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SHOP

MANUAL

KOMATSU

PC100-100L-2

PC120-2

MACHINE MODEL	SERIAL No.
PC100-2	13001 and up
PC100L-2	11001 and up
PC120-2	14001 and up

The affected pages are indicated by the use of the following marks. It is requested that necessary actions be taken to these pages according to the table below.

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○	Page to be newly added	Add
●	Page to be replaced	Replace
()	Page to be deleted	Discard

Pages having no marks are those previously revised or made additions.

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IMPORTANT SAFETY NOTICE

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



SAFETY

GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the Operation and 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

7. Before adding oil or making any repairs, park the machine on hard, level ground, and block the wheels or tracks to prevent the machine from moving.
8. 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.
9. When disassembling or assembling, support the machine with blocks, jacks or stands before starting work.
10. 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

11. 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.
12. 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.
13. Before starting work, remove the leads from the battery. Always remove the lead from the negative (—) terminal first.
14. 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.
15. 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.
16. When removing components, be careful not to break or damage the wiring. Damaged wiring may cause electrical fires.
17. 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.
18. As a general rule, do not use gasoline to wash parts. In particular, use only the minimum of gasoline when washing electrical parts.
19. Be sure to assemble all parts again in their original places.
Replace any damaged parts 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.
20. 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.
21. 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.
22. When aligning two holes, never insert your fingers or hand. Be careful not to get your fingers caught in a hole.
23. When measuring hydraulic pressure, check that the measuring tool is correctly assembled before taking any measurements.
24. 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.

FOREWORD

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 chapters for each main group of components; these chapters are further divided into the following sections.

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 AND ADJUSTING

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.

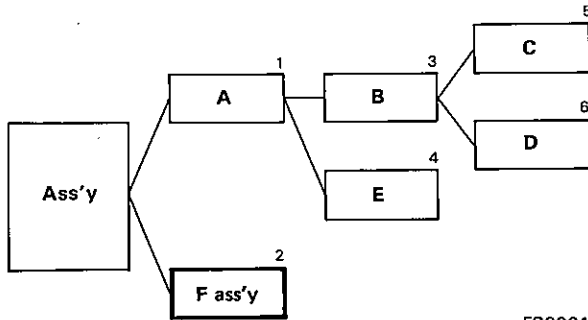
NOTICE

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

HOW TO READ THE SHOP MANUAL

NETWORK (Disassembly and assembly relationship drawings)

In the shop manual the following network drawings show relationship between work items and sequence for assembly and disassembly.



FS0001

In this network the sequence of disassembly is marked on the top right of each work item so that handling can be easily understood. For example, when taking **D** of the Ass'y follow the sequence **A** → **B** → **D**, when removing **E** follow the sequence **A** → **E**.

F ass'y indicates a further separate disassembly, and indicates the existence of a previous work network. For assembly the sequence is shown using the same kind of network.

TROUBLESHOOTING CHART

As shown below, the symptoms relating to a particular trouble are described in the line designated "Problems". The probable cause of the trouble is then marked under the "Causes" column.

Example:

Symptom: Reduced tractive power or slow travel speed.

Problems	Causes	
	Oil leaks in torque converter	Air suction in the hydraulic pump
Torque converter oil pressure gauge shows lower than normal pressure. (normal 3 – 4.8 kg/cm ²)	○	○
Transmission oil pressure gauge shows lower than normal pressure. (normal 20 – 23 kg/cm ²)	○	○
	○	

MAINTENANCE STANDARD

Standard size, Tolerance

The dimensions of finished parts each differ a little. Therefore, when determining the finished dimensions of parts, a dimension that will be standard is determined provisionally, then the difference allowed from it is indicated. The former is called the standard size, and the latter the tolerance.

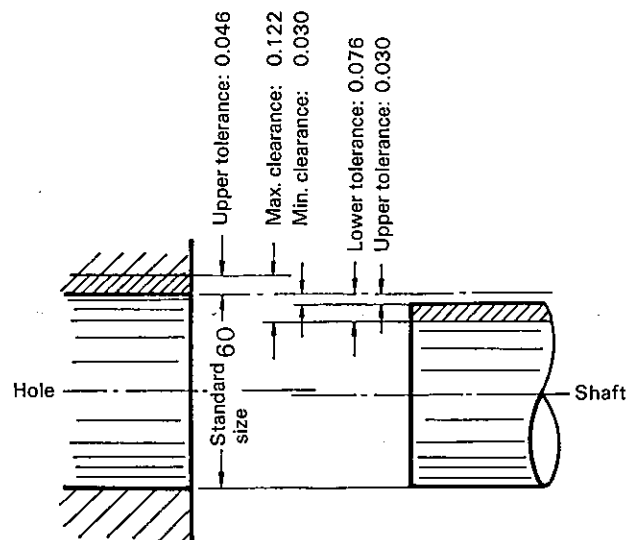
The way to show this is by a plus or a minus sign with the tolerance in smaller numerals to the right of the standard size.

Example: $120 \begin{matrix} -0.026 \\ -0.126 \end{matrix}$
(it equals 119.874 – 119.978 mm)

Moreover, when expressing the dimensions of a hole and the shaft that goes inside it, for the sake of convenience, the standard size for the hole and the shaft are usually taken as the same, and the tolerances changed to indicate the tightness of the fit. For example, the fit of a revolving shaft is indicated as follows, and is shown in the drawing.

Hole: $60 \begin{matrix} +0.046 \\ 0 \end{matrix}$

Shaft: $60 \begin{matrix} -0.030 \\ -0.076 \end{matrix}$



FS0002

HOW TO READ THE SHOP MANUAL

Standard size

This is the standard value at the time of design.

Repair limit

This is the limit in dimensions which the part can be used. When parts exceed the repair limit, they must be repaired or replaced as specified.

Example:

Unit: mm

No.	Check item	Criteria		Remedy
		Standard size	Repair limit	

Standard clearance

This is the clearance between new parts after assembly. It is recorded as a range between minimum clearance and maximum clearance. The clearance is adjusted to this value.

Clearance limit

This is the maximum clearance allowed.

When the clearance exceeds the clearance limit, the parts must be repaired or replaced as specified.

Example:

Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size	Tolerance		Standard clearance		Clearance limit
			Shaft	Hole			

PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

1. PREPARATIONS BEFORE DISASSEMBLY

1. Washing before taking a machine into the repair shop

Thoroughly wash the machine to remove sand, mud and dust before taking it into the shop. Taking a dirty machine into the shop will decrease work efficiency, cause damage to parts, and increase the intrusion of dust and dirt into the machine when it is reassembled.

2. Checking the machine before disassembly

Before disassembly, study the entire disassembly procedure from beginning to end in the reference materials, and carefully check and record the items listed below. This will help to save unnecessary disassembly and parts costs. It will also give clues on how to prevent recurrence of the trouble.

- Machine model, serial number and service meter reading.
- Reason for disassembly. (Symptoms, locations, and cause of trouble)
- Any dirty air cleaner elements or air leakage.
- Properties of fuel used, clogging of fuel filter elements, water mixed in fuel, and leaky or constricted fuel pipes.
- Oil capacities, dirtiness of oils (viscosity, color, and any impurities), water mixed in oil, oil leakage, and any clogging of oil filter elements.
- Tension of the V-belt and tracks.
- Any damaged parts or loose bolts.

3. Preparation for disassembly

Prepare the required facilities, tools, and space for the disassembly work and rack space for storing the disassembled parts. Make sure that they are all clean.

2. PRECAUTIONS FOR DISASSEMBLY AND REASSEMBLY

1. During disassembly

- 1) If the disassembly involves draining oil or lubricants, have containers of suitable capacity on hand. Do not spill any oil or lubricants on the floor.
- 2) Mark the parts clearly to prevent confusion at the time of reassembly.
- 3) For disassembly of certain designated parts, use only the special tool prescribed for that purpose.
- 4) When, after removal of fastening nuts and bolts, a part still can not be removed, never force it. Instead, investigate and correct the cause.
- 5) Maintain disassembled parts in good order for storage, paying special care not to confuse parts that appear similar. Tag them or mark with ink if necessary.
- 6) Store standard parts such as bolts and nuts with reference to where they are to be used and in a manner that will prevent loss.

2. During reassembly

- 1) Thoroughly clean and examine all parts before reassembly. Repair any scratched or dented surfaces.
 - ★ Foreign matter is especially damaging to sliding surfaces, and will greatly decrease their service life.
- 2) Clean new parts to remove any rust preventative coating.

Solvent: Light oil or trichloroethane
- 3) Carefully align any match marks provided.
- 4) Use a press or press-fitting tool to assemble bearings, bushings and oil seals.

3. Checks and inspections during disassembly/reassembly

- 1) During disassembly, watch carefully for evidence of seizing, interference, or improper contact of sliding parts.
- 2) Measure and record end clearances, gear backlashes, protrusions, and the like during the disassembly/reassembly. Quite often they cannot be measured afterwards.

PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

3. DETERGENTS

1. Precautions for cleaning

- 1) Thoroughly clean disassembled parts and group them by unit for storage. Be especially sure to remove sludge from oil holes and pipes.
- 2) Never use dirty solvents to clean important parts.
- 3) Take extreme care with special chemical agents. Observe the manufacturer's handling instructions and take measures to prevent the agent from coming into contact with your skin or eyes.

2. Selection of detergents

Parts	Detergents
Ordinary parts	Kerosene, light oil, or trichloroethane
Finely machined parts (Bearings etc.)	Clean kerosene or neutral dehydrated light oil
Large castings (Cylinder head, cylinder block etc.)	Alkaline detergent, PH10 - 12. (Immerse in 50 - 70°C detergent for 5 - 10 minutes. Then rinse thoroughly with water.)

3. Detergents for washing rubber parts (O-rings, oil seals etc.)

Detergents	Rubber			
	Nitrile rubber	Ester rubber	Silicon rubber	Fluorine rubber
Trichloroethane	○	○	○	○
Trichloroethylene	○	X	X	○
Gasoline	X	X	X	○
Thinner	X	X	X	X
Light oil	○	○	X	○
Steam	○	X	○	○

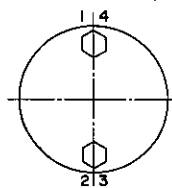
- : Immersion allowed for a short time only
 X: Detergent detrimental to rubber

4. NUTS AND BOLTS

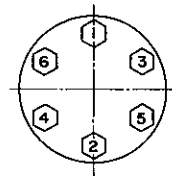
Unless otherwise specified in the DISASSEMBLY AND ASSEMBLY, tighten all bolts to a torque of page 00-29.

- 1) Use bolts having the exact length required for the parts they are to join.
 If too long, the bolt presses against the bottom of the tapped hole; this pressure makes proper tightening impossible. If too short, the bolt lacks the number of threads necessary to hold the parts together.
- 2) Tighten each nut and bolt to the specified torque.
- 3) Tighten bolts evenly and in order.

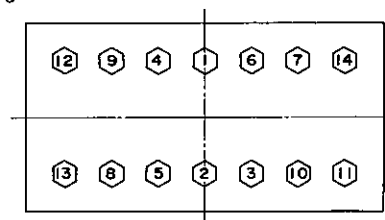
Tighten mutually opposing bolts alternately.



Tighten at an angle.



Tighten from the center outwards and alternate.



FS0003

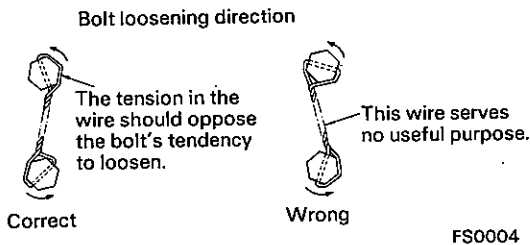
- 4) The Template Method is prescribed for tightening bolts on certain specific parts of the engine.

The Template Method obtains good fittings of bolts with their seats and of bearings with their races to ensure uniform overall tightening. The bolts are tightened in stages, then loosened, and then tightened once more.

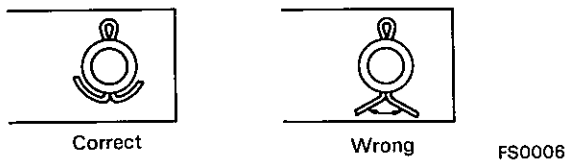
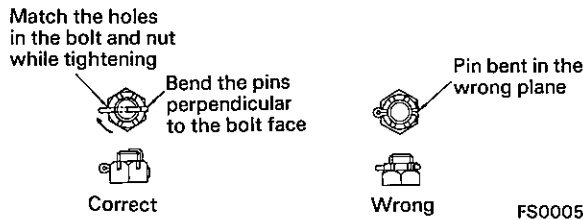
5. HANDLING LOCKING DEVICES

Nuts and bolts which cannot be checked visually from the outside or which are located in vital areas must be firmly locked into position with wires, cotter pins, and lock washers. Never reuse these locking devices.

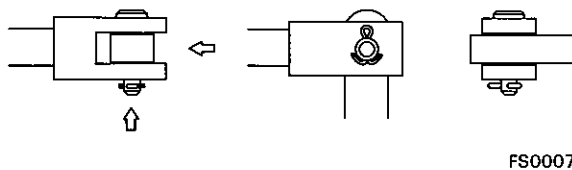
1. Lock wire



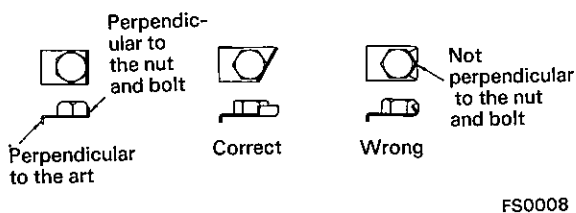
2. Cotter pin



- Bend the head and ends of the cotter pin upwards as far as possible.



3. Lock washer



4. Thread tightener

- 1) Wash and degrease the bolt and bolt hole with trichloroethylene and dry. Coat the bolt threads with two or three drops of thread tightener and tighten the bolts.
- 2) After an hour had passed, the bolt cannot be loosened or tightened any further. If retightening becomes necessary, the bolt must be completely removed, the old thread tightener removed, and a new coat applied.

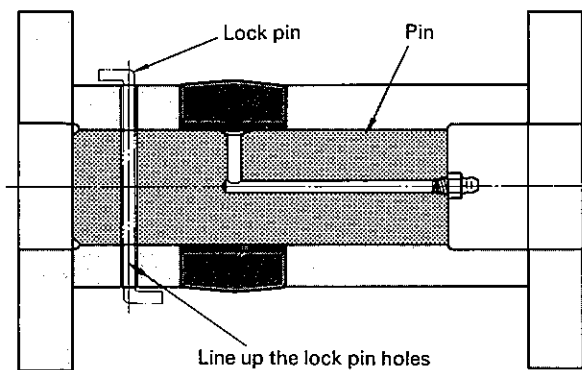
6. PRECAUTIONS FOR PRESS-FITTING

- Coat the surfaces of the parts to be press-fitted with anti-friction grease (molybdenum disulfide) – unless they are tapered.
- For taper spline-to-serration fittings
 - 1) Check that the splines and serrations are free from dust, burr, dents and indentations.
 - 2) Insert and align the splines and serrations by hand before press-fitting the shaft into the hole.
 - 3) If the spline-serration assembly is loose, disassemble and examine for wear. Replace worn parts with new ones.

PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

7. PRECAUTIONS FOR ASSEMBLING THE PIN AND SHAFT

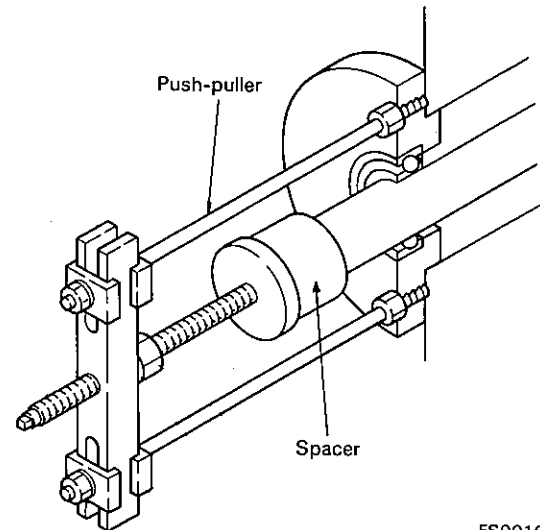
Before reassembling the pin and shaft, check the positions of the locking device and fastening device on the other side. This is especially important when the shaft is retracted from the inside of the hole as illustrated in the accompanying diagram. To ensure proper reassembly, make sure that the lock pin holes coincide.



FS0009

2. Push-puller

When the screw of the push-puller does not reach the surface of the part to be pushed, insert a spacer. It is also a good idea to insert a plate to prevent the head of the screw from damaging the part.

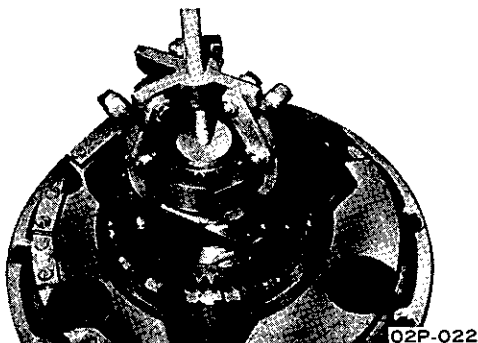


FS0010

8. SERVICE TOOLS

1. Gear puller

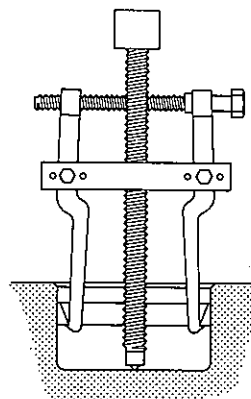
Fit the gear puller over the gear or bearing and tighten the bolt on the gear puller to remove the part from the shaft.



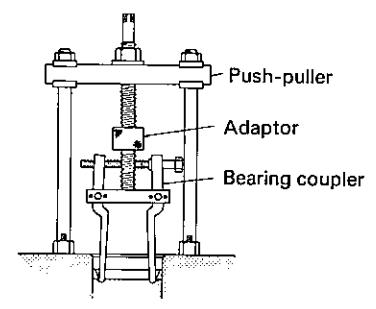
3. Bearing coupler

This can be used two ways:

- 1) When the bottom of the hole is strong enough to withstand the applied force.
- 2) When the bottom of the hole is not strong enough to withstand the applied force.



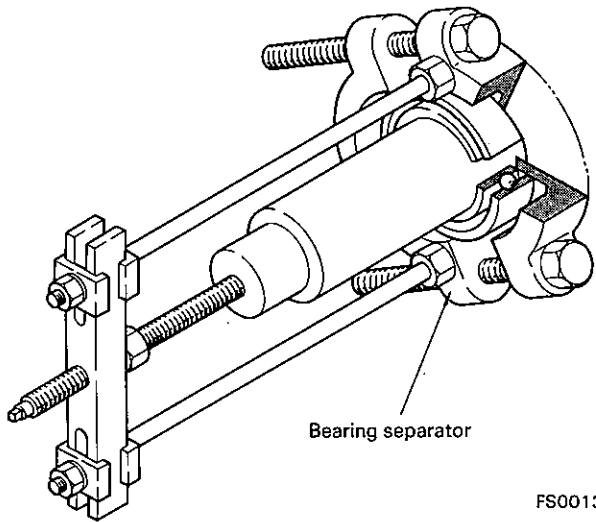
FS0011



FS0012

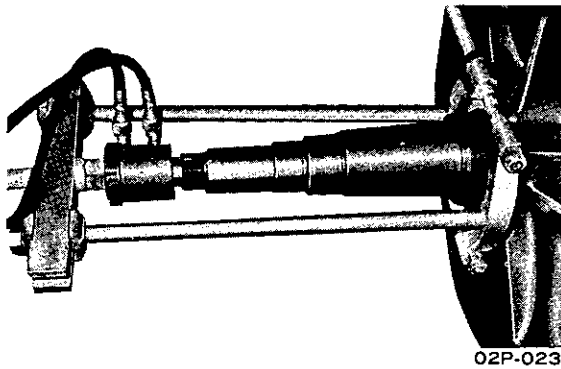
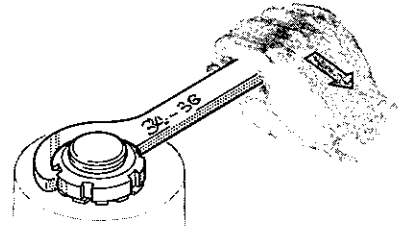
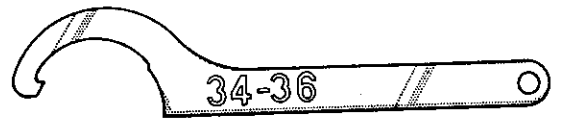
PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

4. Bearing separator

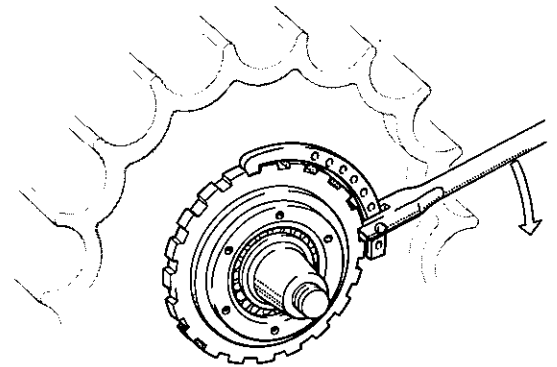


5. Hook wrench

A hook wrench has a claw which hooks into the turning sockets of round nuts. The wrench size is defined by the outer diameter of the round nut turned. The accompanying figure shows a hook wrench designed for use with round nuts of two different sizes.



Removal and Installation of the Sprocket Wheel

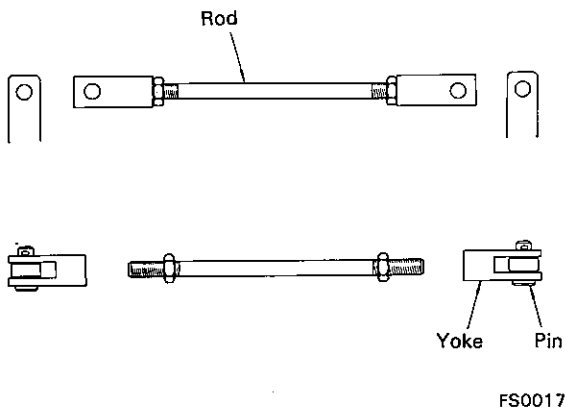


9. CLEARANCE ADJUSTMENTS

Store each set of shims or washers so that they can be installed in their original condition at the time of reassembly.

10. LINK RODS

- 1) If it is necessary to change the length of the link rod in order to remove it, first record the original length so that the rod can be easily reassembled in its original condition.
- 2) Remove the link rod at the pins.

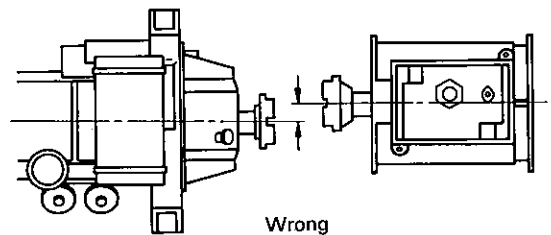
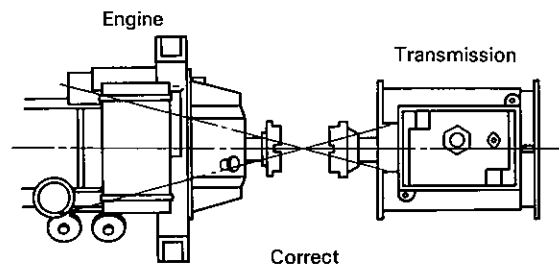
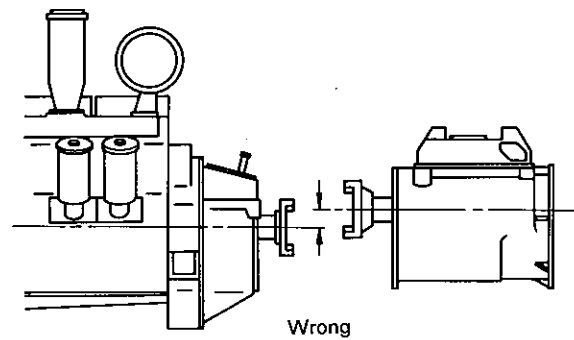
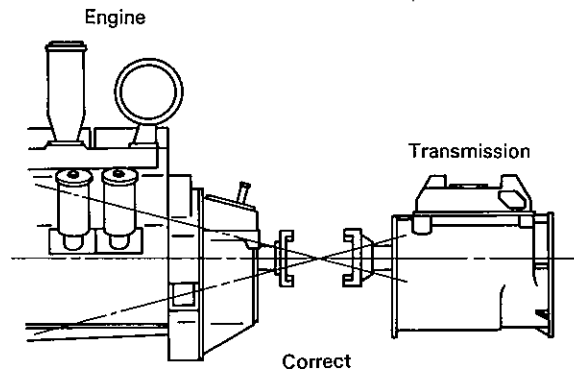


11. SHIMS AND WASHERS

- 1) Shims are used to center the engine and adjust the action of the bevel gears. Handle very carefully as they get deformed easily.
- 2) Record the numbers and positions to speed adjustment after reinstallation.
- 3) Do not reuse any shims or washers that are deteriorated, damaged, bent or deformed.
- 4) Insert thin shims between thicker ones.

12. CENTERING

Centering is very important for interfaces in the power train — for example, between the engine and the transmission and between the transverse axles and the final drives. Incorrect centering only increases the stresses acting on the turning parts, so always make sure that the deviation is within the specified limits.



MEASURING INSTRUCTIONS

PREPARATIONS BEFORE CHECKING

1. Cleaning of parts

Wash parts to be checked. Special care should be paid to thoroughly remove dust and dirt from the surfaces on which measurements are to be made so that possible errors can be eliminated.

2. Minor repair of part surfaces

Remove scratches, dents and rust from parts to be checked. If the surface are rough, the measurements will be inaccurate. When smoothing any surface, be careful not to use an oilstone or sand paper coarser than the finished surface.

3. Preparation of measuring tools

Clean the tools and thoroughly remove dust and dirt from the surfaces which contact parts. Check the tools for proper function and zero-point adjustment. Remedy any abnormality.

4. Maintenance of measuring tools

Handle all tools with sufficient care and do not subject them to unreasonable force or shocks which can affect their delicate construction. Periodically check the tools for accuracy and, if necessary, calibrate them. Put the tools back into their cases and return them to their fixed storage locations whenever not in use. It is recommended to assign a person to be responsible for the proper storage of measuring tools.

MEASURING TOOLS

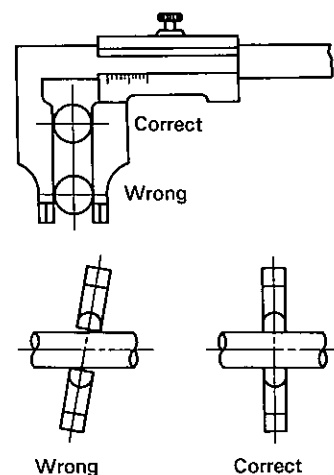
- Repeat each measurement two or three times to eliminate possible errors. Further repetition will be necessary, if there is a large variation in the readings.
- When measuring the inside or outside diameter of a cylindrical object, take two readings with the measuring device put in two directions at right angles to each other. Repeat this at several points along the overall length of the object.
- Along eye-measurement below the unit of a scale may be used for making a comparison between two approximately equal measurements, the accuracy of such eye-measurements should not be considered as reliable.
- At the start of each measurement, select a measuring device having an accuracy appropriate for judging whether the measurement reaches its allowable limit.

BLOCK GAUGES

- To bring two blocks into contact, wash each block with benzene to remove rust-preventing oil and wipe with a clean cotton cloth. Put one block on the other, causing a sliding or twisting movement between the two.
- If the contact between two blocks feels rough, apply a fine-grade oilstone to the blocks along their edges. (Do not try to rub the contact surface of the blocks.)
- Do not leave the blocks in contact for a long time. Long-time contact will make the blocks difficult to separate or cause black rust to appear on the contact surfaces.
- When separating two blocks, slide or twist them. Do not try to pull them apart, by force or strike them with a mallet.
- When storing a block gauge, wipe off moisture, dirt and fingerprints, coat with a rust-preventing lubricant such as vaseline, and put the gauge back in its case.

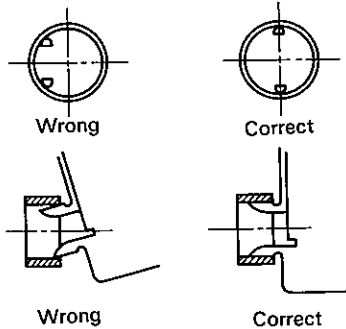
VERNIER CALIPERS

- At the start of measurement, close the jaws and check that there is no clearance (due to wear) between the jaws and that the "zero" point of the graduation is in exact alignment with the "zero" point of the vernier scale.
- Measuring an outer diameter



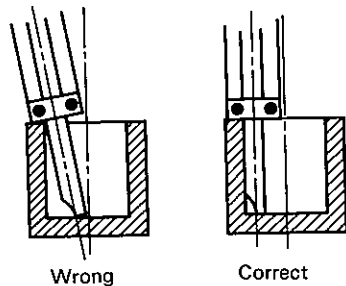
MEASURING INSTRUCTIONS

● Measuring an inner diameter



FS0020

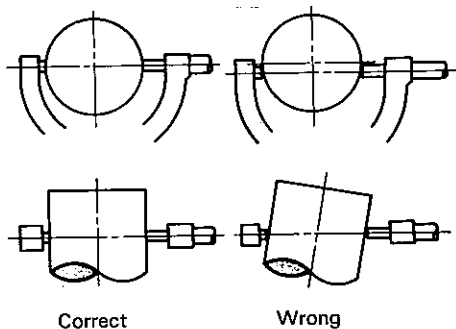
● Measuring a depth



FS0021

MICROMETERS

- Put the anvil onto an object at a right angle and turn in the spindle until it comes into contact with the object. Rotate the ratchet stop until there are two or three idle rotations, then read the measurement.
- When reading a measurement, keep your eyes at a right angle to the graduation on the sleeve.
- To turn back the spindle, rotate the thimble with your fingers.

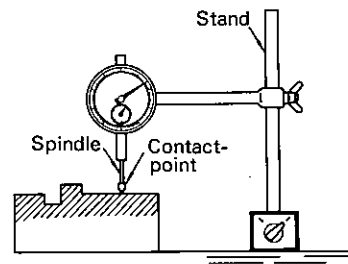


FS0022

- When storing a micrometer, leave a slight clearance between the anvil and the spindle.

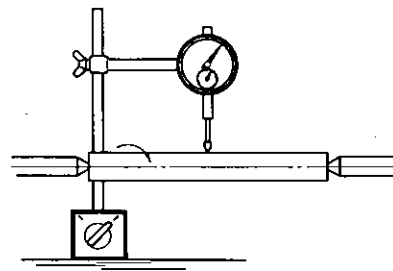
DIAL GAUGES

- Carefully put the gauge contact-point on a surface to be measured to protect the delicate gauge against shock.
- Set the zero-point of the gauge with care to keep the movement of the contact-point within its stroke during measurement.
- Careless setting of the zero-point may cause the spindle to retract or extend to its limit, thus making measurement impossible.
- The measurements of the dial gauge are accompanied by relatively large errors because minute variations of the contact-point (and accompanying errors) are indicated by the dial pointer through an expanding mechanism using gears. The reliability of eye measurements can not be assured below the minimum unit on the scale.
- **Measuring protrusions, depressions or steps**
Set the zero-point so that vertical movement of the probe does not exceed its stroke limits, and slide the base of the gauge on a flat surface.



FS0023

● Measuring bending

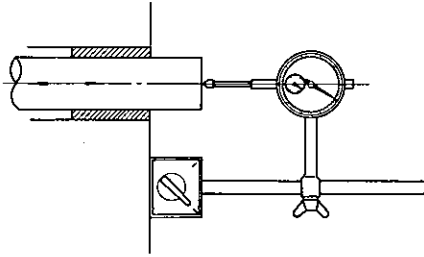


FS0024

Read the Total Indicator Reading (T.I.R.) while moving the object back and forth or vertically. Turn the object one complete rotation and read the difference between the maximum and minimum indications of the gauge pointer.

MEASURING INSTRUCTIONS

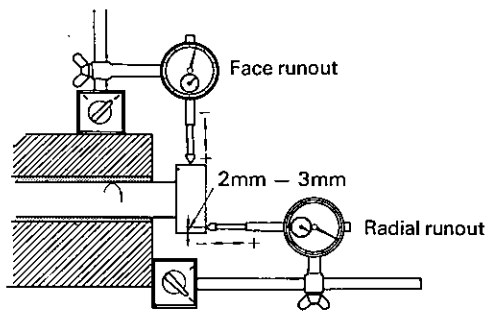
• Measuring end play, looseness or deviation



FS0025

Read the T.I.R. while moving the object back and forth or vertically.

• Measuring face runout or radial runout



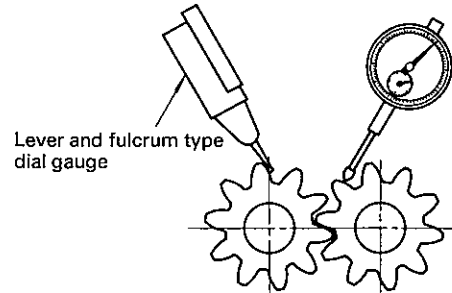
FS0026

- 1) Read runout at six or more positions during one complete rotation of the object.
- 2) At the start of each measurement, set the zero-point at the middle of the assumable range of the spindle movement. Be careful not to confuse positive and negative readings of runout.

	Face runout	Radial runout
When the pointer is to the right of "0"	+	-
When the pointer is to the left of "0"	-	+

- 3) When measuring face runout, place the contact-point on the object along a circle 2 or 3 mm smaller in diameter than the outside diameter of the object.

• Measuring gear backlash

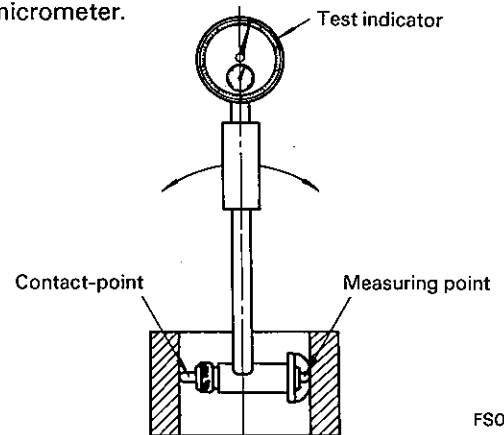


FS0027

- 1) Fully mesh one of two gears and place the dial gauge contact-point on a tooth of the other gear. Swing the free gear within the limits of its play in the rotational directions, and read the T.I.R.
- 2) Use of the lever and fulcrum type dial gauge is recommended for this purpose as the contact-point placed on the gear is moved tangentially to the gear pitch circle.
- 3) The lever and fulcrum type dial gauge is suitable for use in a narrow space or for a special measurement which requires placing the contact-point on an object at an angle to the spindle of the gauge.
Since the contact-point of this type of gauge has a very narrow measuring range (usually 3 mm or less), the contact-point should be carefully checked for contact with the object during measurement.

CYLINDER GAUGES

- Install a contact-point having a length approximately equal to the cylinder bore to the measured on the cylinder gauge. Set the zero-point of the test indicator to the bore diameter of the standard cylinder measured with a reference ring gauge or a micrometer.



FS0028

PARTS CHECKING INSTRUCTIONS

- Insert the gauge into the bore to be measured and read the minimum indication of the test indicator while giving swings to the gauge about the tip of the detachable rod used as the fulcrum.
- When the minimum reading is obtained on the right side of the zero point of the test indicator, and the reading to the standard value to which the zero point is set.
When the minimum reading is obtained on the left side of the zero point, subtract the reading from the standard value.

PARTS CHECKING INSTRUCTIONS

- Check disassembled parts to see if they are reusable or need repair. If the part failed due to an external source, determine the cause and correct before assembly.

1. GENERAL PRECAUTIONS

- Visually inspect parts for cracks, pitting, corrosion, scoring, ridging etc. To ensure proper inspection, every part should be clean before inspection.
- If the cause of the defect can be found, it will be a great help to analyze the part condition; whether the defect will progress or not, and the possibility of future trouble.
Knowing the cause of the defect, the service man can give good advice to the customer to prevent him from having the same trouble again.
- Visual inspection can not find minute or hidden damage. Other methods of inspection are as follows;
 - a) Water-pressure or air-pressure test
 - b) Cold check or magnetic damage test

2. CRACKS

- If the part is found to be cracked by visual inspection, it should be replaced or repaired.
- If the length or depth of crack exceeds 1/3 of the thickness of the part, it should be replaced instead of repaired.
- A part having an internal crack should be replaced.

3. PITTING

1) Pitting by cavitation

In most cases, cavitation is accompanied by chemical corrosion. After removing rust or scale, carefully inspect the depth of pitting.

- When the pitting can not be repaired within the allowable limit, replace the part.
- If pitting is not deep, resurface the part after removing the rust and scale.

2) Pitting due to removal of surface

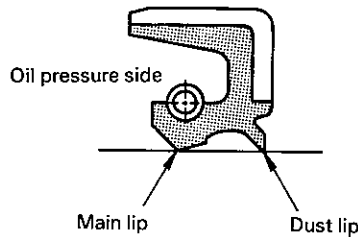
- If ball bearing is pitted, replace it.
- If more than 1/3 of the contact face is pitted, the part should be replaced.
- If pitting is not serious, resurface the part.

THE PARTS HANDLING

1. OIL SEALS

1. Direction

Be careful to install the oil seal with its lips facing in the proper direction, as shown in the figure below.



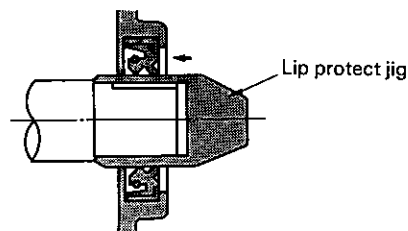
FS0029

2. Inspection prior to installation

- 1) Keep the oil seals free from dust, rust and scratches.
Take special care to prevent rust or scratches on the lips.
- 2) To check the oil seal lip for smoothness, gently slide a wire across its surface. If the wire catches, replace the oil seal with a new one.
★ Make sure that the wire used for this test does not scratch the lip surface.
- 3) Do not use the oil seal on a shaft where it would come into contact with rust or scratches on the shaft surface.
- 4) When removing the oil seal, take care not to damage the housing or shaft surfaces.

3. Installing the oil seal

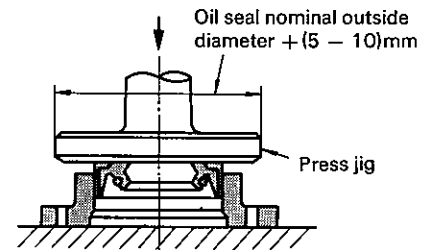
- 1) Coat the surface to which the oil seal is to be applied with a lubricant or grease.
★ If the lip should double over as the oil seal is being fitted over the shaft, return it to its proper place by rotating the shaft and pulling the oil seal slightly backwards.
- 2) When installing an oil seal on a shaft machined with a keyway, splines, or threads, use a suitable jig to protect the lip.



FS0030

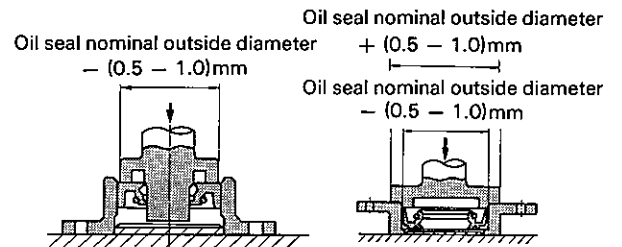
- 3) Use a suitable press to press fit the oil seal into the housing.

- When installing the oil seal flush with the housing surface ...



FS0031

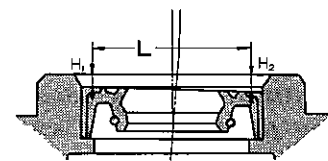
- When installing the oil seal inside the housing ...



FS0032

FS0033

- 4) After press-fitting the oil seal, check that it has not been installed at an angle to the housing.



Max. permissible oil seal slant
 $(H_2 - H_1)/2 \leq 1/400$

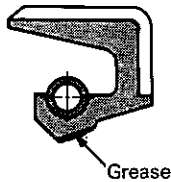
FS0034

4. Applying grease to the lips

Before installing an oil seal, coat it with grease according to the following procedure to prevent friction from burning the seal surfaces while the machine is being started.

1) Single-lip oil seal

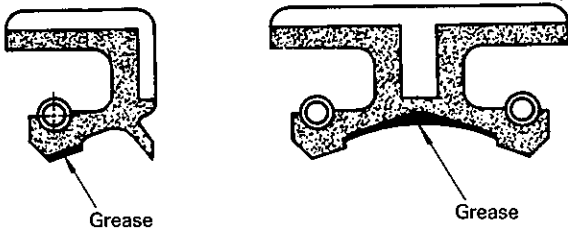
Place a flat, uniform coating of grease on the surface away from the sealing surface.



FS0035

2) Double-lip oil seal

Coat the entire surface between the two lips with grease in the manner shown in the accompanying figures.



FS0036

5. Applying adhesives

Take special care when applying adhesives to the outer surface of oil seals. Adhesive on the surface of the lip or shaft leads to oil leakage.

★ Since any adhesives on the surface of the press jig will soon transfer to the oil seal lips, clean the jig before use.

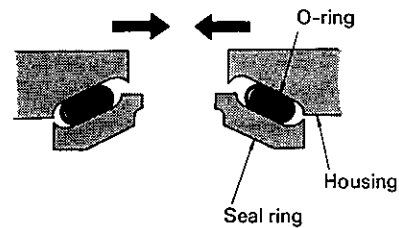
2. FLOATING SEALS

1. Handling floating seals

- 1) Keep each pair of floating seals bundled together with tape to avoid mix-ups when they are reinstalled.
- 2) Discard the old O-rings. Always use new ones when installing the floating seals.
- 3) Replace a floating seal if its contact surface is rusted.

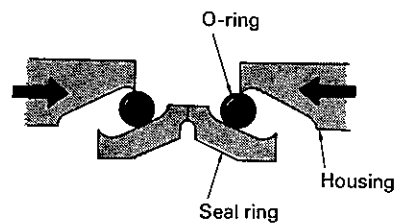
2. Installing floating seals

- 1) Remove all rust and dust from the mounting surfaces of the seal. Use sandpaper to remove any rust that might come into contact with the O-ring.
- 2) When installing the floating seal, coat the mounting surfaces with oil. Then install the O-ring, taking care not to twist it.
★ Do not coat the O-ring with oil.
★ The floating seal has been correctly installed if the seal ring rotates.
- 3) After installing the O-ring and seal rings in both housings, mate the two together.



FS0037

- 4) An installer is recommended for inserting the O-rings.
★ Using a screwdriver or other pointed object risks scarring the O-ring.
- 5) Attempting to mate the two housings together without the O-rings and seal rings in place can damage the O-rings and lead to oil leakage.



FS0038

3. O-RINGS

1. Handling

- 1) Discard any O-ring that has been in storage too long or has hardened.
- 2) Use only the O-rings prescribed for the part in the PARTS BOOK. This is especially important for those rings used with high-temperature engine parts, where heat-resistant and durable materials such as silicon are required.
- 3) ALWAYS USE NEW O-RINGS.

2. O-ring types

KOMATSU O-rings are marked with colored dots as shown in the accompanying chart.

Marking	Part Number	Material	Application
One blue spot	07000-0	Nitrile rubber	For low-pressure
Two blue spots	07000-1	Nitrile rubber	For high-pressure
One green spot	07000-3	Fluorine rubber	For low-pressure
Two green spots	07000-2	Fluorine rubber	For high-pressure
One red spot	07000-4	Nitrile rubber	For low-pressure in cold weather
Two red spots	07000-5	Nitrile rubber	For high-pressure in cold weather
Orange spot	07000-6	Silicon rubber	For low-pressure in hot weather

3. Inserting O-rings

After coating the O-ring with oil, insert carefully so as not to damage it. Silicon rubber O-rings require special care since they tear easily.

4. GASKETS

1. Handling gaskets

- 1) Always replace packings, gaskets and copper packings with new ones.
- 2) Make sure that there are no scratches or burr on the contact surfaces of the gasket.

2. Installing gaskets

- 1) Make sure that the holes in the gasket match those in the mating part.
- 2) Apply liquid gasket for the joints so specified in the SHOP MANUAL.

3. Precautions for using liquid gasket

- 1) Remove all scratches, dirt, paint, grease and old liquid gasket before applying a new coat.
- 2) Coat the specified area evenly and let dry for several minutes.
- 3) Assemble the mating parts when the liquid gasket is sticky to the touch.

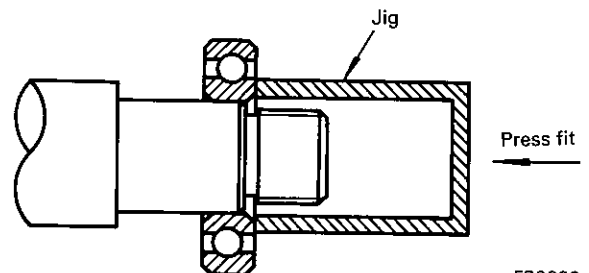
5. BEARINGS

1. Handling bearings

- 1) Shield the bearings from dust and dirt; even the tiniest speck rapidly accelerates wear.
 - ★ Leave the bearings in their protective packaging until just before they are to be installed.
- 2) Protect a bearing from excessive force and shocks.
 - ★ Never dry a bearing with compressed air after cleaning.

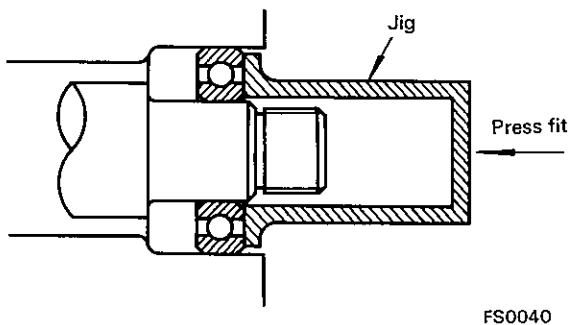
2. Installing bearings

- 1) Never drive a bearing onto a shaft by pounding on the outer race or into an opening by pounding on the inner race. Such pounding produces dents in the tracks in the races.
- 2) When a bearing must be fitted onto a shaft with some interference, press-fit the inner race with the jig shown in the accompanying figure.

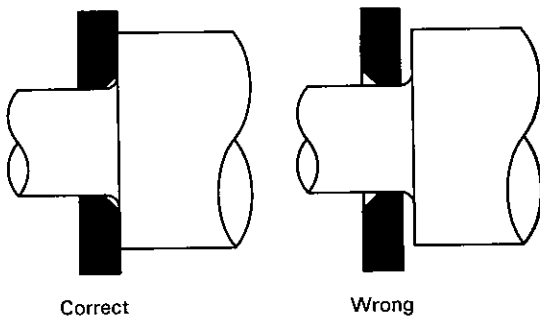


FS0039

- 3) If the shaft of opening has considerable interference, heat the bearing before installing.
★ Do not heat above 120°C.
- 4) When a non-separable bearing must be fitted with interference for both races, press-fit with the jig shown in the accompanying figure.



- 5) Thoroughly coat the bearing with oil before installing.
- 6) Install the bearing, spacer or washer with its chamfered surface facing the step on the shaft.

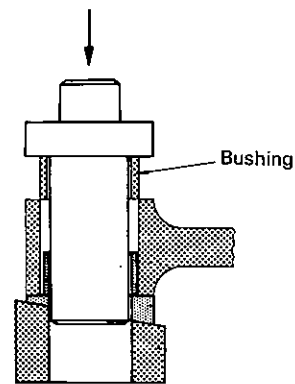


FS0041

6. PRESS-FITTING BUSHINGS

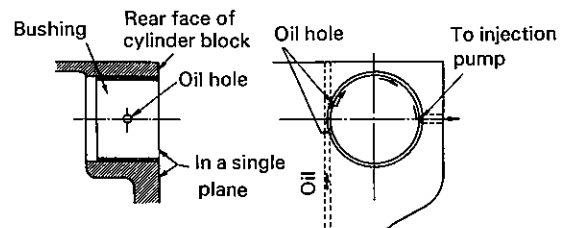
Do not drive in a bushing directly with a hammer. Use a press so that pressure is uniform over the entire circumference.

- 1) If no press is available, hammer in the bushing using a driving tool so that the force is distributed evenly.



FS0042

- 2) If the bushing has an oil hole, bring the hole into exact alignment with the oil hole in the housing.



FS0043

- 3) When a bushing has been removed, remove all burrs and foreign matter from the mounting hole, and then clean.

7. REMOVING SNAP RINGS

- 1) Use snap ring pliers to remove or install snap rings. Do not overexpand them—especially the smaller ones.
- 2) After installing, check to make sure that the snap ring is firmly in place within its groove.

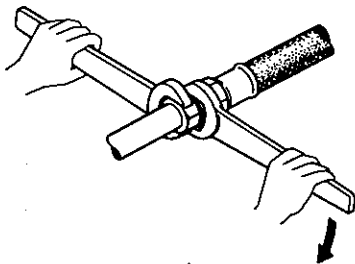
8. HYDRAULIC PIPING

 **Precautions for servicing the work equipment hydraulic system**

- 1) Lower the work equipment to the ground and turn off the engine.
- 2) Loosen the oil filler cap to relieve pressure in the hydraulic oil tank.
- 3) Operate the control levers 2 or 3 times to eliminate hydraulic pressure remaining in the piping to be disassembled.
- 4) Support the work equipment on a stand to prevent it from falling when the piping is removed and the hydraulic pressure is released.

1. Removing the hydraulic piping

- 1) Disconnect hydraulic tubes from hoses or other tubes by holding the nut on the spigot (the male side of the joint) with a wrench while loosening the one on the socket (the female side).

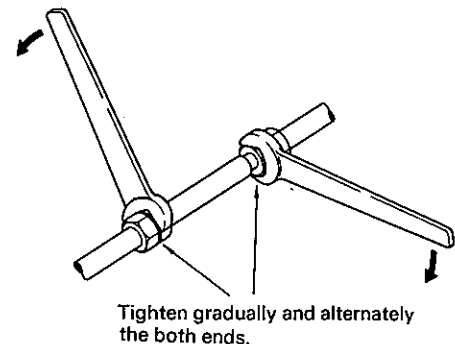


FS0044

- 2) Seal the ends of the disconnected tubes and hoses and the oil ports to the hydraulic equipment with blind plugs to keep out foreign matter. For the same reason, seal the ports of the hydraulic tank with adhesive tape.
- 3) Have appropriately-sized containers underneath to catch the hydraulic fluid that will flow out when the piping is disconnected. Clean up all spills immediately.
- 4) When working under the machine, position yourself out of the way of the oil shower.
- 5) Tag the ends of all piping removed as well as the ports to which they were attached.

2. Installing the hydraulic piping

- 1) Thoroughly clean each piece of piping with a suitable detergent (for example, light oil, kerosene, trichloroethane) and remove all traces of detergent with compressed air.
- 2) Repair the sealing faces or, if the scratches and dents are too large, replace.
- 3) Do not use liquid gasket for hydraulic piping!
- 4) Install the piping so that all the identification tags match.
- 5) When a pipe must be joined at both ends, tightening only one end at a time may make it too short. First fit both ends by hand and then tighten the ends by turns. (See figure.)



FS0045

- 6) To ensure tight-fitting seals, tighten the nuts to 80% of the specified torque, loosen 90°, and then tighten to the full torque.
- 7) After completing all connections, run the engine at idling speed and operate all the control levers of the hydraulic attachments. Then check the oil level in the hydraulic tank and add oil as necessary.

THE PARTS HANDLING

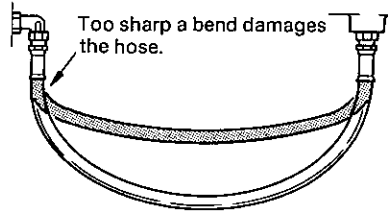
3. Handling high-pressure hoses

- 1) Do not try to shorten the hose. A hose shorter than the specified length is subject to the defects shown in the accompanying figures.

Shorting under pressure increases the tension.



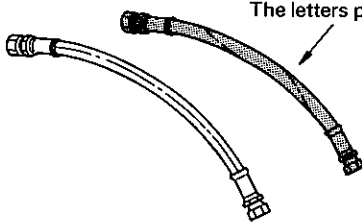
FS0046



FS0047

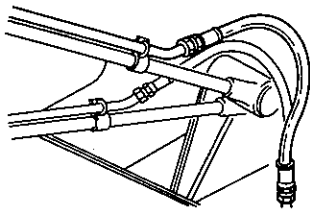
- 2) Make sure the hose is not twisted after it is installed.

The letters printed on the hose soon reveal any twists.

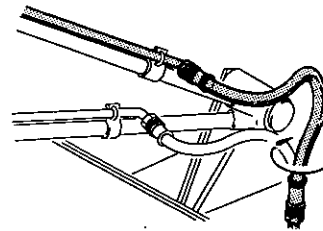


FS0048

- 3) Similarly, the hose must not twist as it moves.



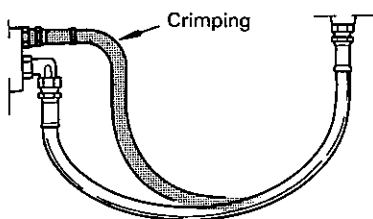
FS0049



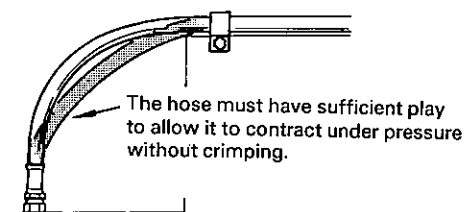
Improper connection causes the hose to twist as the pipe moves.

FS0050

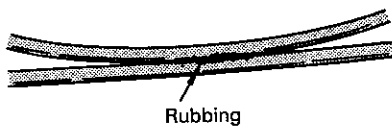
- 4) The last figures on this page are examples of poor connections.



FS0051



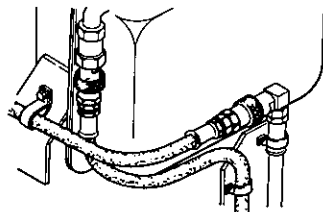
FS0052



FS0053

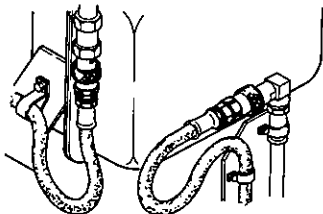
4. Handling hoses with self-seal couplings

- 1) Do not attempt to connect or disconnect or coupling without first relieving the internal hydraulic pressure.
 - ★ The gushing hydraulic fluid will not only soil the surroundings, but the high flow rate may also damage the O-ring of coupling.
- 2) Never use a hammer to tighten or loosen a coupling.
 - ★ Such sharp blows can deform the coupling, leading to oil leakage or cracking of the coupling.
- 3) Protect the disconnected piping from the intrusion of dust and dirt! If it is to remain disconnected for some time, seal by connecting to another coupling or by fitting a dust cap or a blind plug to each end.



FS0054

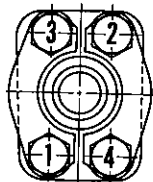
During storage



FS0055

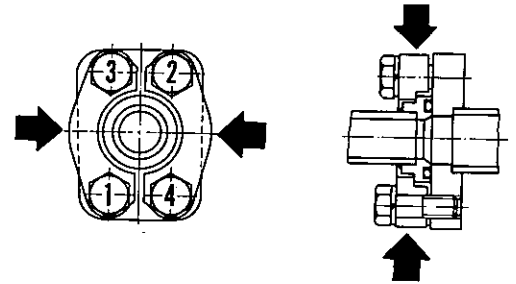
5. Handling split flanges

- 1) Follow the bolt tightening sequence given in the figure.



FS0056

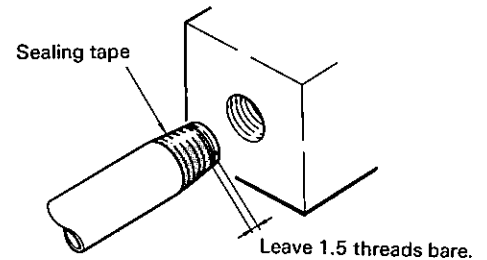
- 2) Press the two halves completely together and tighten them uniformly. If they are not held tightly together, they will separate by a distance equivalent to the clearance between the fastening bolts and their holes, forming a pathway for oil leakage.



FS0057

6. Using sealing tape

- 1) To prevent oil leakage, wind sealing tape around the tapered thread before inserting the plug into the plug hole.
- 2) Wrap all but the first 1.5 threads at the tip and then force the tape into the threads with a fingernail. Wind the tape in the same direction as the threads.

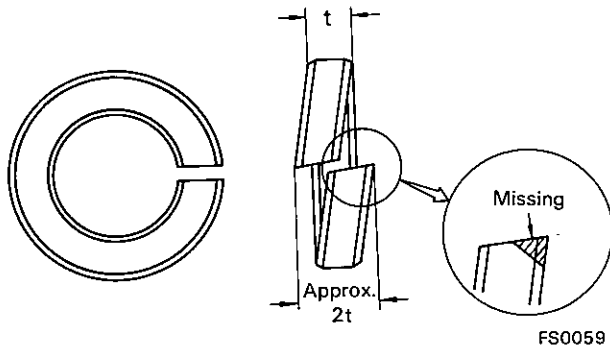


FS0058

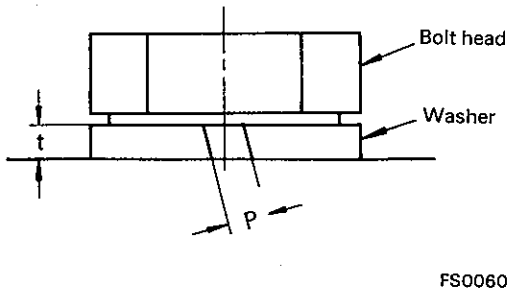
9. SPRING WASHERS

Judging suitability

- 1) Discard the spring washer if the overlapping portion is worn or damaged.



- 2) Discard if the distance P is more than $2t/3$.



10. SPRING (ROLL) PINS

Handling spring pins

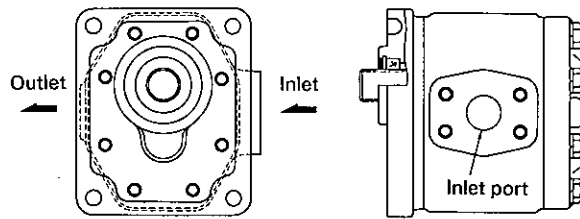
- 1) A spring pin performs somewhat better when the split is placed facing the load instead of at a right angle to the load.



FS0061

11. PUMP

- 1) After assembly and before installation, fill the pump with oil through the intake port to provide initial lubrication.
- 2) Before installing the pump, turn the drive shaft by hand to make sure that it turns smoothly without any catching.



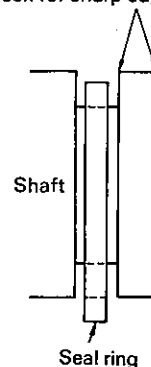
FS0062

- 3) Test run the installed pump and check for unusual noises and leakage.

12. SEAL RINGS

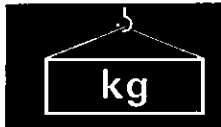
- 1) Seal rings are very delicate, so handle and store carefully.
- 2) Do not reuse rubber seal rings.
- 3) Avoid excessive stretching when fitting a seal ring over a shaft; it decreases the ring's performance.
- 4) Remove all sharp edges before fitting a seal ring into a slot on an abutment.

Check for sharp edges and scratches



FS0063

HOISTING INSTRUCTIONS



⚠ 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 kg

1. If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:

- Check for removal of all bolts fastening the part to the relative parts.
- Check for existence of another part causing interference with the part to be removed.

2. Wire ropes

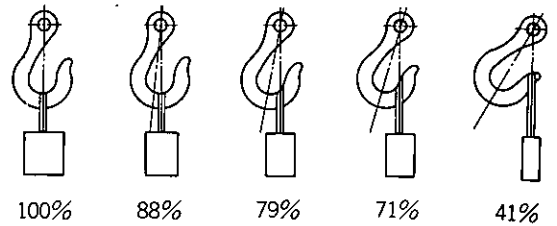
1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

Wire ropes (Standard "Z" or "S" twist ropes without galvanizing)	
Rope diameter (mm)	Allowable load (tons)
10	1.0
11.2	1.4
12.5	1.6
14	2.2
16	2.8
18	3.6
20	4.4
22.4	5.6
30	10.0
40	18.0
50	28.0
60	40.0

The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.

2) Sling wire ropes from the middle portion of the hook.

Slinging 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.



FS0064

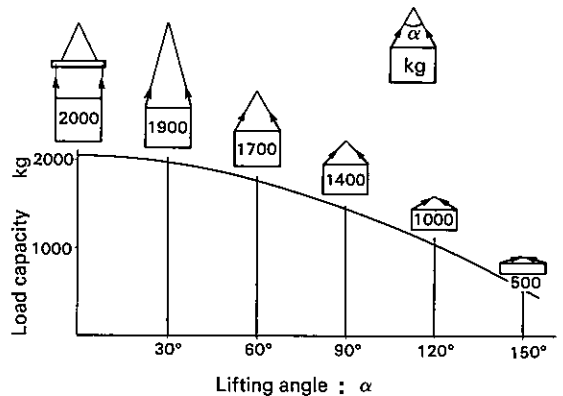
3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.

⚠ Slinging 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 subjected to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.



FS0065

HOISTING INSTRUCTIONS

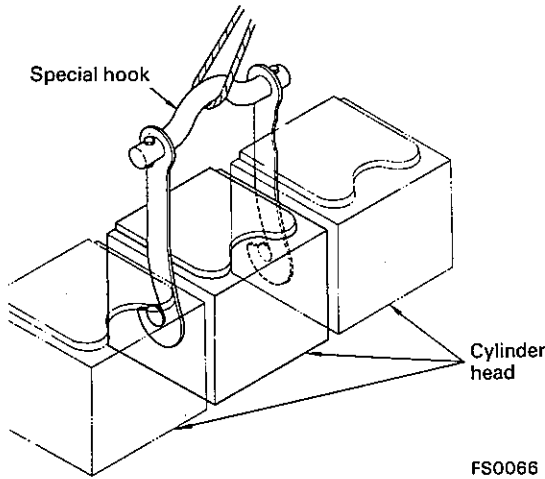


- Approximate reduction of allowable load for wire ropes at various hanging angles.

Hanging angle	Reduction in %
30° or less	10%
31° – 60°	20%
61° – 90°	30%
91° – 120°	50%

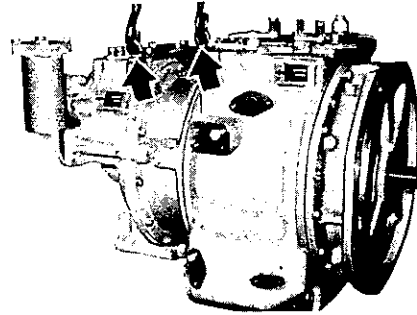
Hanging angles should not exceed 150°.

- 5) When hoisting several parts as a unit, be careful not to allow any part of the unit to fall. Use a suitable container when hoisting many small parts at a time.
- 6) Select the most suitable sling device when hoisting a specially-shaped object.

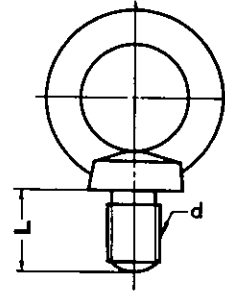


- 7) When using a hoist to turn over a heavy part, observe the following instructions:
 - Clear as much of the area surrounding the part as possible.
 - When turning the part over, take special care to prevent the ropes from slackening and the part from slipping when the center of gravity changes.
 - Gradually slacken the wire ropes after making sure that the part is completely turned over. Slackening the ropes before complete turning of the part may cause the part to fall back to its original position.

3. Hanging bolts



02P-021



FS0067

Part Number	d	Pitch	L	Allowable load (kg)
04530-0815	8	1.25	15	80
04530-1018	10	1.5	18	150
04530-1222	12	1.75	22	220
04530-1628	16	2.0	28	450
04530-2030	20	2.5	30	630
04530-2438	24	3.0	38	950
04530-3045	30	3.0	45	1500
04530-3655	36	3.0	55	2300
04530-4625	46	3.0	25	3400
04530-4870	48	3.0	70	4500



★ The allowable load in the table means the maximum static load which the bolt can withstand. The values of allowable load given in the table should be reduced, taking the necessary safety factors into consideration, as these bolts will be subjected to shocks during actual hoisting operation. The allowable loads in the table are applicable to the bolts slung vertically from a hoist.

STANDARD TIGHTENING TORQUE



1. STANDARD TIGHTENING TORQUE OF BOLTS AND NUTS

The following charts give the standard tightening torques of bolts and nuts. Exceptions are given in sections of "Disassembly and Assembly".

Thread diameter of bolt (mm)	Width across flat (mm)		
		kgm	Nm
6	10	1.35 ± 0.15	13.2 ± 1.4
8	13	3.2 ± 0.3	31.4 ± 2.9
10	17	6.7 ± 0.7	65.7 ± 6.8
12	19	11.5 ± 1.0	112 ± 9.8
14	22	18.0 ± 2.0	177 ± 19
16	24	28.5 ± 3	279 ± 29
18	27	39 ± 4	383 ± 39
20	30	56 ± 6	549 ± 58
22	32	76 ± 8	745 ± 78
24	36	94.5 ± 10	927 ± 98
27	41	135 ± 15	1320 ± 140
30	46	175 ± 20	1720 ± 190
33	50	225 ± 25	2210 ± 240
36	55	280 ± 30	2750 ± 290
39	60	335 ± 35	3280 ± 340

This torque table does not apply to the bolts with which nylon packings or other non-ferrous metal washers are to be used, or which require to tighten to otherwise specified torque.

★ Nm (newton meter): $1 \text{ Nm} \approx 0.1 \text{ kgm}$

2. TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

Use these torques for split flange bolts.

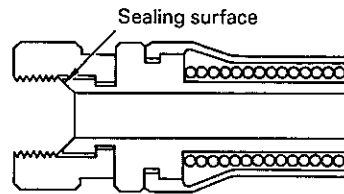
Thread diameter of bolt (mm)	Width across flat (mm)	Tightening torque	
		kgm	Nm
10	14	6.7 ± 0.7	65.7 ± 6.8
12	17	11.5 ± 1	112 ± 9.8
16	22	28.5 ± 3	279 ± 29

STANDARD TIGHTENING TORQUE



3. TIGHTENING TORQUE FOR NUTS AT FLARED

Use these torques for nut part of flared.



FS0068

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



COATING MATERIALS

The recommended coating materials prescribed in Komatsu Shop Manuals are listed below.

Nomenclature	Komatsu code	Applications
Adhesives	LT-1A	Used to apply rubber pads, rubber gaskets, and cork plugs.
	LT-1B	Used to apply resin, rubber, metallic and non-metallic parts when a fast, strong seal is needed.
	LT-2*	Preventing bolts, nuts and plugs from loosening and leaking oil.
	LT-3	Provides an airtight, electrically insulating seal. Used for aluminum surfaces.
Liquid gasket	LG-1	Used with gaskets and packings to increase sealing effect.
	LG-3	Heat-resistant gasket for precombustion chambers and exhaust piping.
	LG-4	Used by itself on mounting surfaces on the final drive and transmission cases. (Thickness after tightening: 0.07 – 0.08 mm)
	LG-5	Used by itself to seal grease fittings, tapered screw fittings and tapered screw fittings in hydraulic circuits of less than 50 mm in diameter.
Antifriction composition (Lubricant including molybdenum disulfide)	LM-P	Applied to bearings and taper shafts to facilitate press-fitting and to prevent sticking, burning or rusting.
Grease (Lithium grease)	G2-L1	Applied to bearings, sliding parts and oil seals for lubrication, rust prevention and facilitation of assembling work.
Vaseline	—	Used for protecting battery electrode terminals from corrosion.

*LT-2 is also called LOCTITE in the shop manuals.

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 sprite.

CLASSIFICATION BY THICKNESS

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)	Applicable circuit
	Number strands	Dia. of strands (mm)	Cross section (mm ²)			
01	11	0.32	0.88	2.4	12	Starting, lighting, signal etc.
02	26	0.32	2.09	3.1	20	Lighting, signal etc.
05	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		Starting	Charging	Lighting	Signal	Instrument	Other
	Classification							
1	Primary	Code	B	W	R	G	Y	L
		Color	Black	White	Red	Green	Yellow	Blue
2	Auxillary	Code	BW	WR	RW	GW	YR	LW
		Color	Black & White	White & Red	Red & White	Green & White	Yellow & Red	Blue & White
3		Code	BY	WB	RB	GR	YB	LR
		Color	Black & Yellow	White & Black	Red & Black	Green & Red	Yellow & Black	Blue & Red
4		Code	BR	WL	RY	GY	YG	LY
		Color	Black & Red	White & Blue	Red & Yellow	Green & Yellow	Yellow & Green	Blue & Yellow
5		Code	—	WY	RG	GB	YL	LB
		Color	—	White & Yellow	Red & Green	Green & Black	Yellow & Blue	Blue
6		Code	—	WG	RL	GL	YW	
		Color	—	White & Green	Red & Blue	Green & Blue	Yellow & White	

1

2

3

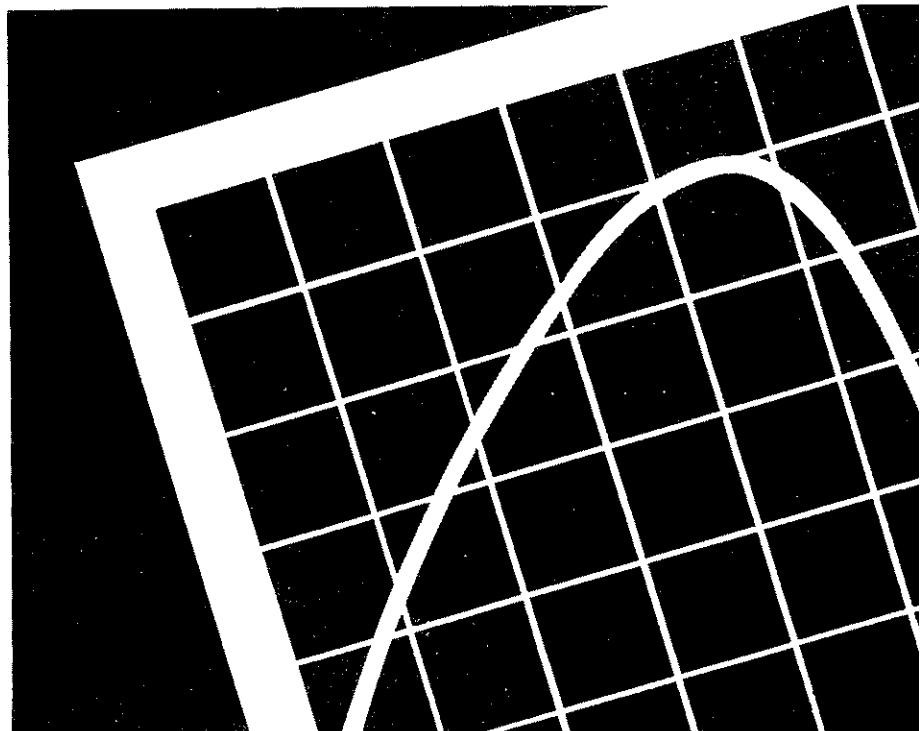
4

SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up

01 GENERAL

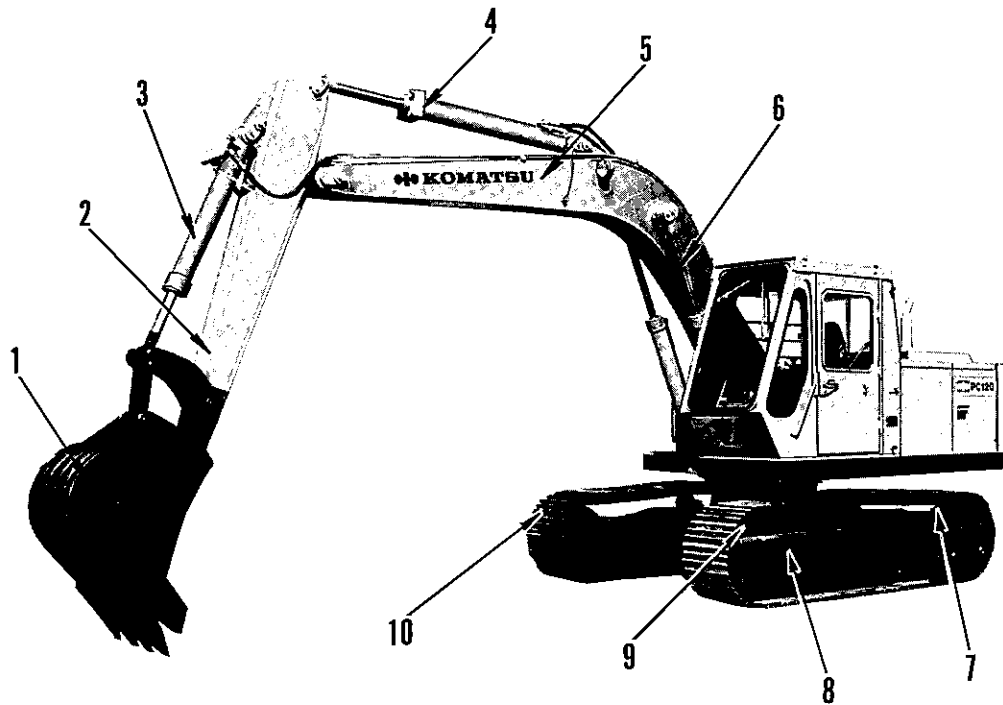




GENERAL

General view	01- 4
General assembly drawing	01- 5
Specifications	01- 8
Engine locations	01-10
List of weight	01-12
List of lubricant and water	01-14

GENERAL VIEW



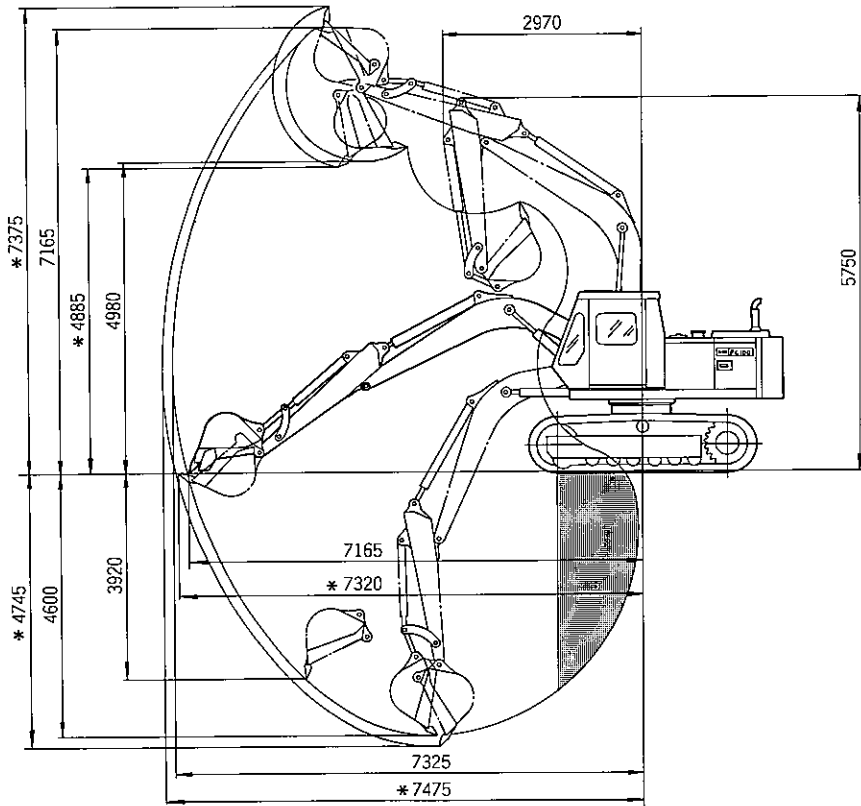
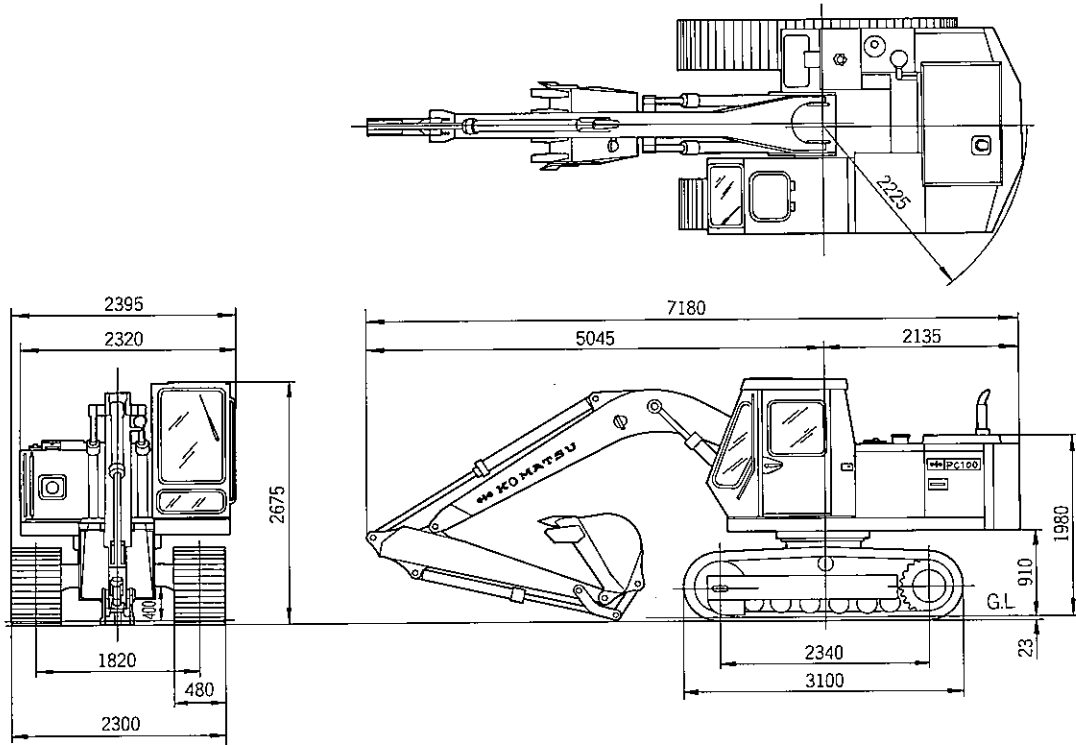
203P401

Note: This photograph shows PC120-2.

1. Bucket
2. Bucket cylinder
3. Arm
4. Arm cylinder
5. Boom
6. Boom cylinder
7. Sprocket
8. Track frame
9. Idler
10. Track shoe

GENERAL ASSEMBLY DRAWING

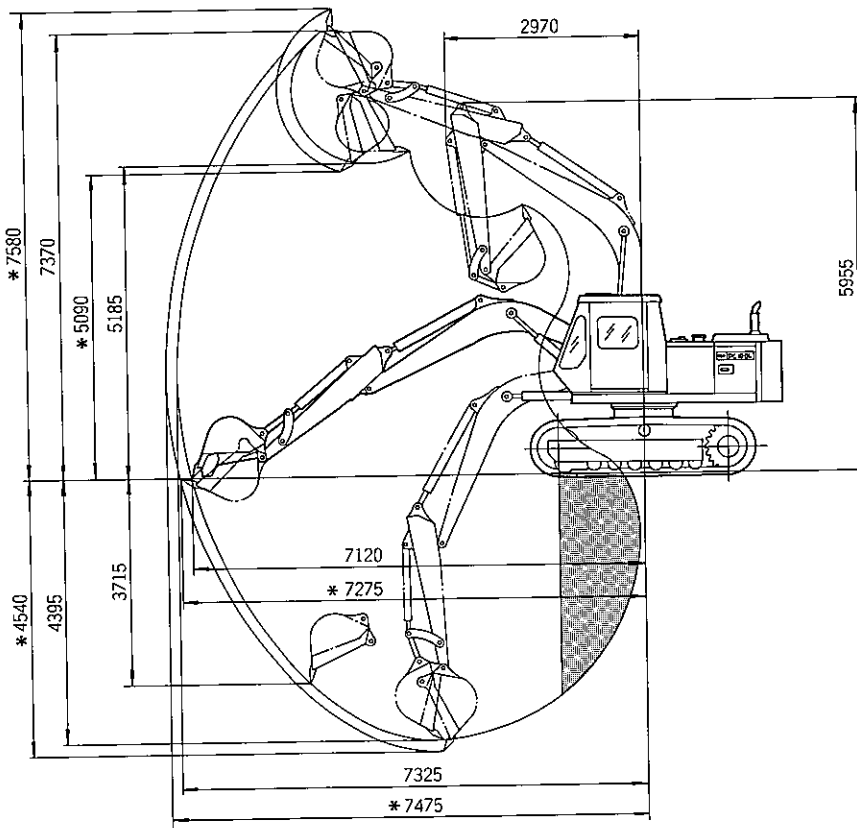
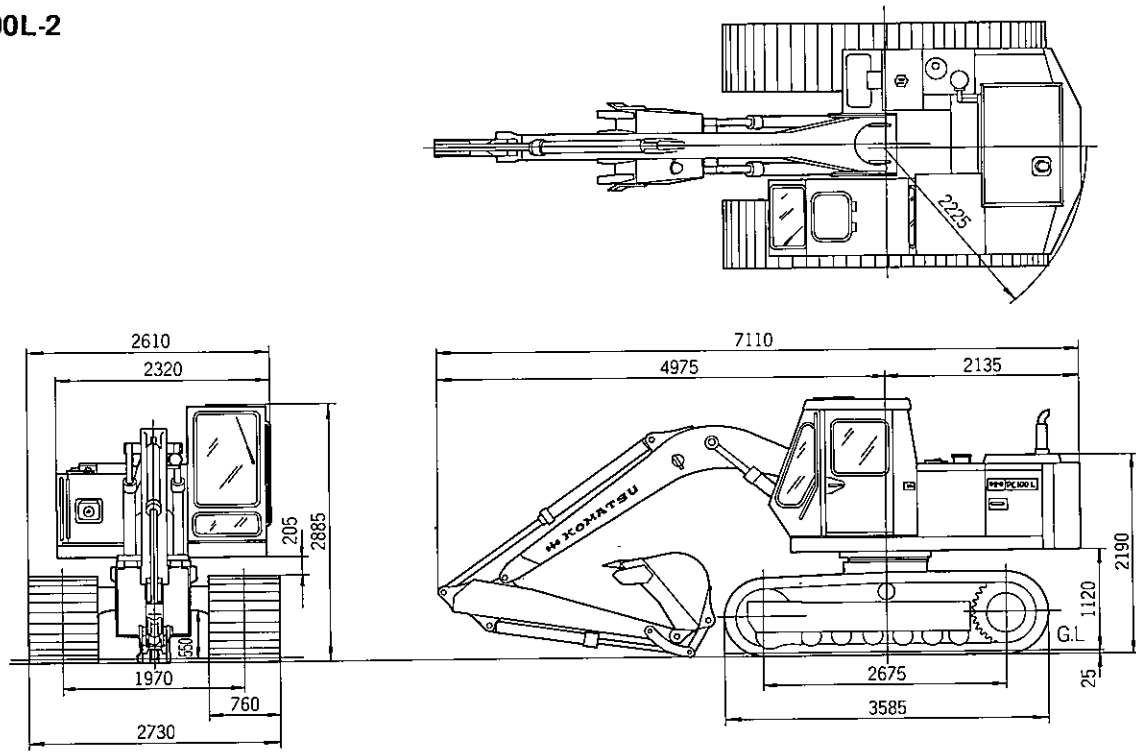
PC100-2



The mark * indicates the dimensions for shovel operation.

203F201

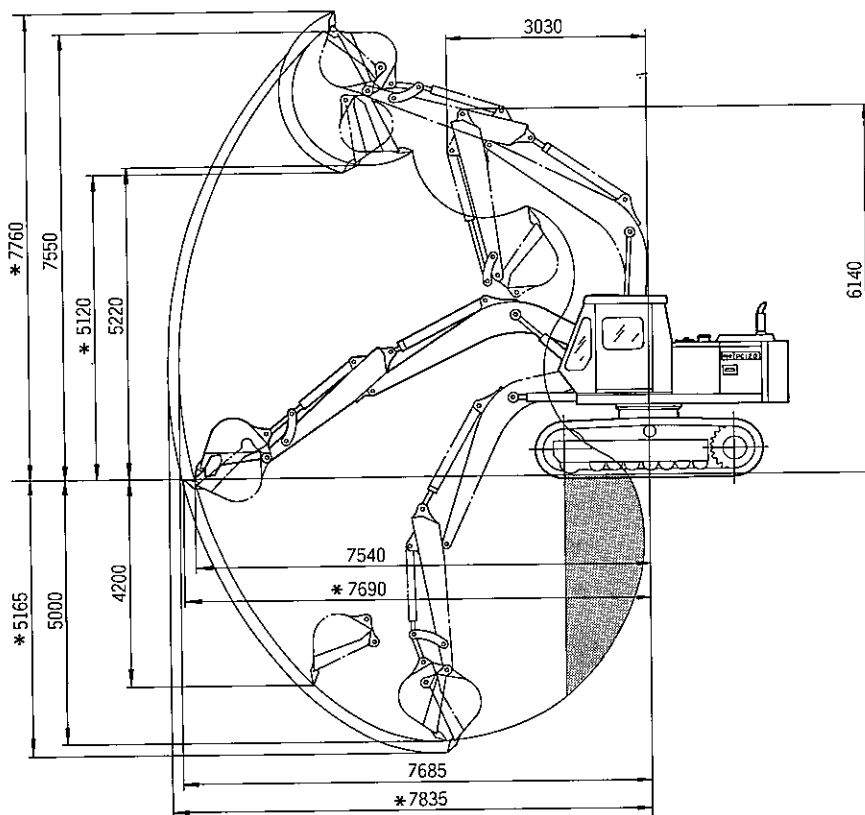
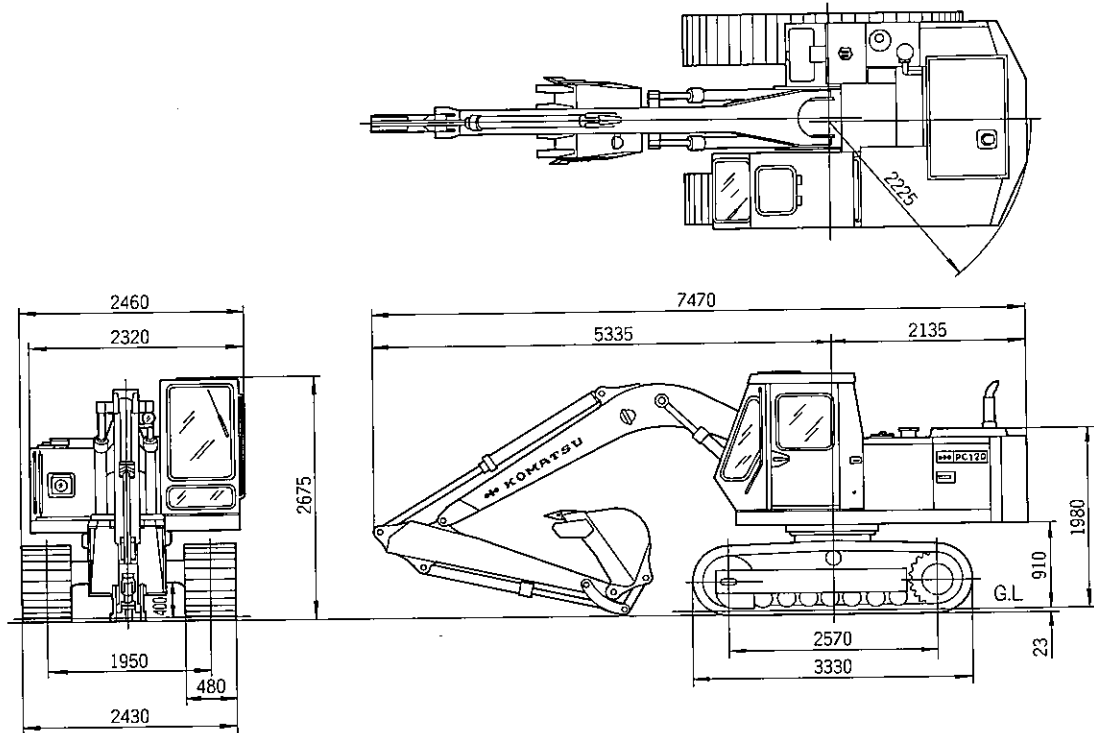
PC100L-2



The mark * indicates the dimensions for shovel operation.

203F202

PC120-2



The mark * indicates the dimensions for shovel operation.

203F203

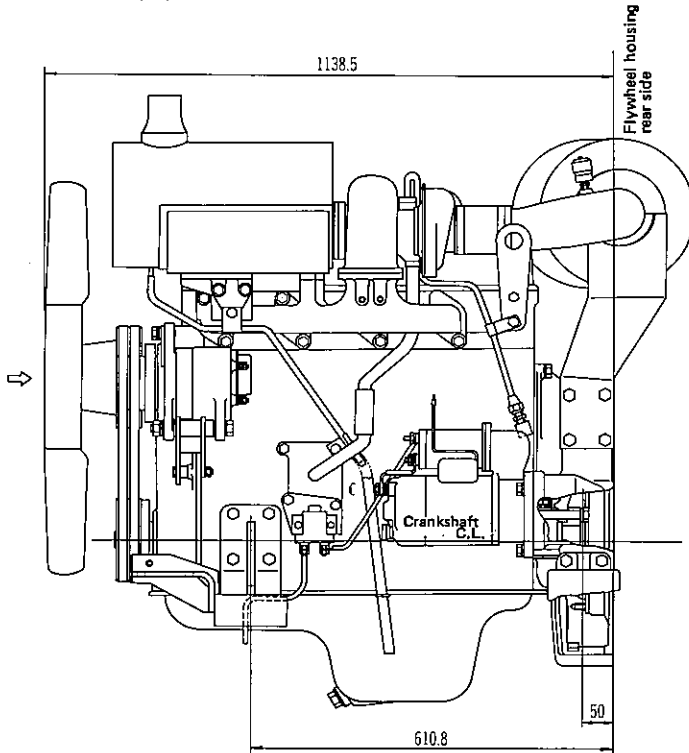
SPECIFICATIONS

Machine model		PC100-2	PC100L-2	PC120-2	
Serial number		13001~	11001~	14001~	
Bucket capacity	Heaped	0.40	0.40	0.45	
	SAE Heaped	0.44	0.44	0.50	
Operating weight (kg)		10,500	12,700	11,500	
Performance	Working ranges	Max. digging depth (mm)	4,600	4,395	5,000
		Max. vertical wall depth (mm)	3,920	3,713	4,200
		Max. digging reach (mm)	7,325	7,325	7,685
		Max. digging reach at grade level (mm)	7,165	7,120	7,540
		Max. digging height (mm)	7,165	7,370	7,550
		Max. dumping height (mm)	4,980	5,185	5,220
		Bucket offset (mm)	—	—	—
	Bucket digging force (kg)	5,810	5,810	6,490	
	Swing speed (rpm)	10	10	12	
	Swing max. slope angle (deg.)	25	24	21	
	Travel speed (km/h)	Low 2.8 High 3.4	Low 1.9 High 2.3	Low 3.0 High 3.6	
	Gradeability (deg.)	35	35	35	
	Ground pressure (kg/cm ²)	0.42	0.27	0.42	
	Dimensions	Overall length (transport) (mm)	7,180	7,110	7,470
Overall width (mm)		2,395	2,730	2,460	
Overall width at track sides (mm)		2,300	2,730	2,430	
Overall height (transport) (mm)		2,675	2,885	2,675	
Overall height to top of cab (mm)		2,675	2,885	2,675	
Ground clearance, counterweight (mm)		910	1,120	910	
Min. ground clearance (mm)		400	550	400	
Tail swing radius (mm)		2,225	2,225	2,225	
Min. swing radius of work equipment (mm)		2,970	2,970	3,030	
Height of work equipment at min. swing radius (mm)		5,750	5,955	6,140	
Length of track on ground (mm)		2,340	2,675	2,570	
Track gauge (mm)		1,820	1,970	1,950	
Height of machine cab (mm)		1,980	2,190	1,980	

Machine model		PC100-2	PC100L-2	PC120-2	
Serial numbers		13001~	11001~	14001~	
Engine	Model	S4D105-1	S4D105-1	S4D105-1	
	Type	4-cycle, water-cooled, in-line, vertical direct injection, with turbo-charger	4-cycle, water-cooled, in-line, vertical direct injection, with turbo-charger	4-cycle, water-cooled, in-line, vertical direct injection, with turbo-charger	
	No. of cylinders — bore x stroke	4 — 105 x 125	4 — 105 x 125	4 — 105 x 125	
	Piston displacement (CC)	4,330	4,330	4,330	
	Flywheel horsepower (HP/rpm)	81/2,100	81/2,100	90/2,400	
	Max. torque (kgm/rpm)	35.5/1,400	35.5/1,400	37/1,400	
	Max. speed at no load (rpm)	2,350 ± 50	2,350 ± 50	2,650 ± 50	
	Min. speed at no load (rpm)	800 ± 25	800 ± 25	800 ± 25	
	Min. fuel consumption (g/HP.h)	165	165	165	
	Starting motor	24V, 5.5 kW	24V, 5.5 kW	24V, 5.5 kW	
Alternator	24V, 25A	24V, 25A	24V, 25A		
Battery	12V/120Ah x 2	12V/120Ah x 2	12V/120Ah x 2		
Undercarriage	Carrier roller	1 on each side	1 on each side	1 on each side	
	Track roller	6 on each side	6 on each side	7 on each side	
	Track shoe	Assembly-type triple grouser	Assembly-type triple grouser	Assembly-type triple grouser	
Hydraulic system	Hydraulic pump	Type x No.	Gear type x 3	Gear type x 3	Gear type x 3
		Delivery (ℓ/min.)	2 x 103 + 42	2 x 103 + 42	2 x 132 + 59
		Set pressure (kg/cm ²)	175	175	175
	Control valve	Type x No.	3-spool x 1, 4-spool x 1	3-spool x 1, 4-spool x 1	3-spool x 1, 4-spool x 1
		Control method	Direct	Direct	Direct
	Hydraulic motor	Travel motor	Piston type (with reduction gear and brake valve)	Piston type (with reduction gear and brake valve)	Piston type (with reduction gear and brake valve)
		Swing motor	Piston type (with brake valve)	Piston type (with brake valve)	Piston type (with brake valve)
	Hydraulic cylinder	Reciprocating piston	Reciprocating piston	Reciprocating piston	
	Hydraulic tank	Box-shaped, open type	Box-shaped, open type	Box-shaped, open type	
	Hydraulic filter	Tank return side	Tank return side	Tank return side	
Hydraulic cooler	Air cooled	Air cooled	Air cooled		

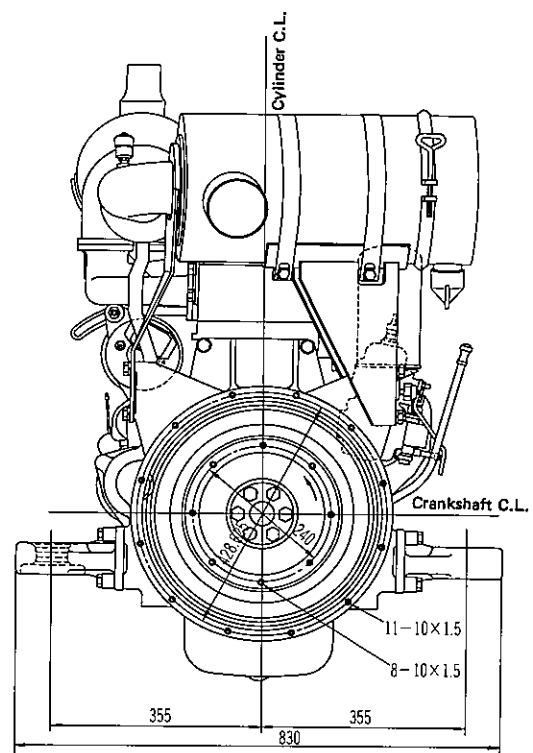
ENGINE LOCATIONS

View from L.H. side



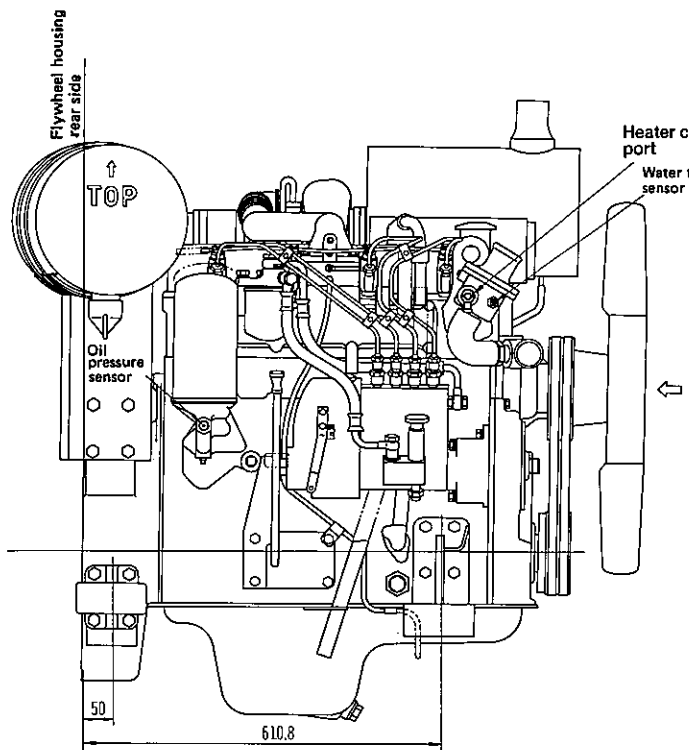
203F204

View from rear



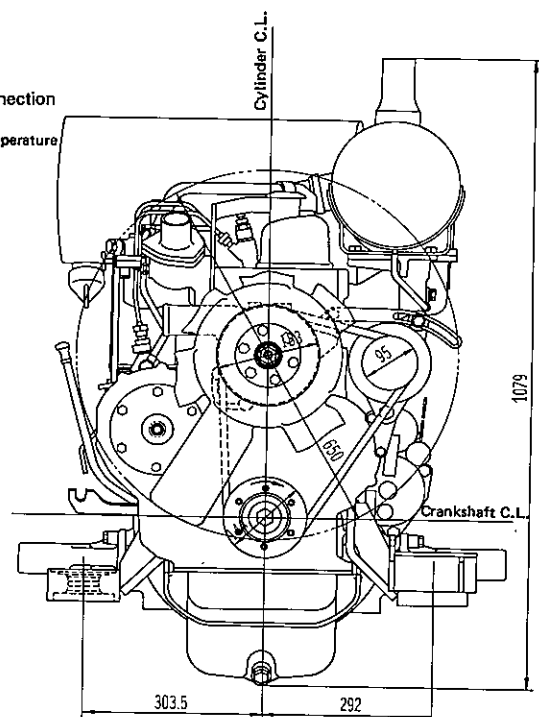
203F205

View from R.H. side



203F206

View from front



203F207

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LIST OF WEIGHT

Machine model	PC100-2	PC100L-2	PC120-2
Serial numbers	13001~	11001~	14001~
Engine assembly (excl. water, engine oil)	502	502	502
P. T. O.	16	16	16
Hydraulic pump	36	36	37
Radiator assembly (incl. oil cooler)	110	110	110
Hydraulic tank (excl. hydraulic oil)	142	142	142
Fuel tank (excl. fuel)	81	81	81
Track shoe assembly			
• Standard triple grouser shoe (480 mm width)	739 x 2	739 x 2	790 x 2
• Standard triple grouser shoe (760 mm width)	—	1,412 x 2	—
• Optional wide triple grouser shoe (610 mm width)	866 x 2	—	927 x 2
• Optional wide triple grouser shoe (710 mm width)	955 x 2	—	1,022 x 2
• Optional flat shoe (480 mm width)	759 x 2	—	812 x 2
• Optional swamp shoe (600 mm width)	711 x 2	—	760 x 2
• Optional swamp shoe (760 mm width)	845 x 2	—	—
• Optional swamp shoe (800 mm width)	—	1,246 x 2	—
• Optional swamp shoe (960 mm width)	—	1,228 x 2	—
Revolving frame	1,048	1,048	1,048
Operator's cab	260	260	260
Swing motor (with brake valve)	68	68	68
L.H. 4-spool control valve	28	28	28
R.H. 3-spool control valve	25	25	25
Swivel joint assembly	37	37	37
Counter weight	980	800	1,300
Track frame assembly	1,960	2,830	2,127
• Track frame	1,210	1,682	1,390
• Carrier roller	22 x 2	29 x 2	22 x 2
• Track roller	21 x 12	37 x 12	21 x 14
• Recoil spring assembly	99 x 2	125 x 2	97 x 2
• Idler	81 x 2	134 x 2	81 x 2
Sprocket	43 x 2	75 x 2	43 x 2
Travel motor (with reduction gear and brake valve)	170 x 2	175 x 2	230 x 2

Unit: kg

Machine model	PC100-2	PC100L-2	PC120-2
Serial numbers	13001~	11001~	14001~
Swing circle assembly	186	186	186
Swing machinery assembly	126	126	126
Boom assembly	648	648	742
Arm assembly	278	278	314
Link assembly	119	119	119
Bucket assembly	352	352	397
Boom cylinder assembly	85 x 2	85 x 2	102 x 2
Arm cylinder assembly	112	112	150
Bucket cylinder assembly	84	84	95

LIST OF LUBRICANT AND WATER

Machine model		PC100-2	PC100L-2	PC120-2	Remarks
Serial number		13001~	11001~	14001~	
Engine cooling water	(ℓ)	27	27	27	Water
Fuel tank	(ℓ)	230	230	230	Above -10°C: ASTM D975 No. 2 Below -10°C: ASTM D975 No. 1
Engine lubricant	(ℓ)	15	15	15	API Service Classification CD Above 0°C: SAE30 Below 10°C: SAE10W
P. T. O. gear case	(ℓ)	0.86	0.86	0.86	API Service Classification CD SAE30
Swing machinery case	(ℓ)	7	7	7	
Final drive case (one side)	(ℓ)	2.0	2.5	2.0	
Hydraulic oil (hydraulic tank)	(ℓ)	145	145	145	API Service Classification CD SAE10W
Carrier roller (each)	(cc)	115	300	115	API Service Classification CD SAE30
Track roller (each)	(cc)	105	190	105	
Idler roller (each)	(cc)	150	200	150	

API: American Petroleum Institute
SAE: Society of Automotive Engineers

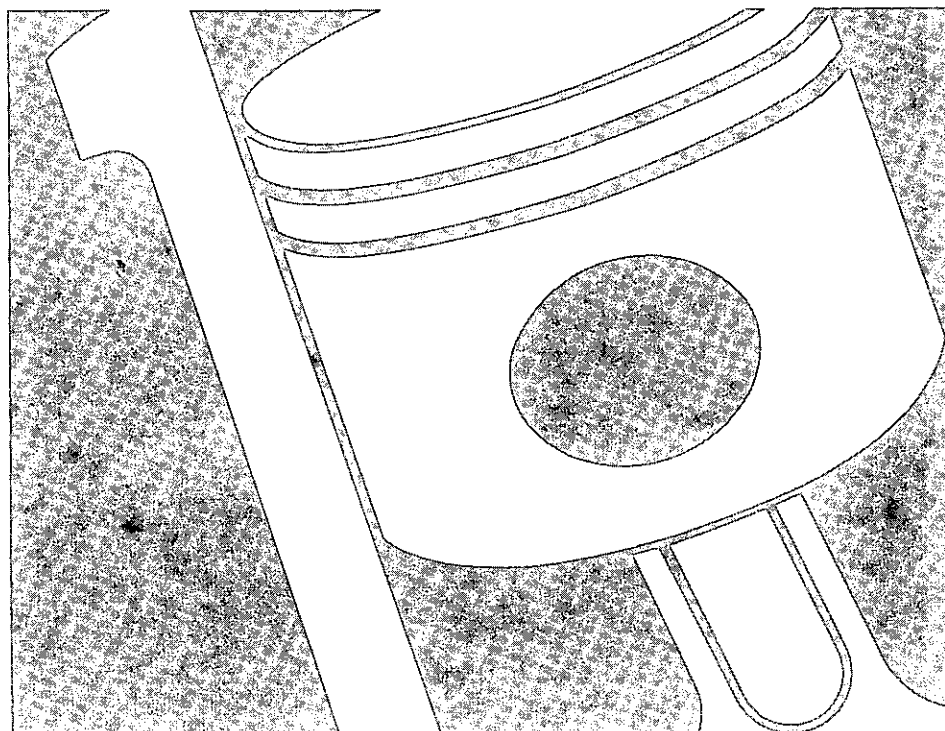
SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up

11 ENGINE

STRUCTURE AND FUNCTION



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STRUCTURE AND FUNCTION

P.T.O. (Power Take Off)	11-4
Fuel tank and piping	11-5

P.T.O.

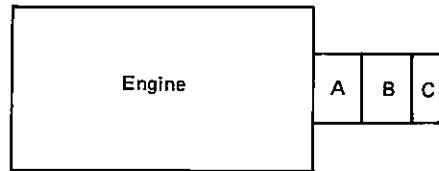
Hydraulic pumps are fitted to the P.T.O. case through the coupling at the rear end of the engine flywheel housing.

Pumps shown in the figure at right:

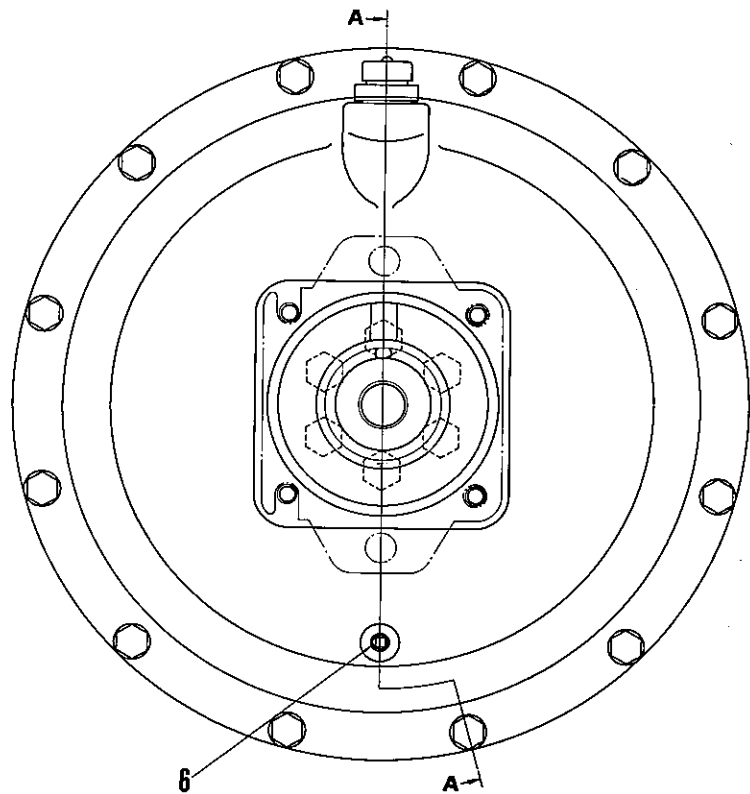
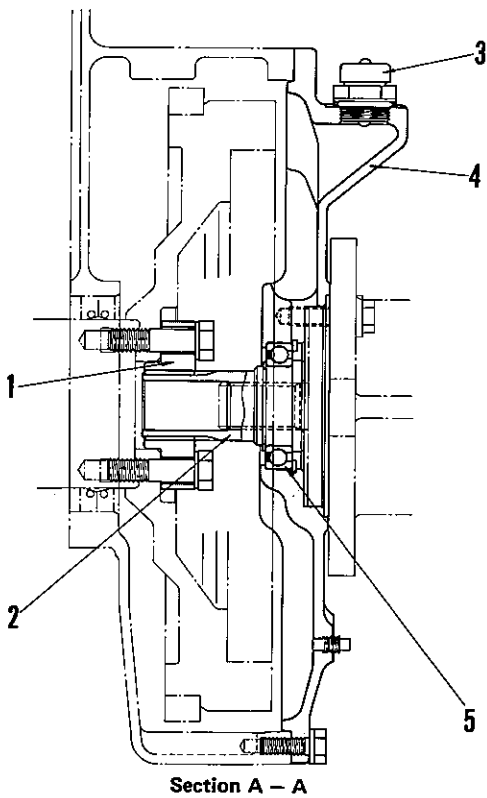
A for R.H. travel motor, bucket and boom operations.

B for L.H. travel motor, boom acceleration, arm and swing operations.

C for arm acceleration and swing operations.



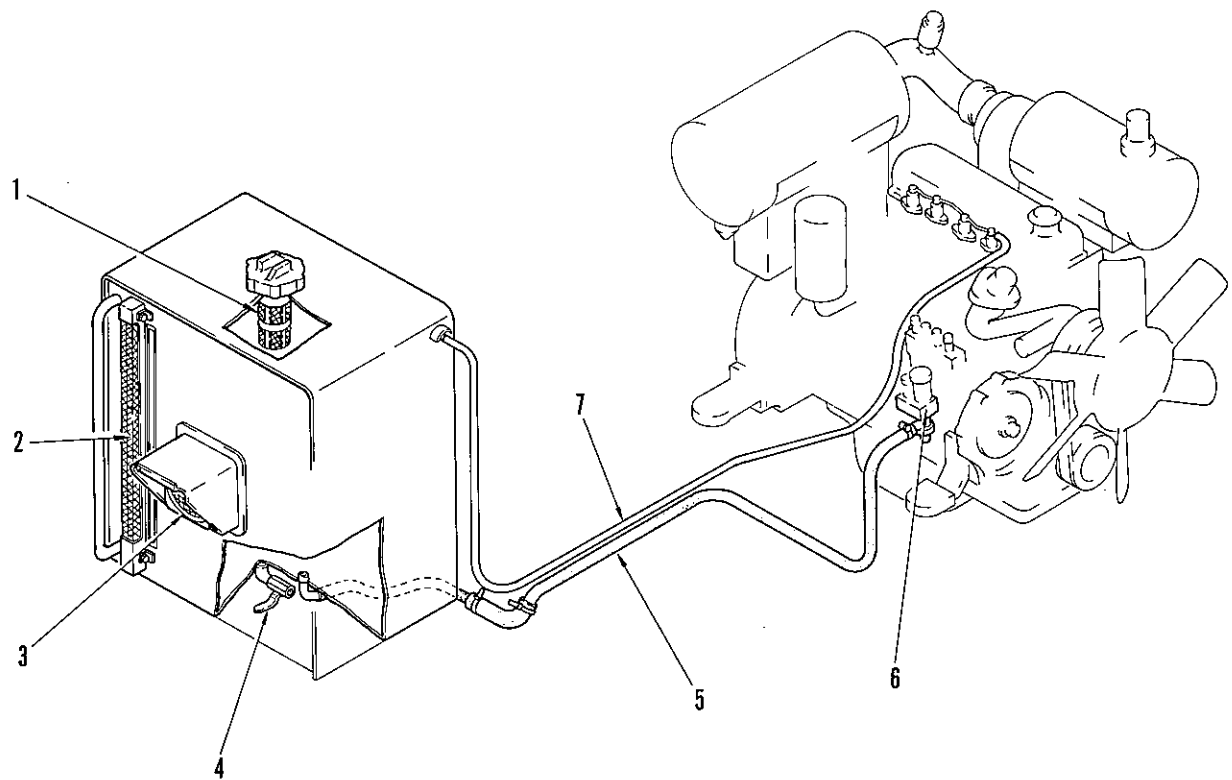
204F076



203F007

- 1. Coupling
- 2. Shaft
- 3. Breather
- 4. Case
- 5. Bearing
- 6. Drain plug

FUEL TANK AND PIPING



F202B018

1. Strainer
2. Fuel gauge
3. Head lamp
4. Drain valve
5. Supply pipe
6. Fuel injection pump (feed pump)
7. Return pipe

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STRUCTURE AND FUNCTION

P.T.O. (Power take off) 11-4

P.T.O.

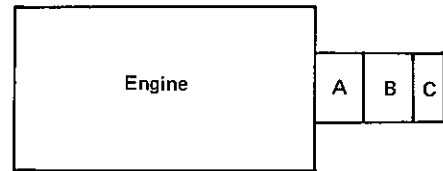
Hydraulic pumps are fitted to the P.T.O. case through the coupling at the rear end of the engine flywheel housing.

Pumps shown in the figure at right:

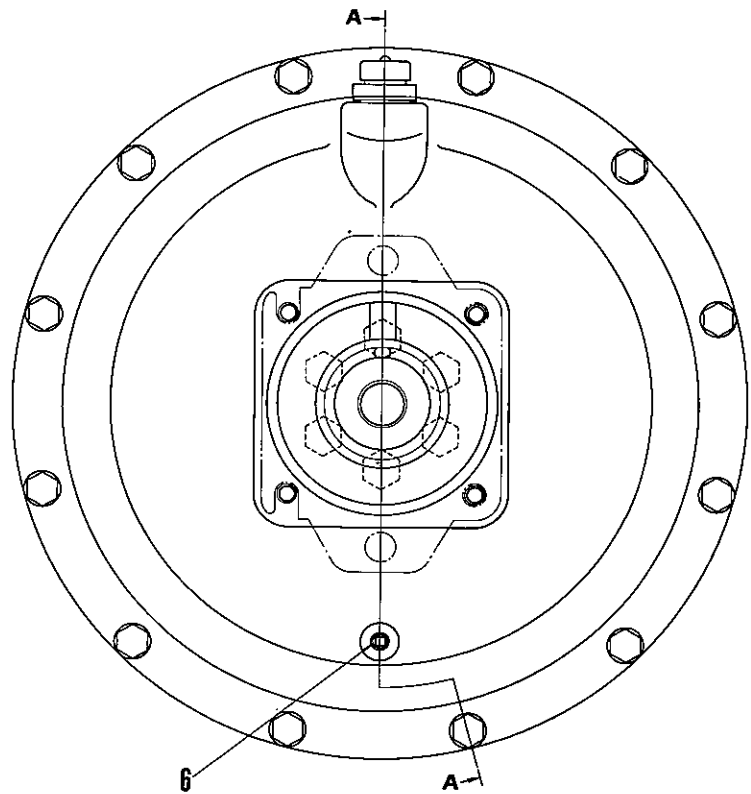
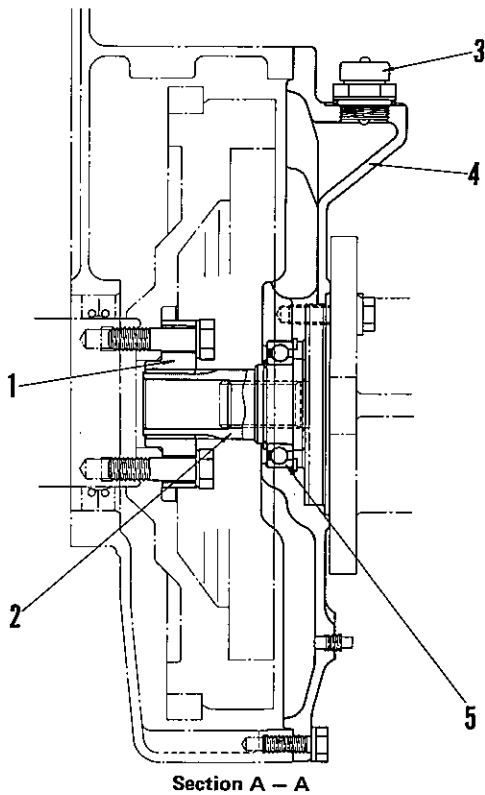
A for R.H. travel motor, bucket and boom operations.

B for L.H. travel motor, boom acceleration, arm and swing operations.

C for arm acceleration and swing operations.



204F076



203F007

- 1. Coupling
- 2. Shaft
- 3. Breather
- 4. Case
- 5. Bearing
- 6. Drain plug

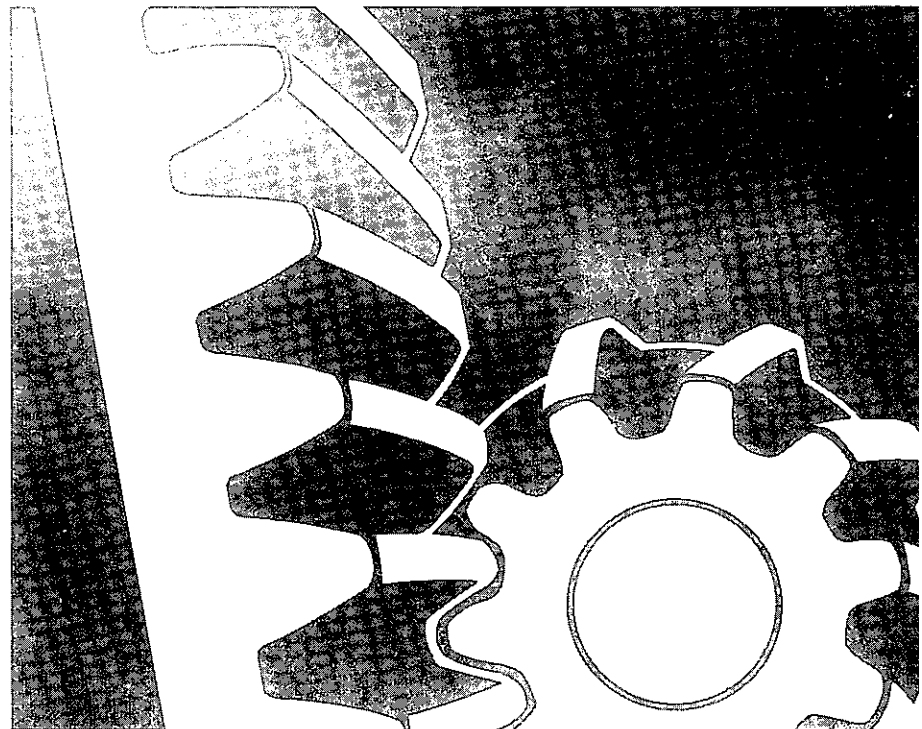
SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
PC100L-2 11001 and up
PC120-2 14001 and up

21 POWER TRAIN

STRUCTURE AND FUNCTION



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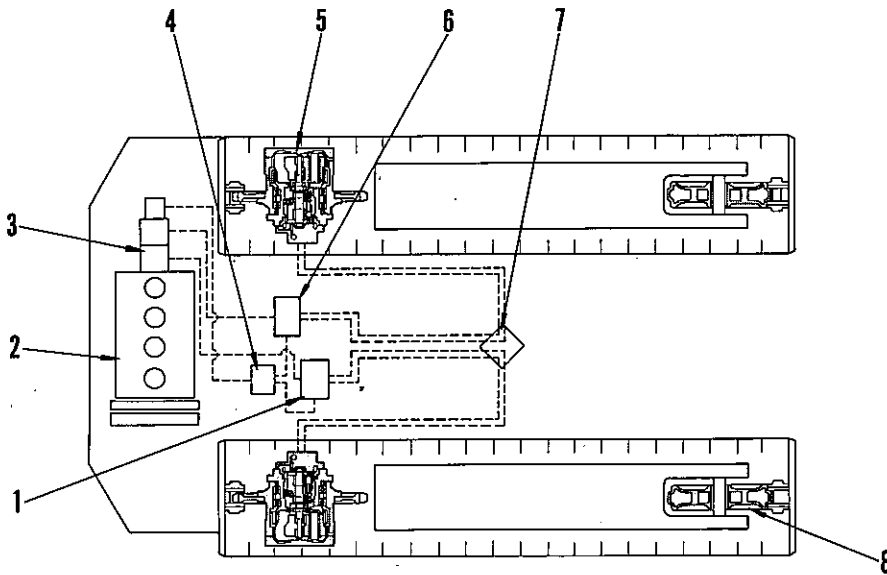
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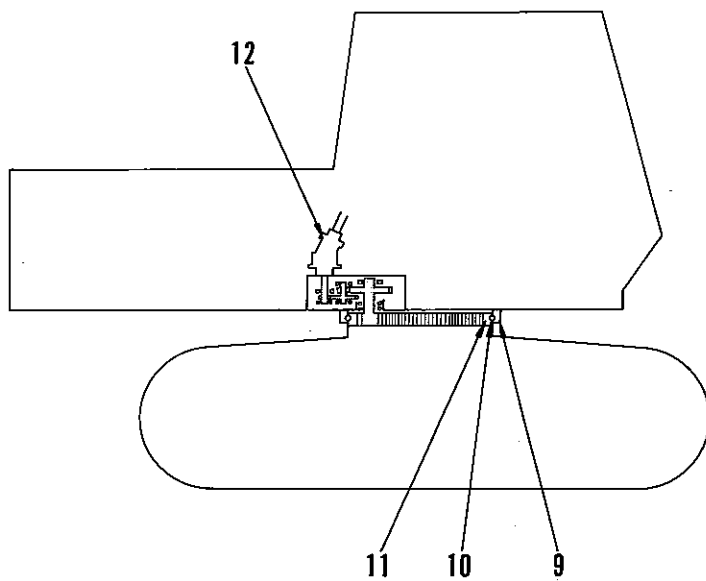
STRUCTURE AND FUNCTION

Power train	21-4
Swing circle	21-5
Swing machinery	21-6
Sprocket	21-8
Swing machinery (Option)	21-9

POWER TRAIN



- 1. R.H. 3-spool control valve
- 2. Engine
- 3. Hydraulic pump
- 4. Pilot check valve
- 5. Travel motor (with reduction gear)
- 6. L.H. 4-spool control valve
- 7. Center swivel joint
- 8. Idler

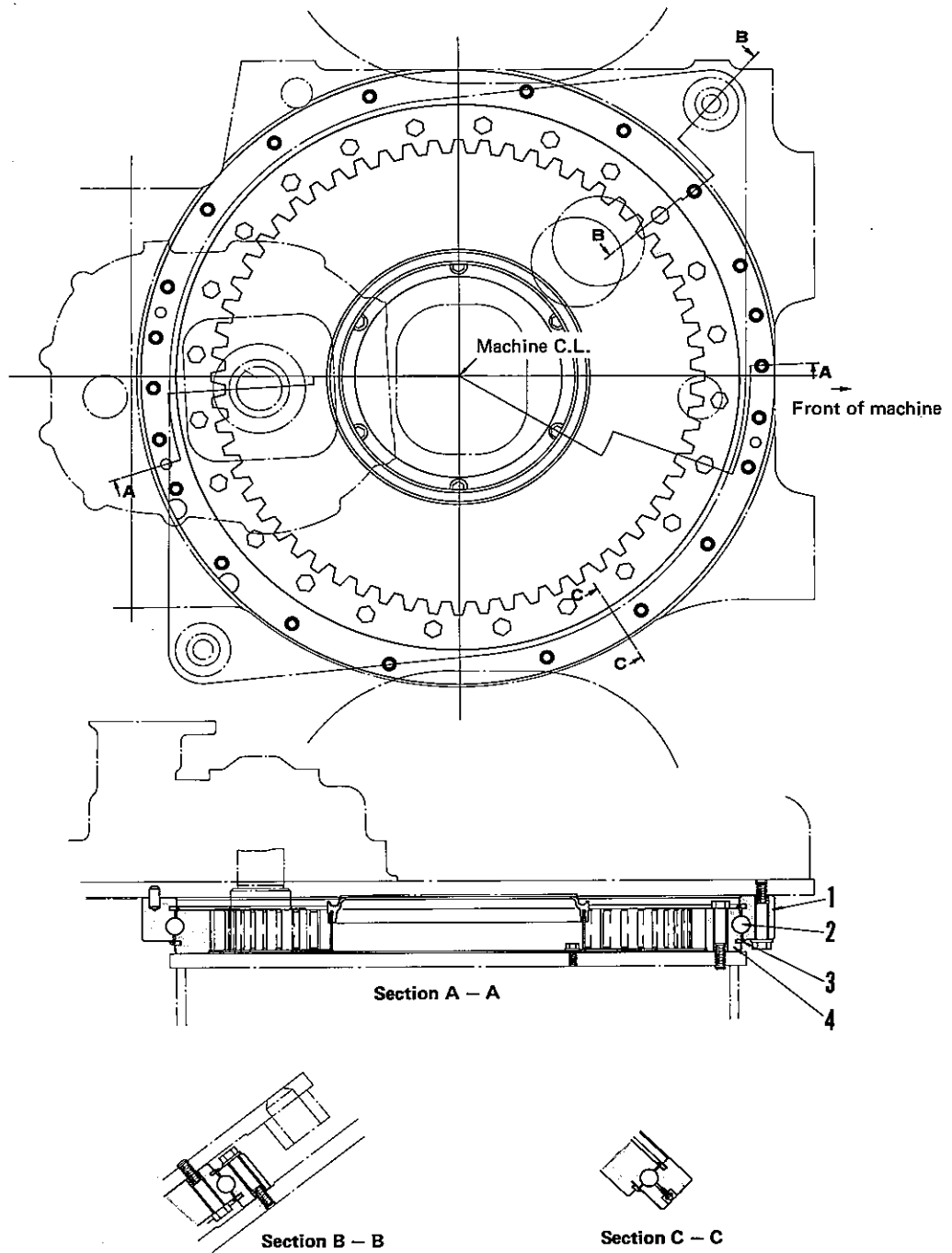


203F210

The mechanical power from engine (2) is converted into the hydraulic power by hydraulic pumps. This hydraulic power is distributed through 2 control valves (1) and (6) and pilot check valve (4) for various functional purposes,

and converted again into the mechanical power through hydraulic motors (5) and (12) as well as hydraulic cylinders for the machine traveling, swinging, and excavating performance.

SWING CIRCLE

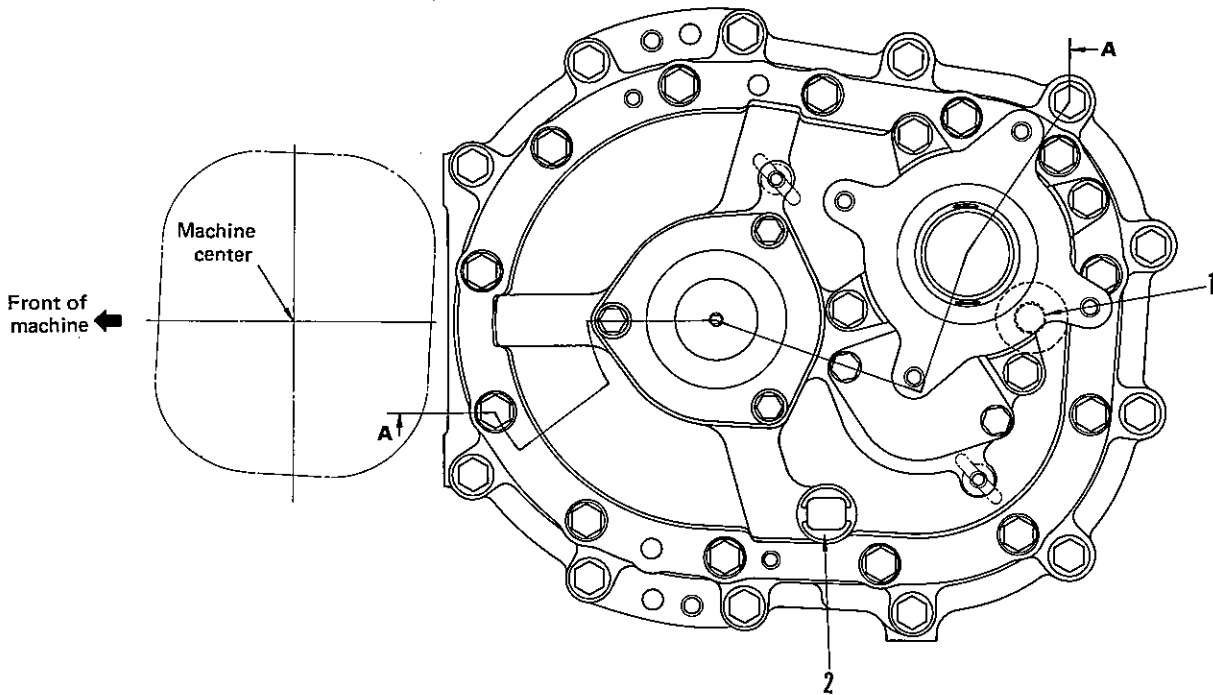


Grease capacity: 3.5 ℓ

- 1. Swing circle outer race
- 2. Ball bearing
- 3. Seal
- 4. Swing circle inner race

203F012

SWING MACHINERY



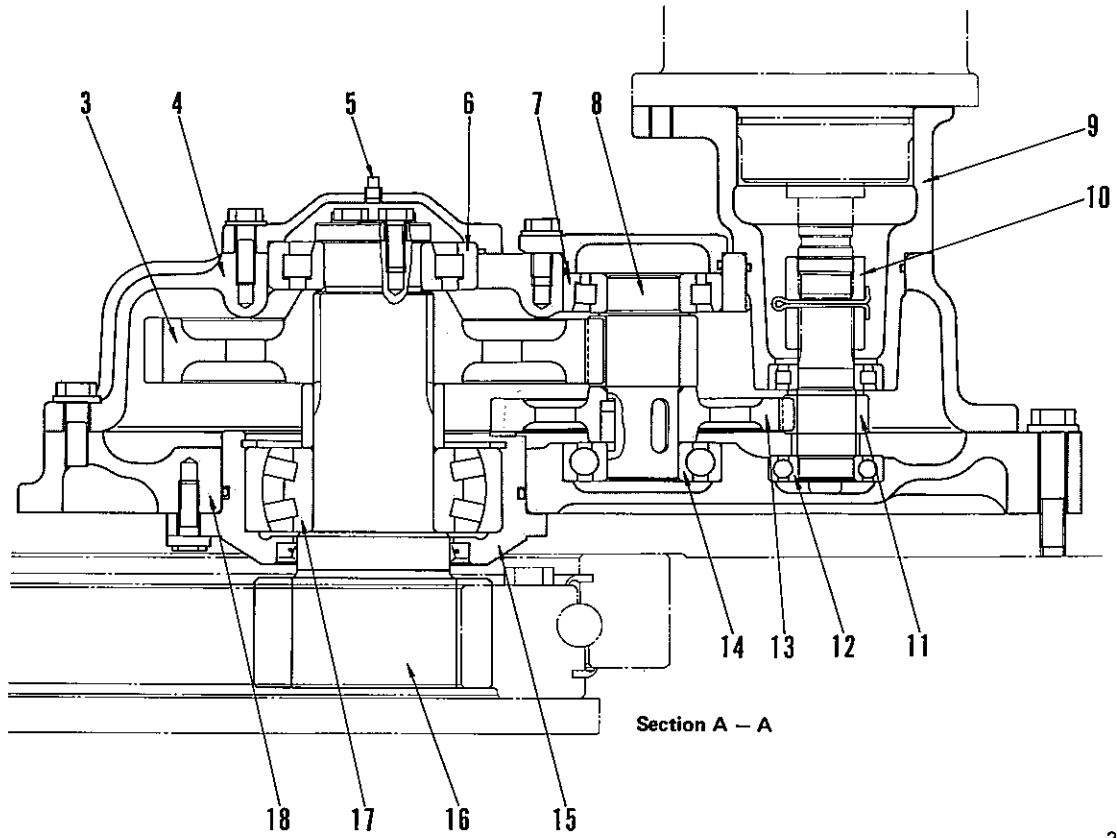
203F211

$$\text{Reduction ratio} = \frac{46}{11} \times \frac{56}{11} \times \frac{77}{12} = 136.606$$

Continued swing speed

PC100 · 100L : 10 rpm
PC120 : 12 rpm

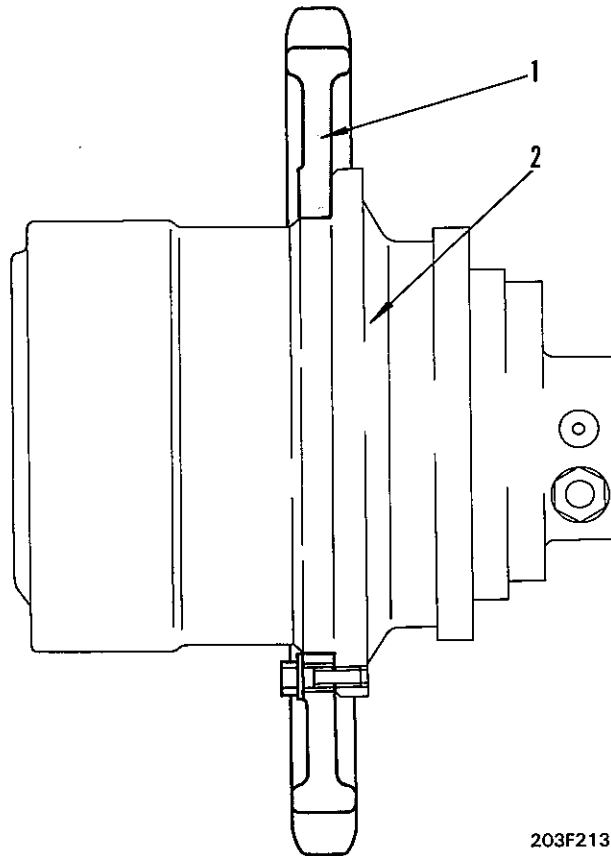
Lubricate oil capacity: 7 ℓ



203F212

- | | | |
|-------------------|-------------------|--|
| 1. Drain plug | 7. Roller bearing | 13. 1st gear |
| 2. Level gauge | 8. 2nd pinion | 14. Roller bearing |
| 3. 2nd gear | 9. Cage | 15. Cage |
| 4. Upper case | 10. Coupling | 16. Swing pinion |
| 5. Air bleed plug | 11. 1st pinion | 17. Roller bearing (Self-centering type) |
| 6. Roller bearing | 12. Ball bearing | 18. Lower case |

SPROCKET



203F213

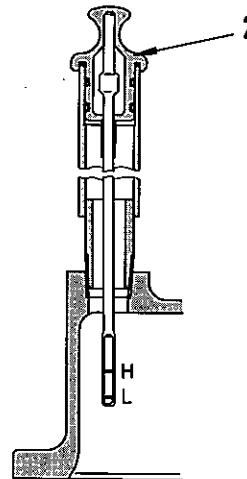
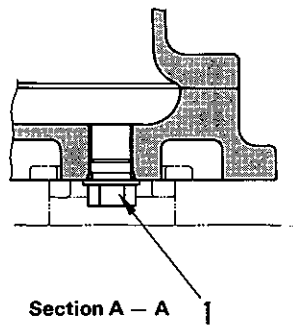
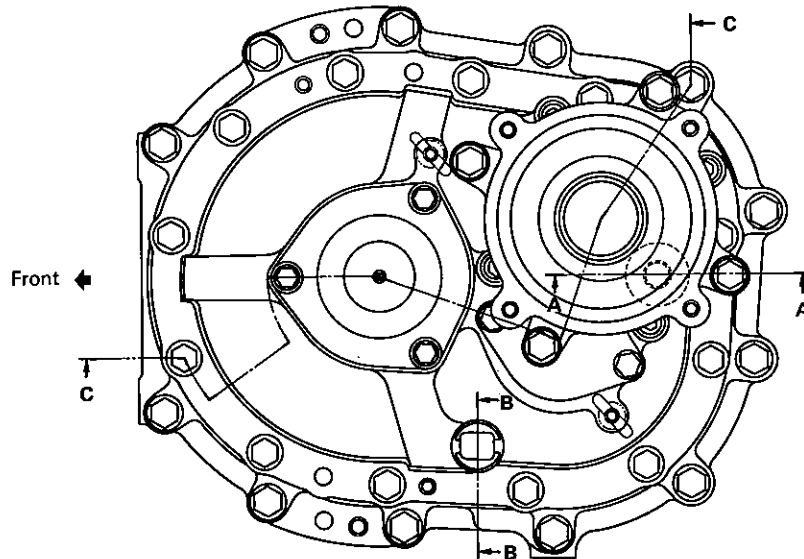
GENERAL

Reduction of speed for travel is made by a composite planetary-differential mechanism (see P. 61-37) which consists of a combination of a differential gear mechanism and a planetary gear mechanism housed together with the travel motor. The sprocket is mounted on the output flange of the travel motor by bolts.

1. Sprocket
2. Travel motor

SWING MACHINERY (OPTION)

Equipped with swing motor with swing lock brake



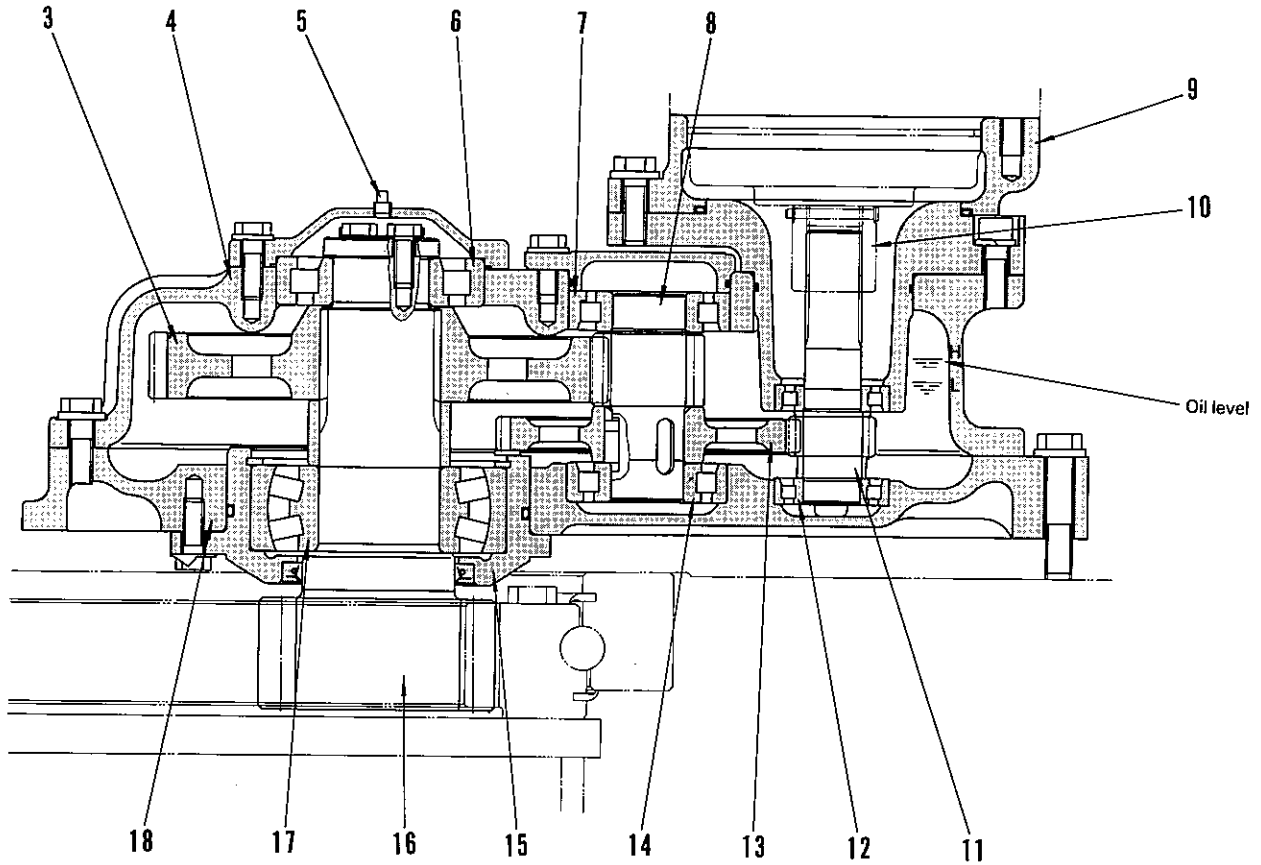
F202B003

$$\text{Reduction ratio} = \frac{46}{11} \times \frac{56}{11} \times \frac{77}{12} = 136.606$$

Continued swing speed

PC120: 12 rpm

Lubricate oil capacity: 7 ℓ



Section C - C

F202B004

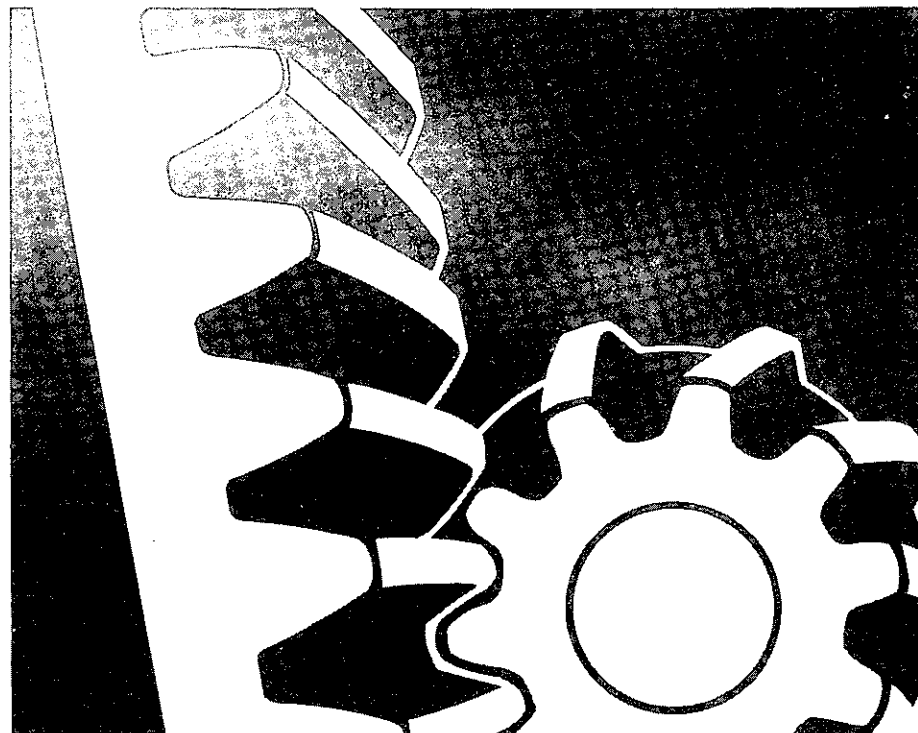
- | | | |
|-------------------|-------------------|--|
| 1. Drain plug | 7. Roller bearing | 13. 1st gear |
| 2. Level gauge | 8. 2nd pinion | 14. Roller bearing |
| 3. 2nd gear | 9. Cage | 15. Cage |
| 4. Upper case | 10. Coupling | 16. Swing pinion |
| 5. Air bleed plug | 11. 1st pinion | 17. Roller bearing (Self-centering type) |
| 6. Roller bearing | 12. Ball bearing | 18. Lower case |

SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
PC100L-2 11001 and up
PC120-2 14001 and up

24 POWER TRAIN MAINTENANCE STANDARD



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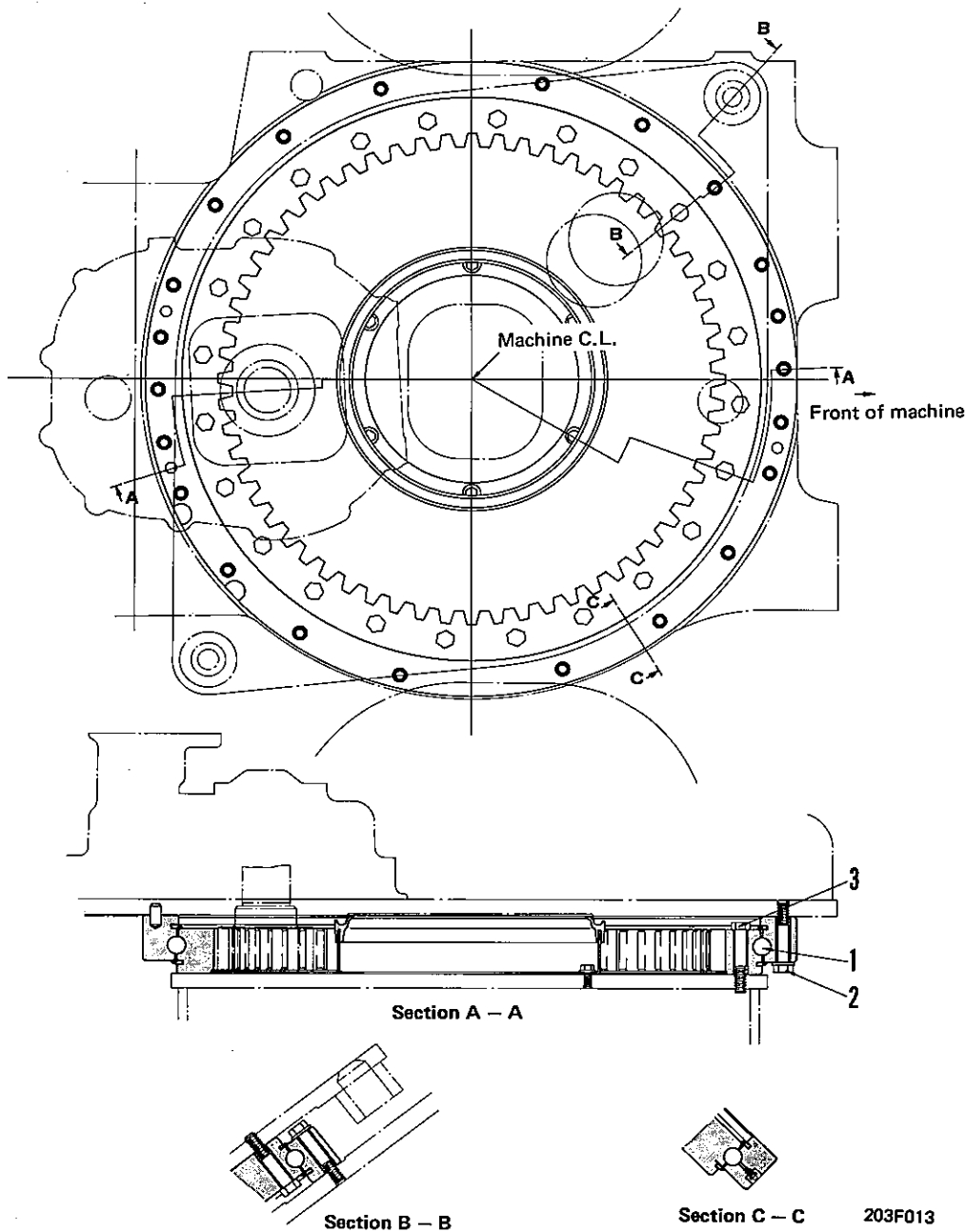
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MAINTENANCE STANDARD

Swing circle	24-4
Swing machinery	24-5
Sprocket	24-6
Swing machinery (Option)	24-7

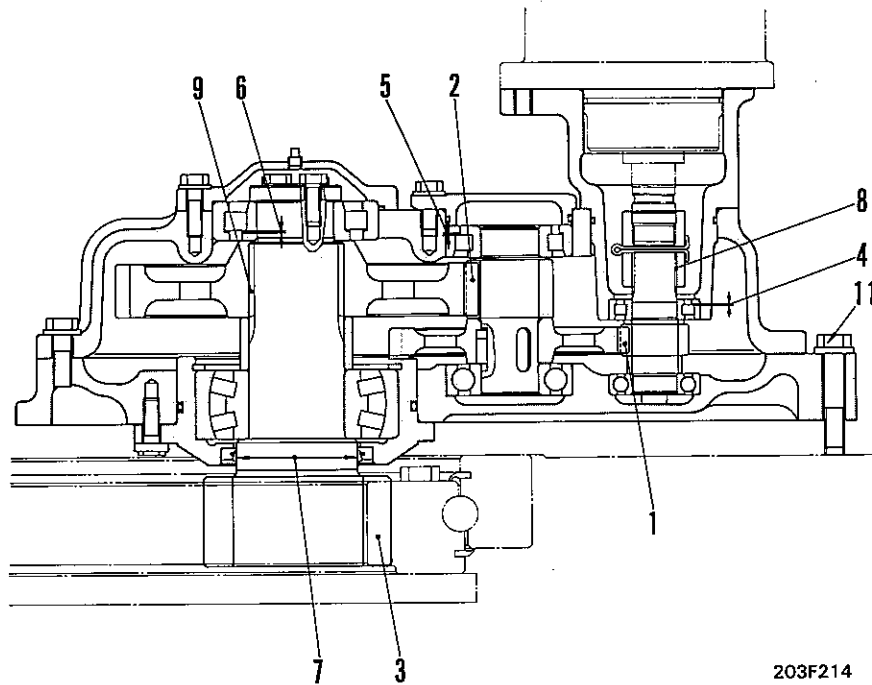
SWING CIRCLE



Unit: mm

No.	Check item	Criteria			Remedy
		Serial No.	Standard clearance	Clearance limit	
1	Bearing axial clearance	PC100 13001~	0.15 ~ 0.45	0.9	Replace
		PC100L 11001~			
		PC120 14001~			
2	Tightening torque for outer race bolt	38.0 ± 5.5 kgm			
3	Tightening torque for inner race bolt	38.0 ± 5.5 kgm			
4	Grease	Grease must not be badly contaminated or fouled in white. (grease capacity: 3.5 ltrs)			Replace

SWING MACHINERY

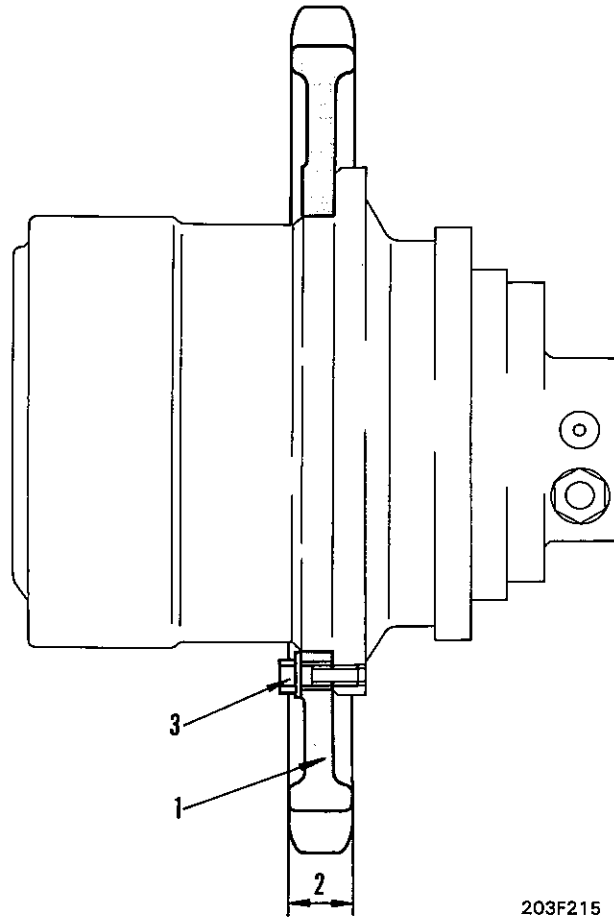


203F214

Unit: mm

No.	Check item	Criteria			Remedy
		Serial No.	Standard clearance	Clearance limit	
1	Backlash between 1st pinion and 1st gear	PC100 13001~	0.14 ~ 0.36	0.7	Replace
		PC100L 11001~			
		PC120 14001~			
2	Backlash between 2nd pinion and 2nd gear	PC100 13001~	0.17 ~ 0.44	0.8	Replace
		PC100L 11001~			
		PC120 14001~			
3	Backlash between output shaft (pinion) and swing circle	PC100 13001~	0.50 ~ 1.44	2.2	Readjust
		PC100L 11001~			
		PC120 14001~			
4	1st pinion end play	PC100 13001~	0.55 ~ 0.99		Readjust
		PC100L 11001~			
		PC120 14001~			
5	2nd pinion end play	PC100 13001~	0.46 ~ 0.98		Readjust
		PC100L 11001~			
		PC120 14001~			
6	Swing pinion end play	PC100 13001~	0.48 ~ 0.97		Readjust
		PC100L 11001~			
		PC120 14001~			
7	Wear of output shaft cooler surface contacting with oil seal	Serial No.	Standard size	Repair limit	Apply hard-chrome plating, reconditioning, or replace
		PC100 13001~	$\phi 95 \begin{matrix} 0 \\ -0.087 \end{matrix}$	-0.2	
		PC100L 11001~			
PC120 14001~					
8	Clearance in the rotating direction between coupling and 1st pinion spline	Serial No.	Standard clearance	Clearance limit	
		PC100 13001~	0.072 ~ 0.177	0.4	
		PC100L 11001~			
PC120 14001~					
9	Clearance in the rotating direction between output shaft and 2nd gear spline	PC100 13001~	0.085 ~ 0.207	0.5	
		PC100L 11001~			
		PC120 14001~			
10	Tightening torque for drain plug	7 ± 1 kgm (width across flats: 24)			
11	Tightening torque for mounting bolt	28.5 ± 3.0 kgm			

SPROCKET

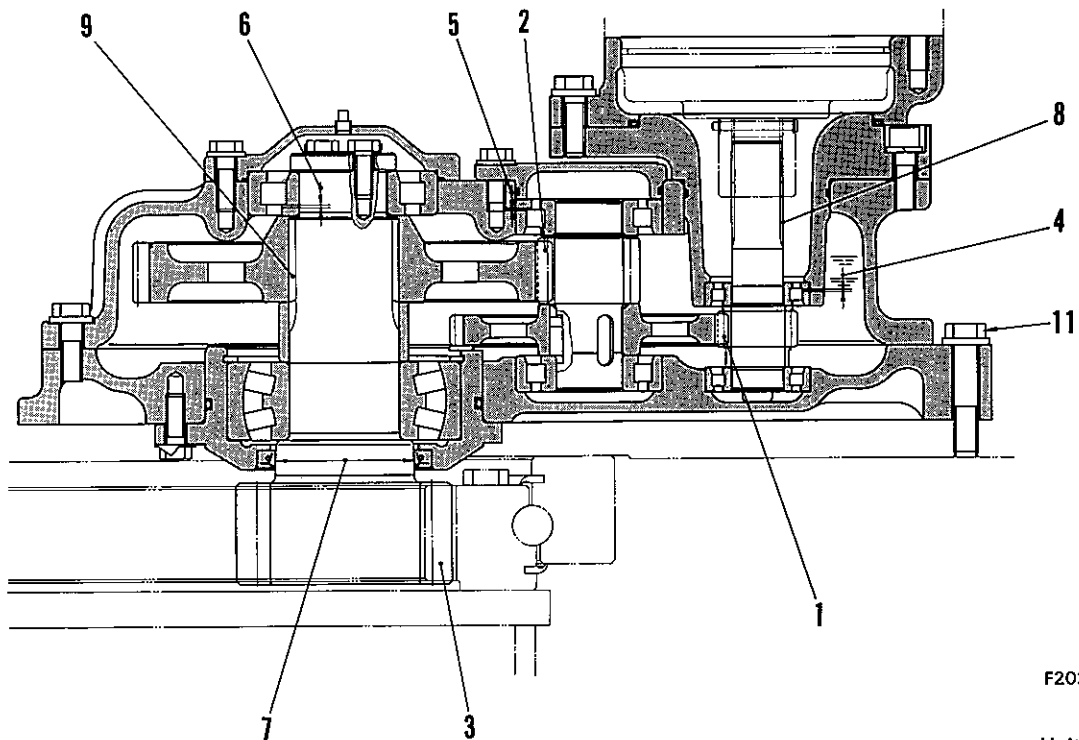


203F215

Unit: mm

No.	Check item	Criteria			Remedy	
1	Amount of wear on sprocket tooth profile	Repair limit: 6			Rebuild or replace	
2	Sprocket tooth width	Serial No.		Standard size		Repair limit
		PC100	13001~	47.5		42.0
		PC120	14001~			
	PC100L	11001~	75.0	69.0		
3	Tightening torque for bolt	28.5 ± 3.0 kgm				

SWING MACHINERY (OPTION)



F202B005

Unit: mm

No.	Check item	Criteria		Remedy
		Standard clearance	Clearance limit	
1	Backlash between 1st pinion and 1st gear	0.14 ~ 0.36	0.7	Replace
		0.17 ~ 0.44	0.8	
2	Backlash between 2nd pinion and 2nd gear	0.22 ~ 1.18	2.2	
3	Backlash between output shaft (pinion) and swing circle	0.55 ~ 0.99		Readjust
4	1st pinion end play	0.46 ~ 0.98		
5	2nd pinion end play	0.48 ~ 0.97		
6	Swing pinion end play	Standard size	Repair limit	Apply hard-chrome plating, recondition, or replace
		$\phi 95 \begin{smallmatrix} 0 \\ -0.087 \end{smallmatrix}$	-0.2	
7	Wear of output shaft collar surface contacting with oil seal	Standard clearance	Clearance limit	
		0.072 ~ 0.177	0.4	
8	Clearance in the rotating direction between coupling and 1st pinion spline	0.085 ~ 0.207	0.5	
9	Clearance in the rotating direction between output shaft and 2nd gear spline	7 ± 1 kgm (width across flats: 24)		
10	Tightening torque for drain plug	28.5 ± 3.0 kgm		
11	Tightening torque for mounting bolt			

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SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up

31 UNDER CARRIAGE STRUCTURE AND FUNCTION



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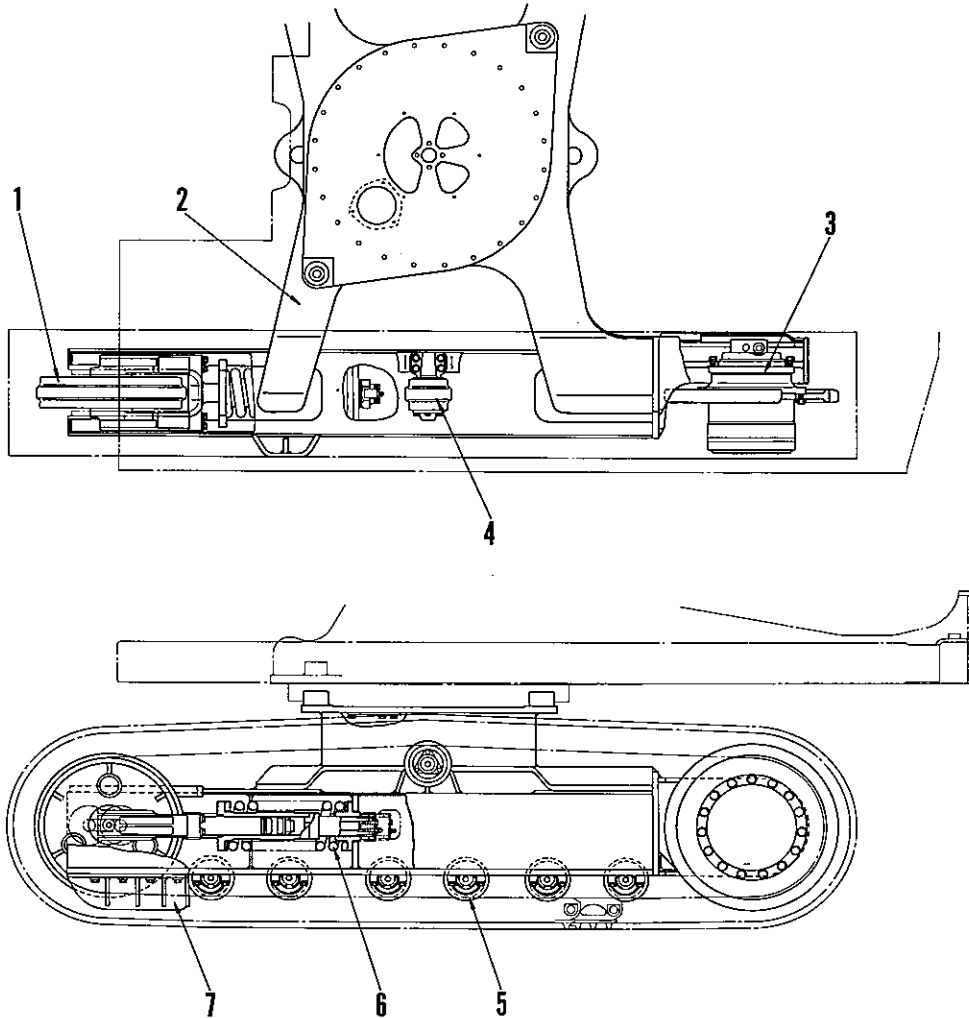
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STRUCTURE AND FUNCTION

Track frame and recoil spring	31- 4
Idler	31- 8
Track roller	31-10
Carrier roller	31-12
Track shoe	31-14

TRACK FRAME AND RECOIL SPRING

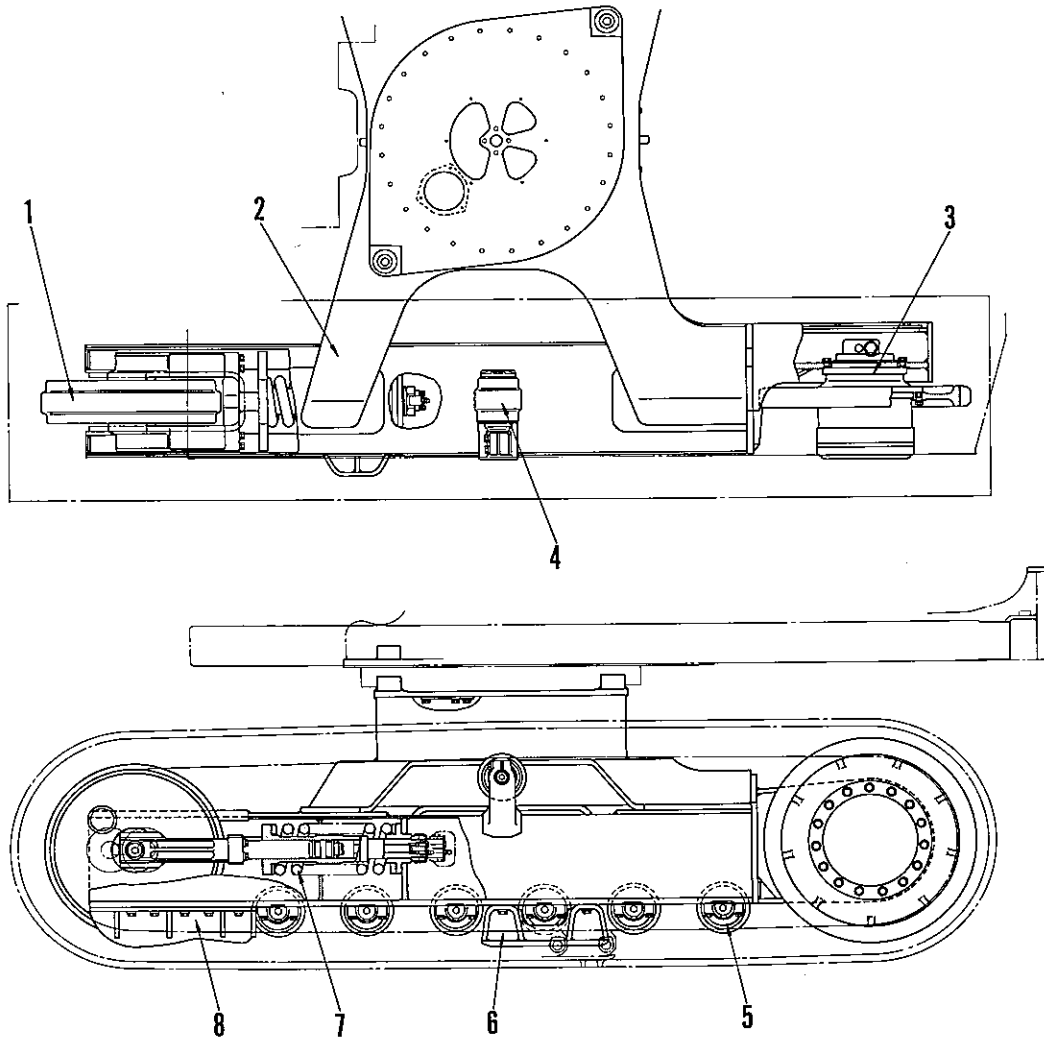
PC100-2



203F216

- 1. Idler
- 2. Track frame
- 3. Travel motor
- 4. Carrier roller
- 5. Track roller
- 6. Recoil spring
- 7. Guard

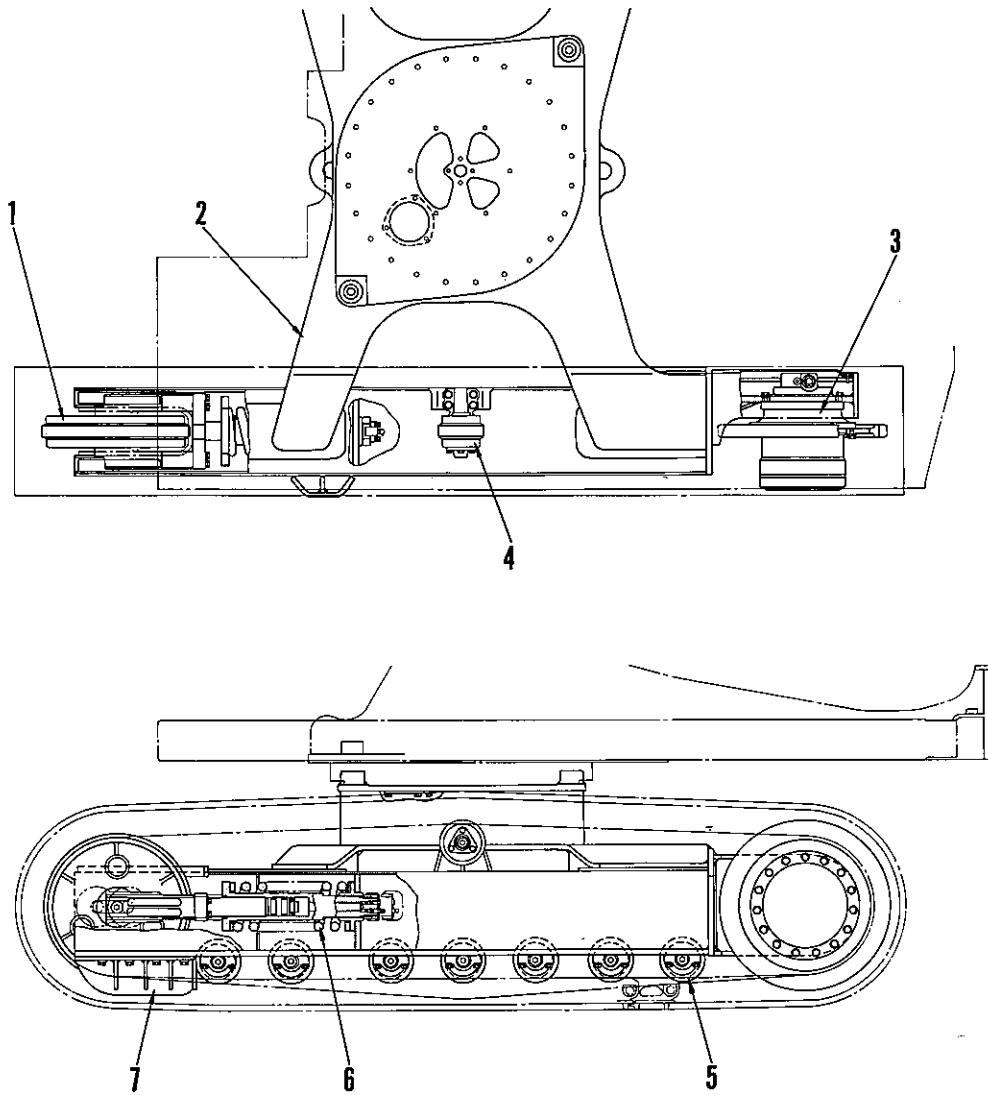
PC100L-2



203F217

- 1. Idler
- 2. Track frame
- 3. Travel motor
- 4. Carrier roller
- 5. Track roller
- 6. Center guard
- 7. Recoil spring
- 8. Front guard

PC120-2



203F218

- 1. Idler
- 2. Track frame
- 3. Travel motor
- 4. Carrier roller
- 5. Track roller
- 6. Recoil spring
- 7. Guard

C

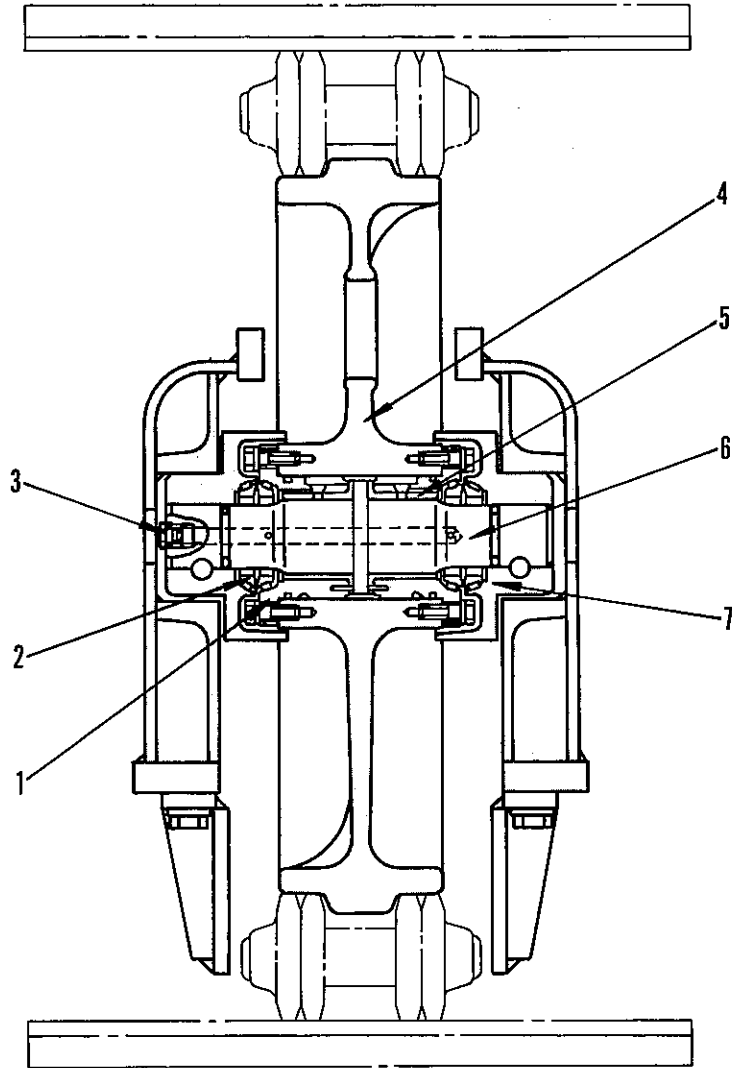
C

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IDLER

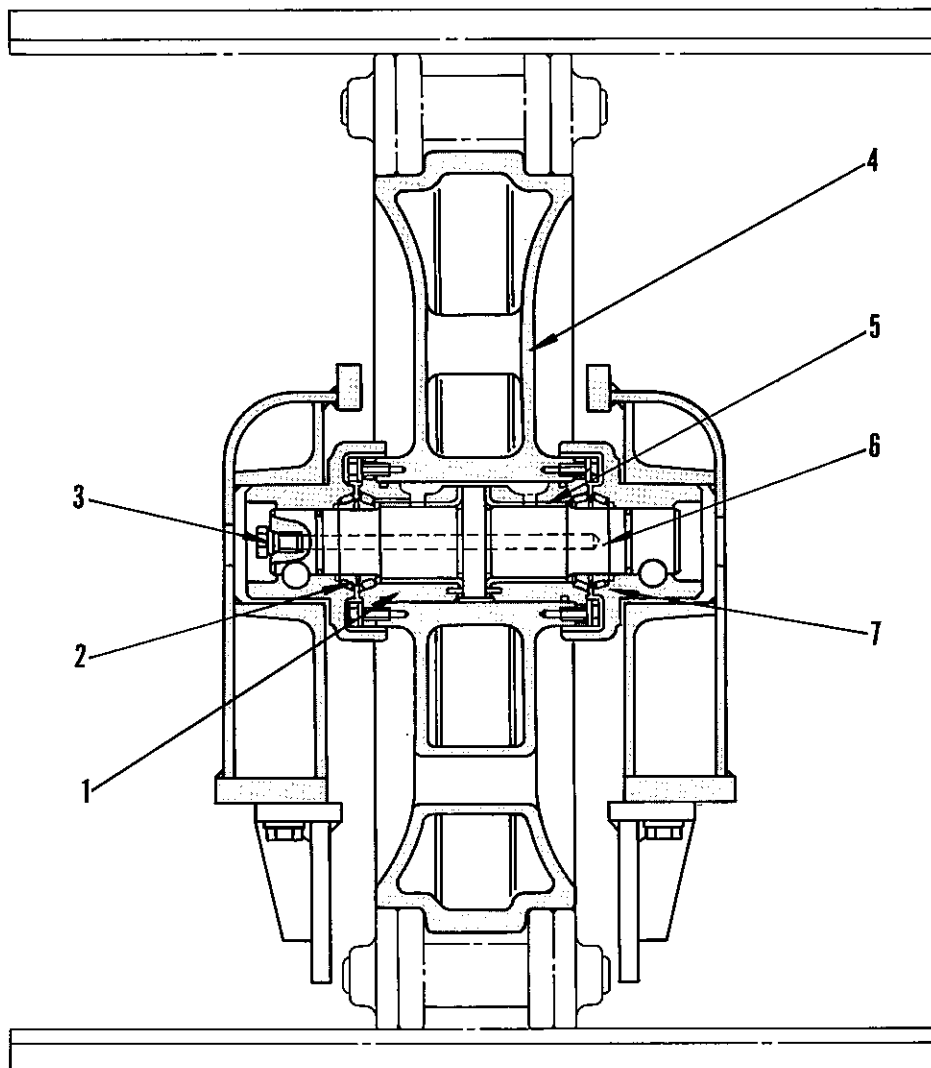
PC100-2, PC120-2



203F219

- 1. Outer bushing
- 2. Floating seal
- 3. Plug
- 4. Idler
- 5. Inner bushing
- 6. Idler shaft
- 7. Bearing support

PC100L-2

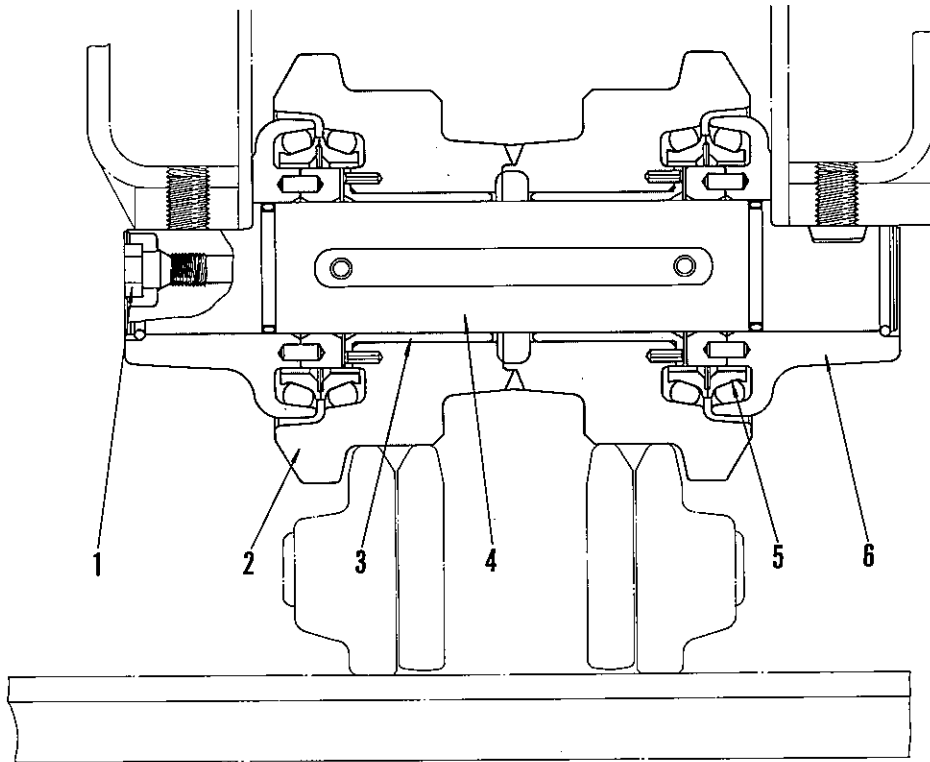


203F220

- 1. Outer bushing
- 2. Floating seal
- 3. Plug
- 4. Idler
- 5. Inner bushing
- 6. Idler shaft
- 7. Bearing support

TRACK ROLLER

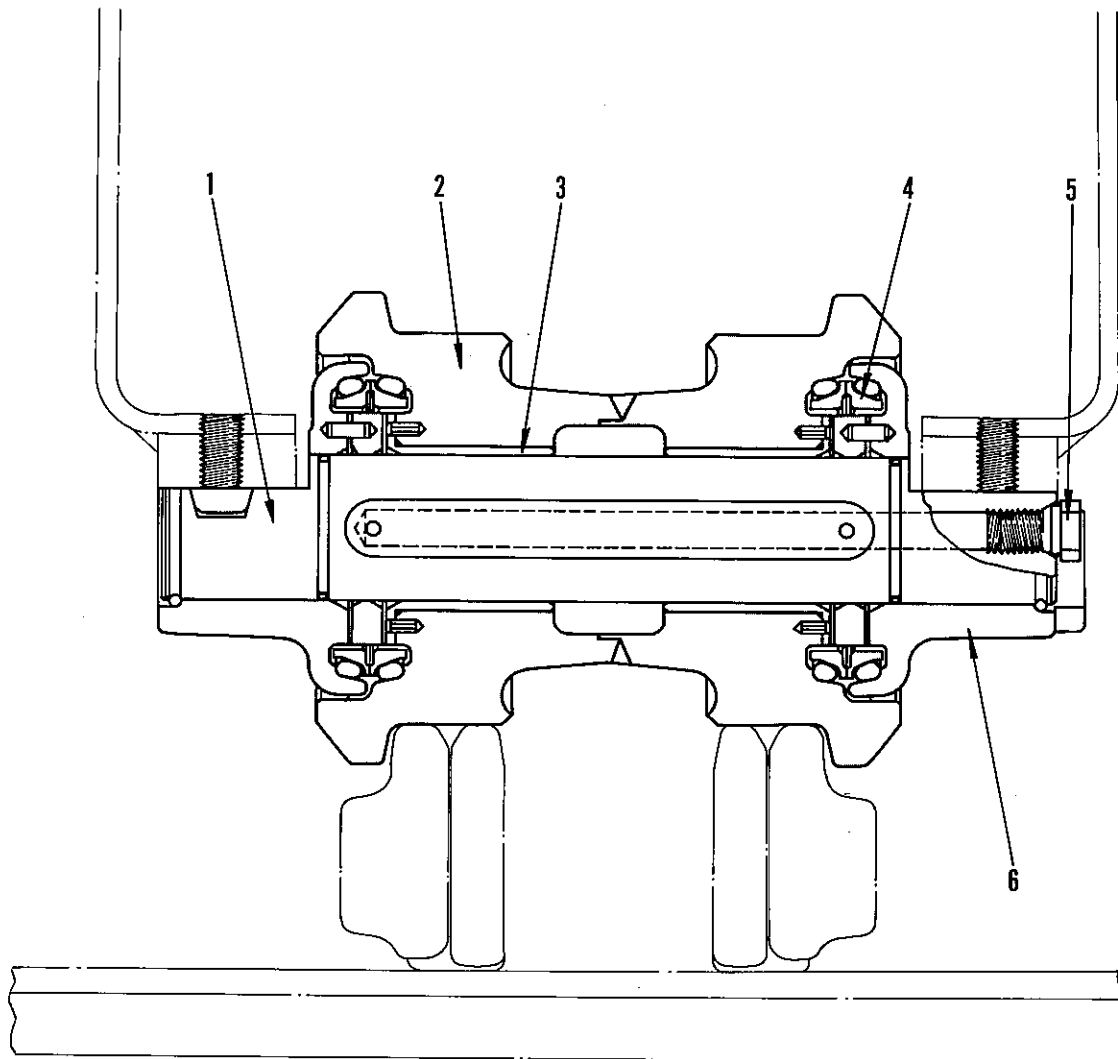
PC100-2, PC120-2



203F019

- 1. Plug
- 2. Roller
- 3. Bushing
- 4. Shaft
- 5. Floating seal
- 6. Collar

PC100L-2

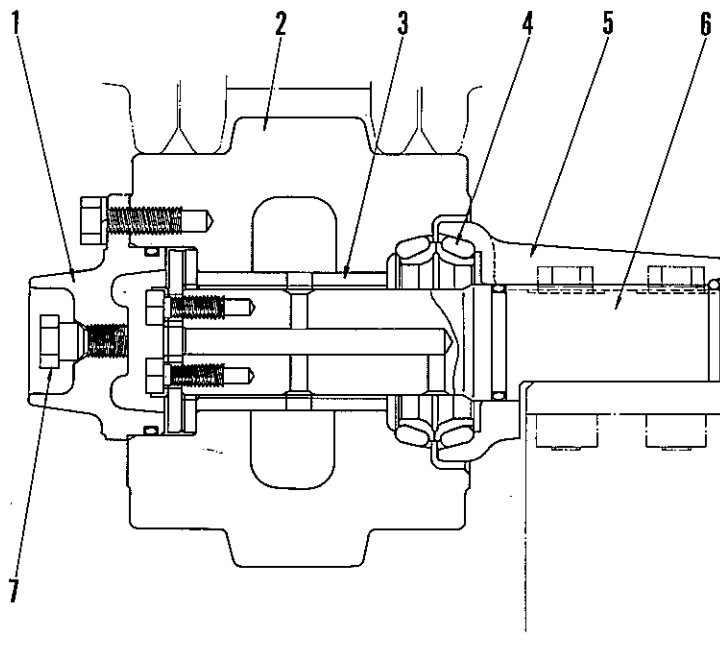


203F020

- 1. Shaft
- 2. Roller
- 3. Bushing
- 4. Floating seal
- 5. Plug
- 6. Collar

CARRIER ROLLER

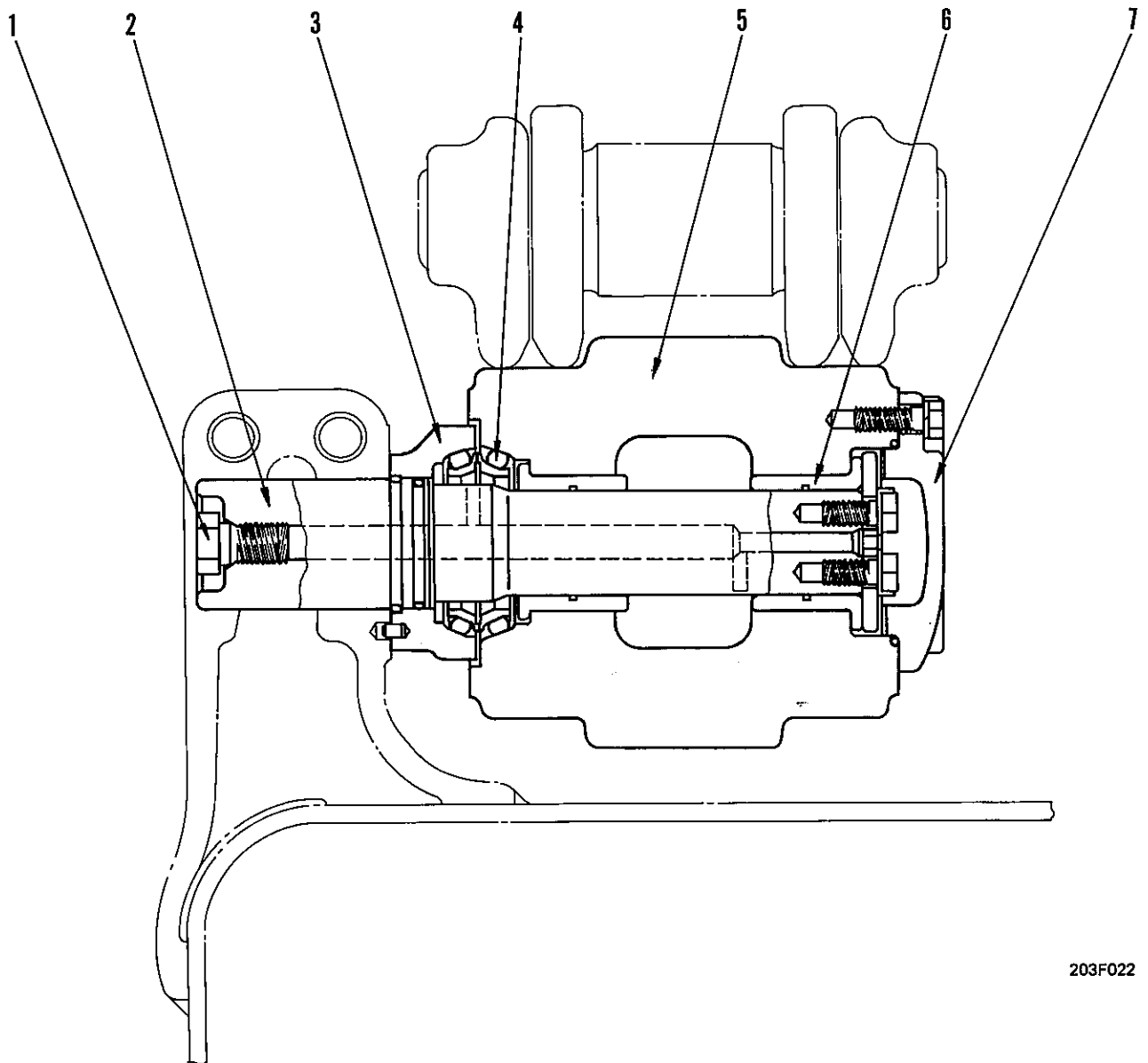
PC100-2, PC120-2



203F021

- 1. Collar
- 2. Roller
- 3. Bushing
- 4. Floating seal
- 5. Collar
- 6. Shaft
- 7. Plug

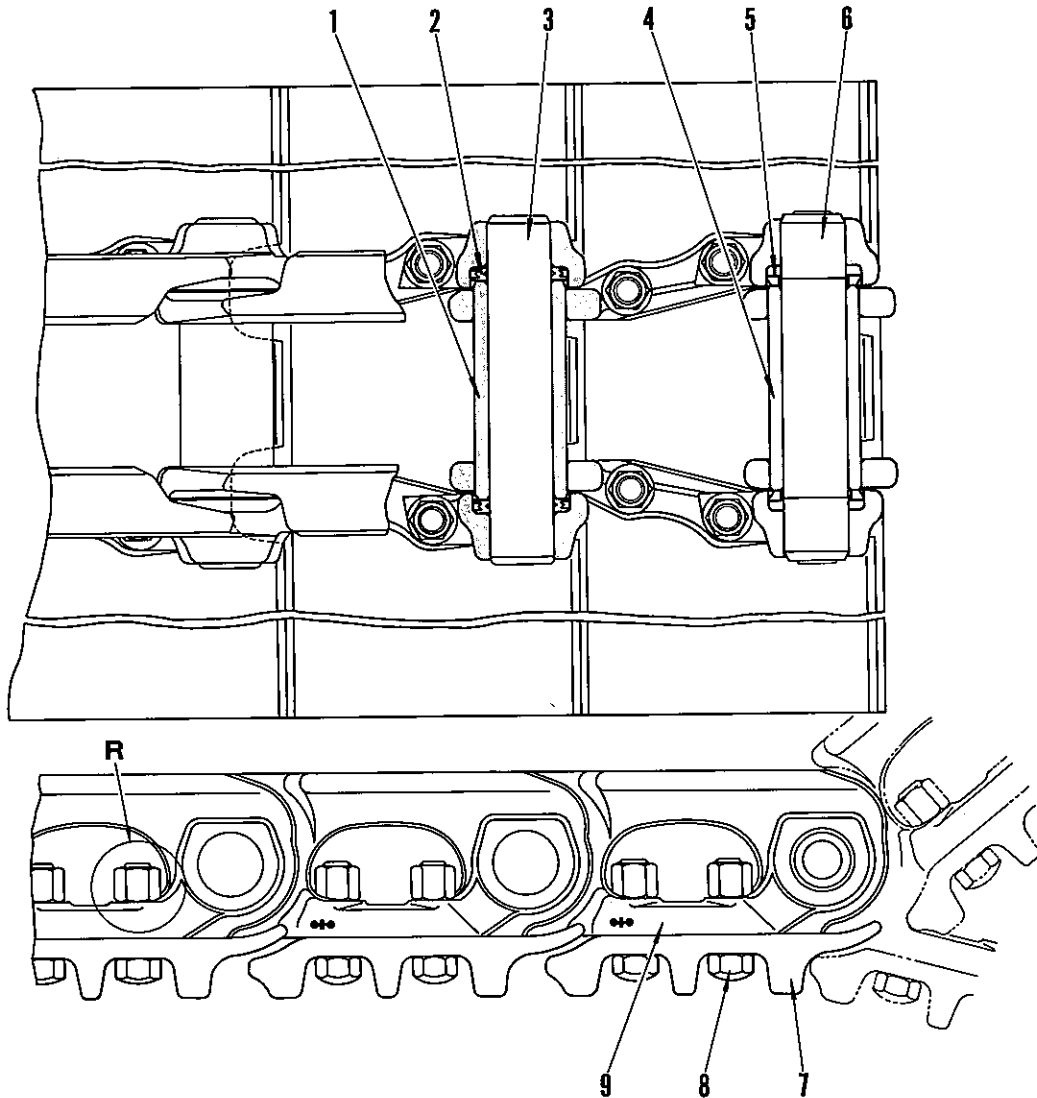
PC100L-2



203F022

- 1. Plug
- 2. Shaft
- 3. Collar
- 4. Floating seal
- 5. Roller
- 6. Bushing
- 7. Cover

TRACK SHOE



204F053

Standard shoe specification

PC100-2	{	480 mm triple-grouser shoe
		Link pitch : 154 mm
		Number of shoes : 86
PC100L-2	{	760 mm triple-grouser shoe
		Link pitch : 175 mm
		Number of shoes : 88
PC120-2	{	480 mm triple-grouser shoe
		Link pitch : 154 mm
		Number of shoes : 92

1. Regular bushing
2. Regular dust seal
3. Regular pin
4. Master bushing
5. Master dust seal
6. Master pin
7. Shoe
8. Shoe bolt
9. Link

Note: Models PC100-2 and PC120-2 are different only in the number of shoe.

Track shoe

Machine	Shoe type	Shoe width (mm)	Ground pressure (kg/cm ²)	Application
PC100-2	Triple-grouser	480 (Standard)	0.42	For general ground
		610	0.34	For muddy ground
		710	0.29	
	Swamp	600	0.33	For extremely muddy ground
		760	0.26	
	Flat	480	0.42	For pavement, etc.
PC100L-2	Triple-grouser	760 (Standard)	0.27	For muddy ground
	Swamp	800	0.25	For extremely muddy ground
		960	0.21	
PC120-2	Triple-grouser	480 (Standard)	0.42	For general ground
		610	0.34	For muddy ground
		710	0.30	
	Swamp	600	0.33	For extremely muddy ground
	Flat	480	0.42	For general ground

C

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C

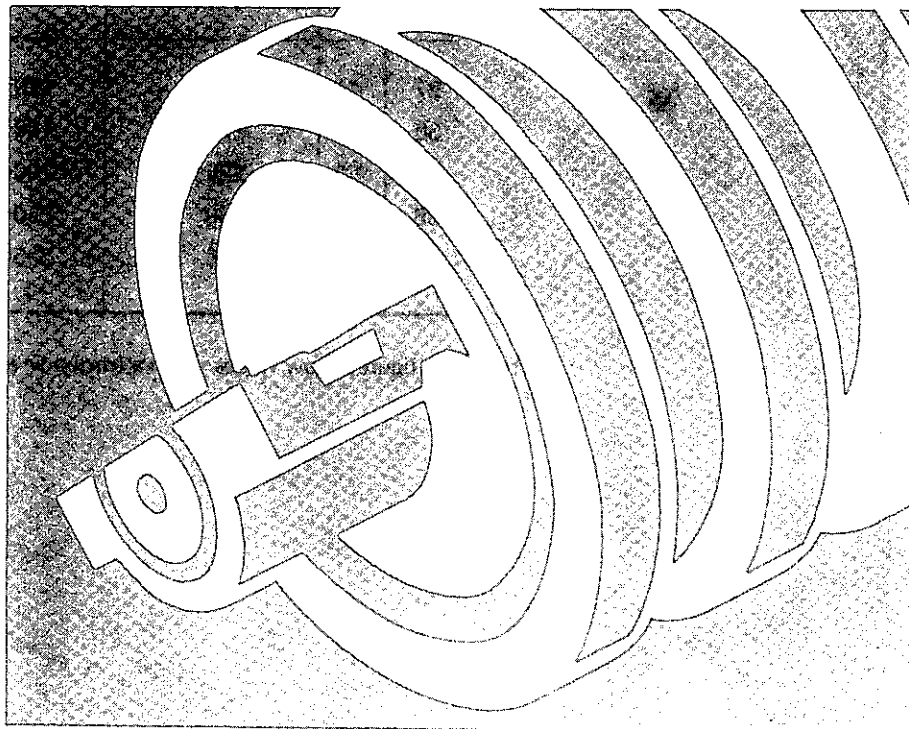
C

SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up



34 UNDER CARRIAGE MAINTENANCE STANDARD



TIGHTENING TORQUES FOR NUTS AND BOLTS

If the tightening torque is not indicated for any nut or bolt, tighten to the values in the table below.

Unit: kg.m

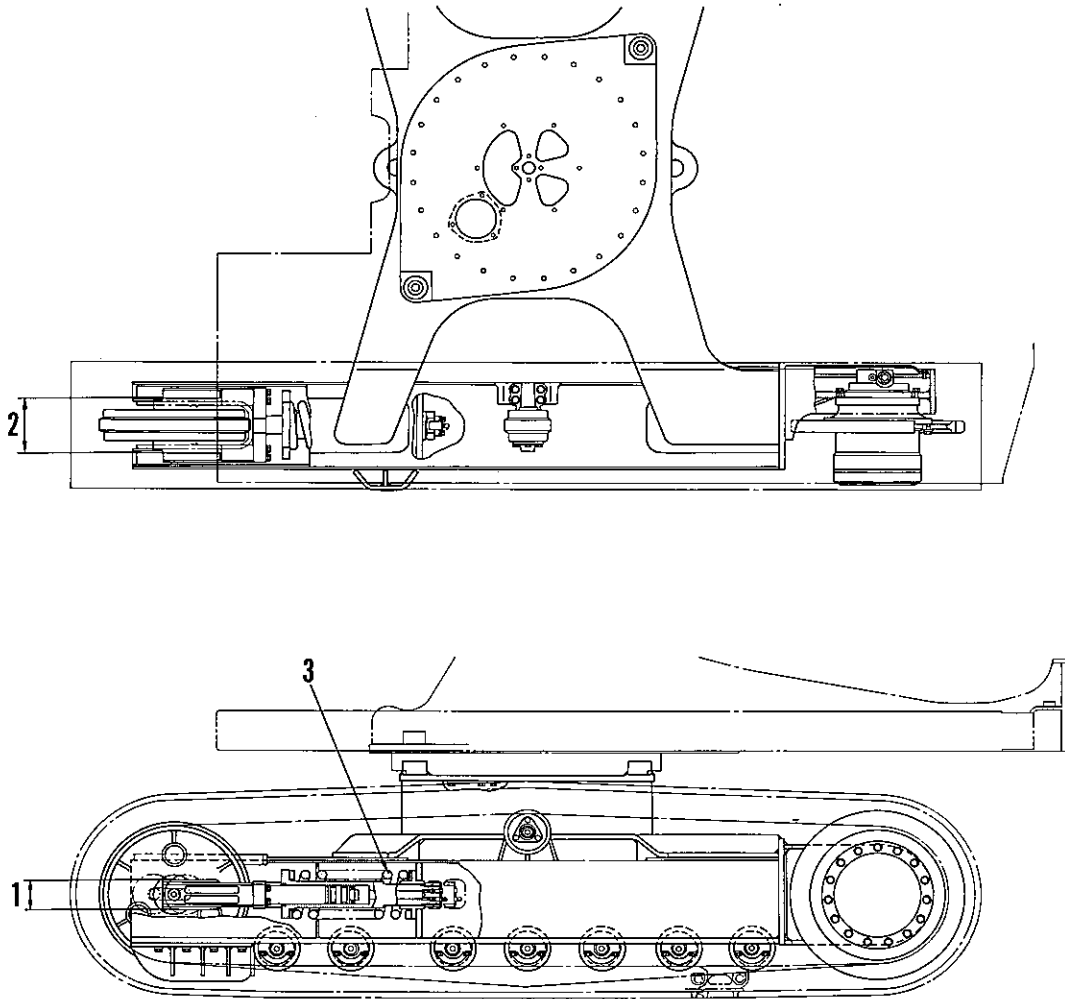
Nominal diameter of bolt (mm)	Width across flats (mm)		
		Target	Range
6	10	1.35	1.2~1.5
8	13	3.2	2.8~3.5
10	17	6.7	6 ~7.5
12	19	11.5	10 ~12.5
14	22	18	16 ~20.0
16	24	28.5	25 ~31.5
18	27	39	35 ~43.5
20	30	56	50 ~62.0
22	32	76	67.5~84.5
24	36	94.5	84 ~105
27	41	135	120~150
30	46	175	155~190
33	50	225	200~250
36	55	280	250~310
39	60	335	295~370

★ The above figures show values when a torque wrench is used.

MAINTENANCE STANDARD

Track frame and recoil spring	34- 4
Idler	34- 6
Track roller	34-10
Carrier roller	34-12
Track shoe	34-14

TRACK FRAME AND RECOIL SPRING



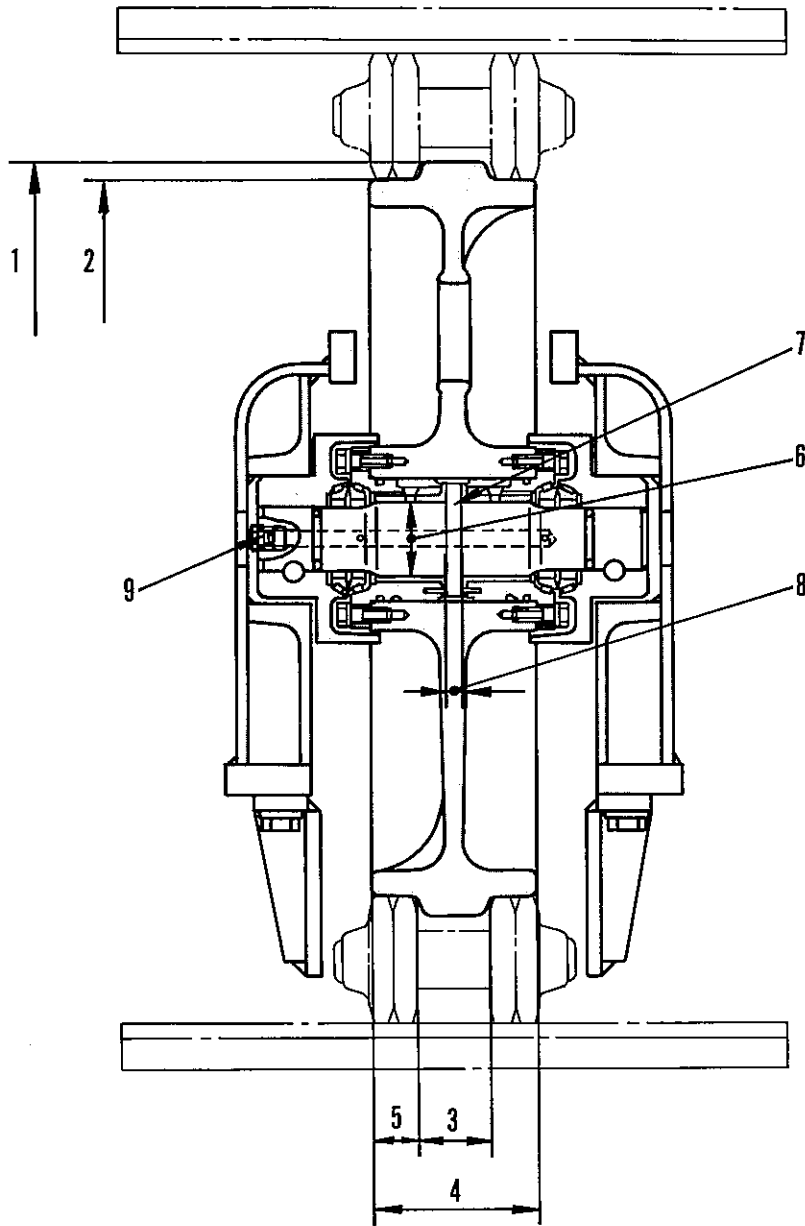
203F221

Unit: mm

No.	Check item	Criteria					Remedy	
			Serial No.	Standard size	Repair limit			
1	Vertical width of idler guide	Track frame	PC100: 13001~ PC120: 14001~	93	98	Rebuild		
			PC100L: 11001~	98	103			
		Idler support	PC100: 13001~ PC100L: 11001~ PC120: 14001~	90	95	Rebuild or replace		
2	Horizontal width of idler guide	Track frame	PC100: 13001~ PC120: 14001~	204	212	Rebuild		
			PC100L: 11001~	244	252			
		Idler	PC100: 13001~ PC120: 14001~	200	192	Rebuild or replace		
			PC100L: 11001~	239	231			
3	Recoil spring length, installed load (kg)	Serial No.	Standard size			Repair limit		Replace
			Free length	Installed length	Installed load	Free length	Installed load	
		PC100 :13001~ PC120 :14001~	564.5	442	6,897	554	6,440	
PC100L:11001~	543	452	7,653	533	7,110			

IDLER

PC100-2, PC120-2

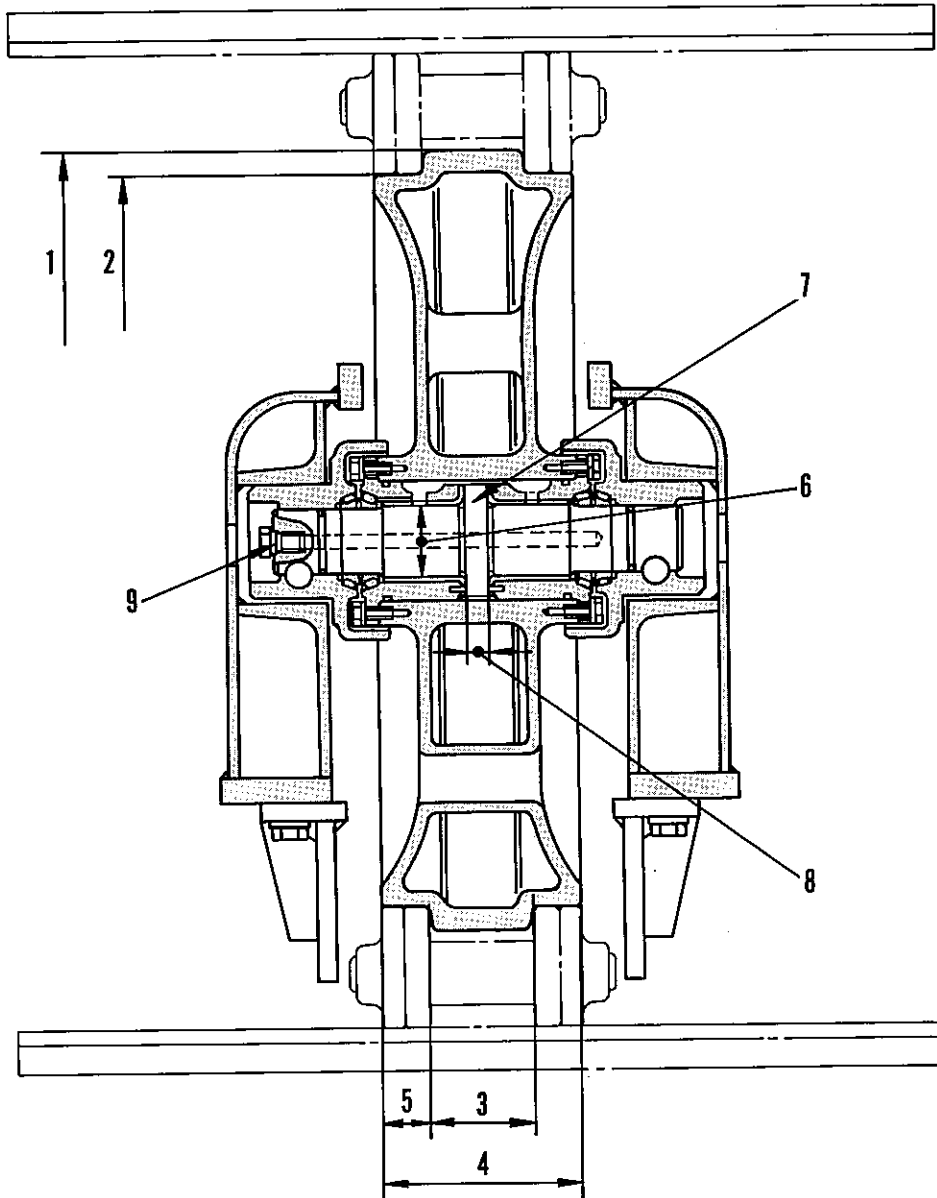


203F222

Unit: mm

No	Check item	Criteria				Remedy	
		Serial No.		Standard size	Repair limit		
1	Outer dia. of protrusion	PC100	13001~	548	536	Rebuild or replace	
		PC120	14001~				
2	Outer dia. of tread	PC100	13001~	520	508		
		PC120	14001~				
3	Width of protrusion	PC100	13001~	52	40		
		PC120	14001~				
4	Total width	PC100	13001~	118	110		
		PC120	14001~				
5	Width of tread	PC100	13001~	33	39		
		PC120	14001~				
6	Clearance between shaft and bushing	Serial No.	Standard size	Tolerance		Standard clearance	Clearance limit
				Shaft	Hole		
		PC100 13001~ PC120 14001~	55	-0.250 -0.300	+0.074 0	0.250 ~ 0.374	1.5
7	End play of idler	Repair limit: 1.5					
8	Shaft flange width	Serial No.		Standard size	Repair limit	Replace	
		PC100	13001~	10	9		
	PC120	14001~					
9	Tightening torque for plug	8 ± 2 kgm					

PC100L-2



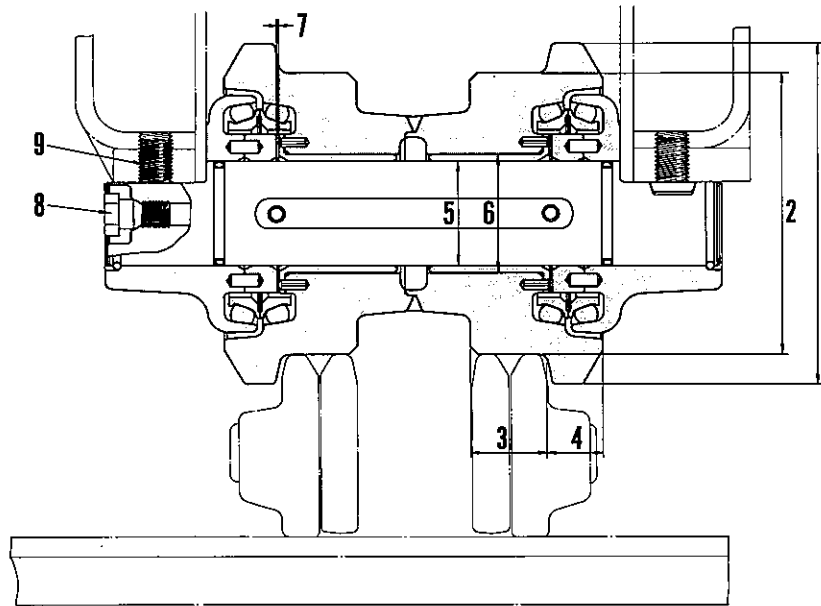
203F223

Unit: mm

No	Check item	Criteria					Remedy	
		Serial No.	Standard size	Tolerance		Repair limit		
1	Outer dia. of protrusion	Serial No.	Standard size	Tolerance		Repair limit	Rebuild or replace	
		11001~	655	640		640		
		11001~	615	600		600		
		11001~	85	77		77		
		11001~	164	154		154		
2	Outer dia. of tread	11001~	615	600		600	Rebuild or replace	
3	Width of protrusion	11001~	85	77		77		
4	Total width	11001~	164	154		154		
5	Width of tread	11001~	39.5	43.5		43.5		
6	Clearance between shaft and bushing	Serial No.	Standard size	Tolerance		Standard clearance		Clearance limit
11001~		60	Shaft	Hole	0.25 ~ 0.364	1.5		
7	End play of idler	Repair limit: 1.5						
8	Shaft flange width	Serial No.	Standard size	Repair limit		Replace		
		11001~	20	19				
9	Tightening torque for plug	21 ± 5 kgm						

TRACK ROLLER

PC100-2, PC120-2

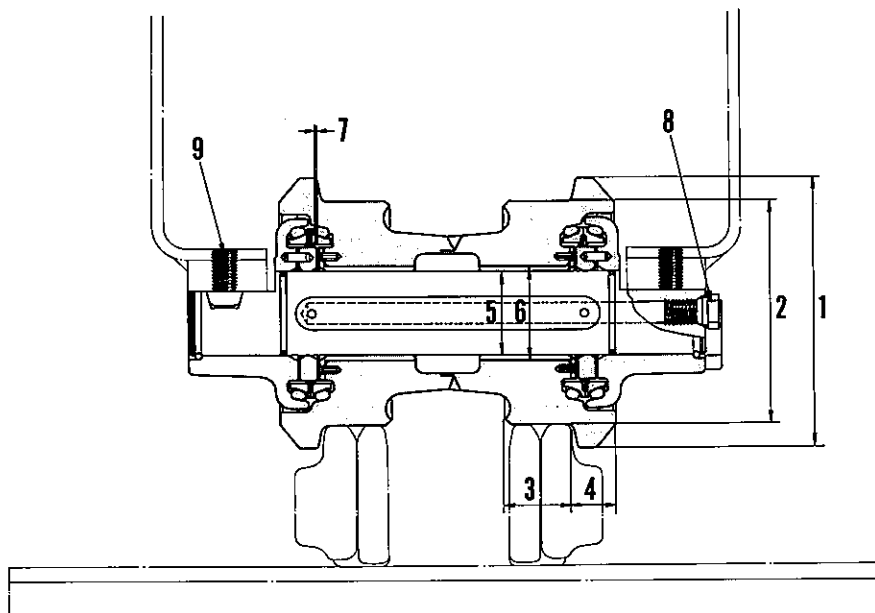


203F028

Unit: mm

No.	Check item	Criteria				Remedy	
		Serial No.		Standard size	Repair limit		
1	Flange (outside) outer dia.	PC100	13001~	163	153	Rebuild or replace	
		PC120	14001~				
2	Tread outside dia.	PC100	13001~	135	125		
3	Tread width	PC100	13001~	35.5	30.5		
4	Flange width	PC100	13001~	26.5	-		
5	Clearance between shaft and bushing	Serial No.	Standard size	Tolerance		Standard clearance 0.250 ~ 0.362	Clearance limit 1.5
				Shaft	Hole		
6	Interference between roller and bushing	Serial No.	Standard size	Tolerance		Standard Interference 0.002 ~ 0.062	Interference limit -
				Shaft	Hole		
7	End play of roller	Serial No.		Standard clearance	Clearance limit	Replace	
		PC100	13001~	0.40 ~ 0.71	3.0		
8	Tightening torque for plug	12 ± 2 kgm					
9	Tightening torque for bolt	28.5 ± 3.0 kgm					

PC100L-2



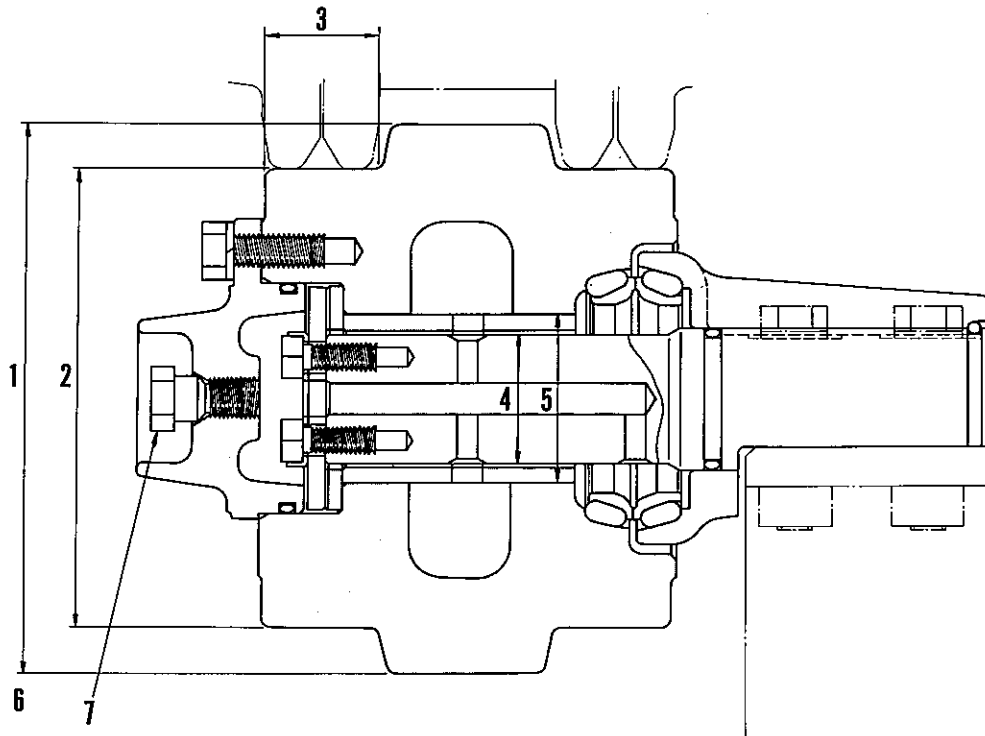
203F029

Unit: mm

No.	Check item	Criteria				Remedy		
		Serial No.	Standard size	Tolerance			Repair limit	
1	Flange (outside) outer dia.	11001~	193			Rebuild or replace		
		11001~	160					
		11001~	47					
2	Tread outside dia.	11001~	160			Rebuild or replace		
3	Tread width	11001~	47					
4	Flange width	11001~	30					
5	Clearance between shaft and bushing	Serial No.	Standard size	Tolerance		Standard clearance	Clearance Limit	Replace bushing
		11001~	60	Shaft: -0.250 -0.290	Hole: +0.074 0	0.250 ~ 0.364	1.5	
6	Interference between roller and bushing	Serial No.	Standard size	Tolerance		Standard interference	Interference limit	
		11001~	67	Shaft: +0.062 +0.032	Hole: +0.030 0	0.002 ~ 0.062	-	
7	End play of roller	Serial No.	Standard clearance		Clearance limit		Replace	
		11001~	0.33 ~ 0.64		3.0			
8	Tightening torque for plug	21 ± 5 kgm						
9	Tightening torque for bolt	28.5 ± 3.0 kgm						

CARRIER ROLLER

PC100-2, PC120-2

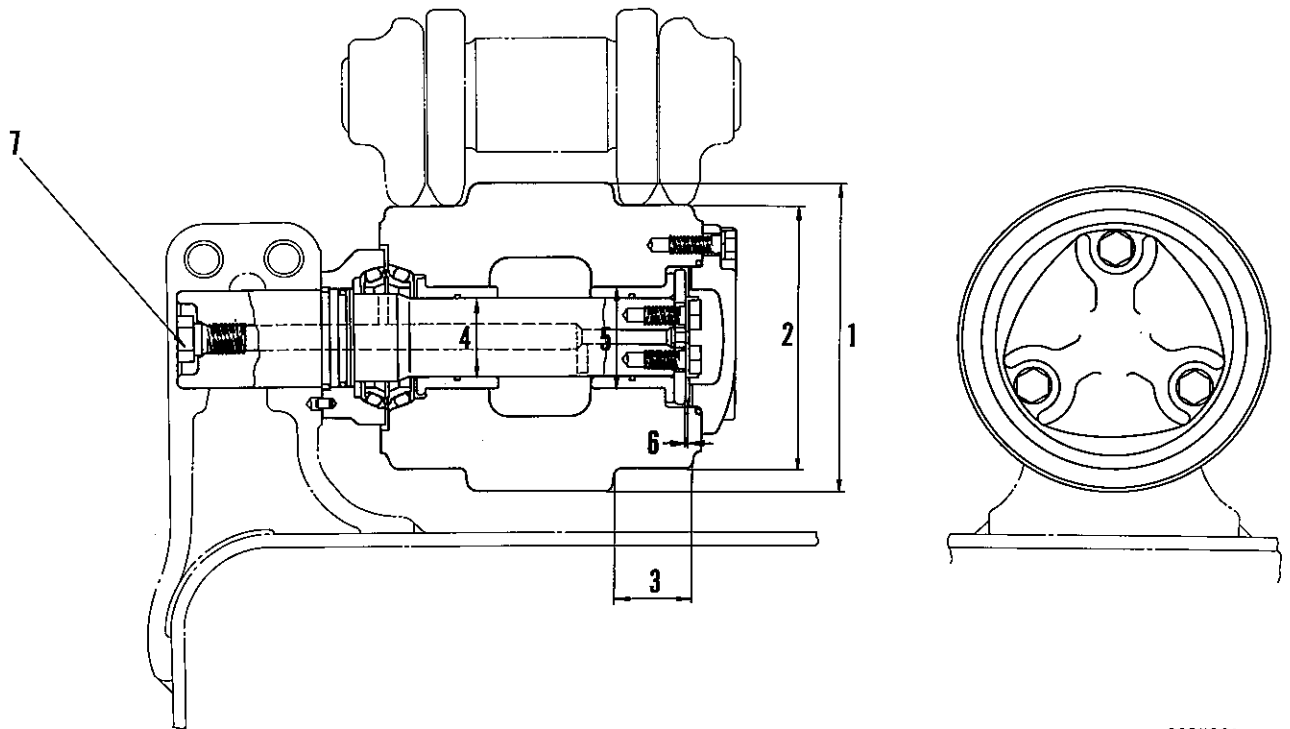


203F030

Unit: mm

No	Check item	Criteria					Remedy
1	Outer dia. of protrusion	Serial No.		Standard size	Repair limit		Rebuild or replace
		PC100	13001~	170	160		
		PC120	14001~				
2	Outer dia. of tread	PC100	13001~	142	130		
		PC120	14001~				
3	Width of tread	PC100	13001~	35	42		
PC120	14001~						
4	Clearance between shaft and bushing	Serial No.	Standard size	Tolerance		Standard clearance 0.080 ~ 0.158	Clearance limit 1.0
				Shaft	Hole		
5	Interference between roller and bushing	Serial No.	Standard size	Tolerance		Standard interference 0.002 ~ 0.062	Interference limit 0
				Shaft	Hole		
6	End play of roller	Serial No.		Standard clearance	Clearance limit		Replace
		PC100	13001~	0.525 ~ 0.700	1.5		
PC120	14001~						
7	Tightening torque for plug	8.5 ± 1.5 kgm					

PC100L-2

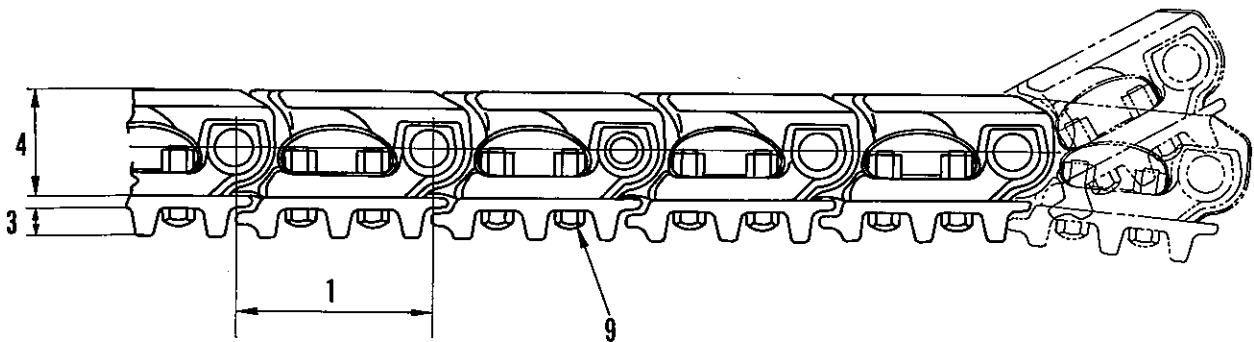
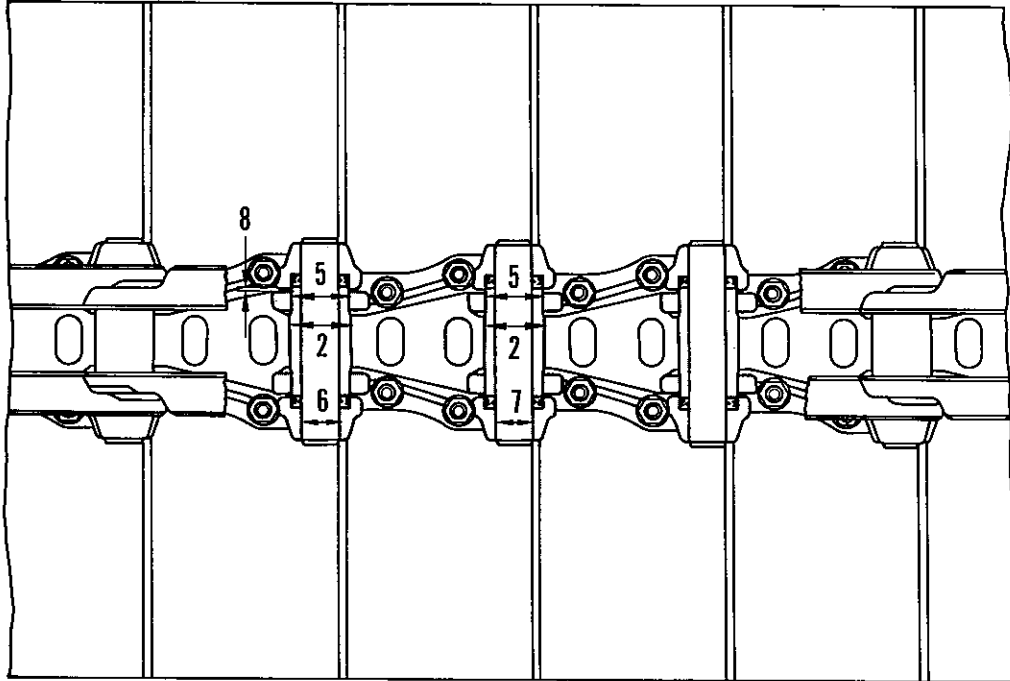


203F031

Unit: mm

No	Check item	Criteria					Remedy	
		Serial No.	Standard size	Tolerance		Standard clearance		Clearance limit
1	Outer dia. of protrusion	Serial No.	Standard size	Tolerance		Standard clearance	Clearance limit	
		11001~	175			0.15 ~ 0.225	1.0	
		11001~	150					
2	Outer dia. of tread	11001~	150				Rebuild or replace	
3	Width of tread	11001~	43					
4	Clearance between shaft and bushing	Serial No.	Standard size	Tolerance		Standard clearance		Clearance limit
		11001~	45	-0.15 -0.20	+0.025 0	0.15 ~ 0.225	1.0	Replace bushing
5	Interference between roller and bushing	Serial No.	Standard size	Tolerance		Standard interference	Interference limit	
		11001~	58	+0.117 +0.087	+0.030 0	0.057 ~ 0.117	-	
6	End play of roller	Serial No.	Standard clearance		Clearance limit		Replace	
		11001~	0.395 ~ 0.550		0.6			
7	Tightening torque for plug	21 ± 5 kgm						

TRACK SHOE



203F032

Note: Track shoe illustrated above is for use in Model PC100-2.

Unit: mm

No	Check item	Criteria					Remedy	
		Serial No.		Standard size	Repair limit			
1	Link pitch	PC100 13001~ PC120 14001~		154.2	157.2		Turn or replace	
		PC100L 11001~		175	178			
		PC100 13001~ PC120 14001~		45	42			
2	Bushing outside dia.	PC100L 11001~		55	52			
		PC100 13001~ PC120 14001~		23	15			
3	Grouser height	PC100L 11001~		25	15		Lug welding rebuild or replace	
		PC100 13001~ PC120 14001~		87	82			
4	Link height	PC100L 11001~		95	92		Rebuild or replace	
		PC100 13001~ PC120 14001~						
5	Interference between bushing and link	PC100 13001~ PC120 14001~	46	Shaft: +0.287 +0.247	Hole: +0.062 0	Standard interference: 0.185 ~ 0.287	Interference limit: 0.1	
		PC100L11001~	55	+0.304 +0.264	+0.074 0	0.190 ~ 0.304	0.1	
		PC100 13001~ PC120 14001~	30	+0.100 0	-0.148 -0.200	0.148 ~ 0.300	0.1	
6	Interference between regular pin and link	PC100L 11001~	37.8	+0.372 +0.272	+0.062 0	0.210 ~ 0.372	0.138	Replace
		PC100 13001~ PC120 14001~	30	-0.030 -0.070	-0.148 -0.200	0.078 ~ 0.170	0.05	
7	Interference between master pin and link	PC100L11001~	37.2	+0.230 +0.200	+0.062 0	0.138 ~ 0.230	0.078	
		PC100 13001~ PC120 14001~						
8	Clearance of link joint surface	PC100 13001~ PC120 14001~ PC100L 11001~		one side: 0 ~ 1.1	both side: 0 ~ 2.2	both side: 5	Replace	
		PC100 13001~ PC120 14001~		27 ± 3 kgm				
9	Tightening torque for shoe bolt	PC100L11001~		40 ± 4 kgm				

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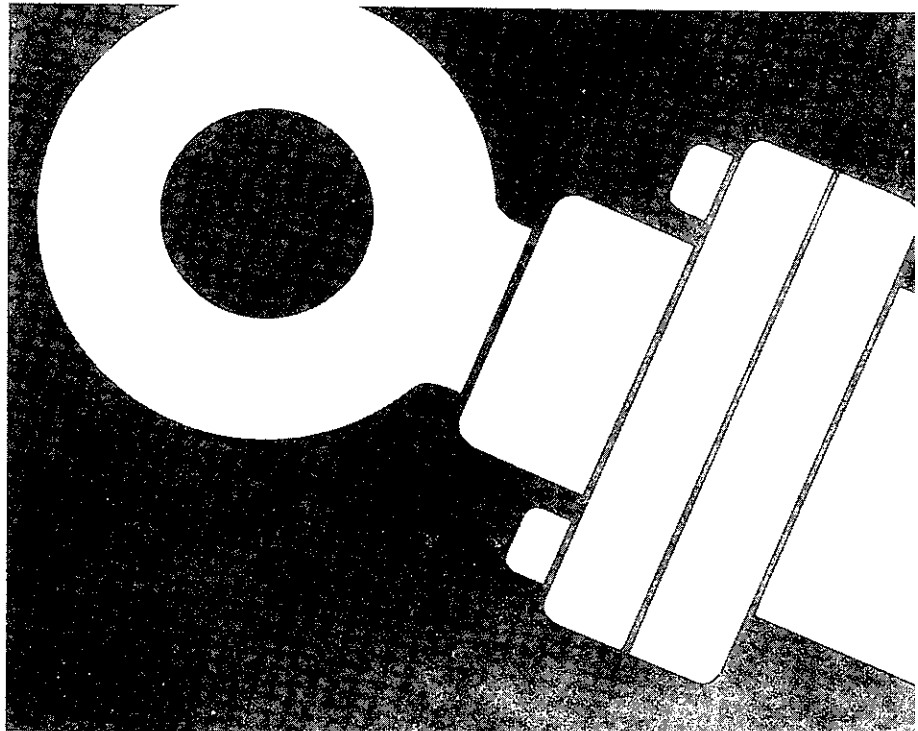
C

SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
PC100L-2 11001 and up
PC120-2 14001 and up

61 HYDRAULIC SYSTEM STRUCTURE AND FUNCTION



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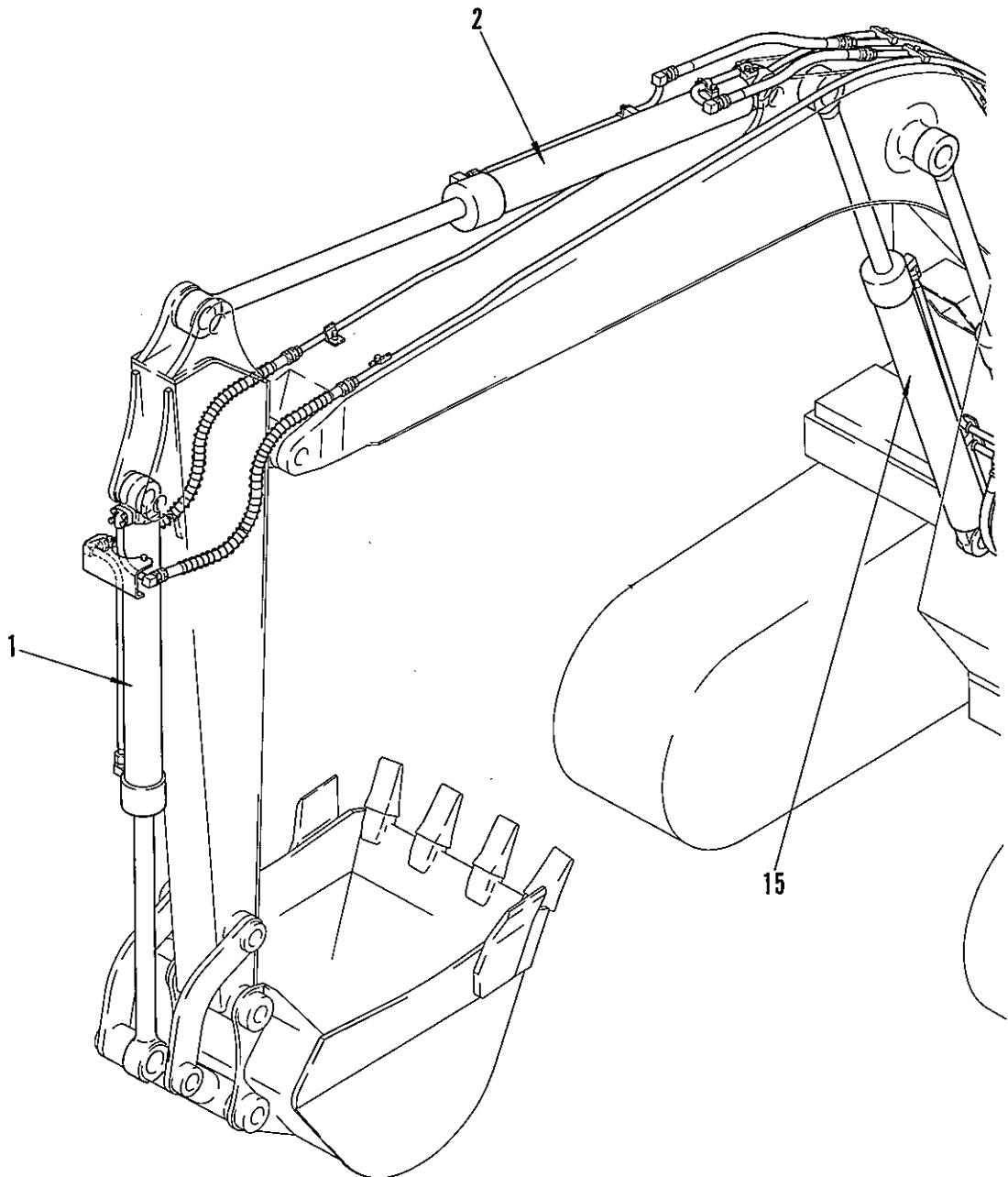
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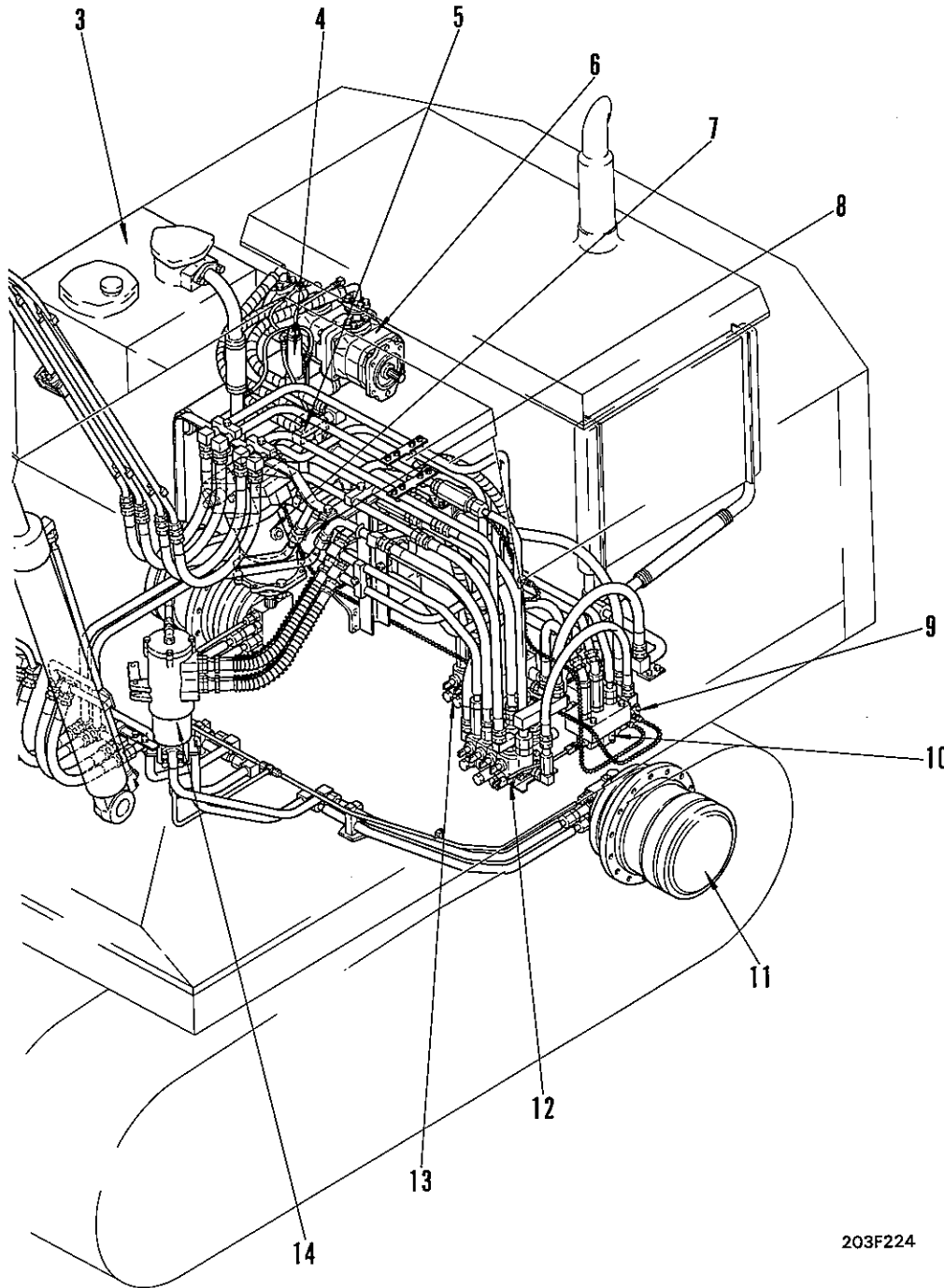
STRUCTURE AND FUNCTION

Hydraulic piping	61- 4
Hydraulic piping (Option)	61-5-1
Hydraulic system	61- 6
Hydraulic system (Option)	61-7-1
Hydraulic circuit	61- 8
Hydraulic circuit (Option).....	61-11-1
Hydraulic tank	61-12
Hydraulic pump	61-13
Hydraulic muffler	61-14
Pressure compensated valve (Option)	61-15
L.H. 4-spool control valve	61-16
R.H. 3-spool control valve	61-17
R.H. 4-spool control valve (Option)	61-17-1
Pilot check valve	61-20
Travel acceleration selector valve	61-24
Variable throttle valve	61-26
Center swivel joint	61-30
Swing motor and brake valve assembly	61-31
Swing brake valve	61-32
Swing motor	61-35
Swing motor and brake valve assembly (Option)	61-36-1
Swing motor (with swing lock brake)	61-36-2
Swing brake valve	63-36-3
Travel motor	61-37
Boom cylinder	61-43
Arm cylinder	61-44
Bucket cylinder	61-45
Valve control	61-46
Valve control (Option)	61-46-1
Auto-deceleration system	61-47
Straight travel system (Option)	61-51
Travel connection valve (Option)	61-53

HYDRAULIC PIPING

(The work equipment and the lower piping are shown in the same drawing, although their dimension, etc. are not proportionate in some portions to the actual ones.)





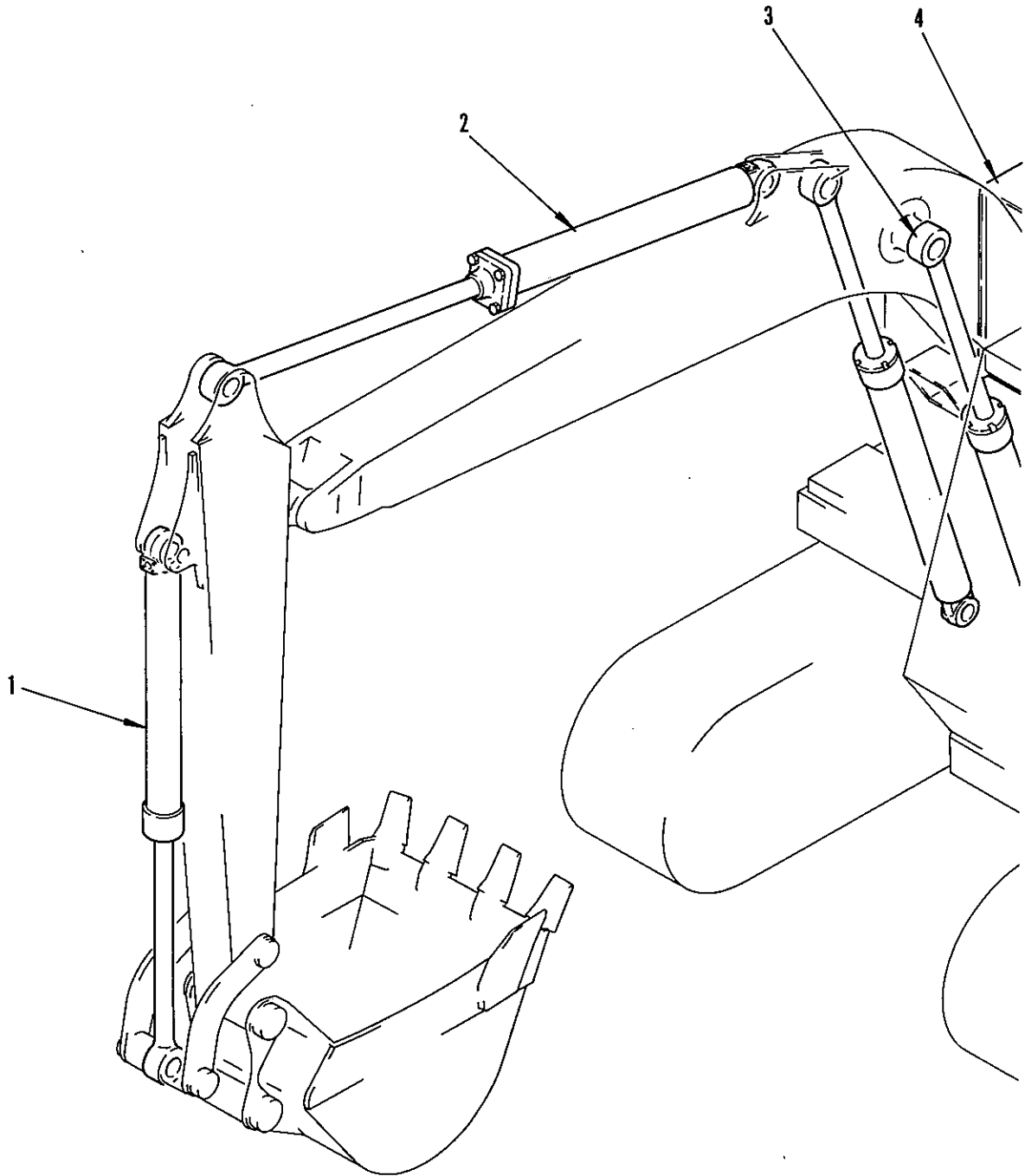
- 1. Bucket cylinder
- 2. Arm cylinder
- 3. Hydraulic tank
- 4. Deceleration cylinder
- 5. Pilot check valve for auto-deceleration
- 6. Tandem gear pump
- 7. Swing motor
- 8. Hydraulic muffler
- 9. Pilot check valve
- 10. Travel acceleration selector valve
- 11. Travel motor
- 12. L.H. 4-spool control valve
- 13. R.H. 3-spool control valve
- 14. Center swivel joint
- 15. Boom cylinder

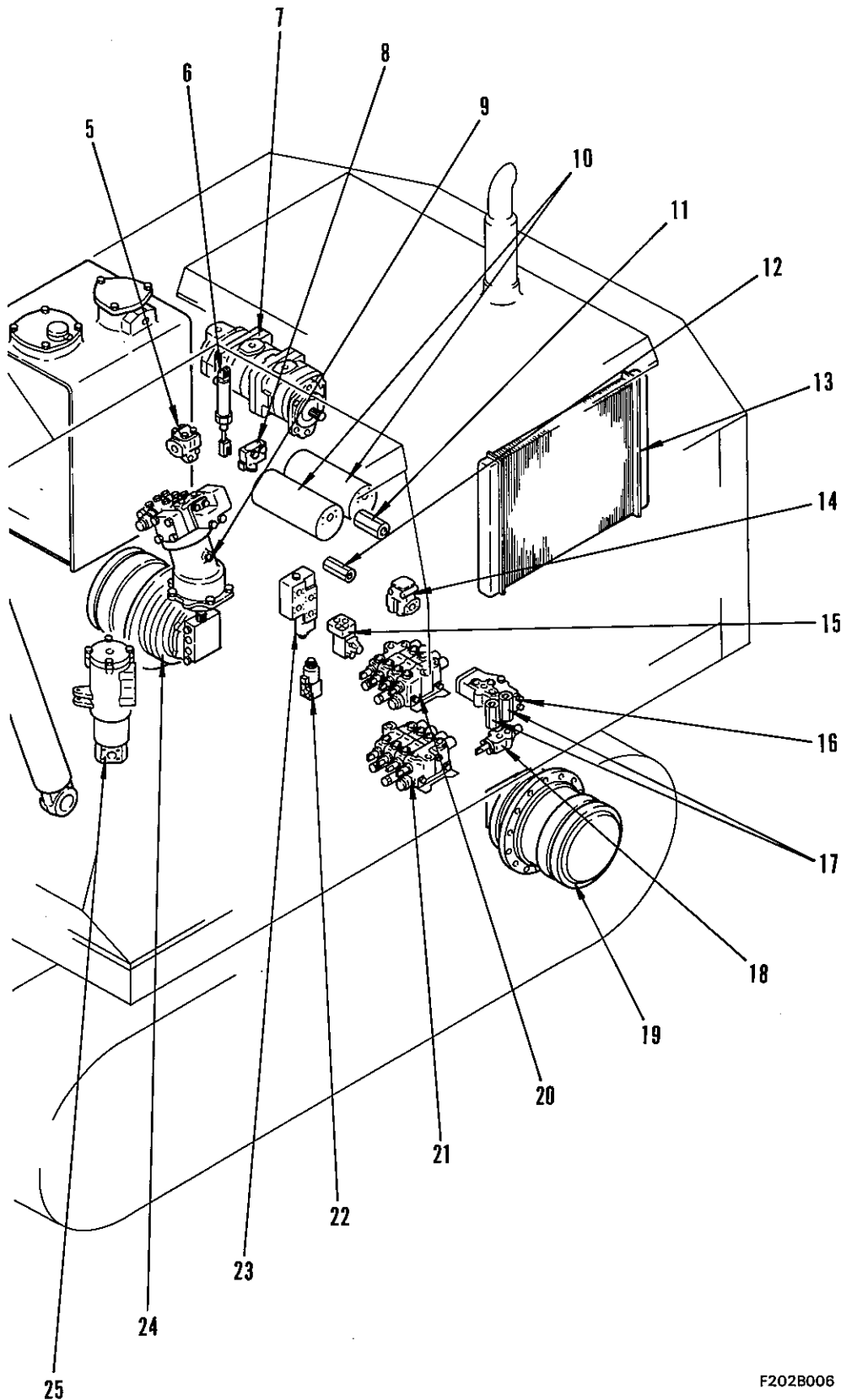
203F224

HYDRAULIC PIPING (OPTION)

Equipped with straight travel system

(The work equipment and the lower piping are shown in the same drawing, although their dimension, etc. are not proportionate in some portions to the actual ones.)



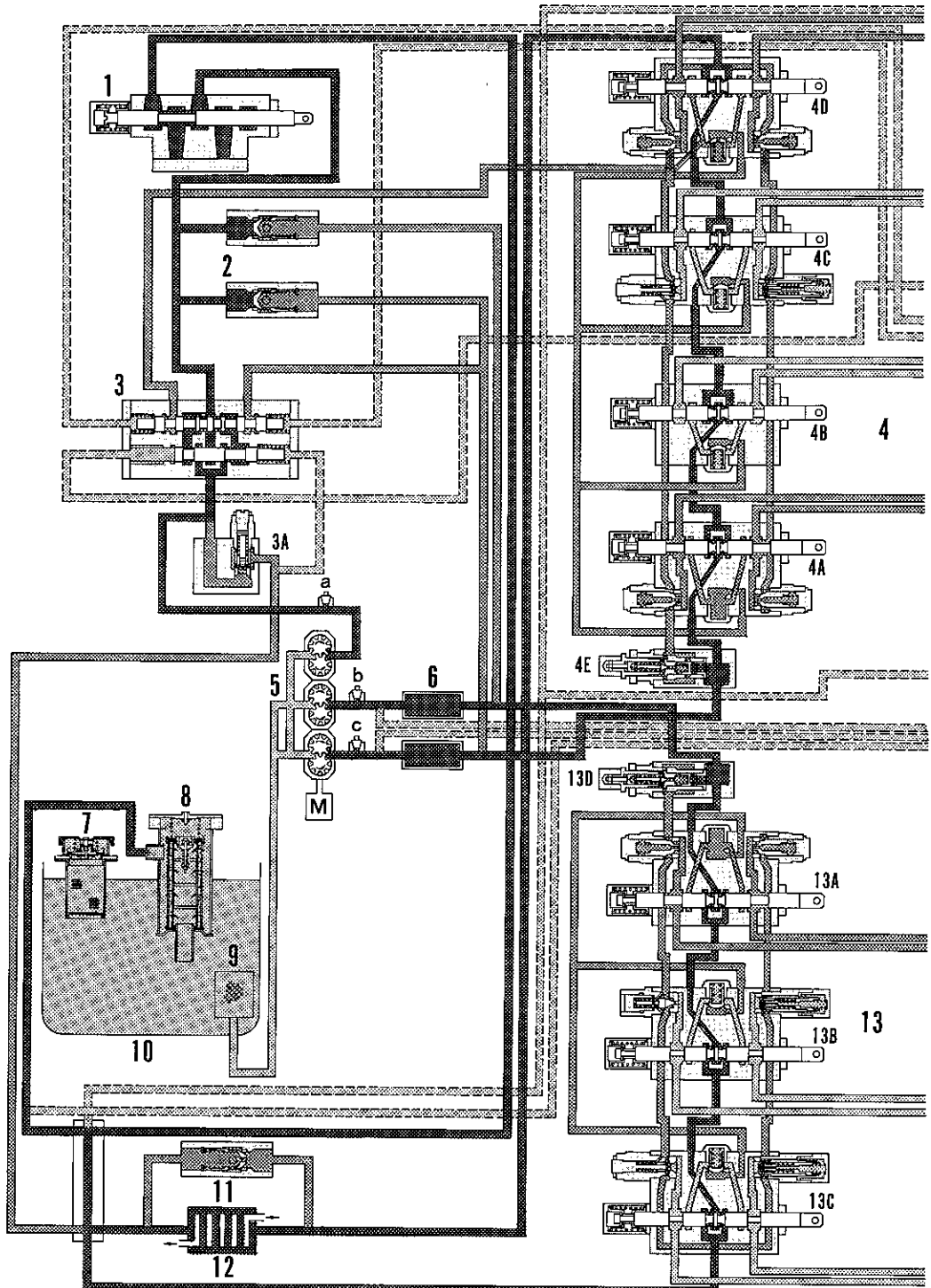


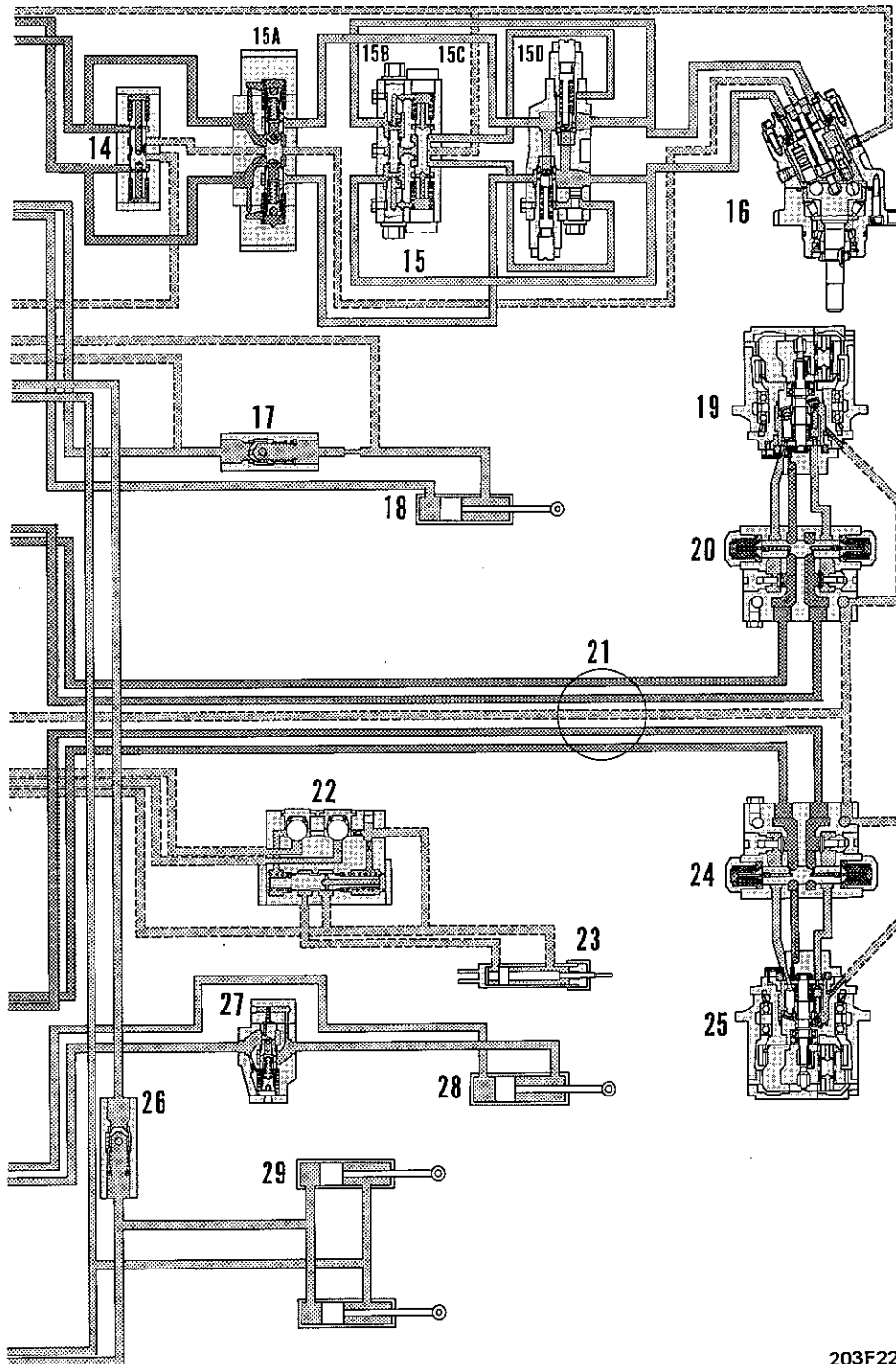
- 1. Bucket cylinder
- 2. Arm cylinder
- 3. Boom cylinder
- 4. Hydraulic tank
- 5. Slow return valve (Variable throttle type)
- 6. Deceleration cylinder
- 7. Tandem gear pump
- 8. Pilot check valve for auto-deceleration
- 9. Swing motor
- 10. Hydraulic muffler
- 11. Slow return valve
- 12. Check valve
- 13. Oil cooler
- 14. Pressure compensated valve
- 15. Solenoid valve
- 16. Pilot check valve
- 17. Check valve
- 18. Travel acceleration selector valve
- 19. L.H. travel motor
- 20. R.H. 4-spool control valve
- 21. R.H. 4-spool control valve
- 22. Solenoid valve
- 23. Travel connection valve
- 24. R.H. travel motor
- 25. Center swivel joint

F202B006

HYDRAULIC SYSTEM

- 1. Travel acceleration selector valve
- 2. Check valve
- 3. Pilot check valve
- 3A. Main relief valve
- 4. L.H. 4-spool control valve
- 4A. For L.H. travel motor control
- 4B. For boom acceleration control
- 4C. For arm control
- 4D. For swing control
- 4E. Main relief valve
- 5. Hydraulic pump
- 6. Oil pressure muffler
- 7. Pressure valve
- 8. Hydraulic filter
- 9. Suction strainer
- 10. Hydraulic tank
- 11. Oil cooler bypass valve
- 12. Oil cooler
- 13. R.H. 3-spool control valve
- 13A. For R.H. travel motor control
- 13B. For bucket control
- 13C. For boom control
- 13D. Main relief valve
- a. Pressure tap for pilot check valve
- b. Pressure tap for R.H. 3-spool control valve
- c. Pressure tap for L.H. 4-spool control valve





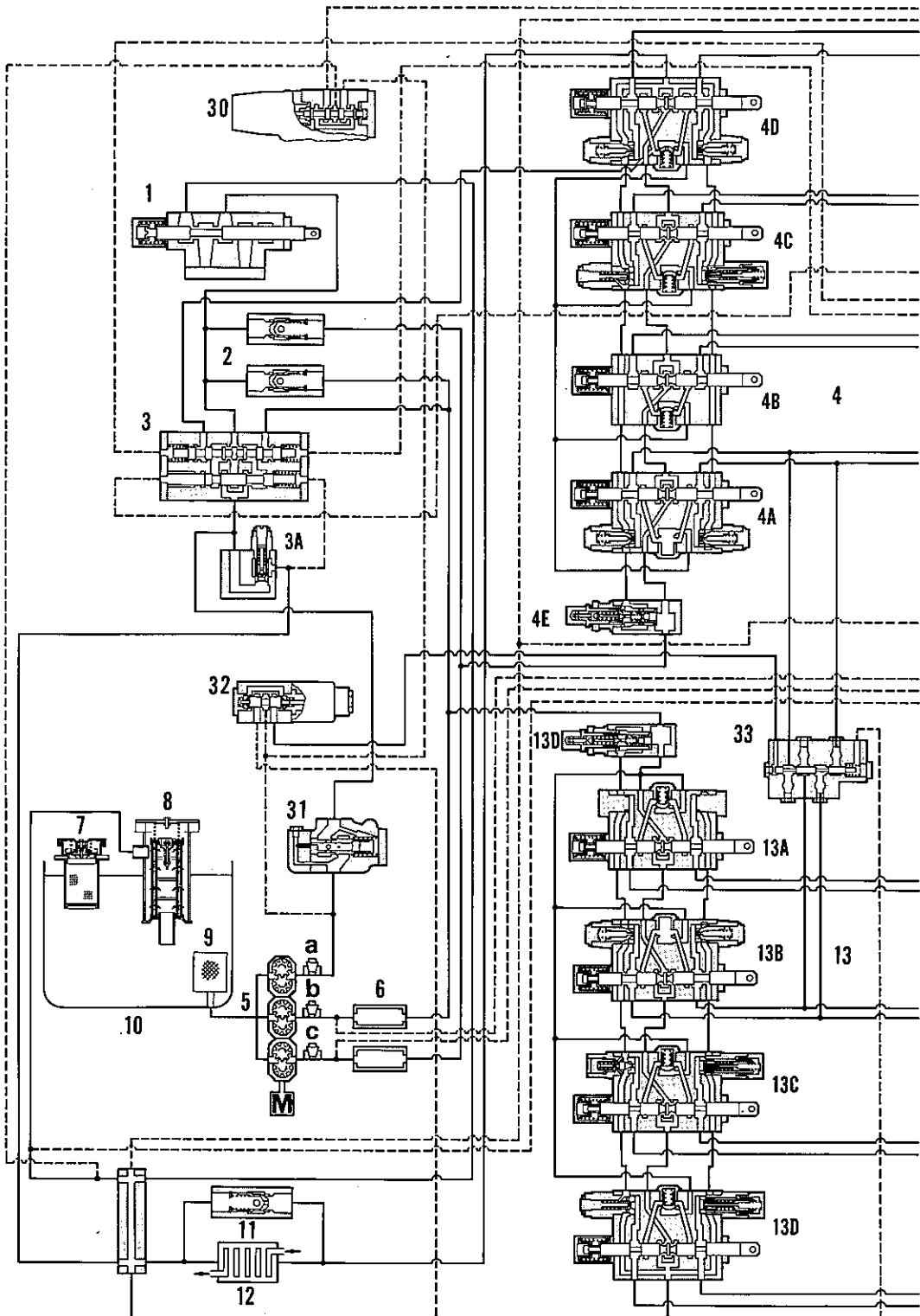
- 14. Swing shuttle valve
- 15. Swing brake valve
 - 15A. Counterbalance valve
 - 15B. Shuttle spool
 - 15C. Timer spool
 - 15D. Safety valve
- 16. Swing motor
- 17. Slow return valve
- 18. Arm cylinder
- 19. L.H. travel motor
- 20. L.H. travel brake valve
- 21. Center swivel joint
- 22. Pilot check valve for auto-deceleration
- 23. Deceleration cylinder
- 24. R.H. travel brake valve
- 25. R.H. travel motor
- 26. Check valve
- 27. Variable throttle valve
- 28. Bucket cylinder
- 29. Boom cylinder

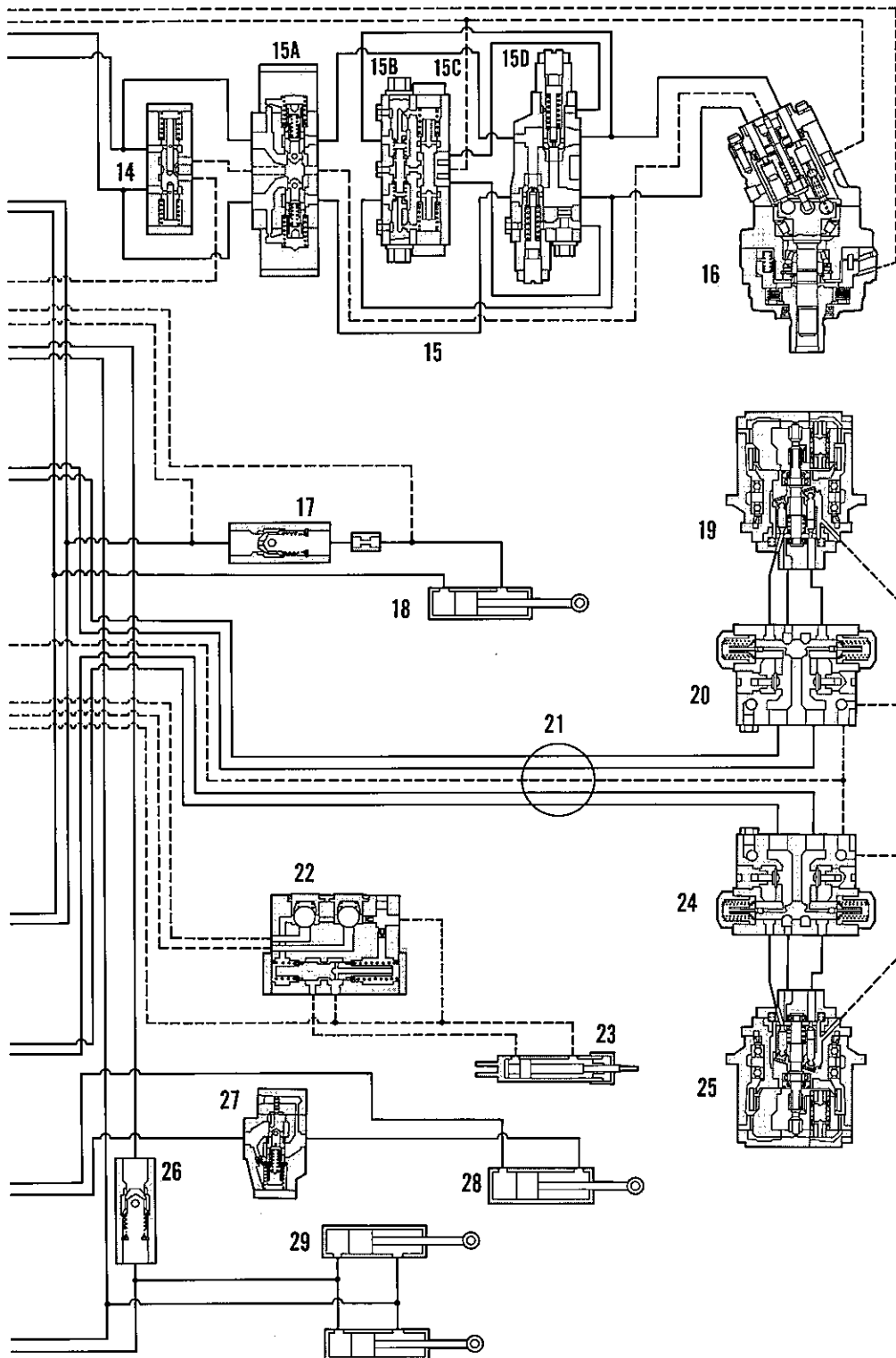
203F225

HYDRAULIC SYSTEM (OPTION)

Equipped with straight travel system

- 1. Travel acceleration selector valve
- 2. Check valve
- 3. Pilot check valve
- 3A. Main relief valve
- 4. L.H. 4-spool control valve
- 4A. For L.H. travel motor control
- 4B. For boom acceleration control
- 4C. For arm control
- 4D. For swing control
- 4E. Main relief valve
- 5. Hydraulic pump
- 6. Oil pressure muffler
- 7. Pressure valve
- 8. Hydraulic filter
- 9. Suction strainer
- 10. Hydraulic tank
- 11. Oil cooler bypass valve
- 12. Oil cooler
- 13. R.H. 3-spool control valve
- 13A. For R.H. travel motor control
- 13B. For bucket control
- 13C. For boom control
- 13D. Main relief valve
- a. Pressure tap for pilot check valve
- b. Pressure tap for R.H. 3-spool control valve
- c. Pressure tap for L.H. 4-spool control valve



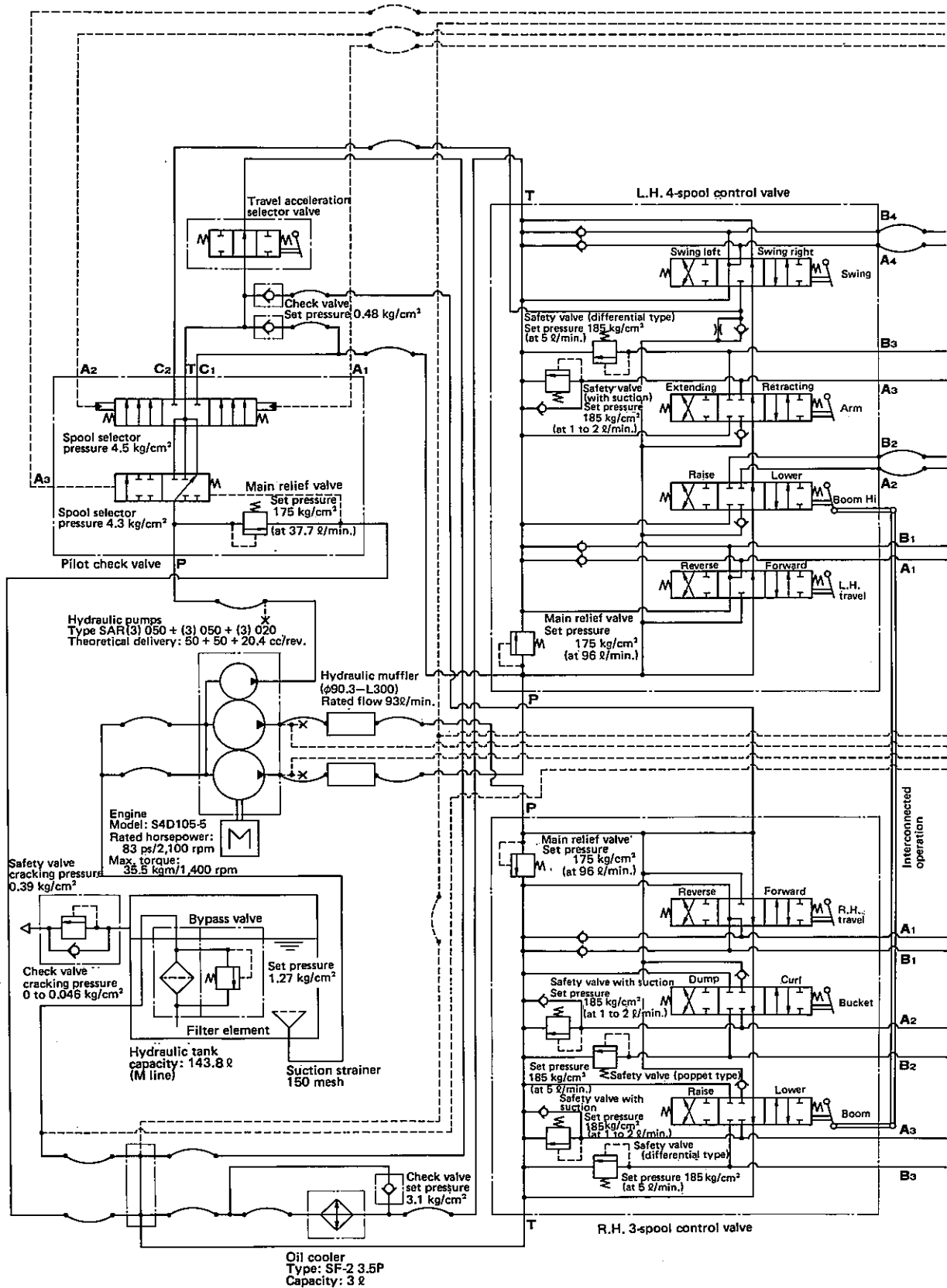


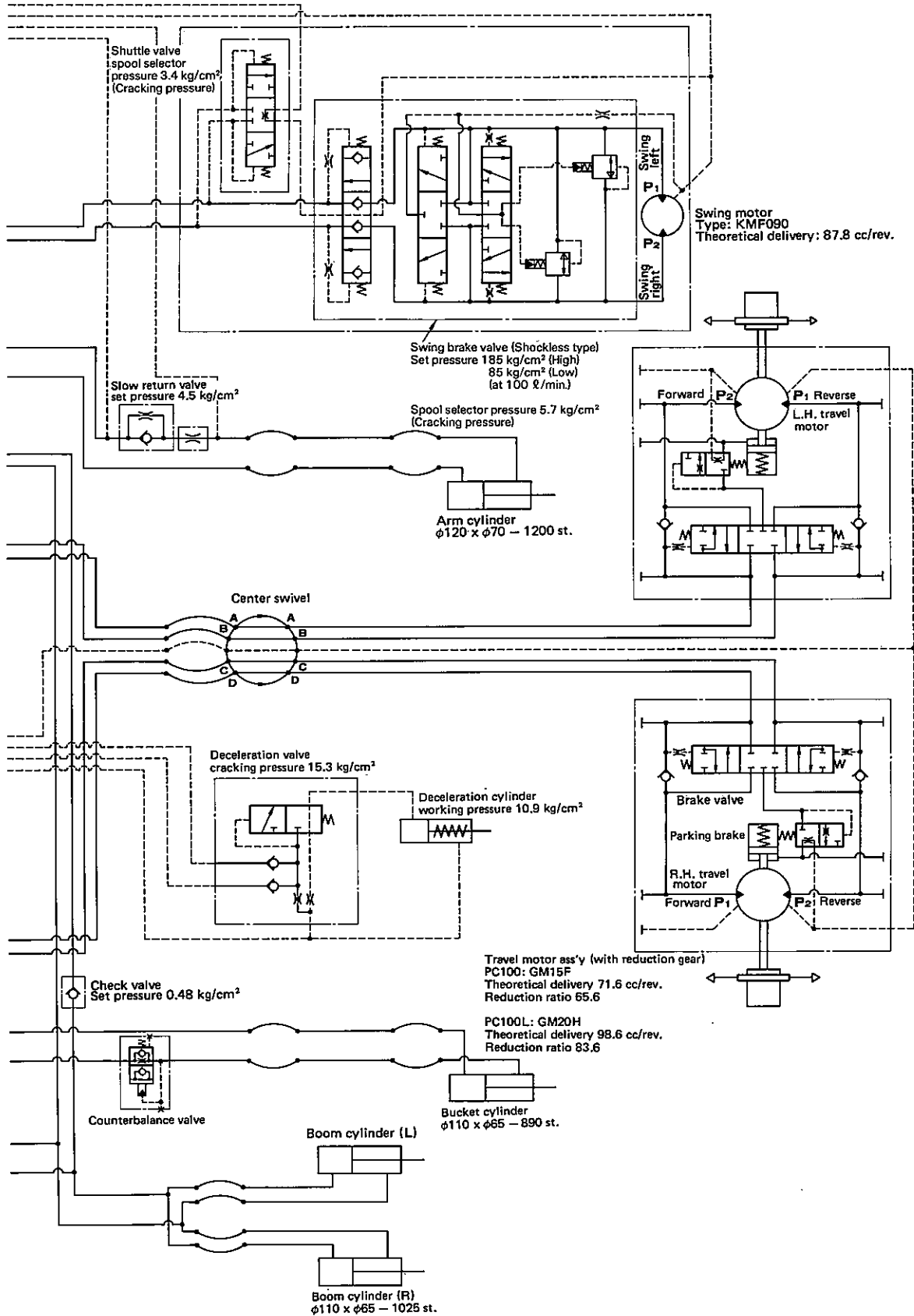
- 14. Swing shuttle valve
- 15. Swing brake valve
 - 15A. Counterbalance valve
 - 15B. Shuttle spool
 - 15C. Timer spool
 - 15D. Safety valve
- 16. Swing motor with swing lock brake
- 17. Slow return valve
- 18. Arm cylinder
- 19. L.H. travel motor
- 20. L.H. travel brake valve
- 21. Center swivel joint
- 22. Pilot check valve for auto-deceleration
- 23. Deceleration cylinder
- 24. R.H. travel brake valve
- 25. R.H. travel motor
- 26. Check valve
- 27. Variable throttle valve
- 28. Bucket cylinder
- 29. Boom cylinder
- 30. Solenoid valve for swing lock brake
- 31. Pressure compensated valve
- 32. Solenoid valve for travel connection valve
- 33. Travel connection valve

F202B007

HYDRAULIC CIRCUIT

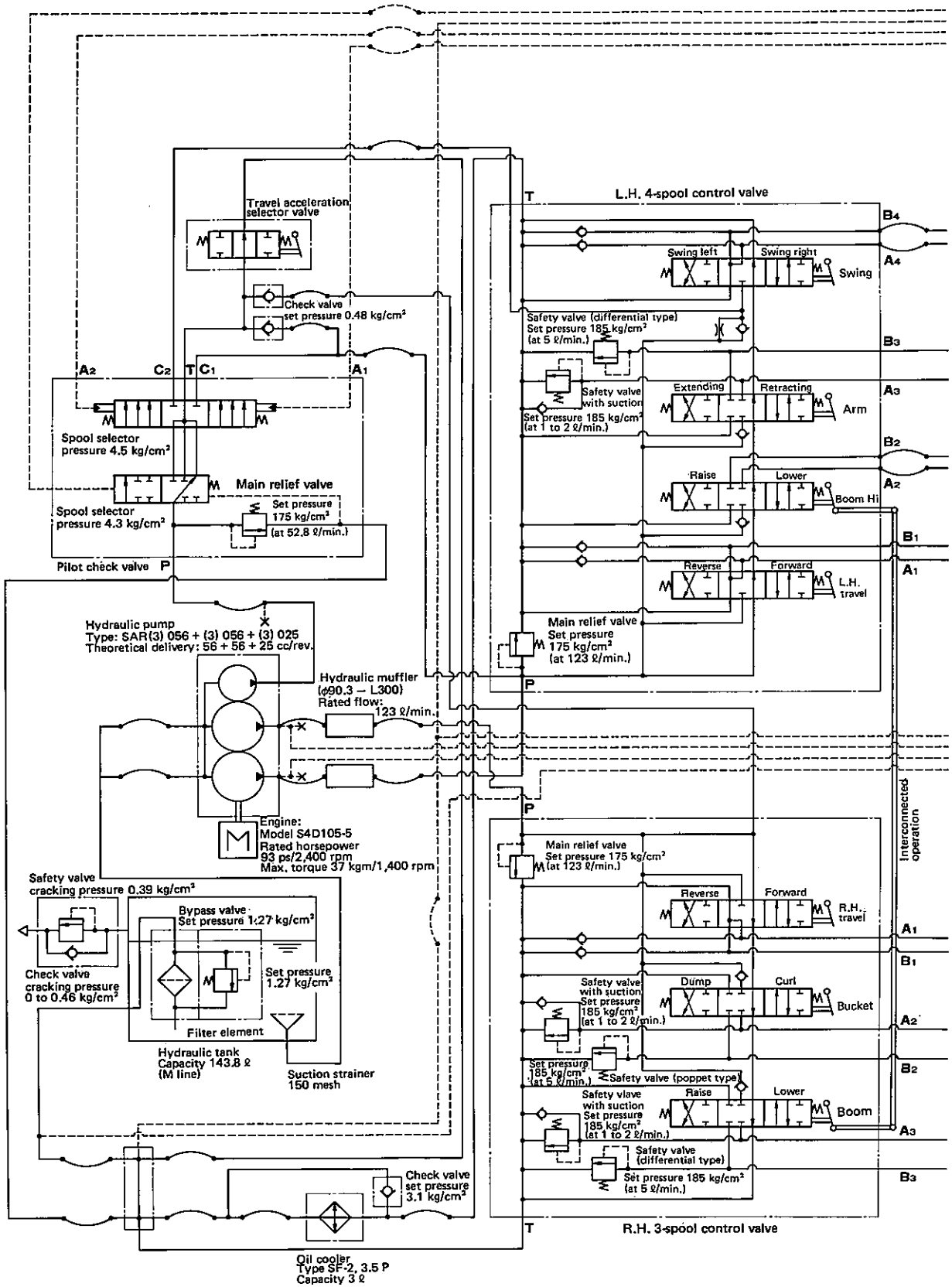
PC100, 100L-2

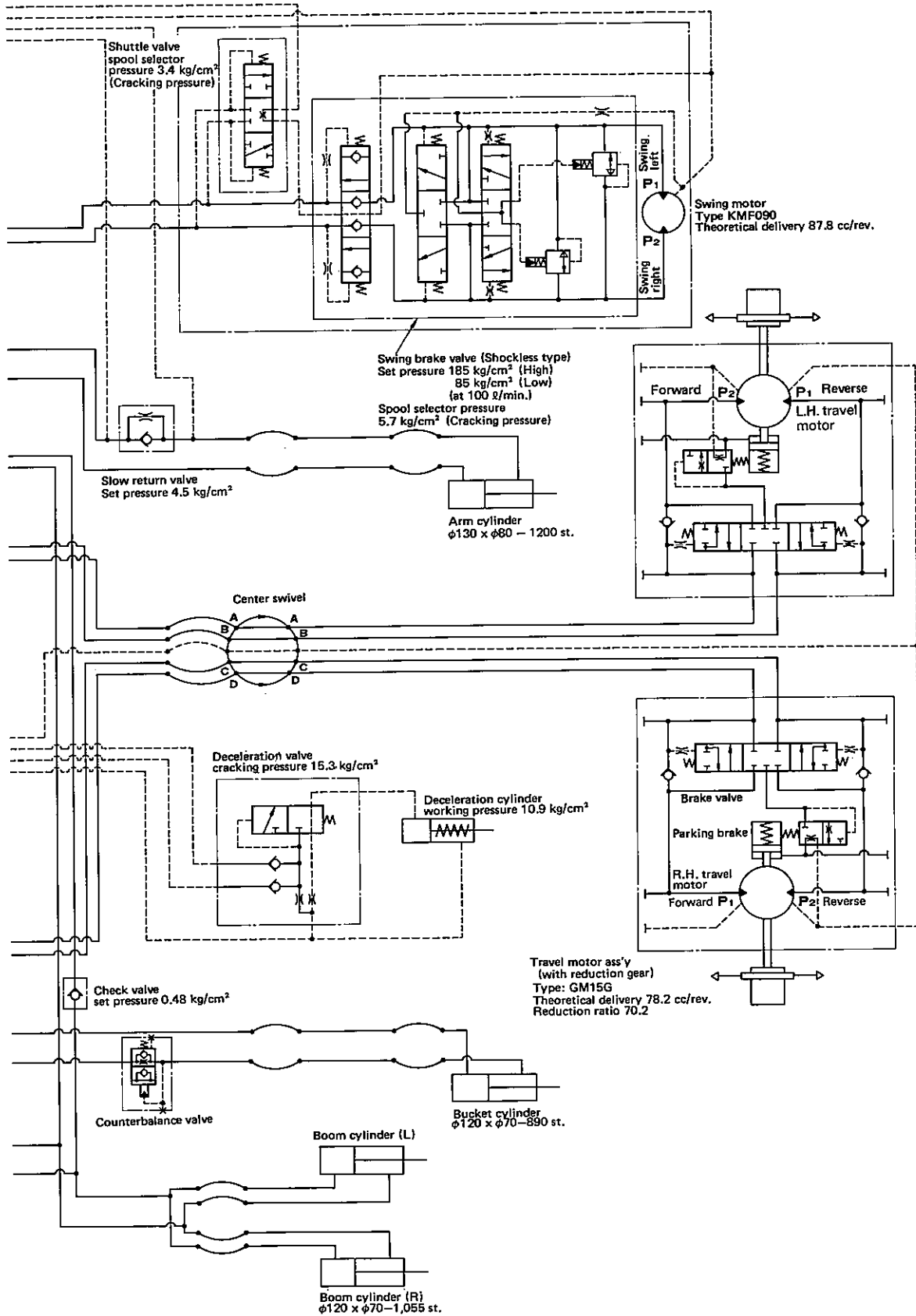




203F226

PC120-2



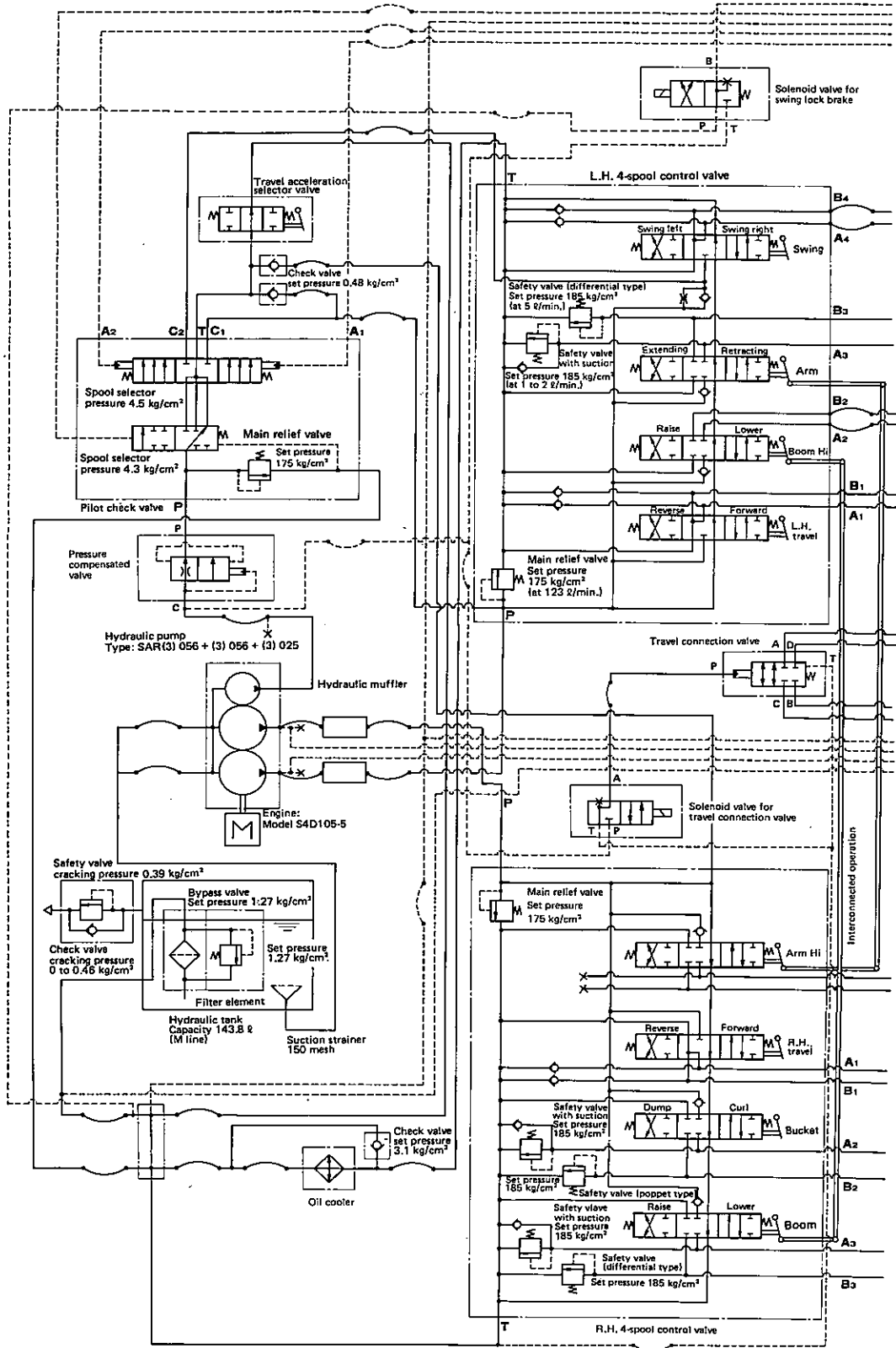


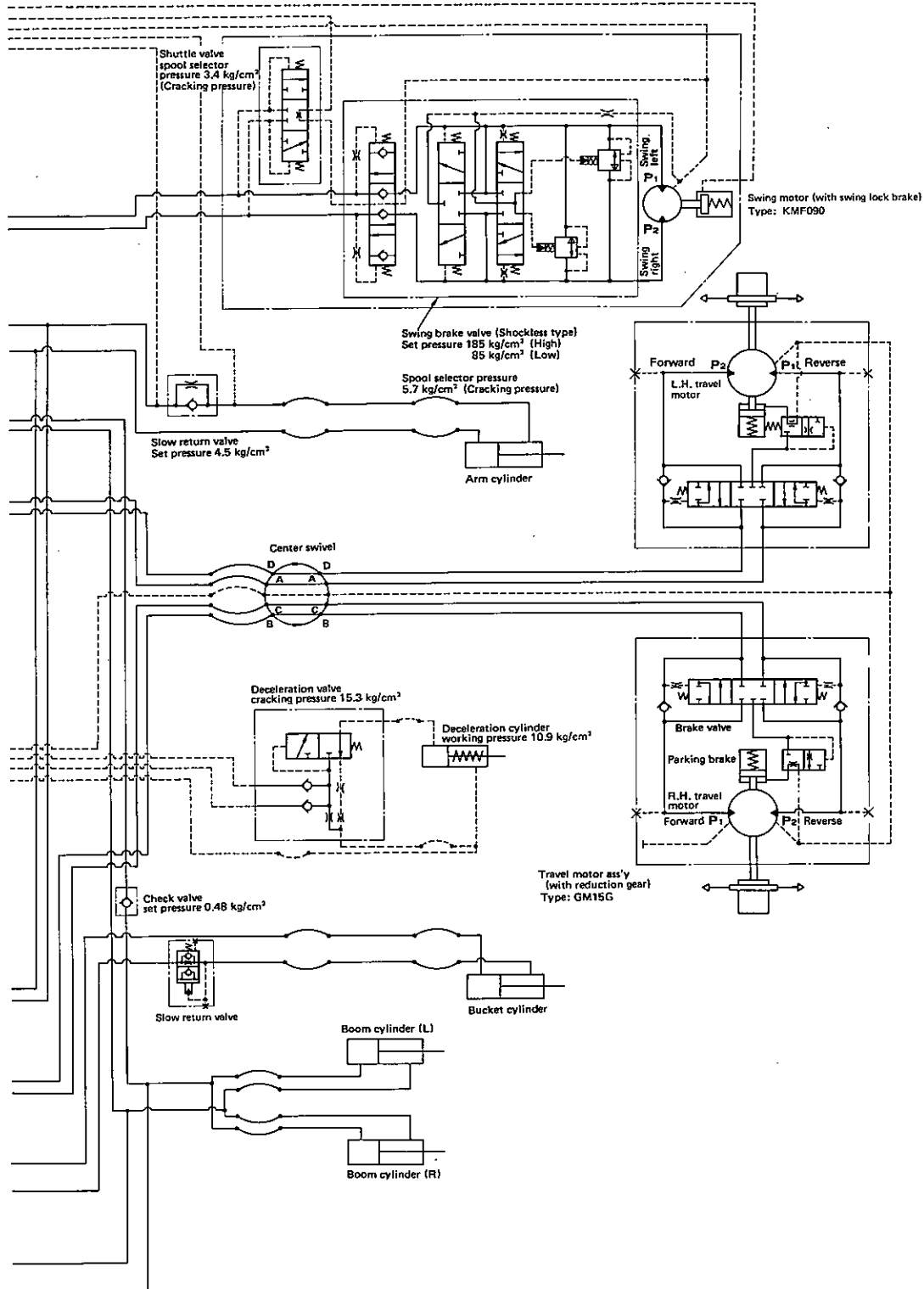
203F227

HYDRAULIC CIRCUIT (OPTION)

Equipped with straight travel system

PC120-2



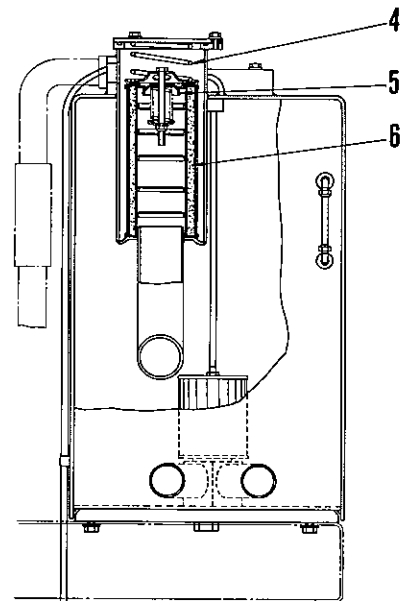
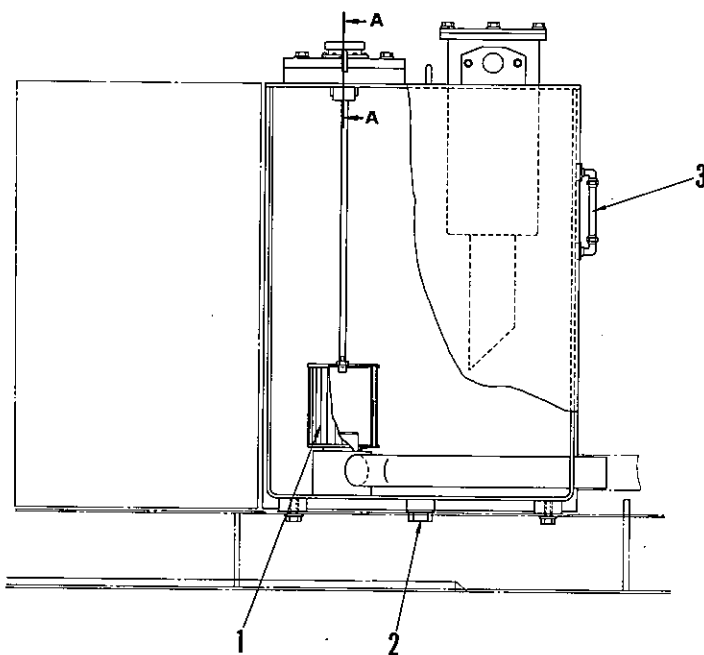
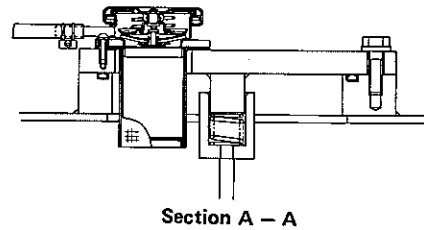
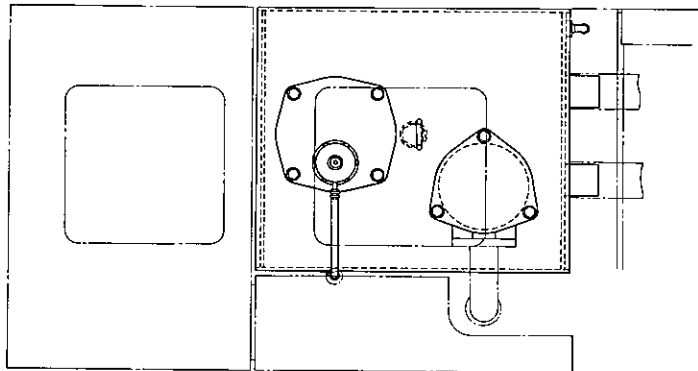


F202B008

HYDRAULIC TANK

Type : Open type

Oil capacity: 145 ℓ (Hydraulic system capacity: 230 ℓ)



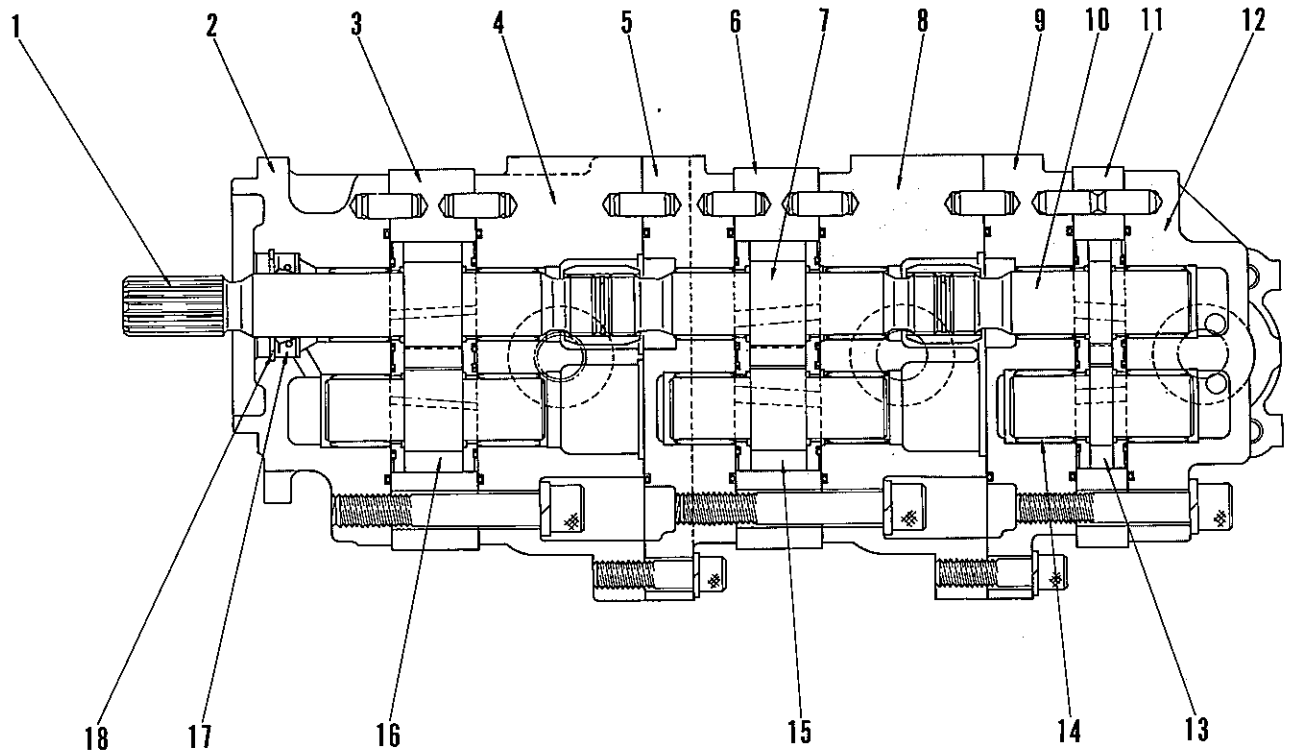
203F228

Hydraulic filter

Type	Return filter
Filtration rating	Max. 10 μ
Filtration area	10,026 cm ²
Bypass valve opening pressure	1.27 kg/cm ²

- 1. Strainer
- 2. Drain plug
- 3. Level gauge
- 4. Element retaining spring
 - Free length: 88.4 mm
 - Installed length: 72.9 mm
 - Installed load: 8.14 kg
- 5. Bypass valve
- 6. Oil filter element

HYDRAULIC PUMP



203F039

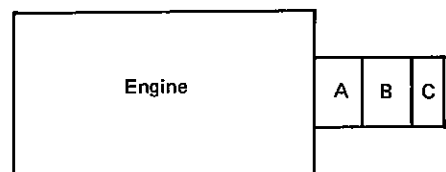
Note: This drawing shows SAR050 x 2 + SAR020.

- | | | |
|---------------|----------------|-----------------|
| 1. Drive gear | 7. Drive gear | 13. Driven gear |
| 2. Bracket | 8. Carrier | 14. Bushing |
| 3. Gear case | 9. Bracket | 15. Driven gear |
| 4. Carrier | 10. Drive gear | 16. Driven gear |
| 5. Bracket | 11. Gear case | 17. Oil seal |
| 6. Gear case | 12. Cover | 18. Snap ring |

Three tandem pumps are fitted to the P.T.O. case through a boss (coupling) at the rear end of the engine flywheel housing.

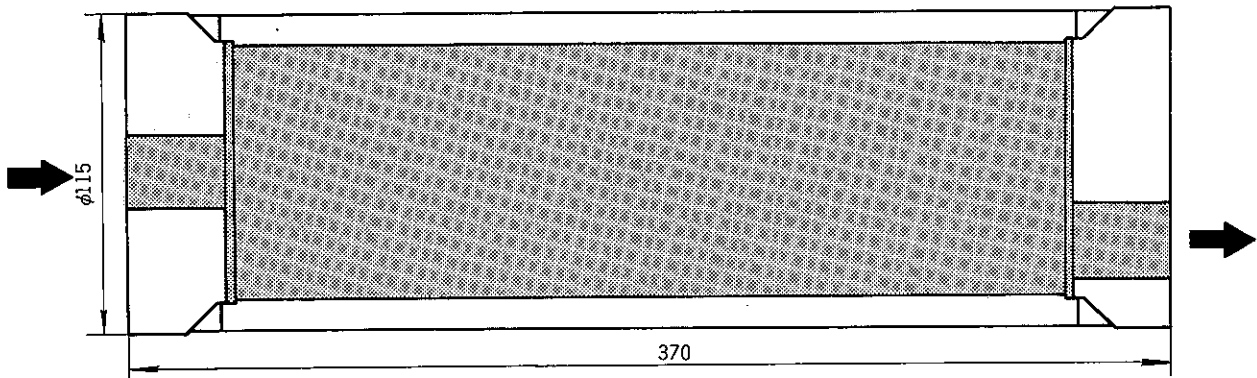
Pumps shown in the figure at right:

- A for R.H. travel motor, bucket and boom operations.
- B for L.H. travel motor, boom acceleration arm and swing operations.
- C for arm acceleration and swing operations.



204F076

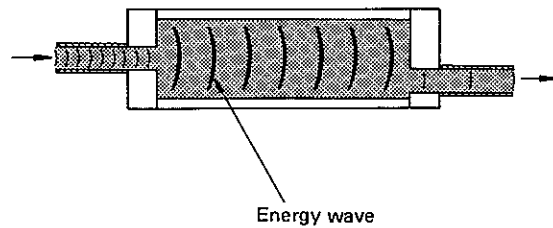
HYDRAULIC MUFFLER



203F038

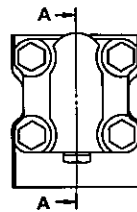
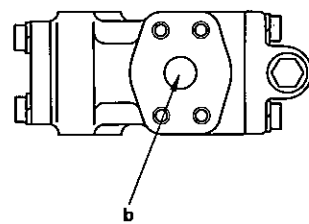
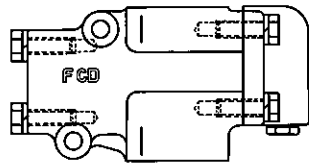
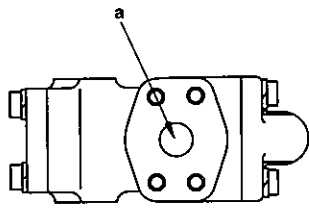
Function

For the lowest possible noise level, the noise from the hydraulic equipment (particularly, the noise when permitting the pressurized oil to flow into an outlet opening, etc.) is absorbed by a hydraulic muffler.

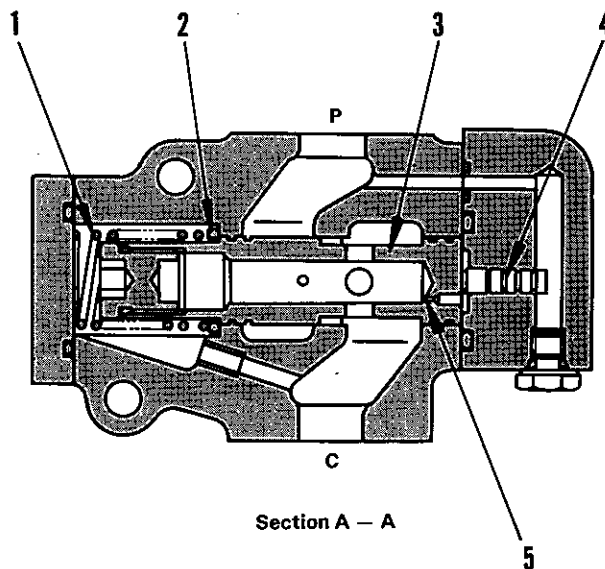


203F073

PRESSURE COMPENSATED VALVE (OPTION)



- 1. Return spring
- 2. Spring seat
- 3. Spool
- 4. Piston
- 5. Throttle

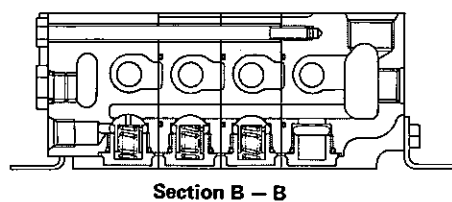
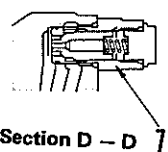
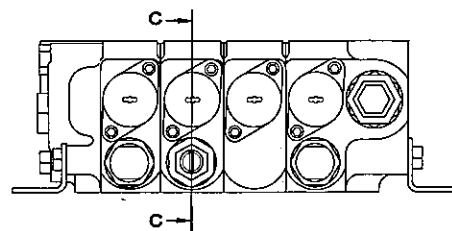
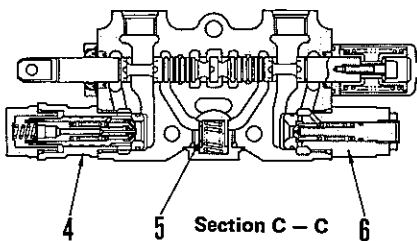
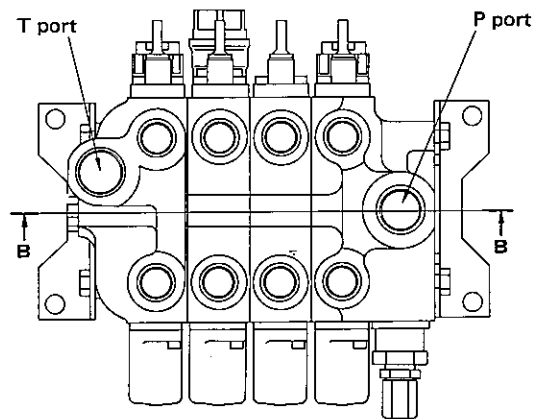
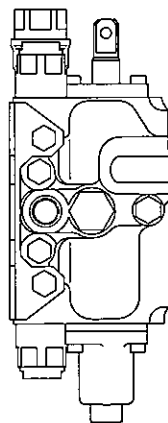
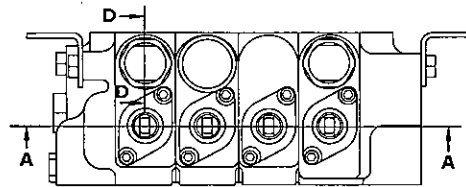
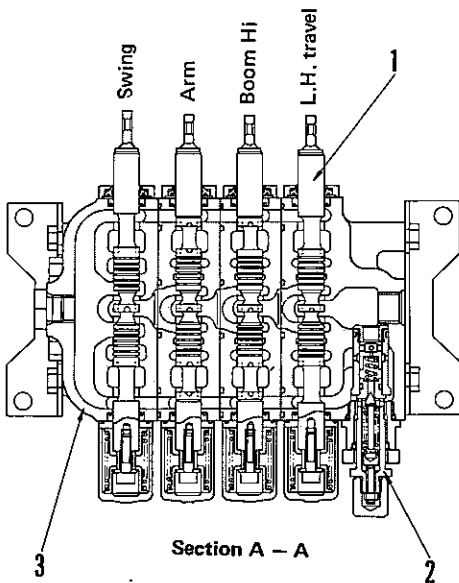


F202B009

L.H. 4-SPOOL CONTROL VALVE

(For L.H. travel, boom acceleration, arm and swing operation)

The same valve assembly with a different main relief set pressure is used for PC120-2. Because PC120-2 requires a different rated flow.



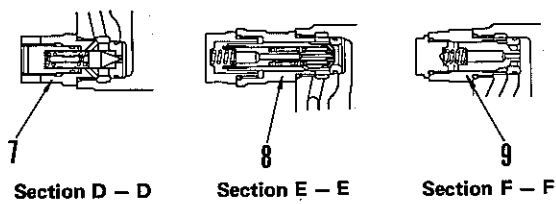
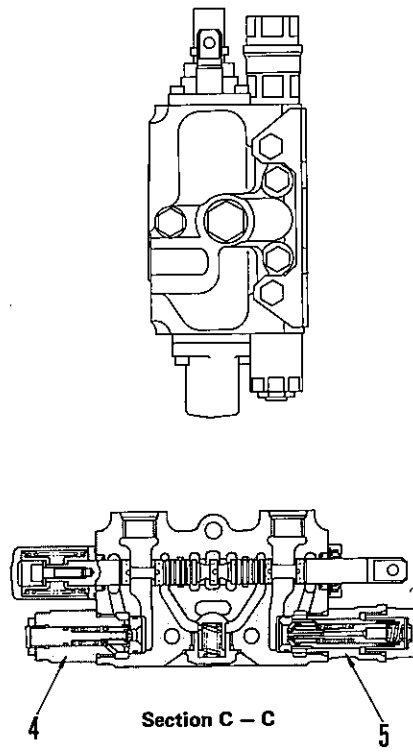
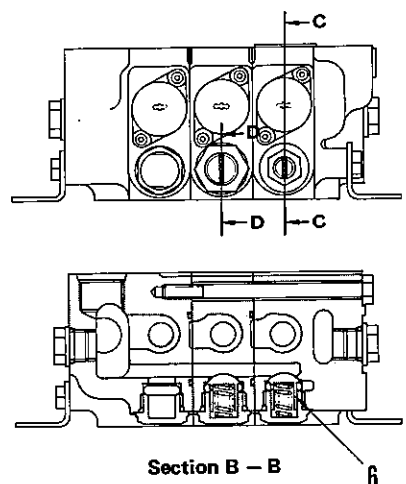
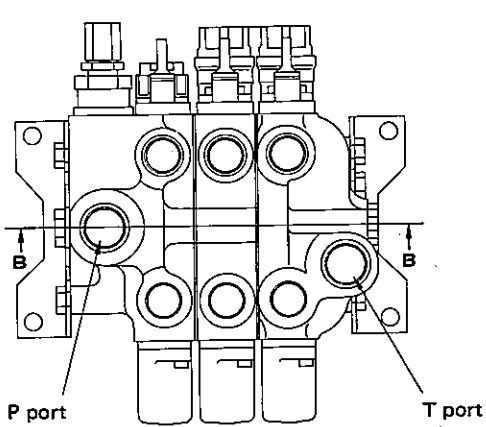
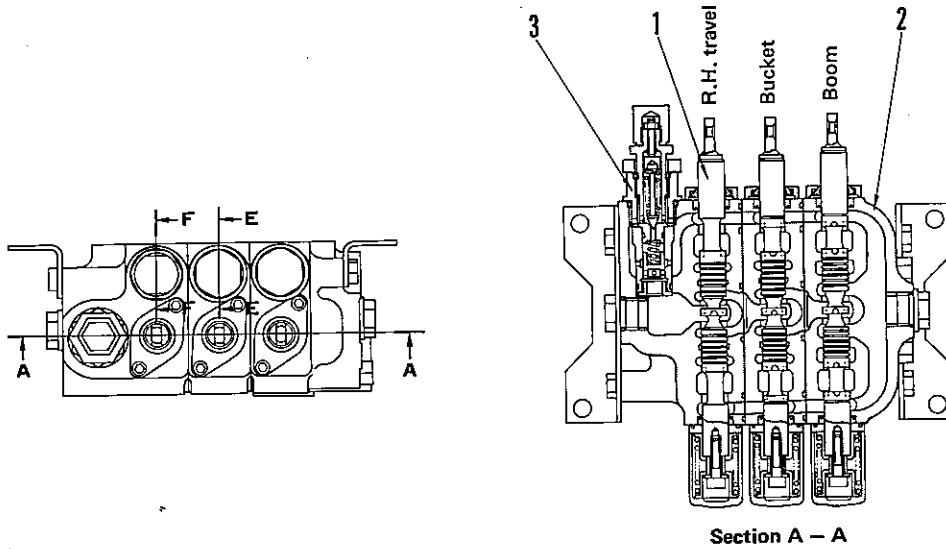
1. Spool
2. Main relief valve
3. Valve body
4. Safety valve with suction
5. Check valve
6. Safety valve
7. Suction valve

203F229

R.H. 3-SPOOL CONTROL VALVE

(For R.H. travel, bucket and boom)

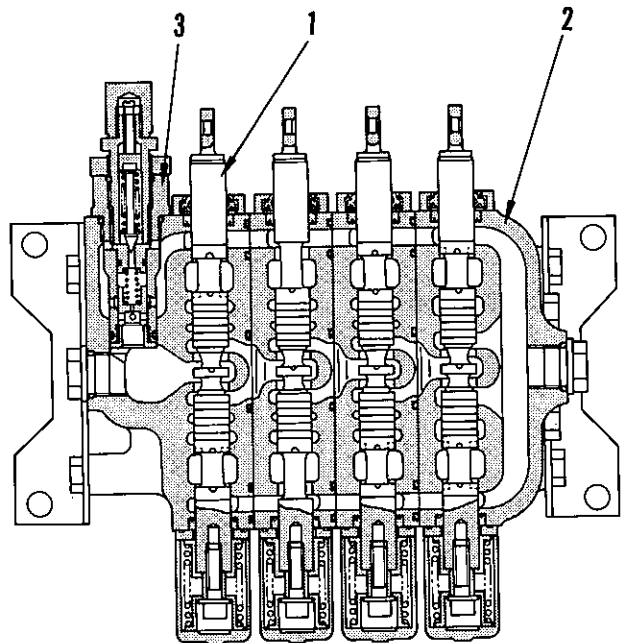
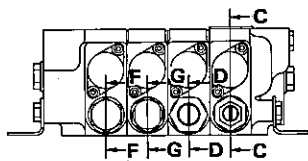
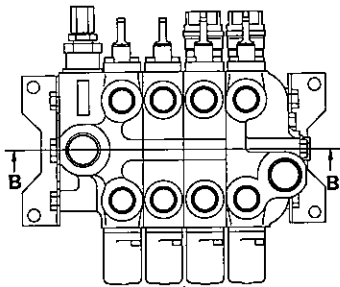
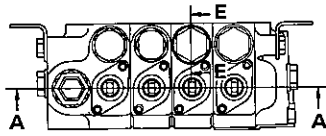
The same valve assembly with a different main relief set pressure is used for PC120-2. Because PC120-2 requires a different rated flow.



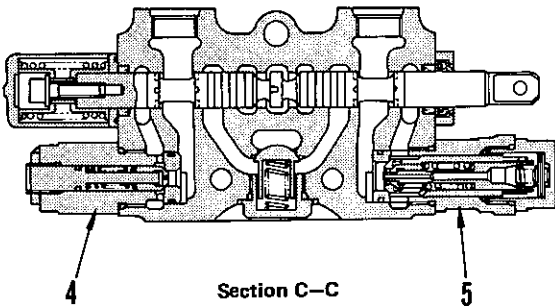
1. Spool
2. Valve body
3. Main relief valve
4. Safety valve
5. Safety valve with suction
6. Check valve
7. Safety valve
8. Safety valve with suction
9. Suction valve

203F230

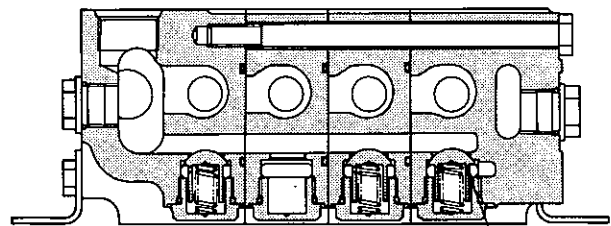
R.H. 4-SPOOL CONTROL VALVE (OPTION)



Section A-A

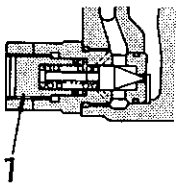


Section C-C

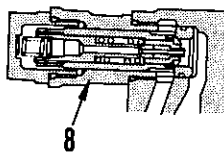


Section B-B

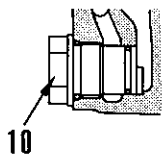
F202B027



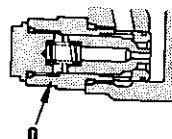
Section D-D



Section E-E



Section F-F



Section G-G

1. Spool
2. Valve body
3. Main relief valve
4. Safety valve
5. Safety valve with suction valve
6. Check valve
7. Safety valve
8. Safety valve with suction valve
9. Suction valve
10. Plug

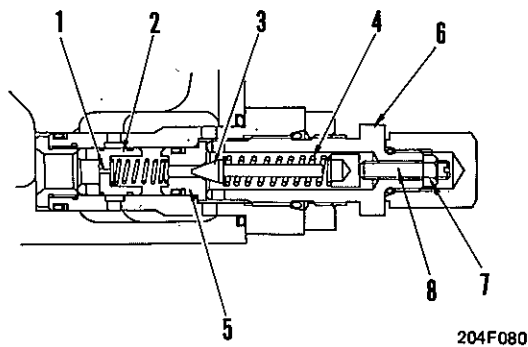
C

C

C

C

Main relief valve



- 1. Orifice
- 2. Main valve
- 3. Poppet
- 4. Poppet spring
- 5. Valve seat
- 6. Holder
- 7. Lock nut
- 8. Adjust screw (adjustment per one turn: 24.8 kg/cm²)

Set pressure

PC100, 100L: 175 kg/cm² (at 96 l/min.)

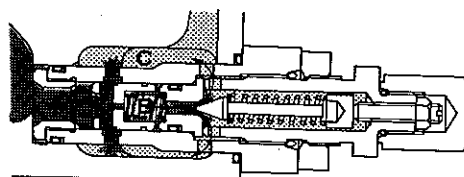
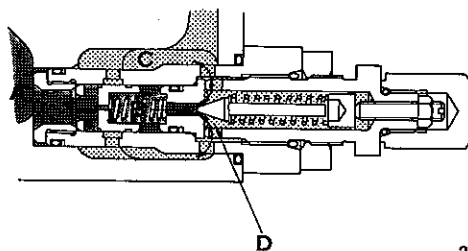
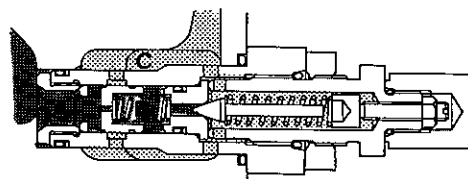
PC120: 175 kg/cm² (at 123 l/min.)

Function

This relief valve is in the circuit between the pump and the control valve. When a cylinder is at its stroke end, or an excessive oil pressure is generated while an actuator is working, oil delivered from pump is relieved through this valve to prevent damage to the pump, etc. (The valve is set for the maximum circuit operating pressure.)

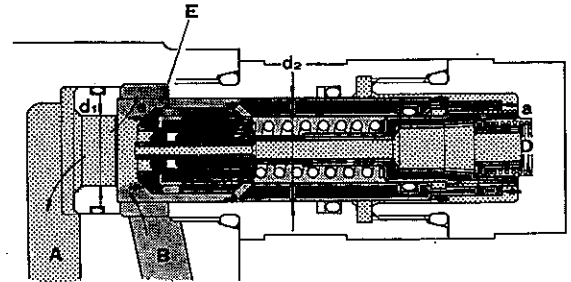
Operation

- Chamber A forms a pump circuit and chamber C is in the tank drain circuit. Chamber B is filled with oil delivered through an orifice in the main valve. A poppet is in the valve seat.
- If the oil pressure in chambers A and B goes up to a preset pressure (the poppet spring force), the poppet opens, causing the pressurized oil in chamber B to flow from chamber D to chamber C. Consequently, the oil pressure in chamber B drops.
- If the pressure in chamber B drops, a pressure difference is generated between chambers A and B due to an orifice in the main valve. Then, the main valve is pushed open by the pressure in chamber A, causing the oil in chamber A to flow from the chamber.



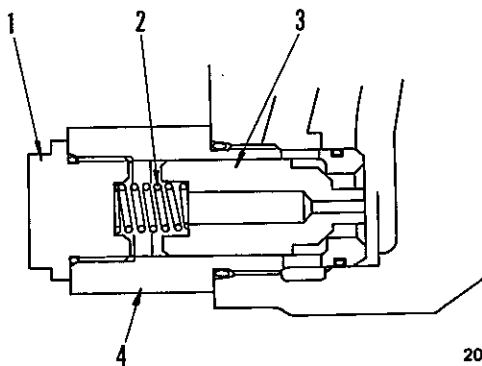
As a suction valve

If a negative pressure is generated in chamber A, chamber D also has a negative pressure because chambers D and A connect with each other. Chamber E is subjected to the tank pressure in chamber B. The suction valve is subjected to oil pressure "a" equivalent to the area difference between d_2 and d_1 because the tank pressure in chamber E, the oil pressure "e", acts to open the valve and the oil pressure "a" to close the valve. If the pressure in chamber A drops, approaching a negative pressure, oil pressure "a" is smaller than oil pressure "e". If oil pressure "e" is smaller than (oil pressure "a" + valve spring force), the valve opens, causing the oil to flow from chamber B into chamber A. Thereby, negative pressure is prevented from building up in chamber A.



204F091

Suction valve: For swing and travel hydraulic circuit

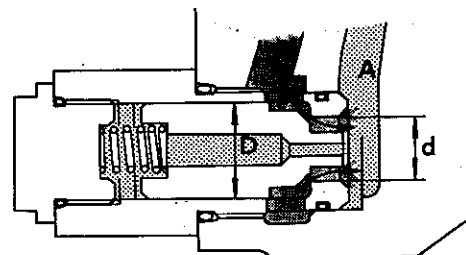


204F092

- 1. Plug
- 2. Spring
- 3. Main poppet
- 4. Sleeve

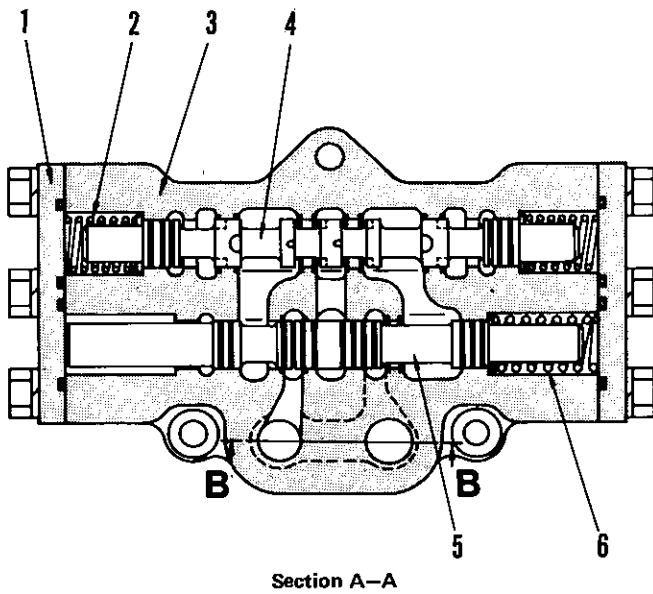
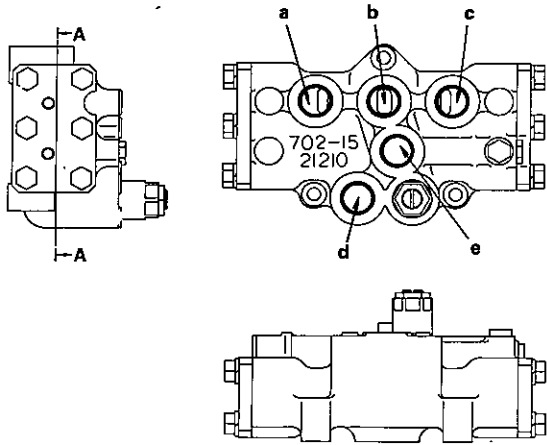
Operation

When vacuum arises in chamber A (swing motor port side) (or when pressure in chamber A becomes lower than pressure in chamber C which connects with the oil tank), the difference in area between two cross-sections indicated by diameter D and d, respectively, will cause the main poppet to open a port through which oil flows from the tank side chamber C to the cylinder port side chamber A.

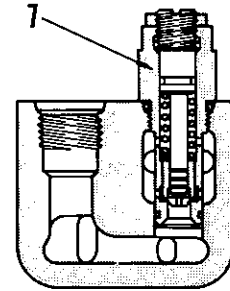


204F093

PILOT CHECK VALVE



Section A-A



Section B-B

F202B031

- | | | |
|--|--------------------------|------------------------|
| a. To swing control valve | 1. Cover | 5. Spool |
| b. To travel acceleration selector valve | 2. Spool selector spring | 6. Spool return spring |
| c. To travel control valve | 3. Valve body | 7. Main relief valve |
| d. From pump | 4. Spool | |
| e. To tank | | |

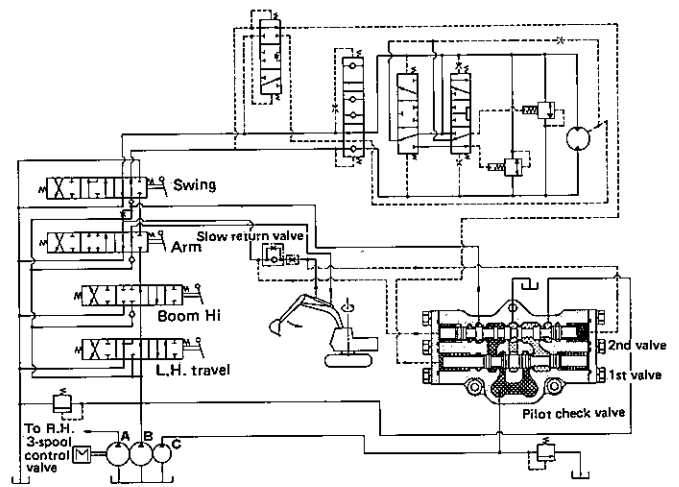
Principle of valve operation

Function

1. When operating both the arm and swing control valves at the same time, the pumps B and C deliver oil to the arm cylinder and swing motor, respectively, thus making
2. When operating the arm control valve alone, both the pumps B and C deliver oil to the arm cylinder in common. This is effective to decrease time lag to the minimum when retracting the arm or to increase operating speed (about 1.5 times as large as operating speed caused by a single pump) when extending the arm.

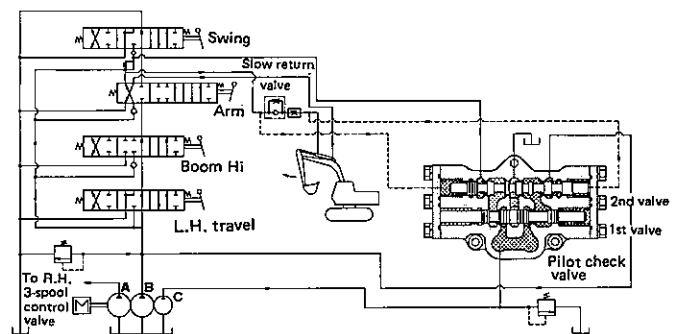
Operation

1. When operating both the arm and swing control valves at the same time
 - 1) When the swing control valve is operated, the shuttle valve will change over oil circuit to lead the oil under pressure to the left side of No.1 valve spool in the pilot check valve. The oil pressure will push the No.1 valve spool to move it to right against return spring force.
 - 2) When the arm control valve is operated, hydraulic oil flows to the arm cylinder and an orifice provided in the circuit will produce a pressure difference. The pressure difference is applied to the No.2 valve spool of the pilot check valve and, when the value of pressure difference becomes large enough to overcome the return spring force, it will move the No.2 valve spool to right.
 - 3) After both the No.1 and No.2 valve spool have been shifted, oil from the pump C starts flowing to the swing motor through the pilot check valve.



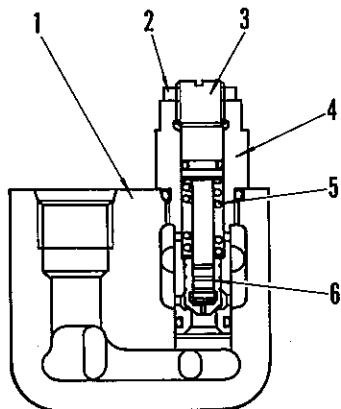
203F236

2. When operating the arm control valve alone
 - 1) When the arm control valve is operated, hydraulic oil flows to the arm cylinder and an orifice provided in the circuit will produce a pressure difference. The pressure difference is applied to the No.2 valve spool of the pilot check valve and, when the value of pressure difference becomes large enough to overcome the return spring force, it will move the No.2 valve spool to right.
 - 2) After the No.2 valve spool has been shifted, oil from the pump C meets with oil from the pump B, and the integrated oil flows to the arm cylinder. Therefore, operating speed of the arm will increase 1.5 times as large as operating speed caused by the pump B alone.



203F237

MAIN RELIEF VALVE



Set pressure

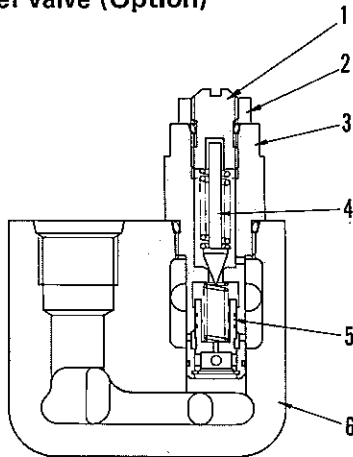
PC100 · 100L : 175 kg/cm² (at 37.7 ℓ/min)

PC120 : 175 kg/cm² (at 52.8 ℓ/min)

- | | |
|---------------------------------------|----------------|
| 1. Valve body | 4. Sleeve |
| 2. Lock nut | 5. Spring |
| 3. Pilot piston
(adjustment screw) | 6. Main poppet |
- (adjustment per one turn:
52.5 kg/cm²)

204F097

Main relief valve (Option)



- 1. Main valve
- 2. Poppet
- 3. Poppet spring
- 4. Holder
- 5. Lock nut
- 6. Adjust screw
(Adjustment per one turn: 28.6 kg/cm²)
- 7. Valve seat

F202B028

Set pressure

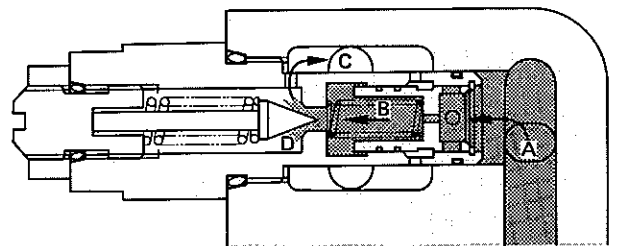
PC120-2: 175 kg/cm² (at 43 l/min.)

Function

The main relief valve is in each oil circuit between a pump and a control valve. The valve prevents the pump and other devices from being damaged by relieving oil sent from the pump when a cylinder reaches its stroke end or when an abnormally high pressure arises in the circuit while operating actuator. (In other words, the main relief valve sets the maximum permissible pressure in the circuit during operation.)

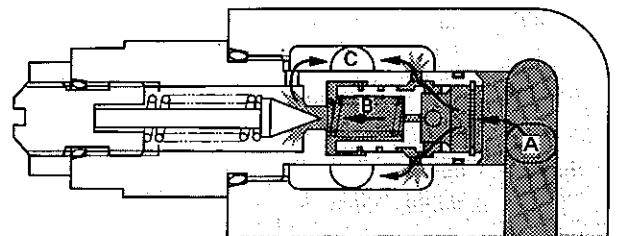
Operation

- Chamber A forms a pump circuit and chamber C is in the tank drain circuit. Chamber B is filled with oil delivered through an orifice in the main valve. A poppet is in the valve seat.
- If the oil pressure in chambers A and B goes up to a preset pressure (the poppet spring force), the poppet opens, causing the pressurized oil in chamber B to flow from chamber B to chamber C. Consequently, the oil pressure in chamber B drops. (See Fig. 1)
- If the pressure in chamber B drops, a pressure difference is generated between chambers A and B due to an orifice in the main valve. Then, the main valve is pushed open by the pressure in chamber A, causing the oil in chamber A to flow from the chamber. (See Fig. 2)



F202B029

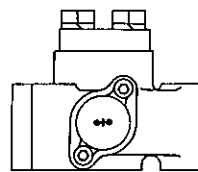
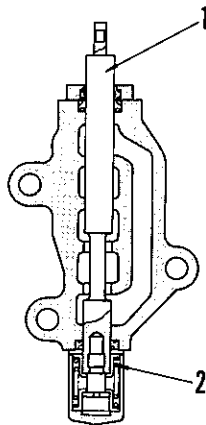
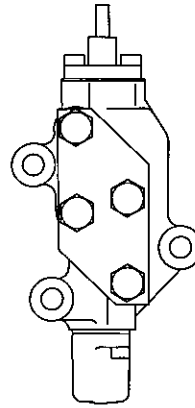
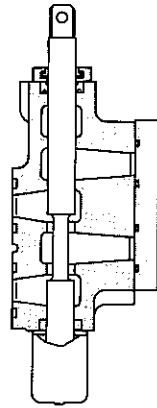
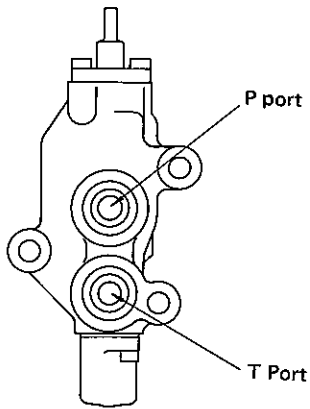
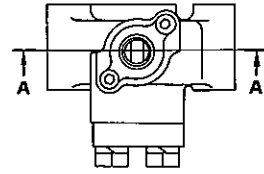
Fig. 1



F202B030

Fig. 2

TRAVEL ACCELERATION SELECTOR VALVE



Section A - A

203F238

Travel speed

PC100	: Low	2.8 km/h
	High	3.4 km/h
PC100L	: Low	1.9 km/h
	High	2.3 km/h
PC120	: Low	3.0 km/h
	High	3.6 km/h

- 1. Spool
- 2. Spool return spring

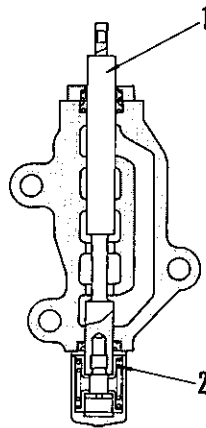
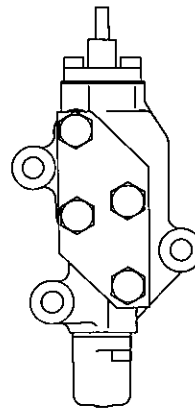
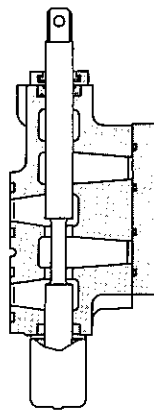
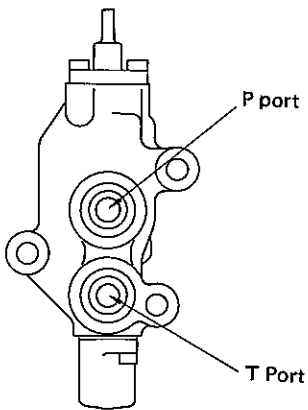
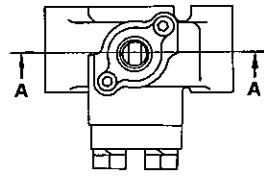
C

C

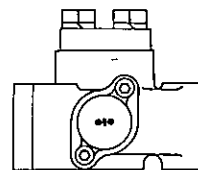
C

C

TRAVEL ACCELERATION SELECTOR VALVE



Section A - A



203F238

Travel speed

PC100	: Low	2.8 km/h
	High	3.4 km/h
PC100L	: Low	1.9 km/h
	High	2.3 km/h
PC120	: Low	3.0 km/h
	High	3.6 km/h

- 1. Spool
- 2. Spool return spring

FUNCTION

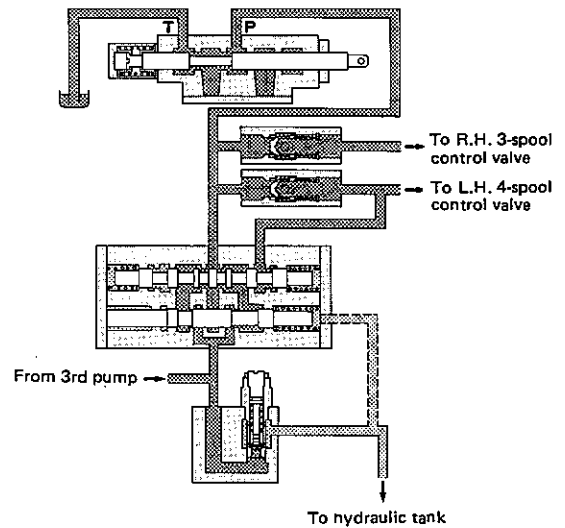
- By switching the travel acceleration selector valve, the flow of oil from No. 3 pump is added to the flow of oil from No. 1 and 2 pumps. This increases the travel speed.

OPERATION

1. When traveling at low speed

The L.H. travel motor is driven by oil from No. 1 pump, the R.H. travel motor is driven by oil from No. 2 pump.

At low speed, the oil from No. 3 pump enters port P of the travel acceleration selector valve, passes out through port T and is drained to the tank.

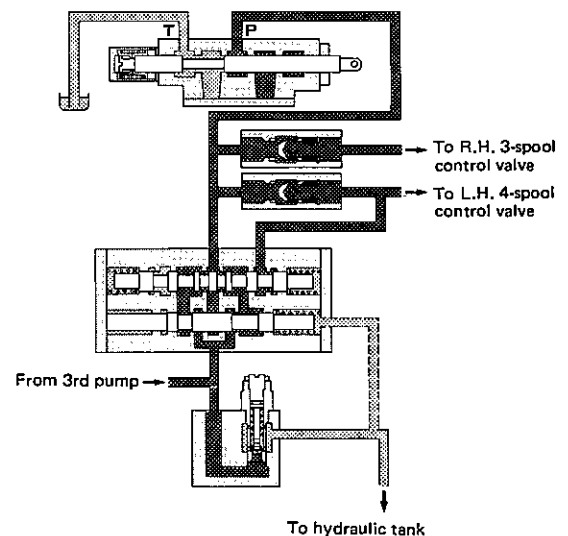


203F239

2. When traveling at high speed

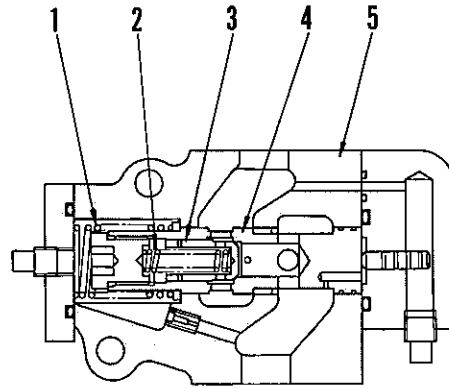
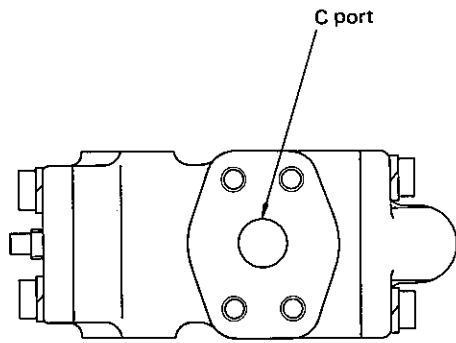
When the accelerator pedal is depressed, the spool inside is pushed to the left. Port P is closed, so the oil from No. 3 pump cannot flow to the tank.

As a result, the oil from No. 3 pump pushes open the check valve, and joins the flow of oil from No. 1 and No. 2 pumps. This increases the travel speed.

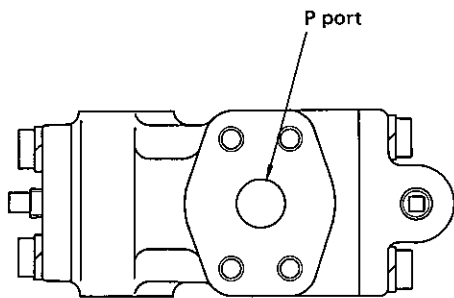
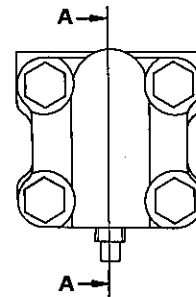
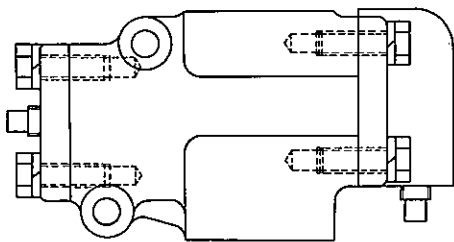


203F240

VARIABLE THROTTLE VALVE



Section A - A



203F241

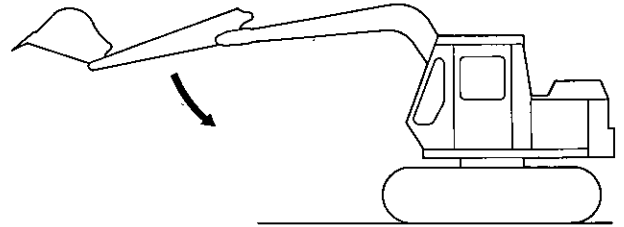
GENERAL

In the PC100, 100L and 120-2, there is a variable throttle valve in the circuit at the head end of the bucket cylinder. There is a slow return valve at the head end of the arm cylinder. These valves prevent time lag in the operation of the bucket and arm.

- 1. Spool return spring
- 2. Check valve spring
- 3. Check valve
- 4. Spool
- 5. Valve body

FUNCTION

- When the work equipment is in the position shown on the right, and the bucket is moved in, the force of gravity is added to force moving the bucket. This makes the bucket try to move more quickly. However, the delivery of oil from the pump is fixed, so negative pressure is formed at the bucket cylinder bottom. This causes a time lag and makes the bucket movement unsteady. The variable throttle valve is employed to prevent this.
- The slow return valve fulfils the same function. However, in operations such as a excavation, when there is no gravity acting on the work equipment, the unnecessary resistance produces heat. For this reason, a variable throttle valve has been installed instead of the slow return valve to reduce this loss and to save energy.

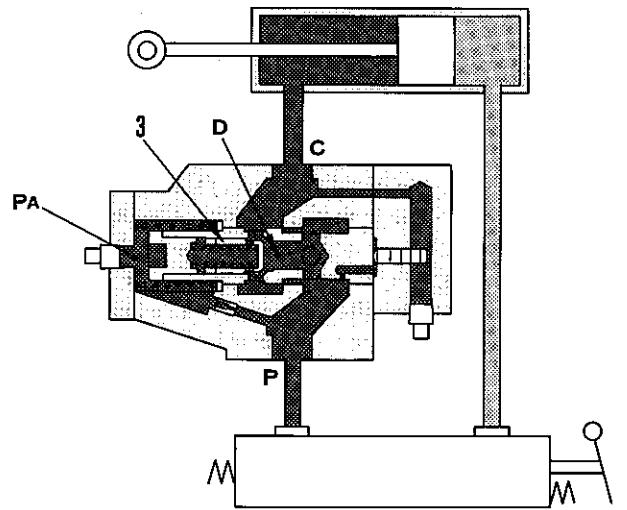


20XF065

OPERATION

1. Bucket dump

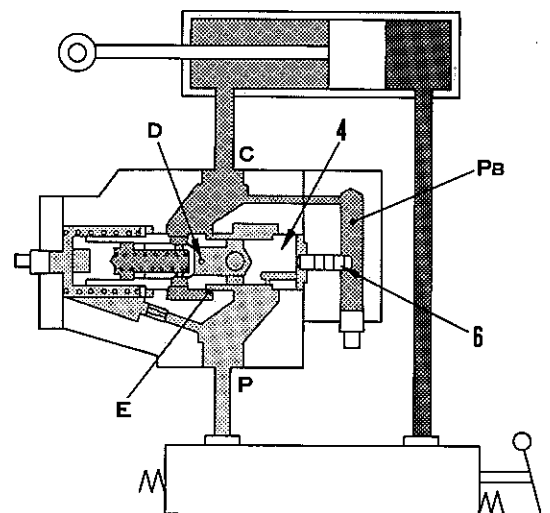
The oil from the pump passes through the control valve and enters port P of the variable throttle. At the same time, the oil is sent to port PA. The oil at port P pushes open check valve (3) and is sent to throttle D and port C.



203F242

2. Bucket curl

The oil from the pump passes through the control valve and enters the bottom of the bucket cylinder. The oil at the head of the bucket cylinder is pushed out and enters port C of the variable throttle valve. At the same time, the oil is also sent to port PB. When the difference in pressure between port C and port P is less than 20 to 50 kg/cm² (at 40 to 85 l/min.), the oil passes through throttle D of spool (4) and is sent to port P. When the difference in pressure between port C and port P is more than 20 to 50 kg/cm² (at 40 to 85 l/min.), the pressure oil sent to port PB pushes piston (6) to the left. It then passes through throttle E (around the edge of the spool) and throttle D, and goes to port P.



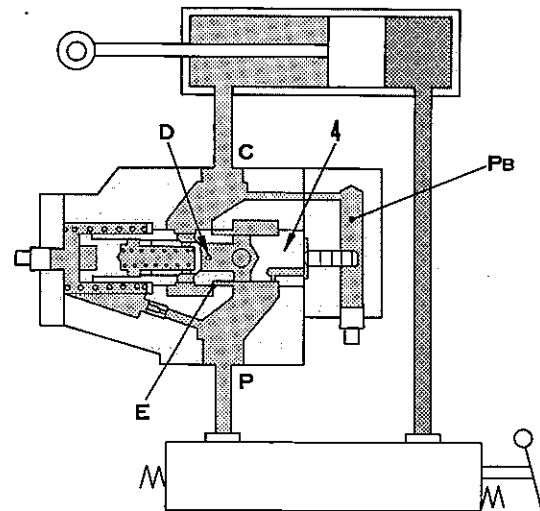
3. Lowering under gravity

When the work equipment lowers under the force of gravity, negative pressure is formed at the bottom of the bucket cylinder. When the flow of oil pushed out from the bucket cylinder head is reduced and the difference of pressure between port C and port P drops below 20 to 50 kg/cm² (at 40 to 85 l/min.), the pressure at port PB acting on piston (6) also drops.

When this happens, spool (4) moves back to the right. Throttle E around the edge of the spool is closed and only the oil from throttle D goes to port P.

This type of variable throttle valve restricts the flow of oil pushed out from the head of the bucket cylinder when the work equipment lowers. In this way, it restricts the speed to correspond to the delivery of oil from the pump.

The throttle valve is designed so that there is almost no variation the resistance during excavation even when the oil flow increases. Compared to the slow return valve, the internal resistance is low. This gives a large effective difference in pressure between the cylinder bottom and cylinder head, and ensures efficiency.



203F244

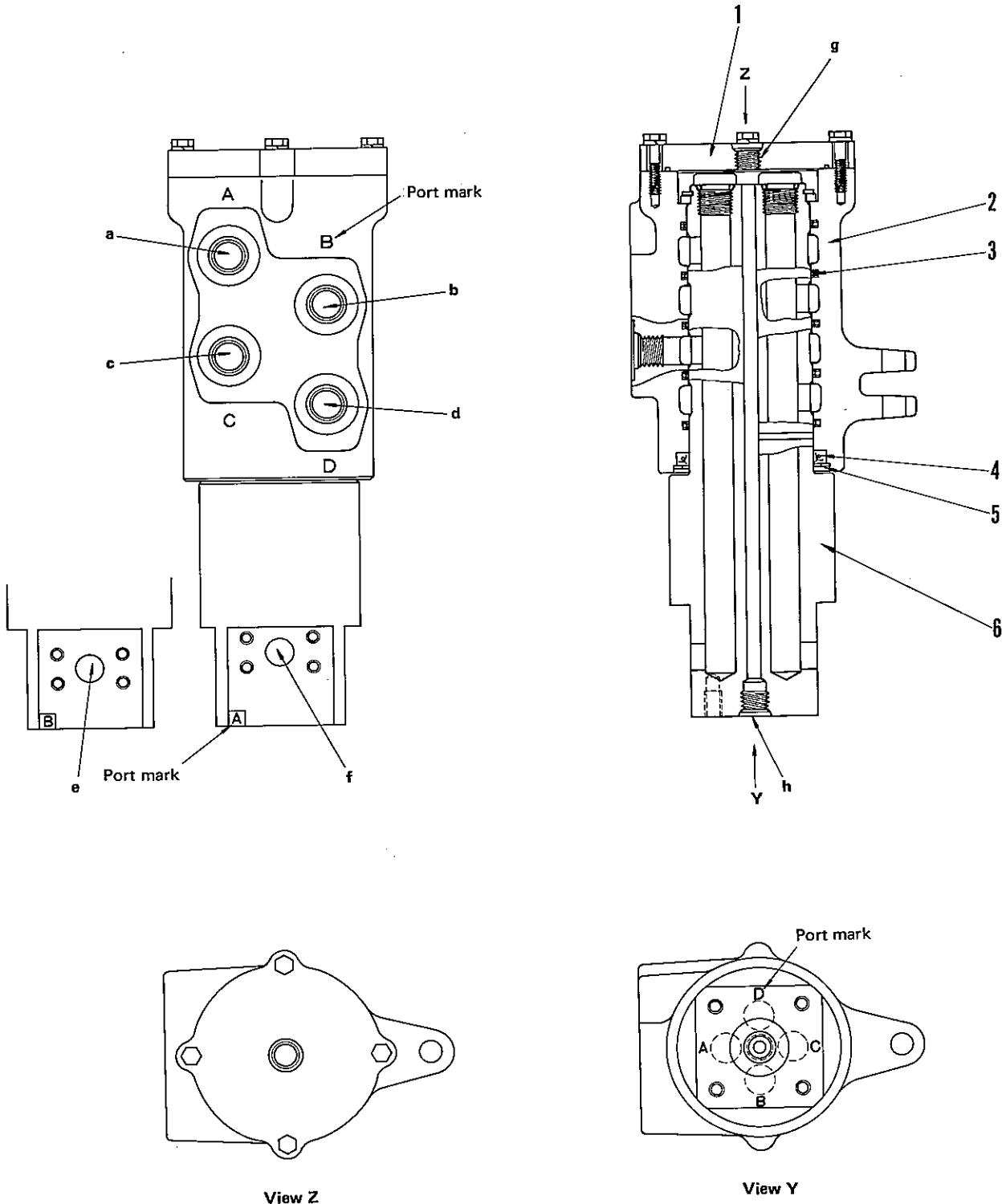
C

C

C

C

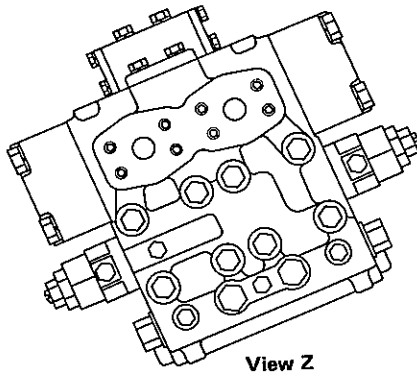
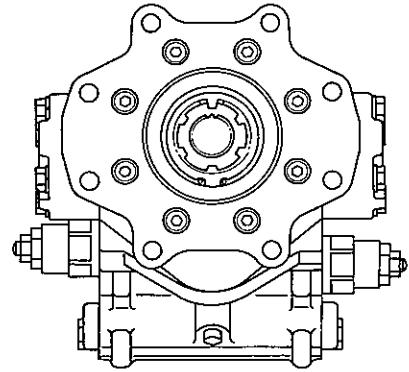
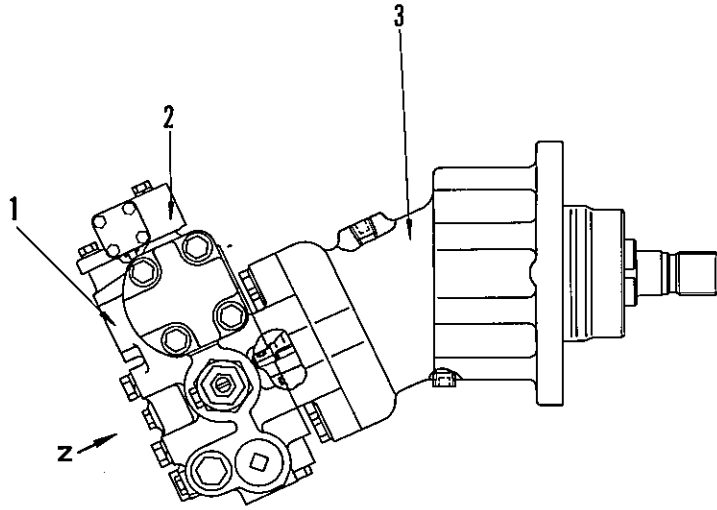
CENTER SWIVEL JOINT



203F044

- | | | | |
|-----------------------------------|----------------------------------|-----------------|--------------|
| a. From L.H. travel control valve | e. To R.H. travel motor | 1. Cover | 4. Oil seal |
| b. From R.H. travel control valve | f. To L.H. travel motor | 2. Body | 5. Snap ring |
| c. From R.H. travel control valve | g. To swing motor/Hydraulic tank | 3. Slipper seal | 6. Shaft |
| d. From L.H. travel control valve | h. To R.H./L.H. propel motor | | |

SWING MOTOR AND BRAKE VALVE ASSEMBLY

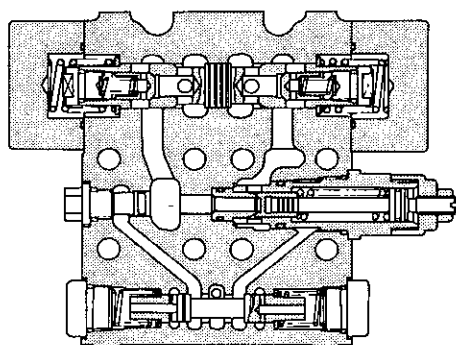
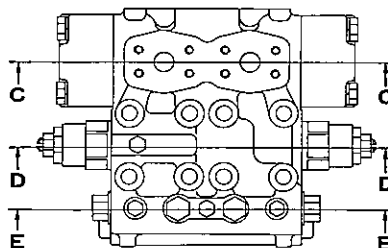
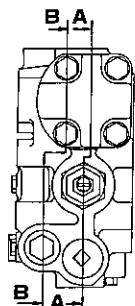


203F245

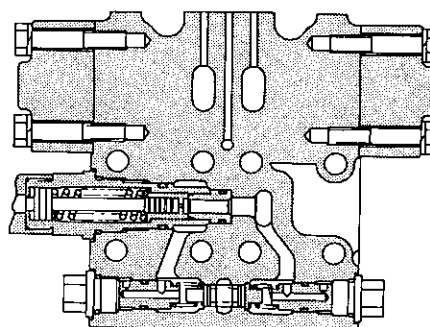
Type: KMF090

- 1. Swing brake valve
- 2. Shuttle valve
- 3. Swing motor

SWING BRAKE VALVE



Section A-A



Section B-B

203F246

GENERAL

The brake valve consists of a counterbalance valve, timer spool, shuttle spool and safety valve.

A shock-less type is used to reduce shock when starting or stopping.

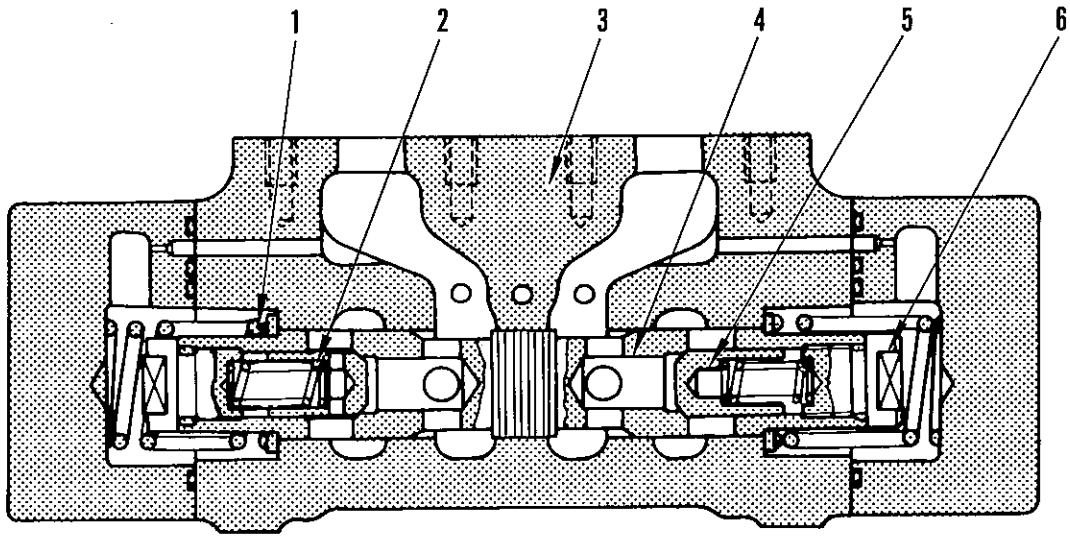
Type: DBV30 (shock-less type)

Rated flow: PC100, 100L 96.2 l/min.
PC120 113.0 l/min.

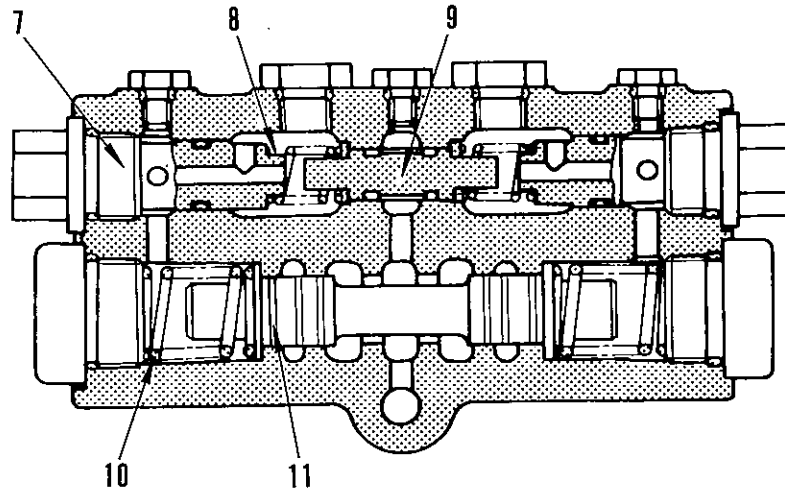
Safety valve:

Set pressure: PC100, 100L High — 165 kg/cm²
Low — 65 kg/cm²
PC120 High — 185 kg/cm²
Low — 85 kg/cm²

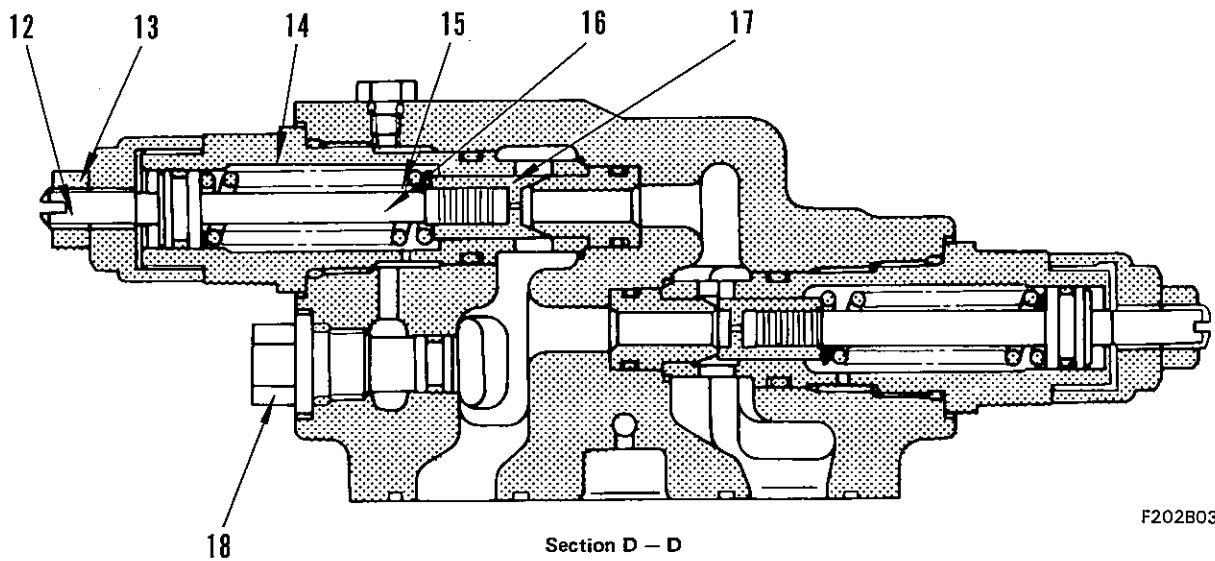
- | | |
|-----------------------------------|----------------------------------|
| 1. Spool switching spring | 10. Timer spool switching spring |
| 2. Check valve spring | 11. Timer spool |
| 3. Valve body | 12. Adjustment screw |
| 4. Counterbalance valve | 13. Lock nut |
| 5. Check valve | 14. Sleeve |
| 6. Plug | 15. Valve spring |
| 7. Plug | 16. Pilot piston |
| 8. Shuttle spool switching spring | 17. Safety valve poppet |
| 9. Shuttle spool | 18. Plug |



Section C - C



Section E - E



Section D - D

F202B032

FUNCTION

1. Counterbalance valve

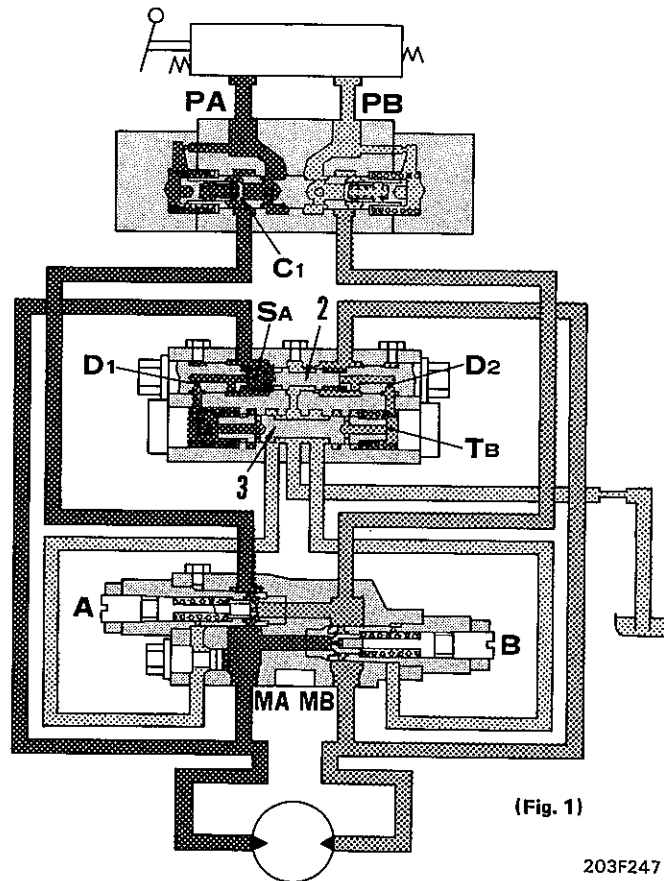
In case of a swing operation on a down-slope, the upper structure tends to revolve too fast for the motor revolutions due to the swing drifting on the slope. For this reason, if the upper structure is swung at a slow engine speed, the motor will race. In order to prevent such trouble, a counterbalance valve is provided to ensure a swing operation corresponding to the engine revolutions.

2. Safety valve

When stopping a swing operation, the motor outlet and inlet circuits are closed by the counterbalance valve. Since the motor is still being run by inertia however, the pressure on the motor outlet side goes up excessively, causing damage to the motor and piping. A safety valve is provided to permit this excessively high pressure oil to move into the inlet side, thereby preventing damage to the motor, piping, etc.

OPERATION

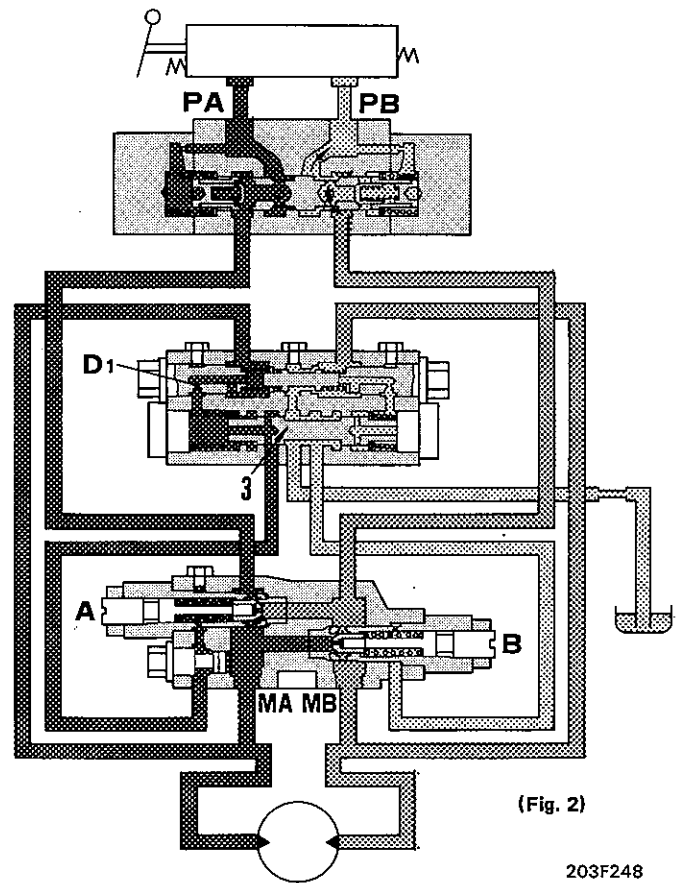
When starting to swing



1. If the swing lever is moved to the swing left position, the oil delivered from the pump flows to port PA through the control valve. It pushes open check valve C1 and flows to swing motor inlet port MA. As a result, the pressure at port MA rises, starting torque is generated in the motor and the motor begins to rotate. The oil from port MA enters chamber SA at the left side of shuttle spool (2), and pushes the shuttle spool to the right. The oil also flows through restriction D1 into chamber TA at the left side of timer spool (3) and pushes the timer spool to the right.

However, the oil in chamber TB at the right side of the timer spool is restricted by restriction D2, so it takes time for the timer spool to reach the end of its stroke (about 0.1 sec.). While the timer spool is moving to the right to the end of its stroke, the oil in the spring chamber of safety valve A flows through the notch in shuttle spool (2) to the low pressure circuit (port MB). As a result, safety valve A operates at the low pressure setting. In addition, the spring chamber of safety valve B is connected to port MB regardless of the movement of timer spool (3), so it is always at the high pressure setting. (Fig. 1)

- When timer spool (3) reaches the end of its stroke, the oil from the pump passes through restriction D1 and the hole in the timer spool, flows to the spring chamber of safety valve A and locks safety valve A. This completes the low pressure setting of safety valve A and the pressure at port MA rises again. When the low pressure setting in safety valve A is completed, port MA is set at high pressure by safety valve B. This high pressure rotates the motor. (Fig. 2)



(Fig. 2)

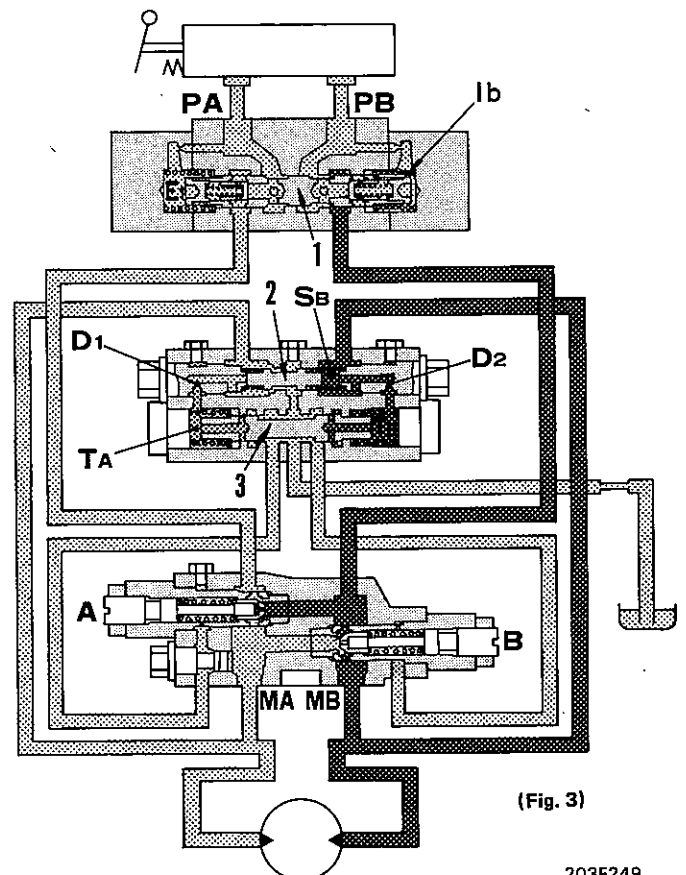
203F248

When stopping swing

- When the swing lever is moved to the neutral position, oil from the pump stops flowing to port PA. As a result, the pressure in chamber E1 drops, and spring 1b moves the counterbalance valve back to the neutral position. In addition, the oil from the outlet port of the motor passes through the clearance between spool (1) and the valve body and flows to port PB. However, as spool (1) moves to the left, the clearance between the spool and the valve body becomes smaller. Because of this, the pressure at MB side rises, generating resistance to the rotation of the motor and thus producing a braking effect.

The oil from port MB enters chamber SB at the left side of shuttle spool (2), and pushes the shuttle spool to the right. The oil also flows through restriction D2 into chamber TB at the left side of timer spool (3) and pushes the timer spool to the right. However, the oil in chamber TA at the right side of the timer spool is restricted by restriction D1, so it takes time for the timer spool to reach the end of its stroke (about 0.2 sec.).

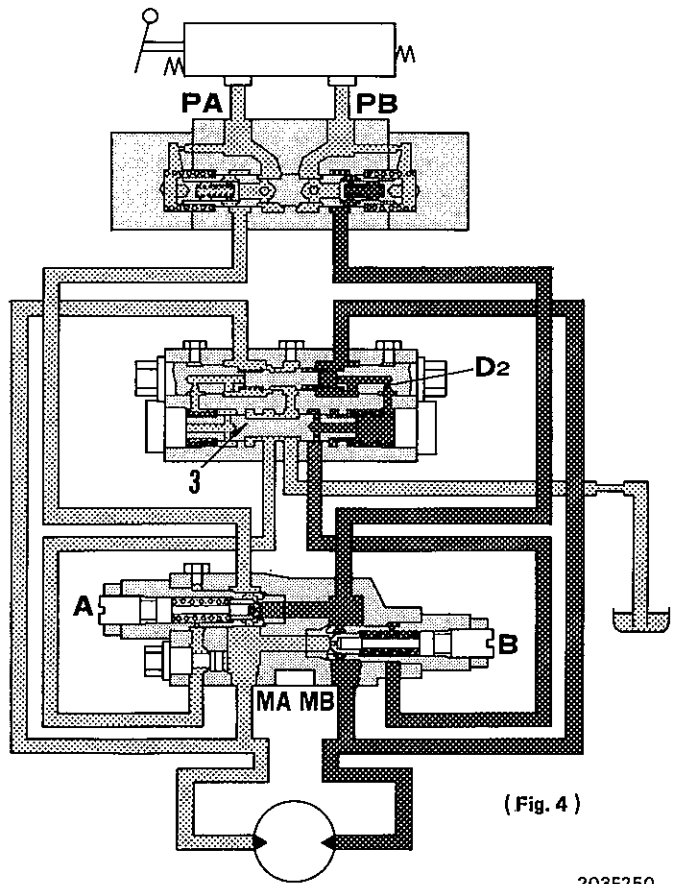
While the timer spool is moving to the right to the end of its stroke, the oil in the spring chamber of safety valve B flows through the notch in shuttle spool (2) to the low pressure circuit (port MA). As a result, safety valve B operates at the low pressure setting. In addition, the spring chamber of safety valve A is connected to port MA regardless of the movement of timer spool (3), so it is always at the high pressure setting. (Fig. 3)



(Fig. 3)

203F249

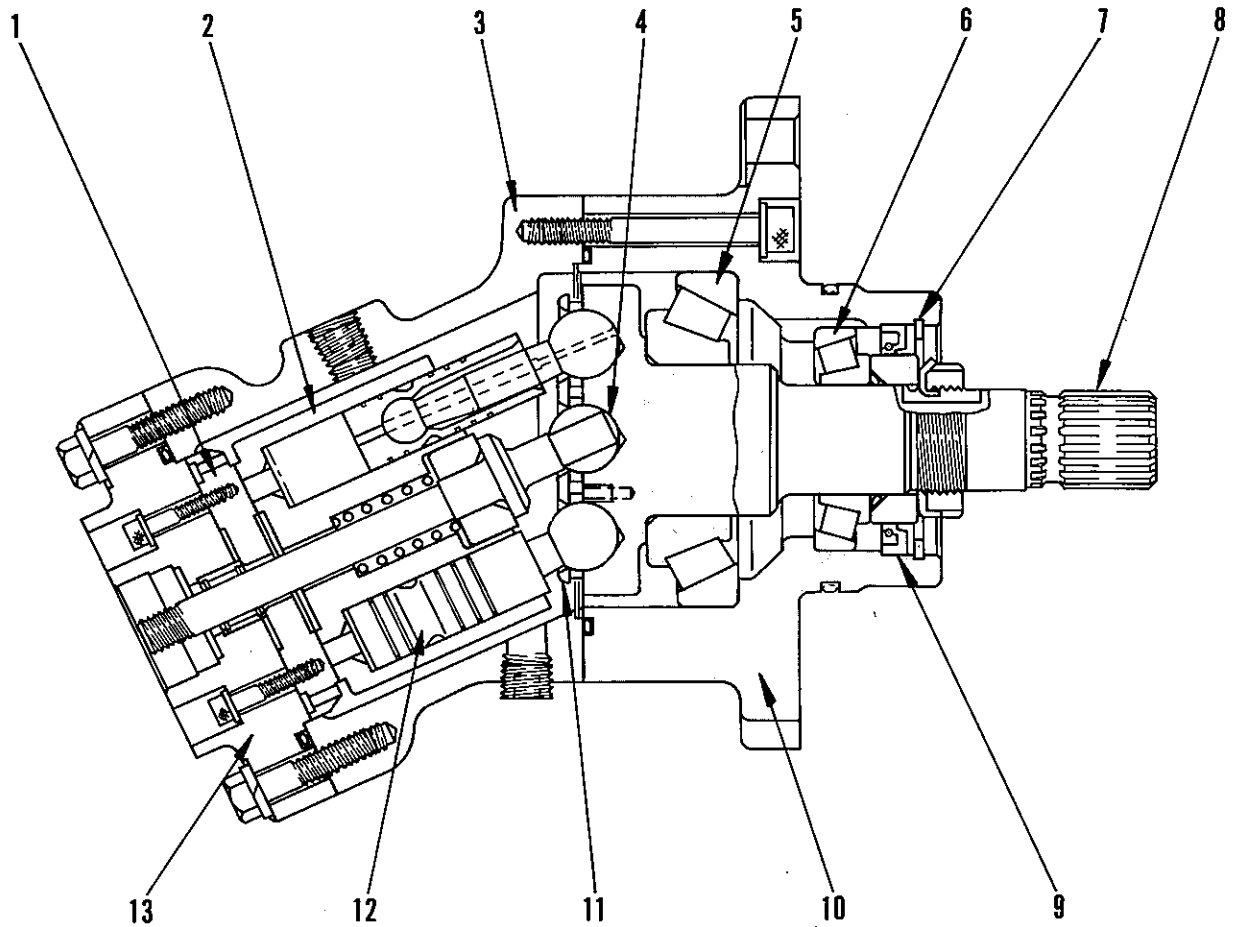
2. When timer spool (3) reaches the end of its stroke, the brake pressure (pressure oil at port MB) passes through restriction D2 and the hole in the timer spool, flows to the spring chamber of safety valve B and locks safety valve B. This completes the low pressure setting of safety valve B and the pressure at port MB rises again. When the low pressure setting in safety valve B is completed, port MB is set at high pressure by safety valve A. A high braking torque is obtained and the motor stops. (Fig. 4)



(Fig. 4)

203F250

SWING MOTOR



203F049

Theoretical delivery: 87.8 cc/rev

Normal outlet and inlet operating pressure: 185 kg/cm²

- | | |
|-------------------|--------------------|
| 1. Valve plate | 8. Output shaft |
| 2. Cylinder block | 9. Oil seal |
| 3. Housing | 10. Body |
| 4. Push rod | 11. Retainer plate |
| 5. Roller bearing | 12. Piston |
| 6. Roller bearing | 13. End cover |
| 7. Snap ring | |

Operating principle

In Fig. 1, a disc shaft is carried on bearings so that the disc is free to rotate. If force F is applied diagonally to this disc, the force F is divided into the components of force, F_1 (force perpendicular to the disc) and F_2 (circumferential force of the disc). F_1 pushes the disc in its axial direction and F_2 rotates the disc clockwise. If force F' is applied to the disc, the force F' is similarly divided into the components, F'_1 and F'_2 , F'_2 rotates the disc counterclockwise.

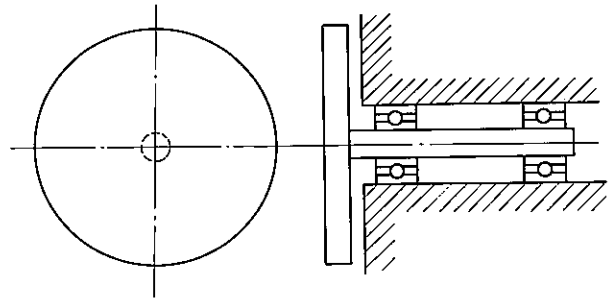


Fig. 1

204F114

Outline of construction

The construction of the swing piston motor is shown on the preceding page. In Fig. 3, seven pistons are installed on disc-like spherical joints. The pistons are fitted in a cylinder block, and keep set angles to the output shaft. The cylinder block and valve plate are guided by a center rod. The cylinder block is free to rotate on the center rod shaft and the valve plate is secured to the base plate with a pin.

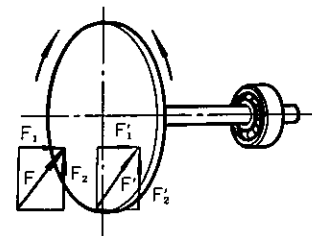


Fig. 2

204F115

Function

Refer to Fig. 4. When oil flows into the L.H. ports and out of the R.H. ports in the valve plate, the oil pressure is applied to the rear sides of the pistons leading to the L.H. ports, causing the output shaft to rotate clockwise as described in the paragraph concerning the operating principle. In this case, the pistons rotate clockwise together with the cylinder block at the same speed as the output shaft, while sliding through the cylinder block. Then, the pistons reach the ports on the outlet side in the valve plate, passing the uppermost point of the output shaft. When the pistons reach the outlet ports, the pressure on the pistons back sides is relieved, eliminating the force on the output shaft. Then the pistons are rotated by the output shaft and allowed to slide through the cylinder block. The oil on the pistons backsides is drained to the tank. The above mentioned movements are followed by all seven pistons and the output shaft rotates clockwise. If the oil inlet and outlet ports are used in the reverse way, the above movements are made oppositely, causing the output shaft to rotate counterclockwise.

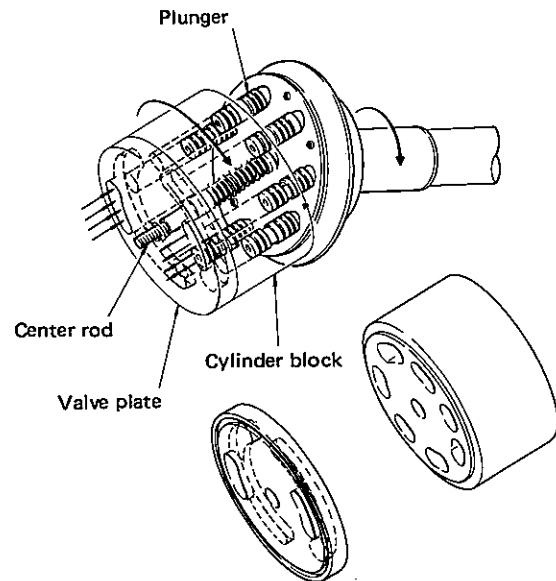


Fig. 3

204F116

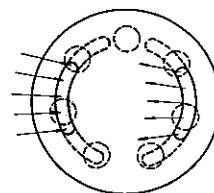
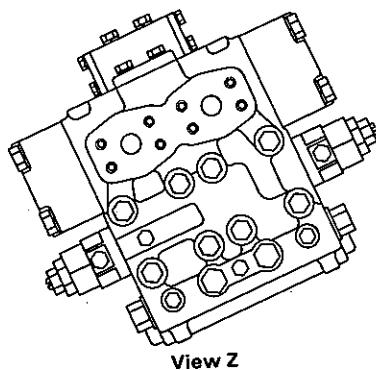
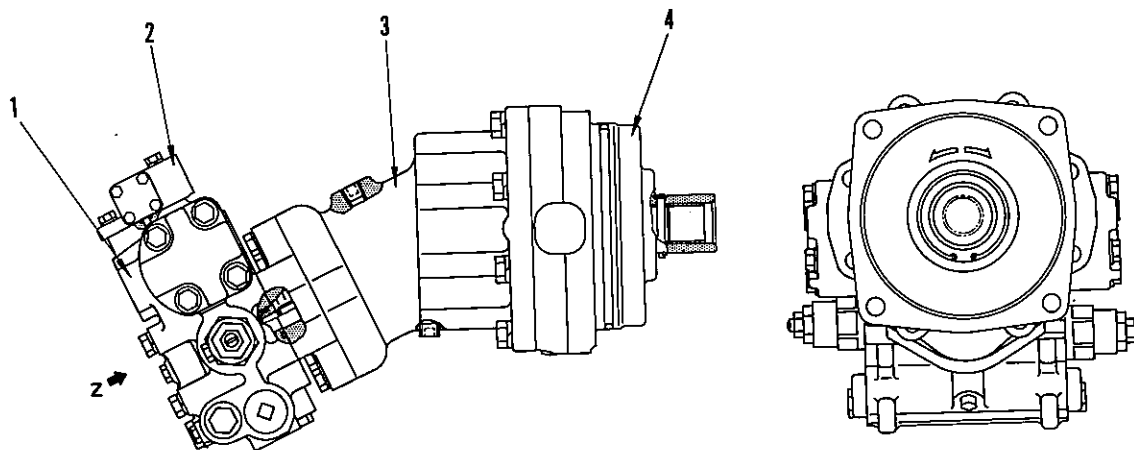


Fig. 4

204F117

SWING MOTOR AND BRAKE VALVE ASSEMBLY (OPTION)

With swing lock brake

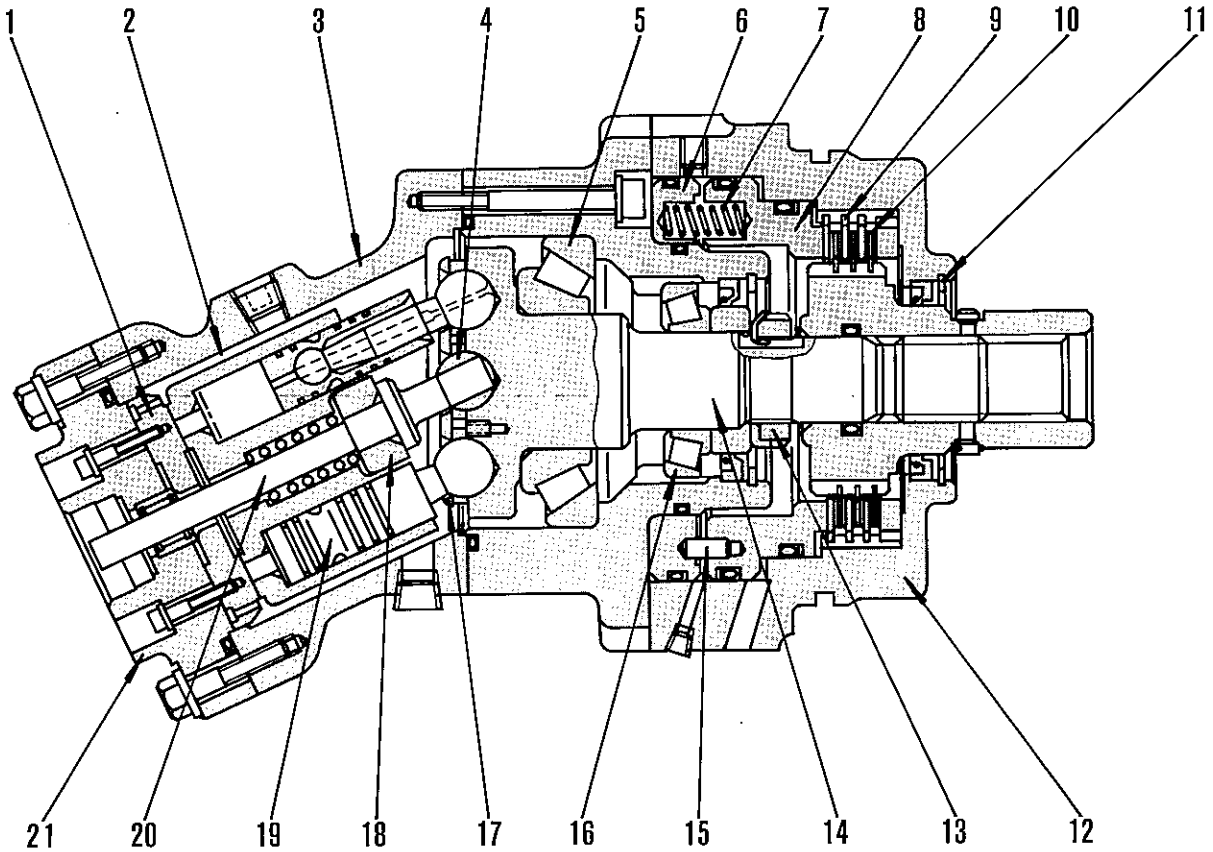


F202B010

Type: KMF090

- 1. Swing brake valve
- 2. Shuttle valve
- 3. Swing motor
- 4. Swing lock brake

SWING MOTOR (With swing lock brake)



F205B084

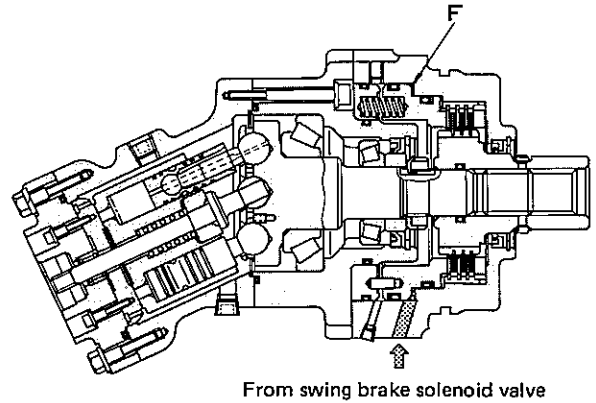
Theoretical delivery capacity: 87.8 cc/rev
 Normal pressure at inlet and outlet port: 185 kg/cm²

- | | |
|-------------------|--------------------|
| 1. Valve seat | 12. Brake housing |
| 2. Cylinder block | 13. Nut |
| 3. Case | 14. Drive shaft |
| 4. Center ball | 15. Dowel pin |
| 5. Bearing | 16. Bearing |
| 6. Spring seat | 17. Retainer plate |
| 7. Spring | 18. Thrust plate |
| 8. Brake piston | 19. Piston ass'y |
| 9. Plate | 20. Center shaft |
| 10. Disc | 21. End cover |
| 11. Snap ring | |

OPERATION OF PARKING BRAKE

Swing lock brake switch is **OFF** position.

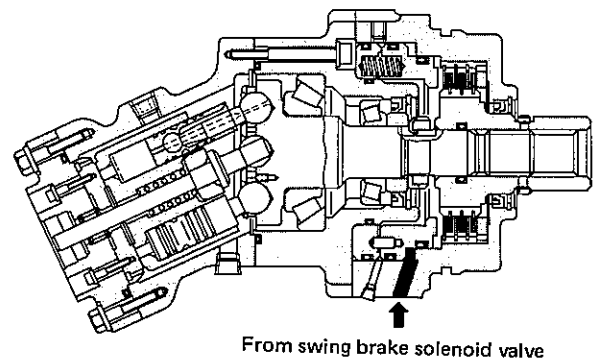
The circuit connected to chamber F of the swing lock brake is connected through the swing lock brake solenoid valve to the tank drain circuit. Consequently, the brake piston is pushed by the spring and the swing brake is applied.



F205B042

Swing lock brake switch is **ON** position.

The swing lock brake solenoid valve permits the oil from the pump to flow into the pressure chamber F, causing the brake piston to move back to its original position, thereby, the swing brake released, allowing the swing brake to swing in the normal condition.



F205B043

SWING BRAKE VALVE

For details of the function and operation, see page 61-32.

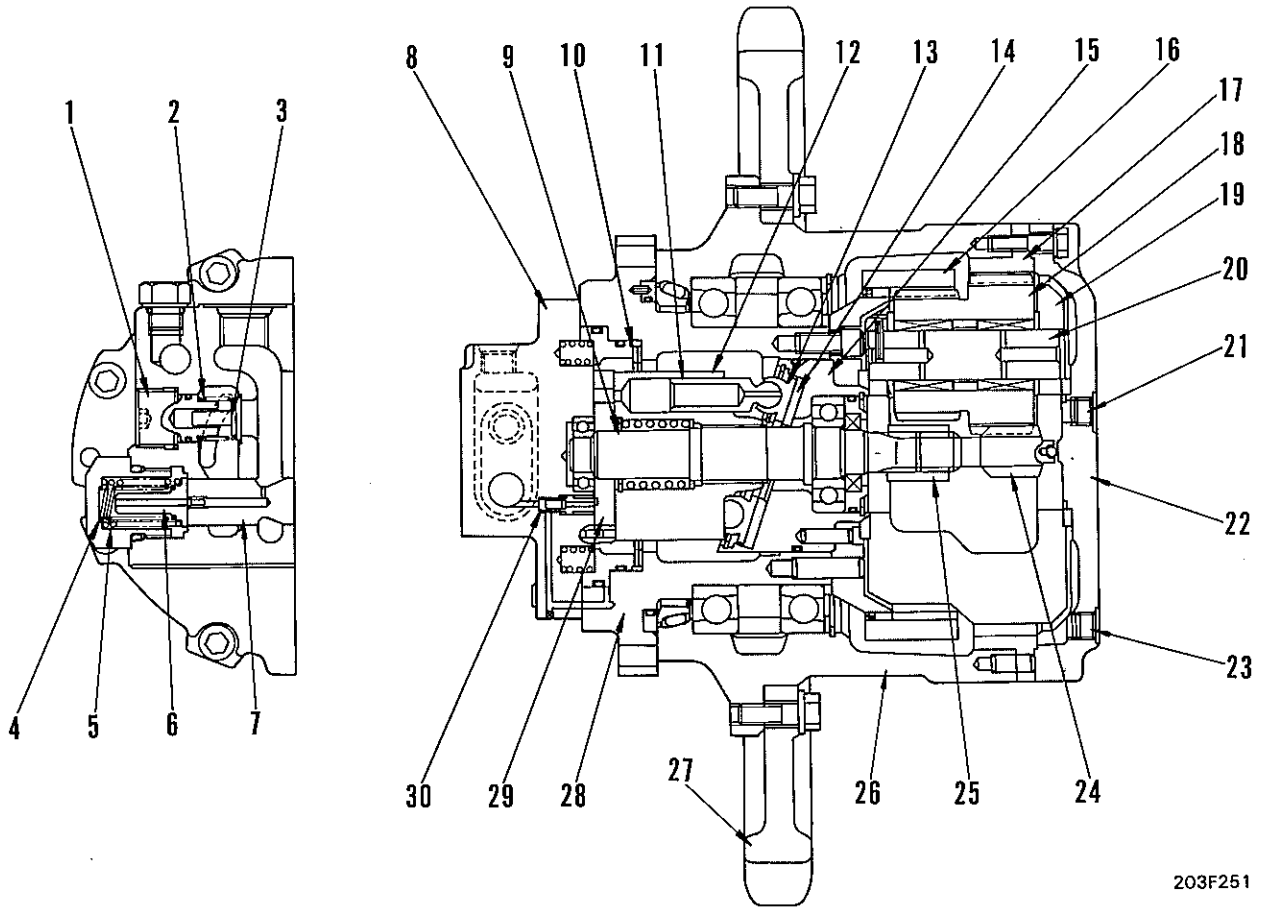
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TRAVEL MOTOR



203F251

- 1. Plug
- 2. Valve spring
- 3. Valve
- 4. Spool return spring
- 5. Spool return spring
- 6. Stopper
- 7. Spool
- 8. Rear flange
- 9. Shaft
- 10. Parking brake plate

- 11. Piston
- 12. Cylinder block
- 13. Piston shoe
- 14. Retainer plate
- 15. Swash plate
- 16. Ring gear
- 17. Ring gear
- 18. Cluster gear
- 19. Carrier
- 20. Shaft

- 21. Oil filler plug
- 22. Cover
- 23. Drain plug
- 24. Sun gear
- 25. Coupling
- 26. Hub (case)
- 27. Sprocket
- 28. Spindle
- 29. Timing plate
- 30. Valve

REDUCTION GEAR

1. Function

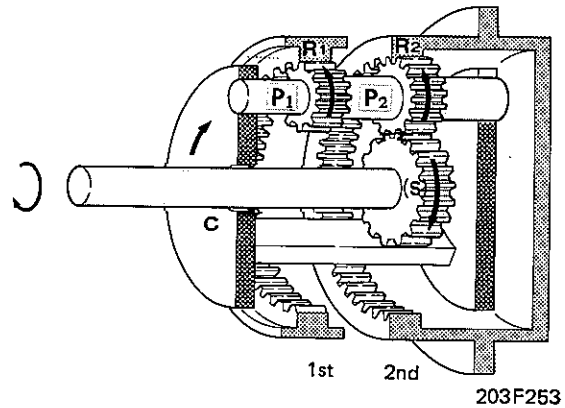
The reduction consists of a combination of two planetary gear mechanisms. To make the total mechanism smaller, one sun gear is employed, and the two planet gears form one unit. The first and second sets of planet gear greatly reduce the high speed rotation from the hydraulic motor and convert it into low-speed, high torque to rotate the hub (or case), which in turn rotates the sprocket.

2. Principle of operation

1) 1st planetary gear mechanism

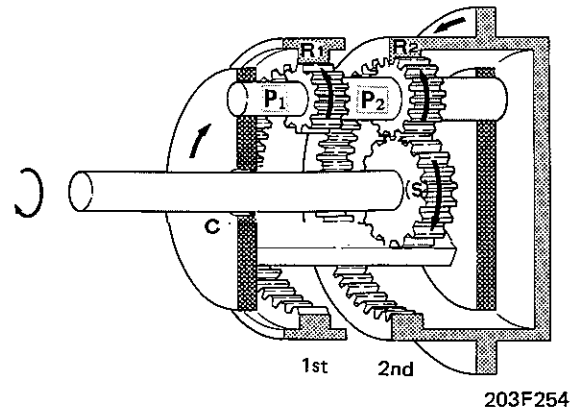
The rotation from the hydraulic motor rotates sun gear S.

The rotation of sun gear S is transmitted to planet gear P₂. Planet gears P₂ and P₁ form one unit, so P₂ and P₁ rotate at the same speed ring gear R₁ is fixed, so planet gear P₁ rotates about its own center and moves in orbit along ring gear R₁. As a result, carrier C rotates in the same direction as sun gear S.



2) 2nd planetary gear mechanism

The rotating speed of carrier C and sun gear S is fixed, so the planetary gear mechanism rotates ring gear R₂ in the opposite direction to the sun gear, and at a lower speed than carrier C. Ring gear R₂ is mounted on the hub (or case). The sprocket is also mounted on the hub (or case), so the rotation of ring gear R₂ is transmitted to the sprocket.



HYDRAULIC MOTOR (WITH BUILT-IN BRAKE VALVE, PARKING BRAKE)

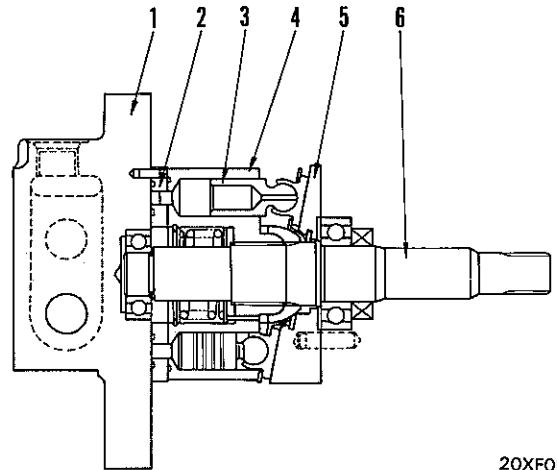
HYDRAULIC MOTOR

1. Function

This hydraulic motor is called a swash plate axial piston motor. It acts to convert the power of the pressure oil sent by the hydraulic pump into rotation.

2. Principle of operation

The oil sent by the hydraulic pump is sent from timing plate (2) to the cylinder through brake valve (1).



20XF051

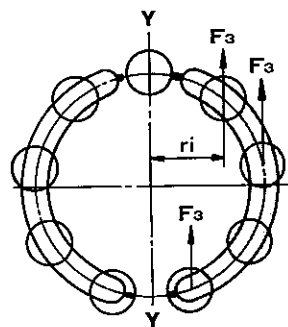
This oil is sent to only one side of the line Y – Y top dead center and bottom dead center of piston (3).

The oil entering cylinder (4) on one side pushes pistons (3) (three or four pistons) and produces force F ($F = P \text{ kg/cm}^2 \times A \text{ cm}^2$).

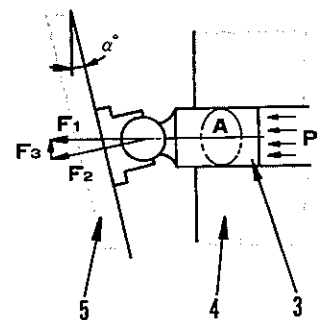
This power acts on swash plate (5). However swash plate (5) is fixed at a certain angle (α°) to output shaft (6). Therefore the force is divided into forces F_2 and F_3 .

Of these forces, radial force (F_3) produces torques ($T = F_3 \times ri$) in relation to line Y – Y joining the top dead center and bottom dead center. The combined force of these torques [$T = \Sigma (F_3 \times ri)$] acts as the rotation force and moves piston (3) to rotate cylinder (4).

Cylinder (4) is connected to output shaft (6) by a spline, so output shaft (6) rotates and transmits the torque.



20XF052

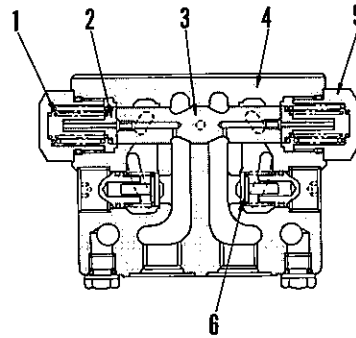


20XF053

BRAKE VALVE

1. Function

- 1) The brake valve acts to stop the inertia produced as the motor tries to rotate with the inertia of the machine. It applies the brake smoothly to stop the motor.
- 2) It also acts as a check valve to prevent cavitation of the hydraulic motor.
- 3) It opens the port to free the parking brake when the motor starts, and to close the port when it stops.



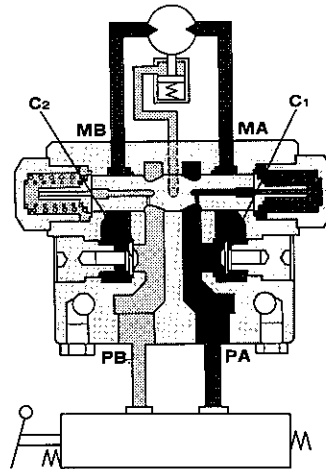
20XF054

- | | |
|---------------------------|----------------|
| 1. Spool switching spring | 4. Valve body |
| 2. Stopper | 5. Plug |
| 3. Counterbalance valve | 6. Check valve |

2. Operation

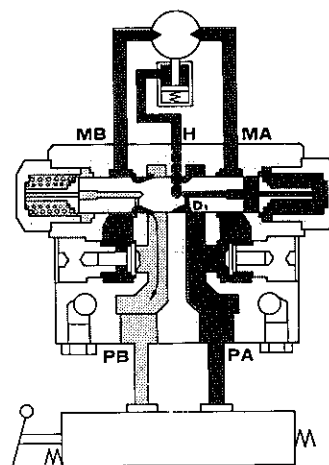
1) Starting travel

- The oil delivered from the pump flows to port PA through the control valve. It pushes open check valve C₁ and flows from motor inlet port MA to motor outlet port MB. However, the outlet side of the motor is kept closed by check valve C₂, causing the oil pressure to go up.



20XF055

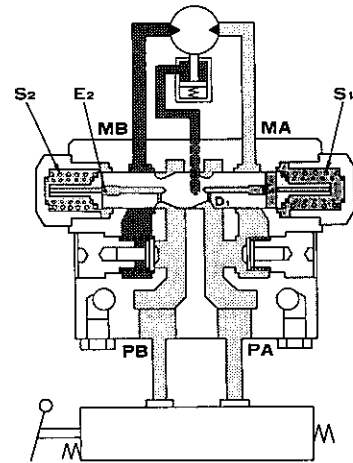
- The oil also flows into chamber E₁ through orifice D₁. If the pressure in chamber E₁ reaches the spool switching pressure, the spool is pushed to the left. Port MB and port PA are connected, and the circuit on the motor outlet side opens. When the spool is pushed to the left, inlet and outlet port H of the parking brake opens. The oil flows to chamber I of the parking brake cylinder. It then pushes the piston and releases the parking brake, then the motor starts.



20XF056

2) Braking on downhill slope

- If the machine tries to run away on a downhill slope, the motor runs idle, causing the oil pressure on the motor inlet side to drop. As the inlet side is connected to chamber E_1 by orifice D_1 , this in turn causes the pressure in chamber E_1 to drop.
- If the difference in pressure between chamber E_1 and chamber E_2 drops below the spool switching pressure, the spool is moved back to the right by the spring force, restricting port **MB** on the outlet side. Then the pressure on the outlet side goes up, increasing the running resistance of the pump. In this way, the motor is prevented from racing or running idle.
- Thus, the motor speed is limited to the pump flow rate.
- When stopping the machine travel, the inertia makes the motor try to rotate. As a result, it acts as a pump and tries to suck in oil. However, the oil passage is restricted, so oil is not supplied. This causes cavitation and has a bad effect on the motor. For this reason, check valves C_1 and C_2 are set to operate at the slightest negative pressure. This avoids cavitation of the motor.



20XF057

PARKING BRAKE

1. Function

A friction disc brake is used to prevent the machine from slipping or running away when stopping or parking on slopes.

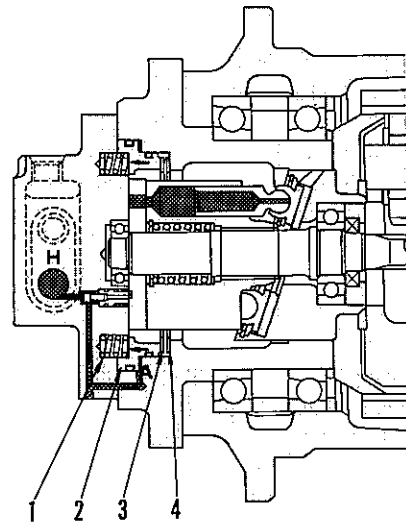
2. Operation

1) Starting travel

When the travel lever is moved to the ON position, the oil delivered from the pump flows to the motor. At the same time it actuates the spool of the brake valve. It opens the circuit to the parking brake and also flows to chamber A of the cylinder chamber.

When the pressure in chamber A reaches 11 kg/cm^2 , it becomes stronger than the force of spring (1) and pushes piston (2) to the left.

When the piston moves, the pressure on plate (3) and friction plate (4) is removed. The friction plate fitted into the cylinder portion of the motor can move freely, so the braking force on the motor is released.

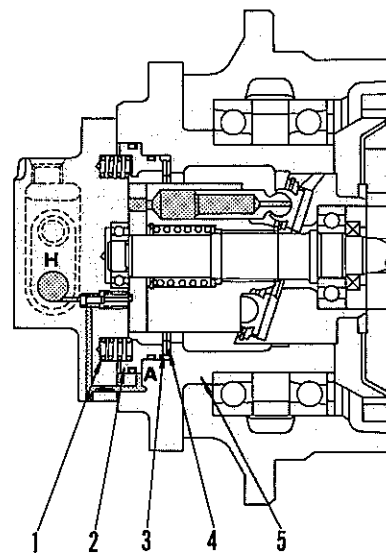


203F258

2) Stopping travel

When the travel lever is returned to NEUTRAL, the supply of oil to the brake valve and motor is shut off. When the pressure inside chamber A of the cylinder chamber drops below 11 kg/cm^2 , piston (2) is pushed back by spring (1).

The piston is pushed by the force of the spring, and plate (3) and friction plate (4) which are free, are pushed against spindle (5) of the reduction gear. The friction produced by this pressure stops the rotation force of the cylinder and gives braking torque (12.6 kgm) to the shaft of the motor.

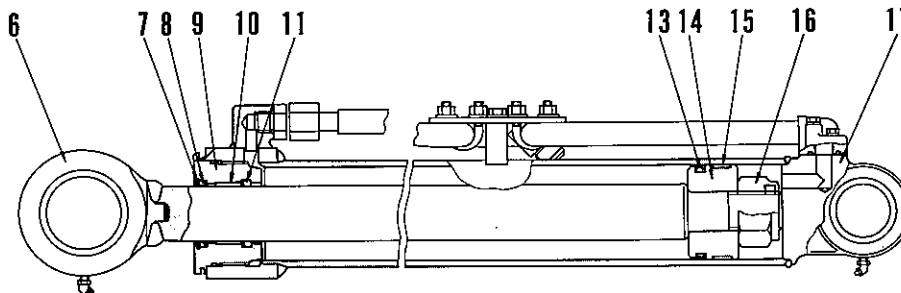
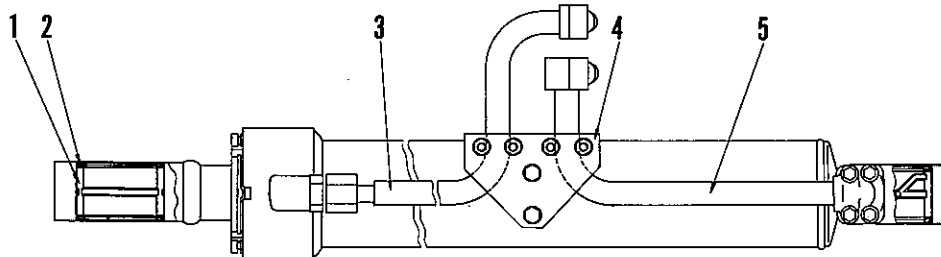


203F259

BOOM CYLINDER

PC100, 100L-2

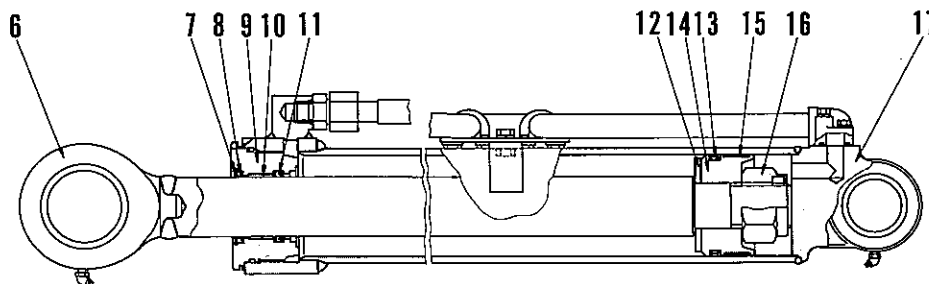
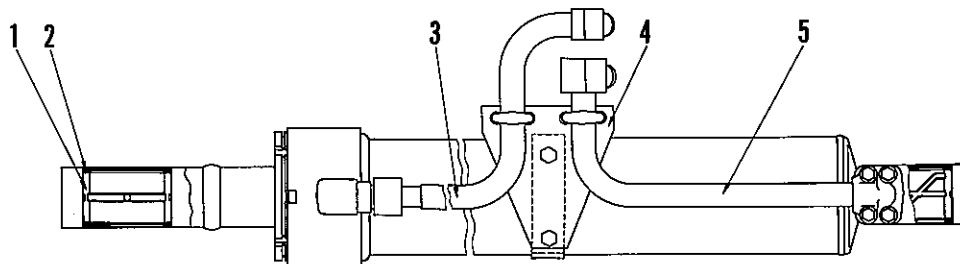
	Unit: mm
Piston rod outside diameter	65
Cylinder inside diameter	110
Piston stroke	1025
Cylinder max. (min.) length	2445 (1420)
Piston nut width across flat	70



203F051

PC120-2

	Unit: mm
Piston rod outside diameter	70
Cylinder inside diameter	120
Piston stroke	1055
Cylinder max. (min.) length	2545 (1490)
Piston nut width across flat	80



1. Bushing
2. Dust seal
3. Head side tube
4. Guard
5. Bottom side tube
6. Piston rod
7. Snap ring
8. Dust seal
9. Cylinder head
10. Bushing
11. Rod packing
12. Retainer
13. Piston packing
14. Piston
15. Wear ring
16. Piston nut
17. Cylinder

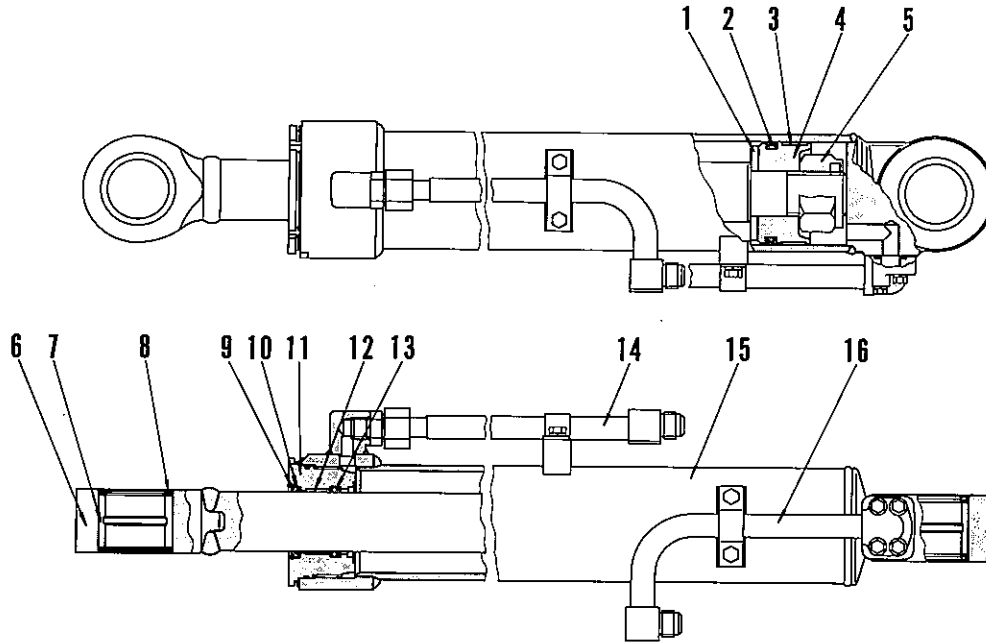
203F052

PC100-120-2

ARM CYLINDER

PC100, 100L-2

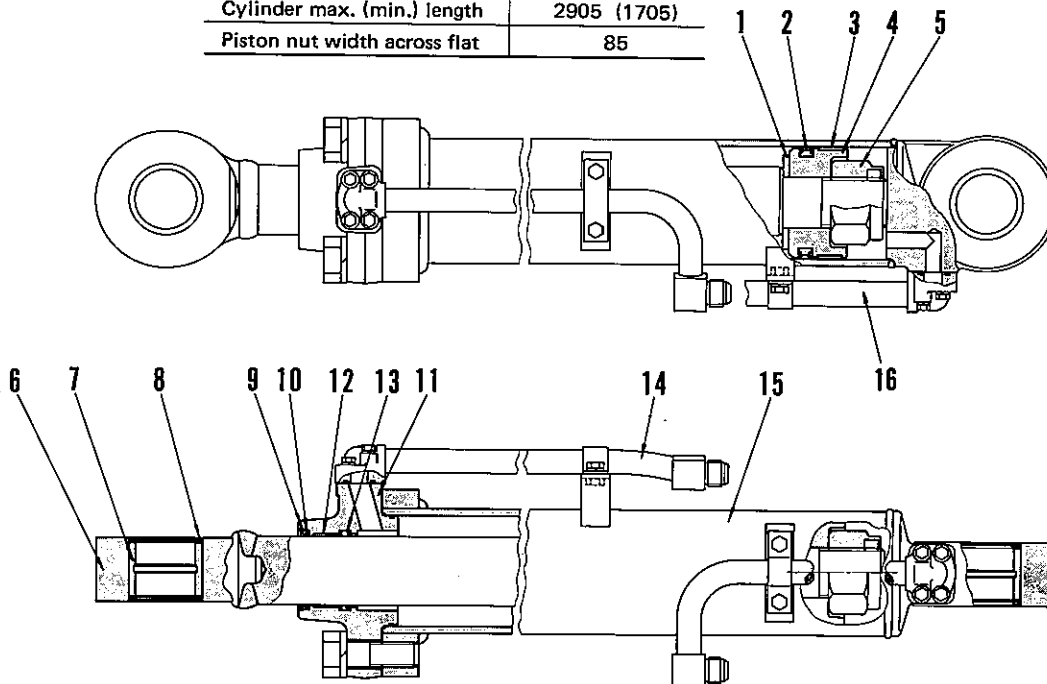
Unit: mm	
Piston rod outside diameter	70
Cylinder inside diameter	120
Piston stroke	1200
Cylinder max. (min.) length	2850 (1650)
Piston nut width across flat	80



203F053

PC120-2

Unit: mm	
Piston rod outside diameter	80
Cylinder inside diameter	130
Piston stroke	1200
Cylinder max. (min.) length	2905 (1705)
Piston nut width across flat	85



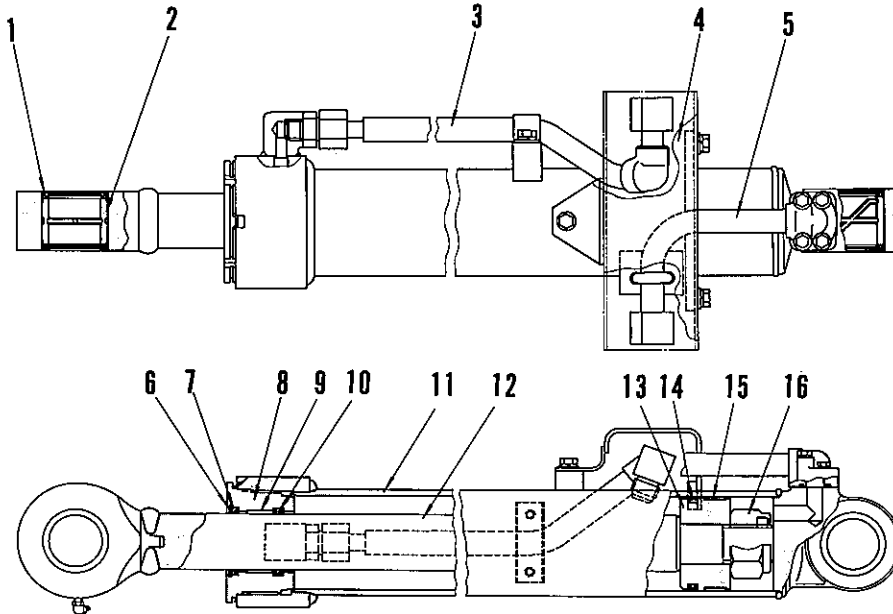
- 1. Retainer
- 2. Piston packing
- 3. Wear ring
- 4. Piston
- 5. Piston nut
- 6. Piston rod
- 7. Bushing
- 8. Dust seal
- 9. Snap ring
- 10. Dust seal
- 11. Cylinder head
- 12. Bushing
- 13. Rod packing
- 14. Head side tube
- 15. Cylinder
- 16. Bottom side tube

203F054

BUCKET CYLINDER

PC100, 100L-2

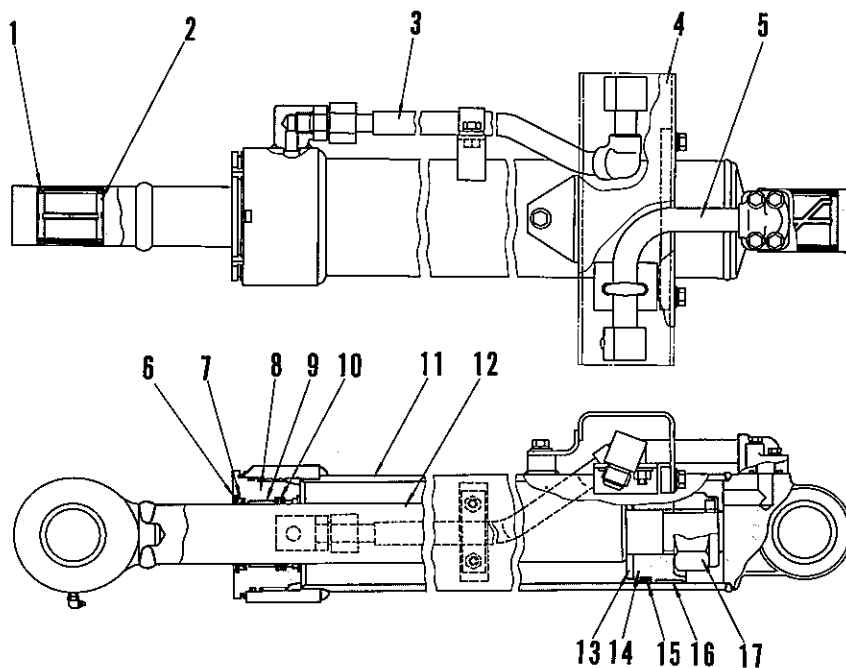
Unit: mm	
Piston rod outside diameter	65
Cylinder inside diameter	110
Piston stroke	890
Cylinder max. (min.) length	2220 (1330)
Piston nut width across flat	70



203F055

PC120-2

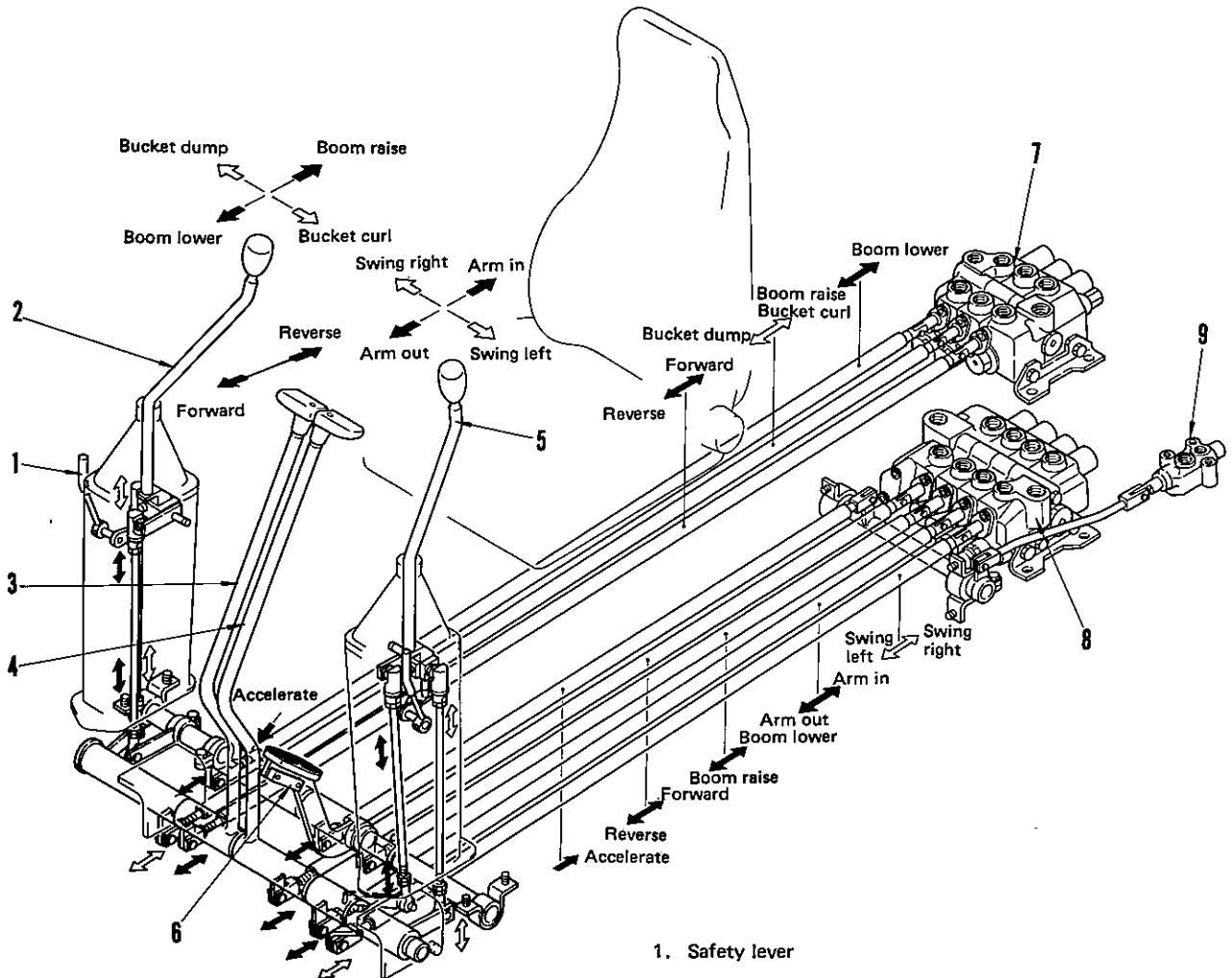
Unit: mm	
Piston rod outside diameter	70
Cylinder inside diameter	120
Piston stroke	890
Cylinder max. (min.) length	2230 (1340)
Piston nut width across flat	80



203F056

- 1. Dust seal
- 2. Bushing
- 3. Head side tube
- 4. Guard
- 5. Bottom side tube
- 6. Snap ring
- 7. Dust seal
- 8. Cylinder head
- 9. Bushing
- 10. Rod packing
- 11. Cylinder
- 12. Piston rod
- 13. Retainer
- 14. Piston
- 15. Piston packing
- 16. Wear ring
- 17. Piston nut

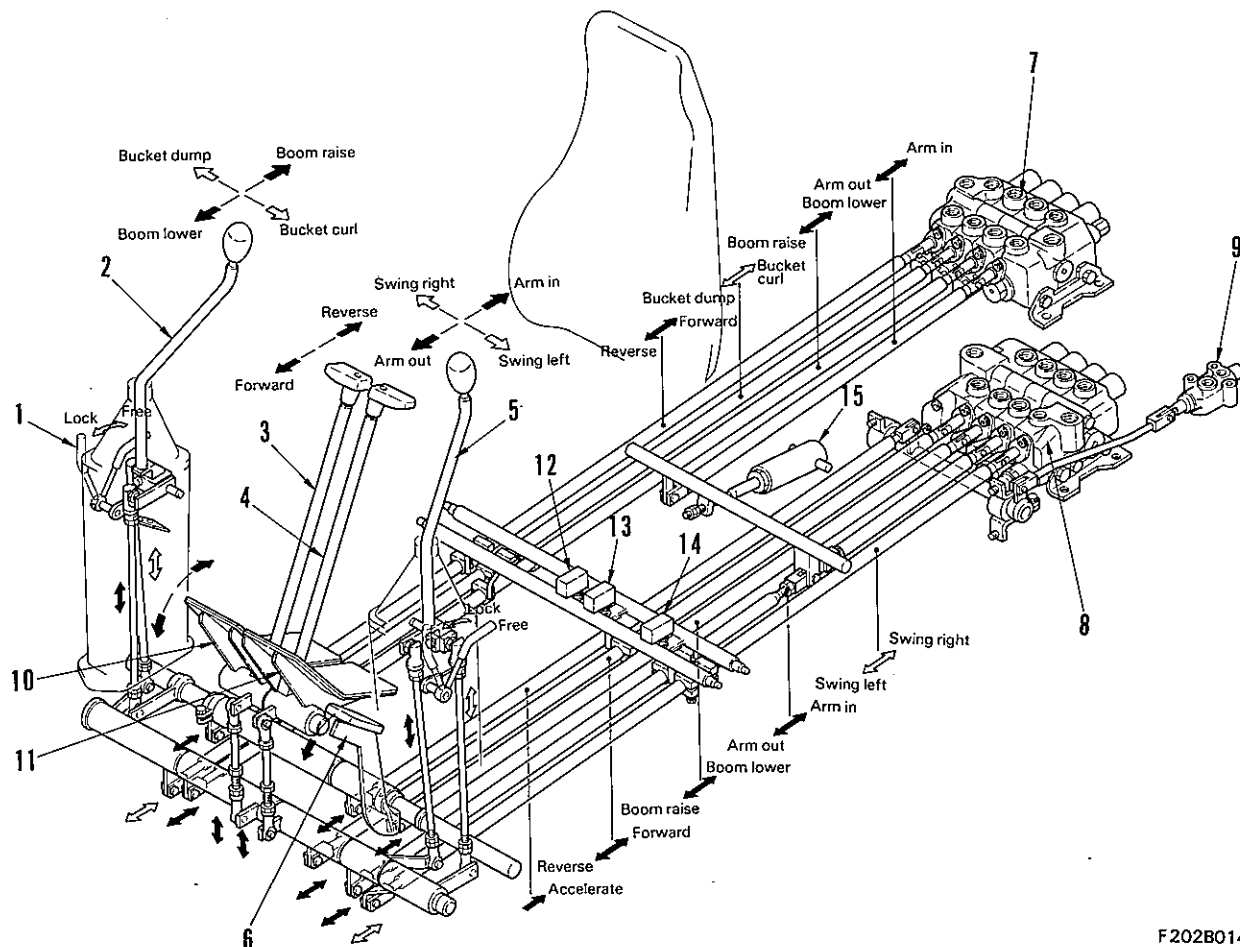
VALVE CONTROL



1. Safety lever
2. R.H. working equipment lever (For bucket, boom control)
3. R.H. travel/steering lever
4. L.H. travel/steering lever
5. L.H. working equipment lever (For arm, swing control)
6. Travel acceleration pedal
7. R.H. 3-spool control valve
8. L.H. 4-spool control valve
9. Travel acceleration selector valve

VALVE CONTROL (OPTION)

Equipped with travel and steering pedal



F202B014

- | | | |
|---|---------------------------------------|---|
| 1. Safety lever | 6. Travel acceleration pedal | 12. Limit switch for straight travel system |
| 2. R.H. working equipment lever
(For bucket, boom control) | 7. R.H. 4-spool control valve | 13. Limit switch for straight traves system |
| 3. R.H. travel/steering lever | 8. L.H. 4-spool control valve | 14. Limit switch for straight travel system |
| 4. L.H. travel /steering lever | 9. Travel acceleration selector valve | 15. Return spring for arm acceleration
valve rod |
| 5. L.H. working equipment lever
(for arm, swing control) | 10. R.H. travel/steering pedal | |
| | 11. L.H. travel/steering pedal | |

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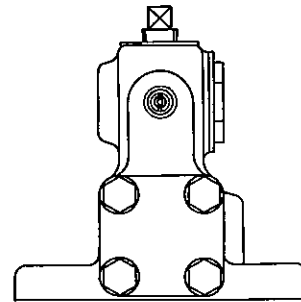
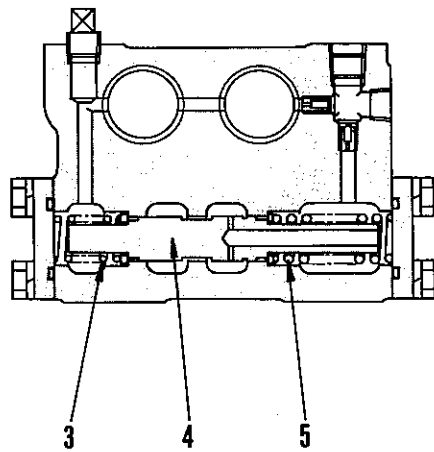
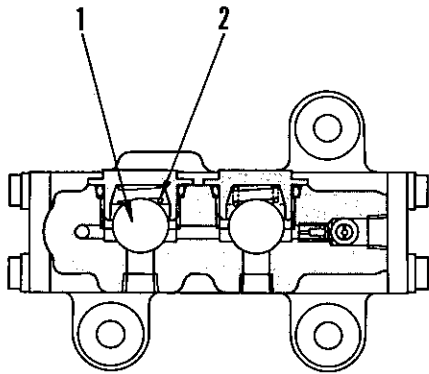
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AUTO-DECELERATION SYSTEM

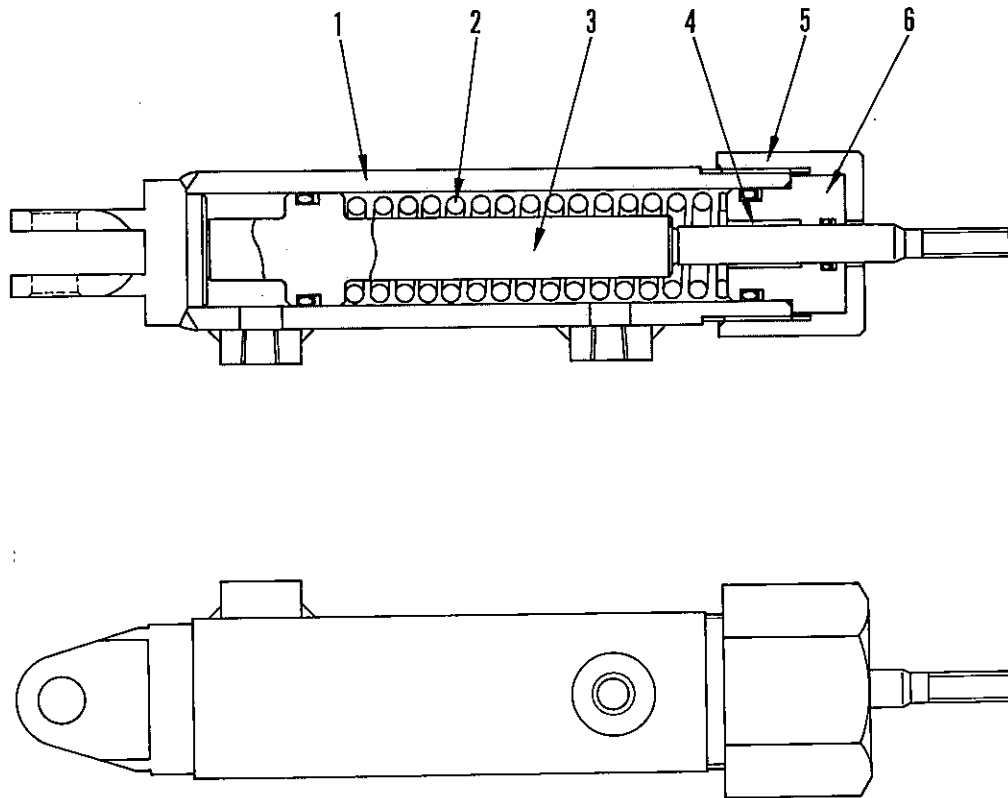
1. Pilot check valve for auto-deceleration



203F261

1. Check valve ball
2. Check valve spring
3. Spool selector spring
4. Spool
5. Spool selector spring

2. Deceleration cylinder



203F262

- 1. Cylinder
- 2. Return spring
- 3. Piston
- 4. Bushing
- 5. NUt
- 6. Stopper

PRINCIPLE OF OPERATION

FUNCTION

- When waiting to start work

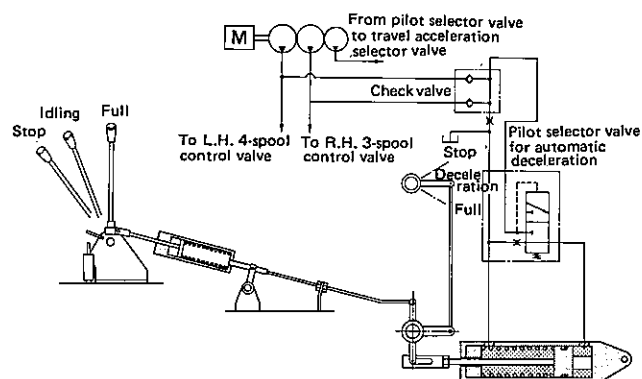
When all the control valves are at neutral, such as when waiting to start work, the automatic deceleration system automatically moves the engine governor control back. This reduces the engine speed and also reduces fuel consumption and noise.

OPERATION

1. Engine running, control levers at neutral

If the fuel control lever is moved to the full position, the loose spring and intermediate shaft will also try to move the engine governor control to the full position. However, the force of the spring inside the deceleration cylinder is greater than the force of the loose spring, so the engine governor control only moves to the half-open (deceleration) position. (Fig. 1)

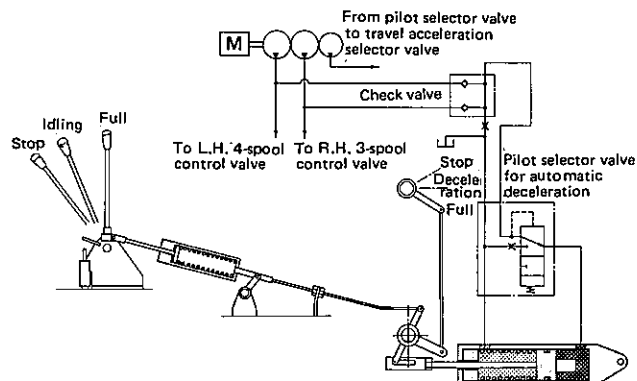
In this condition, the engine speed is 1,600 to 1,800 rpm (deceleration speed).



203F263

2. Engine running, control levers at operating position

If the control levers are operated when the fuel control lever is at the full position, the pressure oil from the pump flows to each actuator. At the same time, oil passes through the check valve and flows to the pilot selector valve. Here it switches pilot selector valve, then enters the bottom of the deceleration cylinder is compressed and its force becomes less than the force of the loose spring. When this happens, the loose spring moves cable and intermediate shaft to move the engine governor control to the full position. (Fig. 2)



203F264

3. Engine running, control levers moved from operating position to hold

If all the control levers are returned to the hold position when the engine is running, no pressure is formed at the bottom of the deceleration cylinder. The piston is moved back by the force of the spring inside the cylinder. In addition, the intermediate shaft moves the engine governor control back to the deceleration position. (Fig. 1)

When this happens, the fuel control lever stays at the set position regardless of the movement of the engine governor control.

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STRAIGHT TRAVEL SYSTEM (OPTION)

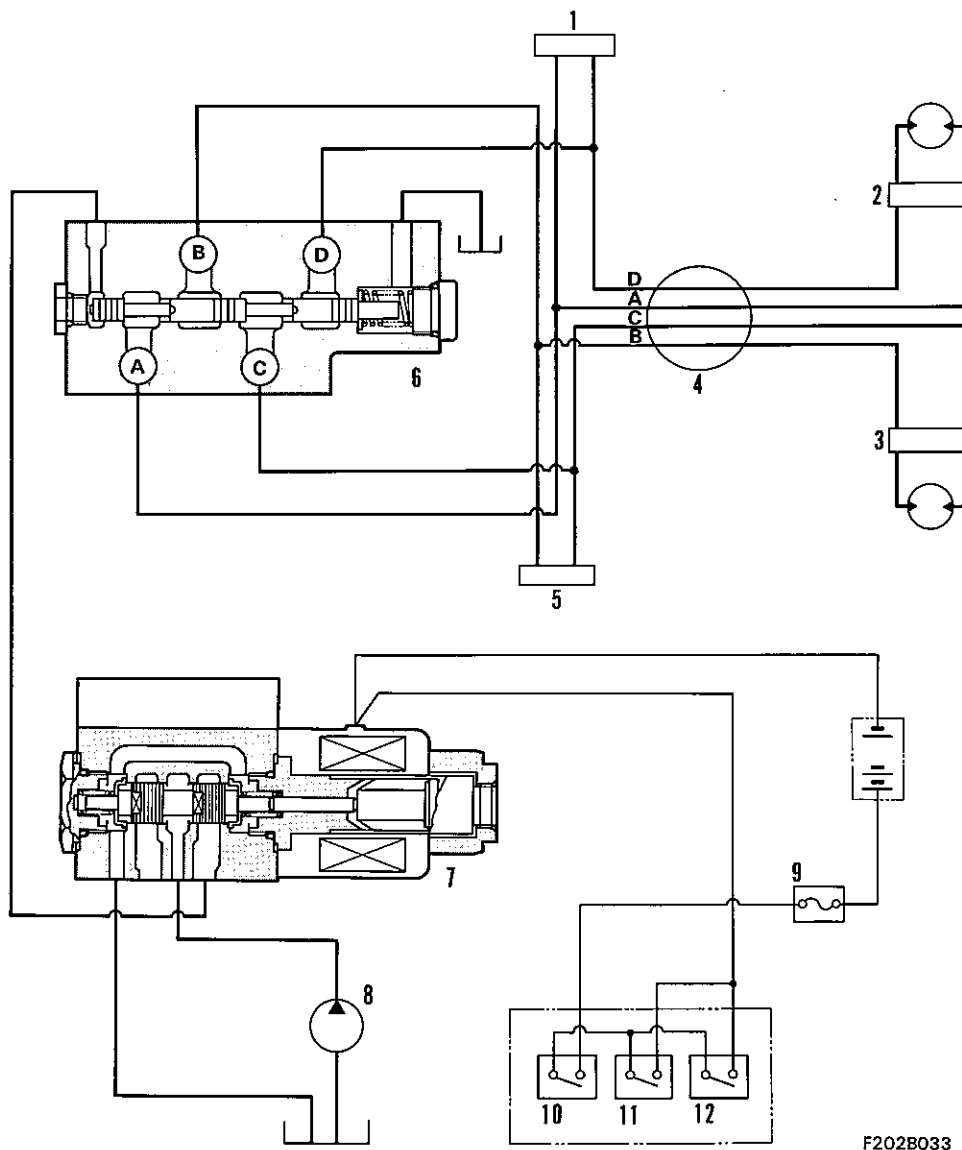
FUNCTION

When traveling in a straight line, if the work equipment is operated, part of the oil flowing to the travel motor flows to the work equipment circuit. Because of this, a difference in the flow to the right and left motors occurs. Consequently, the machine changes course to the right or left.

The straight travel system is a circuit which prevents the machine from changing course when the work equipment is operated.

When traveling in a straight line (forward or reverse), if the work equipment lever is not operated, the straight travel circuit will not be actuated.

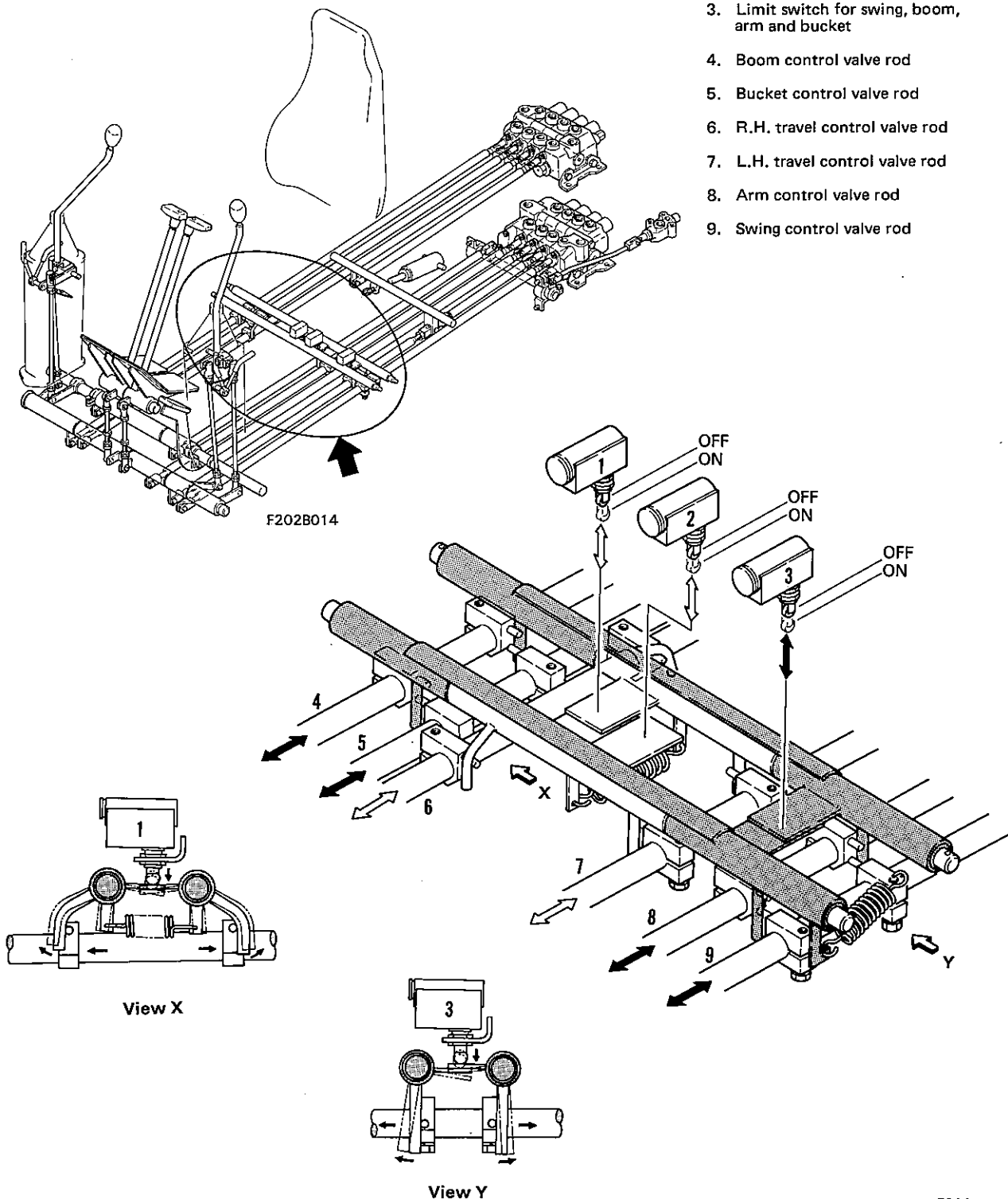
1. L.H. travel control valve
2. L.H. travel brake valve
3. R.H. travel brake valve
4. Center swivel joint
5. R.H. travel control valve
6. Travel connection valve
7. Solenoid valve
8. Pump
9. Fuse
10. Limit switch for swing, boom, arm and bucket
11. Limit switch for travel
12. Limit switch for travel



F202B033

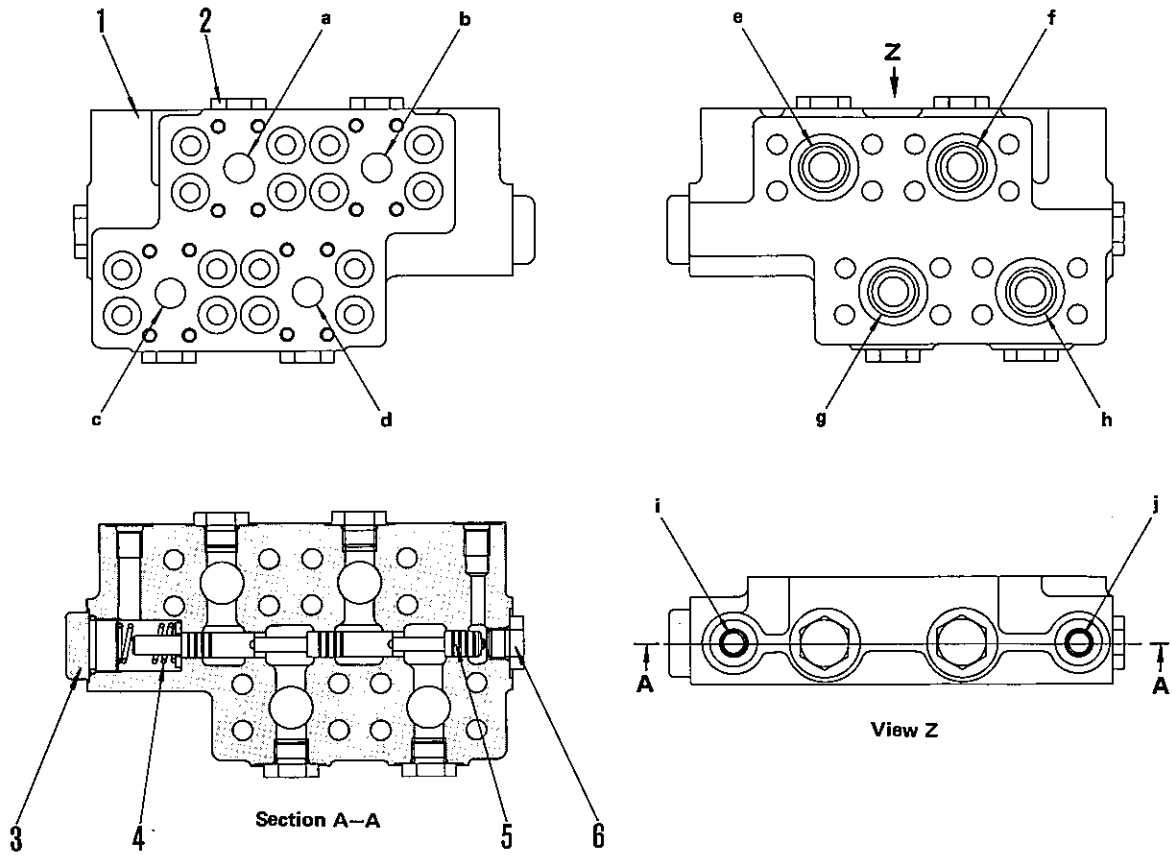
Relation between limit switches and valve control rods

- 1. Limit switch for travel
- 2. Limit switch for travel
- 3. Limit switch for swing, boom, arm and bucket
- 4. Boom control valve rod
- 5. Bucket control valve rod
- 6. R.H. travel control valve rod
- 7. L.H. travel control valve rod
- 8. Arm control valve rod
- 9. Swing control valve rod



F202B034

TRAVEL CONNECTION VALVE (OPTION)



F205B056

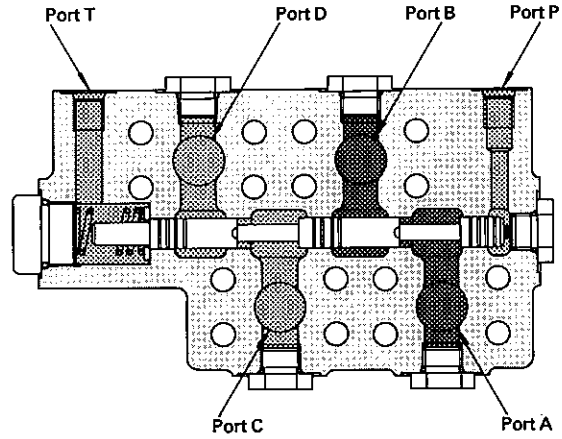
- a. From L.H. travel valve
- b. From L.H. travel valve
- c. From R.H. travel valve
- d. From R.H. travel valve
- e. To center swivel joint
- f. To center swivel joint
- g. To center swivel joint
- h. To center swivel joint
- i. To tank
- j. From pump through solenoid valve

- 1. Valve body
- 2. Plug
- 3. Plug
- 4. Spool return spring
- 5. Spool
- 6. Plug

OPERATION

In Neutral

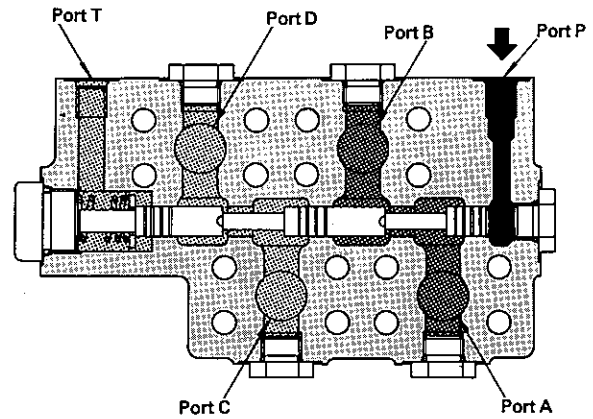
There is no flow of oil from the solenoid valve. Therefore, the valve is not actuated.



F205B057

When actuated

The pilot pressure from the solenoid valve enters port P and pushes the spool to the left. When this happens, the inlet and outlet ports (A and B, C and D) of the right and left motors are connected. Because of this, the same amount of oil flows into both right and left motors. This ensures that the machine continues to travel in a straight line.



F205B058

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Durham Road, Birtley
Chester-le-Street
Co. Durham DH3 2DX

Telephone: (091) 410 3155
Telex: 537978
Fax: (091) 410 8156



TO: MR DIAZ SERVICE DEPT K E	FROM: MR KATO MR TAMARU	KUK DOC REF. NO. 4834	PAGE NO. 1
		DATE: 28-7-88	20
SUBJECT: MISSING SECTION IN SHOP MANUAL		OUR REFERENCE:	
		ANSWER WANTED/INFO ONLY	

(All)

File in PC 100 } shop manual.
PC 120 }
150HD }

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HYDRAULIC SYSTEM

62 TESTING AND ADJUSTING



Table of judgement standard value	62- 3
Troubleshooting tools	62-10
Testing and adjusting	62-11
TRUBLESHOOTING	62-17

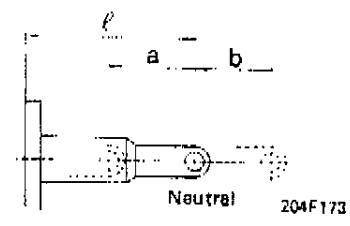
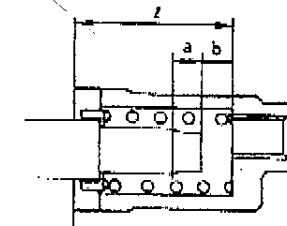
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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

TABLE OF JUDGEMENT STANDARD VALUE

* Standard value and permissible value in following table are the value when mode selector switch is at S position.

Item		Condition	Standard value (New machine)		Permissible value				
Idle	Engine low idling speed	<ul style="list-style-type: none"> Engine oil pressure: in correct range Engine coolant temperature: in correct range 	PC100	PC120	PC100	PC120			
	Engine high idling speed		800	850 rpm	800	850 rpm			
			2,250 - 2,350 rpm	2,350 - 2,450 rpm	2,250 - 2,360 rpm	2,350 - 2,450 rpm			
	Engine speed when two main pump circuit oil is relieved	<ul style="list-style-type: none"> At one pump relief: Bucket circuit relief At two pump relief: Bucket and arm circuits relief 	Min. 2,150 rpm	Min. 2,250 rpm	2,100 rpm	2,200 rpm			
	Engine speed when auto-deceleration acts	<ul style="list-style-type: none"> Fuel control lever at "High idling" Work equipment control lever at "Hold" 	1,800 ± 200 rpm		1,600 ± 200 rpm				
Spool stroke	Boom control valve	A) R.H. and L.H. travel control lever spool (linked type)  B) Control lever spools excepting above A) items (with PPC valve) 	l	a	b	l	a	b	
	Arm control valve		48 mm 7 ^{+0.5} ₀ mm 7 ^{+0.5} ₀ mm 48 mm 7 ^{+0.5} ₀ mm 7 ^{+0.5} ₀ mm						
	Bucket control valve								
	Swing control valve								
	L.H. travel control valve								
	R.H. travel control valve								
	Boom accelerator control valve								
	Arm-accelerator control valve								
	Service valve								
Control lever and pedal travel (mm)	Boom control lever	<ul style="list-style-type: none"> At center of lever knob Neutral → Raise or Lower	Long lever control	Wrist control	Long lever control	Wrist control			
	Arm control lever	<ul style="list-style-type: none"> Measure maximum valve in traveling Neutral → Arm in or out	180 ± 40	70 ± 17	160 ± 40	70 ± 17			
	Bucket control lever	<ul style="list-style-type: none"> Engine stopped Neutral → Curl or Dump	110 ± 27	70 ± 17	110 ± 27	70 ± 17			
	Swing control lever	Neutral → Swing right or swing left	110 ± 27	70 ± 17	110 ± 27	70 ± 17			
	Travel control lever	N → Forward or Reverse (L.H. R.H.)	140 ± 35	70 ± 17	140 ± 35	70 ± 17			
	Fuel control lever	Stop → Low idling Low idling → High idling	110 ± 27	110 ± 27	110 ± 27	110 ± 27			
			45 ± 11	45 ± 11	45 ± 11	45 ± 11			
			152 ± 38	152 ± 38	152 ± 38	152 ± 38			

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TESTING AND ADJUSTING

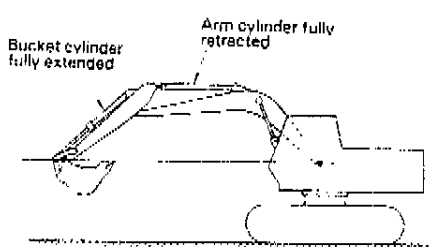
TABLE OF JUDGEMENT STANDARD VALUE

Item	Condition	Standard value (New machine)		Permissible value			
		Long lever control	Wrist control	Long lever control	Wrist control		
Operating force	Boom control lever	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 - 55°C Hook push-pull scale on center of control lever knob to measure Measure maximum value in traveling 	2.0-3.4 kg	1.0- 2.2 kg	3.0 kg	2.4 kg	
	Arm control lever		1.5-2.5 kg	1.0-2.2 kg	2.8 kg	2.4 kg	
	Bucket control lever		1.0-2.5 kg	1.0-2.2 kg	2.8 kg	2.4 kg	
Control	Travel control lever	Lever Forward	1.4 - 2.3 kg		2.8 kg		
		Lever Reverse					
		Pedal Forward	3.6 - 5.4 kg		6.8 kg		
		Pedal Reverse	4.4 - 6.6 kg		8.3 kg		
Hydraulic pressure	Boom	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 - 55°C 1 pump relieved, other pump no load 	280 ⁺¹⁵ ₀ kg/cm ²		280 ⁺²⁵ ₀ kg/cm ²		
	Arm						
	Bucket		PC100	240 ⁺¹⁰ ₀ kg/cm ²		240 ⁺²⁰ ₀ kg/cm ²	
			PC120	280 ⁺¹⁵ ₀ kg/cm ²		280 ⁺²⁵ ₀ kg/cm ²	
	Travel			280 ⁺¹⁵ ₀ kg/cm ²		280 ⁺²⁵ ₀ kg/cm ²	
	Swing			225 ⁺¹⁰ ₀ kg/cm ²		225 ⁺²⁰ ₀ kg/cm ²	
	OLSS charging pump			30 ⁺¹ ₀ kg/cm ²		30 ± 3 kg/cm ²	
TVC valve output pressure	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 - 55°C 	Control levers at NEUTRAL	23.5 kg/cm ²		18 kg/cm ²		
		One pump relief Ave. delivery pressure $\frac{P_1 + P_2}{2} = 145 - 155$ kg/cm ²	17 ± 1 kg/cm ²		16.5 ± 1.5 kg/cm ²		
Pressure when NC valve is actuated	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 - 55°C 	Control levers at NEUTRAL	5.5 ± 1 kg/cm ²		7 kg/cm ²		
		Travel control lever at full travel with track raised from ground and rotated	21 ± 1 kg/cm ²		18 kg/cm ²		
Jet sensor differential pressure	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 - 55°C 	Control lever at NEUTRAL	15.5 ± 1 kg/cm ²		15.5 ± 1 kg/cm ²		
		Control lever at full travel	Max. 1 kg/cm ²		Max. 1 kg/cm ²		
Lowered hydraulic pressure	<ul style="list-style-type: none"> Hydraulic oil temperature: 45 - 55°C Difference oil relief pressure between at engine full speed and at engine a half speed. (Measure pressure in one circuit only) 	Max. 30 kg/cm ²		Max. 30 kg/cm ²			

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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

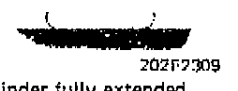
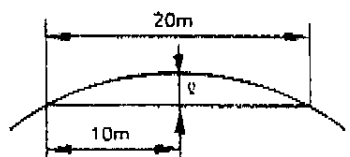
Item	Condition	Standard value (New machine)		Permissible value		
		PC100	PC120	PC100	PC120	
						
	<ul style="list-style-type: none"> Hydraulic oil temperature: 45 – 55°C Bucket unloaded Write 2 match marks on outside of upper and lower swing circles Stop the normal swing at 2 match marks fitted Measure difference between 2 match marks (): Swing brake angle 	(Max. 50°)	(Max. 60°)	(Max. 60°)	(Max. 70°)	
Swing	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 – 55°C Bucket unloaded Measure time taken for 90° – 180° swing from starting point with work equipment in posture in Fig. 1 	90°	2.7±0.3 sec.	2.6±0.3 sec.	3.3 sec.	3.2 sec.
		180°	3.7±0.4 sec.	3.6±0.4 sec.	4.5 sec.	4.4 sec.
	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 – 55°C Work equipment in posture in Fig. 1 Measure time taken to swing for 5 turns, after swinging one turn as an approach swing 	26.4 ±1.3 sec.	24±1.2 sec.	28 sec.	27 sec.	
	<ul style="list-style-type: none"> Engine speed: Stopped Hydraulic oil temperature: 45 – 55°C Work equipment in posture in Fig. 1 Bucket unloaded Swing lock switch is in ON, (with swing lock brake system) Stop the machine on 15° slope and set boom at 90° angle across the slope Measure distance moved by outside of swing circle in 5 min. 	0 mm + 290 mm	0 mm * 290 mm	0 mm * 435 mm	0 mm * 435 mm	
	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 – 55°C Relieve swing circuit Measure leakage from swing motor with measuring cylinder 	Max. 1.5ℓ/min.	Max. 1.5ℓ/min.	2.5 ℓ/min.	2.5 ℓ/min.	
Travel	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 – 55°C Raise track on one side, then measure time taken to rotate for 5 turns after rotating one turn as an approach travel Repeat same way with track on other side 	PC100 35.5±2 sec. PC100L 53±2 sec.	37.0±2 sec.	PC100 39 sec. PC100L 58 sec.	41 sec.	

Note:
* values are available for machines equipped without auto-decelerator and swing mechanical brake.

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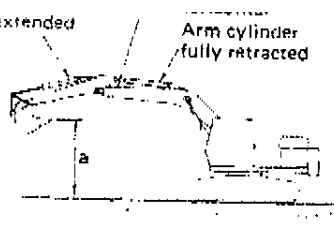
TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

Item	Condition	Standard value (New machine)		Permissible value		
		PC100	PC120	PC100	PC120	
Travel speed (2)	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 – 55°C Machine is on level ground Measure time taken to travel for 20 m after traveling 10 m as an approach travel Work equipment posture: Arm cylinder fully extended 	PC100 20 ± 2 sec.	PC120 20 ± 2 sec.	PC100 20 ⁺⁴ / ₋₂ sec.	PC120 20 ⁺⁴ / ₋₂ sec.	
Travel	 <p>205F2309 Bucket cylinder fully extended</p>					
	 <p>205F2402</p>					
	<ul style="list-style-type: none"> Engine speed: Full speed Hydraulic oil temperature: 45 – 55°C Run the machine for about 30 m on firm and level ground. Lay out a 20 m string from a point 5 – 6 m from the start, and measure the deviation (a) of the machine at the midway point (10 m mark). 	Max. 200 mm		220 mm		
	<ul style="list-style-type: none"> Engine speed: Stopped Hydraulic oil temperature: 45 – 55°C Stop the machine on 12° slope with setting sprocket on uphill Measure distance moved by machine in 5 min. 	0 mm		0 mm		
Leakage from travel motor	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil pressure: 45 – 55°C Raise one track off the ground, let it spin revolution. Measure leakage from travel motor with measuring cylinder 	Max. 0.5l/min.		1 l/min.		
Work equipment	Work equipment speed	<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 – 55°C Bucket unloaded Arm and bucket cylinder fully retracted Measure time taken from bucket tooth touching the ground to boom cylinder fully extended (RAISE) Measure time taken from boom cylinder fully extended to bucket tooth touching the ground (LOWER) 	PC100 RAISE: 3.2±0.4 sec. LOWER: 2.8±0.3 sec.	PC120 3.4±0.4 sec. 3.1±0.4 sec.	PC100 3.9 sec. 3.4 sec.	PC120 4.1 sec. 3.8 sec.
		<ul style="list-style-type: none"> Engine speed: High idling Hydraulic oil temperature: 45 – 55°C Bucket unloaded Top of boom is in horizontal, and bucket cylinder fully extended Measure time taken from arm cylinder fully retracted position to cylinder fully extended position (IN) Measure time taken cylinder fully extended position to cylinder fully retracted position (OUT) 	IN: 3.7±0.4 sec. OUT: 2.8±0.4 sec.	3.7±0.4 sec.	4.5 sec. 3.4 sec.	4.5 sec. 3.4 sec.

TESTING AND ADJUSTING

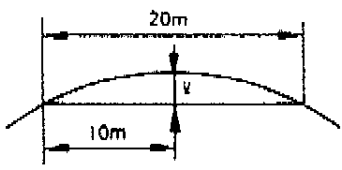
TABLE OF JUDGEMENT STANDARD VALUE

Item		Condition	Standard value (New machine)		Permissible value	
			PC100	PC120	PC100	PC120
Work equipment speed	Bucket	<ul style="list-style-type: none"> • Engine speed: High idling • Hydraulic oil temperature: 45 – 55°C • Bucket unloaded • Top of boom is in horizontal, and arm cylinder fully retracted • Measure time taken from cylinder fully retracted position to cylinder fully extended position (CURL) • Measure time taken from cylinder fully extended position to cylinder fully retracted position (DUMP) 	CURL: 4.1±0.5 sec.	3.9±0.4 sec.	5.0 sec.	4.7 sec.
			DUMP: 2.4±0.3 sec.	2.4±0.3 sec.	2.9 sec.	2.9 sec.
Work equipment	Hydraulic drift	 <p>(Fig. 2) 205F575</p> <ul style="list-style-type: none"> • Engine speed: Stopped • Hydraulic oil temperature: 45 – 55°C • Bucket loaded (PC100: 720 kg) (PC120: 810 kg) • Work equipment in posture in Fig. 2 • Measure amount bucket tooth moved down (distance "a") in 15 min. • Measure immediately after setting 	Max. 700 mm	Max. 700 mm	1050 mm	1050 mm
		<ul style="list-style-type: none"> • Engine speed: Stopped • Hydraulic oil temperature: 45 – 55°C • Bucket rated loaded • Work equipment in posture in Fig. 2 • Measure amount boom cylinder retracted in 15 min. 	Max. 35 mm	Max. 30 mm	53 mm	45 mm
		<ul style="list-style-type: none"> • Engine speed: Stopped • Hydraulic oil temperature: 45 – 55°C • Bucket rated loaded • Work equipment in posture in Fig. 2 • Measure amount arm cylinder extended in 15 min. 	Max. 85 mm	Max. 70 mm	128 mm	105 mm
		<ul style="list-style-type: none"> • Engine speed: Stopped • Hydraulic oil temperature: 45 – 55°C • Bucket rated loaded • Work equipment in posture in Fig. 1 • Measure amount bucket cylinder retracted in 15 min. 	Max. 25 mm	Max. 26 mm	38 mm	38 mm
Internal leakage	Each cylinder	<ul style="list-style-type: none"> • Hydraulic oil temperature: 45 – 55°C • Operating pressure: 280⁺¹⁵/₀ kg/cm² 	Max. 3.0 cc/min.	Max. 3.0 cc/min.	15 cc/min.	15 cc/min.
	Swivel joint		Max. 20 cc/min.	Max. 20 cc/min.	100 cc/min.	100 cc/min.

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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

Item	Condition	Standard value (New machine)		Permissible value	
		PC100	PC120	PC100	PC120
not	Boom	Max. 4.0 sec.		4.8 sec.	
Work	T _{II}				
	Bucket	Max. 4.0 sec.		4.8 sec.	
Compound operation performance	Deviation during compound operation, work equipment travel	 <p>205F2402</p>		Max. 200 mm	
Hydraulic pump performance	Charging pump	PC100: Min. 37.3ℓ/min. (at 2,100 rpm) PC120: Min. 39.5ℓ/min. (at 2,200 rpm)		33 ℓ/min. 35 ℓ/min.	
	Main pump	See next page		See next page	

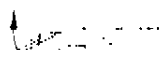

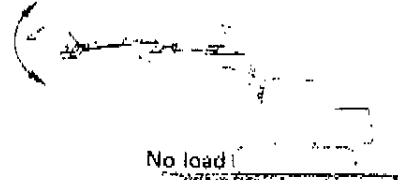
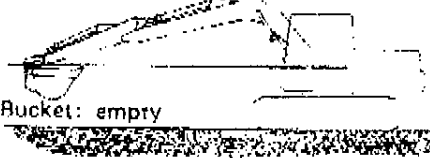
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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

TABLE OF L POSITION VALUE

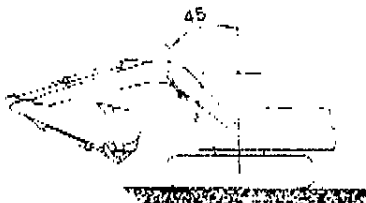
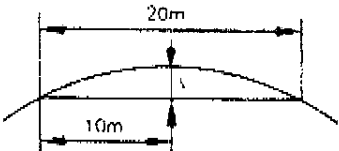
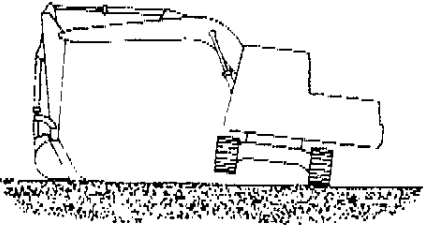
* The following table indicates the reference values for various actions when the mode selector switch is changed over from S position to L position.

Classification	Item	Conditions	L position						
			PC100-3	PC120-3					
Work equipment Work equipment speed	Boom	Posture of work equipment 	RAISE	4.3 ± 0.4	4.7 ± 0.5				
				4.3 ± 0.4	4.7 ± 0.5				
	Cylinder fully extended (sec.)	205F2421 • Engine speed: High idling • Oil temp.: 45 - 55°C	Posture of work equipment 	LOWER	2.8 ± 0.3	3.0 ± 0.3			
					Arm Cylinder fully retracted Cylinder fully extended (sec.)	205F2422 • Engine speed: High idling • Oil temp.: 45 - 55°C	IN	4.4 ± 0.4	4.6 ± 0.5
								OUT	3.3 ± 0.3
					Bucket Cylinder fully retracted Cylinder fully extended (sec.)	205F2423 • Engine speed: High idling • Oil temp.: 45 - 55°C	Posture of work equipment 		CURL
	DUMP	2.9 ± 0.3	3.0 ± 0.3						
		Swing	Normal swing speed (sec.)	Posture of work equipment Max. reach  Bucket: empty 205F2406 • Engine speed: High idling • Oil temp.: 45 - 55°C • Measure time taken to swing for 2 turns, after swiging one turn as an approach swing.		10.5 ± 1	10.2 ± 1		

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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

Classification	Item	Conditions	L position	
			PC100-3	PC120-3
		Travel posture 		
Travel	Travel deviation (mm)	<ul style="list-style-type: none"> Oil temp.: 45 – 55°C On a flat surface, make an approach run of at least 10 m, then travel another 20 m. Measure the travel deviation.  <p>205F2402</p> <ul style="list-style-type: none"> Measure dimension ℓ. 	Max. 200	Max. 200
	Travel speed (sec.)	Machine posture with track spinning  <p>205F2427</p> <ul style="list-style-type: none"> Engine speed: High idling Oil temp.: 45 – 55°C Raise one track off the ground, let it spin one revolution, then measure the time required for it to spin 2 revolutions. Repeat this procedure for the other track. 	14.0 ± 2	14.0 ± 2

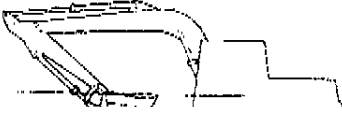
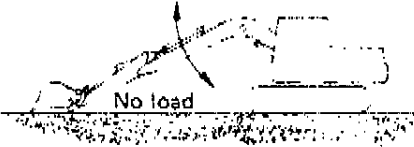

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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

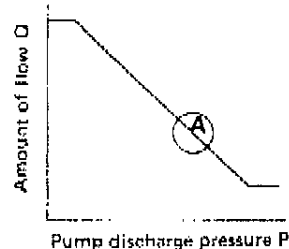
FLOW CONTROL FEATURE TVC VALVE

* The following table shows the reference values for use when troubleshooting.

Classification	Item	Conditions	S position		L position	
			PC100-3	PC120-3	PC100-3	PC120-3
performance		Posture of work equipment 				
Combination ops	swing 90 (sec.)	205F2407A <ul style="list-style-type: none"> • Engine speed: High idling • Oil temp.: 45 – 55°C • Operate at "Boom raise" and in "Swing" at the same time, and measure the time taken when swing for 90°. 				
Flow control feature	Minimum engine speed (rpm) at boom raise, and boom raise speed (sec.)	Posture of work equipment  205F2421 <ul style="list-style-type: none"> • Engine speed: High idling • Oil temp.: 45 – 55°C • Measure time taken from bucket tooth touching the ground to cylinder fully extended (RAISE). 	3.4±0.4 (2100±60)	3.4±0.4 (2200±60)	4.5±0.5 (2180±60)	4.5±0.5 (2280±60)
	Note Bucket dump speed when relieving oil in swing circuit (sec.)	Posture of work equipment  205F2426 <ul style="list-style-type: none"> • Engine speed: High idling • Oil temp.: 45 – 55°C 	3.1±0.4	3.1±0.4	4.7±0.5	4.7±0.5

Note:

With the control performance check of the TVC valve, it becomes the control position (approximately position A on the curve) when (swing relief pressure $225 \frac{+20}{0}$ + bucket operation pressure) ÷ 2 · average pressure.



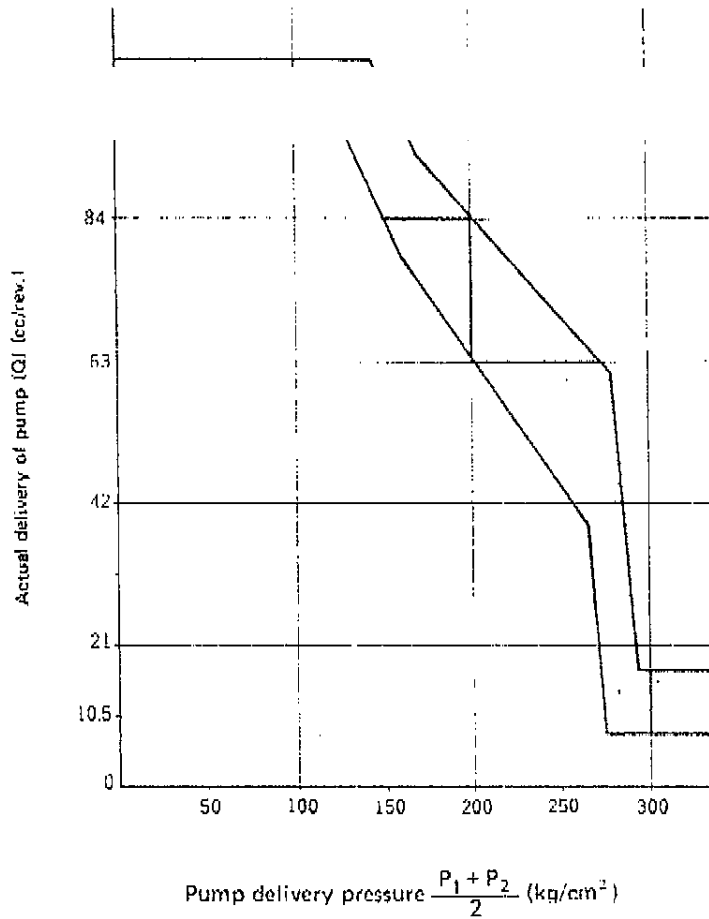
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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

MAIN PISTON PUMP PERFORMANCE

PC100 - 100 Main piston pump (S position)



202F2305A

Check point	Test pump delivery pressure (kg/cm ²)	Other pump delivery pressure (kg/cm ²)	Average pressure (kg/cm ²)	Standard value for delivery (new machine) Q (l/min)	Judgement standard for delivery (bottom level) Q (l/min)
(1)	P ₁	P ₂	$\frac{P_1 + P_2}{2}$	See graph	See graph
(2)	290	0 - 20	(Note)	$7.3 \begin{smallmatrix} +10 \\ -5 \end{smallmatrix}$	0
(3)	210	290	250	57 ± 19	47
(4)	110	290	200	75 ± 10	65
(5)	280 - 260	0 - 20	140	101 ± 10	91
(6)	0 - 20	0 - 20	0 - 20	$105 \begin{smallmatrix} +3 \\ -5 \end{smallmatrix}$	100

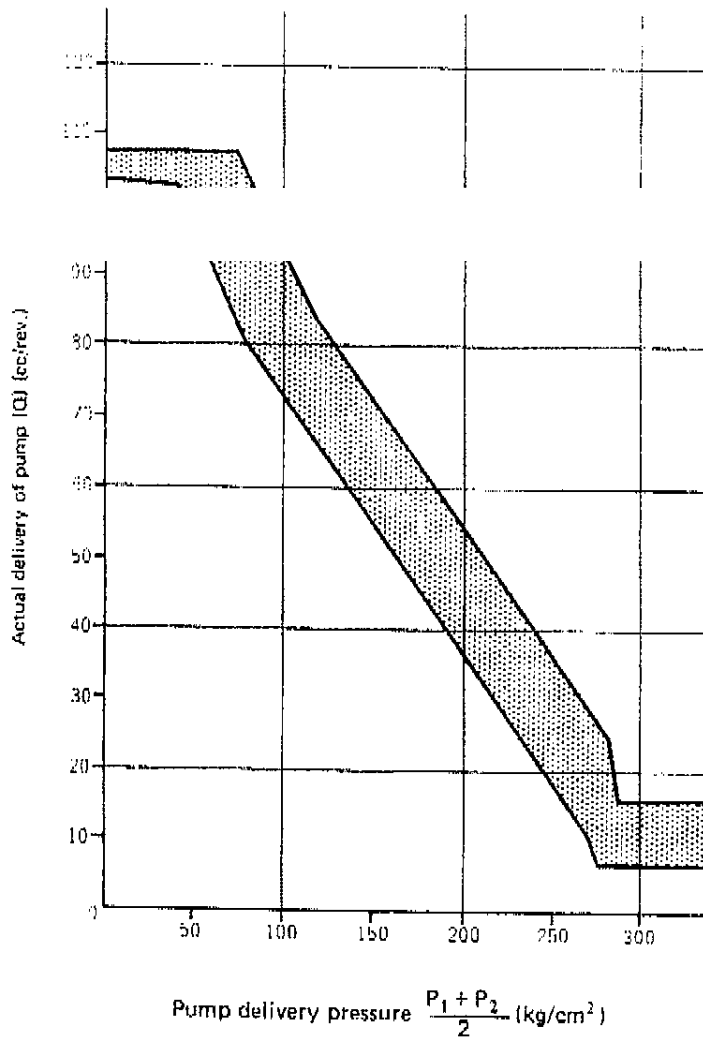
Note: The CO valve is working, so the average pressure is unnecessary.

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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

PC100-3 Main piston pump (L position)



F020203261

Check point	Test pump delivery pressure (kg/cm ²)	Other pump delivery pressure (kg/cm ²)	Average pressure (kg/cm ²)	Standard value for delivery (new machine) Q (l/min)	Judgement standard for delivery (bottom level) Q (l/min)
(1)	P ₁	P ₂	$\frac{P_1 + P_2}{2}$	See graph	See graph
(2)	290	0 - 20	(Note)	7.3 $\begin{smallmatrix} +10 \\ -5 \end{smallmatrix}$	0
(3)	60	280	170	57 ± 10	47
(4)	220 - 200	0 - 20	110	80 ± 10	70
(5)	0 - 20	0 - 20	0 - 20	105 $\begin{smallmatrix} +3 \\ -5 \end{smallmatrix}$	100

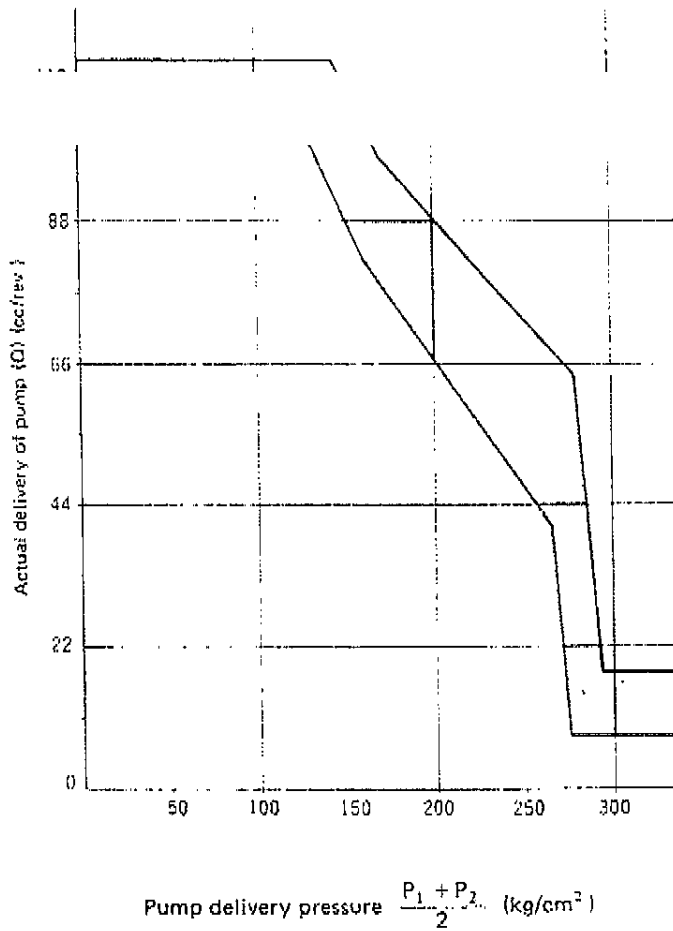
Note: The CO valve is working, so the average pressure is unnecessary.

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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

PC120-3 Main piston pump (S position)



202F23058

Check point	Test pump delivery pressure (kg/cm ²)	Other pump delivery pressure (kg/cm ²)	Average pressure (kg/cm ²)	Standard value for delivery (new machine) Q (l/min)	Judgement standard for delivery (bottom level) Q (l/min)
(1)	P ₁	P ₂	$\frac{P_1 + P_2}{2}$	See graph	See graph
(2)	290	0 - 20	(Note)	7.8 ⁺¹⁰ ₋₅	0
(3)	210	290	250	60 ± 10	50
(4)	110	290	200	78 ± 10	68
(5)	280 - 260	0 - 20	140	6 ± 10	96
(6)	0 - 20	0 - 20	0 - 20	110 ⁺³ ₋₅	105

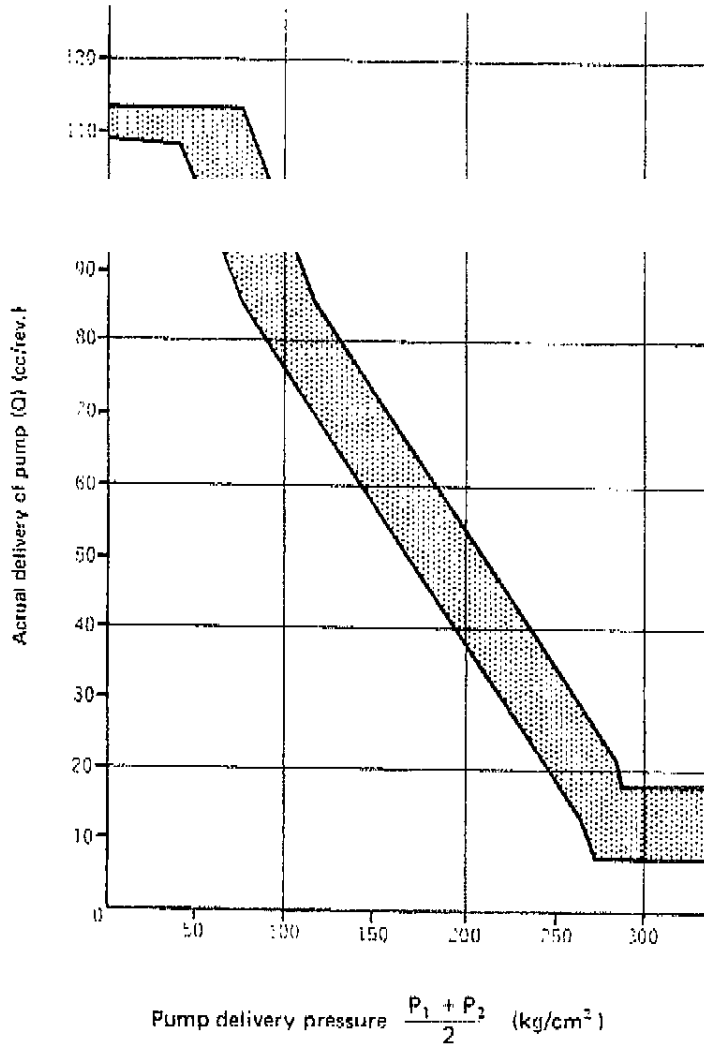
Note: The CO valve is working, so the average pressure is unnecessary.

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TESTING AND ADJUSTING

TABLE OF JUDGEMENT STANDARD VALUE

PC120-3 Main piston pump (L position)



F020203262

Check point	Test pump delivery pressure (kg/cm ²)	Other pump delivery pressure (kg/cm ²)	Average pressure (kg/cm ²)	Standard value for delivery (new machine) Q (ℓ/min)	Judgement standard for delivery (bottom level) Q (ℓ/min)
(1)	P ₁	P ₂	$\frac{P_1 + P_2}{2}$	See graph	See graph
(2)	290	0 - 20	(Note)	$7.8 \begin{matrix} +10 \\ -5 \end{matrix}$	0
(3)	60	280	170	60 ± 10	50
(4)	220 - 200	0 - 20	110	84 ± 10	74
(5)	0 - 20	0 - 20	0 - 20	$110 \begin{matrix} +3 \\ -5 \end{matrix}$	105

Note: The CO valve is working, so the average pressure is unnecessary.

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TESTING AND ADJUSTING

TROUBLESHOOTING TOOLS

TROUBLESHOOTING TOOLS

No.	Troubleshooting tools	Troubleshooting chart No. H													
		-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14
Diagnostic tools															
1	Hydraulic tester		○	○	○	○	○	○		○		○	○		
2	Stop watch	○						○				○	○		○

4	Measuring cylinder	○					○					○	○		
5	Push pull scale				○										
6	Scale	○					○					○			
7	Multi-purpose tachometer						○								
Replacement parts															
8	Servo valve	○		○	○		○	○							
9	Jet sensor relief valve				○		○	○							
10	Swing safety valve														
11	Relief valve in control valve			○	○		○			○					
12	Main relief valve	○			○		○								
13	Suction valve														
KES parts															
14	Gap plug (07020-00010) 0 pieces	○													
15	Sleeve nut (07221-20210,20315,20422)	○		○	○	○	○	○		○		○	○		
16	Plug (07222-00210, 00312, 00414)	○		○	○	○	○	○		○		○	○		
17	Hose (07097-00612)	○													
18	Flange (07379-00500, 00600)	○													
19	Sleeve head (07378-10500)	○													
20	O-ring (07000-03022)	○													
21	Flange (07371-00500) 2 pieces	○													
22	Bolt (01010-50830) 4 pieces	○													
23	Washer (01643-30823) 4 pieces	○													

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TESTING AND ADJUSTING

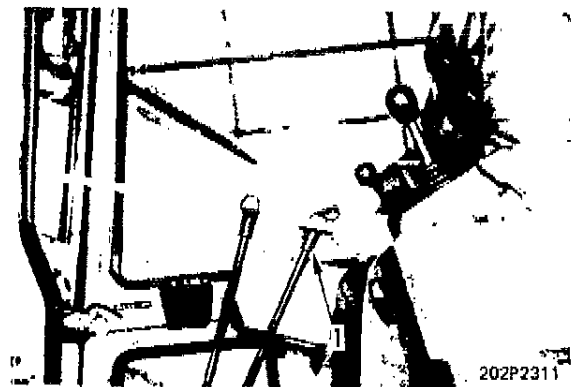
TESTING AND ADJUSTING

TESTING AND ADJUSTING

1. TESTING TRAVEL OF CONTROL LEVERS

Measuring Travel

Hook push-pull scale on the bottom of knob (1) of the control lever, and measure the travel need to move the lever to each position.



★ If the result of the measurement shows that the travel is not within the standard value, check as follows.

- 1) In linkage type (travel control lever), lever travel is the same as valve spool travel. If there is no abnormality in the rod, check the travel of control valve spool.
- 2) In PPC valve type, if the linkage between control lever and PPC valve is normal, disassemble the PPC valve and check.

Adjusting Travel Levers at Neutral Position

- If the control levers are not aligned when they are in neutral or if they hit a wall of the operator's cab when they are operated, loosen nut (3) at each end of rod (2) and adjust the lever by turning rod (2)...



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TESTING AND ADJUSTING

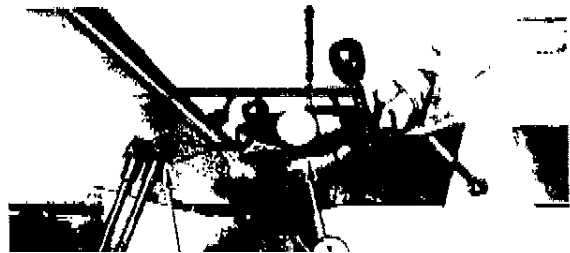
TESTING AND ADJUSTING

2. TESTING OPERATING FORCE OF CONTROL LEVERS

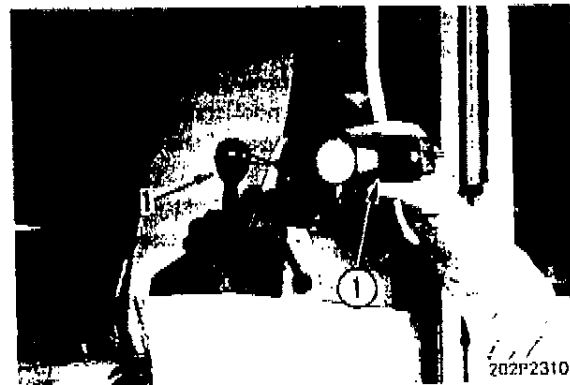
* When measuring, engine is full speed and hydraulic oil temperature is 45 – 55°C.

Measuring Operating Force

Hook push-pull scale ① on the bottom of knob (1) of the control lever, and measure the force needed to move the



202P2309



202P2310

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3. TESTING TRAVEL OF CONTROL VALVE SPOOLS

Measuring Travel

Set the scale to the spool (1), measure and measure the travel when operating the control lever.

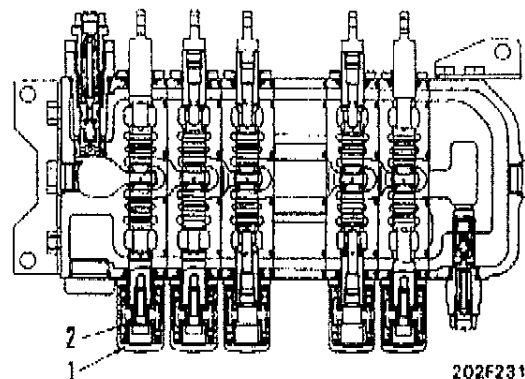
- * When measuring by one person, pull the control lever by a cord or disconnect the linkage (rod) from spool and pull the spool directly.



- * If the result of the measurement shows that the travel is not within the standard value, check as follows.

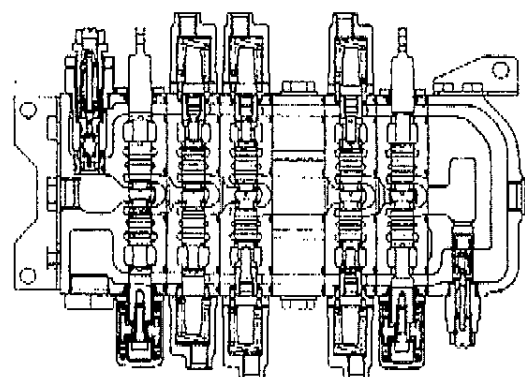
- 1) Remove cover (1). Check the bolts (2) loosened. If there is no abnormality, disassemble control valve and check.
- 2) In PPC valve type, first check the PPC valve.

Long lever control



202F2312

Wrist control



202F2313

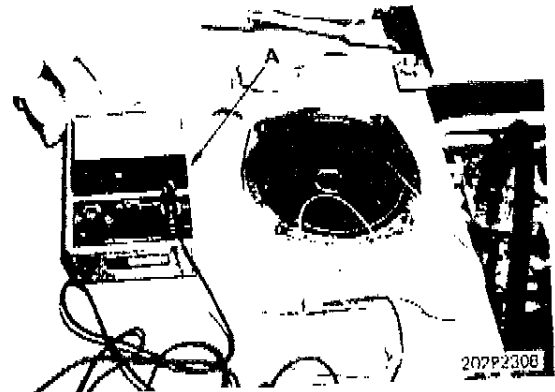
TESTING AND ADJUSTINGTESTING AND ADJUSTING**4. MEASURING HYDRAULIC OIL TEMPERATURE****Special tool**

	Part No.	Part Name	Q'ty
A	790-600-1300	Thermistor temperature gauge	1

- and stop the engine. Operate the control lever several times to release the remaining hydraulic pressure in the hydraulic piping. Then loosen the oil filler cap slowly to release the remaining oil pressure in the hydraulic tank.
- Remove cover, then measure the oil temperature using thermistor A.
 - When hydraulic oil temperature is lower than 45°C, raise the oil temperature as follows.
 - Start the engine and warm up running. Operate the arm or bucket control lever fully to relieve oil from main relief valve so that oil temperature is raised.
 - * Continued operation in above is within 30 seconds.

Note:

When relieving oil in boom, arm, bucket or travel circuit, CO valve acts and main pump delivery is minimum. In result, as oil flows only for hydraulic tank - main pump - main relief valve - hydraulic tank, operate boom, arm and bucket cylinders to raise the temperature of components sometimes.



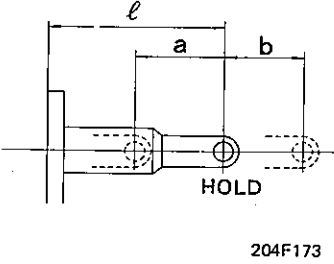
TESTING AND ADJUSTING

Standard for testing and adjusting	62 - 4
Testing and adjusting of main relief valve	62-10
Testing of safety valve	62-12
Testing of suction valve	62-13
Testing and adjusting of relief pressure of pilot check valve	62-14
Testing stroke of control valve spool	62-15
Testing travel of control levers	62-15
Testing operating force of control levers	62-16
Testing performance of swing motor	62-17
Testing performance of travel motor	62-19
Testing performance of work equipment	62-21
Testing performance of hydraulic pump	62-25
Testing and adjusting of deceleration speed	62-27
Flushing hydraulic circuit	62-28

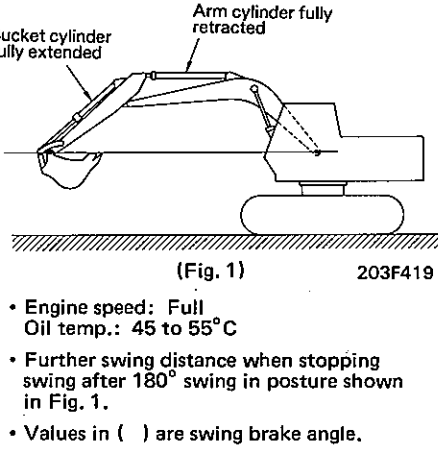
- ★ Always bleed the air as follows when you first operate hydraulic cylinders after reassembling cylinders, pumps and piping.
 1. Start engine and run at low idling.
 2. Operate hydraulic cylinder 4 to 5 times, stopping 100 mm from stroke end.
 3. Next, operate cylinder 3 to 4 times to stroke end.
 4. After doing this, run engine at normal speed.
- ★ After repair or long storage, follow the same procedure.

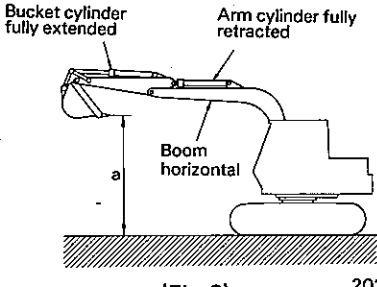
STANDARD FOR TESTING AND ADJUSTING

★ Values shown are at time of shipment from factory. Repair limit shows value for machines after about 1,000 hrs. of operation.

Item		Conditions	Standard value			Repair limit
Hydraulic system	L.H. 4-spool control valve	<ul style="list-style-type: none"> • Engine speed: Full Relieve one pump, other pumps at no load. • Oil temp.: 45 to 55°C 	$175 \begin{smallmatrix} +8 \\ -3 \end{smallmatrix} \text{ kg/cm}^2$			$175 \begin{smallmatrix} +8 \\ -10 \end{smallmatrix} \text{ kg/cm}^2$
	R.H. 3-spool control valve					
	Pilot check valve					
Spool stroke		 <p style="text-align: center;">204F173</p>	ℓ	a	b	Same as standard value
	Swing control valve		48 mm	8 mm	8 mm	
	Arm control valve		48 mm	7 mm	7 mm	
	Boom Hi control valve		48 mm	8 mm	8 mm	
	L.H. travel control valve		48 mm	8 mm	8 mm	
	R.H. travel control valve		48 mm	8 mm	8 mm	
	Bucket control valve		48 mm	8 mm	8 mm	
	Boom control valve		48 mm	8 mm	8 mm	
	Travel acceleration selector valve		33 mm	6.5 mm	6.5 mm	
Travel of control lever	Boom control lever	• The center of control lever knob (N → RAISE or LOWER)	165 ± 17 mm			Same as standard value
	Arm control lever	(N → IN or OUT)	105 ± 15 mm			
	Bucket control lever	(N → CURL or DUMP)	105 ± 15 mm			
	Swing control lever	(N → SWING LEFT or SWING RIGHT)	135 ± 15 mm			
	Travel control lever	(N → F or R)	107 ± 11 mm			
	Travel acceleration pedal	• The center of pedal (N → Travel acceleration)	39 ± 8 mm			
Operating force of control levers	Boom control lever	<ul style="list-style-type: none"> • Hook spring balance on center of control lever knob to measure. (In case of travel acceleration pedal, push push-pull scale at the center of pedal to measure.) • Measure maximum operating force during the travel. • Engine stopped. 	2.6 ± 0.7 kg			2.6 $\begin{smallmatrix} +0.7 \\ -0.9 \end{smallmatrix}$ kg
	Arm control lever		1.7 ± 0.5 kg			1.7 $\begin{smallmatrix} +0.5 \\ -0.7 \end{smallmatrix}$ kg
	Bucket control lever		1.8 ± 0.5 kg			1.8 $\begin{smallmatrix} +0.5 \\ -0.7 \end{smallmatrix}$ kg
	Swing control lever		1.7 ± 0.5 kg			1.7 $\begin{smallmatrix} +0.5 \\ -0.7 \end{smallmatrix}$ kg
	Travel control lever		1.8 ± 0.5 kg			1.8 $\begin{smallmatrix} +0.5 \\ -0.7 \end{smallmatrix}$ kg
	Travel acceleration pedal		6 ± 2 kg			6 $\begin{smallmatrix} +2.0 \\ -2.5 \end{smallmatrix}$ kg

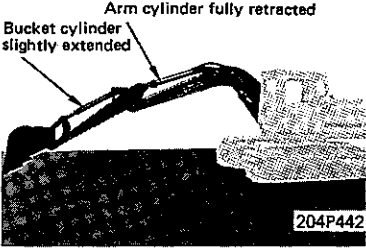
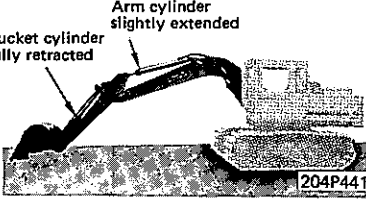
★ Values shown are at time of shipment from factory. Repair limit shows value for machines after about 1,000 hrs. of operation.

Item	Conditions	Standard value	Repair limit
Further swing distance when stopping swing (Swing brake angle)		PC100 } max. 535 mm PC100L } (50 ± 10°) PC120: max. 625 mm (60 ± 10°)	PC100 } max. 625 mm PC100L } (max. 70°) PC120: max. 715 mm (max. 80°)
Swing Time taken to start swing	<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C • 180° swing from starting point in posture shown in Fig. 1. • Bucket with rated load values in () indicates. 	4.0 ± 0.4 secs. (4.7 ± 0.5 secs.)	max. 5.2 secs. (max. 5.9 secs.)
Time taken to swing	<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C • Swing one turn, then measure time taken for next 5 turns in posture shown in Fig. 1. 	PC100 } 31.3 ± 1.8 PC100L } secs. PC120: 25.2 ± 1.5 secs.	PC100 } max. 36.5 PC100L } secs. PC120: max. 29.5 secs.
Hydraulic drift of swing	<ul style="list-style-type: none"> • Oil temp.: 45 to 55°C • Time taken to move from 45° up slope to 45° down slope on slope of 15°. • Work equipment in posture shown in Fig. 1, bucket with rated load. 	min. 15 minutes.	min. 10 minutes.

Item		Conditions	Standard value	Repair limit
Travel	Travel speed (1)	<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C • Raise track on one side and measure time taken for track to rotate 5 turns. Repeat with track on other side. 	PC100 Low: 43 ± 2.5 secs. High: 43 ± 2.5 secs. PC100L Low: 73 ± 3.0 secs. High: 73 ± 3.0 secs. PC120 Low: 43 ± 2.5 secs. High: 43 ± 2.5 secs.	PC100 Low: Max. 48 secs. High: Max. 48 secs. PC100L Low: Max. 80 secs. High: Max. 80 secs. PC120 Low: Max. 48 secs. High: Max. 48 secs.
	Travel deviation (1)	<ul style="list-style-type: none"> • Difference in times taken by right and left tracks. 	Low: Max. 2.0 secs. High: Max. 2.4 secs.	Low: Max. 2.2 secs. High: Max. 2.6 secs.
	Travel speed (2)	<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C, level ground • Travel 10 m, then measure time taken to travel next 20 m. 	PC100 Low: 26 ± 1.5 secs. High: 22 ± 1.5 secs. PC100L Low: 38 ± 2.0 secs. High: 32 ± 1.5 secs. PC120 Low: 24 ± 1.5 secs. High: 20 ± 1.5 secs.	PC100 Low: Max. 29 secs. High: Max. 25 secs. PC100L Low: Max. 42 secs. High: Max. 35 secs. PC120 Low: Max. 27 secs. High: Max. 23 secs.
	Travel deviation (2)	<ul style="list-style-type: none"> • Amount of deviation • Test on firm, level ground 	Low: Max. 200 mm High: Max. 200 mm	Low: Max. 220 mm High: Max. 220 mm
	Hydraulic drift of travel	<ul style="list-style-type: none"> • Oil temp.: 45 to 55°C • Stop machine on 12° slope with sprocket uphill. • Distance moved by machine in 5 mins. 	0 mm	0 mm
Work equipment	Hydraulic drift	Total work equipment  <ul style="list-style-type: none"> • Engine stopped Oil temp.: 45 to 55°C • Bucket empty, work equipment in posture shown in Fig. 2. Measure amount bucket teeth move down in fifteen minutes. (Measure distance "a") • Values in () indicate in bucket with rated load. 	Max. 350 mm (Max. 700 mm)	Max. 700 mm (Max. 1400 mm)

Item		Conditions	Standard value	Repair limit	
Work equipment	Hydraulic drift	Bucket	<ul style="list-style-type: none"> In posture shown in Fig. 2. Measure amount bucket cylinder retracts in fifteen minutes. Values in () indicate in bucket with rated load. 	Max. 10 mm (Max. 15 mm)	Max. 20 mm (Max. 30 mm)
		Arm	<ul style="list-style-type: none"> In posture shown in Fig. 2. Measure amount arm cylinder extends in fifteen minutes. Values in () indicate in bucket with rated load. 	Max. 40 mm (Max. 80 mm)	Max. 80 mm (Max. 160 mm)
		Boom	<ul style="list-style-type: none"> In posture shown in Fig. 2. Measure amount boom cylinder retracts in fifteen minutes. Values in () indicate in bucket with rated load. 	Max. 20 mm (Max. 80 mm)	Max. 40 mm (Max. 160 mm)
	Work equipment speed	Bucket	<ul style="list-style-type: none"> Engine speed: Full Oil temp.: 45 to 55°C Boom horizontal, arm cylinder fully retracted, bucket empty. Time taken for cylinder to move between retracted position and fully extended position. 	Dump PC100 } : 4.6 ± 0.5 secs. PC100L } PC120 : 4.5 ± 0.5 secs. Curl PC100 } : 3.3 ± 0.4 secs. PC100L } PC120 : 3.2 ± 0.4 secs.	Dump PC100 } : Max. 5.6 PC100L } : secs. PC120 : Max. 5.5 secs. Curl PC100 } : Max. 4.1 PC100L } : secs. PC120 : Max. 4.0 secs.
		Arm	<ul style="list-style-type: none"> Engine speed: Full Oil temp.: 45 to 55°C Boom horizontal, bucket empty. Bucket cylinder fully retracted. Time taken for cylinder to move between fully retracted position and fully extended position. 	Out PC100 } : 5.4 ± 0.5 secs. PC100L } PC120 : 5.0 ± 0.5 secs. In PC100 } : 3.7 ± 0.4 secs. PC100L } PC120 : 3.5 ± 0.4 secs.	Out PC100 } : Max. 6.4 PC100L } : secs. PC120 : Max. 6.0 secs. In PC100 } : Max. 4.5 PC100L } : secs. PC120 : Max. 4.3 secs.
		Boom	<ul style="list-style-type: none"> Engine speed: Full Oil temp.: 45 to 55°C Bucket empty, arm and bucket cylinder fully retracted. Time taken for cylinder to move from fully extended position to position where bucket teeth contact ground. 	Raise PC100 } : 3.4 ± 0.4 secs. PC100L } PC120 : 3.2 ± 0.4 secs. Lower PC100 } : 1.9 ± 0.4 secs. PC100L } PC120 : 2.2 ± 0.4 secs.	Raise PC100 } : Max. 4.2 PC100L } : secs. PC120 : Max. 4.0 secs. Lower PC100 } : Max. 2.3 PC100L } : secs. PC120 : Max. 2.8 secs.

★ Values shown are at time of shipment from factory. Repair limit shows value for machines after about 1,000 hrs. of operation.

	Item	Conditions	Standard value	Repair limit
Work equipment Leakage from cylinder	Bucket cylinder	<ul style="list-style-type: none"> Oil temp.: 45 to 55°C  <ul style="list-style-type: none"> Extended bucket cylinder slightly and lower bucket teeth to ground. Stop engine and operate bucket cylinder 2 to 3 times to release remaining hydraulic pressure. Remove piping at rod end and set boom cylinder to LOWER position to apply weight of work equipment to bucket cylinder (with engine stopped). 	Max. 15 cc	Max. 30 cc [Remove rod piping, wait for 5 mins, then measure leakage during next 15 mins.]
	Arm cylinder	<ul style="list-style-type: none"> Oil temp.: 45 to 55°C  <ul style="list-style-type: none"> Extend arm cylinder slightly and lower bucket teeth to ground. Stop engine and operate arm cylinder 2 to 3 times to release remaining hydraulic pressure. Remove piping at rod end and set boom cylinder to LOWER position to apply weight of work equipment to arm cylinder (with engine stopped). 	Max. 15 cc	Max. 30 cc [Remove rod piping, wait for 5 mins, then measure leakage during next 15 mins.]
	Boom cylinder	<ul style="list-style-type: none"> Oil temp.: 45 to 55°C Fully retract arm and bucket cylinders and set boom in horizontal position. Remove piping at rod end, leave for 5 mins., then measure leakage during next 15 mins. 	Max. 20 cc	Max. 40 cc

★ Values shown are at time of shipment from factory. Repair limit shows value for machines after about 1,000 hrs. of operation.

Item		Conditions	Standard value	Repair limit
Work equipment	Time lag	<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C • Boom horizontal. • Arm cylinder fully retracted. • Values in () indicate at low idling. 	0 sec. (Max. 1.0 sec.)	0 sec. (Max. 1.5 secs.)
		<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C • Boom horizontal, bucket cylinder fully retracted. • Values in () indicate at low idling. 	0 sec. (PC100 } : Max. 4.0 PC100L } : secs. (PC120 : Max. 4.5 secs.)	0 sec. (PC100 } : Max. 4.8 PC100L } : secs. (PC120 : Max. 5.3 secs.)
		<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C • Work equipment at maximum reach • Lower boom from fully raised position and measure time taken to raise machine from ground after bucket touches ground. • Values in () indicate at low idling. 	0 sec. (Max. 3.0 secs.)	0 sec. (Max. 3.5 secs.)
Drop in hydraulic power		<ul style="list-style-type: none"> • Oil temp.: 45 to 55°C • Difference between relief pressure with engine at full throttle and relief pressure with engine at 1170 rpm (PC100,PC100L), 1320rpm (PC120). (relief with one circuit relieved) 	Max. 20 kg/cm ²	Same as standard value
Engine performance check		<ul style="list-style-type: none"> • Engine speed: Full Oil temp.: 45 to 55°C 	When one pump is relieved: PC100,PC100L 2,210 ± 100 rpm PC120 2,490 ± 100 rpm	Same as standard value
			When two pumps are relieved: PC100,PC100L 1,940 ± 200 rpm PC120 1,790 ± 200 rpm	Same as standard value
Hydraulic oil temperature			Within (60°C + ambient temp.)	Same as standard value

TESTING AND ADJUSTING OF MAIN RELIEF VALVE

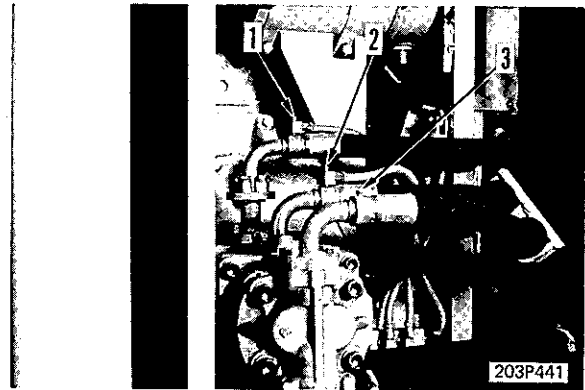
1. Measuring main relief oil pressure

Preparatory work

- Warm up the oil to 45 to 55°C

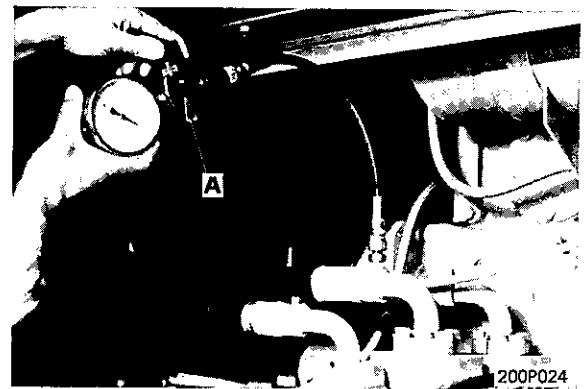


Lower the work equipment completely to the ground and stop the engine. Operate the control lever several times to release the remaining hydraulic pressure in the hydraulic piping. Then loosen the oil filler cap slowly to release the remaining oil pressure in the hydraulic tank.



POINTS TO MEASURE HYDRAULIC PRESSURE

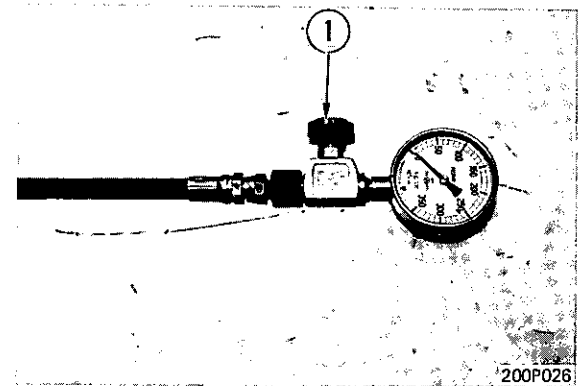
1. Oil pressure pick-up (1) for L.H. 4-spool control valve circuit
2. Oil pressure pick-up (2) for R.H. 3-spool control valve circuit
3. Oil pressure pick-up (3) for pilot selector valve circuit



Measuring relief oil pressure

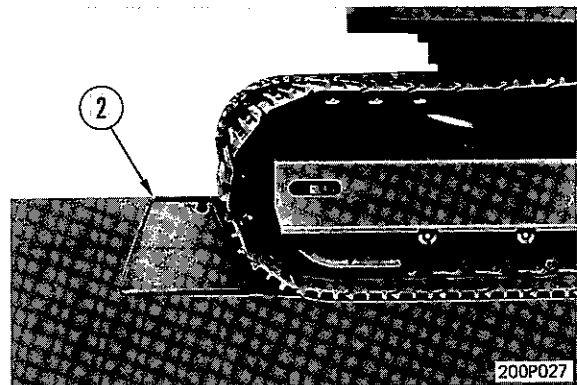
- 1) Remove pressure pick-up plug (1) (PT 1/8) of the circuit to be measured, and install oil pressure gauge A (350 kg/cm²).
- 2) Tighten the oil filler cap and start the engine. Operate the circuit to be measured and measure the main relief oil pressure with the engine at full throttle.

Note: If the oil pressure is measured with valve ① of oil pressure gauge A open, the bourdon tube of the oil pressure gauge may be damaged. When using the oil pressure gauge, tighten valve ① fully, then loosen slightly.



3) Condition of actuator to be measured

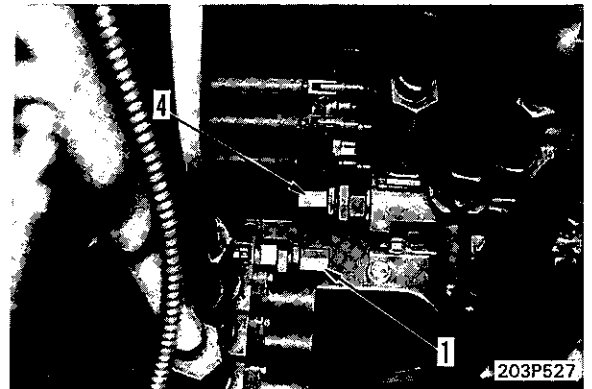
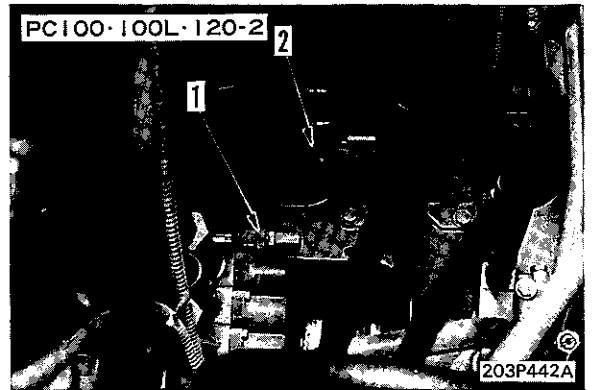
- i) For cylinders: Set the respective cylinders at the end of their stroke.
- ii) For swing: Lock with the swing lock pin.
- iii) For travel: Set block ② in contact with the grouser to stop the track from moving, and measure each side.



2. Adjusting relief pressure of relief valve

Points to measure hydraulic pressure

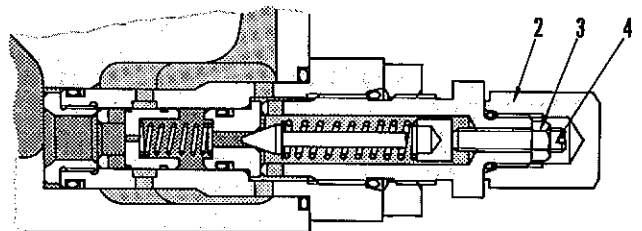
- 1. L.H. 4-spool control valve
- 2. R.H. 3-spool control valve
- 4. R.H. 4-spool control valve



Adjusting procedure

- 1) Remove cap (2) (pilot poppet type only).
- 2) Loosen lock nut (3) and turn adjustment screw (4) to adjust.
 - ★ Turn the adjustment screw as follows.
 - To INCREASE the pressure, turn CLOCKWISE.
 - To DECREASE the pressure, turn COUNTERCLOCKWISE.
 - ★ After adjusting, measure the relief pressure again using the procedure in item 1.

Main relief valve (pilot poppet type)

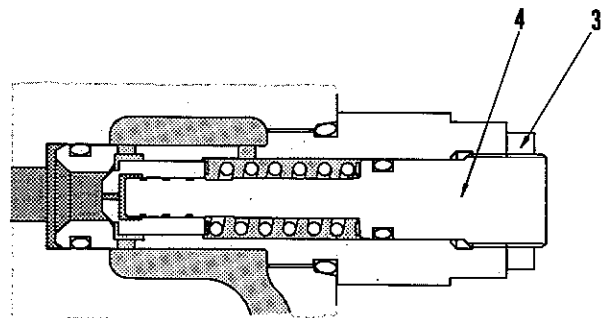


200F155

When measuring for troubleshooting, and the relief pressure is low or the relief does not work.

- 1) Check another actuator using the same control valve.
 - ★ Example: The boom, arm and left travel all use the same relief valve circuit.
- 2) If all the actuators for the same control valve lack power or are defective, and the actuators for the other control valve operate normally, interchange the main relief valves and check again.
- 3) If the opposite set of actuators do not work properly, the main relief valve is defective. Put the proper valve back in its original position and adjust or replace the defective relief valve.

Main relief valve (differential type)



200F157

TESTING OF SAFETY VALVE

Features of safety valve

- 1) Under normal conditions, the set pressure of the safety valve is higher than the set pressure of the main relief valve. Therefore, if the pressure of the safety valve drops below that of the main relief valve, it is difficult to tell if there is any abnormality.
- 2) The safety valve pressure is set to the normal cracking pressure or to the pressure when the specified amount of oil flows. Therefore it cannot be adjusted on the machine.

Symptoms of failure

- 1) If the pressure setting drops, a loss of power (loss of speed) is seen.
- 2) If the sealing is defective, the above symptoms are seen, and in addition, there is an increase in the hydraulic drift of the work equipment.

Note: If there is an increase in the hydraulic drift of the work equipment, check the hydraulic drift. For details, see TESTING HYDRAULIC DRIFT.

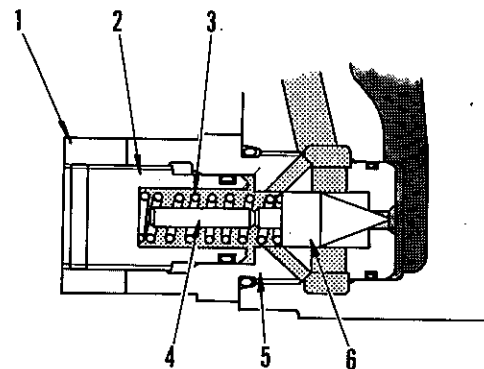
Testing

- Check of the pressure setting of the main relief valve has dropped.
 - ★ For details, see TESTING MAIN RELIEF VALVE.

Reference

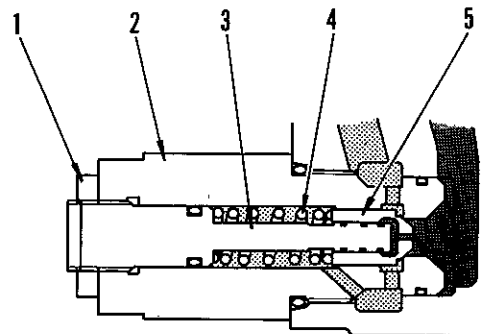
If the machine model is the same, the valve mounts are the same shape. Therefore it is possible to interchange valves for testing, even if the valves are of different types.

Safety valve (Poppet type)



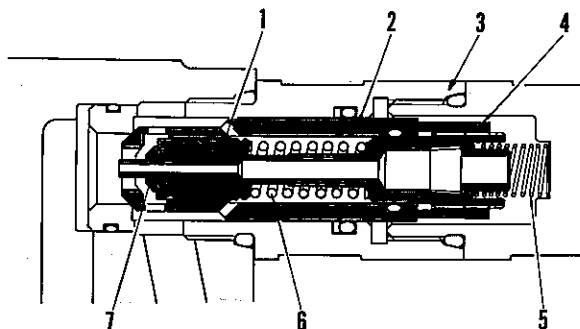
204F084

Safety valve (Differential type)



204F086

Safety valve (With suction valve)



204F088

TESTING OF SUCTION VALVE

Symptoms of failure

- 1) If the valve does not open properly, there is an increase in the time lag for the work equipment.
- 2) If the sealing is defective, there is a loss of power (loss of speed) and an increase in the hydraulic drift of the work equipment.

1. Testing defective opening of valve

- Measure the time lag of the work equipment. For details, see MEASURING TIME LAG OF WORK EQUIPMENT.

(Reference)

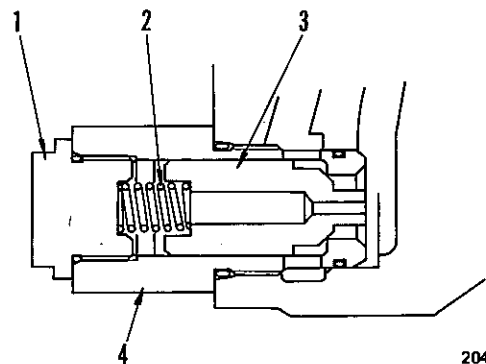
- If the opening of the suction valve is defective, particularly at low engine speeds (low pump delivery), the flow of oil cannot keep up with the lowering speed of the work equipment, so the time lag increases.

2. Testing defective sealing

- Measure the speed and hydraulic drift of the work equipment. For details, see MEASURING SPEED AND HYDRAULIC DRIFT OF WORK EQUIPMENT.

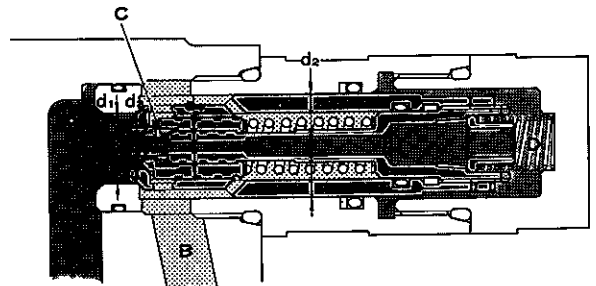
Note: Depending on the results of the above test, measure also the leakage of oil from the cylinder to judge the location of the problem.

A. Suction valve (single type)



204F092

B. Suction valve (with safety valve)



204F089

TESTING AND ADJUSTING OF RELIEF PRESSURE OF PILOT CHECK VALVE

1. Testing relief pressure (relief valve)

- ★ Before testing the pilot check valve, check the relief pressure of No. 2 pump (arm, swing and left travel) and adjust if not within the standard value.
(For details, see TESTING AND ADJUSTING MAIN RELIEF VALVE)

Note: The relief pressure (not operating pressure) of the pilot check valve can only be measured when the swing motor is being relieved.

- ★ With the arm cylinder, if the piston is moved to the end of its stroke, oil will stop flowing to the circuit. Because of this, the spool of the pilot selector valve, which is actuated by the difference in pressure in the arm circuit, will not operate, so the relief pressure cannot be measured.

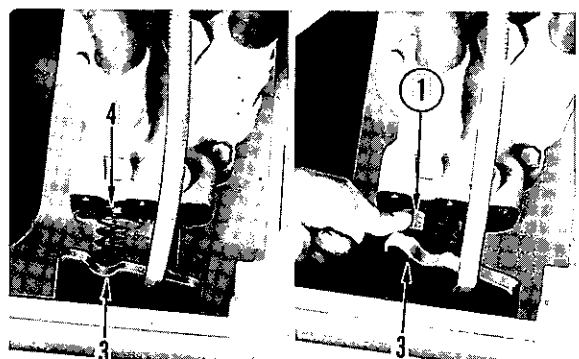
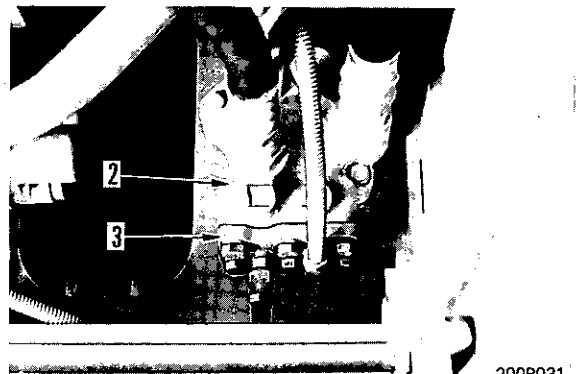
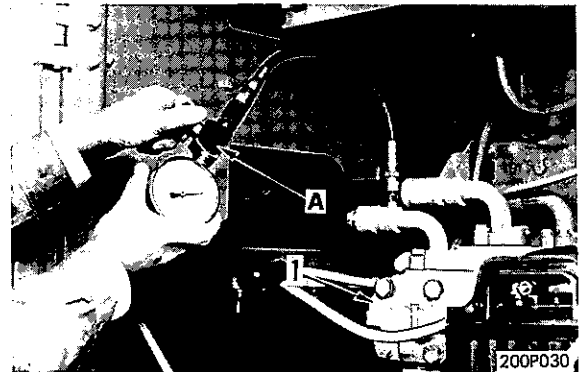
- 1) Remove the pressure measuring plug of No.3 pump (1) and install oil pressure gauge A (350 kg/cm²).

- 2) Remove plate (3) of pilot selector valve (2). Then remove spring (4), fit spacer ① (O.D. 20 mm, thickness; approx. 15 mm) and install plate (3).

- ★ This operation is necessary to actuate the pilot spool of the arm circuit in order to open the swing circuit.

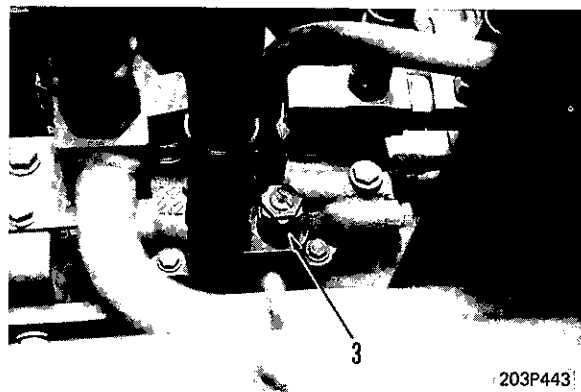
- 3) Start the engine, lock the swing with the lock pin, then relieve the swing circuit and measure the relief pressure.

- ★ Oil temperature when measuring pressure:
45 to 55°C



2. Adjusting relief valve

- ★ For details, see ADJUSTING OF MAIN RELIEF VALVE.



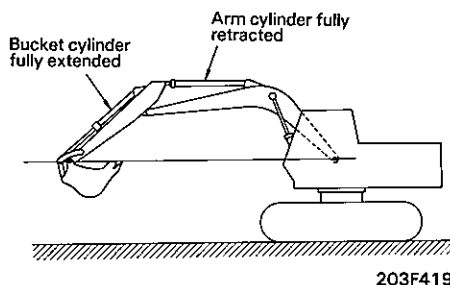
TESTING PERFORMANCE OF SWING MOTOR

Preparatory work

- 1) Warm up the oil to 45 to 55°C.
- 2) Stop the machine in a hard, level place.

1. Time taken to start swinging

- 1) Set the work equipment in the posture shown in the figure.
- 2) Run the engine at full throttle and measure the time it takes to swing the upper revolving works 180° to right or left from a standing position.
 - ★ Do not stop the upper revolving works at the 90° position. Measure the time at the point where the upper revolving works pass the 90° position.
 - ★ Move the control lever quickly and place a marker in front of the work equipment.

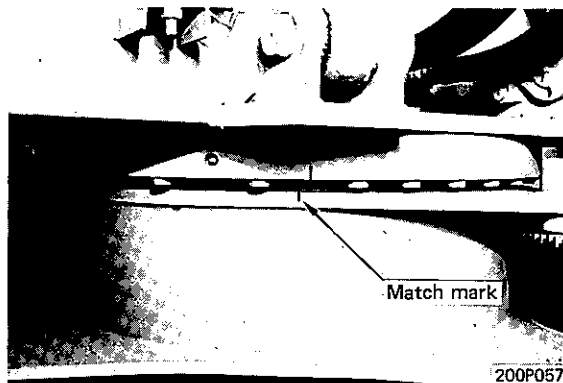


2. Time taken to swing

- 1) Set the work equipment unloaded in the posture shown in the figure.
- 2) Run the engine at full throttle, swing the upper revolving works one turn, then measure the time taken to swing a further five turns.

3. Swing brake angle

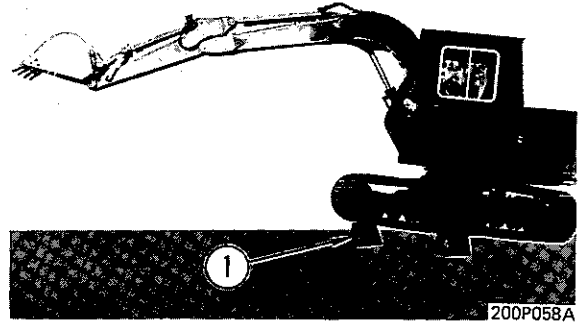
- 1) Set the work equipment unloaded in the posture shown in the figure.
- 2) Make match marks on the frame and outer race of the swing circle.
- 3) Run the engine at full throttle, swing the upper revolving works one turn, then stop the swing and measure the distance between the match marks.
 - ★ Before swing, it may as well set a marker at the tip of the arm in line with the match mark on the outer race.



4. Measuring hydraulic drift of swing

- 1) Stop the machine on 15° slope, or put blocks ① under the tracks.
- 2) Set the work equipment loaded in the posture shown in the figure, bucket with rated load.
- 3) Make match marks on the frame and outer race of the swing circle. Measure time taken to move from 45° up slope to 45° down slope.

Position when measuring hydraulic drift of swing



DISASSEMBLY AND ASSEMBLY

HYDRAULIC PUMP ASSEMBLY		SWING BRAKE VALVE AND SHUTTLE VALVE ASSEMBLY	
Dismounting	63 - 4	Dismounting	63-25
Mounting	63 - 5	Mounting	63-25
L.H. 4-SPOOL CONTROL VALVE ASSEMBLY		Disassembly	63-26
Dismounting	63 - 6	Assembly	63-27
Mounting	63 - 7	SWING MOTOR ASSEMBLY	
R.H. 3-SPOOL CONTROL VALVE ASSEMBLY		Dismounting	63-28
Dismounting	63 - 8	Mounting	63-28
Mounting	63 - 9	Disassembly	63-28-1
CONTROL VALVE ASSEMBLY		Assembly	63-28-6
Disassembly	63-10	TRAVEL MOTOR ASSEMBLY	
Assembly	63-11	Dismounting	63-29
TRAVEL ACCELERATION SELECTOR VALVE ASSEMBLY		Mounting	63-30
Dismounting	63-12	Disassembly	63-30-1
Mounting	63-12	Assembly	63-30-10
Disassembly	63-13	BOOM CYLINDER ASSEMBLY	
Assembly	63-13	Dismounting	63-31
PILOT CHECK VALVE ASSEMBLY		Mounting	63-31
Dismounting	63-14	ARM CYLINDER ASSEMBLY	
Mounting	63-15	Dismounting	63-32
Disassembly	63-16	Mounting	63-32
Assembly	63-16	BUCKET CYLINDER ASSEMBLY	
DECELERATION VALVE ASSEMBLY		Dismounting	63-33
Dismounting	63-17	Mounting	63-33
Mounting	63-17	HYDRAULIC CYLINDER ASSEMBLY	
Disassembly	63-18	Disassembly	63-34
Assembly	63-18	Assembly	63-36
DECELERATION CYLINDER ASSEMBLY		ARM CYLINDER ASSEMBLY (PC120)	
Dismounting	63-19	Disassembly	63-38
Mounting	63-19	Assembly	63-40
CENTER SWIVEL JOINT			
Dismounting	63-20		
Mounting	63-22		
Disassembly	63-24		
Assembly	63-24		

★ When operating the hydraulic cylinders for the first time after reassembling cylinders, pumps and piping, always bleed the air as follows:

1. Start engine and run at low idling.
2. Operate hydraulic cylinder 4 to 5 times, stopping 100 mm from stroke end.
3. Next, operate cylinder 3 to 4 times to stroke end.
4. After doing this, run engine at normal speed.

★ After repair or long storage, follow the same procedure.

DISMOUNTING OF HYDRAULIC PUMP ASSEMBLY

Special tools required

Part No.	Part Name	A
796-731-1320	Stopper	1



Lower the work equipment completely to the ground and stop the engine. Operate the control lever several times to release the remaining hydraulic pressure in the hydraulic piping. Then loosen the oil filler cap slowly to release the remaining oil pressure in the hydraulic tank.

1. Install stopper

Remove rod (2) from strainer (1) and fit tool A instead, then install the strainer on the tank and temporarily fit the strainer cover.

★ When not using tool A, remove the drain plug and drain off the hydraulic oil in the tank.



Hydraulic oil tank: 145 ℓ

2. Cover

- 1) Remove cover (3).
- 2) Open the hood and remove top cover of pump (4).

3. Inlet tube

Disconnect inlet tubes (5) and (6) from the hydraulic pump.

4. Outlet hoses

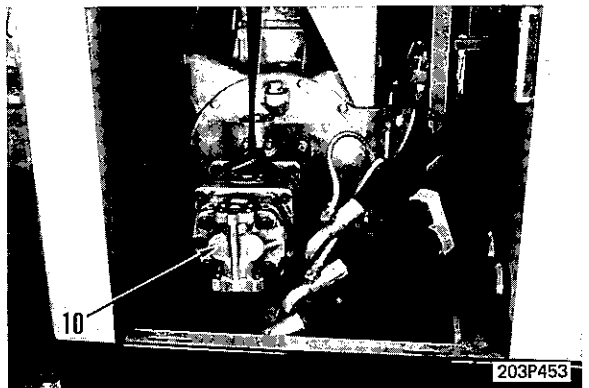
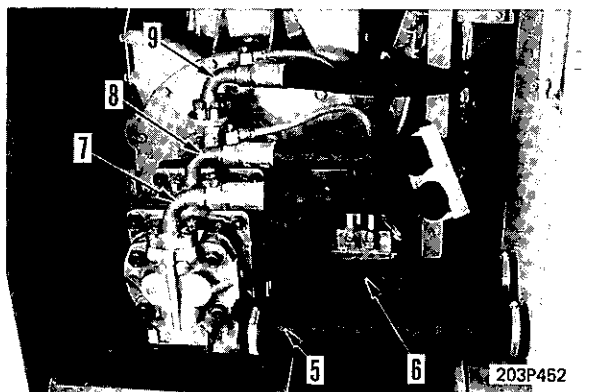
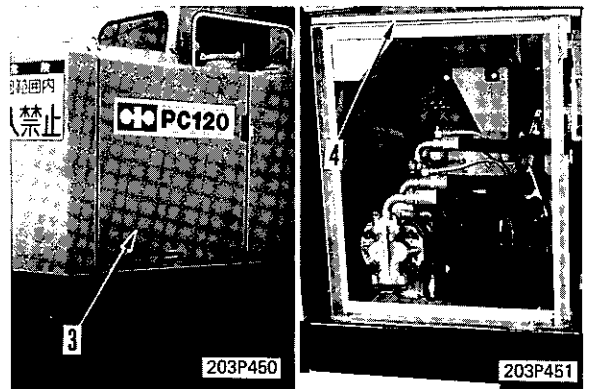
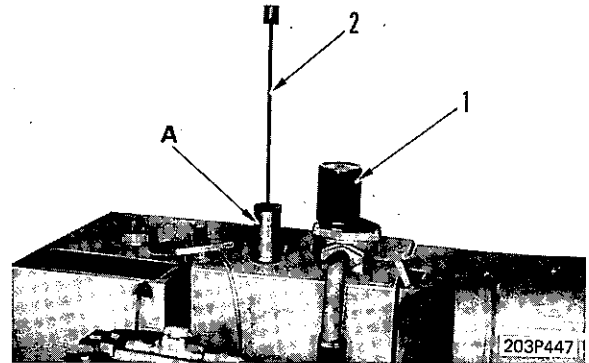
Disconnect outlet hoses (7), (8), and (9) from the hydraulic pump.

5. Hydraulic pump

Lift out hydraulic pump assembly (10).



Hydraulic pump assembly: 40 kg



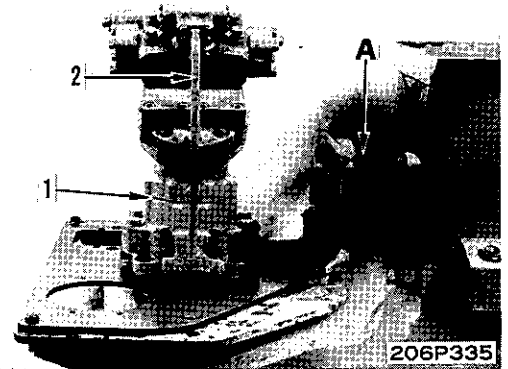
DISASSEMBLY OF SWING MOTOR ASSEMBLY

Special tools

Part number	Tool	A	B	C	D
790-501-5000	Unit repair stand	1			
790-901-2110	Bracket	1			
790-901-2230	Plate	1			
799-301-1600	Leak tester		1		
796-730-2000	Wrench ass'y			1	
09003-03639	Wrench				1

DISASSEMBLY OF MOTOR PROPER**1. Brake tube (traveling motor)**

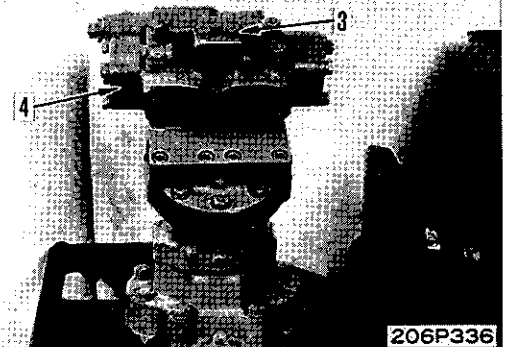
- 1) Set motor ass'y (1) on repair stand A.
- 2) Dismount brake tube (2).

**2. Shuttle valve (traveling motor)**

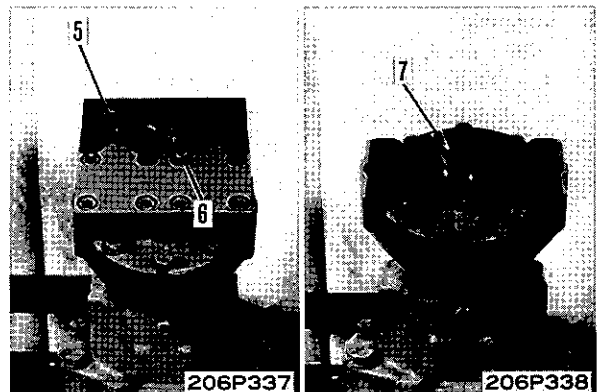
Dismount shuttle valve (3).

3. Brake valve ass'y (common to both traveling and swing brakes)

Dismount brake valve ass'y (4).

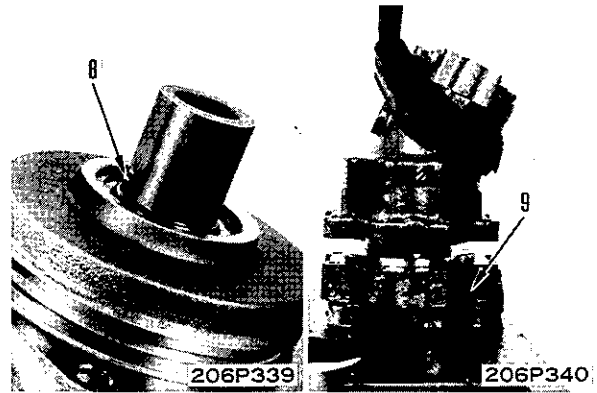
**4. Plate ring and ring (common to both traveling and swing brakes)**

- 1) Remove plate (5) with ring (6) fitted to it.
- 2) Remove ring (7).



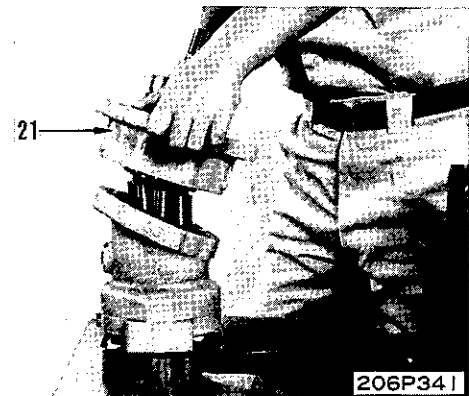
5. Parking brake ass'y (traveling motor)

- 1) Remove pin (8).
- 2) Lift up the motor side of brake ass'y (9) and dismount the brake ass'y.



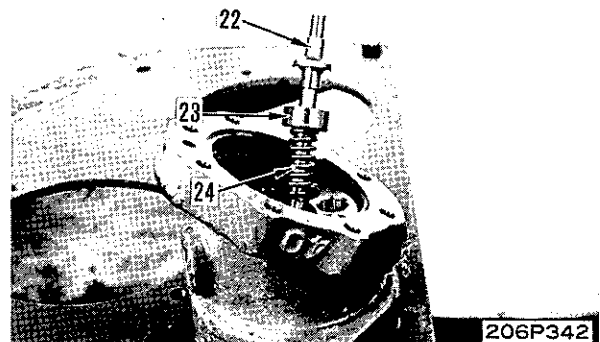
6. Piston drive shaft ass'y

Dismount piston drive shaft ass'y (21).



7. Center shaft

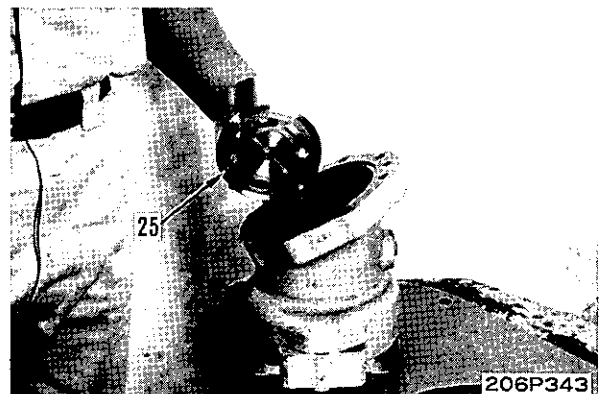
Dismount center shaft (22), seat (23) and spring (24).



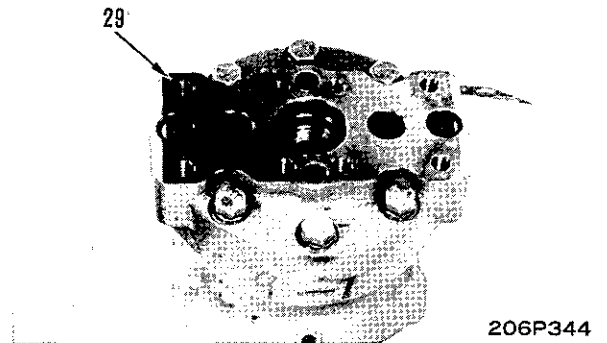
8. Cylinder

Dismount cylinder (25).

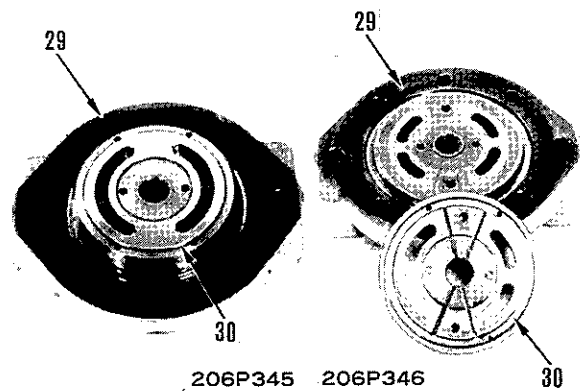
- ★ Dismount the cylinder by inserting the finger into the piston port.



9. End cover ass'y
Dismount end cover ass'y (29).

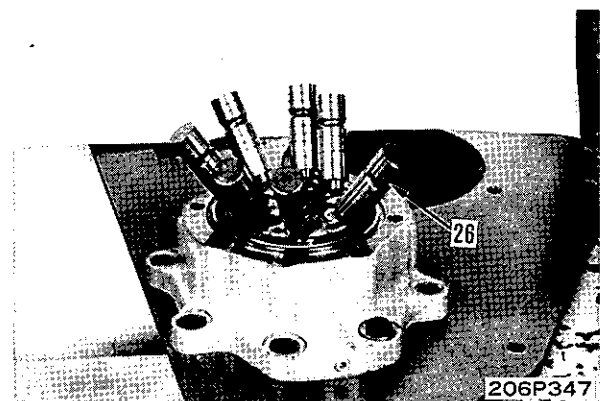


10. Valve plate
Dismount valve plate (30) from end cover ass'y (29).



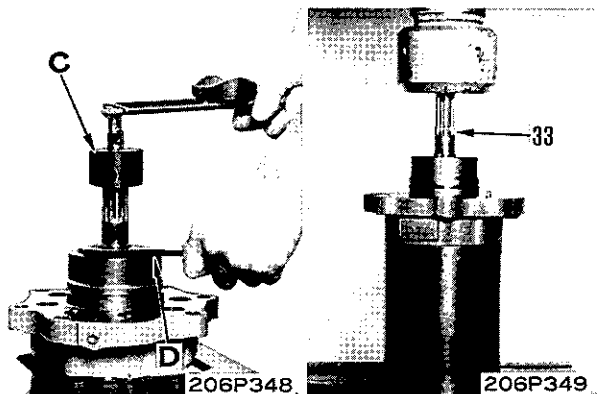
DISASSEMBLY OF PISTON DRIVE SHAFT ASS'Y

1. Piston
Using tool, dismount piston (26).



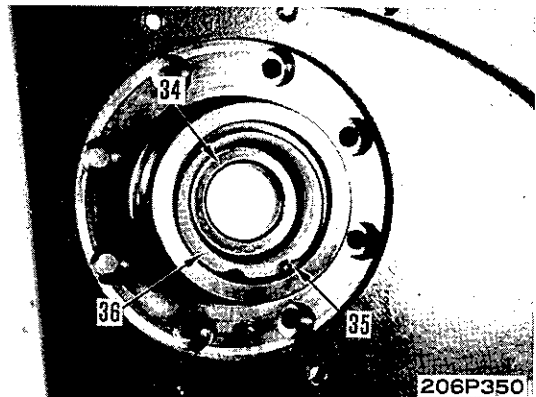
2. Nut and lock washer
Using tool D, remove nut (36) and dismount the lock plate.
★ If the shaft rotates, use tool C to prevent it from rotating.

3. Shaft
Push shaft (33) by means of a press and remove the front cover.



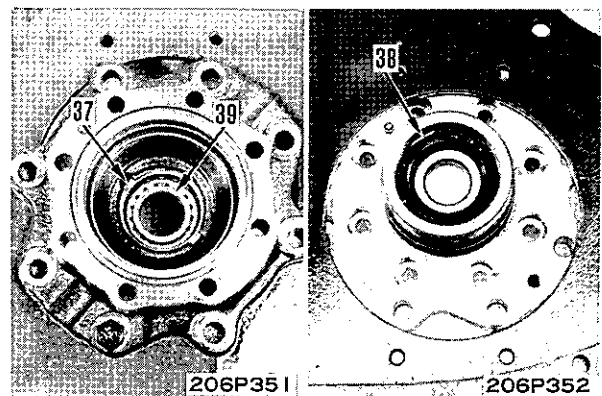
4. Ring and snap ring

- 1) Remove ring (34).
- 2) Remove snap ring (35) and dismount cover (36).



5. Outer race and oil seal

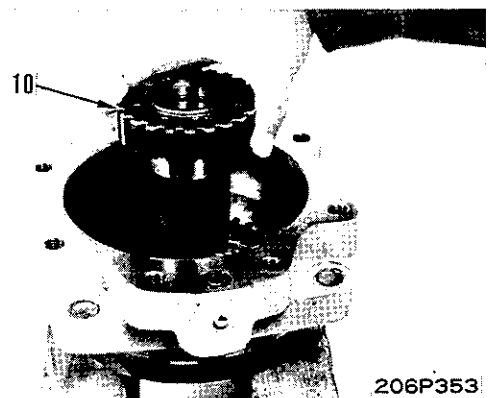
Push outer race (37) and remove oil seal (38) and bearing (39).



DISASSEMBLY OF BRAKE ASS'Y

1. Coupling

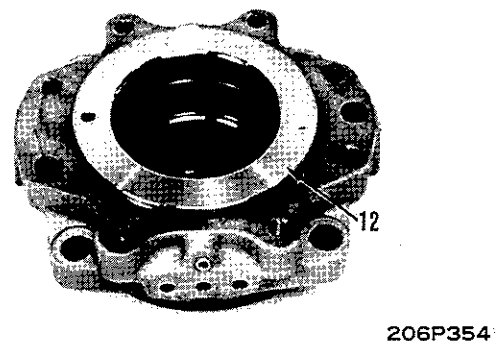
Dismount coupling (10).



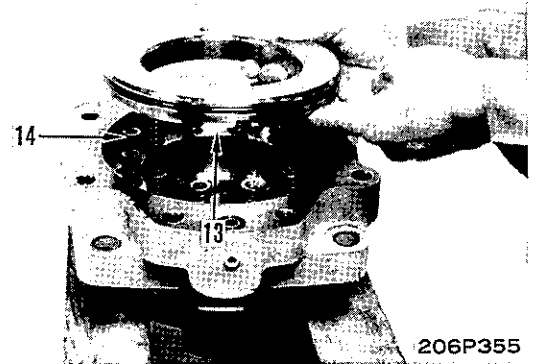
2. Spring seat

Remove spring seat (12).

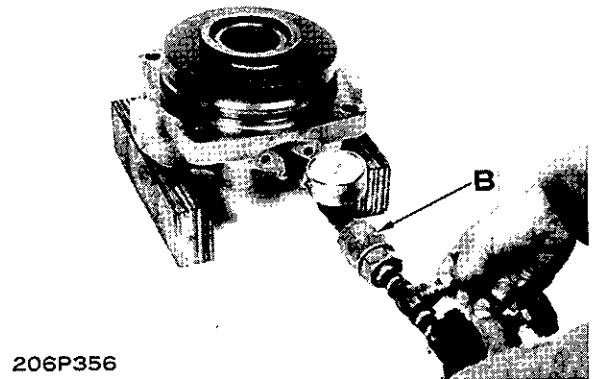
★ When reusing the spring seat, put a match mark in the direction of the dowel pin hole before removing the spring seat.



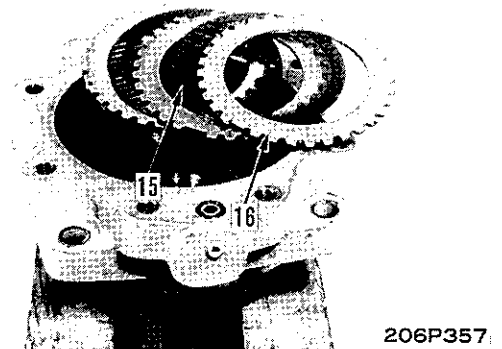
3. Spring
Remove spring (14).



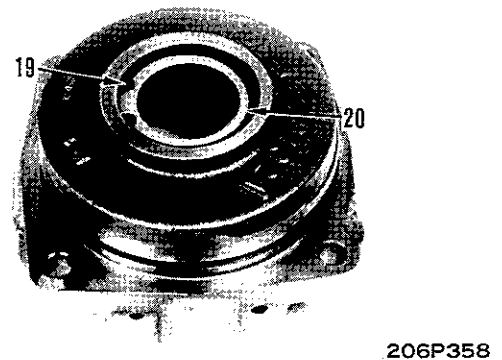
4. Piston
Using leak tester B, dismount piston (13).



5. Discs and plates
Remove discs (15) and plates (16).
★ 3 discs, 3 plates.



6. Oil seal
Remove snap ring (19) then remove oil seal (20).



ASSEMBLY OF SWING MOTOR ASSEMBLY

Special tools

Part number	Tool	A	B	C	D	E	F
795-501-5000	Unit repair stand	1					
795-901-2110	Bracket	1					
790-901-2230	Plate	1					
795-630-1803	Torque wrench		1				
796-730-2000	Wrench ass'y			1			
09003-03639	Wrench				1		
796-720-2300	Holder					1	
796-751-2720	Push tool						1

- Before assembling the piston motor ass'y, apply engine oil to the various sliding faces.

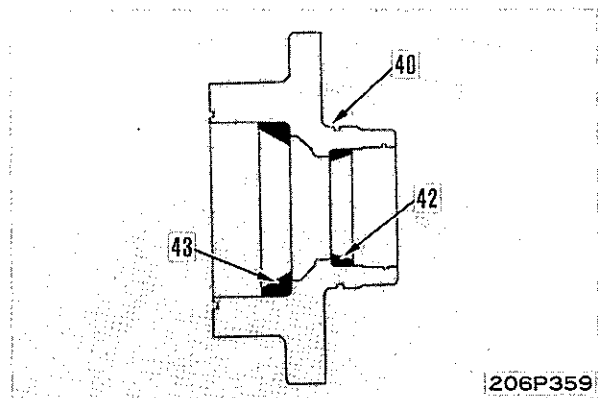
ASSEMBLY OF PISTON DRIVE SHAFT ASS'Y

1. Outer race

Using a push tool, mount outer races (43) and (42) on front cover (40).

★ Push tool O.D.:

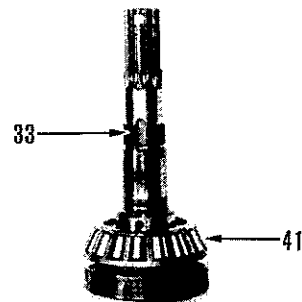
- Large: 120mm
- Small: 80mm



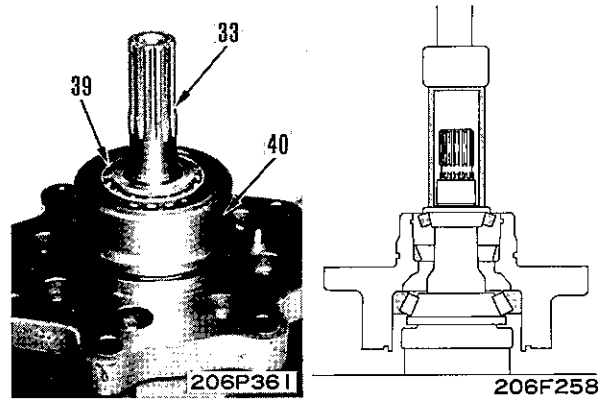
2. Shaft


1) Mount bearing (41) on shaft (33).

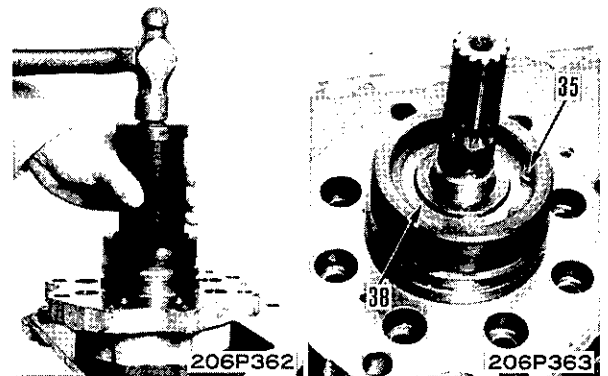
★ Bearing I.D.: 55mm



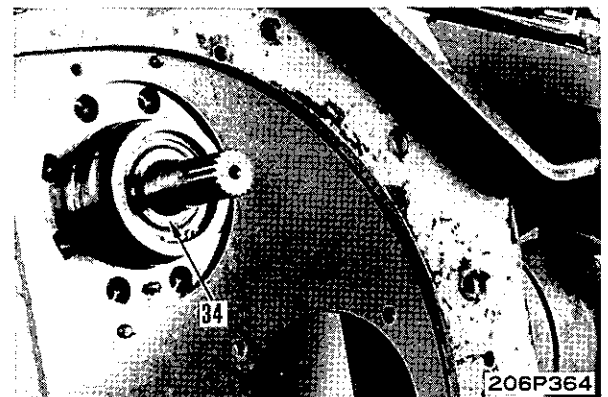
- 2) Set front cover (40) on shaft (33) and fit bearings (39) using a press.
- ★ Press-fit the bearing while rotating the cover. Once rotation starts to become sluggish, disengage the press.
 - ★ Bearing I.D.: 40mm



3. Oil seal
- 1) Using a push tool, fit oil seal (38).
 - ★ Oil seal O.D.: 82mm
-  Oil seal lip face: Grease (GII-LI)
- 2) Fit snap ring (35).

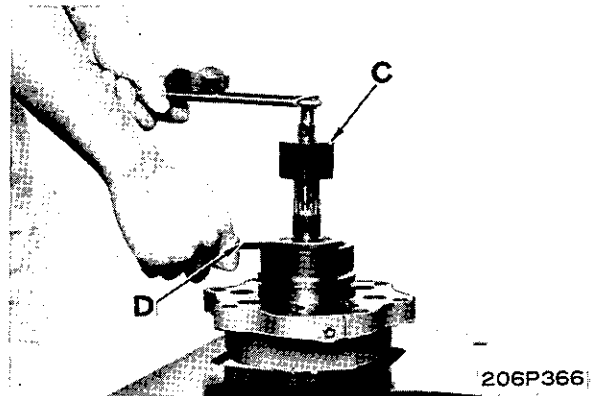
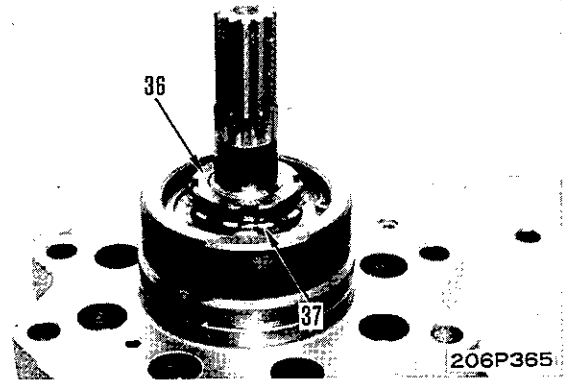


4. Ring
- Fit an O-ring and then fit ring (34).



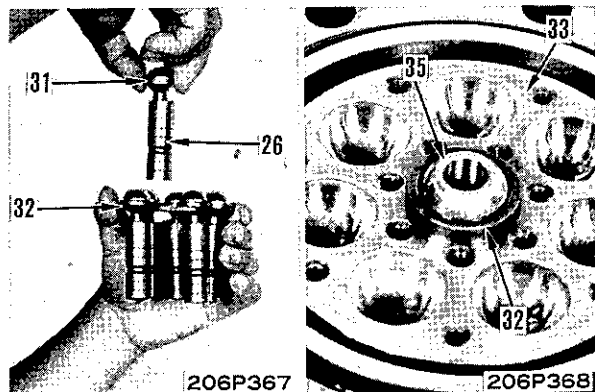
5. Nut and pre-pressure adjustment

- 1) Fit lock plate (37) and nut (36).
- 2) Tighten up the nut using tool D while measuring the rotation torque using tool C.
 - ★ Rotate the shaft at the rate of about one revolution every five seconds.
 - ★ If the rotational torque becomes higher than the specified value, slacken off the nut completely to make the rotational torque zero, then retighten the nut.
 - ★ Rotational torque of shaft: 0.2 ~ 0.3kg.m
 - ★ After adjusting the rotational torque, bend the lock plate.
 - ★ If the lock does not line up with the groove in the nut, either tighten up the nut within the range of the specified rotational torque or slacken it.

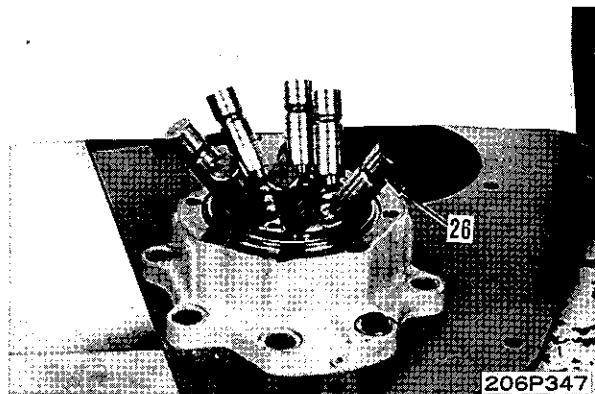


6. Piston

- 1) Mount holder (31) on piston (26) and set the assembly on retainer (32).
- 2) Mount center ball (35) and holder (34) on shaft (33).
 - ★ Clean the spherical face of the shaft and apply a light coating of engine oil.




- 3) Inject about two drops of adhesive (LT-II) into the mounting bolt hole of the shaft retainer.
 - ★ Wipe up any excess adhesive.
- 4) Mount the piston onto the shaft while supporting it with both hands.
 - ★ Clean the spherical face of the shaft and apply a light coating of engine oil.

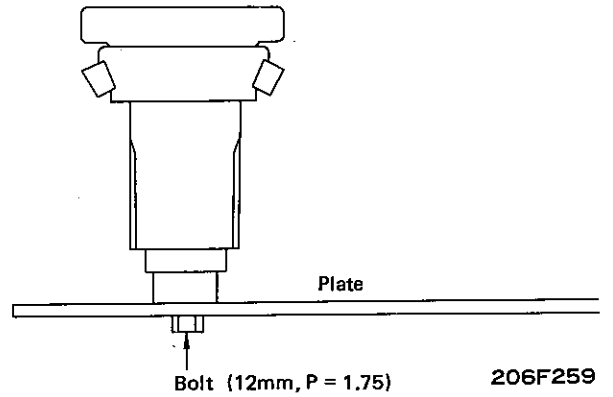


5) Tighten up the screws.

- ★ If oil or grease adheres to the screws, remove it completely before inserting the screws in the holes.
- ★ Tighten up the screw clockwise (or counter-clockwise), applying torque gradually as shown below.

 kgm	Screw: kg.m
	1st pass: 0.1 max.
	2nd pass: 0.5 ± 0.1
	3rd pass: 1.0 ± 0.1

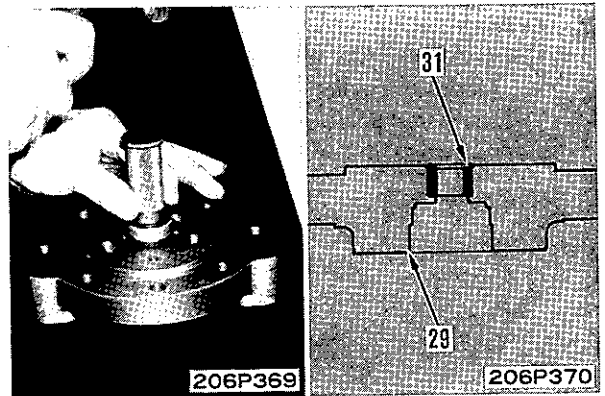
- ★ After tightening up the screws, ensure that the piston moves smoothly and that it falls under its own weight. If it moves sluggishly, slacken off the screws and retighten them.




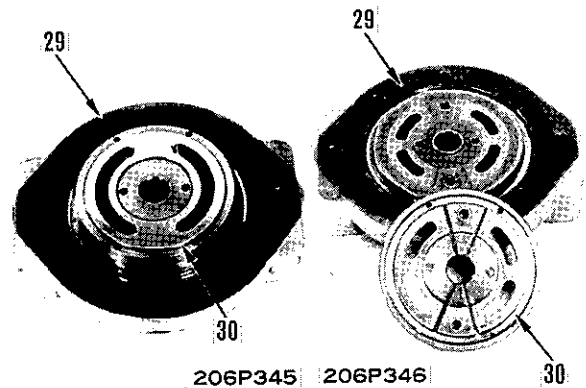
ASSEMBLY OF MOTOR PROPER

1. End cover

- 1) Using tool F, fit bearing (31) onto end cover (29).
 - ★ Do not reuse parts which were dismantled.

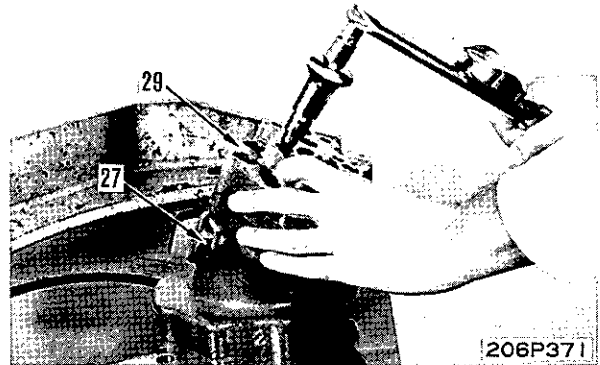


- 2) Mount valve plate (30) on the end cover.
 - ★ Temporarily screw up the mounting bolts.
 -  Adhesive (LT-II)




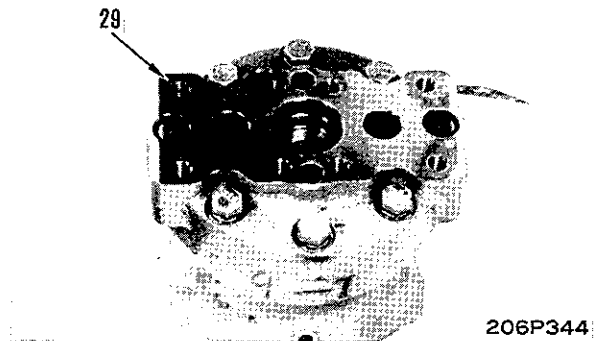
- 3) Fit an O-ring, then set end cover (29) on case (27) and tighten up the valve plate mounting bolts while rotating the engine cover.

 Valve plate mounting bolts: $0.9 \pm 0.1 \text{ kgm}$



- 4) Mount end cover (29).

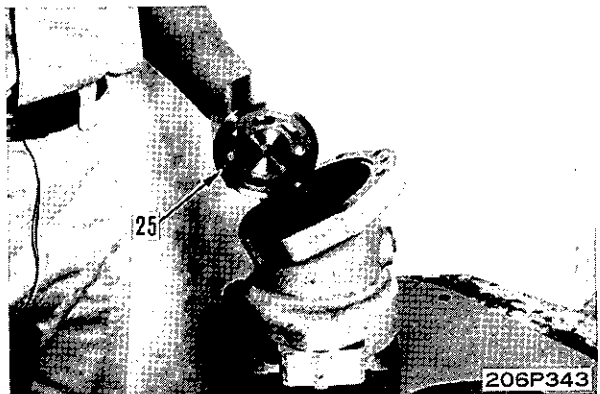
 End cover mounting bolts: $6.8 \pm 0.7 \text{ kg.m}$



2. Cylinder

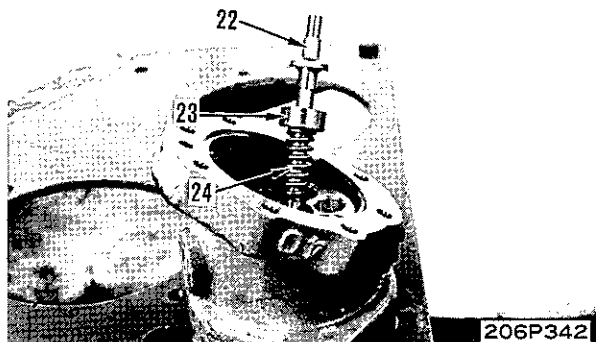
Mount cylinder (26) on case (27).

- ★ Mount the cylinder by inserting all five fingers into the piston port.



3. Center shaft ass'y


Fit seal (23) and spring (24) onto shaft (22), then mount the assembly on cylinder (25).

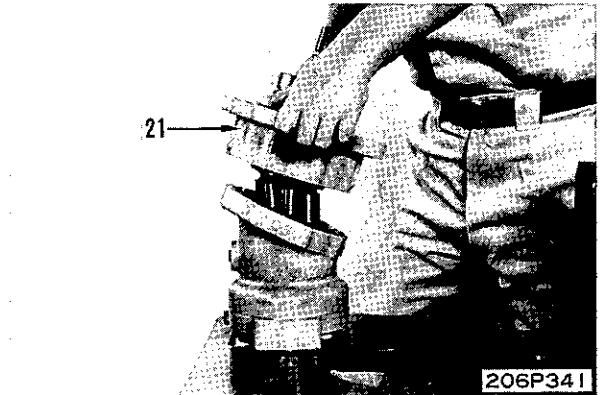


4. Piston/drive shaft ass'y

- 1) Fit an O-ring to the front cover, then align piston (26) with the cylinder and mount piston/drive shaft ass'y (21).

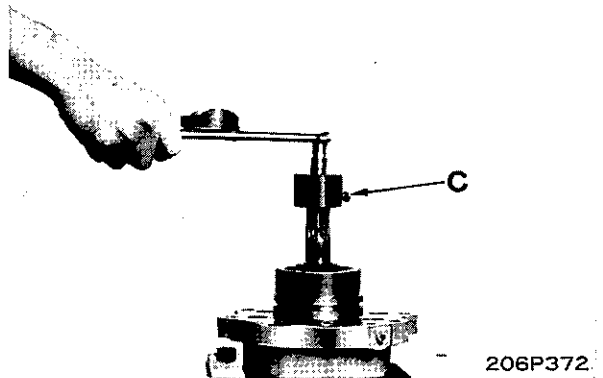
★ Carefully insert the piston after aligning it with the cylinder port. Do not shake it violently.

 Mounting bolt: 6.8 ± 0.7

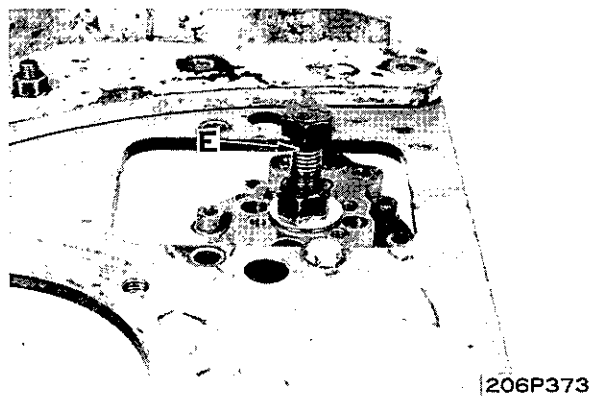


- 2) Dismount tool E, then using tool C measure the rotational torque of the shaft.

★ Rotational torque: $0.4 \sim 0.7 \text{ kg.m}$
Irregular torque: Max. 0.15 kg.m



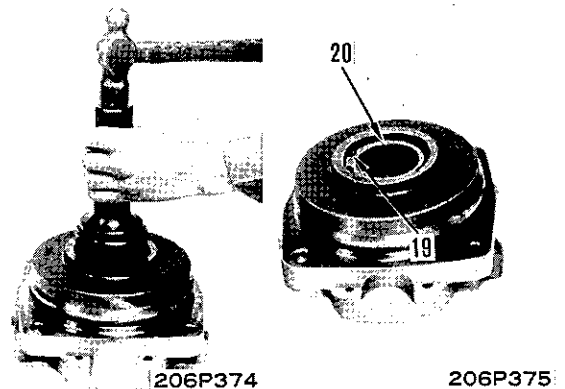
- 3) Using tool E, compress the spring to completely push in the center shaft, then lock the shaft in position.



ASSEMBLY OF BRAKE ASS'Y

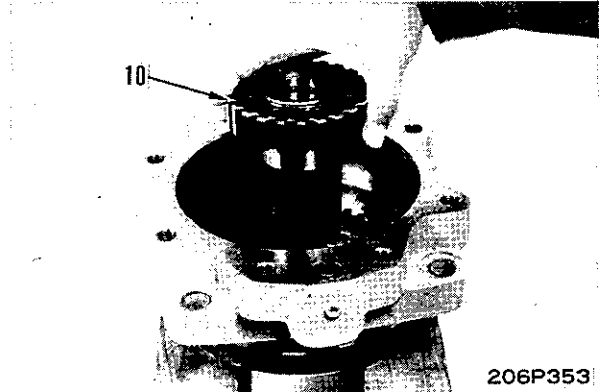
1. Oil seal

Using a push tool, fit oil seal (20) and then fit snap ring (19).



2. Coupling

Mount coupling (10) on housing (18).

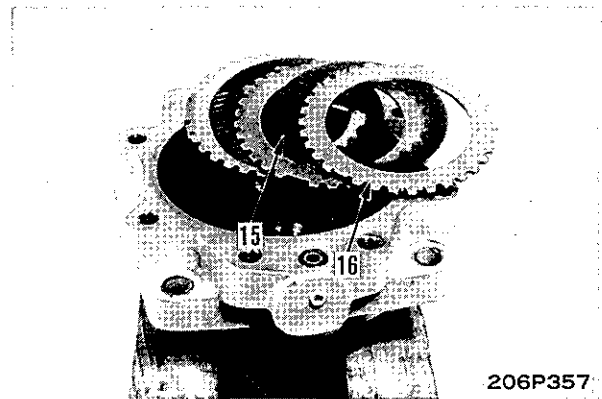


206P353

3. Plates and discs

Assemble plates (16) and discs (15).

★ 3 plates, 3 discs.

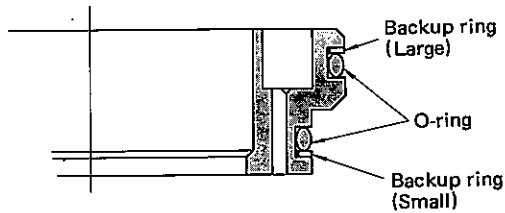


206P357

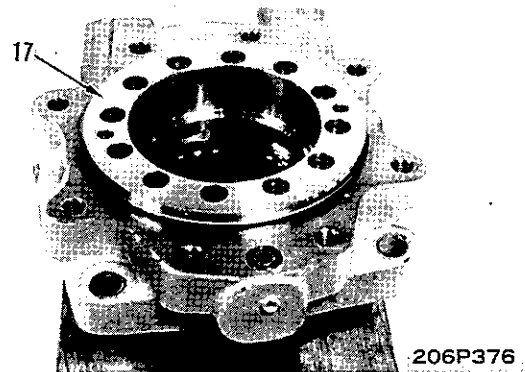
4. Piston

Fit an O-ring and backup ring, then mount piston (17).

★ Fit the O-ring and backup ring as shown in the figure.



206F242

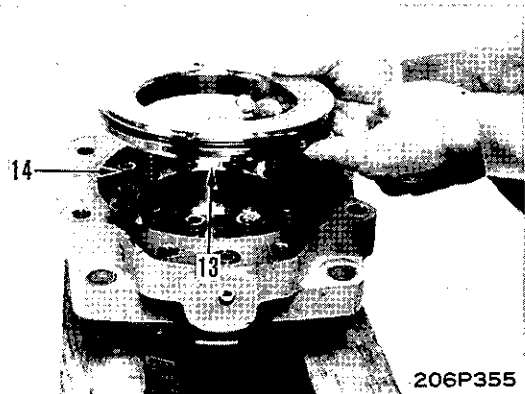


206P376

5. Spring, spring seat

Fit spring (14), then fit an O-ring and install seat (12).

★ Be particularly careful of the direction of the dowel pin holes. (If the pin holes are facing the opposite side, it will be impossible to fit the brake release tube after mounting the brake ass'y.)



206P355

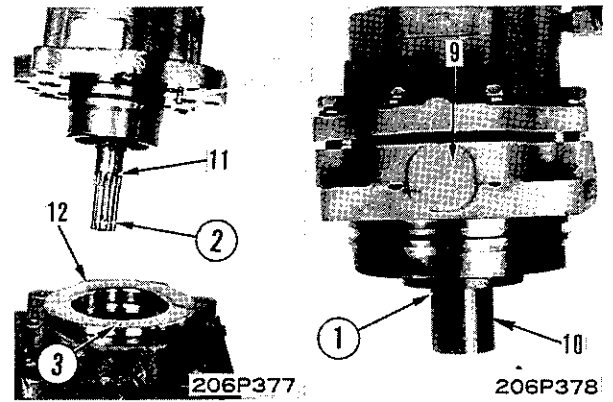
MOUNTING BRAKE ASS'Y

1. Brake ass'y

Align pin hole ① of coupling (10) with pin hole ② of drive shaft (11).

★ Note that it only possible to align the coupling pin hole and the drive shaft pin hole at one point.

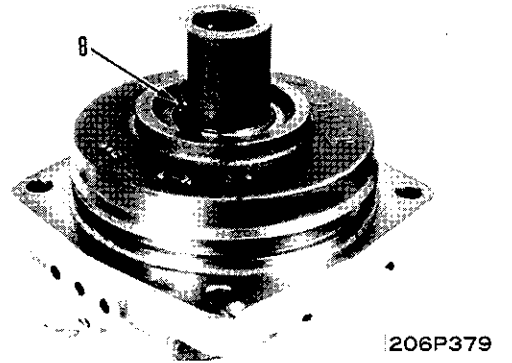
 Brake ass'y mounting bolts: 18 ± 2 kgm



2. Pin

Fit pin (8).

★ Completely bend the cotter pin.

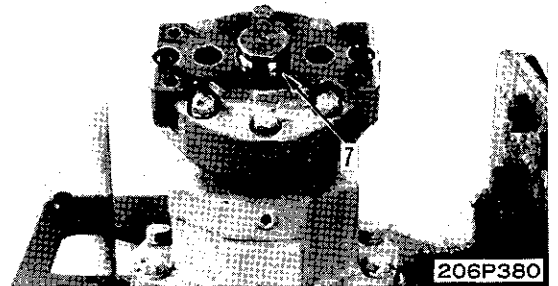


MOUNTING BRAKE VALVE ASS'Y

1. Ring (common to traveling and swing brakes)

Fit an O-ring, then fit ring (7).

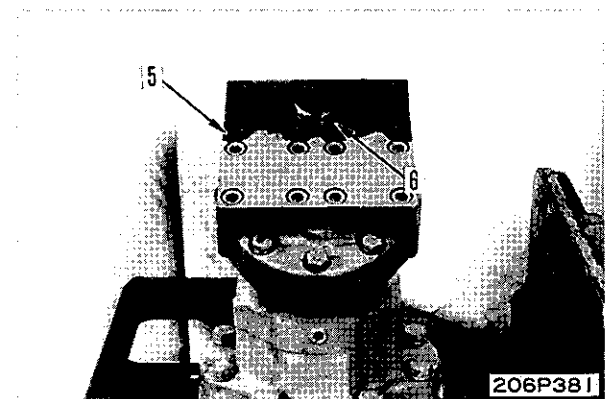
★ In the case of a 40-series machine, subsequently mount brake valve ass'y (4).



2. Ring, valve plate

1) Fit an O-ring and mount plate (5).

2) Fit an O-ring and install ring (6).

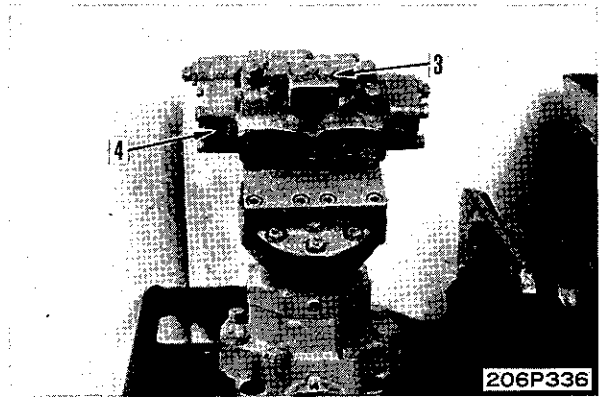


3. Brake valve ass'y (common to both traveling and swing brakes)

Fit an O-ring, and mount brake valve ass'y (4).


 Valve mounting bolts: kg.m

- 1st: 3 ± 1.0
- 2nd: 5.5 ± 1.0

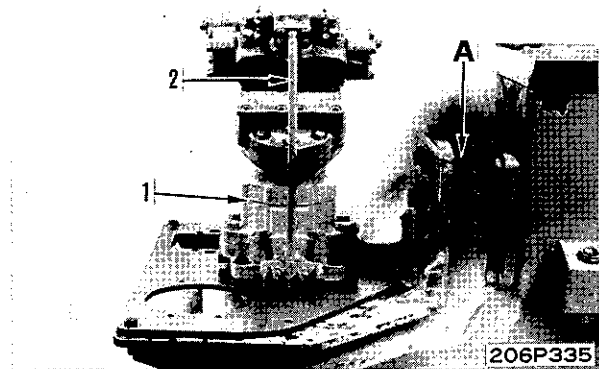


4. Shuttle valve, tube (traveling brake only)

- 1) Fit an O-ring and mount shuttle valve (3).
- 2) Fit an O-ring and install tube (2).

 Shuttle valve mounting bolts:
See item on brake valve.

Tube mounting bolts: 5.5 ± 0.5kg.m




DISASSEMBLY OF TRAVEL MOTOR ASSEMBLY (GM15F)

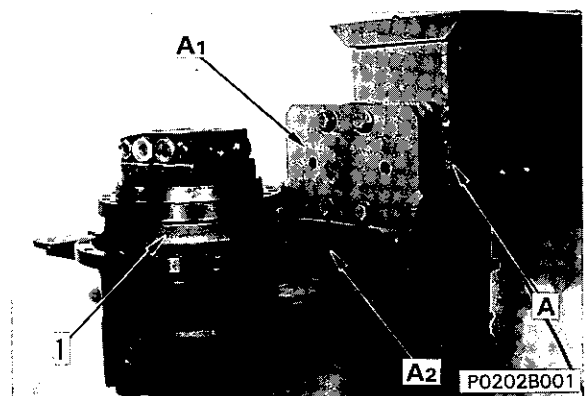
Special tools required

No.	Part No.	Part Name	Q'ty
A	790-501-5000 or 790-501-2000	Unit repair stand or Engine repair stand	1
A ₁	790-501-2110	Bracket	1
A ₂	790-901-1350	Plate	1
B	799-301-1600	Oil leakage tester	1
C	796-720-1100	Lifting tool	1
D	796-720-3700	Fixture	2
E	796-720-1400	Lifting tool	1

• Preparatory work

Set travel motor assembly (1) in tools A, A₁ and A₂.

 Travel motor assembly: 160 kg

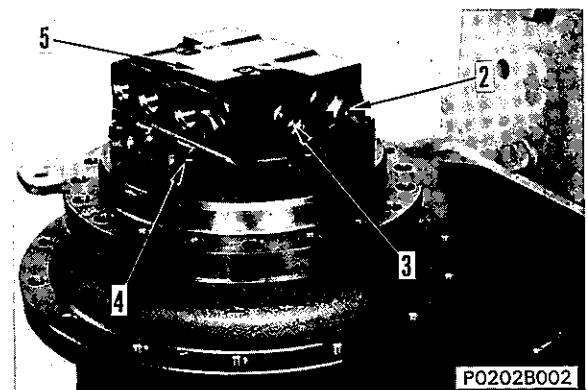


1. Rear flange assembly

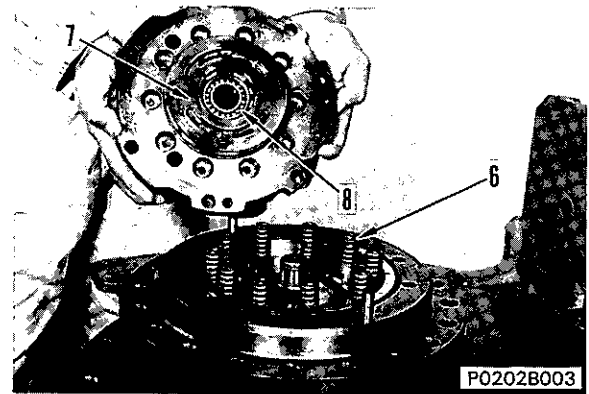
★ Loosen left and right plugs (2) and (3).

1) Remove hexagonal bolts (4), then remove rear flange (5).

★ The springs will drop out, so be careful not to lose them.

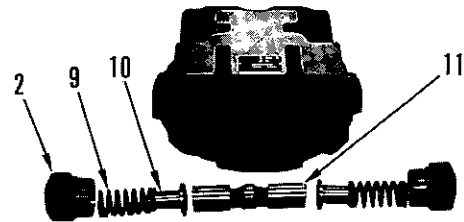


- 2) Remove springs (6).
- 3) Remove timing plate (7).
- 4) Remove bearing (8).



★ Disassemble shuttle valve as follows.

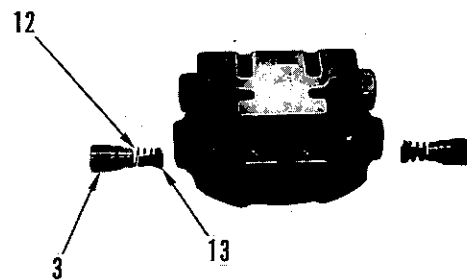
- i) Remove plug (2), then remove spring (9) and stopper (10).
- ii) Remove shuttle valve spool (11).



P0202B004


★ Disassemble check valve as follows.

Remove plug (3), then remove spring (12) and valve (13).



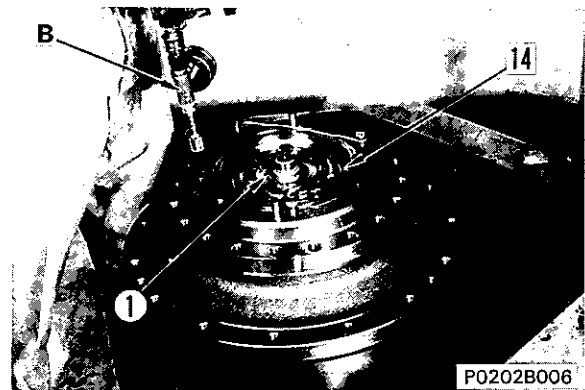
P0202B005

2. Piston .

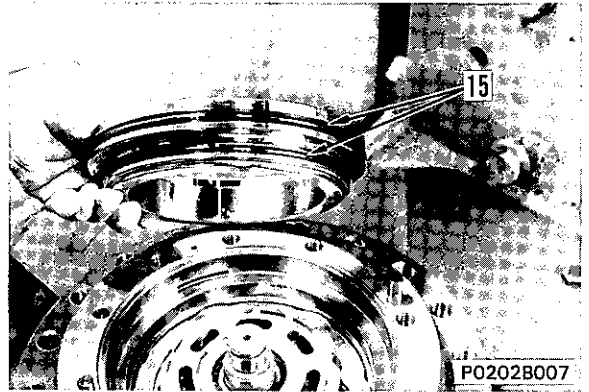
 The piston will fly out if compressed air is applied through the parking brake port, so tie the piston with wire ① to prevent it from flying out.

- 1) Using tool B, apply air through parking brake port, and remove piston (14).

★ Air pressure: 3 to 5 kg/cm²

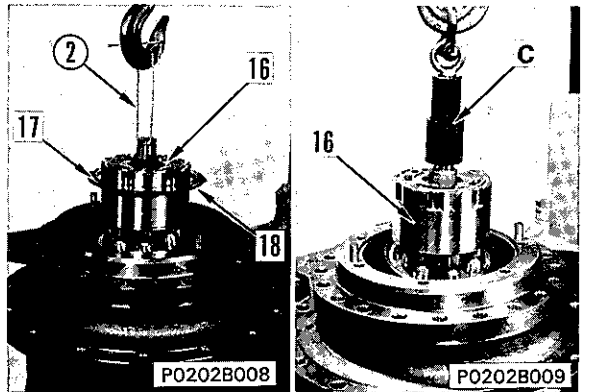


- 2) Remove O-rings (15) from piston.

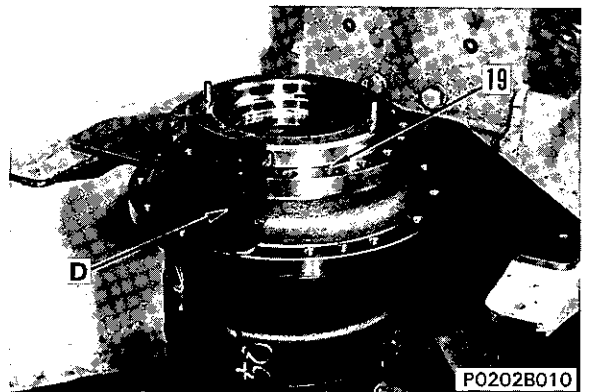


3. Cylinder block, piston, shaft assembly

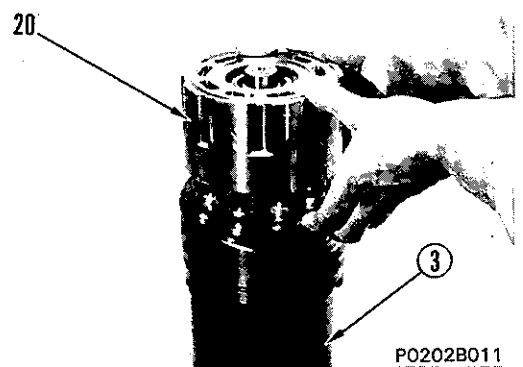
- 1) Using tool C, lift off cylinder block, piston and shaft assembly (16).
 - ★ When not using tool C, fit wire ② in the groove of the shaft, and lift off the cylinder block, piston and shaft assembly (16).
- 2) Remove plate (17) and disc (18).
 - ★ Disc: 1
 - ★ Plate: 1



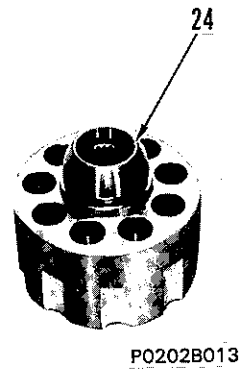
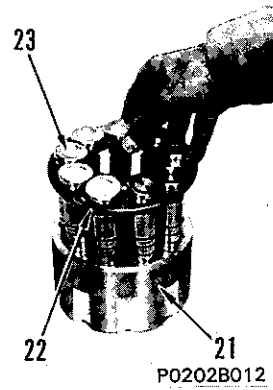
- ★ Using tool D, secure spindle (19) to hub.



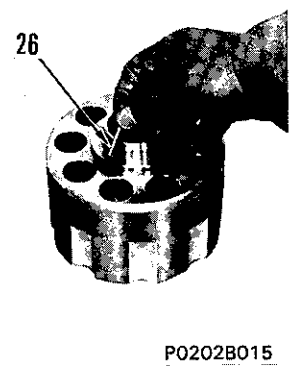
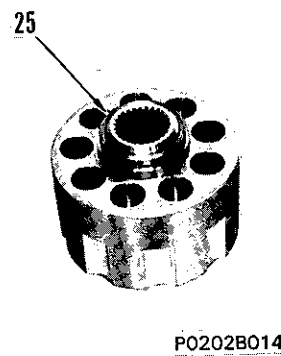
- ★ Disassemble cylinder block, piston and shaft assembly as follows.
 - i) Set cylinder block, piston and shaft assembly on stand ③.
 - ii) Pull out cylinder block and piston assembly (20) from shaft.



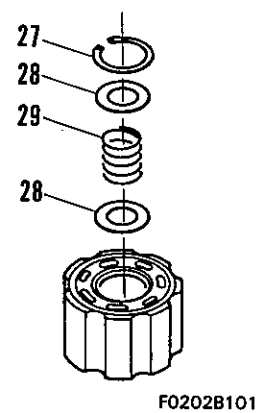
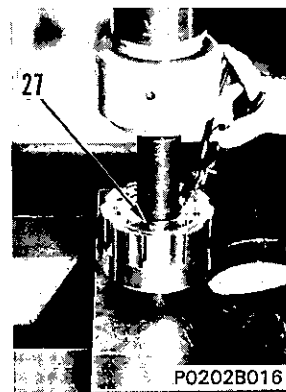
- iii) Remove retainer plate (22) and piston (23) from cylinder block (21).
- iv) Remove thrust ball (24).



- v) Remove washer (25).
- vi) Remove straight pins (26).

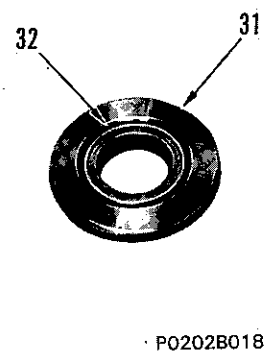
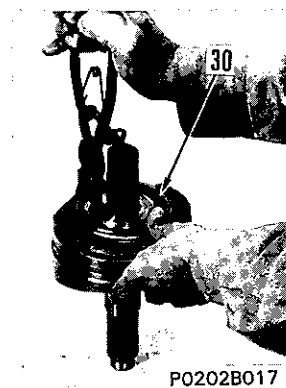


- vii) Set cylinder block on press, and compress spring, then remove snap ring (27).
- viii) Release tension of spring, then remove washers (28) and spring (29).



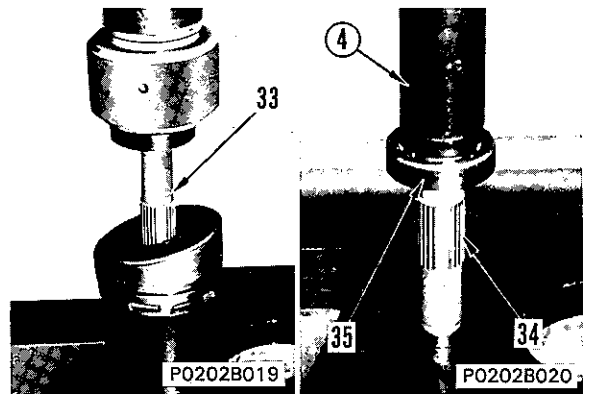
4. Bearing cover

- 1) Remove snap ring (30) from swash plate.
- 2) Tap shaft with plastic hammer, and remove bearing cover (31).
- 3) Remove oil seal (32) from bearing cover.



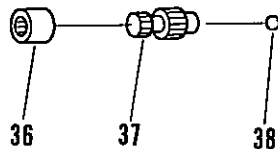
5. Shaft

- 1) Set swash plate and shaft assembly (33) on press, then pull out shaft.
- 2) Using press-fitting kit (4), remove bearing (35) from shaft (34).

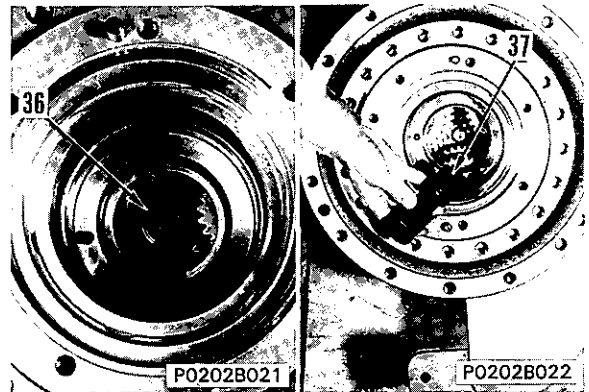


6. Coupling, sun gear

- Remove coupling (36) and sun gear (37).
- ★ Be careful not to lose ball (38), and keep it in a safe plate.

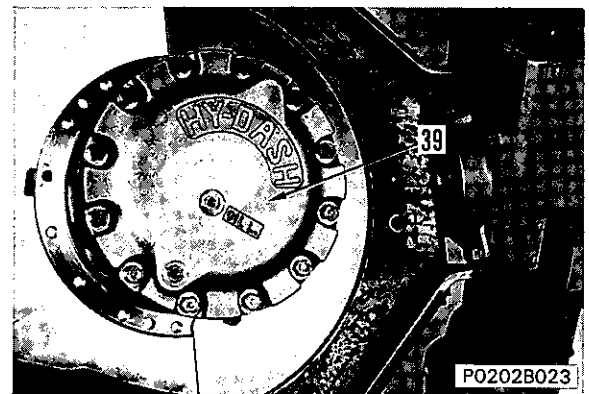


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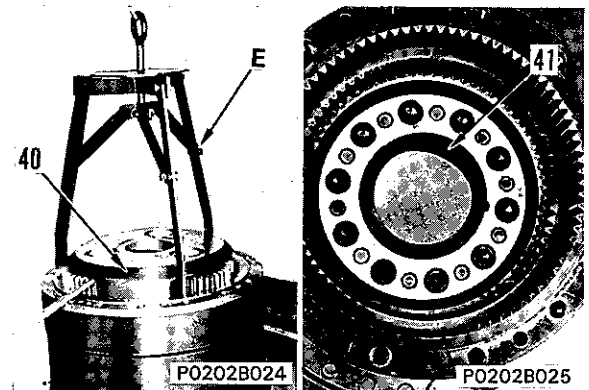
7. Cover

- Remove cover (39).
- ★ Remove the thrust plate and keep it in a safe place.



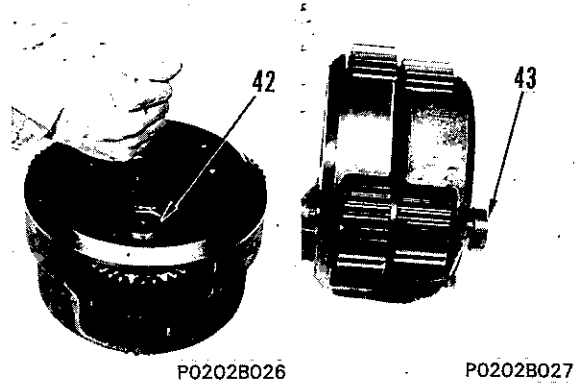
8. Carrier assembly

- Pull out carrier assembly (40) slightly with a screwdriver, then using tool E, lift off carrier assembly.
- ★ Remove thrust plate (41).

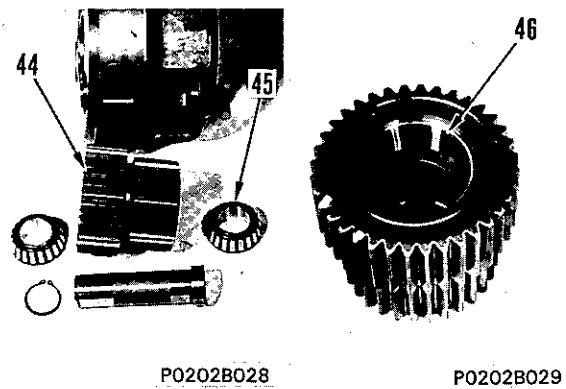


★ Disassemble carrier assembly as follows.

- i) Remove snap ring (42).
- ii) Pull out shaft (43).



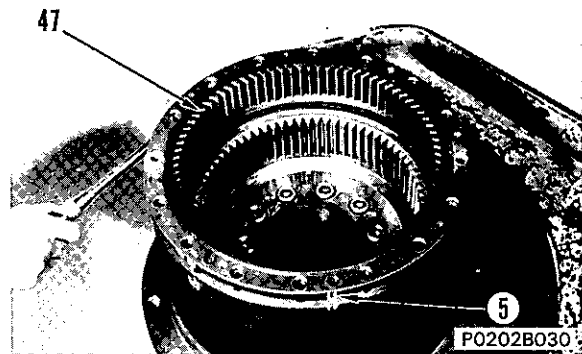
- iii) Remove gear (44) and bearing (45) from carrier case.
- iv) Remove outer race (46) from gear.



9. Ring gear

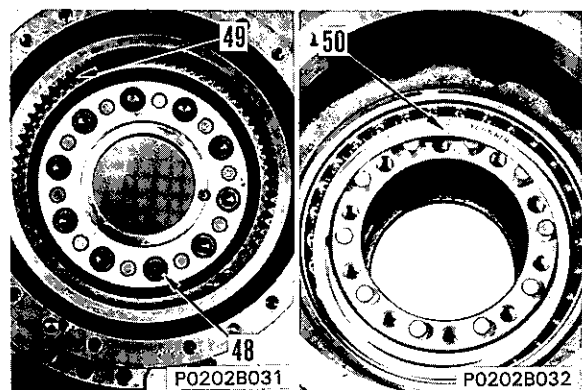
Remove ring gear (47).

★ Make match mark (5) on the ring gear and hub, then remove the ring gear.

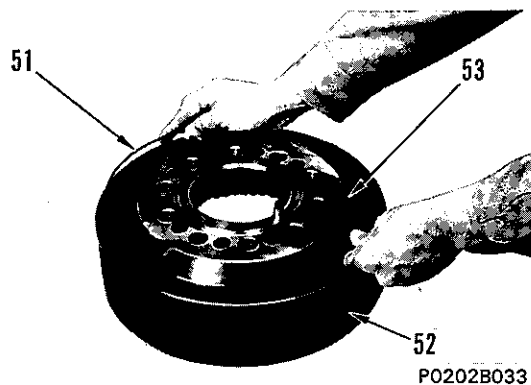


10. Ring gear, coupling gear

- 1) Remove hexagonal bolt (48), then remove ring gear and coupling gear (49).
- 2) Remove distance piece (50).

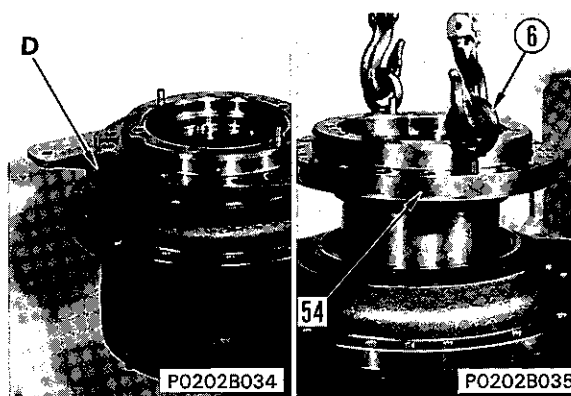


- 3) Remove ring (51), then disconnect ring gear (52) and coupling gear (53).

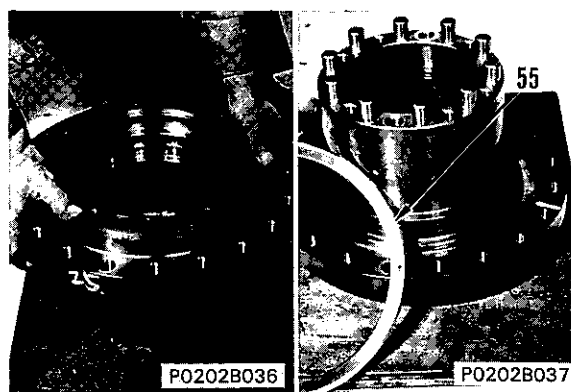


11. Spindle

- 1) Turn over repair stand so that spindle faces up.
- 2) Remove tool D.
- 3) Using eye bolts ⑥ (Thread dia. = 12 mm, Pitch = 1.75 mm), lift off spindle (54).

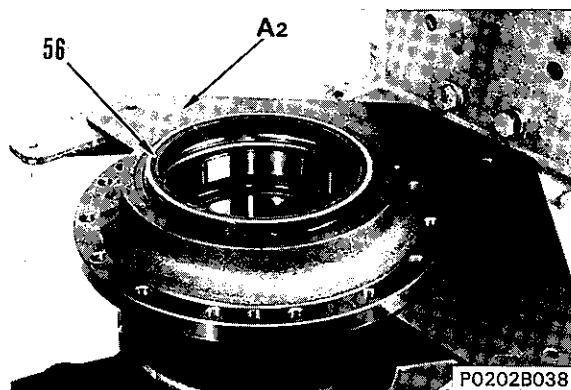


- 4) Set with distance piece side at bottom and drop lightly on to a plate to remove distance piece (55).



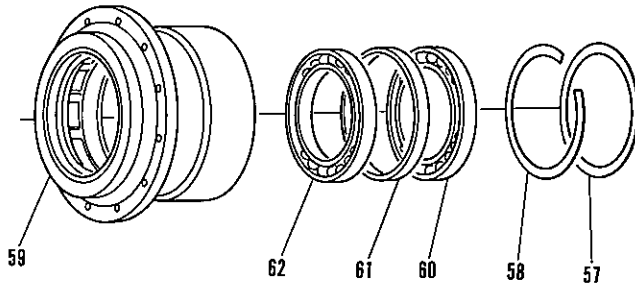
12. Floating seal

Remove floating seal (56).

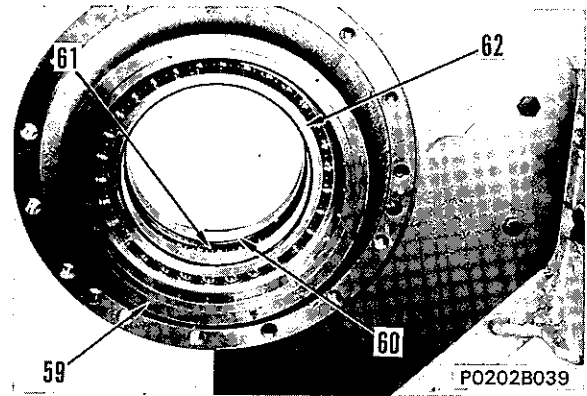


13. Bearing, distance piece

- 1) Remove snap ring (57), then remove distance piece (58).
- 2) Remove bearing (60), collar (61) and bearing (62) from hub (59).



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ASSEMBLY OF TRAVEL MOTOR ASSEMBLY (GM15F)

Special tools required

No.	Part No.	Part Name	Q'ty
A	790-501-5000 or 790-501-2000	Unit repair stand or Engine repair stand	1
A ₁	790-501-2110	Bracket	1
A ₂	790-901-1350	Plate	1
B	799-301-1600	Oil leakage tester	1
C	796-720-1100	Lifting tool	1
D	796-720-3700	Fixture	2
E	796-720-1400	Lifting tool	1
F	796-720-2800	Plate	1

• Preparatory work

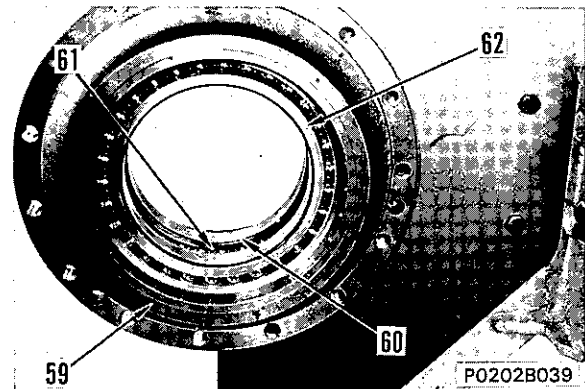
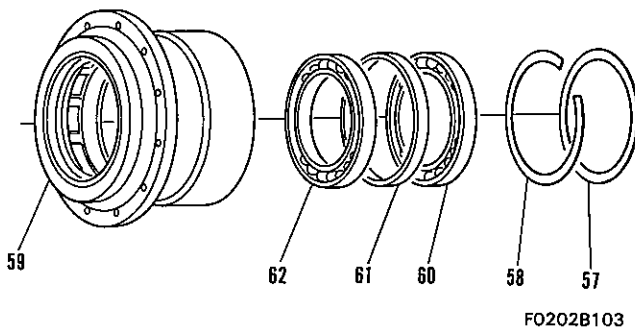
Clean all parts, and check for dirt or damage. Remove all burrs.

• Precautions

- 1) Replace all O-rings and oil seals with new parts.
- 2) Use a torque wrench for bolts and plugs, and tighten to the specified tightening torque.
- 3) Coat the sliding surfaces of all parts with engine oil before installing.


1. Bearing, distance piece

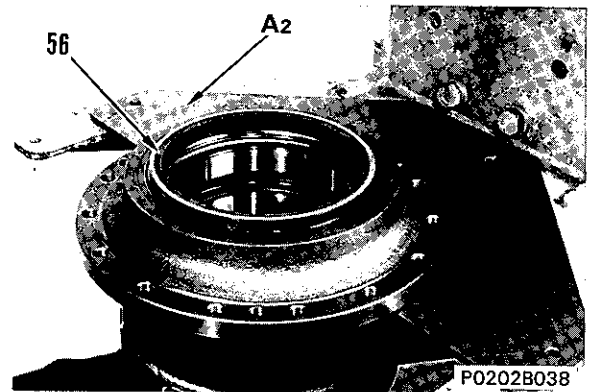
- 1) Install bearing (62), collar (61) and bearing (60) to hub (59).
- 2) Install distance piece (58), and secure with snap ring (57).



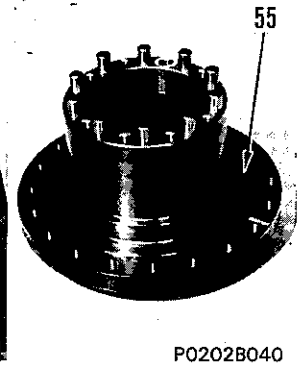
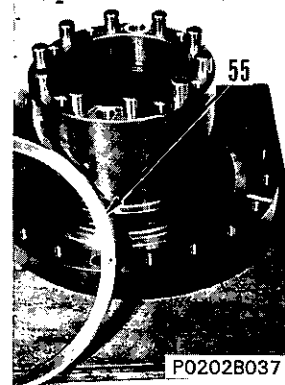
2. Floating seal

- 1) Install hub assembly in tool A₂.
- 2) Install floating seal (56) to hub.

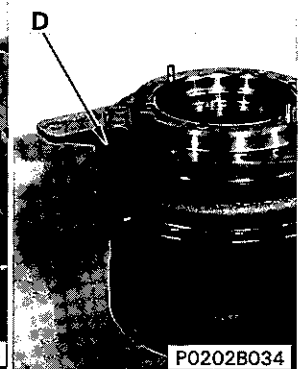
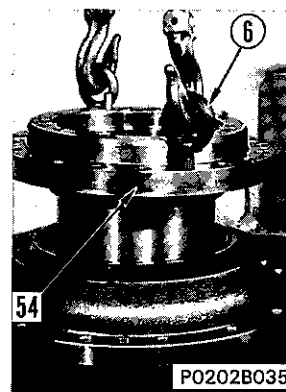
 Floating seal: Molybdenum disulphide

**3. Spindle**

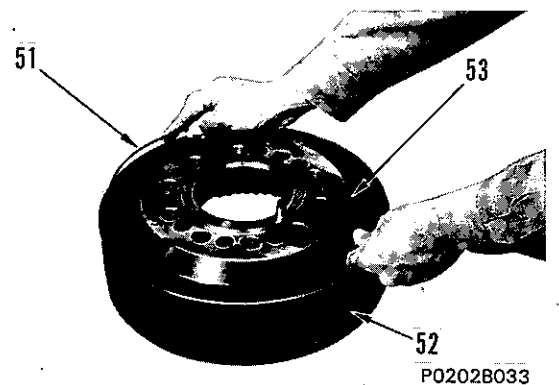
- 1) Fit O-ring and install distance piece (55) to spindle.



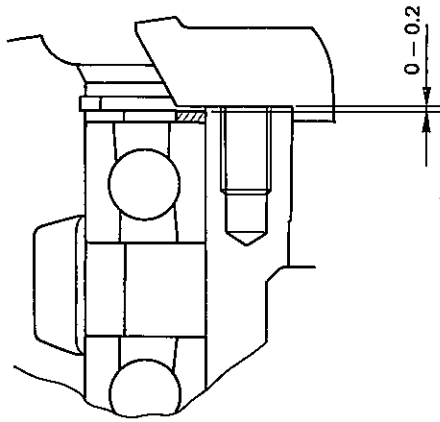
- 2) Using eye bolts (6) (Thread dia = 12 mm, pitch = 1.75 mm), raise spindle (54), and install hub.
- 3) Using tool D, secure hub to spindle.

**4. Ring gear, coupling gear**

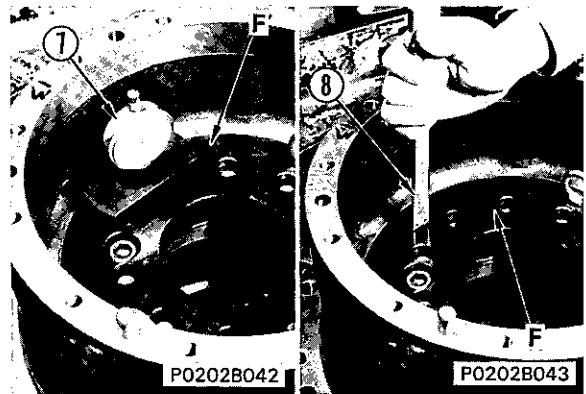
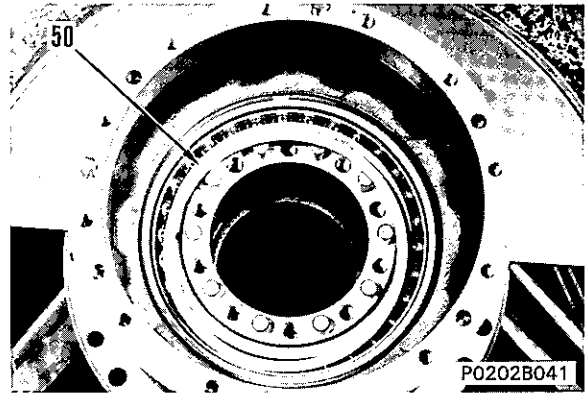
- 1) Install ring gear (52) to coupling gear (53), and secure with ring (51).




- 2) Assemble distance piece (50) temporarily.
- 3) Set tool F on top of distance piece, then using depth micrometer (7) or calipers (8), measure distance between bearing and top of spindle. Use this measurement to select distance piece.
- ★ Standard clearance: 0 to 0.2 mm




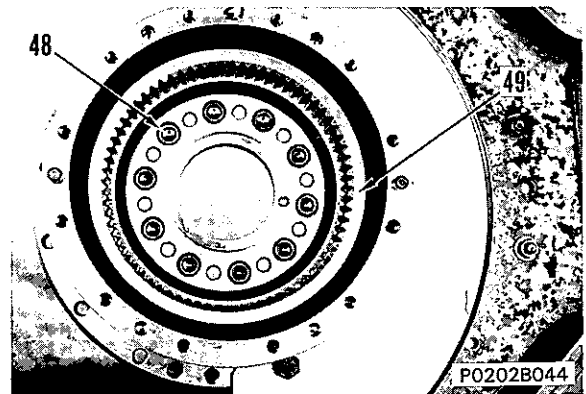
F0202B104



- 4) Install ring gear (49), then tighten hexagonal bolts (48).

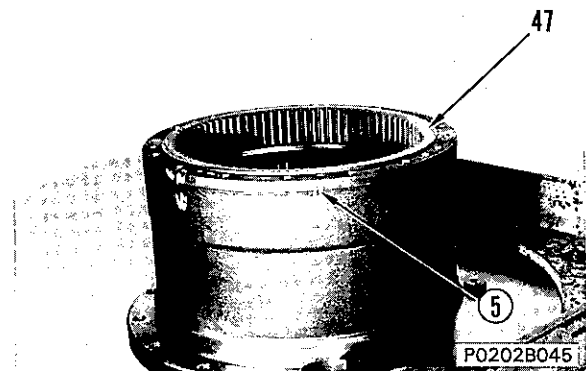
 Thread of hexagonal bolt: Anti-friction compound (LM-P)

 Hexagonal bolt: 16 ± 8 kgm



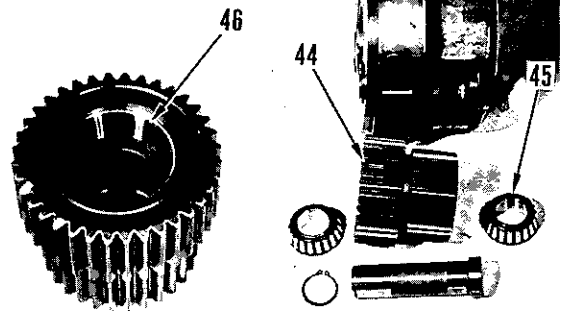
5. Ring gear

Align match mark (5) of ring gear and hub, and install ring gear (47).



6. Carrier assembly

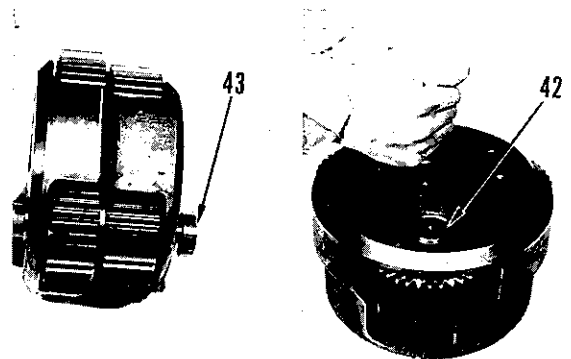
- ★ Assemble carrier assembly as follows.
 - i) Install outer race (46) to gear.
 - ii) Assemble bearing (45) to gear (44), and install in carrier case.



P0202B029

P0202B028

- iii) Install shaft (43), and secure with snap ring (42).

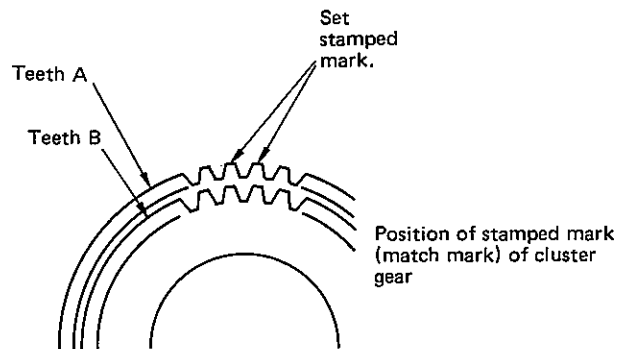


P0202B027

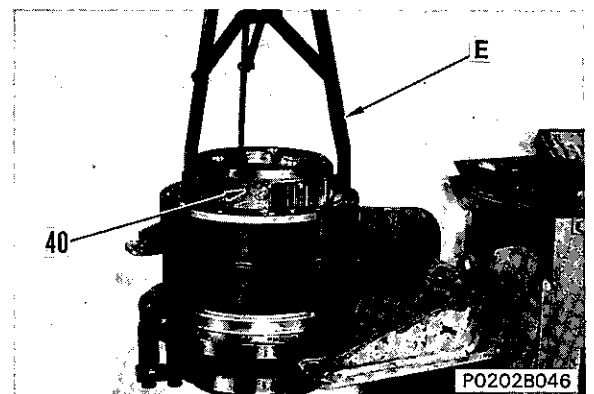
P0202B026

Using tool E, raise carrier assembly (40), align teeth of ring gear and install carrier assembly.

- ★ In order to insert the carrier assembly inside the hub and align teeth (B) of the cluster gear correctly with teeth (A) of the ring gear, set each cluster gear in the position shown in the diagram.



F0202B105




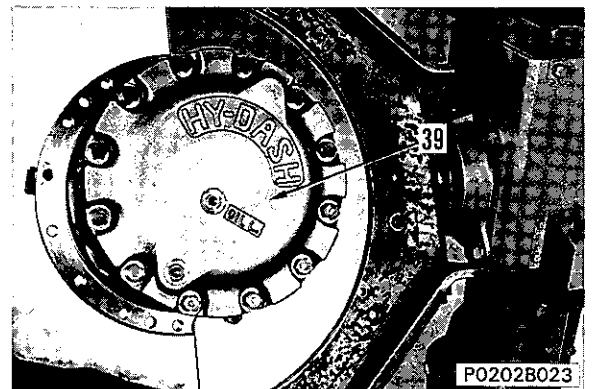
P0202B046

7. Cover

Fit thrust plate, and install cover (39).

 Three Bond No. 10

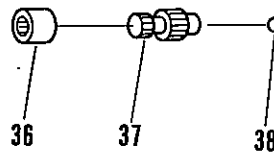
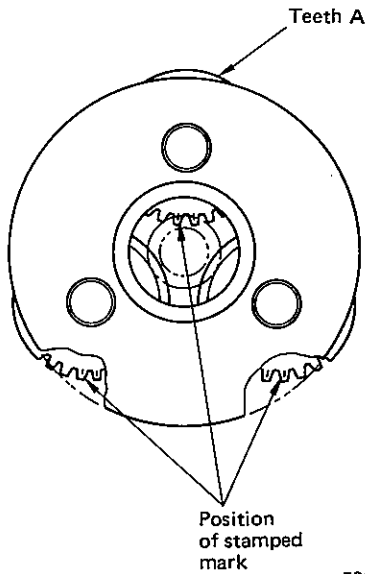
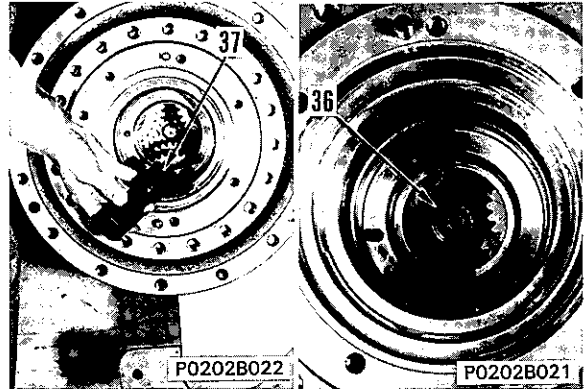
 Cover: 10 ± 0.5 kgm



P0202B023

8. Coupling, sun gear

- 1) Fit ball (38) to sun gear (37), and set stamped mark of cluster gear in position shown in diagram. Then align inner teeth of sun gear and cluster gear, and install.
- ★ Coat the ball with grease (G2-LI) to prevent it from falling out.



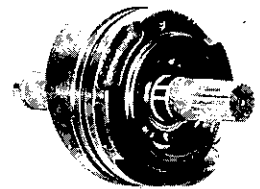
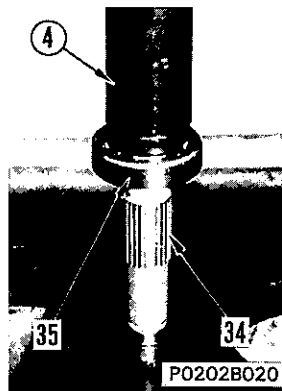
F0202B102

F0202B106

- 2) Install coupling (36) to sun gear.

9. Shaft

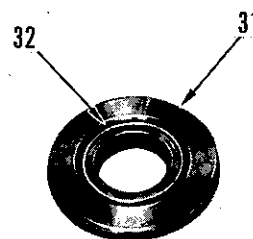
- 1) Using press-fitting kit (4), press fit bearing (35) to shaft (34).
- 2) Install shaft to swash plate.



P0202B047

10. Bearing cover

- 1) Install oil seal (32) to bearing cover.
- 2) Fit O-ring and install bearing cover (31), then secure with snap ring (30).



P0202B018

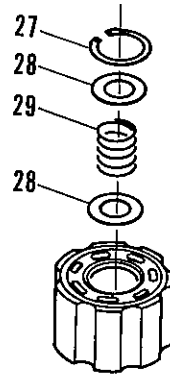


P0202B017

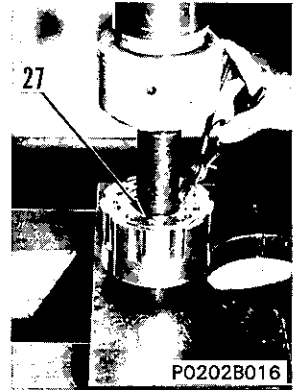
11. Cylinder block, piston, shaft assembly

★ Assemble cylinder block, piston and shaft as follows.

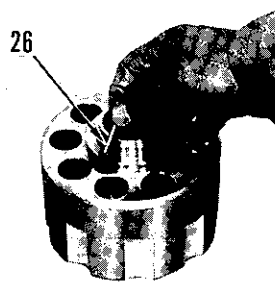
- i) Assemble washer (28) and spring (29) in cylinder block.
- ii) Set cylinder block on press, then tighten spring, and install snap ring (27).



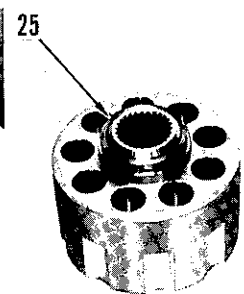
F0202B101



- iii) Install 3 straight pins (26).
- iv) Install washer (25).

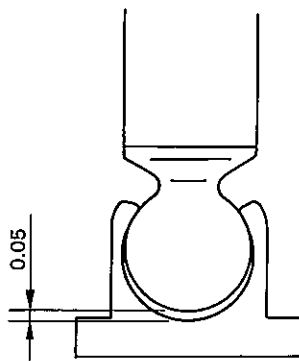


P0202B015

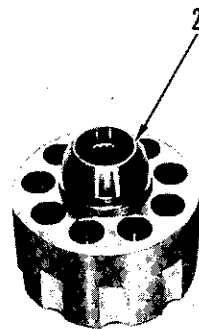


P0202B014

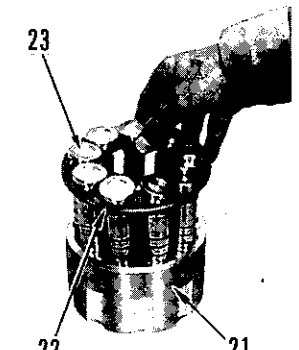
- v) Install thrust ball (24).
- vi) Install piston (23) to retainer plate (22), then assemble in cylinder block (21).
- ★ Clearance between piston and shoe: 0.05 mm



F0202B107

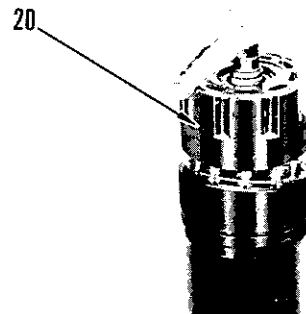


P0202B013



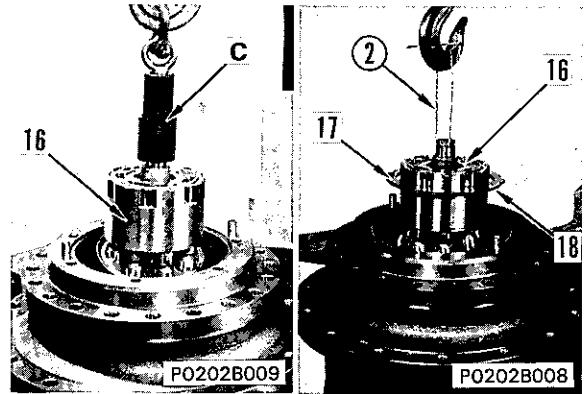
P0202B012

- vii) Install cylinder block and piston assembly (20) to swash plate and shaft.
- ★ Check that the cylinder block moves smoothly.

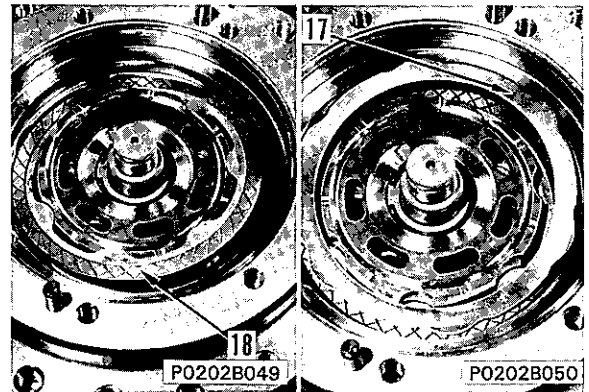


P0202B048

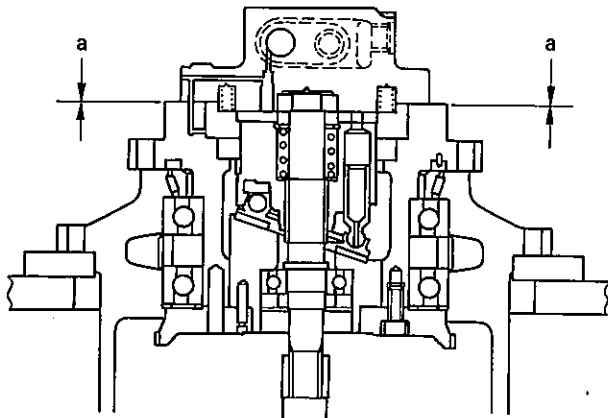
- 1) Using tool C, raise cylinder block, piston and shaft assembly (16), then align dowel pin hole of swash plate and dowel pin of coupling gear, and install.
 - ★ When not using tool C, fit wire ② in the groove of the shaft, and raise the cylinder block, piston and shaft assembly (16) to install.



- 2) Install disc (18) and plate (17).
 - ★ Disc: 1
 - ★ Plate: 1



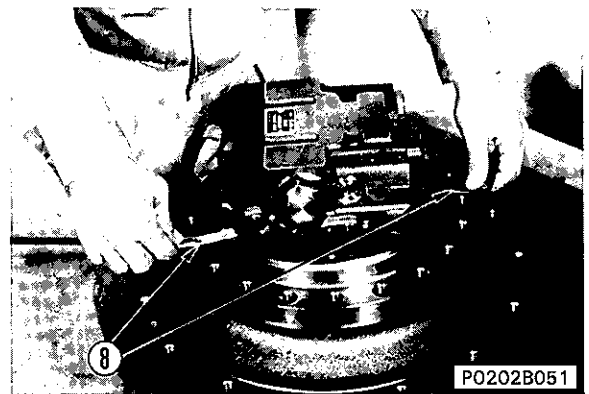
- ★ Select thickness of washer (25) as follows.
 - i) Insert feeler gauges (approx. 80μ) at 2 places between spindle and rear flange, and temporarily tighten rear flange.
 - ii) Rotate hydraulic motor shaft by hand, and adjust thickness of feeler gauge to "a" sliding fit.



F0202B108

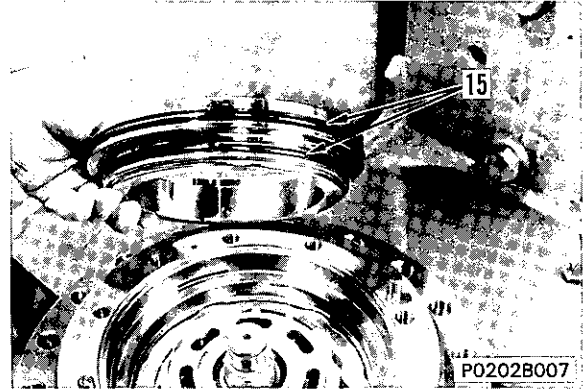
Suitable thickness (mm) = (temporarily installed thickness (see step 11. iv)) - (Thickness of feeler gauge + 0.08 mm).

- ★ After selecting the thickness, remove the rear flange, and install the hydraulic motor properly.

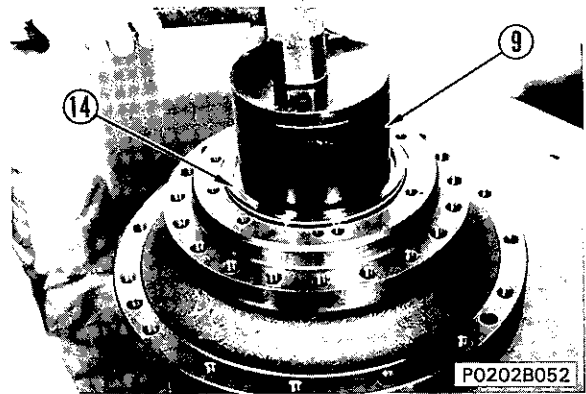


12. Piston

- 1) Install O-ring (15) to piston.




- 2) Using press-fitting kit (9), install piston (14).



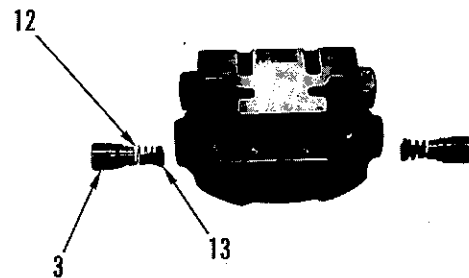
13. Rear flange

- ★ Assemble check valve as follows.

Assemble valve (13) and spring (12) to rear flange, then fit O-ring and tighten plug (3).

 Plug: 11.0 ± 0.5 kgm


- ★ Tighten the plug to the specified tightening torque after installing the rear flange to the spindle.



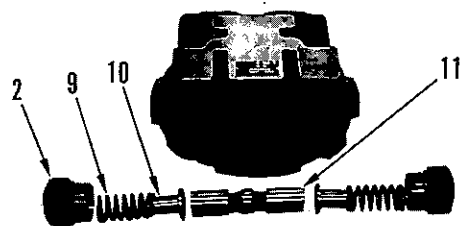
P0202B005

- ★ Assemble shuttle valve as follows.

- i) Assemble shuttle spool (11) to rear flange.
- ii) Assemble stopper (10) and spring (9) in valve, then fit O-ring and tighten plug (2).

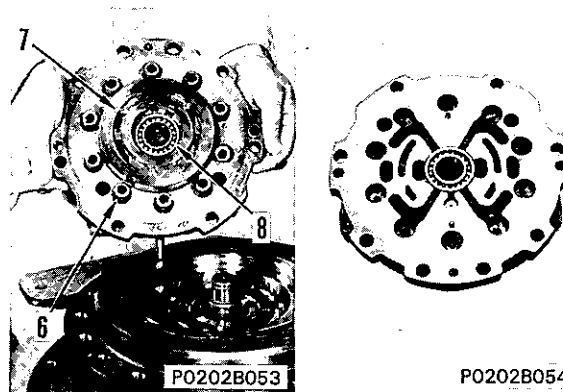
 Plug: 18.5 ± 0.9 kgm

- ★ Tighten the plug to the specified tightening torque after installing the rear flange to the spindle.




P0202B004

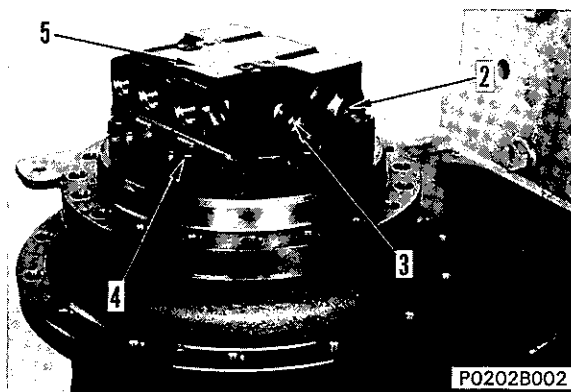
- 1) Install bearing (8) to rear flange.
- 2) Align with dowel pin, and install timing plate (7).
- 3) Install 10 springs (6).
 - ★ Coat the springs with grease (G2-LI) to prevent them from falling out.



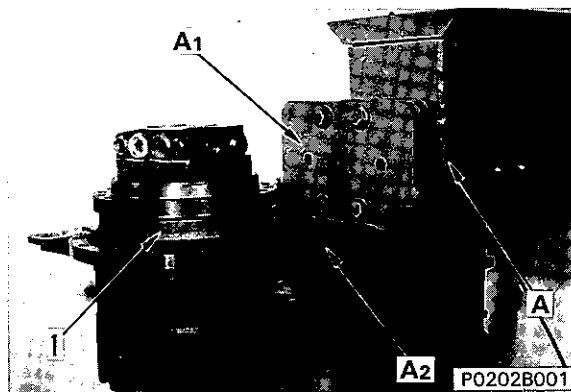
- 4) Fit O-ring and install rear flange (5), then tighten hexagonal bolts.

 kgm Hexagonal bolt: 10 ± 0.5 kgm

- ★ Tighten plugs (3) and (2) to the specified torque.



- ★ Raise travel motor assembly (1), and remove from tools A, A₁ and A₂.

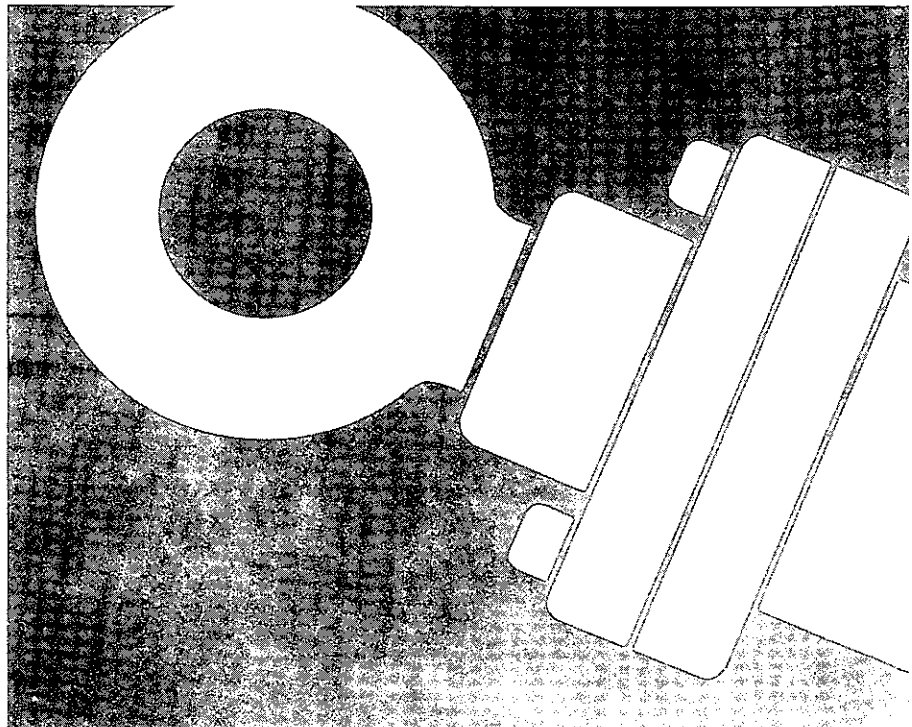


SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up



64 HYDRAULIC SYSTEM MAINTENANCE STANDARD



TIGHTENING TORQUES FOR NUTS AND BOLTS

If the tightening torque is not indicated for any nut or bolt, tighten to the values in the table below.

Unit: kg.m

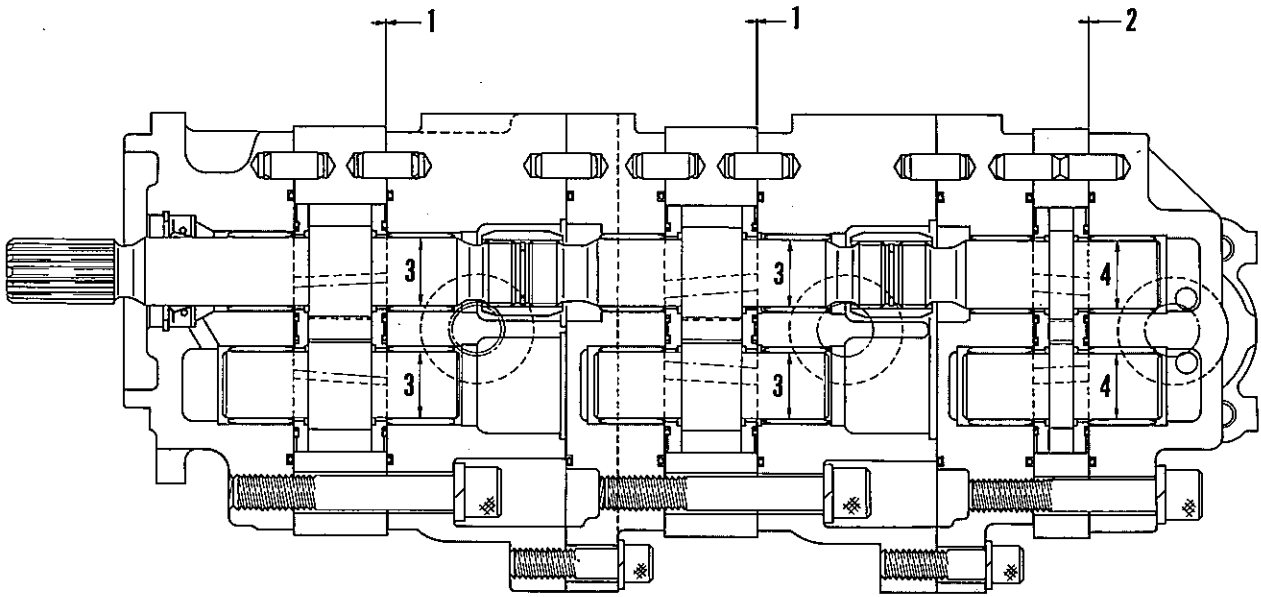
Nominal diameter of bolt (mm)	Width across flats (mm)		
		Target	Range
6	10	1.35	1.2~1.5
8	13	3.2	2.8~3.5
10	17	6.7	6 ~7.5
12	19	11.5	10 ~12.5
14	22	18	16 ~20.0
16	24	28.5	25 ~31.5
18	27	39	35 ~43.5
20	30	56	50 ~62.0
22	32	76	67.5~84.5
24	36	94.5	84 ~105
27	41	135	120~150
30	46	175	155~190
33	50	225	200~250
36	55	280	250~310
39	60	335	295~370

★ The above figures show values when a torque wrench is used.

MAINTENANCE STANDARD

Hydraulic pump	64- 4
L.H. 4-spool control valve	64- 6
R.H. 3-spool control valve	64- 8
R.H. 4-spool control valve (Option)	64-9-1
Pilot check valve	64-10
Travel acceleration selector valve	64-11
Shuttle valve	64-12
Slow return valve (Variable throttle type)	64-13
Swing brake valve	64-14
Hydraulic cylinder	64-16
Pilot check valve for auto-deceleration	64-18
Deceleration cylinder	64-19
Pressure compensated valve (Option)	64-20

HYDRAULIC PUMP



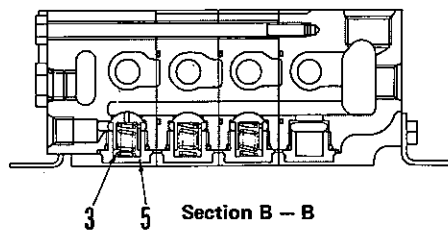
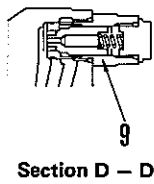
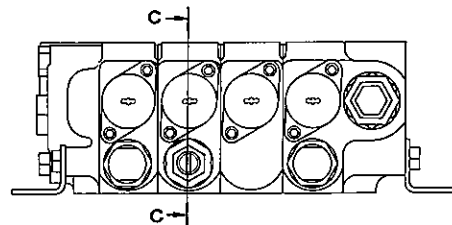
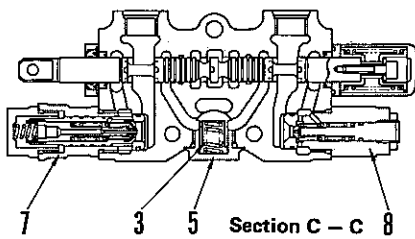
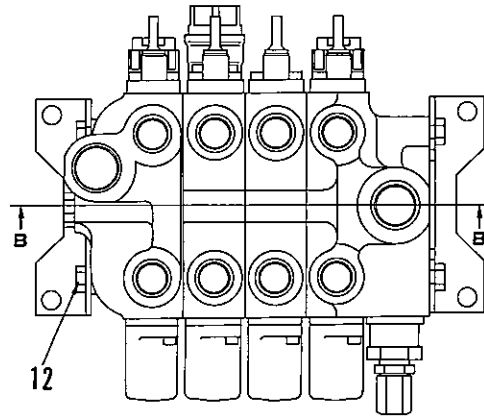
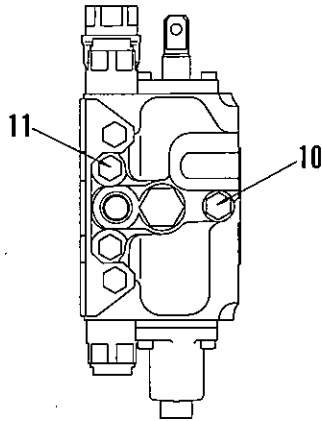
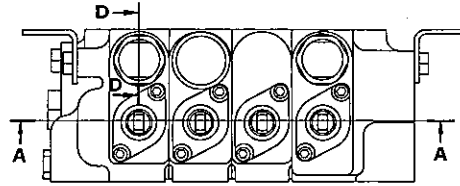
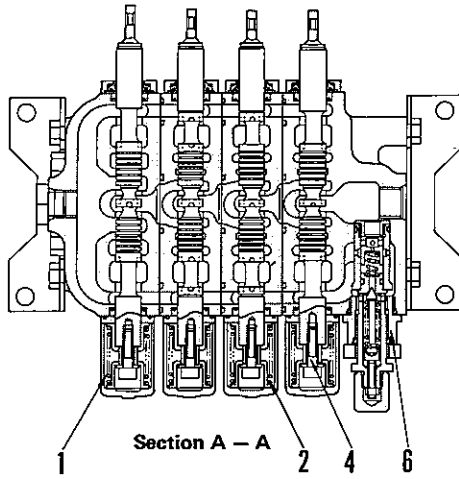
203F058

Unit: mm

No.	Check item	Criteria			Remedy	
		Serial No.	Standard clearance	Clearance limit		
1	Clearance between gear case and gear (SAR050)	PC100 13001~ PC100L 11001~	0.10 ~ 0.15	0.18		
	Clearance between gear case and gear (SAR056)	PC120 14001 ~	0.10 ~ 0.15	0.18		
2	Clearance between gear case and gear (SAR020)	PC100 13001~ PC100L 11001~	0.10 ~ 0.15	0.18		
	Clearance between gear case and gear (SAR025)	PC120 14001~	0.10 ~ 0.15	0.18		
3	Clearance between bearing I.D. and gear shaft dia. (SAR050)	PC100 13001~ PC100L 11001~	0.060 ~ 0.129	0.20		
	Clearance between bearing I.D. and gear shaft dia. (SAR056)	PC120 14001~	0.060 ~ 0.129	0.20		
4	Clearance between bearing I.D. and gear shaft dia. (SAR020)	PC100 13001~ PC100L 11001~	0.060 ~ 0.129	0.20		
	Clearance between bearing I.D. and gear shaft dia. (SAR025)	PC120 14001~	0.060 ~ 0.129	0.20		
5	Delivery (flow rate) (EO10-CD at 50°C and 210 kg/cm ²)		Standard size		Repair limit	
			Revolutions (rpm)	Delivery (ltr/min)	Revolutions (rpm)	Delivery (ltr/min)
		SAR050	2,500	112	2,500	102
		SAR020	3,000	55	3,000	50
		SAR056	2,500	129	2,500	119
	SAR025	3,000	67	3,000	62	

L.H. 4-SPOOL CONTROL VALVE

(For L.H. travel, boom acceleration, arm and swing operation)



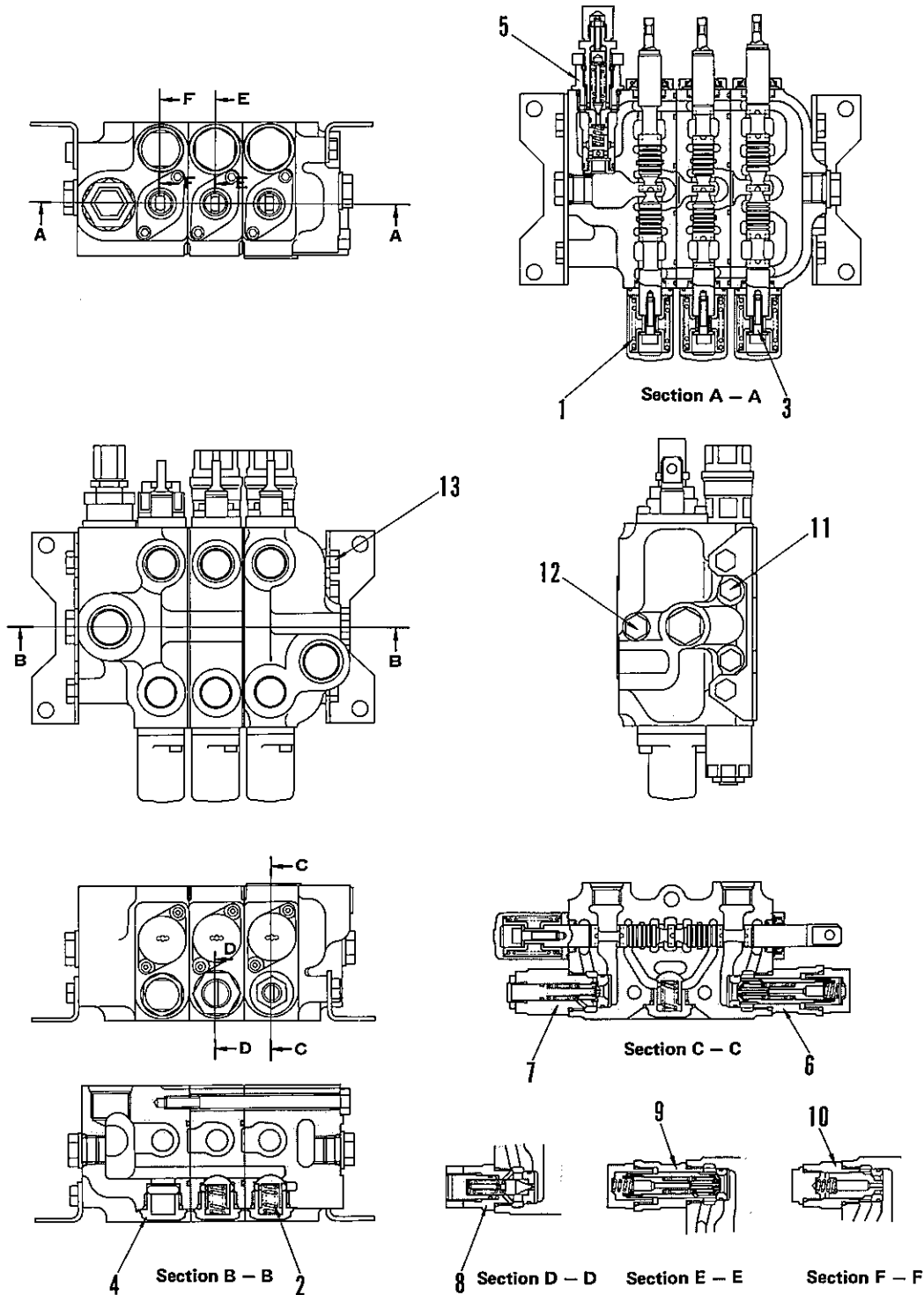
203F265

UNit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
			Free length	Installed length	Installed load	Free length	Installed load	
1	Spool return spring (for swing)	PC100: 13001~	74.1	45.2	15.5 kg	-	12.4 kg	Replace, if damaged or deformed.
		PC100L:11001~						
		PC120: 14001~						
2	Spool return spring (for arm, boom hi, left travel)	PC100: 13001~ PC100L:11001~ PC120: 14001~	74.5	45.2	13.5 kg	-	10.8 kg	
3	Check valve spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	38.5	26.0	26.0 kg	-	0.4 kg	
4	Tightening torque for plug	3.0 ± 0.5 kgm						
5	Tightening torque for plug	11.0 ± 1.5 kgm						
6	Tightening torque for main relief valve	8.5 ± 1.5 kgm						
7	Tightening torque for safety valve (for arm cylinder bottom)	5.5 ± 0.5 kgm						
8	Tightening torque for safety valve (for arm cylinder head)	5.5 ± 0.5 kgm						
9	Tightening torque for suction valve (for swing and travel motor)	5.5 ± 0.5 kgm						
10	Tightening torque for bolt	9.0 ± 1.0 kgm						
11	Tightening torque for bolt	6.0 ± 1.0 kgm						
12	Tightening torque for bolt	6.0 ± 1.0 kgm						

R.H. 3-SPOOL CONTROL VALVE

(For R.H. travel, bucket and boom operation)



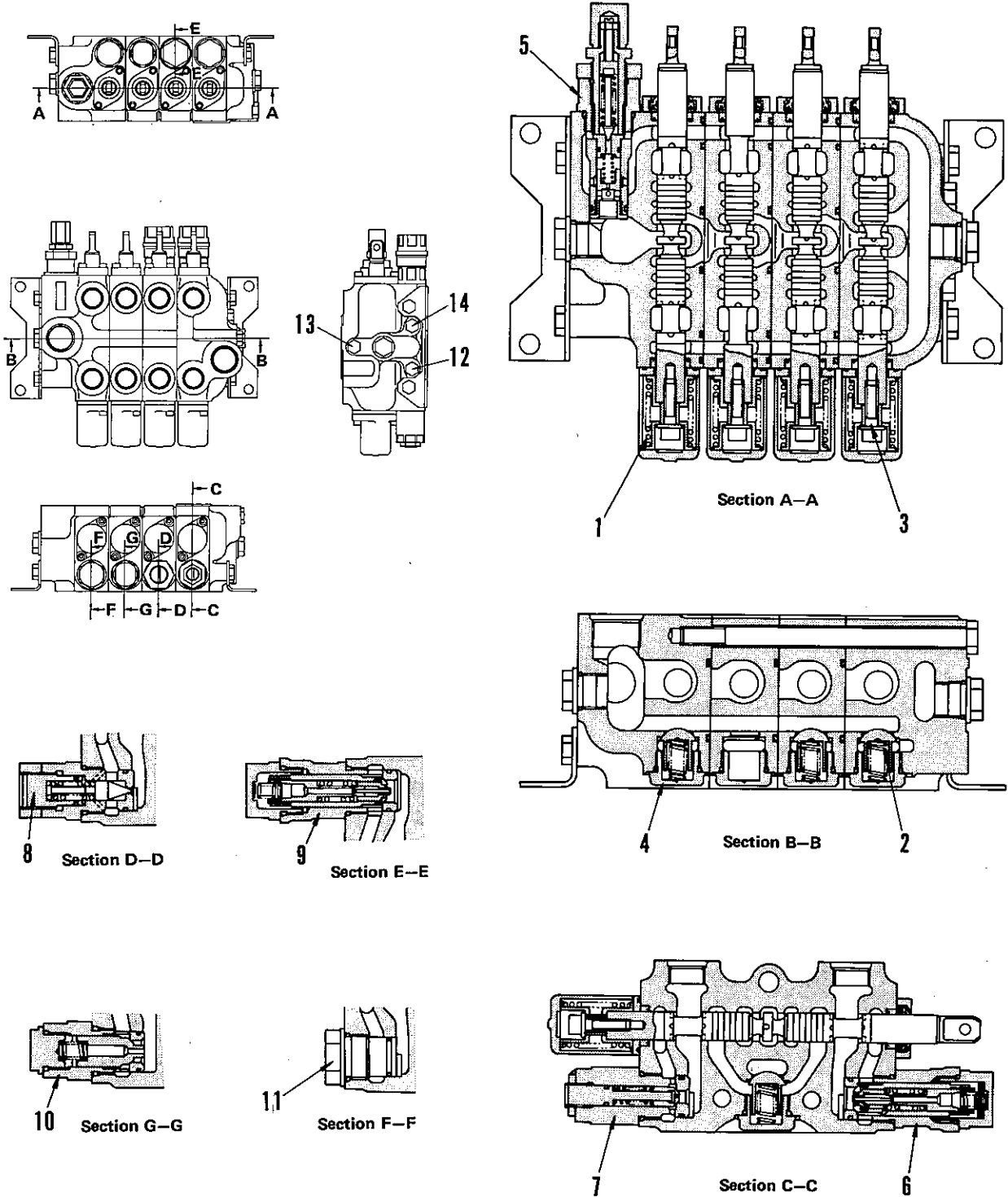
203F266

Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Spool return spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	74.5	45.2	13.5 kg	—	10.8 kg	Replace, if damaged or deformed.
		PC100: 13001~ PC100L:11001~ PC120: 14001~	38.5	26.0	0.5 kg	—	0.4 kg	
3	Tightening torque for plug	3.5 ± 0.5 kgm						
4	Tightening torque for plug	11.0 ± 1.5 kgm						
5	Tightening torque for main relief valve	6.0 ± 1.0 kgm						
6	Tightening torque for safety valve (for boom cylinder head)	5.5 ± 0.5 kgm						
7	Tightening torque for safety valve (for boom cylinder bottom)	5.5 ± 0.5 kgm						
8	Tightening torque for safety valve (for bucket cylinder head)	5.5 ± 0.5 kgm						
9	Tightening torque for safety valve (for bucket cylinder bottom)	5.5 ± 0.5 kgm						
10	Tightening torque for suction valve (for R.H. travel motor)	5.5 ± 0.5 kgm						
11	Tightening torque for bolt	6.0 ± 1.0 kgm						
12	Tightening torque for bolt	9.0 ± 1.0 kgm						
13	Tightening torque for bolt	6.0 ± 1.0 kgm						

R.H. 4-SPOOL CONTROL VALVE (OPTION)

(For R.H. travel, bucket, boom and arm acceleration operation)

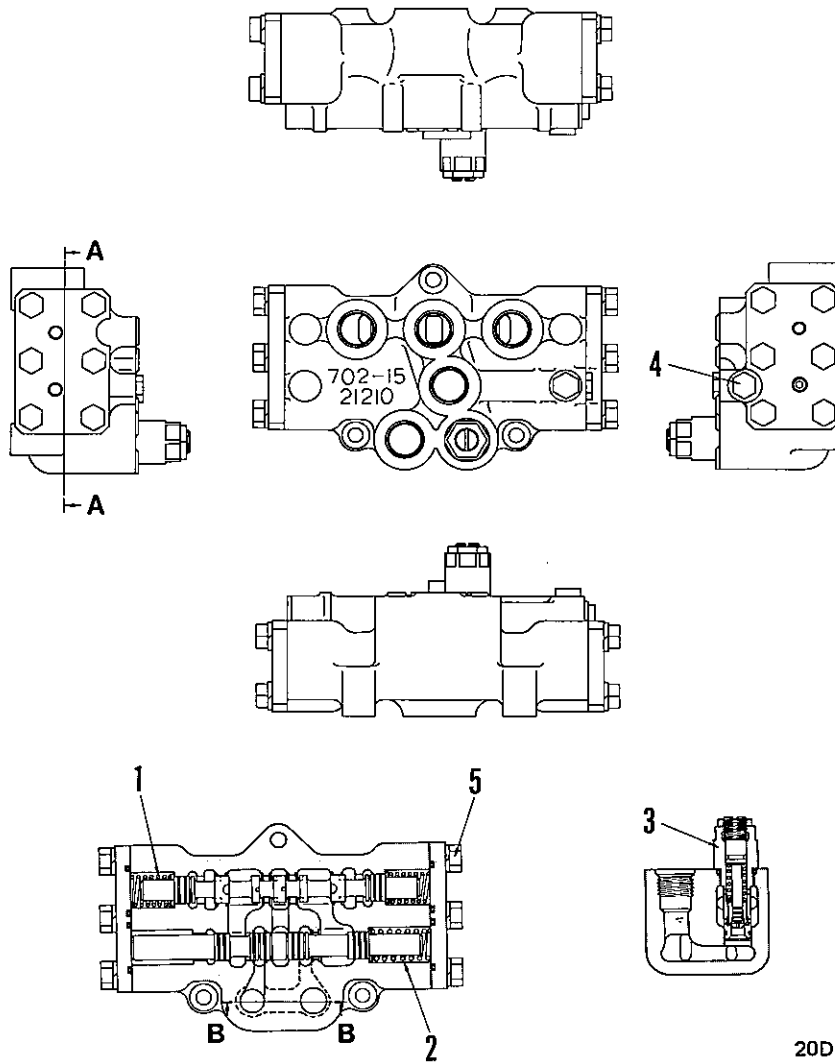


203F424

Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
			Free length	Installed length	Installed load	Free length	Installed load	
1	Spool return spring	PC120-2: 15664 -	74.5	45.2	13.5 kg	-	10.8 kg	Replace, if damaged or deformed.
2	Check valve spring	PC120-2: 15664 -	38.5	26.0	0.5 kg	-	0.4 kg	
3	Tightening torque for plug	3.5 ± 0.5 kgm						
4	Tightening torque for plug	10.5 ± 2 kgm						
5	Tightening torque for main relief valve	6.0 ± 1.0 kgm						
6	Tightening torque for safety valve (for boom cylinder head)	5.5 ± 0.5 kgm						
7	Tightening torque for safety valve (for boom cylinder bottom)	5.5 ± 0.5 kgm						
8	Tightening torque for safety valve (for bucket cylinder head)	5.5 ± 0.5 kgm						
9	Tightening torque for safety valve (for bucket cylinder bottom)	5.5 ± 0.5 kgm					Retighten	
10	Tightening torque for suction valve (for R.H. travel motor)	5.5 ± 0.5 kgm						
11	Tightening torque for plug	5.5 ± 0.5 kgm						
12	Tightening torque for bolt	9.0 ± 1.0 kgm						
13	Tightening torque for bolt	6.0 ± 1.0 kgm						
14	Tightening torque for bolt	6.0 ± 1.0 kgm						

PILOT CHECK VALVE

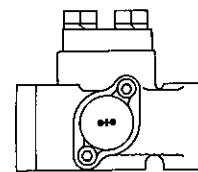
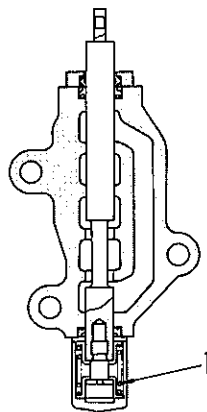
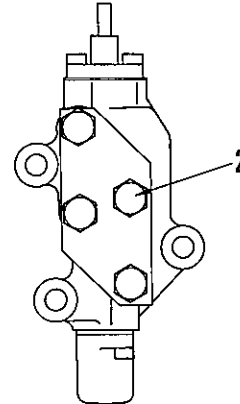
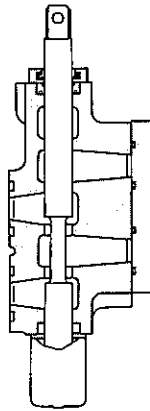
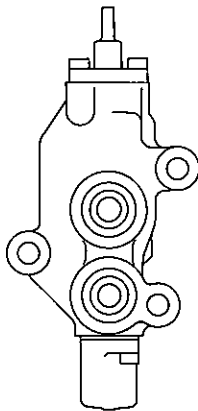
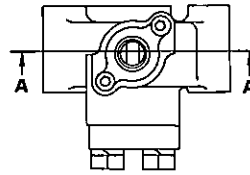


20DF162

Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Spool selector spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	65.6	28	7.2 kg	—	5.8 kg	Replace, if damaged or deformed.
2	Spool return spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	54.2	41	8.3 kg	—	6.6 kg	
3	Tightening torque for main relief valve	5.5 ± 0.5 kgm						
4	Tightening torque for plug	1.2 ± 0.1 kgm						
5	Tightening torque for bolt	5.0 ± 1.0 kgm						

TRAVEL ACCELERATION SELECTOR VALVE



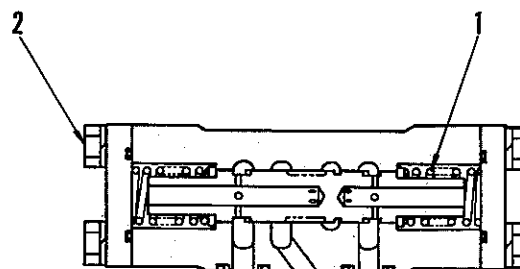
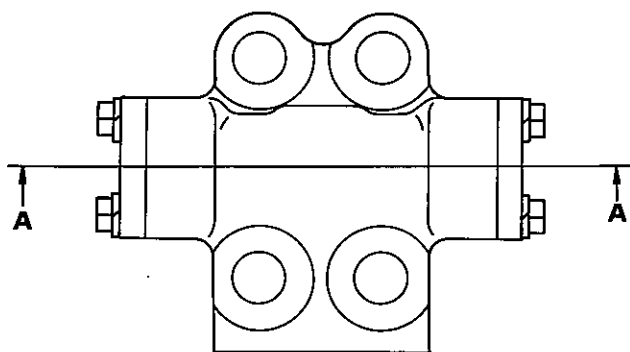
Section A - A

203F267

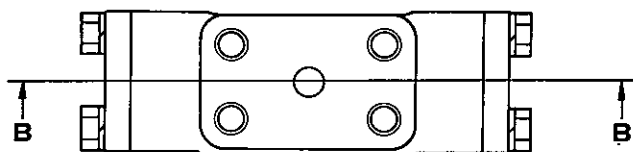
Unit: mm

No.	Check item	Criteria						Remedy
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Spool return spring	PC100: 13001~ PC100L: 11001~ PC120: 14001~	44.8	26.5	11.0 kg	-	8.8 kg	Replace, if damaged or deformed.
2	Tightening torque for bolt	5.5 ± 2.0 kg						
3	Tightening torque for travel acceleration selector valve	7.0 ± 0.5 kg						

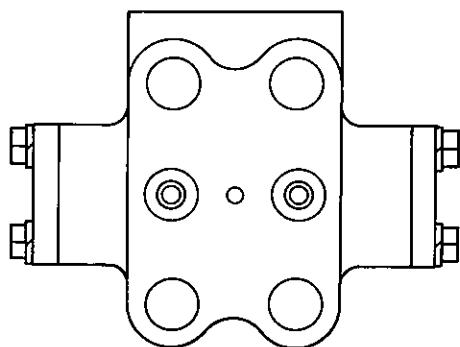
SHUTTLE VALVE



Section A - A



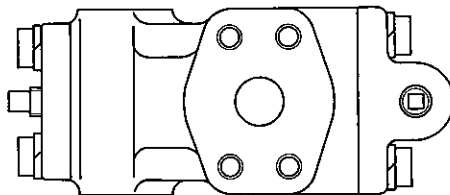
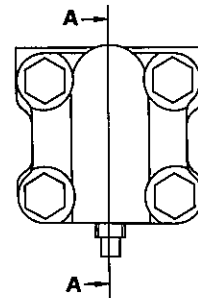
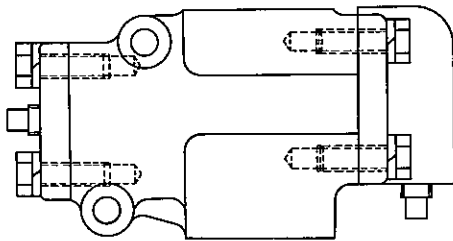
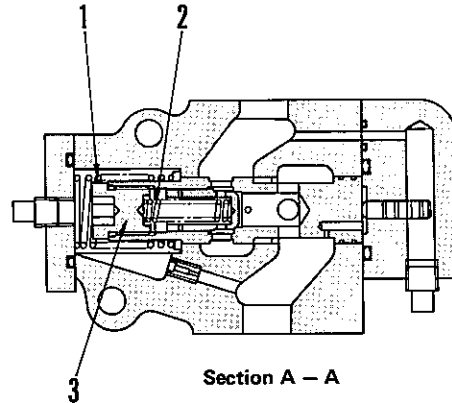
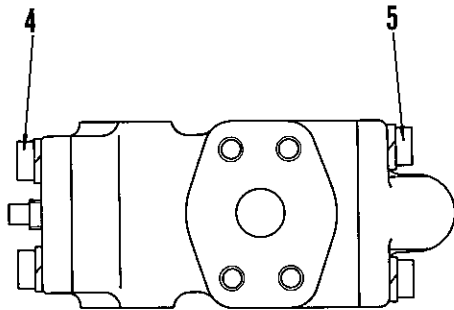
Section B - B



204F144
Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Spool selector spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	25.3	2.0	3.56 kg	—	2.8 kg	Replace, if damaged or deformed.
2	Tightening torque for bolt	1.4 ± 0.1 kgm						
3	Tightening torque for shuttle valve	3.0 ± 0.5 kgm						

SLOW RETURN VALVE (Variable throttle type)

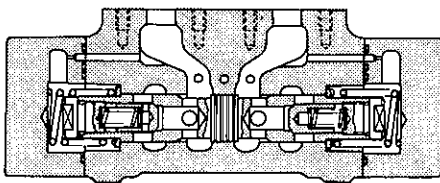
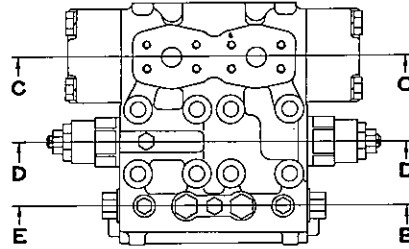
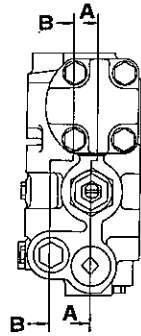


203F268

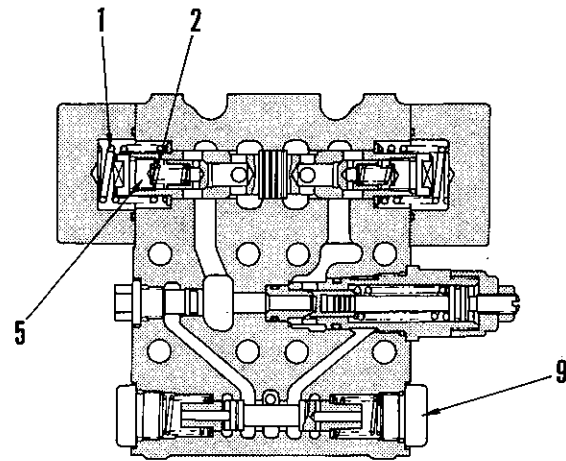
Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Spool return spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	44.5	32.7	9.9 kg	—	7.9 kg	Replace, if damaged or deformed.
2	Check valve spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	33.6	27.6	5.2 kg	—	4.2 kg	
3	Tightening torque for plug	6.5 ± 1.0 kgm						
4	Tightening torque for bolt	3.0 ± 0.5 kgm						
5	Tightening torque for bolt	3.0 ± 0.5 kgm						

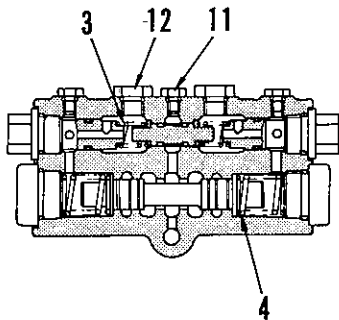
SWING BRAKE VALVE



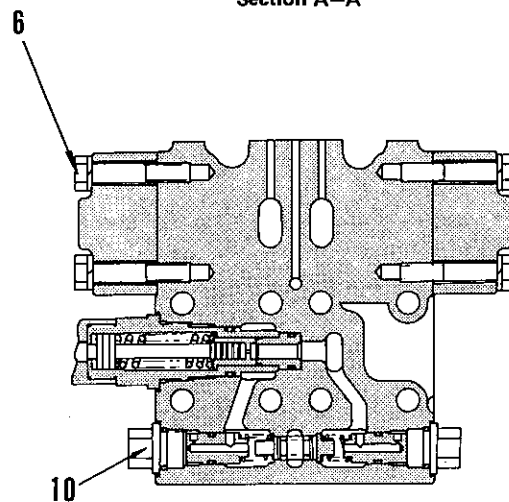
Section C-C



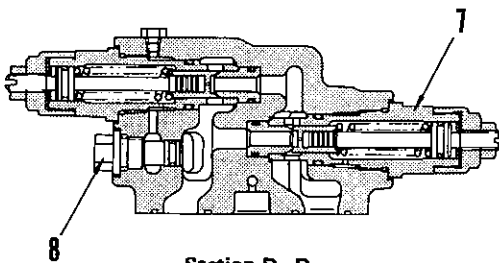
Section A-A



Section E-E



Section B-B



Section D-D

203F269

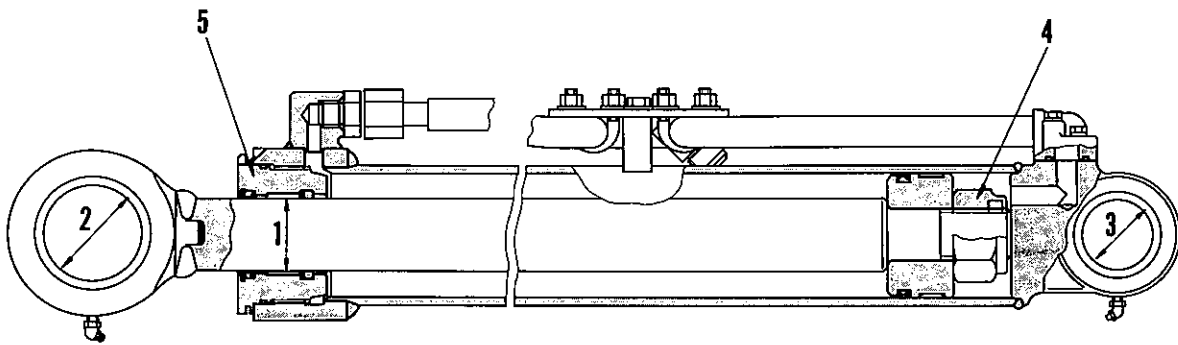
Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Spool selector spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	66.2	44	35.5 kg	—	28.4 kg	Replace, if damaged or deformed.
2	Check valve spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	27.5	26	1.5 kg	—	1.2 kg	
3	Shuttle spool spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	25.3	20	3.56 kg	—	2.8 kg	
4	Timer spool spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	52.9	30.5	9.6 kg	—	7.7 kg	
5	Tightening torque for check valve plug	8.0 ± 1.0 kgm						
6	Tightening torque for bolt	11.5 ± 1.0 kgm						
7	Tightening torque for safety valve	26.5 ± 3.5 kgm						
8	Tightening torque for plug	5.0 ± 0.5 kgm						
9	Tightening torque for plug	22.0 ± 3.0 kgm						
10	Tightening torque for plug	13.0 ± 1.5 kgm						
11	Tightening torque for plug	0.8 ± 0.1 kgm						
12	Tightening torque for plug	2.3 ± 0.2 kgm						
13	Tightening torque for brake valve	8.5 ± 1.5 kgm						

HYDRAULIC CYLINDER

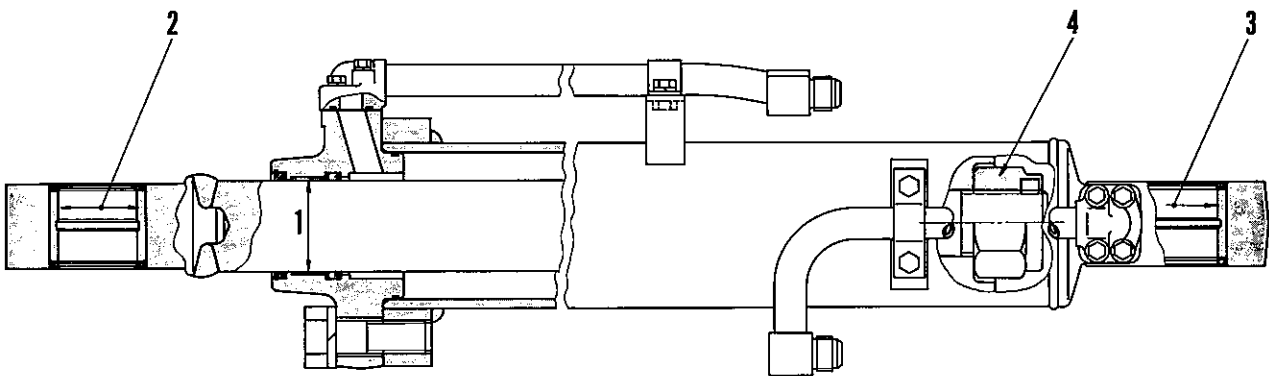
PC100, 100L-2 (Boom cylinder, Arm cylinder, Bucket cylinder)

PC120-2 (Boom cylinder, Bucket cylinder)



203F062

PC120-2 (Arm cylinder)

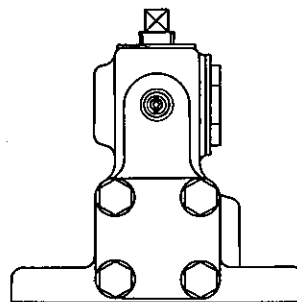
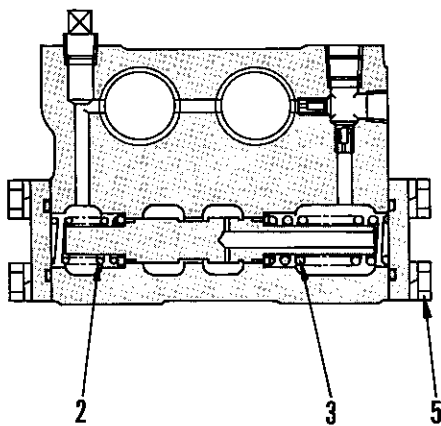
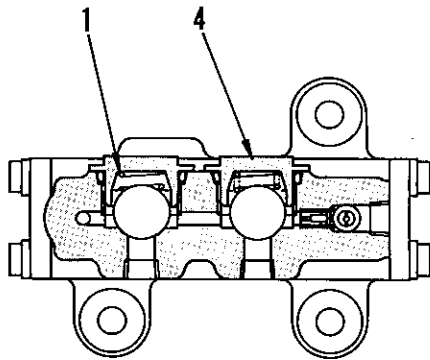


203F063

Unit: mm

No	Check item	Criteria						Remedy	
		Cylinder	Serial No.	Standard size	Tolerance		Standard clearance		Clearance limit
Shaft	Hole								
1	Clearance between piston rod and bushing	Boom cylinder	PC100 13001~ PC100L11001~	65	-0.100 -0.175	+0.260 +0.065	0.165 ~ 0.435	0.735	Replace
			PC120 14001~	70	-0.100 -0.175	+0.270 +0.075	0.175 ~ 0.445	0.745	
		Arm cylinder	PC100 13001~ PC100L11001~	70	-0.100 -0.175	+0.270 +0.075	0.175 ~ 0.445	0.745	
			PC120 14001~	80	-0.100 -0.175	+0.270 +0.060	0.160 ~ 0.445	0.745	
		Bucket cylinder	PC100 13001~ PC100L11001~	65	-0.100 -0.175	+0.260 +0.065	0.165 ~ 0.435	0.735	
			PC120 14001~	70	-0.100 -0.175	+0.270 +0.075	0.175 ~ 0.445	0.745	
2	Clearance between piston rod bushing and pin	Boom cylinder	PC100 13001~ PC100L11001~ PC120 14001~	85	-0.035 -0.090	+0.455 +0.370	0.405 ~ 0.545	1.0	Replace
		Arm cylinder	PC100 13001~ PC100L11001~ PC120 14001~	70	-0.030 -0.075	+0.425 +0.350	0.380 ~ 0.500	1.0	
		Bucket cylinder	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.075	+0.425 +0.350	0.380 ~ 0.500	1.0	
3	Clearance between cylinder bottom bushing and pin	Boom cylinder	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.075	+0.425 +0.350	0.380 ~ 0.500	1.0	Replace
		Arm cylinder	PC100 13001~ PC100L11001~ PC120 14001~	70	-0.030 -0.075	+0.425 +0.350	0.380 ~ 0.500	1.0	
		Bucket cylinder	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.075	+0.425 +0.350	0.380 ~ 0.500	1.0	
4	Tightening torque for piston nut	Boom cylinder	PC100, 100L : 265 ± 26.5 kgm PC120 : 405 ± 40.5 kgm	(Width across flats: 70) (Width across flats: 80)				Replace	
		Arm cylinder	PC100, 100L : 520 ± 52 kgm PC120 : 720 ± 72 kgm	(Width across flats: 80) (Width across flats: 85)					
		Bucket cylinder	PC100, 100L : 265 ± 26.5 kgm PC120 : 520 ± 52 kgm	(Width across flats: 70) (Width across flats: 80)					
5	Tightening torque for cylinder head	Boom cylinder	PC100, 100L : 95 ± 9.5 kg.m PC120 : 100 ± 10 kg.m	Replace					
		Arm cylinder	PC100, 100L : 100 ± 10 kg.m	Replace					
		Bucket cylinder	PC100, 100L : 95 ± 9.5 kg.m PC120 : 100 ± 10 kg.m	Replace					

PILOT CHECK VALVE FOR AUTO-DECELERATION

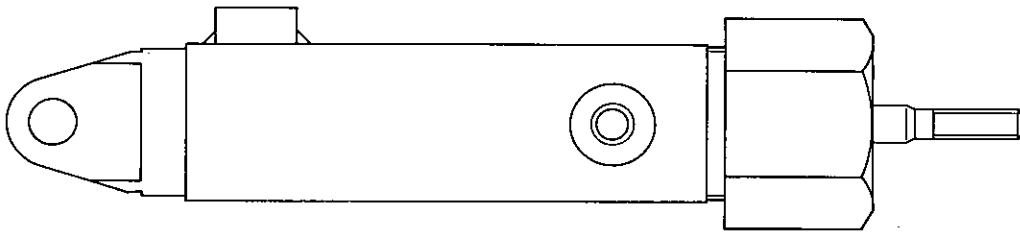
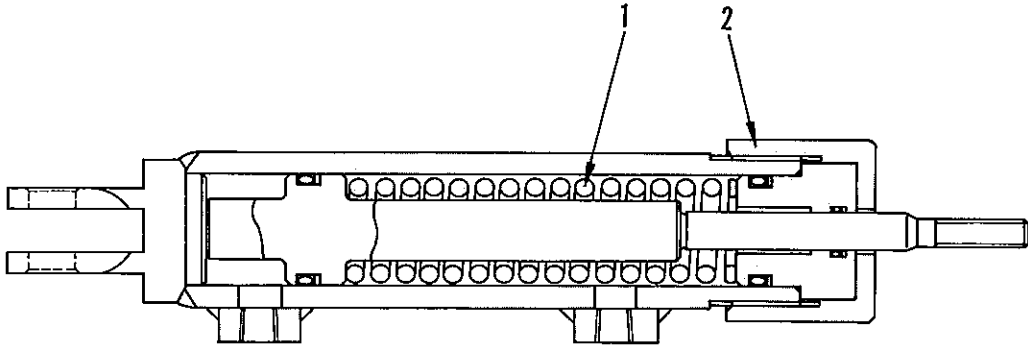


203F270

Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Check valve spring	PC100: 13001~ PC100L:11001~ PC120: 14001~	18.0	7.5	0.2 kg	—	0.16 kg	Replace, if demanged or deformed.
2	Spool selector spring (small)	PC100: 13001~ PC100L:11001~ PC120: 14001~	24.7	20.0	11.4 kg	—	9.10 kg	
3	Spool selector spring (large)	PC100: 13001~ PC100L:11001~ PC120: 14001~	45.0	36.0	18.4 kg	—	14.70 kg	
4	Tightening torque for plug	7.0 ± 1.0 kgm						
5	Tightening torque for bolt	1.4 ± 0.1 kgm						

DECELERATION CYLINDER

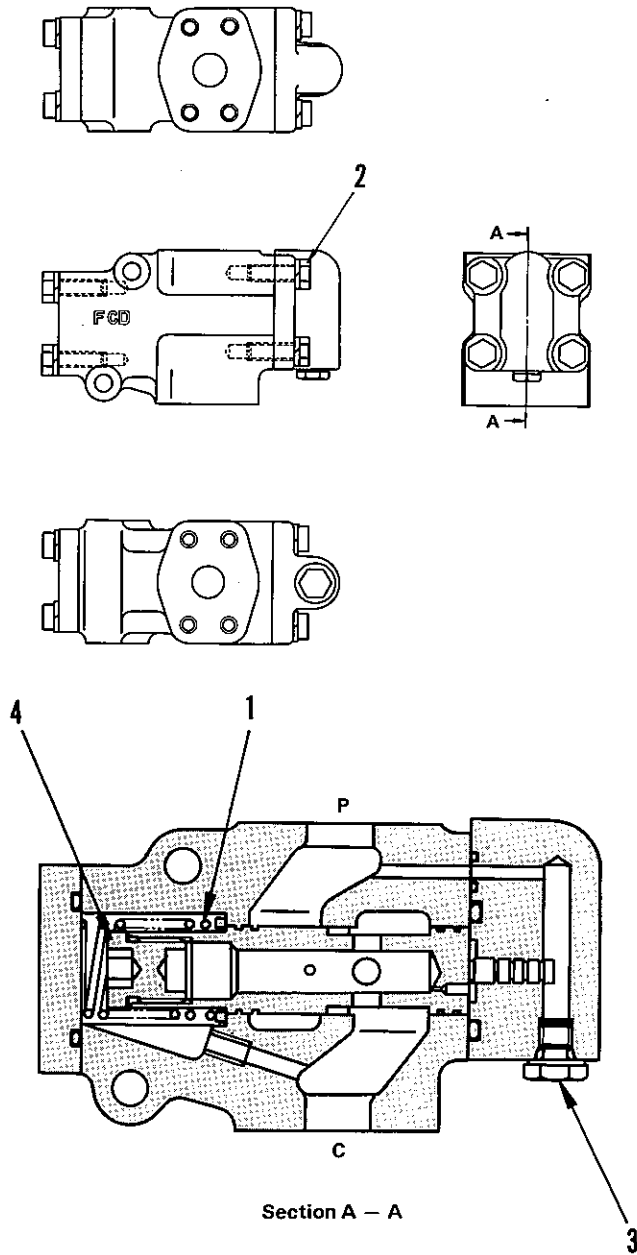


203F271

Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size			Repair limit		
	Free length		Installed length	Installed load	Free length	Installed load		
1	Piston spring	PC100 13000~ PC100L11000~ PC120 14000-	131.0	103.5	82.5 kg	—	60.0 kg	Replace, if damaged or deformed.
2	Tightening torque for bolt	38.0 kgm						

PRESSURE COMPENSATED VALVE (OPTION)



F202B015

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
1	Spool selector spring	—	32.7 mm	5.38 kg	—	4.30 kg	Replace, if damaged or deformed
2	Tightening torque for plate mounting bolt	3.0 ± 0.5 kgm					Retighten
3	Tightening torque for plug	6.5 ± 1.0 kgm					
4	Tightening torque for plug	1.75 ± 0.25 kgm					

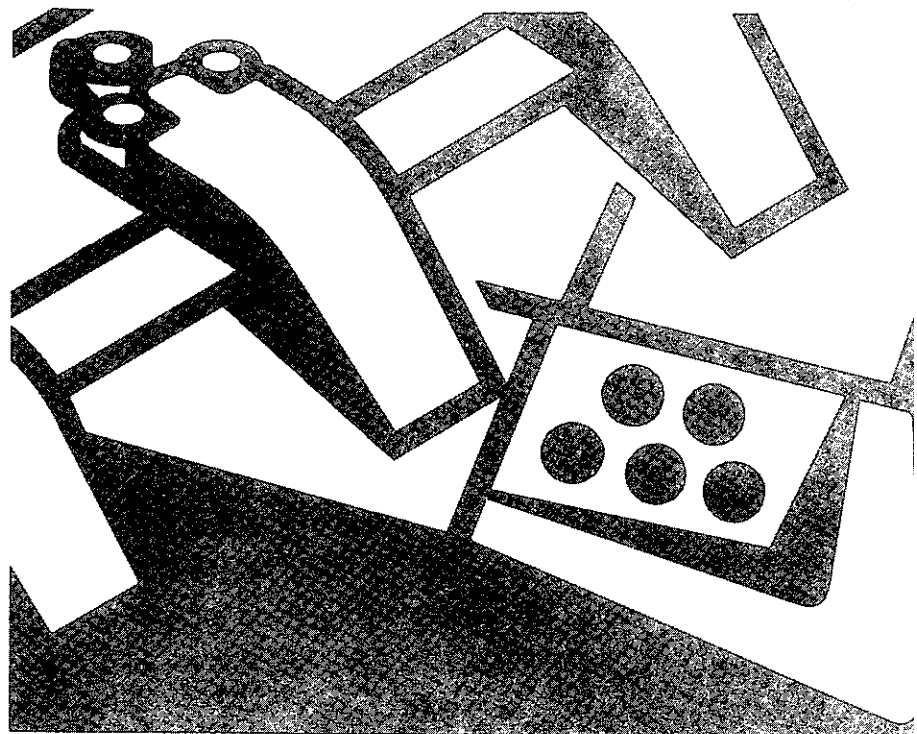
SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up

71 WORK EQUIPMENT

STRUCTURE AND FUNCTION



C

C

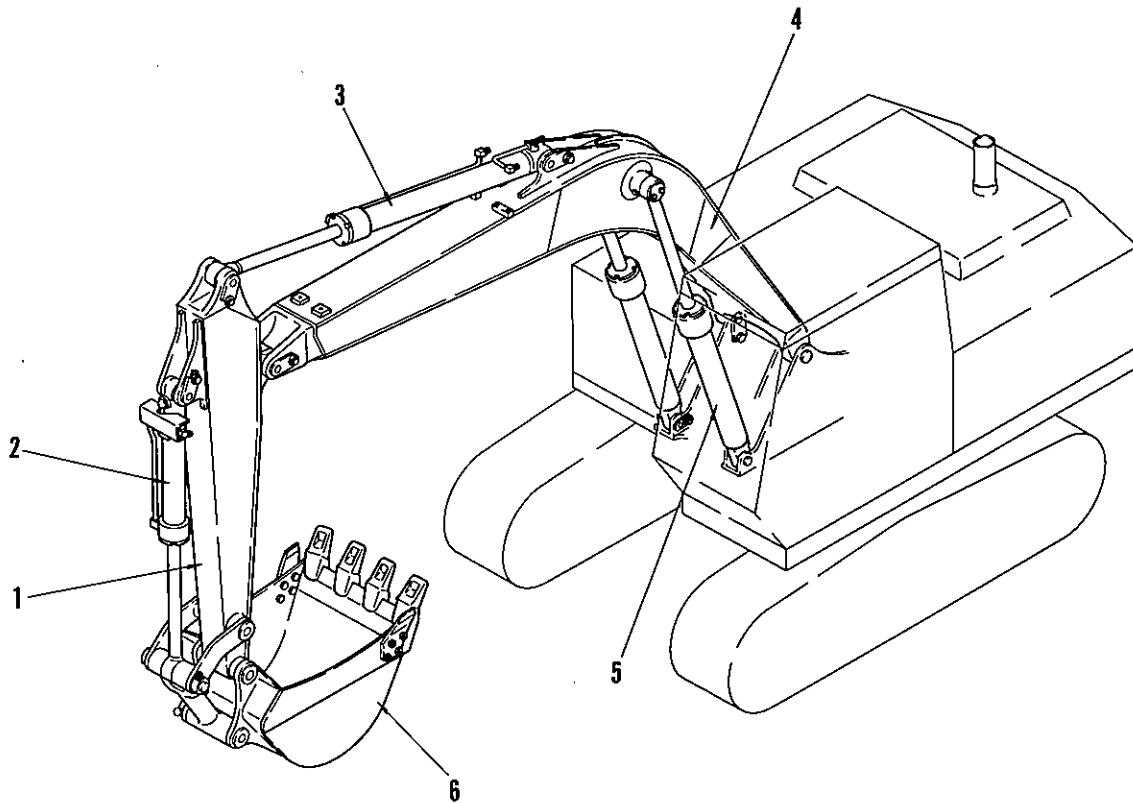
C

C

STRUCTURE AND FUNCTION

Work equipment	71-4
Attachment	71-5

WORK EQUIPMENT

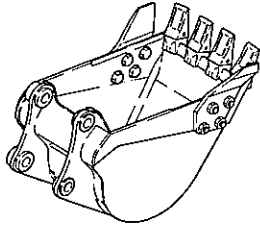
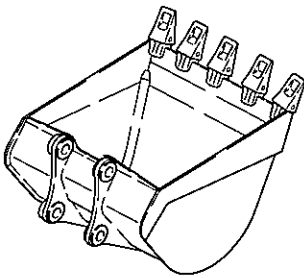
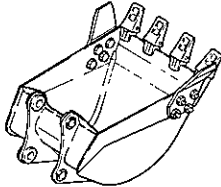
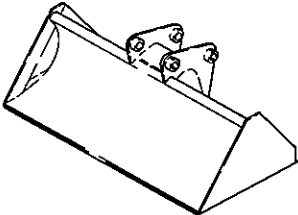


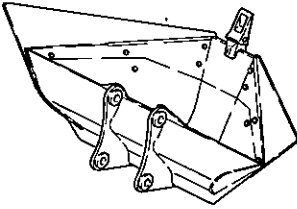
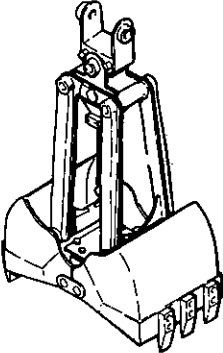
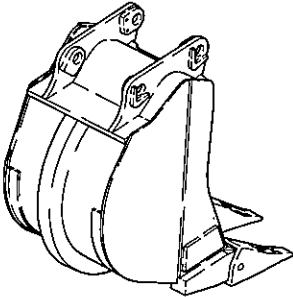
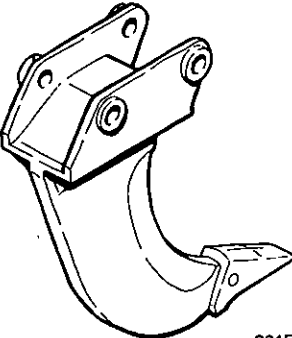
203F272

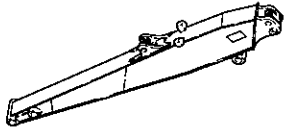
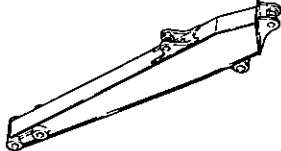
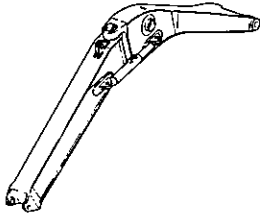
- 1. Arm
- 2. Bucket cylinder
- 3. Arm cylinder
- 4. Boom
- 5. Boom cylinder
- 6. Bucket

Note: The exactly same work equipment are used on Models PC100-2 and PC100L-2. The work equipment used on Model PC120-2, however, is different in most dimensions from the above work equipment.

ATTACHMENT

Name	Model	Application	Specifications			
Narrow bucket	 203F071	Used for digging narrow trenches or for digging hard ground beyond ability of standard bucket	Capacity (m ³)	0.33	0.26	0.16
			Bucket width (mm ³)	700	600	450
			Weight (kg)	324	312	218
			Reverse	possible	possible	possible
Light-duty bucket	 204F153	Used for loading a large quantity of relatively light material		PC100, 100L		PC120
			Capacity (m ³)	0.5		0.55
			Bucket width (mm ³)	1,000		1,000
			Weight (kg)	355		410
Reverse	possible		possible			
Shallow bucket	 203F072	Used for loading inadhesive soil	Capacity (m ³)	0.35		
			Bucket width (mm ³)	825		
			Weight (kg)	328		
			Reverse	possible		
Slope bucket	 204F155	Suitable for slope forming work Used for digging trapezoid ditches in farms and paddy fields	Compaction area (m ³)	1.7		
			Compaction width (mm)	1,820		
			Capacity (m ³)	0.34		
			Weight (kg)	550		

Name	Model	Application	Specifications			
Trapezoidal bucket	 204F156	Used for digging trapezoidal channels in farms and paddy fields	Capacity (m ³)	0.3		
			Ditching angle (deg)	45	40	38
			Bucket width (mm)	1,770	2,060	2,190
			Weight (kg)	355 (side plate 95 kg)		
Clamshell bucket	 204F157	Suitable for digging and loading work in a restricted spot such as bridge girder foundation digging work	Capacity (m ³)	0.35		
			Bucket width (mm)	655		
			Opening width (mm)	1,670		
			Weight (kg) (incl. hydraulic cylinder)	740		
			Weight of cylinder (kg)	103		
			Opening time (sec.)	PC100, 100L : 3.5	PC120 : 2.7	
Closing time (sec.)	PC100, 100L : 2.6	PC120 : 2.0				
Ripper bucket	 204F158	Used for digging hard ground rockbed and pavements	Capacity (m ³)	0.30		
			Bucket width (mm)	780		
			Weight (kg)	540		
			Reverse	impossible		
Ripper	 204F159	Suitable for digging rocks and pavements and tree roots.	Width of shank (mm)	one ripper	three rippers	
				76	50	
			Ripping force (kg) (Bucketing force)	PC100, 100L: 5,400 PC120: 6,400	PC100, 100L: 5,490 PC120: 6,500	
Weight (kg)	340	600				

Name	Model	Application	Specifications				
			PC100	PC100L	PC120		
Long arm	 <p>204F160</p>	Suitable for digging deep beyond the ability of semi-long arm	Length of arm (mm) (Overall length)	2,850 (3,635)	2,850 (3,635)	3,000 (3,815)	
			Maximum digging depth (mm)	5,445	5,240	5,940	
			Maximum vertical digging depth (mm)	4,560	4,355	4,690	
			Weight (kg)	392	392	478	
Semi-long arm	 <p>204F161</p>	Suitable for digging deep beyond the ability of standard arm	Length of arm (mm) (Overall length)	2,380 (3,030)	2,380 (3,030)	2,500 (3,144)	
			Maximum digging depth (mm)	4,995	4,790	5,440	
			Maximum vertical digging depth (mm)	4,220	4,015	4,470	
			Weight (kg)	317	317	370	
Offset boom (Applicable PC100,100L only)	 <p>204F162</p>	Suitable for digging side-gutter near a fence or on a sidewalk with many obstructions	Overall length (mm) (without offset)	4,390			
			Boom length (mm) (without offset)	4,250			
			Amount offset (mm)	1st stage	556		
				2nd stage	1,075		
			3rd stage	1,520			
Weight (kg)	986						

Combinations of attachments with work equipment components

Attachment name	Standard arm	Semi-long arm	Long arm
* Narrow bucket (with small width) (bucket width: 450 mm)	○	○	○
* Narrow bucket (with small width) (bucket width: 600 mm)	○	○	○
* Narrow bucket (with small width) (bucket width: 700 mm)	○	○	PC100-2 △ PC100L-2 △ PC120-2 ○
* Shallow bottom bucket (bucket width: 825 mm)	○	○	△
* Standard bucket (PC100,100L — bucket width: 825 mm) (PC120 — bucket width: 850 mm)	○	△	△
Light-duty bucket (bucket width: 1000 mm)	△	X	X
Trapezoidal bucket (inclination variable)	○	X	X
Clamshell bucket	○	X	X
Slope bucket	○	X	X
Ripper bucket (bucket width: 780 mm)	○	X	X
One-tooth ripper	○	○	○
Three-tooth ripper	○	○	○

○ : Applicable in general operation

△ : Applicable only in a light-duty operation

X : Not applicable (not attachable)

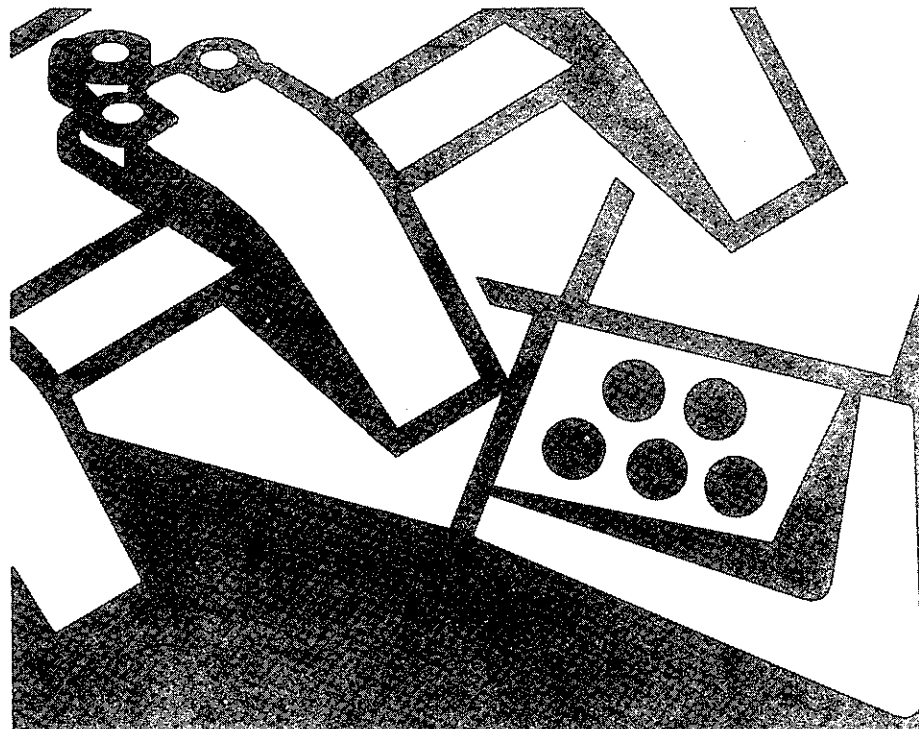
Note: Those buckets marked * are provided with side cutter.

SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up



74 WORK EQUIPMENT MAINTENANCE STANDARD



TIGHTENING TORQUES FOR NUTS AND BOLTS

If the tightening torque is not indicated for any nut or bolt, tighten to the values in the table below.

Unit: kg.m

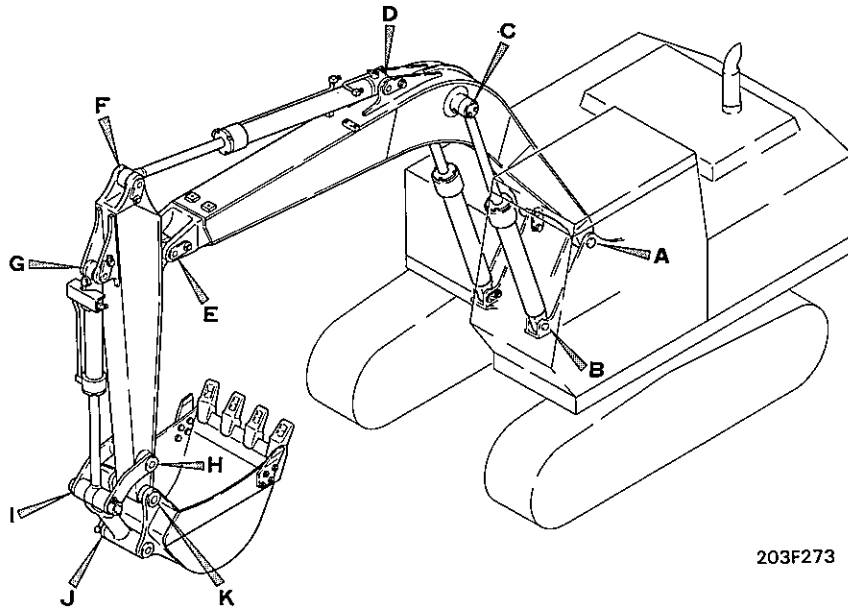
Nominal diameter of bolt (mm)	Width across flats (mm)		
		Target	Range
6	10	1.35	1.2~1.5
8	13	3.2	2.8~3.5
10	17	6.7	6 ~7.5
12	19	11.5	10 ~12.5
14	22	18	16 ~20.0
16	24	28.5	25 ~31.5
18	27	39	35 ~43.5
20	30	56	50 ~62.0
22	32	76	67.5~84.5
24	36	94.5	84 ~105
27	41	135	120~150
30	46	175	155~190
33	50	225	200~250
36	55	280	250~310
39	60	335	295~370

★ The above figures show values when a torque wrench is used.

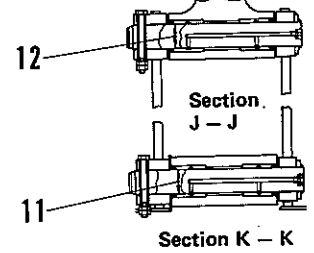
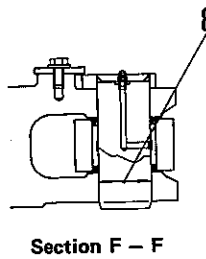
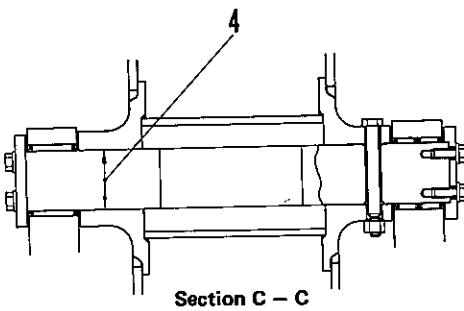
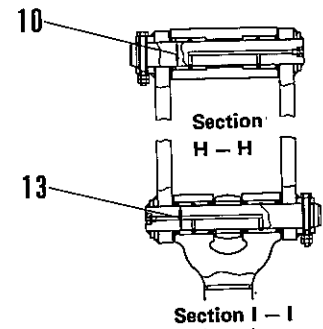
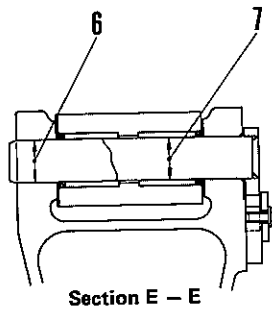
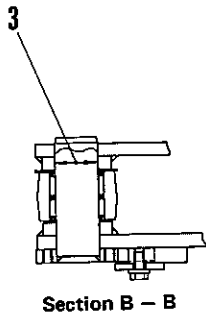
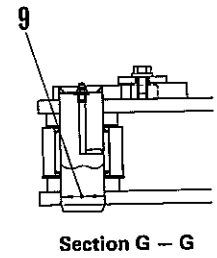
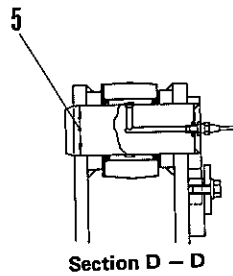
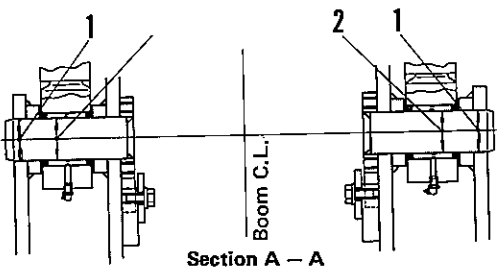
MAINTENANCE STANDARD

Work equipment 74-4

WORK EQUIPMENT



203F273



203F067

Unit: mm

No.	Check item	Criteria					Remedy	
		Serial No.	Standard size	Tolerance		Standard clearance		Clearance limit
				Shaft	Hole			
1	Clearance between revolving frame mounting pin and boss hole	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.1 0	0.030 ~0.176	0.5	
		PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.170 +0.096	0.126 ~0.246	1.0	
		PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.1 0	0.030 ~0.176	0.5	
4	Clearance between boom-to-boom-cylinder mounting pin and boss hole	PC100 13001~ PC100L11001~ PC120 14001~	85	-0.036 -0.090	+0.1 0	0.036 ~0.190	0.5	
5	Clearance between boom-to-arm-cylinder mounting pin and boss hole	PC100 13001~ PC100L11001~ PC120 14001~	70	-0.030 -0.076	+0.1 0	0.030 ~0.176	0.5	
6	Clearance between boom-to-arm mounting pin and boss hole	PC100 13001~ PC100L11001~	60	-0.030 -0.076	+0.1 0	0.030 ~0.176	0.5	
		PC120 14001~	70	-0.030 -0.076	+0.1 0	0.030 ~0.176	0.5	
7	Clearance between boom-to-arm mounting pin and bushing	PC100 13001~ PC100L11001~	60	-0.030 -0.076	+0.175 +0.103	0.133 ~0.251	1.0	
		PC120 14001~	70	-0.030 -0.076	+0.176 +0.100	0.130 ~0.252	1.0	
8	Clearance between arm-to-cylinder mounting pin and boss hole	PC100 13001~ PC100L11001~ PC120 14001~	70	-0.030 -0.076	+0.1 0	0.030 ~0.176	0.5	
9	Clearance between arm-to-bucket-cylinder mounting pin and boss hole	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.1 0	0.030 ~0.176	0.5	
10	Clearance between arm-to-link mounting pin and bushing	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.409 +0.337	0.367 ~0.485	1.0	
11	Clearance between arm-to-bucket mounting pin and bushing	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.128 +0.074	0.104 ~0.204	1.0	
12	Clearance between bucket-to-link mounting pin and bushing	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.409 +0.337	0.367 ~0.485	1.0	
13	Clearance between bucket-cylinder-to-link mounting pin and bushing	PC100 13001~ PC100L11001~ PC120 14001~	60	-0.030 -0.076	+0.409 +0.337	0.367 ~0.485	1.0	

Replace

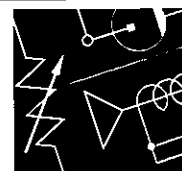
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88 ELECTRICAL SYSTEM



Electrical wiring diagram	88-3
Electrical circuit diagram	88-4
Electrical wiring diagram (Equipped with straight travel system)	88-6
Electrical circuit diagram (Equipped with straight travel system)	88-8

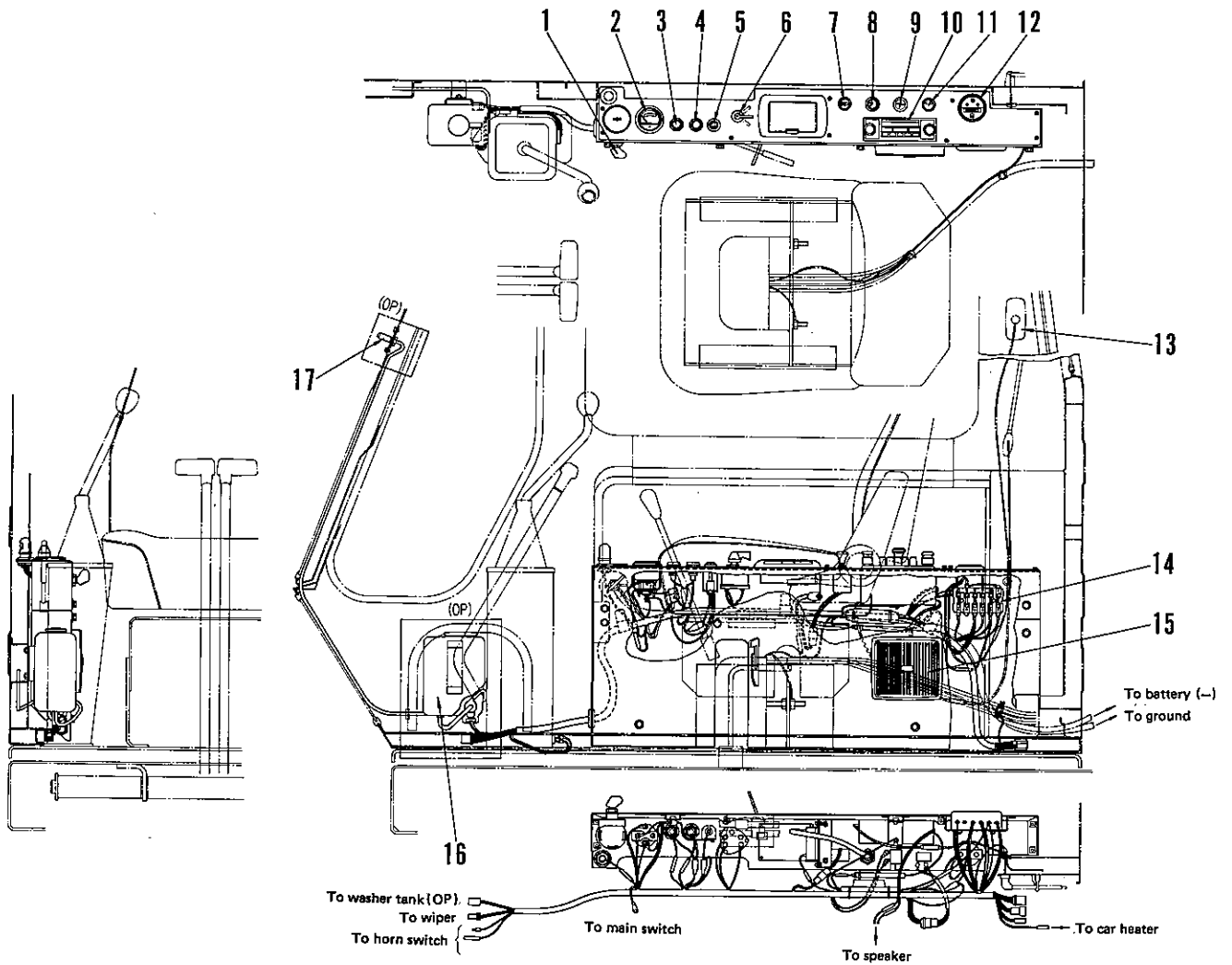
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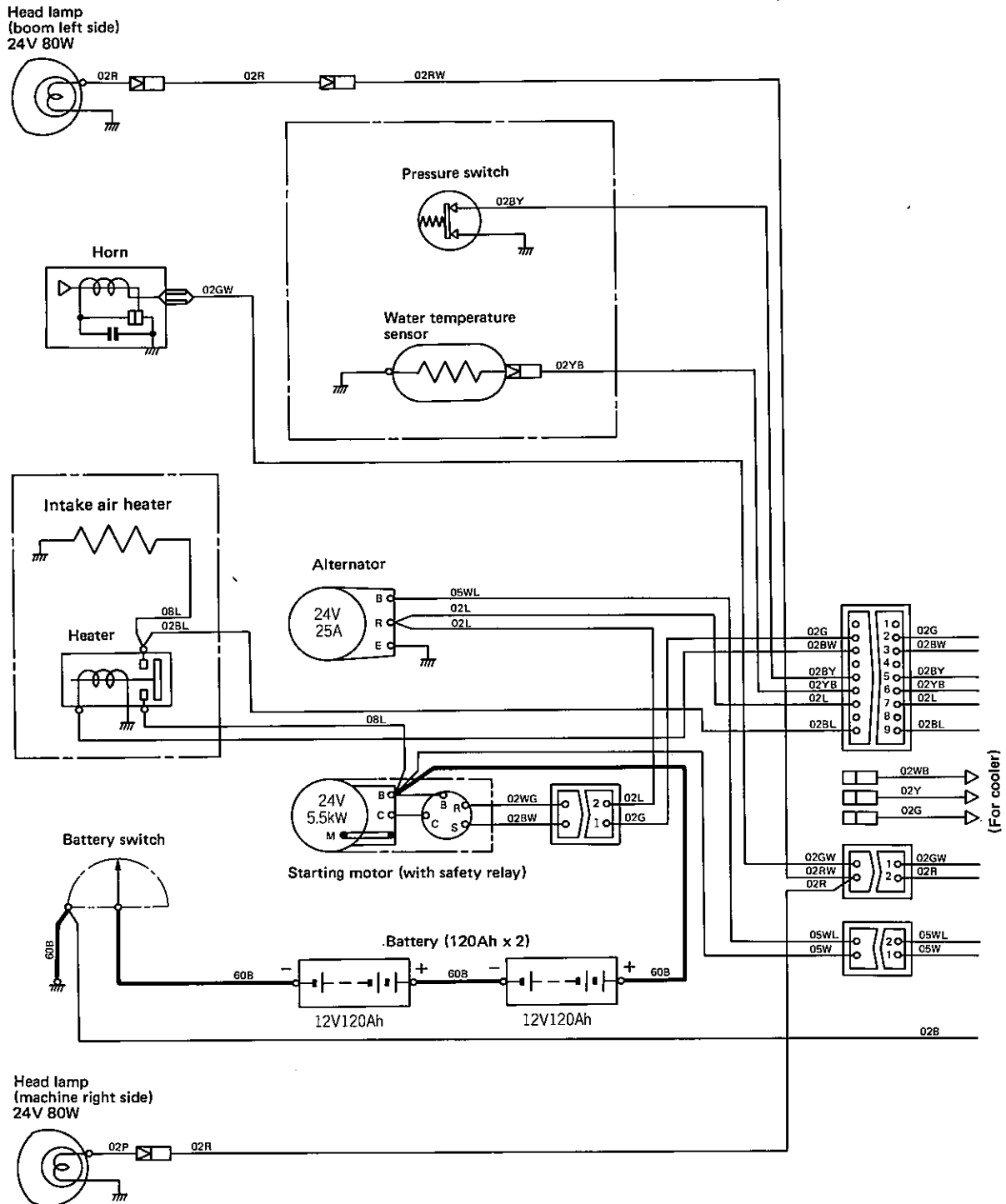
ELECTRICAL WIRING DIAGRAM



203F274

- | | |
|-------------------------------------|------------------------------|
| 1. Main switch | 10. Radio |
| 2. Engine water temperature gauge | 11. Wiper switch |
| 3. Engine oil pressure caution lamp | 12. Service meter |
| 4. Charge lamp | 13. Room lamp |
| 5. Heater signal | 14. Fuse box |
| 6. Starting switch | 15. Speaker |
| 7. Lamp switch | 16. Washer tank (optional) |
| 8. Cigarette lighter | 17. Washer nozzle (optional) |
| 9. Heater switch | |

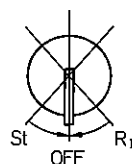
ELECTRICAL CIRCUIT DIAGRAM



Wiper switch connecting table

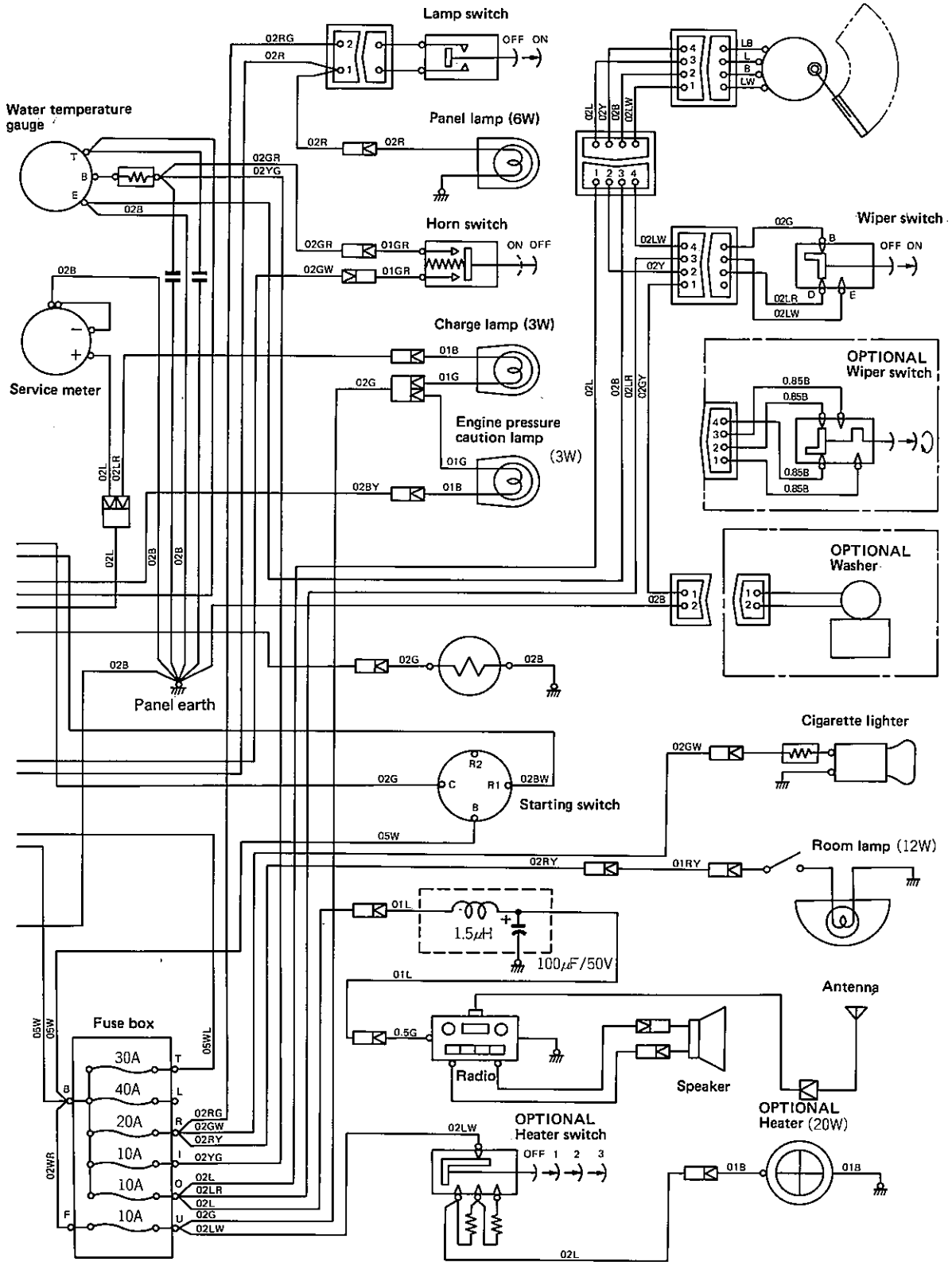
Terminal Key position	B	D	E
OFF	○—○		
ON	○—○	○—○	

Key position



Starting switch connecting table

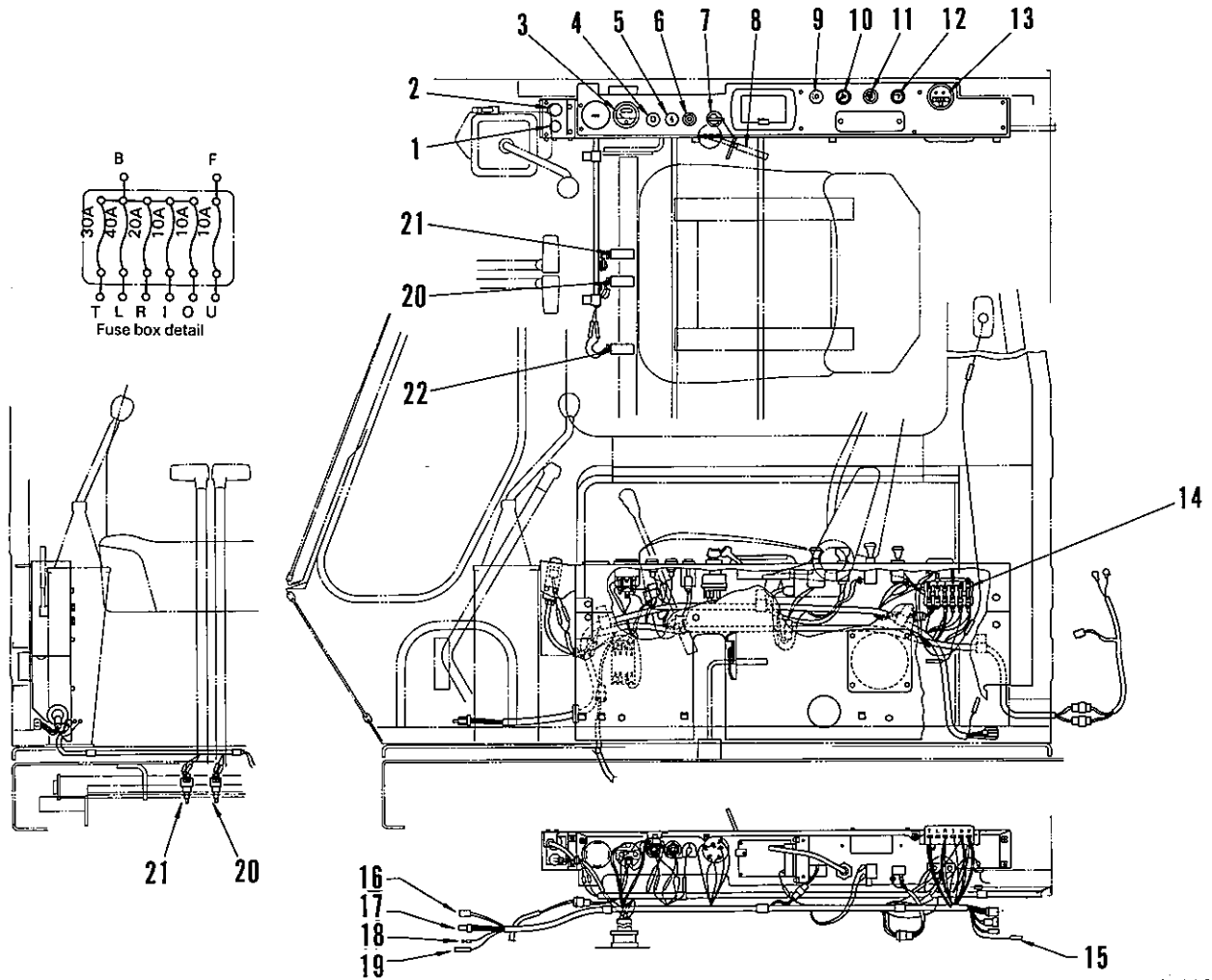
Terminal Key position	B	R ₁	R ₂	C
R ₁	○—○			
OFF	○			
St	○—○	○—○	○—○	



203F275

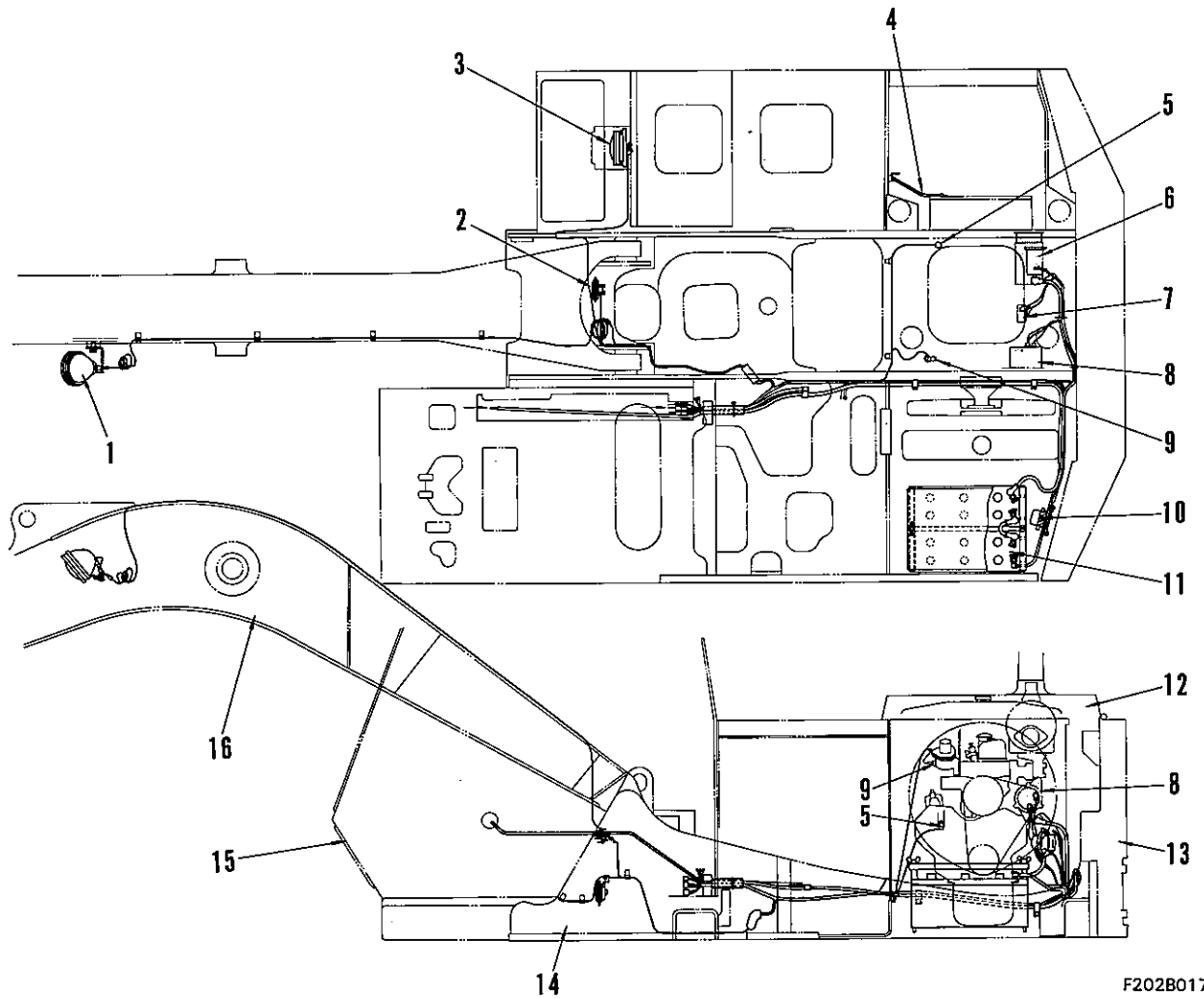
ELECTRICAL WIRING DIAGRAM (OPTION)

Equipped with straight travel system



F202B016

- | | | |
|-------------------------------------|-----------------------|--|
| 1. Brake switch | 8. Swing lock lever | 16. To washer tank |
| 2. Indicator lamp | 9. Lamp switch | 17. To wiper |
| 3. Engine water temperature gauge | 10. Cigarette lighter | 18. To horn switch |
| 4. Engine oil pressure caution lamp | 11. Heater switch | 19. To horn switch |
| 5. Charge lamp | 12. Wiper switch | 20. Limit switch for travel |
| 6. Heater signal | 13. Service meter | 21. Limit switch for travel |
| 7. Starting switch | 14. Fuse box | 22. Limit switch for swing, boom, arm and bucket |
| | 15. To car heater | |

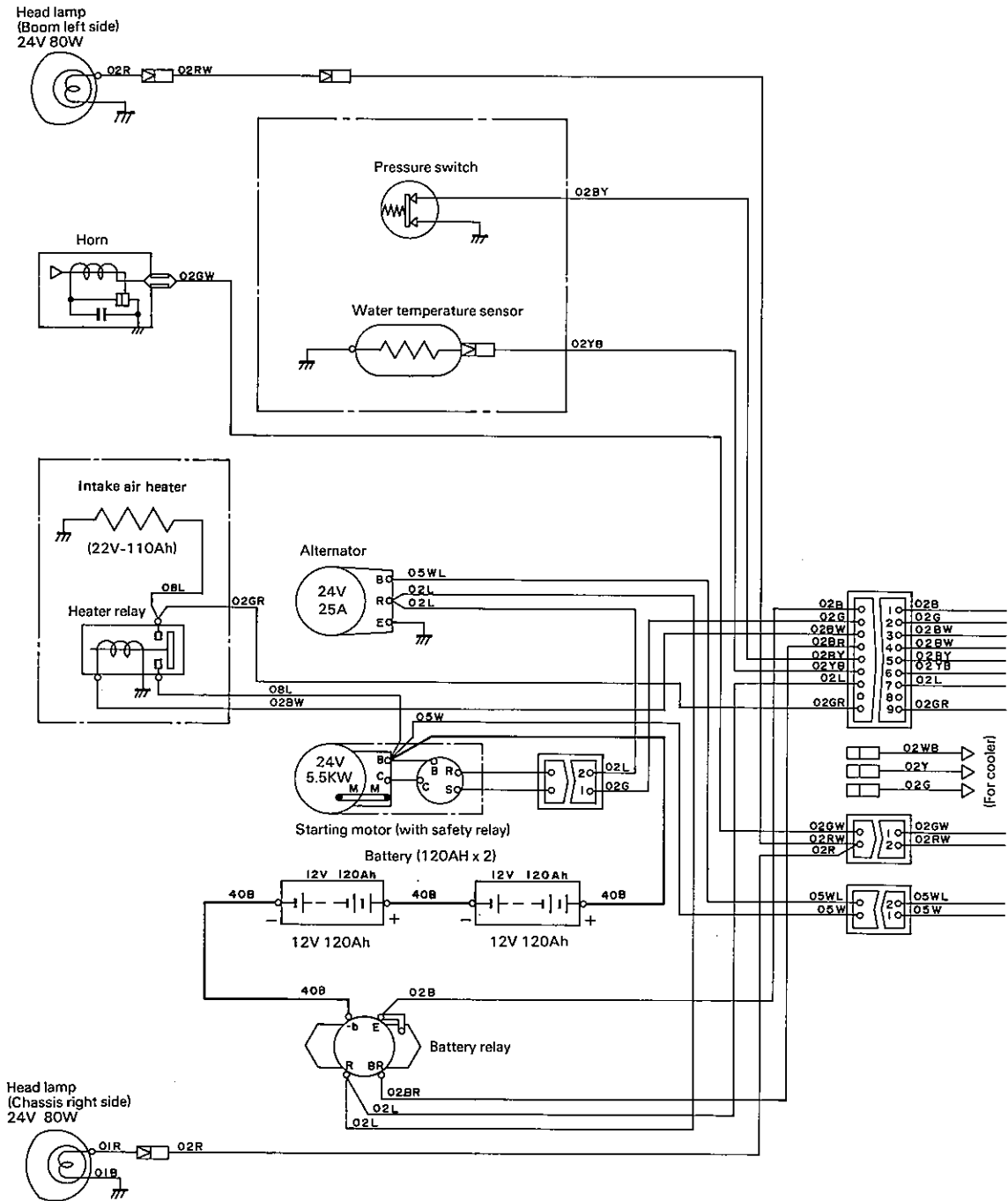


F202B017

- | | |
|----------------------------|-----------------------------|
| 1. Head lamp (boom) | 9. Water temperature sensor |
| 2. Horn | 10. Battery relay |
| 3. Head lamp | 11. Battery |
| 4. Engine ground strap | 12. Hood |
| 5. Engine oil pressure | 13. Counterweight |
| 6. Starting motor | 14. Revolving frame |
| 7. Intake air heater relay | 15. Cab |
| 8. Alternator | 16. Boom |

ELECTRICAL CIRCUIT DIAGRAM (OPTION)

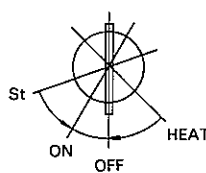
Equipped with straight travel system



Wiper switch connecting table

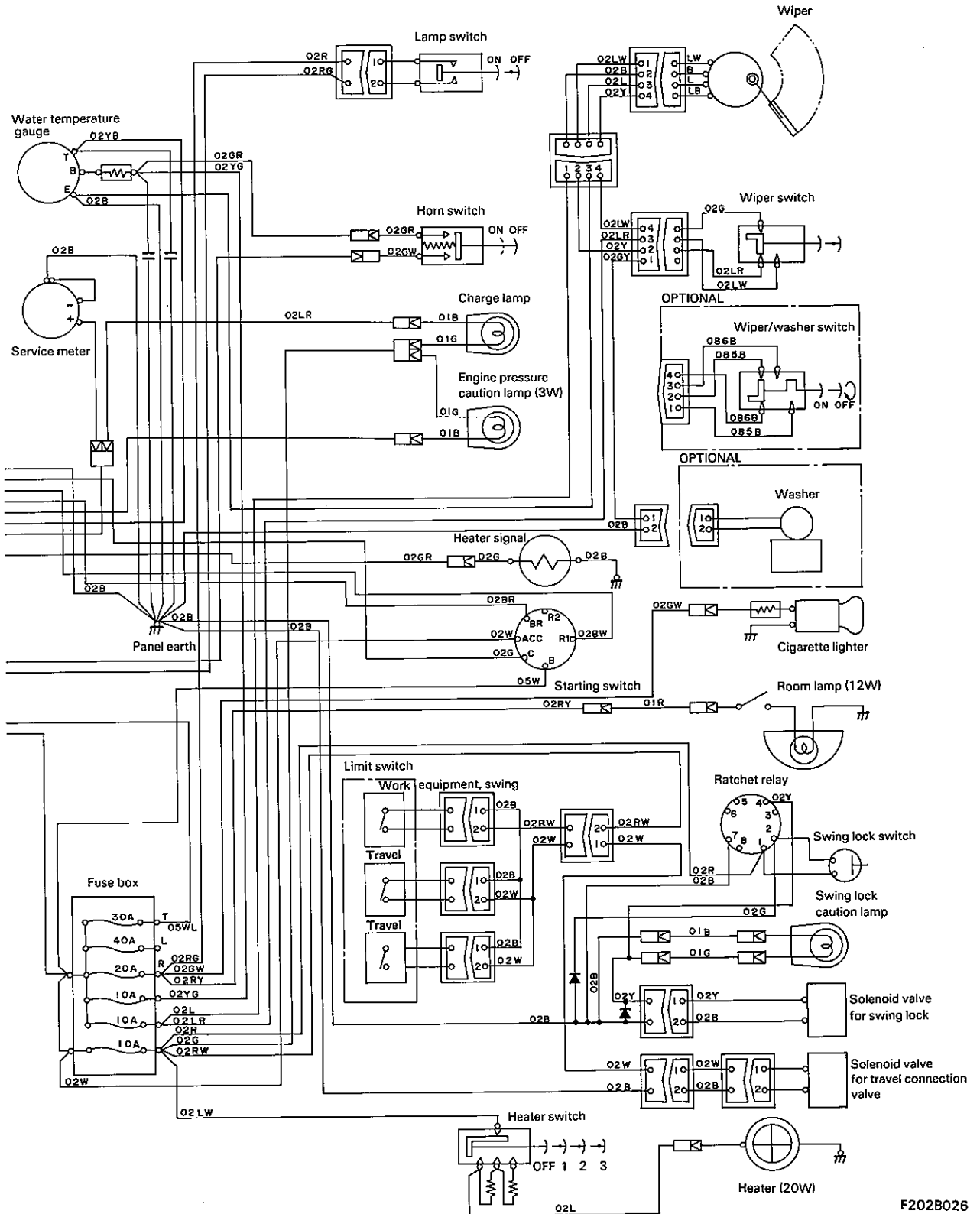
Key position \ Terminal	B	D	E
OFF	○	○	
ON	○		○

Key position



Starting switch connecting table

Terminal \ Key position	B	BR	R1	R2	C	ACC
OFF	○					
HEAT	○	○	○			○
ON	○	○				○
START	○	○	○	○	○	



F202B026

C

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SHOP MANUAL

PC100-120-2

Serial Number: PC100-2 13001 and up
 PC100L-2 11001 and up
 PC120-2 14001 and up

91 OTHERS

ELECTRICAL SYSTEM

C

C

C

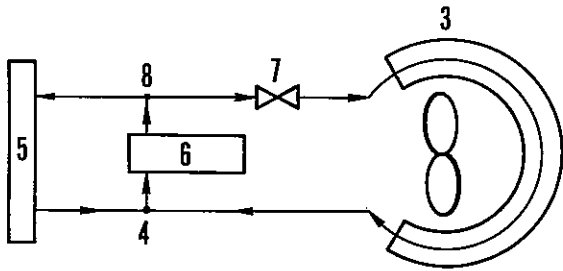
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91 OTHERS

Operator's cab heater 91-2

OPERATOR'S CAB HEATER (OPTION)

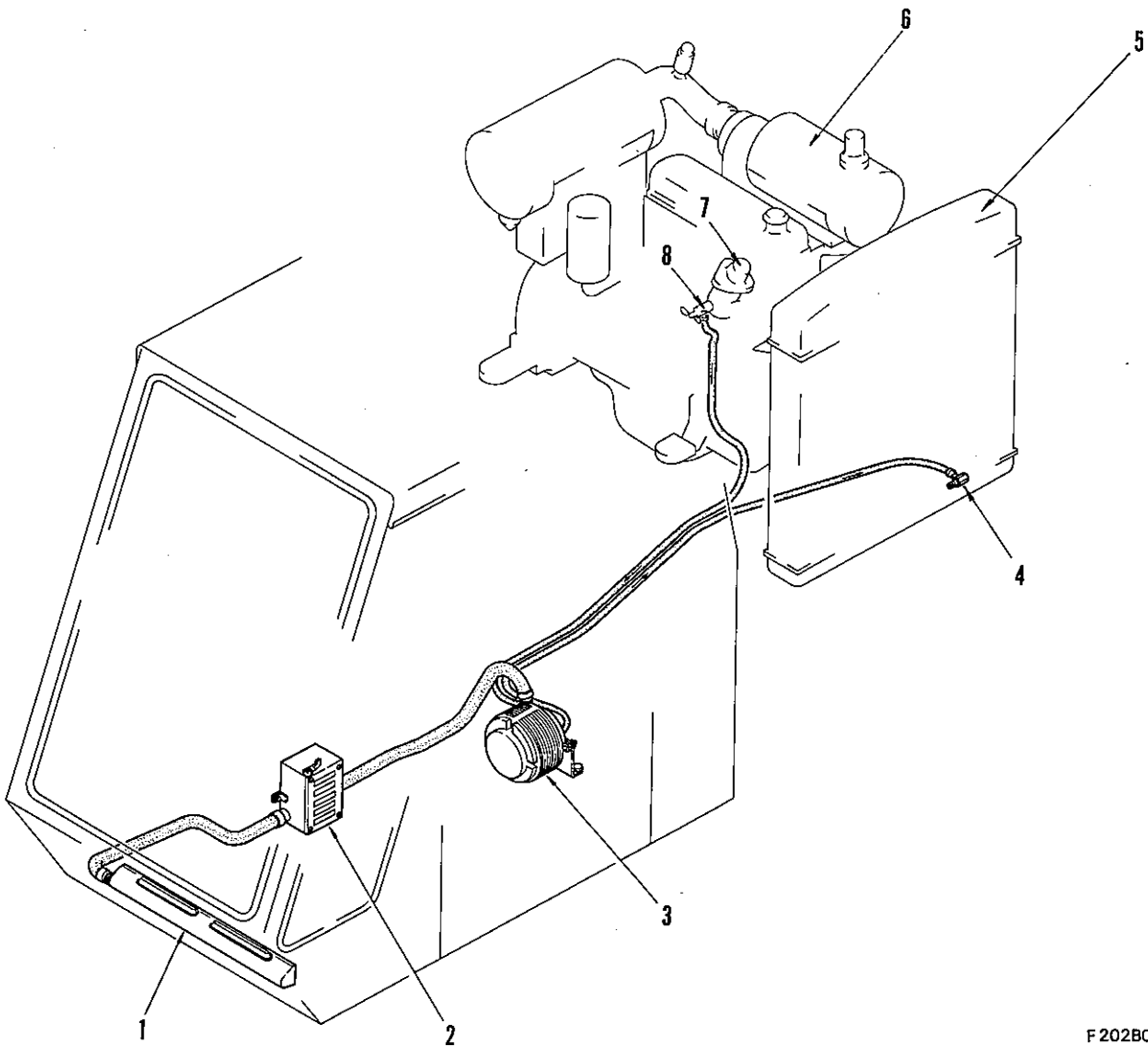
OUTLINE



F202B019

- 1. Defroster
- 2. Valve
- 3. Heater
- 4. Radiator outlet
- 5. Radiator
- 6. Engine
- 7. Radiator inlet
- 8. Cock

HEATER PIPING



F202B020

ELECTRICAL SYSTEM

Battery handling	91-4
Electrical wire code	91-5
Electrical wiring diagram	91-6
Electrical circuit diagram	91-8

BATTERY HANDLING

- Coat vaseline or grease on the battery terminals after connecting cords to the terminal parts. Do not allow vaseline or grease to adhere to the contact surfaces between the terminal posts and cords. Poor contact due to vaseline or grease will make it difficult for the engine to start.
- ★ When a battery removed from the machine is to be reinstalled, wipe the terminals with a clean cloth to thoroughly remove vaseline or grease.
- Fix the battery securely to the machine body. If loosely fitted to the machine, the battery will dance during running of the machine on rough ground, thus causing damage to the electrodes and early deterioration of the battery. On the other hand, excessive tension to the battery mounting bolts may cause breakage of the electrolyte container. "No Fire"
- When connecting a charger to the battery, connect the charger positive lead to the battery positive terminal and the charger negative lead to the battery negative terminal.
- During battery charging, the cathode issues hydrogen gas and the anode issues oxygen gas, both of which are scattered in the air through a small hole in the electrolyte filler plug for each cell. The mixture of the two gases is explosive and should be kept far away from fire.
- ★ Do not attempt under any circumstances to light a match or a lighter to check the electrolyte level in a battery in a dark place.
- "No Sparking"
The battery may park if a tool is carelessly placed on the battery over two terminals. If a spark occurs, an instantaneous large current flow will cause damage to the electrodes. Causing a battery to spark intentionally to check the degrees of battery charge, which may sometimes be performed by unformed persons, should be absolutely avoided.
- When the battery is not used for a long time, remove the battery from the machine and store it indoors. Check the specific gravity of the battery from time to time during storage and, if necessary, recharge it. A battery in storage loses its charge due to its self-discharge property and, therefore, must be recharged monthly in summer or every two months in winter.
- Specific gravity of the electrolyte
Battery charring rate can be determined by measuring the specific gravity of the electrolyte.
- When connecting a booster battery, be certain to connect the negative battery terminals together and the positive battery terminals together.

ELECTRICAL WIRE CODE

In the wiring diagrams, various colors and symbols are employed to indicate thickness of wires.

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

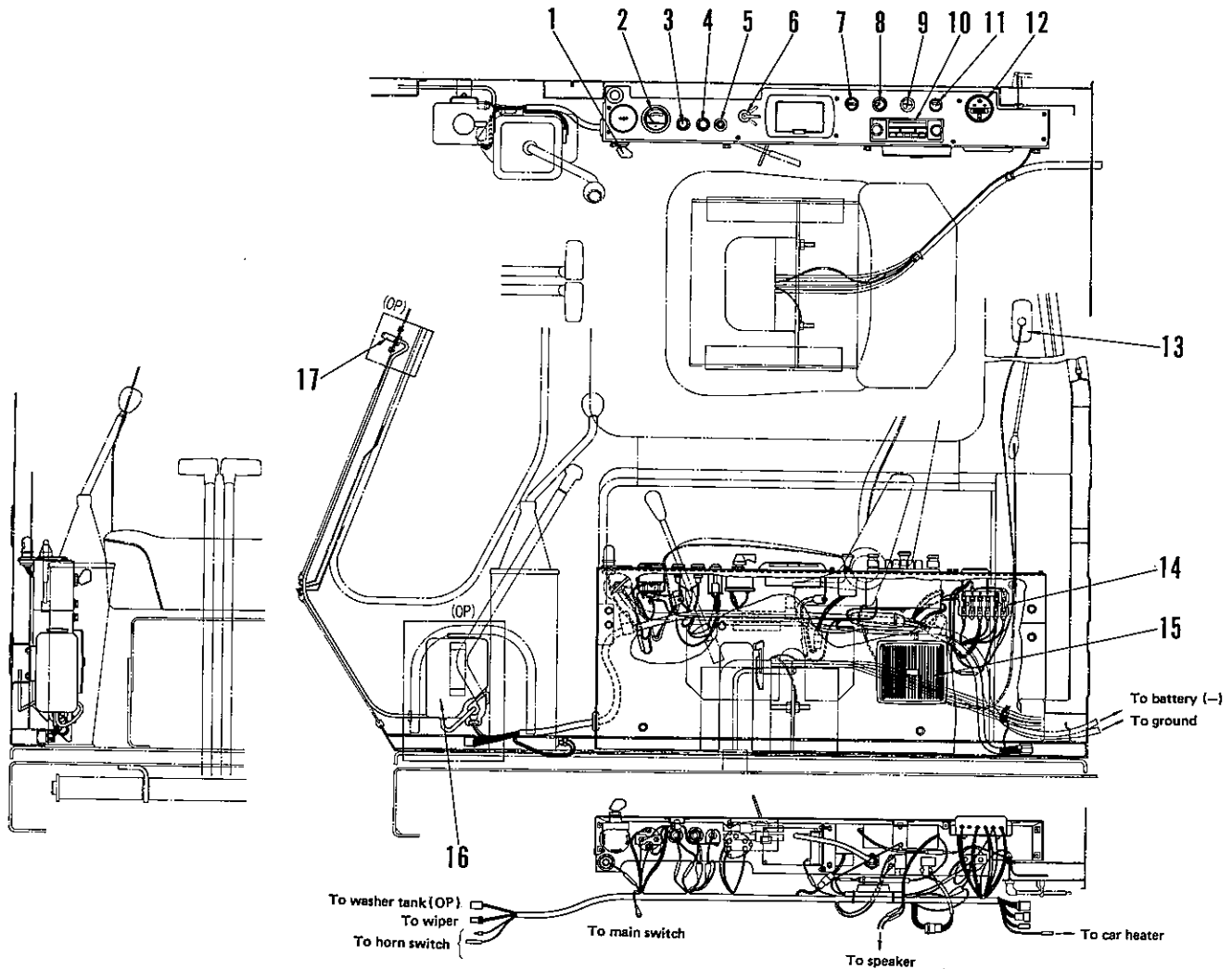
Classification by thickness

Nominal number	Copper wire			Cable O.D. (mm)	Current rating (A)	Circuits applied
	Number of strands	Dia. of strand (mm)	Cross section (mm ²)			
01	11	0.32	0.88	2.4	12	Starting, lighting, signal and instrument
02	26	0.32	2.09	3.1	20	Lighting, signal and instrument
05	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	Starting circuit	Charging circuit	Lighting circuit	Signal circuit	Instrument circuit	Others	
1	Primary	Code	B	W	R	G	Y	L
		Color	Black	White	Red	Green	Yellow	Blue
2	Auxiliary	Code	BW	WR	RW	GW	YR	LW
		Color	Black & White	White & Red	Red & White	Green & White	Yellow & Red	Blue & White
3	Auxiliary	Code	BY	WB	RB	GR	YB	LR
		Color	Black & Yellow	White & Black	Red & Black	Green & Red	Yellow & Black	Blue and Red
4	Auxiliary	Code	BR	WL	RY	GY	YG	LY
		Color	Black & Red	White & Blue	Red & Yellow	Green & Yellow	Yellow & Green	Blue & Yellow
5	Auxiliary	Code	—	WY	RG	GB	YL	LB
		Color	—	White & Yellow	Red & Green	Green & Black	Yellow Blue	Blue & Black
6	Auxiliary	Code	—	WG	RL	GL	YW	
		Color	—	White & Green	Red & Blue	Green & Blue	Yellow & White	

ELECTRICAL WIRING DIAGRAM



203F274

- | | |
|-------------------------------------|------------------------------|
| 1. Main switch | 10. Radio |
| 2. Engine water temperature gauge | 11. Wiper switch |
| 3. Engine oil pressure caution lamp | 12. Service meter |
| 4. Charge lamp | 13. Room lamp |
| 5. Heater signal | 14. Fuse box |
| 6. Starting switch | 15. Speaker |
| 7. Lamp switch | 16. Washer tank (optional) |
| 8. Cigarette lighter | 17. Washer nozzle (optional) |
| 9. Heater switch | |

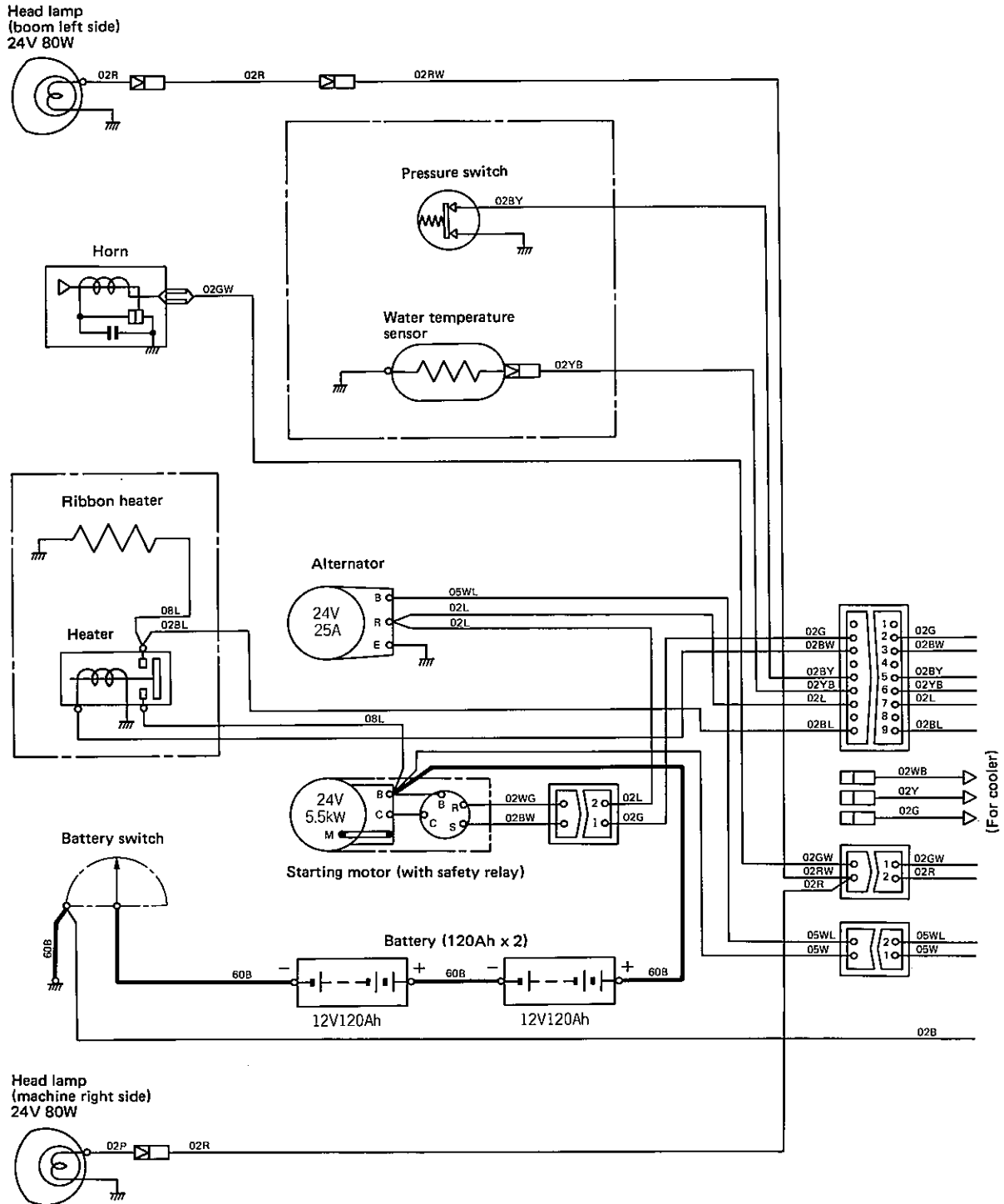
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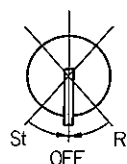
ELECTRICAL CIRCUIT DIAGRAM



Wiper switch connecting table

Terminal Key position	B	D	E
OFF	○—○		
ON	○—○		○

Key position



Starting switch connecting table

Terminal Key position	B	R ₁	R ₂	C
R ₁	○—○			
OFF	○			
St	○—○—○—○			

