

SHOP

MANUAL

KOMATSU

PC25-1 PC30-7

PC40-7 PC45-1

MACHINE MODEL	SERIAL No.
PC25-1	1001 and up
PC30-7	18001 and up
PC40-7	18001 and up
PC45-1	1001 and up

- This shop manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require. Materials and specifications are subject to change without notice.
- PC25-1 and PC30-7 mount the 3D84-3 engine,
PC40-7 and PC45-1 mount the 4D84-3 engine;
For details of engine, see the 84 Series Engine Shop Manual.

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●	Page to be replaced	Replace
()	Page to be deleted	Discard

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SAFETY

SAFETY NOTICE

IMPORTANT SAFETY NOTICE

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

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

GENERAL PRECAUTIONS

Mistakes in operation are extremely dangerous. Read the Operation 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 onto 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

GENERAL

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

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

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. Use the specifications given in the book with the latest date.

HOW TO READ THE SHOP MANUAL

VOLUMES

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

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

Electrical volume: } Each issued as one
Attachments volume: } volume to cover all
 models

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

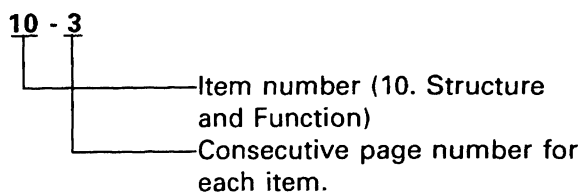
DISTRIBUTION AND UPDATING

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

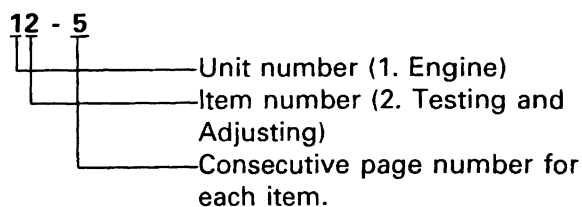
FILING METHOD

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

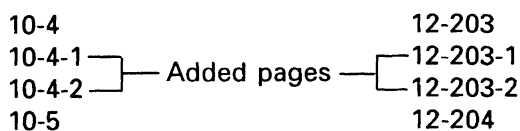
Example 1 (Chassis volume):



Example 2 (Engine volume):



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



REVISED EDITION MARK

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

REVISIONS

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
SYMBOLS

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

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

HOISTING INSTRUCTIONS

HOISTING

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

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

WIRE ROPES

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

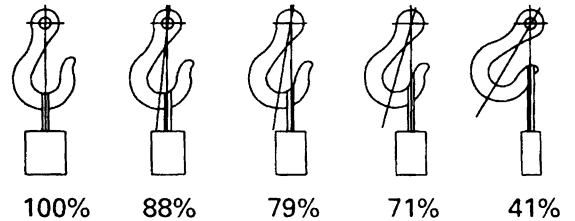
Wire ropes
(Standard "Z" or "S" twist ropes
without galvanizing)

Rope diameter (mm)	Allowable load (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.



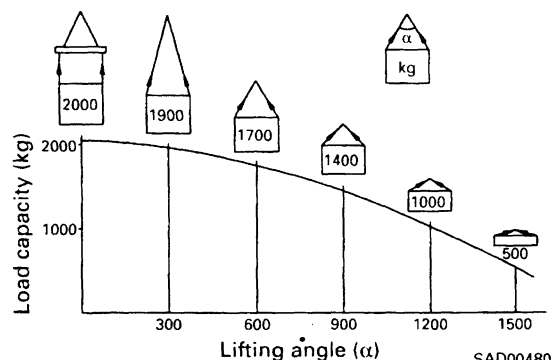
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- 3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound onto the load.

! 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°.



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COATING MATERIALS

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



Category	Komatsu code	Part No.	Q'ty	Container	Main applications, features
Adhesive	LT-1A	790-129-9030	150 g	Tube	<ul style="list-style-type: none"> Used to prevent rubber gaskets, rubber cushions, and cork plugs from coming out
	LT-1B	790-129-9050	20 g (x2)	Plastic container	<ul style="list-style-type: none"> Used in places requiring an immediately effective, strong adhesive. Used for plastics (except polyethylene, polypropylene, tetrafluoroethylene, and vinyl chloride), rubber, metal, and non-metal.
	LT-2	09940-00030	50 g	Plastic container	<ul style="list-style-type: none"> Features: Resistance to heat, chemicals Used for anti-loosening and sealant purposes for bolts and plugs.
	LT-3	790-129-9060 (Set of adhesive and hardening agent)	Adhesive :1 Kg Hardening agent: :500 g	Can	<ul style="list-style-type: none"> Used as adhesive or sealant for metal, glass, plastic
	LT-4	790-129-9040	250 g	Plastic container	<ul style="list-style-type: none"> Used as sealant for machined holes
	(Loctite 648-50)	79A-129-9110	50 cc	—	<ul style="list-style-type: none"> Features: Resistance to heat, chemicals Used at joint portions subject to high temperature
Gasket sealant	LG-1	790-129-9010	200 g	Tube	<ul style="list-style-type: none"> Used as adhesive or sealant for gaskets and packings of power train case, etc.
	LG-3	790-129-9070	1 Kg	Can	<ul style="list-style-type: none"> Features: Resistance to heat Used as sealant for flange surfaces and bolts at high temperature locations, used to prevent seizure Used as sealant for heat resistant gasket for high temperature locations such as engine precombustion chamber, exhaust pipe
	LG-4	790-129-9020	200 g	Tube	<ul style="list-style-type: none"> Features: Resistance to water, oil Used as sealant for flange surface, thread Also possible to use as sealant for flanges with large clearance Used as sealant for mating surfaces of final drive case, transmission case
	LG-5	790-129-9080	1 Kg	Plastic container	<ul style="list-style-type: none"> Used as sealant for various threads, pipe joints, flanges Used as sealant for tapered plugs, elbows, nipples of hydraulic piping
	LG-6	09940-00011	250 g	Tube	<ul style="list-style-type: none"> Features: Silicon based, resistance to heat, cold Used as sealant for flange surface, thread Used as sealant for oil pan, final drive case, etc.
	LG-7	09920-00150	150 g	Tube	<ul style="list-style-type: none"> Features: Silicon based, quick hardening type Used as sealant for flywheel housing, intake manifold, oil pan, thermostat housing, etc.
	Rust prevention lubricant	LM-G	09940-00051	60 g	Can
Molybdenum disulphide lubricant	LM-P	09940-00040	200 g	Tube	<ul style="list-style-type: none"> Used to prevent seizure or scuffing of the thread when press fitting or shrink fitting Used as lubricant for linkage, bearings, etc.
Lithium grease	G2-LI	SYG-350LI SYG-400LI SYG-400LI-A SYG-160LI SYGA-160CNLI	Various	Various	<ul style="list-style-type: none"> General purpose type
Calcium grease	G2-CA	SSG2-400CA SYG2-350CA SYG2-400CA-A SYG2-160CA SYGA-16CNCA	Various	Various	<ul style="list-style-type: none"> Used for normal temperature, light load bearing at places in contact with water or steam
Molybdenum disulphide grease	—	SYG2-400M	400 g (10 per case)	Bellows type	<ul style="list-style-type: none"> Used for places with heavy load

STANDARD TIGHTENING TORQUE

STANDARD TIGHTENING TORQUES OF BOLTS AND NUTS

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

1 Kgm = 9.806 Nm

Thread diameter of bolt	Width across flats		
		SAD00481	SAD00482
mm	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 nonferrous metal washers are to be used, or which require tightening to otherwise specified torque.

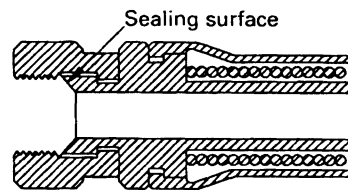
TIGHTENING TORQUE OF SPLIT FLANGE BOLTS

Use these torques for split flange bolts.

Thread diameter of bolt	Width across flats	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

TIGHTENING TORQUE FOR FLARED NUTS

Use these torques for flared part of nut.



SAD00483

Thread diameter of nut part	Width across flats of nut part	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

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: 5WB indicates a cable having a nominal number 5 and white coating with black stripe.

CLASSIFICATION BY THICKNESS

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

CLASSIFICATION BY COLOR AND CODE

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

CONVERSION TABLE

METHOD OF USING THE CONVERSION TABLE

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

EXAMPLE

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

(B)

1 mm = 0.03937 in

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

(C)

Millimeters to Inches

1 mm = 0.03937 in

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

Kilogram to Pound

1 kg = 2.2046 lb

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

Liter to U.S. Gallon

1ℓ = 0.2642 U.S. Gal

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

Liter to U.K. Gallon

1ℓ = 0.21997 U.K. Gal

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

kgm to ft. lb

1 kgm = 7.233 ft. lb

	0	1	2	3	4	5	6	7	8	9
0	0	7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	296.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	1005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kg/cm² to lb/in²1kg/cm² = 14.2233 lb/in²

	0	1	2	3	4	5	6	7	8	9
0	0	14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	1863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	2603	2617	2631	2646	2660	2674	2688
190	2702	2717	2731	2745	2759	2773	2788	2802	2816	2830
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

Temperature

Fahrenheit-Centigrade Conversion ; a simple way to convert a Fahrenheit temperature reading into a Centigrade temperature reading or vice versa is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

$$1^{\circ}\text{C} = 33.8^{\circ}\text{F}$$

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

WEIGHT TABLE

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

Unit: kg

Machine model	PC25-1	PC25-1	PC30-7	PC30-7
Serial No.	1001—6470	6471 and up	18001—26422	26423 and up
Engine assembly	194	194	194	209.6
• Engine (including engine mount)	177	177	177	177
• P. T. O.	8.8	8.8	8.6	8.6
• Hydraulic pump	8.2	8.2	44.7	24
Radiator assembly	16.5	16.5	19.2	19.2
Hydraulic tank (excluding oil)	47.3	47.3	47.3	47.3
Fuel tank (excluding fuel)	45.8	45.8	45.8	45.8
Canopy	44.5	44.5	44.5	44.5
Operator's cab	195	195	195	195
Revolving frame	480	480	682	682
Swing machinery	20.7	20.7	20.7	20.7
Swing motor	12.6	12.6	12.6	12.6
Travel motor	46×2	46×2	45×2	45×2
7-spool control valve	18.5	18.5	18.5	18.5
2-spool control valve	5.4	5.4	5.4	5.4
Center swivel joint	26.3	26.3	26.3	26.3
Counterweight	246	246	248	248
Track frame assembly	630 (652)	656	630 (652)	656
• Track frame	325	325	325	325
• Carrier roller	3.4×2 (5.8×2)	3.4×2	3.4×2 (5.8×2)	3.4×2
• Track roller	5.7×8 (8.2×8)	7.2×8	5.7×8 (8.2×8)	7.2×8
• Recoil spring assembly	6.6×2 (6.3×2)	11.5×2	6.6×2 (6.3×2)	11.5×2
• Idler assembly	12.9×2 (14.9×2)	14.9×2	12.9×2 (14.9×2)	14.9×2
• Sprocket	8.1×2	8.1×2	8.1×2	8.1×2
• Swing circle assembly	46.3	46.3	46.3	46.3

★ (): For rubber shoe

020S07

WEIGHT TABLE

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

Unit: kg

Machine model	PC40-7	PC40-7	PC45-1	PC45-1
Serial No.	18001—24521	24522 and up	1001—3505	3506 and up
Engine assembly	230.1	230.1	230.1	253.2
• Engine (including engine mount)	212.7	212.7	212.7	212.7
• P. T. O.	8.8	8.8	8.5	8.5
• Hydraulic pump	8.6	8.6	44.7	32
Radiator assembly	22	22	22	22
Hydraulic tank (excluding oil)	47.3	47.3	47.3	47.3
Fuel tank (excluding fuel)	45.8	45.8	45.8	45.8
Canopy	44.5	44.5	44.5	44.5
Operator's cab	195	195	195	195
Revolving frame	766	766	916	916
Swing machinery	24.2	24.2	24.2	24.2
Swing motor	14.9	14.9	14.9	14.9
Travel motor	47×2	47×2	62×2	62×2
7-spool control valve	18.5	18.5	23	23
2-spool control valve	5.4	5.4	5.4	5.4
Center swivel joint	26.3	26.3	26.3	26.3
Counterweight	248	248	473	473
Track frame assembly	862 (898)	894.5	904 (928)	936.5
• Track frame	514	514	510	510
• Carrier roller	3.4×2 (5.8×2)	3.4×2	3.4×2 (5.8×2)	3.4×2
• Track roller	6.9×8 (9.7×10)	8.2×8	6.9×10 (9.7×10)	8.2×10
• Recoil spring assembly	6.2×2 (7.4×2)	17.2×2	6.2×2 (7.4×2)	17.2×2
• Idler assembly	19.7×2 (19.2×2)	19.7×2	19.7×2 (19.7×2)	19.7×2
• Sprocket	13×2 (11×2)	13×2	12.4×2 (11×2)	12.4×2
• Swing circle assembly	54.5	54.5	66	66

★ (): For rubber shoe

Unit: kg

Machine model	PC25-1	PC25-1	PC30-7	PC30-7
Serial No.	1001—6470	6471 and up	18001—26422	26423 and up
Track shoe assembly				
• Steel shoe 300 mm (without hole)	168×2	168×2	168×2	168×2
300 mm (with hole)				
400 mm (without hole)				
400 mm (with hole)	—	—	—	—
480 mm	—	—	—	—
550 mm	—	—	—	—
Rubber shoe 300 mm	141×2	124.2×2	141×2	124.2×2
400 mm	—	—	—	—
Boom swing bracket assembly	65	65	65	65
Boom assembly	112	112	116	116
Arm assembly	50	50	61	61
Bucket assembly	59	59	77	77
Blade assembly	181	181	181	181
Boom cylinder assembly	30	30	31	31
Arm cylinder assembly	23	23	28	28
Bucket cylinder assembly	18	18	18	18
Boom swing cylinder assembly	29.7	29.7	29.7	29.7
Blade cylinder assembly	18.7	18.7	18.7	18.7

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Unit: kg

Machine model	PC40-7	PC40-7	PC45-1	PC45-1
Serial No.	18001—24521	24522 and up	1001—3505	3506 and up
Track shoe assembly				
• Steel shoe 300 mm (without hole)	—	—	—	—
300 mm (with hole)	—	—	—	—
400 mm (without hole)	264.5×2	264.5×2	295.7×2	295.7×2
400 mm (with hole)				
480 mm				
550 mm				
Rubber shoe 300 mm	—	—	—	—
400 mm	236×2	221.5×2	236×2	221.5×2
Boom swing bracket assembly	101.4	101.4	101.4	101.4
Boom assembly	171	171	175	175
Arm assembly	78	78	82	82
Bucket assembly	109	109	113	113
Blade assembly	233	233	233	233
Boom cylinder assembly	45	45	50	50
Arm cylinder assembly	34	34	37	37
Bucket cylinder assembly	28	28	31	31
Boom swing cylinder assembly	36.1	36.1	40.2	40.2
Blade cylinder assembly	26.6	26.6	26.6	26.6

LIST OF LUBRICANT AND WATER

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE								CAPACITY (ℓ)			
		-22 -30	-4 -20	14 -10	32 0	50 10	68 20	86 30	104°F 40°C	Specified	Refill		
Engine oil pan	Engine oil									SAE 30CD		PC25, 30 : 7.8 PC40, 45 : 9.1	PC25, 30 : 7.3 PC40, 45 : 8.5
										SAE 10WCD			
										SAE 10W-30CD			
										SAE 15W-40CD			
Swing machinery case	Engine oil									SAE 30CD		PC25, 30 : 0.9 PC40, 45 : 1.0	PC25, 30 : 0.9 PC40, 45 : 1.0
Final drive case (each)										SAE 30CD		PC25, 30 : 1.2 PC40 : 1.4 PC45 : 1.1	PC25, 30 : 1.2 PC40 : 1.4 PC45 : 1.1
Track roller (1 piece)											0.04	0.04	
Carrier roller (1 piece)		Grease									G2-L1		0.03
Hydraulic system	Engine oil									SAE 10WCD		78	45
										SAE 10W-30CD			
										SAE 15W-40CD			
Fuel tank	Diesel fuel									ASTM D975 No.2		50	—
										* 1			
Cooling system	Water	Add antifreeze								PC25 : 4.8 PC30 : 5.1 PC40, 45 : 8.0			

* 1: ASTM D975 No. 1

NOTE:

ASEM: American Society of Testing and Material

SAE: Society of Automotive Engineers

API: American Petroleum Institute

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

Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

- (1) When fuel sulphur content is less than 0.5%, change oil in the oil pan every periodic maintenance hours described in this manual. Change oil according to the following table if fuel sulphur content is above 0.5%.

Fuel sulphur content	Change interval of oil in engine oil pan
0.5 to 1.0%	1/2 of regular interval
Above 1.0%	1/4 of regular interval

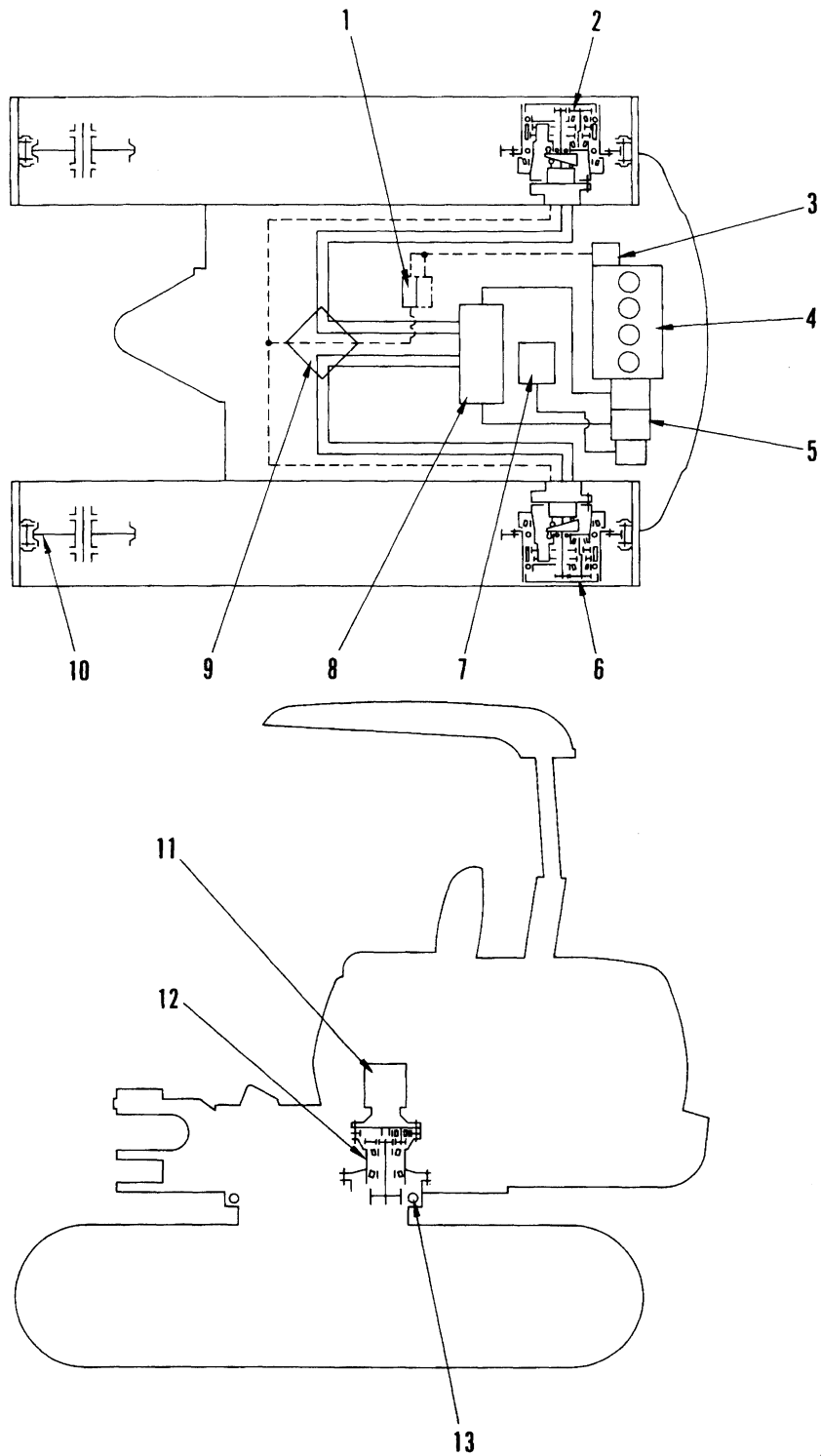
- (2) When starting the engine in an atmospheric temperature of lower than 0°C, be sure to use engine oil of SAE10W, SAE10W-30 and SAE15W-40 even though an atmospheric temperature goes up to 10°C more or less in the day time.
- (3) Use API classification CD as engine oil and if API classification CC, reduce the engine oil change interval to half.

10 STRUCTUR AND FUNCTION

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POWER TRAIN



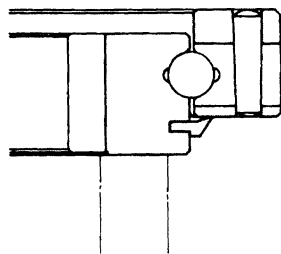
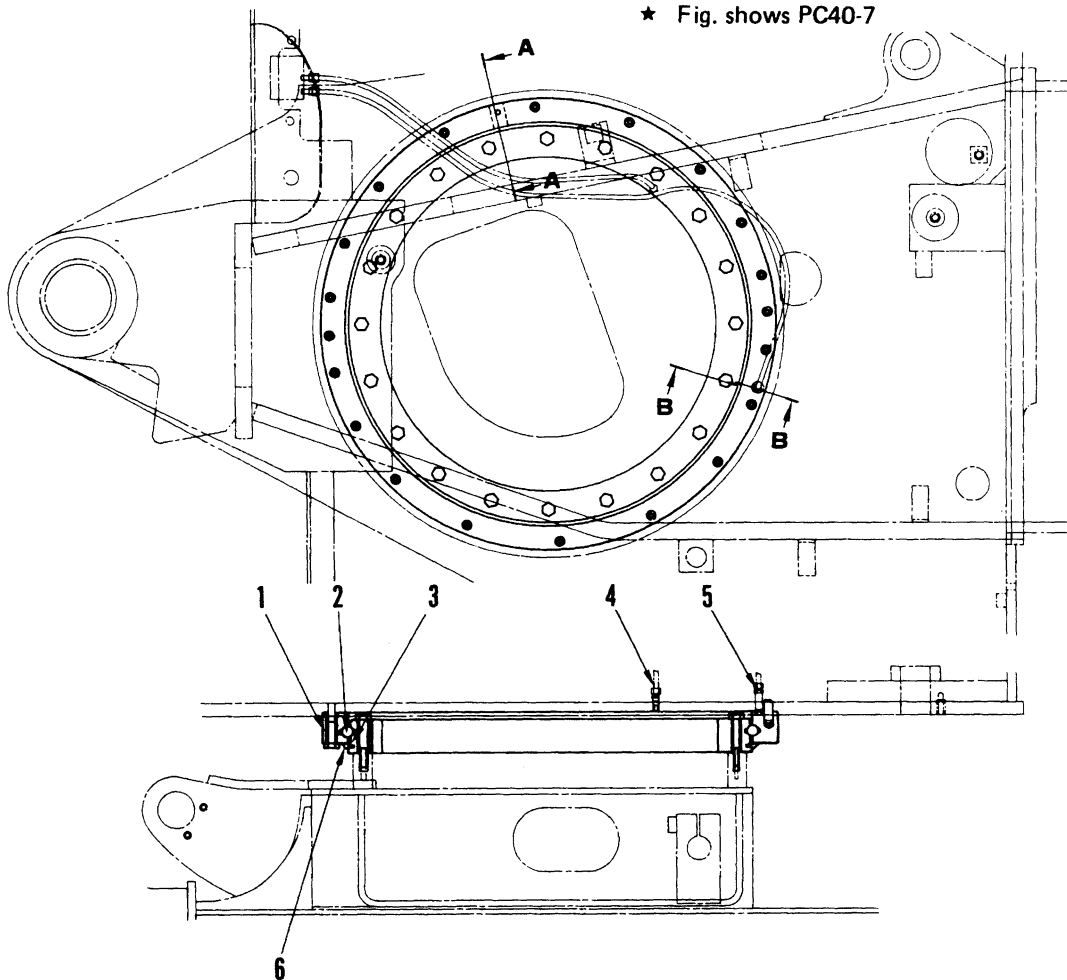
- | | |
|---|--------------------------|
| 1. Travel speed acceleration solenoid valve | 8. 7-spool control valve |
| 2. R.H. travel motor | 9. Center swivel joint |
| 3. Control pump | 10. Idler |
| 4. Engine | 11. Swing motor |
| 5. Hydraulic pump | 12. Swing machinery |
| 6. L.H. travel motor | 13. Swing circle |
| 7. 2-spool control valve | |

020S07

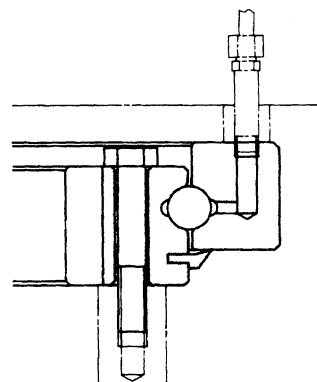
20TF01001

SWING CIRCLE

★ Fig. shows PC40-7



Section A - A



Section B - B

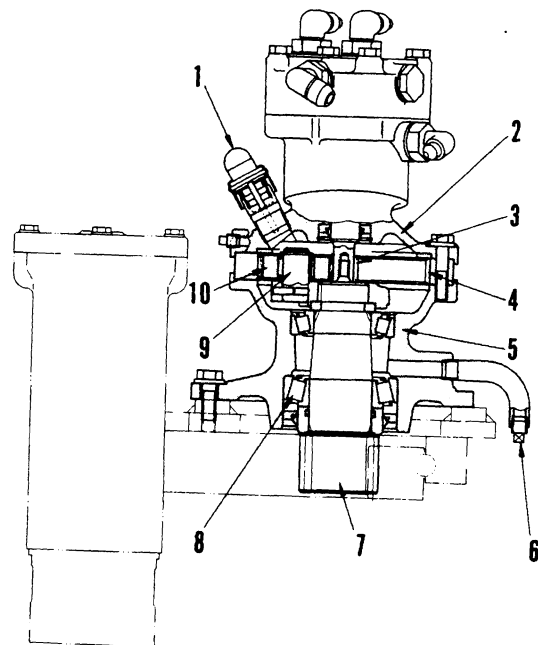
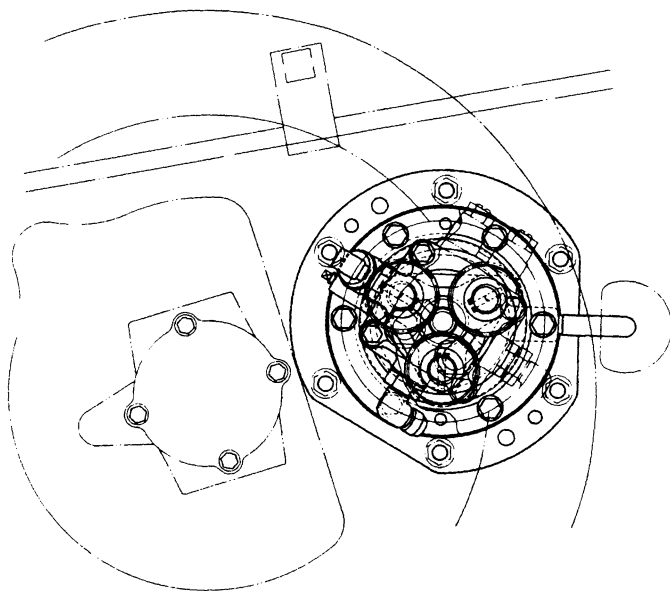
20TF01002

- | | |
|----------------------------|-------------------------------------|
| 1. Swing circle outer race | 4. Swing circle pinion lubricating |
| 2. Ball bearing | 5. Swing circle bearing lubricating |
| 3. Swing circle inner race | 6. Seal |

020S07

SWING MACHINERY

PC25-1, PC30-7



1. Level gauge
2. Motor case
3. Drive gear (14 teeth)
4. Ring gear (97 teeth)
5. Case
6. Drain plug
7. Swing pinion (11 teeth)
8. Bearing
9. Planetary shaft
10. Planetary gear (41 teeth)

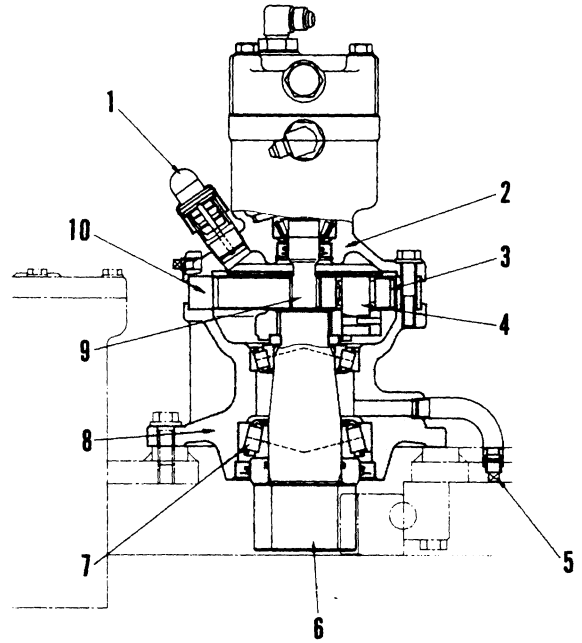
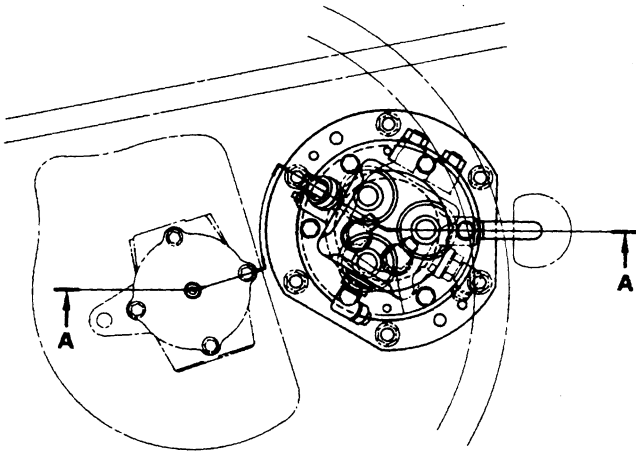
SPECIFICATION

- Reduction ratio: 7.929

20TF01003

202507

PC40-7, PC45-1



Section A - A

020S07

20TF01004

1. Level gauge
2. Motor case
3. Planetary gear (41 teeth)
4. Planetary gear shaft
5. Drain plug
6. Swing pinion (10 teeth)
7. Bearing
8. Case
9. Drive gear
10. Ring gear (97 teeth)

SPECIFICATION

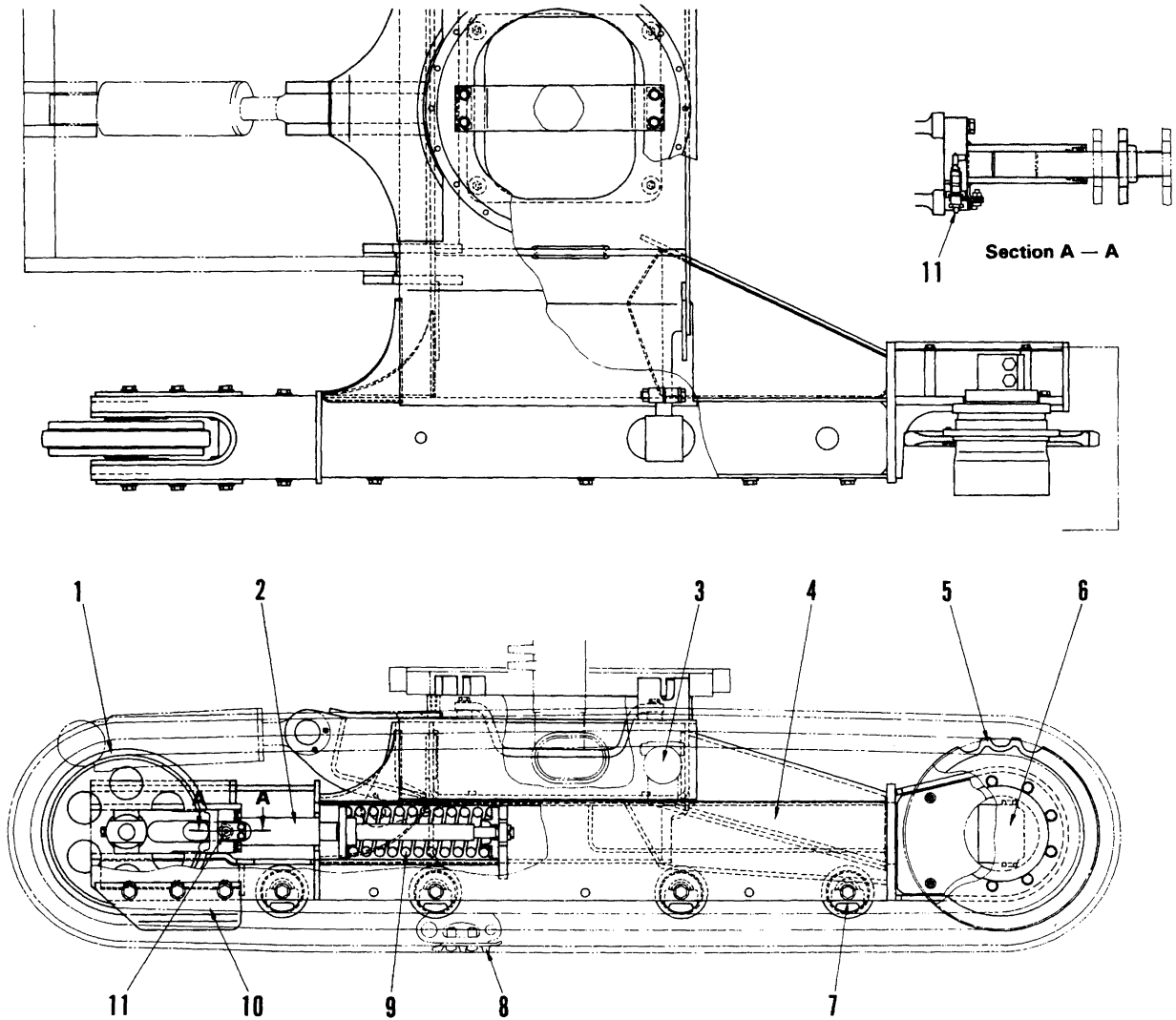
- Reduction ratio: 7.929

TRACK FRAME AND RECOIL SPRING

STEEL SHOE SPEC.

- PC25-1 Serial No. 1001—6470
- PC30-7 Serial No. 18001—26422
- PC40-7 Serial No. 18001—24521
- PC45-1 Serial No. 1001—3505

★ Fig. shows PC40-7



020507

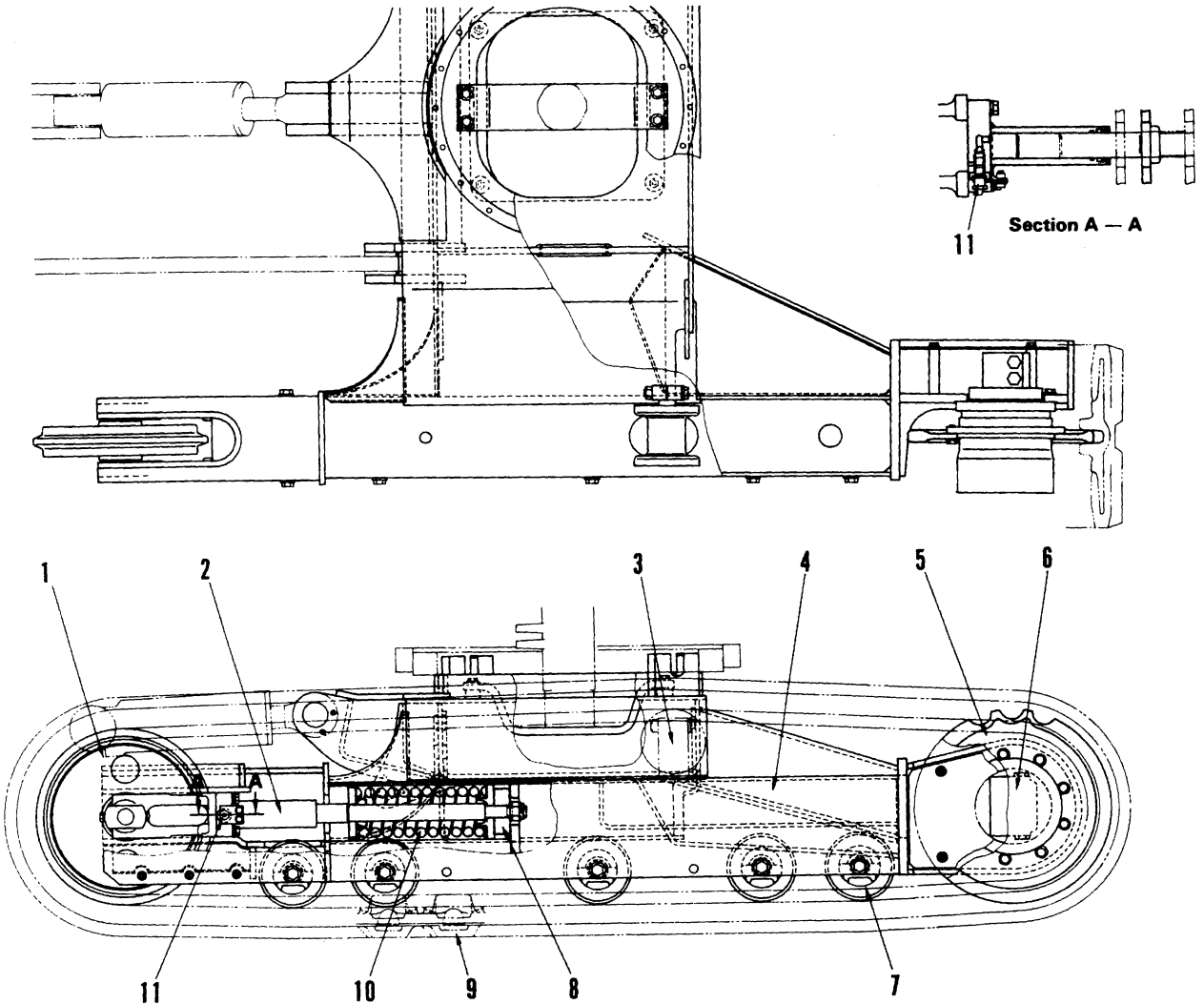
20TF01005

- | | |
|-------------------|------------------|
| 1. Idler | 7. Track roller |
| 2. Plunger | 8. Track shoe |
| 3. Carrier roller | 9. Recoil spring |
| 4. Track frame | 10. Guard |
| 5. Sprocket | 11. Lubricator |
| 6. Travel motor | |

RUBBER SHOE SPEC.

- PC25-1 Serial No. 1001—6470
- PC30-7 Serial No. 18001—26422
- PC40-7 Serial No. 18001—24521
- PC45-1 Serial No. 1001—3505

★ Fig. shows PC40-7



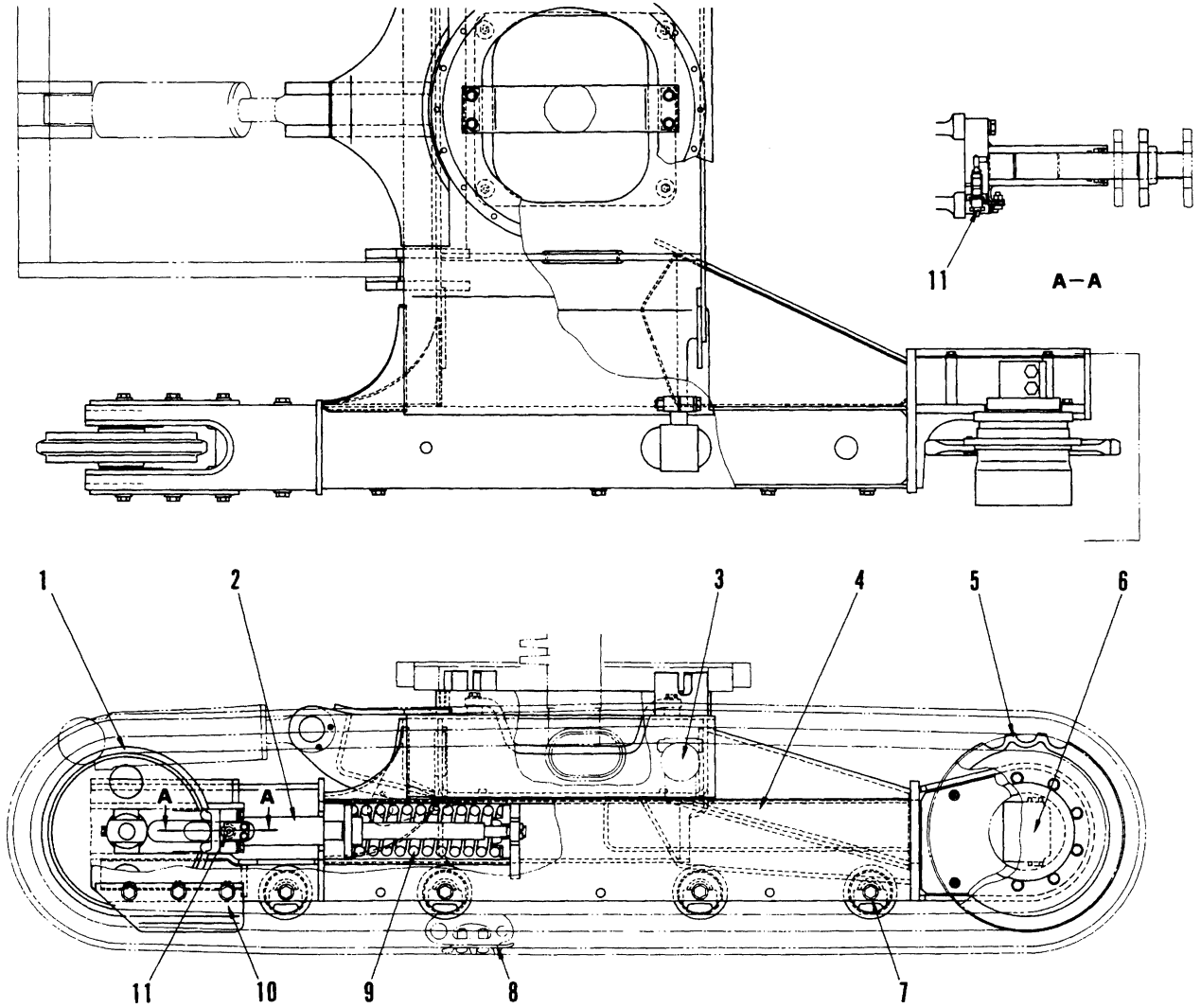
020S07

- | | |
|-------------------|-------------------|
| 1. Idler | 7. Track roller |
| 2. Plunger | 8. Spacer |
| 3. Carrier roller | 9. Track shoe |
| 4. Track frame | 10. Recoil spring |
| 5. Sprocket | 11. Lubricator |
| 6. Travel motor | |

20TF01006

PC25-1 Serial No. 6471 and up
PC30-7 Serial No. 26423 and up
PC40-7 Serial No. 24522 and up
PC45-1 Serial No. 3506 and up

★ Fig. shows PC40-7 (Show steel shoe)



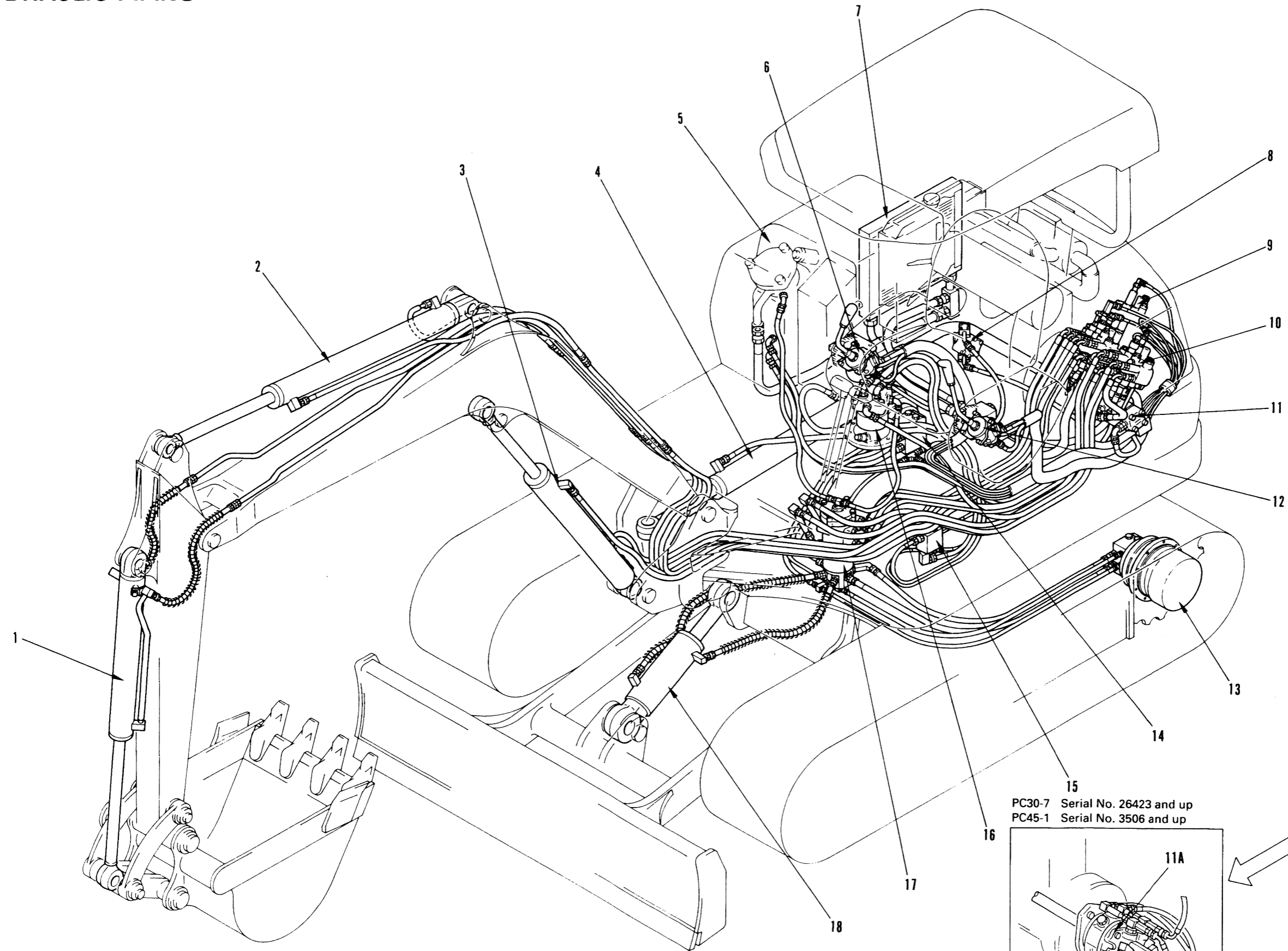
020S07

20TF01088

- | | |
|-------------------|------------------------|
| 1. Idler | 7. Track roller |
| 2. Plunger | 8. Track shoe |
| 3. Carrier roller | 9. Recoil spring |
| 4. Track frame | 10. Guard (Steel shoe) |
| 5. Sprocket | 11. Lubricator |
| 6. Travel motor | |

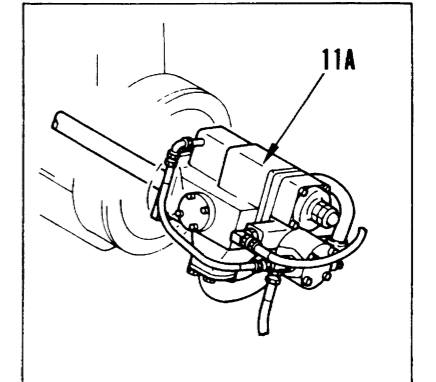
HYDRAULIC PIPING

020S07

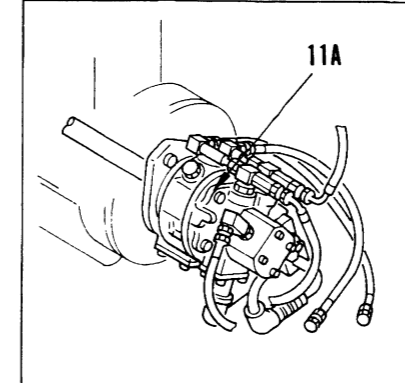


- 1. Bucket cylinder
- 2. Arm cylinder
- 3. Boom cylinder
- 4. Boom swing cylinder
- 5. Hydraulic tank
- 6. R.H. PPC valve
- 7. Oil cooler
- 8. Control pump
- 9. 2-spool control valve
- 10. 7-spool control valve
- 11. Hydraulic pump
- 12. R.H. PPC valve
- 13. L.H. travel motor
- 14. R.H. travel motor
- 15. Solenoid valve assembly
- 16. Swing motor
- 17. Center swivel joint
- 18. Blade cylinder

For PC30-7 Serial No. 18001—26422
 For PC45-1 Serial No. 1001—3505

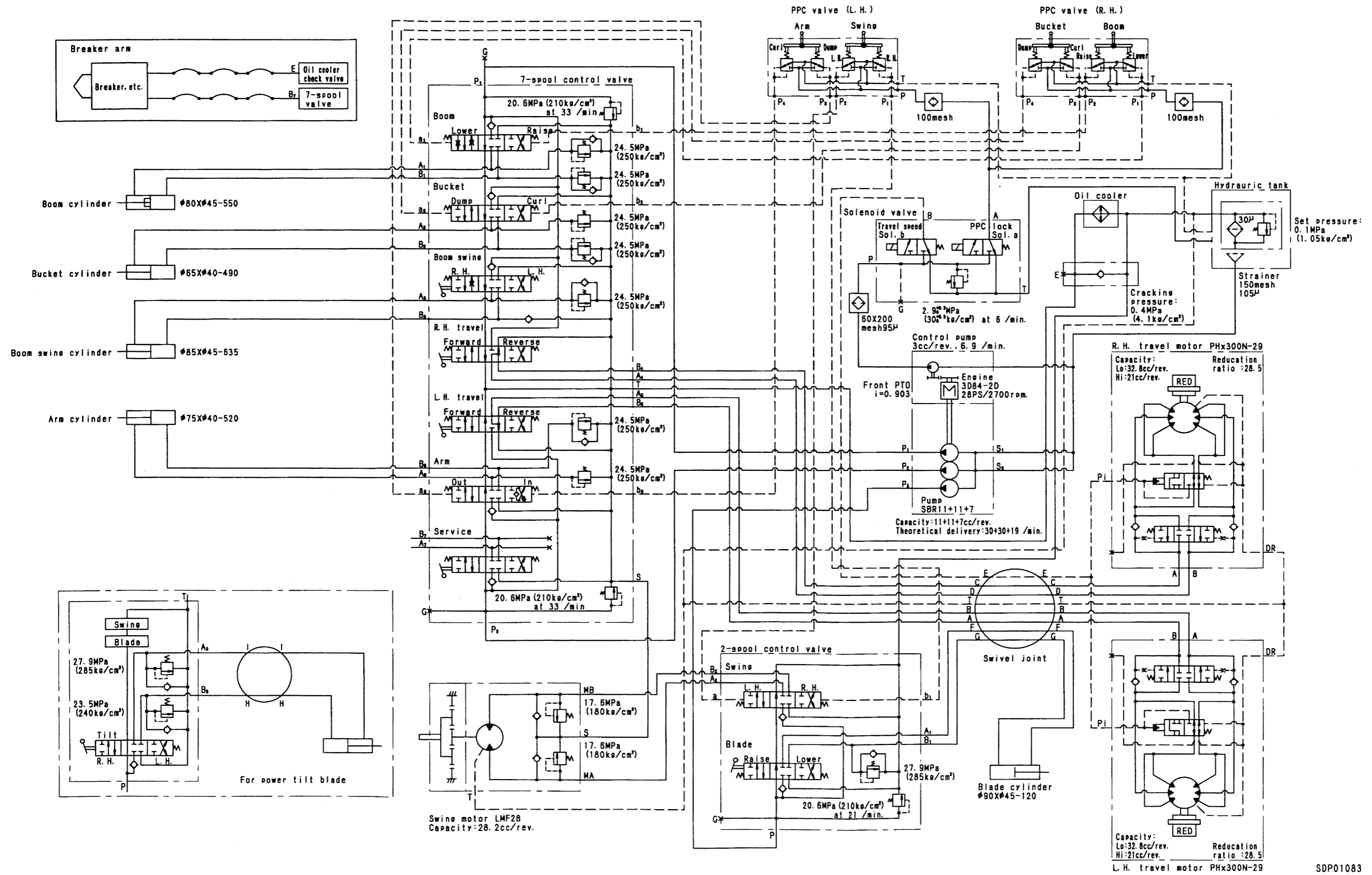


PC30-7 Serial No. 26423 and up
 PC45-1 Serial No. 3506 and up



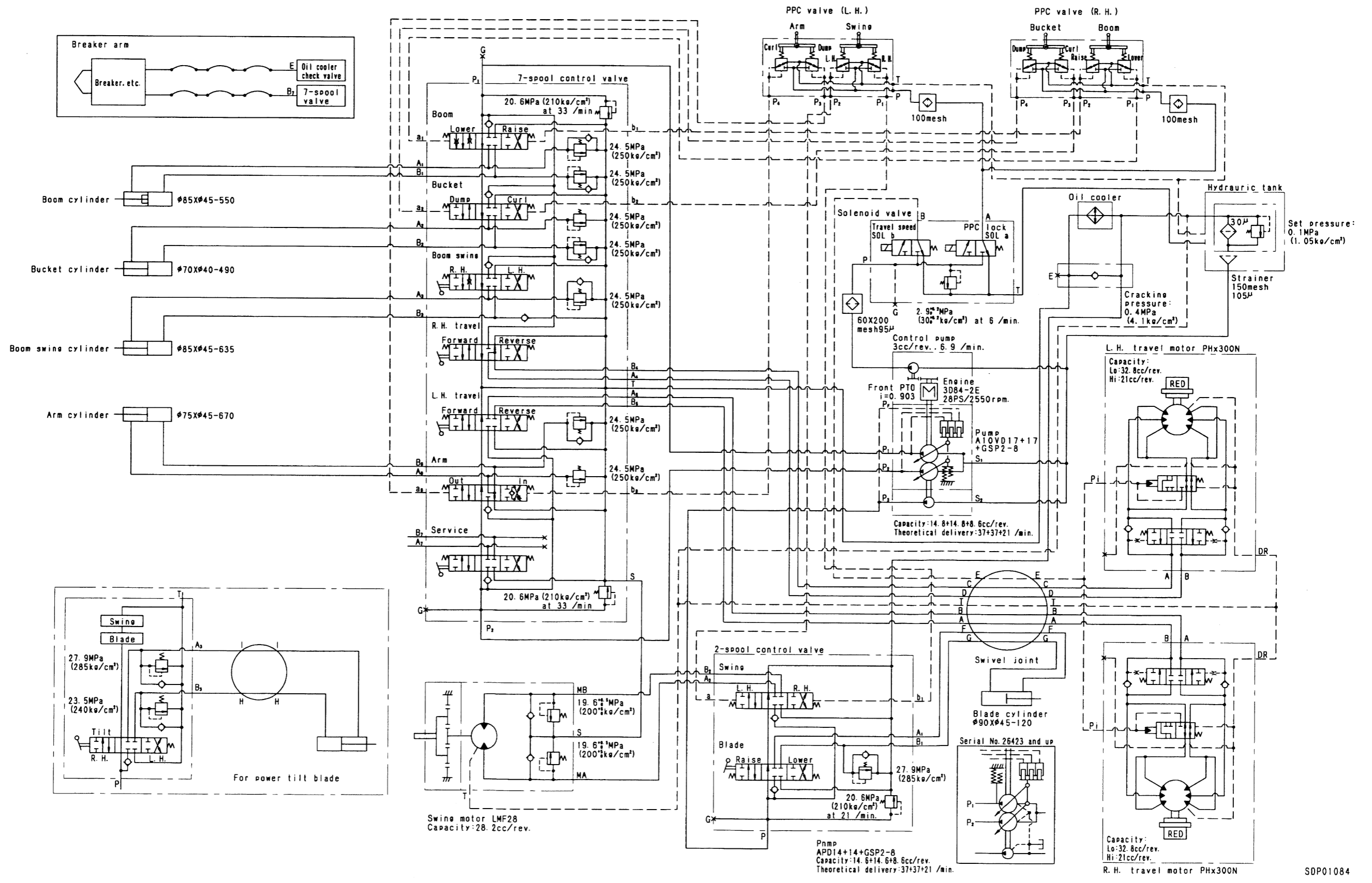
HYDRAULIC CIRCUIT DIAGRAM

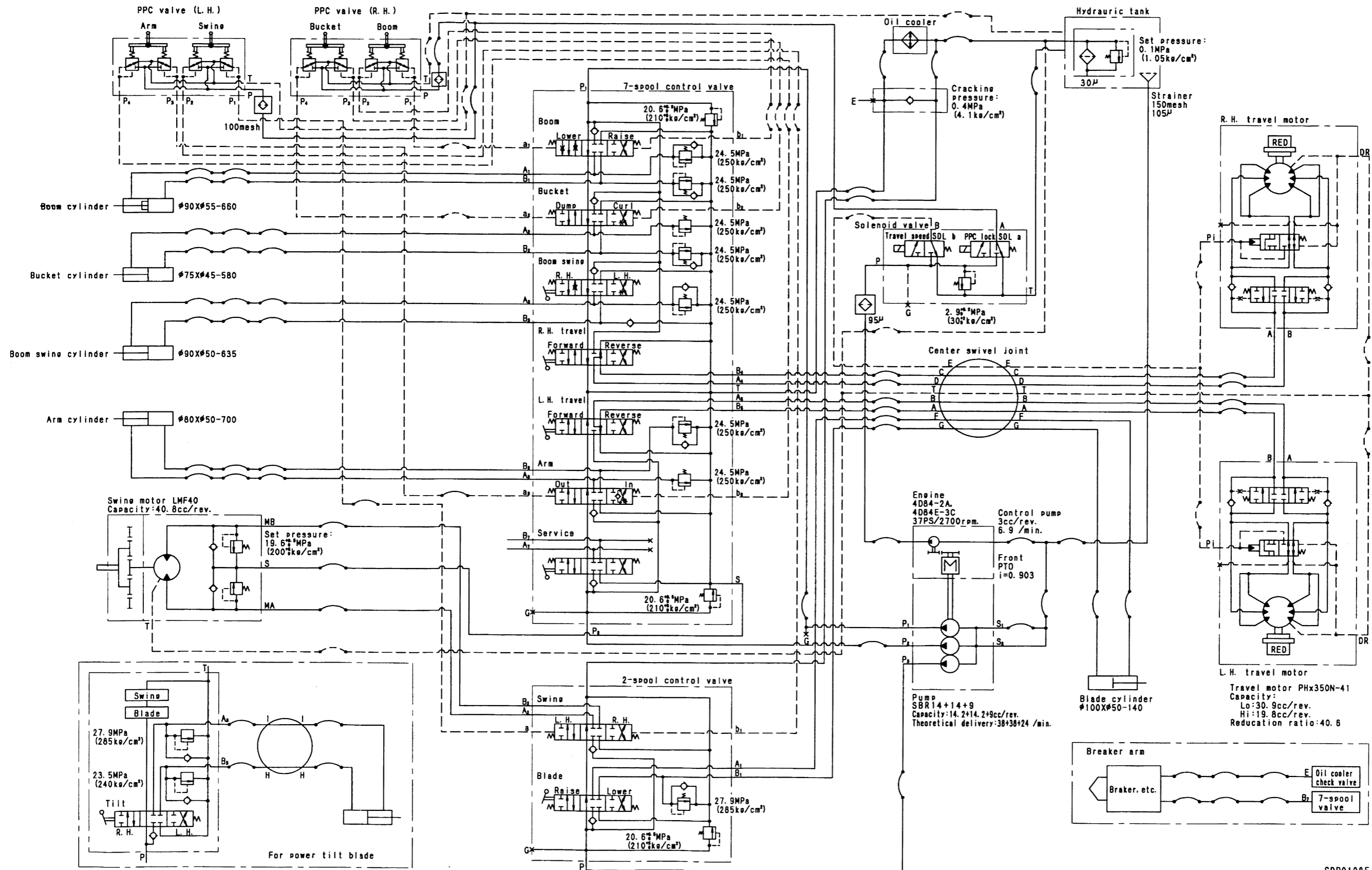
PC25-1



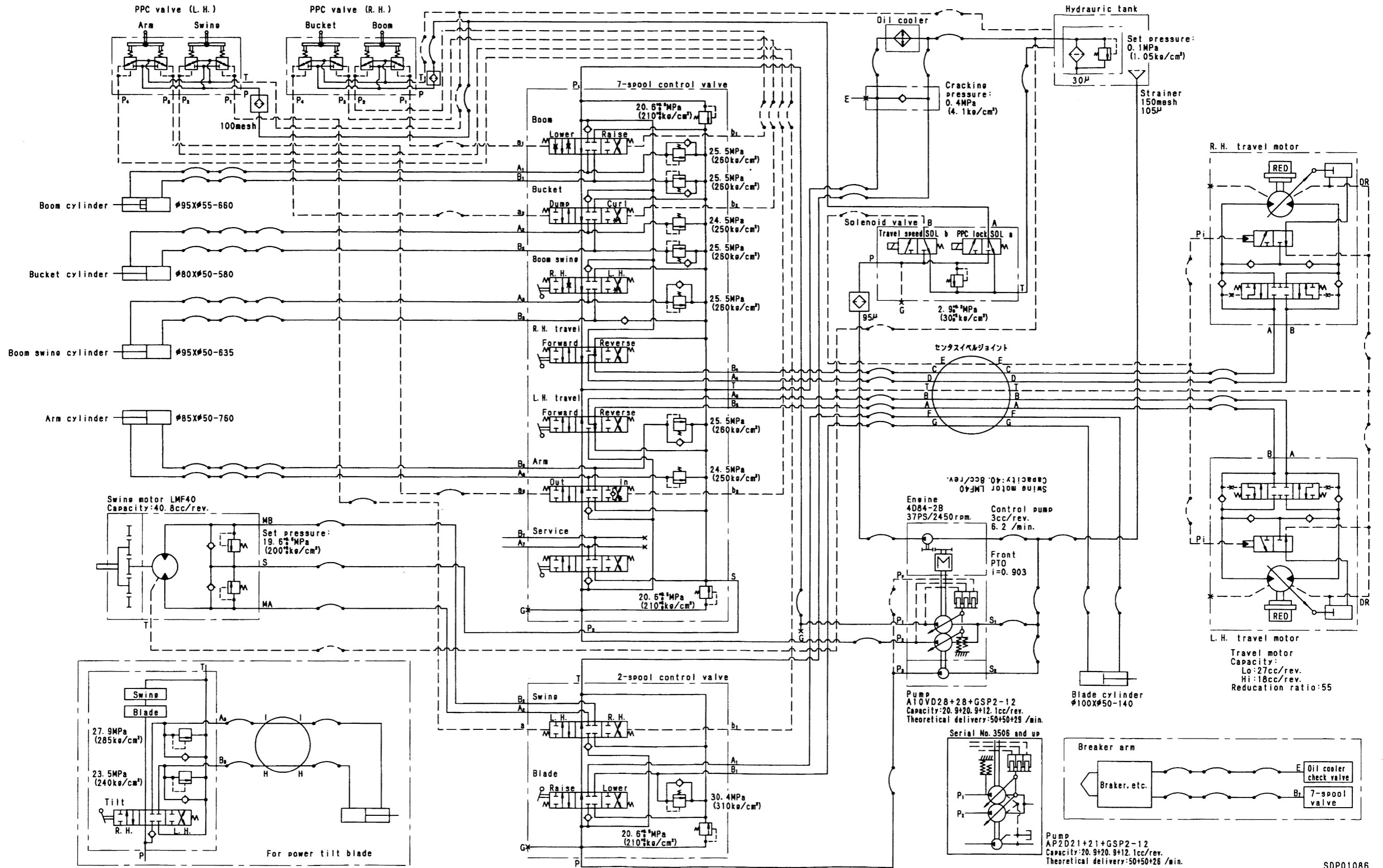
020S07

SDP01083



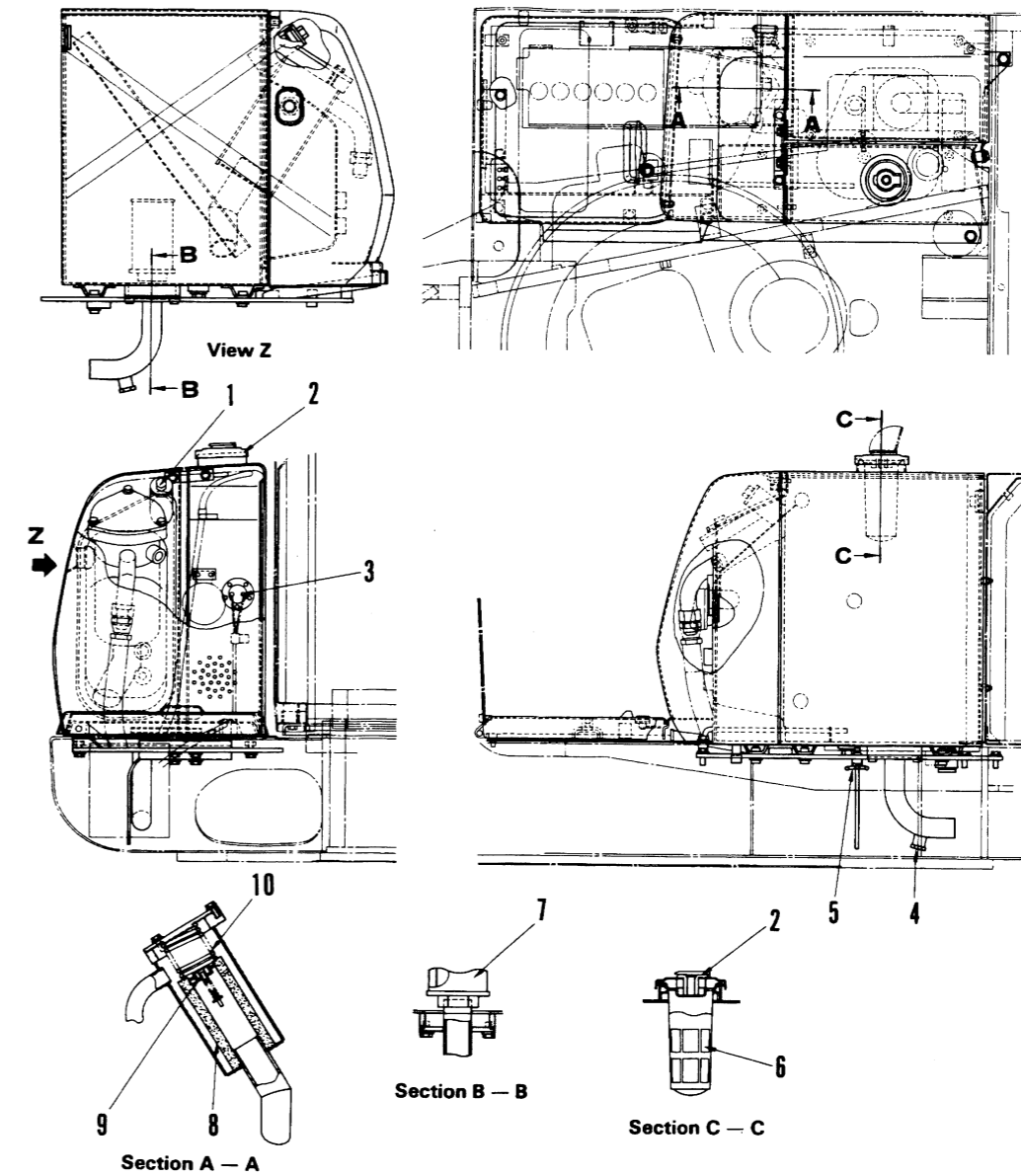


SDP01085



SDP01086

HYDRAULIC TANK AND FUEL TANK



1. Hydraulic tank filler cap
2. Fuel tank filler cap
3. Fuel level sensor
4. Hydraulic tank drain plug
5. Fuel tank drain plug
6. Fuel tank strainer
7. Hydraulic tank strainer
8. Hydraulic tank oil filter
9. Safety valve
10. Spring

SPECIFICATIONS

Hydraulic tank

- Safety valve set pressure: 1.05 kg/cm²
- Tank capacity: 65 l
- Oil amount: 45 l

Fuel tank

- Capacity: 50 l

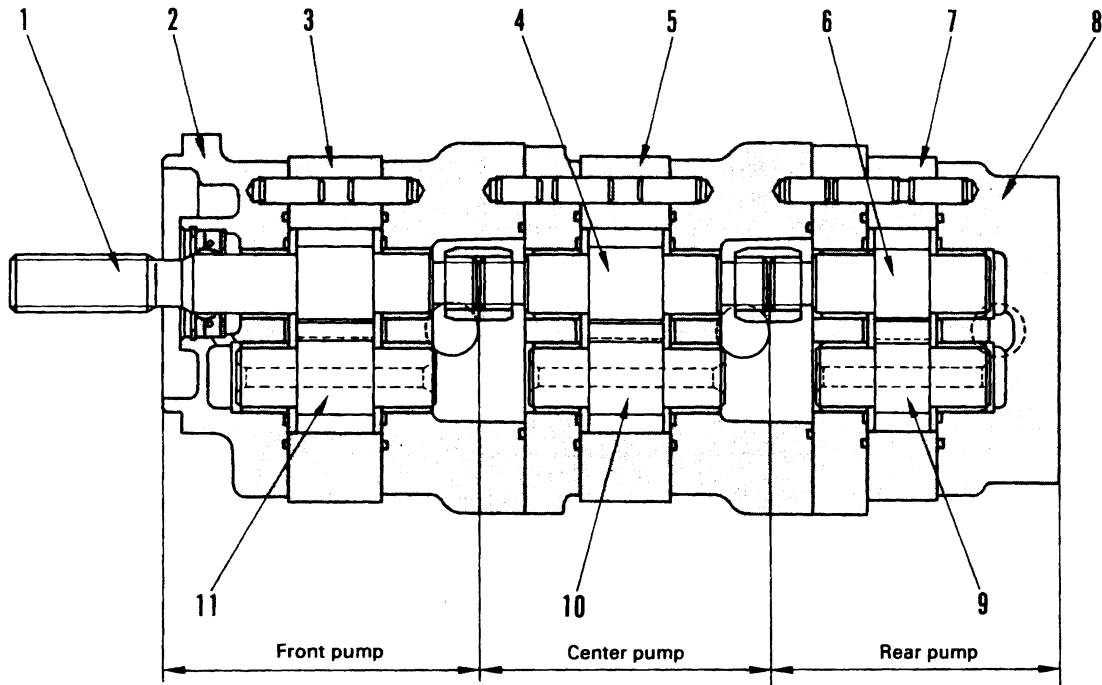
20TF01012

020S07

HYDRAULIC PUMP

PC25-1 (SBR11+11+7)

PC40-7 (SBR14+14+9)



20TF06012A

1. Front drive gear
2. Front cover
3. Front body
4. Center drive gear
5. Center body
6. Rear drive gear
7. Rear body
8. Rear cover
9. Rear driven gear
10. Center driven gear
11. Front driven gear

OUTLINE

There are three pumps installed in a straight line to the PTO case using the boss (coupling) installed to the cover at the rear face of the engine flywheel housing.

Front pump: For R.H. travel, bucket, boom, boom swing

Center pump: For L.H. travel, arm, service

Rear pump: For swing, blade

SPECIFICATIONS

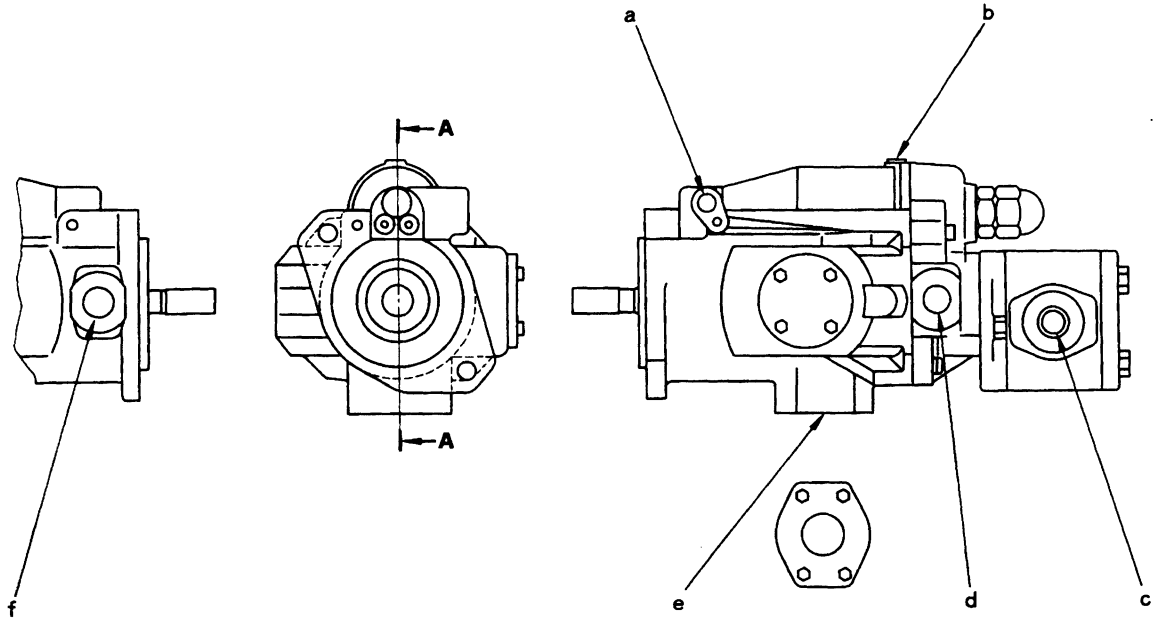
PC25-1

- Type: SRB11+11+7
- Theoretical delivery: 11+11+7 cc/rev
- Rated pressure: 210 kg/cm²

PC40-7

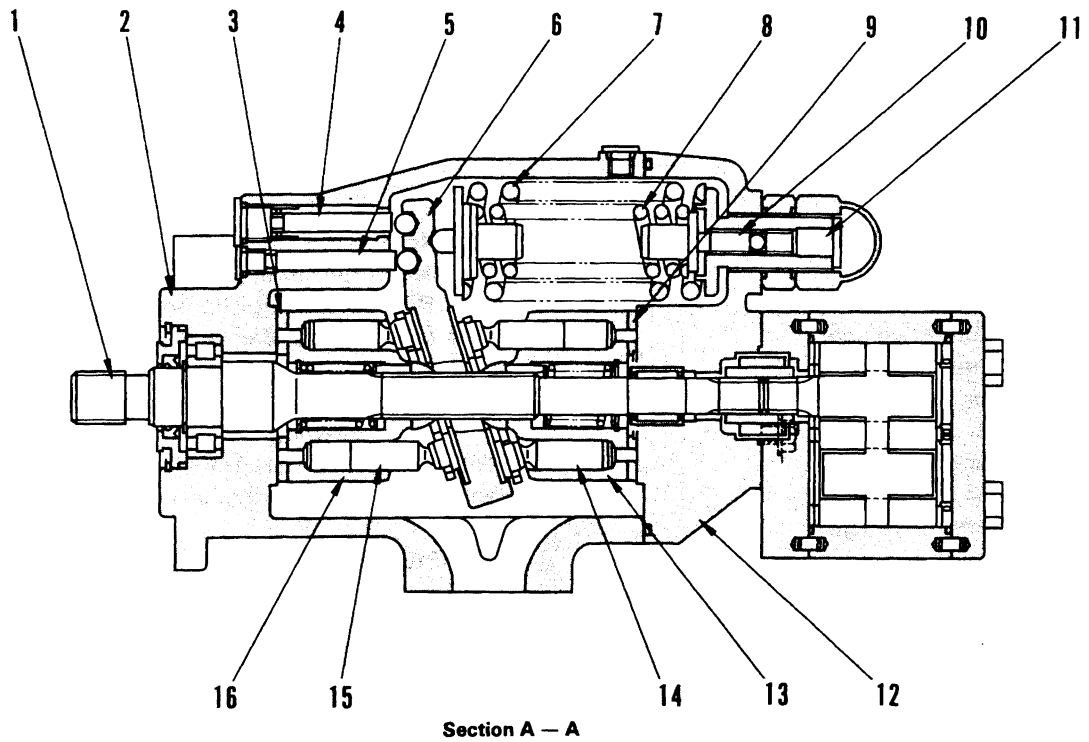
- Type: SRB14+14+9
- Theoretical delivery: 14.2+14.2+9 cc/rev
- Rated pressure: 210 kg/cm²

PC30-7 Serial No. 18001—26422 (A10VD17+17+GSP2-8)
 PC45-1 Serial No. 1001—3505 (A10VD28+28+GSP2-12)



20TF01013

020S07



20TF01014

- a. Pilot port
- b. Air bleeding port
- c. Gear pump outlet port
- d. Rear piston pump outlet port
- e. Piston pump inlet port
- f. Front piston pump outlet port

- 1. Drive shaft
- 2. Pump case
- 3. Front valve plate
- 4. Shift piston
- 5. Pilot piston
- 6. Hunger (swash plate)
- 7. Spring A
- 8. Spring B
- 9. Rear valve plate
- 10. Adjustment screw B
- 11. Adjustment screw A
- 12. End cover
- 13. Rear cylinder
- 14. Rear piston
- 15. Front piston
- 16. Front cylinder

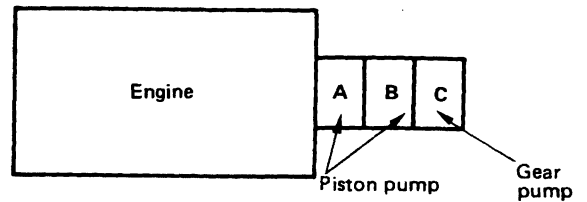
OUTLINE

- Two piston pumps and one gear pump are installed to the same shaft.
- The piston pumps are arranged at the front and rear of one swash plate, and the angle of both pumps is the same. Structurally speaking, the position of the top dead center and bottom dead center points of the pistons for the front and rear pumps is opposite, so the suction and delivery is also opposite.

Pump A: For R.H. travel, bucket, boom, boom swing

Pump B: For L.H. travel, arm, service

Pump C: For swing, blade



SPECIFICATIONS

PC30-7

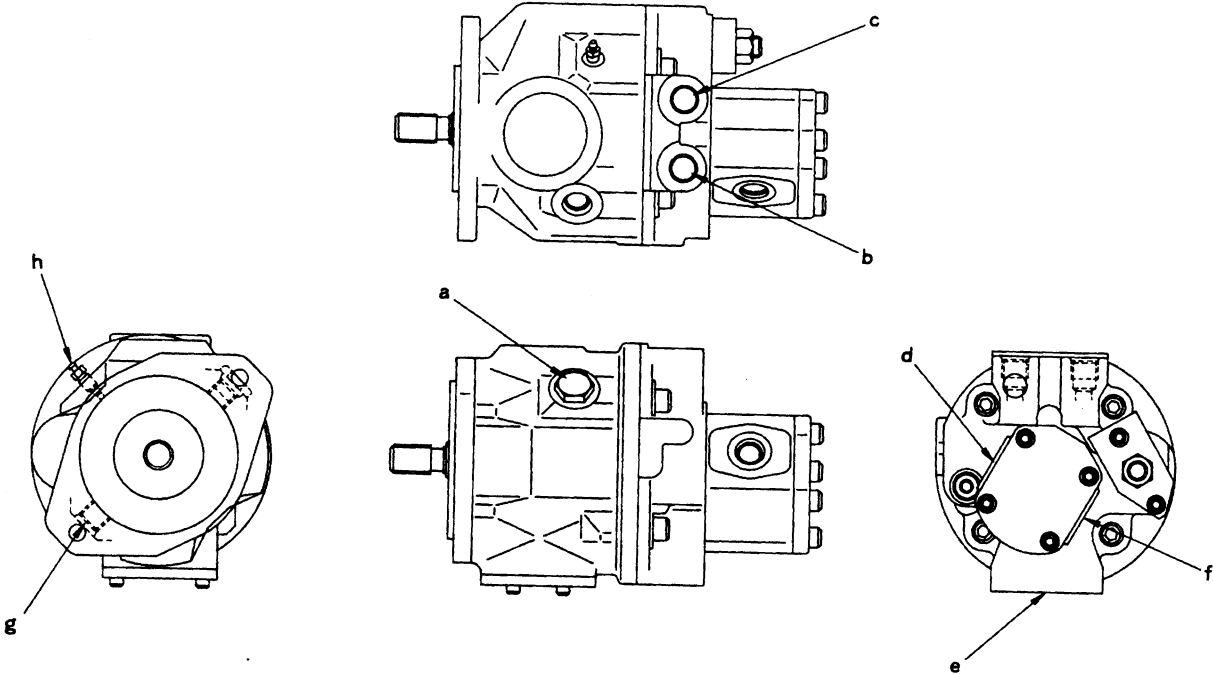
- Type: A10VD17+17+GSP2-8
- Theoretical delivery: 14.8+14.8+8.6 cc/rev
- Rated pressure: 210 kg/cm²

PC45-1

- Type: A10VD28+28+GSP2-12
- Theoretical delivery: 20.9+20.9+12.1 cc/rev
- Rated pressure: 210 kg/cm²

020S07

PC30 AVANCE R Serial No. 26423 and up (AP2D14+14+GSP2-8)
PC45 AVANCE R Serial No. 3506 and up (AP2D21+21+GSP2-12)

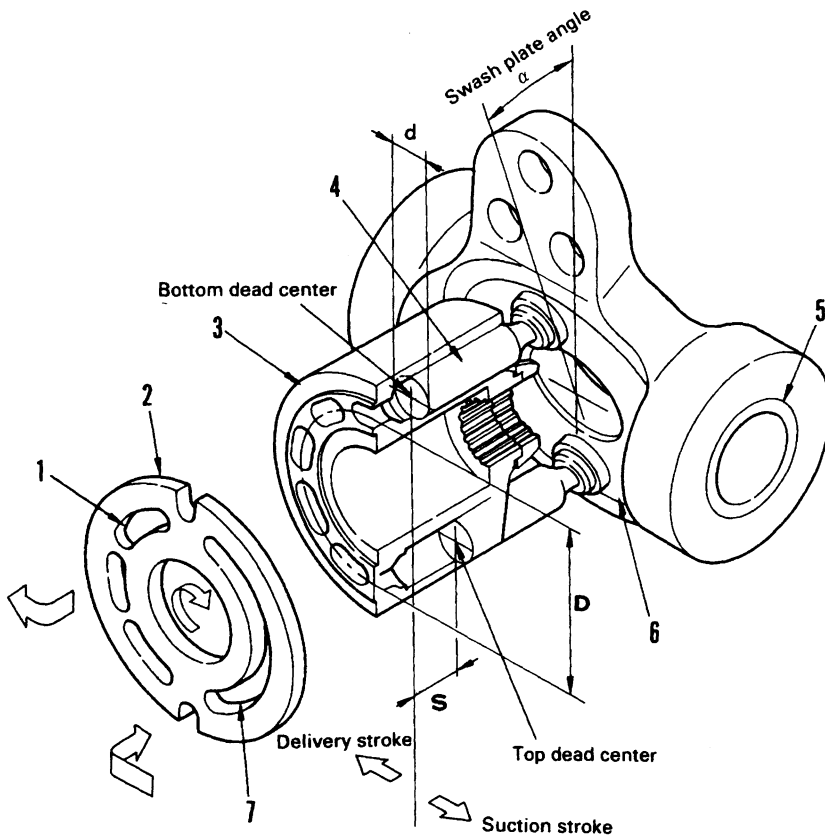


020507

20TF01090

- a: Drain port
- b: Front piston pump outlet port
- c: Rear piston pump outlet port
- d: Gear pump outlet port
- e: Piston pump inlet port
- f: Gear pump inlet port
- g: Drain port
- h: Air bleeding port

1. FUNCTION OF PISTON PUMP



1. Delivery port
2. Valve plate
3. Cylinder block
4. Piston
5. Hanger bearing
6. Hanger (swash plate)
7. Suction port

20TF01015

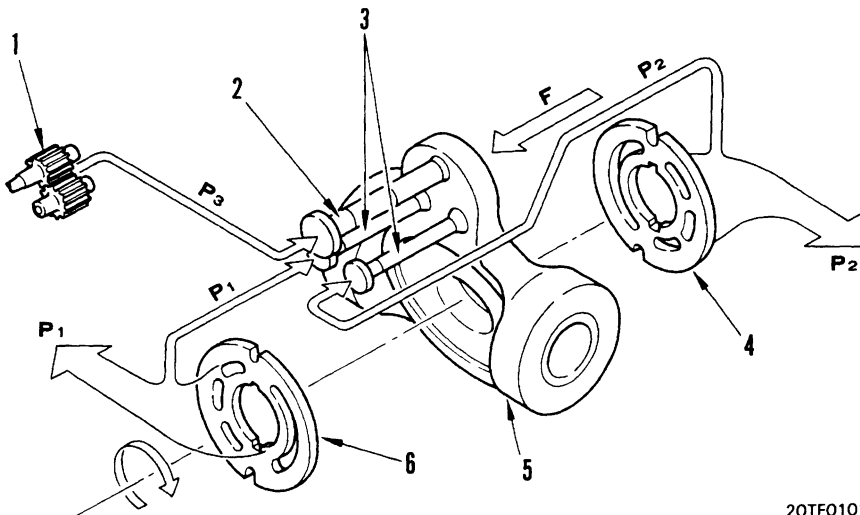
- Cylinder block (3) is connected to the drive shaft and rotates.
When this happens, piston (4), which is assembled to cylinder block (3) moves in a reciprocal motion following swash plate (6). This creates changes in the volume of the cylinder, and performs the suction and delivery action of the pump.
The movement of piston (4) from the bottom dead center to the top dead center is the suction stroke; and when the piston moves back from the top dead center to the bottom dead center, the oil is forcibly delivered through delivery port (1) of valve plate (2).
- Each of the nine pistons performs one suction and delivery stroke for each rotation of cylinder block (3), so the rotation of the drive shaft provides continuous suction and delivery.
- The top dead center and bottom dead center positions of the rear pump and front pump are opposite, so the suction and delivery strokes are also opposite.
- The volume of the cylinder is governed by swash plate angle α , so it is possible to change the delivery amount of the pump by changing the swash plate angle.
- Delivery amount Q (cc/rev) is calculated by the following formula.

$$Q = \frac{\pi d^2}{4} \times S \times n$$

- d: Diameter of piston
- S: Stroke = $\tan \alpha \times D$
- n: Number of pistons = 9

2. CONTROL FUNCTION

The control of the pump absorption horsepower is carried out by changing the swash plate angle of the piston pump using the delivery pressure of the gear pump and piston pump.

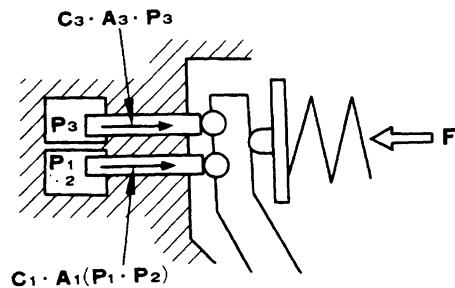


1. Gear pump
2. Shift piston
3. Pilot piston
4. Rear valve plate
5. Hanger (swash plate)
6. Front valve plate

20TF01016

1) Horsepower shift control (total horsepower control)

- Piston pump delivery pressures P_1 and P_2 go to pilot pistons (3), which have the same area, and act on swash plate (5).
At the same time, delivery pressure P_3 of the gear pump for the swing and blade goes to shift piston (2), and acts on swash plate (5).
 - When there is no pressure P_3 from the gear pump (when the swing and blade are not being operated), the absorption horsepower of the piston pumps is the maximum; when P_3 is the maximum (210 kg/cm²), the absorption horsepower of the piston pumps is the minimum.
- As a result, the total horsepower (absorption horsepower of gear pump + absorption horsepower of piston pumps) is controlled.
- Piston pump output (P-Q diagram)



20TF01017

- The relationship between the spring force (F) and the hydraulic control is as shown in the following formula.

$$F = C_1 \cdot A_1 (P_1 + P_2) + C_3 \cdot A_3 \cdot P_3$$

C_1, C_3 : Constant

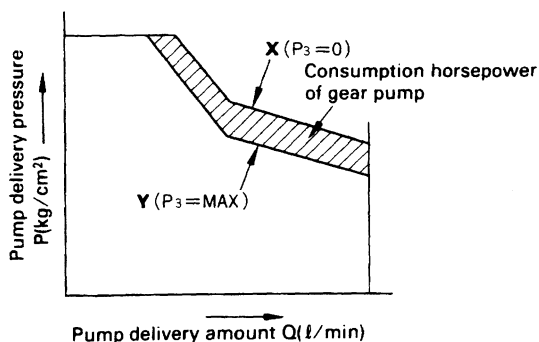
A_1 : Cross-sectional area of pilot piston

A_3 : Cross-sectional area of shift piston

P_1, P_2 : Delivery pressure of piston pumps

P_3 : Delivery pressure of gear pump

- When $P_3 = 0$:
 $F = C_1 \cdot A_1 (P_1 + P_2)$ and the P-Q graph follows the X line.
- When $P_3 = \text{MAX. (210 kg/cm}^2\text{)}$:
The piston pump output goes down by an amount equal to the force of $(C_3 \cdot A_3 \cdot P_3)$, and becomes the Y line.
In other words, the output of the piston pump changes in the range between X and Y according to the delivery pressure of the gear pump.



20TF01018

2) Flow control (PC control)

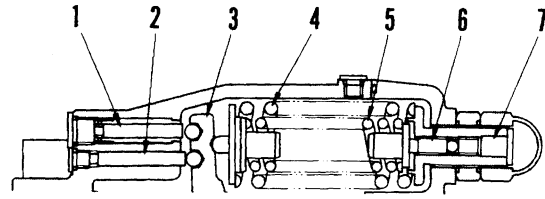
The absolute amount of the piston pump output (P-Q diagram) changes according to whether the swing or blade is being operated. However, the flow is also controlled by the delivery pressure of the piston pump itself.

- If hydraulic pressures P_1 and P_2 acting on pilot piston (2) are lower than the installed load of spring A, swash plate (3) is fixed at the maximum angle. (Q_{MAX})
- If hydraulic pressures P_1 and P_2 acting on pilot piston (2) are greater than the installed load of spring A, the swash plate angle becomes smaller, and the swash plate is held at an angle that balances the hydraulic pressure and the force of the spring.

(Piston pump output ... Area A of P-Q curve)

- If the hydraulic pressure acting on the pilot piston rises further, and the swash plate angle becomes smaller, the load of spring B, which was not acting until this point, is added, so a higher hydraulic pressure is needed and the angle of the curve becomes steeper.

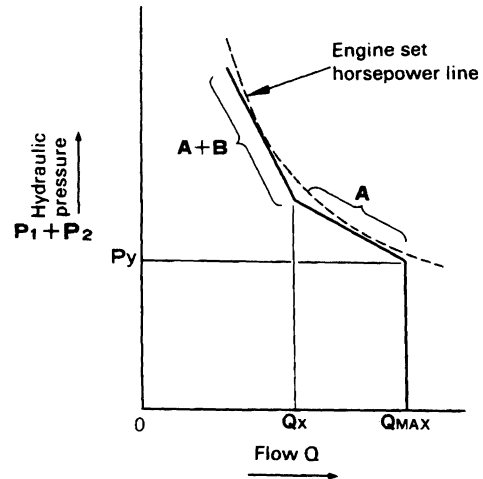
(Piston pump output ... Area A+B of P-Q curve)



20TF01019

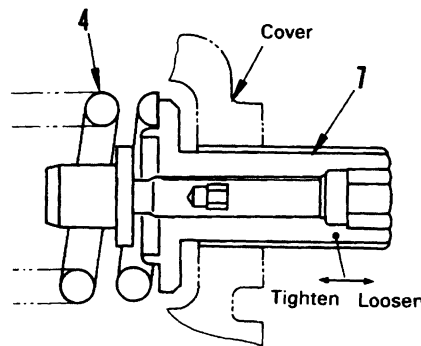
1. Shift piston
2. Pilot piston
3. Hanger (swash plate)
4. Spring A
5. Spring B
6. Adjustment screw B
7. Adjustment screw A

Piston pump output (P-Q diagram)

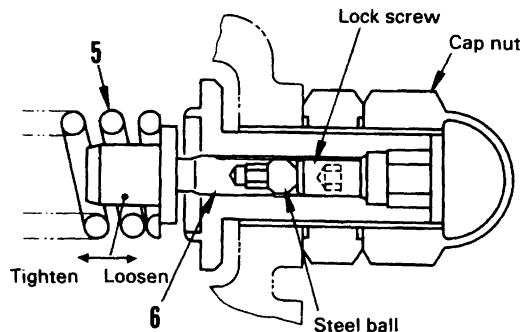
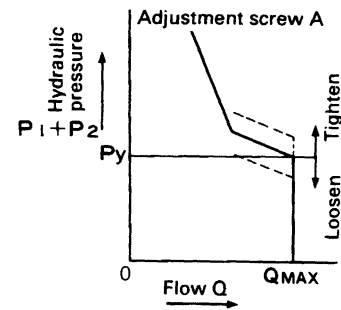


LUBUUV

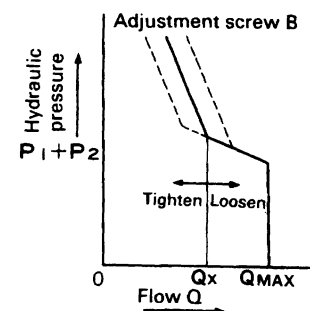
- The pressure (P_y) for starting the change of the angle can be set by turning adjustment screw A (7) to change the installed load of spring A (4).
- The starting point for the flow (Q_x) can be set by changing the actuation position of spring B (5) with adjustment screw B (6).
- The P-Q diagram can be adjusted to the following range: Engine horsepower \cong P-Q diagram



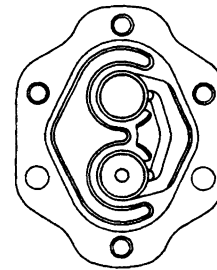
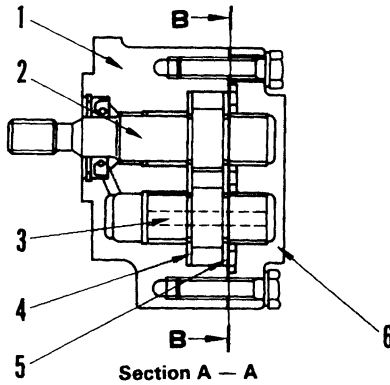
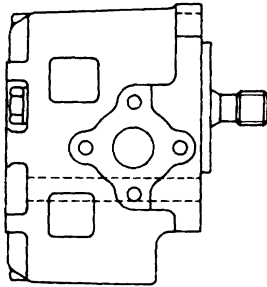
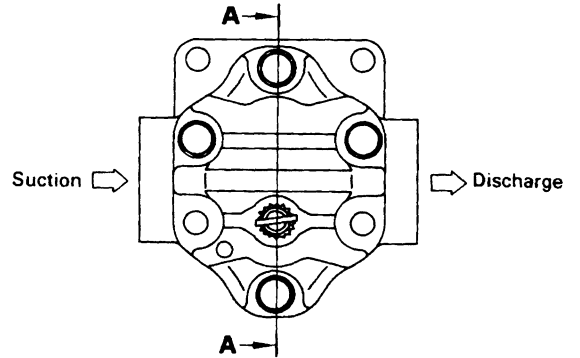
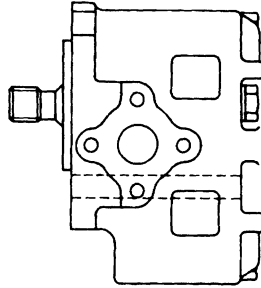
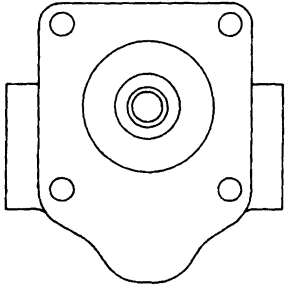
20TF01020



20TF01021



CONTROL PUMP



Section B - B

UZSUZU/

1. Case
2. Drive gear
3. Driven gear
4. Plate A
5. Plate B
6. Cover

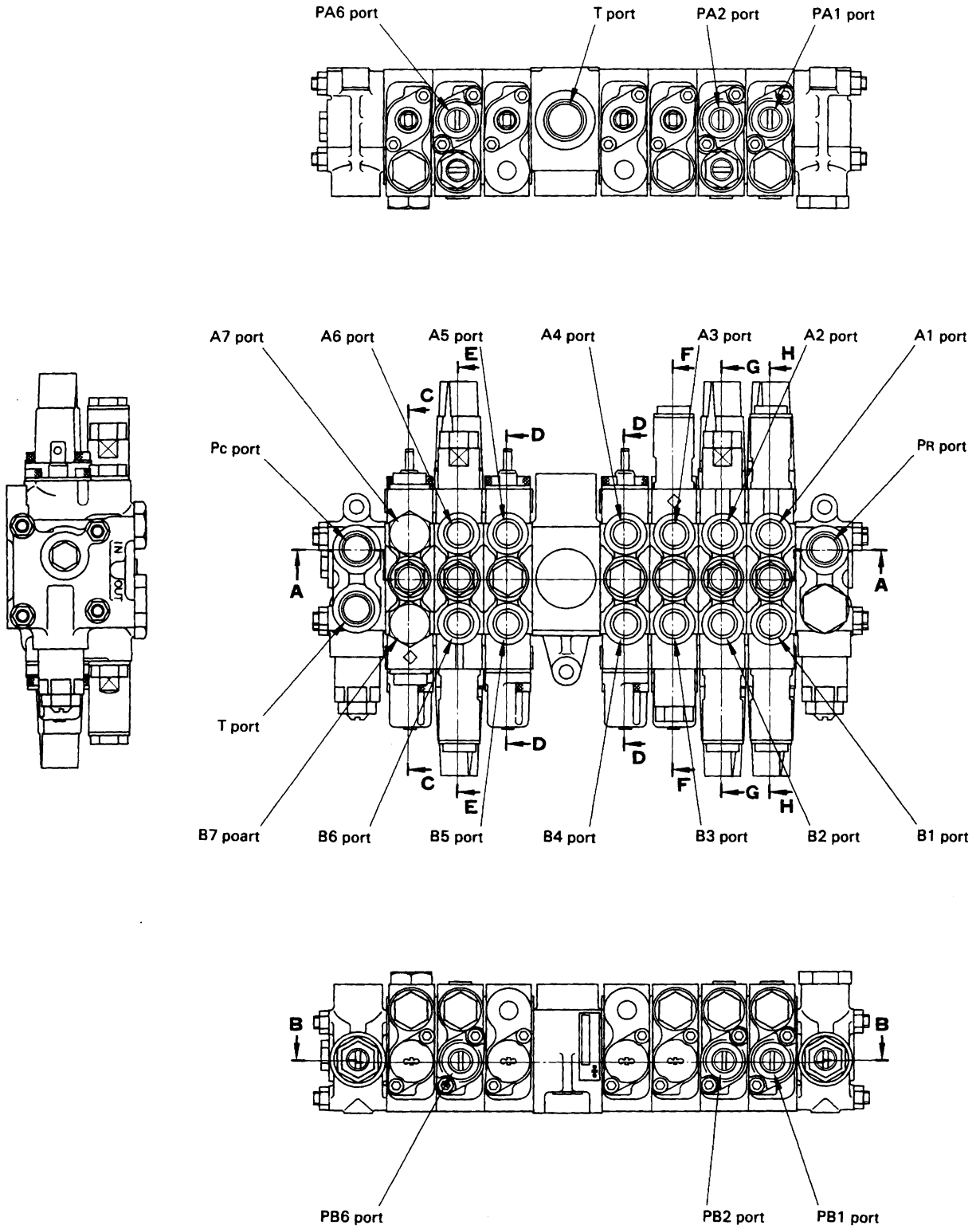
SPECIFICATIONS

- Type: PW1-C-3A
- Theoretical delivery: 3 cc/rev
- Rated pressure: 30 kg/cm²

20TF01022

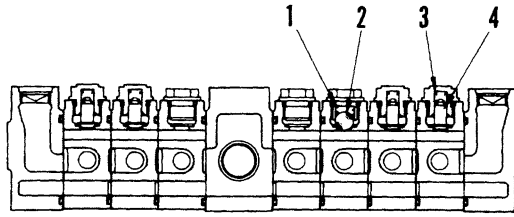
7-SPOOL CONTROL VALVE

PC25-1, PC30-7, PC40-7

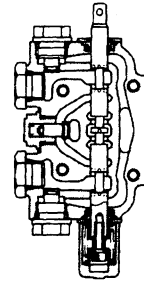


LUSVU7

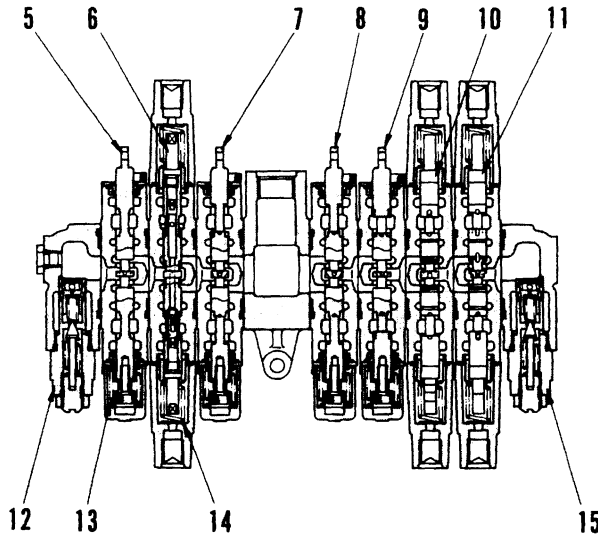
20TF01024



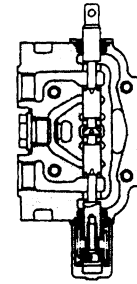
Section A - A



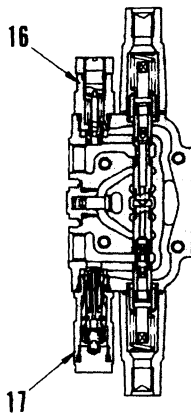
Section C - C



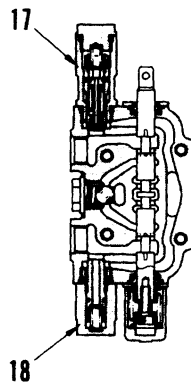
Section B - B



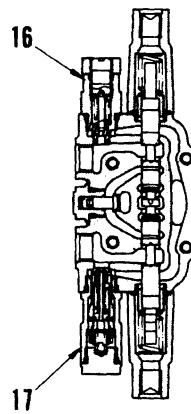
Section D - D



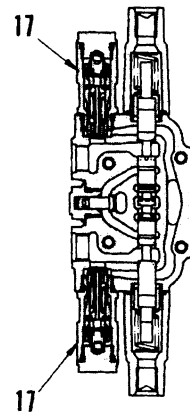
Section E - E



Section F - F



Section G - G



Section H - H

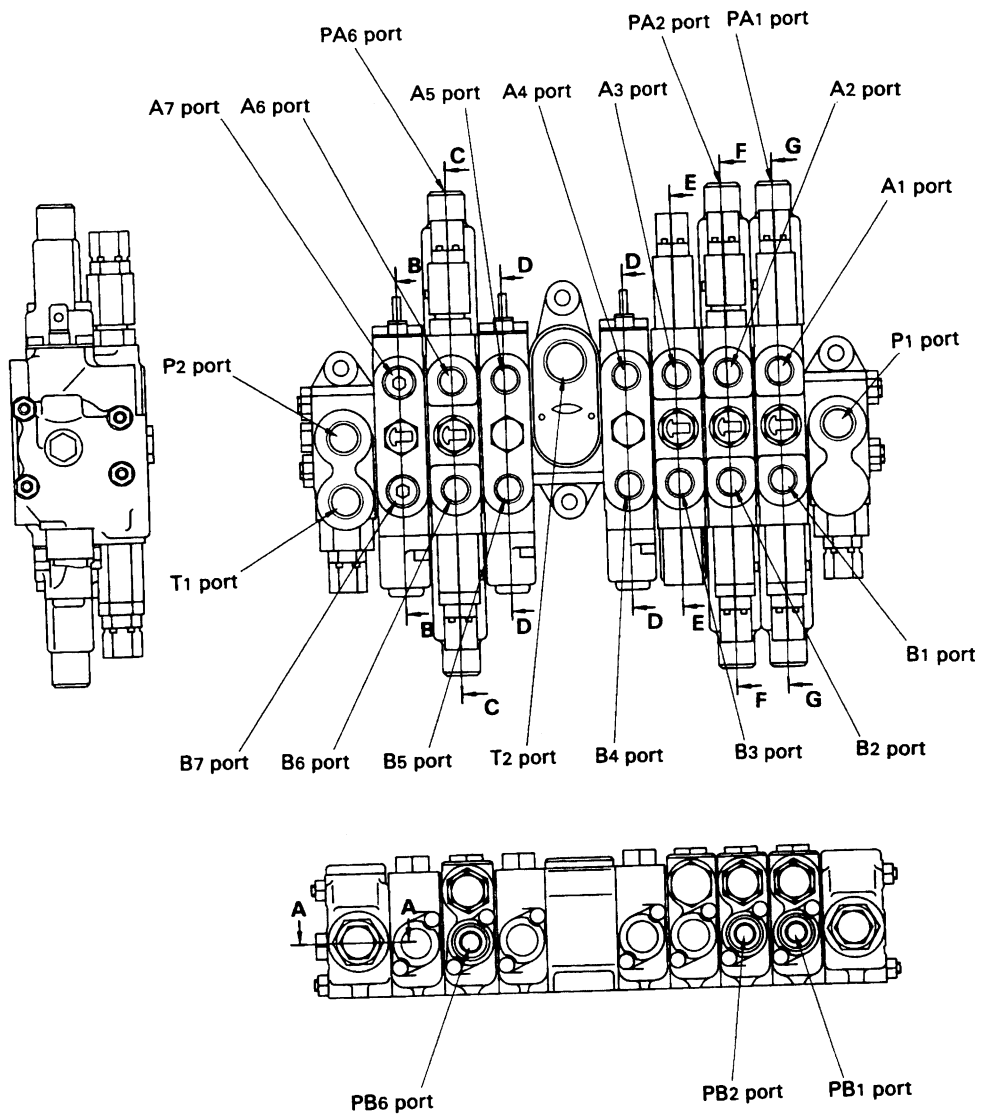
- 1. Check valve spring
- 2. Check valve (ball)
- 3. Check valve spring
- 4. Check valve
- 5. Spool (Service)
- 6. Spool (Arm)

- 7. Spool (L.H. travel)
- 8. Spool (R.H. travel)
- 9. Spool (Boom swing)
- 10. Spool (Bucket)
- 11. Spool (Boom)
- 12. Main relief valve

- 13. Spool return spring
- 14. Spool return spring
- 15. Main relief valve
- 16. Safety valve
- 17. Safety-suction valve
- 18. Suction valve

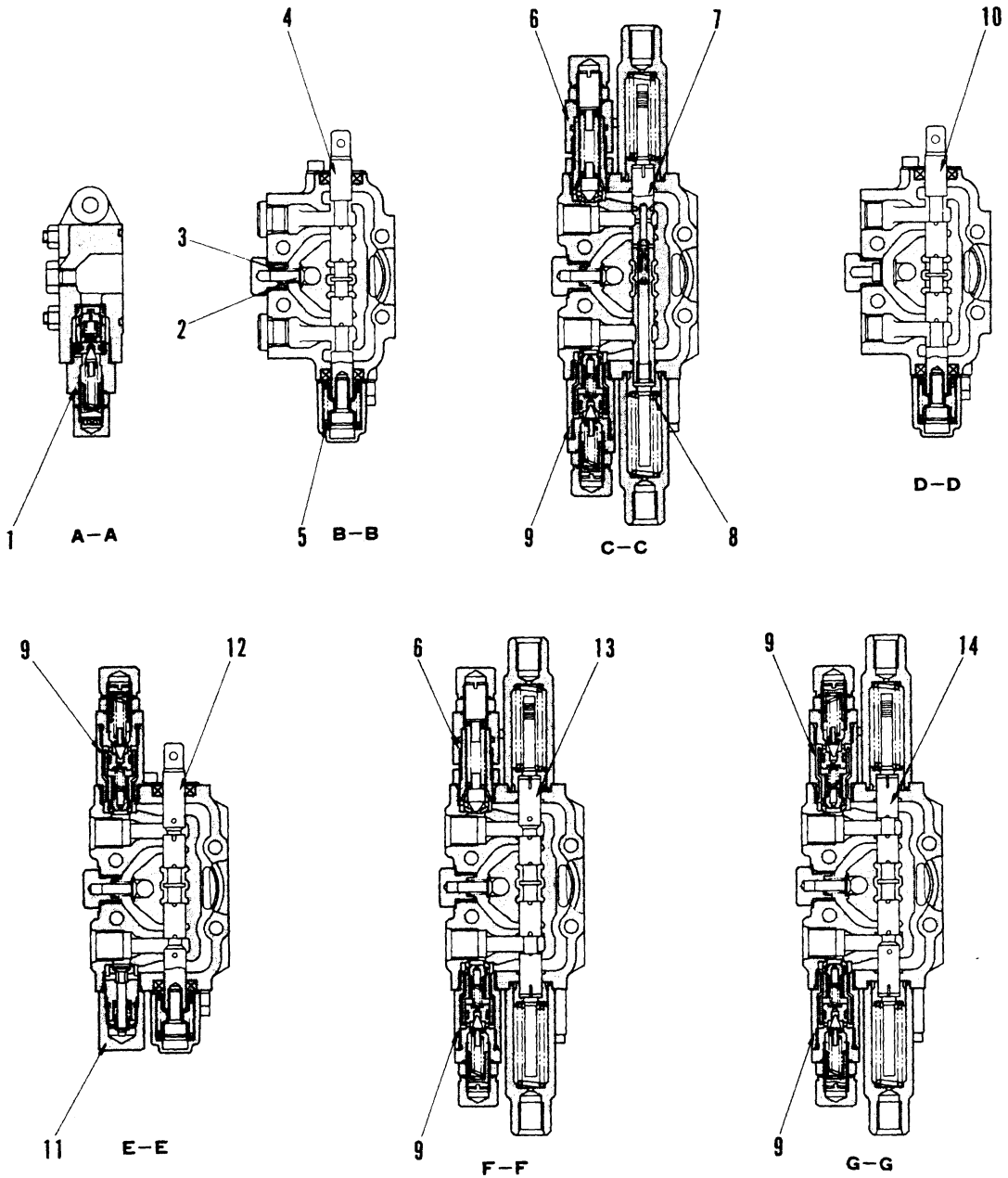
20TF01025A

PC45-1



F20S07001-1

020S07

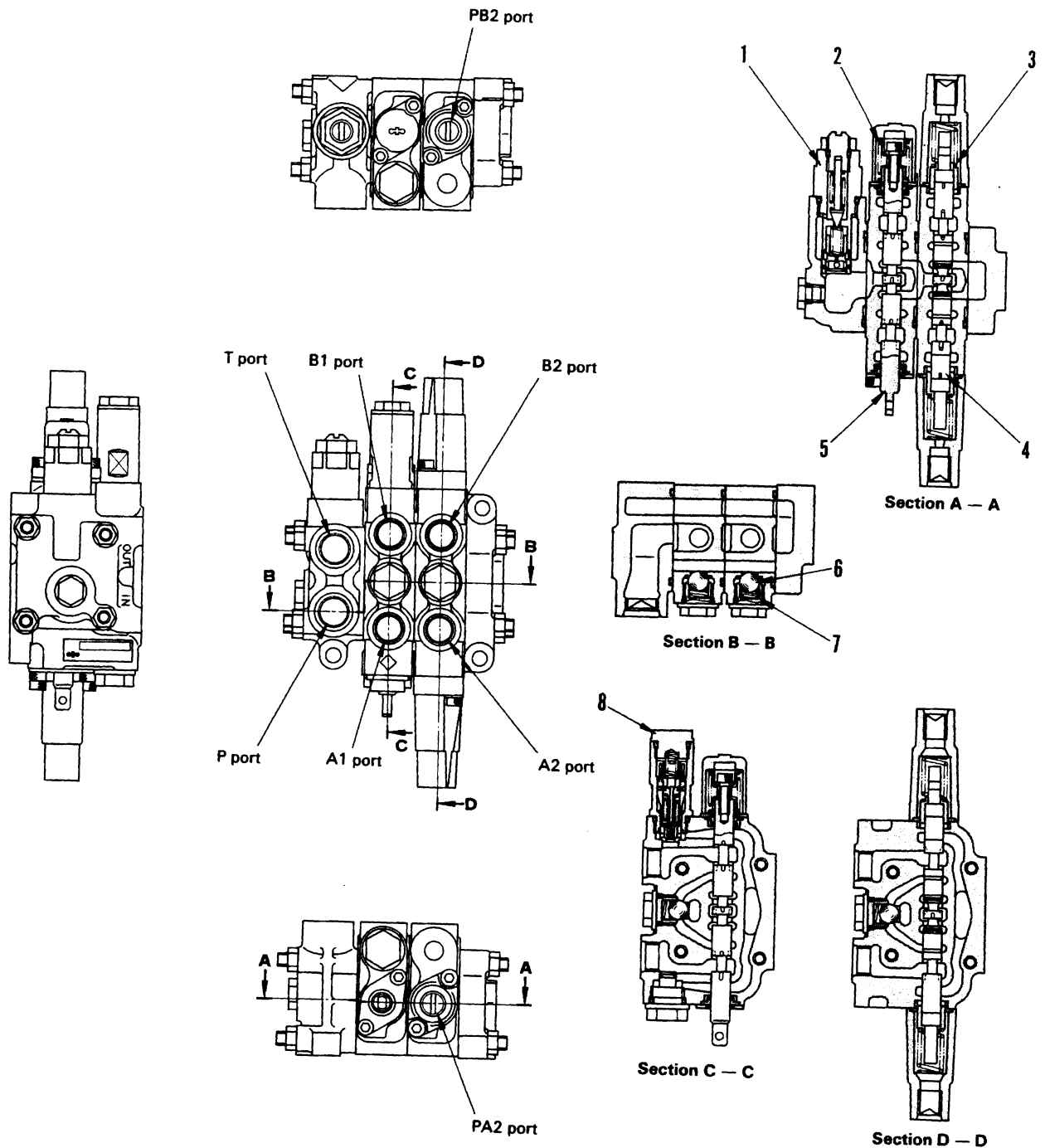


- 1. Main relief valve
- 2. Check valve
- 3. Check valve spring
- 4. Spool (Service)
- 5. Spool return spring
- 6. Safety valve
- 7. Spool (Arm)

- 8. Spool return spring
- 9. Safety-suction valve
- 10. Spool (L.H. and R.H. travel)
- 11. Spool (Boom swing)
- 12. Suction valve
- 13. Spool (Bucket)
- 14. Spool (Boom)

F20S07002-1

2-SPOOL CONTROL VALVE

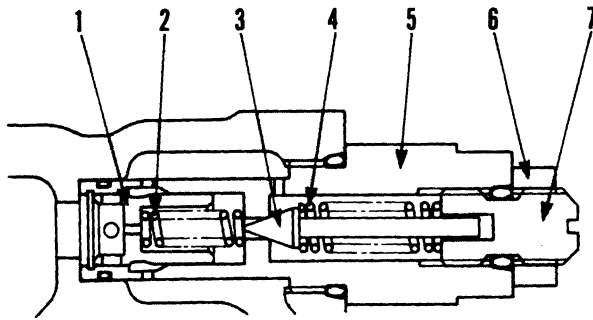


1. Main relief valve
2. Spool return spring
3. Spool return spring
4. Spool (Swing)

5. Spool (Blade)
6. Check valve
7. Check valve spring
8. Safety-suction valve

20TF01023

MAIN RELIEF VALVE
PC25-1, PC30-7, PC40-7

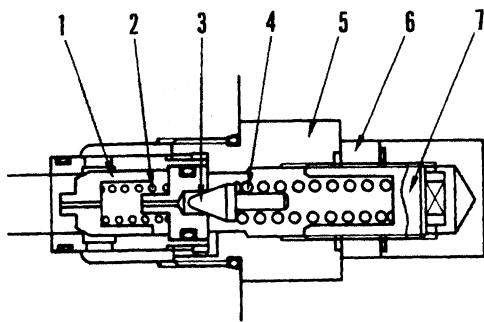


1. Main valve
2. Main valve spring
3. Pilot poppet
4. Pilot poppet spring
5. Sleeve
6. Locknut
7. Adjustment screw

Set pressure :
 2-spool control valve : 21.6 MPa (220 kg/cm²)
 7-spool control valve : 20.6 MPa (210 kg/cm²)

20TF1030

PC45-1

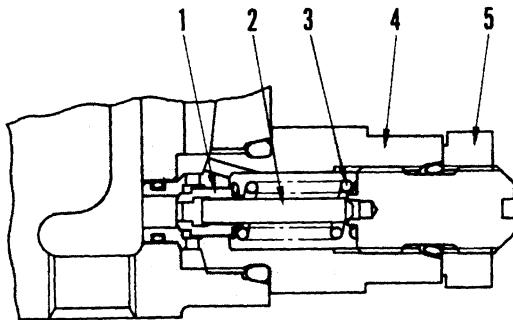


1. Main valve
2. Main valve spring
3. Pilot poppet
4. Pilot poppet spring
5. Sleeve
6. Locknut
7. Adjustment screw

Set pressure :
 2-spool control valve : 20.6 MPa (210 kg/cm²)
 7-spool control valve : 20.6 MPa (210 kg/cm²)

F20S07003

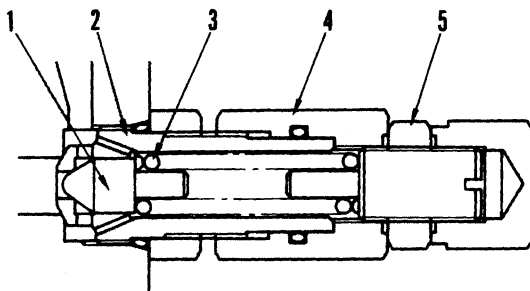
SAFETY VALVE
PC25-1, PC30-7, PC40-7



1. Main valve
 2. Pilot piston
 3. Main valve spring
 4. Sleeve
 5. Locknut
- Arm cylinder head side
 - Bucket cylinder head side

20SF6020

PC45-1

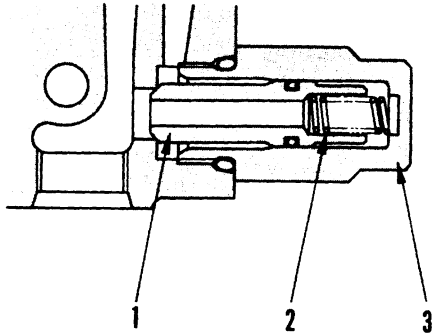


1. Valve
 2. Sleeve
 3. Spring
 4. Retainer
 5. Locknut
- Arm cylinder head side
 - Bucket cylinder head side

20TF01027

/0S070

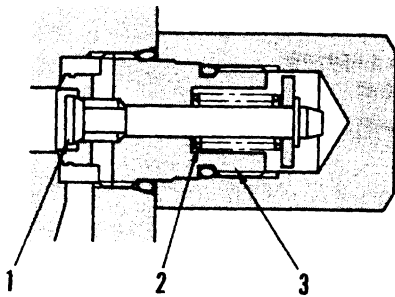
SUCTION VALVE
PC25-1, PC30-7, PC40-7



PC45-1

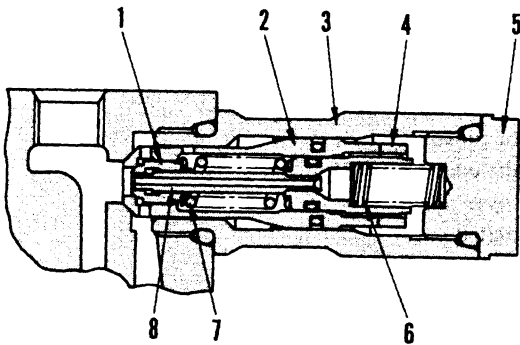
20RF5017

1. Valve
2. Valve spring
3. Sleeve
 - Swing
 - Swing cylinder bottom



20TF01028

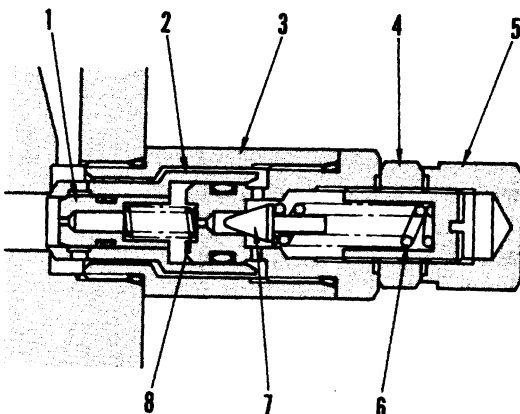
SAFETY-SUCTION VALVE
PC25-1, PC30-7, PC40-7



PC45-1

20SF6021

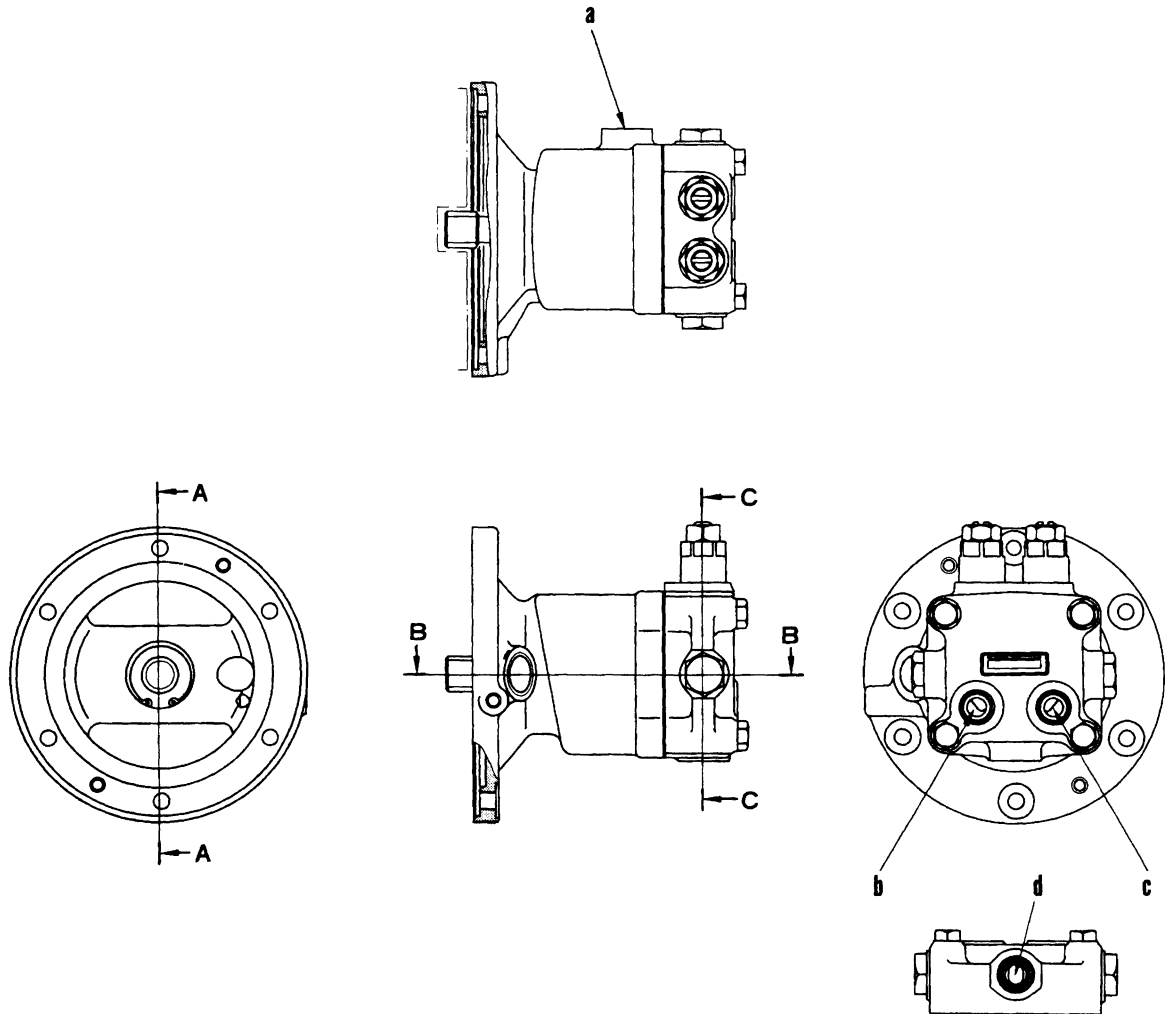
1. Main valve
2. Suction valve
3. Sleeve
4. Locknut
5. Plug
6. Suction valve spring
7. Main valve spring
8. Pilot piston
 - Boom cylinder bottom side
 - Boom cylinder head side
 - Arm cylinder bottom side
 - Bucket cylinder bottom side
 - Blade cylinder bottom side
 - Swing cylinder head side



20TF01029

1. Main valve
2. Suction valve
3. Sleeve
4. Locknut
5. Plug
6. Pilot spring
7. Pilot poppet
8. Main valve spring
 - Boom cylinder bottom side
 - Boom cylinder head side
 - Arm cylinder bottom side
 - Bucket cylinder bottom side
 - Swing cylinder head side

SWING MOTOR



020507

20PFA5013

- a. T Port (To tank)
- b. MB port (From 2-spool control valve B2 port)
- c. MA port (From 2-spool control valve A2 port)
- d. S port (From tank)

SPECIFICATIONS

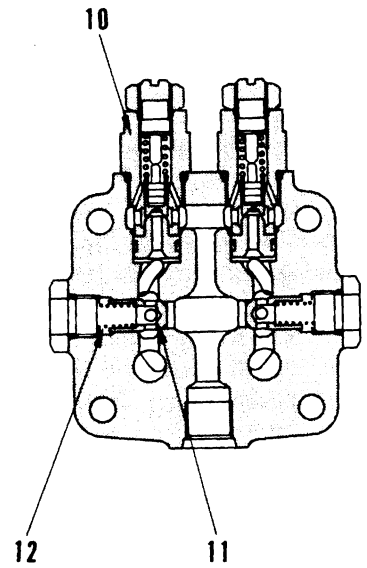
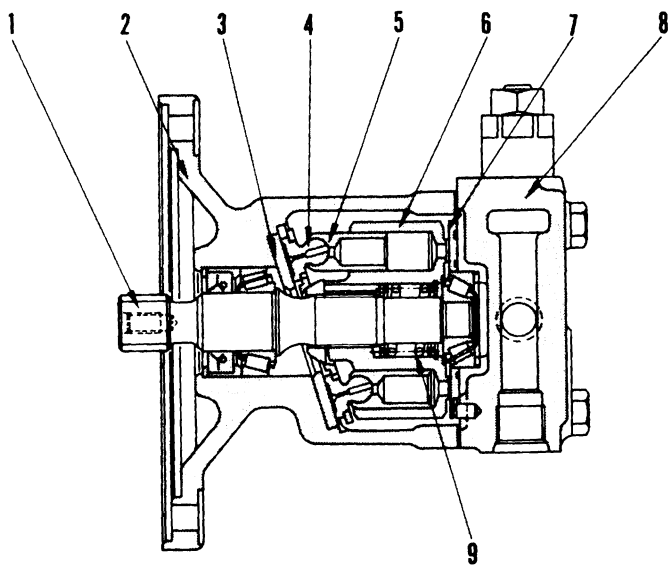
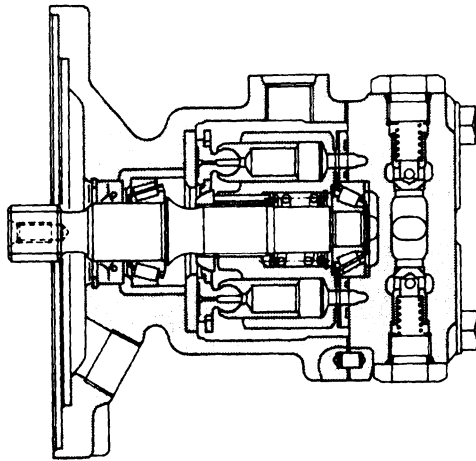
PC25-1, PC30-7

- Type: LMF28-2
- Theoretical delivery : 28.2 cc/rev
- Safety valve set pressure:
 - 17.6 MPa (180 kg/cm²)(PC25)
 - 19.6 MPa (200 kg/cm²)(PC30)

PC40-7, PC45-1

- Type: LMF40-2
- Theoretical delivery : 40.8 cc/rev
- Safety valve set pressure:
 - 19.6 MPa (200 kg/cm²)(PC25)

020S07



- 1. Output shaft
- 2. Housing
- 3. Swash plate
- 4. Shoe
- 5. Piston
- 6. Cylinder

- 7. Valve plate
- 8. End cap
- 9. Center spring
- 10. Safety valve
- 11. Check valve
- 12. Check valve spring

20PFA5014

SAFETY VALVE

1. OUTLINE

The safety valve portion consists of a check valve and safety valve.

2. FUNCTION

When the swing is stopped, the output circuit of the motor is closed by the control valves, but the motor continues to rotate because of inertia. For this reason, the pressure at the output side of the motor becomes abnormally high, and this will damage the motor. To prevent this, the oil causing the abnormal hydraulic pressure is allowed to escape from the outlet port (high-pressure side) of the motor to port **S**, thereby preventing damage to the motor.

Compared with a counterbalance valve, there is no closed-in pressure generated at the outlet port side when slowing down the swing speed. This means that there is no vibration when slowing down, so the ease of swing control is improved.

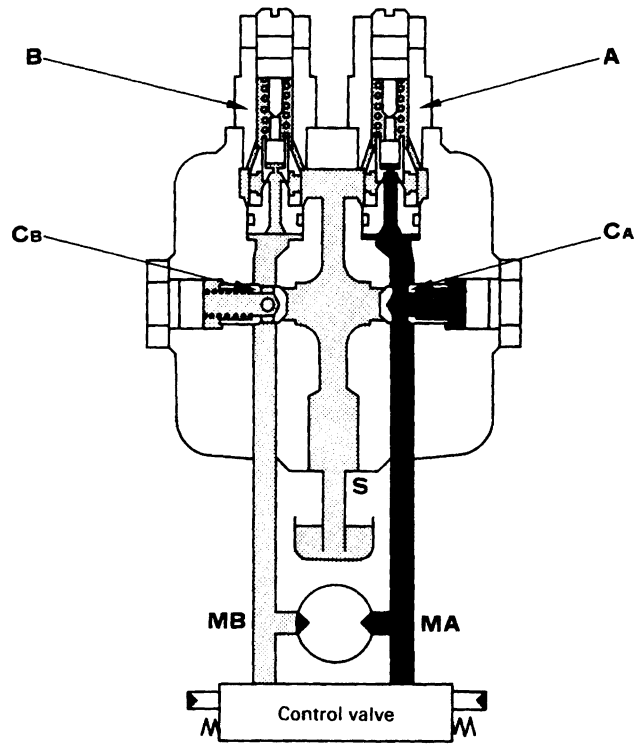
3. OPERATION

1) When starting swing

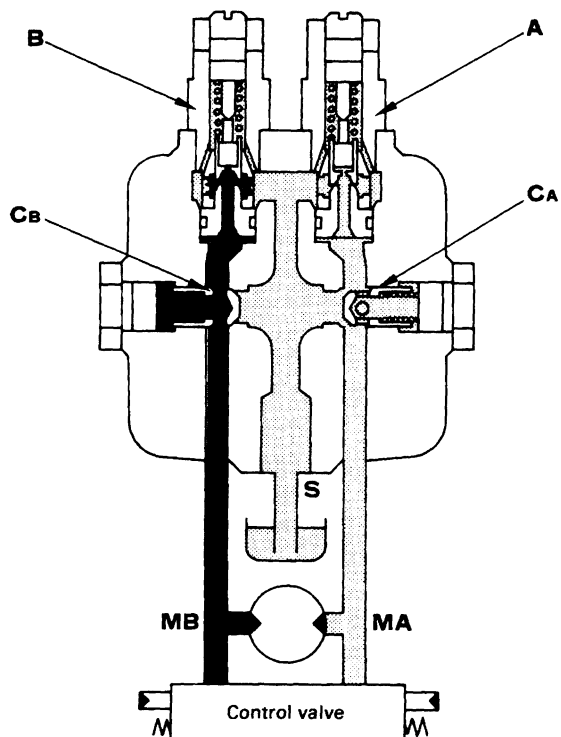
When the swing control lever is operated to left swing, the pressurized oil from the pump passes through the control valves and is supplied to port **MA**. Because of this, the pressure at port **MA** rises, starting torque is generated in the motor, and the motor starts to rotate. The oil from the outlet port of the motor passes from port **MB** through the control valve and returns to the tank.

2) When stopping swing

- When the swing control lever is returned to neutral, no pressurized oil is supplied from the pump to port **MA**. The return circuit to the tank is closed by the control valve, so the oil from the outlet port of the motor increases in pressure at port **MB**. Resistance to the rotation of the motor is created, and the brake starts to act.
- The pressure at port **MB** rises to the set pressure of safety valve **B**, and in this way, a high brake torque acts on the motor, and the motor stops.
- When safety valve **B** is being actuated, the relief oil from safety valve **B** and the oil from port **S** pass through check valve **CA** and are supplied to port **MA**. This prevents cavitation from forming at port **MA**.

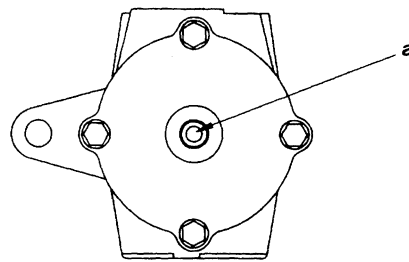


20TF01036

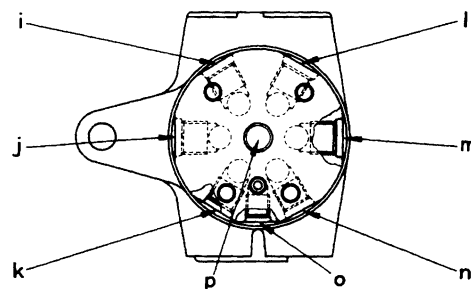
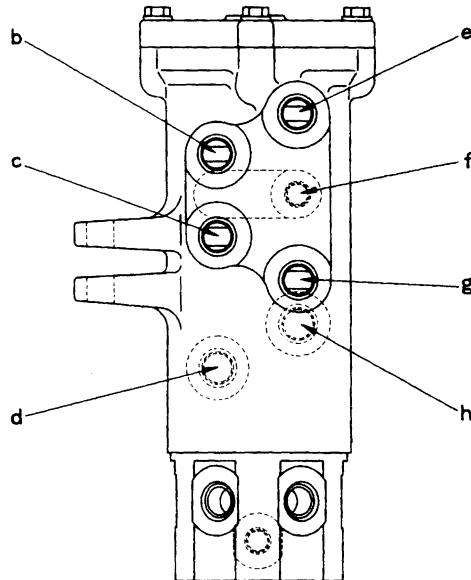
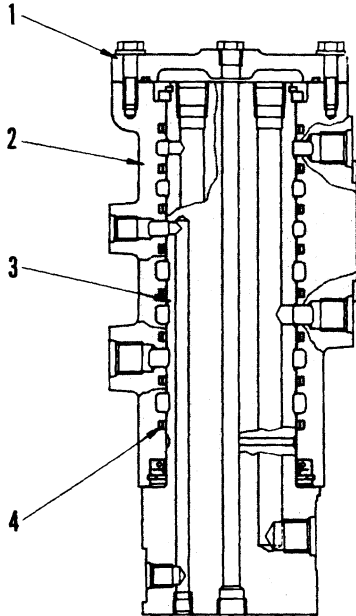


20TF01037

CENTER SWIVEL JOINT



1. Cover
2. Shaft
3. Rotor
4. Slipper seal



1/020770

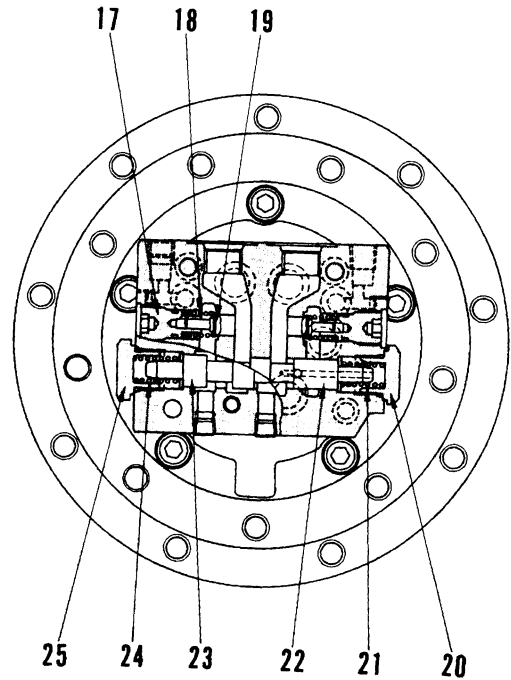
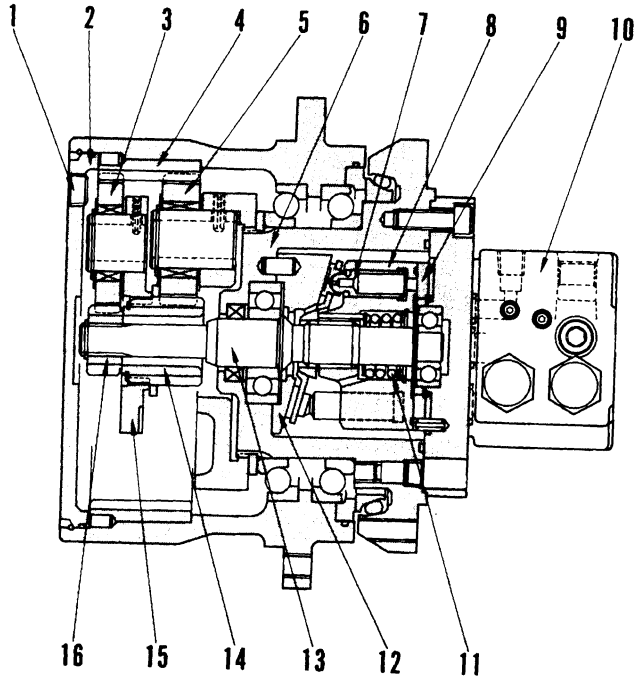
20TF01030

- a. T port (To tank)
- b. F port (From blade control valve)
- c. D port (From R.H. travel control valve)
- d. A port (From L.H. travel control valve)
- e. G port (From blade control valve)
- f. E port (From travel speed acceleration solenoid valve)
- g. C port (From R.H. travel control valve)
- h. B port (From L.H. travel control valve)

- i. B port (To L.H. travel motor)
- j. A port (To L.H. travel motor)
- k. F port (To blade cylinder head side)
- l. D port (To R.H. travel motor)
- m. C port (To R.H. travel motor)
- n. G port (To blade cylinder bottom side)
- o. E port (To travel speed acceleration valve)
- p. From travel motor drain port

TRAVEL MOTOR

PC25-1, PC30-7

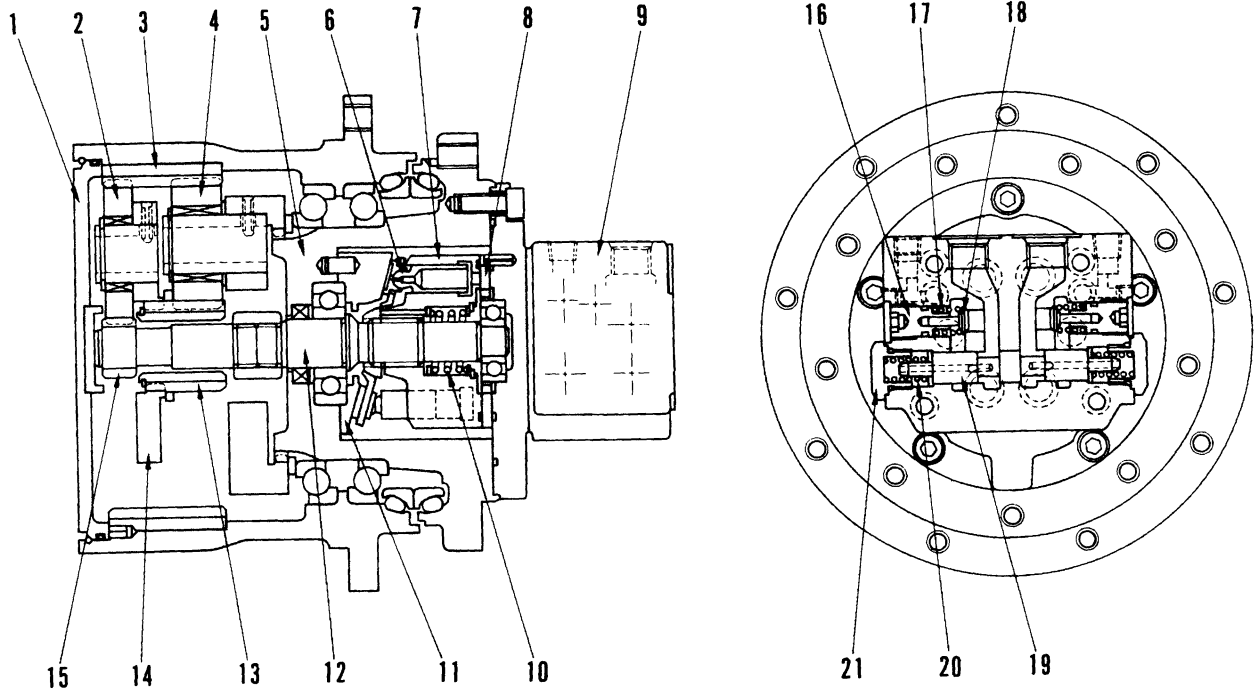


20SF6083

- | | |
|------------------------|--------------------------------|
| 1. Drain plug | 14. No.1 sun gear |
| 2. Cover | 15. No.2 planetary carrier |
| 3. No.2 planetary gear | 16. No.2 sun gear |
| 4. Ring gear | 17. Plug |
| 5. No.1 planetary gear | 18. Check valve spring |
| 6. Housing | 19. Check valve |
| 7. Piston | 20. Plug |
| 8. Cylinder | 21. Spool return spring |
| 9. Valve plate | 22. Counterbalance valve spool |
| 10. Brake valve | 23. Regulator valve spring |
| 11. Center spring | 24. Spool return spring |
| 12. Swash plate | 25. Plug |
| 13. Output shaft | |

- SPECIFICATIONS**
- PC25-1
- Type: PHX300N-29
 - Theoretical delivery:
 - Lo: 32.8 cc/rev
 - Hi: 21.0 cc/rev
 - Reduction ratio: 28.5
- PC30-7
- Type: PHX300N-33
 - Theoretical delivery:
 - Lo: 30.9 cc/rev
 - Hi: 19.8 cc/rev
 - Reduction ratio: 33.3

PC40-7



020S07

- | | |
|------------------------|----------------------------|
| 1. Cover | 12. Output shaft |
| 2. No.2 planetary gear | 13. No.1 sun gear |
| 3. Ring gear | 14. No.2 planetary carrier |
| 4. No.1 planetary gear | 15. No.2 sun gear |
| 5. Housing | 16. Plug |
| 6. Piston | 17. Check valve spring |
| 7. Cylinder | 18. Check valve |
| 8. Valve plate | 19. Counterbalance valve |
| 9. Brake valve | 20. Spool return spring |
| 10. Center spring | 21. Plug |
| 11. Swash plate | |

SPECIFICATIONS

PC40-7

- Type: PHX350N-41
- Theoretical delivery:
 - Lo: 30.9 cc/rev
 - Hi: 19.8 cc/rev
- Reduction ratio: 40.6

SELECTION OF TRAVEL SPEED

PC25-1, PC30-7, PC40-7

OUTLINE

- Port **A** and port **B** of valve plate (1) each consist of three independent ports (**A**, **A1**, **A2** and **B**, **B1**, **B2**).
- The travel speed is switched by switching the supply of pressurized oil to each port.

OPERATION

1) Low speed

When the travel speed acceleration pedal is released, travel speed acceleration solenoid valve (3) is demagnetized, and no pressurized oil is supplied to port **PP**.

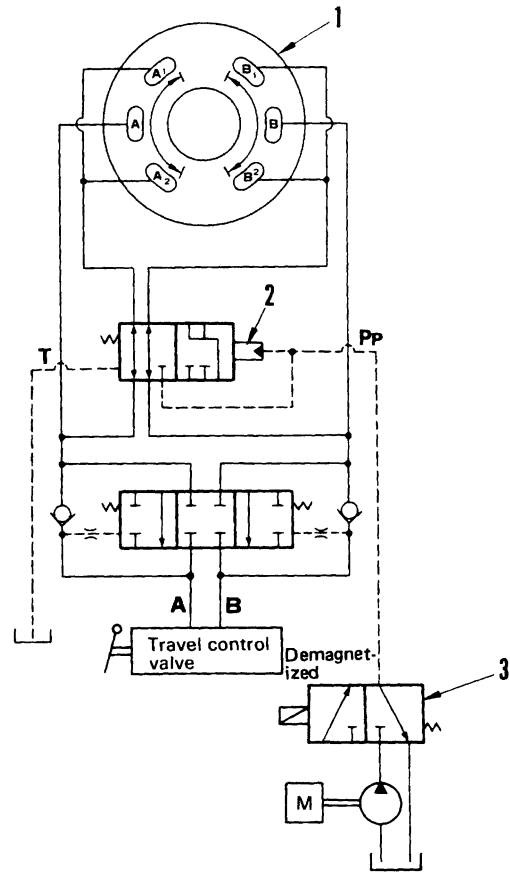
When this happens, all the pressure oil from the travel control valve is supplied to ports **A**, **A1**, and **A2** (or **B**, **B1**, and **B2**), so the piston becomes a large capacity motor that acts from the top dead point to the bottom dead point.

Therefore, the travel speed is set to low speed.

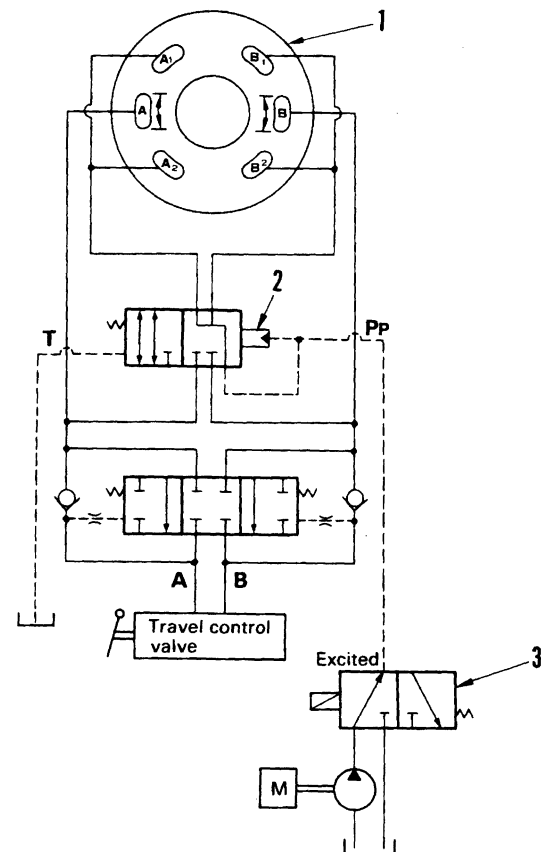
2) High speed

When the travel speed acceleration pedal is depressed, travel speed acceleration solenoid valve (3) is excited, pressurized oil is supplied to port **PP**, and regulator valve (2) is switched. When this happens, the supply of pressure oil from the travel control valve to ports **A1** and **A2** (or **B1** and **B2**) is shut off, and oil is supplied only to port **A** (port **B**).

As a result, the piston becomes a small capacity motor that acts only on a fixed part in the stroke. Therefore, the travel speed is set to high speed.

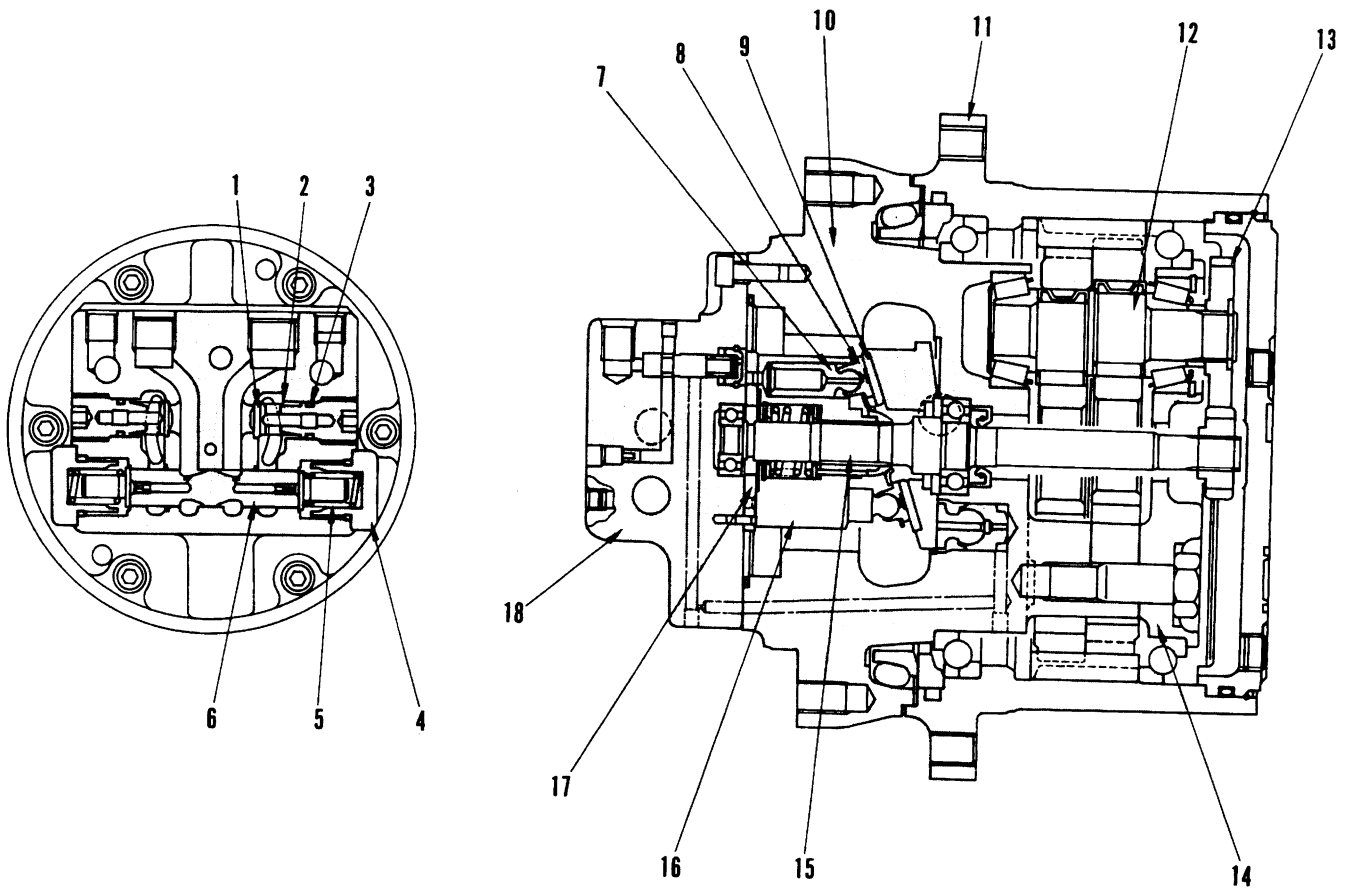


F20S07004



F20S07005

PC45-1



020S07

20TF01040A

- 1. Valve
- 2. Spring
- 3. Plug
- 4. Plug
- 5. Spring
- 6. Spool
- 7. Piston
- 8. Shoe
- 9. Slide plate

- 10. Spindle
- 11. Hub
- 12. Crankshaft
- 13. Spur gear
- 14. Hold flange
- 15. Shaft
- 16. Cylinder block
- 17. Timing plate
- 18. Rear flange

SPECIFICATIONS

PC45-1

- Type: GM05VL
- Theoretical delivery:
 - Lo: 27 cc/rev
 - Hi: 18 cc/rev
- Reduction ratio: 55

SELECTION OF TRAVEL SPEED

PC45-1

OUTLINE

- The travel speed is switched by switching the angle of the swash plate.

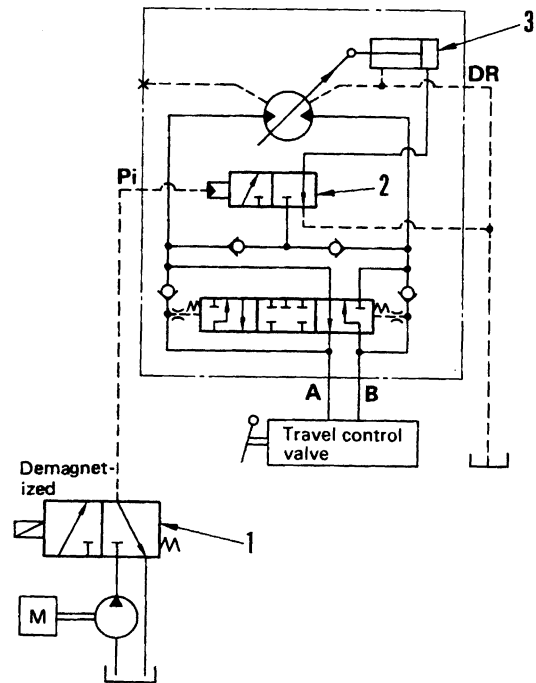
OPERATION

1) Low speed

When the travel speed acceleration pedal is released, travel speed acceleration solenoid valve (1) is demagnetized, and no pressurized oil is supplied to port Pi.

When this happens, pilot piston (3) is fixed at the maximum swash plate angle and the motor capacity becomes the maximum.

Therefore, the travel speed is set to low speed.

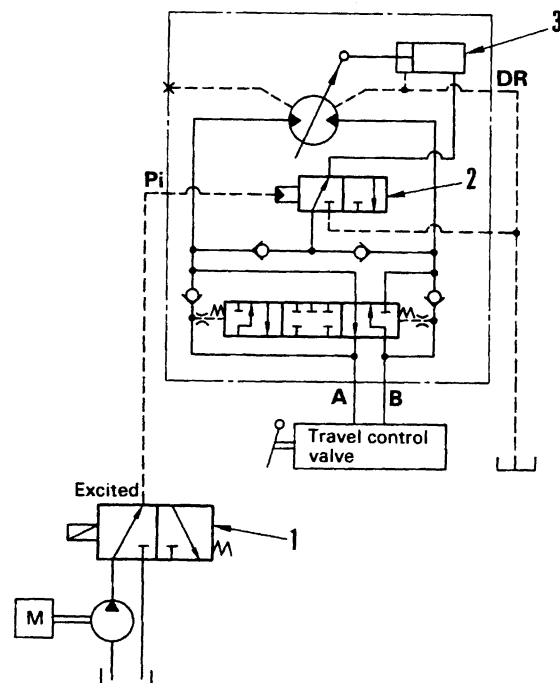


F20S07006

2) High speed

When the travel speed acceleration pedal is depressed, travel speed acceleration solenoid valve (1) is excited, pressurized oil is supplied to port Pi, and regulator valve (2) is switched. When this happens, the pressure oil from the main circuit acts on pilot piston (3), moves pilot piston (3) to the minimum swash plate angle and the motor capacity becomes the minimum.

Therefore, the travel speed is set to high speed.

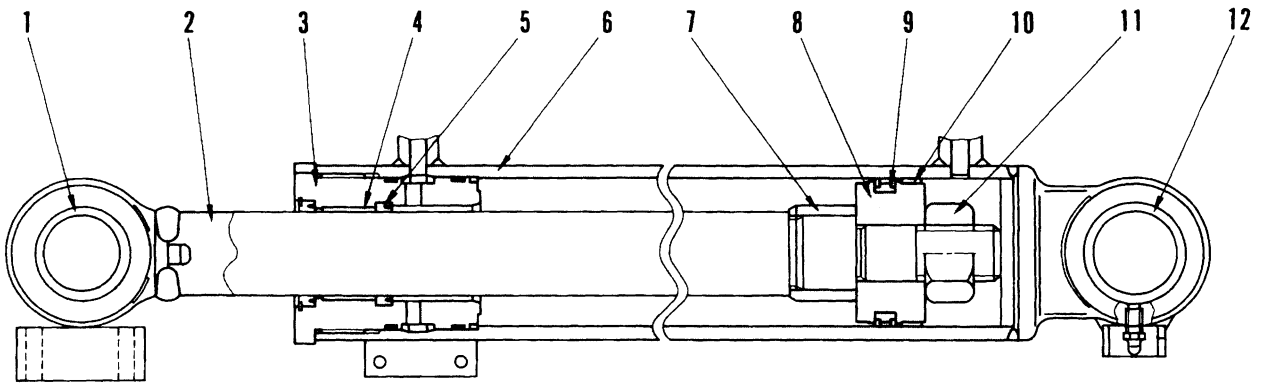


F20S07007

HYDRAULIC CYLINDER

1. BOOM CYLINDER

★ Figs. show PC25-1.



F20S07008

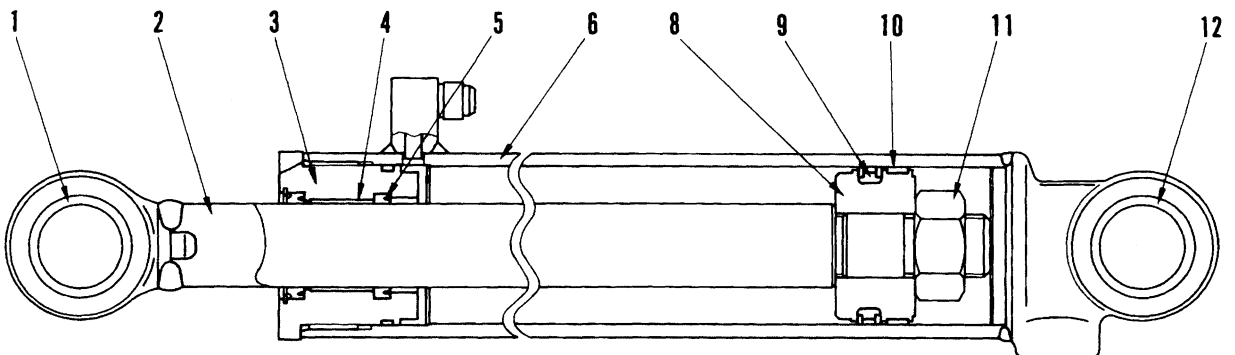
- 1. Rod side bushing
- 2. Piston rod
- 3. Cylinder head
- 4. Wear ring

- 5. Rod packing
- 6. Cylinder
- 7. Cushion plunger
- 8. Piston

- 9. Piston ring
- 10. Wear ring
- 11. Piston nut
- 12. Bottom side bushing

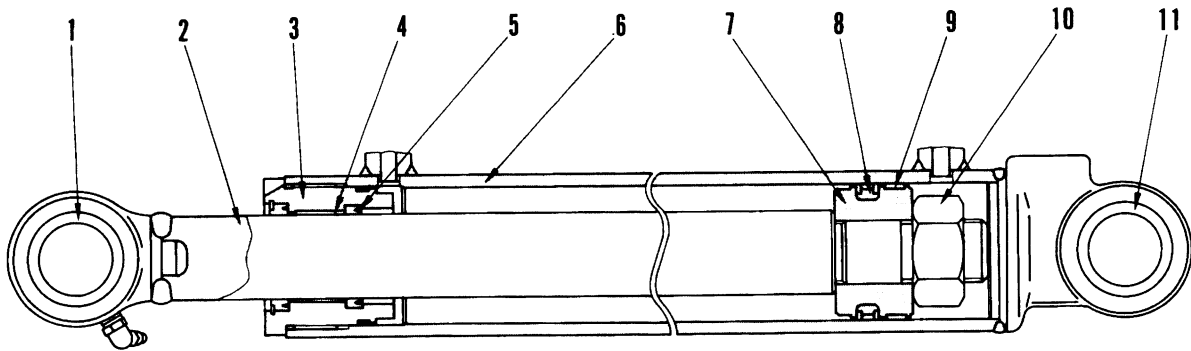
020S07

2. ARM CYLINDER



F20S07009

3. BUCKET CYLINDER



F20S07010

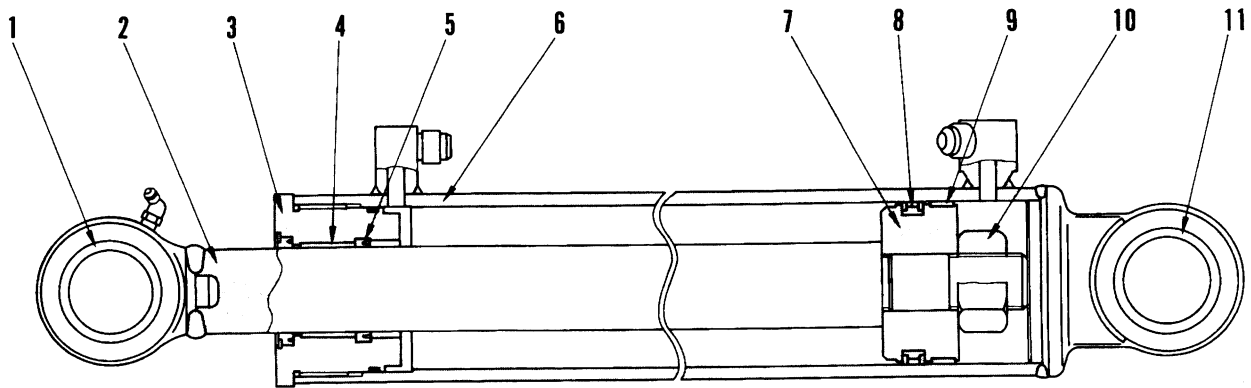
- 1. Rod side bushing
- 2. Piston rod
- 3. Cylinder head
- 4. Wear ring

- 5. Rod packing
- 6. Cylinder
- 7. Piston
- 8. Piston ring

- 9. Wear ring
- 10. Piston nut
- 11. Bottom side bushing

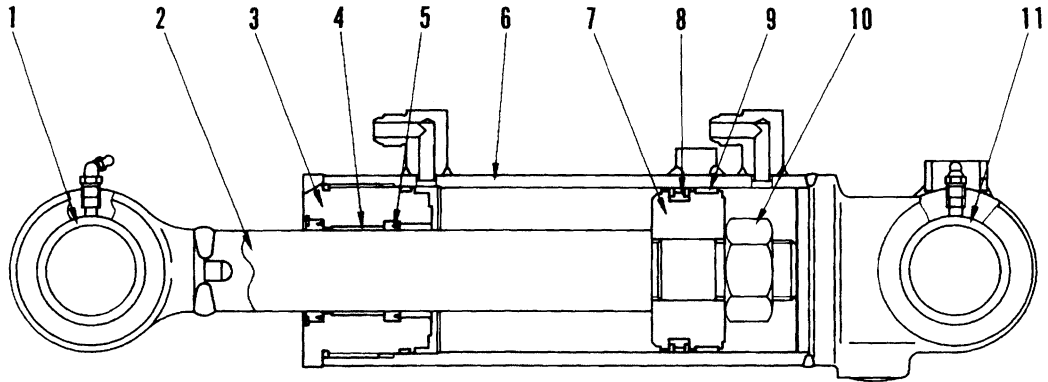
F
C
C
C
C

4. BOOM SWING CYLINDER



F20S07011

5. BLADE CYLINDER



F20S07012

020S07

- | | | |
|---------------------|----------------|-------------------------|
| 1. Rod side bushing | 5. Rod packing | 9. Wear ring |
| 2. Piston rod | 6. Cylinder | 10. Piston nut |
| 3. Cylinder head | 7. Piston | 11. Bottom side bushing |
| 4. Wear ring | 8. Piston ring | |

SPECIFICATIONS

PC25-1

Unit: mm

Item	Cylinder	Boom	Arm	Bucket	Boom swing	Blade
	Piston rod outside diameter		45	40	40	45
Cylinder inside diameter		80	75	65	85	90
Piston stroke		550	520	490	635	120
Cylinder max. length		1,460	1,345	1,270	1,575	590
Cylinder min. length		910	825	780	940	470
Piston nut width across flat		46	46	46	46	50

PC30-7

Unit: mm

Item	Cylinder	Boom	Arm	Bucket	Boom swing	Blade
	Piston rod outside diameter		45	45	40	45
Cylinder inside diameter		85	75	70	85	90
Piston stroke		550	670	490	635	120
Cylinder max. length		1,460	1,650	1,270	1,575	590
Cylinder min. length		910	980	780	940	470
Piston nut width across flat		46	50	46	46	50

PC40-7

Unit: mm

Item	Cylinder	Boom	Arm	Bucket	Boom swing	Blade
	Piston rod outside diameter		55	50	45	50
Cylinder inside diameter		90	80	75	90	100
Piston stroke		660	700	580	635	140
Cylinder max. length		1,700	1,720	1,480	1,610	632
Cylinder min. length		1,040	1,020	900	975	492
Piston nut width across flat		55	55	50	55	55

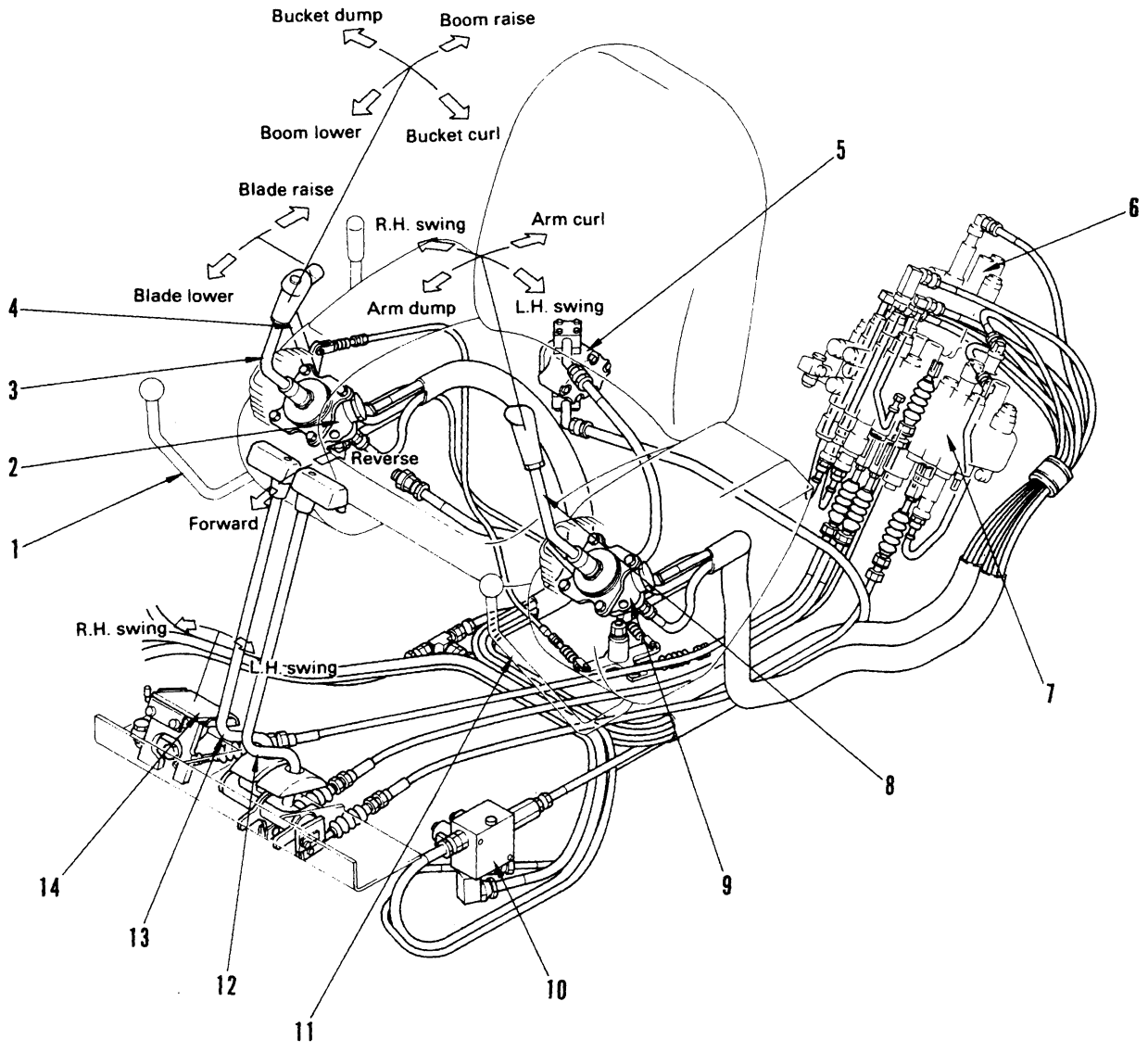
PC45-1

Unit: mm

Item	Cylinder	Boom	Arm	Bucket	Boom swing	Blade
	Piston rod outside diameter		55	50	50	50
Cylinder inside diameter		95	85	80	95	100
Piston stroke		660	760	580	635	140
Cylinder max. length		1,700	1,845	1,480	1,610	632
Cylinder min. length		1,040	1,085	900	975	492
Piston nut width across flat		55	55	55	55	55

VALVE CONTROL

705070



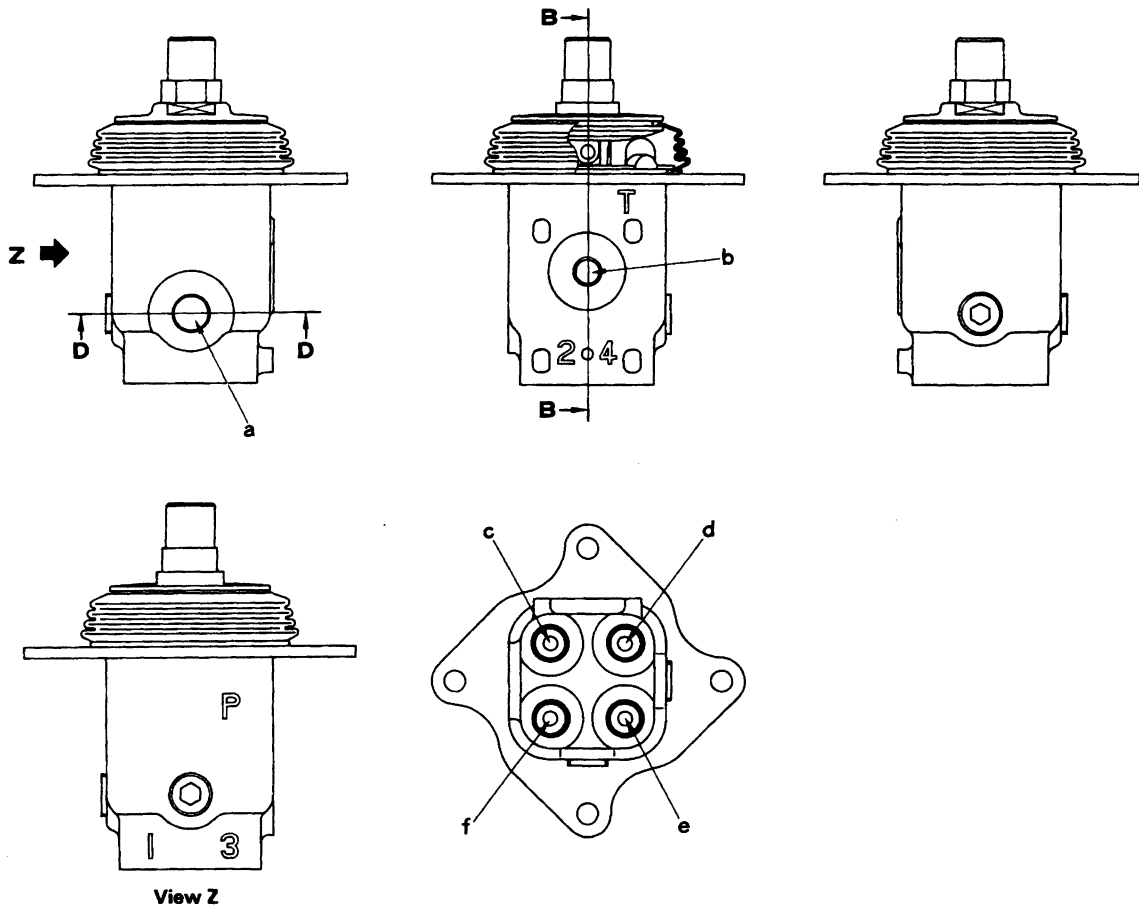
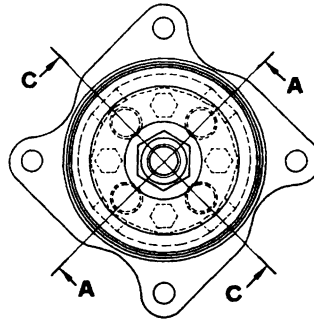
20TF01041-1

- 1. R.H. work equipment lock lever
- 2. R.H. PPC valve
- 3. R.H. work equipment lever
- 4. Blade control lever
- 5. Control pump
- 6. 2-spool control valve
- 7. 7-spool control valve

- 8. L.H. work equipment lever
- 9. L.H. PPC valve
- 10. Solenoid valve
- 11. L.H. work equipment lock lever
- 12. L.H. travel control lever
- 13. R.H. travel control lever
- 14. Swing pedal

PPC VALVE

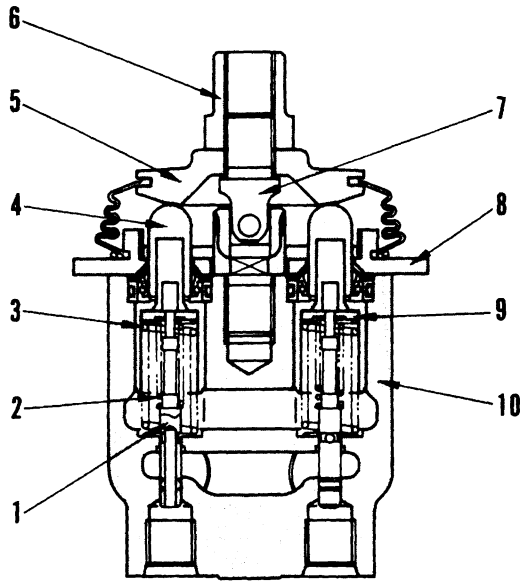
PC25-1 Serial No. 1001—5678
 PC30-7 Serial No. 18001—25054
 PC40-7 Serial No. 18001—23296
 PC45-1 Serial No. 1001—3014



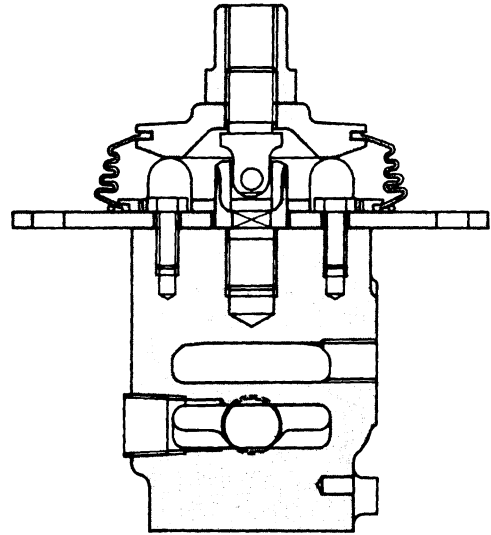
View Z

20TF01042

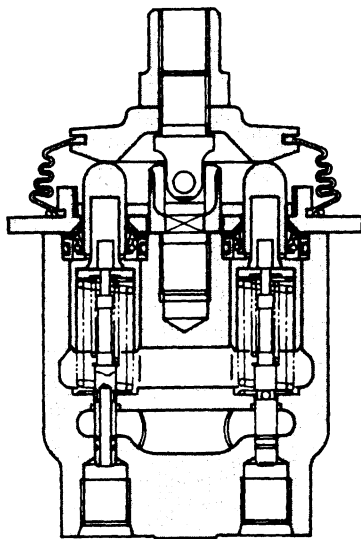
- a. P port (From control pump)
- b. T port (To tank)
- c. P2 port (L.H. : Arm dump / R.H. : Boom raise)
- d. P4 port (L.H. : Swing left / R.H. : Bucket dump)
- e. P1 port (L.H. : Arm curl / R.H. : Boom lower)
- f. P3 port (L.H. : Swing right / R.H. : Bucket curl)



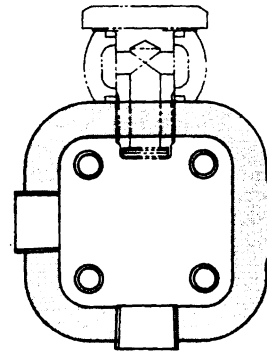
Section A - A



Section B - B



Section C - C



Section D - D

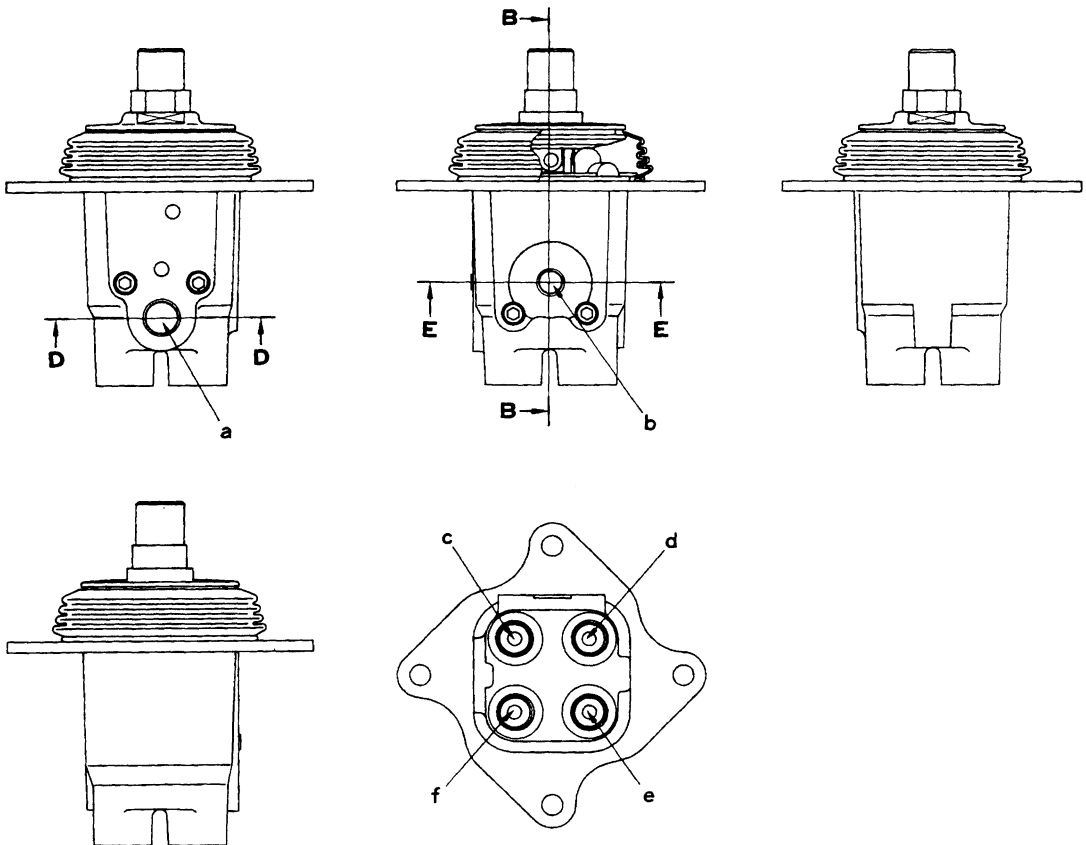
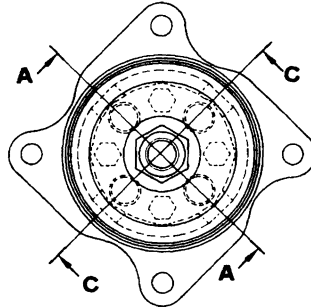
- 1. Spool
- 2. Metering spring
- 3. Centering spring
- 4. Piston
- 5. Disc

- 6. Nut
- 7. Joint
- 8. Plate
- 9. Retainer
- 10. Body

U20507

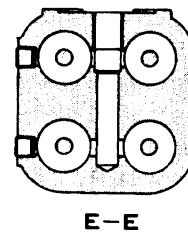
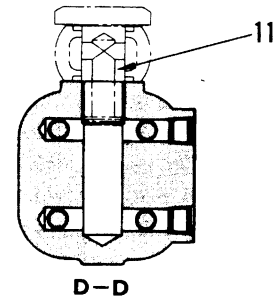
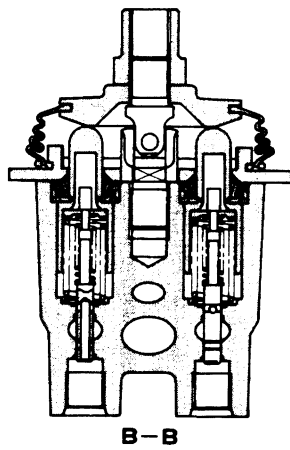
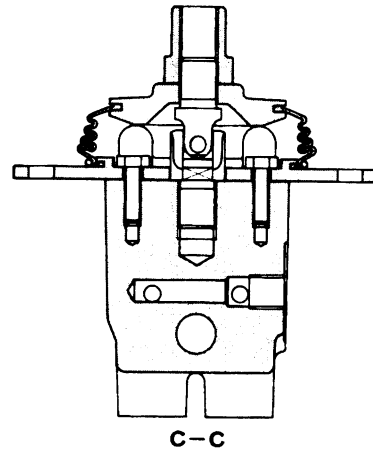
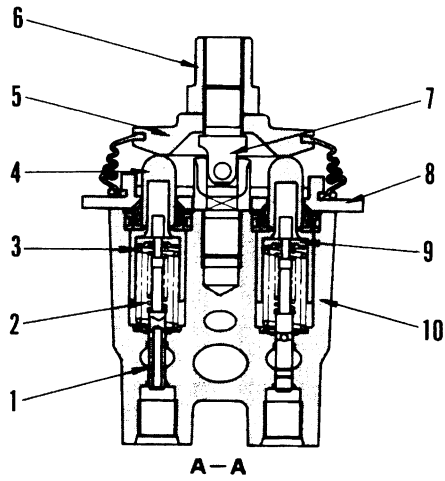
20TF01043

PC25-1 Serial No. 5679 and up
PC30-7 Serial No. 25055 and up
PC40-7 Serial No. 23297 and up
PC45-1 Serial No. 3015 and up



- a. P port (From control pump)
- b. T port (To tank)
- c. P2 port (L.H. : Arm dump / R.H. : Boom raise)
- d. P4 port (L.H. : Swing left / R.H. : Bucket dump)
- e. P1 port (L.H. : Arm curl / R.H. : Boom lower)
- f. P3 port (L.H. : Swing right / R.H. : Bucket curl)

20UF02032



1. Spool
2. Metering spring
3. Centering spring
4. Piston
5. Disc

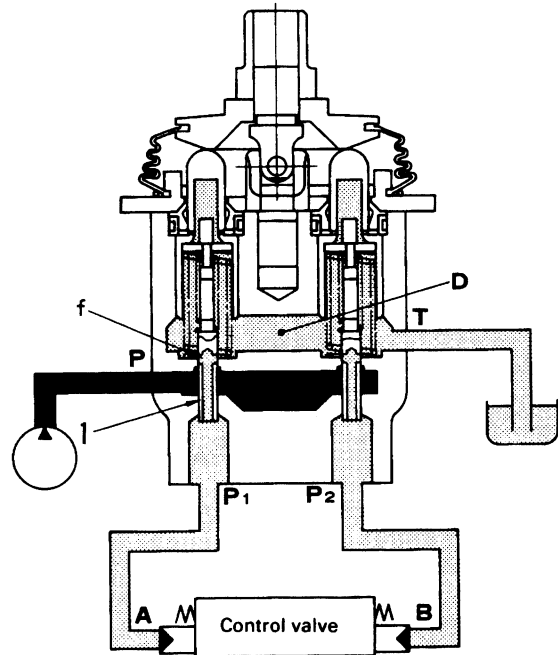
6. Nut
7. Joint
8. Plate
9. Retainer
10. Body
11. Filter

20UF02033

OPERATION

1) At neutral

Ports **A** and **B** of the control valve and ports **P1** and **P2** of the PPC valve are connected to drain chamber **D** through fine control hole **f** in spool (1). (Fig. 1)



20TF01044

(Fig.1)

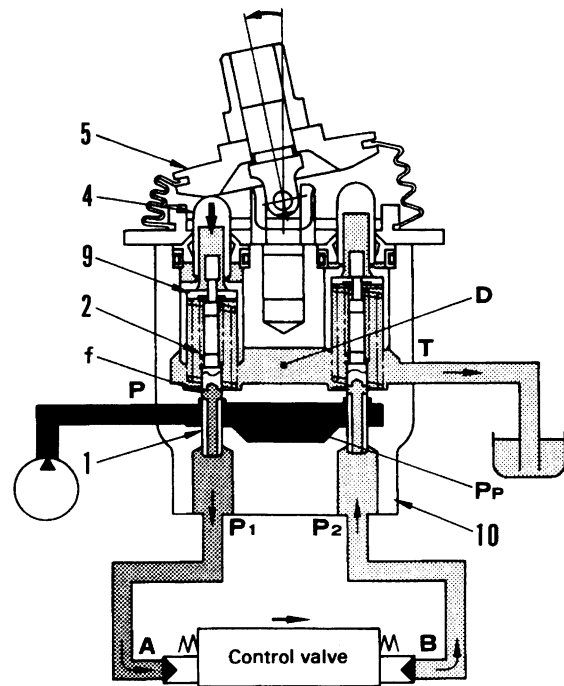
2) During fine control (neutral → fine control)

When piston (4) starts to be pushed by disc (5), retainer (9) is pushed; spool (1) is also pushed by metering spring (2), and moves down.

When this happens, fine control hole **f** is shut off from drain chamber **D**, and at almost the same time, it is connected to pump pressure chamber **PP**, so pilot pressure oil from the charging pump passes through fine control hole **f** and goes from port **P1** to port **A**.

When the pressure at port **P1** becomes higher, spool (1) is pushed back and fine control hole **f** is shut off from pump pressure chamber **PP**. At almost the same time, it is connected to drain chamber **D** to release the pressure at port **P1**. When this happens, spool (1) moves up or down so that the force of metering spring (2) is balanced with the pressure at port **P1**. The relationship in the position of spool (1) and body (10) (fine control hole **f** is at a point midway between drain hole **D** and pump pressure chamber **PP**) does not change until retainer (9) contacts spool (1).

Therefore, metering spring (2) is compressed proportionally to the amount of movement of the control lever, so the pressure at port **P1** also rises in proportion to the travel of the control lever. In this way, the control valve spool moves to a position where the pressure in chamber **A** (the same as the pressure at port **P1**) and the force of the control valve spool return spring are balanced. (Fig. 2)



20TF01045

(Fig.2)

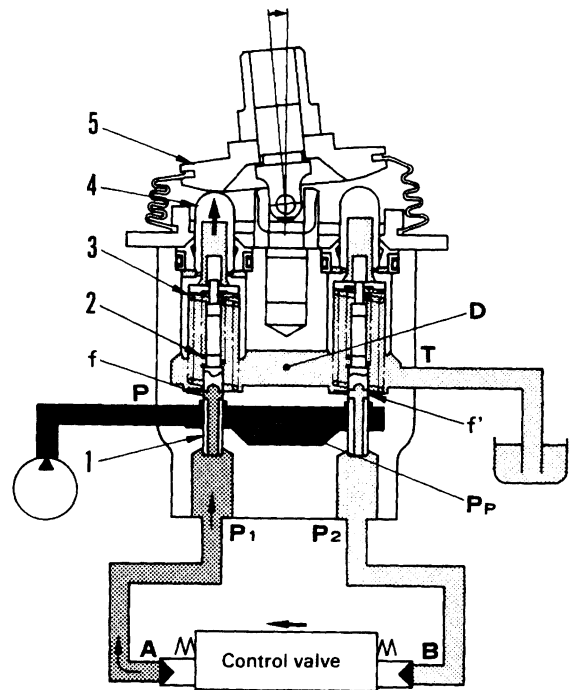
**3) During fine control
(when control lever is returned)**

When disc (5) starts to be returned, spool (1) is pushed up by the force of centering spring (3) and the pressure at port **P1**.

When this happens, fine control hole **f** is connected to drain chamber **D** and the pressure oil at port **P1** is released.

If the pressure at port **P1** drops too far, spool (1) is pushed down by metering spring (2), and fine control hole **f** is shut off from drain chamber **D**. At almost the same time, it is connected to pump pressure chamber **PP**, and the pump pressure is supplied until the pressure at port **P1** recovers to a pressure that corresponds to the lever position.

When the spool of the control valve returns, oil in drain chamber **D** flows in from fine control hole **f'** in the valve on the side that is not working. The oil passes through port **P2** and enters chamber **B** to fill the chamber with oil. (Fig. 3)



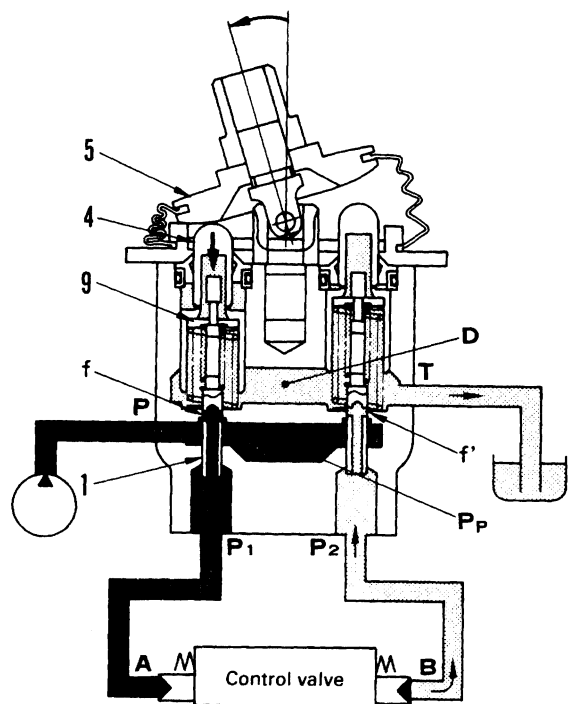
20TF01046

(Fig.3)

4) At full stroke

When disc (5) pushes down piston (4), and retainer (9) pushes down spool (1), fine control hole **f** is shut off from drain chamber **D**, and is connected with pump pressure chamber **PP**. Therefore, the pilot pressure oil from the charging pump passes through fine control hole **f** and flows to chamber **A** from port **P1**, and pushes the control valve spool.

The oil returning from chamber **B** passes from port **P2** through fine control hole **f'** and flows to drain chamber **D**. (Fig. 4)



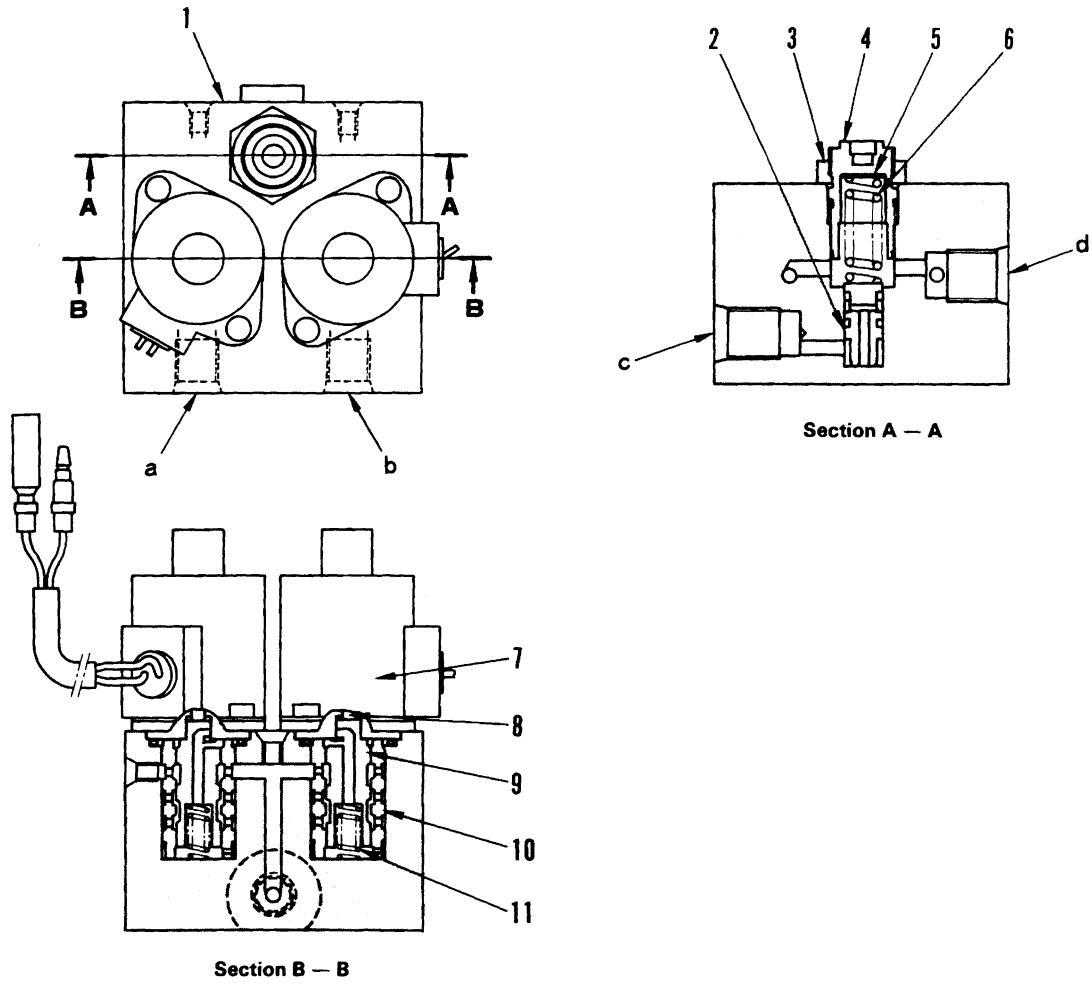
20TF01047

(Fig.4)

020S07

SOLENOID VALVE

TRAVEL SPEED ACCELERATION AND PPC LOCK



- a. A port (To PPC valve)
- b. B port (To travel motor)
- c. P port (From control pump)
- d. T port (To tank)

- 1. Body
- 2. Relief valve
- 3. Locknut
- 4. Adjustment screw
- 5. Shim
- 6. Spring

- 7. Solenoid
- 8. Push pin
- 9. Spool
- 10. Guide
- 11. Spring

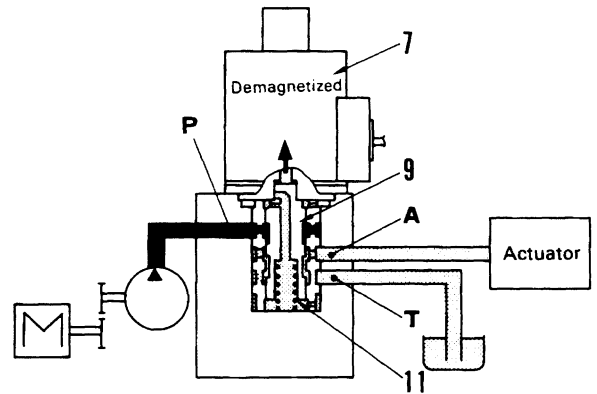
20TF01048

070507

OPERATION

When solenoid is demagnetized

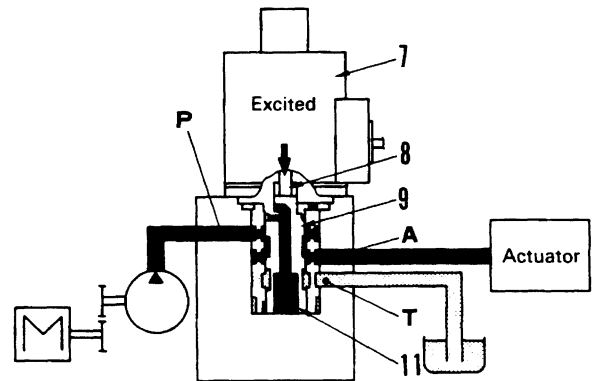
- When the signal current does not flow from the PPC lock switch or travel speed acceleration switch, solenoid (7) is demagnetized. For this reason, spool (9) is kept pushed up by spring (11). As a result, port P is closed, and no pressure oil flows from the control pump to the actuator. At the same time, the oil from the actuator flows from port A to port T and is drained to the tank.



20TF01049

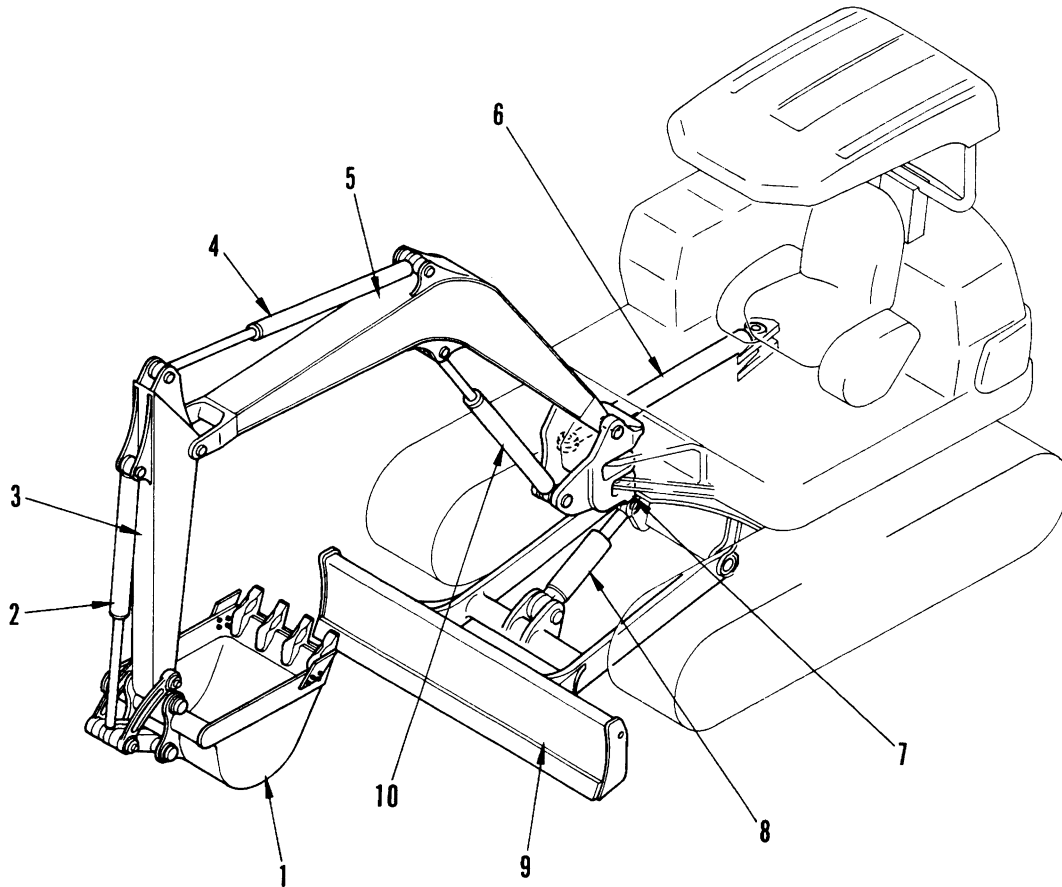
When solenoid is excited

- When the signal current flows to solenoid (7) from the PPC lock switch or travel speed acceleration switch, solenoid (7) is excited. For this reason, spool (9) is pushed down by push pin (8). As a result, the pressure oil from the control pump passes from port P through the inside of spool (9), flows to port A and then flows to the actuator. At the same time, port T is closed and the oil does not flow to the tank.



20TF01050

WORK EQUIPMENT

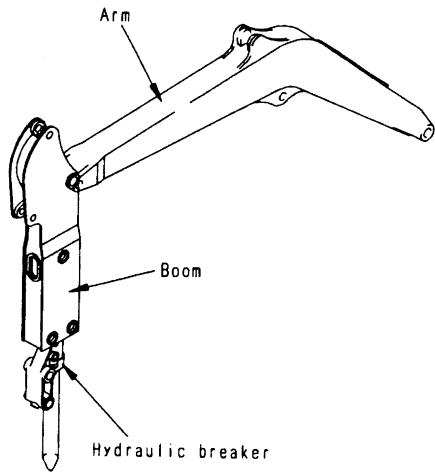


7
2000

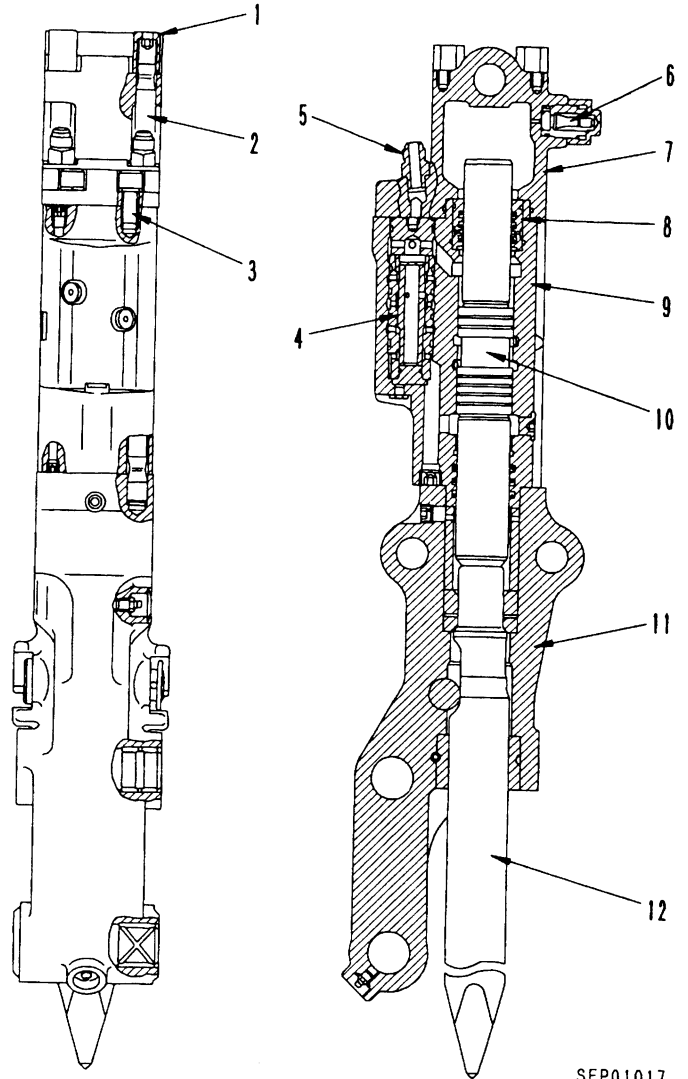
20TF01051

- | | |
|--------------------|------------------------|
| 1. Bucket | 6. Boom swing cylinder |
| 2. Bucket cylinder | 7. Boom swing bracket |
| 3. Arm | 8. Blade cylinder |
| 4. Arm cylinder | 9. Blade |
| 5. Boom | 10. Boom cylinder |

HYDRAULIC BREAKER



SDP01087



SEP01017

020S07

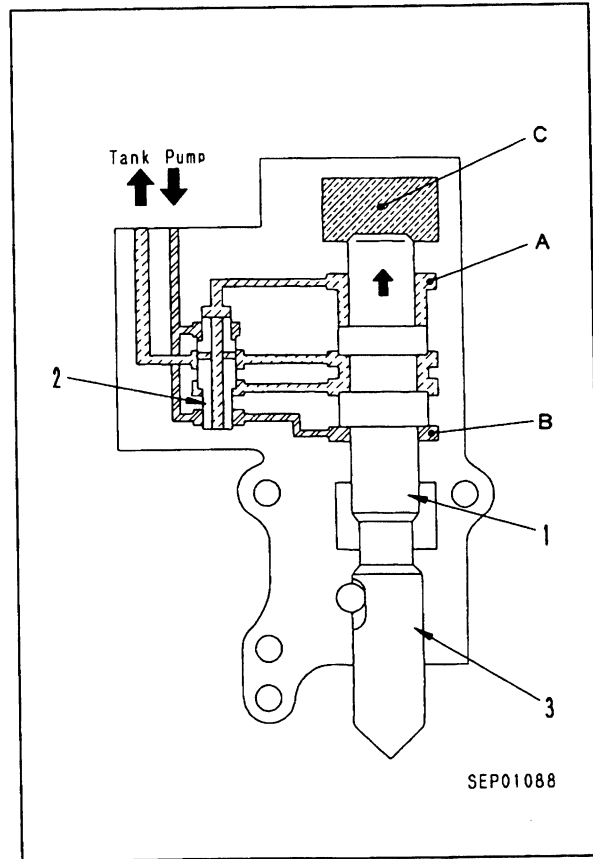
- | | |
|--------------|--------------------|
| 1. Nut | 7. Back cap |
| 2. Side lod | 8. Cylinder sleeve |
| 3. Cap screw | 9. Cylinder |
| 4. Valve | 10. Piston |
| 5. Adapter | 11. Front cap |
| 6. Gas valve | 12. Chisel |

OPERATION

1. When piston goes up

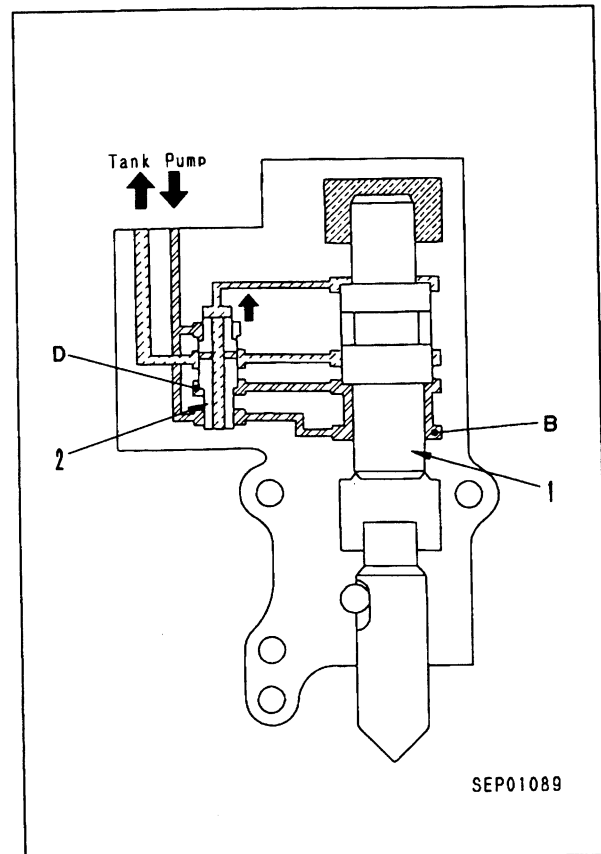
The diagram shows the point where piston (1) hits chisel (3). Reverse chamber A of piston (1) is interconnected with the tank port through valve (2).

Pressure oil enters high pressure chamber B of piston (1) from the tank, so piston (1) goes up and the gas inside gas cushion chamber C is compressed.



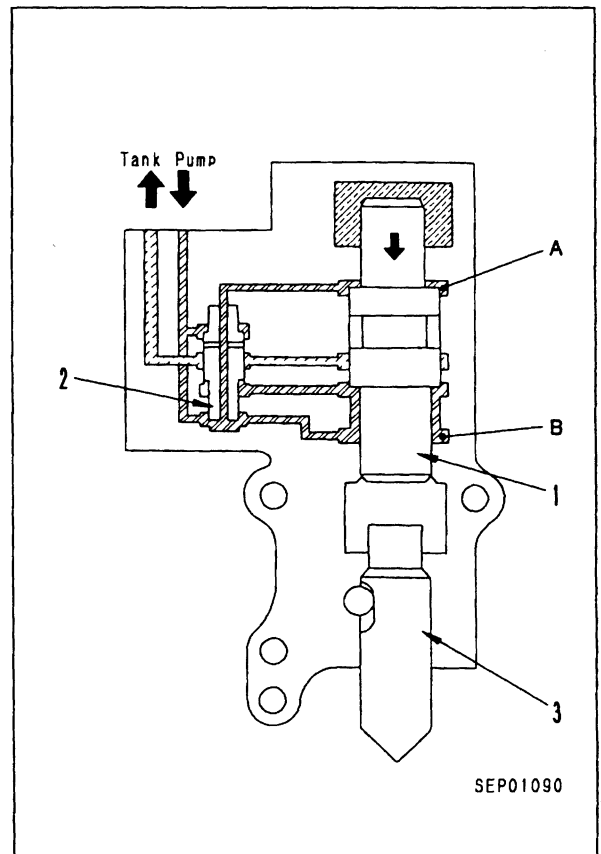
2. When valve goes up

When piston (1) goes up, reverse chamber D of valve (2) is interconnected with high pressure chamber B of piston (1), so it becomes high pressure and valve (2) goes up.



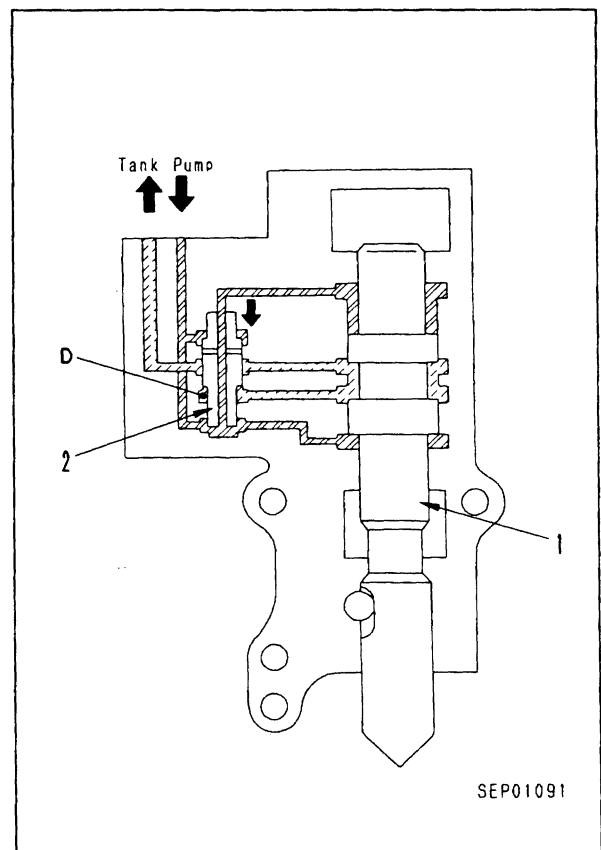
3. When piston goes down

When valve (2) goes up, the pressure oil passes through the inside of valve (2). Reverse chamber A of piston (1) is interconnected with high pressure chamber B. Piston (1) goes down because of the difference in the area receiving the pressure at reverse chamber A end and high pressure chamber B end. When this happens, the pressure of the compressed gas increases the downward speed of piston (1), and piston (1) strikes chisel (3).



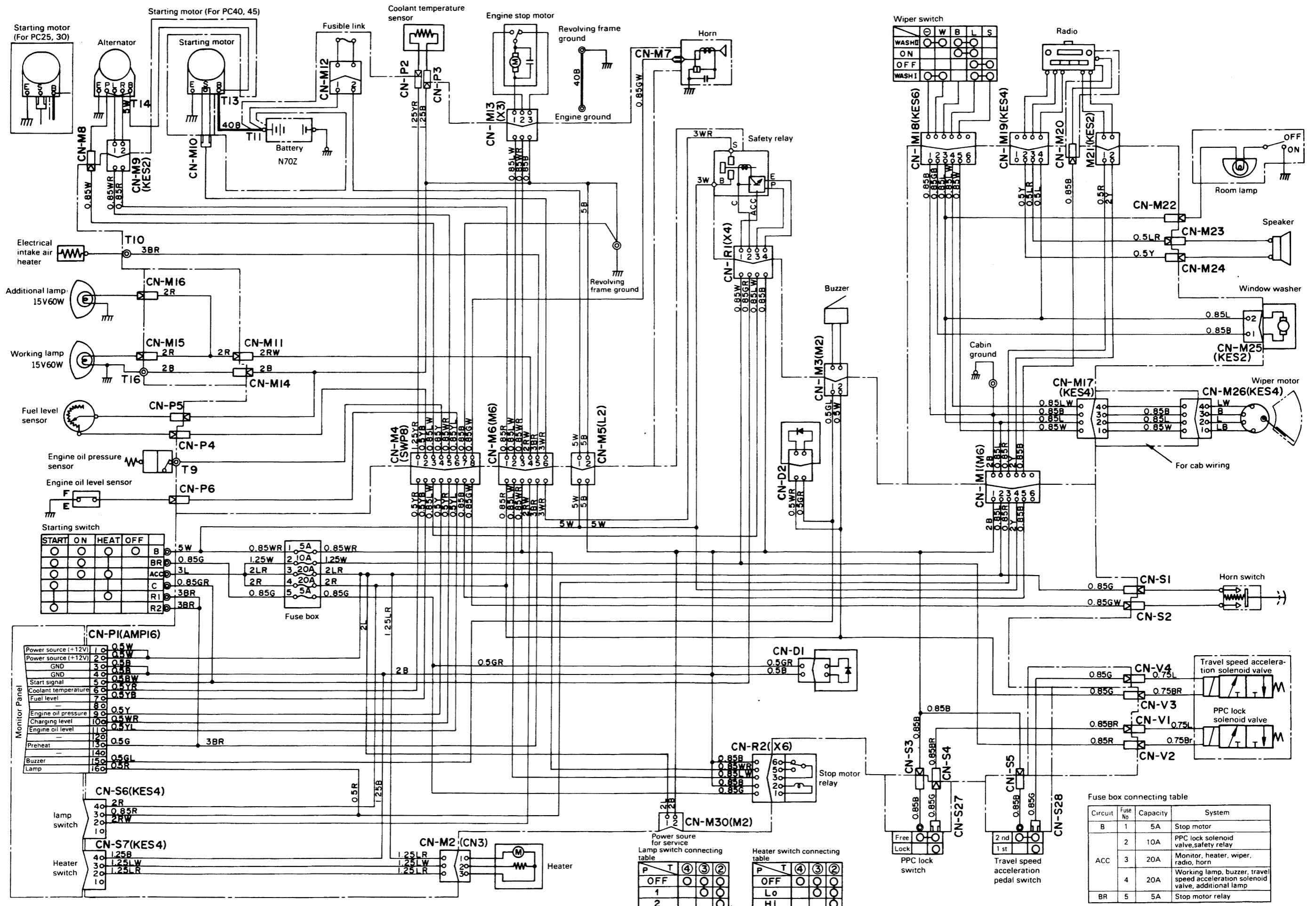
4. When valve goes down

When piston (1) goes down, reverse chamber D of valve (2) is interconnected with the drain port and the pressure goes down. As a result, the pressure on the area receiving the pressure at the top becomes greater than the pressure on the area receiving the pressure at the bottom, so valve (2) goes down.



ELECTRICAL CIRCUIT DIAGRAM

PC25-1 Serial No. 1001 - 6470
 PC40-7 Serial No. 18001 - 24521
 PC30-7 Serial No. 18001 - 26422
 PC45-1 Serial No. 1001 - 3505



020S07

Fuse box connecting table

Circuit	Fuse No	Capacity	System
B	1	5A	Stop motor
ACC	2	10A	PPC lock solenoid valve, safety relay
	3	20A	Monitor, heater, wiper, radio, horn
BR	4	20A	Working lamp, buzzer, travel speed acceleration solenoid valve, additional lamp
	5	5A	Stop motor relay

Lamp switch connecting table

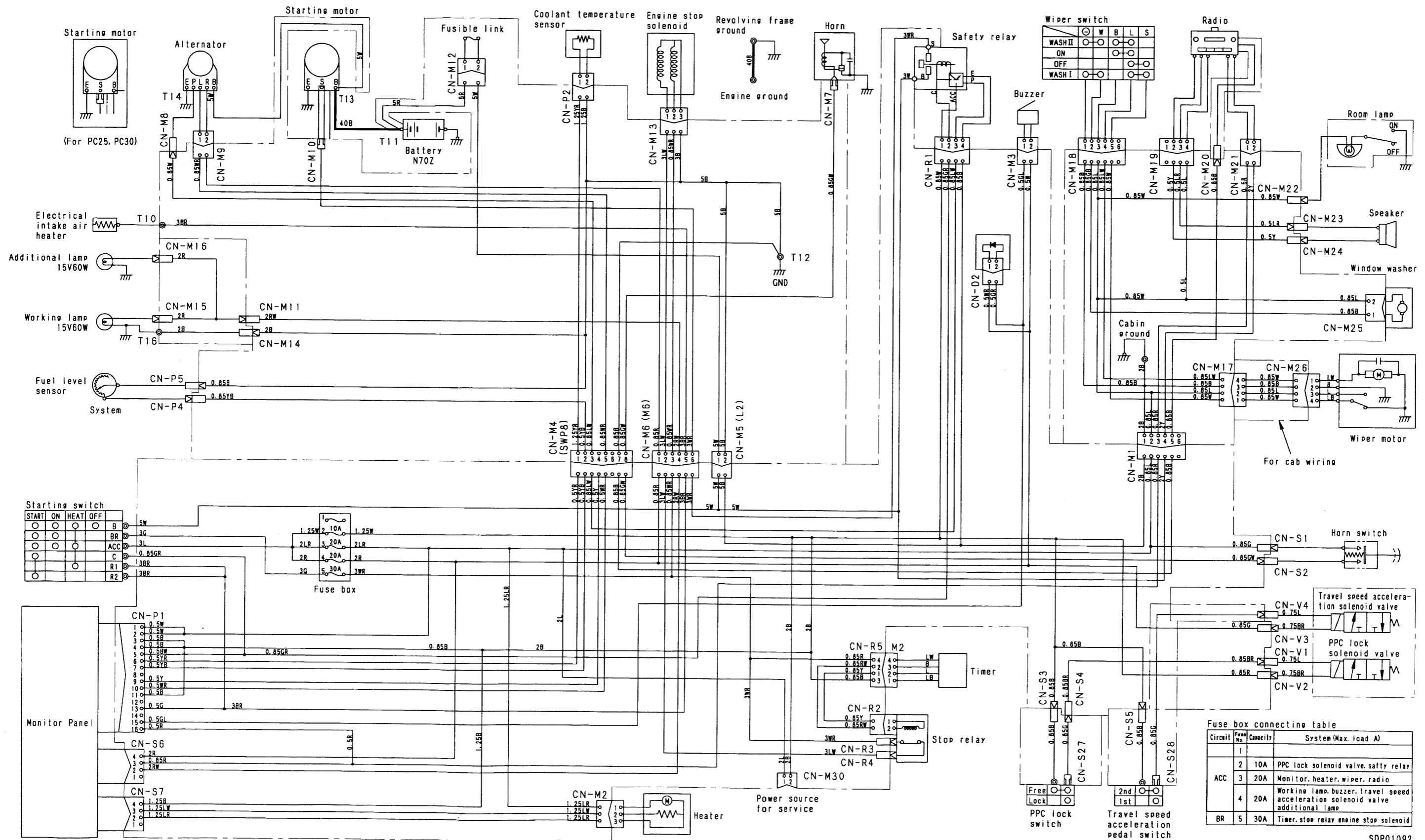
P	T	④	③	②
OFF		○	○	○
1		○	○	○
2		○	○	○

Heater switch connecting table

P	T	④	③	②
OFF		○	○	○
Lo		○	○	○
Hi		○	○	○

PC25-1 Serial No. 6471 and up
 PC40-7 Serial No. 24522 and up

PC30-7 Serial No. 26423 and up
 PC45-1 Serial No. 3506 and up



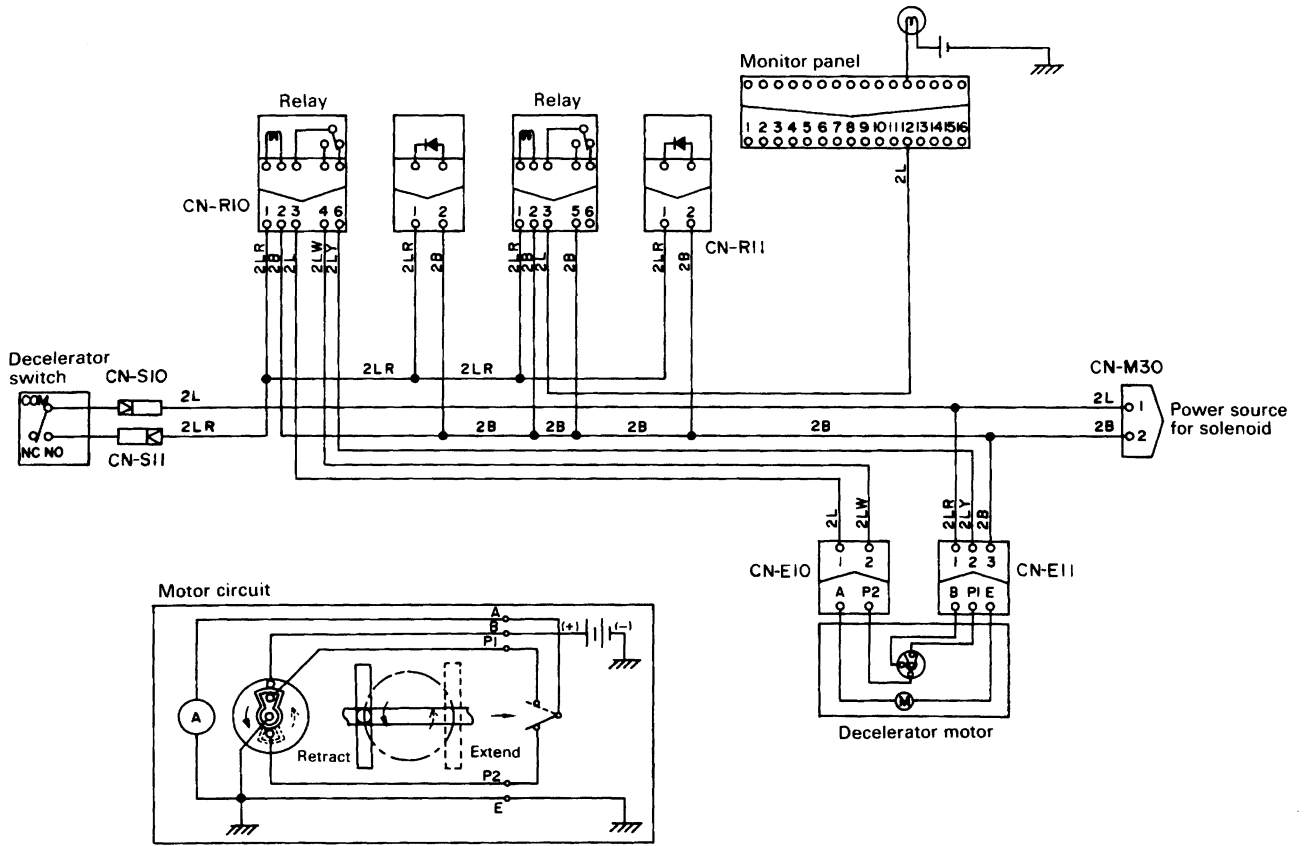
Fuse box connecting table

Circuit	Fuse No.	Capacity	System (Max. load A)
	1		
	2	10A	PPC lock solenoid valve, safety relay
ACC	3	20A	Monitor, heater, wiper, radio
	4	20A	Working lamp, buzzer, travel speed acceleration solenoid valve, additional lamp
BR	5	30A	Timer, stop relay engine stop solenoid

020S07

SDP01092

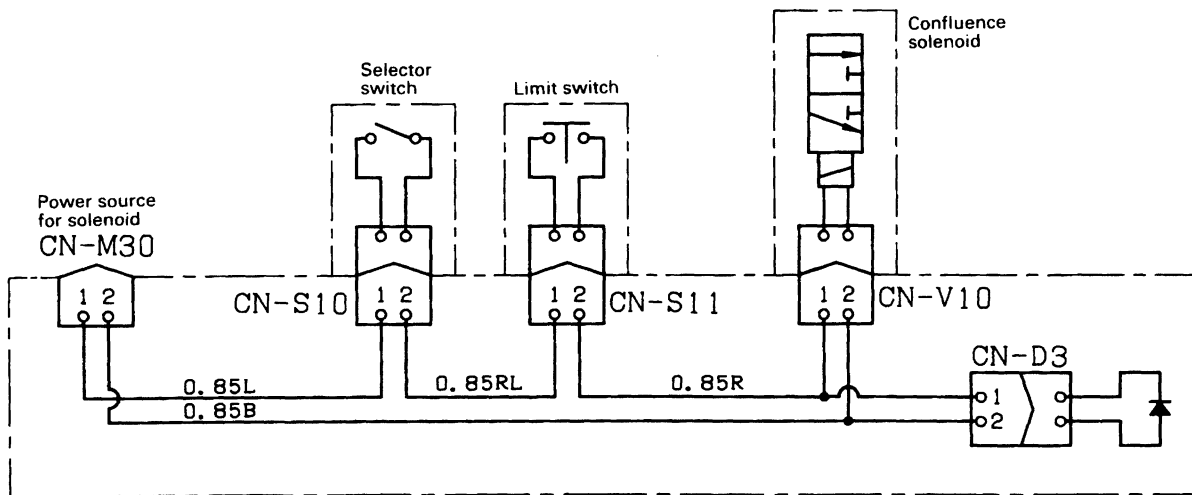
ONE-TOUCH DECELERATION CIRCUIT



20TF01085

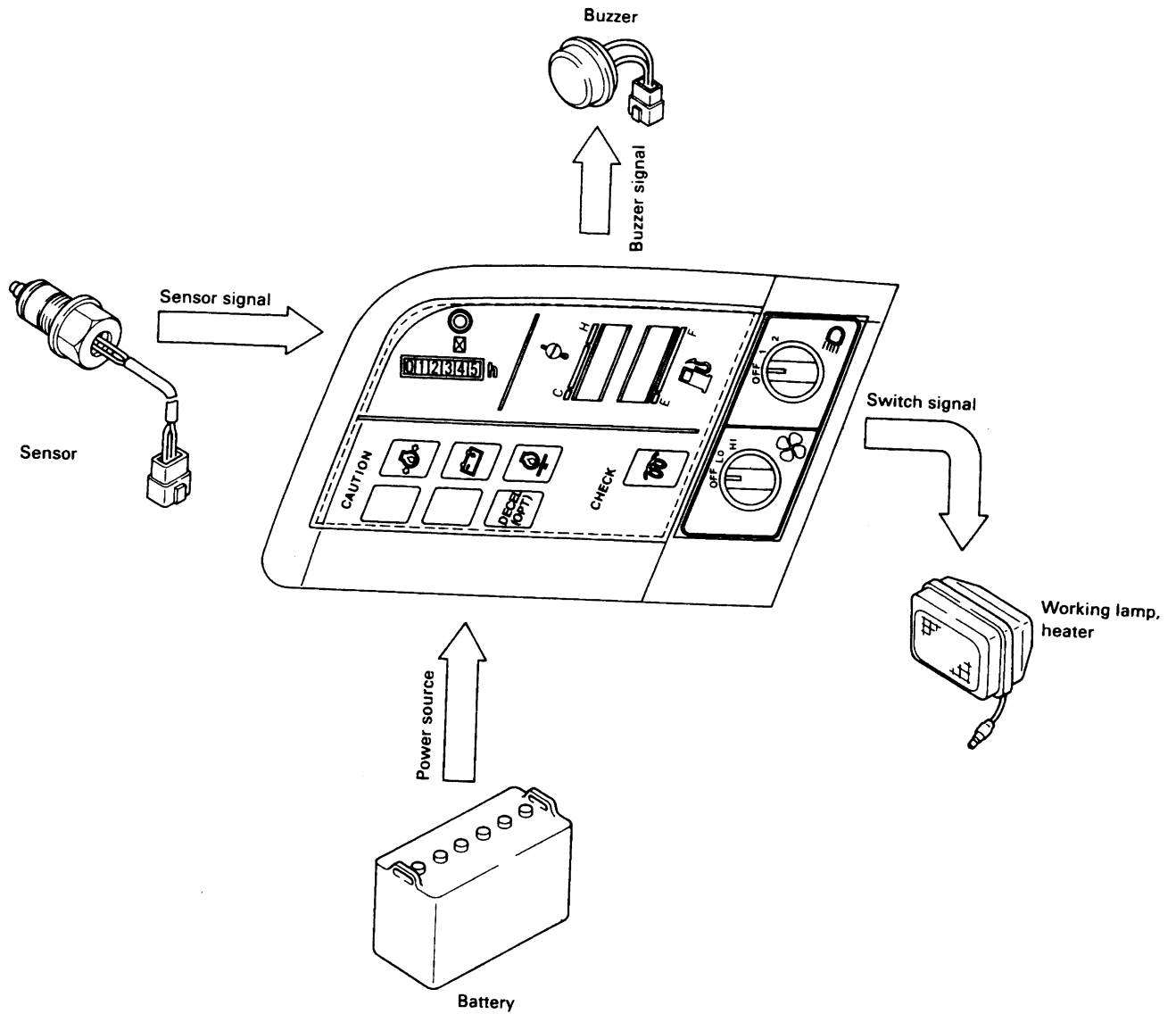
020S07

ADDITIONAL ATTACHMENT CIRCUIT



20TF01086

MONITOR SYSTEM



020S07

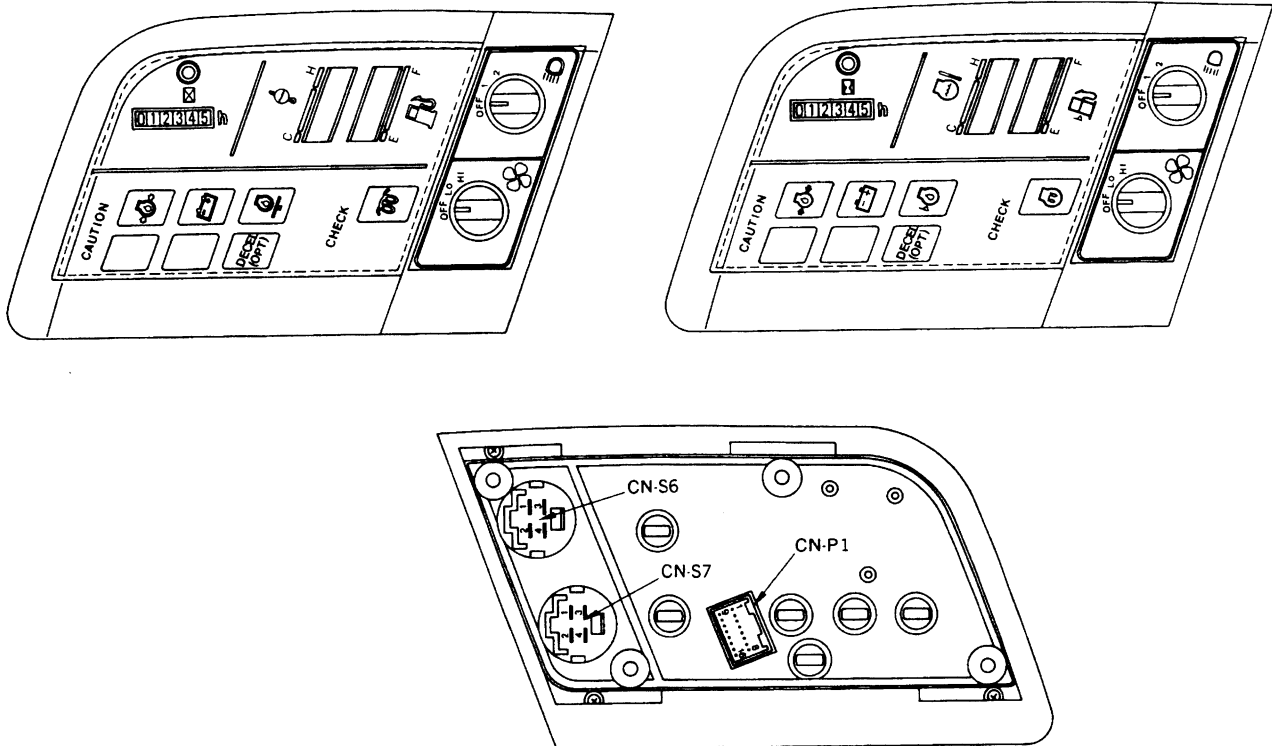
20TF01052

- The machine monitor system is a system that uses sensors installed at various parts of the machine to observe the condition of the machine. It then processes this information swiftly and displays it on a panel to inform the operator of the condition of the machine. The panel display can be broadly divided into the following:
 1. The monitor portion that issues a warning when any abnormality is found in the machine.
 2. The gauge portion that always displays the conditions of the machine (coolant temperature and fuel level).
- A switch for electrical attachments is also installed inside the monitor panel.

1. MONITOR PANEL

PC25-1 Serial No. 1001—6470
 PC30-7 Serial No. 18001—26422
 PC40-7 Serial No. 18001—24521
 PC45-1 Serial No. 1001—3505

PC25-1 Serial No. 6471 and up
 PC30-7 Serial No. 26423 and up
 PC40-7 Serial No. 24522 and up
 PC45-1 Serial No. 3506 and up



20TF01092

Outline

- The monitor panel has a monitor display function and switches for electrical components. It has a built-in CPU (Central Processing Unit) which processes the data and outputs the display. A liquid crystal display is used for the gauge display. Lamps are used for the monitor display.

Input and output signal

CN-P1

No.	Signal	Input/ out put	No.	Signal	Input/ out put
1	Power source (+12V)	—	9	Engine oil pressure	input
2	Power source (+12V)	—	10	Charge level	input
3	GND	—	11	Engine oil level *	input
4	GND	—	12	—	—
5	Start signal	input	13	Preheat	input
6	Coolant temperature	input	14	—	—
7	Fuel level	input	15	Buzzer	output
8	—	—	16	Lump	input

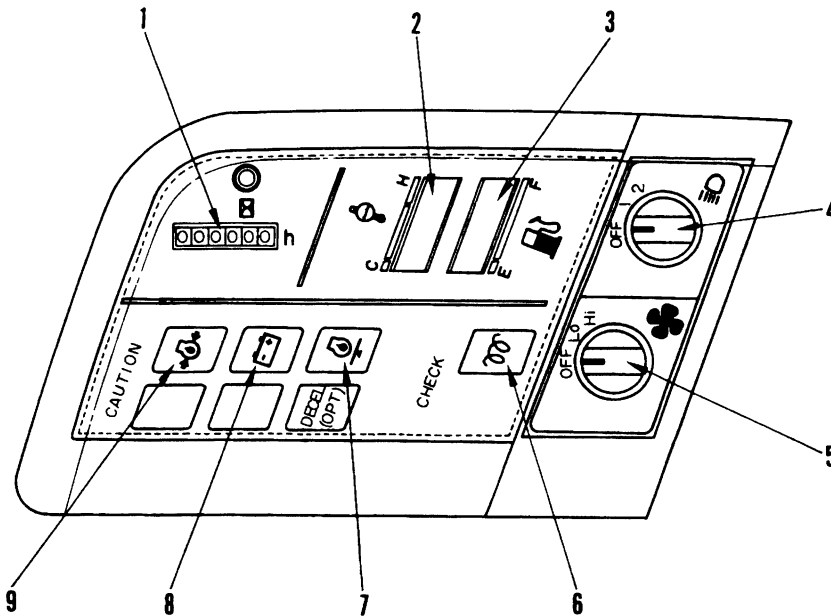
CN-S6

CN-S7

No.	Signal	Input/ out put	No.	Signal	Input/ out put
2	Head lamp	output	2	Heater Hi	output
3	Monitor panel	output	3	Heater Lo	output
4	Power source (+12V)	—	4	GND	—

(*) For minor-changed models, GND is applicable

PC25-1 Serial No. 1001—6470
 PC30-7 Serial No. 18001—26422
 PC40-7 Serial No. 18001—24521
 PC45-1 Serial No. 1001—3505



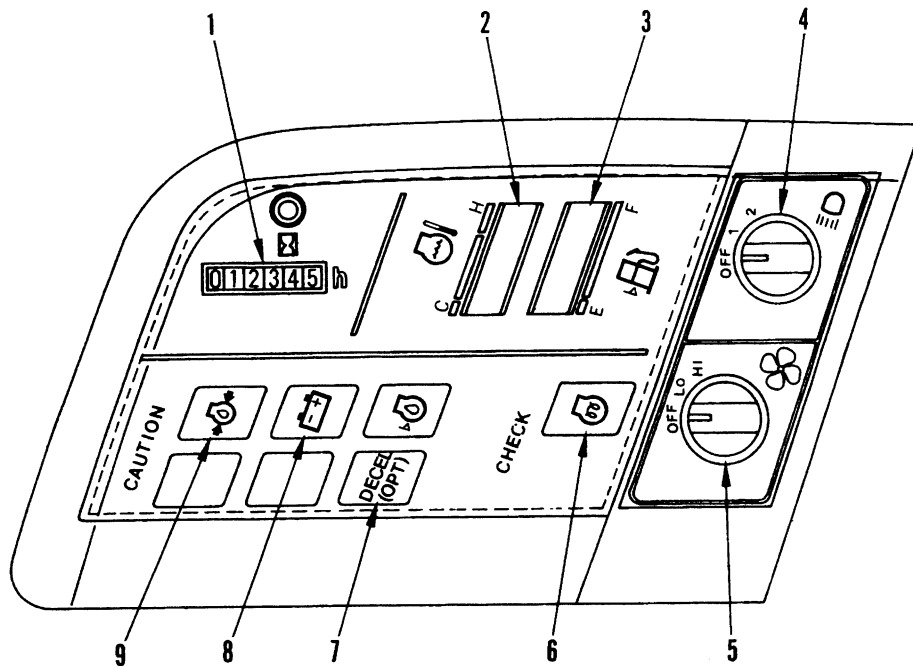
1. Service meter
2. Coolant temperature gauge
3. Fuel level gauge
4. Lamp switch
5. Heater switch (for cab)
6. Preheat pilot lamp
7. Engine oil level caution lamp
8. Charge caution lamp
9. Engine oil pressure caution lamp

20PFA5021

Display category	Symbol	Display item	Display range	Display method
CHECK		Engine oil level	Below low level	When the starting switch is turned ON with the engine stopped, the display is as follows: Normal: OFF Abnormal: ON, buzzer sounds
CAUTION		Engine oil pressure	Below 0.05 MPa (0.5 kg/cm ²)	When the starting switch is turned ON with the engine running, the display is as follows: Normal: OFF Abnormal: ON, buzzer sounds
		Charge level	When there is defective charging	
GAUGE		Coolant temperature	 20PFA5022	One lamp lights up to show the temperature [When the lamp at the highest level lights up, the segment flashes and the buzzer sounds]
		Fuel level	 20PFA5023	One lamp lights up to show the temperature [When the lamp at the lowest level lights up, the segment flashes]
PILOT		Preheating	When preheating	When the starting switch is at HEAT, lamp is ON (18 sec), and after this it goes OFF to indicate completion of preheating.

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PC25-1 Serial No. 6471 and up
 PC30-7 Serial No. 26423 and up
 PC40-7 Serial No. 24522 and up
 PC45-1 Serial No. 3506 and up



1. Service meter
2. Coolant temperature gauge
3. Fuel level gauge
4. Lamp switch
5. Heater switch (for cab)
6. Preheat pilot lamp
7. DECEL (OP)
8. Charge caution lamp
9. Engine oil pressure caution lamp

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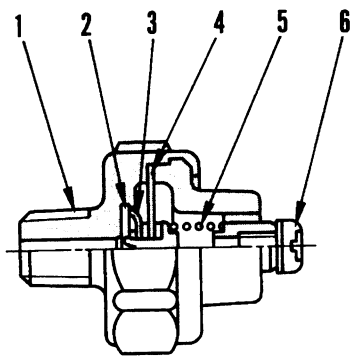
Display category	Symbol	Display item	Display range	Display method
CHECK				
CAUTION		Engine oil pressure	Below 0.05 MPa (0.5 kg/cm ²)	When the starting switch is turned ON with the engine running, the display is as follows: Normal: OFF Abnormal: ON, buzzer sounds
		Charge level	When there is defective charging	
GAUGE		Coolant temperature	 20PFA5022	One lamp lights up to show the temperature. [When the lamp at the highest level lights up, the segment flashes and the buzzer sounds]
		Fuel level	 20PFA5023	One lamp lights up to show the temperature. [When the lamp at the lowest level lights up, the segment flashes]
PILOT		Preheating	When preheating	When the starting switch is at HEAT, lamp is ON (18 sec), and after this it goes OFF to indicate completion of preheating.

2. SENSOR

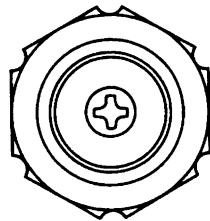
- The signals from the sensors are input directly to the monitor panel.
- One of the contact points of the sensors with contacts is always connected to the chassis GND.

Classification of indication	Type of sensor	Sensing type	Normal	Abnormal
CAUTION	Engine oil pressure	Contact type	OFF (open)	ON (Closed)
	Engine oil level	Contact type	ON (close)	OFF (open)
GAUGE	Coolant temperature	Resistance type	—	—
	Fuel level	Resistance type	—	—

1) ENGINE OIL PRESSURE SENSOR



1. Plug
2. Contact ring
3. Contact
4. Diaphragm
5. Spring
6. Terminal

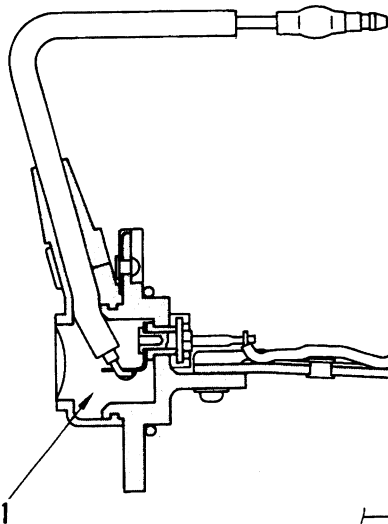


Composition of circuit

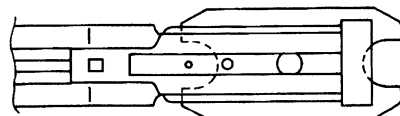
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2) ENGINE OIL LEVEL SENSOR

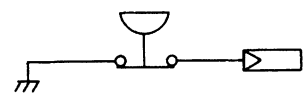
- PC25-1 Serial No. 1001—6470
 PC30-7 Serial No. 18001—26422
 PC40-7 Serial No. 18001—24521
 PC45-1 Serial No. 1001—3505



1. Bracket
2. Switch
3. Float



FLOAT movable range
 ON
 OFF

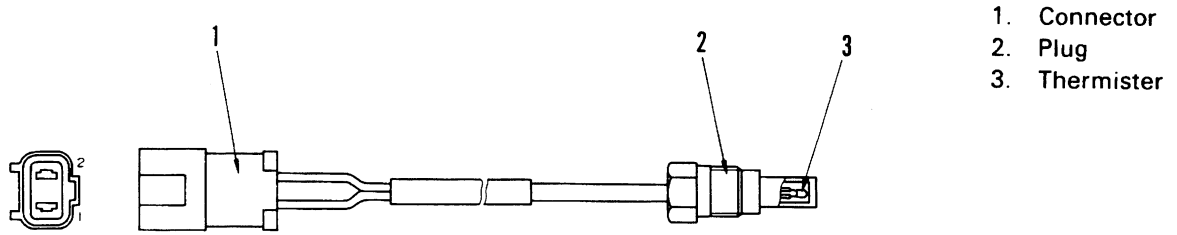


Composition of circuit

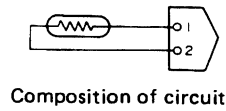
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3) COOLANT TEMPERATURE SENSOR



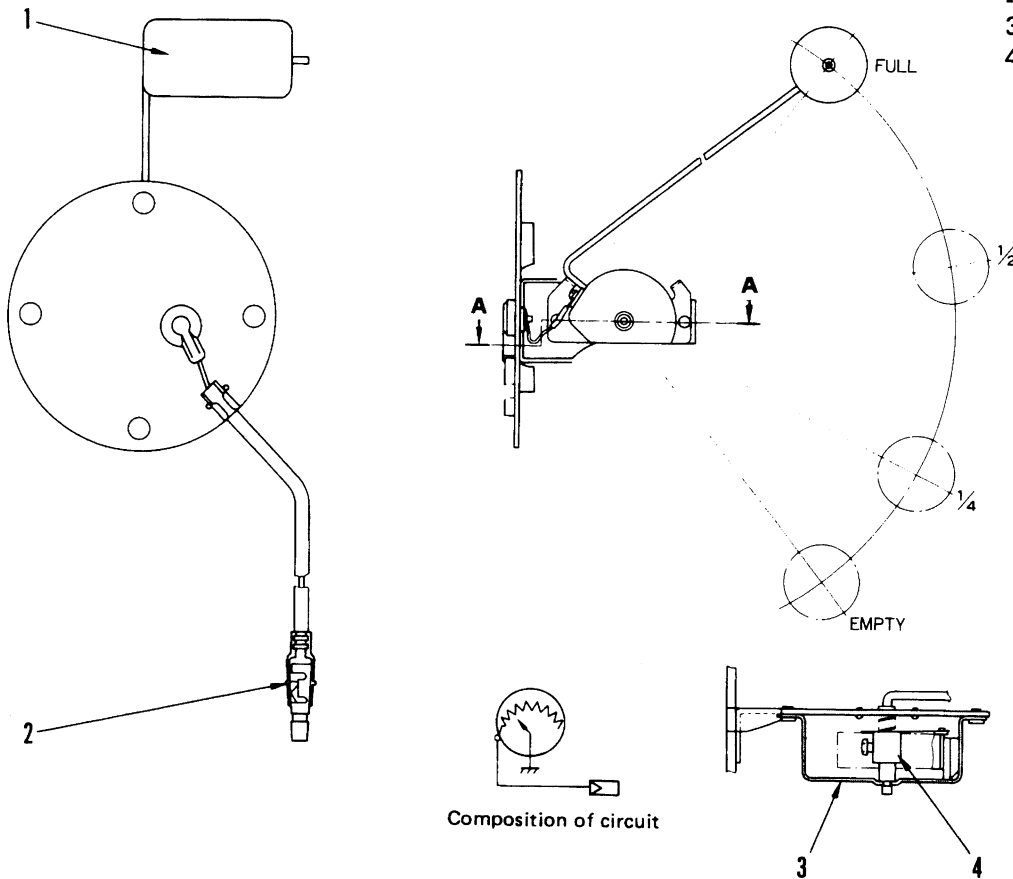
- 1. Connector
- 2. Plug
- 3. Thermister



202F05176-1

4) FUEL LEVEL SENSOR

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- 1. Float
- 2. Connector
- 3. Cover
- 4. Variable resistance

Composition of circuit

20TF01058

20 TESTING, ADJUSTING AND TROUBLESHOOTING

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★ The following precautions are necessary when using the standard value tables for testing and adjusting or for troubleshooting.

1. The values in the tables are for new machines and are obtained from reference to values when the machine is shipped from the factory. These values should be used only as a target guide for judging the progress of wear or when repairing the machine.
2. The standard values for judging failures are based on the results of various tests when shipping the machine from the factory. These values should be used as reference together with the repair condition and operating record of the machine to make judgement on failures.
3. These standard values do not form a basis for judging claims.



WARNING! Before performing inspection, adjustment or faultfinding, park the machine on level ground and check the safety pin and chock.



WARNING! When performing joint work, make appropriate signals and allow only authorized personnel near the machine.



WARNING! When checking the water level, allow the engine to cool down before removing the radiator cap to prevent the risk of being scalded by hot water which may spurt out if engine is hot.



WARNING! Take great care to avoid getting caught in rotating parts such as the fan, etc.

TABLE OF JUDGEMENT STANDARD VALUE

• FOR ENGINE

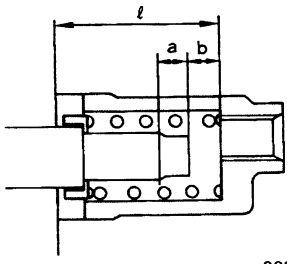
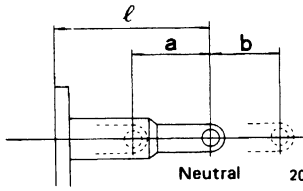
Machine model			PC25-1			
Serial No.			1001 – 6470		6471 and up	
Engine			3D84-2D		3D84E-3B	
Item	Measurement conditions	Unit	Standard value	Permissible value	Standard value	Permissible value
Engine speed	High idling	rpm	2,900±50	—	2,875±50	—
	Low idling	rpm	950 ⁺⁵⁰ ₀	—	1,050±50	—
	Rated speed	rpm	2,700	—	2,700	—
Exhaust gas color	At sudden acceleration	Bosch index	4.0	6.0	2.0	4.0
	At high idling	Bosch index	1.5	2.5	1.0	2.0
Valve clearance (normal temperature)	Intake valve	mm	0.20	—	0.20	—
	Exhaust valve	mm	0.20	—	0.20	—
Compression pressure (SAE 30 oil)	Oil temperature: 40 – 60°C (Engine speed)	MPa (kg/cm ²)	2.9 (30)	2.5 (26)	2.9 (30)	2.5 (26)
		(rpm)	(250)	(250)	(250)	(250)
Blowby pressure (SAE oil)	(Coolant temperature: Operating range) At high idling	mmH ₂ O	—	—	—	—
Oil pressure	(Coolant temperature: Operating range) At high idling (SAE30)	MPa (kg/cm ²)	0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)	0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)
	At low idling (SAE30)	MPa (kg/cm ²)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)
	At low idling (SAE10W)	MPa (kg/cm ²)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)
Oil temperature	Whole speed range (inside oil pan)	°C	Max. 120	Max. 120	Max. 120	Max. 120
Fuel injection timing	B.T.D.C.	°	14±1	—	14±1	—
Belt tension (alternator)	Deflection when pressed with finger force of approx. 6 kg	mm	10 – 15	—	10 – 15	—

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PC30-7				PC40-7			
18001 – 26422		26423 and up		18001 – 24521		24522 and up	
3D84-2E		3D84E-3A		4D84-2A		4D84E-3C	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
2,650±50	—	2,675±50	—	2,850±50	—	2,850±50	—
950 ⁺⁵⁰ ₀	—	1,050±50	—	950 ⁺⁵⁰ ₀	—	1,050±50	—
2,550	—	2,500	—	2,700	—	2,700	—
4.0	6.0	2.0	4.0	4.0	6.0	2.0	4.0
1.5	2.5	1.0	2.0	1.5	2.5	1.0	2.0
0.20	—	0.20	—	0.20	—	0.20	—
0.20	—	0.20	—	0.20	—	0.20	—
2.9 (30)	2.5 (26)	2.9 (30)	2.5 (26)	2.9 (30)	2.5 (26)	2.9 (30)	2.5 (26)
(250)	(250)	(250)	(250)	(250)	(250)	(250)	(250)
—	—	—	—	—	—	—	—
0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)	0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)	0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)	0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)
Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)
Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)
Max. 120	Max. 120	Max. 120	Max. 120	Max. 120	Max. 120	Max. 120	Max. 120
14±1	—	14±1	—	14±1	—	14±1	—
10 – 15	—	10 – 15	—	10 – 15	—	10 – 15	—

Machine model			PC45-1			
Serial No.			1001 – 3505		3506 and up	
Engine			4D84-2B		4D84E-3B	
Item	Measurement conditions	Unit	Standard value	Permissible value	Standard value	Permissible value
Engine speed	High idling	rpm	2,550±50	—	2,550±50	—
	Low idling	rpm	950 ⁺⁵⁰ ₀	—	1,050±50	—
	Rated speed	rpm	2,450	—	2,450	—
Exhaust gas color	At sudden acceleration	Bosch index	4.0	6.0	2.0	4.0
	At high idling	Bosch index	1.5	2.5	1.0	2.0
Valve clearance (normal temperature)	Intake valve	mm	0.20	—	0.20	—
	Exhaust valve	mm	0.20	—	0.20	—
Compression pressure (SAE 30 oil)	Oil temperature: 40 – 60°C (Engine speed)	MPa (kg/cm ²)	2.9 (30)	2.5 (26)	2.9 (30)	2.5 (26)
		(rpm)	(250)	(250)	(250)	(250)
Blowby pressure (SAE oil)	(Coolant temperature: Operating range) At high idling	mmH ₂ O	—	—	—	—
Oil pressure	(Coolant temperature: Operating range) At high idling (SAE30)	MPa (kg/cm ²)	0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)	0.3 – 0.35 (3.0 – 3.5)	Min. 0.2 (Min. 2.0)
	At low idling (SAE30)	MPa (kg/cm ²)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)
	At low idling (SAE10W)	MPa (kg/cm ²)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)	Min. 0.15 (Min. 1.5)	Min. 0.1 (Min. 1.0)
Oil temperature	Whole speed range (inside oil pan)	°C	Max. 120	Max. 120	Max. 120	Max. 120
Fuel injection timing	B.T.D.C.	°	14±1	—	14±1	—
Belt tension (alternator)	Deflection when pressed with finger force of approx. 6 kg	mm	10 – 15	—	10 – 15	—

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Machine model				PC25-1						
Classification	Item	Measurement conditions	Unit	Standard value			Permissible value			
Engine speed	At 1-pump relief	<ul style="list-style-type: none"> Hydraulic oil temperature: 45 – 55° C Engine oil pressure: Within operating range Coolant temperature: Within operating range 1-pump relief: Bucket relief 2-pump relief: Arm + bucket relief 	rpm	Min. 2,750			Min. 2,750			
	At 2-pump relief			Min. 2,200			Min. 2,200			
Spool stroke	Boom control valve	 <p>202F2302</p>	mm	ℓ	a	b	ℓ	a	b	
	Arm control valve			 <p>Neutral 204F173</p>	41	6	6	41	6	6
	Bucket control valve									
	Swing control valve									
	Boom swing control valve									
	Blade control valve	20		6	6	20	6	6		
	L.H. travel control valve									
	R.H. travel control valve									
	Service valve									
Control levers travel	Boom control lever	<ul style="list-style-type: none"> Center of lever knob Read max. value to end of travel Engine stopped 	N → Raise, Lower	100±10			100±10			
	Arm control lever		N → In, Out	100±10			100±10			
	Bucket control lever		N → Curl, Dump	100±10			100±10			
	Swing control lever		N → L.H., R.H. swing	100±10			100±10			
	Boom swing control pedal		N → L.H., R.H. boom swing	15±2			15±2			
	Blade control lever		N → Raise, Lower	50±5			50±5			
	Travel control lever		N → Forward, Reverse travel (L.H., R.H.)	90±9			90±9			
	Fuel control lever		Idling ↔ Full	200±20			200±20			
	Amount of play in control lever		Boom ↔ Bucket	Max. 5			Max. 5			
Arm ↔ Swing		Max. 5			Max. 5					

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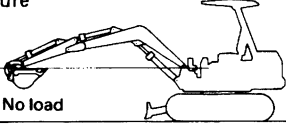
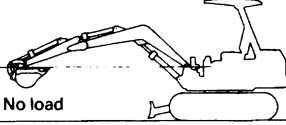
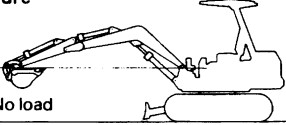
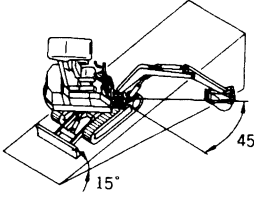
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PC30-7						PC40-7						PC45-1					
Standard value			Permissible value			Standard value			Permissible value			Standard value			Permissible value		
Min. 2,500			Min. 2,500			Min. 2,750			Min. 2,750			Min. 2,400			Min. 2,400		
Min. 2,400			Min. 2,400			Min. 2,200			Min. 2,200			Min. 2,300			Min. 2,300		
ℓ	a	b	ℓ	a	b	ℓ	a	b	ℓ	a	b	ℓ	a	b	ℓ	a	b
41	6	6	41	6	6	41	6	6	41	6	6	61	7	7	61	7	7
20	6	6	20	6	6	20	6	6	20	6	6	18.5	6	6	18.5	6	6
100±10			100±10			100±10			100±10			100±10			100±10		
100±10			100±10			100±10			100±10			100±10			100±10		
100±10			100±10			100±10			100±10			100±10			100±10		
100±10			100±10			100±10			100±10			100±10			100±10		
15±2			15±2			15±2			15±2			15±2			15±2		
50±5			50±5			50±5			50±5			50±5			50±5		
90±9			90±9			90±9			90±9			90±9			90±9		
190±20			190±20			200±20			200±20			190±20			190±20		
Max. 5			Max. 5			Max. 5			Max. 5			Max. 5			Max. 5		
Max. 5			Max. 5			Max. 5			Max. 5			Max. 5			Max. 5		

Machine model				PC25-1		
Classi- fica- tion	Item	Measurement conditions	Unit	Standard value	Permissible value	
Control levers operating force	Boom control lever	<ul style="list-style-type: none"> • Engine at high idling • Oil temperature: 45 – 55°C • Fit push-pull scale to center of control lever knob to measure • Measure max. value to end of travel 	kg	1.6±0.5	1.6±0.5	
	Arm control lever			1.4±0.5	1.4±0.5	
	Bucket control lever			1.4±0.5	1.4±0.5	
	Swing control lever			1.6±0.5	1.6±0.5	
	Boom swing control pedal			8.0±2.0	8.0±2.0	
	Blade control lever			3.0±0.5	3.0±0.5	
	Travel control lever			2.0±0.5	2.0±0.5	
	Fuel control lever			Idler → Full	3.0±1.5	3.0±1.5
				Full → Idler	2.5±1.5	2.5±1.5
Hydraulic pressure	Boom	<ul style="list-style-type: none"> • Oil temperature: 45 – 55°C • Relief pressure with engine at high idling (Relieve only circuit to be measured) • At outlet of pump 	kg/cm ²	210 ⁺¹⁰ ₀	210 ⁺¹⁰ ₀	
	Arm			210 ⁺¹⁰ ₀	210 ⁺¹⁰ ₀	
	Bucket			210 ⁺¹⁰ ₀	210 ⁺¹⁰ ₀	
	Swing			180 ⁺¹⁵ ₀	180 ⁺¹⁵ ₀	
	Boom swing			210 ⁺¹⁰ ₀	210 ⁺¹⁰ ₀	
	Blade			210 ⁺¹⁰ ₀	210 ⁺¹⁰ ₀	
	Travel			210 ⁺¹⁰ ₀	210 ⁺¹⁰ ₀	
	Control			30 ⁺⁵ ₋₁	30 ⁺⁵ ₋₁	
	Lowered hydraulic pressure	<ul style="list-style-type: none"> • Oil temperature: 45 – 55°C • Difference oil relief pressure between at engine high idling and at engine a half speed. (Measure pressure when one pump circuit oil is relieved.) 		—	—	

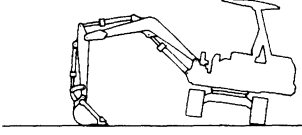
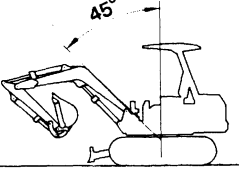
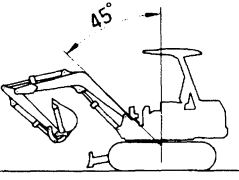
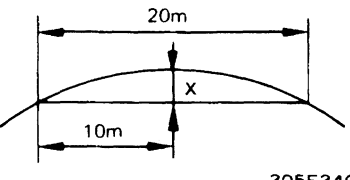
020S07

PC30-7		PC40-7		PC45-1	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5
1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5
1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5	1.4 ± 0.5
1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5	1.6 ± 0.5
8.0 ± 2.0	8.0 ± 2.0	8.0 ± 2.0	8.0 ± 2.0	8.0 ± 2.0	8.0 ± 2.0
3.0 ± 0.5	3.0 ± 0.5	3.0 ± 0.5	3.0 ± 0.5	3.0 ± 0.5	3.0 ± 0.5
2.0 ± 0.5	2.0 ± 0.5	2.0 ± 0.5	2.0 ± 0.5	2.0 ± 0.5	2.0 ± 0.5
3.0 ± 1.5	3.0 ± 1.5	3.0 ± 1.5	3.0 ± 1.5	3.0 ± 1.5	3.0 ± 1.5
2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5
210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0	220^{+10}_{-5}	220^{+10}_{-5}
210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0	220^{+10}_{-5}	220^{+10}_{-5}
210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0	220^{+10}_{-5}	220^{+10}_{-5}
200^{+15}_0	200^{+15}_0	200^{+15}_0	200^{+15}_0	200^{+15}_0	200^{+15}_0
210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0	220^{+10}_{-5}	220^{+10}_{-5}
210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0
210^{+10}_0	210^{+10}_0	210^{+10}_0	210^{+10}_0	220^{+10}_{-5}	220^{+10}_{-5}
30^{+5}_{-1}	30^{+5}_{-1}	30^{+5}_{-1}	30^{+5}_{-1}	30^{+5}_{-1}	30^{+5}_{-1}
-	-	-	-	-	-

Machine model			PC25-1		
Classification	Item	Measurement conditions	Unit	Standard value	Permissible value
Swing	Swing brake angle	<p>Working equipment posture Max. reach</p>  <p>No load</p> <p>20RF5104</p> <ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Stop after swinging one turn and measure distance that swing circle moves • () : Distance of movement on outside circumference of swing circle 	Deg. (mm)	Max. 40 (Max. 223)	50 (280)
	Time taken to start swing	<p>Work equipment posture Max. reach</p>  <p>No load</p> <p>20RF5104</p> <ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Time taken from starting position to swing 90° and 180° • () : When bucket rated load 	90°	2.3±0.3	2.9
		<p>20RF5104</p> <ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Time taken from starting position to swing 90° and 180° • () : When bucket rated load 	180°	—	—
	Time taken to swing	<p>Work equipment posture Max. reach</p>  <p>No load</p> <p>20RF5104</p> <ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Swing one turn, and measure time taken to swing next 5 turns 	sec.	30.0±1.5	33.0
Hydraulic drift of swing	<ul style="list-style-type: none"> • Work equipment posture: Max. reach, bucket at rated load or filled with sand or soil  <p>15° 45°</p> <p>20UF01271</p> <ul style="list-style-type: none"> • Engine stopped • Hydraulic oil temperature: 45 – 55° C • Set machine on 15° slope, and set upper structure facing 45° uphill. • Make match marks on swing circle outer race and track frame. • Measure distance that match marks move apart after 15 minutes. 	mm (Deg.)	Max. 500 (Max. 90)	Max. 500 (Max. 90)	

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PC30-7		PC40-7		PC45-1	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
Max. 40 (Max. 223)	50 (280)	Max. 40 (Max. 237)	50 (296)	Max. 40 (Max. 262)	50 (327)
2.4±0.3	3.0	2.2±0.3	2.8	2.4±0.3	3.0
-	-	-	-	-	-
27.2±1.5	30.2	31.5±1.5	34.5	30.0±1.5	33.0
• Rated load: 180 kg		• Rated load: 230 kg		• Rated load: 250 kg	
Max. 500 (Max. 90)	Max. 500 (Max. 90)	Max. 530 (Max. 90)	Max. 530 (Max. 90)	Max. 590 (Max. 90)	Max. 590 (Max. 90)

Machine model				PC25-1	
Classification	Item	Measurement conditions	Unit	Standard value	Permissible value
Swing	Leakage from swing motor	<ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Relieve swing circuit 	ℓ/min	Max. 3	5
Travel	Travel speed (1)	Measuring posture  20RF5106	Lo	33.9±2	33.9±4
		<ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Raise track on one side at a time, rotate one turn, then measure time taken for next 5 turns. 	Hi	21.5±2	21.5±4
	Travel speed (2)	Measuring posture 	Lo	31.3±1.5 (30.0±1.5) [31.0±1.5]	31.3±3 (30.0±3) [31.0±3]
		<ul style="list-style-type: none"> • []: *1 • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Run up for at least 10 m, and measure time taken to travel next 20 m on flat ground. • (): For rubber shoe 	Hi	20.0±1.5 (19.0±1.5) [19.8±1.5]	20.0±3 (19.0±3) [19.3±3]
Travel deviation	Measuring posture  <ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55° C • Run up for at least 10 m, and measure deviation when traveling next 20 m on flat ground. ★ Use a hard horizontal surface  205F2402 ★ Measure dimension X	mm	Max. 300	330	

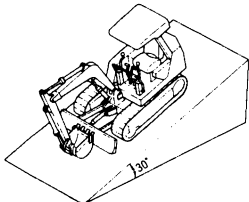
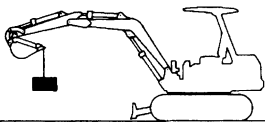
020S07

*1 PC25-1 Serial No. 6471 and up
PC40-7 Serial No. 24522 and up

PC30-7 Serial No. 26423 and up
PC45-1 Serial No. 3506 and up

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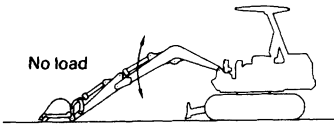
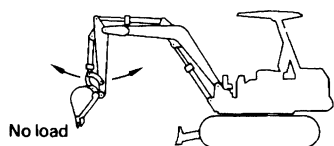
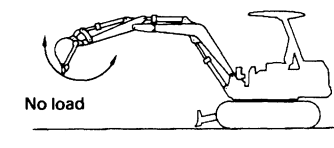

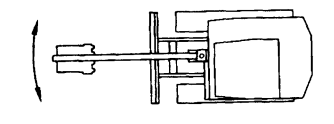
PC30-7		PC40-7		PC45-1	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
Max. 3	5	Max. 3	5	Max. 3	5
30.0±2	30.0±4	38.0±2	38.0±4	35.0±2	35.0±4
19.4±2	19.4±4	25.0±2	25.0±4	24.0±2	24.0±4
29.0±1.5 (28.0±1.5) [29.0±1.5]	29.0±3 (28.0±3) [29.0±3]	30.0±1.5 (29.0±1.5) [28.2±1.5]	30.0±3 (29.0±3) [28.2±3]	28.0±1.5 (26.0±1.5) [25.3±1.5]	28.0±3 (26.0±3) [25.3±3]
19.0±1.5 (18.0±1.5) [18.5±1.5]	19.0±3 (18.0±3) [18.5±3]	19.5±1.5 (18.5±1.5) [18.0±1.5]	19.5±3 (18.5±3) [18.0±3]	19.5±1.5 (18.0±1.5) [17.5±1.5]	19.5±3 (18.0±3) [17.5±3]
Max. 300	330	Max. 300	330	Max. 300	330

Machine model				PC25-1									
Classification	Item	Measurement conditions	Unit	Standard value	Permissible value								
Travel	Hydraulic drift of travel	Measuring posture  20RF5108 <ul style="list-style-type: none"> • Engine stopped • Hydraulic oil temperature: 45 – 55° C • Stop machine on 30° slope with sprocket facing straight up the slope. • Measure the distance the machine moves in 5 minutes. 	mm	Max. 300	330								
		Measuring posture  <ul style="list-style-type: none"> • Rated load: 145 kg 				mm	Max. 300	450					
Work equipment	Hydraulic drift of work equipment	Total work equipment (hydraulic drift at tip of bucket teeth)	mm	Max. 14	21								
		Boom cylinder (amount of retraction of cylinder)				<ul style="list-style-type: none"> • Place in above posture and measure extension or retraction of cylinder and downward movement at tip of bucket teeth. • Bucket: Rated load • Horizontal, flat ground • Levers at neutral • Engine stopped • Hydraulic oil temperature: 45 – 55° C • Start measuring immediately after setting. • Measure hydraulic drift for each 5 minutes, and judge from results for 15 minutes. 	Max. 12	18					
		Arm cylinder (amount of extension of cylinder)							Max. 6	9			
		Bucket cylinder (amount of retraction of cylinder)									<ul style="list-style-type: none"> • Engine stopped • Hydraulic oil temperature: 45 – 55° C • Bucket: Rated load • Stop the machine in the above posture on a 15° slope with the upper structure at 90° to the side, and measure the amount of retraction or extension of the cylinder over 15 minutes. 	Max. 20	30
		Boom swing (amount of retraction, extension of cylinder)											
Blade (hydraulic drift at tip of blade)													

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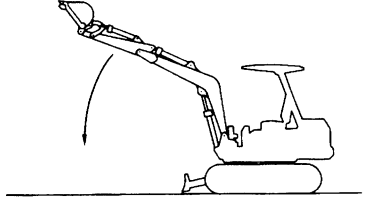
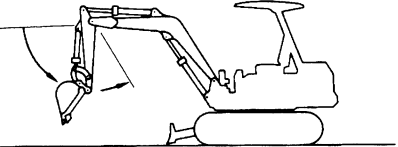
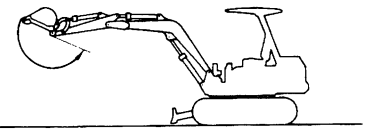
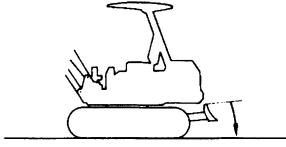
020S07

PC30-7		PC40-7		PC45-1	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
Max. 300	330	Max. 300	330	Max. 300	330
• Rated load: 180 kg Max. 300	450	• Rated load: 230 kg Max. 300	450	• Rated load: 250 kg Max. 300	450
Max. 16	24	Max. 19.5	30	Max. 19	29
Max. 19	28.5	Max. 20.5	30	Max. 24	36
Max. 8	12	Max. 8	12	Max. 10	15
Max. 20	30	Max. 10	15	Max. 10	15
Max. 10	15	Max. 10	15	Max. 10	15

		Machine model			PC25-1	
Classi- fica- tion	Item	Measurement conditions	Unit	Standard value	Permissible value	
Work equipment	Boom Bucket teeth in contact with ground ↑↓ Cylinder fully extended	Measuring posture  No load	RAISE	3.4 ± 0.3	4.0	
		<ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55°C 	LOWER	3.3 ± 0.3	3.9	
	Arm Cylinder fully retracted ↑↓ Fully extended	Measuring posture  No load	CURL	4.0 ± 0.4	4.8	
		<ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55°C 	DUMP	3.4 ± 0.3	4.0	
	Bucket Cylinder fully retracted ↑↓ Fully extended	Measuring posture  No load	CURL	3.3 ± 0.3	3.9	
		<ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55°C 	DUMP	2.1 ± 0.2	2.5	
	Blade Blade in contact with ground ↑↓ Blade fully extended	Measuring posture  No load	RAISE	1.0 ± 0.3	1.6	
		<ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55°C 	LOWER	1.2 ± 0.3	1.8	
	Boom swing cylinder full retracted ↑↓ Fully extended	Measuring posture  No load	L.H. Boom swing	7.4 ± 0.5	8.4	
		<ul style="list-style-type: none"> • Engine at high idling • Hydraulic oil temperature: 45 – 55°C 	R.H. Boom swing	7.0 ± 0.5	8.0	

020507

PC30-7		PC40-7		PC45-1	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
3.1 ± 0.3	3.7	4.0 ± 0.4	4.8	3.5 ± 0.4	4.3
3.0 ± 0.3	3.6	3.3 ± 0.3	3.9	2.7 ± 0.3	3.3
4.1 ± 0.4	4.9	4.3 ± 0.4	5.1	4.1 ± 0.4	4.9
3.5 ± 0.3	4.1	3.6 ± 0.4	4.4	3.6 ± 0.4	4.4
3.5 ± 0.3	4.1	4.1 ± 0.4	4.9	3.7 ± 0.4	4.5
2.2 ± 0.2	2.6	2.6 ± 0.3	3.2	2.3 ± 0.2	2.7
1.0 ± 0.3	1.6	1.1 ± 0.3	1.7	1.0 ± 0.3	1.6
1.0 ± 0.3	1.6	1.2 ± 0.3	1.8	1.0 ± 0.3	1.6
7.0 ± 0.5	8.0	7.5 ± 0.5	8.5	7.0 ± 0.5	8.0
7.0 ± 0.5	8.0	7.0 ± 0.5	8.0	7.0 ± 0.5	8.0

		Machine model		PC25-1	
Classi- fica- tion	Item	Machine model	Unit	Standard value	Permissible value
Work equipment	Time leg	Measuring posture  20RF5116 <ul style="list-style-type: none"> • Lower bucket to ground and measure time taken for chassis to rise from ground • Engine: Low idling • Hydraulic oil temperature: 45 – 55° C 	sec.	Max. 2	Max. 2
		Measuring posture  20RF5117 <ul style="list-style-type: none"> • Amount of time when arm stops for a moment • Engine: Low idling • Hydraulic oil temperature: 45 – 55° C 		0	0
		Measuring posture  20RF5118 <ul style="list-style-type: none"> • Amount of time when bucket stops for a moment • Engine: Low idling • Hydraulic oil temperature: 45 – 55° C 		0	0
		Measuring posture  20RF5119 <ul style="list-style-type: none"> • Engine speed: Low idling • Oil temperature: 45 – 55° C • Measure the time it takes for the rear of the machine to be lifted off the ground, starting from the time the blade contacts the ground. 		Max. 1	Max. 1
		Internal leakage of each cylinder	<ul style="list-style-type: none"> • Hydraulic oil temperature: 45 – 55° C • Relieve circuit to be measured 	cc/min	2

020S07

020S07

PC30-7		PC40-7		PC45-1	
Standard value	Permissible value	Standard value	Permissible value	Standard value	Permissible value
Max. 2	Max. 2	Max. 2	Max. 2	Max. 2	Max. 2
0	0	0	0	0	0
0	0	0	0	0	0
Max. 1	Max. 1	Max. 1	Max. 1	Max. 1	Max. 1
2	10	2	10	2	10

STANDARD VALUE TABLE FOR ELECTRICAL SYSTEM

System	Component	Connector No.	Inspection method	Judgement table	Measurement conditions																																																																						
Machine monitor	Monitor panel			<p>If the condition is as shown in Table 1 and Table 2, the monitor panel is normal Table 1 (CHECK, CAUTION portion)</p> <table border="1"> <thead> <tr> <th>Monitor item (input connector)</th> <th>Measurement condition</th> <th>Display</th> <th>Sensor signal input</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Engine oil pressure P1 (9)</td> <td rowspan="2">Engine started</td> <td>ON</td> <td>Max. 1V</td> </tr> <tr> <td>OFF</td> <td>10 – 15V</td> </tr> <tr> <td rowspan="2">Charge amount P1 (10)</td> <td rowspan="2">Engine started</td> <td>ON</td> <td>Max. 5V</td> </tr> <tr> <td>OFF</td> <td>10 – 15V</td> </tr> <tr> <td rowspan="2">Engine oil level (*) P1 (11)</td> <td rowspan="2">Engine stopped</td> <td>ON</td> <td>Max. 1V</td> </tr> <tr> <td>OFF</td> <td>3.5 – 15V</td> </tr> <tr> <td rowspan="2">Preheating P1 (13)</td> <td rowspan="2">Engine stopped</td> <td>ON</td> <td>5 – 7V</td> </tr> <tr> <td>OFF</td> <td>Max. 1V</td> </tr> </tbody> </table>	Monitor item (input connector)	Measurement condition	Display	Sensor signal input	Engine oil pressure P1 (9)	Engine started	ON	Max. 1V	OFF	10 – 15V	Charge amount P1 (10)	Engine started	ON	Max. 5V	OFF	10 – 15V	Engine oil level (*) P1 (11)	Engine stopped	ON	Max. 1V	OFF	3.5 – 15V	Preheating P1 (13)	Engine stopped	ON	5 – 7V	OFF	Max. 1V	1) Connect T-adaptor.																																										
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	Gauge portion			<p>Table 2 (gauge portion)</p> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">Gauge display position</th> <th colspan="2">Display level resistance (monitor panel input resistance)</th> </tr> <tr> <th colspan="2">Starting switch ON</th> <th colspan="2">Starting switch OFF</th> </tr> </thead> <tbody> <tr> <td rowspan="14"> Measure resistance between P1 (female) (6) and (3) of coolant temperature gauge </td> <td rowspan="7">Right side</td> <td>All OFF</td> <td colspan="2">Min. – Max. (kΩ)</td> </tr> <tr> <td>7</td> <td colspan="2">0 – 0.34</td> </tr> <tr> <td>6</td> <td colspan="2">0.05 – 3.40</td> </tr> <tr> <td>5</td> <td colspan="2">3.19 – 3.67</td> </tr> <tr> <td>4</td> <td colspan="2">3.46 – 4.19</td> </tr> <tr> <td>3</td> <td colspan="2">3.95 – 6.75</td> </tr> <tr> <td>2</td> <td colspan="2">6.36 – 10.05</td> </tr> <tr> <td rowspan="7">Left side</td> <td>1</td> <td colspan="2">9.47 – 15.1</td> </tr> <tr> <td colspan="2"></td> <td colspan="2">13.75 – disconnection</td> </tr> <tr> <td rowspan="7">Right side</td> <td>7</td> <td colspan="2">Min. – Max. (Ω)</td> </tr> <tr> <td>6</td> <td colspan="2">0 – 15.7</td> </tr> <tr> <td>5</td> <td colspan="2">12.6 – 24.0</td> </tr> <tr> <td>4</td> <td colspan="2">20.5 – 30.6</td> </tr> <tr> <td>3</td> <td colspan="2">26.7 – 39.6</td> </tr> <tr> <td>2</td> <td colspan="2">35.2 – 51.6</td> </tr> <tr> <td>1</td> <td colspan="2">46.5 – 78.0</td> </tr> <tr> <td rowspan="2">Left side</td> <td>All OFF</td> <td colspan="2">71.2 – 800</td> </tr> <tr> <td colspan="2"></td> <td colspan="2">500 – disconnection</td> </tr> </tbody> </table>		Gauge display position		Display level resistance (monitor panel input resistance)		Starting switch ON		Starting switch OFF		Measure resistance between P1 (female) (6) and (3) of coolant temperature gauge	Right side	All OFF	Min. – Max. (kΩ)		7	0 – 0.34		6	0.05 – 3.40		5	3.19 – 3.67		4	3.46 – 4.19		3	3.95 – 6.75		2	6.36 – 10.05		Left side	1	9.47 – 15.1				13.75 – disconnection		Right side	7	Min. – Max. (Ω)		6	0 – 15.7		5	12.6 – 24.0		4	20.5 – 30.6		3	26.7 – 39.6		2	35.2 – 51.6		1	46.5 – 78.0		Left side	All OFF	71.2 – 800				500 – disconnection		1) With starting switch OFF insert of dummy resistance or measure resistance of sensor. 2) Check display with starting switch ON. 3) Connect socket.
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1	46.5 – 78.0																																																																										
Left side	All OFF	71.2 – 800																																																																									
			500 – disconnection																																																																								

(*) Without PC25-1 Serial No. 6471 and up PC30-7 Serial No. 26423 and up
 PC40-7 Serial No. 24522 and up PC45-1 Serial No. 3506 and up

System	Component	Connector No.	Inspection method	Judgement table	Measurement conditions				
Machine monitor system	Engine oil pressure sensor	T9 (male)	Measure resistance	<p>If the condition is as shown in the table below, it is normal</p> <table border="1"> <tr> <td>Oil pressure above 0.7 kg/cm²</td> <td>Min. 1 MΩ</td> </tr> <tr> <td>Oil pressure below 0.3 kg/cm²</td> <td>Max. 1 Ω</td> </tr> </table>	Oil pressure above 0.7 kg/cm ²	Min. 1 MΩ	Oil pressure below 0.3 kg/cm ²	Max. 1 Ω	<ol style="list-style-type: none"> 1) Start engine. 2) Disconnect connector T9.
	Oil pressure above 0.7 kg/cm ²	Min. 1 MΩ							
	Oil pressure below 0.3 kg/cm ²	Max. 1 Ω							
	Engine oil level sensor (*)	P6 (male)	Continuity	<p>If the condition is as shown in the table below, it is normal</p> <table border="1"> <tr> <td>Engine oil level normal</td> <td>Continuity</td> </tr> <tr> <td>Engine oil level abnormal</td> <td>No continuity</td> </tr> </table>	Engine oil level normal	Continuity	Engine oil level abnormal	No continuity	<ol style="list-style-type: none"> 1) Turn starting switch OFF. 2) Disconnect connector P6.
	Engine oil level normal	Continuity							
Engine oil level abnormal	No continuity								
Coolant temperature sensor	P2 (male)	Measure resistance	<p>If the condition is as shown in the table below, it is normal</p> <table border="1"> <tr> <td>Normal temperature (25°C)</td> <td>Approx. 37 – 50 kΩ</td> </tr> <tr> <td>100°C</td> <td>Approx. 3.5 – 4.0 kΩ</td> </tr> </table>	Normal temperature (25°C)	Approx. 37 – 50 kΩ	100°C	Approx. 3.5 – 4.0 kΩ	<ol style="list-style-type: none"> 1) Turn starting switch OFF. 2) Disconnect connector P2. 	
Normal temperature (25°C)	Approx. 37 – 50 kΩ								
100°C	Approx. 3.5 – 4.0 kΩ								
Fuel level sensor	P4 (male) P5 (female)	Measure resistance	<p>If the condition is as shown in the table below, it is normal</p> <table border="1"> <tr> <td rowspan="2">P4 – P5</td> <td>Full</td> <td>Max. 10 Ω</td> </tr> <tr> <td>Empty</td> <td>Min. 85 Ω</td> </tr> </table>	P4 – P5	Full	Max. 10 Ω	Empty	Min. 85 Ω	<ol style="list-style-type: none"> 1) Turn starting switch OFF. 2) Disconnect connectors P4 and P5.
P4 – P5	Full	Max. 10 Ω							
	Empty	Min. 85 Ω							
Alternator	Between alternator terminal R and chassis	Measure voltage	<p>When engine is running (1/2 throttle or above): 13.5 – 14.5 V</p> <p>* If the battery is old, or after starting in cold areas, the voltage may not rise for some time.</p>	<ol style="list-style-type: none"> 1) Start engine. 					

(*) Without **PC25-1 Serial No. 6471 and up**
PC30-7 Serial No. 26423 and up
PC40-7 Serial No. 24522 and up
PC45-1 Serial No. 3506 and up

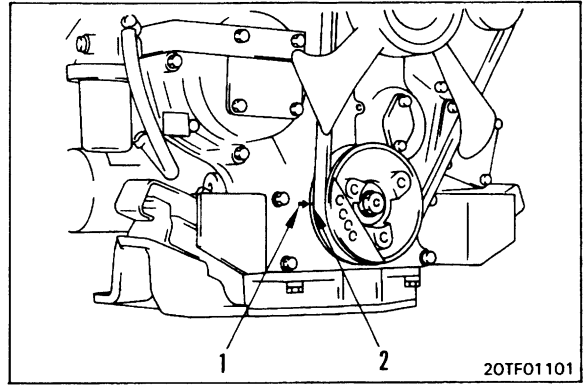
TOOL FOR TESTING, ADJUSTING, AND TROUBLESHOOTING

Check or measurement item	Symbol	Part No.	Part Name	Remarks	
Engine speed	A	1	799-203-8000	Multi-tachometer Digital display L : 60 – 2,000 rpm H : 60 – 19,999 rpm	
		2	799-203-8901	Clamp set —	
Water and oil temperatures	B	799-101-1500	Digital temperature gauge	– 50 — 1,200°C	
Hydraulic pressure	C	1	799-101-5001	Hydraulic tester Pressure gauge 2.5 (25), 5.9 (60), 39.2 (400), 58.8 (600) MPa (kg/cm ²)	
			790-261-1201	Digital hydraulic tester Pressure gauge 49 MPa (500 kg/cm ²)	
	2	790-261-1310	Adapter	—	
		790-261-1320		—	
	3	799-401-2320	Hydraulic gauge	1.0 MPa (10 kg/cm ²)	
Compression pressure	D	1	795-502-1590	Compression gauge	
		2	795-111-1110	Adapter	0 — 6.9 MPa (70 kg/cm ²) Kit Part No. 795-502-1205
		3	795-101-1571	Joint	
Valve clearance	E	Commercially available	Feeler gauge	—	
Exhaust color	F	799-201-9000	Handy smoke checker	Discoloration 0 – 70 % (with standard color) (Discoloration % x 1/10 = Bosch index)	
		Commercially available	Smoke meter		
Operating force	G	Commercially available	Push-pull scale	—	
Stroke, hydraulic drift	H	Commercially available	Scale	—	
Work equipment speed	I	Commercially available	Stop watch	—	
Pump performance	J	790-303-1003	Flowmeter kit	—	
Troubleshooting of wiring harnesses and sensors	K	1	799-601-2600	• Kit Part No. T-adapter kit 799-601-7100	
		2	799-601-7000		Adapter Ass'y
Troubleshooting of voltage and resistance values	L	Commercially available	Tester	—	

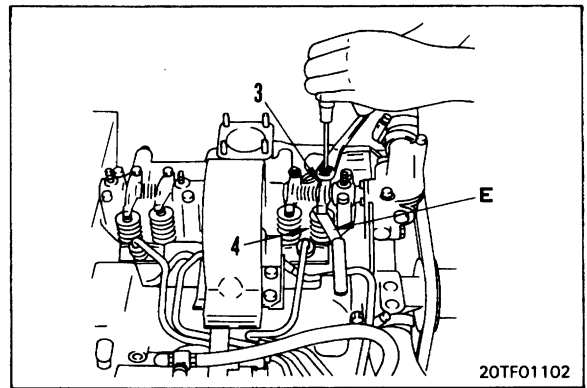
ADJUSTING VALVE CLEARANCE


PC25-1, PC30-7

1. Remove the cylinder head cover.
2. Rotate the crankshaft in the normal direction, set No. 1 cylinder at compression top dead center, and align pointer (1) on the gear case with mark (2) on the crankshaft pulley. When rotating, check the movement of the valve.
 - ★ When the crankshaft is rotated, the valves of the cylinder at compression top dead center do not move.
 - If the valves move, rotate the crankshaft one more turn and align pointer (1) with mark (2).



3. To adjust the valve clearance, loosen locknut (6), then insert feeler gauge E between rocker lever (3) and valve stem (4), and turn adjustment screw (5) until the clearance is a sliding fit. Then tighten locknut (6) to hold the adjustment screw in position.



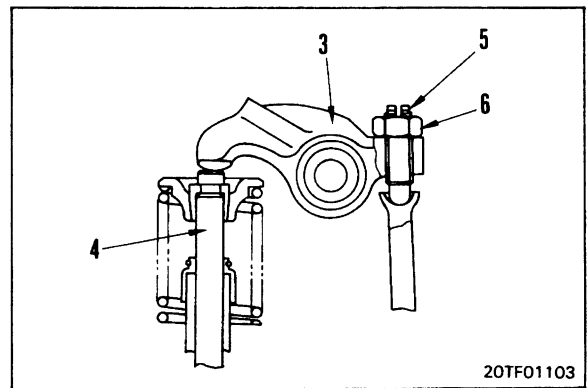
 Locknut: 4.5 ± 0.5 kgm

4. After adjusting No. 1 cylinder at top dead center, turn the crankshaft 240° each time and adjust the valve clearance of the remaining cylinders according to the firing order.
 - ★ Firing order: 3 – 1 – 2

- ★ As another method of adjustment, set No. 1 cylinder at top dead center, and adjust the valves marked ●. Next, rotate the crankshaft one turn (360°) in the normal direction and adjust the clearance of the remaining valves marked ○.

● Valve arrangement

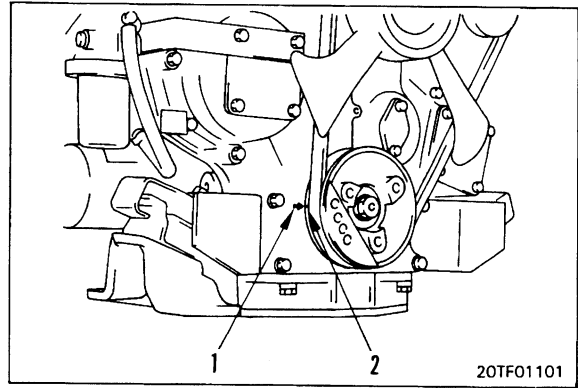
Cylinder No.	1	2	3
Exhaust valve	●	●	○
Intake valve	●	○	●



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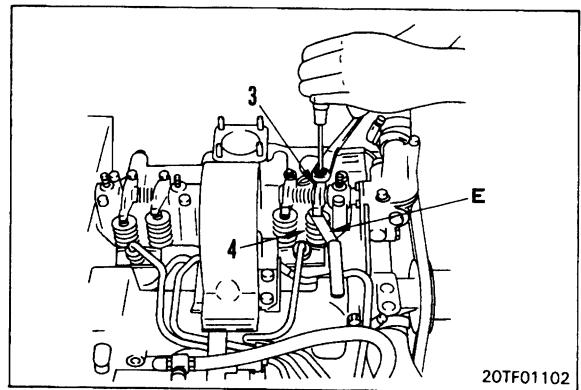
PC40-7, PC45-1

1. Remove the cylinder head cover.
2. Rotate the crankshaft in the normal direction, set No. 1 cylinder at compression top dead center, and align pointer (1) on the gear case with mark (2) on the crankshaft pulley. When rotating, check the movement of the valve.
 - ★ When the crankshaft is rotated, the valves of the cylinder at compression top dead center do not move.
 - If the valves move, rotate the crankshaft one more turn and align pointer (1) with mark (2).



3. To adjust the valve clearance, loosen locknut (6), then insert feeler gauge E between rocker lever (3) and valve stem (4), and turn adjustment screw (5) until the clearance is a sliding fit. Then tighten locknut (6) to hold the adjustment screw in position.

Locknut: 4.5 ± 0.5 kgm

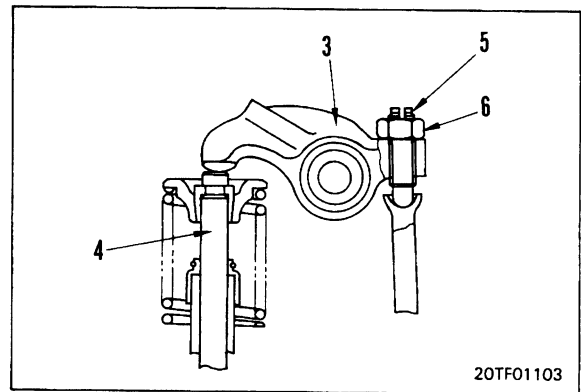


4. After adjusting No. 1 cylinder at top dead center, turn the crankshaft 180° each time and adjust the valve clearance of the remaining cylinders according to the firing order.
 - ★ Firing order: 1 – 3 – 4 – 2

★ As another method of adjustment, set No. 1 cylinder at top dead center, and adjust the valves marked ●. Next, rotate the crankshaft one turn (360°) in the normal direction and adjust the clearance of the remaining valves marked ○.

● Valve arrangement

Cylinder No.	1	2	3	4
Exhaust valve	●	○	●	○
Intake valve	●	●	○	○

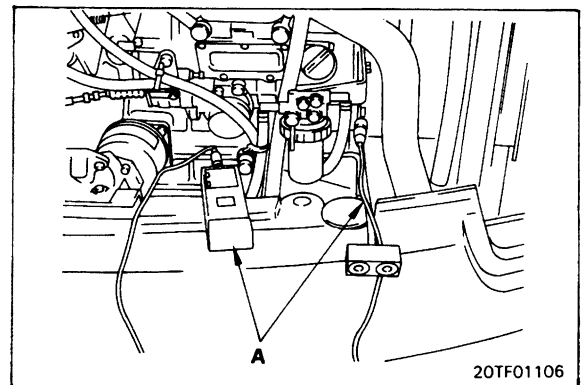
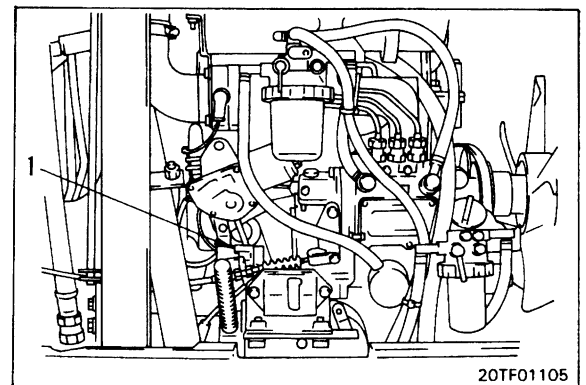
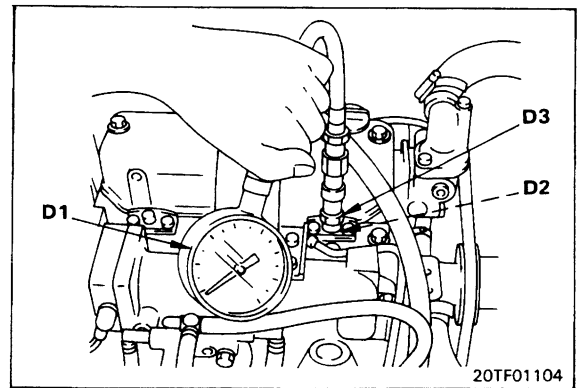


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MEASURING COMPRESSION PRESSURE

⚠ When measuring the compression pressure, be careful not to touch the exhaust manifold or muffler, or to get your clothes caught in the fan, fan belt or other rotating parts.

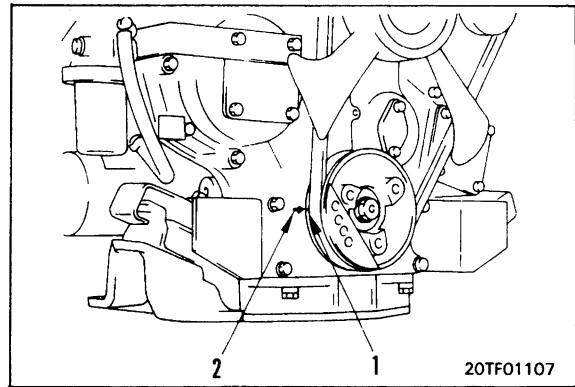
1. Adjust the valve clearance.
For details, see ADJUSTING VALVE CLEARANCE.
 2. Warm up the engine to make the oil temperature 40 – 60°C.
 3. Remove the nozzle holder assembly from the cylinder to be measured.
 4. Install adapter **D2** and joint **D3** in the mount of the nozzle holder, then connect compression gauge **D1**.
 5. Set multi-tachometer **A** in position.
 6. Disconnect connector **E4** (1) of the engine stop motor, place the injection pump stop lever in the STOP position, then crank the engine with the starting motor and measure the compression pressure.
- ★ Measure the compression pressure at the point where the pressure gauge indicator remains steady.
 - ★ When measuring the compression pressure, measure the engine speed also to confirm that it is within the specified range for the measurement conditions.
 - ★ After measuring the compression pressure, install the nozzle holder assembly.



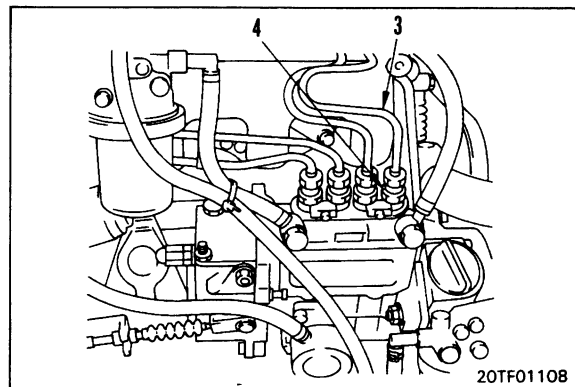
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ADJUSTING FUEL INJECTION TIMING

1. Rotate the crankshaft in the normal direction to align pointer (2) with injection timing line (1) on the crankshaft pulley.
2. Disconnect fuel injection pipe (3).
3. Remove delivery valve holder (4), take out delivery valve (5) and spring (6), then install delivery valve holder (4) again.
4. Place the fuel injection lever at the FULL position.
5. Loosen nut (7) in the oblong hole of the mounting flange of the fuel injection pump.




6. Move the fuel injection pump towards the outside, then move the injection pump towards the cylinder block a little at a time while operating the priming pump, and stop at the point where the fuel stops flowing from the delivery valve holder.
 - ★ If the fuel does not stop whichever way the injection pump is moved, rotate the crankshaft one more turn.
 - ★ Adjust the fuel injection timing by moving the fuel injection pump as follows.
 - To RETARD timing, move towards OUTSIDE
 - To ADVANCE timing, move towards CYLINDER BLOCK




7. Tighten nut (7) in the oblong hole of the mounting flange of the fuel injection pump.

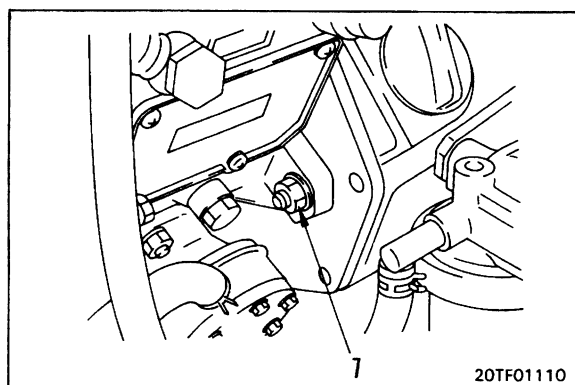
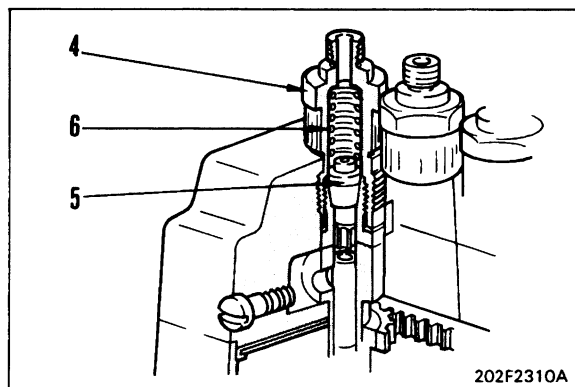
 Nut: 2.6 kgm

8. Remove delivery valve holder (4), assemble delivery valve (5) and spring (6), then install delivery valve holder (4) again.

 Delivery valve holder: 3.75 ± 0.25 kgm

9. Connect fuel injection pipe (3).

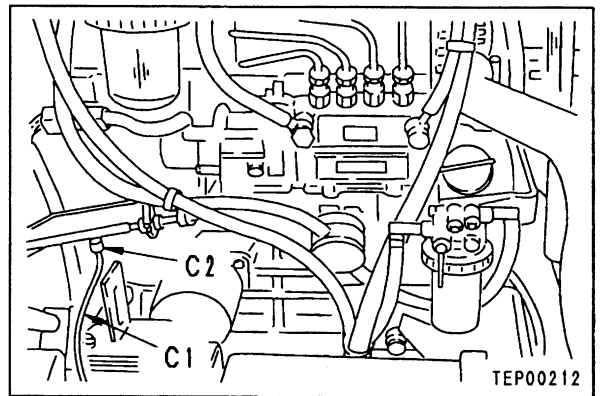
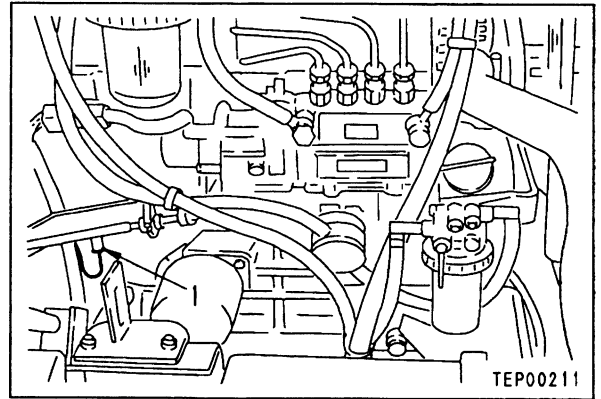
 Sleeve nut: 3.25 ± 0.25 kgm



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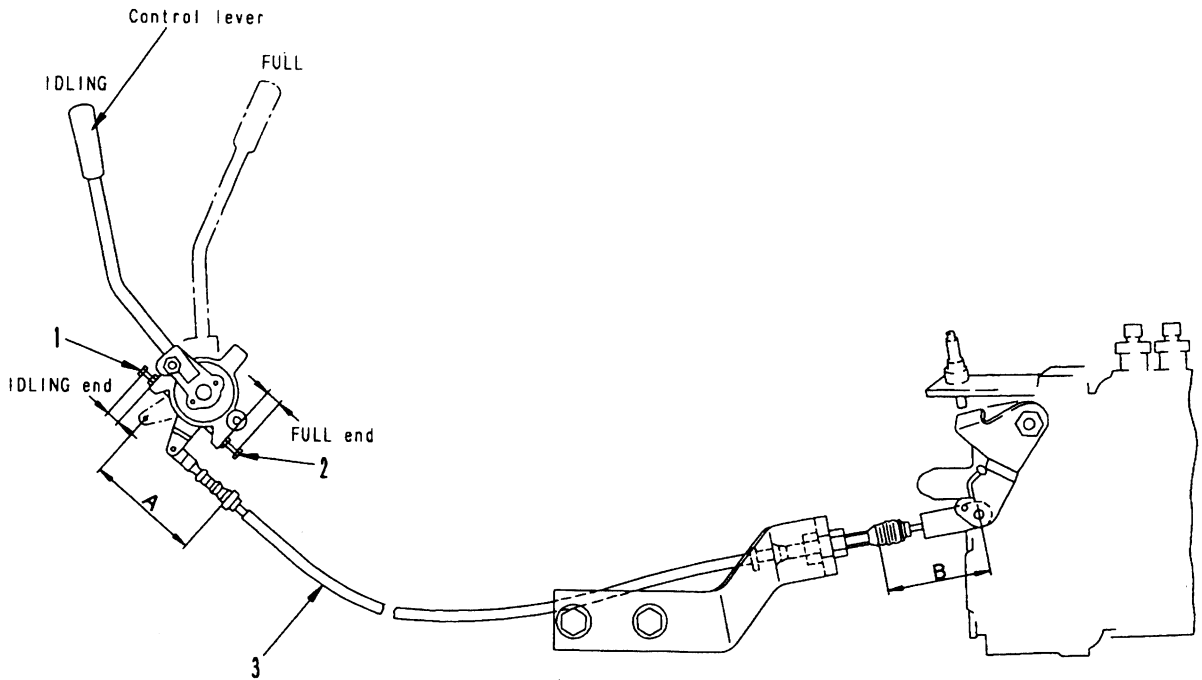
MEASURING ENGINE OIL PRESSURE

- ★ Measure the engine oil pressure under the following conditions.
 - Coolant temperature: Within operating range
- 1. Remove engine oil pressure sensor (1), then install the adapter of oil pressure gauge kit **C1** and oil pressure gauge **C2** (0.98 MPa (10 kg/cm²)).
- 2. Start the engine, and measure the oil pressure at the low pressure end with the engine at low idling and at the high pressure end with the engine at high idling.



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ADJUSTING FUEL CONTROL LEVER



020S07

TEP00237

1. Set stopper bolts (1) and (2) to the standard dimensions.
 - Standard dimension of stopper bolt
 - FULL (1) : 10.0 mm
 - IDLING (2) : 22.5 mm
2. Set the fuel control lever at the FULL position, then set cable (3) to the standard dimensions (A) at the control lever end and (B) at the injection pump end.

- Standard dimension (A) at control lever end:

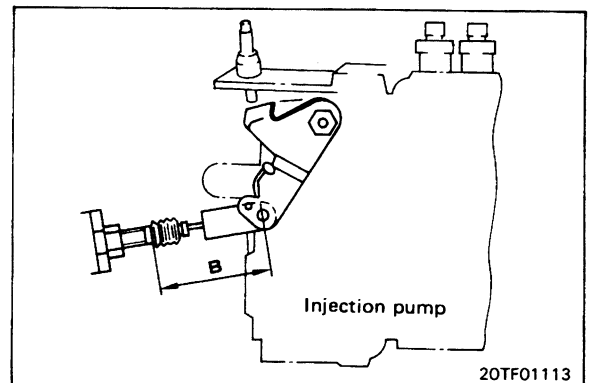
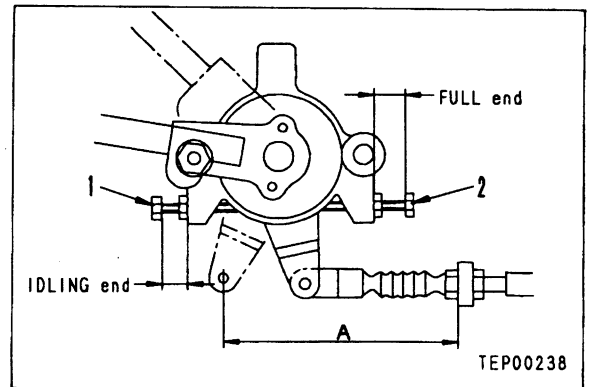
(mm)			
PC25	PC30	PC40	PC45
110.5	108.5	110.5	106.5

- Standard dimension (B) at injection pump end:

PC25	PC30	PC40	PC45
56.0	58.5	56.0	60.0

3. Operate the fuel control lever and check that the fuel control lever and injection pump lever contact the stopper bolts.
4. Start the engine and check the engine speed.


★ For details of the engine speed, see TABLE OF JUDGEMENT STANDARD VALUE TABLE.



TESTING AND ADJUSTING HYDRAULIC PRESSURE IN WORK EQUIPMENT, SWING, TRAVEL CIRCUIT

1. MEASURING

★ Oil temperature when measuring: 45 – 55°C

 Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the remaining pressure in the hydraulic piping. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Set the safety lock lever to the LOCK position.

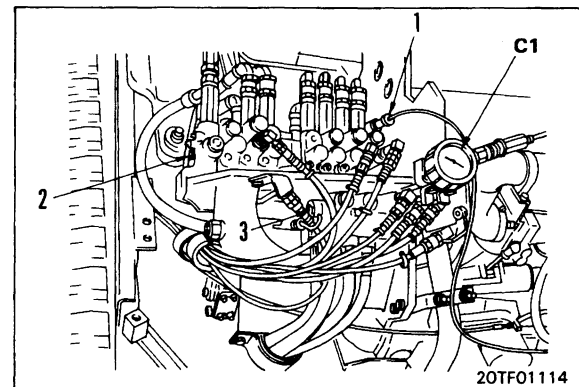
- 1) Remove pressure pick-up plug (1), (2) or (3) (Thread dia. = 10 mm, Pitch = 1.25 mm) from the circuit to be measured, then install oil pressure gauge C1 (400 kg/cm²).
- 2) Start the engine and measure the main relief pressure with the engine at high idling. (See Table 1)
 - Condition of actuator to be measured
 - i) For the work equipment, set each cylinder to the end of its stroke.
 - ii) For swing, lock with the swing lock pin.
 - iii) For travel, fit block ① under the track shoe grouser, or fit block ② between the sprocket and frame to lock the track shoe. Measure one side at a time.

Table 1

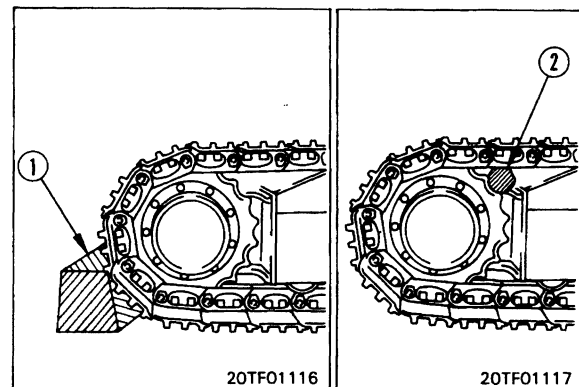
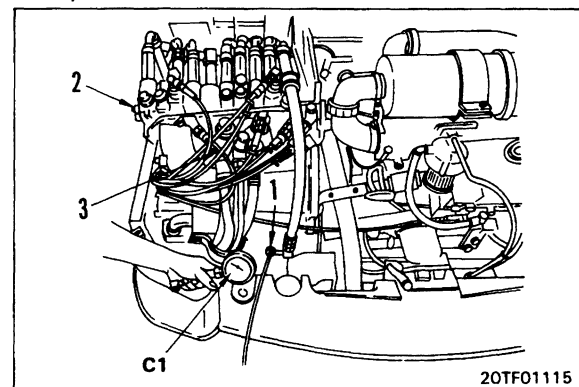
Plug	Pump	Actuator controlled
1	Front pump (7-spool control valve right side)	Boom cylinder Bucket cylinder Boom swing cylinder Right travel motor
2	Center pump (7-spool control valve left side)	Service Arm cylinder Left travel motor
3	Rear pump (2-spool control valve)	Blade cylinder Swing motor

- ★ Measure all the actuators at single pump relief.
- ★ The set pressure of the safety valve for the swing motor is lower than the set pressure of the main relief valve, so when the swing is relieved, it becomes the set pressure of the safety valve.

PC25, 40



PC30, 45



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2. ADJUSTING

- ★ Adjust the swing circuit with the swing motor safety valve. Adjust the other work equipment and travel circuits with the main relief valve.


Main relief valve

- (4): For boom, bucket, boom swing, right travel (7-spool control valve right side)
- (5): For service, arm, left travel (7-spool control valve left side)
- (6): For blade (swing) (2-spool control valve)

2-spool control valve, 7-spool control valve
(PC25, 30, 40)

- 1) Loosen locknut (7) and turn adjustment screw (8) to adjust.

- ★ Adjust with the adjustment screw as follows.
 - To INCREASE pressure, turn COUNTER-CLOCKWISE
 - To DECREASE pressure, turn COUNTER-CLOCKWISE
- ★ Amount of adjustment for one turn of adjustment screw: 5.5 MPa (56 kg/cm²)


 Locknut: **68.6 ± 9.8 Nm (7 ± 1 kgm)**

- ★ After adjusting, repeat the procedure in Step 1 to check again.

7-spool control valve (PC45)

- 2) Remove cap (9), then loosen locknut (10) and turn adjustment screw (11) to adjust.

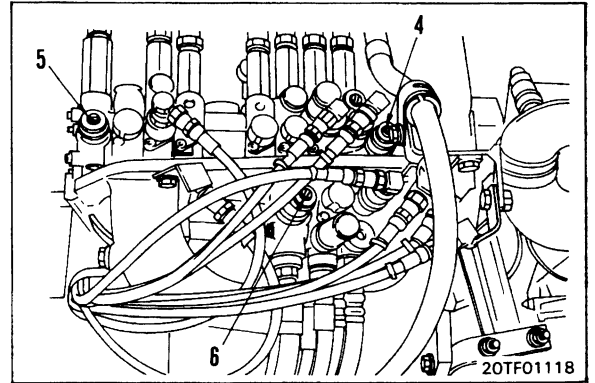
- ★ Adjust with the adjustment screw as follows.
 - To INCREASE pressure, turn COUNTER-CLOCKWISE
 - To DECREASE pressure, turn COUNTER-CLOCKWISE
- ★ Amount of adjustment for one turn of adjustment screw: 10.4 MPa (106 kg/cm²)

 Locknut: **19.6 ± 4.9 Nm (2 ± 0.5 kgm)**

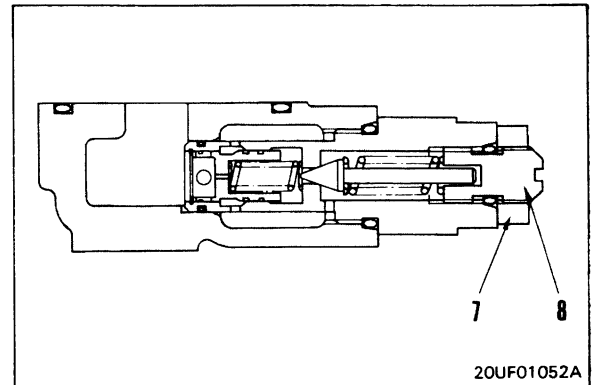
- ★ After adjusting, repeat the procedure in Step 1 to check again.

Swing motor safety valve

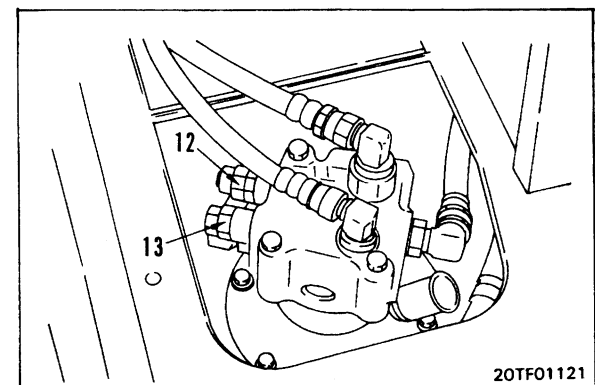
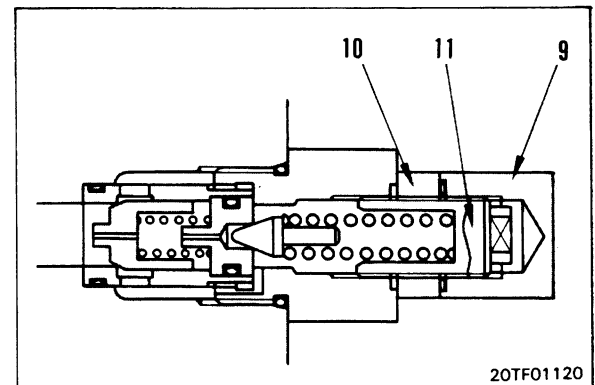
- (12): For left swing
- (13): For right swing



PC25 - 40 : 7-spool control valve
PC25 - 45 : 2-spool control valve



PC45 7-spool control valve




1) Loosen locknut (14) and turn adjustment screw (15) to adjust.

★ Adjust with the adjustment screw as follows.

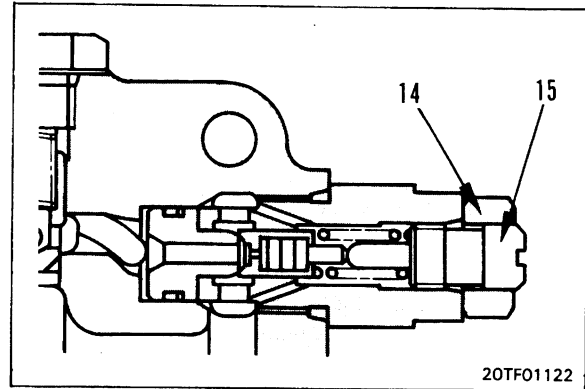
- To INCREASE pressure, turn CLOCKWISE
- To DECREASE pressure, turn COUNTER-CLOCKWISE

★ Amount of adjustment for one turn of adjustment screw: 179 kg/cm^2

 Locknut: $3.5 \pm 0.5 \text{ kgm}$

★ After adjusting, repeat the procedure in Step 1 to check again.

★ Adjustment of the safety valve set pressure is only for the swing motor. Do not try to adjust the safety valve set pressure for any other part.



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TESTING CONTROL CIRCUIT PRESSURE

1. MEASURING

★ Oil temperature when measuring: 45 – 55°C

⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the remaining pressure in the hydraulic piping. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Set the safety lock lever to the LOCK position.

1) Remove pressure pick-up plug (1) (Thread dia. = 10 mm, Pitch = 1.25 mm), and install oil pressure gauge C1 (60 kg/cm²).

2) Start the engine and measure with the engine at high idling.

★ When testing for internal leakage of the equipment in the control circuit, use the parts given below to shut off the circuit for the following sections when measuring the relief pressure.

No.	Section of hydraulic circuit shut off	Component that can be checked
1	PPC lock solenoid valve lock	Charging pump relief valve
2	PPC lock solenoid valve outlet port	PPC lock solenoid valve
3	Left PPC valve inlet port	Left PPC valve
4	Right PPC valve inlet port	Right PPC valve

★ For Item No. 1, set the safety lock lever at the LOCK position.

★ With Item No. 2, Nos. 3 and 4 are shut off at the same time.

★ Use the following parts to shut off the circuit.

- For elbow
Sleeve nut: 07221-20210
Plug: 07222-00210
- For hose
Plug: 07376-50210

2. ADJUSTING

1) Loosen locknut (5) and turn adjustment screw (6) to adjust.

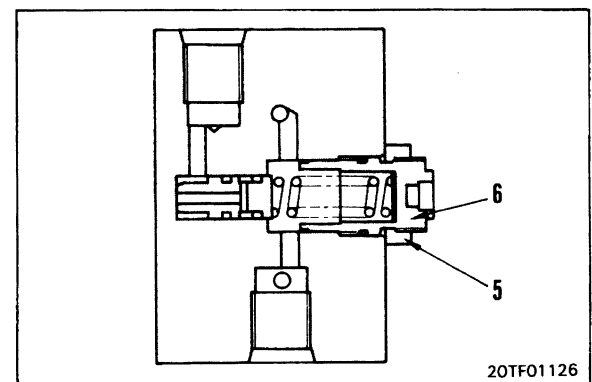
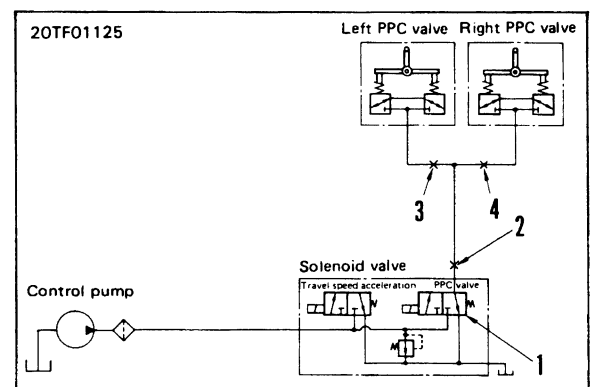
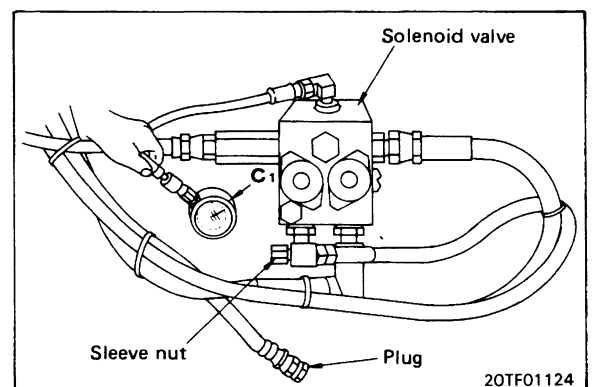
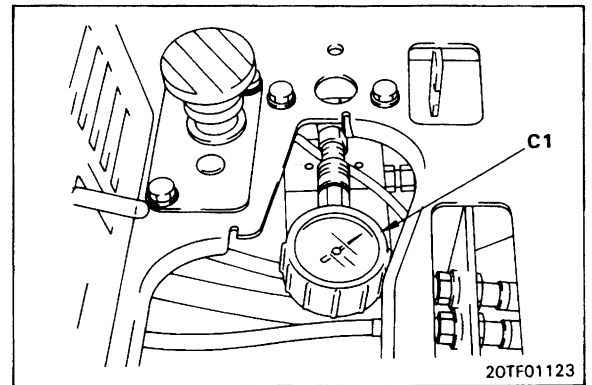
★ Adjust with the adjustment screw as follows.

- To INCREASE pressure, turn CLOCKWISE
- To DECREASE pressure, turn COUNTER-CLOCKWISE

★ Amount of adjustment for one turn of adjustment screw: 5.3 kg/cm²

🔒 Locknut: 0.9 ± 0.1 kgm

★ After adjusting, repeat the procedure in Step 1 to check again.



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MEASURING OUTPUT PRESSURE OF PPC VALVE

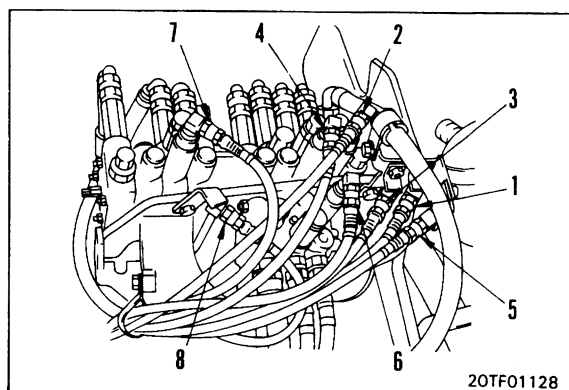
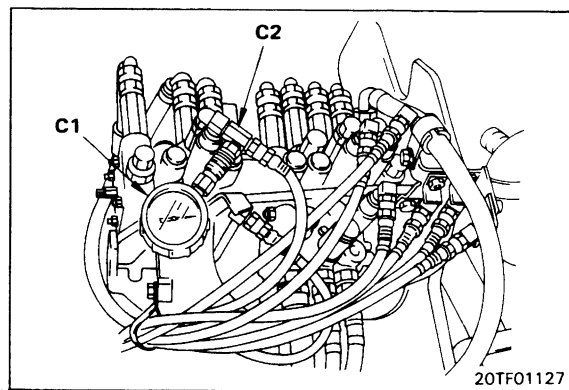
★ Measure the output pressure if the work equipment or swing are slow or do not move, or if there is any other problem.

★ Oil temperature when measuring: 45 – 55°C

1. Disconnect the inlet hose port from the valve to be measured, install adapter **C2** between the hose and elbow, then install oil pressure gauge **C1** (60 kg/cm²) to adapter **C2**.
2. Run the engine at high idling, operate the control lever for the circuit to be measured, and measure the output pressure of the PPC valve.

- Measurement position

- (1): Boom RAISE
- (2): Boom LOWER
- (3): Bucket DUMP
- (4): Bucket CURL
- (5): Swing LEFT
- (6): Swing RIGHT
- (7): Arm IN
- (8): Arm OUT




ADJUSTING PPC VALVE

PC25-1 Serial No. 1001 – 5678
PC30-7 Serial No. 18001 – 25054
PC40-7 Serial No. 18001 – 23296
PC45-1 Serial No. 1001 – 3014

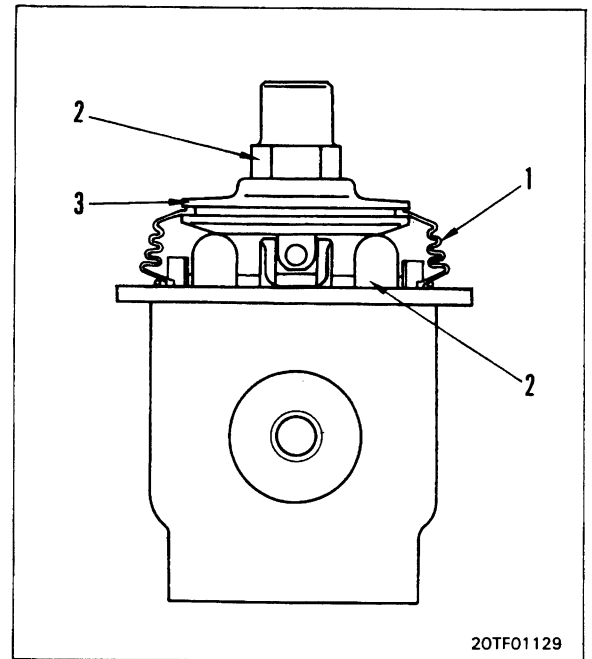
★ If there is excessive play in the work equipment or swing lever, adjust as follows.

⚠ Lower the work equipment to the ground and stop the engine. Operate the control levers several times to release the remaining pressure in the hydraulic piping. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Set the safety lock lever to the LOCK position.

1. Remove the PPC valve.
2. Remove boot (1).
3. Loosen locknut (2), and screw in disc (3) until it contacts the head of 4 pistons (4).
★ When adjusting, do not operate the pistons.
4. Hold disc (3) in position and tighten locknut (2) to the specified tightening torque.

 Locknut: $107.8 \pm 9.8 \text{ Nm}$ ($11 \pm 1 \text{ kgm}$)

5. Install boot (1).
- ★ With this adjustment, the clearance between disc (3) and piston (4) is mode 0.



20TF01129

020S07


ADJUSTING WORK EQUIPMENT, SWING PPC VALVE

PC25-1 Serial No. 5679 and up
PC30-7 Serial No. 25055 and up
PC40-7 Serial No. 23297 and up
PC45-1 Serial No. 3015 and up

★ If there is excessive play in the work equipment or swing lever, adjust as follows.

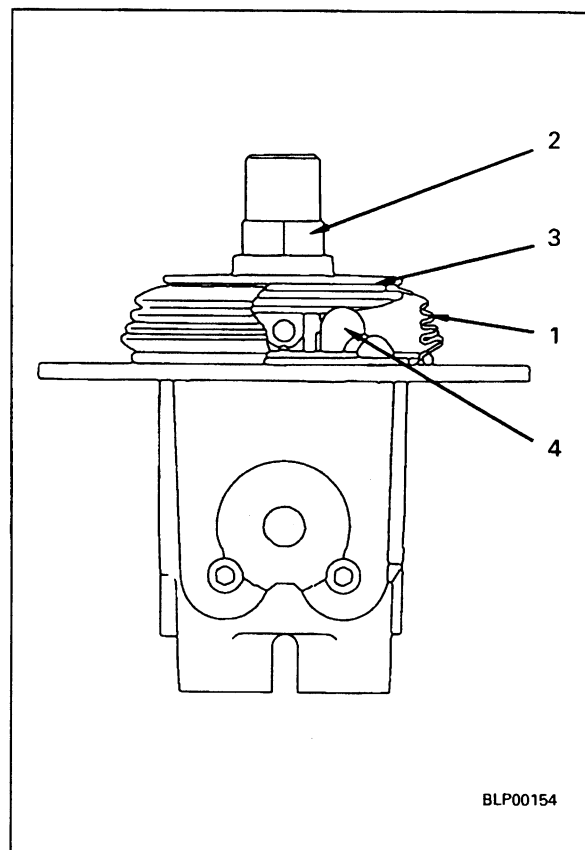
⚠ Lower the work equipment to the ground and stop the engine. Loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Then set the safety lock lever to the LOCK position.

1. Remove the PPC valve.
2. Remove boot (1).
3. Loosen locknut (2), then screw in disc (3) until it contacts the 4 heads of pistons (4).
★ When doing this, do not move the piston.
4. Secure disc (3) in position, then tighten locknut (2) to the specified torque.

 Locknut: $112.7 \pm 14.7 \text{ Nm}$
($11.5 \pm 1.5 \text{ kgm}$)

5. Install boot (1).

★ With the above adjustment, the clearance between disc (3) and piston (4) becomes 0.



BLP00154

MEASURING SOLENOID VALVE OUTLET PORT PRESSURE

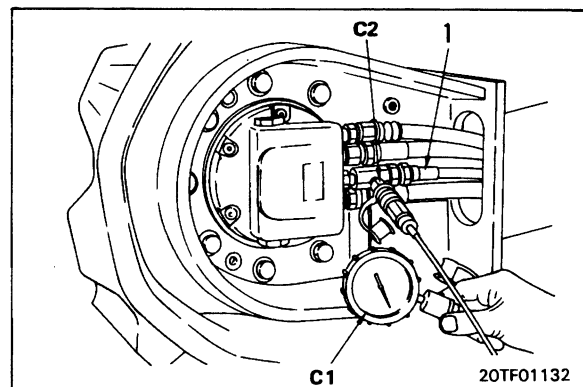
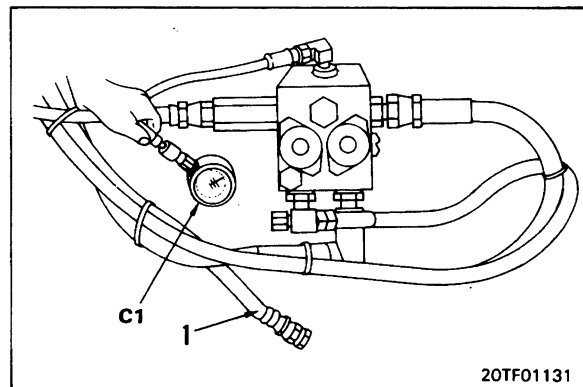
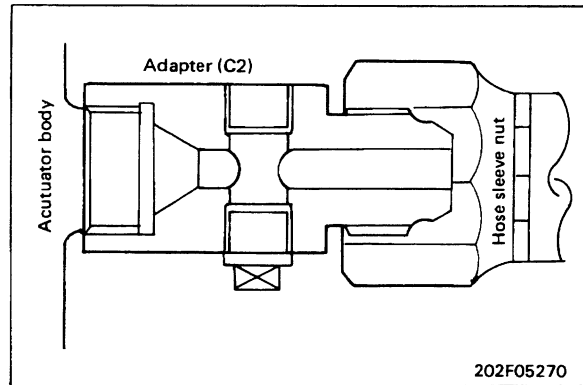
- Measure each solenoid valve at the following places.

Solenoid valve	Measurement location
PPC lock	Solenoid valve outlet port
Travel speed acceleration	Travel motor inlet port

1. Disconnect hose (1), and install adapter **C2** between the measurement point and the hose.
★ Adapter **C2**

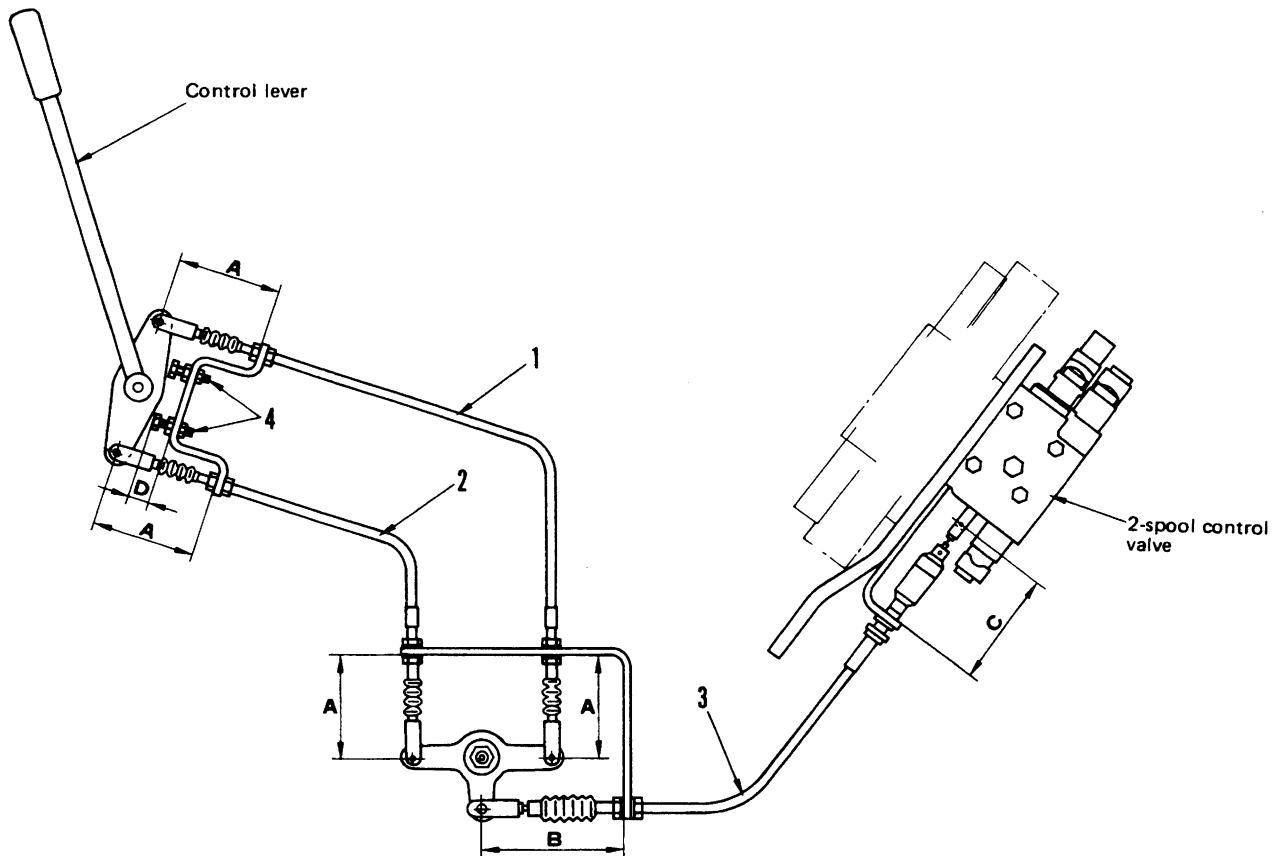
Measurement location	Size	Part No.
PPC lock solenoid valve outlet port	02	790-261-1310
Travel motor inlet port	03	790-261-1320

2. Install oil pressure gauge **C1** (60 kg/cm²) to adapter **C2**.
3. Run the engine at high idling and measure the pressure under the following conditions.
 - 1) PPC lock solenoid valve
Set the safety lock lever to the FREE position.
 - 2) Travel speed acceleration solenoid valve
Depress the travel speed acceleration pedal.



020S07

ADJUSTING BLADE CONTROL LEVER



/US071

20TF01133

1. Install cables (1), (2), and (3).
2. Adjust cable mounts A, B, and C to the standard dimension.

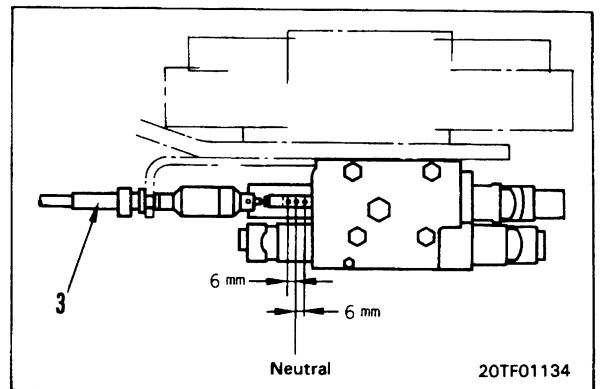
- Standard dimensions:

	(mm)
A	90.0
B	123.5
C	117.0

3. Adjust stopper bolt (4) to standard dimension D.

- Standard dimension:

	(mm)
D	17.5



20TF01134

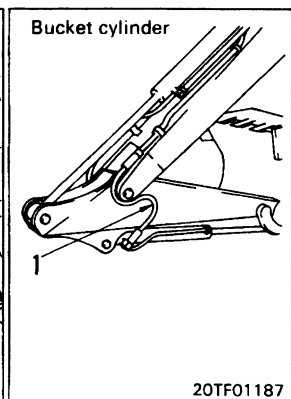
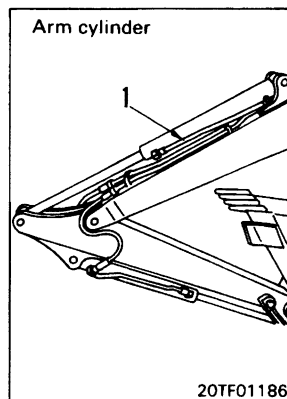
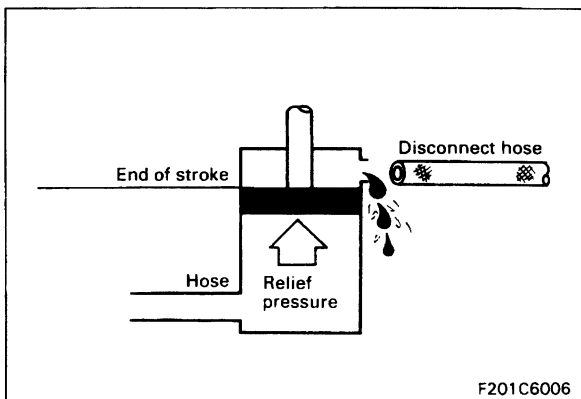
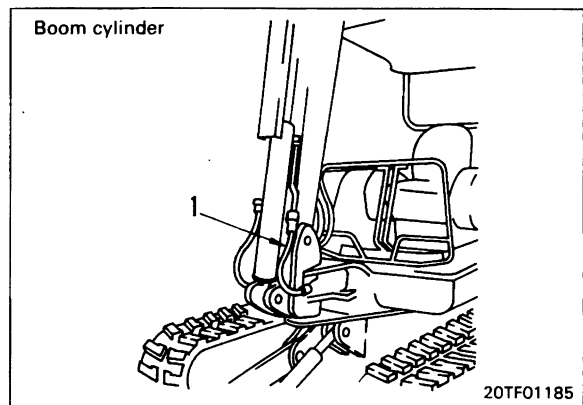
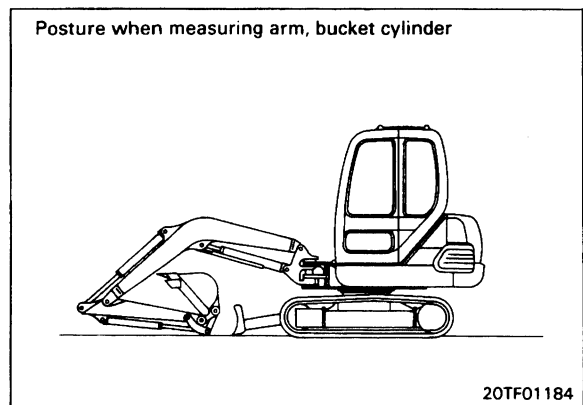
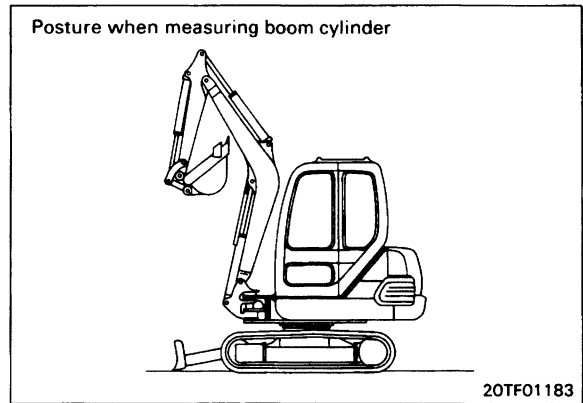
4. Operate the blade control lever and check the travel of the control valve spool.

- Travel of spool: 6 mm (both RAISE and LOWER)

- ★ If the travel of the spool is too small, adjust stopper bolt (4) to give the correct travel, then adjust so that there is a clearance of 0.5 mm between the lever and stopper bolt.

MEASURING INTERNAL LEAKAGE OF CYLINDER

- ★ If the hydraulic drift of the work equipment is not within the standard value, measure the amount of leakage inside the cylinder as follows to judge if the cause of the hydraulic drift is in the cylinder or in the control valve.
 - If the amount of leakage is within the standard value, the problem is with the control valve.
 - If the amount of leakage is not within the standard value, the problem is with the cylinder.
- ★ Oil temperature when measuring: 45 — 55°C
- 1. Fully extend the rod of the cylinder to be measured, then stop the engine.
- 2. Disconnect piping (1) at the head end, and block the piping at the chassis end with a blind plug.
 - ⚠ Be careful not to disconnect the piping at the bottom end.
- 3. Start the engine, then run the engine at high idling the apply the relief pressure to the bottom end of the cylinder.
- 4. Wait for 30 seconds, then measure the amount of oil that leaks during the next minute.



20-34

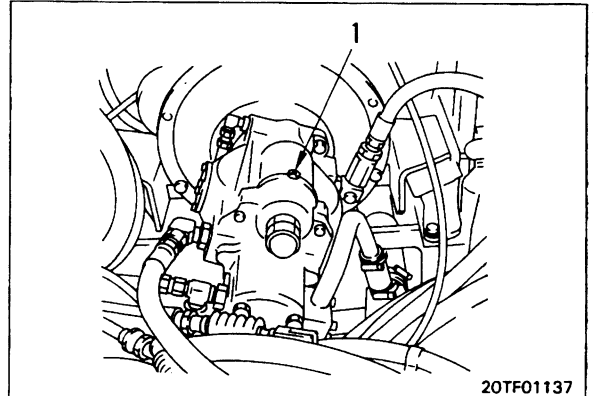
BLEEDING AIR FROM HYDRAULIC CIRCUIT

- ★ If any hydraulic piping or equipment, such as the pump or cylinder, have been removed for repair, or the hydraulic oil has been changed, or if a hydraulic breaker or other attachment has been newly installed, always bleed the air as follows when assembling.

1. Add oil

- Add hydraulic oil to the hydraulic tank to the specified level.

PC30 : 18001 – 26422, PC45 : 1001 – 3505

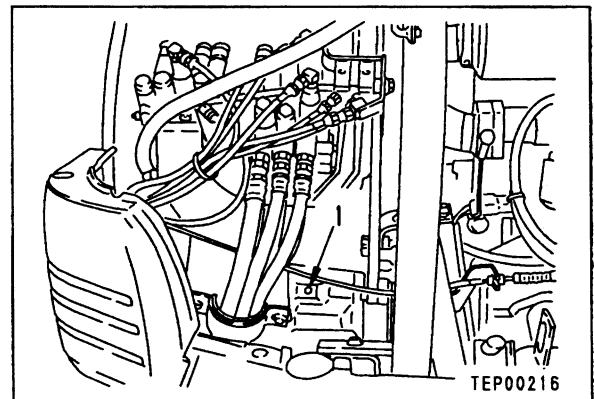


20TF01137

2. Bleeding air from main pump (PC30, 45)

- 1) Remove the oil filler cap from the hydraulic tank.
- 2) Loosen air bleed plug (1), and check that oil or oil with bubbles flows out from the plug hole.
- 3) When no more bubbles come out from the plug hole, tighten plug (1).
- 4) Tighten the oil filler cap of the hydraulic tank.

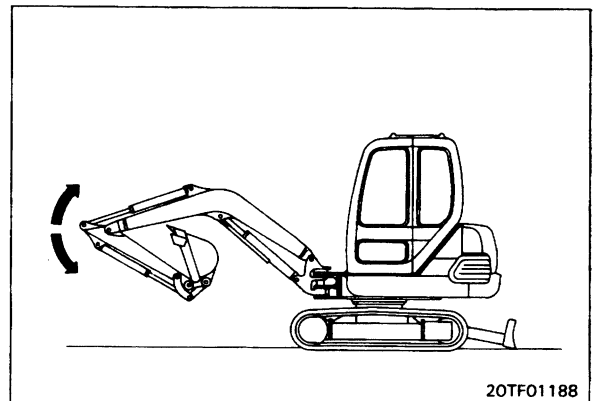
PC30 : 26423 and up, PC45 : 3506 and up



TEP00216

3. Bleeding air from cylinders

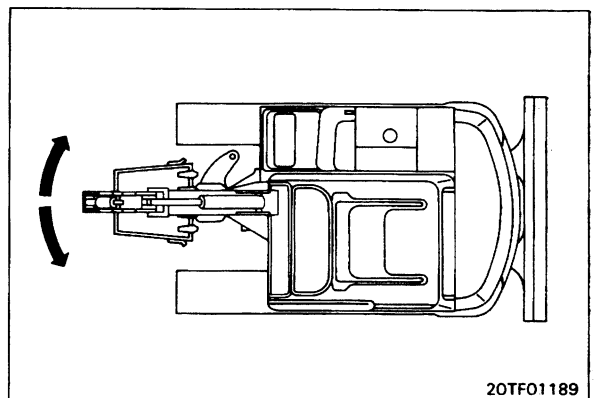
- 1) Start the engine and run at low idling for approx. 5 minutes.
- 2) With the engine at low idling, raise and lower the boom 4 – 5 times.
 - ★ Stop the piston rod approx. 100 mm from the end of the stroke. Do not relieve the circuit at the end of the stroke under any circumstances.
- 3) Next, run the engine at low idling and operate the cylinder 2 – 4 times to the end of its stroke.
- 4) Carry out Steps 2) and 3) in the same way for the arm, bucket, boom swing, and blade cylinders.



20TF01188

4. Bleeding air from swing motor

- 1) Run the engine at low idling and swing 3 turns to the left.
- 2) Next, swing 3 turns to the right.



20TF01189

020S07

5. Bleeding air from travel motor

- 1) Run the engine at low idling, and use the work equipment to raise the left track off the ground.
- 2) Run at low idling and rotate the left track for approx. 30 seconds.
- 3) Carry out Steps 1) and 2) in the same way for the track on the right side.

6. Bleeding air from attachment (hydraulic breaker, etc.)

- If a hydraulic breaker or any other attachment has been newly installed, run the engine at low idling and operate the equipment repeatedly until the air has been bled from the attachment and circuit.
- ★ If the method of bleeding the air from the attachment itself is specified, bleed the air according to those specifications.

7. Bleeding air from inside hydraulic tank

- 1) Set in the position to check the oil level, then stop the engine.
 - ★ If the level of the oil inside the hydraulic tank has gone down, add oil to the specified level.
- 2) After stopping the engine, leave the machine for a short time, and wait until the bubbles in the hydraulic tank disappear.

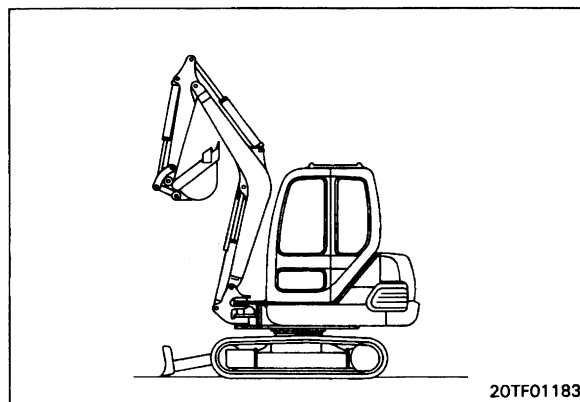
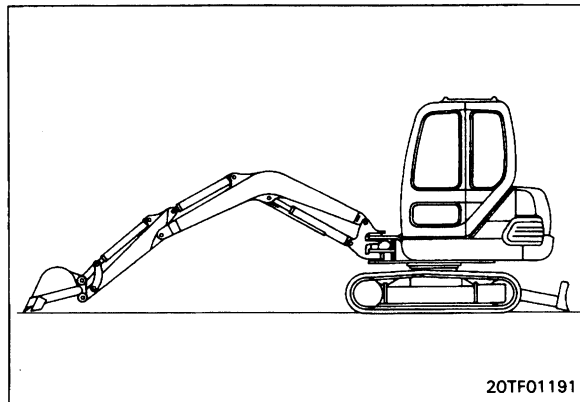
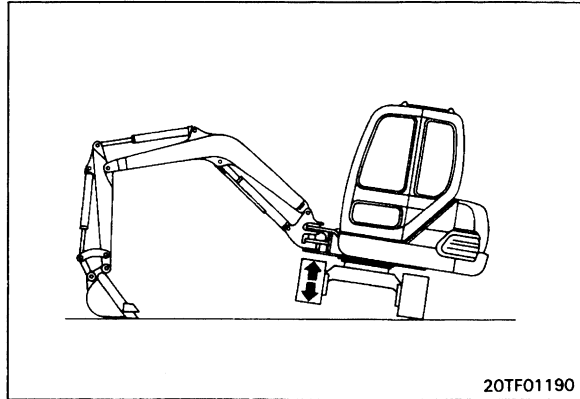
8. Bleeding air from main pump (repeat) (PC30, 45)

- ★ Repeat the operation in Step 2 for bleeding the air from the main pump.

9. Pressurizing hydraulic tank

- 1) Run the engine at low idling and extend each cylinder slowly to the end of its stroke.
- 2) Stop the engine, remove the oil filler cap from the hydraulic tank, then fit it again.
 - ★ This will pressurize the inside of the tank.

- ★ Do not run the engine at high idling under any circumstances until all of the above air bleeding procedures have been completed.
- ★ After completing the air bleeding procedure, always run the engine at low idling for 10 minutes before starting operations.



020S07

RELEASING REMAINING FROM HYDRAULIC CIRCUIT



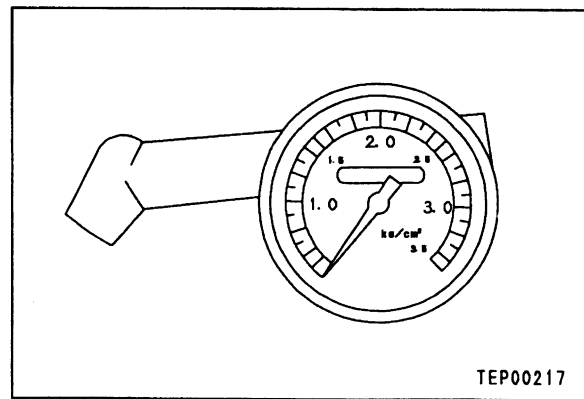
There is no accumulator installed, so the remaining pressure in the piping between the control valve and hydraulic cylinder or swing motor cannot be released by operating the control levers. When the above piping is removed, be careful of the following points.

1. Run the engine at low idling, operate the hydraulic cylinders as far as possible so that the pressure is not relieved at the end of the stroke, lower the work equipment to the ground, and stop the engine.
 - ★ If the engine is stopped with the hydraulic circuit relieved and the hydraulic cylinder at the end of its stroke, do not carry out any work for 5 to 10 minutes.
2. When removing the piping, loosen the piping sleeve nut gradually to release the pressure remaining in the piping slowly, then remove the piping after the oil stops spurting out.

020S07

TESTING HYDRAULIC BREAKER GAS PRESSURE

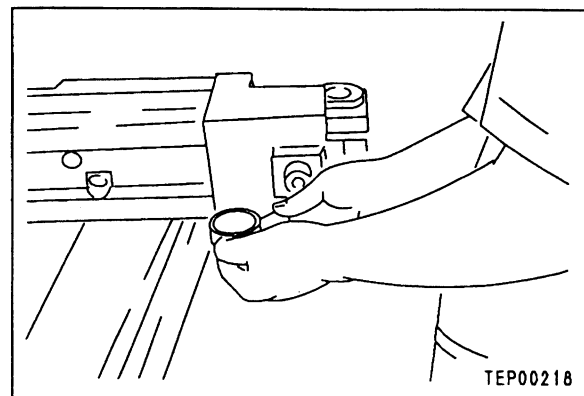
- ★ Specified gas pressure (20°C): 0.1 – 0.15 MPa
(1.0 – 1.5 kg/cm²)
 - ★ Always check the pressure at normal temperature.
1. Loosen the cover cap with a wrench, then remove it.
 2. Loosen the gas valve cap by hand, then remove it.
 3. Use a pressure gauge in the same way as when measuring the tire inflation pressure on a car, and check carefully that there is no leakage of gas when measuring.
 - ★ There is a push button installed to the pressure gauge. Press it after measuring the pressure to return the pressure to 0 kg/cm². When measuring or adjusting the pressure, always return the gauge pressure to 0 kg/cm² before starting.



TEP00217

4. If the gas pressure is below the specified pressure, check for gas leakage.
 - Put soapy water on the joints and check for any bubbles.

	Locations to check for gas leakage
a	Gas valve body filler port
b	Mount of gas valve body and cylinder
c	Joint of back cap and cylinder
d	Other places



TEP00218

CHARGING WITH GAS

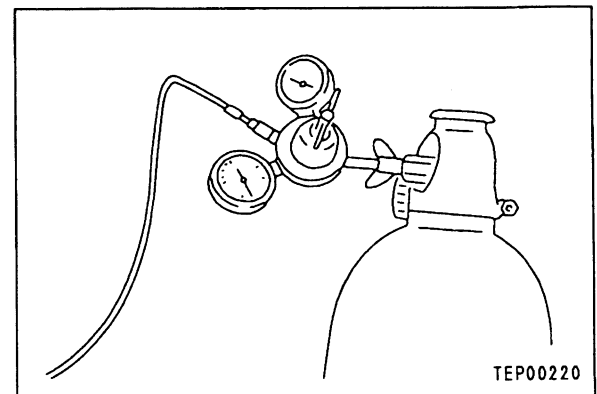
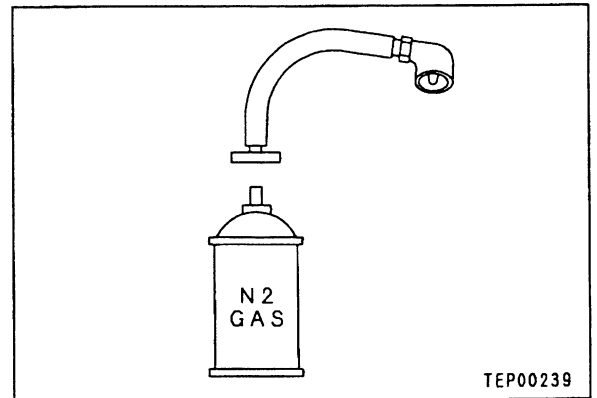
- ⚠ Use only nitrogen gas. Never use any other gas.
- ⚠ When charging with gas, the chisel may fly out, so do not go close to the chisel.

1. Insert the hose into the filler port of the nitrogen gas cartridge as shown in the diagram. There is an O-ring inside the mouthpiece of the filler port, so it will start to feel rather stiff at some point. When this happens, use a small amount of force to twist the hose and insert it completely.

★ Always use a genuine Komatsu cartridge.

- It is also possible to use a nitrogen gas cylinder.

★ Adjust the scale of the regulator to 2 – 3 kg/cm² before charging with gas.



2. Keep the mouthpiece at the other end of the charging hose pushed against the gas valve filler port, and push in the cartridge filler port with the charging hose for approx. 10 seconds to charge the cushion chamber with nitrogen gas.
Specified gas pressure (20°C): 0.1 - 0.15 MPa
(1.0 - 1.5 kg/cm²)

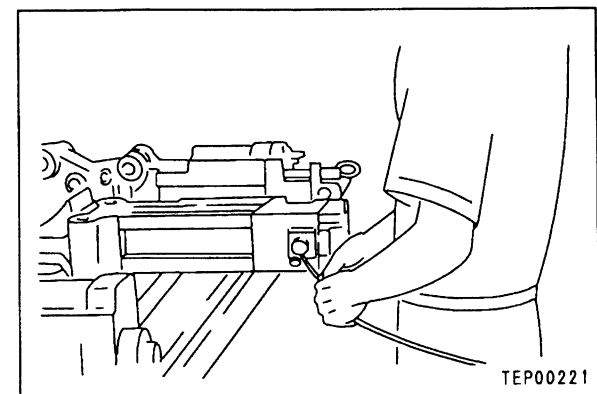
3. Remove the charging hose from the gas valve filler port, and at the same time, stop pushing in the cartridge filler port.

4. If an unused cartridge is used, the gas will be charged at a pressure higher than specified, so adjust in the same way as when adjusting the inflation pressure of a car tire.

5. If the gas pressure is lower than the specified pressure, use an unused cartridge to charge with nitrogen gas and adjust to the specified pressure.

6. Check all parts for gas leakage, then tighten the gas valve cap.

7. Tighten the cover cap completely with a wrench.

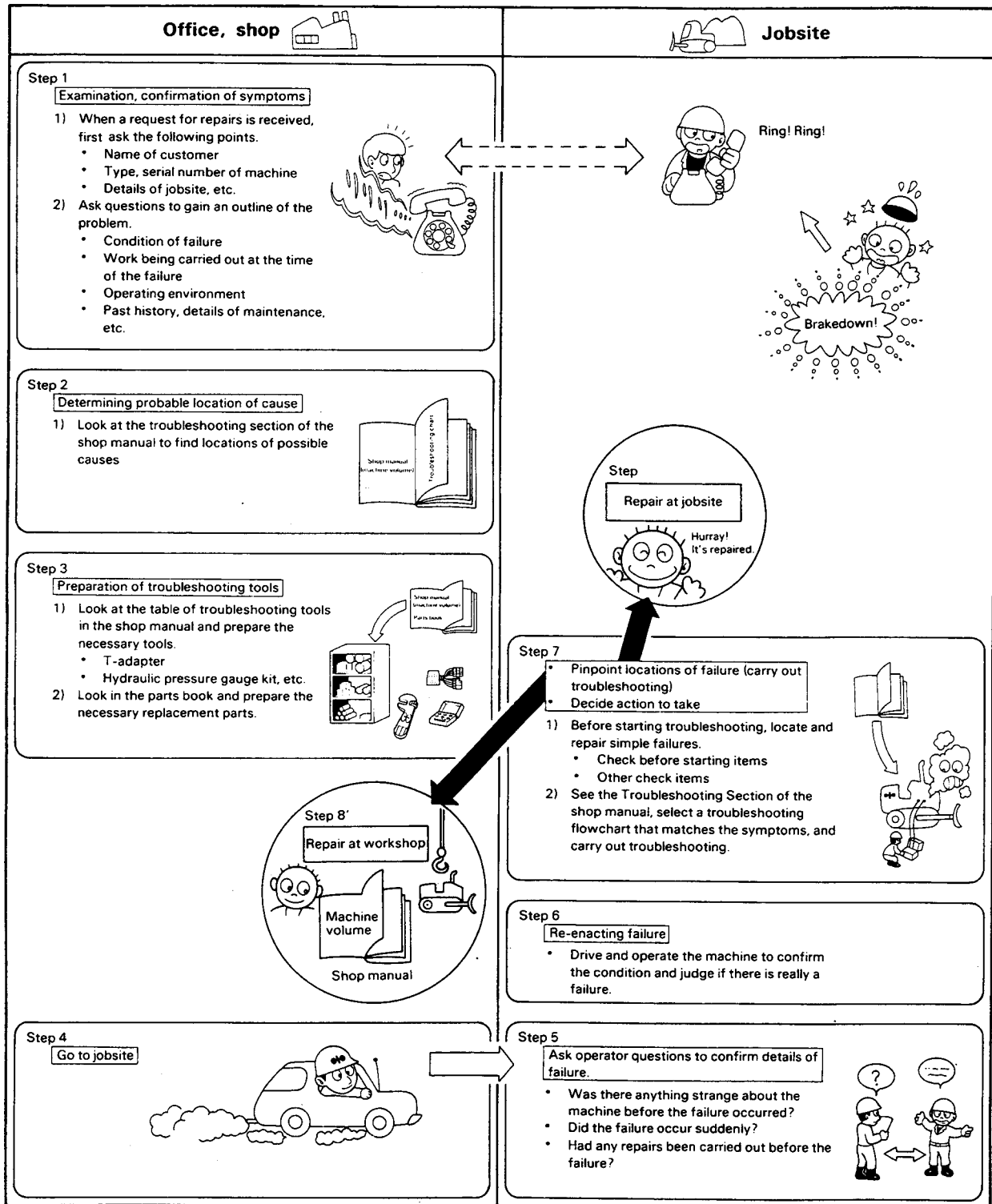


TROUBLESHOOTING

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020S07

SEQUENCE OF EVENTS IN TROUBLESHOOTING



020507

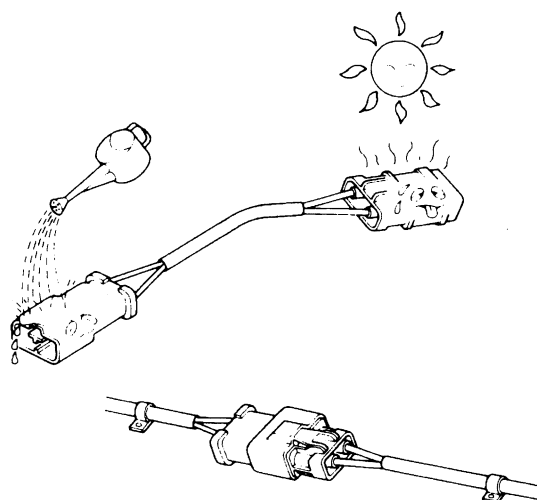
PRECAUTIONS WHEN CARRYING OUT MAINTENANCE

To maintain the performance of the machine over a long period, and to prevent failures or other troubles before they occur, correct operation, maintenance and inspection, troubleshooting, and repairs must be carried out. This section deals particularly with correct repair procedures for mechatronics and is aimed at improving the quality of repairs. For this purpose, it gives sections on "Handling electric equipment" and "Handling hydraulic equipment" (particularly hydraulic oil).

1. PRECAUTIONS WHEN HANDLING ELECTRIC EQUIPMENT

1) Handling wiring harnesses and connectors

Wiring harnesses consist of wiring connecting one component to another component, connectors used for connecting and disconnecting one wire from another wire, and protector or tubes used for protecting the wiring. Compared with other electrical components fitted in boxes or cases, wiring harnesses are more likely to be affected by the direct effects of rain, water, heat, or vibration. Furthermore, during inspection and repair operations they are frequently removed and installed again, so they are likely to suffer deformation or damage. For this reason, it is necessary to be extremely careful when handling wiring harnesses.

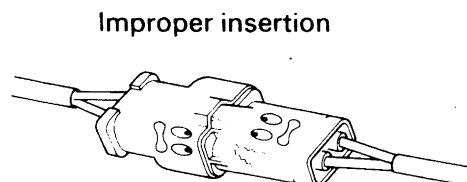


F20505201

Main failures occurring in wiring harness

(1) Defective contact of connectors (defective contact between male and female)

Problems with defective contact are likely to occur because the male connector is not properly inserted into the female connector, or because one or both of the connectors is deformed or the position is not correctly aligned, or because there is corrosion or oxidization of the contact surfaces.

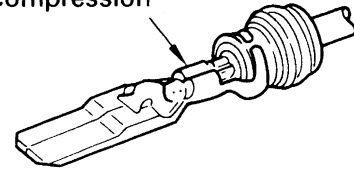


F20505202

(2) Defective compression or soldering of connectors

The pins of the male and female connectors are in contact at the compressed terminal or soldered portion, but there is excessive force on the wiring, and the plating peels to cause improper connection or breakage.

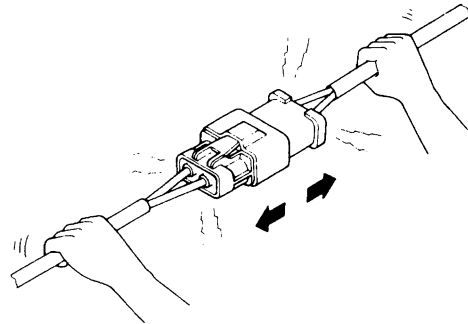
Improper compression



F56103079

(3) Disconnections in wiring

If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the compression of the connector may be lost, or the soldering may be damaged, or the wiring may be broken.

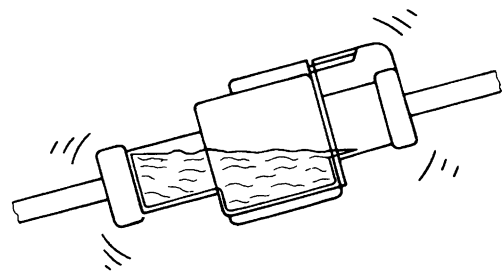


F20505204

(4) High pressure water entering connector

The connector is designed to make it difficult for water to enter (drip-proof structure), but if high-pressure water is sprayed directly on the connector, water may enter the connector depending on the direction of the water jet.

The connector is designed to prevent water from entering, but at the same time, if the water does enter, it is difficult for it to be drained. Therefore, if water should get into the connector, the pins will be short-circuited by the water, so if any water gets in, immediately dry the connector or take other appropriate action before passing electricity through it.



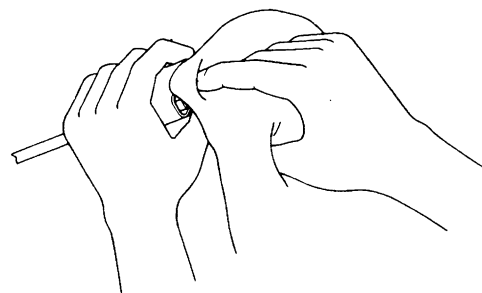
F20505205

(5) Oil or dirt stuck to connector

If oil or grease are stuck to the connector and an oil film is formed on the mating surface between the male and female pins, the oil will not let the electricity pass, so there will be defective contact.

If there is oil or grease or dirt stuck to the connector, wipe it off with a dry cloth or blow dry with air, and spray it with a contact restorer.

★ When wiping the mating portion of the connector, be careful not to use excessive force or deform the pins.



F20505206

- ★ If there is water or oil in the air, it will increase the contamination of the points, so clean with air from which all the water and oil has been removed.

2) Removing, installing, and drying connectors and wiring harnesses

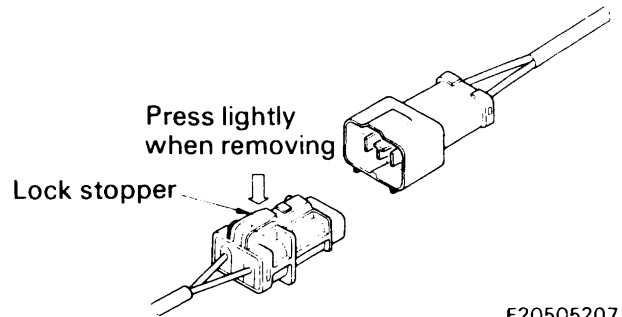
Disconnecting connectors

- (1) Hold the connectors when disconnecting.

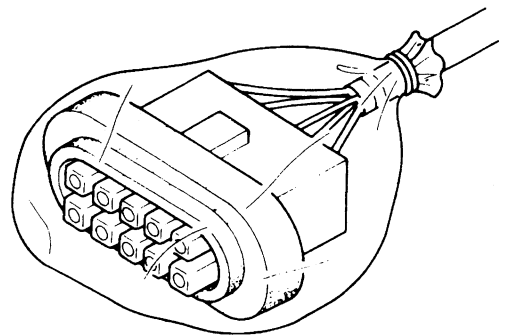
When disconnecting the connectors, hold the connectors and not the wires. For connectors held by a screw, loosen the screw fully, then hold the male and female connectors in each hand and pull apart. For connectors which have a lock stopper, press down the stopper with your thumb and pull the connectors apart.

- (2) Action to take after removing connectors

After removing any connector, cover it with a vinyl bag to prevent any dust, dirt, oil, or water from getting in the connector portion.



F20505207

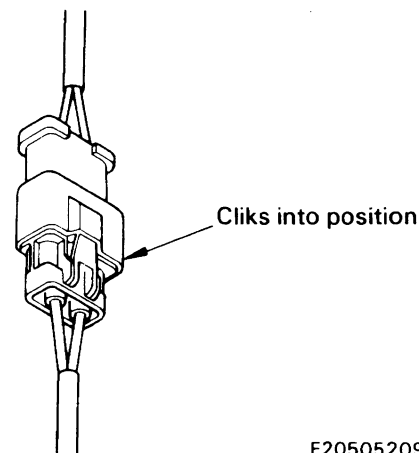


F20505208

Connecting connectors

- (1) Check the connector visually.
- a. Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).
 - b. Check that there is no deformation, defective contact, corrosion, or damage to the connector pins.
 - c. Check that there is no damage or breakage to the outside of the connector.
- ★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has got inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.
 - ★ If there is any damage or breakage, replace the connector.

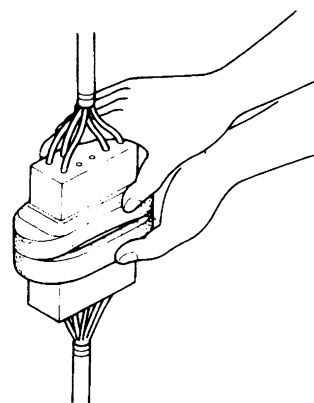
- (2) Fix the connector securely.
Align the position of the connector correctly, then insert it securely.
For connectors with lock stopper
Push in the connector until the stopper clicks into position.



F20505209

- (3) Correct any protrusion of the boot and any misalignment of the wiring harness
For connectors fitted with boots, correct any protrusion of the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.

- ★ When blowing with dry air, there is danger that the oil in the air may cause improper contact, so clean with air from which all the water and oil has been removed.



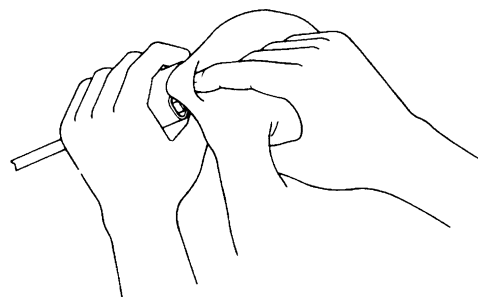
F20505210

Drying wiring harness

If there is any oil or dirt on the wiring harness, wipe it off with a dry cloth. Avoid washing it in water or using steam. If the connector must be washed in water, do not use high pressure water or steam directly on the wiring harness. If water gets directly on the connector, do as follows.

- (1) Disconnect the connector and wipe off the water with a dry cloth.

- ★ If the connector is blown dry with air, there is the risk that oil in the air may cause defective contact, so avoid blowing with air.

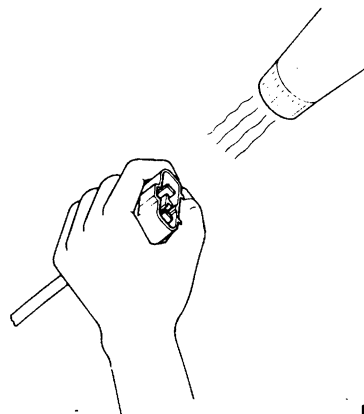


F20505211

- (2) Dry the inside of the connector with a dryer.

If water gets inside the connector, use a dryer to dry the connector.

- ★ Hot air from the dryer can be used, but be careful not to make the connector or related parts too hot, as this will cause deformation or damage to the connector.

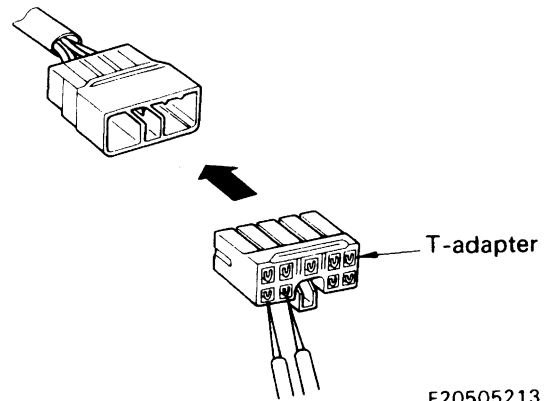


F20505212

- (3) Carry out a continuity test on the connector.

After drying, leave the wiring harness disconnected and carry out a continuity test to check for any short circuits between pins caused by water.

- ★ After completely drying the connector, blow it with contact restorer and reassemble.

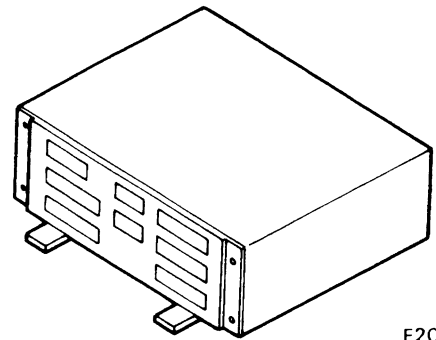


F20505213

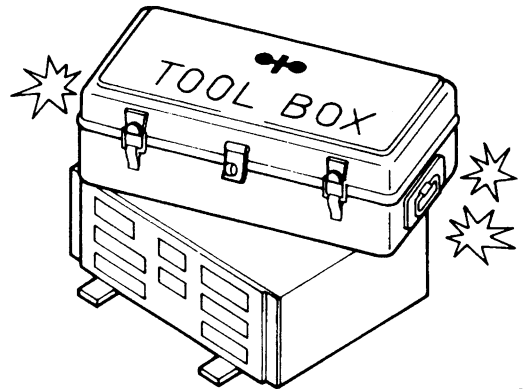
3) Handling control box

- (1) The control box contains a micro-computer and electronic control circuits. These control all of the electronic circuits on the machine, so be extremely careful when handling the control box.
- (2) Do not open the cover of the control box unless necessary.
- (3) Do not place objects on top of the control box.
- (4) Cover the control connectors with tape or a vinyl bag.
- (5) During rainy weather, do not leave the control box in a place where it is exposed to rain.
- (6) Do not place the control box on oil, water, or soil, or in any hot place, even for a short time. (Place it on a suitable dry stand)
- (7) Precautions when carrying out arc welding

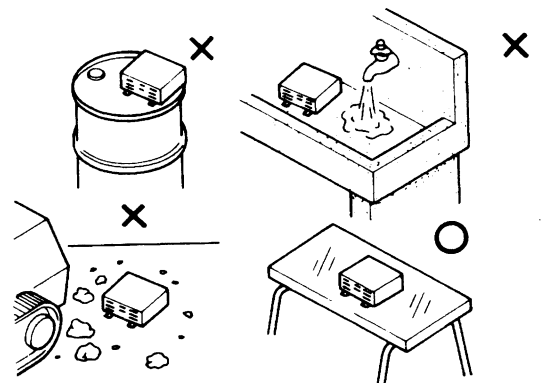
When carrying out arc welding on the body, disconnect all wiring harness connectors connected to the control box. Fit an arc welding ground close to the welding point.



F20505214



F20505215



F20505216

2. POINTS TO REMEMBER WHEN HANDLING HYDRAULIC EQUIPMENT

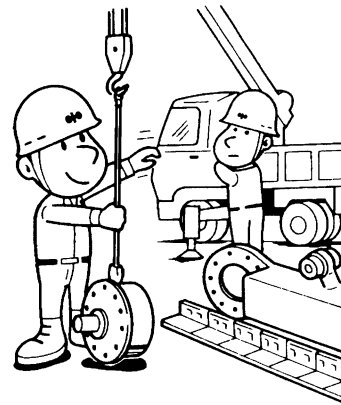
With the increase in pressure and precision of hydraulic equipment, the most common cause of failure is dirt (foreign material) in the hydraulic circuit. When adding hydraulic oil, or when disassembling or assembling hydraulic equipment, it is necessary to be particularly careful.

1) Be careful of the operating environment.

Avoid adding hydraulic oil, replacing filters, or repairing the machine in rain or high winds, or places where there is a lot of dust.

2) Disassembly and maintenance work in the field

If disassembly or maintenance work is carried out on hydraulic equipment in the field, there is danger of dust entering the equipment. It is also difficult to confirm the performance after repairs, so it is desirable to use unit exchange. Disassembly and maintenance of hydraulic equipment should be carried out in a specially prepared dustproof workshop, and the performance should be confirmed with special test equipment.

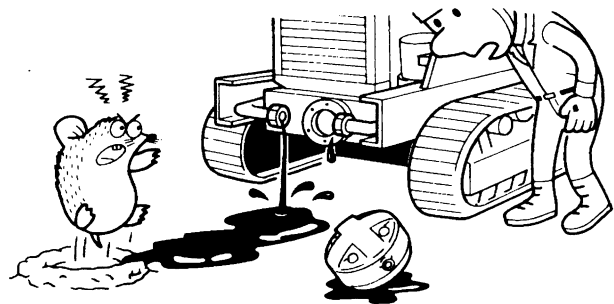


F20505217

3) Sealing openings

After any piping or equipment is removed, the openings should be sealed with caps, tapes, or vinyl bags to prevent any dirt or dust from entering. If the opening is left open or is blocked with a rag, there is danger of dirt entering or of the surrounding area being made dirty by leaking oil so never do this.

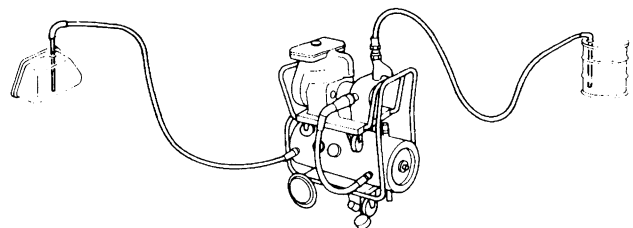
Do not simply drain oil out on to the ground, collect it and ask the customer to dispose of it, or take it back with you for disposal.



F20505218

4) Do not let any dirt or dust get in during refilling operations.

Be careful not to let any dirt or dust get in when refilling with hydraulic oil. Always keep the oil filler and the area around it clean, and also use clean pumps and oil containers. If an oil cleaning device is used, it is possible to filter out the dirt that has collected during storage, so this is an even more effective method.



F20505219

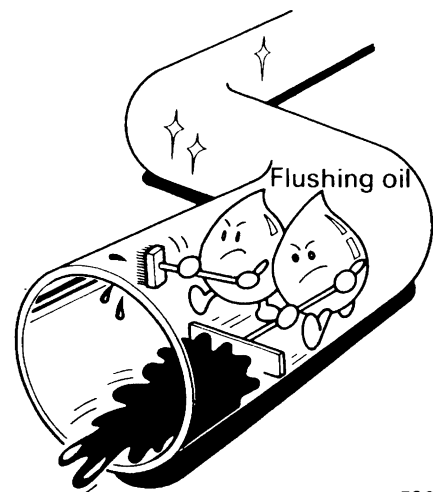
5) Change hydraulic oil when the temperature is high.

When hydraulic oil or other oil is warm, it flows easily. In addition, the sludge can also be drained out easily from the circuit together with the oil, so it is best to change the oil when it is still warm. When changing the oil, as much as possible of the old hydraulic oil must be drained out. (Do not drain the oil from the hydraulic tank; also drain the oil from the filter and from the drain plug in the circuit.) If any old oil is left, the contaminants and sludge in it will mix with the new oil and will shorten the life of the hydraulic oil.

6) Flushing operations

After disassembling and assembling the equipment, or changing the oil, use flushing oil to remove the contaminants, sludge, and old oil from the hydraulic circuit.

Normally, flushing is carried out twice: primary flushing is carried out with flushing oil, and secondary flushing is carried out with the specified hydraulic oil.

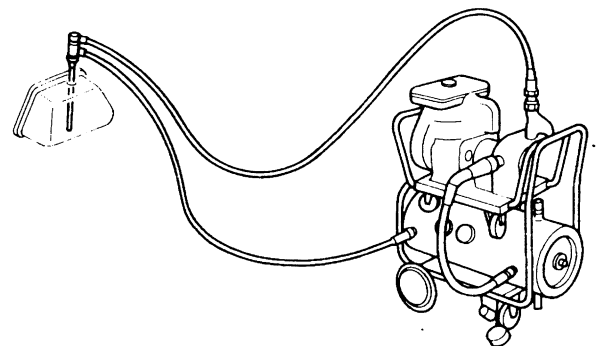


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7) Cleaning operations

After repairing the hydraulic equipment (pump, control valve, etc.) or when running the machine, carry out oil cleaning to remove the sludge or contaminants in the hydraulic oil circuit.

The oil cleaning equipment is used to remove the ultrafine (about 3μ) particles that the filter built into the hydraulic equipment cannot remove, so it is an extremely effective device.



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020S07

CHECKS BEFORE TROUBLESHOOTING

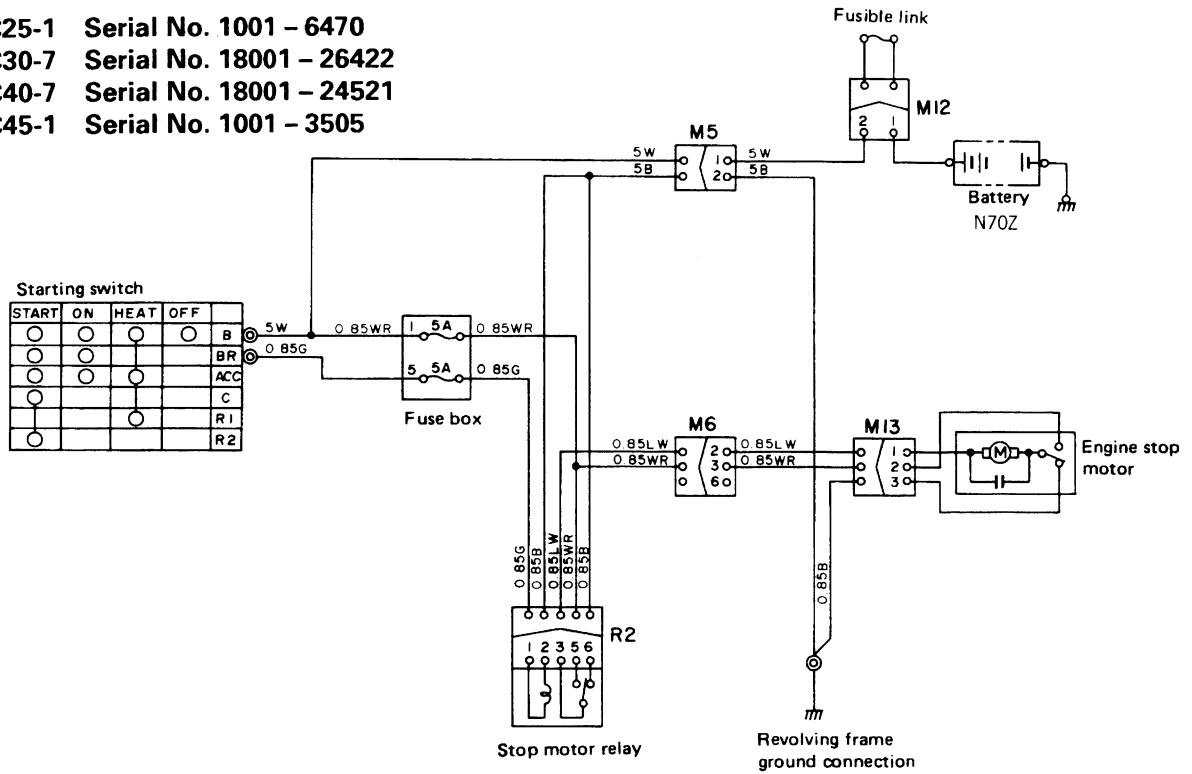
(1. Checks before starting, 2. Other check items)

		Item	Judgement standard	Remedy
Check before starting items	Lubricating oil, cooling water	1. Check fuel level	—	Add fuel
		2. Check for dirt or water in fuel	—	Clean, drain
		3. Check hydraulic oil level	—	Add oil
		4. Check hydraulic oil strainer	—	Clean, drain
		5. Check swing machinery oil level	—	Add oil
		6. Check engine oil level (Level of oil in oil pan)	—	Add oil
7. Check cooling water level		—	Add water	
8. Check condition of dust indicator		—	Clean or replace	
Electrical equipments	9. Check for loose or corroded battery terminals	—	Tighten or replace	
	10. Check for loose or corroded alternator terminals	—	Tighten or replace	
	11. Check for loose or corroded starting motor terminals	—	Tighten or replace	
Other check items	Hydraulic, mechanical equipments	12. Check for abnormal noise or smell	—	Repair
		13. Check for oil leakage	—	Repair
		14. Bleed air from system	—	Bleed air
	Electrical components	15. Check battery voltage (engine stopped)	10 – 15 V	Replace
		16. Check level of battery electrolyte	—	Add or replace
		17. Check for discolored, burnt, or bare wiring	—	Replace
		18. Check for missing wiring clamps, hanging wires	—	Repair
		19. Checks for water leaking onto wiring (check carefully water leakage at connectors and terminals)	—	Disconnect connector and dry connection
		20. Check for broken or corroded fuses	—	Replace
		21. Check alternator voltage (engine running at over half throttle)	After run a few minutes 13.5–14.5V	Replace

ELECTRICAL CIRCUIT DIAGRAM

ENGINE STOP MOTOR SYSTEM

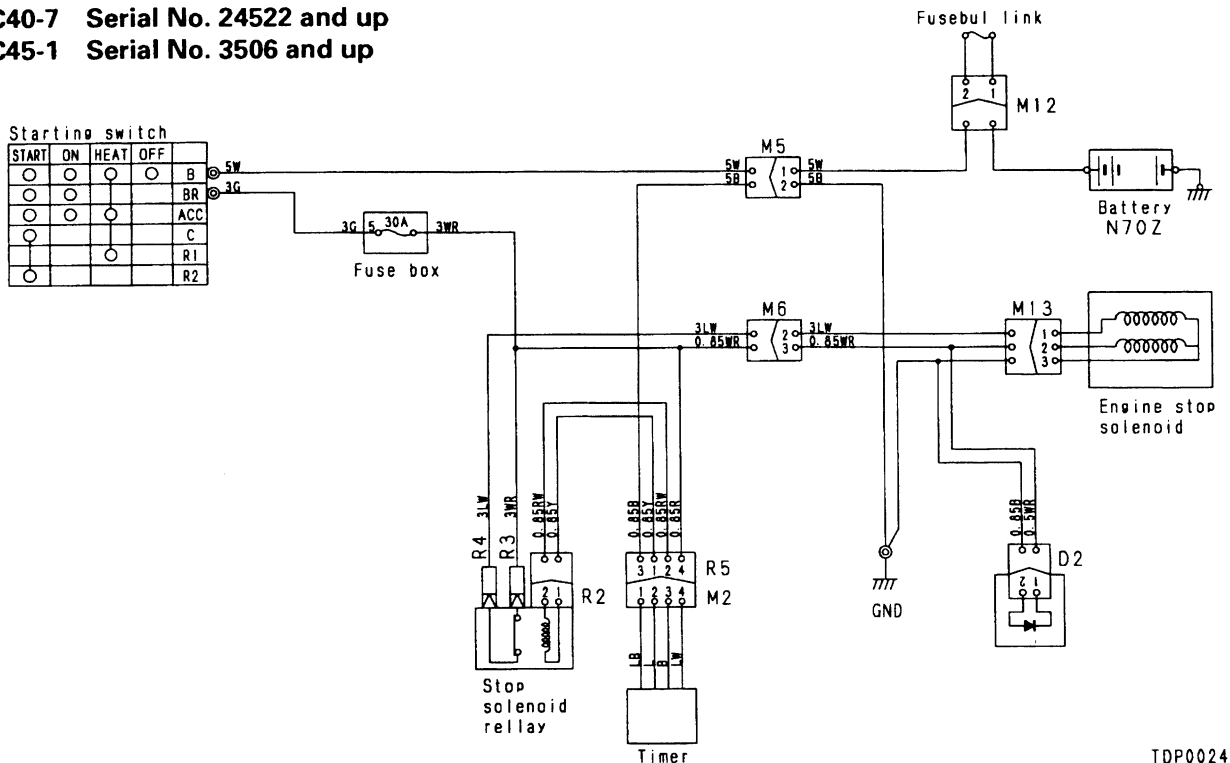
- PC25-1 Serial No. 1001 – 6470
- PC30-7 Serial No. 18001 – 26422
- PC40-7 Serial No. 18001 – 24521
- PC45-1 Serial No. 1001 – 3505



20TF01141

ENGINE STOP SOLENOID SYSTEM

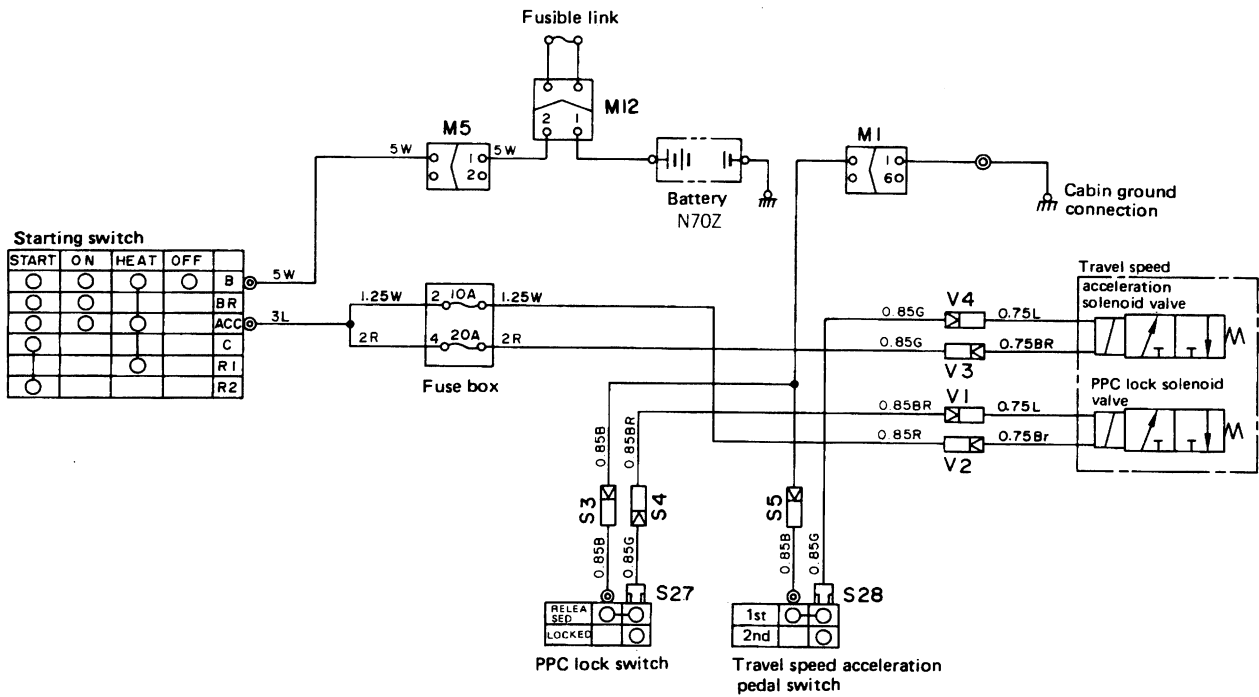
- PC25-1 Serial No. 6471 and up
- PC30-7 Serial No. 26423 and up
- PC40-7 Serial No. 24522 and up
- PC45-1 Serial No. 3506 and up



TDP00240

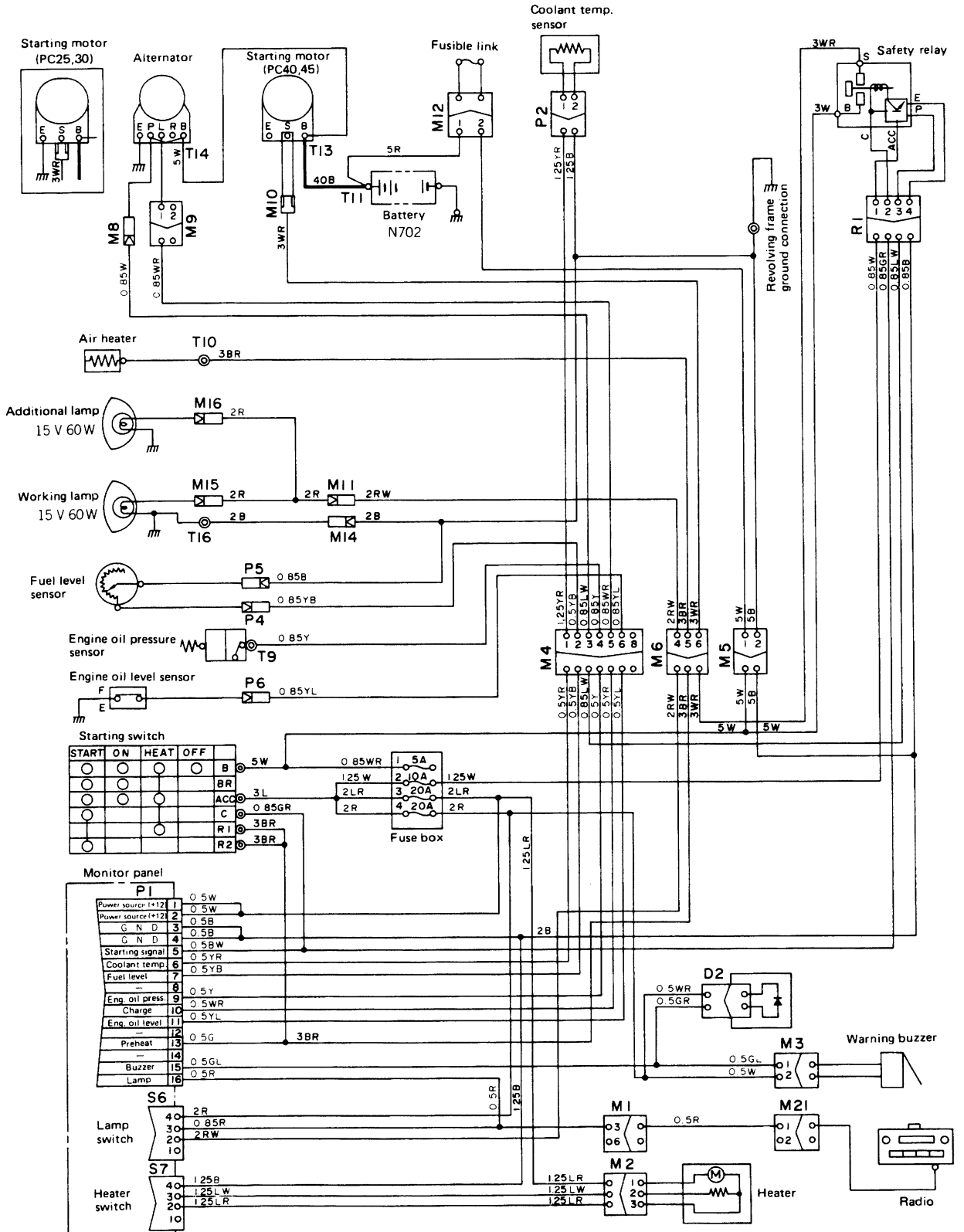
020S07

PPC LOCK, TRAVEL SPEED ACCELERATION SOLENOID SYSTEM



20TF01142

MONITOR SYSTEM



020S07

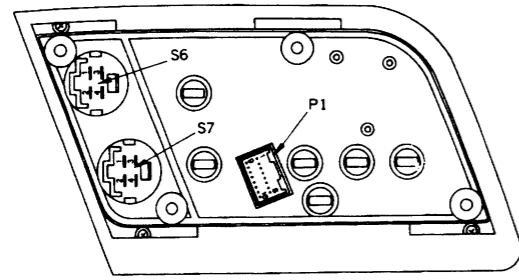
Lamp switch connection table

P	T	④	③	②
OFF		○	○	○
1		○	○	○
2			○	○

Heater switch connection table

P	T	④	③	②
OFF		○	○	○
Lo		○	○	○
Hi			○	○

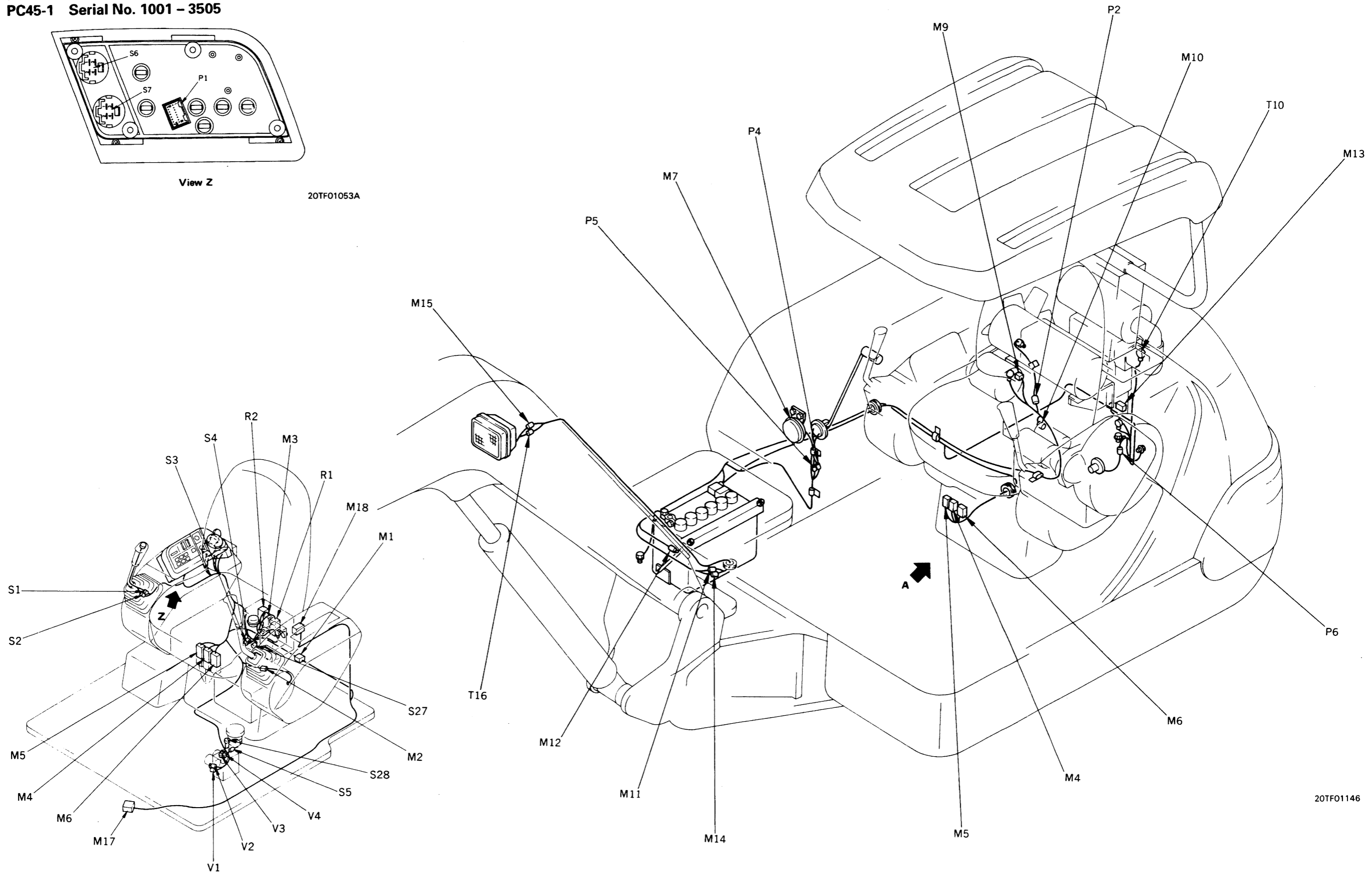
PC25-1 Serial No. 1001 - 6470
 PC30-7 Serial No. 18001 - 26422
 PC40-7 Serial No. 18001 - 24521
 PC45-1 Serial No. 1001 - 3505



View Z

20TF01053A

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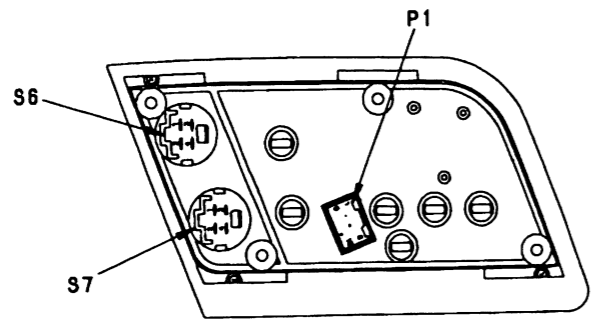
Detail A

20TF01145

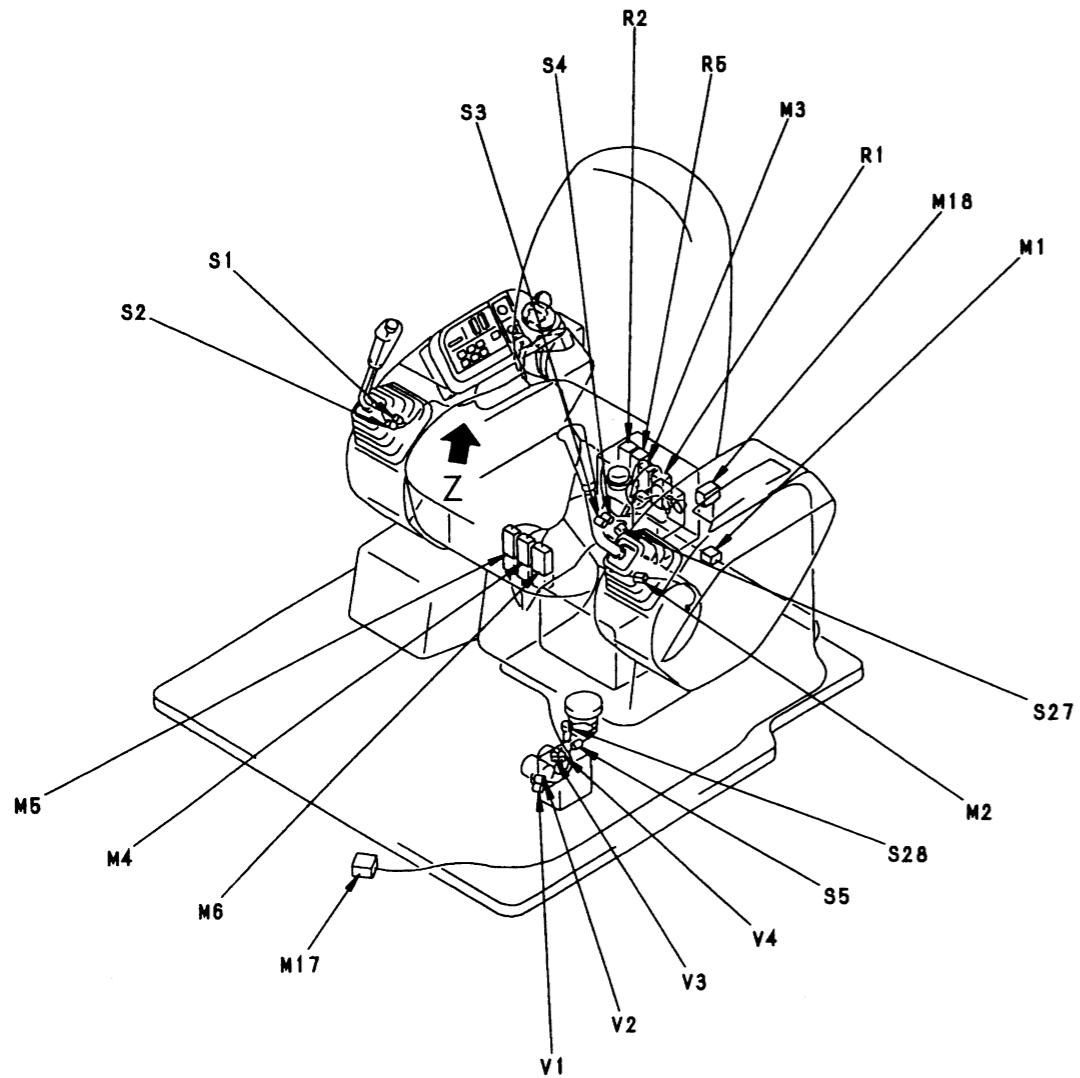
20TF01146



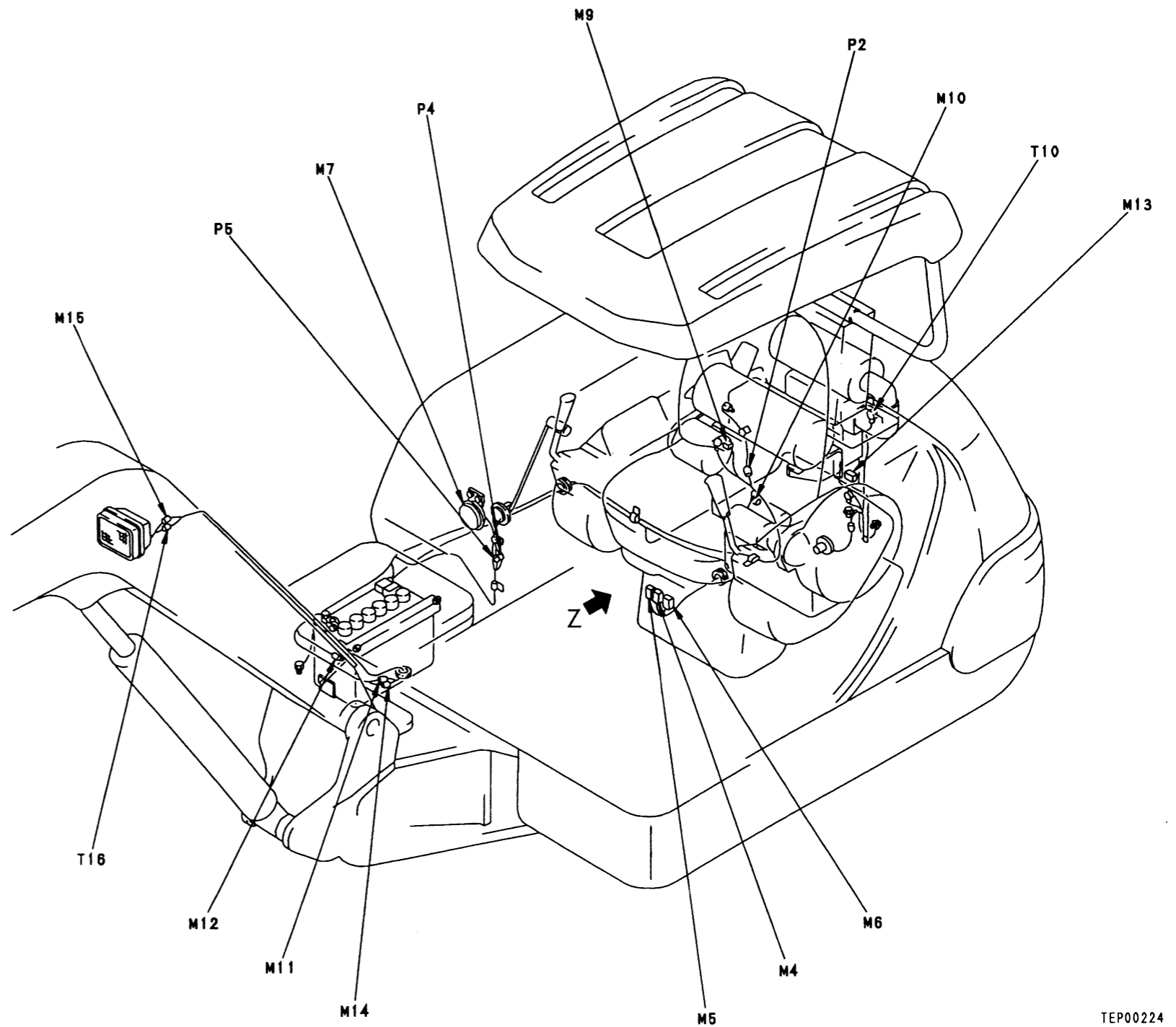
PC25-1 Serial No. 6471 and up
 PC30-7 Serial No. 26423 and up
 PC40-7 Serial No. 24522 and up
 PC45-1 Serial No. 3506 and up



Z TEP00226



Z TEP00223



Z TEP00224

020S07

A B C D E F G H I J K L M N

9

8

7

6

5

4

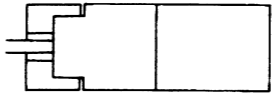
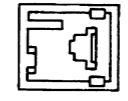
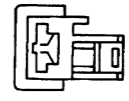
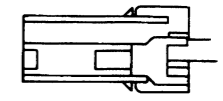
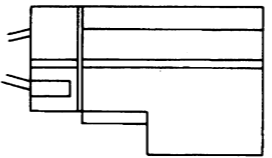
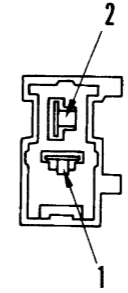

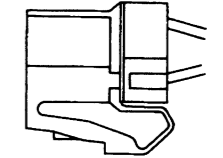
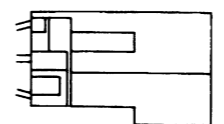
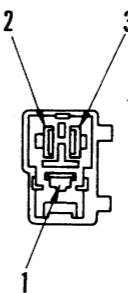
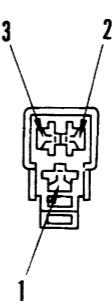
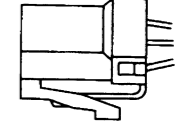
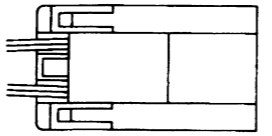
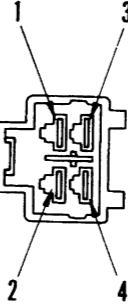
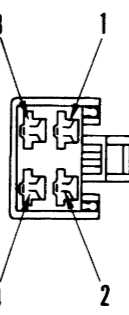
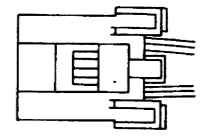
3

2

1

CONNECTION TABLE FOR CONNECTOR

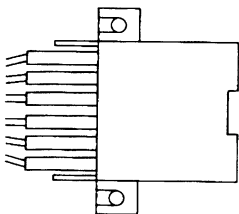
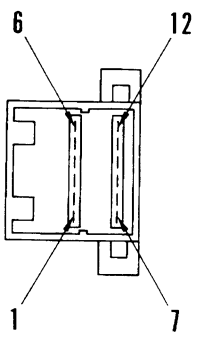
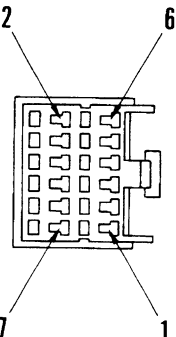
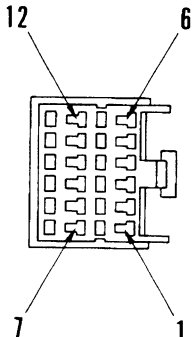
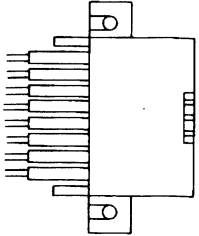
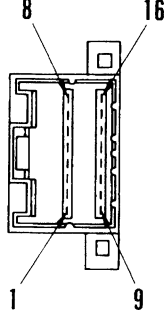
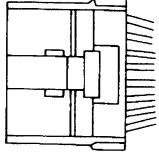
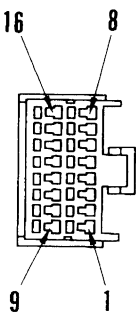
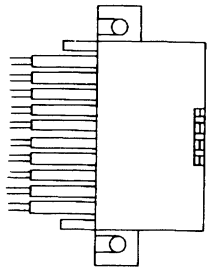
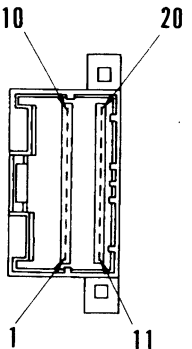
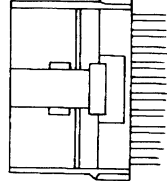
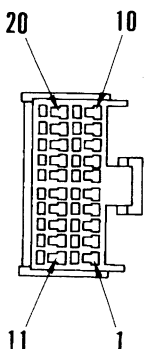
★ Male and female refers to the pins and the receptacle at the mating portion (housing).

No. of pins	M TYPE CONNECTOR			
	Male connector		Female connector	
1				
		202F05319		202F05320
2				
		202F05321		202F05322
3				
		202F05323		202F05324
4				
		202F05325		202F05326

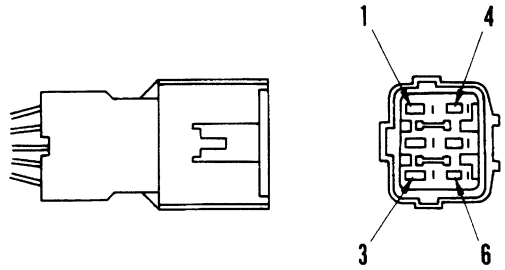
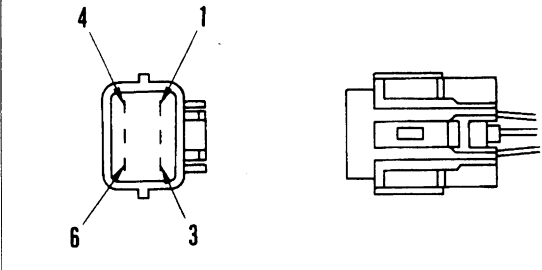
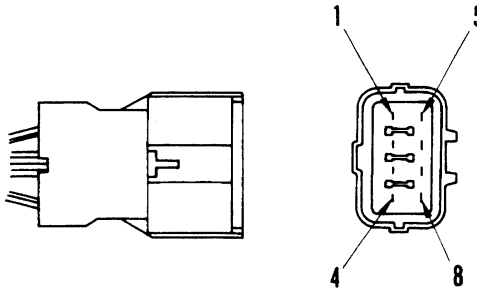
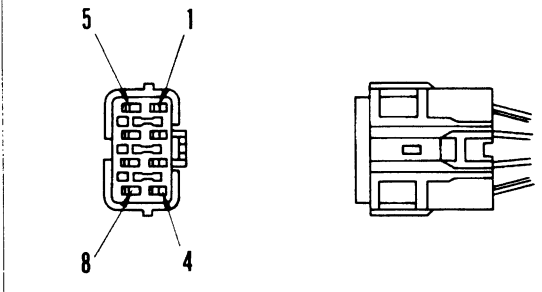
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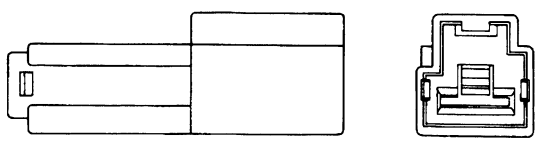
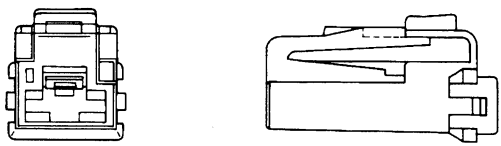
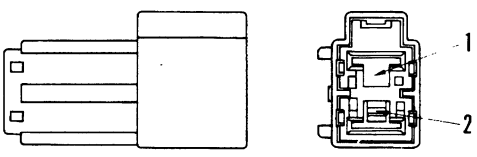
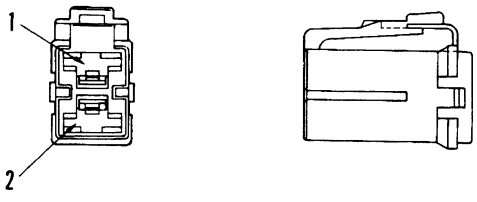
No. of pins	M TYPE CONNECTOR	
	Male connector	Female connector
6	<p>202F05327</p>	<p>202F05328</p>

UZUSU1

No. of pins	AMP040 TYPE CONNECTOR			
	Male connector		Female connector	
12	 201F06230	 1 6 7 12	 201F06231	 1 6 7 12
16	 202F05337	 1 8 9 16	 202F05338	 1 8 9 16
20	 202F05339	 1 10 11 20	 202F05340	 1 10 11 20

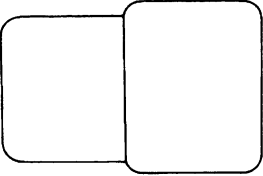
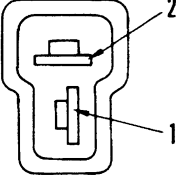
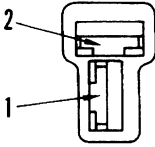
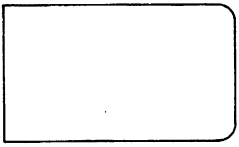
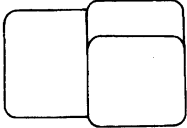
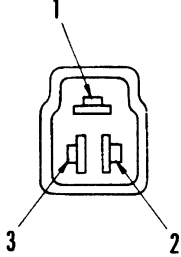
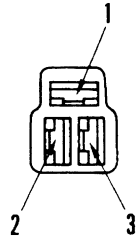

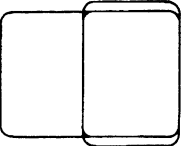
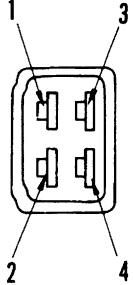

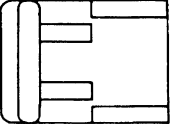
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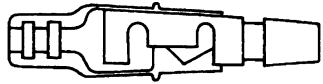
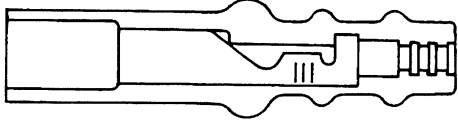
No. of pins	SWP TYPE CONNECTOR	
	Male connector	Female connector
6	 <p>202F05341</p>	 <p>202F05342</p>
8	 <p>202F05343</p>	 <p>202F05344</p>

No. of pins	L TYPE CONNECTOR	
	Male connector	Female connector
1	 <p>20TF01147</p>	 <p>20TF01148</p>
2	 <p>20TF01149</p>	 <p>20TF01150</p>
2		
3		

020507

020S07

No. of pins	M TYPE CONNECTOR			
	Male connector		Female connector	
2				
		20TF01151		20TF01152
3				
		20TF01153		20TF01154
4				
		20TF01155		20TF01156

No. of pins	AUTOMOBILE TYPE CONNECTOR	
	Male connector	Female connector
1	 <p>20TF01157</p>	 <p>20TF01158</p>

020507

METHOD OF USING TROUBLESHOOTING CHARTS

1. Category of troubleshooting code number

Troubleshooting Code No.	Component
C-00	Troubleshooting of electrical system
H-00	Troubleshooting of hydraulic, mechanical system
P-00	Troubleshooting of monitor system

2. Method of using troubleshooting table

(1) Troubleshooting code number and problem

The top left of the troubleshooting chart gives the troubleshooting code number and the problem with the machine. An example of this is given in Item (1) on the next page.

(2) Distinguishing conditions

Even with the same problem, the method of troubleshooting may differ according to the model, component, or problem. In such cases, the troubleshooting chart is further divided into sections marked with small letters (for example, a), so go to the appropriate section to carry out troubleshooting. An example of this is given in Item (2) on the next page.

If the troubleshooting table is not divided into sections, start troubleshooting from the first check item.

(3) General precautions

When using the troubleshooting chart, precautions that apply to all items (Item (4) in the example on the next page) are given at the top of the page and marked with ★. The precautions marked ★ are not given in the , but must always be followed when carrying out the check inside the .

(4) Method of following troubleshooting chart

- Check or measure the item inside and according to the answer follow either the YES line or the NO line to go to the next . (Note: The number written at the top right corner of the is an index number; it does not indicate the order to follow.)
- Following the YES or NO lines according to the results of the check or measurement will lead finally to the Cause column. Check the cause and take the action given in the Remedy column on the right. (See Item (3) of the example on the next page.)
- Below the there are the methods for inspection or measurement, and the judgement values. If the judgement values below the are correct or the answer to the question inside the is YES, follow the YES line; if the judgement value is not correct, or the answer to the question is NO, follow the No line.
- Below the is given the preparatory work needed for inspection and measurement, and the judgement values. If this preparatory work is neglected, or the method of operation or handling is mistaken, there is danger that it may cause mistaken judgement, or the equipment may be damaged. Therefore, before starting inspection or measurement, always read the instructions carefully, and start the work in order from Item 1).

(5) Troubleshooting tools

When carrying out the troubleshooting, prepare the necessary troubleshooting tools. For details, see TOOLS FOR TESTING, ADJUSTING, AND TROUBLESHOOTING.

(6) Installation position, pin number

A diagram or chart is given for the connector type, installation position, and connector pin number connection, so when carrying out troubleshooting, see this chart for details of POSITION OF CONNECTORS FOR TROUBLESHOOTING and CONNECTION TABLE FOR CONNECTOR and measurement of wiring connector number CN00 appearing in the troubleshooting flow chart.

020S07

< Example >

(1) C-5 Power mode does not switch.

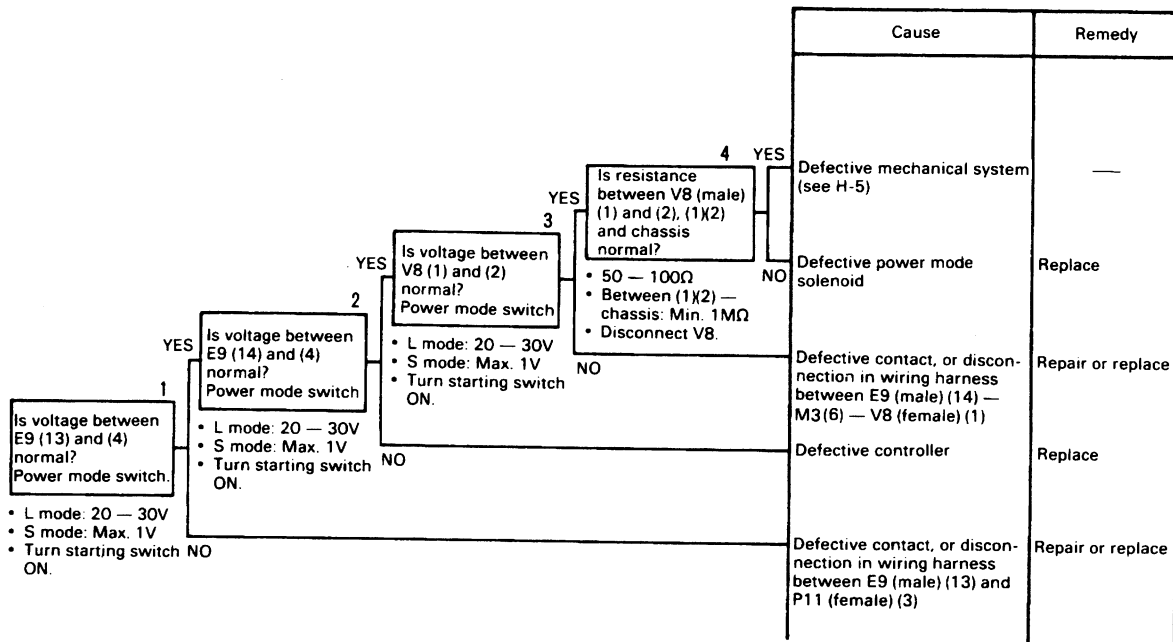
(2) a) Does not switch to L mode

- ★ Check that Fuse 2 is not blown.
- ★ Note: If the signal from the travel limit switch enters the controller, the mode will not switch to L mode. (However, if the actuation of the auto-deceleration is normal when the travel lever is operated, the limit switch is normal.)

(3) ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.

- ★ Always connect any disconnected connectors before going on to the next step.
- ★ When the power mode switch is normal (see P-18).

(4)



U25207

TROUBLESHOOTING OF ELECTRICAL SYSTEM (E MODE)

Failure mode

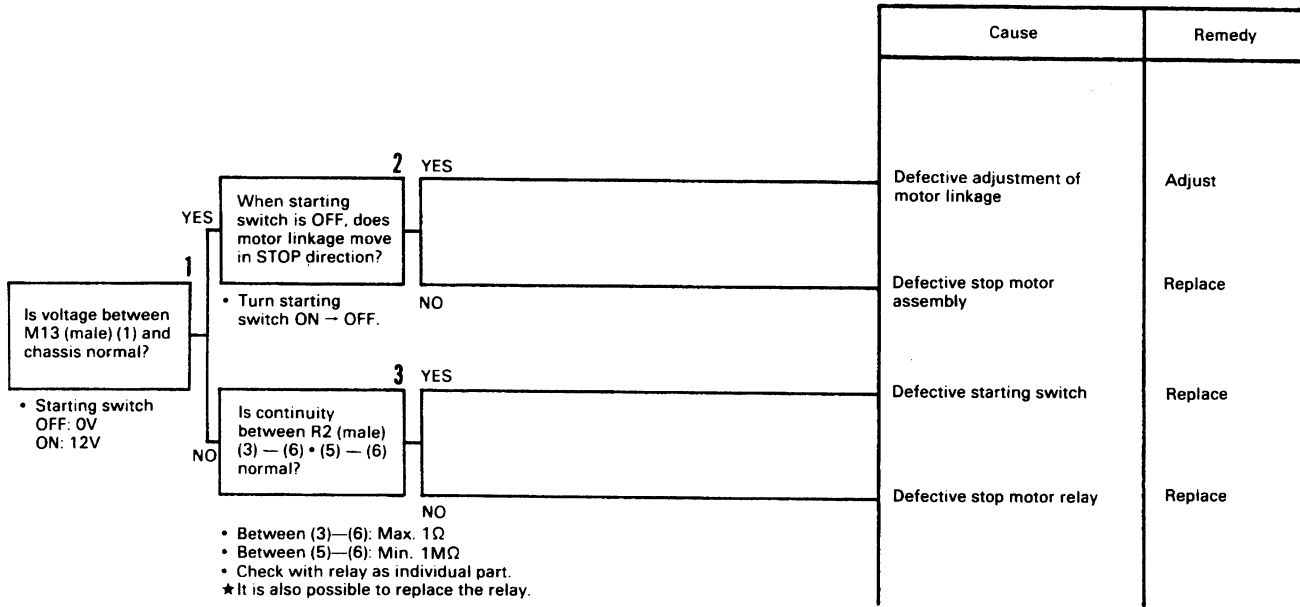
- E-1. This engine does not stop when the starting switch is turned OFF 20-64
- E-2. Work equipment does not move even when work equipment lock level is released 20-65
- E-3. Work equipment moves even when work equipment lock lever is locked 20-66
- E-4. Travel speed does not increase even when travel speed acceleration pedal is depressed 20-67
- E-5. Travel speed increases even when travel speed acceleration pedal is not depressed 20-68

020S07

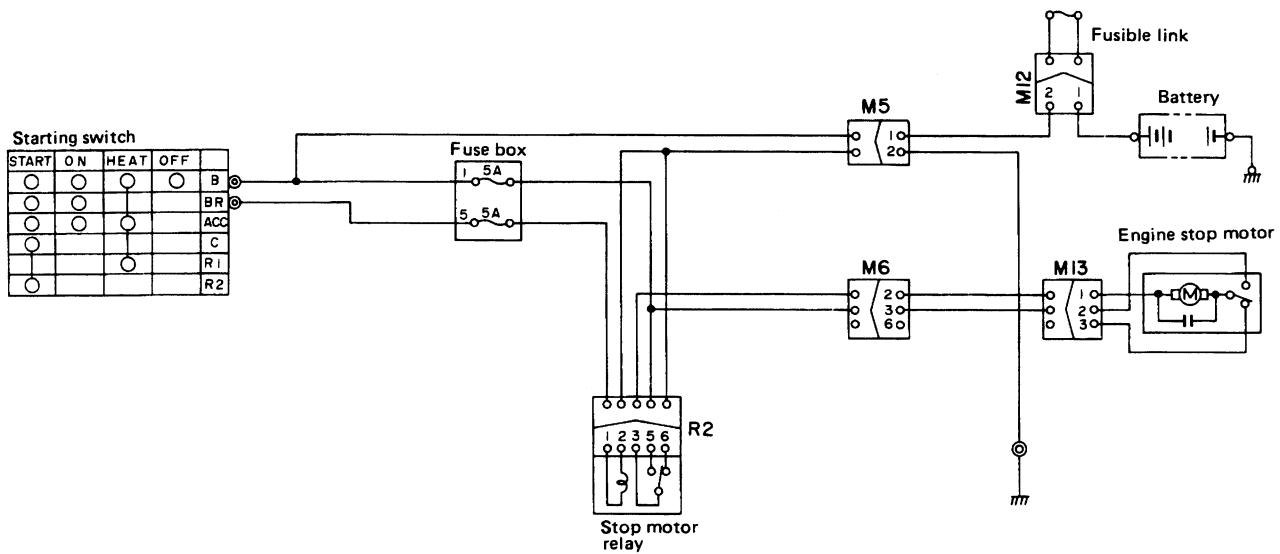
E-1 The engine does not stop when the starting switch is turned OFF.

- PC25-1 Serial No. 1001 – 6470
- PC30-7 Serial No. 18001 – 26422
- PC40-7 Serial No. 18001 – 24521
- PC45-1 Serial No. 1001 – 3505

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



020S07

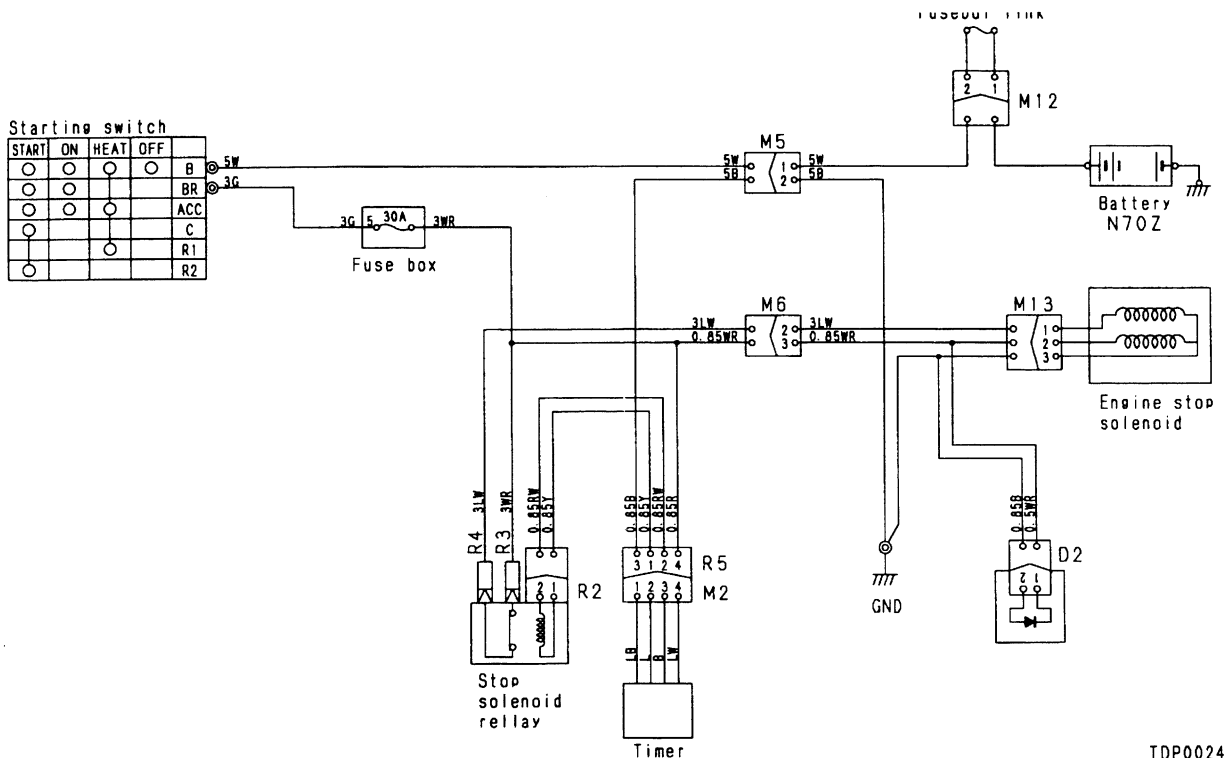
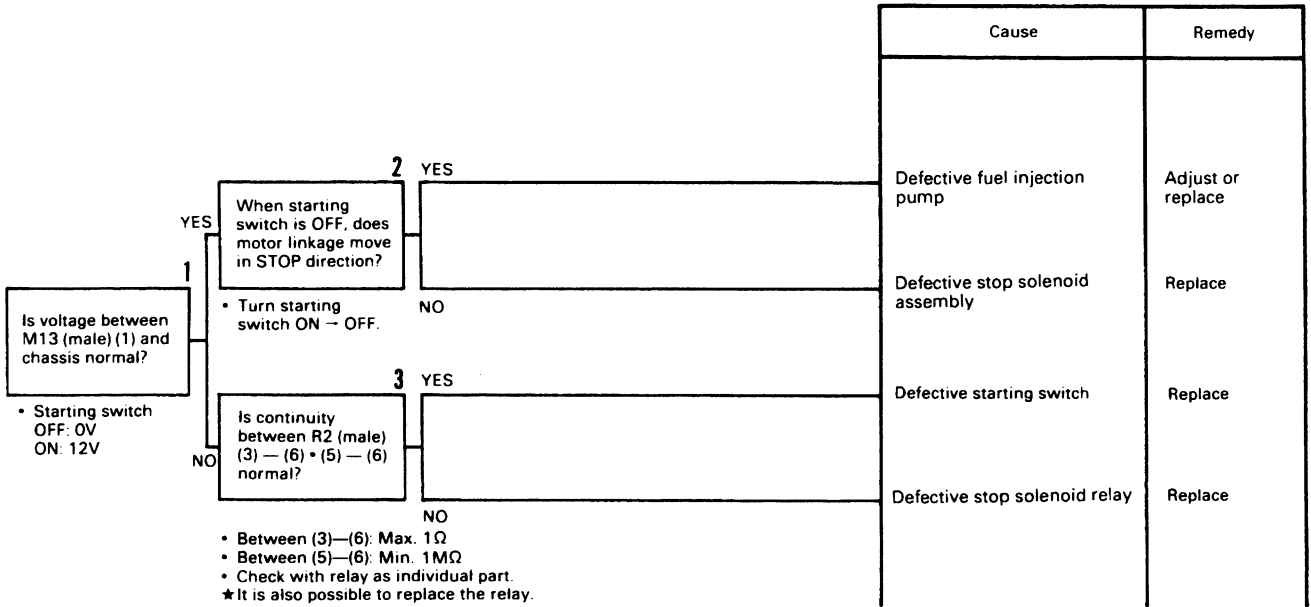


20TF01159

- PC25-1 Serial No. 6471 and up
- PC30-7 Serial No. 26423 and up
- PC40-7 Serial No. 24522 and up
- PC45-1 Serial No. 3506 and up

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

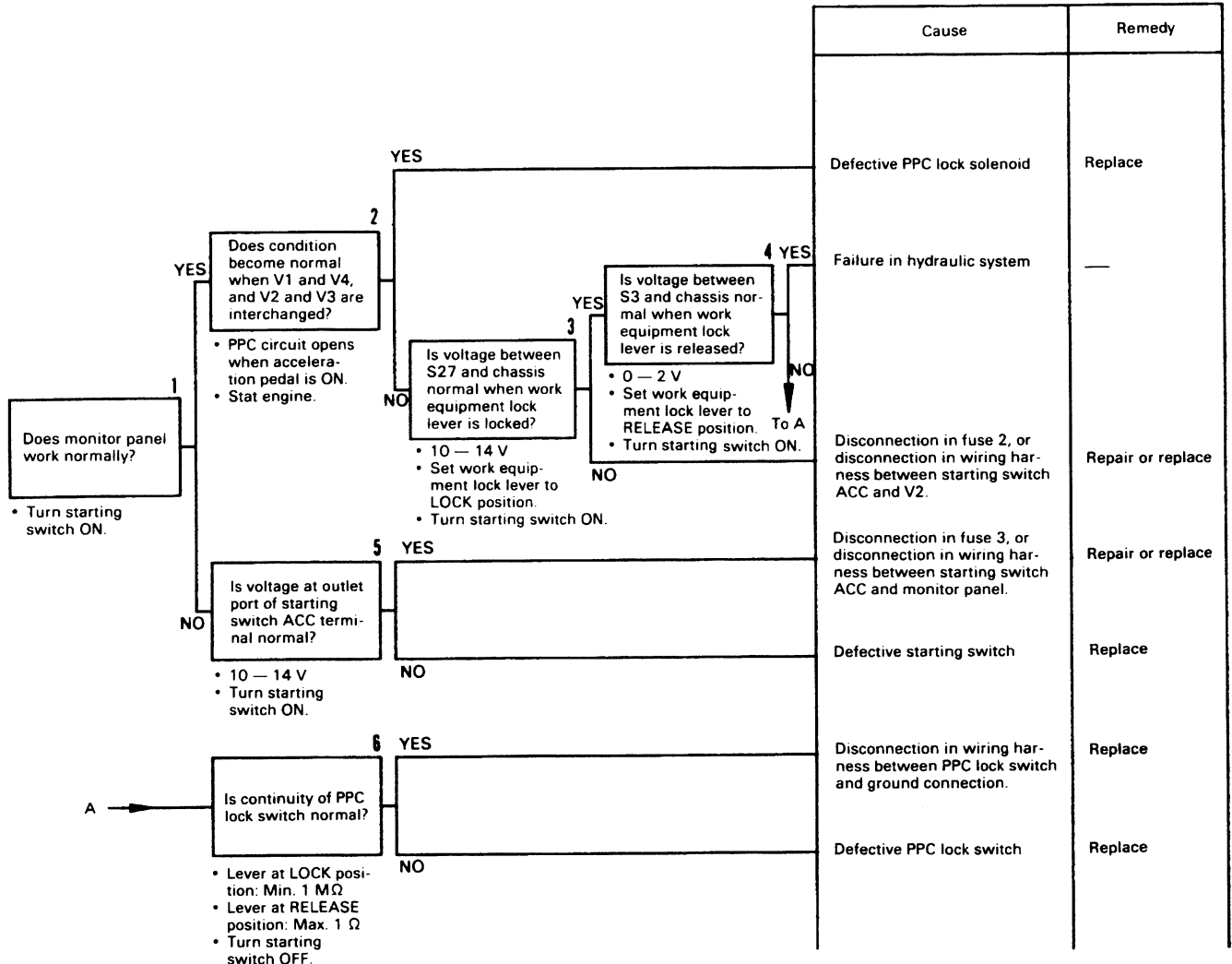
020S07



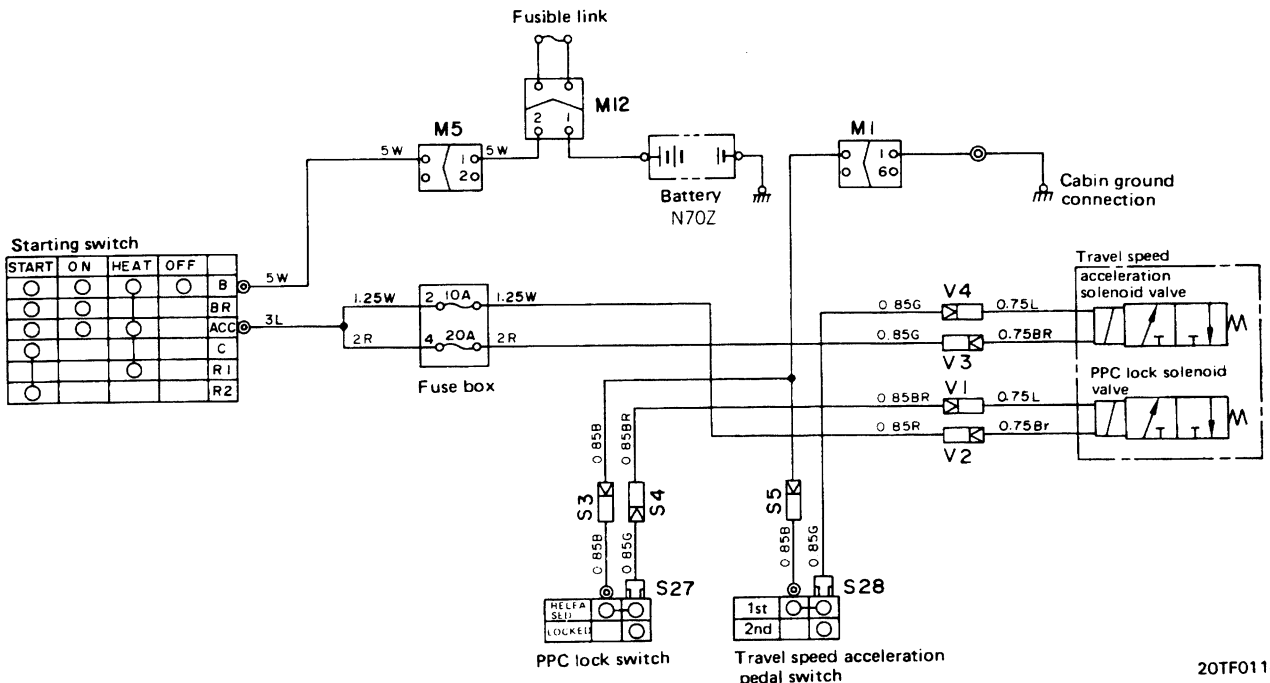
TDP00240

E-2 Work equipment does not move even when work equipment lock lever is released.

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



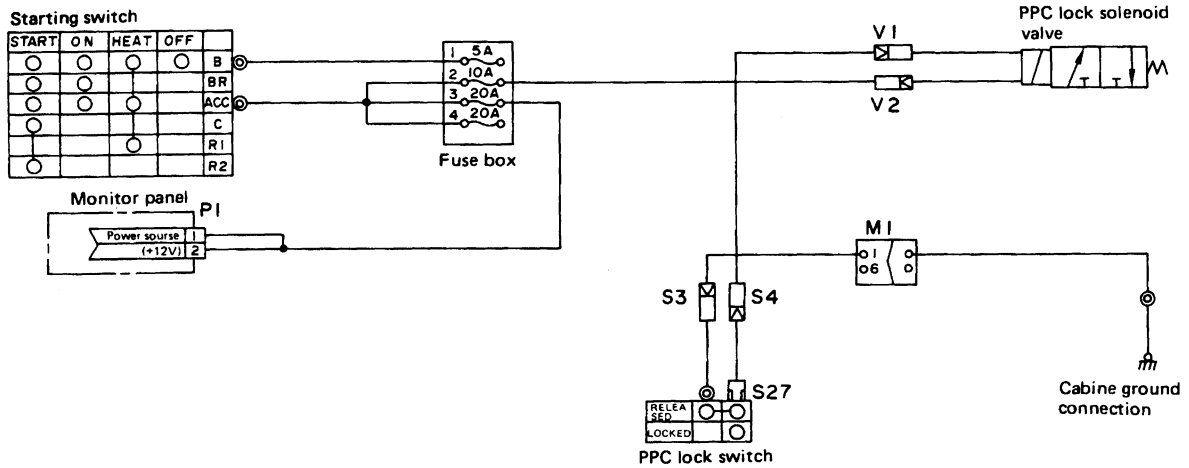
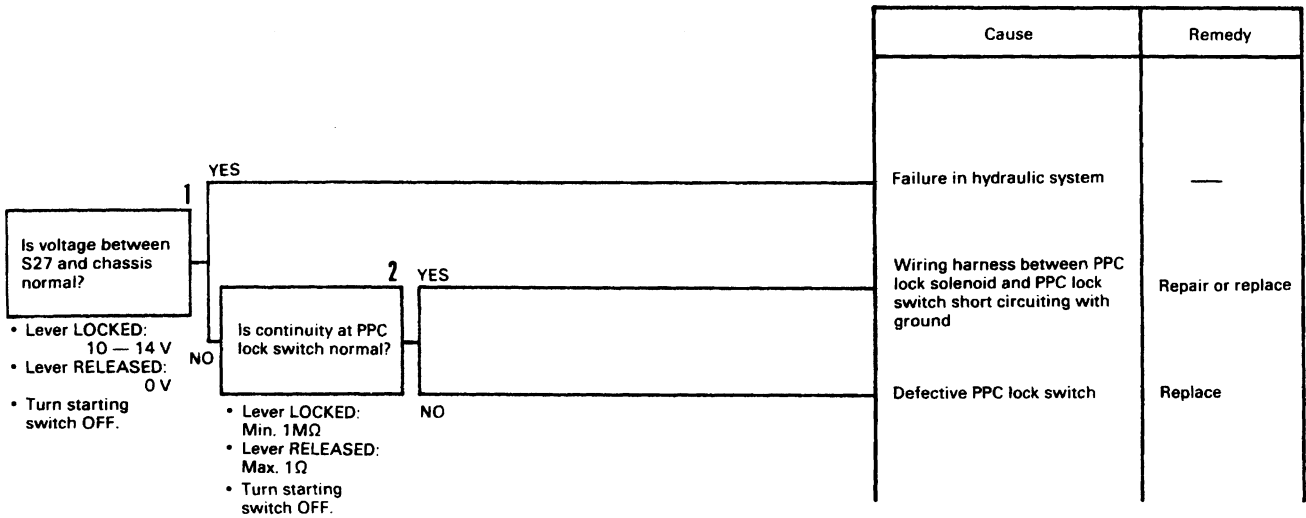
020S07



20TF01142

E-3 Work equipment moves even when work equipment lock lever is locked.

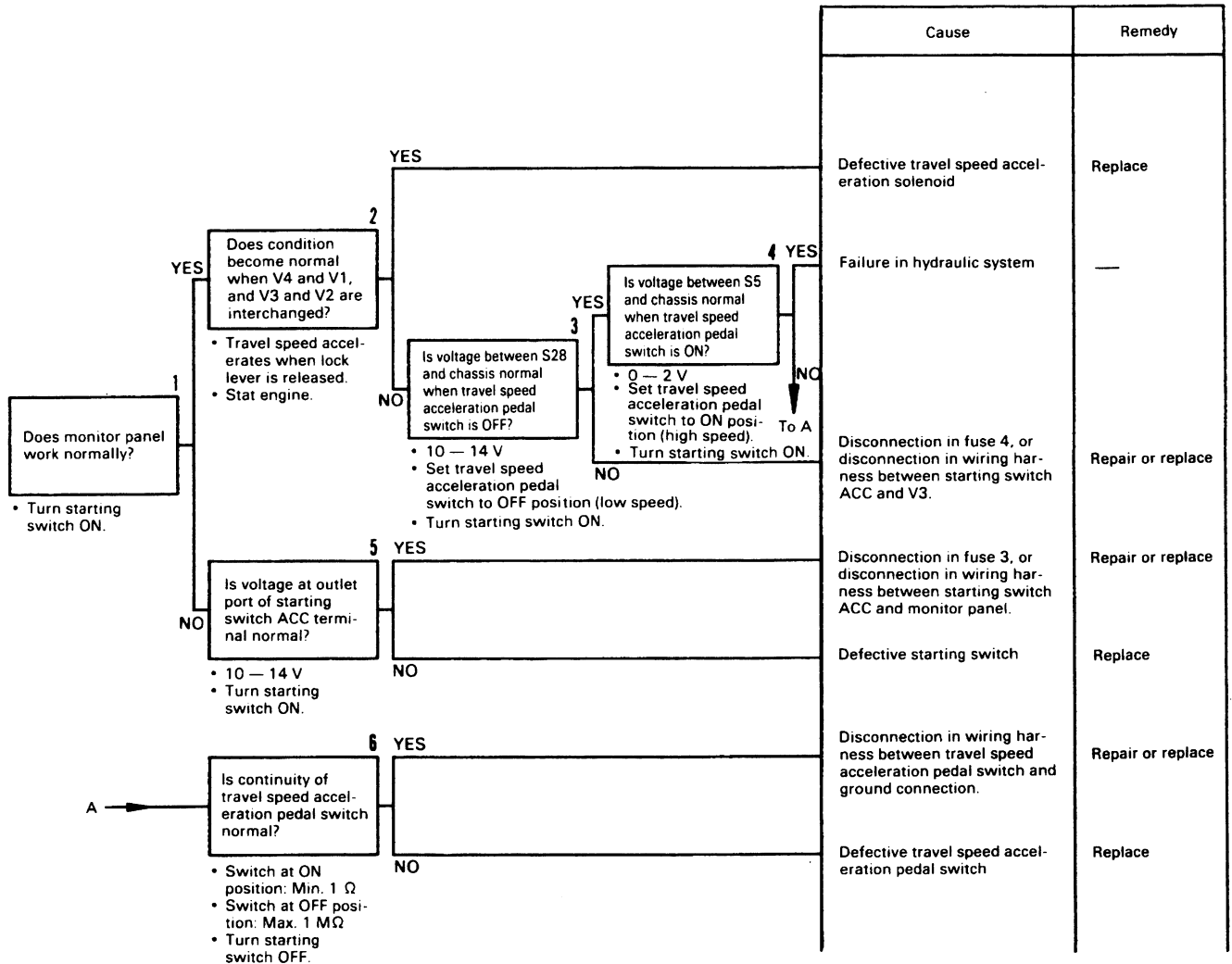
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



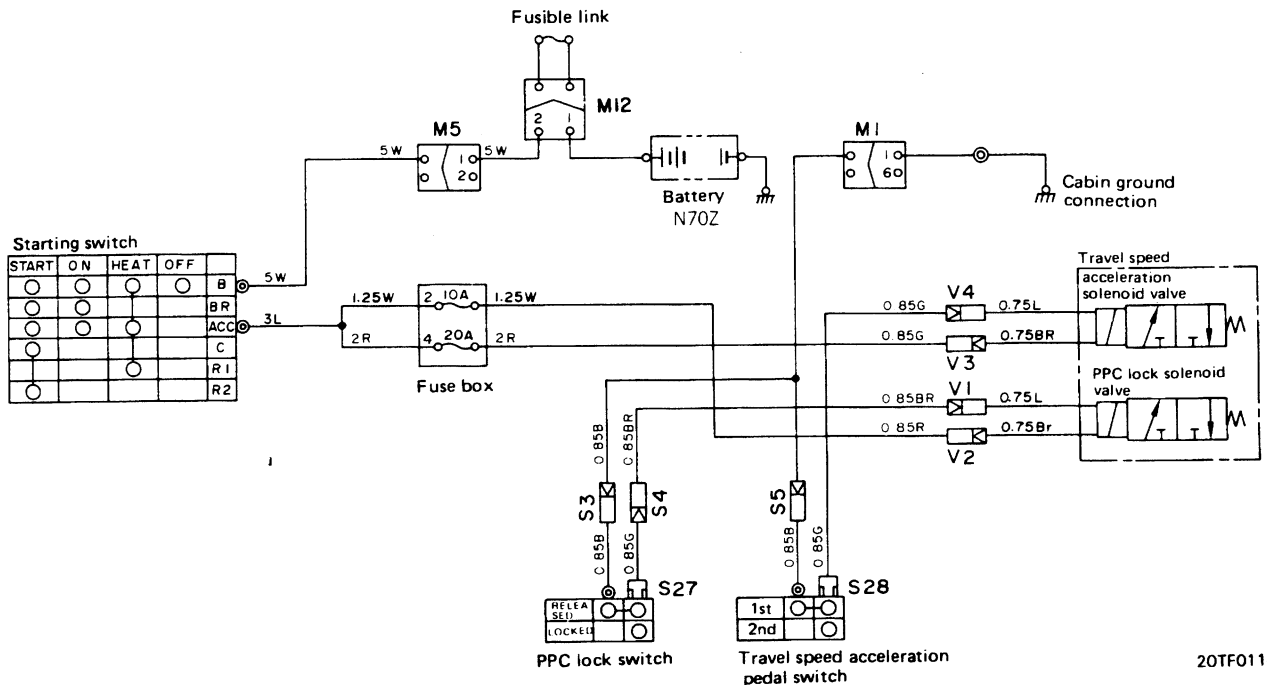
20TF01160

E-4 Travel speed does not increase even when travel speed acceleration pedal is depressed.

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



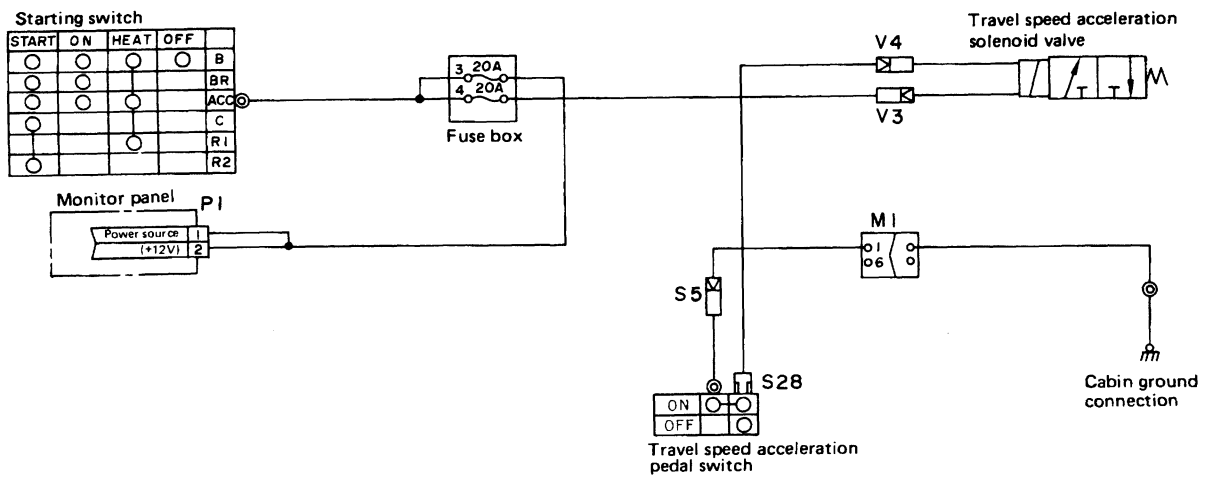
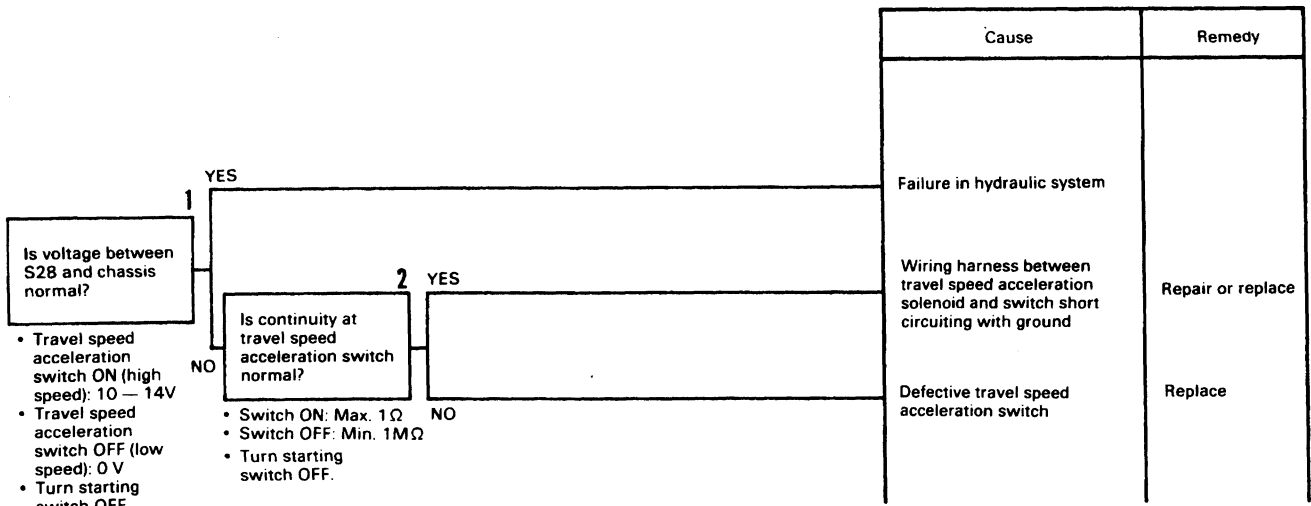
020S07



20TF01142

E-5 Travel speed increases even when travel speed acceleration pedal is not depressed.

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



20TF01162

020S07

TROUBLESHOOTING OF HYDRAULIC AND MECHANICAL SYSTEM (H MODE)

Failure mode

Work equipment, travel, swing system

H-1	Speeds of work equipment, travel swing are all slow	20-70
H-2	There is excessive drop in engine speed, or engine stalls	20-71
H-3	Work equipment, travel, swing do not move, or speed is extremely slow	20-72
	a) None of work equipment, travel, swing, move, or speed is extremely slow	20-72
	b) Only travel is normal, or drop in speed is comparatively small	20-73
H-4	All work equipment, travel, swing lack power	20-73
H-5	Abnormal noise generated (from around pump)	20-73

Work equipment

H-6	Work equipment (boom, arm, bucket) speed is slow	20-74
H-7	Work equipment (boom, arm, bucket) lacks power	20-75
H-8	Excessive hydraulic drift	20-75
H-9	Excessive time lag	20-75

Travel system

H-10	When machine is traveling. It deviates naturally to one side	20-76
	a) Deviates in same direction both in forward and reverse	20-76
	b) Deviates in different direction in forward and reverse	20-80
H-11	Excessive deviation when starting (PC30, 40)	20-81
H-12	Travel lacks power (or speed is slow)	20-82
H-13	Travel speed does not switch	20-83
H-14	Machine does not move (one side only)	20-83
H-15	Travel lever is heavy	20-84

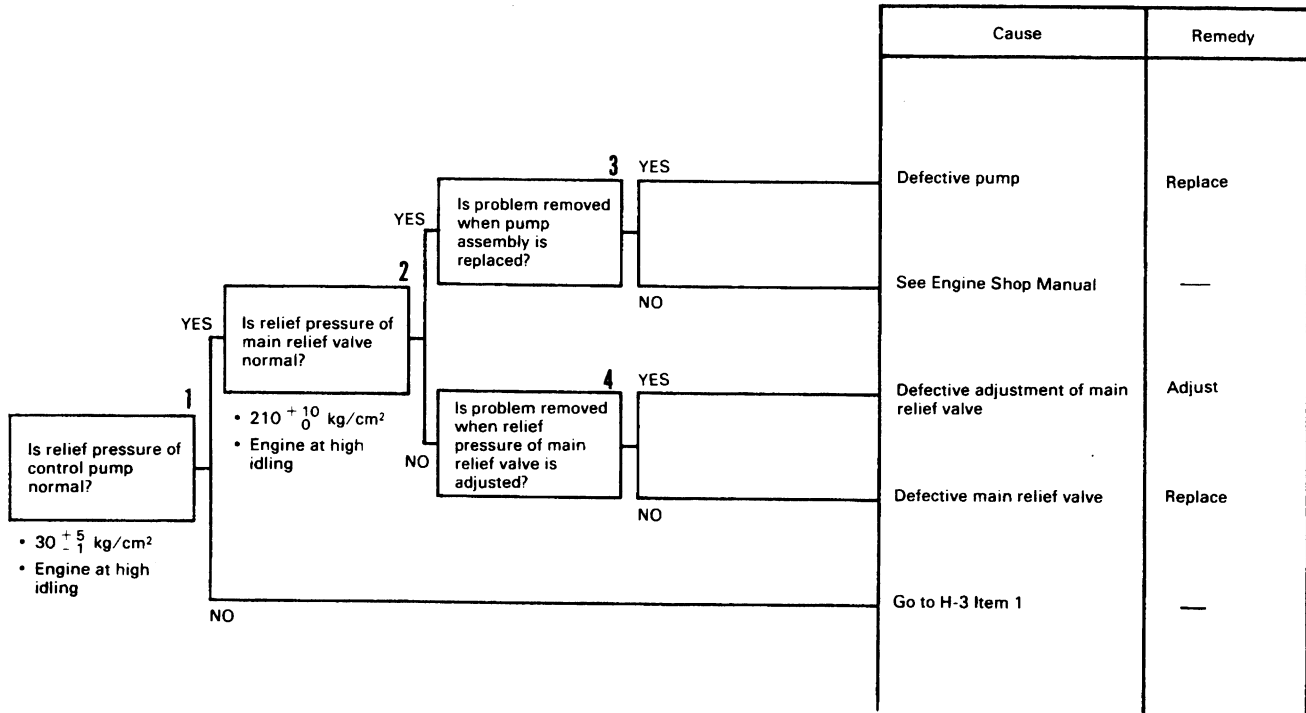
Swing system

H-16	Does not swing	20-84
H-17	Swing speed is slow or acceleration is poor	20-86
H-18	Excessive overrun when stopping swing	20-86
H-19	Excessive shock when stopping swing	20-87
H-20	Excessive abnormal noise when stopping swing	20-87
H-21	Excessive hydraulic drift of swing	20-88
H-22	Excessive hydraulic drift of boom swing	20-89

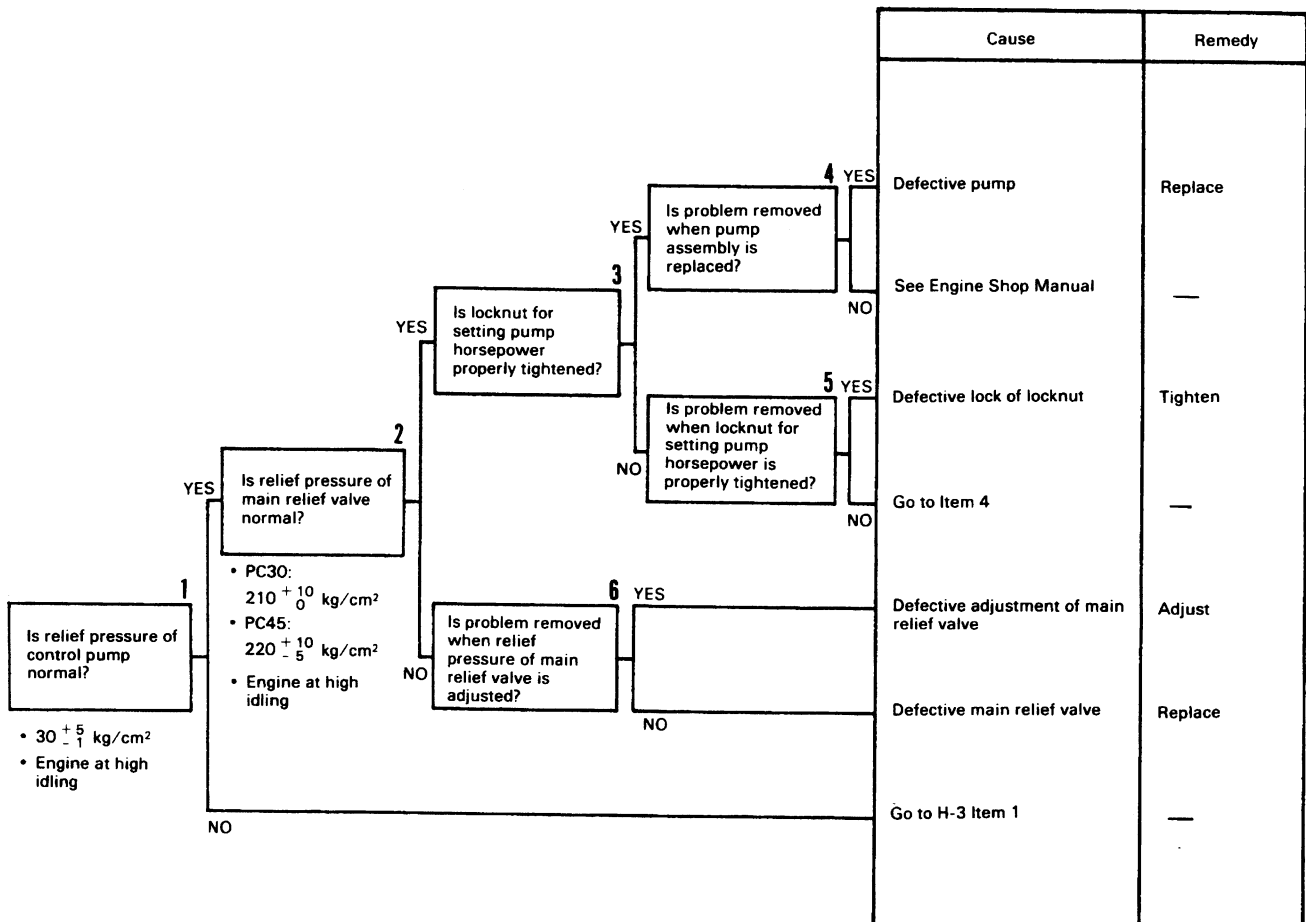
TABLE OF FAILURE MODES AND CAUSES	20-91
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H-1 Speeds of work equipment, travel, swing are all slow.

PC25, 40



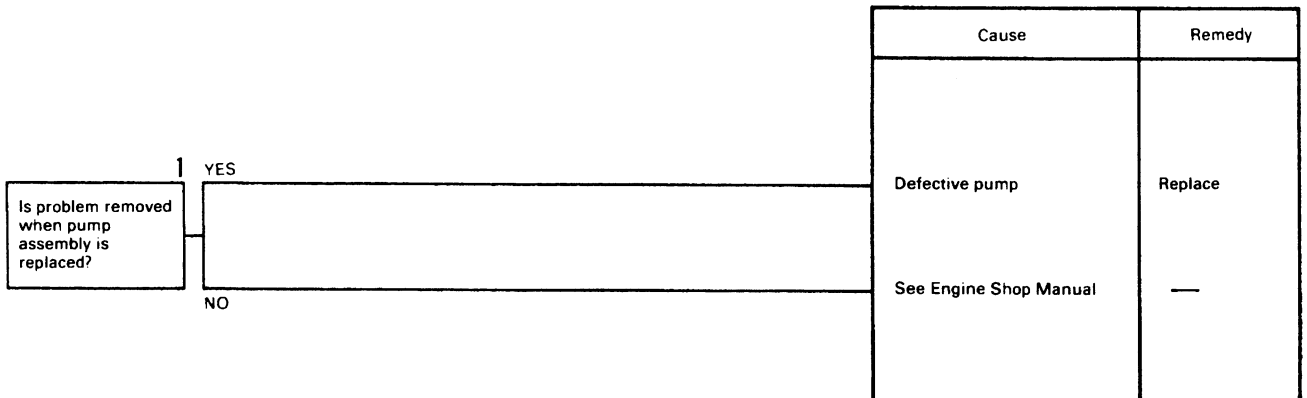
PC30, 45



LUSU

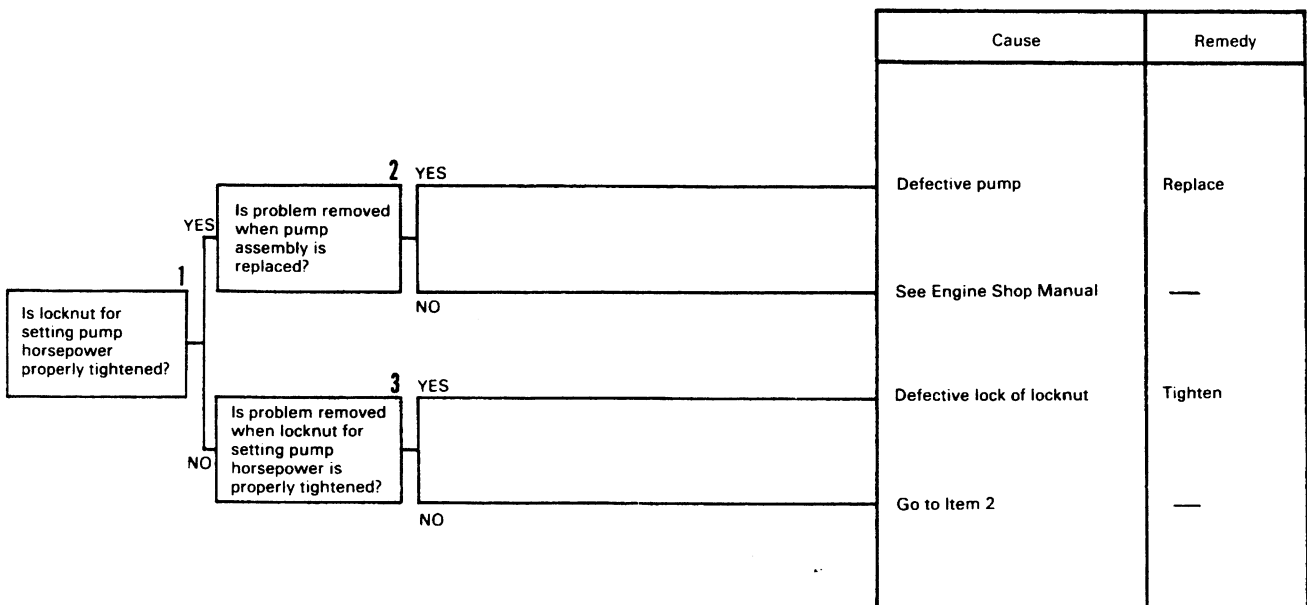
H-2 There is excessive drop in engine speed, or engine stalls.

PC25, 40



PC30, 45

020S07



H-3 Work equipment, travel, swing do not move, or speed is extremely slow.

★ When there is a big difference from the permissible value.

a) None of work equipment, travel, swing do not move, or speed is slow.

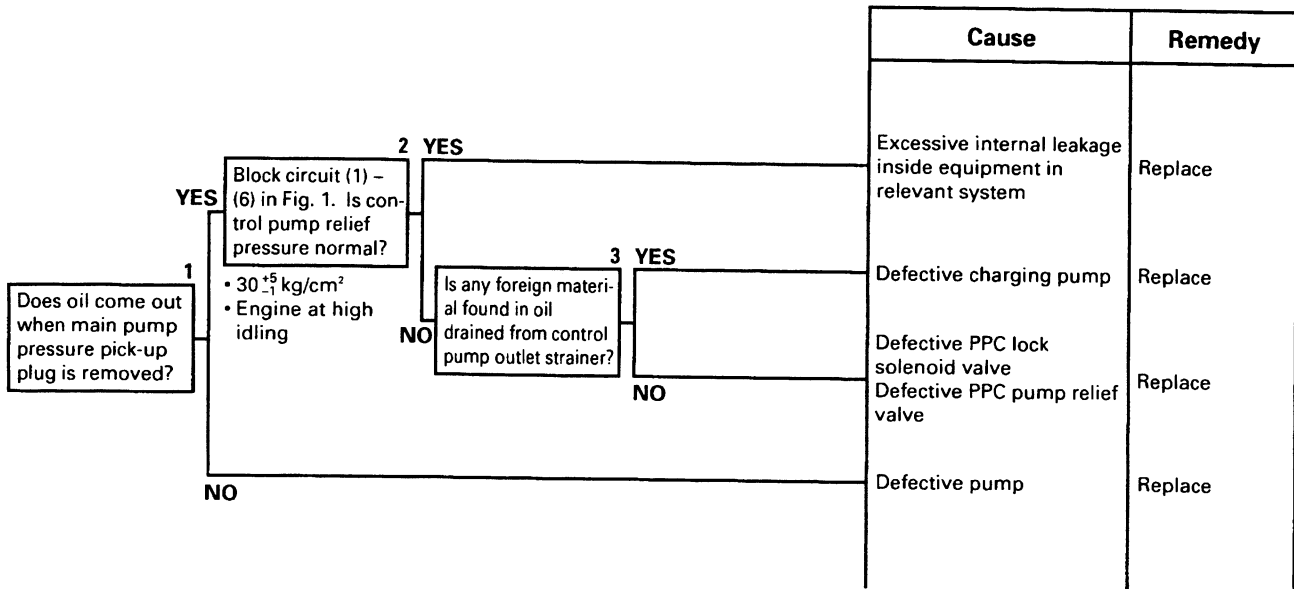
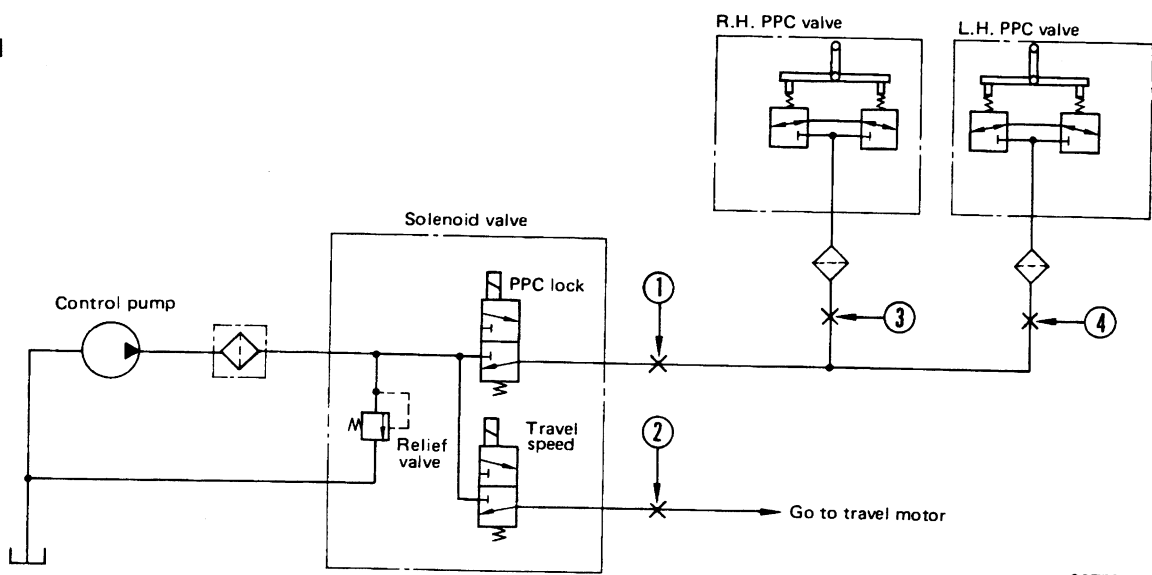
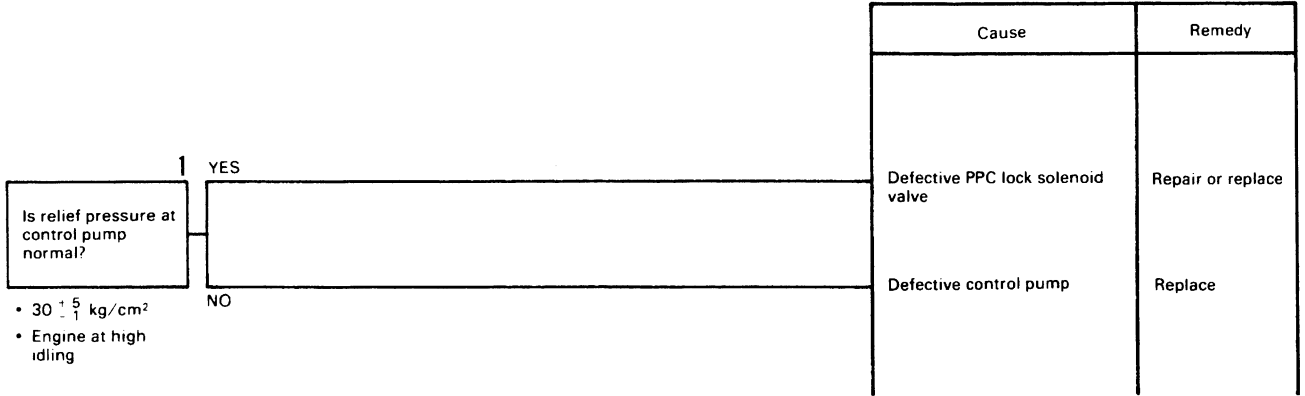


Fig. 1



20TF01164

b) Only travel is normal, or drop in speed is comparatively small.

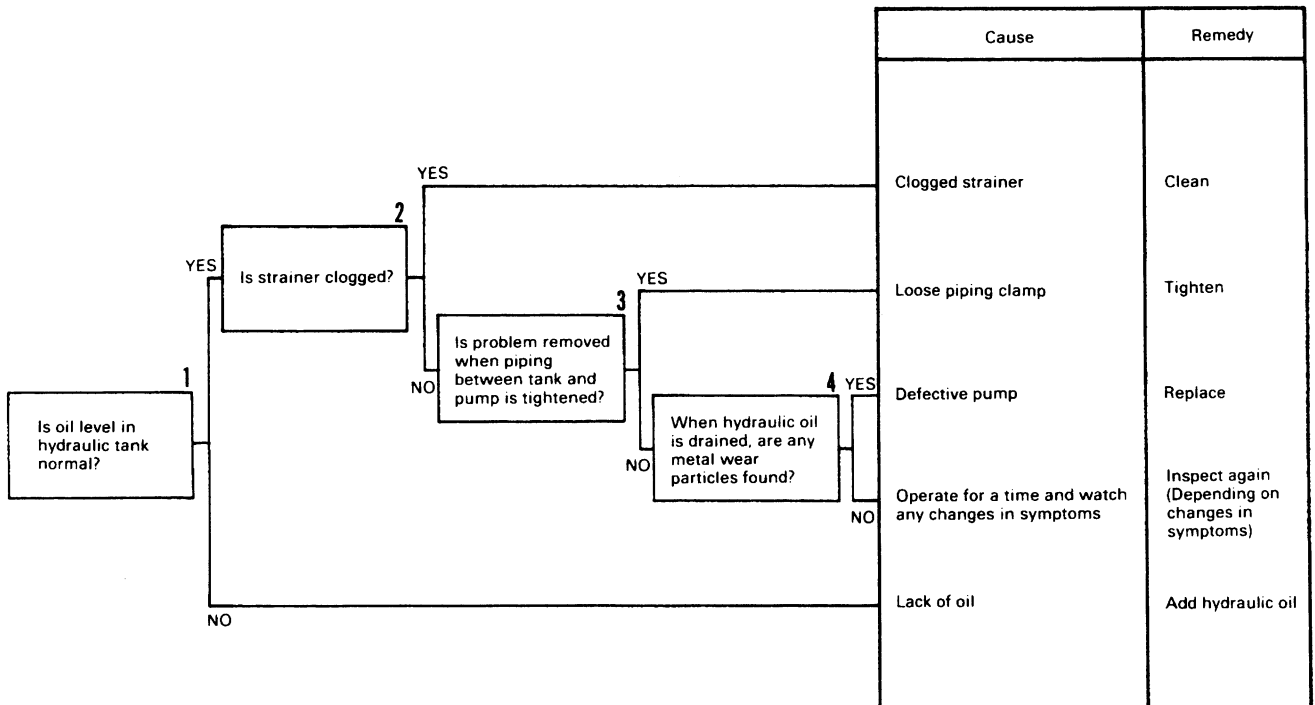


H-4 All work equipment, travel, swing lack power.

★ Carry out troubleshooting for H-1 Item 2.

020S07

H-5 Abnormal noise generated (from around pump).



H-6 Work equipment (boom, arm, bucket) speed is slow.

★ Travel, swing, boom swing and blade speeds are normal.

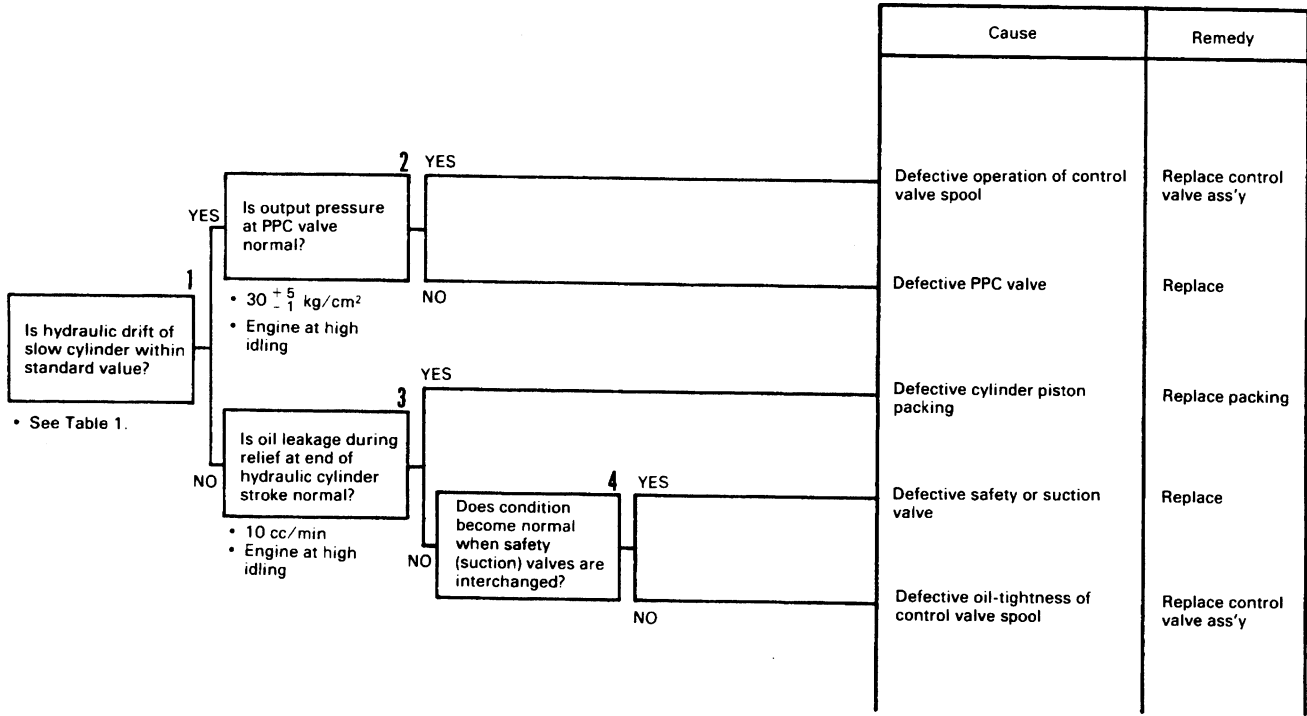
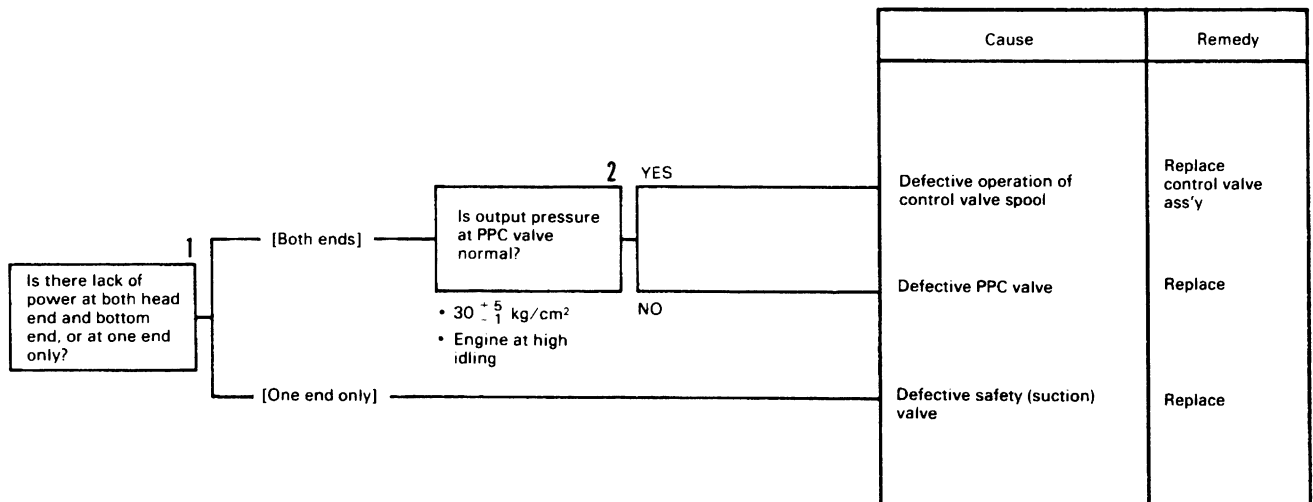


Table 1

Model Cylinder	(mm)			
	PC25	PC30	PC40	PC45
Boom	Max. 21	Max. 24	Max. 30	Max. 29
Arm	Max. 18	Max. 28.5	Max. 30	Max. 36
Bucket	Max. 9	Max. 12	Max. 12	Max. 15

H-7 Work equipment (boom, arm bucket) lacks power.

★ When hydraulic drift is normal.



H-8 Excessive hydraulic drift.

★ Carry out troubleshooting for H-6 work equipment speed is slow.

H-9 Excessive time lag.

★ If the work equipment speed is normal (if the speed is slow, go first to H-6).

Cause	Remedy
Defective operation of suction valve	Replace

Time lag

● Engine slow

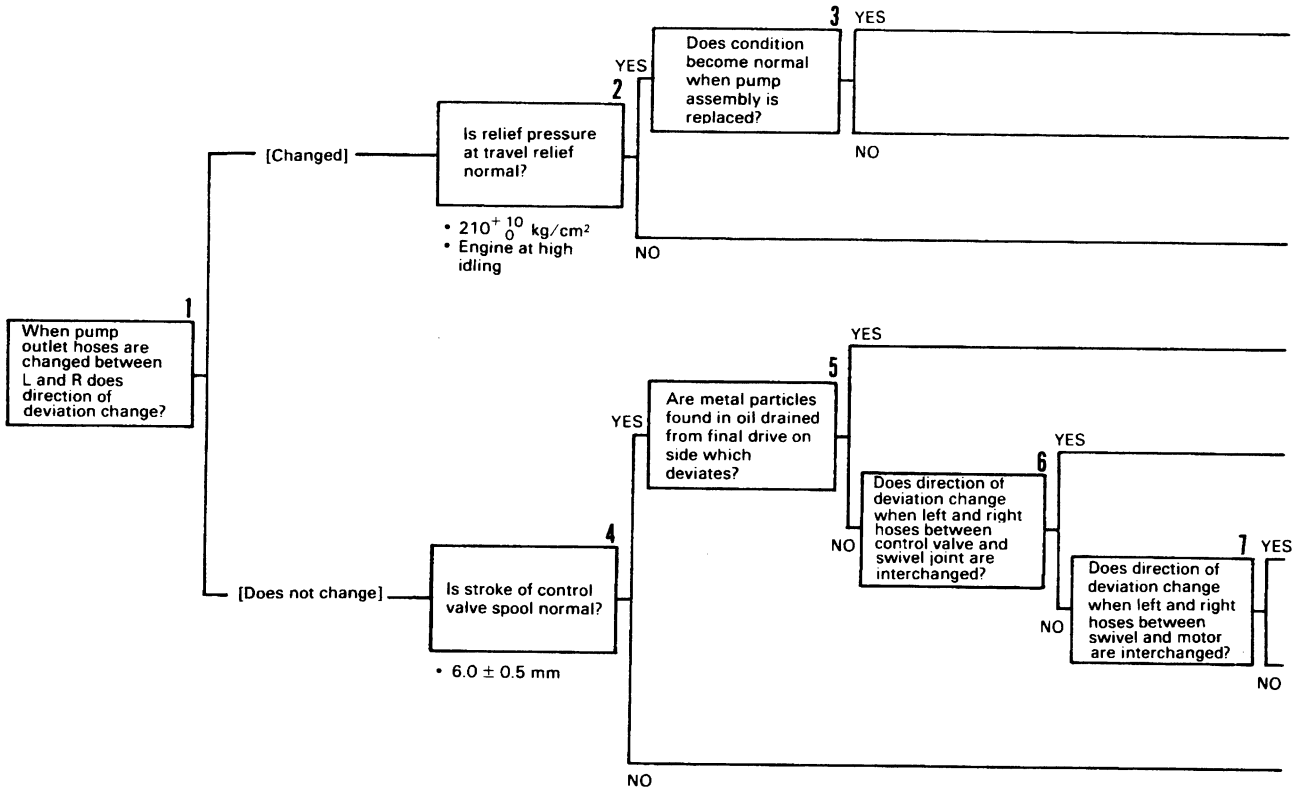
Model Cylinder	(sec)			
	PC25	PC30	PC40	PC45
Boom	Max. 2	Max. 2	Max. 2	Max. 2
Arm	0	0	0	0
Bucket	0	0	0	0

H-10 When machine is traveling. It deviates naturally to one side.

★ When the travel speed is normal.

a) Deviates in same direction both in forward and reverse

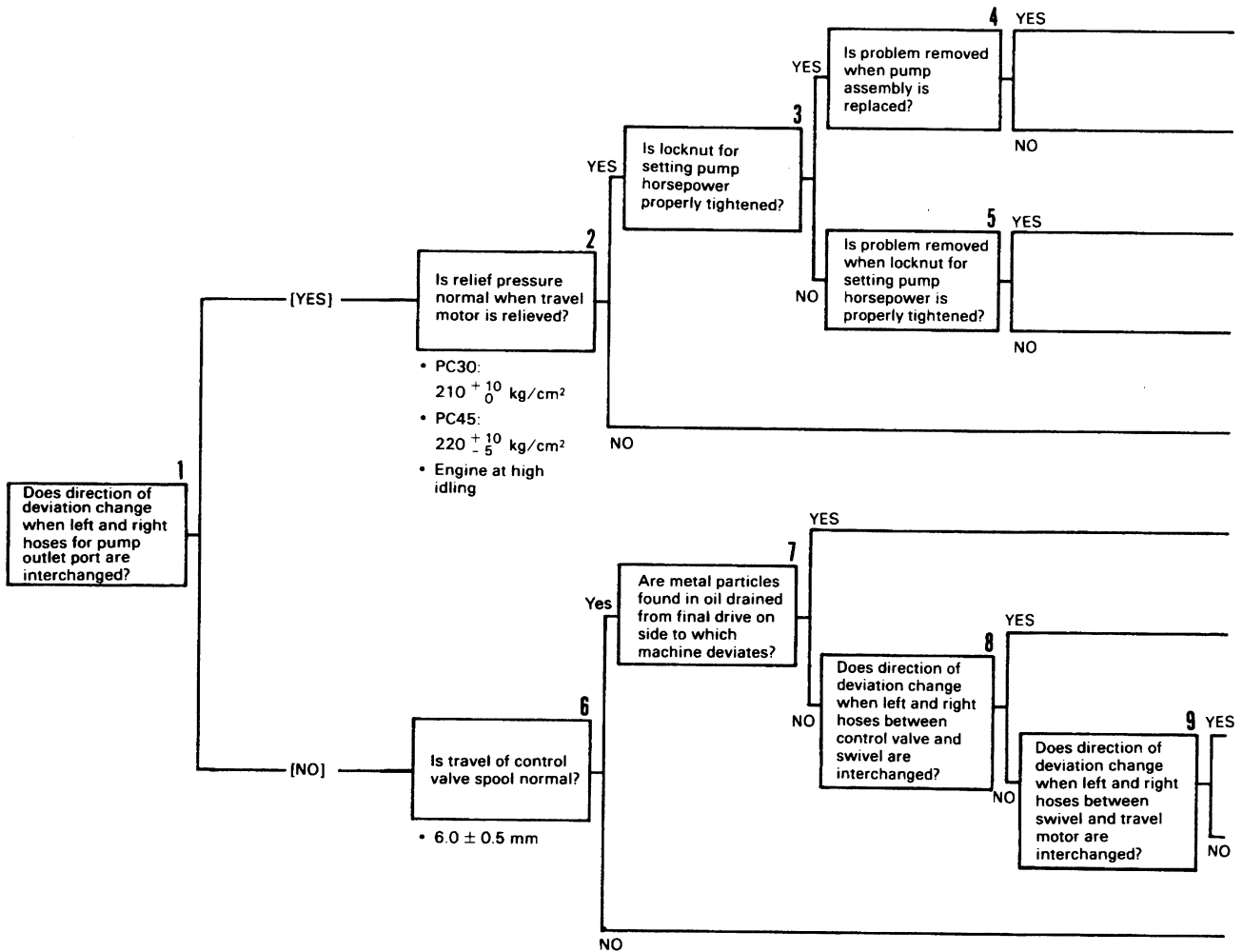
PC25, 40



LUSU

020S07

	Cause	Remedy
	Defective pump	Replace
	Go to Item 5	—
	Drop in set pressure of main relief valve	Adjust or replace
	Defective final drive	Repair or replace
	Defective control valve	Replace
	Defective swivel joint packing	Replace packing or replace assembly
	Defective travel motor	Replace
	Defective operation of travel lever linkage (cable) or control valve spool	Repair or replace



U2USU7

105020

	Cause	Remedy
_____	Defective pump	Replace
_____	Go to Item 7	—
_____	Defective lock of locknut	Tighten
_____	Go to Item 4	—
_____	Drop in set pressure of main relief valve	Adjust or replace
_____	Defective final drive	Repair or replace
_____	Defective control valve	Replace
_____	Defective swivel joint packing	Replace packing, or replace ass'y
_____	Defective travel motor	Replace
_____	Defective operation of travel motor linkage (cable) or defective operation of control valve spool	Repair or replace

b) Deviates in different direction in forward and reverse (See Fig. 1)

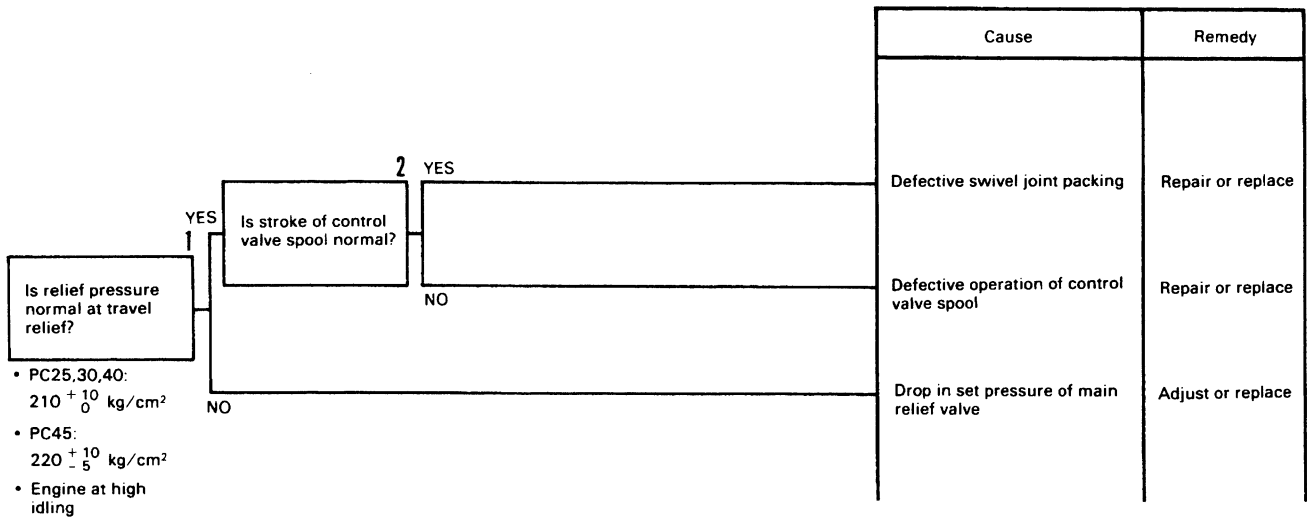
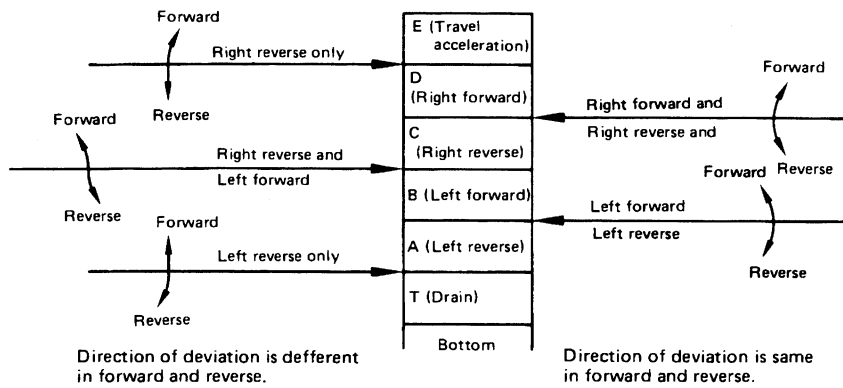


Fig. 1 Location of defective swivel joint packing and direction of deviation in travel

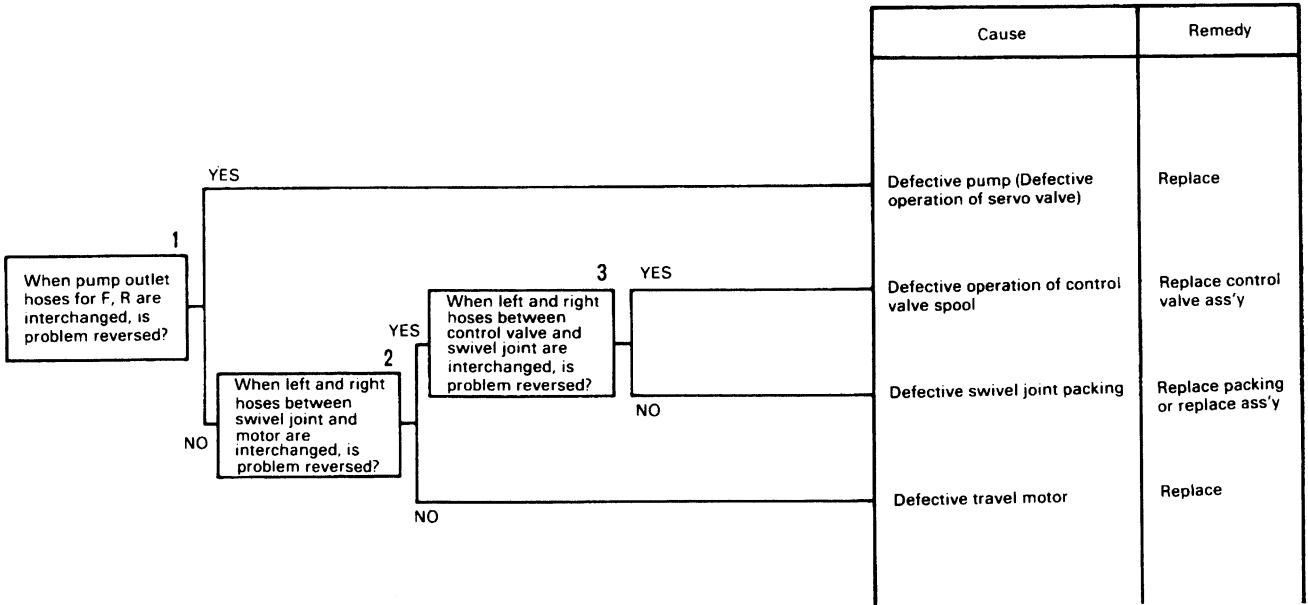


20TF01165-K

H-11 Excessive deviation when starting (PC30, 40).

★ When the travel speed is normal.

(If there is also deviation during normal travel, go to H-10 Machine deviates naturally when traveling.)

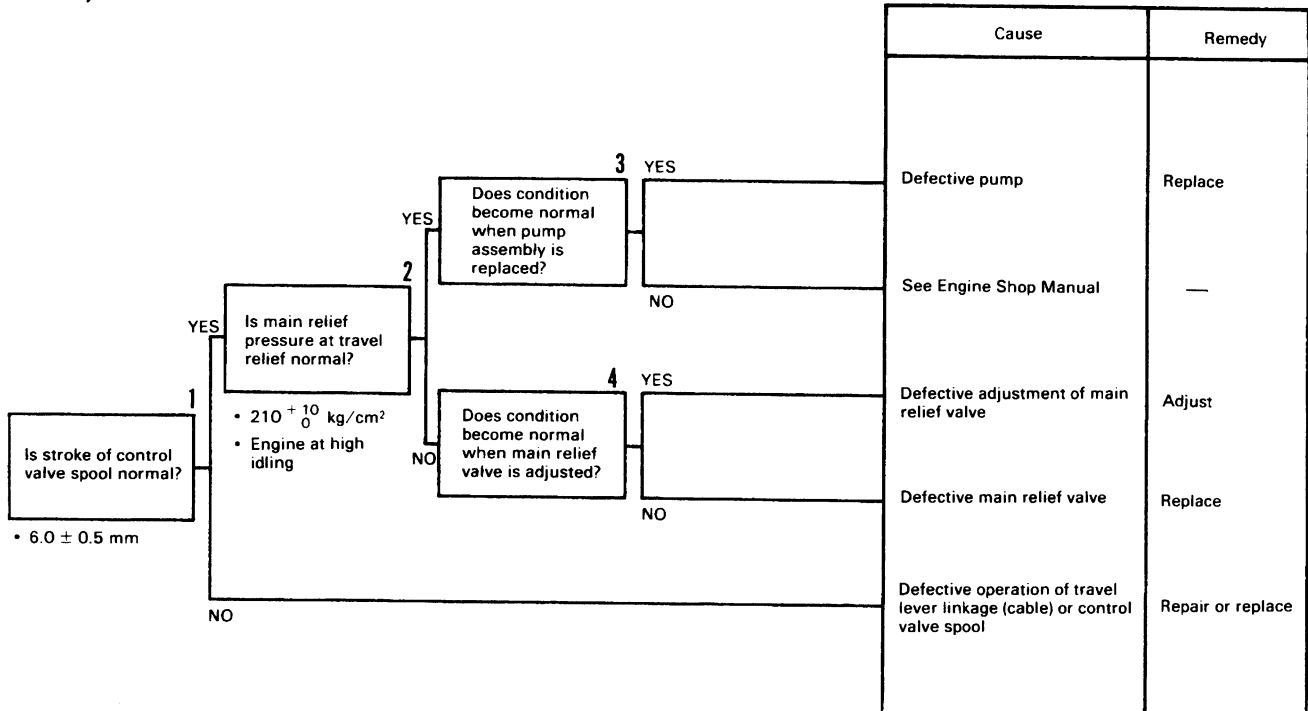


020S07

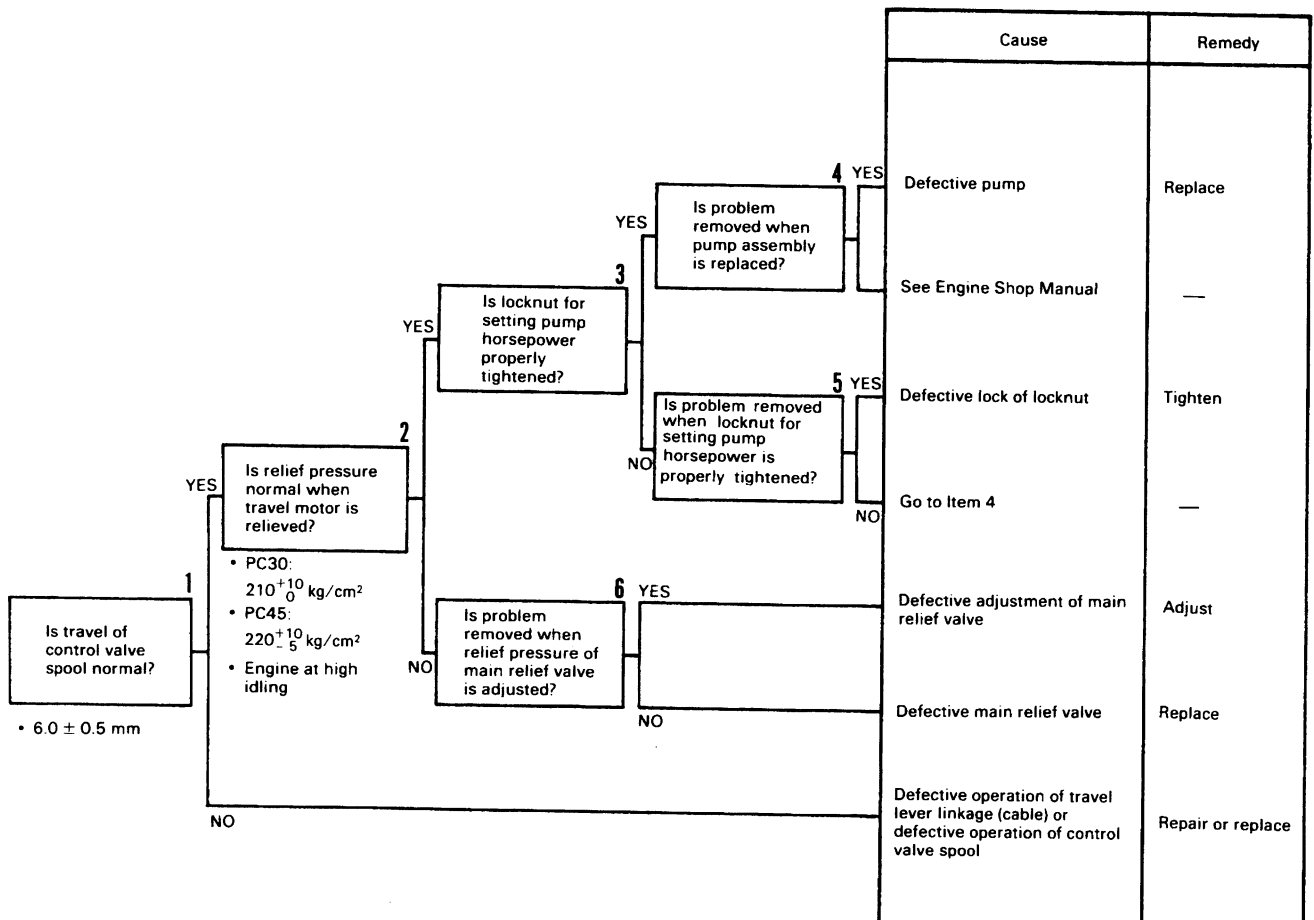
H-12 Travel lacks power (or speed is slow).

★ When there is no travel deviation. (If there is travel deviation, go first to H-13 Machine deviates naturally when traveling.)

PC25, 40

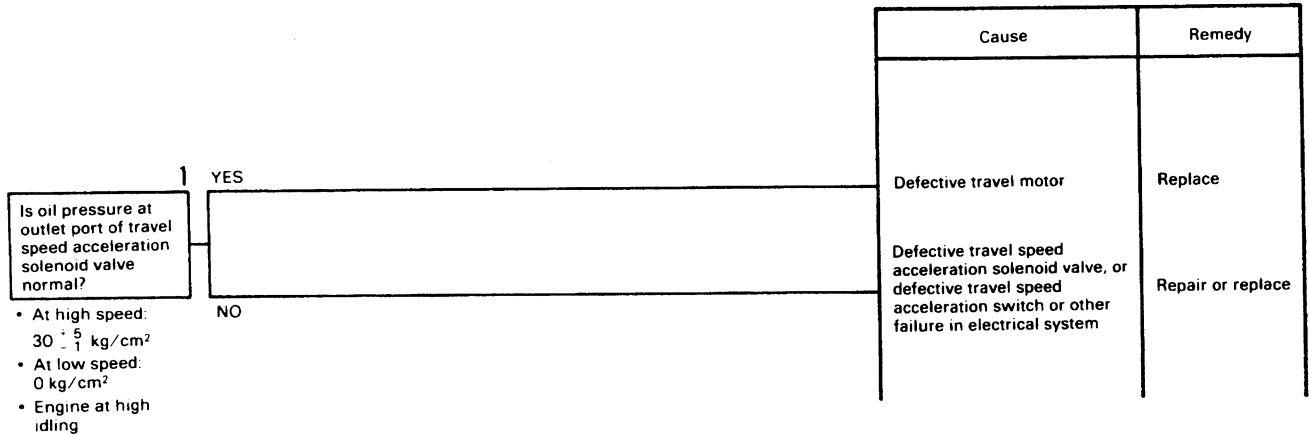


PC30, 45



H-13 Travel speed does not switch.

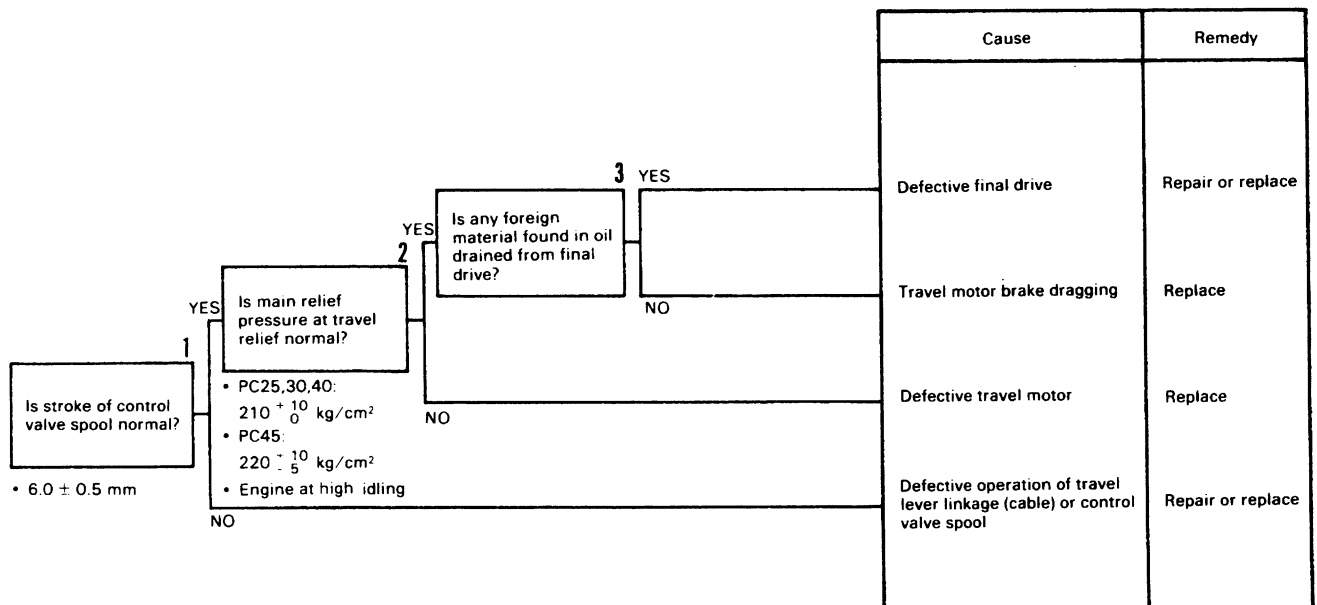
★ When the travel speed is normal for either high speed or low speed.



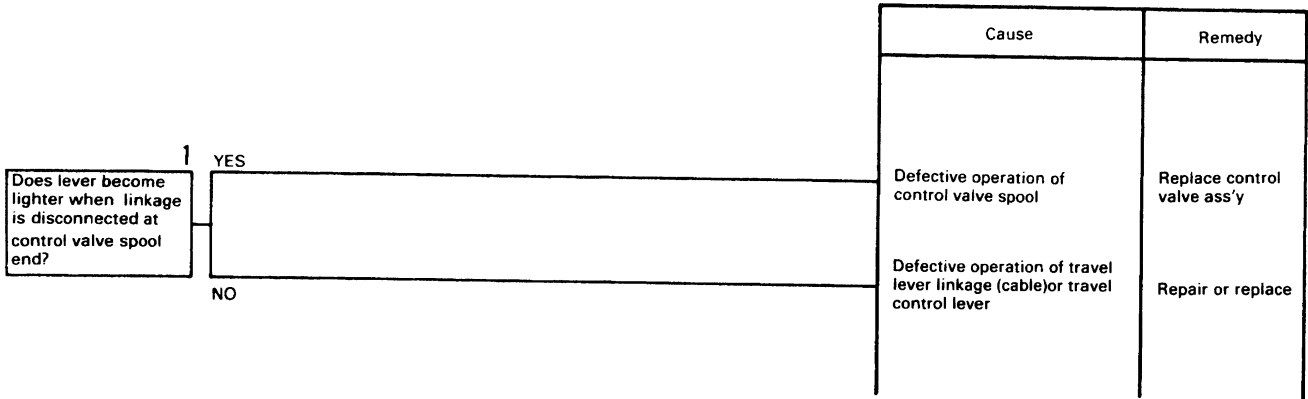
020S07

H-14 Machine does not move (one side only).

★ When work equipment and swing are normal.

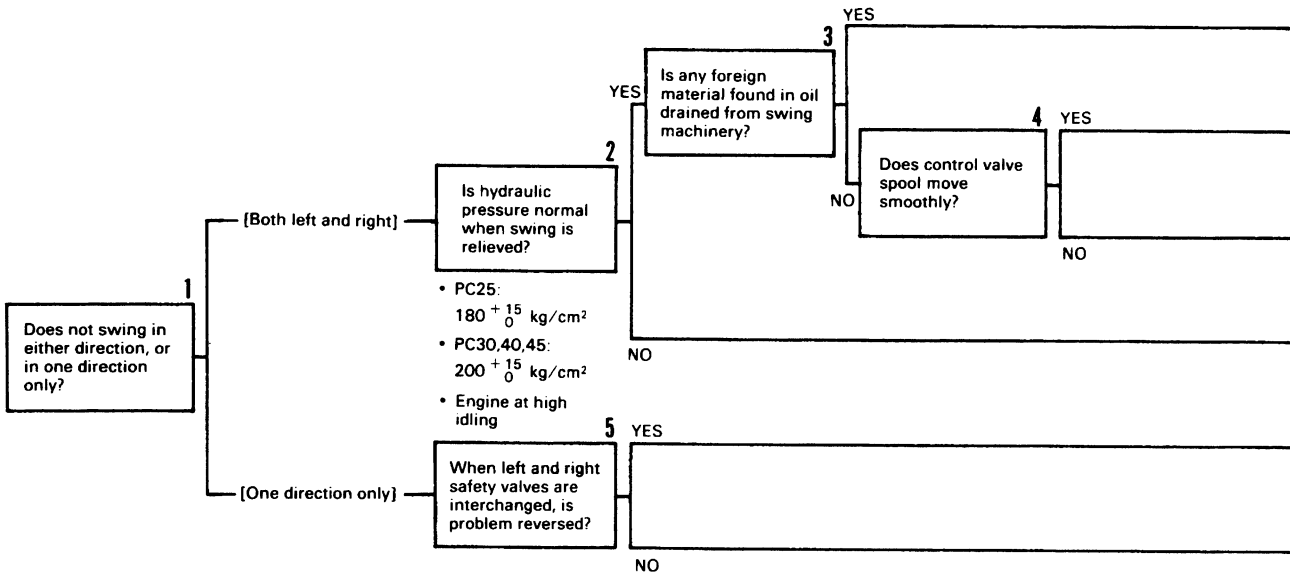


H-15 Travel lever is heavy.



H-16 Does not swing.

- When other work equipment and travel speeds are normal.

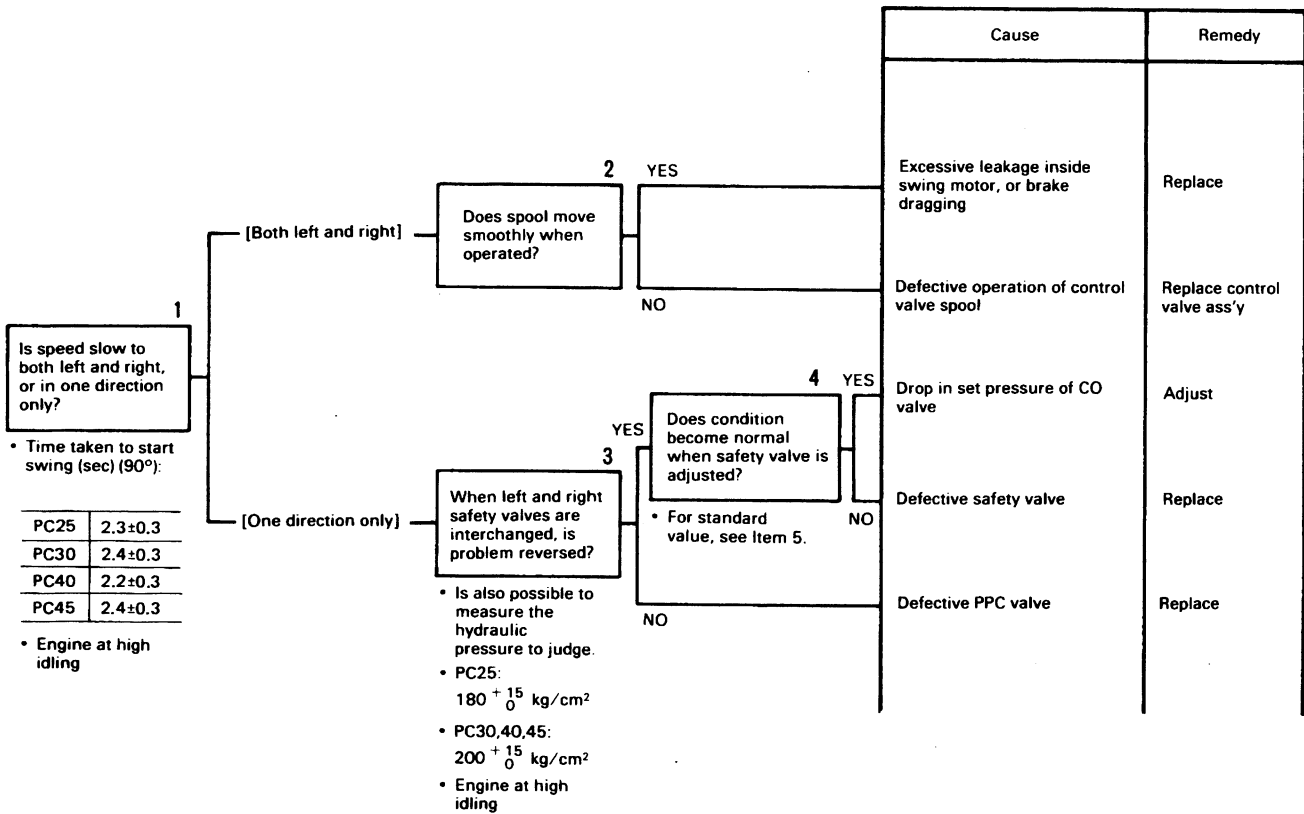


020S07

Cause	Remedy
Defective swing machinery	Repair or replace
Defective motor brake	Replace
Defective operation of control valve spool	Repair or replace
Defective swing motor	Replace
Defective safety valve	Replace
Defective PPC valve	Replace

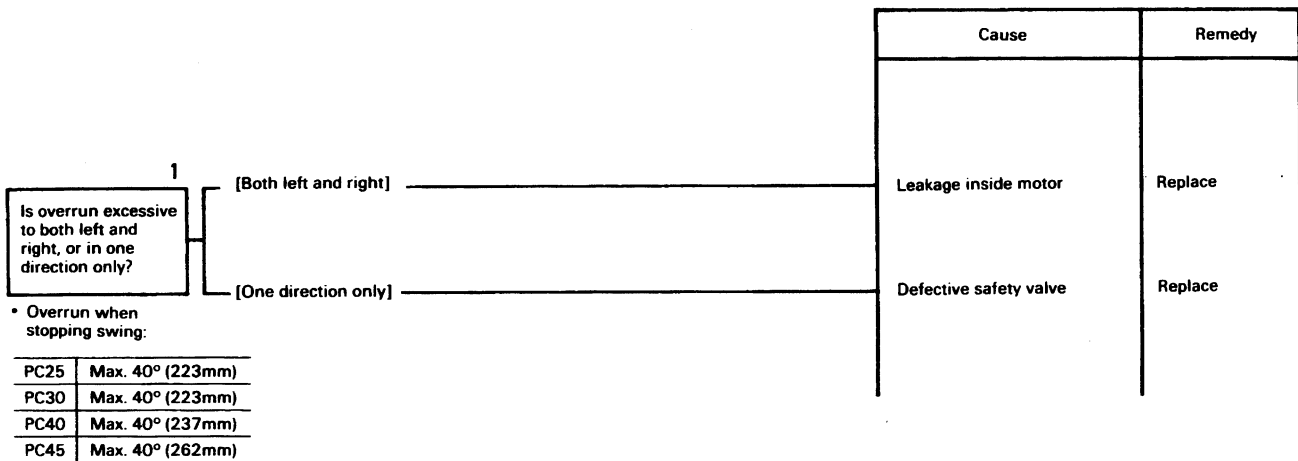
H-17 Swing speed is slow or acceleration is poor.

★ When other work equipment and travel speeds are normal. (If there is also deviation (to left) during normal travel, go first to "H-10 When machine is traveling, it deviates naturally to one side.")



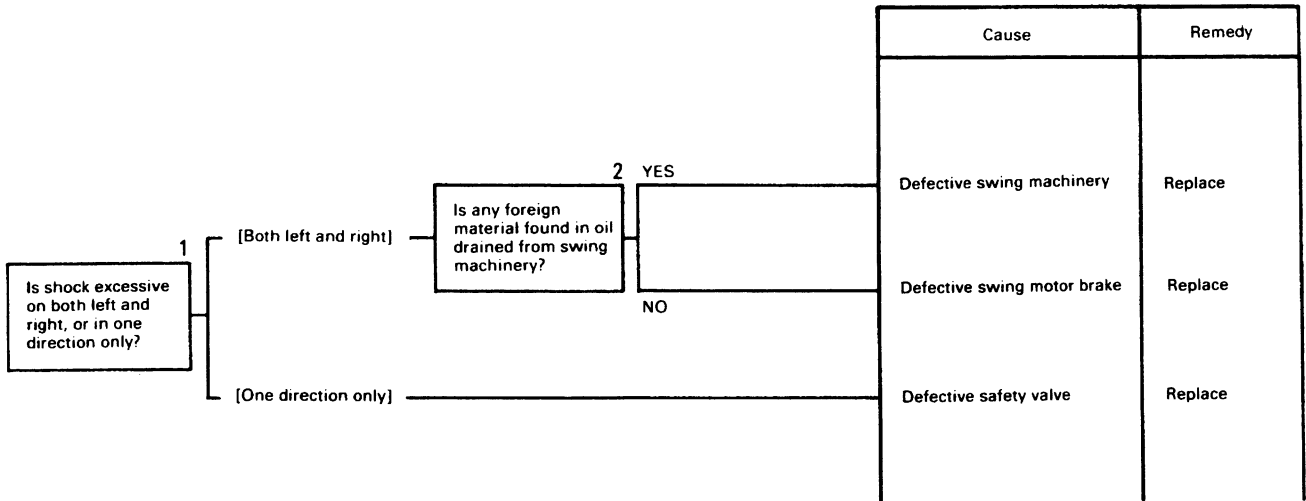
H-18 Excessive overrun when stopping swing.

★ If the speed is slow or the acceleration is poor, go first to H-17.



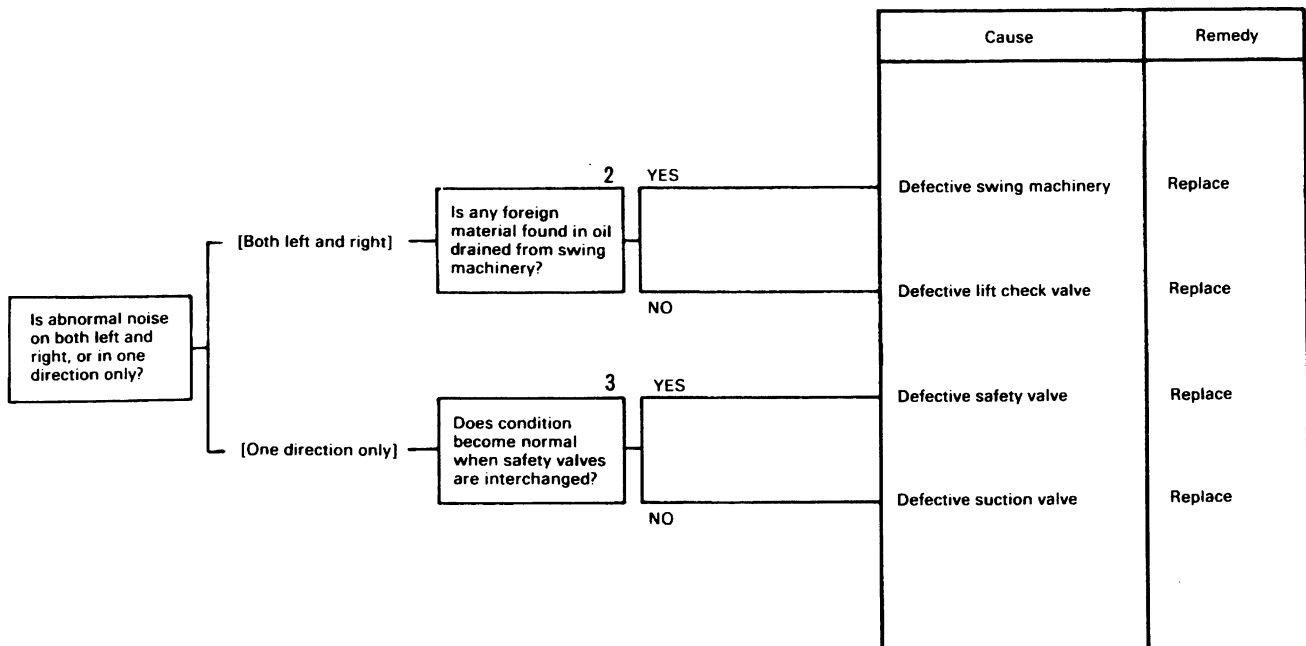
H-19 Excessive shock when stopping swing.

★ When the swing speed is normal.



H-20 Excessive abnormal noise when stopping swing.

★ When the swing speed is normal.



020S07

H-21 Excessive hydraulic drift of swing

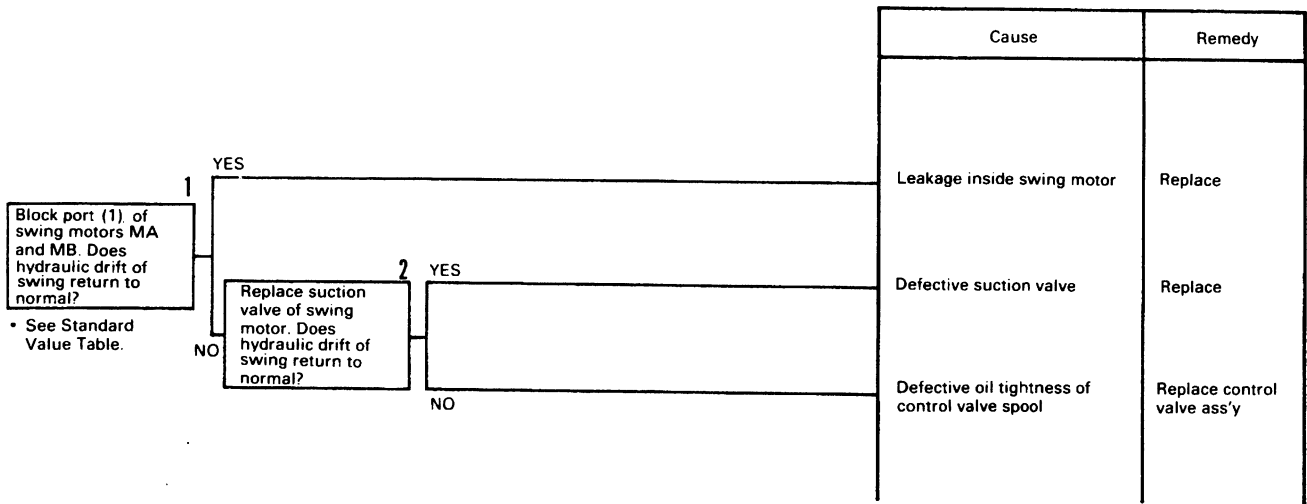
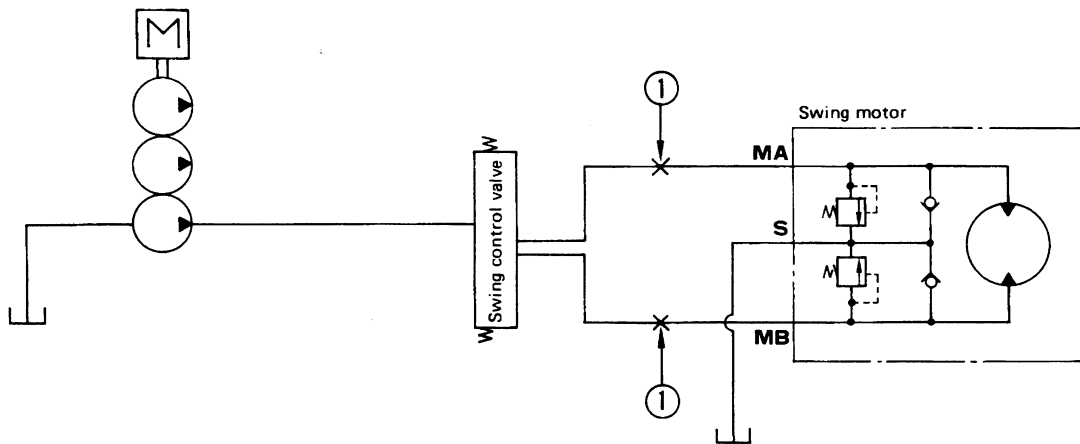


Fig. 1



20TF01166

H-22 Excessive hydraulic drift of boom swing

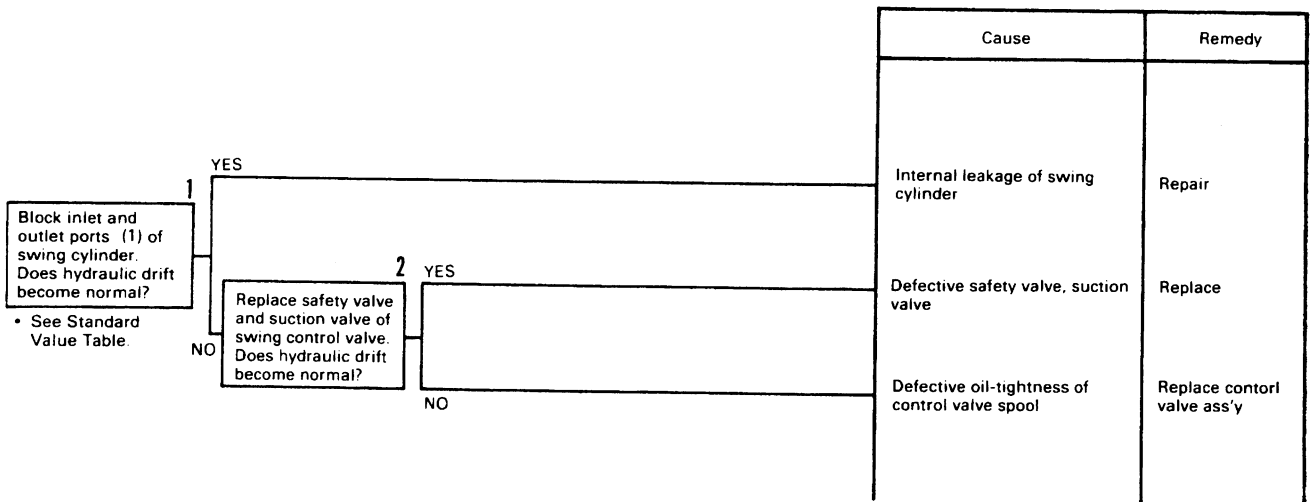
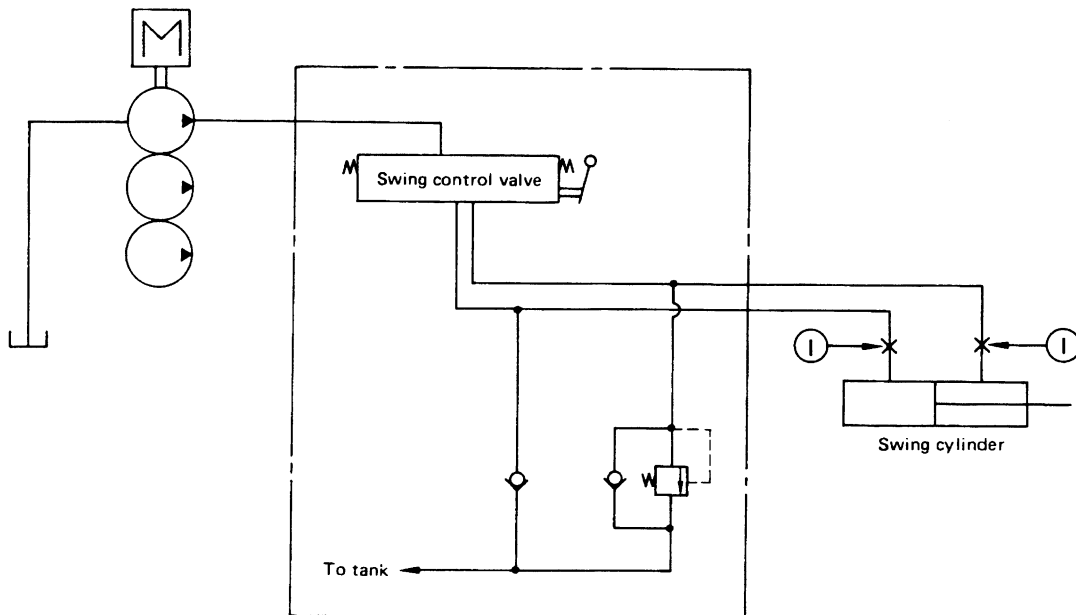


Fig. 1

UJ05UJ



20TF01167

TABLE OF FAILURE MODES AND CAUSES







★ Applicable to PC30, 45 only

Failure mode	Main pump		Control pump		Strainer	Control valve					Linkage (cable)	PPC valve	Swivel joint	Solenoid valve		Swing motor					Travel motor					Swing machinery	Hydraulic cylinder	Lift check valve	Engine system	Troubleshooting code																												
	Body	Locknut for setting horsepower ★	Body	Relief valve		Body	Main relief valve	Safety valve	Suction valve	Spool				PPC lock	Travel speed acceleration	Body	Internal leakage	Safety valve	Suction valve	Brake	Body	Internal leakage	Safety valve	Brake valve	Final dirve																																	
All work equipment, travel, and swing	All work equipment, travel, and swing speeds are slow																												<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>																				<input type="checkbox"/>	H- 1			
	Engine stalls or speed drops excessively																												<input type="checkbox"/>	<input type="checkbox"/>																									<input type="checkbox"/>	H- 2		
	Nothing moves																														<input type="checkbox"/>																											
	Speed is extremely slow (when the speed is far outside the permitted range)																												<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>																										
	Travel speed is normal or drop in speed is comparatively small																														<input type="checkbox"/>																											
	All work equipment, travel, and swing lack power																												<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>																					<input type="checkbox"/>	H- 4		
	Abnormal noise is generated																												<input type="checkbox"/>				<input type="checkbox"/>																									
Work equipment system	Work equipment (boom, arm, bucket) speeds are slow																																		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>																<input type="checkbox"/>	H- 6		
	Work equipment (boom, arm, bucket) lacks power																																		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>																			
	Excessive hydraulic drift																																		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>																<input type="checkbox"/>	H- 8		
	Excessive time lag																																		<input type="checkbox"/>																							
Travel system	Travel deviation	Deviates in same direction in both forward and reverse																												<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>																	<input type="checkbox"/>	H-10(a)		
		Deviates in different directions for forward and reverse																																			<input type="checkbox"/>			<input type="checkbox"/>															<input type="checkbox"/>			H-10(b)
		Excessive deviation when starting																																			<input type="checkbox"/>			<input type="checkbox"/>																		
	Lacks power when traveling (or speed is slow)																												<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>																		<input type="checkbox"/>	H-12		
	Travel speed does not switch																																																						<input type="checkbox"/>	H-13		
	Does not move (one side only)																																			<input type="checkbox"/>	<input type="checkbox"/>																	<input type="checkbox"/>			H-14	
	Travel lever is heavy																																			<input type="checkbox"/>	<input type="checkbox"/>																					
Swing system	Does not swing	Both left and right																																																				<input type="checkbox"/>				
		One side only																																																					<input type="checkbox"/>			
	Swing speed is slow or acceleration is poor	Both left and right																																																					<input type="checkbox"/>			
		One side only																																																					<input type="checkbox"/>			
	Excessive overrun when stopping swing	Both left and right																																																					<input type="checkbox"/>			
		One side only																																																					<input type="checkbox"/>			
	Excessive shock when stopping swing	Both left and right																																																					<input type="checkbox"/>			
		One side only																																																					<input type="checkbox"/>			
	Excessive abnormal noise when stopping swing	Both left and right																																																					<input type="checkbox"/>		<input type="checkbox"/>	
		One side only																																																					<input type="checkbox"/>			
Excessive hydraulic drift of swing																																																										
Excessive hydraulic drift of boom swing																																																										

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TROUBLESHOOTING OF MONITOR SYSTEM (M MODE)

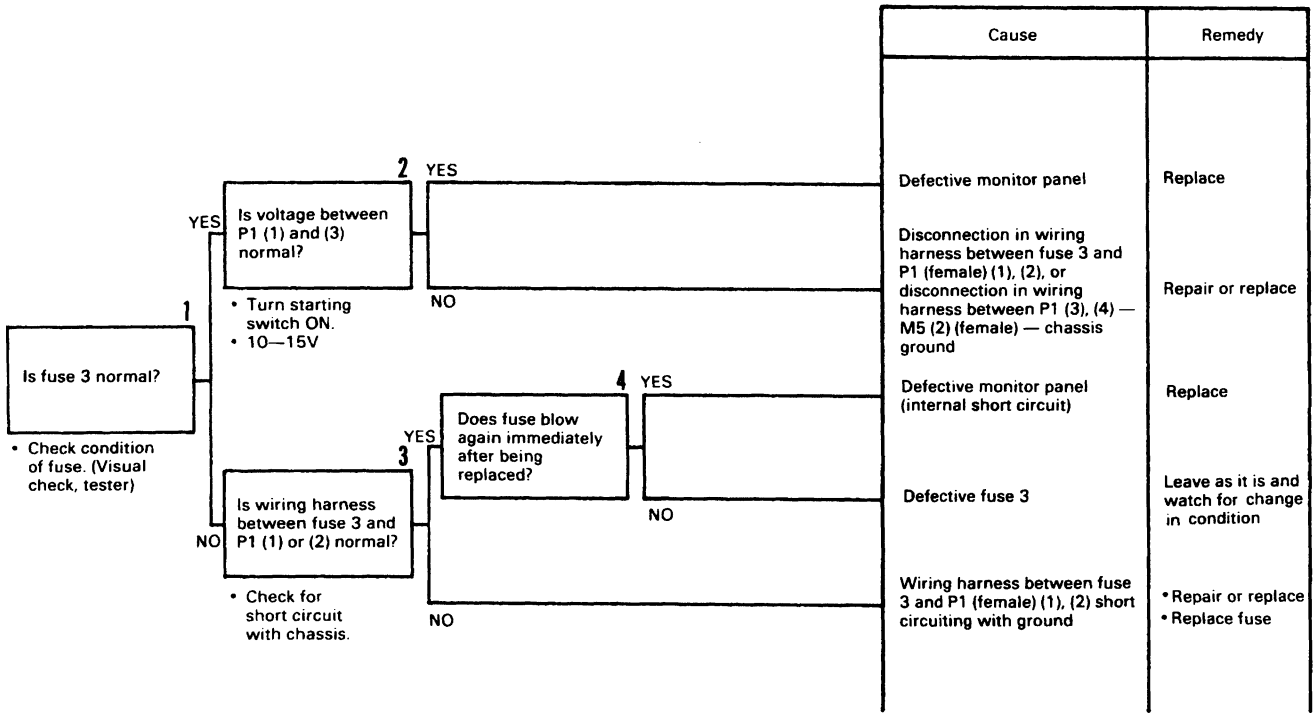
Failure mode

M-1	Monitor panel does not work	20-94
M-2	Monitor panel CAUTION and gauge lamps do not light up for 3 seconds after starting switches turned ON, or all lamps stay lighted up	20-95
M-3	 (Oil pressure caution lamp) does not light up when starting switch is turned ON (engine stopped)	20-96
M-4	 (Charge caution lamp) does not light up when starting switch is turned ON (engine stopped)	20-96
M-5	 (Preheating pilot lamp) does not light up when preheating	20-97
M-6	 (Engine oil level caution lamp) lights up when starting switch is turned ON (engine stopped) (Engine oil level is normal)	20-97
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M-9	Abnormality in coolant temperature gauge display	20-99
	a) After engine is started, gauge stays at lowest level and does not move	20-99
	b) After engine is started, level rises immediately	20-99
	Enters red range even when engine is not overheating	20-99
M-10	Abnormality in fuel gauge display	20-100
	a) All segments of fuel gauge go out	20-100
	b) Fuel level has gone down, but fuel gauge still gives FULL display, and does not go down	20-100
	c) Fuel gauge does not give FULL display even when fuel tank is filled	20-101
M-11	When starting switch is turned ON, buzzer does not sound for 1 second	20-101
M-12	Abnormality in service meter display	20-102
	a) Service meter does not move when engine is running	20-102
	b) Service meter pilot lamp does not flash	20-102
M-13	Night lighting does not light up	20-103
	a) When lamp switch is at position 1 or position 2, internal lighting of monitor (gauge portion) does not light up	20-103
	b) When lamp switch is at position 2, working lamp does not light up	20-103
M-14	Heater does not work when heater switch is operated (machines with cab specification)	20-104

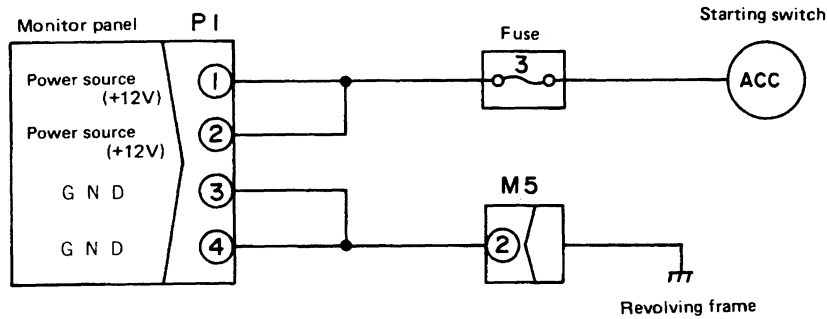
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M-1 Monitor panel does not work

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



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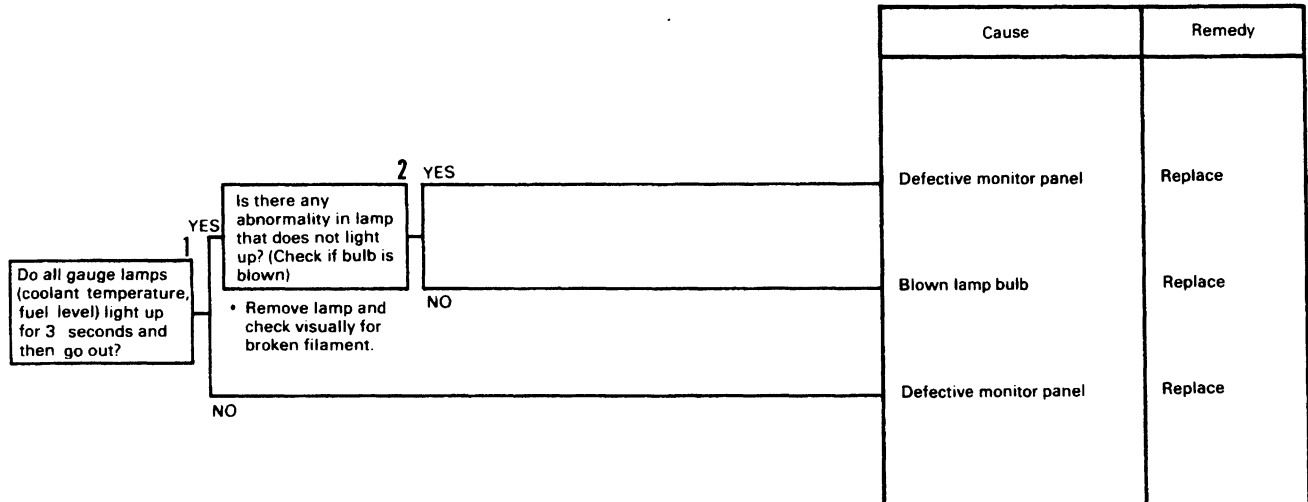


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M-2 Monitor panel CAUTION and gauge lamps do not light up for 3 seconds after starting switch is turned ON, or all lamps stay lighted up

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

a) Do not light up for 3 seconds.



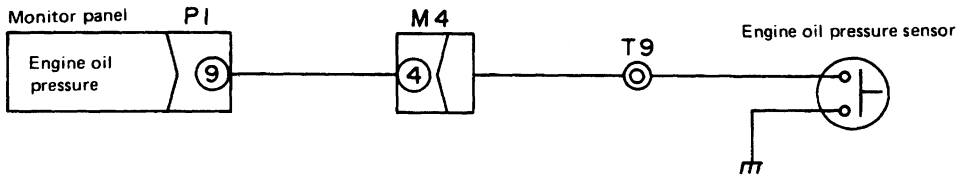
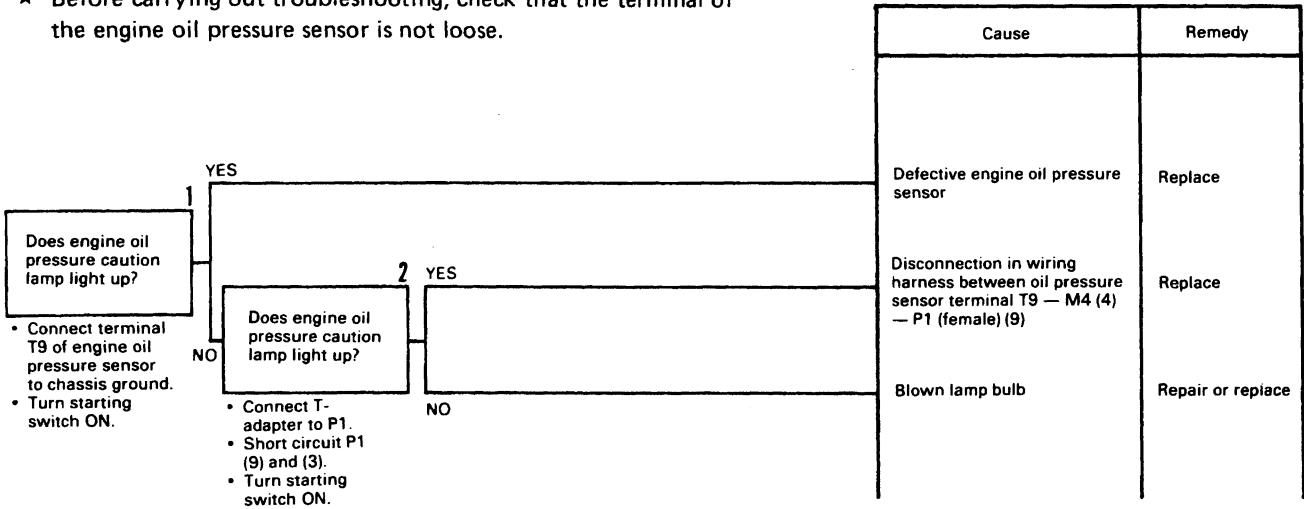
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b) All lamps stay lighted up.



M-3 (Oil pressure caution lamp) does not light up when starting switch is turned ON (engine stopped)

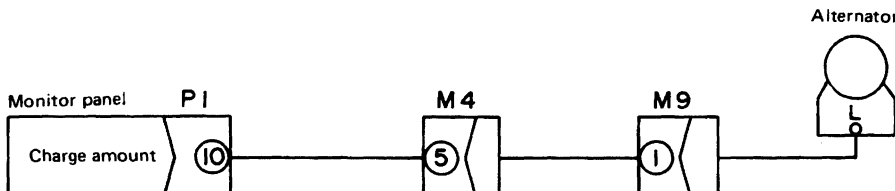
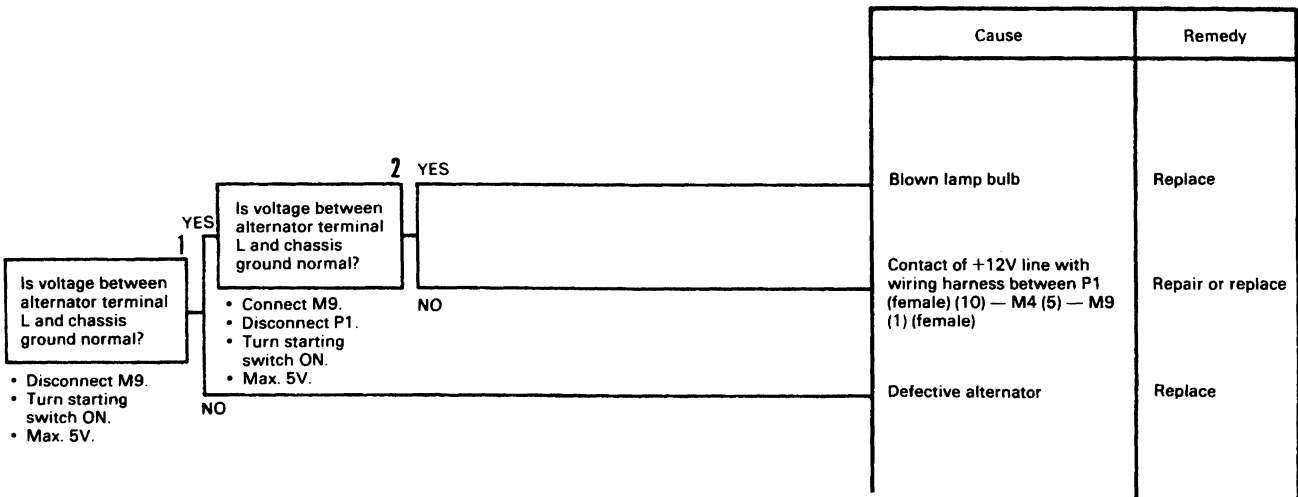
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.
- ★ Before carrying out troubleshooting, check that the terminal of the engine oil pressure sensor is not loose.



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M-4 (Charge caution lamp) does not light up when starting switch is turned ON (engine stopped)

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

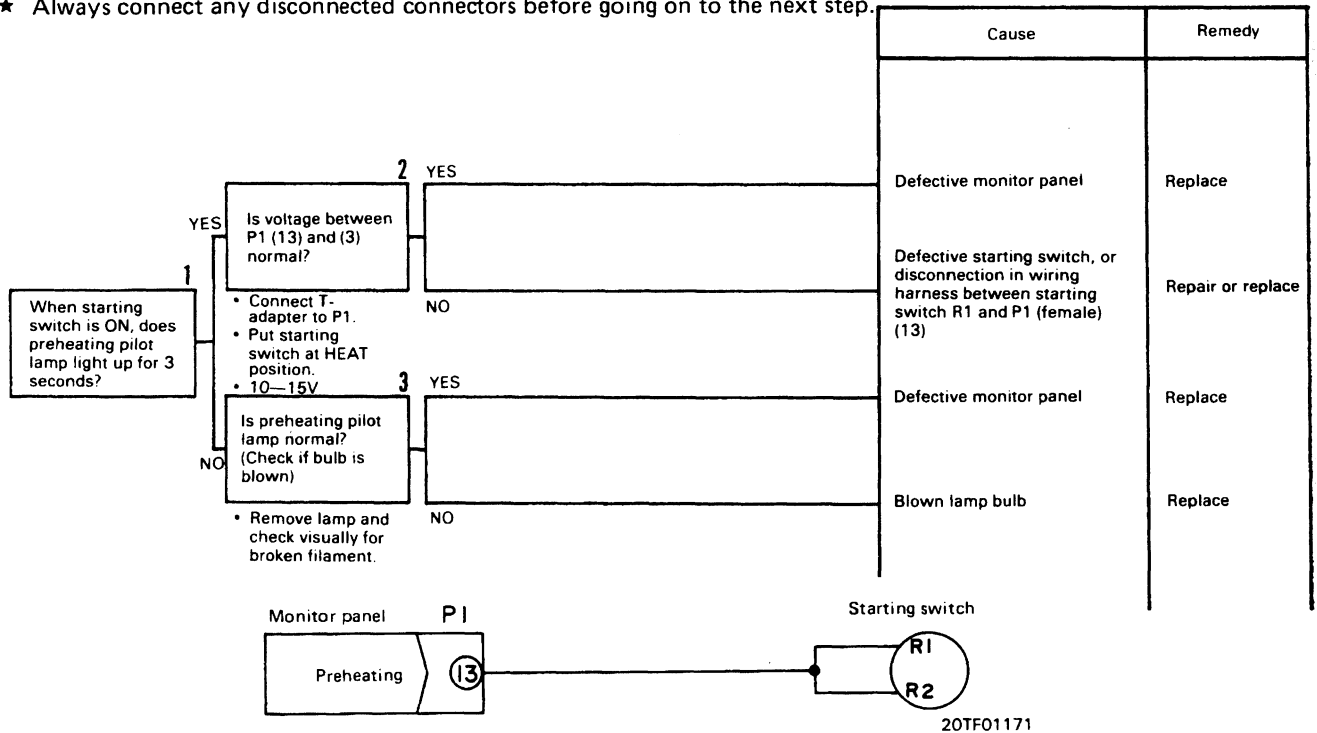


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M-5 (Preheating pilot lamp) does not light up when preheating

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

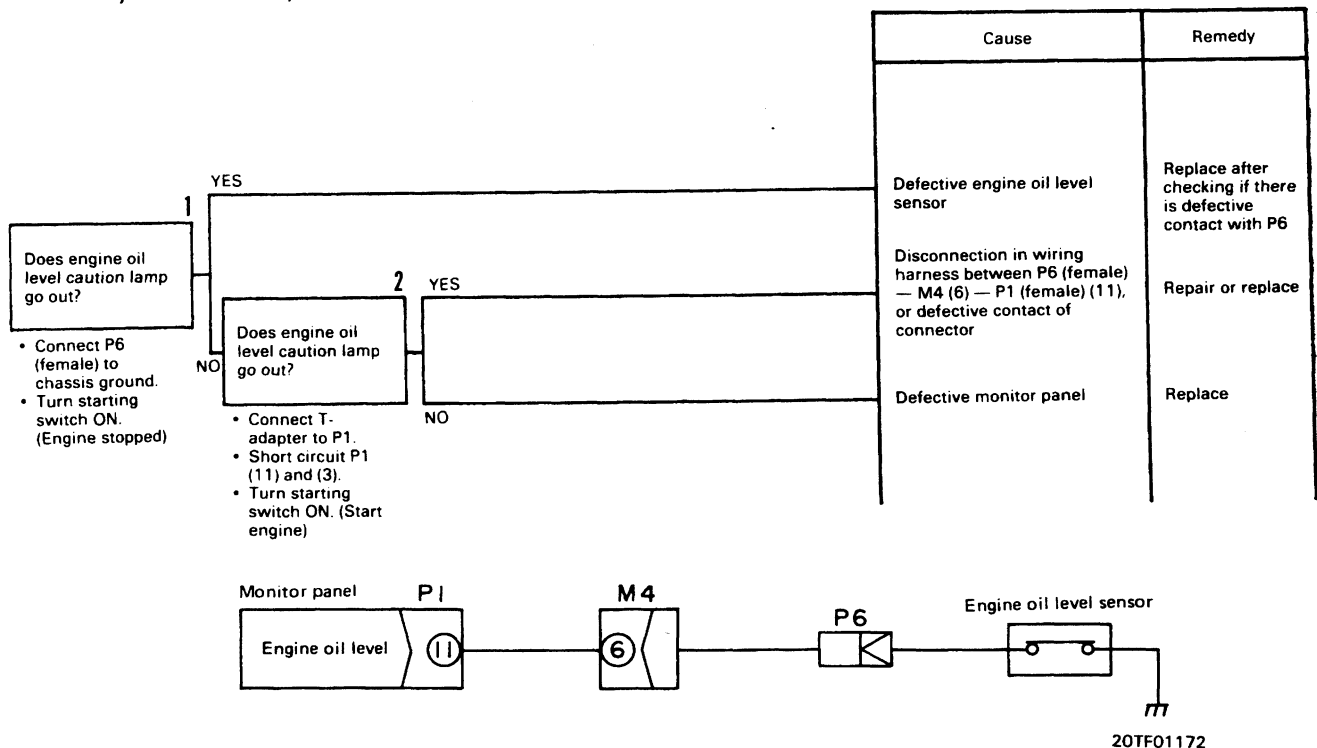


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M-6 (Engine oil level caution lamp) lights up when starting switch is turned ON (engine stopped) (Engine oil level is normal)

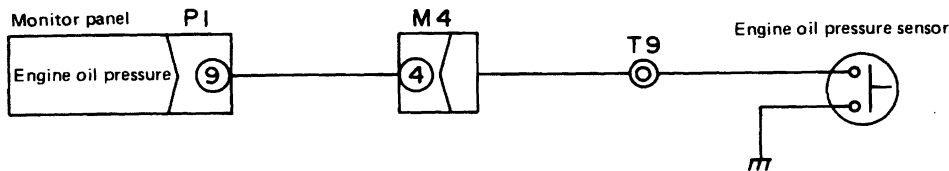
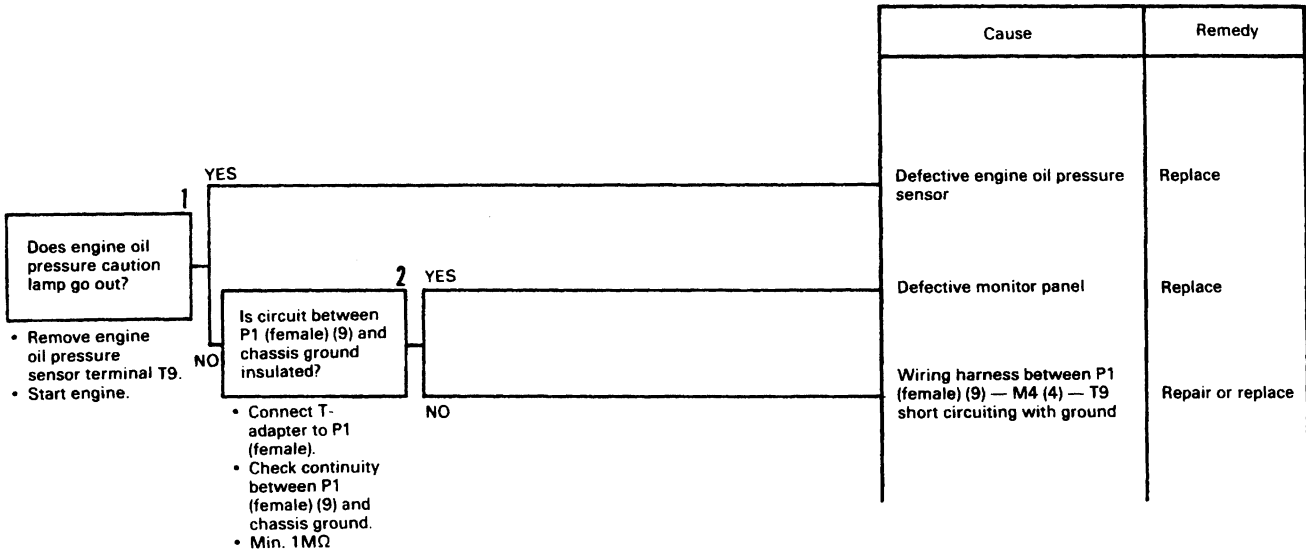
PC25-1 Serial No. 1001 - 6470 PC30-7 Serial No. 18001 - 26422
 PC40-7 Serial No. 18001 - 24521 PC45-1 Serial No. 1001 - 3505

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



M-7 (Engine oil pressure caution lamp) lights up when engine is running (Engine oil pressure is normal)

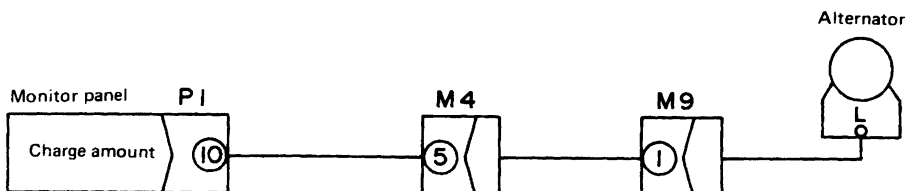
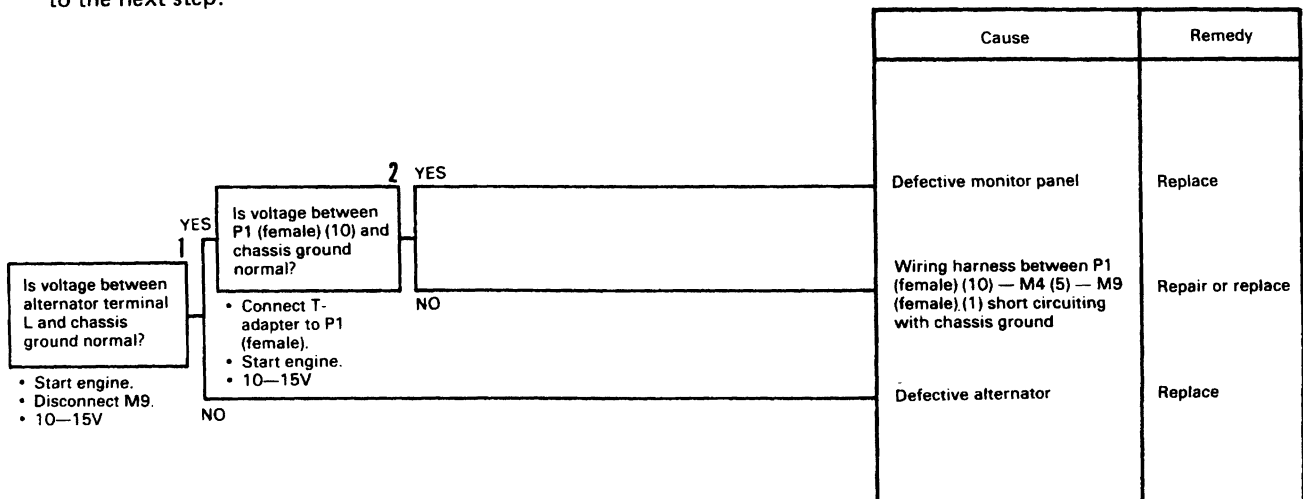
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



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M-8 (Charge caution lamp) lights up when engine is running

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

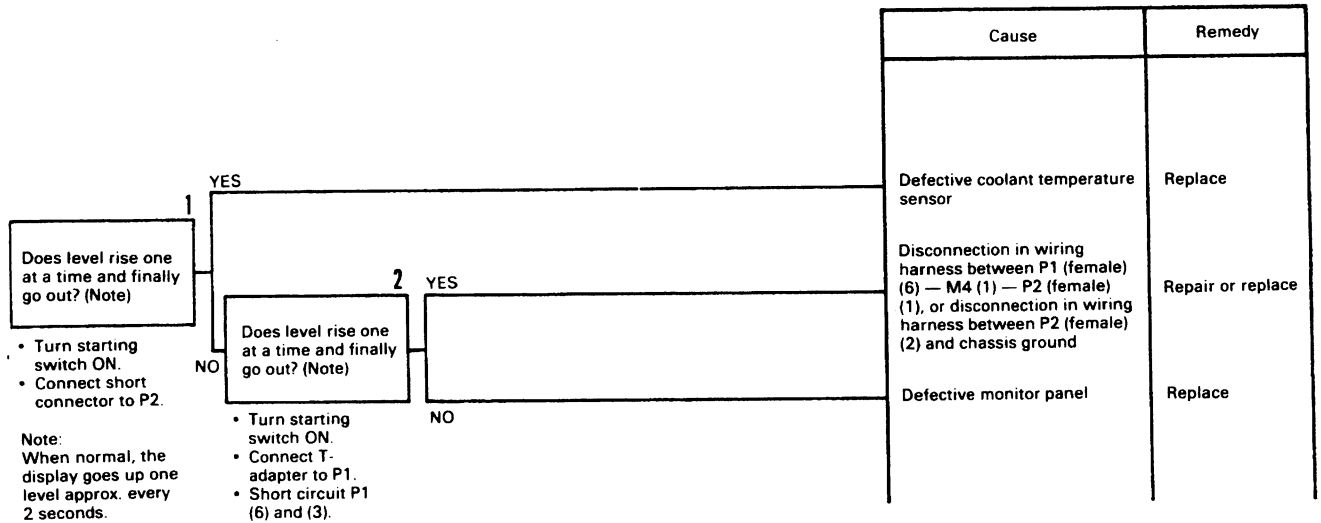


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M-9 Abnormality in coolant temperature gauge display

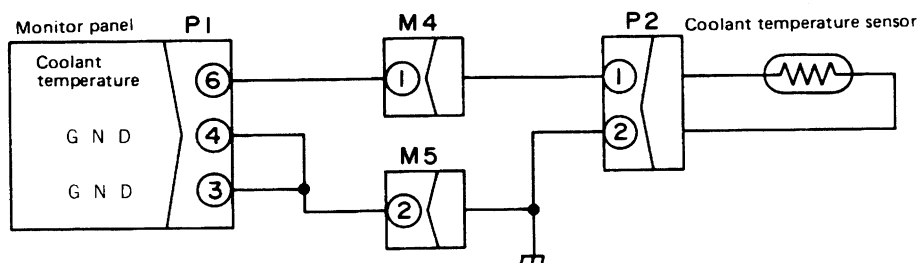
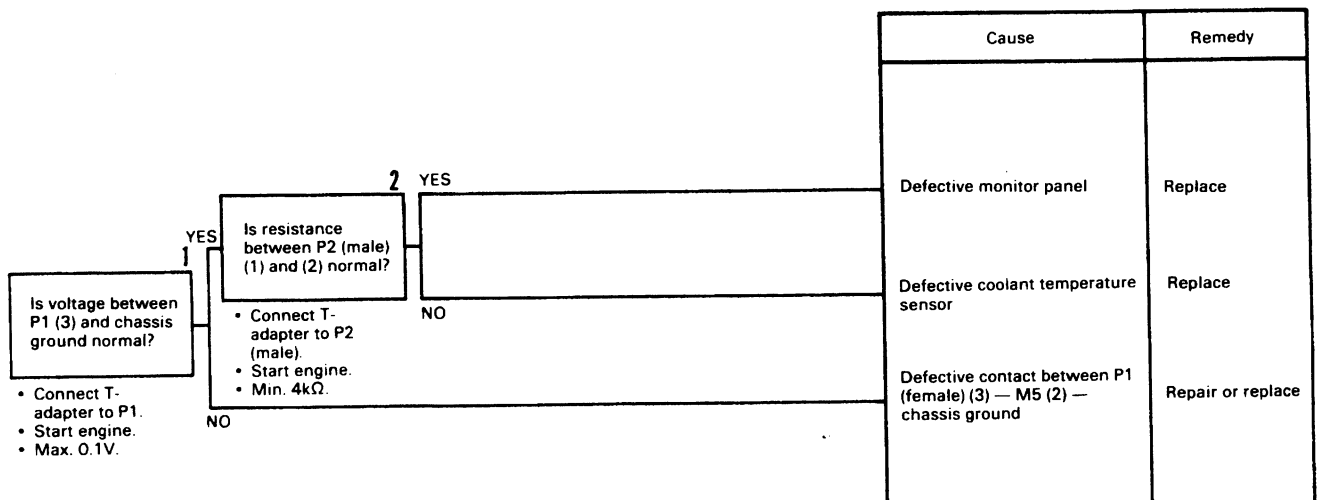
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

a) After engine is started, gauge stays at lowest level and does not move.



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b) After engine is started, level rises immediately.
Enters red range even when engine is not overheating.

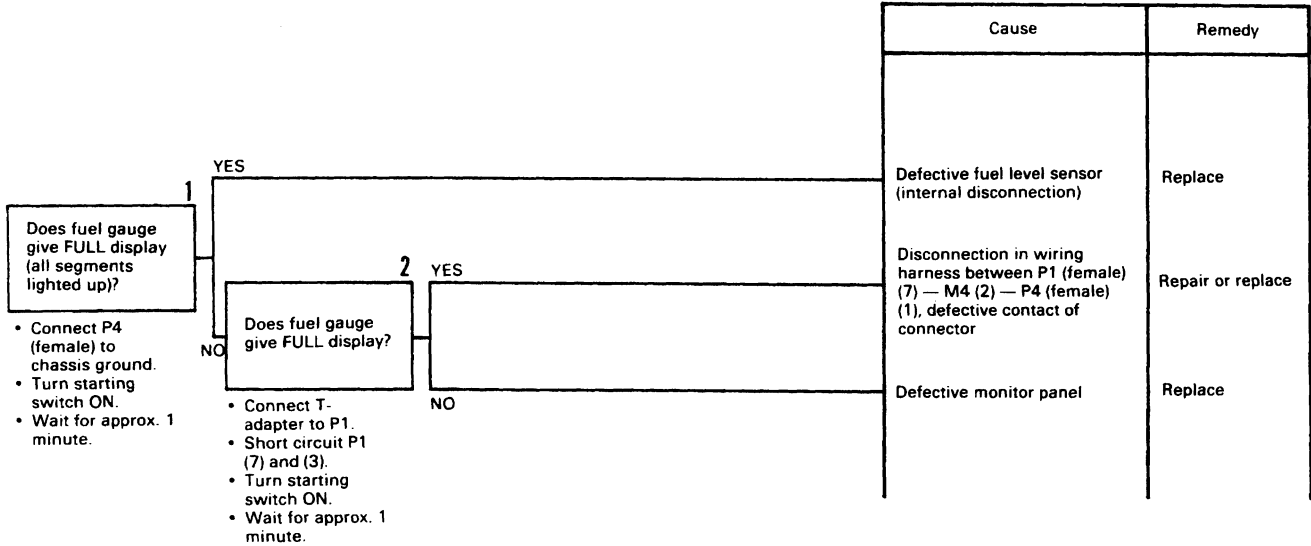


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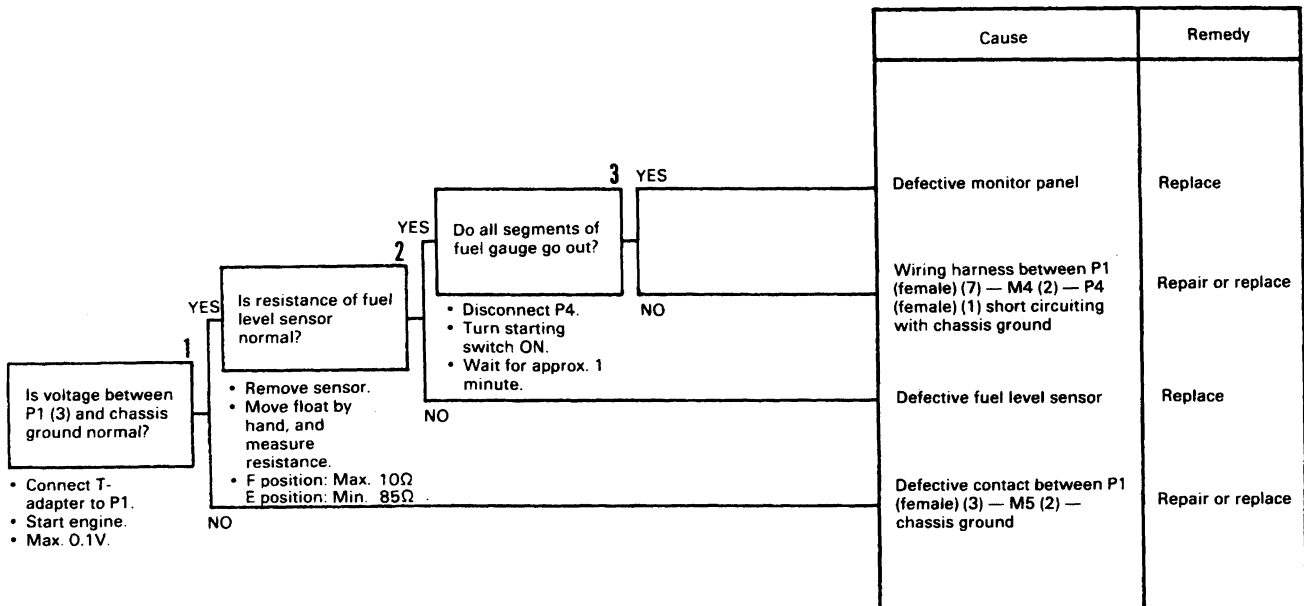
M-10 Abnormality in fuel gauge display

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

a) All segments of fuel gauge go out.



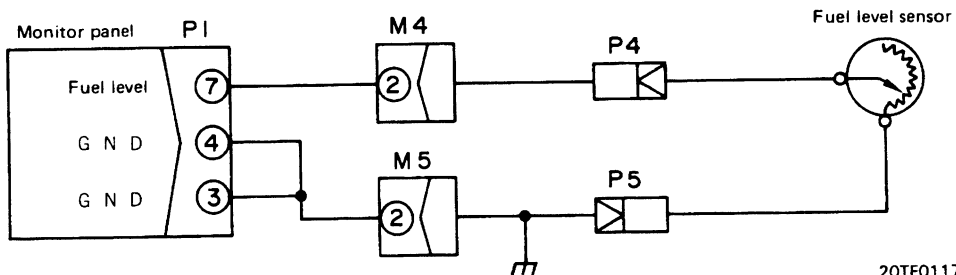
b) Fuel level has gone down, but fuel gauge still gives FULL display, and does not go down.



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c) Fuel gauge does not give FULL display even when fuel tank is filled.

		Cause	Remedy
<p>Is resistance of fuel level sensor normal?</p> <p>1 YES</p> <p>2 YES</p> <p>NO</p> <p>Is voltage between P1 (3) and chassis ground normal?</p> <p>• Connect T-adapter to P1.</p> <p>• Start engine.</p> <p>• Max. 0.1V</p> <p>• Remove sensor.</p> <p>• Move float by hand, and measure resistance.</p> <p>• F position: Max. 10Ω</p> <p>• E position: Min. 85Ω</p>	YES	Defective monitor panel	Replace
	NO	Defective contact between P1 (female) (3) — M5 (2) — chassis ground	Repair or replace
	NO	Defective fuel level sensor	Replace



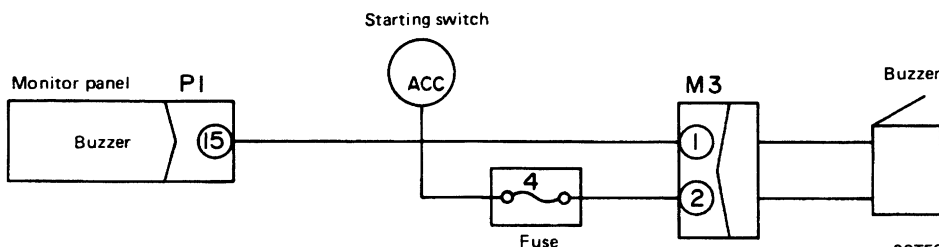
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M-11 When starting switch is turned ON, buzzer does not sound for 1 second

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

		Cause	Remedy
<p>Does buzzer sound?</p> <p>1 YES</p> <p>NO</p> <p>• Connect T-adapter to P1 (female).</p> <p>• Short circuit P1 (female) (15) and (3).</p> <p>• Turn starting switch ON.</p>	YES	Defective monitor panel	Replace
	NO	Defective buzzer, or disconnection in wiring harness between P1 (female) (15) and M3 (female) (1), or disconnection in wiring harness between M3 (female) (2) and fuse 4	Repair or replace

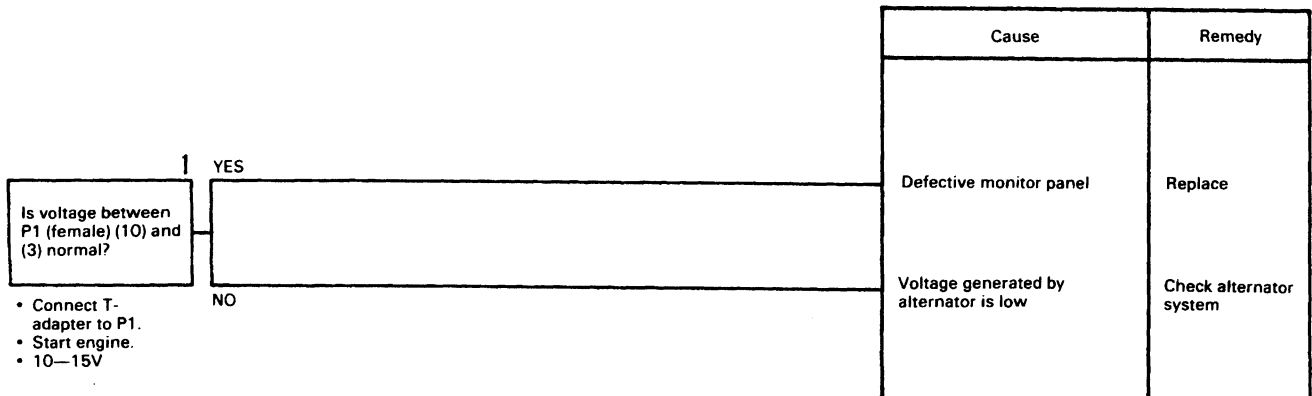


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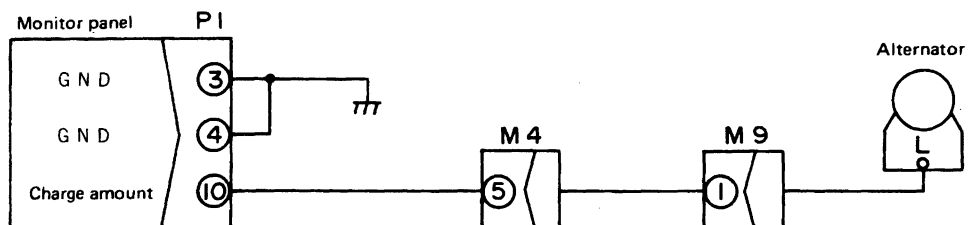
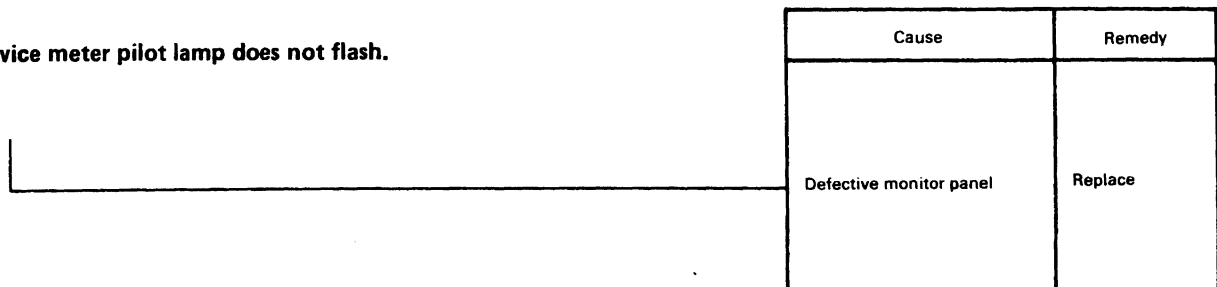
M-12 Abnormality in service meter display

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

a) Service meter does not move when engine is running.



b) Service meter pilot lamp does not flash.



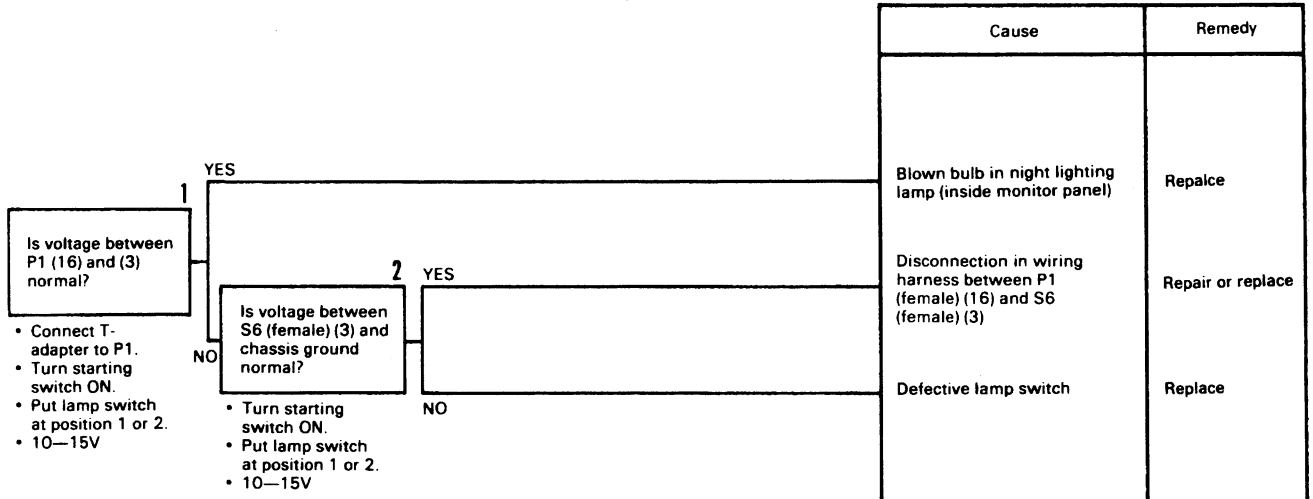
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M-13 Night lighting does not light up

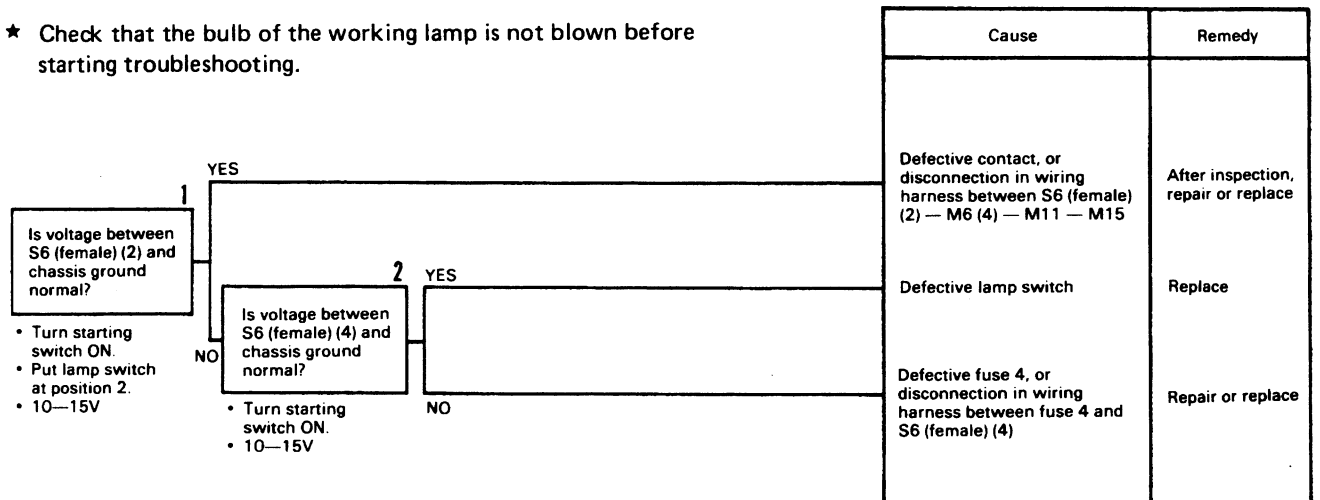
- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.

a) When lamp switch is at position 1 or position 2, internal lighting of monitor (gauge portion) does not light up.

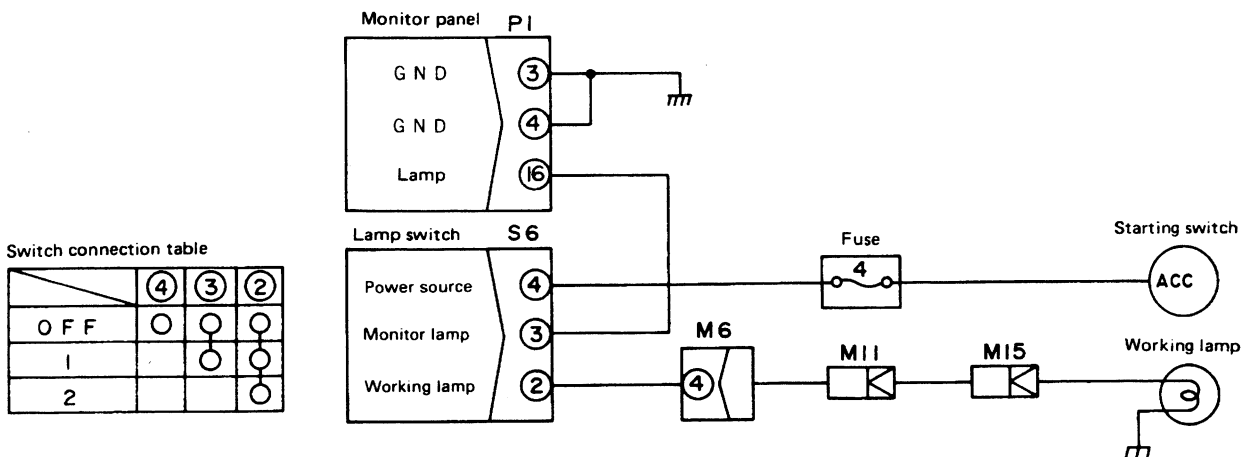


b) When lamp switch is at position 2, working lamp does not light up.

- ★ Check that the bulb of the working lamp is not blown before starting troubleshooting.



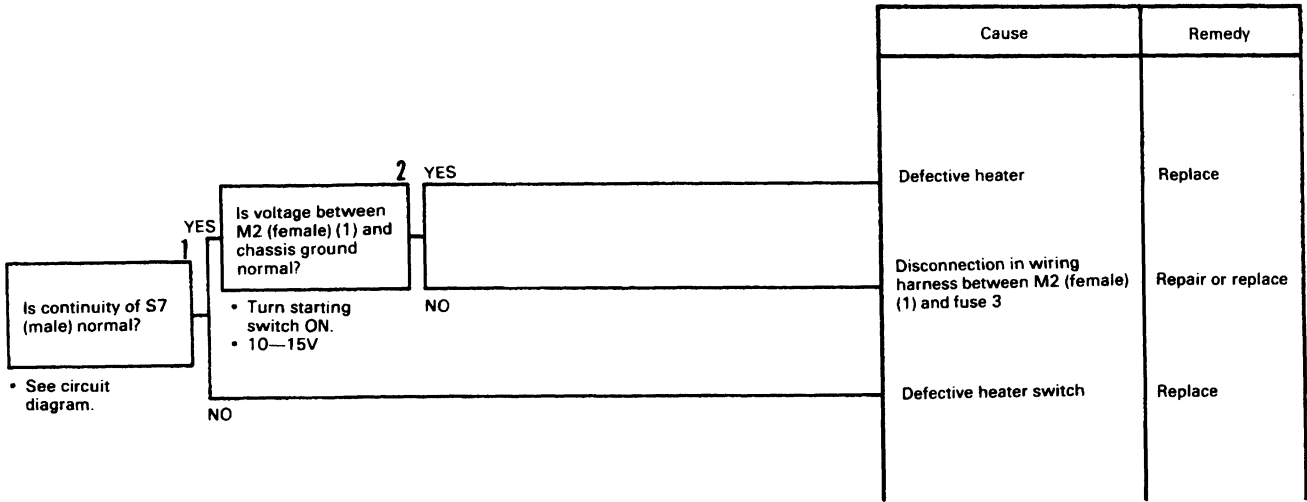
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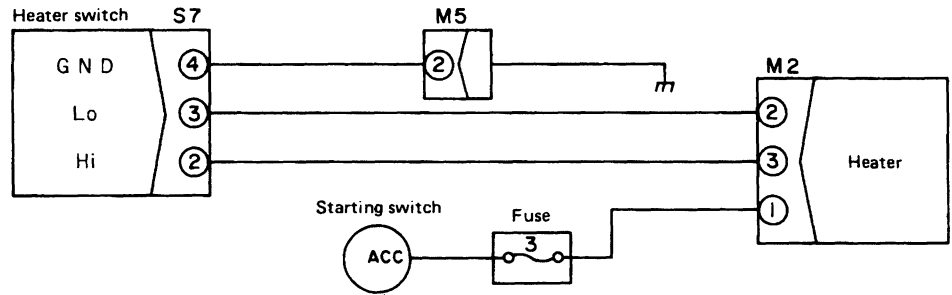
M-14 Heater does not work when heater switch is operated (machines with cab specification)

- ★ Before carrying out troubleshooting, check that all the related connectors are properly inserted.
- ★ Always connect any disconnected connectors before going on to the next step.



Switch connection table

	④	③	②
OFF	○	○	○
Lo		○	○
Hi			○



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TROUBLESHOOTING OF HYDRAULIC BREAKER

No.	Problem	Main causes	Remedy
1.	Does not start (or does not start immediately)	<ul style="list-style-type: none"> Excessive sliding resistance of U-packing due to damage to U-packing Excessive sliding resistance of piston due to natural hardening of U-packing in cold temperatures Damage to valve and valve sleeve, valve liner Damage to sliding portion of cylinder and piston 	<ul style="list-style-type: none"> Replace U-packing Push in chisel and push out piston Use oilstone and sandpaper to remove damage Use oilstone and sandpaper to remove damage
2.	Sometimes stops moving during operation	<ul style="list-style-type: none"> Damage to cylinder and piston, cylinder sleeve and valve, valve liner, valve sleeve 	<ul style="list-style-type: none"> Use oilstone and sandpaper to remove damage (If the damage is not corrected quickly it will become impossible to repair)
3.	Irregularity in movement	<ul style="list-style-type: none"> Improper charging pressure of gas in gas cushion chamber Shank bushing wear has exceeded limit Wear, damage to cylinder and piston, cylinder sleeve and valve, valve liner, valve sleeve 	<ul style="list-style-type: none"> Adjust pressure of gas Replace shank bushing Use oilstone and sandpaper to remove damage (It is important to correct the damage quickly)
4.	Reduction in impact frequency, drop in impact force	<ul style="list-style-type: none"> Improper charging pressure of gas in gas cushion chamber Shank bushing wear has exceeded limit Wear, damage, deformation of impact surface of piston, or shank, impact receiving surface, tip of chisel Wear, damage to cylinder and piston, cylinder sleeve and valve, valve liner, valve sleeve 	<ul style="list-style-type: none"> Adjust pressure of gas Replace shank bushing Replace piston, replace chisel (replace with genuine parts) Use oilstone and sandpaper to remove damage, or replace

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30 DISASSEMBLY AND ASSEMBLY

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METHOD OF USING MANUAL	30- 2	RECOIL SPRING	
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VALUE TABLE	30- 7	7-SPOOL CONTROL VALVE	
LUBRICANT AND COOLANT TABLE	30- 8	Disassembly	30-24
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Assembly	30-11-22	Removal	30-34
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Assembly	30-13	HYDRAULIC BREAKER	
TRAVEL MOTOR		Removal	30-36
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Assembly	30-13-7	HYDRAULIC BREAKER	
SWING MOTOR		Disassembly	30-37
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SWING MACHINERY		Removal	30-44
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Assembly	30-16	CHISEL	
REVOLVING FRAME		Removal	30-45
Removal	30-18	Installation	30-45
Installation	30-18		

★ Take the following method for air bleeding when you start to operate hydraulic cylinders after reassembling cylinders, pumps and pipings.

1. Start engine, keep idling.
2. Operate hydraulic cylinder 4 — 5 cycles, but do not exceed beyond 100 mm of stroke end.
3. Continue to operate cylinder 3 — 4 cycles until stroke end.
4. After finishing above steps, keep normal engine speed.



NOTE: After long storage, same procedure is required.

METHOD OF USING MANUAL

1. When removing or installing unit assemblies

- (1) When removing or installing a unit assembly, the order of work and techniques used are given for the removal operation; the order of work for the installation operation is not given.
- (2) Any special techniques applying only to the installation procedure are marked ※ 1, and the same mark is placed after the relevant step in the removal procedure to indicate which step in the installation procedure it applies to.

(Example)




REMOVAL OF ○○○ ASSEMBLY	Title of operation
	Precautions related to safety when carrying out the operation
1. XXXX (1)	Step in operation
★	Technique or important point to remember when removing XXXX (1).
2. △ △ △ (2):	※ 1 Indicates that a technique is listed for use during installation
3. □ □ □ □ assembly (3)	
	See Lubricant and Coolant Table
INSTALLATION OF ○○○ ASSEMBLY	Title of operation
• Carry out installation in the reverse order to removal.	
※ 1	Technique used during installation
★	Technique or important point to remember when installing △ △ △ (2).
• Adding water, oil	Step in operation
★	Point to remember when adding water or oil

2. General precautions when carrying out installation or removal (disassembly or assembly) of units are given together as PRECAUTIONS WHEN CARRYING OUT OPERATION, so be sure to follow these precautions when carrying out the operation.

3. Listing of special tools

- (1) For details of the description, part number, and quantity of any tools (A₁, etc.) that appear in the operation procedure, see the SPECIAL TOOLS LIST given in this manual.

4. Listing of tightening torque, weight, refill amount for oil and water

- (1) If symbols such as , , or  appear in the operation procedure, See TIGHTENING TORQUES AND STANDARD VALUES TABLE, MAINTENANCE STANDARD TABLE, WEIGHT TABLE, and LUBRICANT AND COOLANT TABLE for details of the values.

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PRECAUTIONS WHEN CARRYING OUT OPERATION

[When carrying out removal or installation (disassembly or assembly) of units, be sure to follow the general precautions given below when carrying out the operation.]

1. Precautions when carrying out removal work

- If the coolant contains antifreeze, dispose of it correctly.
- After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
- When draining oil, prepare a container of adequate size to catch the oil.
- Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
- Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- Check the number and thickness of the shims, and keep in a safe place.
- When raising components, be sure to use lifting equipment of ample strength.
- When using forcing screws to remove any components, tighten the forcing screws alternately.
- Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.

★ Precautions when handling piping during disassembling

Fit the following blind plugs into the piping after disconnecting it during disassembly operations.

1) Hoses and tubes using sleeve nuts

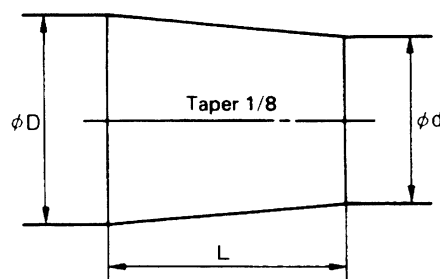
Nominal number	Plug (nut end)	Sleeve nut (elbow end) Use the two items below as a set
02	07376-50210	07221-20210 (Nut), 07222-00210 (Plug)
03	07376-50315	07221-20315 (Nut), 07222-00312 (Plug)
04	07376-50422	07221-20422 (Nut), 07222-00414 (Plug)
05	07376-50522	07221-20522 (Nut), 07222-00515 (Plug)
06	07376-50628	07221-20628 (Nut), 07222-00616 (Plug)
10	07376-51034	07221-21034 (Nut), 07222-01018 (Plug)
12	07376-51234	07221-21234 (Nut), 07222-01219 (Plug)

2) Split flange type hoses and tubes

Nominal number	Flange (hose end)	Sleeve head (tube end)	Split flange
04	07379-00400	07378-10400	07371-30400
05	07379-00500	07378-10500	07371-30500

3) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Part number	Dimensions		
		D	d	L
06	07049-00608	6	5	8
08	07049-00811	8	6.5	11
10	07049-01012	10	8.5	12
12	07049-01215	12	10	15
14	07049-01418	14	11.5	18
16	07049-01620	16	13.5	20
18	07049-01822	18	15	22
20	07049-02025	20	17	25
22	07049-02228	22	18.5	28
24	07049-02430	24	20	30
27	07049-02734	27	22.5	34



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2. Precautions for installation operations

- Tighten all bolts and nuts (sleeve nuts) to the specified (KES) torque.
- Install the hoses without twisting or interference.
- Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
- Bend the cotter pin or lock plate securely.
- When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2 – 3 drops of adhesive.
- When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
- Clean all parts, and correct any damage, dents, burrs, or rust.
- Coat rotating parts and sliding parts with engine oil.
- When press fitting parts, coat the surface with antifriction compound (LM-P).
- After fitting snap rings, check that the snap ring is fitted securely in the ring groove.
- When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.
- When using eyebolts, check that there is no deformation or deterioration, screw them fully, and align the direction of the hook.
- When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.
- ★ If any hydraulic piping or equipment, such as the pump, control valve, or cylinder, have been removed for repair, or the hydraulic oil has been changed, or if an attachment has been newly installed, always bleed the air when assembling. For details, see TESTING AND ADJUSTING, BLEEDING AIR FROM HYDRAULIC CIRCUIT.

3. Precautions when completing the operations

- If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.
- If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.
 - ★ For details, see TESTING AND ADJUSTING, Bleeding air.
- Add the specified amount of grease (molybdenum disulphide grease) to the work equipment related parts.

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SPECIAL TOOL LIST

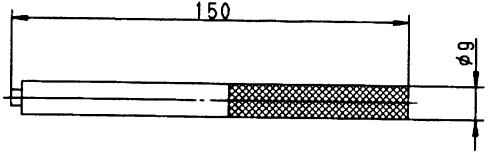
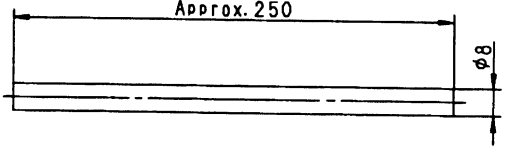
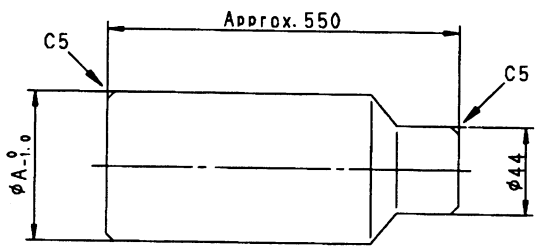
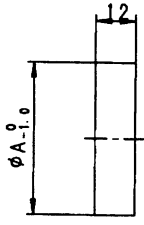
Nature of work	Symbol	Part No.	Part Name	Model, Q'ty				Remarks	
				PC25	PC30	PC40	PC45		
Disassembly, assembly of swing machinery assembly	A	1	796-112-1110	Push tool	1	1	1	1	Removal, installation of spacer
		2	795-630-1803	Torque wrench	1	1	1	1	Measurement starting torque of shaft
			796-730-2150	Wrench	1	1	1	1	
			793-615-1120	Bolt	1	1	1	1	
Disassembly, assembly of recoil spring assembly	B	792-371-1400	Sleeve	1	1	1	1		
Disassembly, assembly of hydraulic cylinder assembly	1	790-502-1003	Cylinder repair stand	1	1	1	1		
		790-101-1102 or 790-102-1100	Pump Power wrench	1	1	1	1		
		790-442-2871	Bracket	1	1	1	1		
		790-445-3590	Pin	2	2	2	2		
	2	790-330-1100 or 790-102-3802	Multi-wrench	1	1	1	1	Removal, installation of cylinder head assembly	
		3	790-102-1520	Adapter (46 mm)	1				Boom, arm, bucket, swing
					1			Boom, bucket, swing	
	790-302-1270		Socket (50 mm)		1				Blade
						1			Blade, arm
							1		Bucket
								1	
	4	790-302-1280	Socket (55 mm)				1	All cylinders	
		790-720-1000	Expander	1	1	1	1	Expansion of piston ring	
	5	796-720-1740 07281-00809	Ring Clamp	1				Bucket	
		796-720-1640 07281-00909	Ring Clamp		1			Arm, boom	
						1	1	Arm, bucket	
							1	Bucket	
		796-720-1650 07281-01029	Ring Clamp		1				Swing, blade
						1			Boom, swing, blade
							1		Boom, swing
							1	1	Boom, arm, swing
796-720-1660 07281-01159	Ring Clamp			1	1	Blade			

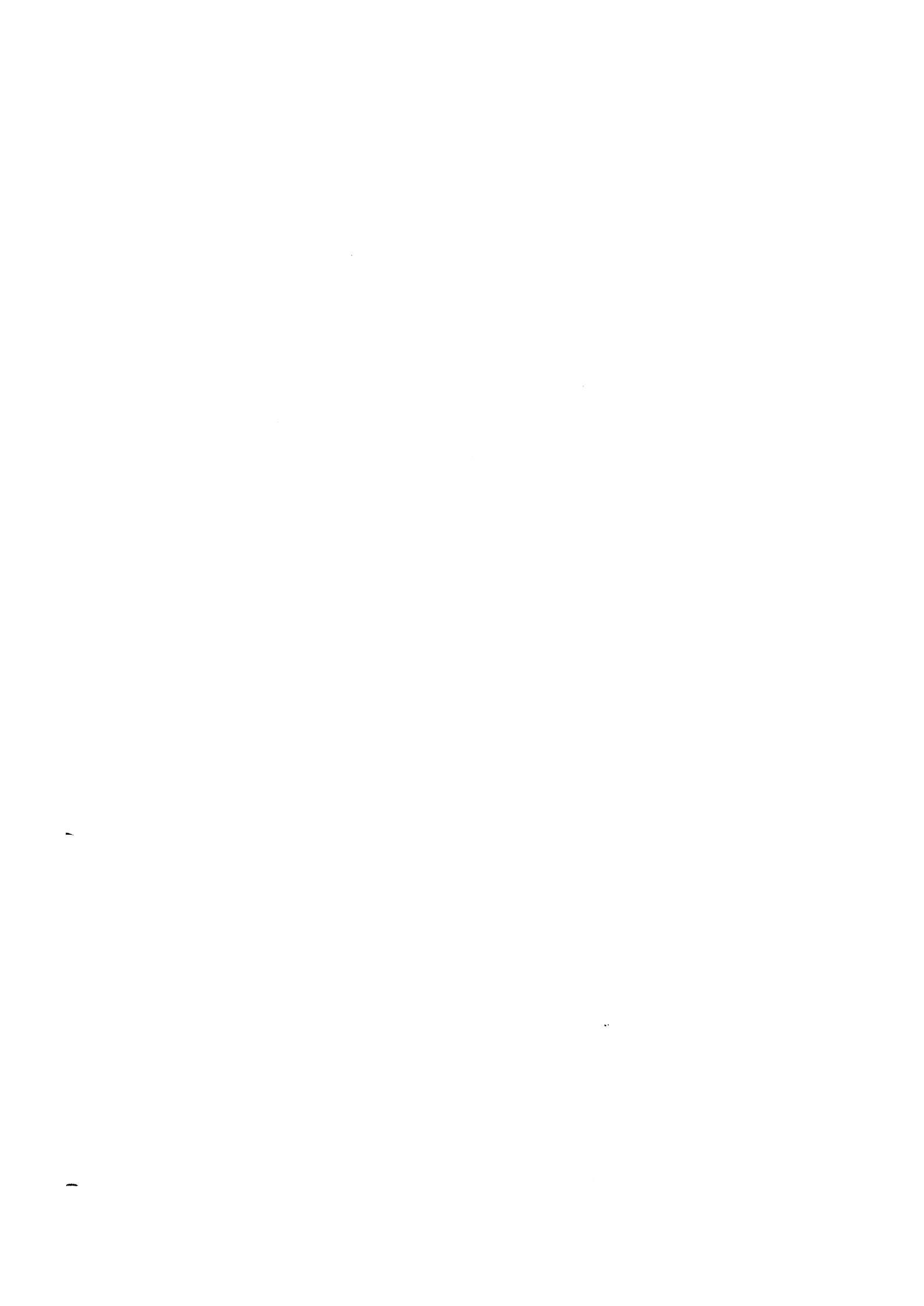
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Nature of work	Symbol	Part No.	Part Name	Model, Q'ty				Remarks	
				PC25	PC30	PC40	PC45		
Disassembly, assembly of swing motor assembly	D	1	791-420-2110	Plate	1	1	1	1	Removal of sub bearing
		796-126-1150	Plate	1	1	1	1		
		791-415-2121	Bolt	1	1	1	1		
		177-54-13912	Bolt	1	1	1	1		
		01580-01613	Nut	2	2	2	2		
		01643-31645	Washer	2	2	2	2		
	2	790-445-3880	Push tool	1	1	1	1	Removal, installation of spring of cylinder block	
	3	790-101-5081	Plate	1	1	1	1	Press fitting of bearing outer race	
		790-101-5021	Grip	1	1	1	1		
		01010-50816	Bolt	1	1	1	1		
	4	790-101-5051	Plate	1	1	1	1	Press fitting of oil seal	
		790-101-5021	Grip	1	1	1	1		
		01010-50816	Bolt	1	1	1	1		
	5	796-126-1140	Push tool	1	1	1	1	Press fitting of main bearing	
	6	796-126-1130	Push tool	1	1	1	1	Press fitting of sub bearing	
	7	796-720-3510	Wrench	1	1	1	1	Measurement of rotat- ing torque of shaft	
		793-615-1120	Bolt	1	1	1	1		
795-630-1803		Torque wrench	1	1	1	1			
Disassembly, assembly of hydraulic pump assembly	E	1	796-160-1110	Bolt		2		2	Removal, installation of cover
		01580-00806	Nut		2		2		
Disassembly, assembly of travel motor assembly	F	1	790-445-4160	Eye bolt				2	Lifting of motor assembly
		2	790-501-5000 or 790-501-5200	Repair stand				1	
			790-901-2110	Bracket				1	
			790-901-4211	Plate				1	
	3	79G-05V-1700	Bar				1	Removal of ring	
	4	79G-05V-0500L 79G-05V-0501L 79G-05V-0502L	Remover • Plate • Bolt				1 1 2	Removal of cover	
		790-201-3230	Bolt				2		
5	790-445-3990	Eye bolt					2		

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Nature of work	Symbol	Part No.	Part Name	Model, Q'ty				Remarks	
				PC25	PC30	PC40	PC45		
Disassembly, assembly of travel motor assembly	F	6	79G-05V-0700L	Spatula				1	Removal of timing plate and bearing outer race
		7	79G-05V-0501	Push tool				1	Disassembly, assembly of cylinder block
		8	79G-05V-0201L	Push tool				1	Removal of bearing
		9	799-301-1600	Oil leak tester				1	Removal of piston
		10	79G-05V-0100L 79G-05V-0101L 01252-31480 01252-31420	Fixture • Plate • Bolt • Bolt				2 1 1 1	Fixation of hub and spindle
		11	79G-05V-1300	Bar				1	Removal of collar and bearing outer race
		12	79G-05V-0600L	Push tool				1	Removal of bearing inner race
		13	79G-05V-1500	Bar				1	Removal of regulator valve
		14	79G-05V-1400	Bar				1	Installation of regulator valve
		15	79G-05V-0400L 79G-05V-0410L 79G-05V-0401L 79G-05V-0402L 796-720-3660 796-720-3670 01252-30612 01252-30640 06000-51204	Pusher • Flange bolt • Pin • Adapter • Nut • Guide ring • Bolt • Bolt • Bearing				1 1 1 1 1 1 1 2 1	Measurement thickness of hold flange
		16	79G-05V-0301L	Push tool				1	Press fitting of bearing outer race
		17	79G-05V-0701	Push tool				1	Press fitting of oil seal

No.	Part name	Nature of work	Q'ty	Tool
1	Shaft	Spring pin removal shaft (for front cap bushing)	1	 <p>150</p> <p>$\phi 9$</p> <p>DDD00087</p>
2	Shaft	Valve liner removal shaft	1	 <p>APPROX. 250</p> <p>$\phi 8$</p> <p>DDP00145</p>
3	Shaft	Shank bushing, front cap bushing removal shaft	1	 <p>APPROX. 550</p> <p>C5</p> <p>C5</p> <p>$\phi A-1.0$</p> <p>$\phi 4.4$</p> <p>DDP00146</p>
4	Plate	Front cap bushing removal plate (for welding)	1	 <p>12</p> <p>$\phi A-1.0$</p> <p>DDP00090</p>



WEIGHT TABLE

Unit: kg

Name of component		PC25	PC30	PC40	PC45
Engine	Engine, hydraulic pump assembly	170	170	200	200
Power train	Center swivel joint	30	30	30	30
	Travel motor assembly	50	50	50	65
	Swing motor, swing machinery assembly	35	35	40	40
	Revolving frame assembly	1,500	1,700	1,850	2,050
	Swing circle	50	50	55	70
Under-carriage	Idler assembly	40	40	55	55
Hydraulic system	Hydraulic pump assembly	8.2	45	8.6	45
	7-spool control valve	30	30	30	30
	2-spool control valve	5.4	5.4	5.4	5.4
	Boom cylinder	30	30	45	50
	Arm cylinder	25	30	35	45
	Bucket cylinder	20	20	30	30
	Swing cylinder	30	30	40	40
	Blade cylinder	20	20	30	30
Work equipment, others	Work equipment assembly	345	390	545	580
	Bucket assembly	60	80	110	115
	Arm assembly	100	110	155	165
	Arm, bucket assembly	160	190	265	280
	Boom assembly	185	200	280	300
	Blade assembly	180	180	240	240
	Canopy assembly	45	45	45	45
	Control valve bracket	25	25	25	25

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TIGHTENING TORQUES AND STANDARD VALUES TABLE

★ This section gives the tightening torques and standard values only for items not given in MAINTENANCE STANDARDS.

For items not given here, please see MAINTENANCE STANDARDS.

Component	Item		Unit	PC25	PC30	PC40	PC45	
Engine	1	Fuel injection tube sleeve nut	kgm	2.6±0.1	2.6±0.1	2.6±0.1	2.6±0.1	
	2	Mounting nut for fuel injection pump		2.6±0.1	2.6±0.1	2.6±0.1	2.6±0.1	
	3	Mounting nut for fuel injection pump drive gear		6.0±0.1	6.0±0.1	6.0±0.1	6.0±0.1	
	4	Delivery valve holder		3.75±0.25	3.75±0.25	3.75±0.25	3.75±0.25	
	5	Water pump mounting bolt		1.1±0.2	1.1±0.2	1.1±0.2	1.1±0.2	
	6	Nozzle holder mounting nut		0.4±0.1	0.4±0.1	0.4±0.1	0.4±0.1	
	7	Head cover mounting bolt		2.6±0.3	2.6±0.3	2.6±0.3	2.6±0.3	
	8	Rocker arm mounting bolt		2.6±0.3	2.6±0.3	2.6±0.3	2.6±0.3	
	9	Cylinder head mounting bolt		1st step	3.5	3.5	3.5	3.5
				2nd step	6.5	6.5	6.5	6.5
				3rd step	8.0±0.5	8.0±0.5	8.0±0.5	8.0±0.5
	10	Crankshaft pulley mounting bolt	12.0±0.5	12.0±0.5	12.0±0.5	12.0±0.5		
11	Flywheel 1) Mounting bolt	8.5±0.5	8.5±0.5	8.5±0.5	8.5±0.5			
	2) Face runout, radial runout	mm	0.2	0.2	0.2	0.2		
12	Engine mount bolt	kgm	6.75±0.75	6.75±0.75	6.75±0.75	6.75±0.75		
Power train	1	Damper mounting bolt	kgm	9.0±0.4	9.0±0.4	9.0±0.4	9.0±0.4	
	2	Travel motor mounting bolt		11.25±0.25	11.25±0.25	11.25±0.25	11.25±0.25	
	3	Swing machinery assembly 1) Bearing press-fitting force	kg	690	690	670	670	
2) Swing pinion starting torque		kgm	1.35	1.35	1.52	1.52		
Hydraulic system	1	Gear pump mounting bolt	kgm	—	2.4±0.2	—	2.4±0.2	
	2	7-spool control valve mounting bolt		3.3±0.2	3.3±0.2	3.3±0.2	3.3±0.2	
	3	2-spool control valve mounting bolt		3.3±0.2	3.3±0.2	3.3±0.2	3.3±0.2	
Work equipment	1	Link pin lock bolt	kgm	28.25±3.25	28.25±3.25	56±6	56±6	

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LUBRICANT AND COOLANT TABLE

Unit: ℓ

Name of component	PC25	PC30	PC40	PC45	Remarks
Engine cooling water	4.8	5.1	8.0	8.0	
Engine oil pan	7.3	7.3	8.5	8.5	
Swing machinery case	0.9	0.9	1.0	1.0	
Final drive case	1.2	1.2	1.4	1.1	Each side
Hydraulic tank	45	45	45	45	

Note: The values for oil volumes are the values for normal oil changes during inspection and maintenance.



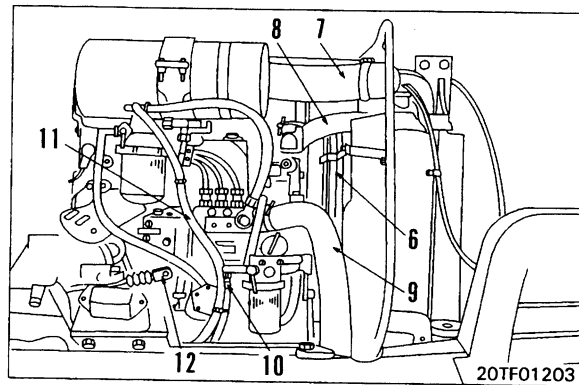
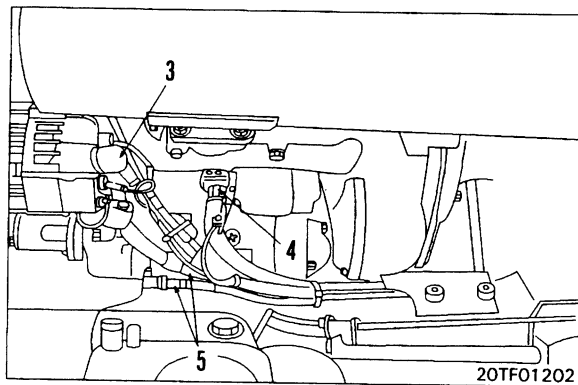
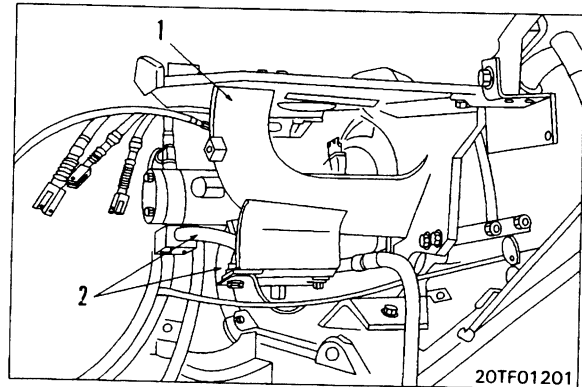
REMOVAL OF ENGINE, HYDRAULIC PUMP ASSEMBLY

⚠ Disconnect the cable from the negative (-) terminal of the battery.

⚠ Lower the work equipment to the ground and stop the engine. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

★ After removing the piping, mark with tags to prevent mistakes when installing.

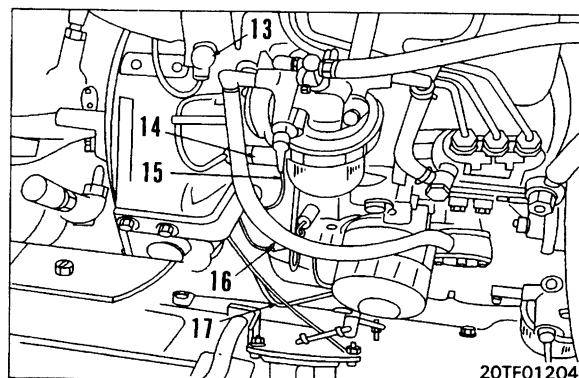
1. Drain water.
2. Remove 7-spool control valve assembly.
For details, see REMOVAL OF 7-SPOOL CONTROL VALVE ASSEMBLY.
3. Remove 2-spool control valve assembly.
For details, see REMOVAL OF 2-SPOOL CONTROL VALVE ASSEMBLY.
4. Remove control valve bracket (1).
5. Disconnect tubes (2).
★ For PC25 and PC40, disconnect 2 tubes at the gear pump end.
6. Disconnect wires (3).
★ Disconnect 4 alternator wires.
7. Disconnect wires (4).
★ Disconnect 3 starting motor wires.
8. Disconnect hoses (5).
9. Disconnect fan guard (6).
10. Remove hoses (7), (8), and (9).
11. Disconnect fuel hose (10) and (11).
12. Disconnect cable (12).



13. Disconnect wiring connectors (13), (14), (15), and (16).
14. Disconnect ground wiring (17).

*: No. 16 has been discontinued from the following Serial Numbers.

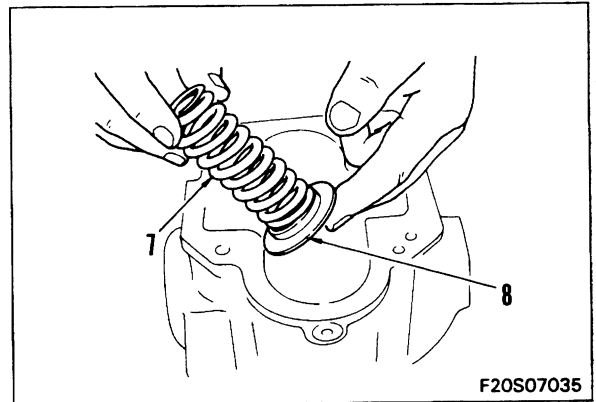
- PC25-1** Serial No. 6471 and up
- PC30-7** Serial No. 26423 and up
- PC40-7** Serial No. 24522 and up
- PC45-1** Serial No. 3506 and up



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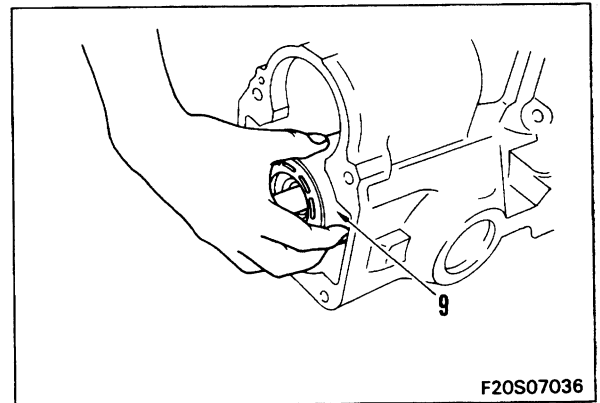
4. Spring

- 1) Set spring case facing side.
- 2) Remove outer spring, inner spring (7), and spring seat (8) from pump case.



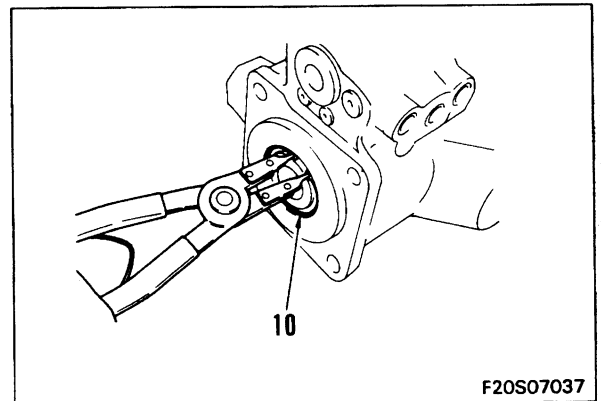
5. Cylinder block assembly (rear end)

- Remove cylinder block assembly (9) from shaft.



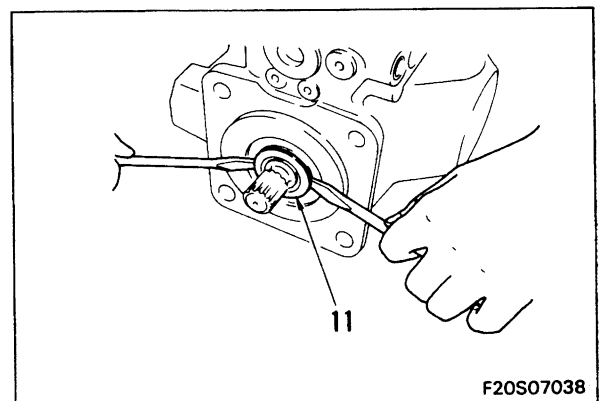
6. Oil seal case

- 1) Remove snap ring (10).



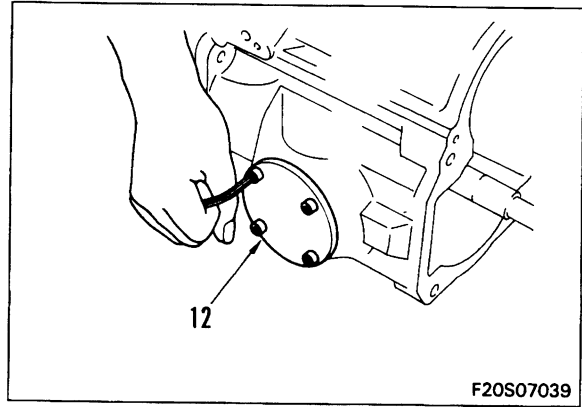
- 2) Insert 2 flat-headed screwdrivers between pump case and oil seal case (11), and remove oil seal case.

- 3) Remove O-ring.

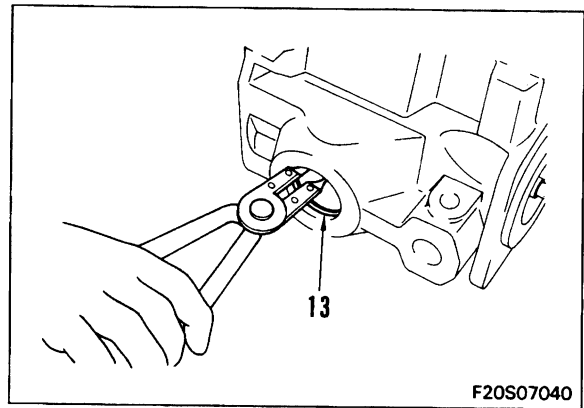


7. Hanger shaft

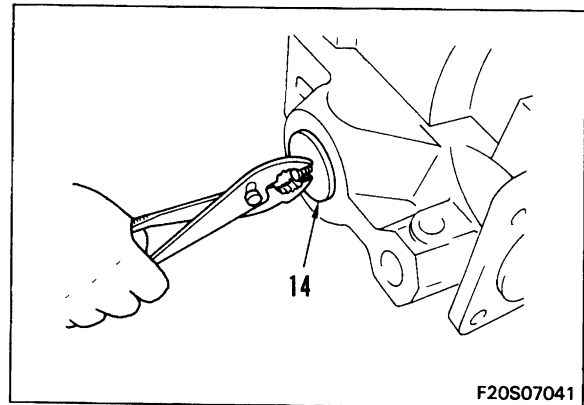
1) Remove cover (12), then remove O-ring and shim.



2) Remove snap ring (13) on opposite side.

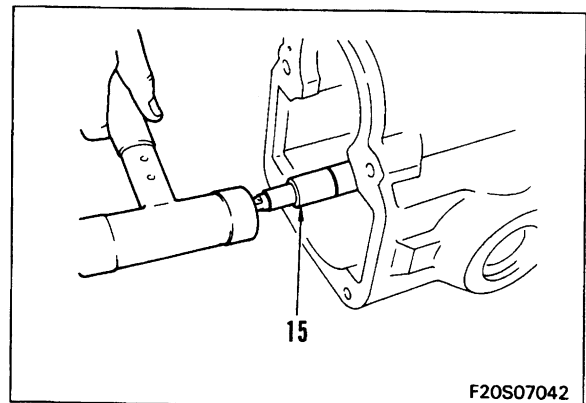


3) Install cover mounting bolts in forcing tap of hanger shaft (14), and pull out straight with pliers.
★ Remove the opposite side in the same way.



8. Drive shaft

Tap drive shaft (15) with plastic hammer and remove from pump case.



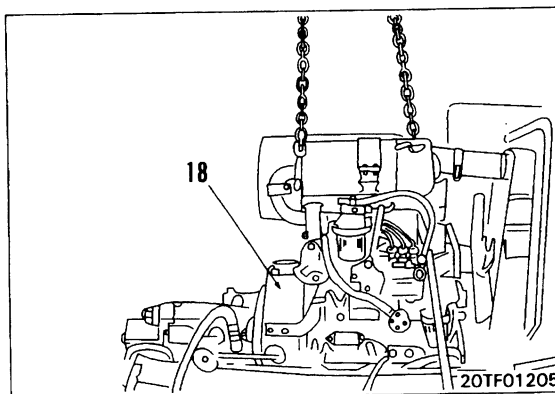
020S07

15. Remove engine and hydraulic pump assembly (18). ※ 1

- ★ At the front of the engine, disconnect together with the bracket on the left and right; at the rear, remove the mounting bolts.
- ★ When removing the engine and hydraulic pump assembly, do not forget to disconnect the piping and wiring, and check that there is no interference at any point when removing.



See WEIGHT TABLE.



INSTALLATION OF ENGINE, HYDRAULIC PUMP ASSEMBLY

- Carry out installation in the reverse order to removal.



Mounting bolt: See TIGHTENING TORQUES AND STANDARD VALUES TABLE.

- Refilling with oil
Add oil to the specified level, and run the engine to circulate the oil through the system. Then check the oil level again.



See LUBRICANT AND COOLANT TABLE.

- Refilling with water
Add water to the specified level, and run the engine to circulate the water through the system. Then check the water level again.
- Pressurizing hydraulic tank (PC30, 45)
Pressurize the hydraulic tank.
For details, see TESTING AND ADJUSTING, Pressurizing of hydraulic tank.
- Bleeding air from main piston pump (PC30, 45)
Bleed the air from the main piston pump.
For details, see TESTING AND ADJUSTING, Bleeding air from all parts.

DISASSEMBLY OF HYDRAULIC PUMP ASSEMBLY

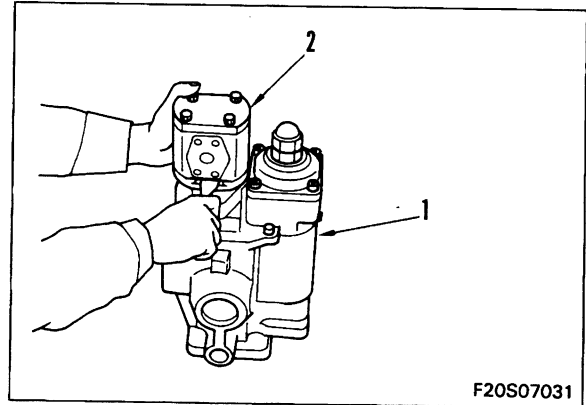
A10VD17SR (PC30-7)

DISASSEMBLY OF PISTON PUMP ASSEMBLY

1. Gear pump assembly

Remove 2 bolts, then remove gear pump assembly (2) from hydraulic pump assembly (1).

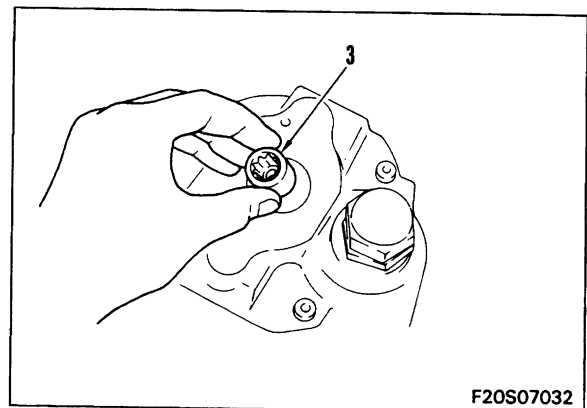
★ For details, see 30-11-22 DISASSEMBLY OF GEAR PUMP ASSEMBLY.



F20S07031

2. Coupling

Remove coupling (3) from drive shaft.



F20S07032

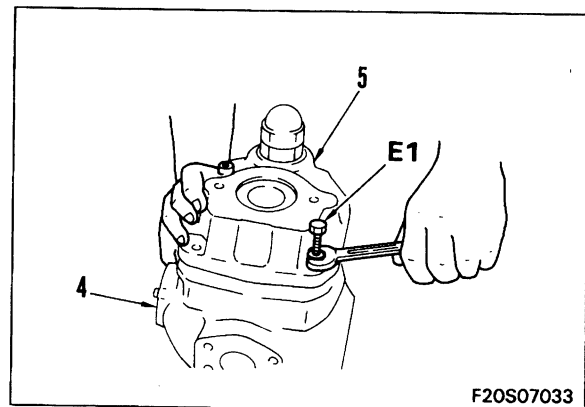
3. End cover

1) Remove 2 mounting bolts on diametrically opposite sides.

2) Install tool E1 to bolt hole.

3) Raise pump case (4) so that drive shaft faces down.

4) Loosen nuts (2 places) of tool E1 in turn to remove load from spring, then remove end cover (5).

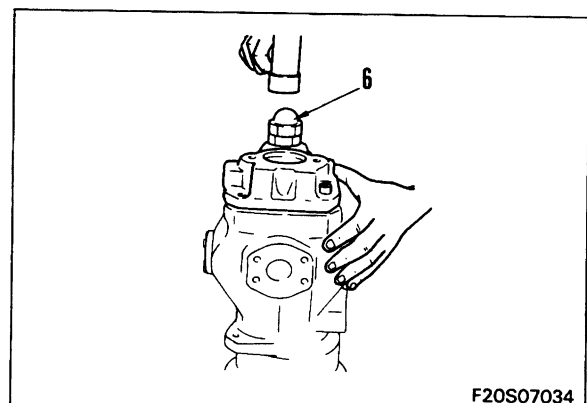


F20S07033

★ If it is difficult to remove, tap cap nut (6) with a plastic hammer and remove.

★ In order not to damage the bearing, keep horizontal when removing the end cover.

★ The valve plate is stuck to the rear face of the end cover, so be careful not to drop it.

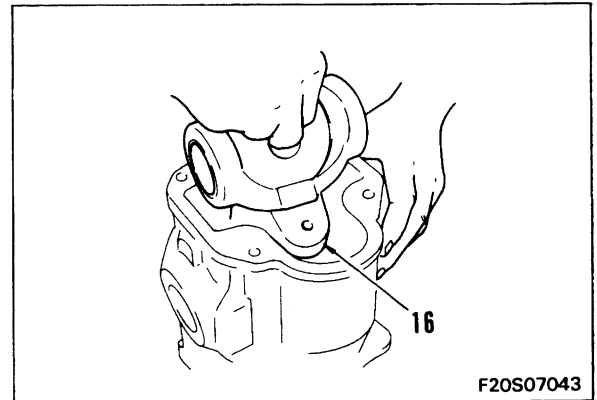


F20S07034

9. Hanger

Set hanger (16) at an angle, and remove from pump case.

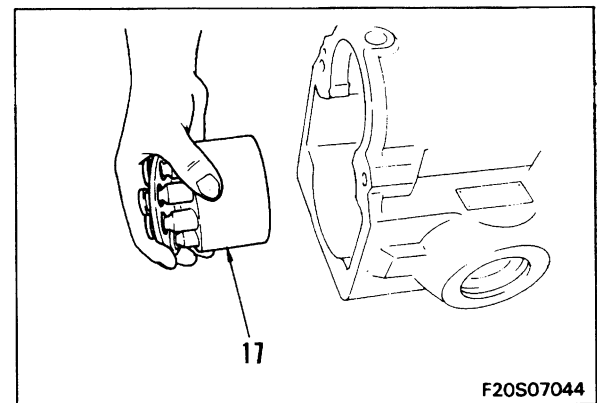
★ At the front, the piston may come out together with the hanger, so be careful.



F20S07043

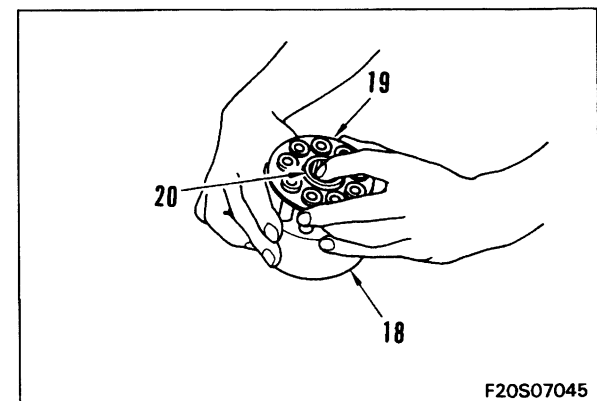
10. Cylinder block assembly (front end)

1) Remove cylinder block assembly (17) and valve plate.



F20S07044

2) Remove retainer, piston sub-assembly (19), and guide (20) from cylinder block (18).

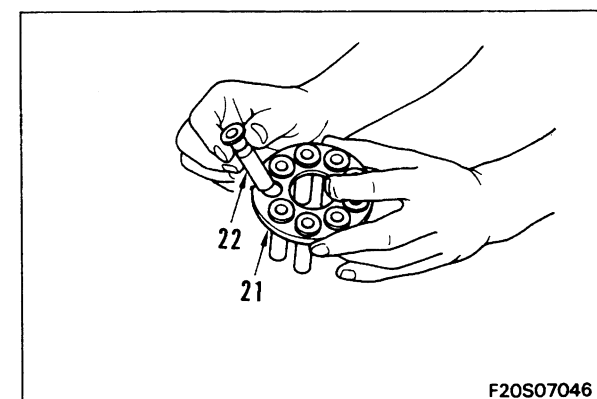


F20S07045

3) Remove piston (22) from retainer (21).

★ Disassemble the rear end in the same way.

★ Be careful not to mix the front and rear parts when storing the parts.



F20S07046

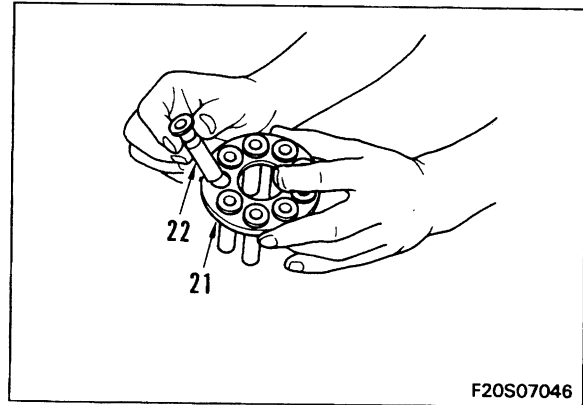
ASSEMBLY OF HYDRAULIC PUMP ASSEMBLY

A10VD17SR (PC30-7)


ASSEMBLY OF PISTON PUMP ASSEMBLY

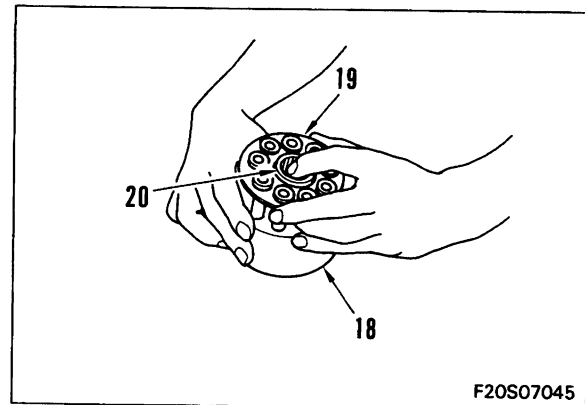
1. Cylinder block assembly (front, rear)

- 1) Assemble 9 pistons (22) to retainer (21).
★ Be careful not to mix the front and rear parts when assembling the parts.

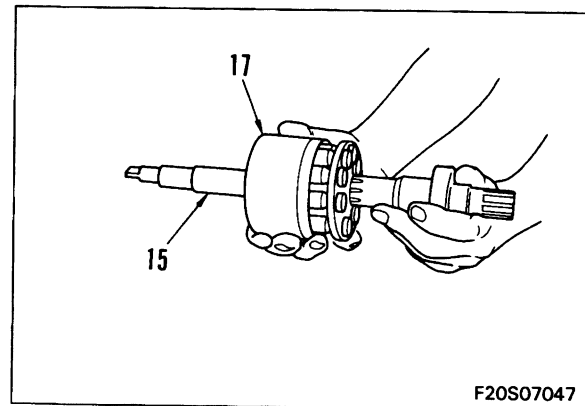


- 2) Put guide (20) on cylinder block (18), and assemble retainer and piston sub-assembly (19).

 Guide: Grease (G2-LI)



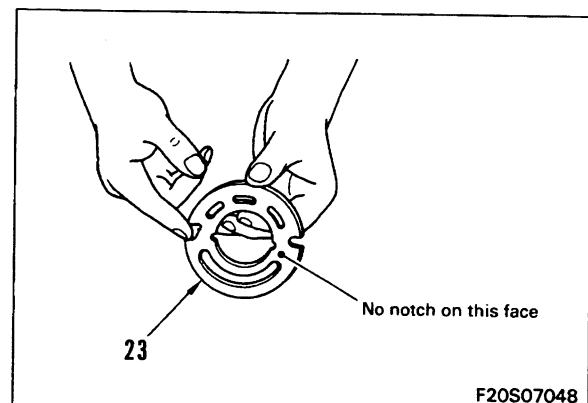
- 3) Pass drive shaft (15) through, and align guide and spline of cylinder block assembly (17).



2. Valve plate

- 1) Coat the side of valve plate (23) with no notch with grease to prevent it from falling off.

 Valve plate: Grease (G2-LI)

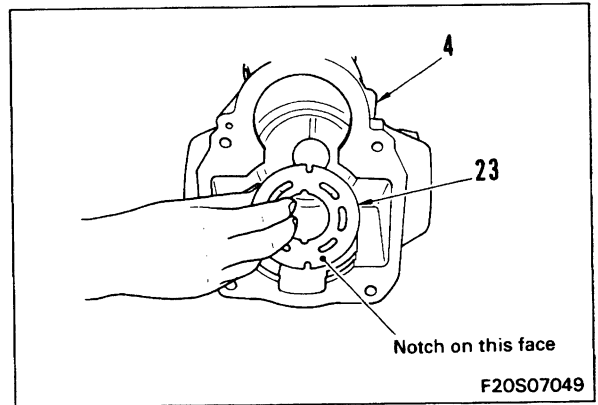


020S07

2) Align with dowel pin of pump case (4), and assemble valve plate (23).

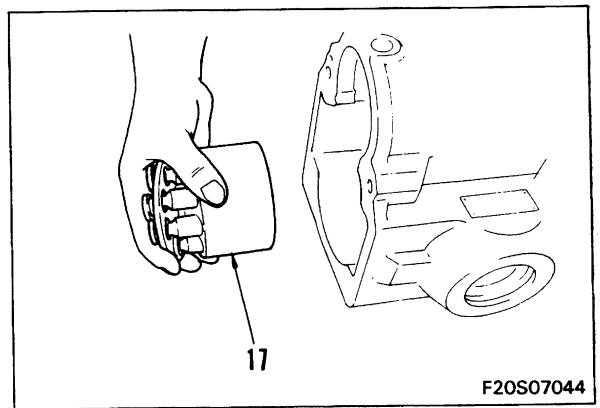
★ Be careful to install the valve plate facing in the correct direction.

★ Be careful not to assemble the valve plate incorrectly at the rear.



3. Cylinder block assembly (front end)


1) Assemble cylinder block assembly (17) so that piston shoe is at front.



4. Hanger

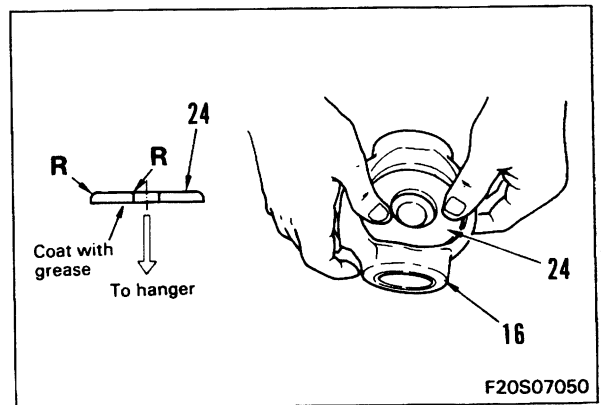
1) Coat hanger mounting surface of plate (24) with grease to prevent it from falling off.

★ Be careful not to install it back to front.

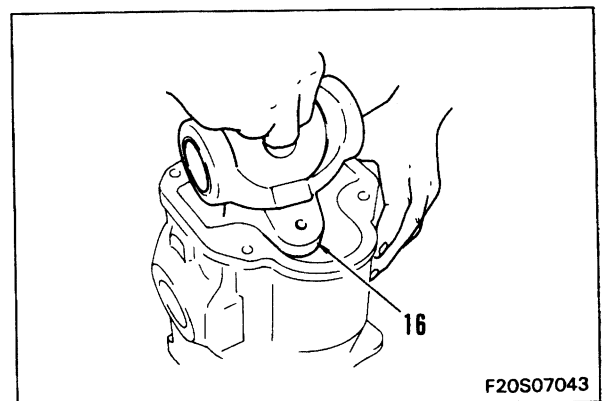
 Plate: Grease (G2-LI)

2) Assemble plate (24) to hanger (16).

★ After assembling, turn over the hanger, put the plate in tight contact, and check that it does not fall off.

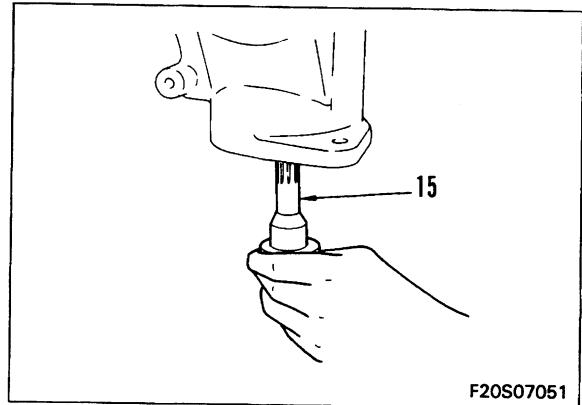


3) Align protruding portion with mounting position of spring of pump case, and install hanger (16) so that protruding part is facing down.




5. Drive shaft


- 1) Align with spline of cylinder block and guide, and install drive shaft (15).

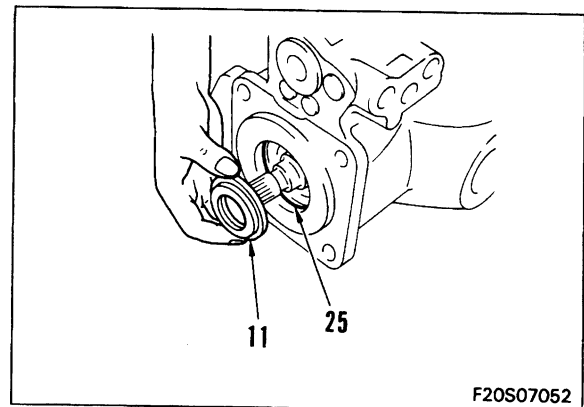


- 2) Coat O-ring (25) with grease to prevent it from falling off, then assemble inside rear of pump case.

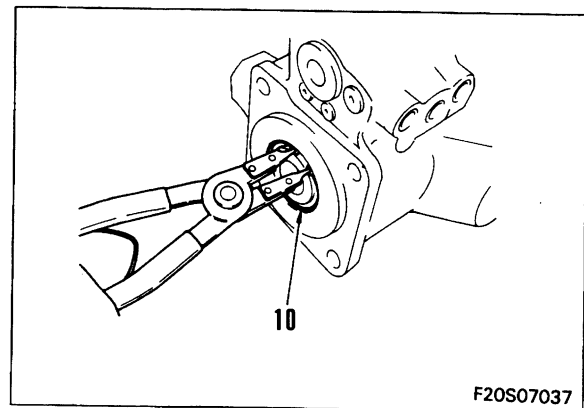
 O-ring: Grease (G2-LI)

- 3) Install oil seal to oil seal case (11), and insert straight in pump case.

 Oil seal: Grease (G2-LI)




- 4) Install snap ring (10).

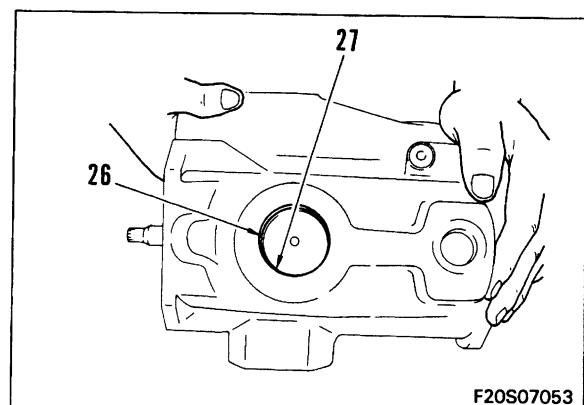


6. Hanger shaft (right)

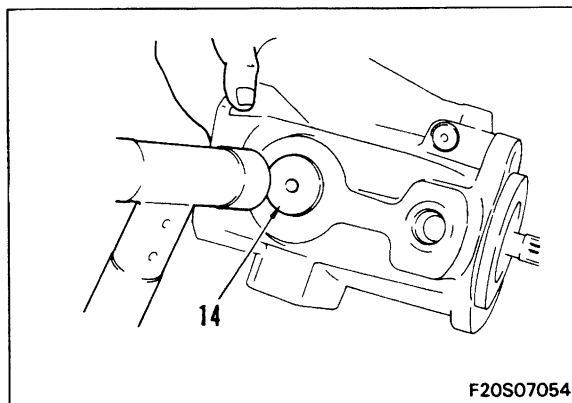
- 1) Assemble O-ring (26) to pump case.

 O-ring: Grease (G2-LI)

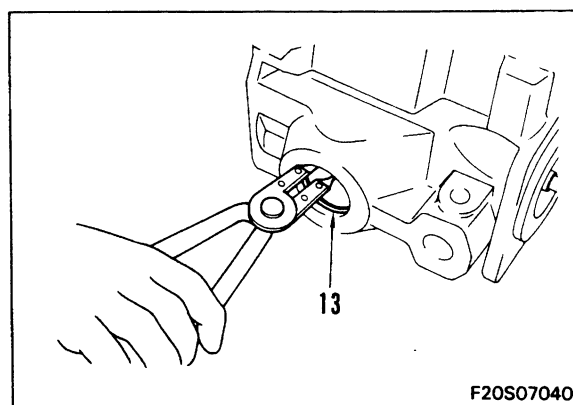
- 2) Align position of hole in pump case and bearing outer race (27) of hanger.



- 3) Insert hanger shaft (14) straight in hole of pump case.
- 4) Tap hanger shaft (14) with plastic hammer, and insert to point where groove of snap ring can be seen.
 - ★ If it is difficult to insert, do not try to force it in. Check again that the position of the holes in the hanger and pump case are aligned.





- 5) Install snap ring (13).

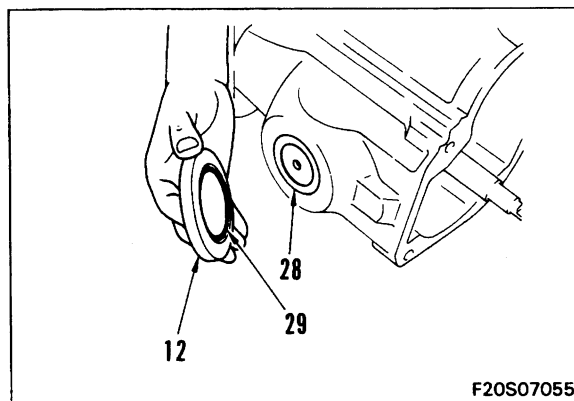


7. Hanger shaft (left)

- 1) Push in hanger with handle of hammer, and align hole of pump case and bearing outer race of hanger.
- 2) Insert hanger shaft straight in hole of pump case.
- 3) Put shim (28) on hanger shaft.
- 4) Coat O-ring (29) coated with grease to prevent it from falling off, install to cover (12), then install to pump case.

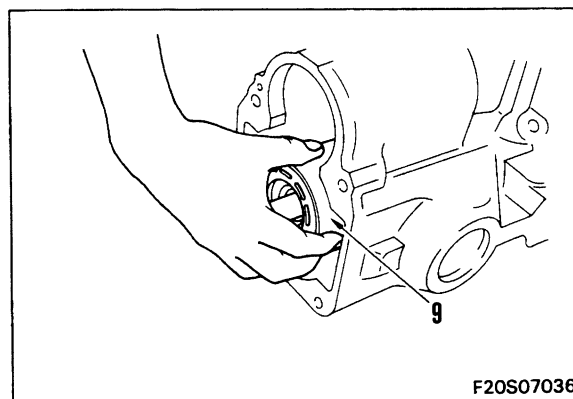
 O-ring: Grease (G2-LI)

 Bolt: 1.35 ± 0.15 kgm



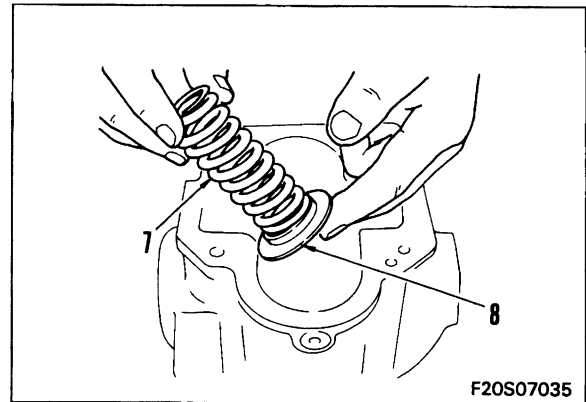
8. Cylinder block assembly (rear)

- Align with spline of drive shaft, and install cylinder block assembly (9).



9. Spring

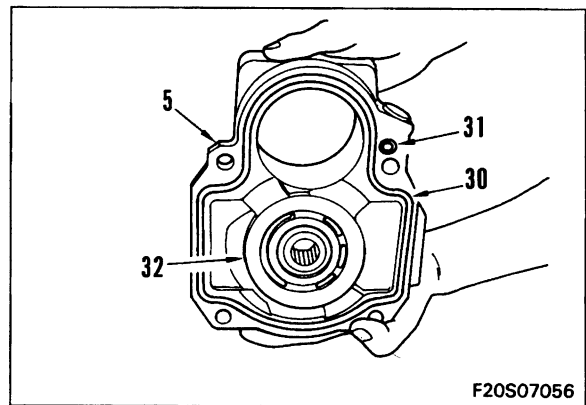
- 1) Raise pump case so that drive shaft is at bottom.
- 2) Push in hanger with handle of hammer, and with hanger at an angle, install spring seat (8) and inner spring (7) to hanger.
- 3) After checking that protrusion of spring seat (8) is fitted securely in hole of hanger, install outer spring.




10. End cover

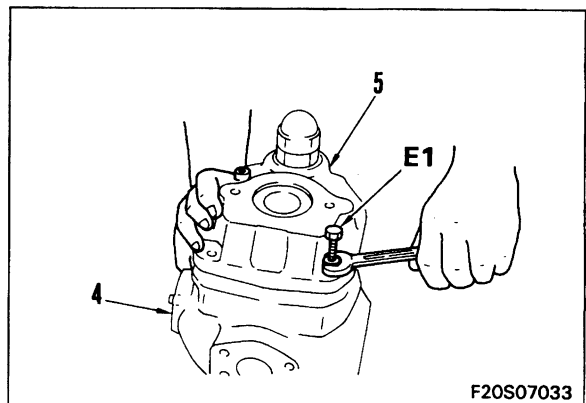
- 1) Coat O-ring (30) and (31), and valve plate (32) with grease to prevent them from falling off, install to end cover (5), then turn over and check that they do not fall out.
 - ★ Coat the face of the valve plate with no notch with grease.

 Control plate: Grease (G2-LI)



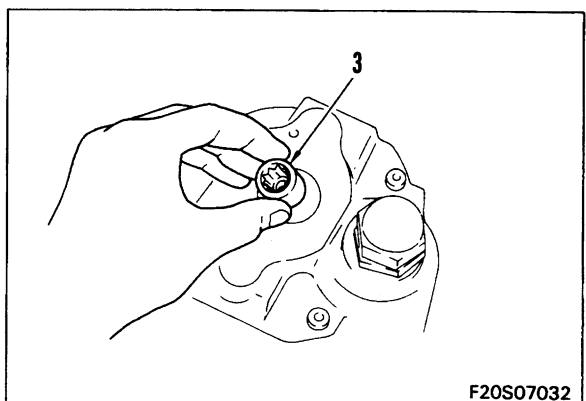
- 2) Install tool E1 on diametrically opposite sides, then tighten nuts in turn to a point where mounting bolts at other 2 places reach threaded hole in pump case.
- 3) When mounting bolts at other 2 places have taken hold firmly in pump case (4), remove tool E1 and install normal mounting bolts.
 - ★ When installing, be careful to keep the end cover (5) horizontal.

 Bolt: 3.25 ± 0.35 kgm




11. Coupling

Insert coupling (3) in drive shaft.

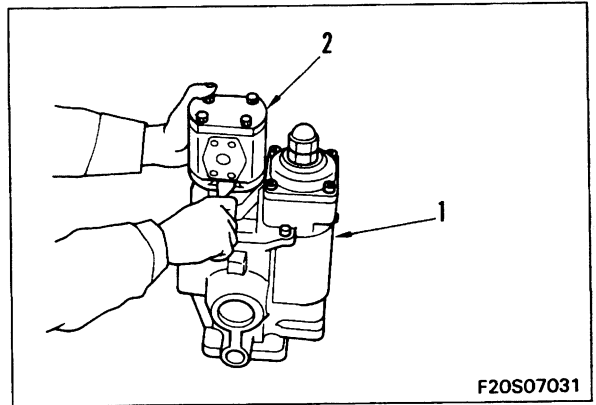


12. Gear pump assembly

Install gear pump assembly (2) to hydraulic pump assembly (1).


 Bolt: 2.35 ± 0.25 kgm

★ For details, see 30-11-22 ASSEMBLY OF GEAR PUMP ASSEMBLY.




13. Pilot piston

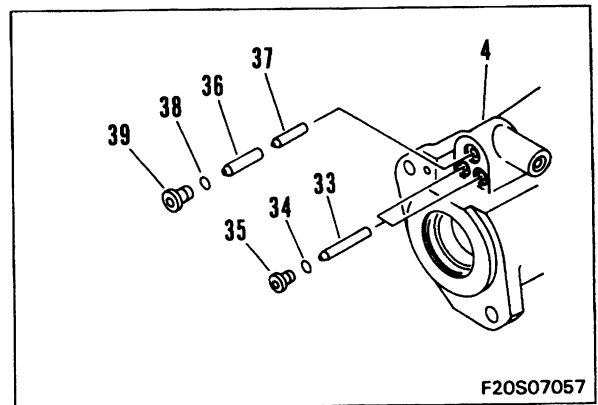
Assemble piston (33) in pump case (4), and install O-ring (34) and plug (35).

 Plug: 0.85 ± 0.1 kgm

14. Shift piston

- 1) Assemble piston (37) in barrel (36), then assemble in pump case (4).
- 2) Install O-ring (38) and plug (39).

 Plug: 2.1 ± 0.2 kgm



DISASSEMBLY OF HYDRAULIC PUMP ASSEMBLY

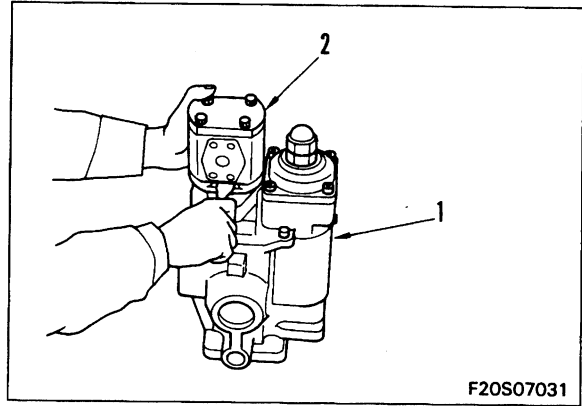
A10VD28SR (PC45-1)

DISASSEMBLY OF PISTON PUMP ASSEMBLY

1. Gear pump assembly

Remove 2 bolts, then remove gear pump assembly (2) from hydraulic pump assembly (1).

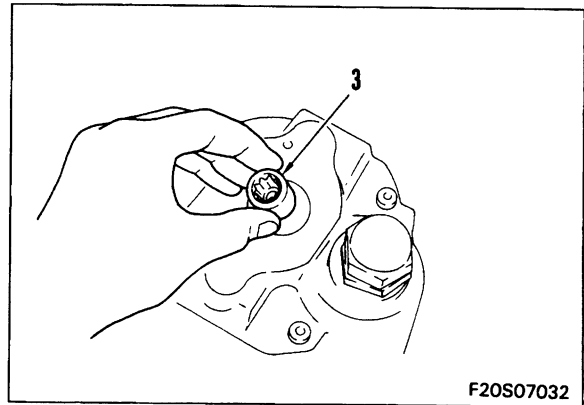
★ For details, see 30-11-22 DISASSEMBLY OF GEAR PUMP ASSEMBLY.



F20S07031

2. Coupling

Remove coupling (3) from drive shaft.



F20S07032

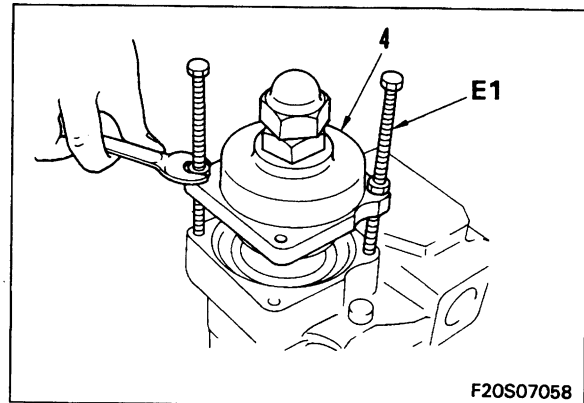
3. Cover

1) Remove 2 mounting bolts on diametrically opposite sides.

2) Install tool E1 to bolt hole.

3) Loosen nuts (2 places) of tool E1 in turn to remove load from spring, then remove cover (4)

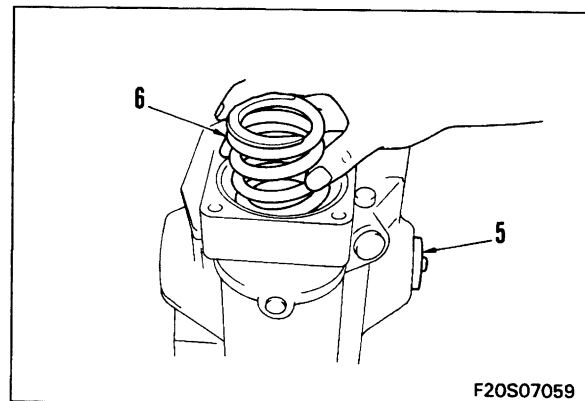
★ Do not remove the cap nut unless necessary.



F20S07058

4. Spring

Remove outer spring (6), inner spring, and spring seat from pump case (5).



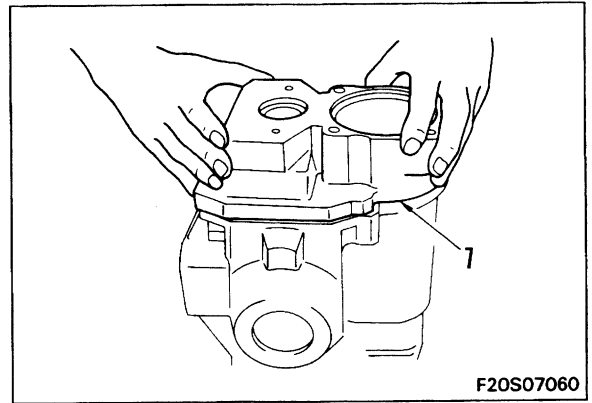
F20S07059

020S07

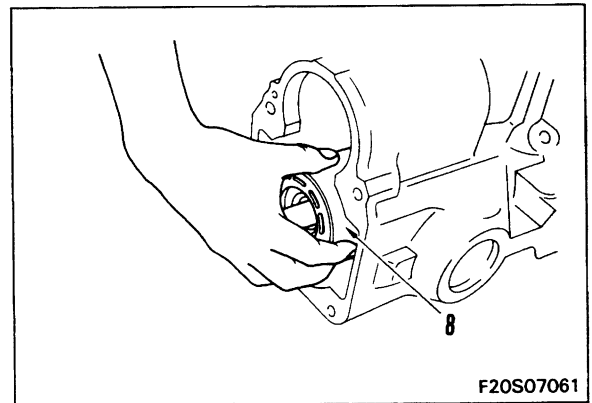
5. End cover

Remove end cover (7).

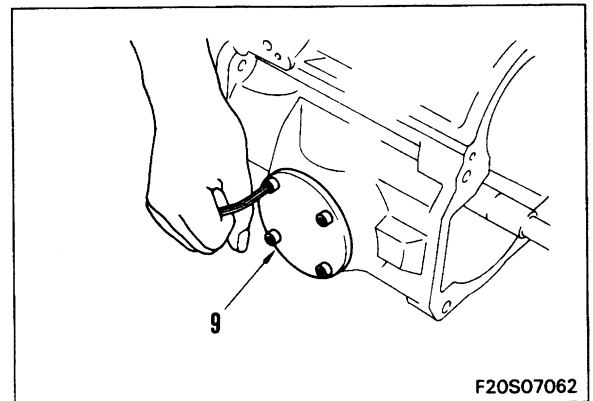
- ★ If it is difficult to remove, tap around the end cover with a plastic hammer and remove.
- ★ In order not to damage the bearing, keep horizontal when removing the end cover.
- ★ The valve plate is stuck to the rear face of the end cover, so be careful not to drop it.

**6. Cylinder block assembly (rear end)**

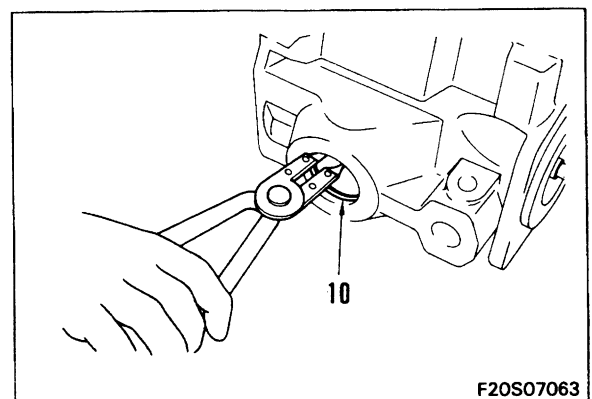
- 1) Set cylinder block assembly facing side.
- 2) Remove cylinder block assembly (8) from shaft.

**7. Hanger shaft**

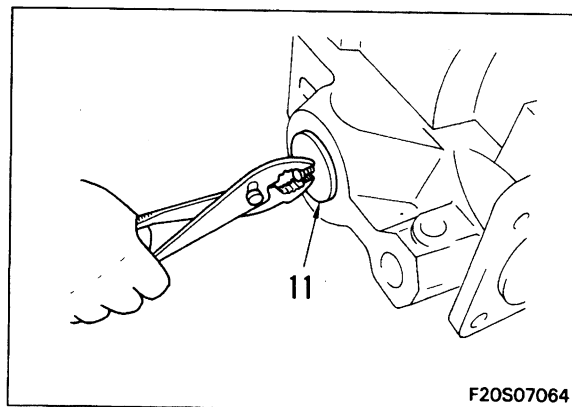
- 1) Remove cover (9), then remove O-ring and shim.



- 2) Remove snap ring (10) on opposite side.



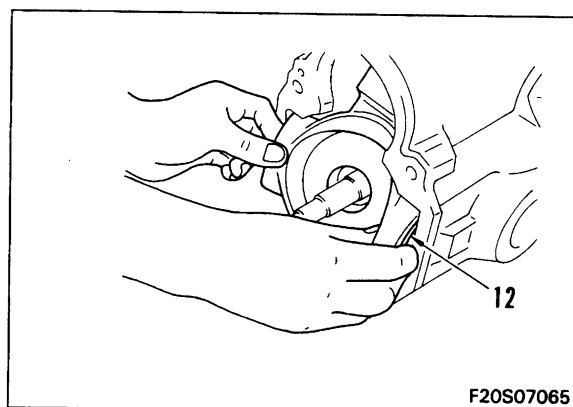
- 3) Install cover mounting bolts in forcing tap of hanger shaft (11), and pull out straight with pliers.
 ★ Remove the opposite side in the same way.



8. Hanger

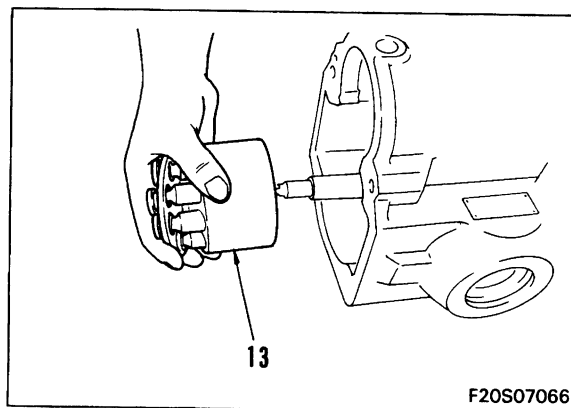
Set hanger (12) at an angle, and remove from pump case.

- ★ At the front, the piston may come out together with the hanger, so be careful.

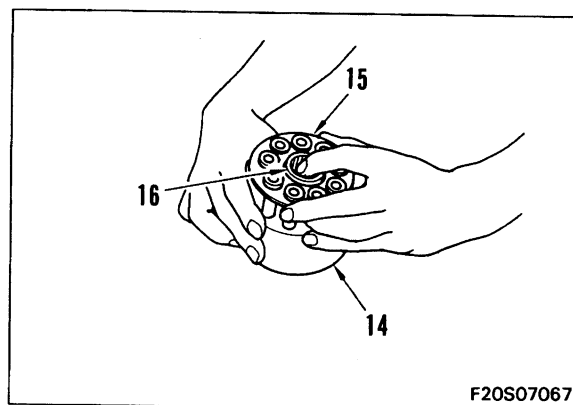


9. Cylinder block assembly (front end)

- 1) Remove cylinder block assembly (13) and valve plate.

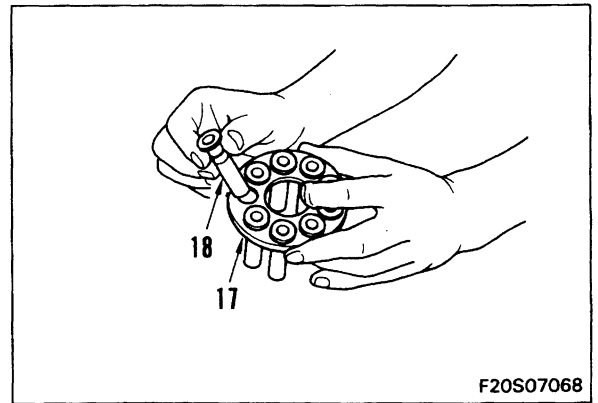


- 2) Remove retainer, piston sub-assembly (15), and guide (16) from cylinder block (14).



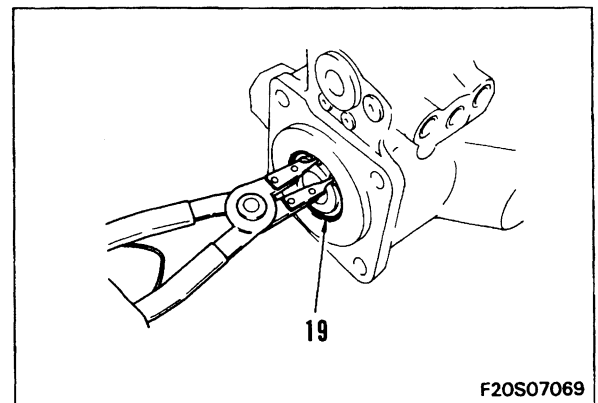
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- 3) Remove piston (18) from retainer (17).
 ★ Disassemble the rear end in the same way.
 ★ Be careful not to mix the front and rear parts when storing the parts.



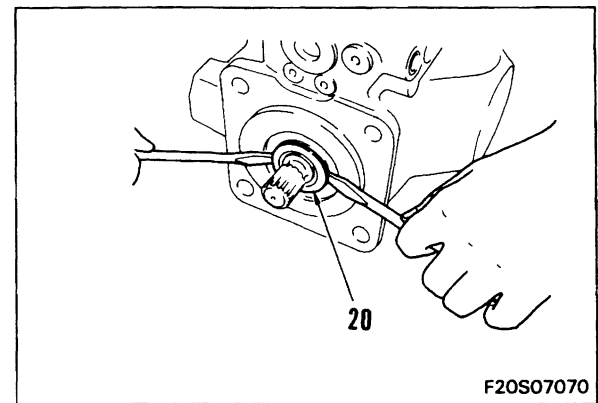
10. Oil seal case

- 1) Remove snap ring (19).



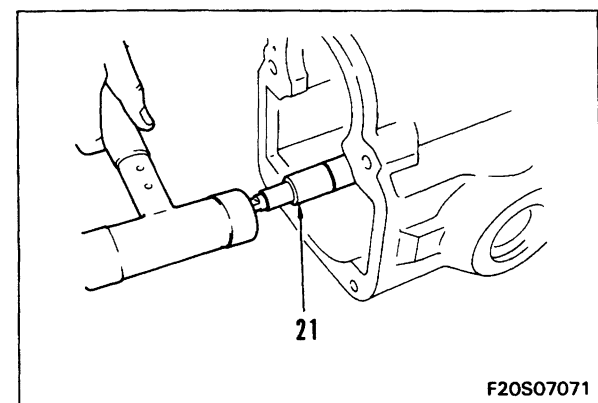
- 2) Insert 2 flat-headed screwdrivers between pump case and oil seal case (20), and remove oil seal case.

- 3) Remove O-ring.



11. Drive shaft

- Tap drive shaft (21) with plastic hammer and remove from pump case.



020S07

ASSEMBLY OF HYDRAULIC PUMP ASSEMBLY

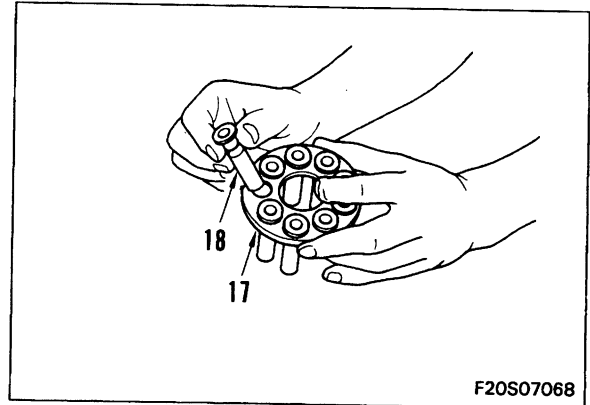
A10VD28SR (PC45-1)

ASSEMBLY OF PISTON PUMP ASSEMBLY

1. Cylinder block assembly (front, rear)


1) Assemble 9 pistons (18) to retainer (17).

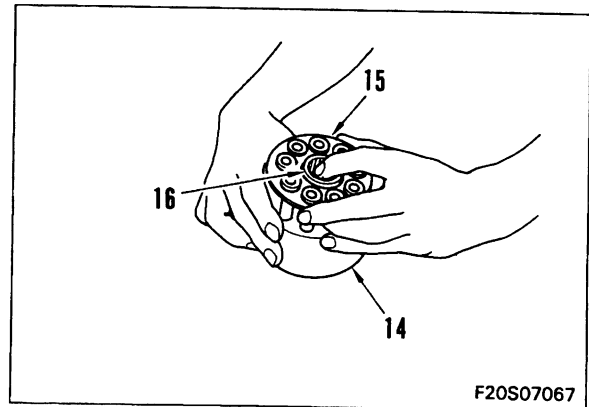
★ Be careful not to mix the front and rear parts when assembling the parts.



F20S07068

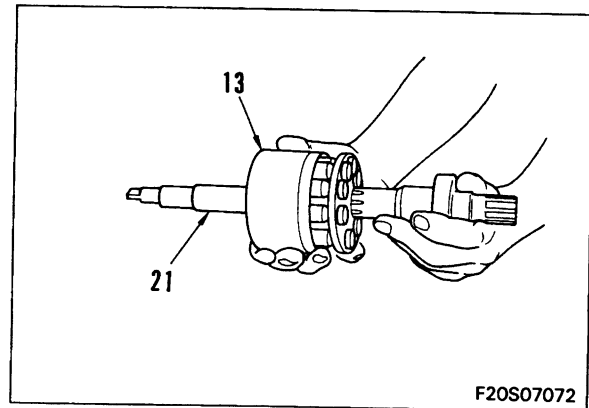
2) Put guide (16) on cylinder block (14), and assemble retainer and piston sub-assembly (15).

 Guide: Grease (G2-LI)



F20S07067

3) Pass drive shaft (21) through, and align guide and spline of cylinder block assembly (13).

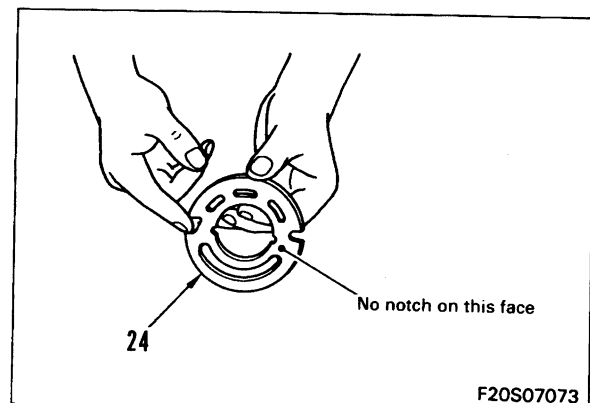


F20S07072

2. Valve plate

1) Coat the side of valve plate (24) with no notch with grease to prevent it from falling off.

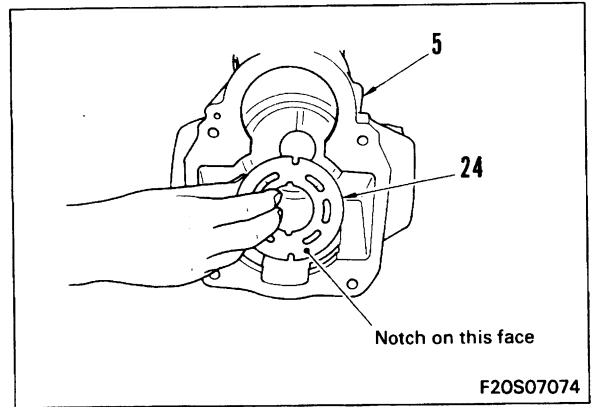
 Valve plate: Grease (G2-LI)



F20S07073


2) Align with dowel pin of pump case (5), and assemble valve plate (24).

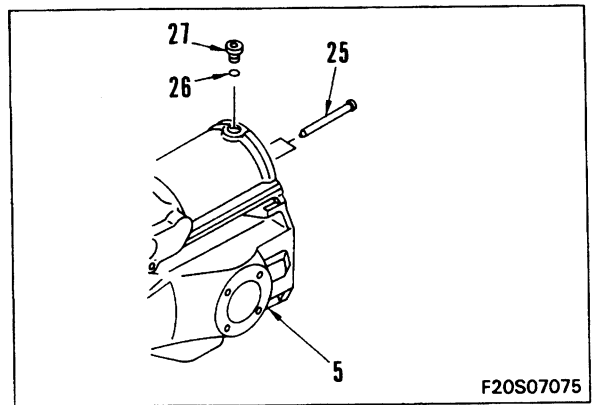
- ★ Be careful to install the valve plate facing in the correct direction.
- ★ Be careful not to assemble the valve plate incorrectly at the rear.



3. Pilot piston

- 1) Install pilot pistons (2 set) to pump case (25).
- 2) Install O-ring (26) and plug (27).

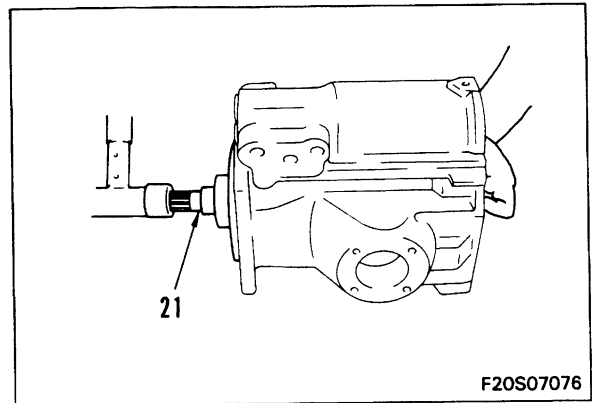
 Plug: 0.85 ± 0.1 kgm




4. Drive shaft

- 1) Tap spline portion with a plastic hammer and install drive shaft (21).


- ★ Press fit the outer race of the shaft bearing securely in the pump case.

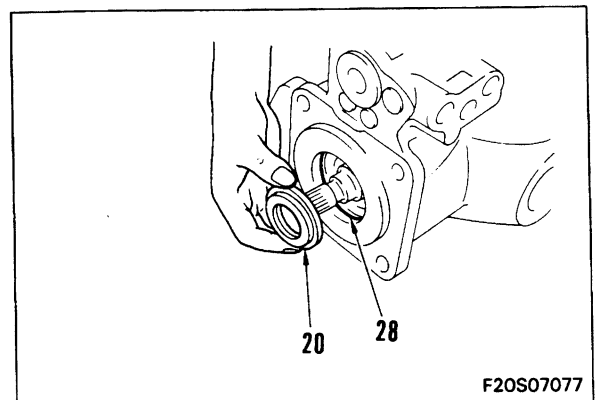


- 2) Coat O-ring (28) with grease to prevent it from falling off, then assemble inside rear of pump case.

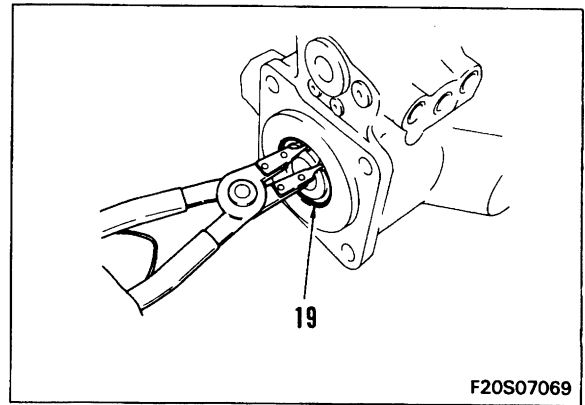
 O-ring: Grease (G2-LI)

- 3) Install oil seal to oil seal case (20), and insert straight in pump case.

 Oil seal: Grease (G2-LI)

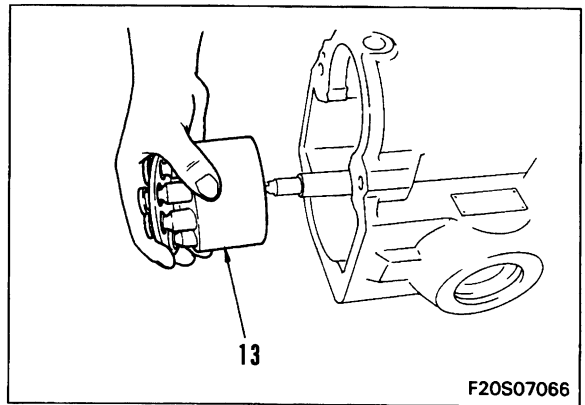


4) Install snap ring (19).




5. Cylinder block assembly (front end)

Align with spline of drive shaft and assemble cylinder block assembly. (13).

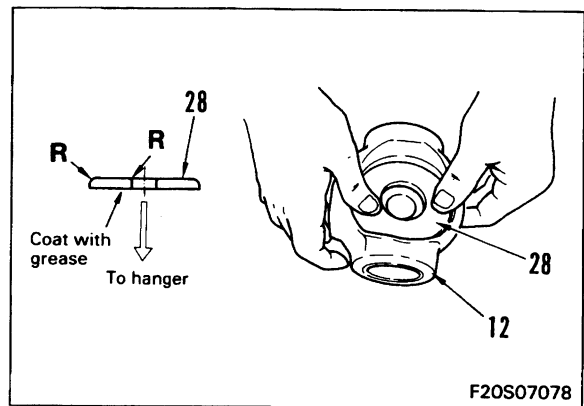


6. Hanger

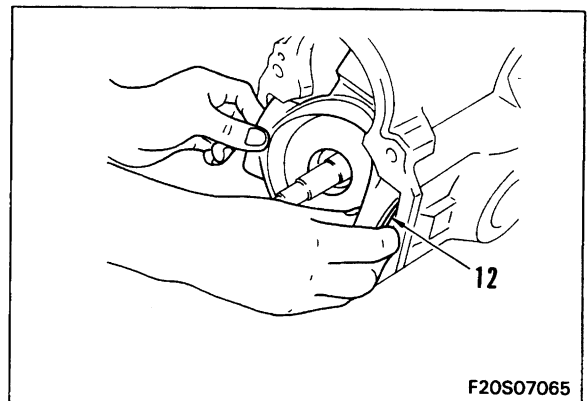
- 1) Coat hanger mounting surface of plate (28) with grease to prevent it from falling off.
★ Be careful not to install it back to front.

 Plate: Grease (G2-LI)

- 2) Assemble plate (28) to hanger (12).




- 3) Set dowel pin side facing inside, and assemble hanger (12) to pump case.

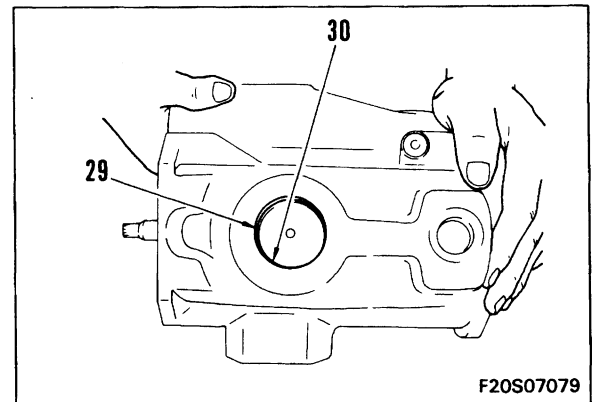


7. Hanger shaft (right)

1) Assemble O-ring (29) to pump case.

 O-ring: Grease (G2-LI)

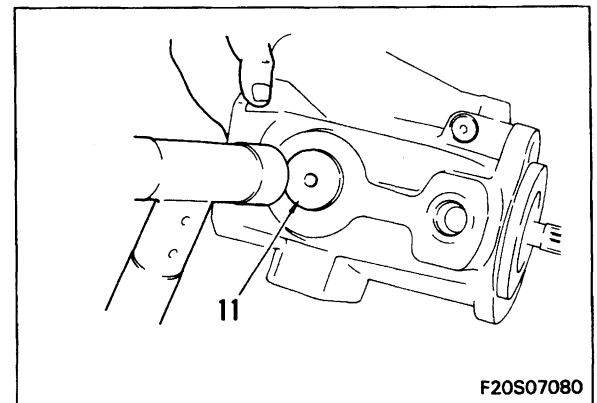
2) Align position of hole in pump case and bearing outer race (30) of hanger.



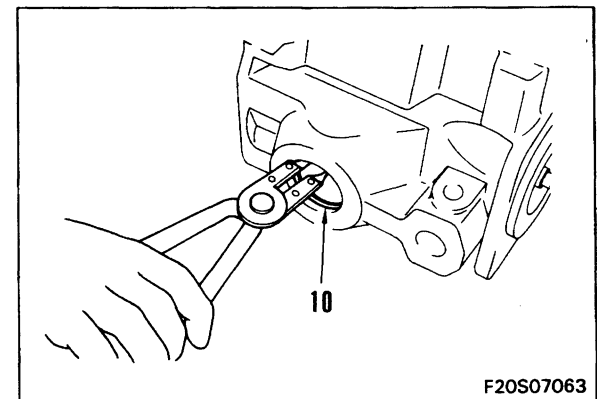
3) Insert hanger shaft (11) straight in hole of pump case.

4) Tap hanger shaft (11) with plastic hammer, and insert to point where groove of snap ring can be seen.

★ If it is difficult to insert, do not try to force it in. Check again that the position of the holes in the hanger and pump case are aligned.



5) Install snap ring (10).




8. Hanger shaft (left)


1) Push in hanger with handle of hammer, and align hole of pump case and bearing outer race of hanger.

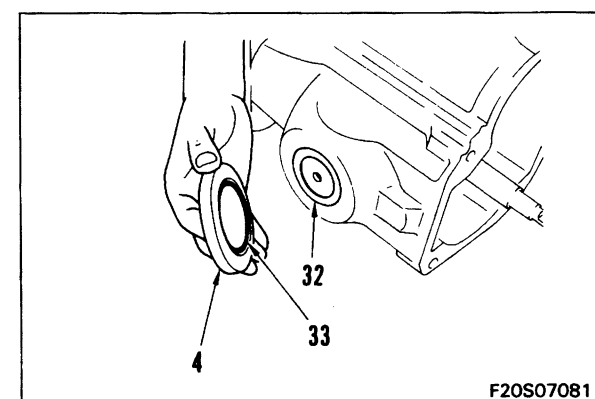
2) Insert hanger shaft straight in hole of pump case.

3) Put shim (32) on hanger shaft.

4) Coat O-ring (33) coated with grease to prevent it from falling off, install to cover (4), then install to pump case.

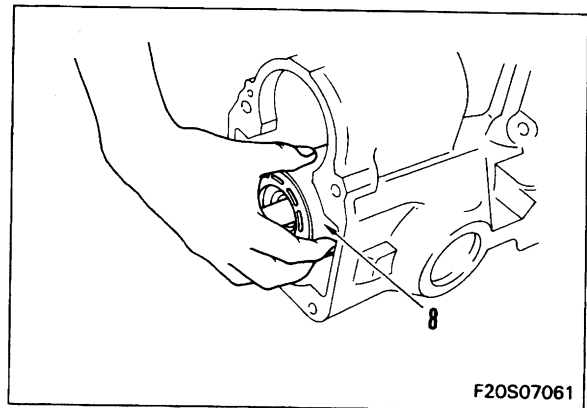
 O-ring: Grease (G2-LI)

 Bolt: 1.35 ± 0.15 kgm



9. Cylinder block assembly (rear)

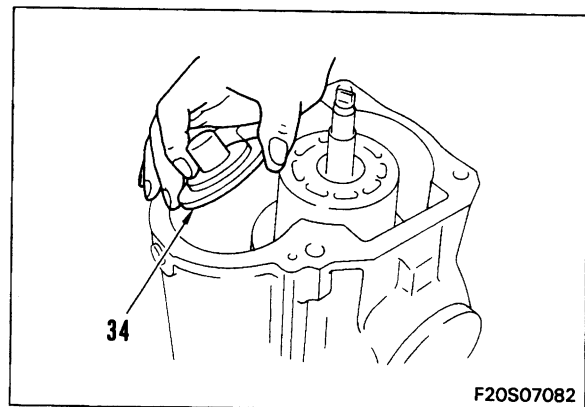
Align with spline of drive shaft, and install cylinder block assembly (8).



10. Spring seat

Push in hanger with handle of hammer, and with hanger at an angle, install spring seat (34) to hanger.

★ Check that the protrusion of the spring seat is fitted securely in the hole in the hanger.

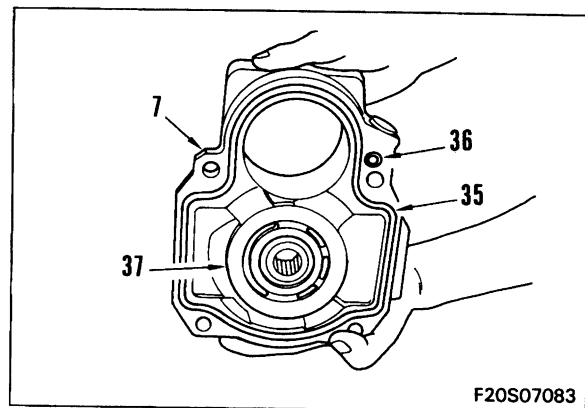


11. End cover

1) Coat O-ring (35) and (36), and valve plate (37) with grease to prevent them from falling off, install to end cover (7), then turn over and check that they do not fall out.


★ Coat the face of the valve plate with no notch with grease.

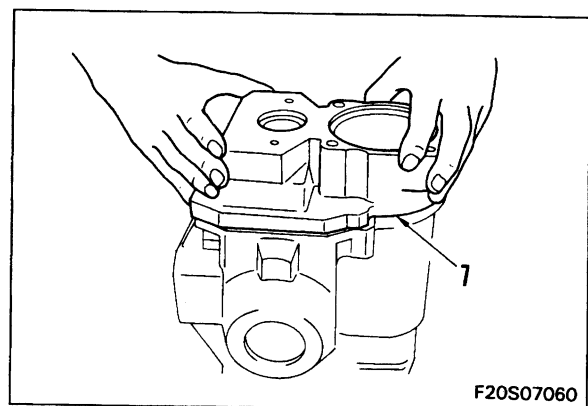
 Control plate: Grease (G2-LI)



2) Install end cover (7).

★ When installing, be careful to keep the end cover horizontal.

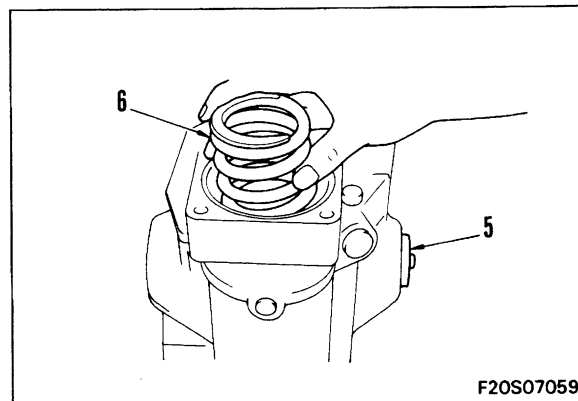
 Bolt: 6.3 ± 0.7 kgm



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
12. Spring

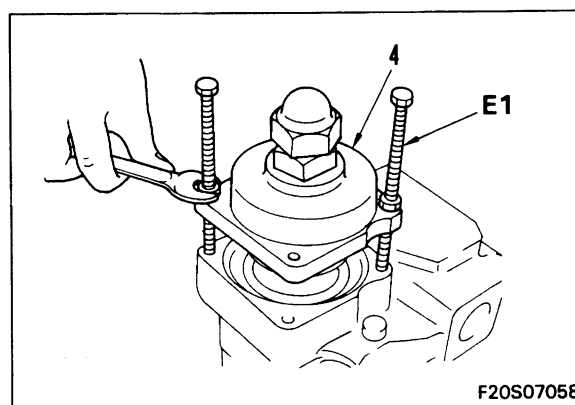
Align with spring seat, and assemble inner spring and outer spring (6) to pump case (5).



13. Cover

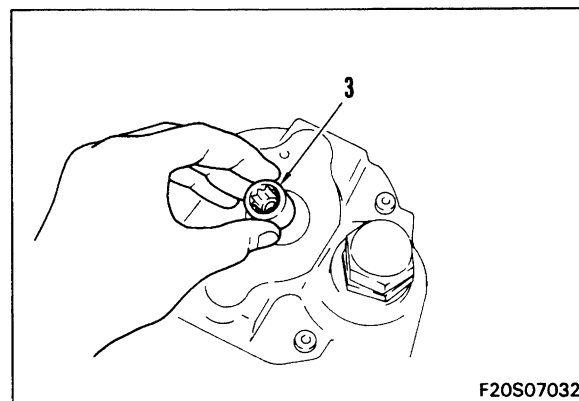
- 1) Set cover (4) on spring.
- 2) Install tool E1 on diametrically opposite sides, then tighten nuts in turn to a point where mounting bolts at other 2 places reach threaded hole in pump case.
- 3) When mounting bolts at other 2 places have taken hold firmly in pump case, remove tool E1 and install normal mounting bolts.
★ When installing, be careful to keep the cover horizontal.

 Bolt: 3.25 ± 0.35 kgm




14. Coupling

Insert coupling (3) in drive shaft.

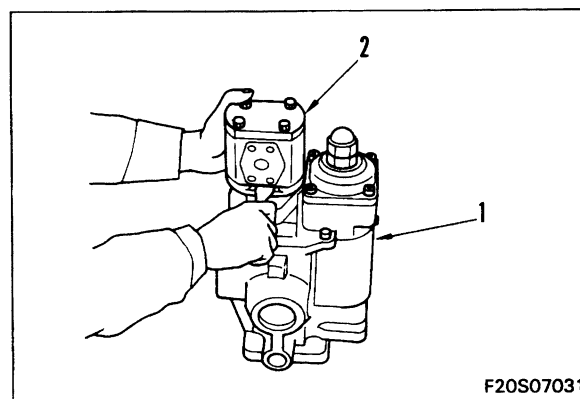


15. Gear pump assembly

Install gear pump assembly (2) to hydraulic pump assembly (1).


 Bolt: 2.35 ± 0.25 kgm

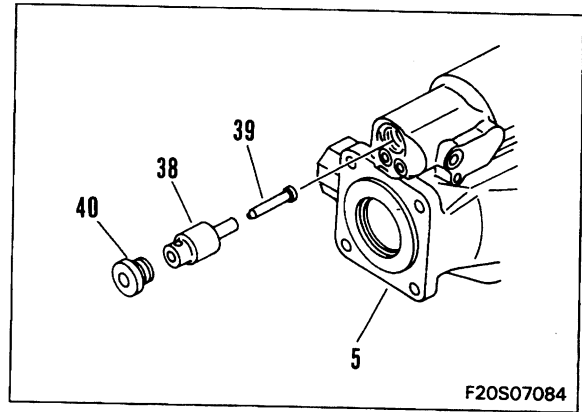
- ★ For details, see 30-11-22 ASSEMBLY OF GEAR PUMP ASSEMBLY.



16. Shift piston

- 1) Assemble piston (39) in barrel (38), then assemble in pump case (5).
- 2) Install plug (40).

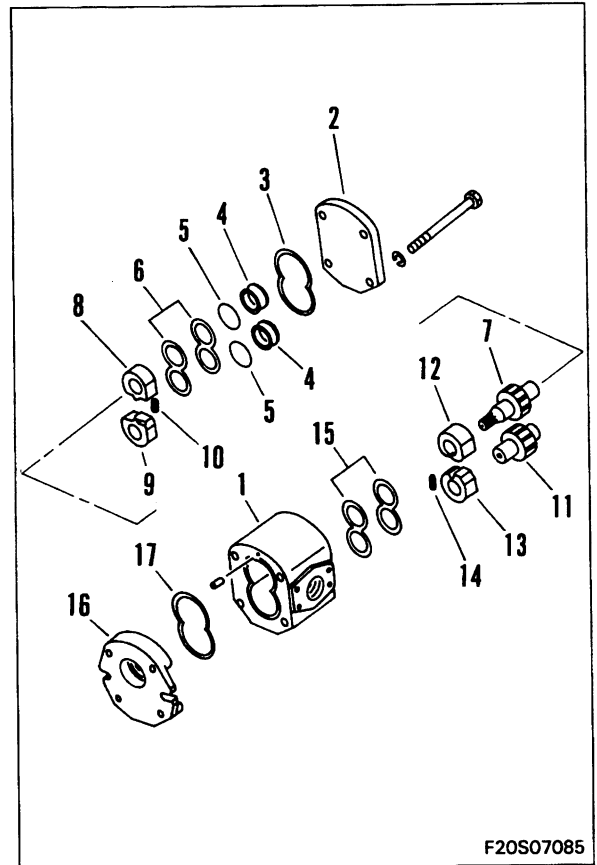
 Plug: 15.6 ± 1.5 kgm



DISASSEMBLY OF GEAR PUMP ASSEMBLY

(PC30-7) (PC45-1)

1. Remove cover (2) from gear case (1).
2. Remove ring (3).
3. Remove guides (4) and O-rings (5).
4. Remove plates (6).
5. Push shaft of drive gear (7) from rear face, and remove side plates (8) and (9), ring (10), and driven gear (11).
6. Remove side plates (12) and (13), ring (14), and plates (15) from inside rear of gear case.
7. Remove bracket (16) from gear case (1), then remove ring (17).



ASSEMBLY OF GEAR PUMP ASSEMBLY


(PC30-7) (PC45-1)

1. Assemble ring (17) in gear case (1), then align bracket (16) with gear case.
2. Assemble plates (15) in gear case.
3. Align side plates (12) and (13), and assemble ring (14) between them.
4. Assemble side plate and ring sub-assembly (assembled in Step 3) in gear case.
5. Assemble drive gear (7).
6. Assemble driven gear (11).
7. Align side plates (8) and (9), and assemble ring (10) between them.
8. Assemble side plate and ring sub-assembly (assembled in Step 7) in gear case.
9. Assemble plates (6), O-rings (5), and guides (4).
10. Assemble ring (3).
11. Install cover (2).

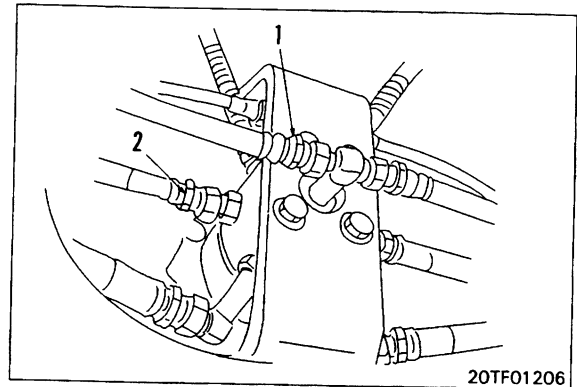
Bolt: 6 ± 0.6 kgm

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REMOVAL OF CENTER SWIVEL JOINT ASSEMBLY

 Lower the work equipment to the ground and stop the engine. Then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.

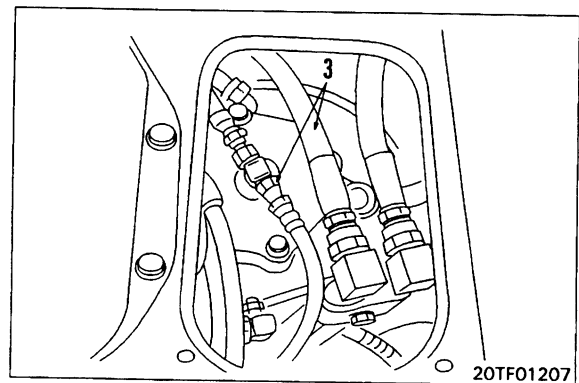
1. Disconnect hoses (1) and (2).
 - ★ Disconnect 10 hoses at the bottom.
 - ★ After removing the piping, mark with tags to prevent mistakes when installing.
2. Disconnect hoses (3).
 - ★ Disconnect 9 hoses at the top.
 - ★ After removing the piping, mark with tags to prevent mistakes when installing.



3. Remove link (4).
4. Remove center swivel joint assembly (5).

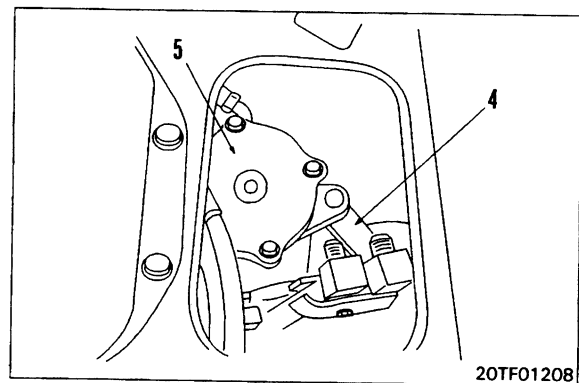


See WEIGHT TABLE.



INSTALLATION OF CENTER SWIVEL JOINT ASSEMBLY

- Carry out installation in the reverse order to removal.
- Refilling with oil
Add oil to the specified level, and run the engine to circulate the oil through the system. Then check the oil level again.




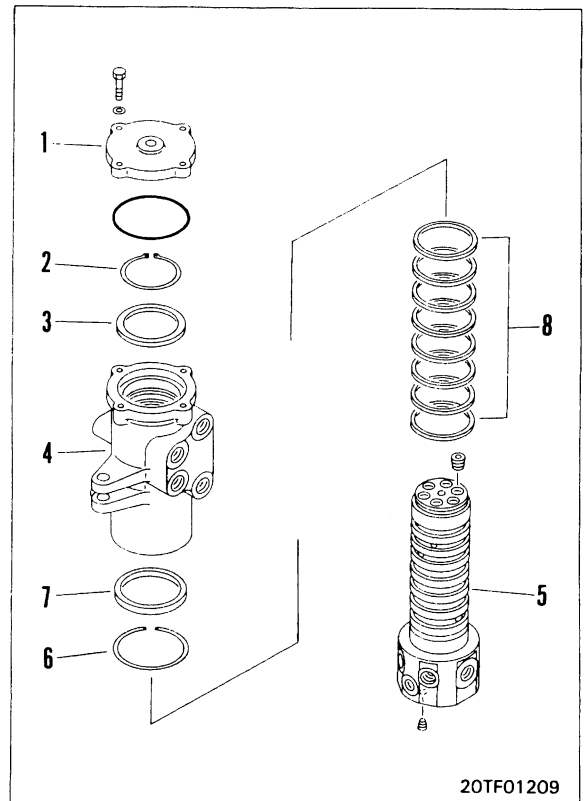
7
2
2
2
2

DISASSEMBLY OF CENTER SWIVEL JOINT ASSEMBLY

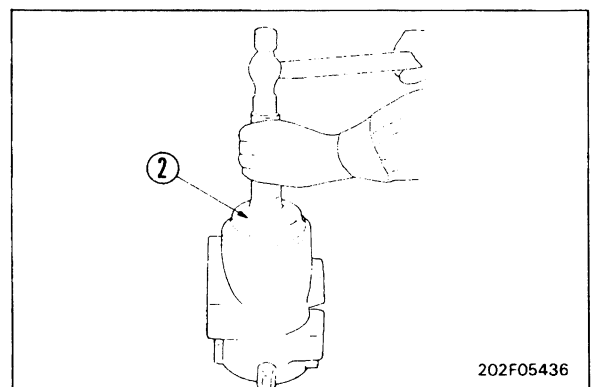
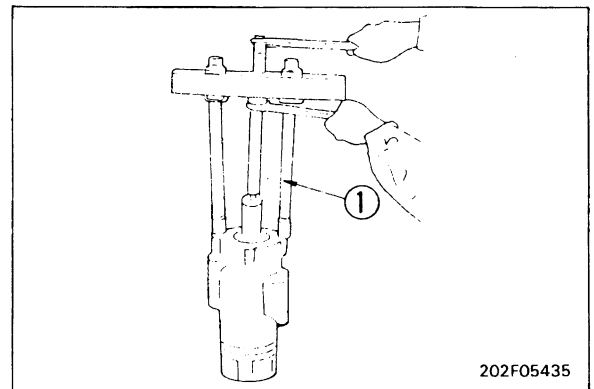
1. Remove cover (1).
2. Remove snap ring (2).
3. Using push puller ①, remove swivel rotor (4) and ring (3) from swivel shaft (5).
4. Remove snap ring (6), then remove oil seal (7) and slipper seals (8).

ASSEMBLY OF CENTER SWIVEL JOINT ASSEMBLY

1. Assemble slipper seals (8) in swivel rotor (4).
2. Using push tool ②, press fit oil seal (7) in swivel rotor (4), then install snap ring (6).
-  Lip of oil seal: Grease (G2-LI)
3. Set swivel shaft (5) on block, then using push tool, tap swivel rotor (4) with plastic hammer and install.
 - ★ When installing the rotor, the extremely careful not to damage the slipper seal and the lip of oil seal.
4. Install ring (3), and lock with snap ring (2).
5. Fit O-ring and install cover (1).



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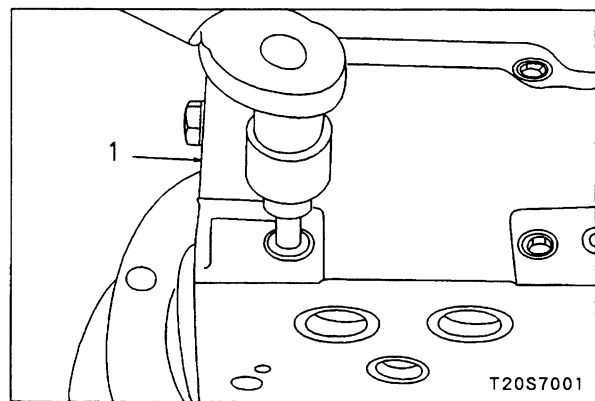
DISASSEMBLY OF TRAVEL MOTOR ASSEMBLY

PHX-300N (PC25-1, PC30-7)
PHX-350N (PC40-7)

DISASSEMBLY OF BRAKE VALVE ASSEMBLY

1. Brake valve assembly

Remove brake valve assembly (1) from travel motor assembly.



2. Counterbalance valve

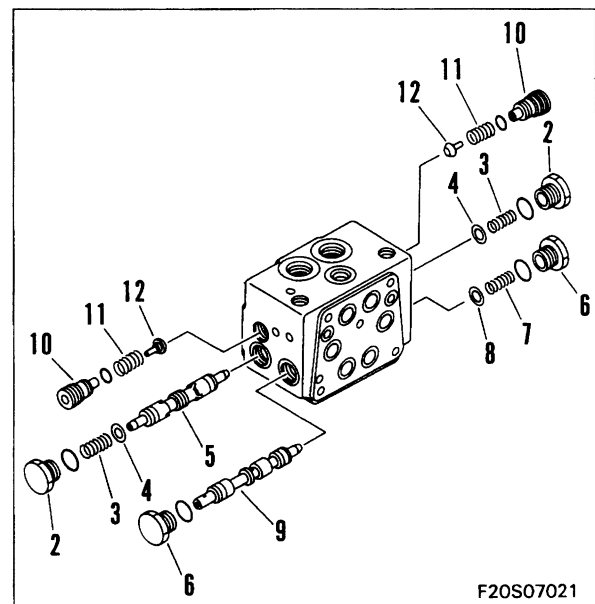
1) Remove plug (2), then remove spring (3), ring (4) and spool (5).

3. Regulator valve

1) Remove plug (6).
2) Remove spring (7) and ring (8).
3) Remove spool (9).

4. Check valve

1) Remove plug (10).
2) Remove spring (11), then remove check valve (12).



DISASSEMBLY OF FINAL DRIVE ASSEMBLY

1. Cover

1) Remove plug, then drain oil.

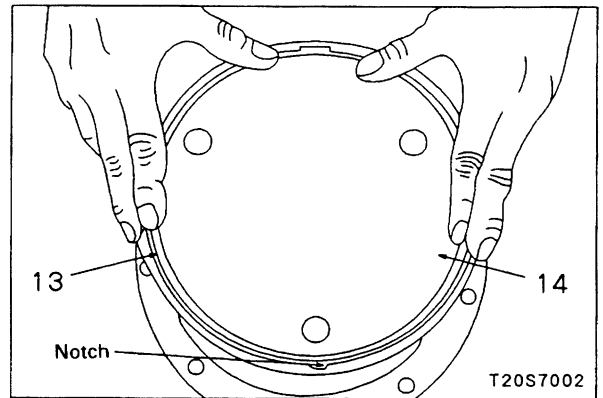


- PHX-300N : Approx. 1,200 cc
- PHX-350N : Approx. 1,400 cc

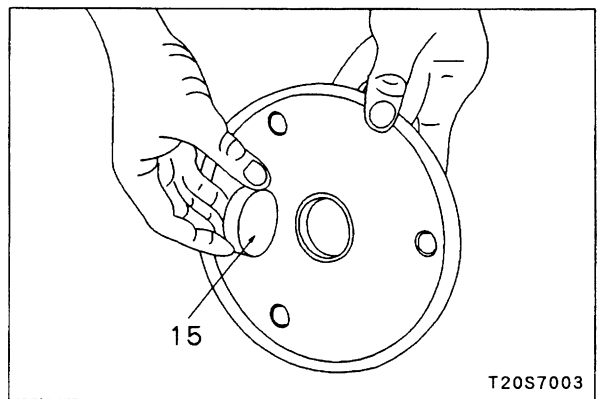
2) Remove snap ring (13).

★ Insert a flat-blade screwdriver into the notch in the case, then lift up and remove.

3) Remove cover (14).



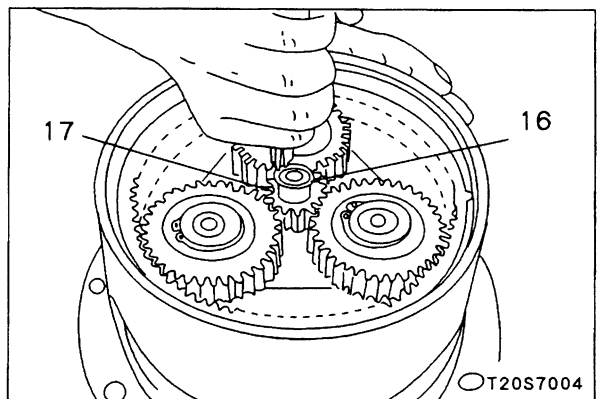
4) Remove slide ring (15) from cover.
(PHX 350 only)



2. No. 2 sun gear

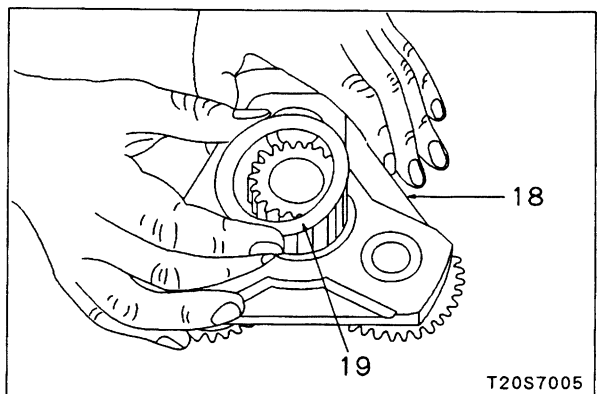
Remove snap ring (16), then remove No. 2 sun gear (17). (PHX-300N)

Remove No. 2 sun gear shaft. (PHX-350N)



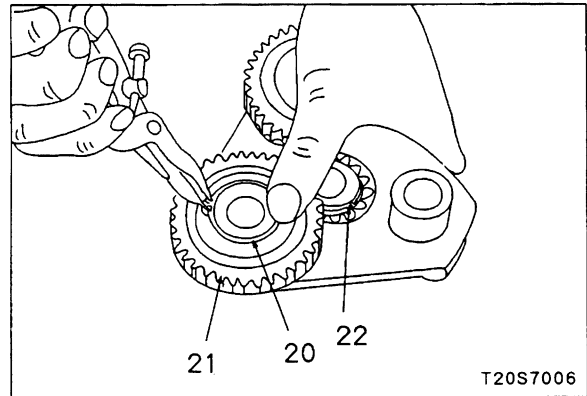
3. No. 2 planetary carrier assembly

- 1) Remove No. 2 planetary carrier assembly (18).
- 2) Remove thrust collar (19).



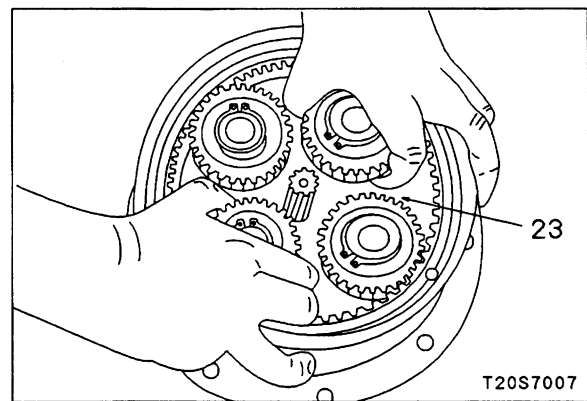
3) Disassemble No. 2 planetary carrier assembly as follows.

- i) Remove snap ring (20), then remove No. 2 planetary gear (21), bearing, and thrust washer.
- ii) Remove snap ring (22), then remove No. 1 sun gear.



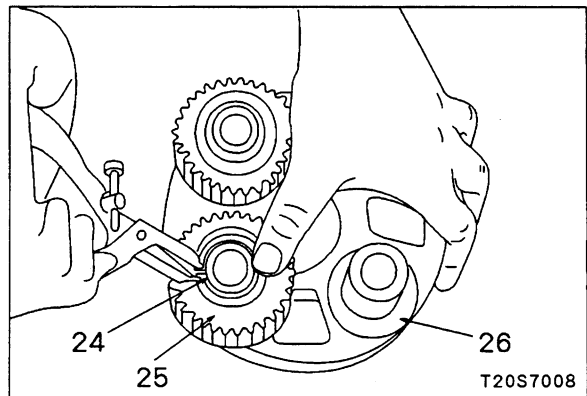
4. No. 1 planetary carrier assembly

1) Remove No. 1 planetary carrier assembly (23).



2) Disassemble No. 1 planetary carrier assembly as follows.

- i) Remove snap ring (24).
- ii) Remove bearing.
- iii) Remove No. 1 planetary gear (25), then remove thrust washer (26).

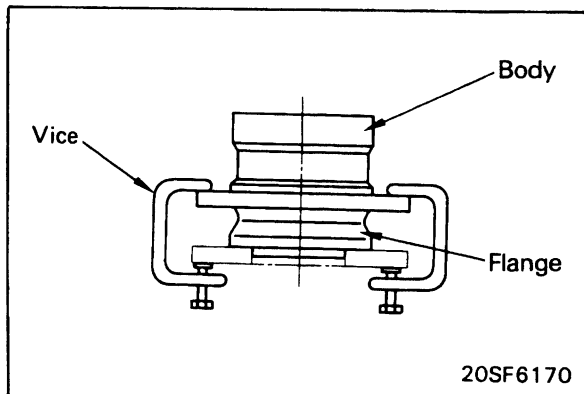


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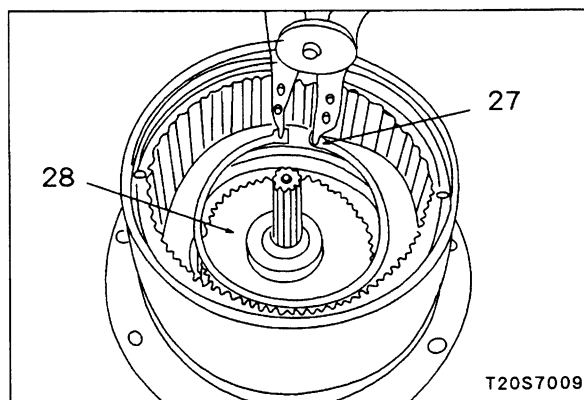
5. Case

1) Tighten final drive flange and hydraulic motor flange in a vice.

★ Tightening force: Max. 800 kg

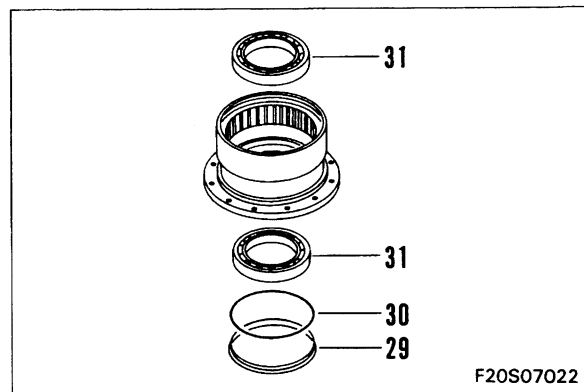


2) Remove snap ring (27), then remove hydraulic motor assembly (28).



3) Remove floating seal (29) and O-ring (30).

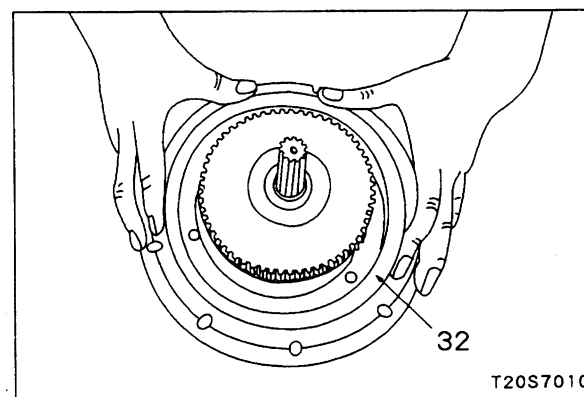
4) Remove bearings (31).



DISASSEMBLY OF HYDRAULIC MOTOR ASSEMBLY

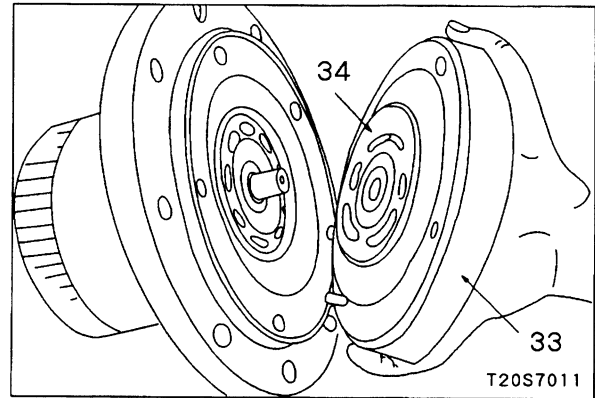
1. Floating seal

Remove floating seal (32) and O-ring.

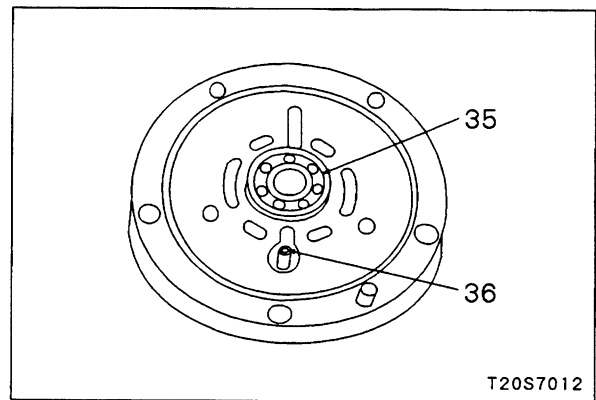


2. Valve body

- 1) Remove valve body (33) from housing.
- 2) Remove valve plate (34).

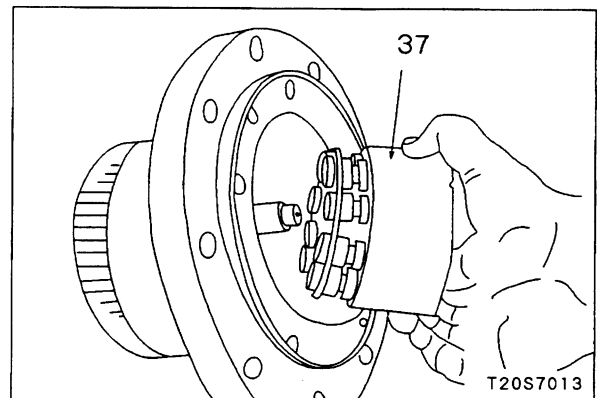


- 3) Remove bearing (35) and spring pin (36).

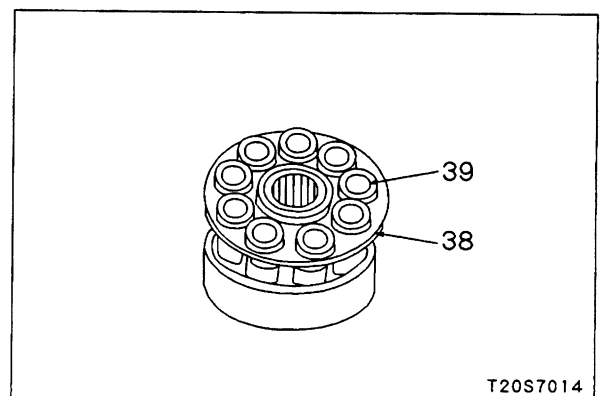


3. Cylinder block assembly

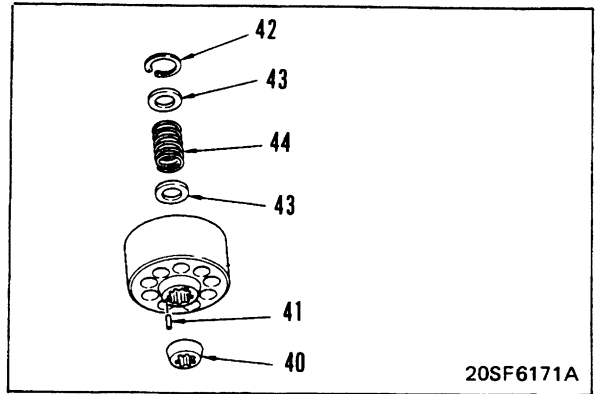
- 1) Remove cylinder block assembly (37).



- 2) Disassemble cylinder block assembly as follows.
 - i) Remove retainer plate (38) together with pistons (39).

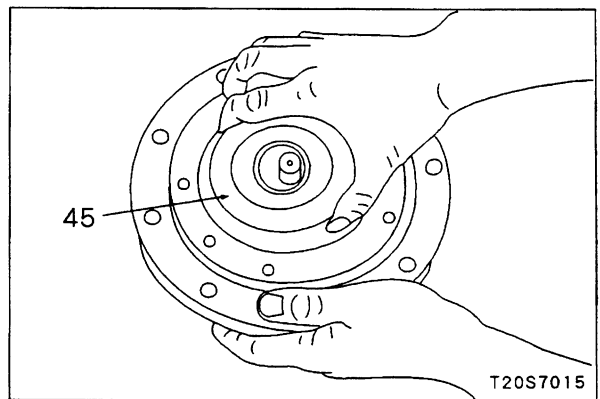


- ii) Remove barrel holder (40) and pin (41).
- iii) Remove snap ring (42), then remove retainer (43), spring (44), and retainer (43).



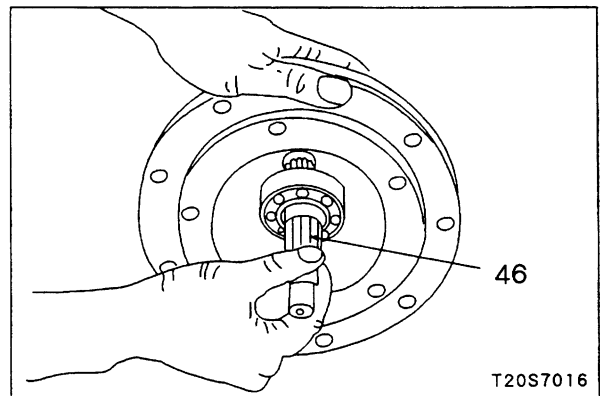
4. Swash plate

Remove swash plate (45).



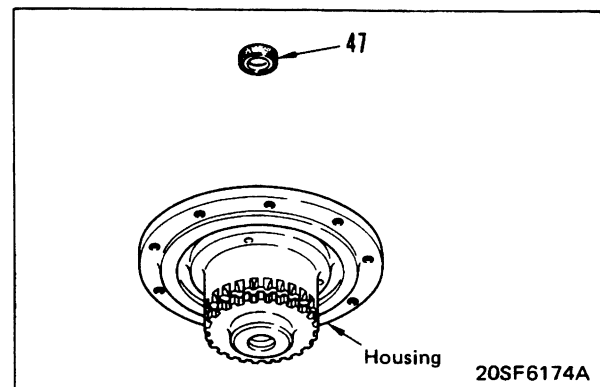
5. Shaft assembly

- 1) Remove shaft assembly (46).
- 2) Remove bearing from shaft.
- ★ Be careful not to scratch the sliding surface of the oil seal.



6. Oil seal

Remove oil seal (47).



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ASSEMBLY OF TRAVEL MOTOR ASSEMBLY

PHX-300N (PC25-1, PC30-7)
PHX-350N (PC40-7)

Preparatory work

- Clean all parts, and check for dirt or damage. Coat the sliding surfaces of all parts with engine oil (EO10-CD, new oil) before installing.

ASSEMBLY OF HYDRAULIC MOTOR ASSEMBLY

1. Oil seal

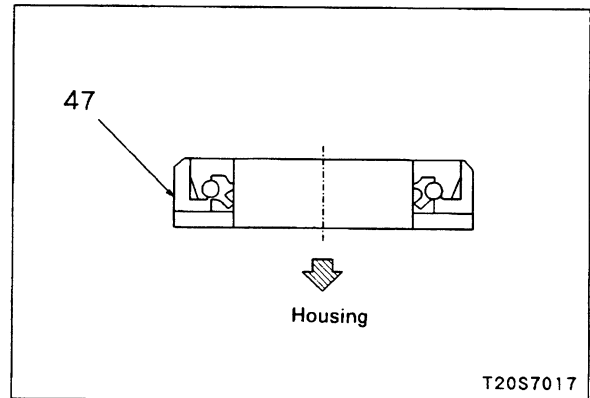
Press fit oil seal (47) to housing.

★ Use a new part for the oil seal.

★ Press fit the oil seal in the direction shown in the diagram.



Lip of oil seal: Grease (G2-LI)

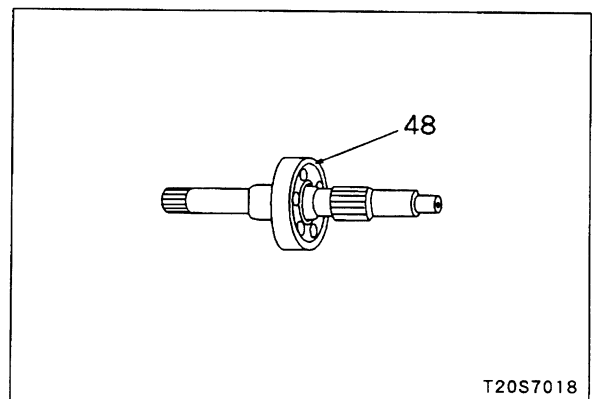


2. Shaft assembly

1) Press fit bearing (48) to shaft.

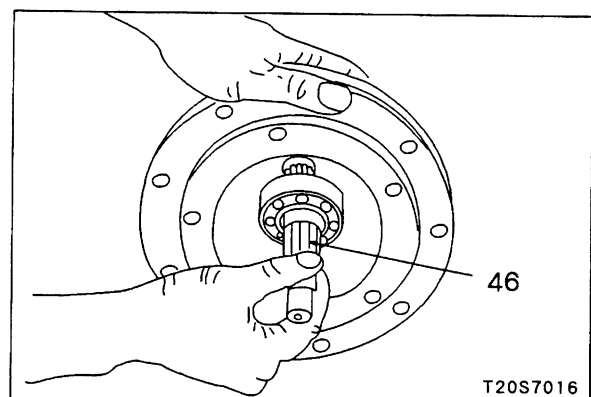
★ Use a new part for the bearing.

★ Be careful not to damage the sliding surface of the shaft oil seal.



2) Install shaft assembly (46) to housing.

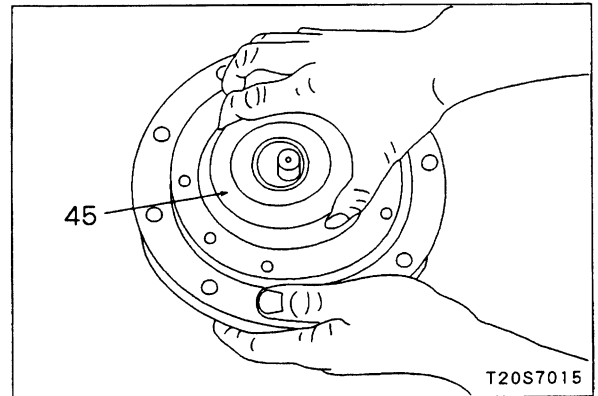
★ Be careful not to damage the oil seal when installing the shaft.



3. Swash plate

Install swash plate (45) in housing.

★ Align with the positioning pin when installing.

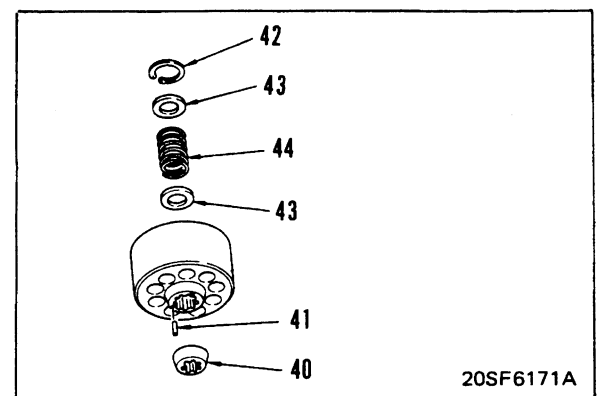


4. Cylinder block assembly

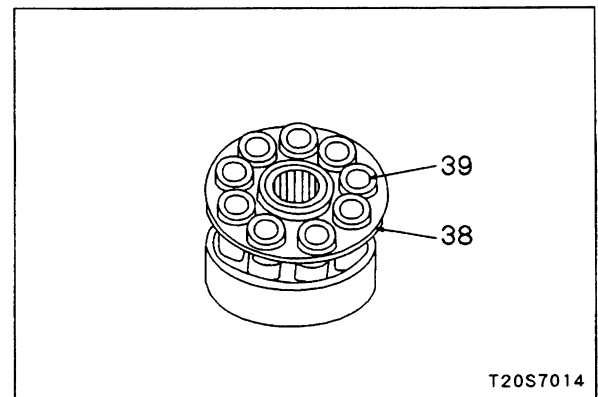
1) Assemble cylinder block assembly as follows.

i) Install retainer (43), spring (44), and retainer (43), then install snap ring (42).

ii) Install pin (41) and barrel holder (40).

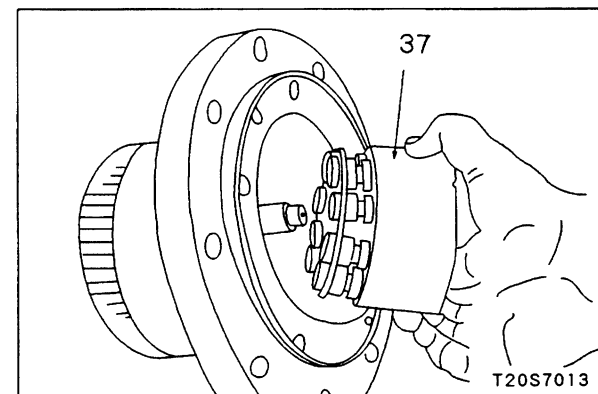


2) Assemble pistons (39) to retainer plate (38), then install it to cylinder block.



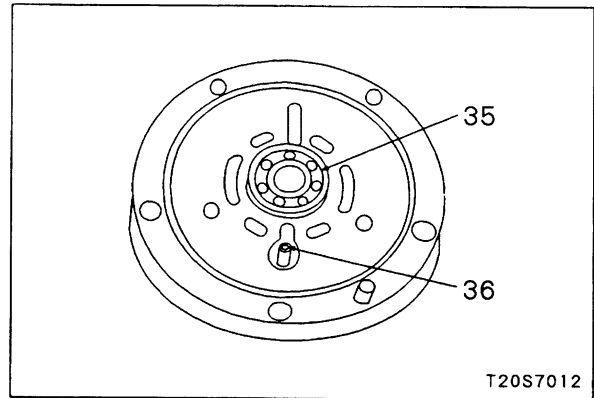
3) Install cylinder block assembly (37) in housing.
★ Install so that the shoe contacts the swash plate.

4) Fit O-ring to housing.



5. Valve body, valve plate

- 1) Install spring pin (36) and bearing (35) to valve body.
- 2) Fit O-ring to valve body.



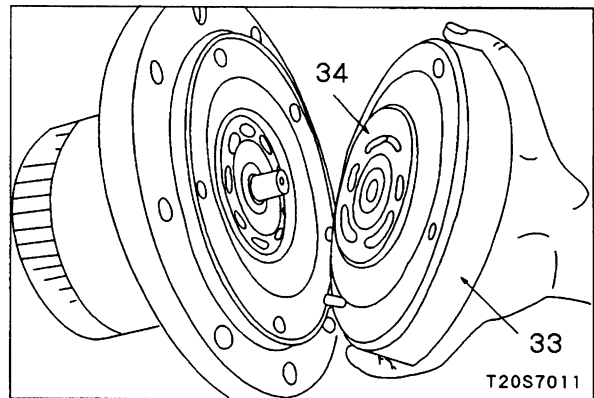
- 3) Assemble valve plate (34) to valve body (33).
- 4) Install valve body (33) to housing.



Housing: Approx, 250 cc

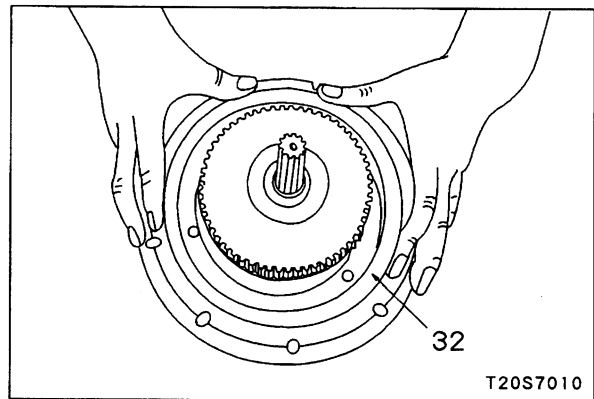
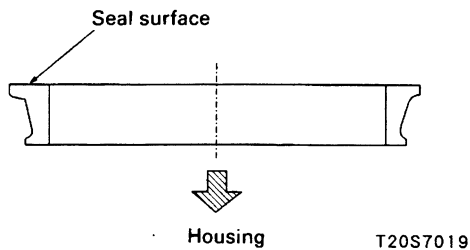


Mounting bolt: 5.9 ± 0.7 kgm



6. Floating seal

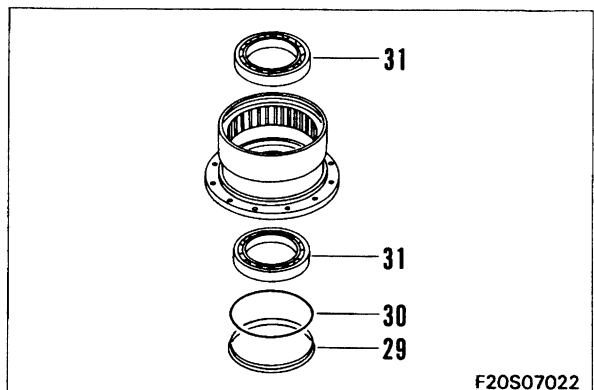
- Fit O-ring and floating seal (32) to housing.
- ★ Install the floating seal in the direction shown in the diagram.
 - ★ After installing the floating seal, remove all grease and oil from the seal surface.



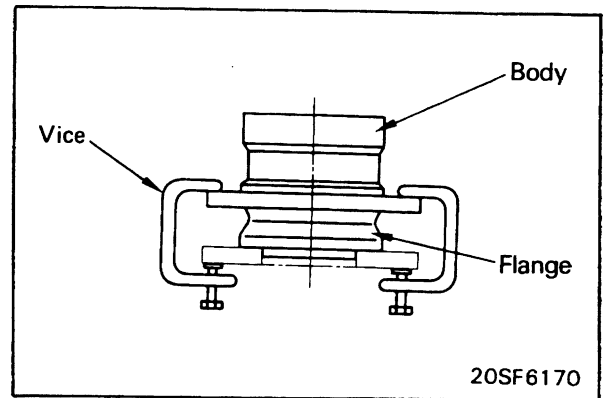
ASSEMBLY OF FINAL DRIVE ASSEMBLY

1. Case

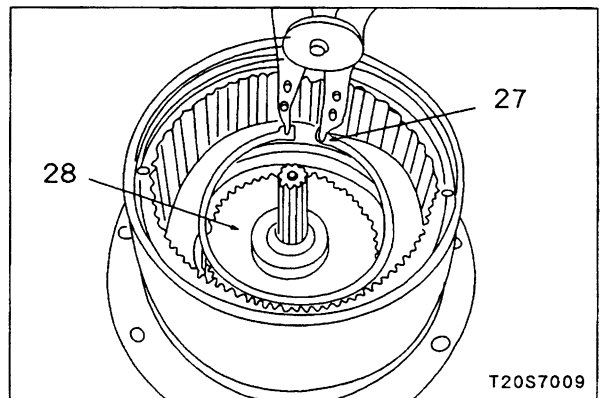
- 1) Press fit bearings (31) to case.
 - ★ Press fit with the side where the inner race is protruding at the top.
 - 2) Fit O-ring (30) and floating seal (29).
- ★ After installing, remove all grease and oil from the seal surface.



- 3) Tighten final drive flange and hydraulic motor flange in a vice.
 ★ Tightening force: Max. 800 kg



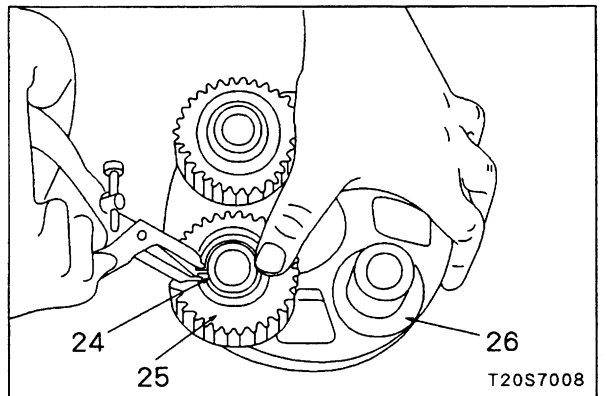
- 4) Install snap ring (27).



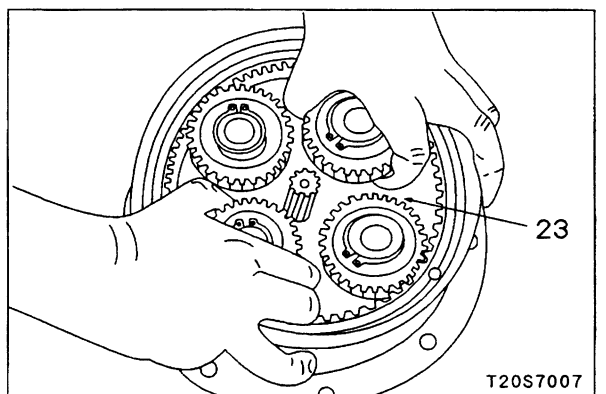
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2. No. 1 planetary carrier assembly

- 1) Assemble No. 1 planetary carrier assembly as follows.
 i) Install thrust washer (26).
 ii) Install No. 1 planetary gear (25).
 iii) Install bearing.
 iv) Install snap ring (24).

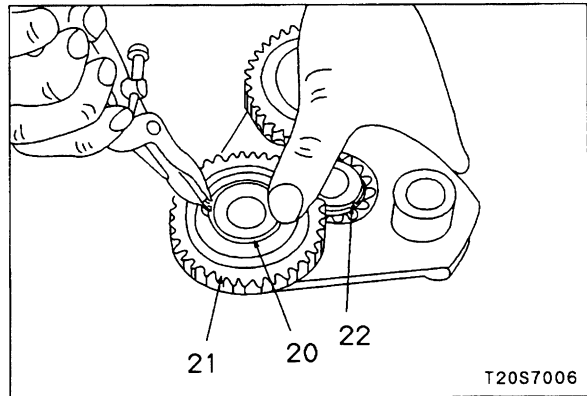


- 2) Install No. 1 planetary carrier assembly (23) in case.
 ★ Align with the shaft spline when installing.

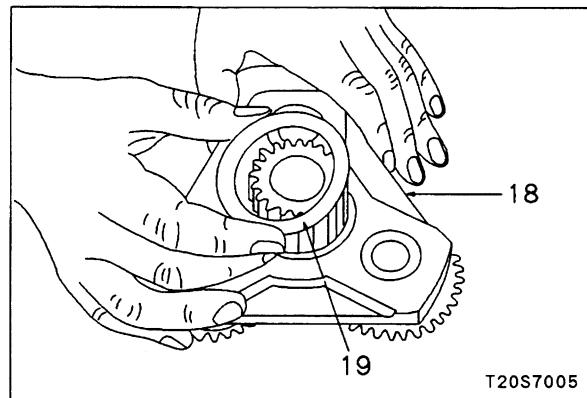


3. No. 2 planetary carrier assembly

- 1) Assemble No. 2 planetary carrier assembly as follows.
- i) Install No. 1 sun gear, then install snap ring (22).
 - ii) Install thrust washer.
 - iii) Install No. 2 planetary gear (21).
 - iv) Install bearing, then install snap ring (20).



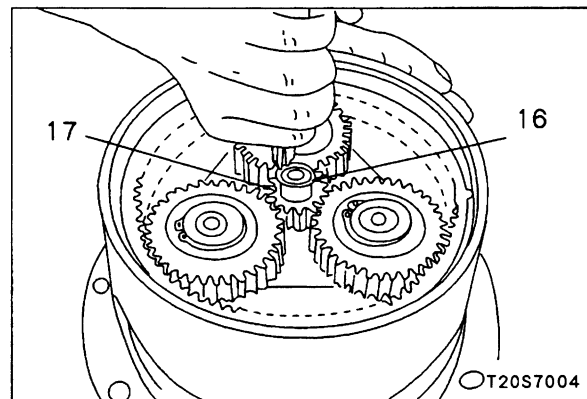
- 2) Install No. 2 planetary carrier assembly (18) together with thrust collar (19).
- ★ Stick with grease to prevent the thrust collar from falling out when installing.



4. No. 2 sun gear

Install No. 2 sun gear (17), then install snap ring (16). (PHX-300N)

Install No. 2 sun gear shaft. (PHX-350N)

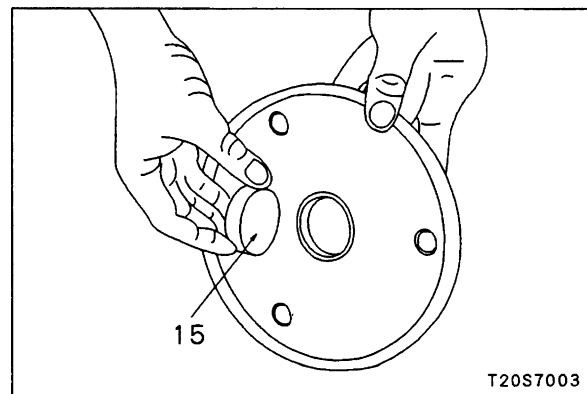


5. Cover


- 1) Install slide ring (15) to cover. (PHX-350N only)
- ★ Stick it with grease to prevent it from coming out of position when the cover is installed.
- 2) Fit O-ring to cover.

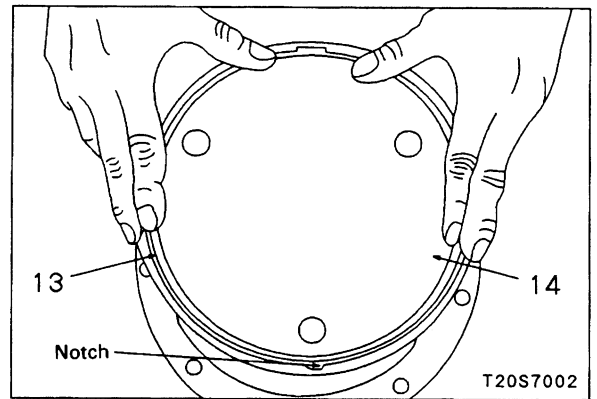


Final drive: Approx. 1,200 cc (PHX-300N)
Approx. 1,400 cc (PHX-350N)



- 4) Install cover (14), then install snap ring (13).
 - ★ Be careful not to damage the O-ring when installing the cover.
 - ★ Install so that the end gap of the snap ring is at a position $180 \pm 30^\circ$ from the notch in the case.
- 5) Install plug.
 - ★ Wind seal tape.


 Plug: 4.5 ± 1.5 kgm



ASSEMBLY OF BRAKE VALVE ASSEMBLY


1. Check valve

- 1) Install check valve (12) and spring (11).
- 2) Fit O-ring, then tighten plug (10).

 Plug: 6 ± 1 kgm


2. Regulator valve

- 1) Install spool (9).
- 2) Install ring (8) and spring (7).
- 3) Fit O-ring, then tighten plug (6).

 Plug: 18.5 ± 1.5 kgm

3. Counterbalance valve

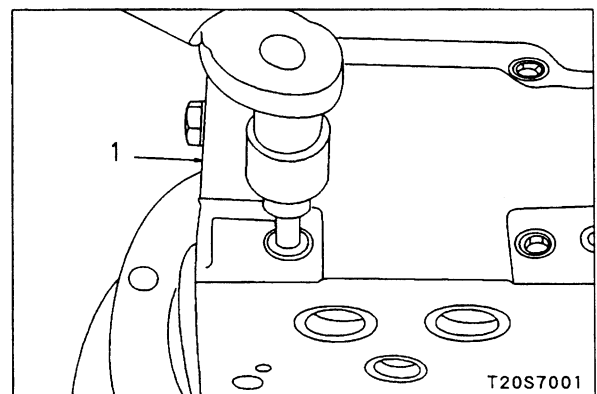
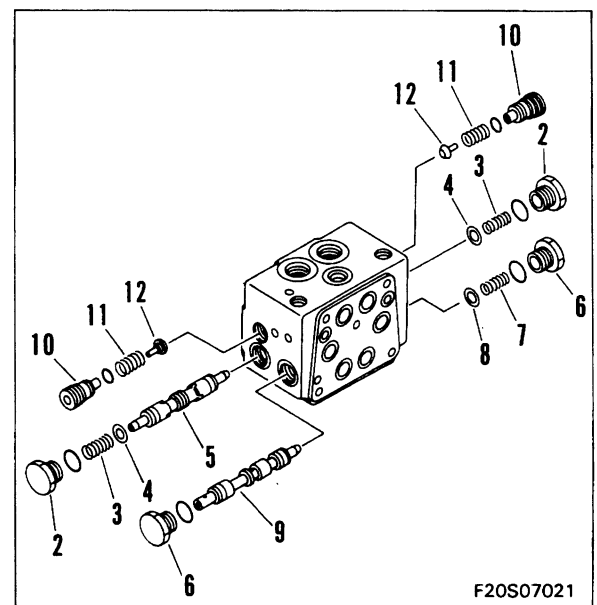
- 1) Install spool (5).
- 2) Install ring (4) and spring (3).
- 3) Fit O-ring, then tighten plug (2).

 Plug: 18.5 ± 1.5 kgm

4. Brake valve assembly

- 1) Fit O-rings to brake valve assembly.
- 2) Install brake valve assembly (1).

 Mounting bolt: 2.95 ± 0.35 kgm

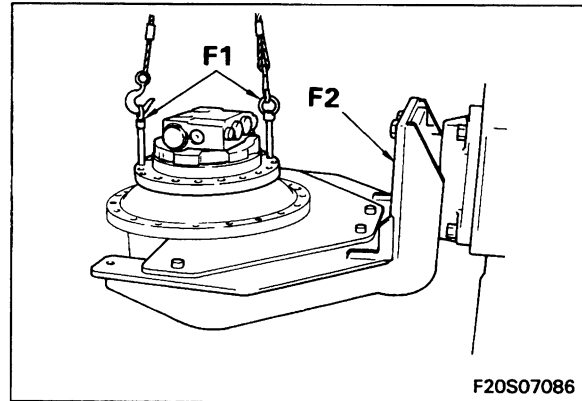


DISASSEMBLY OF TRAVEL MOTOR ASSEMBLY

GM05VL (PC45-1)

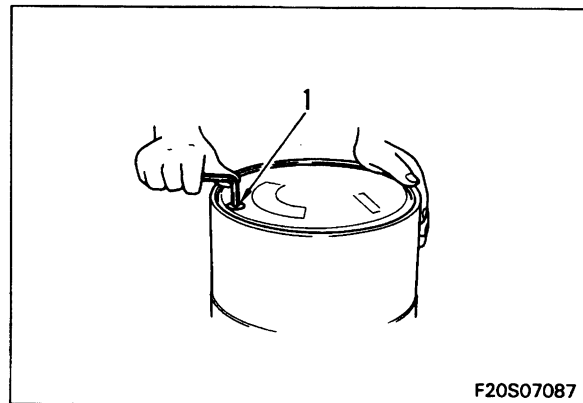
Preparatory work

- 1) Install tool F1 to spindle, then raise with crane and install to tool F2.
- ★ Install tool F1 at diametrically opposite points.



- 2) Remove 3 plugs (1) and drain oil.

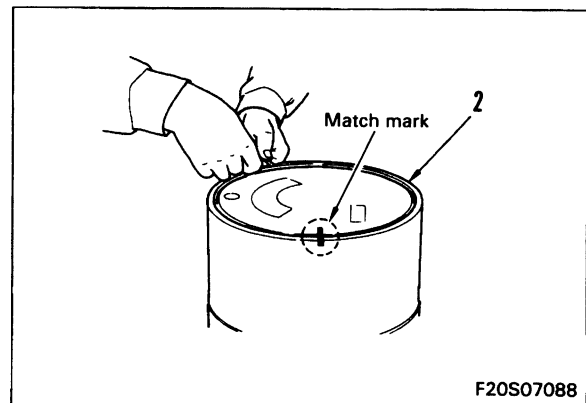
 : Approx. 1.1 l



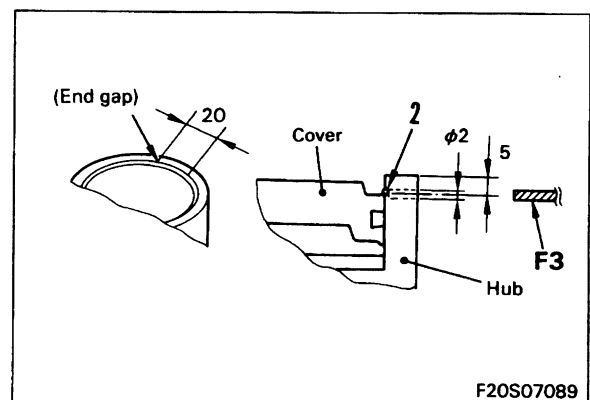
DISASSEMBLY OF TRAVEL MOTOR ASSEMBLY

1. Cover

- 1) Set motor in position with cover at top.
- 2) Make match marks on mating surface of cover and hub.
- 3) Twist end gap with pin pliers, and remove ring (2).



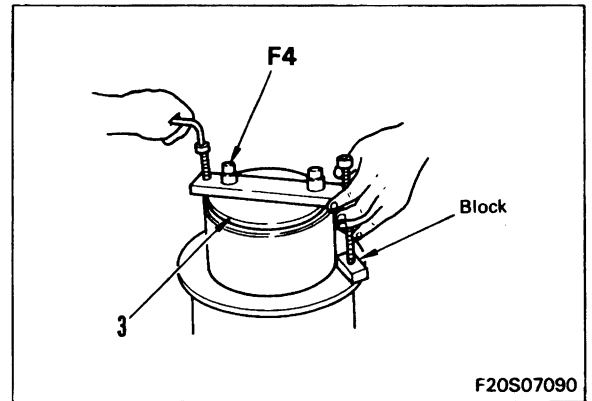
- ★ If it is difficult to remove the ring, drill a hole of $\phi 2$ mm at the position shown in the diagram on the right, lift up the ring with tool F3, and remove it.



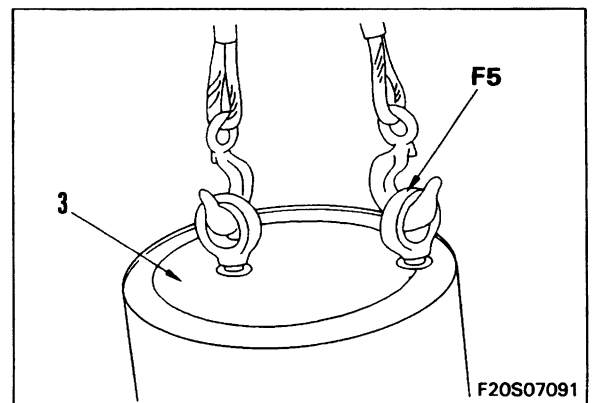
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4) Install 2 bolts inside tool **F4** to plug hole, and tighten 2 bolts outside in turn, then remove cover (3).

★ To prevent damage to the hub, fit a block at the point where the tip of the outside bolt contacts.



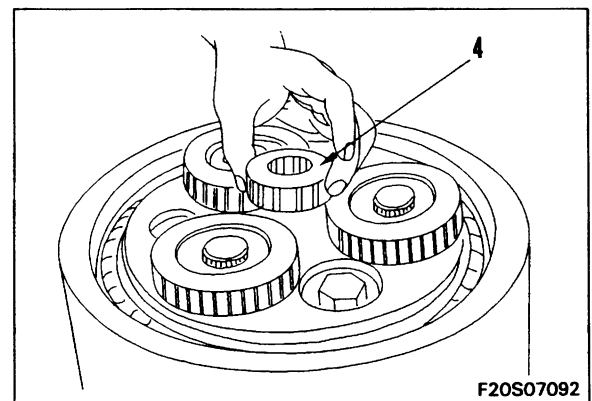
★ When not using tool **F4**, install tool **F5** to plug hole, then raise with crane and remove cover (3).



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2. Input gear

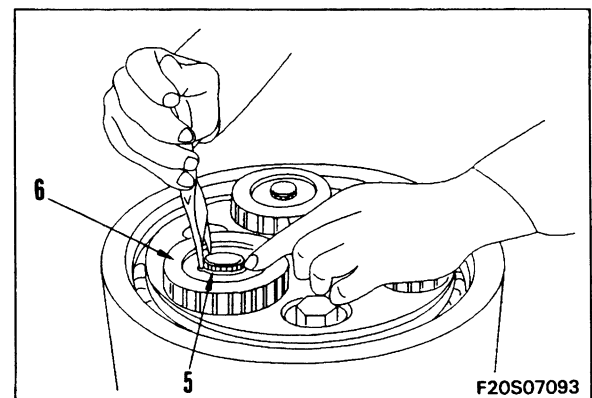
1) Remove snap ring, then remove input gear (4).



3. Spur gear

1) Remove snap ring (5).

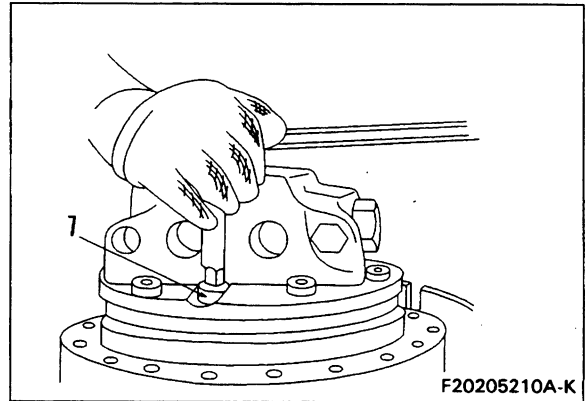
2) Remove spur gear (6) and distance piece.



4. Rear flange

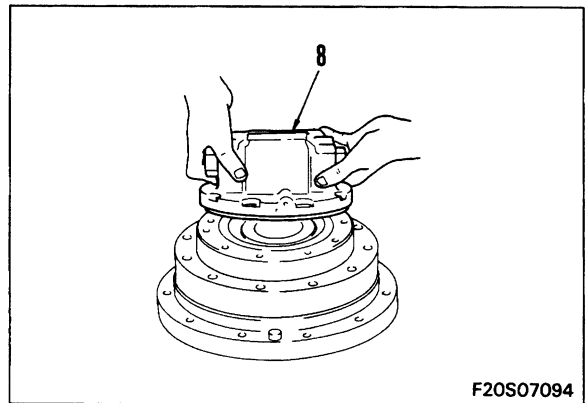
1) Remove 6 mounting bolts (7).

★ If the rear flange is to be further disassembled, loosen the plug.



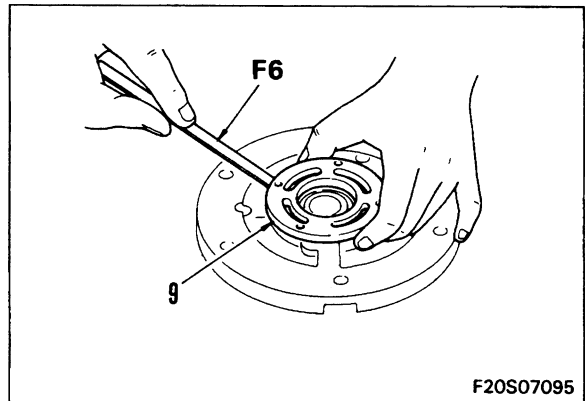
2) Remove rear flange (8).

★ Hold the rear flange with both hands, then lift it straight up slowly and remove it. If it is forcibly twisted or hit, the timing plate may drop and be damaged.



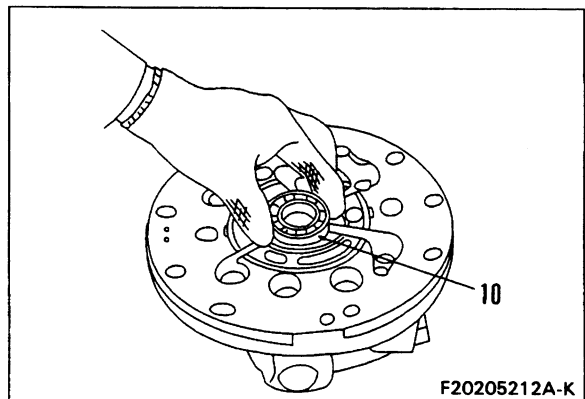
3) Using tool F6, remove timing plate (9).

★ Be careful not to damage the mating surface.



4) Remove bearing (10).

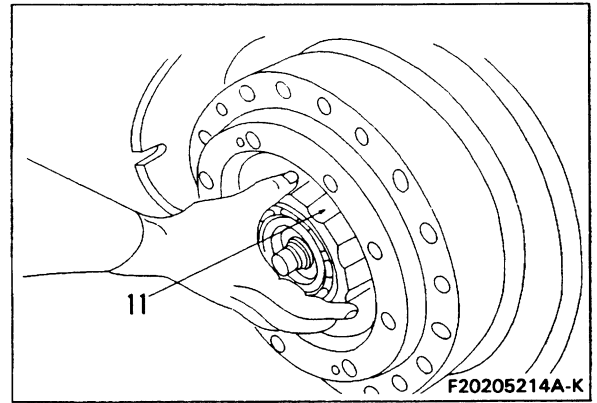
5) Remove pin from rear flange.



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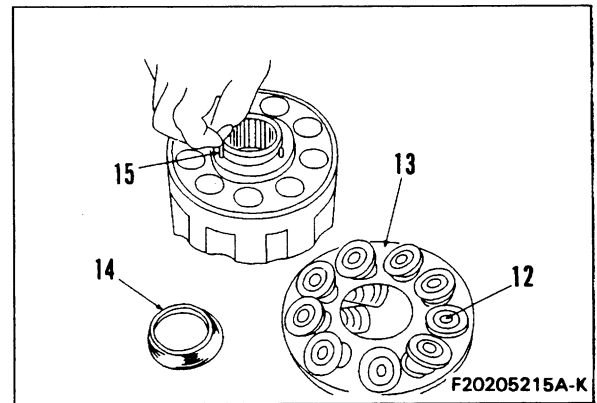
5. Cylinder, piston assembly

- 1) Set travel motor facing side.
- 2) Drain oil from motor.
- 3) Hold cylinder block (11) with both hands, and remove together with piston assembly.
★ Before removing, rotate the cylinder block backwards and forwards 2 — 3 times by hand, and check that the shoe is completely disconnected from the swash plate.



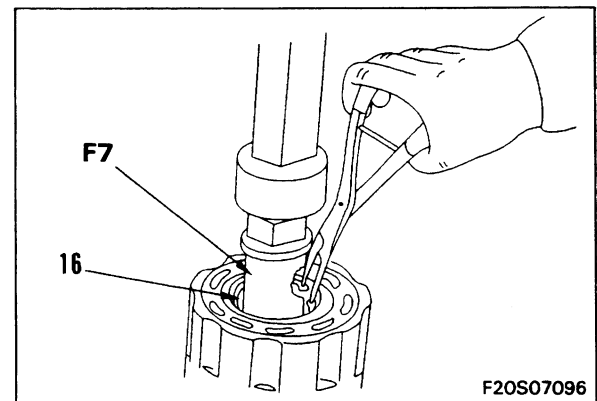
6. Piston

- 1) Remove piston (12) and retainer plate (13).
- 2) Remove thrust bowl (14).
- 3) Remove 3 pins (15).

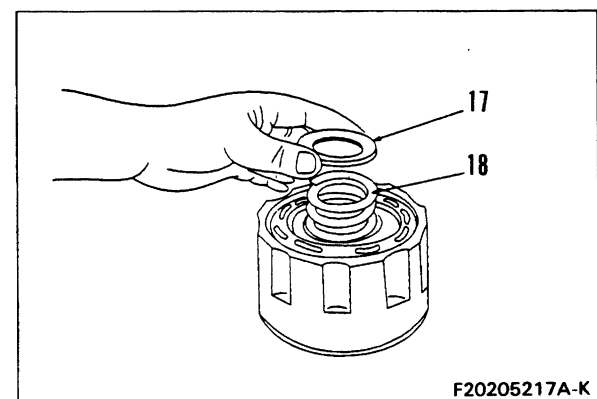


7. Disassembly of cylinder block

- 1) Set cylinder block on press work stand, and hold washer in position with tool F7.
- 2) Using pliers, remove snap ring (16).



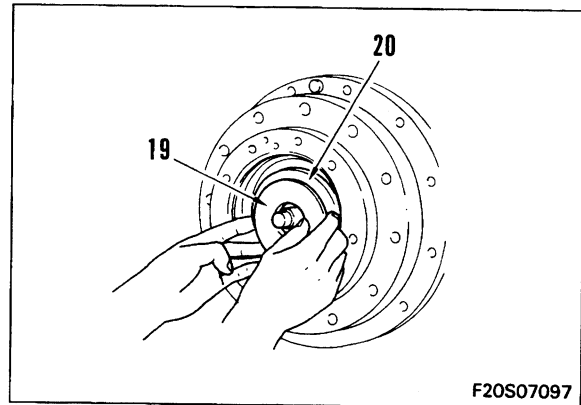
- 3) Loosen press, and remove 2 washers (17) and spring (18).



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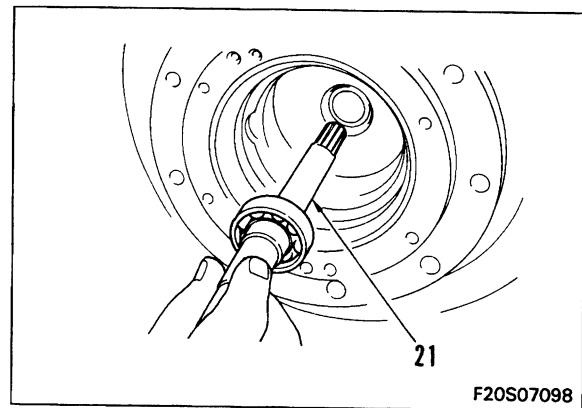
8. Swash plate

- 1) Remove swash plate (20).
- 2) Remove thrust plate (19) from swash plate.
 - ★ If it is in tight contact because of oil and is difficult to remove, blow compressed air at the mating surface, then remove it.
- 3) Remove 2 balls.



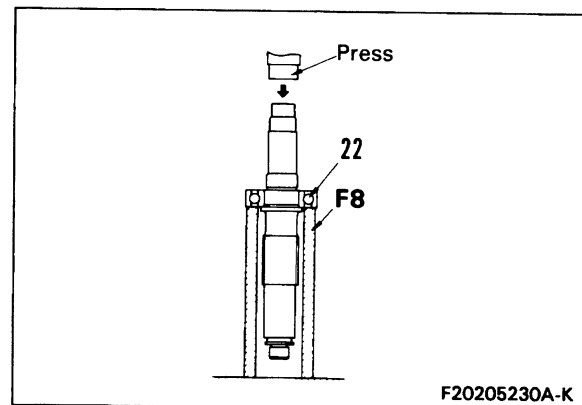
9. Shaft

- Remove shaft (21) together with bearing.
- ★ If it is difficult to remove, tap the end of the shaft with a plastic hammer from the final drive end, and then remove it.



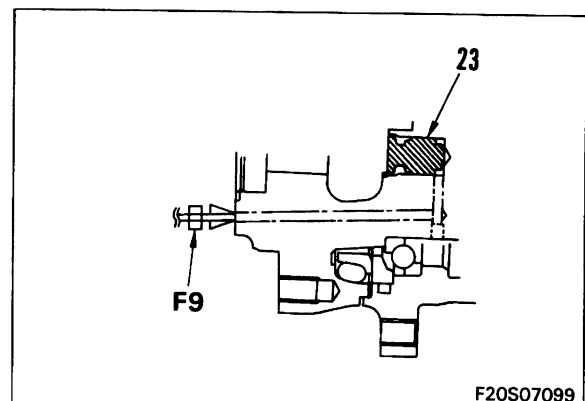
10. Disassembly of shaft

- 1) Install shaft in tool F8.
- 2) Hold tip of shaft with press, and remove bearing (22).



11. Speed selector piston

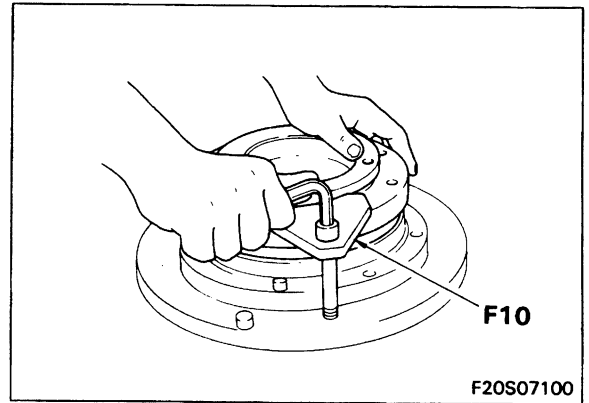
- Using tool F9, blow in compressed air from hole of passage, and remove speed selector piston (23).
- ★ Air pressure: 3 — 5 kg/cm²



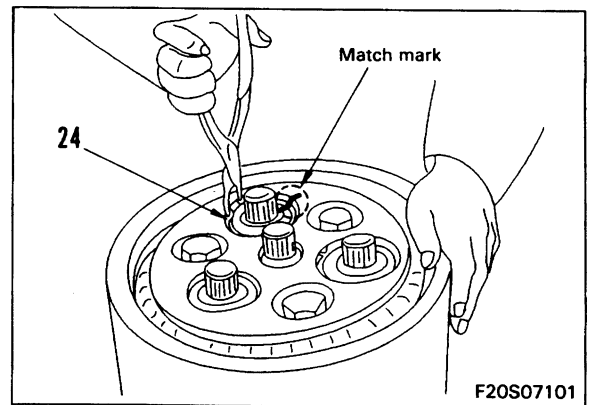
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12. Hold flange

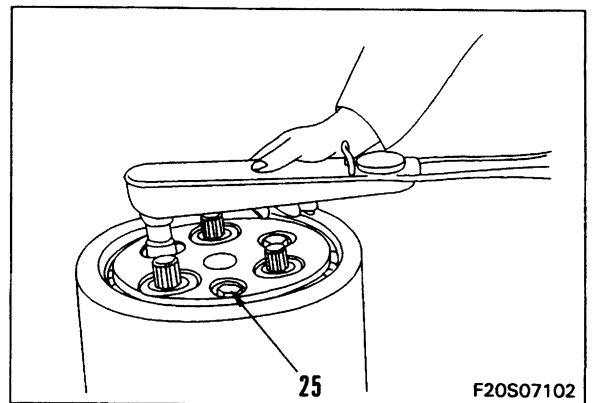
- 1) Turn over motor.
- 2) Install tool **F10** to hub and spindle.
 - ★ Install the holders so that they are on symmetrically opposite sides.



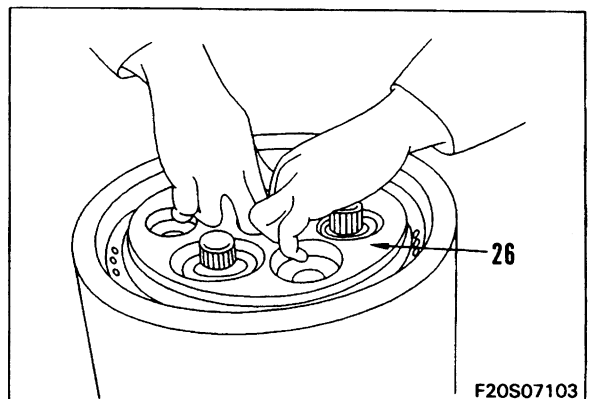
- 3) Turn over motor.
- 4) Remove 3 snap rings (24).
 - ★ Make match marks on the snap ring and the hold flange, then remove.



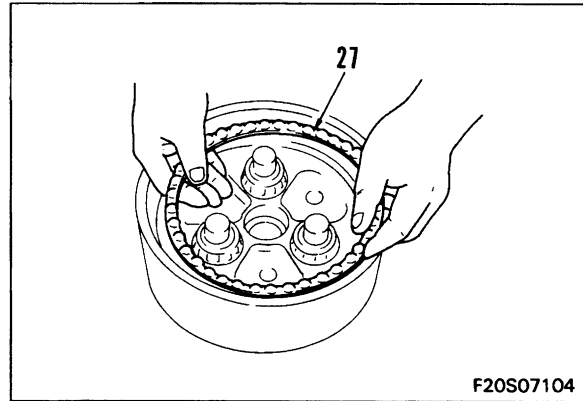
- 5) Remove reamer bolt (25).
 - ★ Loosen the reamer bolt slowly. If it becomes stiff when removing it, tighten it, and loosen it again.



- 6) Remove hold flange (26).
 - ★ The bearing inner race can be removed at the same time.
 - ★ Make a match mark on the hold flange and the spindle, then remove.



7) Remove bearing (27).



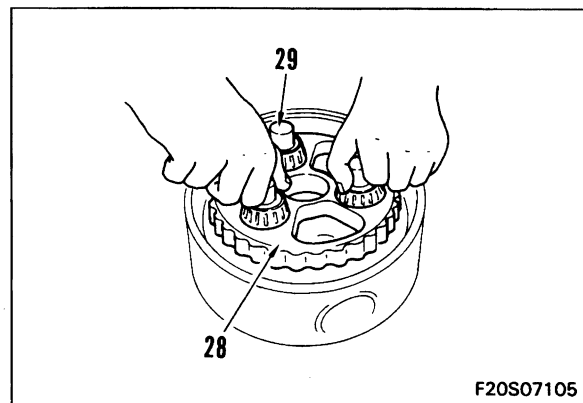
13. RV gear assembly

1) Remove RV gear assembly (28).

★ To remove the RV gear assembly, hold the tip of crankshaft (29), then lift it straight up and remove it.

★ Do not disassemble the RV gear assembly.

2) Remove 30 pins.



14. Hub

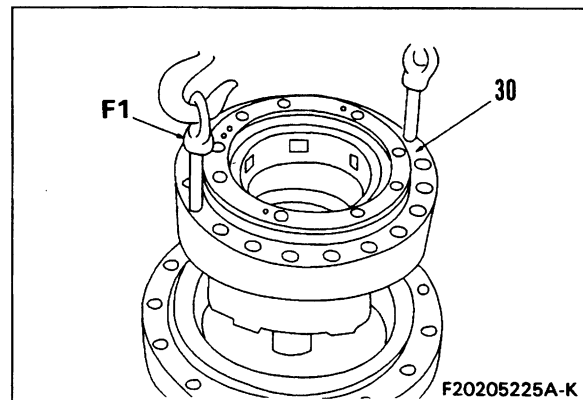
1) Turn over motor.

2) Remove tool F10.

3) Install tool F1, and lift off spindle (30).

★ Install tool F1 so that they are at diagonally opposite sides.

★ To prevent damage to the bearing retainer, lift the spindle up slowly.

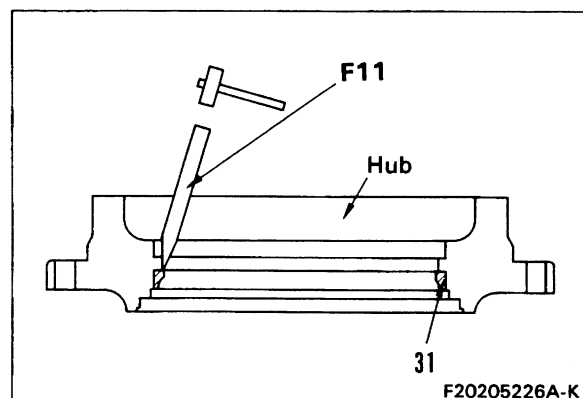


4) Disassembly of hub

i) Remove distance piece.

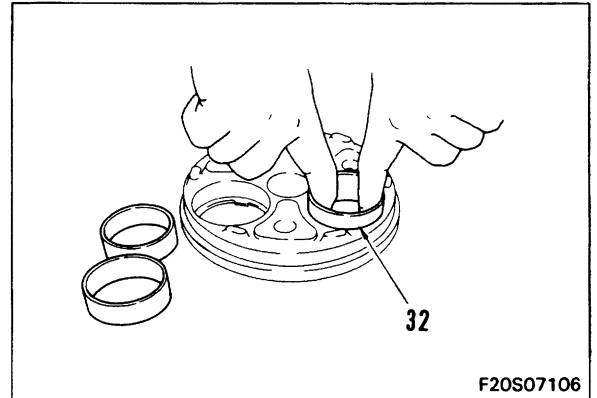
ii) Remove bearing inner race and ball.

iii) Using tool F11, hit bearing outer race (31) with a hammer to remove.



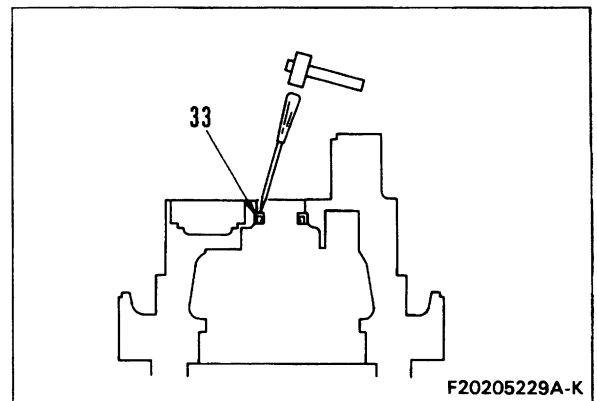
15. Disassembly of hold flange

- 1) Remove bearing outer race (32) from hold flange.
- 2) Remove bearing inner race from hold flange.

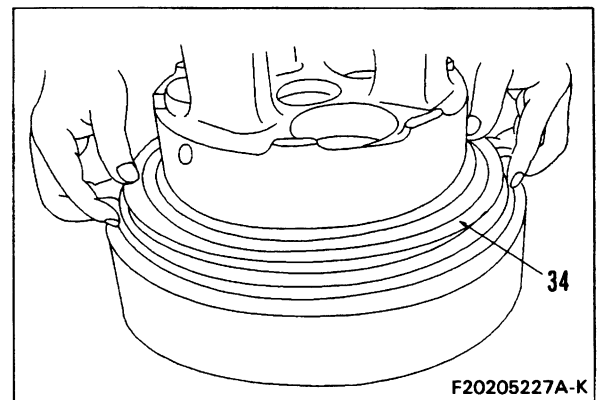


16. Disassembly of spindle

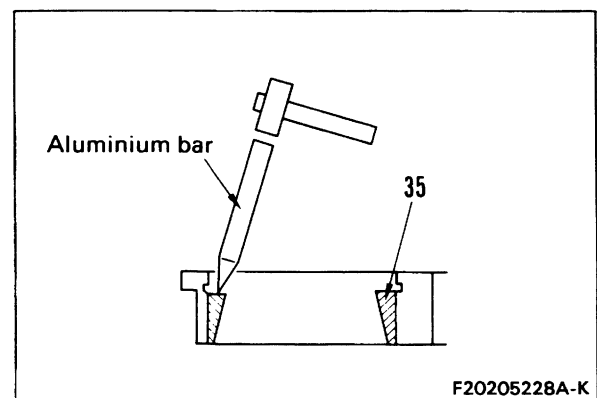
- 1) Using screwdriver, remove oil seal (33) from spindle.



- 2) Remove floating seal (34) from spindle.

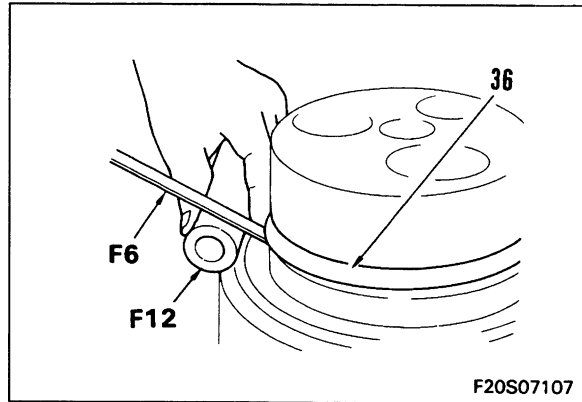


- 3) Using an aluminium bar remove bearing outer race (35) from spindle.



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- 4) Using tool **F6** and **F12**, remove bearing inner race (36).



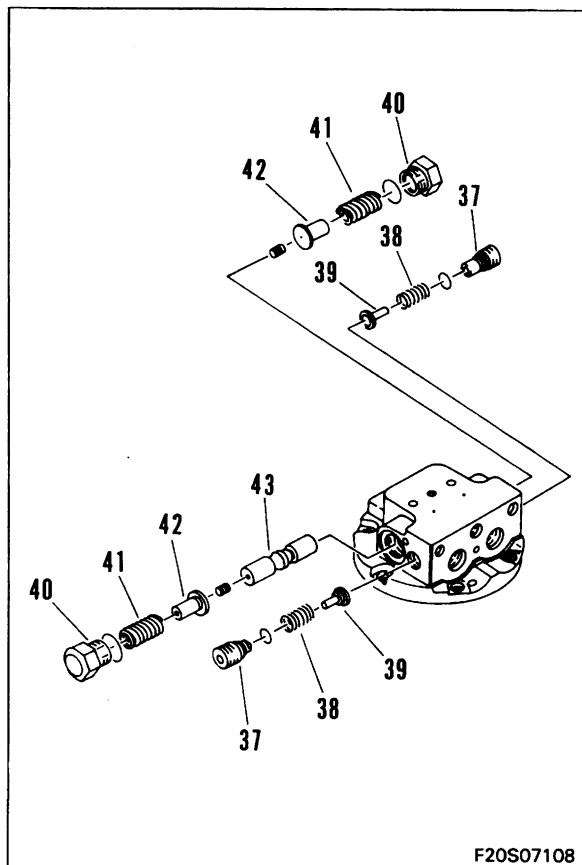
DISASSEMBLY OF BRAKE VALVE ASSEMBLY

1. Check valve

- 1) Remove plug (37).
- 2) Remove spring (38) and check valve (39).
 - ★ Be careful not to damage the oscillating surface of the spool.

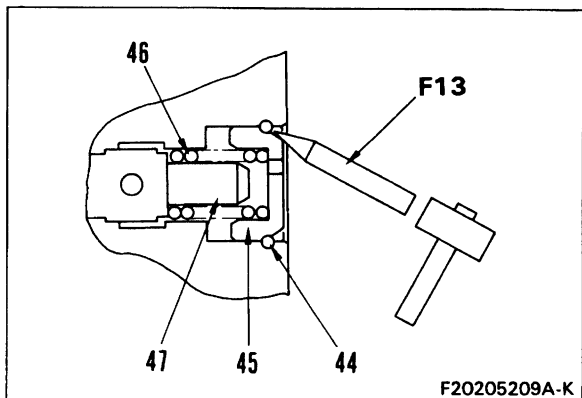
2. Counterbalance valve

- 1) Remove plug (40).
- 2) Remove spring (41) and stopper (42).
- 3) Remove spool (43).
 - ★ Be careful not to damage the outer surface of the spool and oscillating surface of the flange.



3. Regulator valve

- 1) Put tool **F13** in contact with ring notch, tap with a hammer and remove ring (44).
 - ★ When the ring is removed, the hole is damaged, so repair the hole after removing the ring.
- 2) Remove stopper (45), spring (46), and valve (47).



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ASSEMBLY OF TRAVEL MOTOR ASSEMBLY


GM05VL (PC45-1)

ASSEMBLY OF BRAKE VALVE ASSEMBLY

1. Check valve


- 1) Install O-rings to plugs.
- 2) Coat spring (38) and valve (39) with grease, then assemble temporarily to plugs.
- 3) Install plug (37) and tighten to specified torque.


 O-ring: Grease (G2-LI)

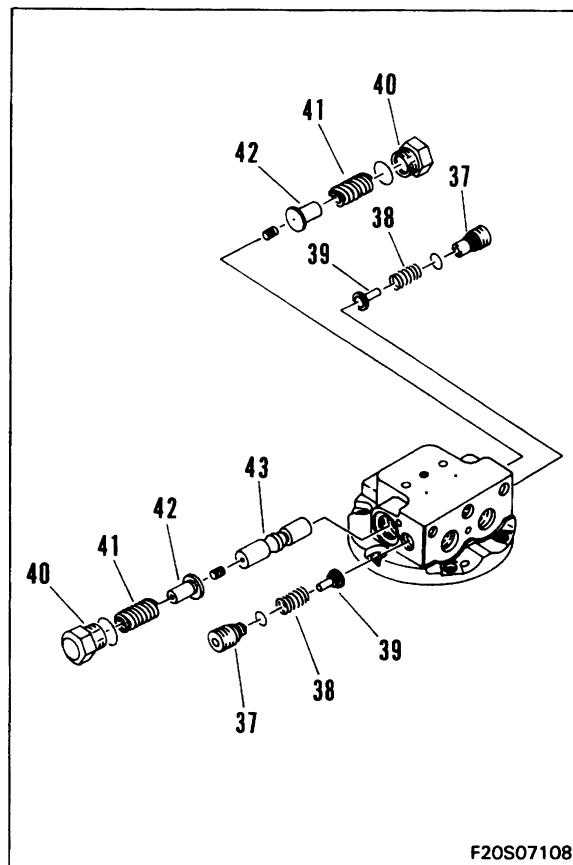
 Plug: 5.0 ± 0.5 kgm

2. Counterbalance valve

- 1) Install spool (43).
 - ★ Coat the outside circumference of the spool with engine oil.
 - ★ To prevent damage to the inside surface of the flange and the outside circumference of the spool, align the center of the flange hole with the center of the spool when installing.
- 2) Install stopper (42) and spring (41).
- 3) Fit O-ring to plug, then install plug (40) and tighten to specified tightening torque.

 O-ring: Grease (G2-LI)

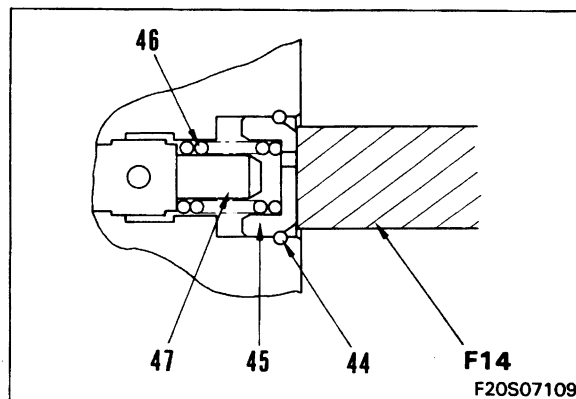
 Plug: 11 ± 1.1 kgm



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3. Regulator valve

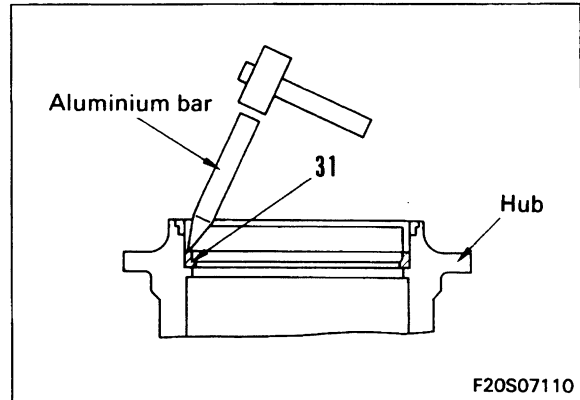
- 1) Install valve (47).
- 2) Install spring (46) and stopper (45).
- 3) Bend ring (44) slightly, and install to valve hole.
- 4) Using tool F14, push ring (44) and install ring groove.
 - ★ Install the ring securely in the ring groove.




ASSEMBLY OF TRAVEL MOTOR ASSEMBLY

1. Assembly of hub

- 1) Using an aluminium bar, install bearing outer race (31).
 - ★ Press fit a little at a time around the whole circumference.

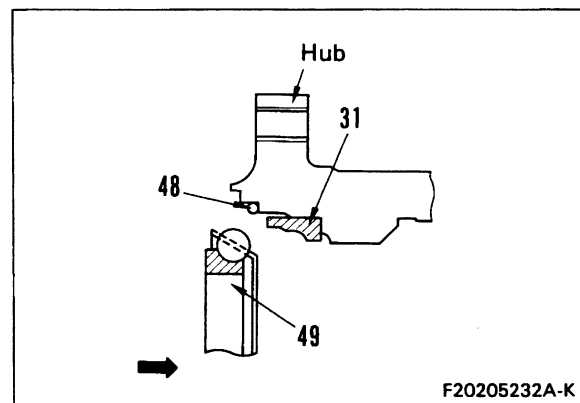


- 2) Install O-ring (48) in ring groove of hub.

 O-ring: Grease (G2-LI)

- 3) Install bearing inner race and balls (49).
- 4) Install distance piece.

- ★ When installing the distance piece, tap with plastic hammer to prevent damage to the O-ring, and press fit.

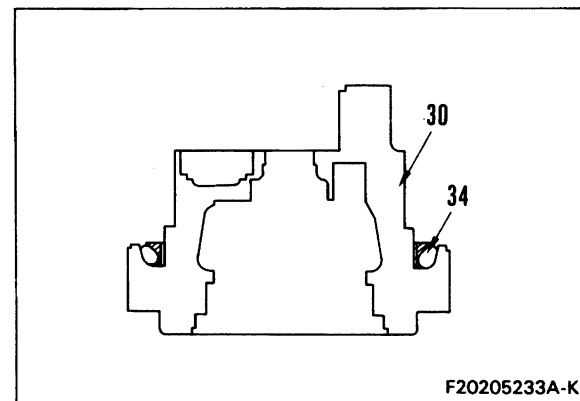


2. Assembly of spindle

- 1) Install floating seal (34) to spindle (30).

 O-ring of floating seal: Grease (G2-LI)

- ★ Insert the O-ring securely in the groove, then assemble so that the spindle groove face and floating seal face are parallel when assembled.

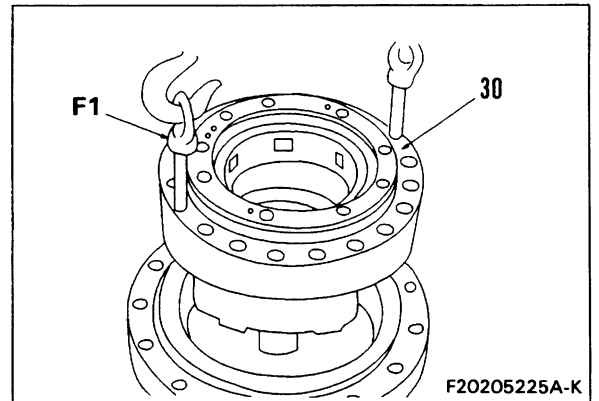


- 2) Using aluminium bar, install bearing inner race.
 - ★ Tap the outside circumference of the outer race a little at a time to press fit uniformly.
- 3) Install 3 bearing outer races.

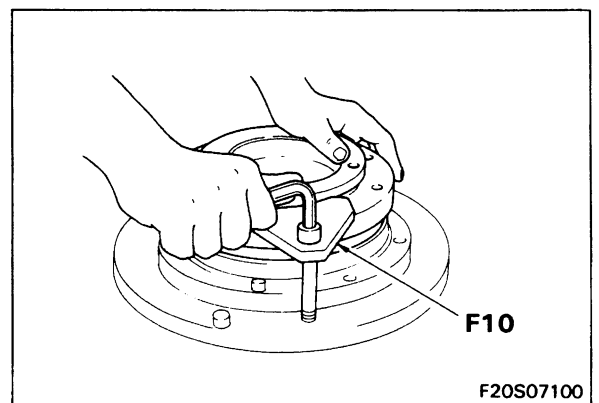
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3. Assembly of hub and spindle

- 1) Install tool F1 in spindle.
- 2) Raise spindle (30) and install to hub.

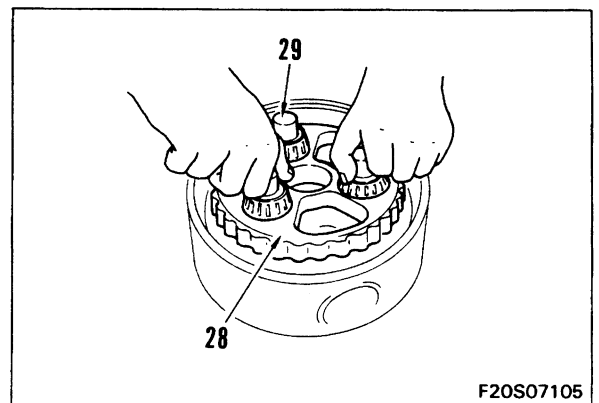


- 3) Using tool F10, secure hub and spindle.
★ Install tool F10 so that they are on symmetrically opposite sides.

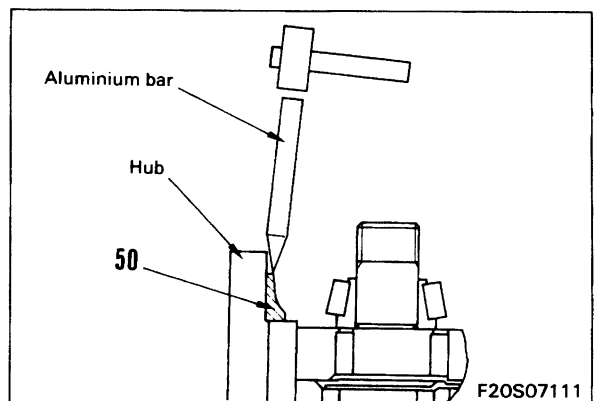


4. RV gear assembly

- 1) Turn over motor and set cover facing up.
- 2) Install RV gear assembly (28).
★ Be careful not to drop the RV gear assembly suddenly.
- 3) Install 30 pins between pin groove of hub and tooth groove of gear.



- 4) Using an aluminium bar, install bearing outer race (50).
- 5) Install bearing inner race and balls.



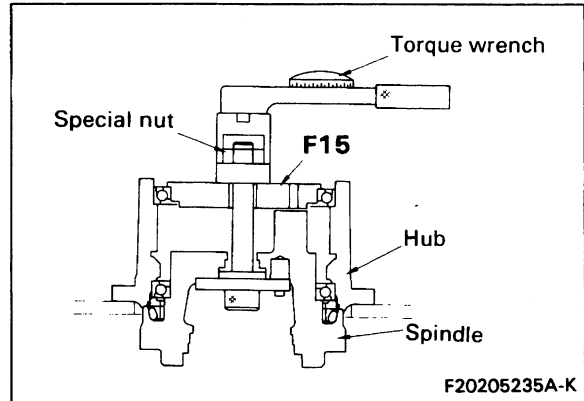
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5. Adjusting thickness of hold flange

★ When replacing the hub, spindle, hold flange, and bearing, adjust the thickness of the hold flange as follows, then adjust the preload of the bearing.

1) Install tool **F15** to spindle, then tighten special nut to specified tightening torque.

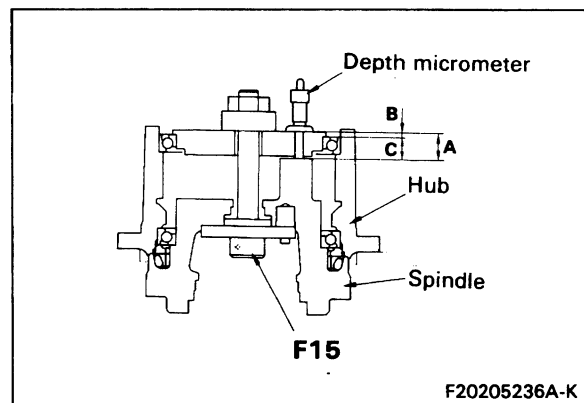
 Special nut: 3 kgm



2) Using a depth micrometer, measure dimension of depth "A".

3) Using the following formula, calculate clearance "C".

- $C = A - B$ A: Depth (Actual value)
- B: Measurement jig dimension
- C: Clearance (Calculated value)



4) Measure dimension "D" of hold flange (26).

5) Using results of measurements made in steps 1) — 4), adjust hold flange (26) as follows.

a) If hold flange dimension "D" is larger than clearance "C".

Shave hold flange with a lathe until it is clearance "C" (specified dimension).

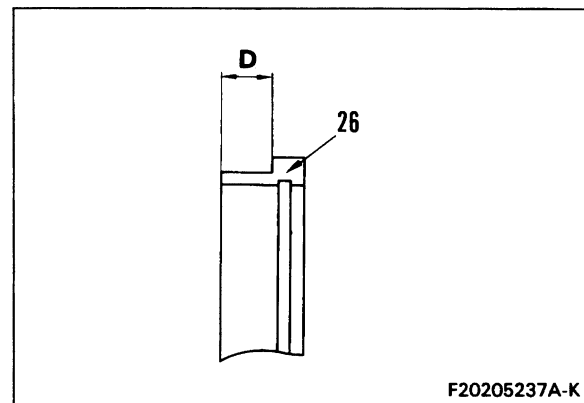
b) If hold flange dimension "D" is within tolerance for clearance "C".

Use hold flange as it is.

c) If hold flange dimension "D" is smaller than clearance "C".

Use a new hold flange and shave it until it is clearance "C".

6) Remove tool **F15**.

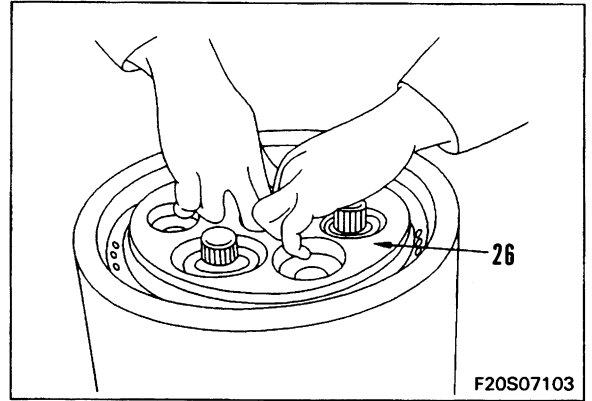


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6. Hold flange

- 1) Install bearing inner race and balls to hold flange.
- 2) Install hold flange (26).
 - ★ Align with the match marks on the spindle and install the hold flange.

 Joint of hold flange and bearing:
Antifriction compound (LM-P)

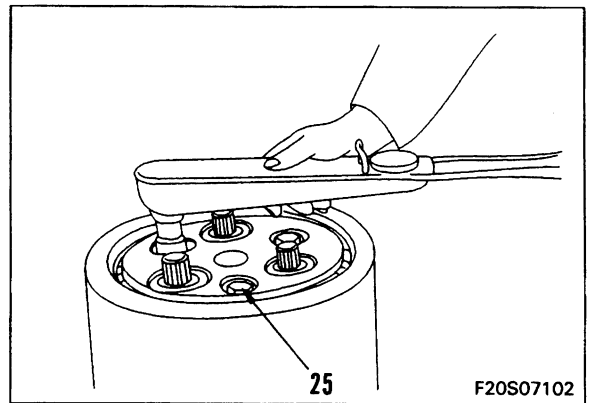


- 3) Tighten 3 reamer bolts (25) to specified torque.
 - ★ Remove all grease from the reamer bolt.
 - ★ Tighten the bolts uniformly in turn.

 Reamer portion: Antifriction compound (LM-P)

Thread: Loctite

 Reamer bolt: 19.2 ± 3 kgm



- 4) Install 3 bearing outer race in hold flange.

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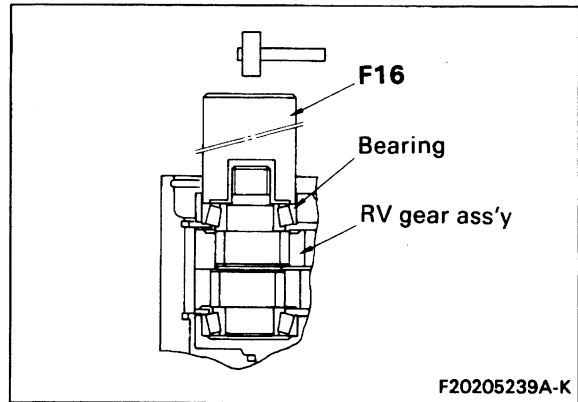
7. Selecting thickness of snap ring

★ When the hub, spindle, hold flange, RV gear assembly, and snap ring have been replaced, select snap ring (24) as follows.

★ When replacing only snap ring (24), replace with a snap ring of the same thickness.

Select the thickness of the snap ring as follows.

1) Hold outer race of crankshaft bearing with tool **F16**, and tap with a hammer.



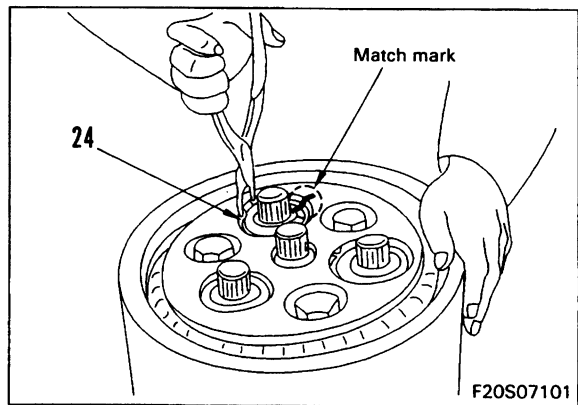
2) Install the thinnest snap ring (24) to ring groove of hold flange.

3) Hold outer circumference of snap ring with tool **F16**, and tap with a hammer.

4) Using thickness gauge, measure clearance "X" between snap ring and bearing.

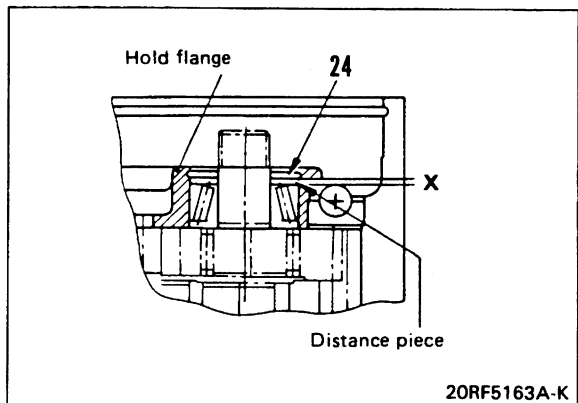
5) Calculate thickness of snap ring.

- Max. set thickness of snap ring
Max. = Clearance "X" + presently inserted snap ring
- Min. set thickness of snap ring
Min. = Clearance "X" + presently inserted snap ring - 0.05 mm



6) After calculating thickness of snap ring, select from 12 types and install to hold flange.

Category symbol	Dimension T (thickness) (mm)
A	Over 1.90 — Up to 1.95
B	Over 1.95 — Up to 2.00
C	Over 2.00 — Up to 2.05
D	Over 2.05 — Up to 2.10
E	Over 2.10 — Up to 2.15
F	Over 2.15 — Up to 2.20
G	Over 2.20 — Up to 2.25
H	Over 2.25 — Up to 2.30
I	Over 2.30 — Up to 2.35
J	Over 2.35 — Up to 2.40
K	Over 2.40 — Up to 2.45
L	Over 2.45 — Up to 2.50



• Snap ring dimension table

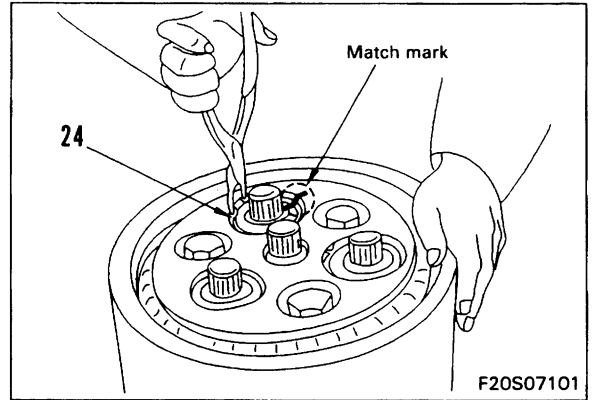
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8. Snap ring

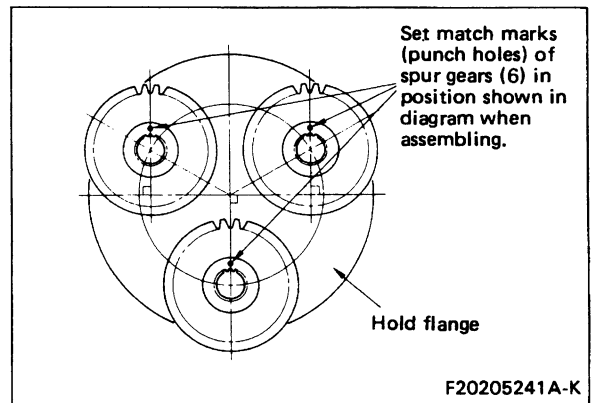
Install 3 snap rings (24) to ring groove.

- ★ When reusing the snap ring, align the match marks for the hold flange made when removing.
- ★ Install the snap ring securely in the ring groove.



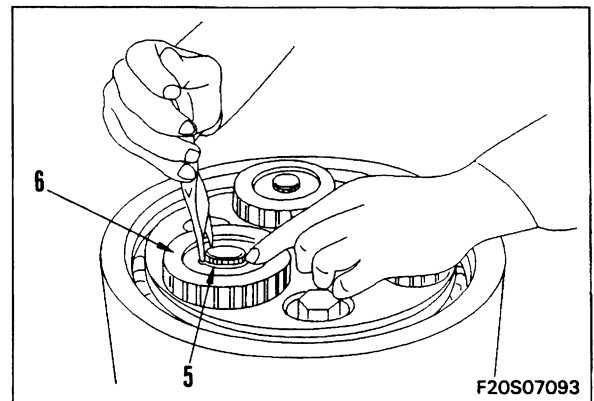
9. Spur gears

- 1) Install distance piece to crankshaft.
- 2) Align match marks and install 3 spur gears (6).




- 3) Install 3 snap rings (5) to ring groove.

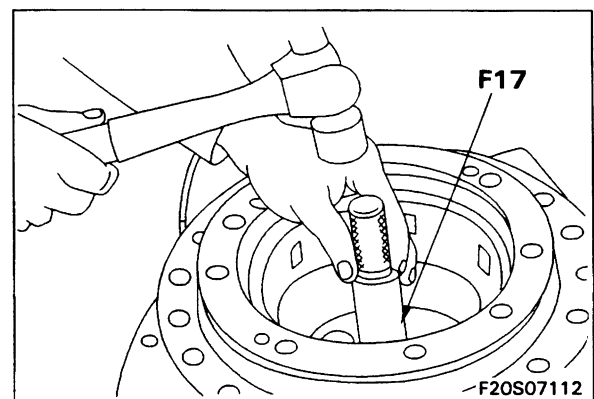
- ★ Install the snap rings securely in the ring grooves.



10. Oil seal

- 1) Turn over motor.
- 2) Using tool F17, press fit oil seal.

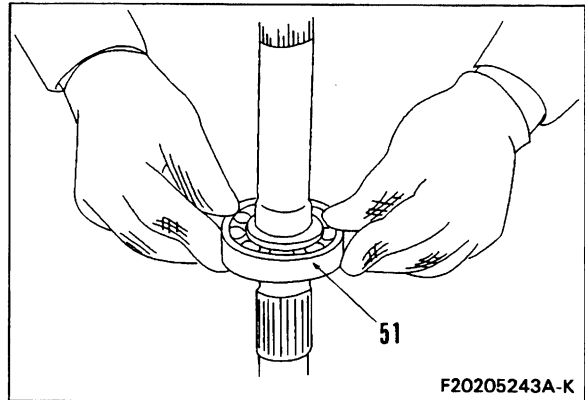
 Lip of oil seal: Grease (G2-LI)




11. Shaft

- 1) Shrink fit bearing (51) to shaft.
 - Shrink-fitting temperature: $100 \pm 10 \text{ }^\circ\text{C}$

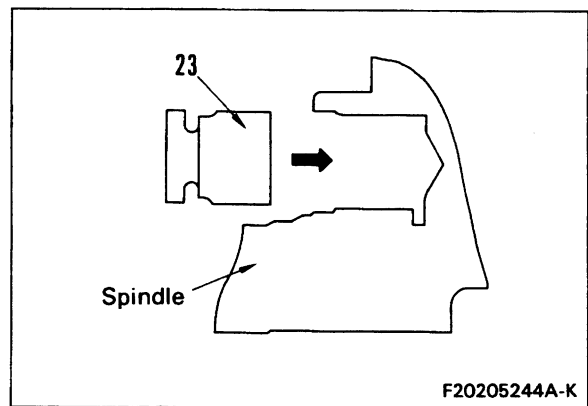
 Outer circumference of bearing:
Antifriction compound (LM-P)



- 2) Install 2 balls in spindle.

 Ball: Grease (G2-LI)


- 3) Install speed selector piston (23) in hole of spindle.

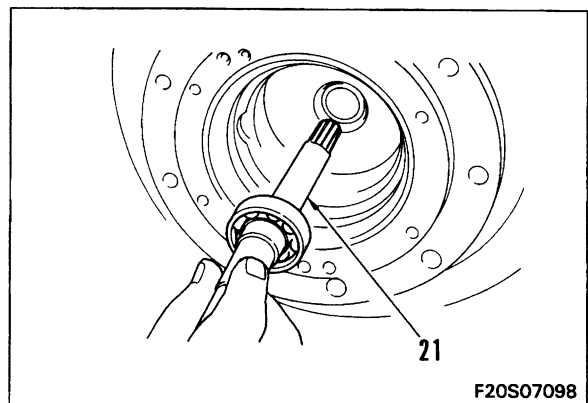


- 4) Set motor facing 90° to side.

- 5) Install shaft (21) to spindle.

★ Install slowly in order not to damage the lip of the oil seal.

 Spline of shaft: Antifriction compound (LM-P)

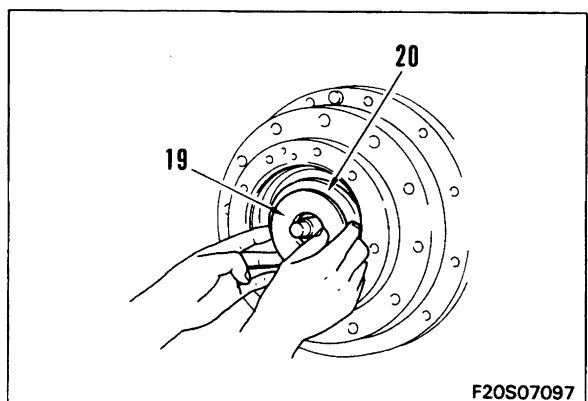


12. Swash plate

- 1) Install thrust plate (19) to swash plate (20).

- 2) Install swash plate (20) in spindle.

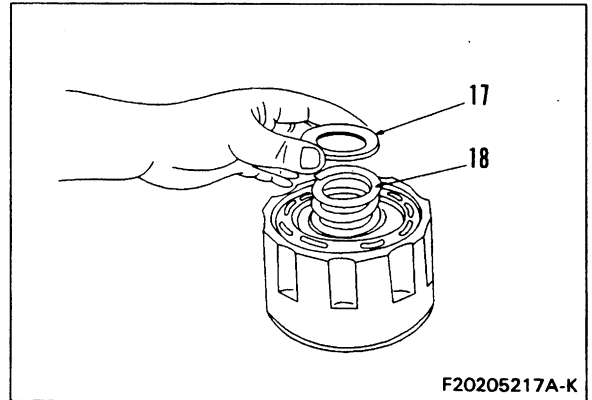
★ Check that the ball and ball holes in the swash plate are correctly aligned.



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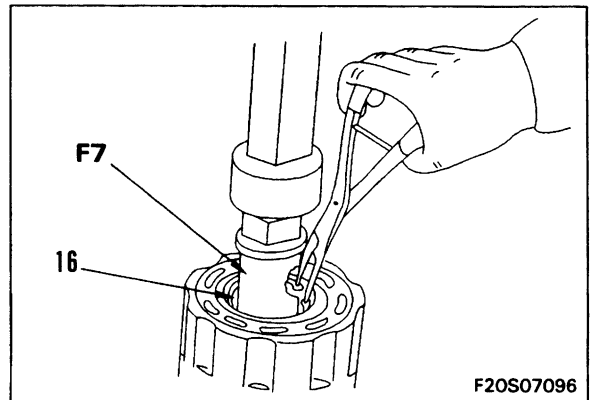
13. Cylinder, piston assembly

1) Set 2 washers (17) and spring (18) in cylinder.



2) Place cylinder on press stand, then use tool F7 to hold down washer portion.

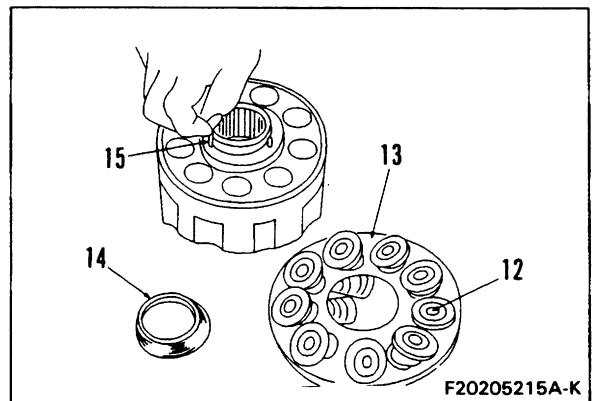
3) Install snap ring (16) in ring groove.



4) Install 3 pins (15), then install thrust bowl (14).

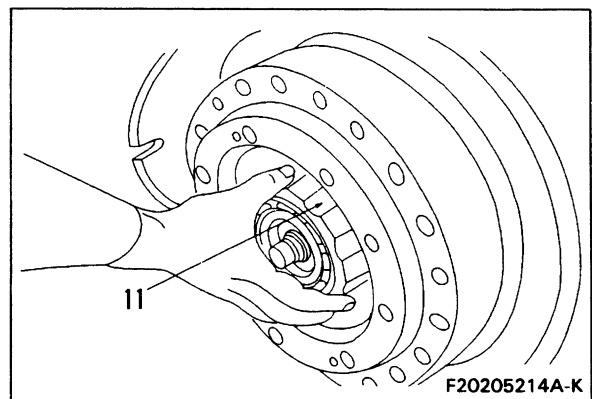
5) Install piston (12) to retainer plate (13).

6) Install piston assembly to cylinder.



7) Install cylinder block assembly (11) to shaft.

★ After installing, rotate the cylinder block by hand and check that there is no play.

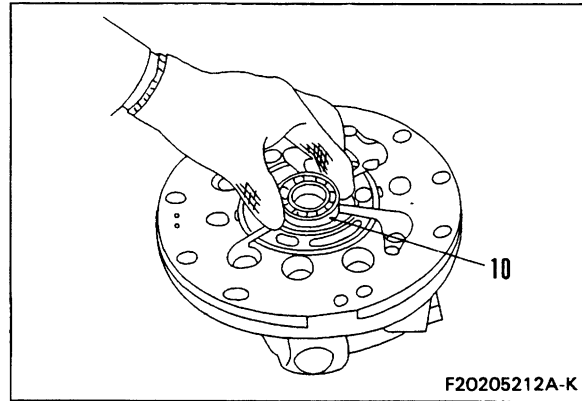


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14. Rear flange

1) Install bearing (10).

★ Coat the bearing with hydraulic oil.

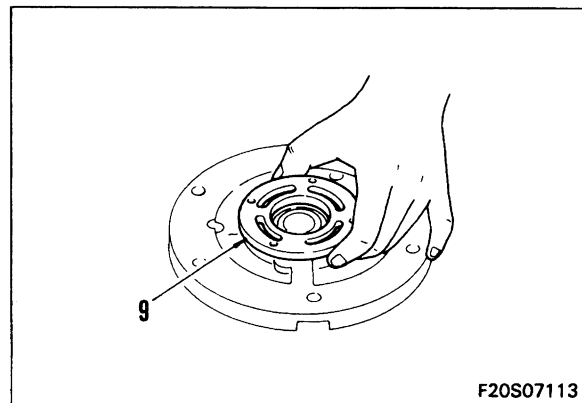


2) Install 2 pins.

3) Install timing plate (9).

★ Use grease to bring the rear flange and timing plate into tight contact.

 Timing plate: Grease (G2-LI)



4) Rotate motor so that rear flange side is at top.

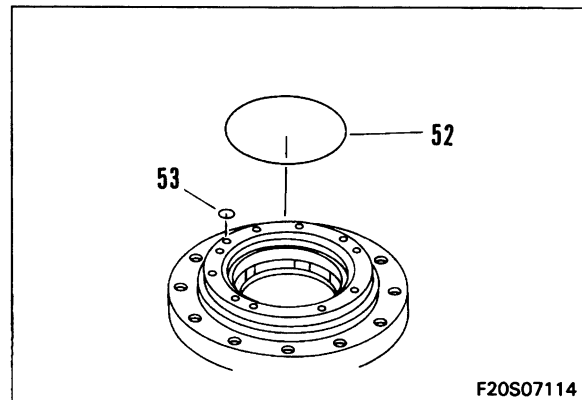
5) Install O-rings (52) and (53).

★ Do not coat the O-rings with grease.


6) Install 2 pins to spindle.

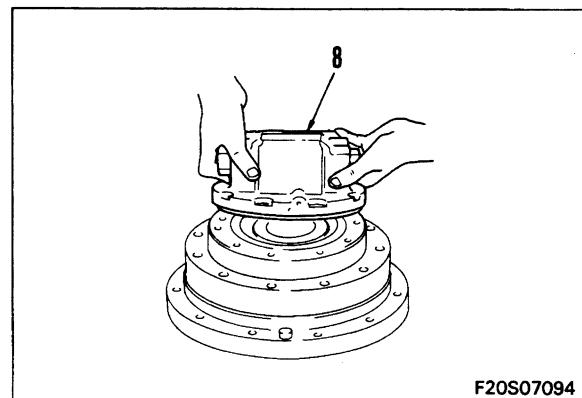
7) Fill inside of spindle with hydraulic oil.

 Spindle: 0.3 l



8) Install rear flange (8) to spindle.

 3.0 ± 0.5 kgm



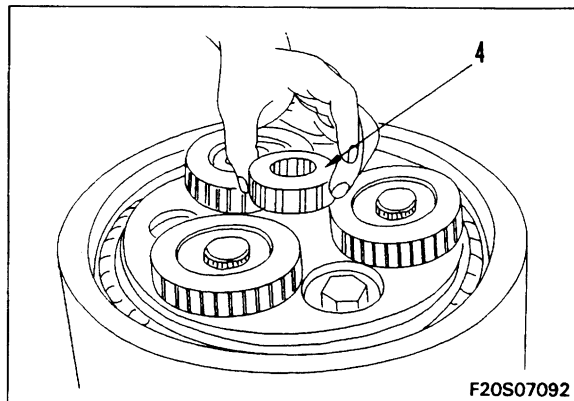
020S07

15. Input gear

- 1) Install input gear (4), then install snap ring.
- 2) Fill inside of final drive case with lubricating oil.



Final drive case: Approx. 1.1 l



16. Cover

- 1) Install O-ring to cover.

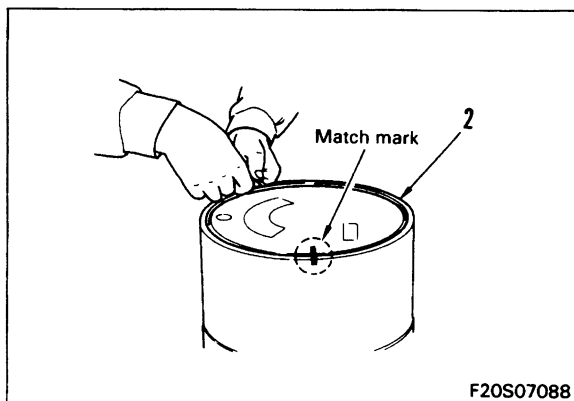


O-ring: Grease (G2-LI)

- 2) Install cover to hub.

- ★ To install, align the position of the match mark made when removing.
- ★ Tap the outer circumference of the cover uniformly with a plastic hammer in order not to damage the O-ring, then install.

- 3) Install ring (2).

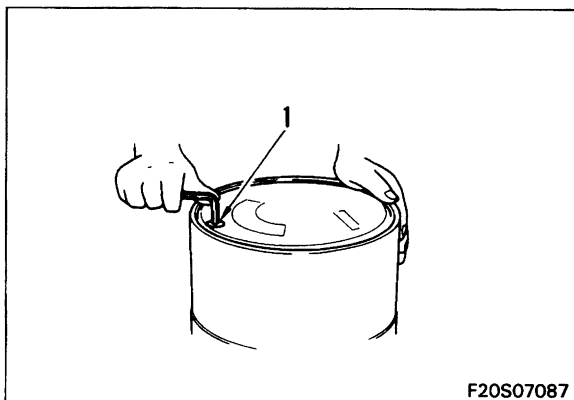


- 4) Install plug (1).

- ★ Wind the plug with seal tape.



Plug: 4.0 ± 1.5 kgm



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DISASSEMBLY OF SWING MOTOR ASSEMBLY

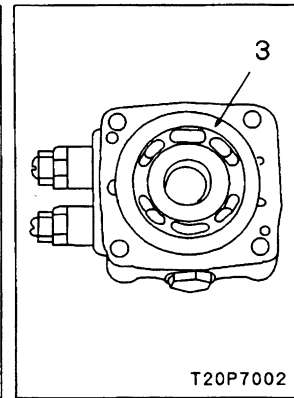
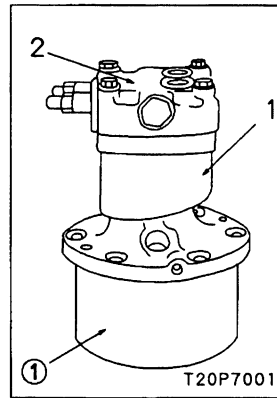
LMF28-2 (PC25-1, PC30-7)
LMF40-2 (PC40-7, PC45-1)

1. Swing motor assembly

Set motor assembly (1) on block ①.

2. End cap assembly

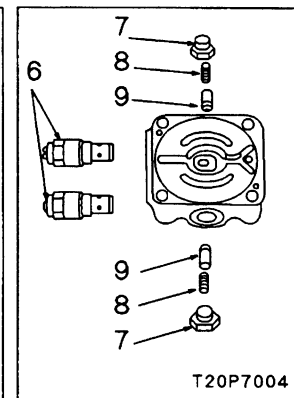
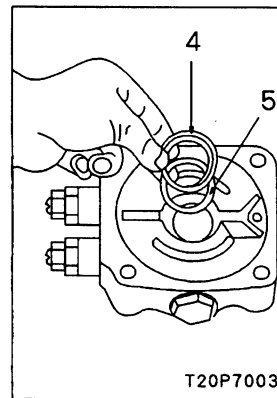
- 1) Remove end cap assembly (2).
- 2) Disassembly end cap assembly as follows.
 - i) Remove valve plate (3).



- ii) Remove outer race (4) and spacer (5).
- iii) Remove relief valve assembly (6).

★ If the locknut is loosened and the adjustment screw is turned, the set pressure will change, so do not disassemble.

- iv) Remove plug (7), then remove spring (8) and valve (9).

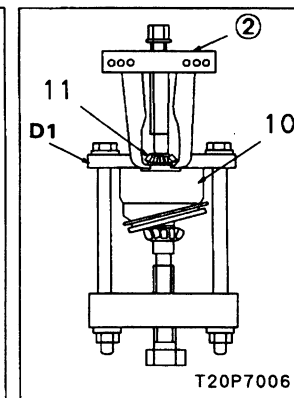
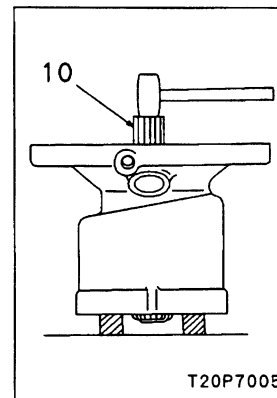


3. Shaft and cylinder block assembly

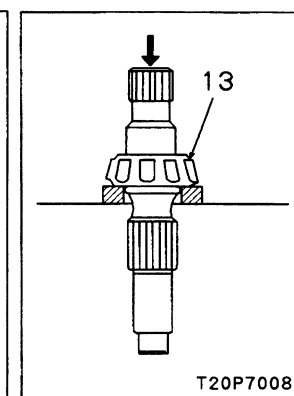
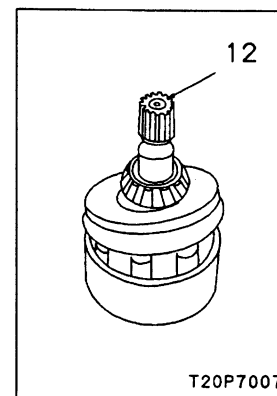
- 1) Tap tip of shaft with plastic hammer, and remove shaft and cylinder block assembly (10).

★ Wind tape around the shaft spline and take care not to damage the oil seal.
- 2) Set tool D1 to shaft and cylinder block assembly (10), then compress cylinder block spring, and use puller ② to remove bearing (11).

★ Put thick paper on the top surface of the cylinder block to prevent damage to the seat surface.

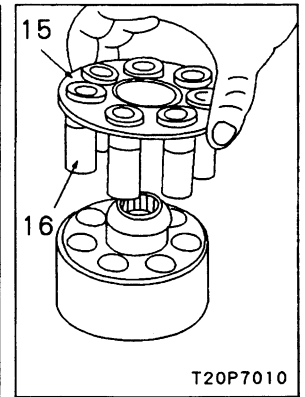
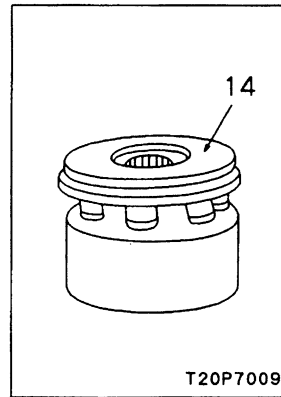


- 3) Remove shaft assembly (12).
- 4) Set shaft assembly to press, then remove bearing (13).

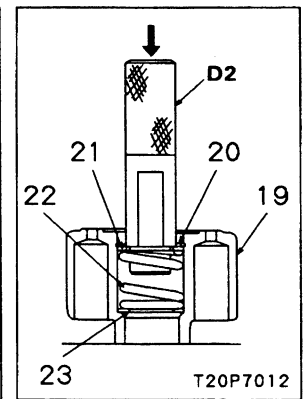
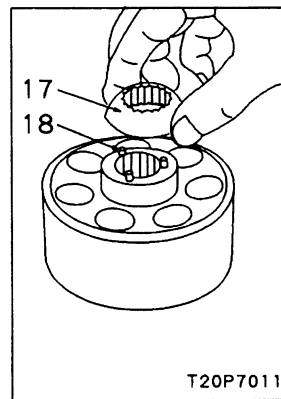


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- 5) Remove thrust plate (14).
- 6) Remove shoe retainer (15) and piston (16) as a set.

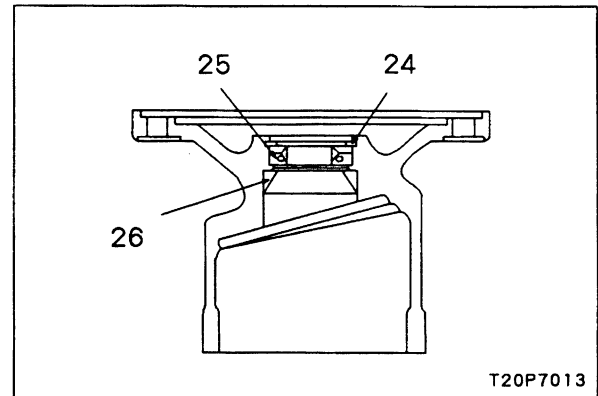


- 7) Remove retainer guide (17).
- 8) Remove 3 pins (18).
- 9) Disassemble cylinder block assembly as follows.
 - i) Set cylinder block assembly (19) to press.
 - ii) Using tool D2, compress spring, then remove snap ring (20).
 - ★ Spring installation load: 45 ± 2.7 kg (LMF28-2)
 - 70 ± 4.2 kg (LMF40-2)
 - iii) Remove tool D2, then remove washer (21), spring (22) and washer (23).



4. Case assembly

- 1) Remove snap ring (24), then remove oil seal (25).
- 2) Using push tool, remove bearing outer race (26).




ASSEMBLY OF SWING MOTOR ASSEMBLY

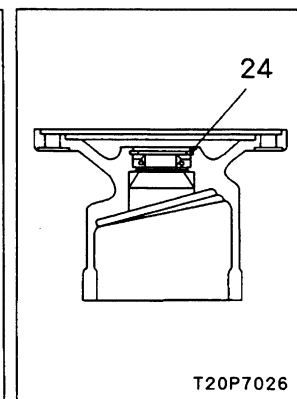
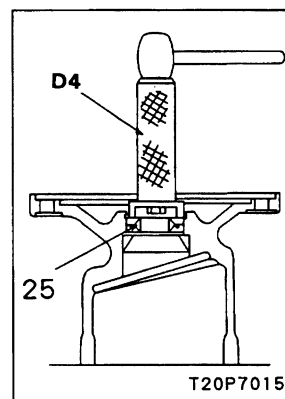
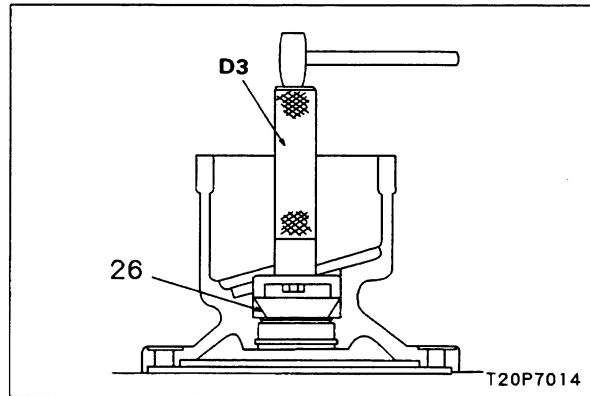
LMF28-2 (PC25-1, PC30-7)
LMF40-2 (PC40-7, PC45-1)

- ★ Clean all parts, and check for dirt or damage.
- ★ Coat the sliding surfaces of all parts with engine oil before installing.
- ★ When press fitting the bearing, coat the press-fitting portion with engine oil.

1. Case assembly

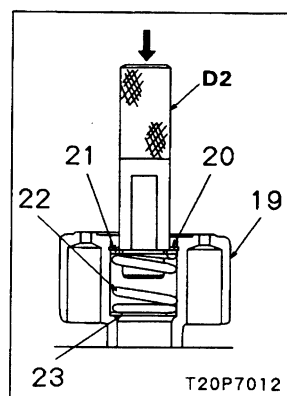
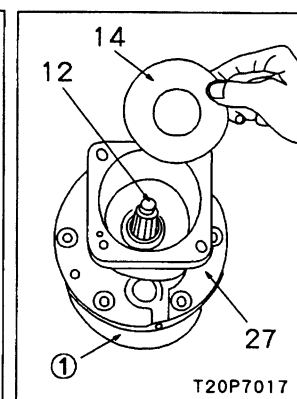
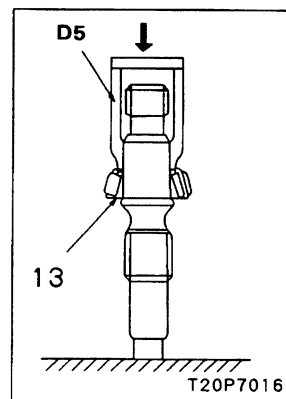
- 1) Using tool **D3**, press fit bearing outer race (26).
- 2) Using tool **D4** press fit oil seal (25), then secure with snap ring (24).

 Lip of oil seal: Grease (G2-LI)



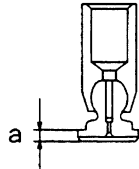
2. Shaft and cylinder block assembly

- 1) Set shaft to press, then using tool **D5**, press fit bearing (13).
 - ★ Press fit until the end face of the bearing inner race is in tight contact with the shaft flange.
 - ★ Press fitting load: 173 — 713 kg (LMF28-2)
187 — 726 kg (LMF40-2)
- 2) Set case assembly (27) on block ①.
- 3) Install shaft assembly (12).
 - ★ Wind tape around the shaft spline and take care not to damage the oil seal when installing the shaft assembly.
- 4) Install thrust plate (14).
 - ★ Set the thrust plate with the chamfered portion of the inside diameter facing the main bearing, then install securely.
- 5) Assemble cylinder block assembly as follows.
 - i) Assemble washer (23), spring (22) and washer (21) to cylinder block, then set cylinder block assembly (19) to press.
 - ii) Using tool **D2**, compress spring, then secure with snap ring (20).



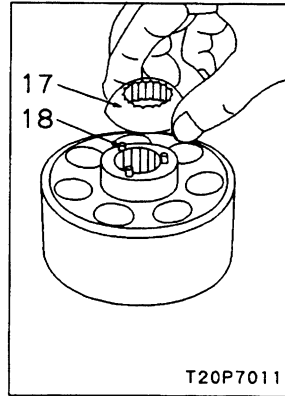
020S07

- 6) Install 3 pins (18).
 - ★ Coat the pins with grease to prevent them from coming out of the mounting position.
- 7) Install retainer guide (17).
- 8) Install shoe retainer (15) and piston (16) as a set.
 - ★ The overall difference in the thickness of the piston shoe flange (dimension a) must be within ± 0.005 mm.

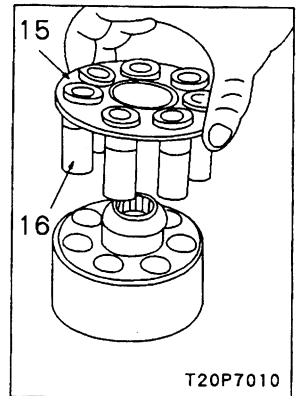


T20P7018

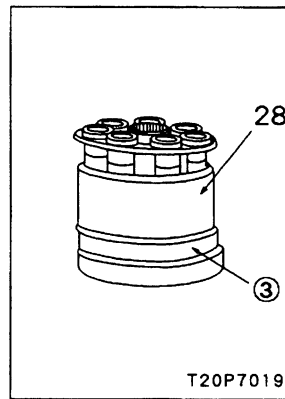
- 9) Set piston and cylinder block assembly (28) on block ③.
- 10) Install shaft and case assembly (29) to piston and cylinder block assembly (28).
 - ★ Align the shaft and retainer guide, and cylinder block spline, then install.



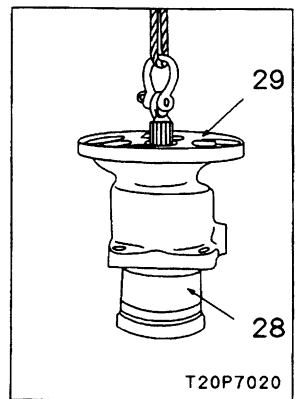
T20P7011



T20P7010

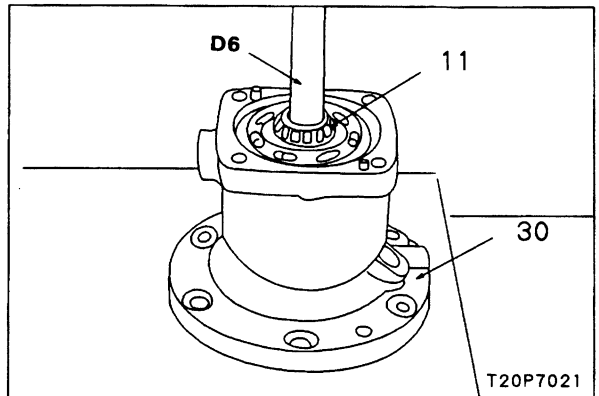


T20P7019



T20P7020

- 11) Hold cylinder block down by hand, turn over swing motor subassembly (30), then set in press.
- 12) Using tool D6, press fit bearing (11).
 - ★ Press fit until the end face of the bearing inner race is in tight contact with the shaft flange.
 - ★ Press fitting load: 144 — 534 kg



T20P7021

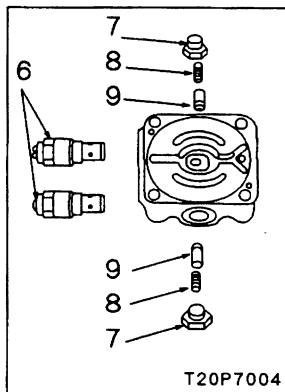
3. End cap assembly

- 1) Assemble end cap assembly as follows.
 - i) Assemble valve (9) and spring (8), then install plug (7) with O-ring, and tighten to specified torque.

kgm Plug: 4 ± 0.5 kgm

- ii) Install relief valve assembly (6).

kgm Relief valve assembly: 5.5 ± 0.5 kgm



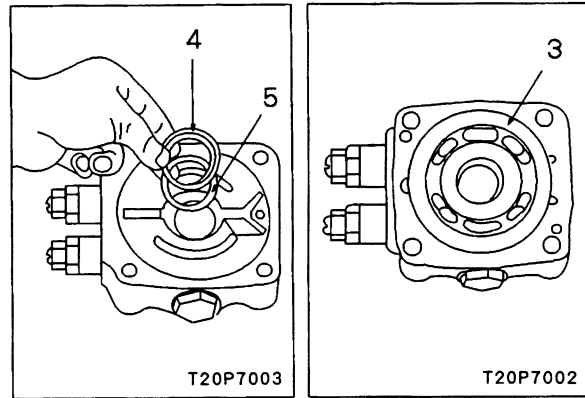
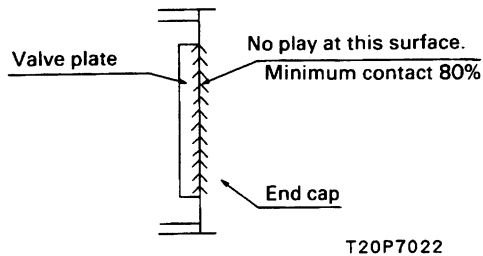
T20P7004

iii) Install spacer (5), then press fit bearing outer race (4).

★ Standard thickness of spacer: $t = 1.9 \text{ mm}$

iv) Align dowel pin and valve plate (3), then install.

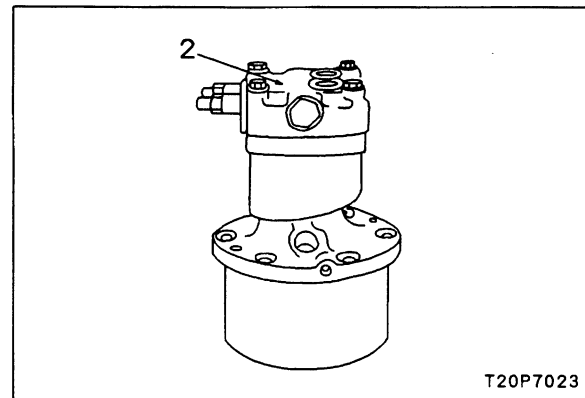
★ There must be no play at the mating surface of the valve plate and end cap, and the area of contact must be at least 80%.



2) Fit gasket, align with dowel pin, and install end cap assembly (2).

★ When installing the end cap assembly, check that the valve plate has not come away from the dowel pin.

 End cap assembly: $6.75 \pm 0.75 \text{ kgm}$



4. Measuring

1) After completion of assembly, measure end play and rotating torque of shaft as follows.

i) Rotate shaft 3 — 4 times to settle bearing.

ii) Using dial gauge (4), measure end play.

★ End play: $0.05 - 0.25 \text{ mm}$

★ If the results of the measurement show that the end play is not within the standard value, remove the end cap, assemble a different spacer, then check again.

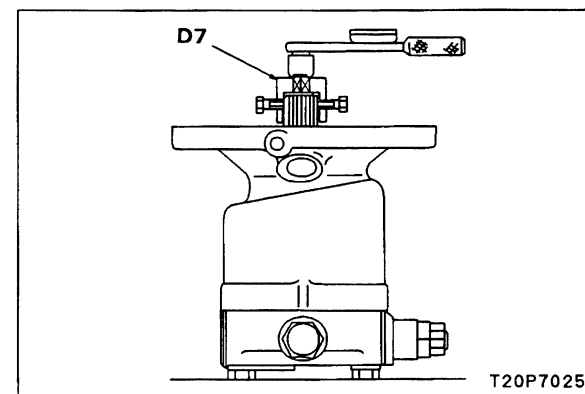
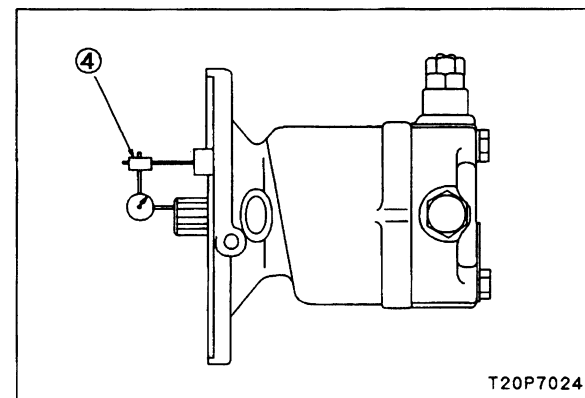
★ Types of spacer:

$t = 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2 \text{ mm}$
(Standard spacer: 1.9 mm)

iii) Using tool D7, rotate shaft at a constant speed of one turn every 3 — 5 seconds, and measure rotating torque.

★ Rotating torque: $0.3 - 0.8 \text{ kgm}$ (LMF28-2)
 $0.5 - 1.3 \text{ kgm}$ (LMF40-2)

★ The variation in the rotating torque must be less than 0.2 kgm .



020S07

DISASSEMBLY OF SWING MACHINERY ASSEMBLY

1. Draining oil

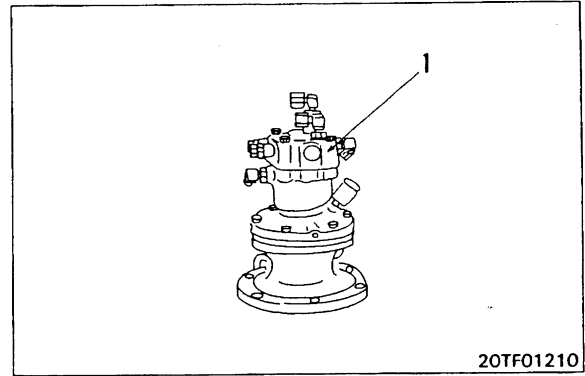
Remove drain plug and drain oil from swing machinery case.



Swing machinery case: See LUBRICANT AND COOLANT TABLE.

2. Swing motor assembly

Remove swing motor assembly (1).

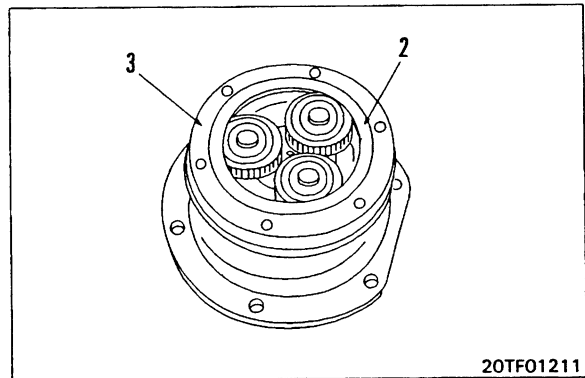


3. Spacer

Remove spacer (2).

4. Ring gear

Remove ring gear (3).



5. Carrier assembly

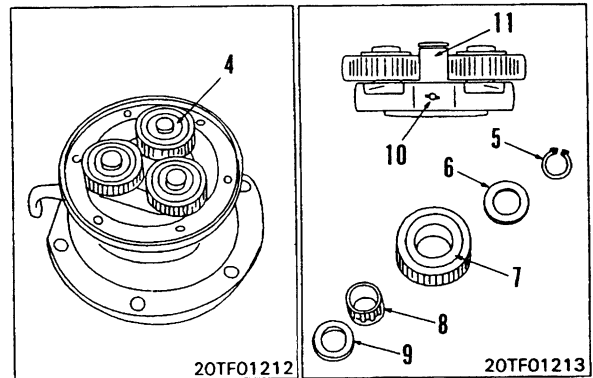
1) Remove carrier assembly (4).

2) Disassembly of carrier assembly

i) Remove snap ring (5), then remove thrust washer (6), gear (7), bearing (8), and thrust washer (9).

ii) Knock in pin (10), and remove shaft (11).

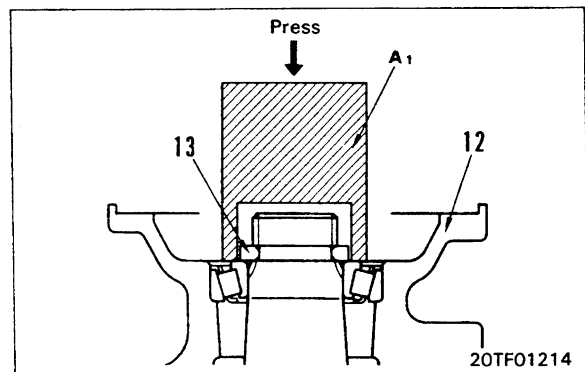
★ After removing shaft (11), remove pin (10).



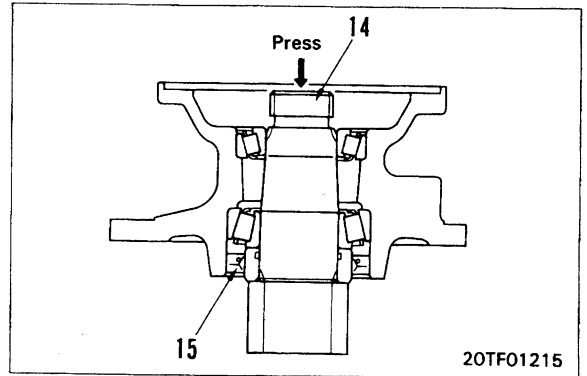
6. Shaft assembly

1) Set shaft and case assembly (12) in press, then using tool A1, remove split spacer (13).

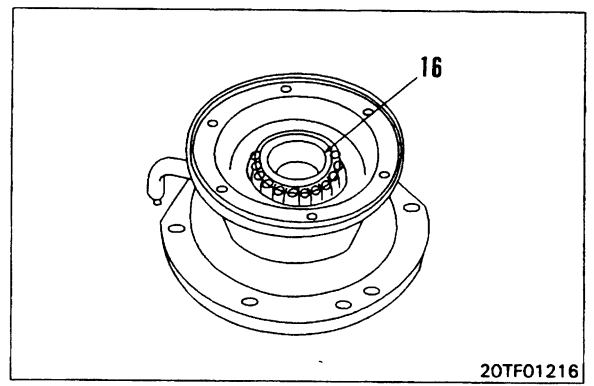
★ Operate the press slowly when removing the spacer.



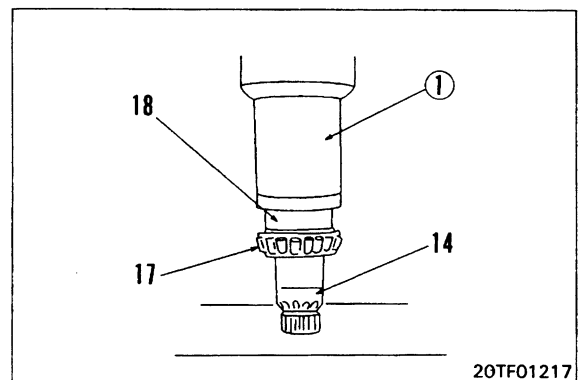
- 2) Using push tool, remove shaft assembly (14) together with oil seal (15).



- 3) Remove bearing (16).

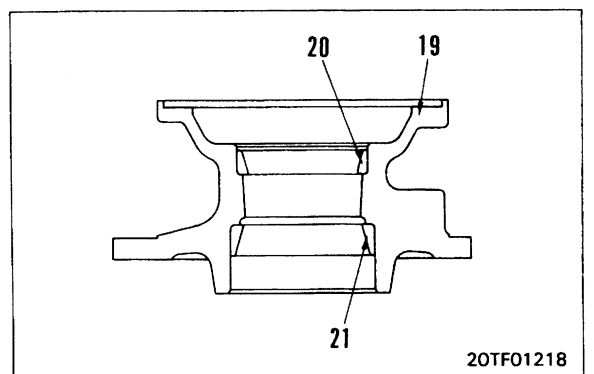


- 4) Set shaft assembly (14) in press, then using push tool ①, remove bearing (17) and collar (18) from shaft.



7. Case assembly

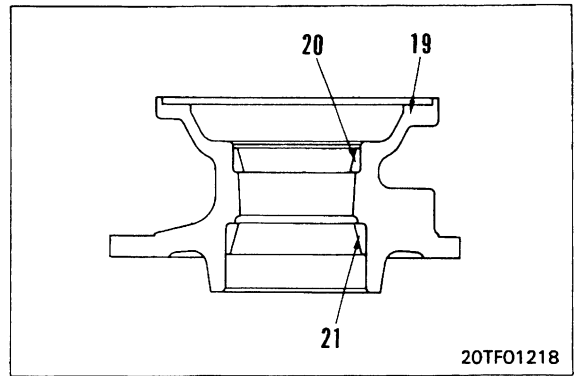
- Remove outer races (20) and (21) from case assembly (19).



ASSEMBLY OF SWING MACHINERY ASSEMBLY

1. Case assembly

Case push tool, press fit outer races (21) and (20) in case assembly (19).

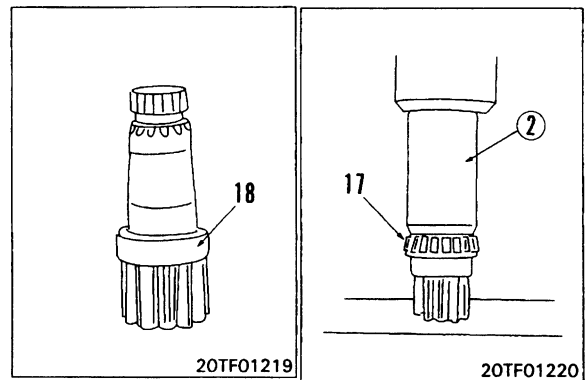


2. Shaft assembly

1) Fit O-ring to inside of collar (18), then install to shaft.

★ Install so that the larger chamfered face on the inside of the collar faces the pinion gear.

2) Using push tool (2), press fit bearing (17) with press.

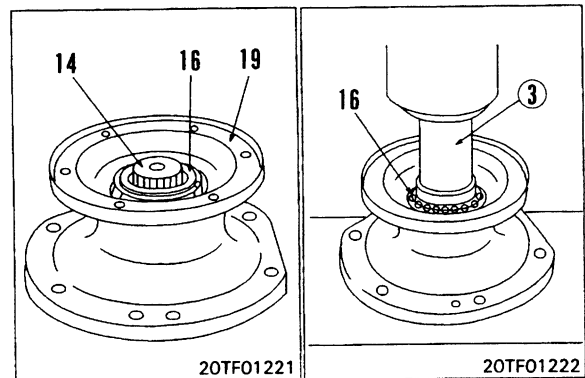


3) Set case assembly (19) and bearing (16) in shaft assembly (14).

4) Using push tool (3), press fit bearing (16) with press.

★ Press fitting force: See TIGHTENING TORQUES AND STANDARD VALUES TABLE.

★ Rotate the case and press fit the bearing gradually.

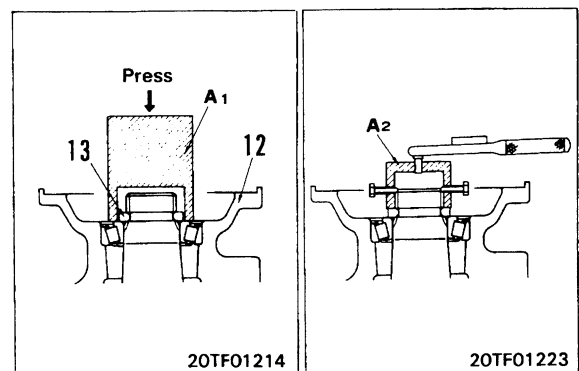


5) Set shaft and case assembly (12) in press, then using tool A1, install split spacer (13).

★ Operate the press slowly when installing the spacer.

6) Fit tool A2 to tip of shaft, and measure starting torque.

★ Starting torque : MAX 13.2 N (1.35 kgf)




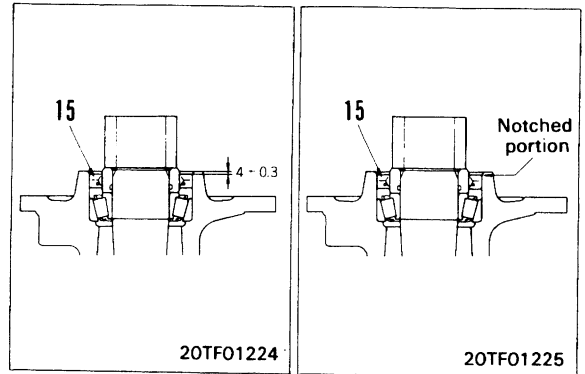
7) Using push tool, press fit oil seal (15).

★ Replace the oil seal with a new part.

★ PC25, 30: Press fit the oil seal to a point 4 ± 0.3 mm from the end face of the case.

PC40, 45: Press fit the oil seal to the notched portion in the case.

 Lip of oil seal: Grease (G2-LI)



3. Carrier assembly

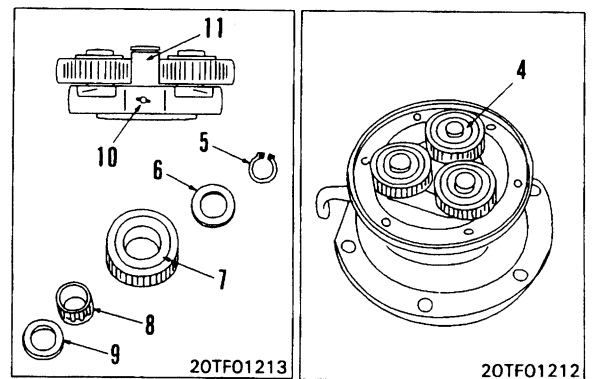
1) Assembly of carrier assembly

i) Fit shaft (11) and insert pin (10).

★ Caulk at three places around the pin hole.


ii) Assemble thrust washer (9), bearing (8), gear (7), and thrust washer (6), and secure with snap ring (5).

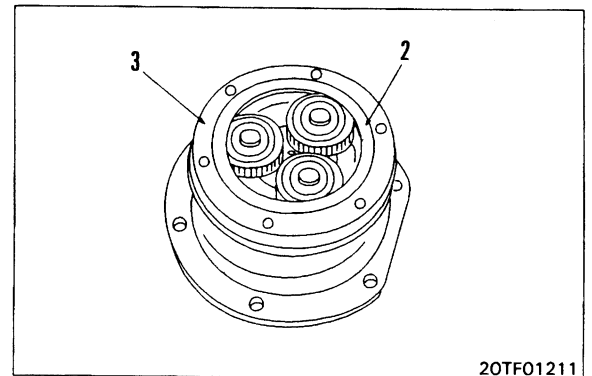
2) Install carrier assembly (4).



4. Ring gear

Install ring gear (3).

 Mating surface of case: Gasket sealant (LG-4)





5. Spacer

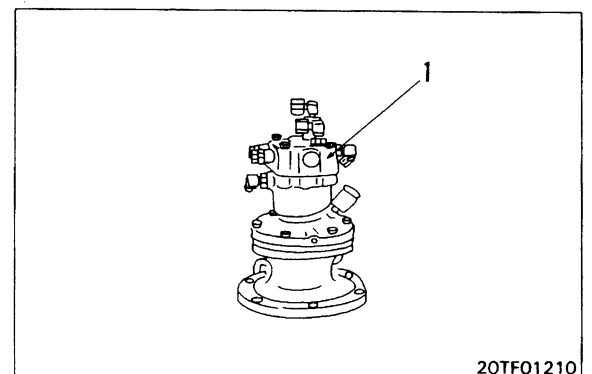
Install spacer (2).

6. Swing motor assembly

Install swing motor assembly (1).

 Mating surface of motor: Gasket sealant (LG-4)

 Mounting bolt: See MAINTENANCE STANDARDS.



7. Refilling with oil

Tighten drain plug and add engine oil through oil filler.

 See LUBRICANT AND COOLANT TABLE.

REMOVAL OF REVOLVING FRAME ASSEMBLY

1. Remove canopy assembly (1).



See WEIGHT TABLE.

2. Remove engine hood (2).
3. Remove side protectors (3).
4. Remove work equipment assembly.
For details, see REMOVAL OF WORK EQUIPMENT ASSEMBLY.
5. Disconnect hoses (4).
6. Remove boom cylinder (5).
★ Sling the boom cylinder assembly, then remove the pin, and remove the boom cylinder assembly.



See WEIGHT TABLE.

7. Disconnect hoses (6).
★ Disconnect 9 hoses at the top of the swivel joint.
8. Remove pin (7).
9. Disconnect hose (8).
10. Remove safety valve assembly (9).
★ The brake valve of the swing motor is applied, and the revolving frame will not turn, so remove the safety valve assembly.

11. Remove revolving frame assembly (10). **※1**
★ When removing the mounting bolts, rotate the revolving frame assembly and leave 2 bolts each at the front and rear.
★ Using a lever block, adjust the balance of the revolving frame assembly to the front and rear, and left and right, then remove the remaining bolts, and lift off.
★ When removing the revolving frame assembly, be careful not to hit the center swivel joint assembly.



See WEIGHT TABLE.

INSTALLATION OF REVOLVING FRAME ASSEMBLY

- Carry out installation in the reverse order to removal.

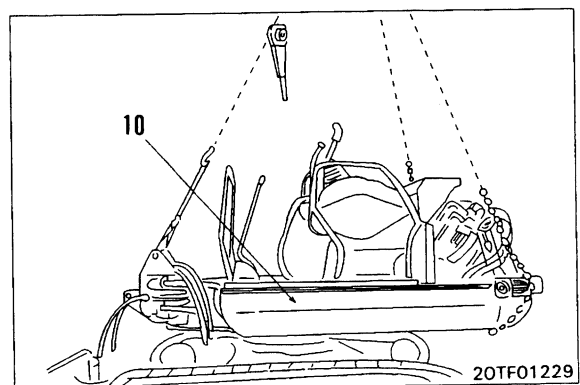
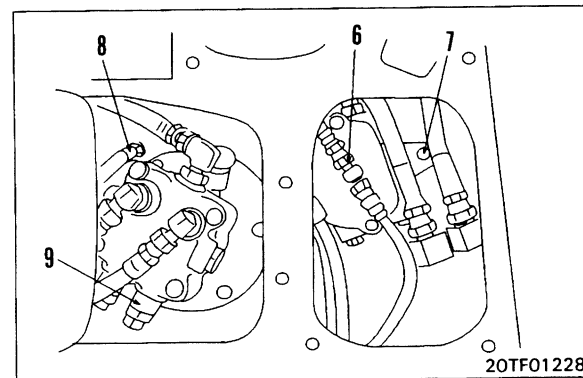
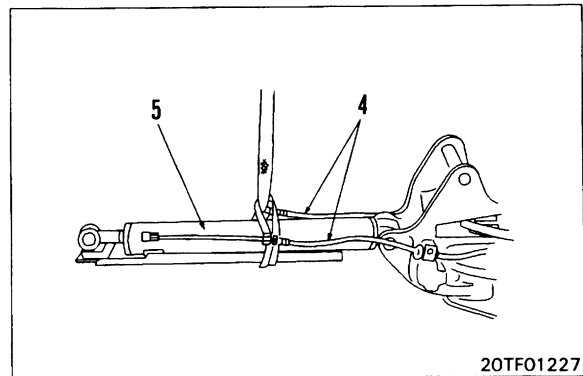
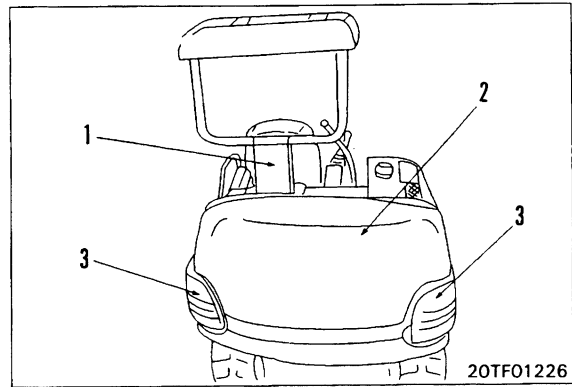
※1



Mounting bolt: Thread tightener (LT-2)

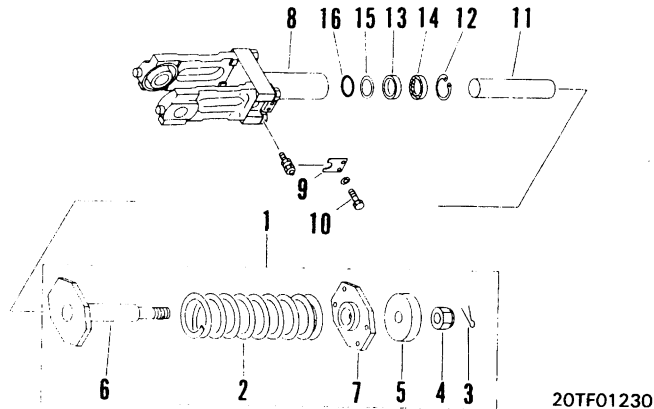


Mounting bolt: See TIGHTENING TORQUES AND STANDARD VALUES TABLE.



DISASSEMBLY OF RECOIL SPRING ASSEMBLY

PC25-1 Serial No. 1001 – 6470
 PC30-7 Serial No. 18001 – 26422
 PC40-7 Serial No. 18001 – 24521
 PC45-1 Serial No. 1001 – 3505



20TF01230

1. Disassembly of recoil spring assembly

- 1) Install tool B to recoil spring assembly (1), then set in press.

⚠ The spring is under large installed load, so be sure to set tool B properly to the press and plate. Failure to do this is dangerous.

★ Spring installed load: See MAINTENANCE STANDARDS.

- 2) Apply hydraulic pressure slowly to compress recoil spring (2), then remove cotter pin (3), nut (4), and spacer (5).

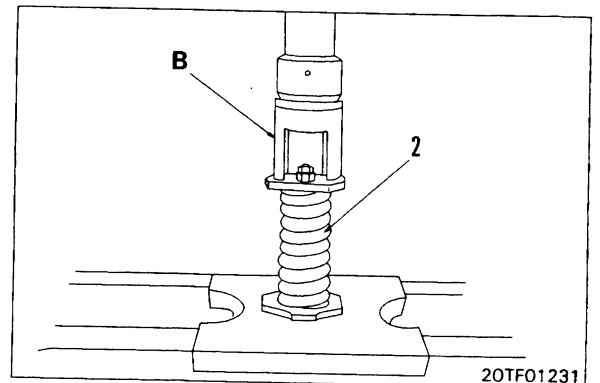
★ Spacer (5) is installed only for the rubber shoe specification.

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

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

★ Free length of spring: See MAINTENANCE STANDARDS.

- 3) Remove rod (6) and plate (7) from spring (2).



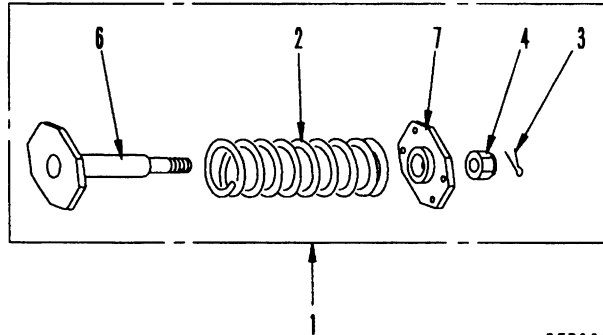
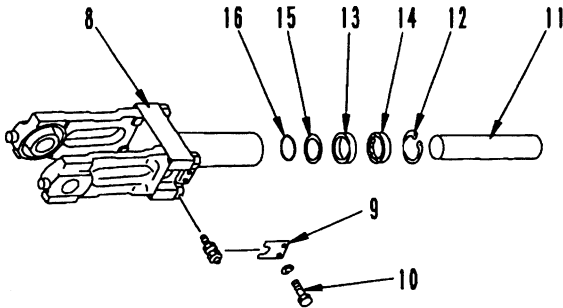
20TF01231

2. Disassembly of piston assembly

- 1) Remove piston assembly from idler.
- 2) Remove plate (9) from cylinder (8), then remove lubricator (10).
- 3) Pull out rod (11) from cylinder (8).
- 4) Remove snap ring (12) from cylinder (8), then remove spacer (13), dust seal (14), backup ring (15), and O-ring (16).

020S07

PC25-1 Serial No. 6471 and up
 PC30-7 Serial No. 26423 and up
 PC40-7 Serial No. 24522 and up
 PC45-1 Serial No. 3506 and up



DEP00091

1. Disassembly of recoil spring assembly

1) Install tool **B** to recoil spring assembly (1), then set in press.

! The spring is under large installed load, so be sure to set tool **B** properly to the press and plate. Failure to do this is dangerous.

★ Spring installed load: See MAINTENANCE STANDARDS.

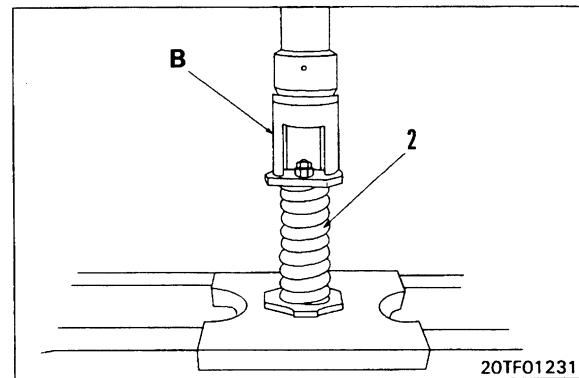
2) Apply hydraulic pressure slowly to compress recoil spring (2), then remove cotter pin (3), nut (4), and spacer (5).

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

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

★ Free length of spring: See MAINTENANCE STANDARDS.

3) Remove rod (6) and plate (7) from spring (2).



020S07

2. Disassembly of piston assembly

1) Remove piston assembly from idler.

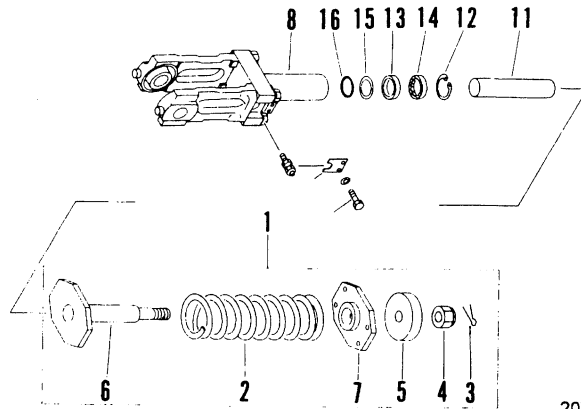
2) Remove plate (9) from cylinder (8), then remove lubricator (10).

3) Pull out rod (11) from cylinder (8).

4) Remove snap ring (12) from cylinder (8), then remove spacer (13), dust seal (14), backup ring (15), and O-ring (16).

ASSEMBLY OF RECOIL SPRING ASSEMBLY

PC25-1 Serial No. 1001 – 6470
 PC30-7 Serial No. 18001 – 26422
 PC40-7 Serial No. 18001 – 24521
 PC45-1 Serial No. 1001 – 3505



20TF01230

1. Assembly of piston assembly

- 1) Assemble O-ring (16), backup ring (15), dust seal (14), and spacer (13) in cylinder (8), then secure with snap ring (12).
 - ★ Check that the snap ring is fitted securely in the groove.
- 2) Insert cylinder rod (11).
 - ★ Be careful not to damage the lip of the dust seal.
- 3) Install lubricator (10), then install plate (9).
- 4) Install piston assembly to idler.

2. Assembly of recoil spring assembly

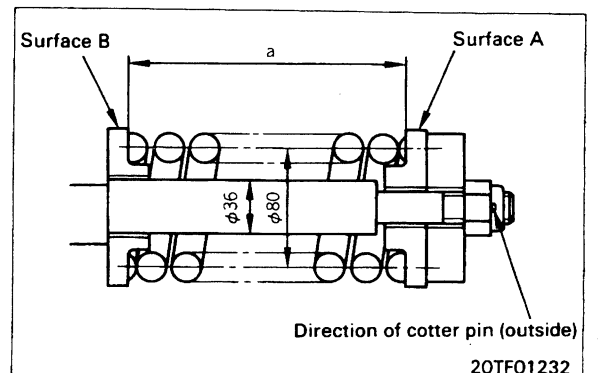
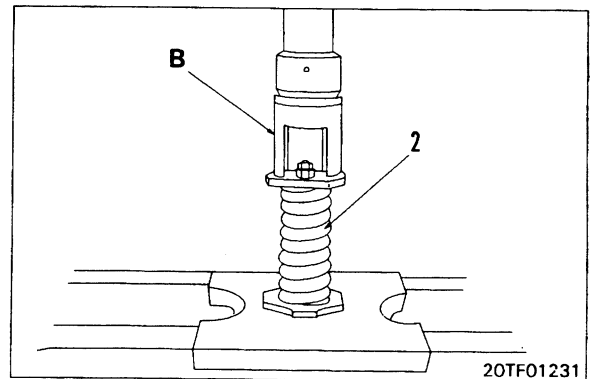
- 1) Assemble plate (7), recoil spring (2), and rod (6), and set tool **B** in position.

⚠ The spring is under large installed load, so be sure to set tool **B** properly to the press and plate. Failure to do this is dangerous.

- 2) Apply hydraulic pressure slowly to compress spring, assemble spacer (5), and tighten nut (4) so that installed length of spring is dimension "a", then install cotter pin (3).

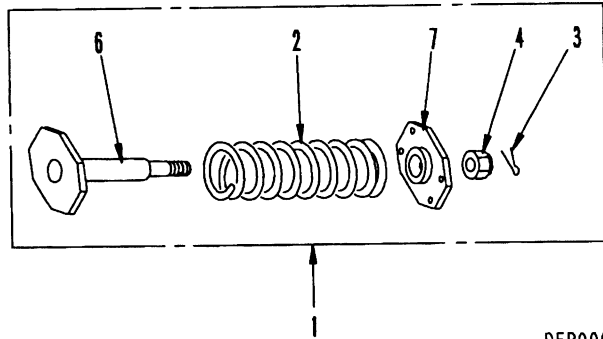
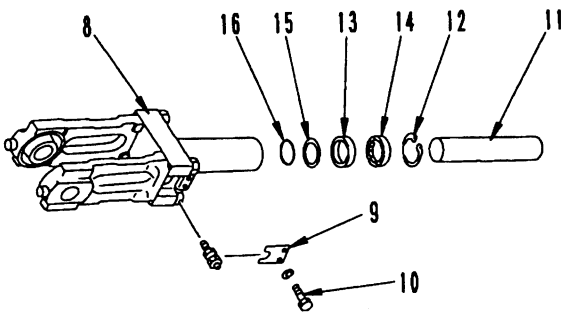
★ Install length a of spring: See MAINTENANCE STANDARDS.

★ After assembling, check that the out-of-parallel between plate surface A and rod surface B is less than 0.5 mm.



020S07

PC25-1 Serial No. 6471 and up
 PC30-7 Serial No. 26423 and up
 PC40-7 Serial No. 24522 and up
 PC45-1 Serial No. 3506 and up



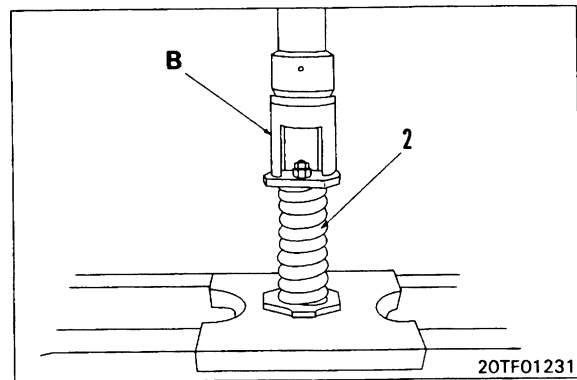
DEP00091

1. Assembly of piston assembly

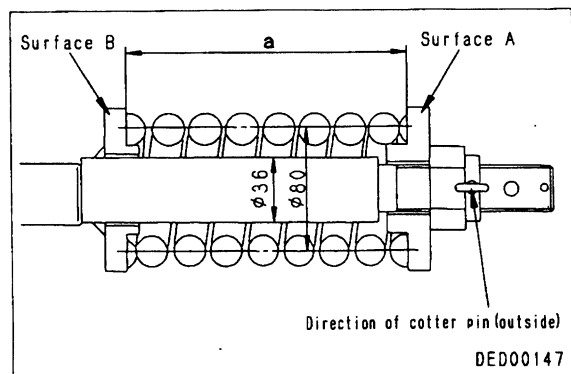
- 1) Assemble O-ring (16), backup ring (15), dust seal (14), and spacer (13) in cylinder (8), then secure with snap ring (12).
 - ★ Check that the snap ring is fitted securely in the groove.
- 2) Insert cylinder rod (11).
 - ★ Be careful not to damage the lip of the dust seal.
- 3) Install lubricator (10), then install plate (9).
- 4) Install piston assembly to idler.

2. Assembly of recoil spring assembly

- 1) Assemble plate (7), recoil spring (2), and rod (6), and set tool **B** in position.
 - ⚠ The spring is under large installed load, so be sure to set tool **B** properly to the press and plate. Failure to do this is dangerous.
- 2) Apply hydraulic pressure slowly to compress spring, tighten nut (4) so that installed length of spring is dimension "a", then install cotter pin (3).
 - ★ Install length a of spring: See MAINTENANCE STANDARDS.
 - ★ After assembling, check that the out-of-parallel between plate surface **A** and rod surface **B** is less than 0.5 mm.



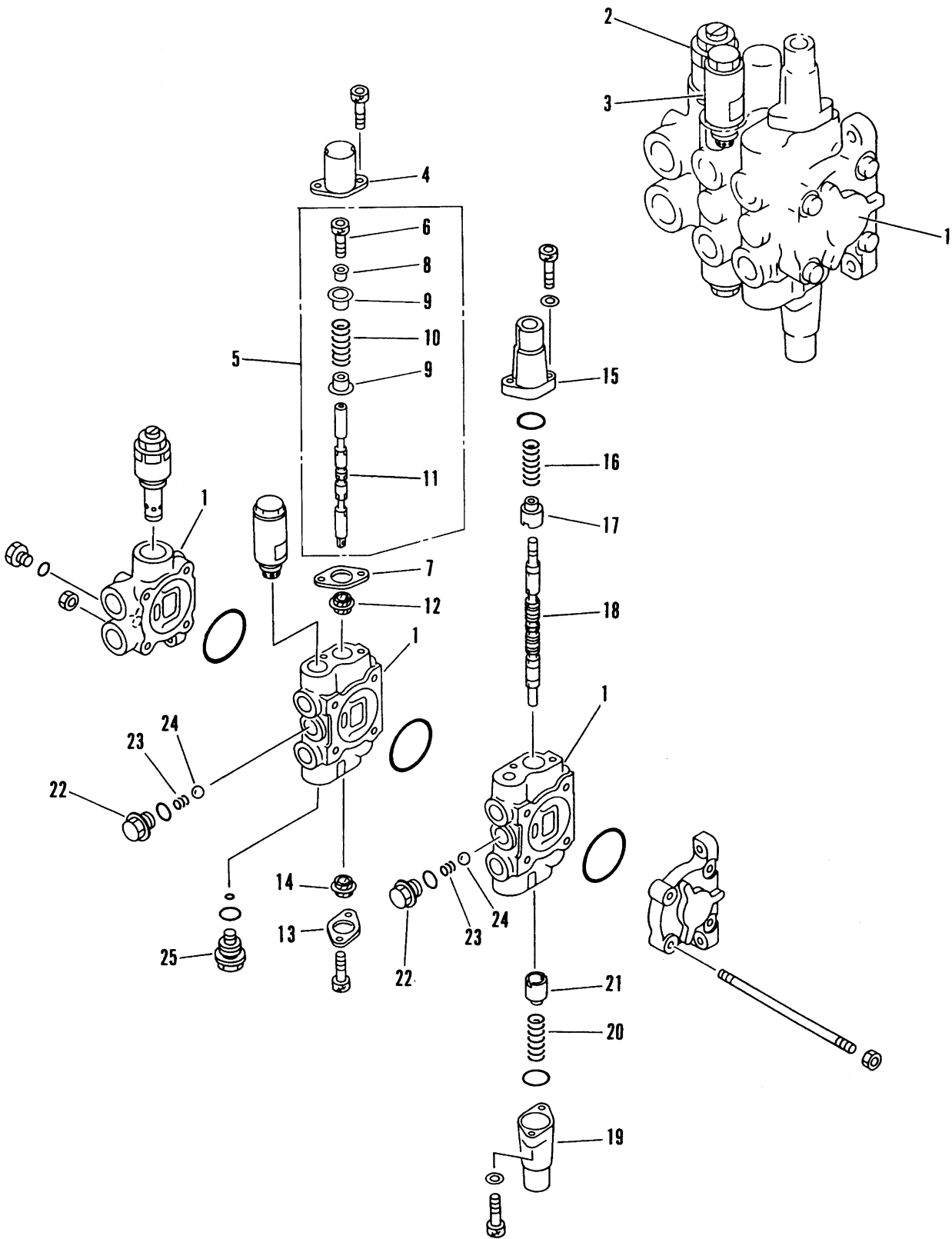
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DED00147

020S07

DISASSEMBLY OF 2-SPOOL CONTROL VALVE ASSEMBLY



020S07

20TF01233

ASSEMBLY OF 2-SPOOL CONTROL VALVE ASSEMBLY

★ The set pressure of the safety valve cannot be adjusted when the safety valve is installed on the machine, so do not disassemble it.

★ If the results of the disassembling show any abnormality in the spool or body, replace the valve as an assembly.

1. Remove main relief valve (2) and safety valve with suction (3) from body (1).

2. Disassembly of blade control valve spool assembly

1) Remove case (4), then loosen plug (6) with spool assembly (5) still assembled.

2) Pull out spool assembly (5), and remove plate (7), then remove plug (6), collar (8), retainer (9), and spring (10) from spool (11).

3) Remove dust seal (12) from body (1).

4) Remove dust seal (14) from plate (13).

3. Disassembly of swing control valve spool assembly

1) Remove case (15), then remove spring (16) and retainer (17).

2) Remove spool (18).

3) Remove case (19), then remove spring (20) and retainer (21).

4. Disassembly of check valve assembly

Remove plug (22), then remove spring (23) and ball (24).

5. Remove plug (25).

★ After assembling each spool assembly, always check that the spool moves smoothly.

1. Install plug (25).

 Plug: See MAINTENANCE STANDARDS.

2. Assembly of check valve assembly

Assemble ball (24) and spring (23) in body (1), and install plug (22).

 Plug: See MAINTENANCE STANDARDS.

3. Assembly of swing control valve spool assembly

1) Assemble spool (18) in body (1).

2) Assemble retainer (21) and spring (20) to spool (18), then fit O-ring to case (19) and install to body.

3) Assemble retainer (17) and spring (16) to spool (18), then fit O-ring to case (15) and install to body.

4. Assembly of blade control valve spool assembly

1) Install dust seal (12) to body.

2) Assemble retainer (9), spring (10), and collar (8) to spool (11), and fit with plug (6) temporarily.

3) Fit plate (7) to spool assembly (5), then assemble in body, and tighten plug (6).


 Plug: See MAINTENANCE STANDARDS.

4) Fit case (4), and install dust seal (14) and plate (13) to opposite side.

5. Install safety valve with suction (3) in body (1).

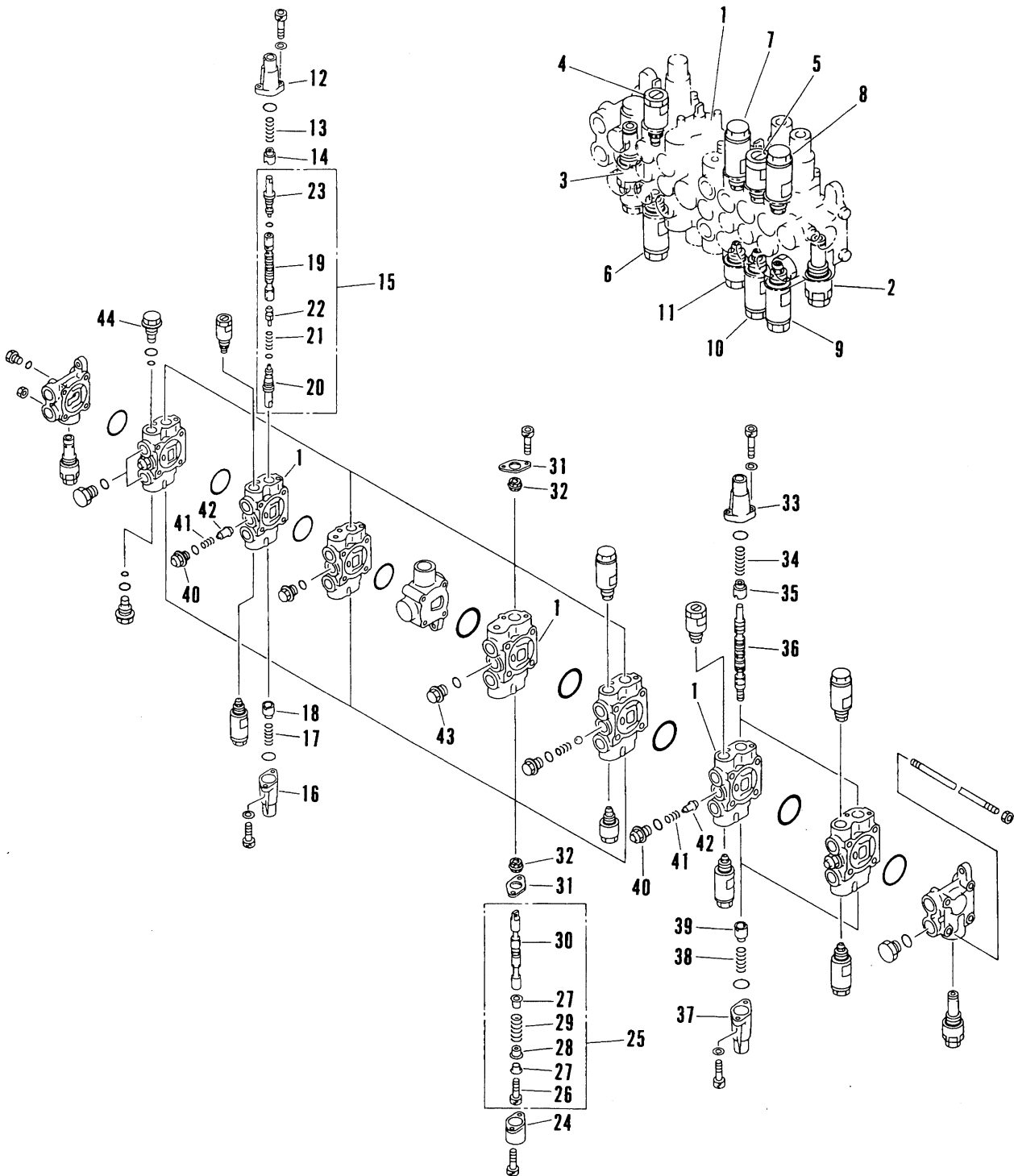
 Safety valve with suction: See MAINTENANCE STANDARDS.

6. Install main relief valve (2) to body (1).

 Main relief valve: See MAINTENANCE STANDARDS.

DISASSEMBLY OF 7-SPOOL CONTROL VALVE ASSEMBLY

PC25, 30, 40



20TF01234

★ The set pressure of the safety valve cannot be adjusted when the safety valve is installed on the machine, so do not disassemble it.

★ If the results of the disassembling show any abnormality in the spool or body, replace the valve as an assembly.

1. Remove main relief valves (2) and (3), safety valves (4) and (5), safety valves with suction (6), (7), (8), (9), and (10), and suction valve (11) from body (1).

2. Disassembly of arm control valve spool assembly

1) Remove case (12), then remove spring (13) and retainer (14).

2) Remove spool assembly (15).

3) Remove case (16), spring (17), and retainer (18).

4) Disassembly of spool assembly (15).

i) Remove joint (20), spring (21), and poppet (22) from spool (19).

ii) Remove joint (23).

3. Disassembly of L.H., R.H. travel, swing, service control valve spool assembly

1) Remove case (24), then loosen plug (26) with spool assembly (25) still assembled.

2) Pull out spool assembly (25), and remove plug (26), then remove collars (27), retainer (28), and spring (29) from spool (30).

3) Remove plate (31) and dust seal (32) from body (1).

4. Disassembly of boom, bucket control valve spool assembly

1) Remove case (33), then remove spring (34) and retainer (35).

2) Remove spool (36).

3) Remove case (37), then remove spring (38) and retainer (39).

5. Disassembly of check valve assembly

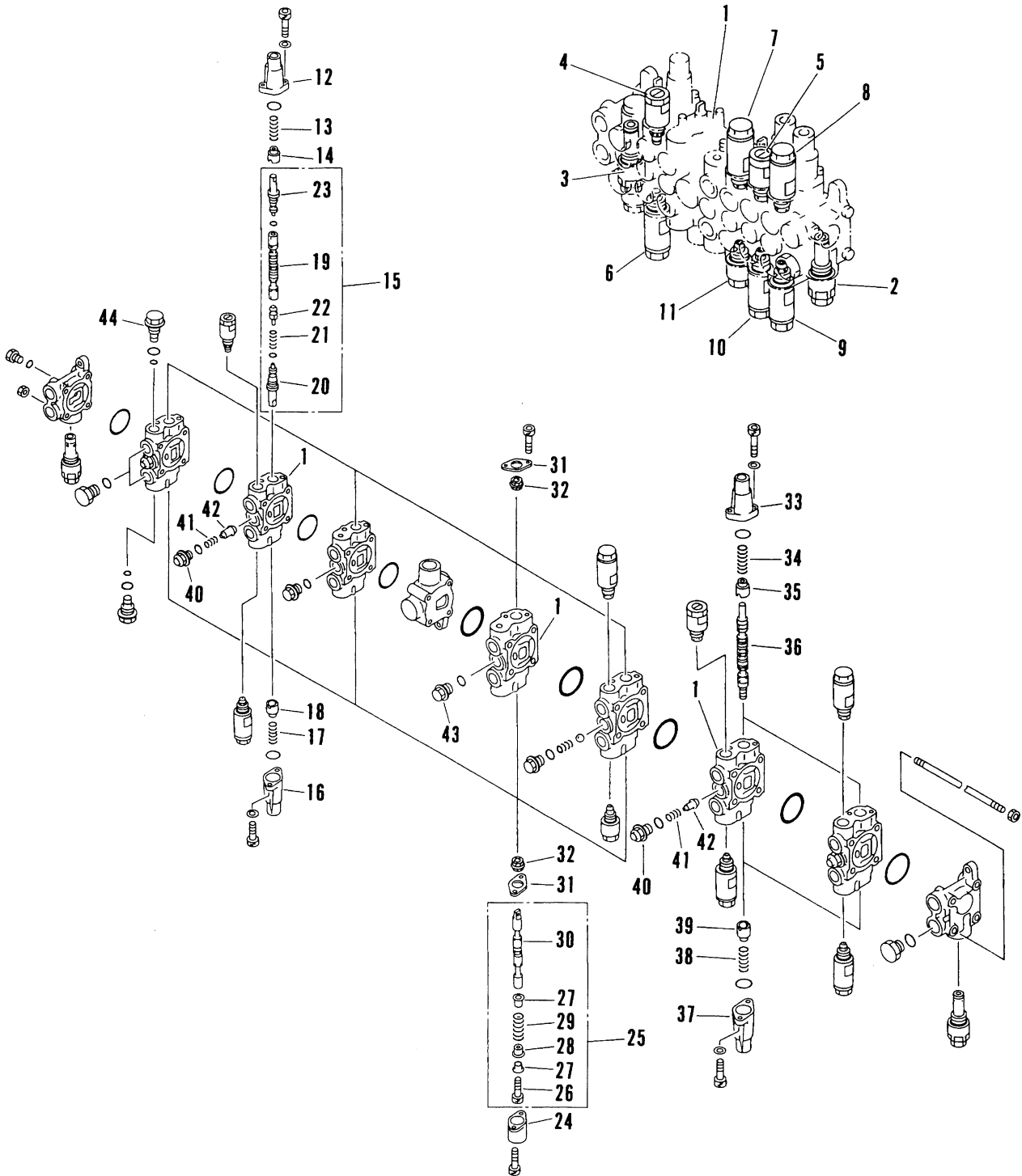
Remove plug (40) from body (1), then remove spring (41) and valve (42).

6. Remove plug (43).

7. Remove plug (44).

ASSEMBLY OF 7-SPOOL CONTROL VALVE ASSEMBLY

PC25, 30, 40



20TF01234

★ After assembling each spool assembly, always check that the spool moves smoothly.

1. Assembly of check valve assembly

1) Install plug (44).

 Plug: See MAINTENANCE STANDARDS.

2) Install plug (43).

 Plug: See MAINTENANCE STANDARDS.

3) Assemble check valve (42) and spring (41) in body (1), then fit O-ring and install plug (40).

 Plug: See MAINTENANCE STANDARDS.

2. Assembly of boom, bucket control valve spool assembly

1) Assemble spool (36) in body (1), then assemble retainer (39) and spring (38) to spool (36), fit O-ring and install case (37).

2) Assemble retainer (35) and spring (34) to spool, and install case (33).

3. Assembly of L.H., R.H. travel, swing, service control valve spool assembly

1) Assemble dust seal (32) in body (1).

2) Assemble spring (29), retainer (28), and collars (27) to spool (30), and fit with plug (26) temporarily.

3) Fit plate (31) to spool assembly (25), then assemble in body, and tighten plug (26).

 Plug: See MAINTENANCE STANDARDS.

4) Fit case (24), and install dust seal (32) and plate (31) to opposite side.

4. Assembly of arm control valve spool assembly

1) Assembly of spool assembly (15)

i) Assemble poppet (22) and spring (21) to spool (19), then fit O-ring and install joint (20).

 Joint: See MAINTENANCE STANDARDS.


ii) Install joint (23).

 Joint: See MAINTENANCE STANDARDS.

2) Assemble spool assembly (15) in body (1), and install retainer (18) and spring (17), then fit O-ring to case (16) and install to body.

3) Install retainer (14) and spring (13), then fit O-ring to case (12) and install to body.


5. Install suction valve (11) to body.

 Suction valve: See MAINTENANCE STANDARDS.


6. Install safety valves with suction (6), (7), (8), (9), and (10) in body.

 Safety valve with suction: See MAINTENANCE STANDARDS.

7. Install safety valves (4) and (5) in body.

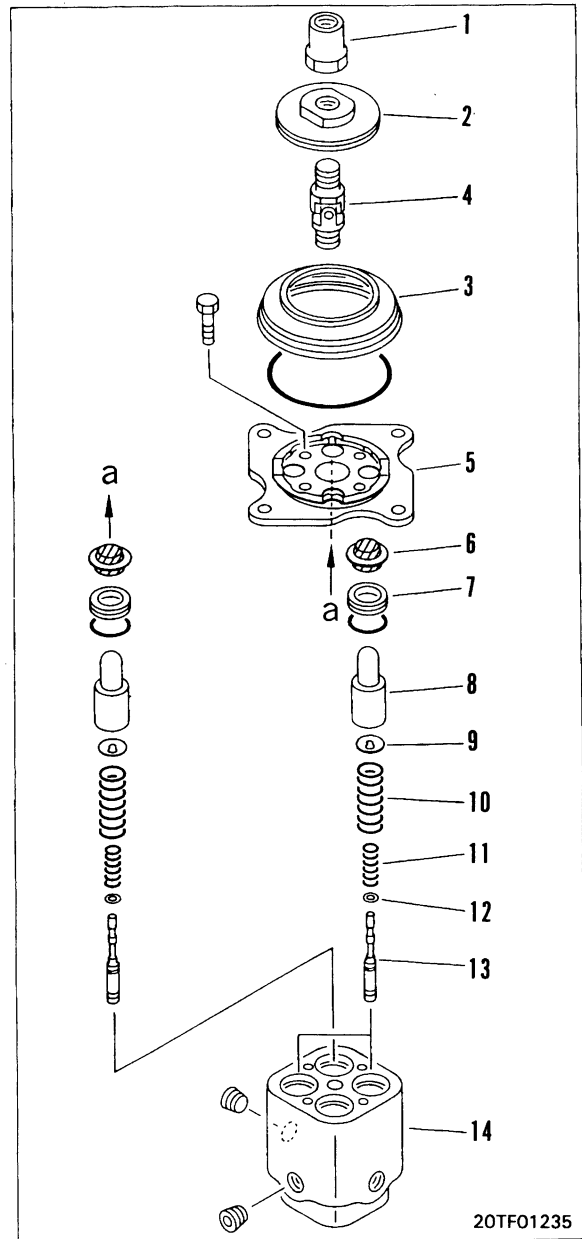
 Safety valve: See MAINTENANCE STANDARDS.

8. Install main relief valves (2) and (3) in body.

 Main relief valve: See MAINTENANCE STANDARDS.

DISASSEMBLY OF PPC VALVE ASSEMBLY

1. Remove nut (1), then remove disc (2) and boot (3).
2. Remove joint (4), then remove plate (5).
3. Remove seal (6) and collar (7).
4. Pull out piston (8), and remove retainer (9), springs (10) and (11), and shim (12).
★ Spring (10) consists of two sets of two types of spring with different installed loads, so check the installation position (hydraulic port) and fit tags to prevent mistakes when installing.
5. Pull out valve (13) from body (14).




20TF01235

ASSEMBLY OF PPC VALVE ASSEMBLY

1. Assemble valve (13) to body (14).
2. Assemble shim (12) and spring (11) to valve (13).
3. Assemble spring (10), retainer (9), and piston (8).
 ★ Spring (10) consists of spring with a different number of coils for each hydraulic port. The number of coils and position of use are as follows.

Port	Number of coils on spring
P1, P2	11
P3, P4	9


★ The position of each port is stamped on the bottom of the valve body.

 Piston: Grease (LG-2)


★ When assembling piston (18), coat the outer circumference of the piston and the inner circumference of the body hole with grease.

4. Fit O-ring to collar (7), then assemble in body (14), and install seal (6).

5. Install plate (5).

 Mounting bolt: See MAINTENANCE STANDARDS.

6. Install joint (4).

 Sliding portion of joint: Grease (LG-2)

 Joint: Threas tightener (LT-2)

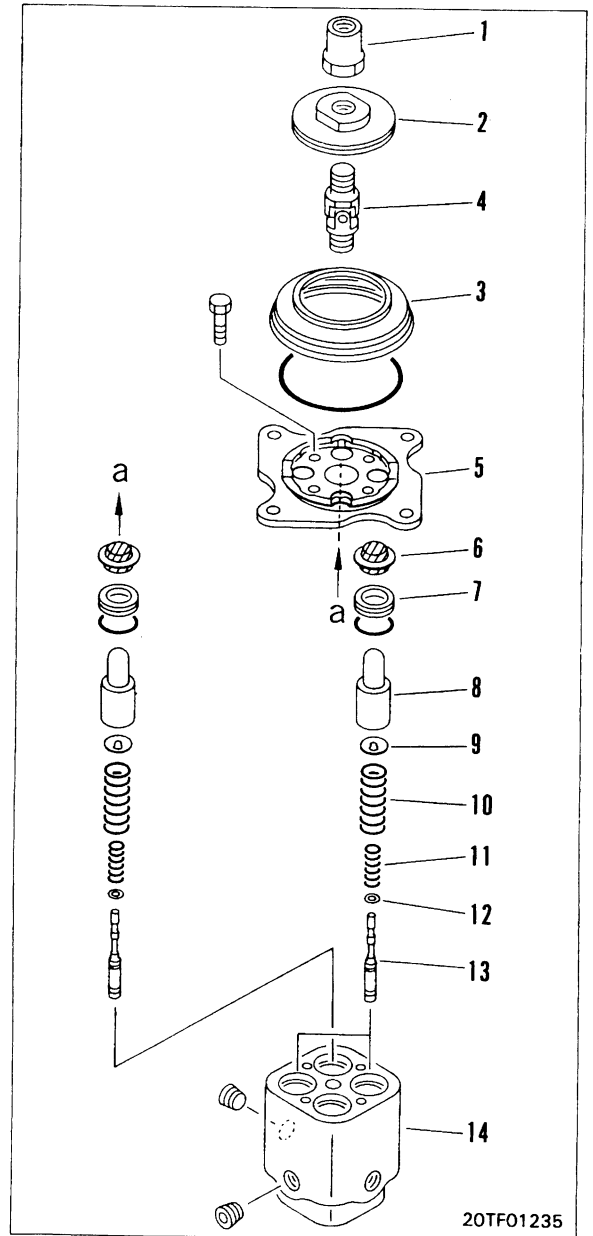
 Joint: See MAINTENANCE STANDARDS.

★ Keep strictly to the standard value for the tightening torque of the joint.

7. Assemble disc (2), and tighten with nut (1).

 Nut: See MAINTENANCE STANDARDS.

★ After assembling the disc, adjust the assembled height of the disc. For details, see TESTING AND ADJUSTING, Adjusting PPC valve.

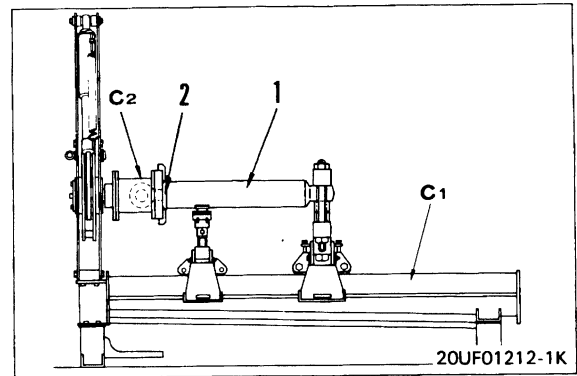


/05070

DISASSEMBLY OF HYDRAULIC CYLINDER ASSEMBLY

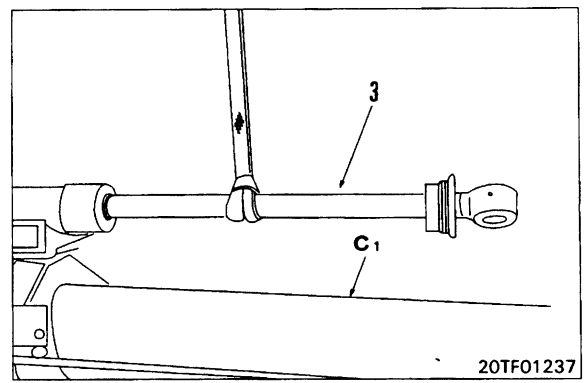
1. Cylinder assembly

- 1) Set cylinder assembly (1) to tool C1.
- 2) Using hydraulic pump or power wrench, loosen head assembly (2) with tool C2.



- 3) Pull out piston rod assembly (3).

★ Place a container under the cylinder to catch the oil.

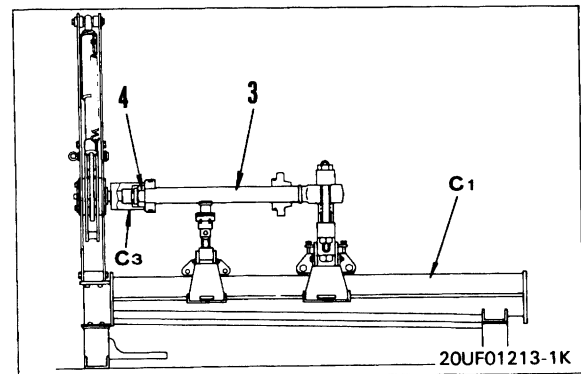


2. Piston rod assembly

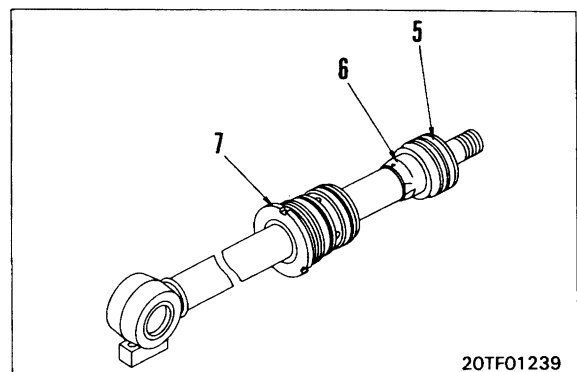
- 1) Set piston rod assembly (3) to tool C1.
- 2) Using hydraulic pump or power wrench, remove nut (4) with tool C3.

★ Width across flats of nut

Cylinder		mm				
Model	Boom	Arm	Bucket	Swing	Blade	
PC25	46	46	46	46	50	
PC30	46	50	46	46	50	
PC40	55	55	50	55	55	
PC45	55	55	55	55	55	

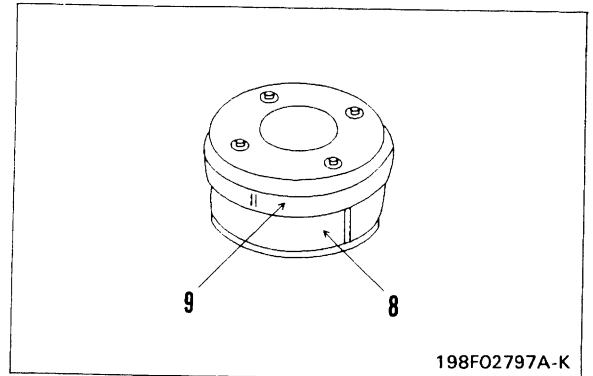


- 3) Remove piston assembly (5).
- 4) Remove plunger (6).
- ★ Boom cylinder only.
- 5) Remove head assembly (7).



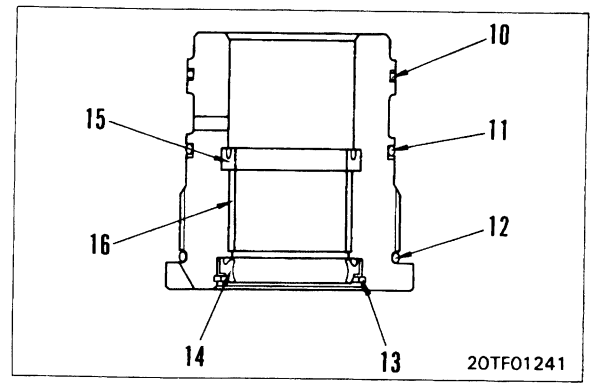
3. Disassembly of piston assembly

- 1) Remove wear ring (8).
- 2) Remove piston ring (9).



4. Disassembly of cylinder head assembly

- 1) Remove backup ring, O-ring, and backup ring (10).
- ★ Boom cylinder only.
- 2) Remove backup ring and O-ring (11).
- 3) Remove O-ring (12).
- 4) Remove snap ring (13), then remove dust seal (14).
- 5) Remove rod packing (15).
- 6) Remove bushing (16).



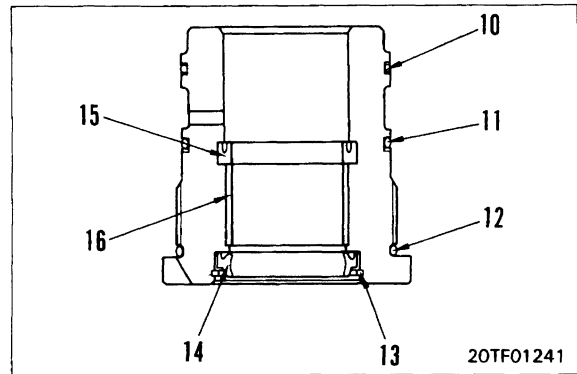
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ASSEMBLY OF HYDRAULIC CYLINDER ASSEMBLY

- ★ Be careful not to damage the packings, dust seals, and O-rings.
- ★ Do not try to force the backup ring into position. Warm it in warm water (50 — 60°C) before fitting it.

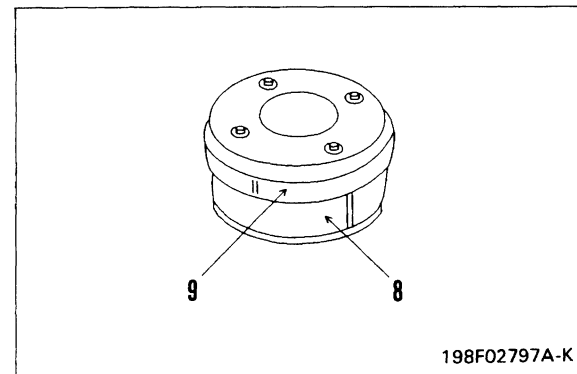
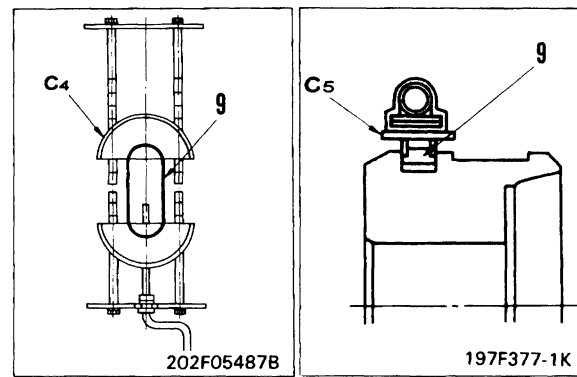
1. Assembly of cylinder head assembly

- 1) Using push tool, press fit bushing (16).
- 2) Install rod packing (15).
- 3) Install dust seal (14), and secure with snap ring (13).
- 4) Install O-ring (12).
- 5) Install backup ring and O-ring (11).
- 6) Install backup ring, O-ring, and backup ring (10).
 - ★ Boom cylinder only.



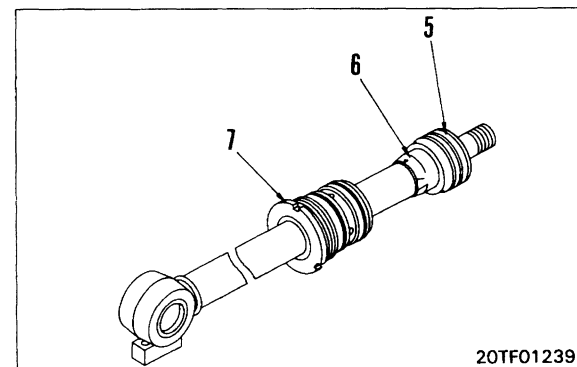
2. Assembly of piston assembly

- 1) Using tool C4, expand piston ring (9).
 - ★ Set the piston ring on tool C4 and turn the handle 8 — 10 times to expand the ring.
- 2) Set tool C5 in position, and compress piston ring (9).
- 3) Assemble wear ring (8).




3. Piston rod assembly

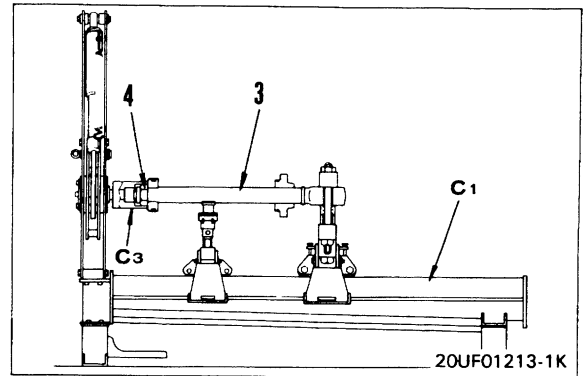
- 1) Install head assembly (7).
- 2) Install plunger (6).
 - ★ Boom cylinder only.
- 3) Install piston assembly (5).



- 4) Set piston rod assembly (3) to tool C1.
- 5) Using hydraulic pump or power wrench, tighten nut (4) with tool C3.

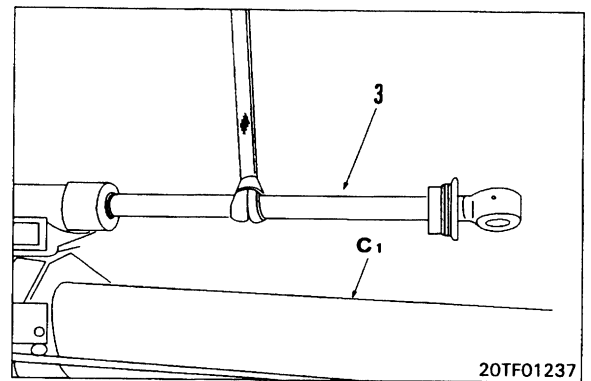
 Nut: Thread tightener (LT-2)

 Nut: See MAINTENANCE STANDARDS.




4. Cylinder assembly

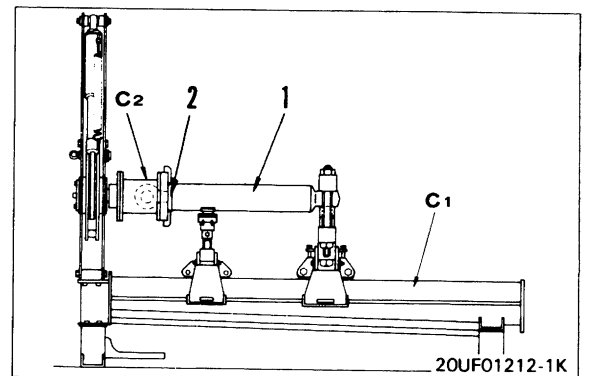
- 1) Set cylinder to tool C1.
- 2) Install piston rod assembly (3).
 - ★ Push in the piston rod fully.



- 3) Using hydraulic pump or power wrench, tighten head assembly (2) with tool C2.


 Head assembly: See MAINTENANCE STANDARDS.

- 4) Remove cylinder assembly (1) from tool C1.




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REMOVAL OF WORK EQUIPMENT ASSEMBLY


 Extend the arm and bucket fully and lower the work equipment completely to the ground.

1. Remove pin (1).  

★ Sling the boom cylinder assembly and remove the pin.


 Start the engine and retract the boom cylinder rod. Tie the rod with wire to prevent it from coming out, and lower it on the block.

Release the remaining pressure inside the circuit.

 For details, see TESTING AND ADJUSTING, Releasing remaining pressure inside hydraulic circuit.

2. Disconnect hoses (2).

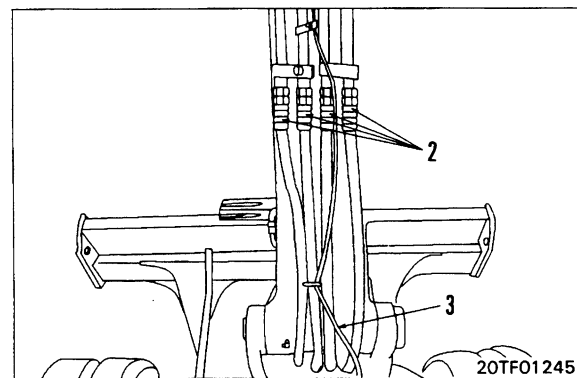
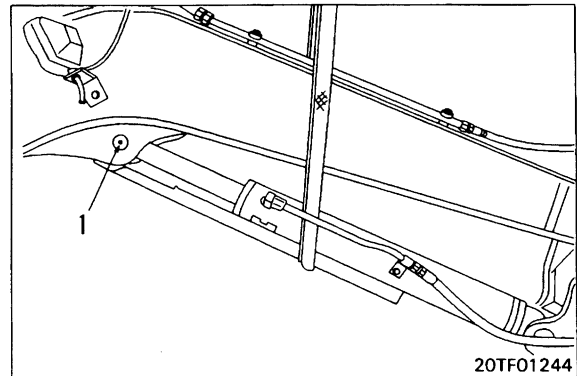
3. Disconnect wire (3).

4. Remove pin (4). 

★ Sling the work equipment assembly and remove the pin.



5. Remove work equipment assembly (5).


 See WEIGHT TABLE.



INSTALLATION OF WORK EQUIPMENT ASSEMBLY

• Carry out installation in the reverse order to removal.

 When aligning the position of the pin hole, run the engine at low idling. Never insert your fingers into the pin hole.



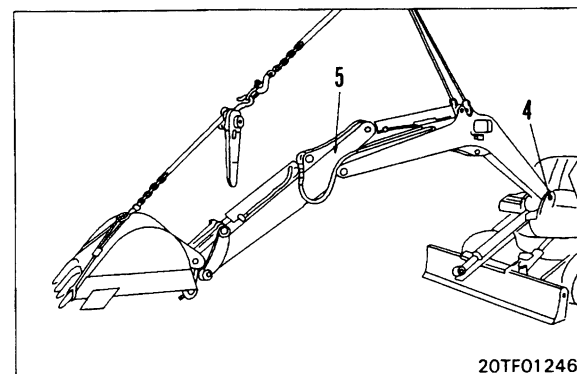
★ Adjust with shims so that the clearance between the piston rod and boom and boss is less than 1 mm.

• Bleeding air

Bleed the air from the cylinder.

For details, see TESTING AND ADJUSTING, Bleeding air from all parts.

After bleeding the air from the cylinder, check the hydraulic tank level.

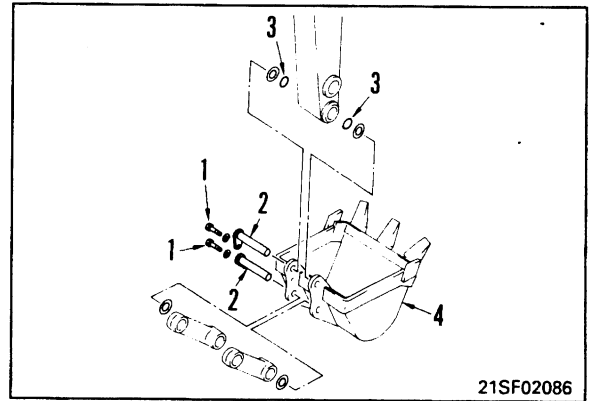


REMOVAL OF BUCKET ASSEMBLY

1. Remove lock bolt (1), then remove connecting pin (2) of bucket and link. ※ 1
 - ★ Check the number and thickness of the shims, and keep in a safe place.
 - ★ O-ring (3) is installed only at the tip of the arm.
2. Raise work equipment and disconnect bucket assembly (4).



WEIGHT TABLE.



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INSTALLATION OF BUCKET ASSEMBLY

- Carry out installation in the reverse order to removal.

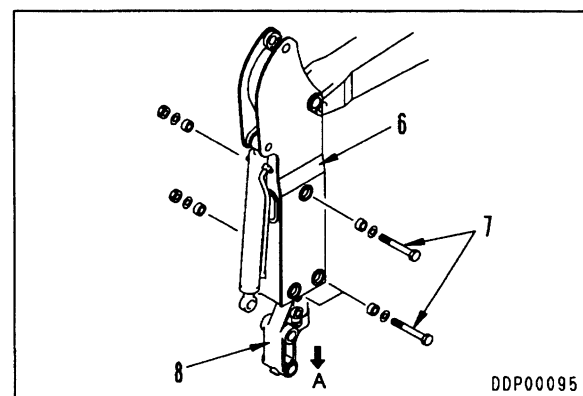
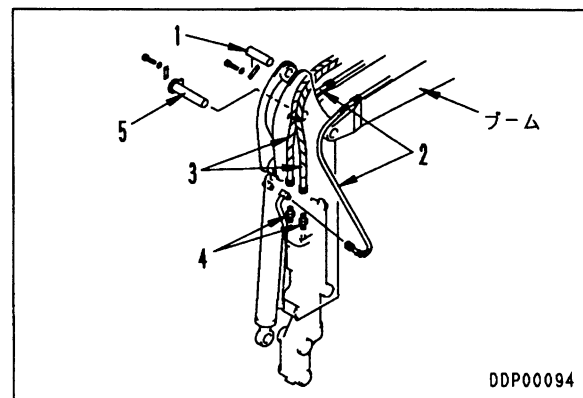
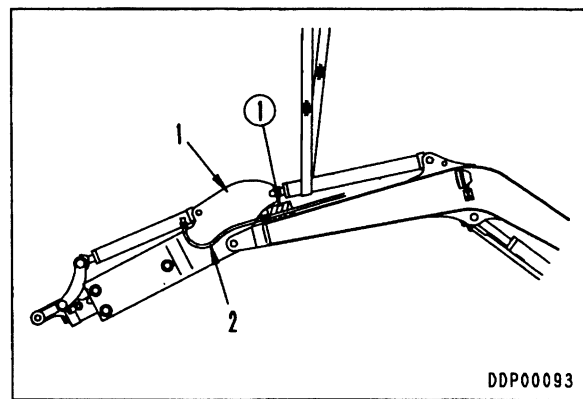
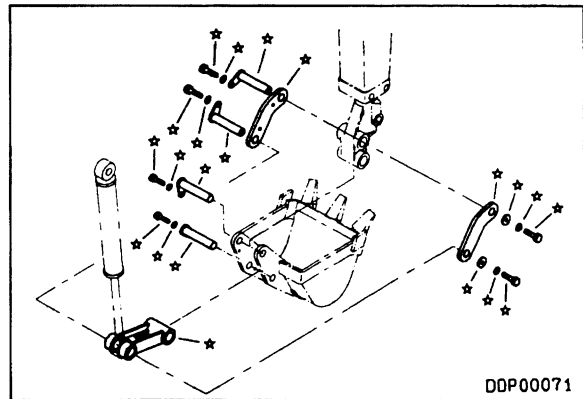
※ 1



When aligning the position of the pin hole, run the engine at low idling, and never insert your fingers in the pin hole.

REMOVAL OF HYDRAULIC BREAKER ASSEMBLY

1. Remove bucket assembly.
 - ★ Remove the part marked ☆, then remove the bucket assembly.
For details, see REMOVAL OF BUCKET ASSEMBLY.
 - ⚠ Set block (1) between the arm and boom, then extend the arm and lower the work equipment completely to the ground.
 - ⚠ Sling the arm cylinder assembly.
2. Remove pin (1). ※ 1 ※ 2
 - ★ Check the number and thickness of the shims, and keep in a safe place.
 - ⚠ Start the engine and retract the arm cylinder rod, then tie the rod with wire to prevent it from coming out.
 - ⚠ Stop the engine, then loosen the oil filler cap slowly to release the pressure inside the hydraulic tank.
3. Disconnect hoses (2) and (3).
 - ★ Remove hoses (3) on both the left and right.
4. Remove left and right elbows (4).
5. Remove pin (5), then remove arm assembly (6).
※ 1 ※ 2
 - ★ Check the number and thickness of the shims, and keep in a safe place.
 - ★ Sling the arm assembly and remove the pin.
6. Remove mounting bolts (7), and pull hydraulic breaker assembly (8) in direction A to remove from arm assembly (6).



INSTALLATION OF HYDRAULIC BREAKER ASSEMBLY

- Carry out installation in the reverse order to removal.
 - ※ 1 ※ 3
 - ⚠ When aligning the position of the pin hole, run the engine at low idling, and never insert your fingers in the pin hole.
 - ※ 2 ※ 4
 - ★ Insert shims securely.
- Refilling with oil (hydraulic tank)
 - ★ Add oil through oil filler cap to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- Bleeding air
 - ★ Bleed the air.
For details, see TESTING AND ADJUSTING, Bleeding air from hydraulic cylinder.

DISASSEMBLY OF HYDRAULIC BREAKER ASSEMBLY

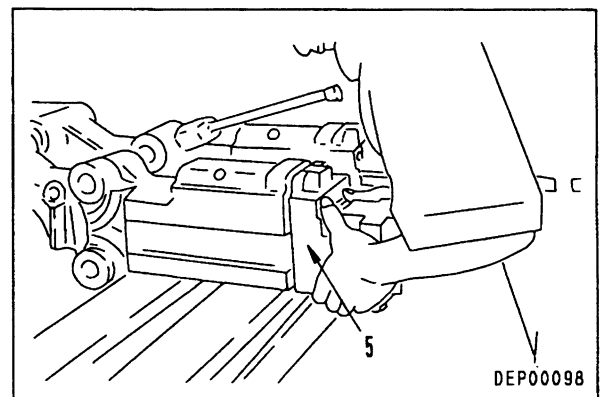
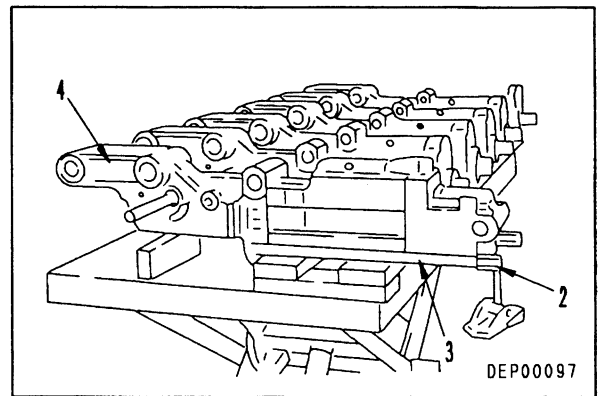
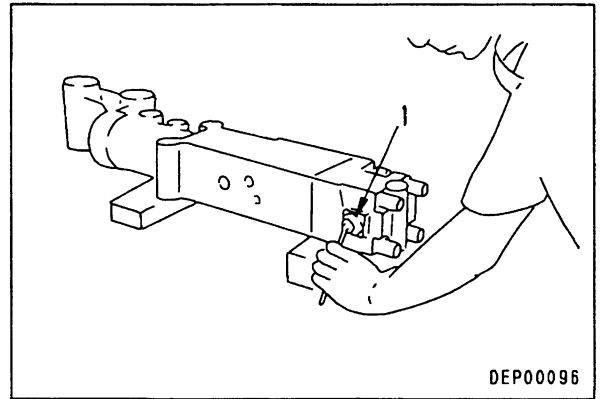
★ Carry out this operation in a clean environment. Dust is an enemy of hydraulic breakers, so it is more convenient and safer to carry out this operation inside a repair shop.

1. Release gas from gas cushion chamber.
★ Remove the cover cap, then push in gas valve (1) with a 3Ø bar to release the gas completely.

2. Remove chisel.
★ For details, see REPLACING CHISEL.

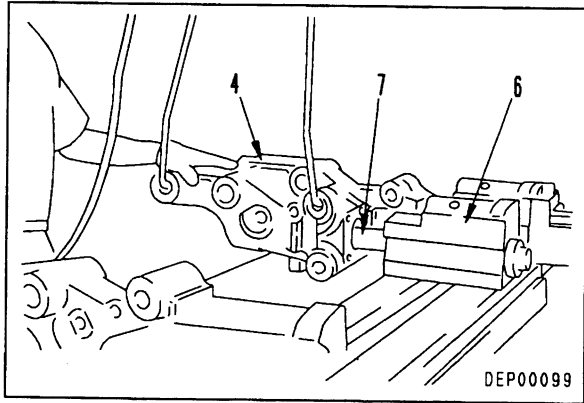
3. Loosen back nut (2), then remove side rod (3).
★ If the side rod will not turn, do not remove it by force. Remove it while still installed to front cap (4).

4. Remove back cap (5).

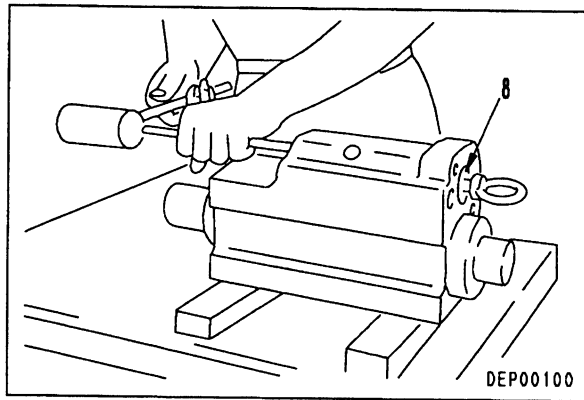


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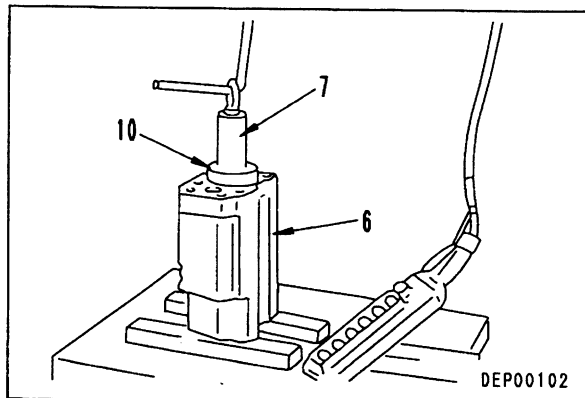
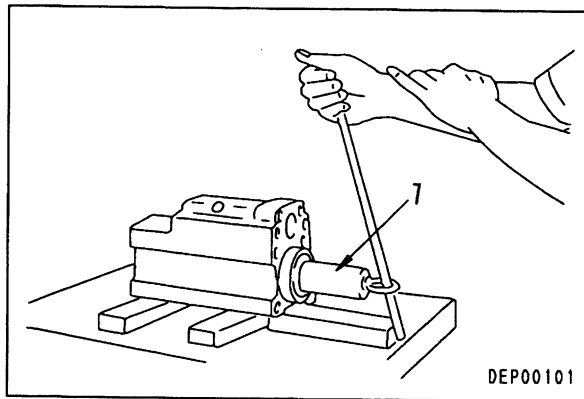
5. Remove front cap (4) from cylinder (6).
 ★ The piston protrudes from the cylinder, so be careful not to damage the piston.



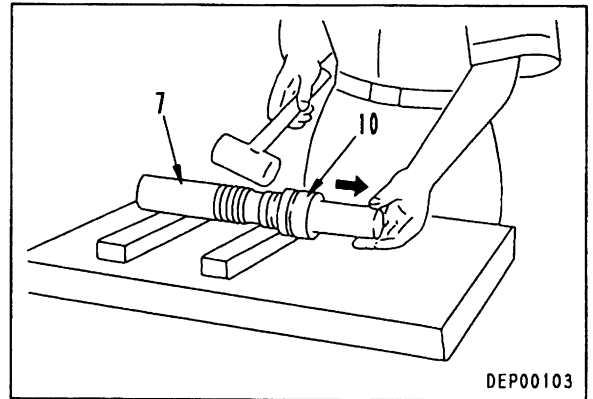
6. Install eyebolt (M12) to valve plug (8), remove valve plug, then remove valve and valve sleeve.
 ★ If it is difficult to remove the valve, use a bar from the flange plug (M10) end, and remove together with the valve liner.
 ★ See tool No. 2.



7. Install eyebolt (M12) to head of piston (7), then use bar as a lever and pull out together with cylinder sleeve (10). When doing this, be careful not to cause scuffing.
 If it is difficult to remove, insert a bar from front cap (4) end and hit with a hammer.
 ★ If lifting equipment is available, stand cylinder (6) upright and lift piston (7) and sleeve (10) together. This makes it easy to remove.
 ★ When the piston is removed, the hydraulic oil remaining inside may spurt out from the hole.

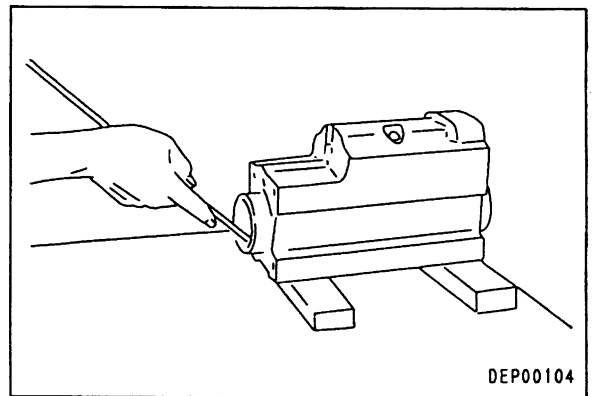


8. Pull out cylinder sleeve (10) from piston.



9. Remove seals from each part.

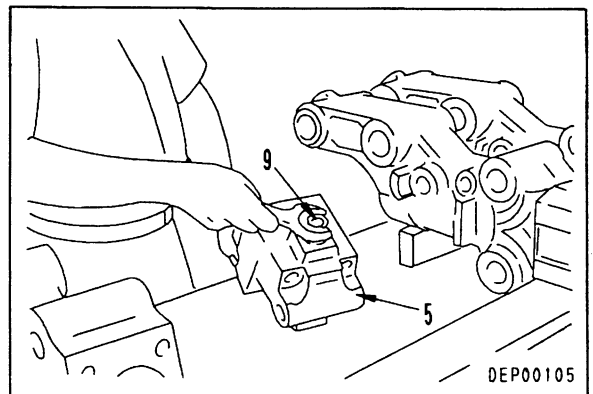
- ★ For the U-packing, it is useful to use a bar with the tip ground to form a cone.



10. Remove gas valve body (9) from back cap (5).

- ⚠ When the gas valve body is removed from the back cap, there is danger that the gas valve body may fly off if there is any gas remaining inside. Be sure to release all the gas from the cushion chamber before removing the gas valve body.

- ★ It is also possible to cut the rubber at the bottom of the gas valve with a cutter, but if the body is damaged, there is danger that it will cause gas leakage. (As a basic rule, replace the gas valve and gas valve body as an assembly.)



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ASSEMBLY OF HYDRAULIC BREAKER ASSEMBLY

- ★ Wash all parts thoroughly. (Remove the plug from the machined hole and wash the inside also.)
- ★ Be careful not to cause any damage or let dirt or dust get in. Never use a dirty cloth.
 - Loose threads from cotton gloves or cloths can also cause trouble.

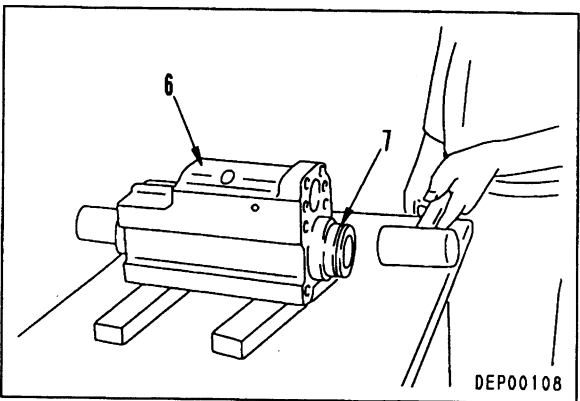
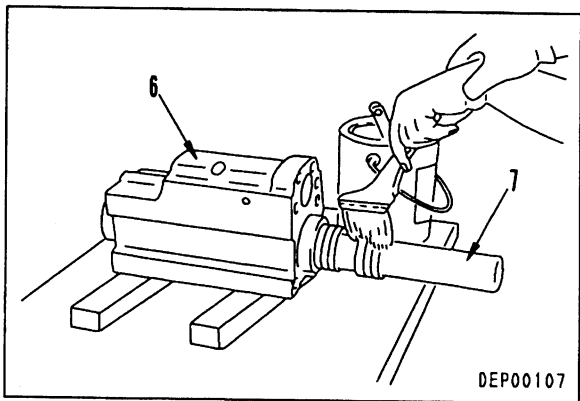
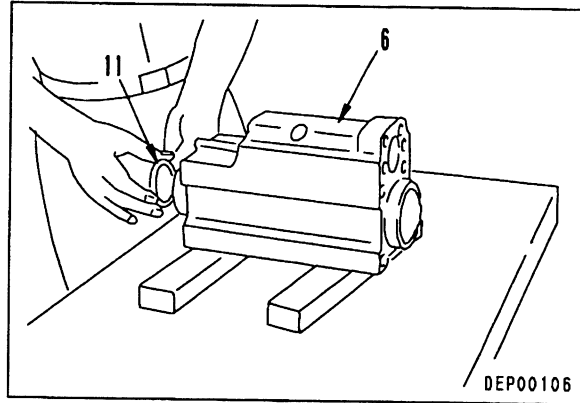
1. Assemble U-packings (11) to cylinder sleeve (10) and cylinder (6).

(For details of the direction of assembly, see the assembly diagram.)

- Soak the seal in hydraulic oil before assembling it.
- Be careful not to mistake the direction of assembly of the U-packing, and fit it completely in the groove.
- Be careful not to damage the lip of the U-packing. If it is assembled with the lip damaged, it will cause leakage of oil and gas.

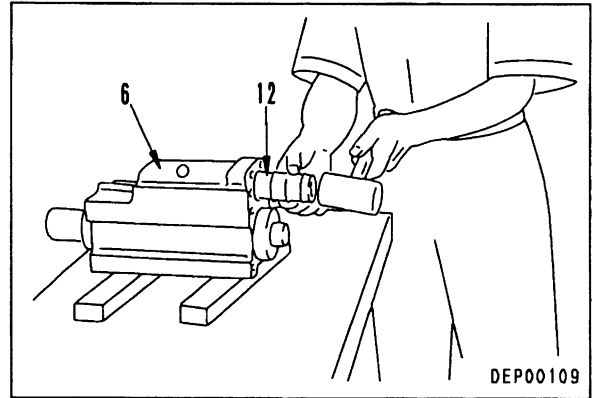
2. Before completely inserting piston (7) in cylinder (6), assemble cylinder sleeve (10) to piston (7), and insert completely together with piston (7).

- Coat the sliding surface thinly with hydraulic oil, then push the top of the piston by hand to insert it. To prevent scuffing, put a stand under the bottom of the piston, and assemble slowly and carefully.
- Tap portions **A** and **B** in turn with a plastic hammer to insert.
- ★ Do not hit directly with a metal hammer. This may cause damage or deformation.
- If it is possible to use a crane, stand the cylinder upright, assemble the cylinder sleeve to the piston, then raise with an eyebolt and assemble to the cylinder.

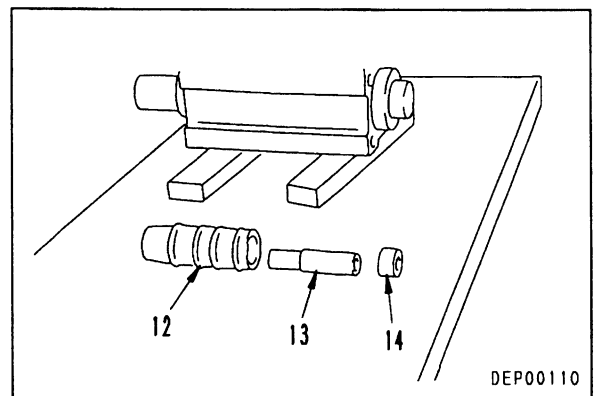


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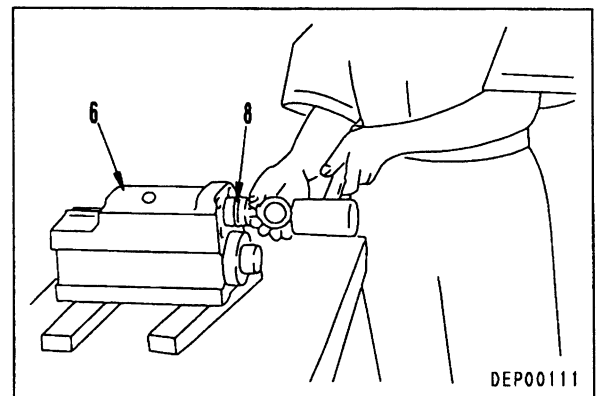
3. Assemble valve liner (12) to cylinder (6).
 - Be careful not to forget to fit the O-ring. (When assembling, to prevent the liner plug from coming out, push from the flange plug M10 side when inserting.)
 - Set the position of the hole horizontal.
 - When assembling, the backup ring may easily slip out or get caught, so carry out the operation carefully.
 - Coat the O-ring thinly with oil.



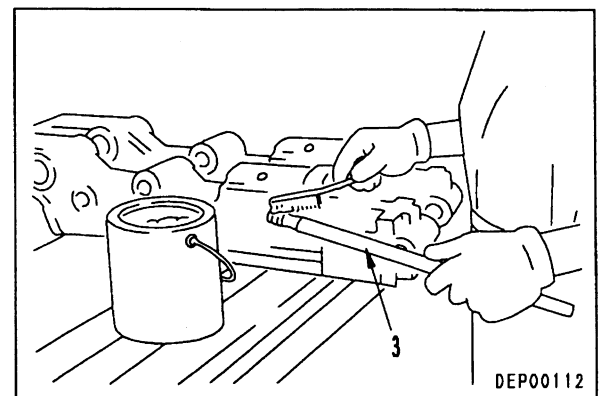
4. Assemble valve (13) and valve sleeve in valve liner (12).
 - Coat the sliding surface thinly with oil.



5. Assemble valve plug (8).
 - Coat the O-ring thinly with oil.
6. Assemble front cap (4) to cylinder (6). (For details, see DISASSEMBLY OF HYDRAULIC BREAKER ASSEMBLY.)
 - The piston protrudes from the cylinder, so be careful not to damage the piston.

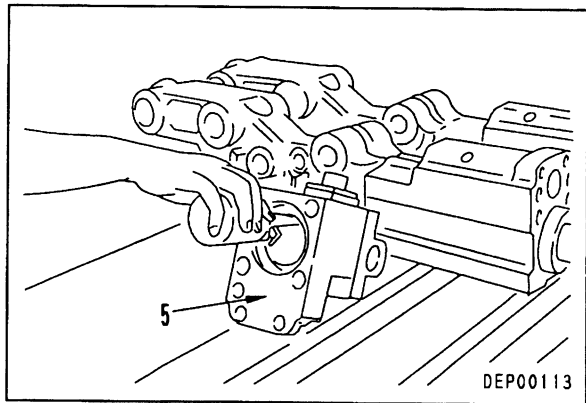


7. Insert side rod (3) from top of cylinder, and screw in lightly to front.
 - Coat the thread portion with molybdenum disulphide.



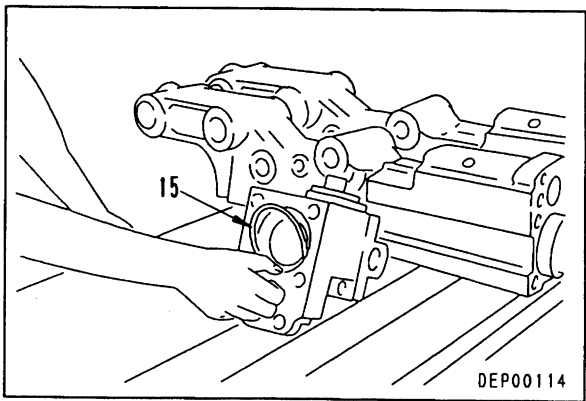
8. Fill inside of back cap (5) with specified amount of hydraulic oil.

Amount of oil	cc	50
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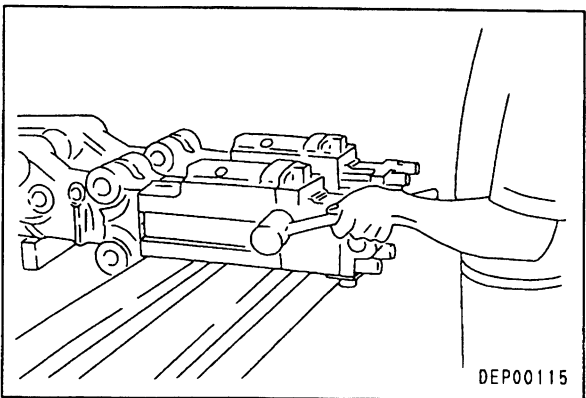
9. Align hole in back cap (5) with side rod (3), then pass side rod (3) through and assemble to cylinder (6).

- Be careful not to forget backup O-ring (15).
- Be careful not to let the backup cap hit the thread of the side rod.

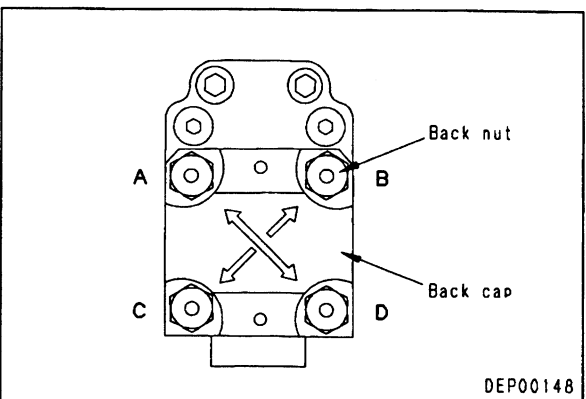


10. Align faces of front and cylinder, and cylinder and back.

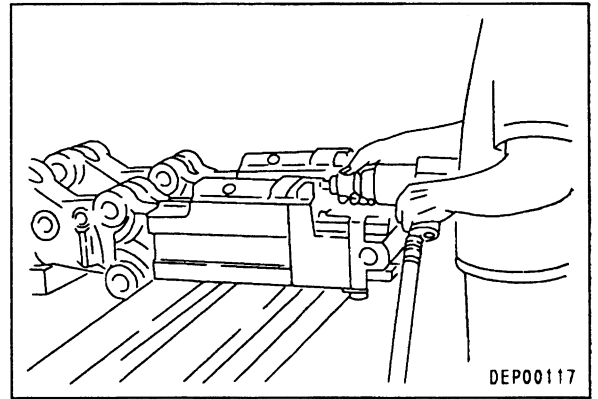
- Loosen the side rod and tighten the nut until the bottom of the back nut contacts the side rod.
- If the nut contacts the back cap before the bottom, loosen further. Always tighten so that the bottom of the back nut contacts the tip of the side rod first.



11. Tighten back nuts a little at a time on diagonally opposite sides in the order A->D->B->C until all nuts are tightened to the specified torque. (See diagram.)



12. Tighten M16 bolt.



13. Charge with nitrogen gas.

- As the gas is charged, the force of the gas will move the piston, and there will be a sound of the piston contacting the front cap.
- ★ Make sure that no one is standing near the front cap when carrying out this operation.

14. Insert chisel.

(For details of the procedure, see REPLACING CHISEL.)

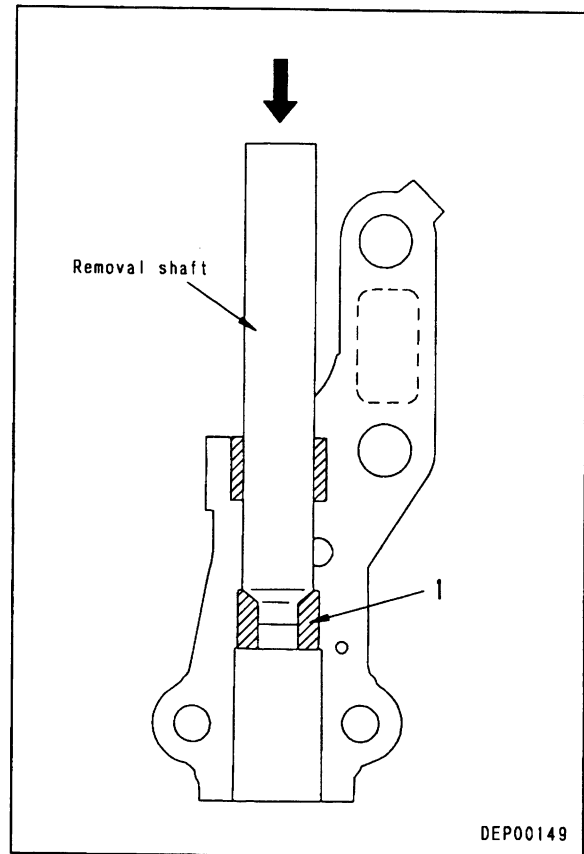
15. Using a grease gun, pump in grease several times through grease nipple at side face at bottom of front cap.

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REMOVAL OF BUSHING

1. Using removal tool, remove shank bushing (1) with a hydraulic press or hammer as shown in the diagram.

★ See tool No. 3.



2. Front cap bushing

- 1) Using a spring pin removal tool, knock out spring pin.

★ When the spring pin comes out, there is danger that it may fly out.

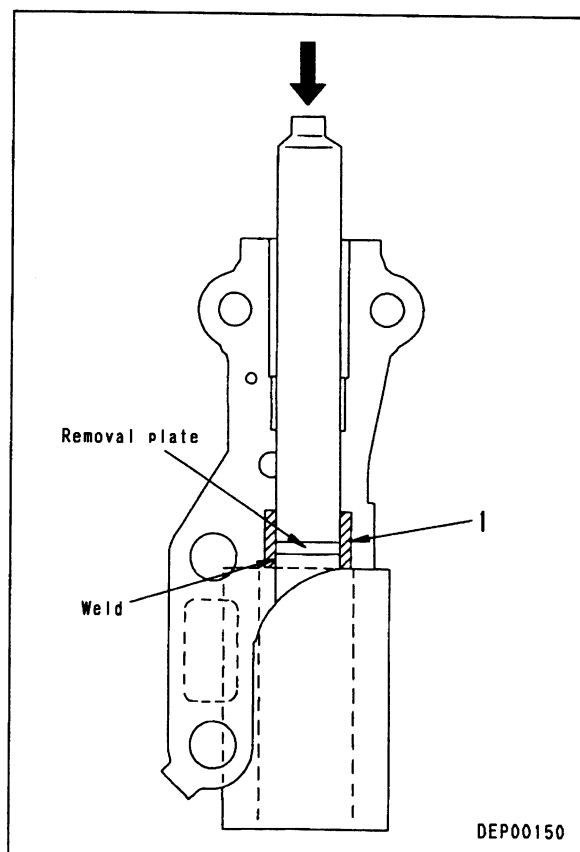
Make sure that there is no one in the area when removing.

★ See tool No. 1.

- 2) Remove front cap bushing in direction of chisel.

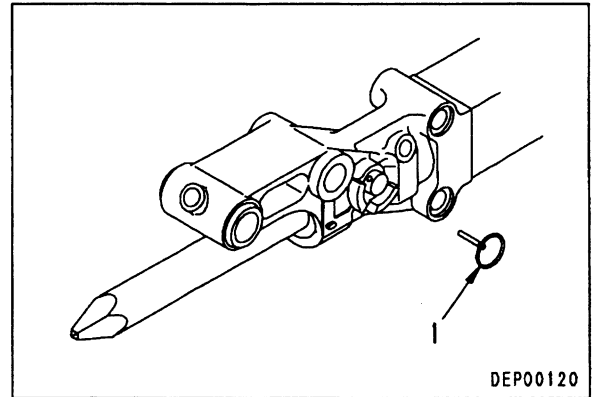
- Weld the welding plate (removal plate) to the inside of front cap bushing (1) as shown in the diagram. Using a removal tool, remove with a hydraulic press or hammer.

★ See tools No. 3, 4.

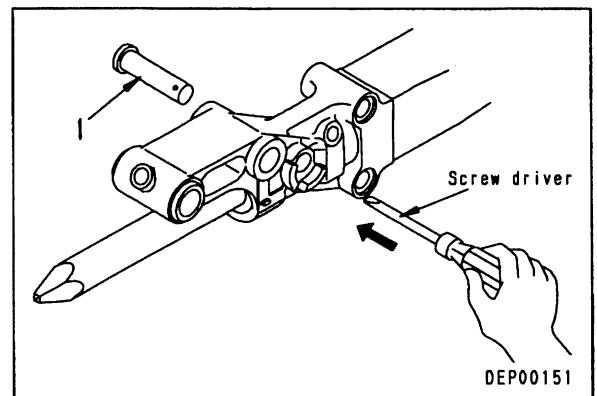


REMOVAL OF CHISEL

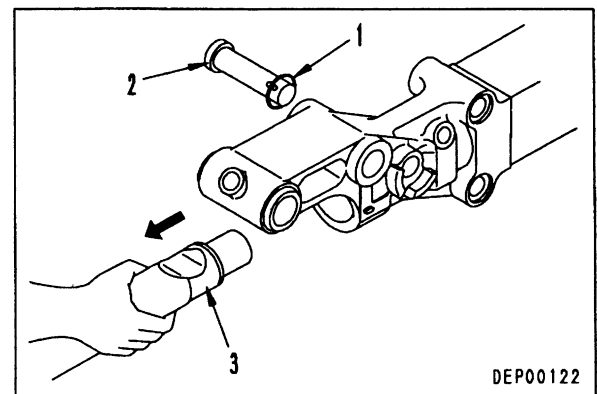
1. Remove link pin (1).



2. Push up chisel set pin (2) with a screwdriver from side, and remove chisel set pin.



3. Remove chisel (3).
(Keep chisel set pin (2) and link pin (1) as a set and be careful not to lose them.)



INSTALLATION OF CHISEL

- Carry out installation in the reverse order to removal.

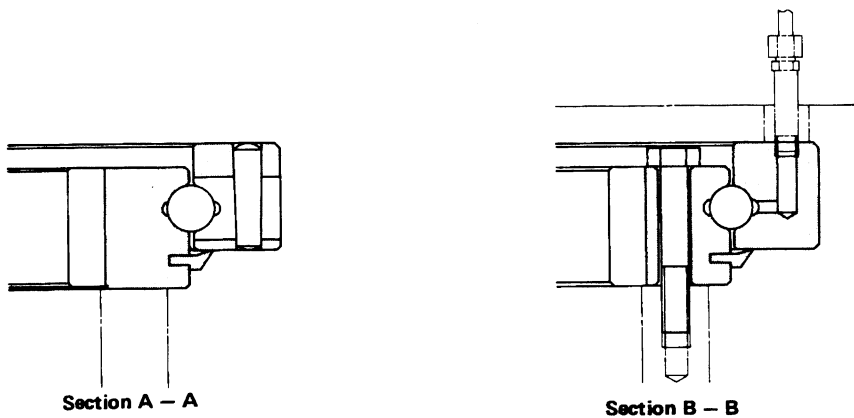
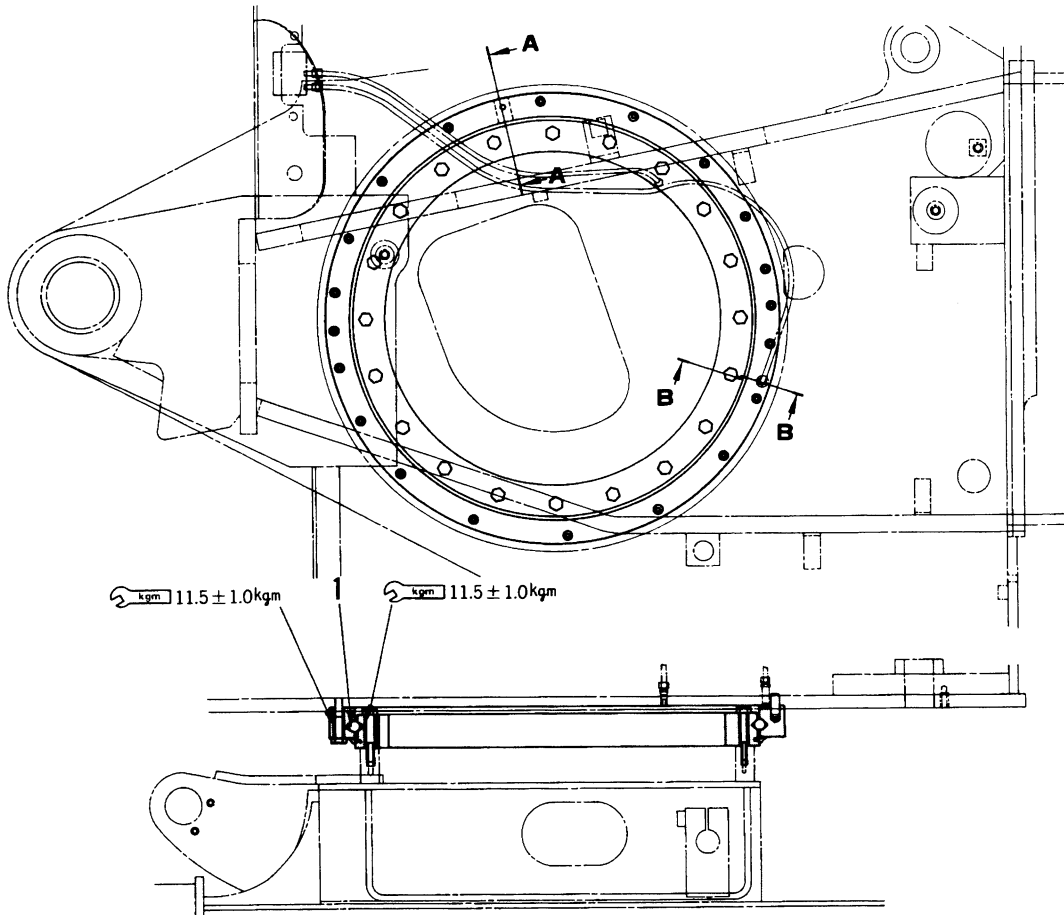
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40 MAINTENANCE STANDARD

Swing circle	40- 2
Swing machinery	40- 3
Sprocket	40- 5
Track frame and recoil spring	40- 8
Idler	40-12
Track roller	40-16
Carrier roller	40-20
Track shoe	40-22
Hydraulic pump	40-26
7-spool control valve	40-28
2-spool control valve	40-30
Swing motor	40-31
Center swivel joint	40-32
PPC valve	40-33
Hydraulic cylinder	40-34
Work equipment	40-38
Hydraulic breaker	40-42
Piston, chisel	40-44

020S07

SWING CIRCLE



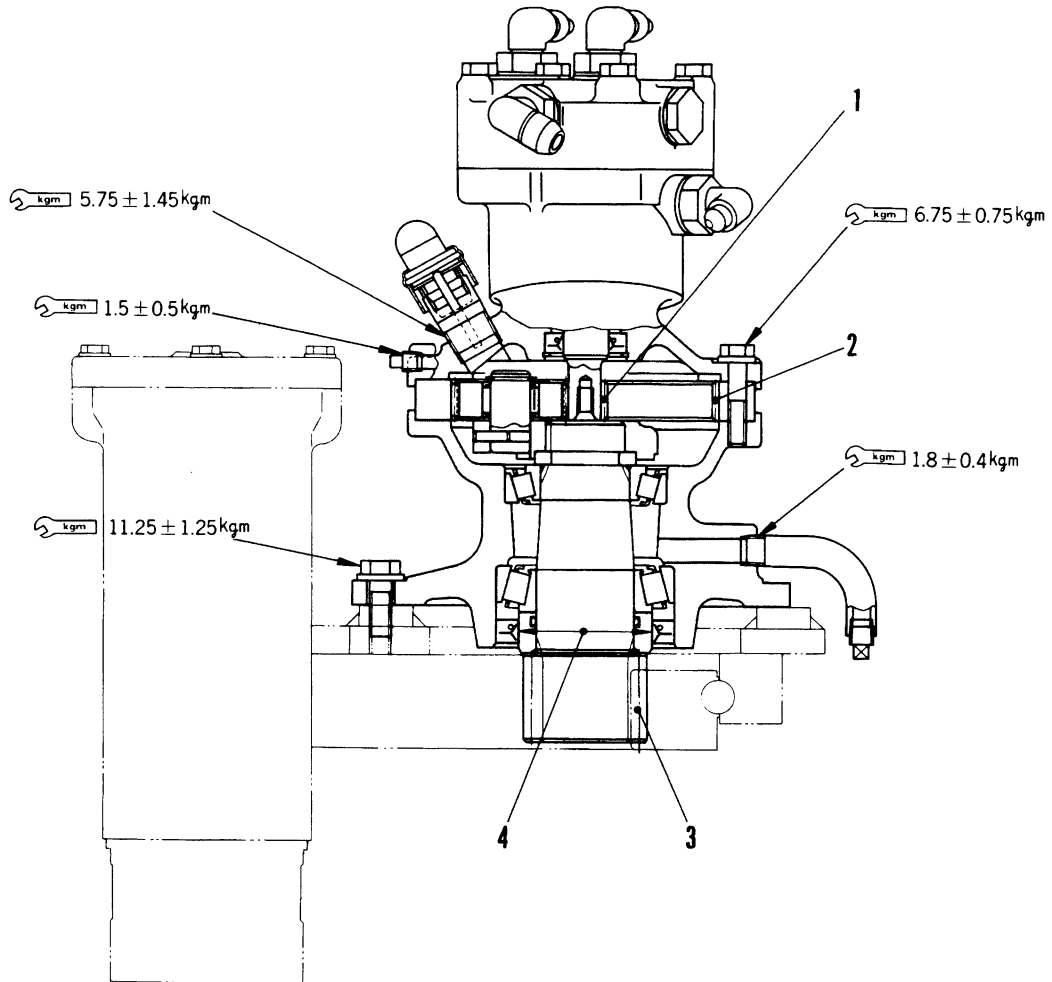
20TF01061

Unit: mm

No.	Check item	Criteria		Remedy
		Standard clearance	Clearance limit	
1	Axial clearance of bearing	0.1 - 0.3	0.4	Replace

SWING MACHINERY

PC25-1, PC30-7



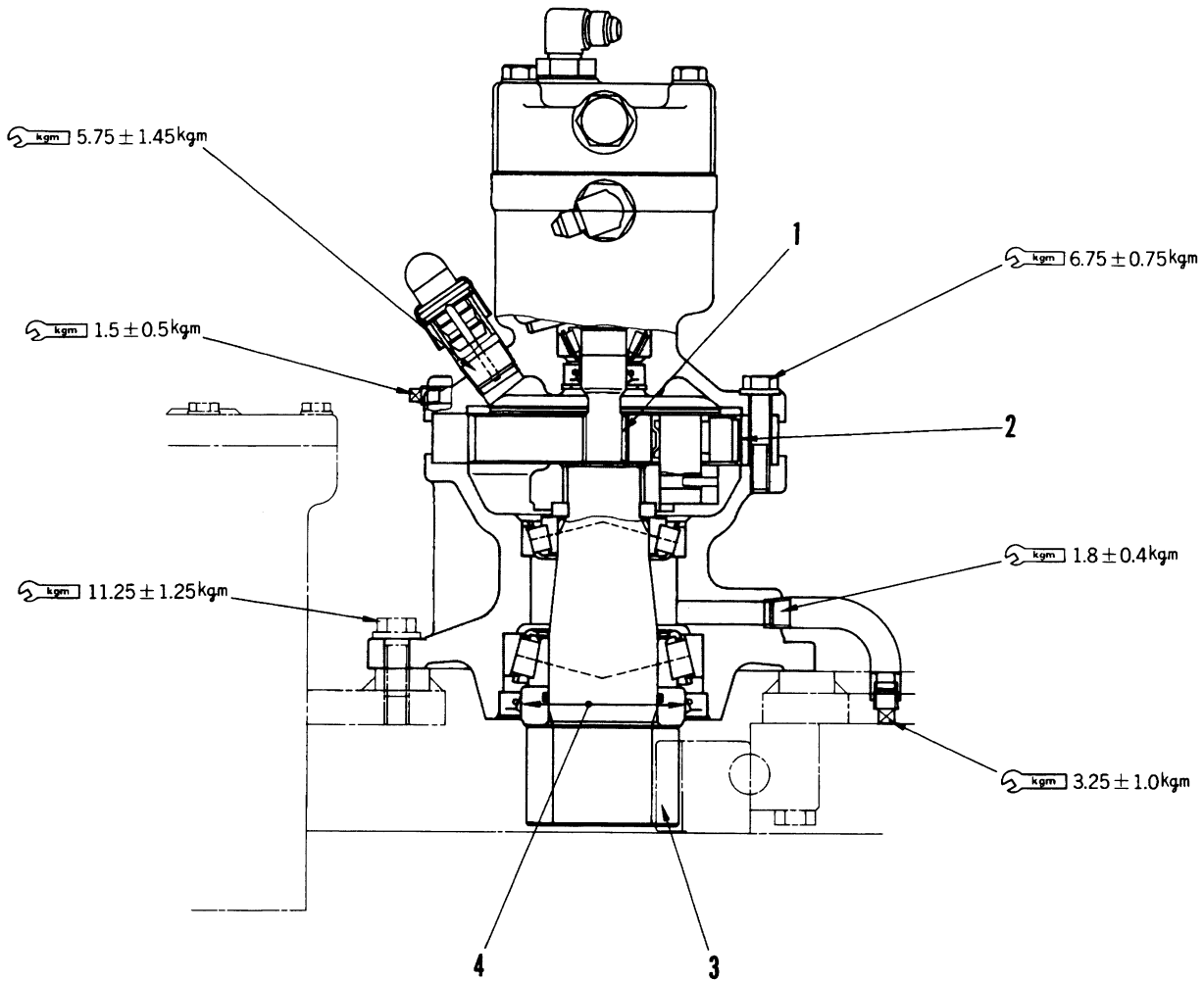
020S07

20TF01062

Unit: mm

No.	Check item	Criteria		Remedy
		Standard clearance	Clearance limit	
1	Backlash between sun gear and planetary gear	0.08 – 0.26	0.6	Replace
2	Backlash between planetary gear and ring gear	0.12 – 0.31	0.6	
3	Backlash between swing pinion and swing circle	0.08 – 0.88	2.0	
4	Wear of swing pinion surface contacting with oil seal	Standard size	Repair limit	Apply hardchrome plating recondition, or replace
		$75 \begin{smallmatrix} 0 \\ -0.074 \end{smallmatrix}$	74.8	

PC40-7, PC45-1



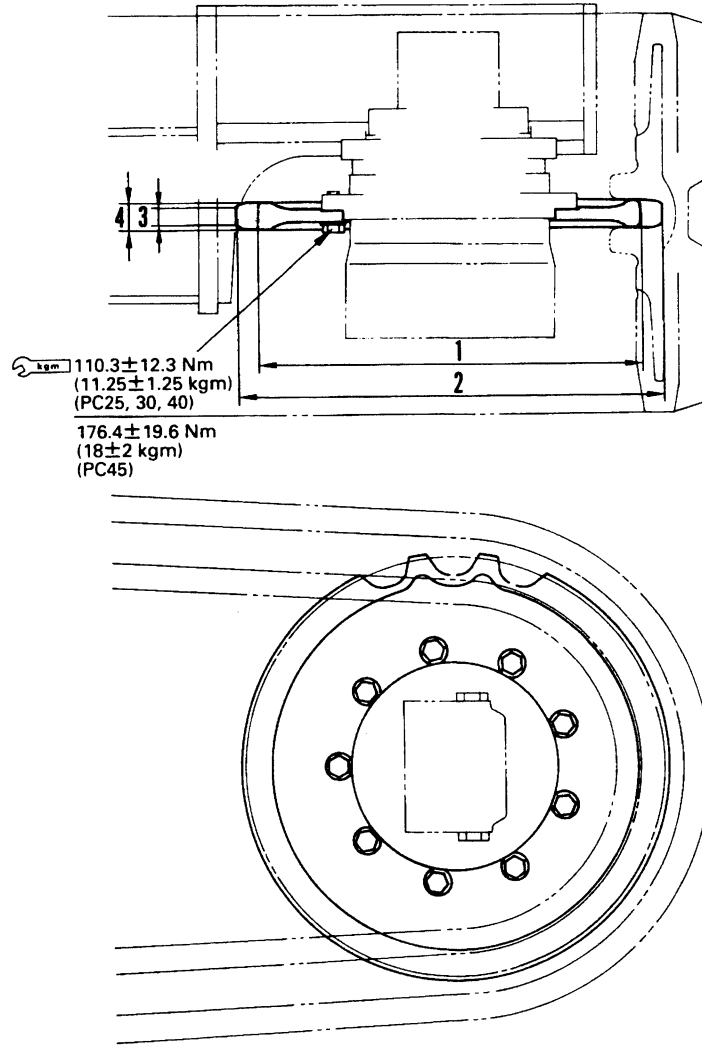
020507

20TF01063

Unit : mm

No.	Check item	Criteria		Remedy
		Standard clearance	Clearance limit	
1	Backlash between sun gear and planetary gear			Replace
		0.08 – 0.26	0.6	
2	Backlash between planetary gear and ring gear	0.12 – 0.31	0.6	
3	Backlash between swing pinion and swing circle	PC40	0.09 – 0.94	
		PC45	0.08 – 0.89	
4	Wear of swing pinion surface contacting with oil seal	Standard size		Repair limit
			$90 \begin{smallmatrix} 0 \\ -0.087 \end{smallmatrix}$	

SPROCKET



20TF01064

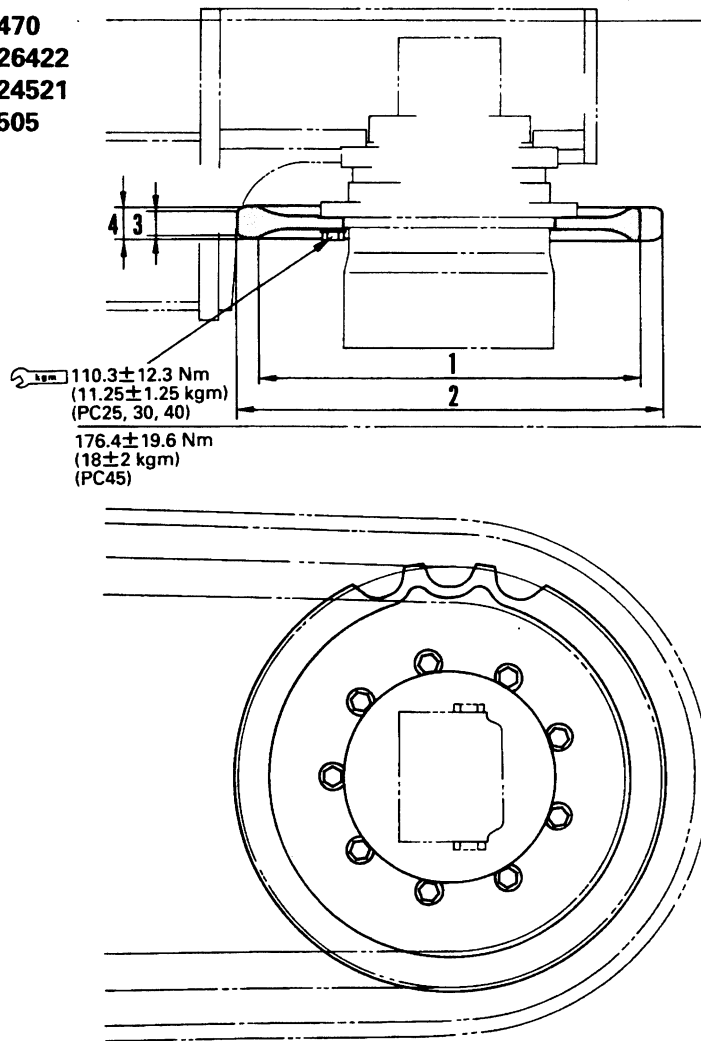
Unit: mm

No.	Check item	Criteria				Remedy
		Model	Standard size	Tolerance	Repair limit	
1	Wear in diameter of sprocket tooth root	PC25 PC30	344.3	+1.0 -2.0	332	Rebuild or replace
		PC40 PC45	380.37	+1.0 -2.0	368	
2	Wear in diameter of sprocket tooth top	PC25 PC30	386.2	±1.5	374	
		PC40 PC45	423.99	0 -3	412	
3	Wear in width of sprocket tooth top	PC25 PC30	20	-	18	
		PC40 PC45	26	-	24	
4	Wear in width of sprocket tooth root	PC25 PC30	28	±1.0	25	
		PC40 PC45	33	+0.5 -1.0	30	

020S07

RUBBER SHOE SPEC.

- PC25-1 Serial No. 1001—6470**
- PC30-7 Serial No. 18001—26422**
- PC40-7 Serial No. 18001—24521**
- PC45-1 Serial No. 1001—3505**



20TF01065

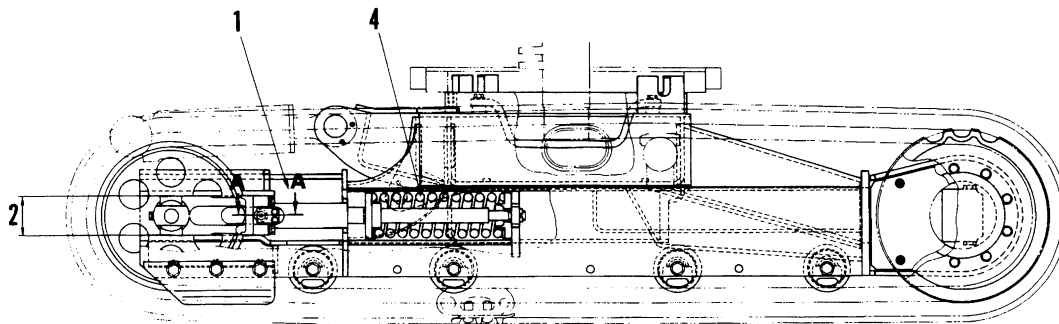
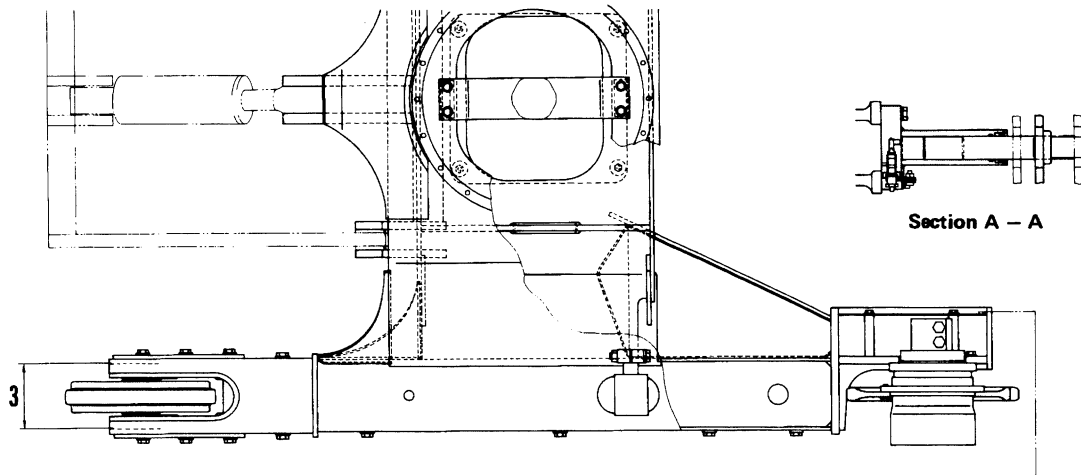
Unit: mm

No.	Check item	Criteria			Remedy	
		Model	Standard size	Tolerance		Repair limit
1	Wear in diameter of sprocket tooth root	PC25 PC30	344.3	+1.0 -2.0	332	Rebuild or replace
		PC40 PC45	380.37	+1.0 -2.0	368	
2	Wear in diameter of sprocket tooth top	PC25 PC30	386.2	±1.5	374	
		PC40 PC45	423.99	0 -3	412	
3	Wear in width of sprocket tooth top	PC25 PC30	20	—	18	
		PC40 PC45	20	—	18	
4	Wear in width of sprocket tooth root	PC25 PC30	28	±1.0	25	
		PC40 PC45	28	±1.0	25	



TRACK FRAME AND RECOIL SPRING

STEEL SHOE SPEC.

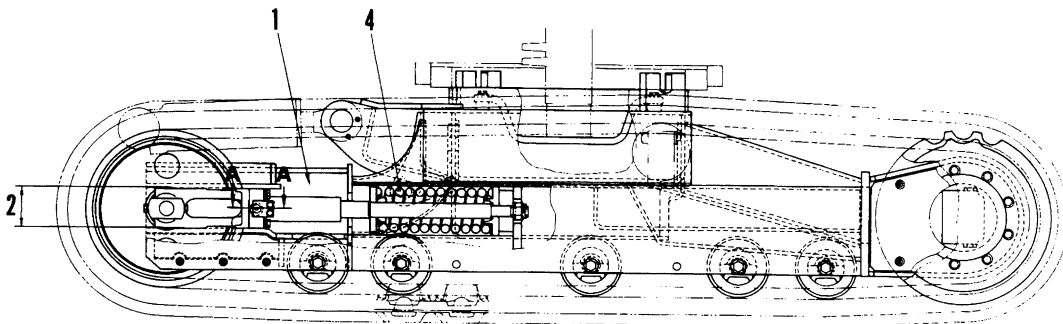
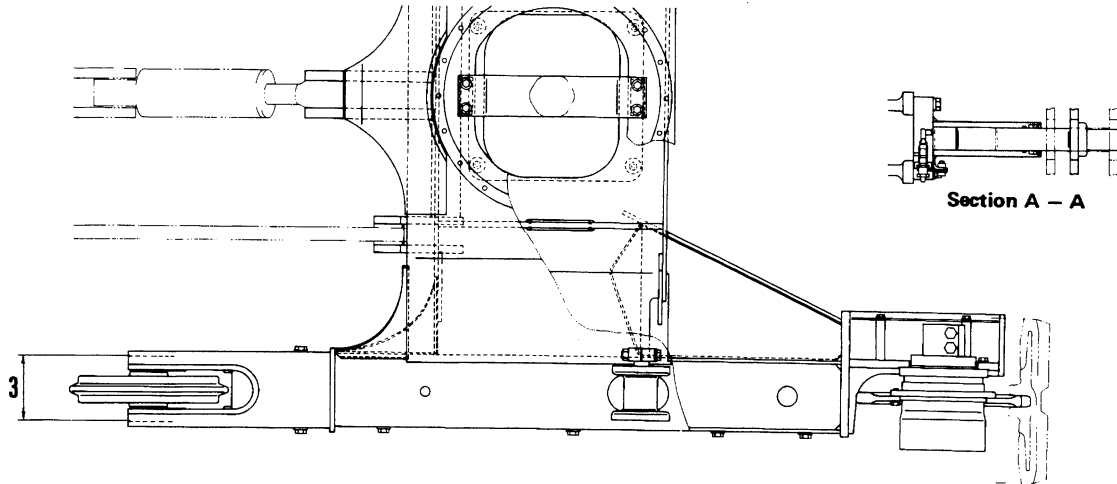


20TF01066

Unit: mm

No.	Check item	Criteria					Remedy	
		Item	Repair limit					
1	Deformation of frame	Curvature	5 (for 1,000 mm)				Repair	
		Twisting	5 (for 300 mm)					
		Out of parallel at idler	5					
2	Vertical width of idler guide		Standard size	Repair limit			Rebuild	
		Track frame	96	100				
		Idler support	94	90				
3	Horizontal width of idler guide	Track frame	161	165			Rebuild	
		Idler guide	159	155			Rebuild or replace	
4	Recoil spring	Model	Standard size			Repair limit		Replace
			Free length	Installed length	Installed load	Free length	Installed load	
		PC25 PC30	248	206.4	2,000 kg	241.8	1,780 kg	
		PC40 PC45	400	320	2,750 kg	391.2	2,447.5 kg	

RUBBER SHOE SPEC.



020507

20TF01067

020S07

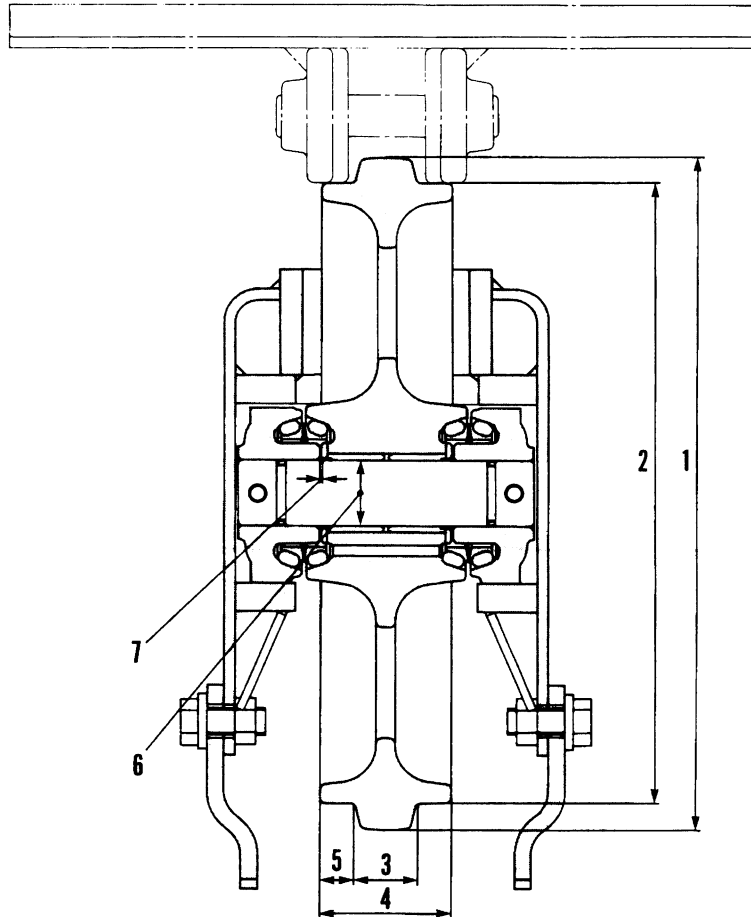
Unit : mm

No.	Check item	Criteria					Remedy	
		Item	Repair limit					
1	Deformation of frame	Curvature	5 (for 1,000 mm)				Repair	
		Twisting	5 (for 300 mm)					
		Out of parallel at idler	5					
2	Vertical width of idler guide		Standard size	Repair limit			Rebuild	
		Track frame	96	100				
		Idler support	94	90				
3	Horizontal width of idler guide	Track frame	161	165			Rebuild	
		Idler guide	159	155			Rebuild or replace	
4	Recoil spring	Model	Standard size			Repair limit		Replace
			Free length	Installed length	Installed load	Free length	Installed load	
		PC25 PC30	248	181.4	3,202 kg	242.5	2,937 kg	
		PC40 PC45	400	284	3,987.5 kg	391	3,678 kg	

IDLER

STEEL SHOE SPEC.

- PC25-1 Serial No. 1001—6470
- PC30-7 Serial No. 18001—26422
- PC40-7 Serial No. 18001—24521
- PC45-1 Serial No. 1001—3505



020S07

20TF06019-1

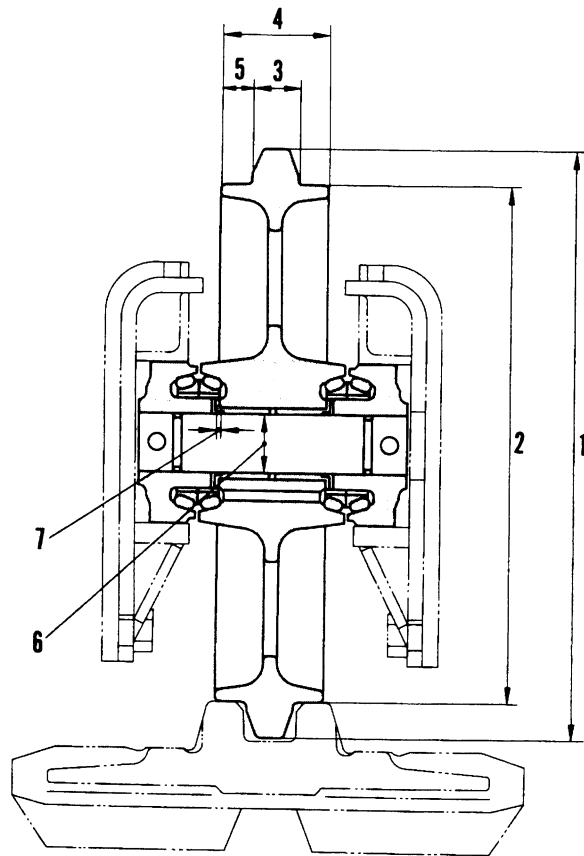
Unit: mm

100070

No.	Check item	Criteria				Remedy
		Model	Standard size	Repair limit		
1	Outside diameter of protrusion	PC25 PC30	328	320		Rebuild or replace
		PC40 PC45	363	355		
		PC25 PC30	300	292		
2	Outside diameter of tread	PC40 PC45	335	327		
		PC25 PC30	28	20		
3	Width of protrusion	PC40 PC45	39	31		
		PC25 PC30	64	59		
4	Total width	PC40 PC45	75	70		
		PC25 PC30	18	22		
5	Width of tread	PC40 PC45	18	22		
		Standard size	Tolerance		Standard clearance	Clearance limit
6	Clearance between shaft and bushing	35	Shaft -0.025 -0.064	Hole +0.142 +0.080	0.105 – 0.206	Replace
		Standard clearance		Clearance limit		
7	Side clearance of idler shaft	0.25		1.0		

RUBBER SHOE SPEC.

- PC25-1 Serial No. 1001—6470**
- PC30-7 Serial No. 18001—26422**
- PC40-7 Serial No. 18001—24521**
- PC45-1 Serial No. 1001—3505**



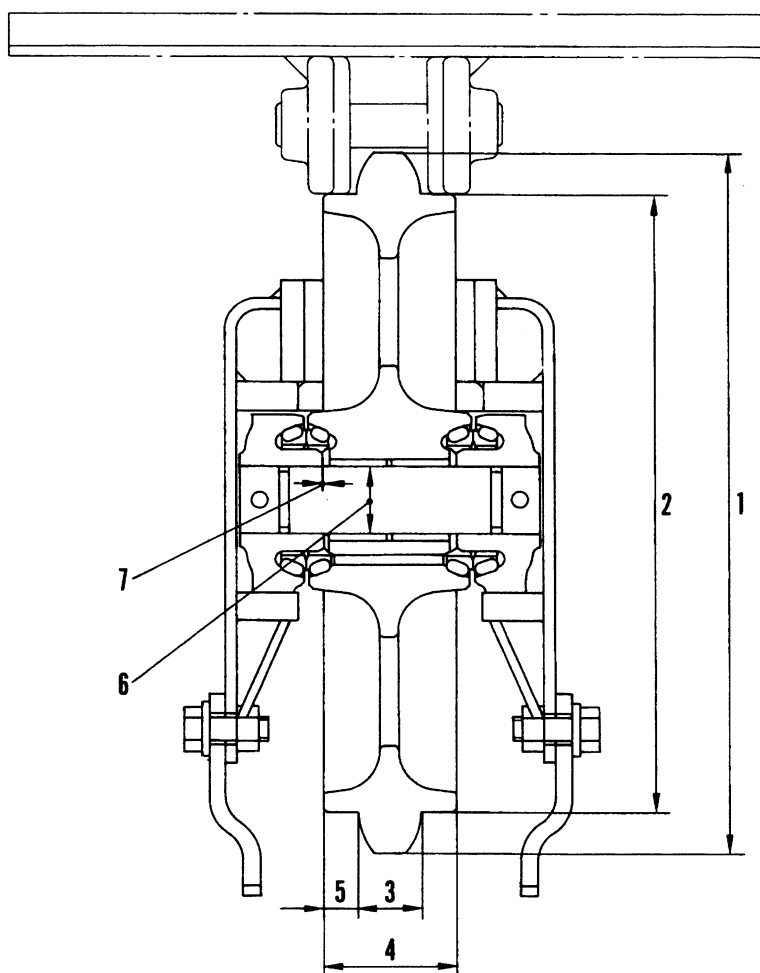
20TF01068

020S07

Unit: mm

No.	Check item	Criteria				Remedy
		Model	Standard size	Repair limit		
1	Outside diameter of protrusion	PC25 PC30	347	339		Rebuild or replace
		PC40 PC45	385	377		
		PC25 PC30	305	297		
2	Outside diameter of tread	PC40 PC45	335	327		
		PC25 PC30	28	20		
3	Width of protrusion	PC40 PC45	28	20		
		PC25 PC30	64	59		
4	Total width	PC40 PC45	64	59		
		PC25 PC30	18	22		
5	Width of tread	PC40 PC45	18	22		
		Standard size	Tolerance		Standard clearance	Clearance limit
6	Clearance between shaft and bushing	35	Shaft -0.025 -0.064	Hole +0.142 +0.080	0.105 – 0.206	Replace
		Standard clearance		Clearance limit		
7	Side clearance of idler shaft	0.25		1.0		

PC25-1 Serial No. 6471 and up
PC30-7 Serial No. 26423 and up
PC40-7 Serial No. 24522 and up
PC45-1 Serial No. 3506 and up



020S07

20TF01095

Unit: mm

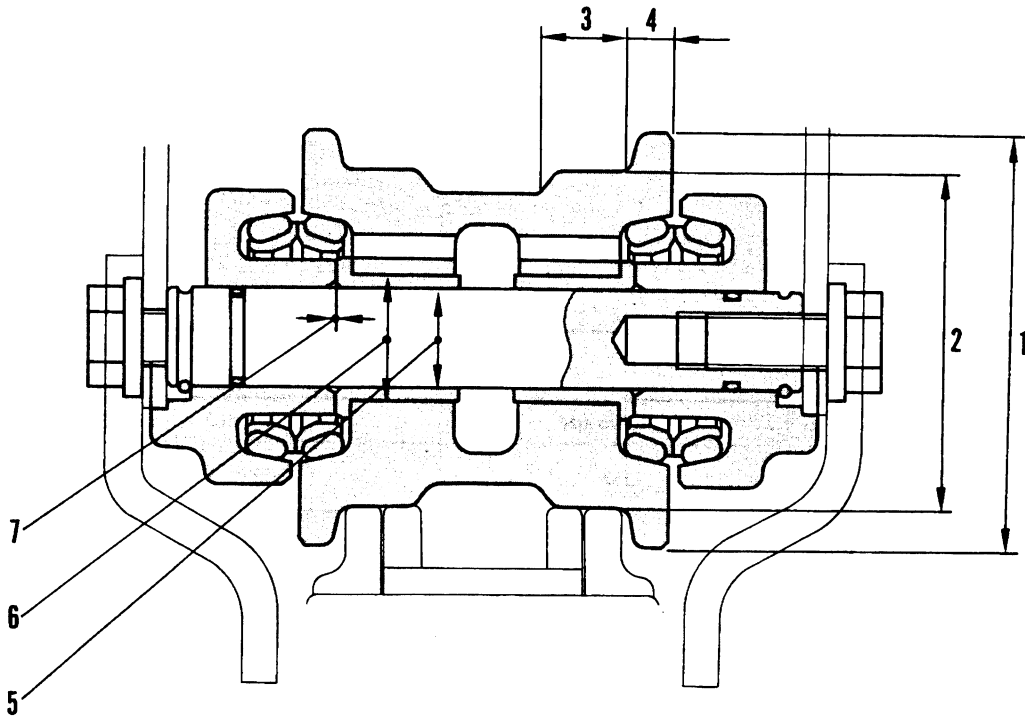
020S07

No.	Check item		Criteria				Remedy
			Model	Standard size	Repair limit		
1	Outside diameter of protrusion	PC25 PC30	347	339		Rebuild or replace	
		PC40 PC45	377	369			
		PC25 PC30	305	297			
2	Outside diameter of tread	PC40 PC45	335	327			
		PC25 PC30	28	20			
3	Width of protrusion	PC40 PC45	39	31			
		PC25 PC30	64	59			
4	Total width	PC40 PC45	75	70			
		PC25 PC30	18	22			
5	Width of tread	PC40 PC45	18	22			
		Standard size	Tolerance		Standard clearance	Clearance limit	
6	Clearance between shaft and bushing	35	Shaft	Hole	0.105 – 0.206	1.5	
			-0.025 -0.064	+0.142 +0.080			
7	Side clearance of idler shaft	Standard clearance		Clearance limit		Replace	
		0.25		1.0			

TRACK ROLLER

STEEL SHOE SPEC.

PC25-1 Serial No. 1001—6470
PC30-7 Serial No. 18001—26422
PC40-7 Serial No. 18001—24521
PC45-1 Serial No. 1001—3505



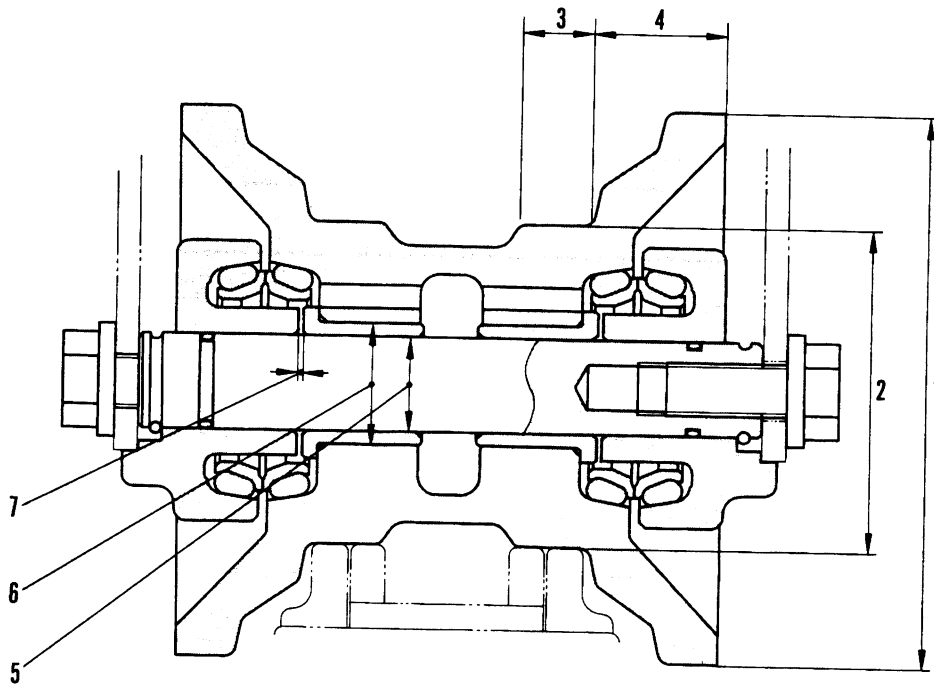
020507

Unit: mm

No.	Check item		Criteria				Remedy
1	Outside diameter of flange	Model	Standard size		Repair limit		Rebuild or replace
		PC25 PC30	115		109		
		PC40 PC45	115		109		
2	Outside diameter of tread	PC25 PC30	85		77		
		PC40 PC45	95		87		
3	Width of tread	PC25 PC30	20		24		
		PC40 PC45	24		28		
4	Width of flange	PC25 PC30	10.5		7.5		
		PC40 PC45	10.5		7.5		
5	Clearance between shaft and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
		PC25 PC30	25	0 -0.013	+0.184 +0.144	0.144 – 0.196	1.5
PC40 PC45	35	-0.025 -0.050	+0.142 +0.080	0.105 – 0.192	1.5		
6	Interference between roller and bushing	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		PC25 PC30	32	+0.073 +0.048	+0.039 0	0.009 – 0.073	–
PC40 PC45	42	+0.079 +0.054	+0.039 0	0.015 – 0.079	–		
7	Side clearance of roller	Standard clearance		Clearance limit		Replace	
		0.25		1.0			

RUBBER SHOE SPEC.

- PC25-1 Serial No. 1001—6470**
- PC30-7 Serial No. 18001—26422**
- PC40-7 Serial No. 18001—24521**
- PC45-1 Serial No. 1001—3505**



020507

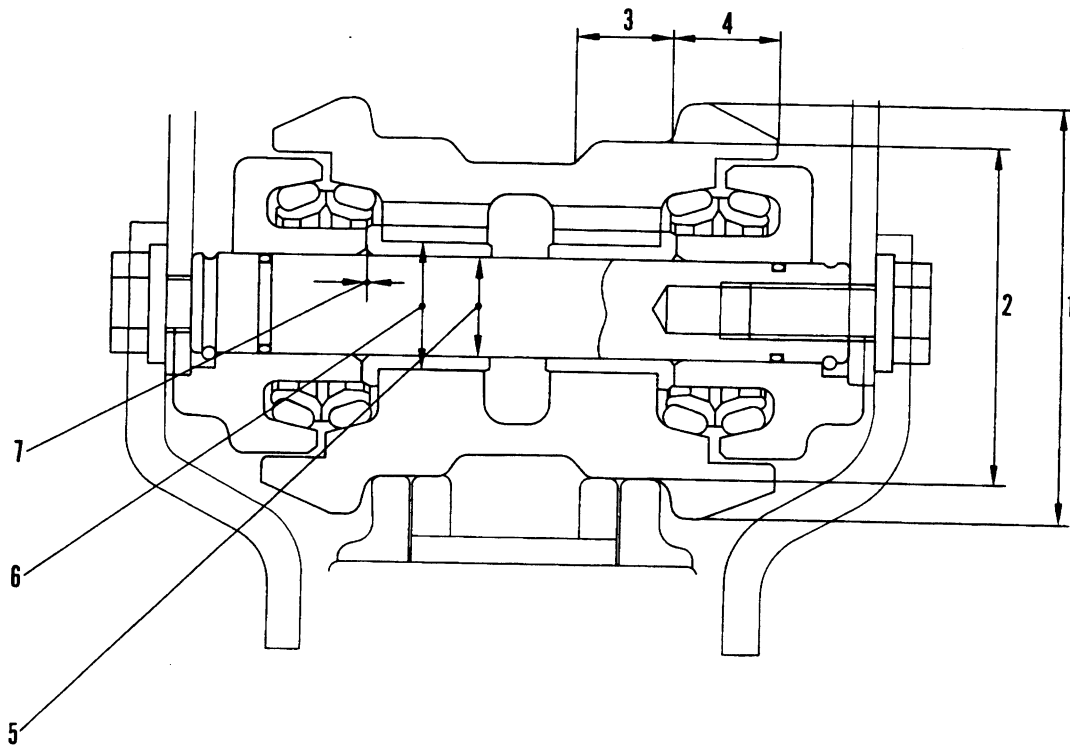
20TF01069

Unit: mm

No.	Check item	Criteria				Remedy	
1	Outside diameter of flange	Model	Standard size		Repair limit		
		PC25 PC30	145		139		
		PC40 PC45	151		145		
2	Outside diameter of tread	PC25 PC30	85		77		
		PC40 PC45	95		87		
3	Width of tread	PC25 PC30	20		24		
		PC40 PC45	24		28		
4	Width of flange	PC25 PC30	33.5		31		
		PC40 PC45	33.5		31		
5	Clearance between shaft and bushing		Standard size	Tolerance		Standard clearance	Clearance limit
				Shaft	Hole		
		PC25 PC30	25	0 -0.013	+0.210 +0.180	0.180 – 0.223	1.5
	PC40 PC45	35	-0.025 -0.050	+0.142 +0.080	0.105 – 0.192	1.5	
6	Interference between roller and bushing		Standard size	Tolerance		Standard interference	Interference limit
				Shaft	Hole		
		PC25 PC30	32	+0.073 +0.048	+0.039 0	0.009 – 0.073	–
	PC40 PC45	42	+0.079 +0.054	+0.039 0	0.015 – 0.079	–	
7	Side clearance of roller	Standard clearance			Clearance limit		Replace
		0.25			1.0		

UZUSU/

- PC25-1 Serial No. 6471 and up
- PC30-7 Serial No. 26423 and up
- PC40-7 Serial No. 24522 and up
- PC45-1 Serial No. 3506 and up



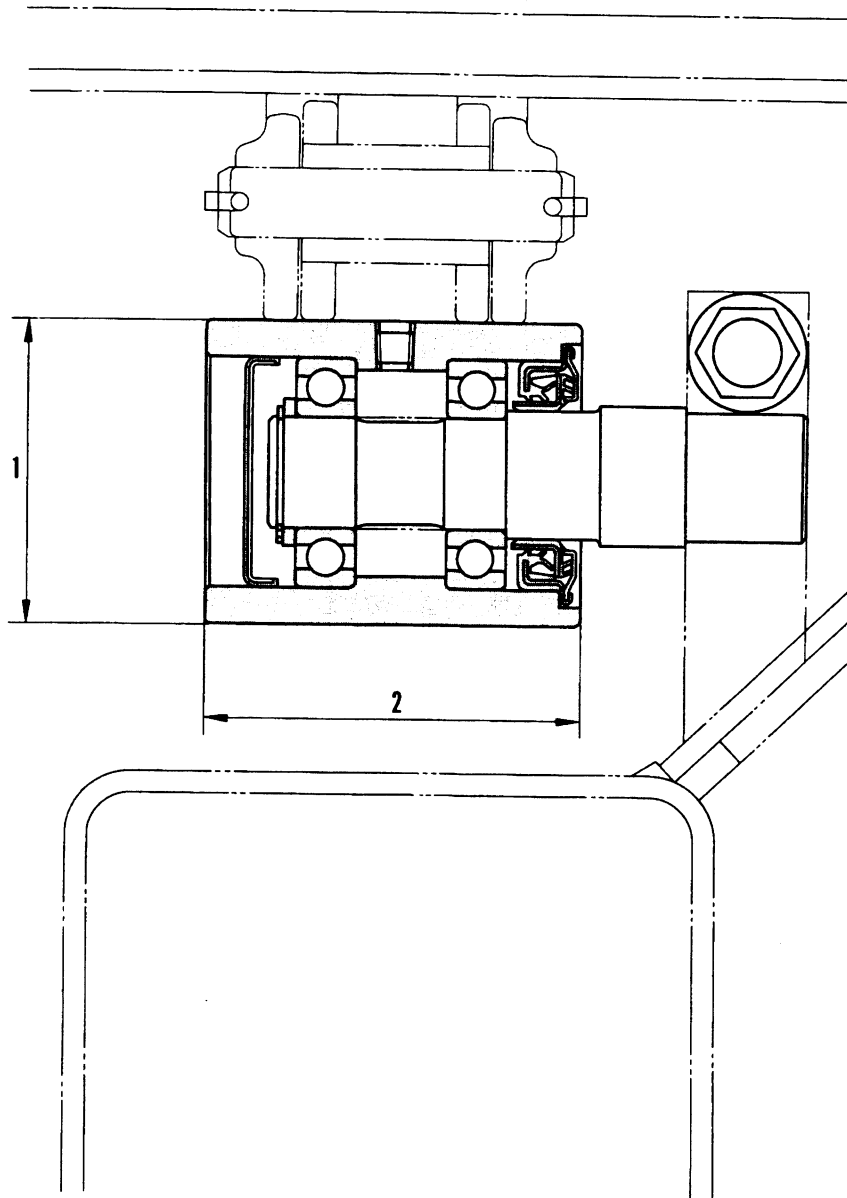
20TF01096

Unit: mm

No.	Check item		Criteria				Remedy	
1	Outside diameter of flange	Model	Standard size		Repair limit		Rebuild or replace	
		PC25 PC30	115		109			
		PC40 PC45	125		119			
2	Outside diameter of tread	PC25 PC30	85		77			
		PC40 PC45	95		87			
3	Width of tread	PC25 PC30	20		24			
		PC40 PC45	24		28			
4	Width of flange	PC25 PC30	23.5		20.5			
		PC40 PC45	25		22			
5	Clearance between shaft and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	Replace bushing	
		PC25 PC30	25	Shaft	Hole	0.144 – 0.196		1.5
				0 -0.013	+0.184 +0.144			
PC40 PC45	35	-0.025 -0.050	+0.142 +0.080	0.105 – 0.192	1.5			
6	Interference between roller and bushing	Standard size	Tolerance		Standard interference	Interference limit	Replace bushing	
		PC25 PC30	32	Shaft	Hole	0.009 – 0.073		–
				+0.073 +0.048	+0.039 0			
PC40 PC45	42	+0.079 +0.054	+0.039 0	0.015 – 0.079	–			
7	Side clearance of roller	Standard clearance		Clearance limit		Replace		
		0.25		1.0				

020S07

CARRIER ROLLER



323507

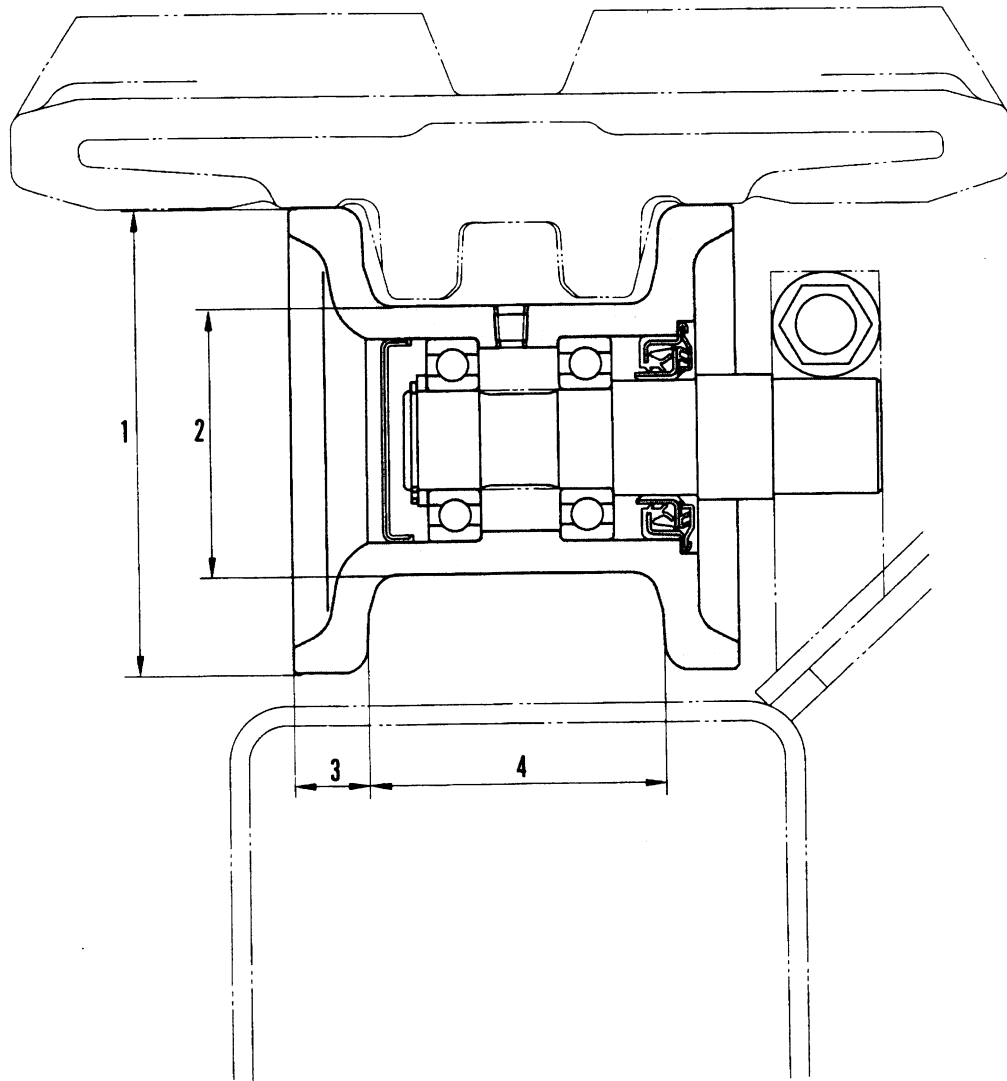
20TF01070

Unit: mm

No.	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of tread	82	77	Rebuild or replace
2	Width of tread	100	-	-

RUBBER SHOE SPEC.

- PC25-1 Serial No. 1001—6470**
- PC30-7 Serial No. 18001—26422**
- PC40-7 Serial No. 18001—24521**
- PC45-1 Serial No. 1001—3505**



020S07

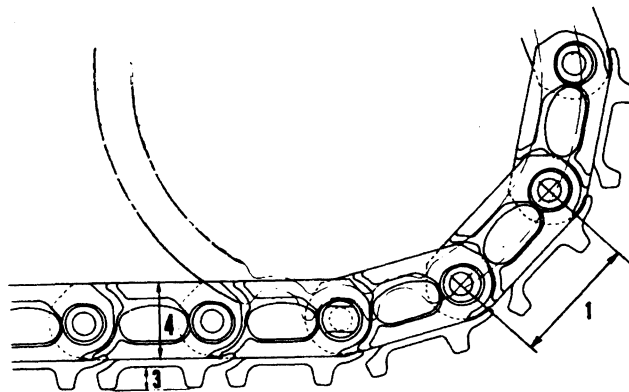
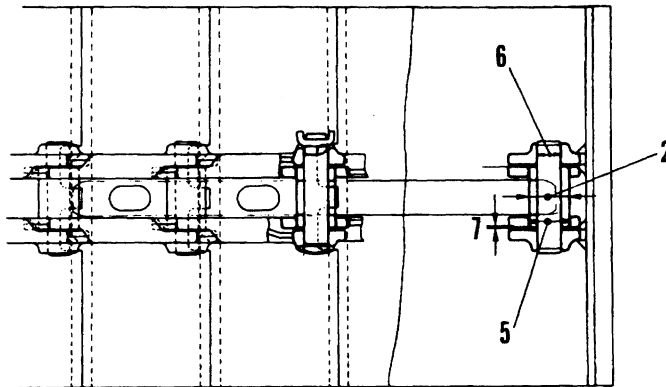
20TF01071

Unit: mm

No.	Check item	Criteria		Remedy
		Standard size	Repair limit	
1	Outside diameter of flange (outside)	142	135	Rebuild or replace
2	Outside diameter of tread	82	77	
3	Width of flange	22	18.5	
4	Width of tread	90	83	

TRACK SHOE

STEEL SHOE SPEC. (PC25-1, PC30-7)

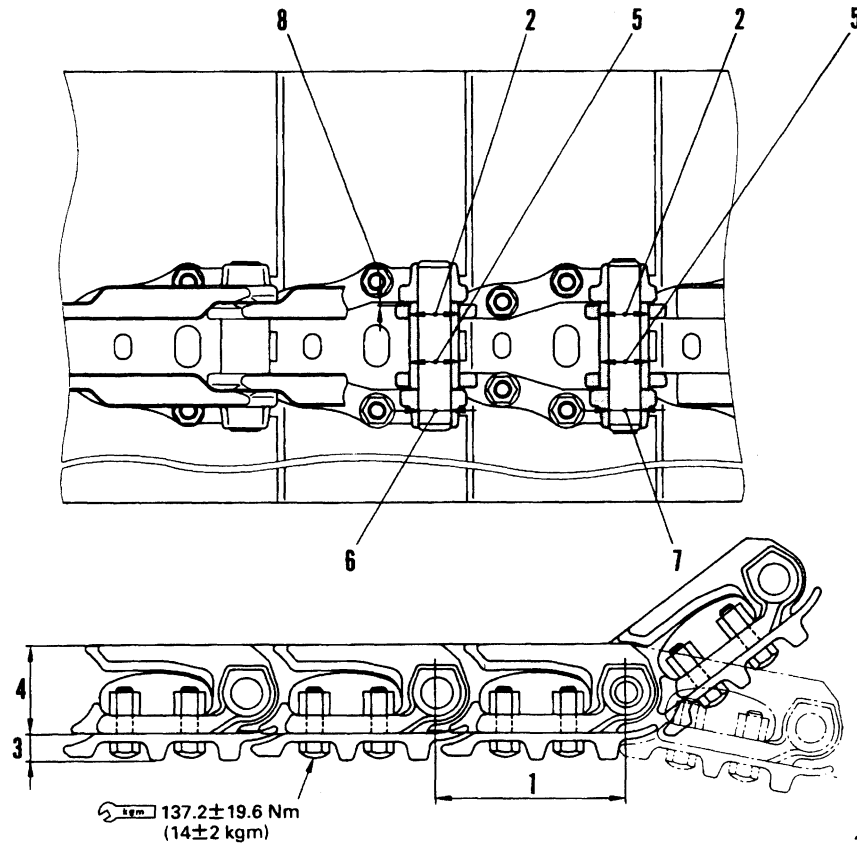


20RF029-K

Unit: mm

No.	Check item	Criteria				Remedy
		Standard size	Tolerance		Repair limit	
1	Link pitch	102			107	Replace bushing and pin or link assembly
2	Outside diameter of bushing	32			26	
3	Height of grouser	16.5			10	Lug welding, rebuild or replace
4	Height of link	61			55	
5	Interference between bushing and link	Standard size 32	Tolerance		Standard interference 0.07 – 0.15	Interference limit –
			Shaft	Hole		
6	Interference between pin and link	19	+0.15 +0.12	+0.05 0	0.07 – 0.15	–
7	Clearance of link matching surface	Standard clearance		Clearance limit		
		0.4 – 1.8		–		

STEEL SHOE SPEC. (PC40-7, PC45-1)



020S07

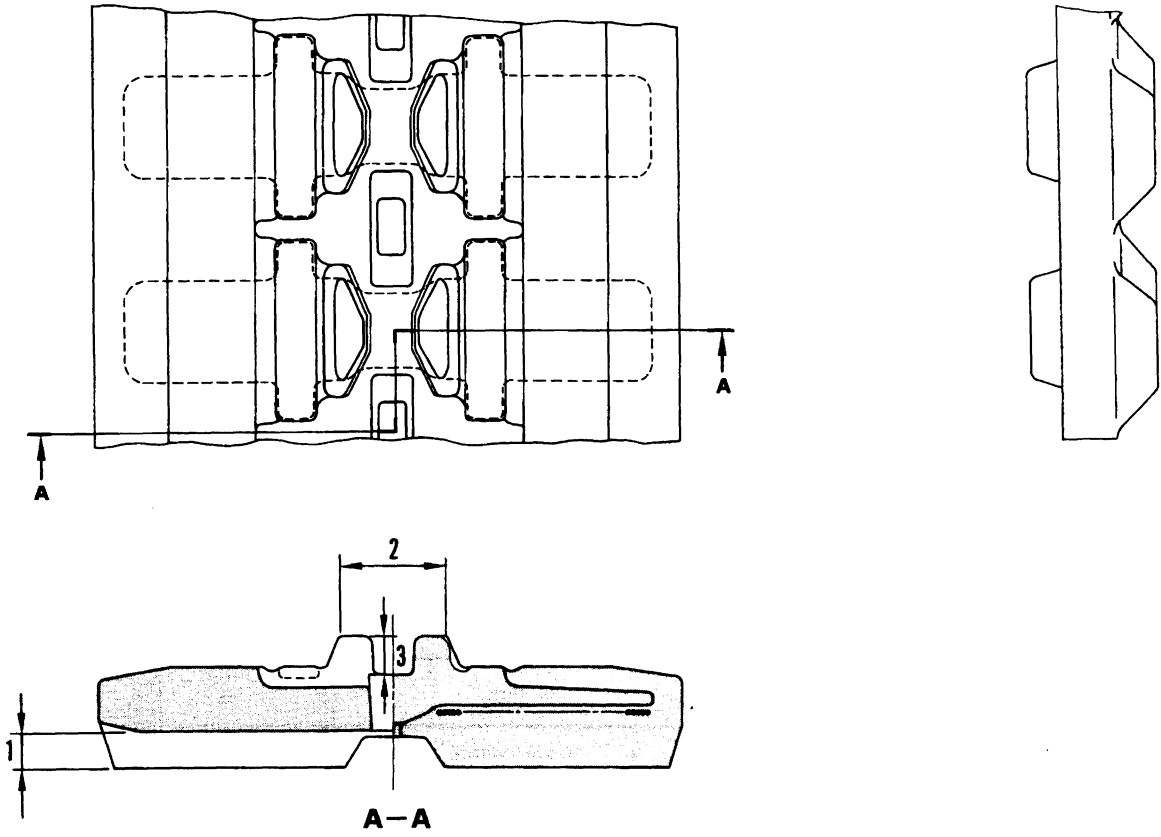
20TF01072

Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size	Turning limit		Repair limit		
1	Link pitch	135	138		143	Repair by turning or replace	
2	Outside diameter of bushing	35	32		29		
3	Height of grouser	Standard size		Repair limit		Lug welding or replace	
		18		10			
4	Height of link	65		59			
5	Interference between bushing and link	Standard size	Tolerance		Standard interference	Interference limit	Replace
			Shaft	Hole			
6	Interference between regular pin and link	22.5 (Shaft)	+0.060	+0.052	0.148 –	–	Replace
		22.3 (Hole)	0	0	0.260	–	
7	Interference between master pin and bushing	22.5 (Shaft)	–0.030	+0.052	0.087 –	–	Replace
		22.3 (Hole)	–0.070	0	0.170	–	
8	Clearance of link matching	Standard clearance		Clearance limit		–	
		1.4 – 2.8					

RUBBER SHOE SPEC.

- PC25-1 Serial No. 1001—6470
- PC30-7 Serial No. 18001—26422
- PC40-7 Serial No. 18001—24521
- PC45-1 Serial No. 1001—3505



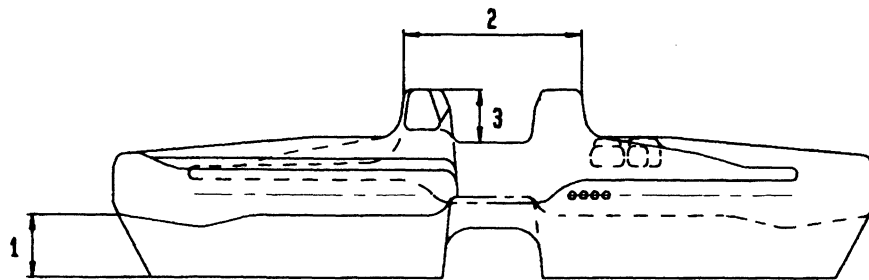
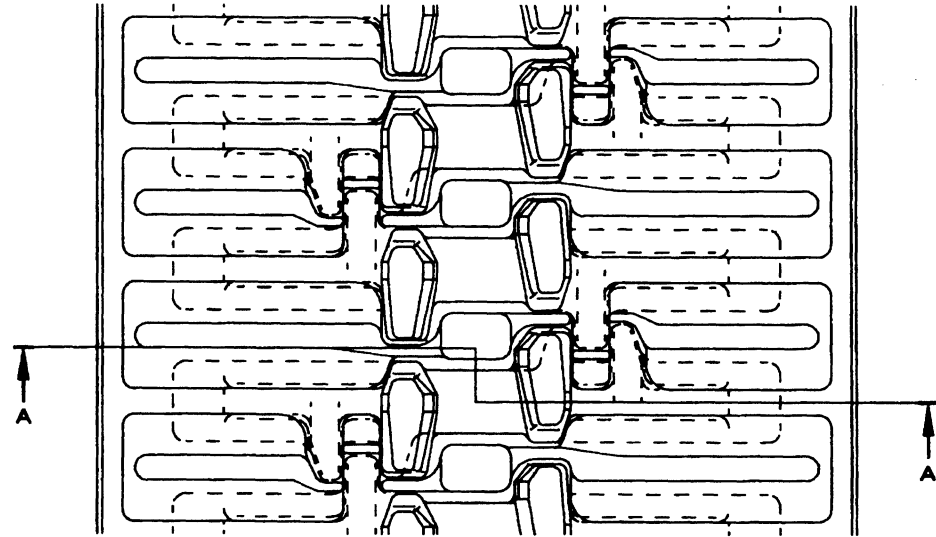
20TF01087

Unit: mm

No.	Check item		Criteria			Remedy
			Standard size	Tolerance	Repair limit	
1	Grouser height		25		5	Replace
2	Wear of roller guard portion	PC25 PC30	73		55	
		PC40 PC45	77		59	
3	Wear of meshing portion of sprocket		Standard size	Tolerance	Repair limit	
		PC25 PC30	23	+0.5 0	27	
	PC40 PC45	30.5			34.5	

RUBBER SHOE SPEC.

- PC25-1 Serial No. 6471 and up
- PC30-7 Serial No. 26423 and up
- PC40-7 Serial No. 24522 and up
- PC45-1 Serial No. 3506 and up



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SDP00126

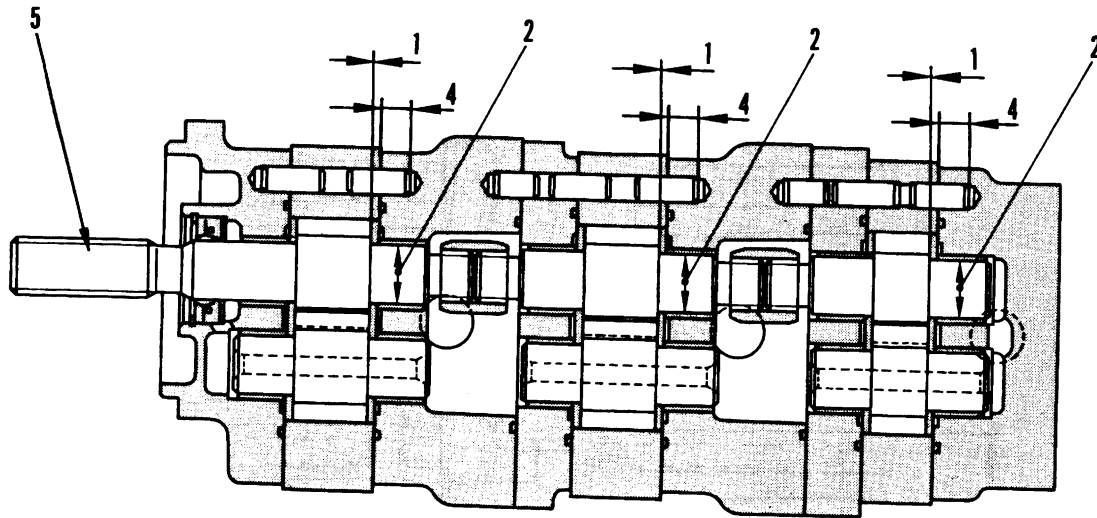
Unit: mm

No.	Check item		Criteria			Remedy
			Standard size	Repair limit		
1	Grouser height		25	5		Replace
2	Wear of roller guard portion	PC25 PC30	70	62		
		PC40 PC45	86	68		
3	Wear of meshing portion of sprocket		Standard size	Tolerance	Repair limit	
		PC25 PC30	21	+0.5 0	25	
	PC40 PC45	23			27	

HYDRAULIC PUMP

PC25-1 (SBR11+11+7)

PC40-7 (SBR14+14+9)



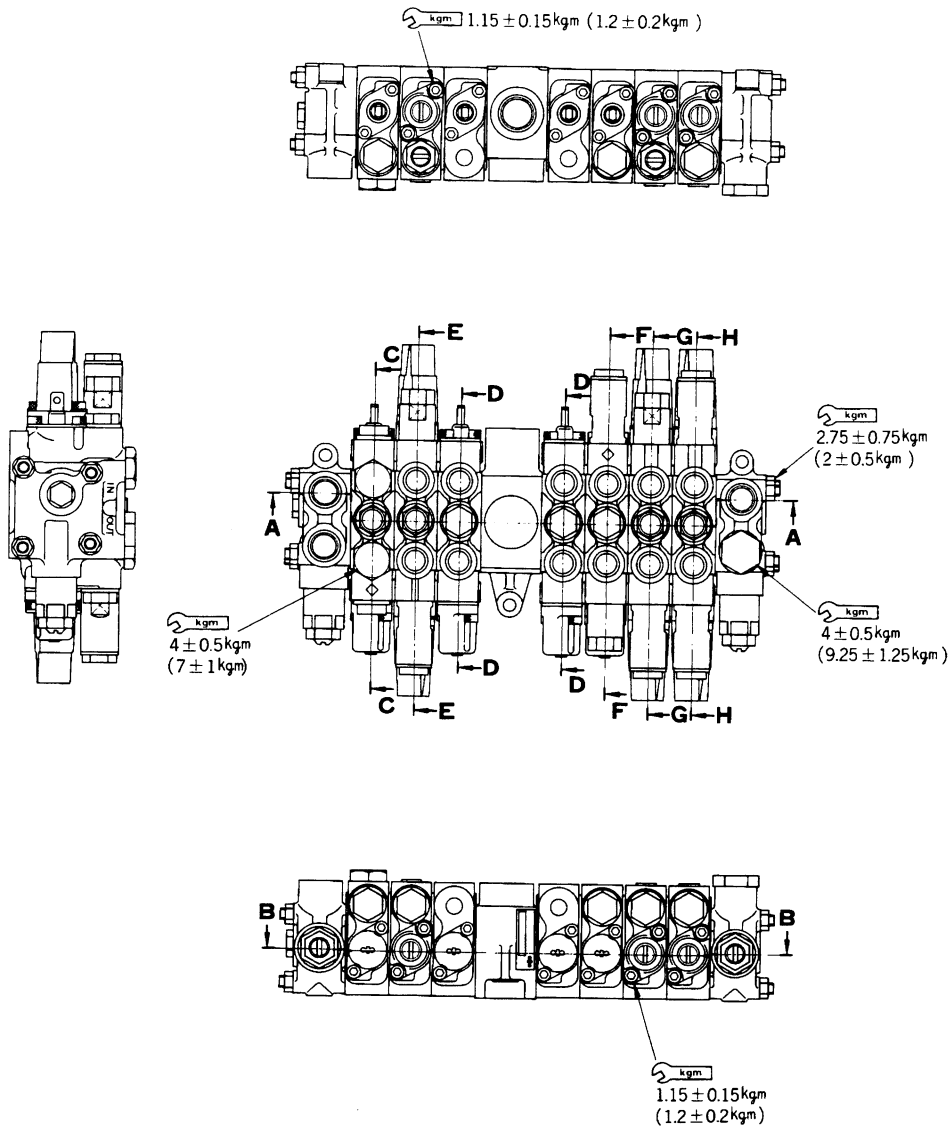
20TF01074-1K

							Unit: mm
No.	Check item	Criteria					Remedy
		Standard clearance		Clearance limit			
1	Clearance between side plate and gear	0.10—0.15		0.19			Replace
2	Clearance between gear shaft and bushing	0.060—0.119		0.20			
3	Delivery (SAE10W, 45—55°C)	PC25	SBR11	3,500	20.6 (210)	34.7	32.8
			SBR7	3,500	20.6 (210)	22.1	20.8
		PC40	SBR14	3,000	20.6 (210)	38.4	35.4
			SBR9	3,000	20.6 (210)	23.8	22.4
4	Pin insertion depth	Model	Standard size	Tolerance		Repair limit	
		SBR7	10.1	±0.3		—	
		SR9 SBR11 SBR14	10	0 -0.5		—	
5	Rotating torque	5.9—14.7 Nm (0.6—1.5 kgm)					—

7-SPOOL CONTROL VALVE

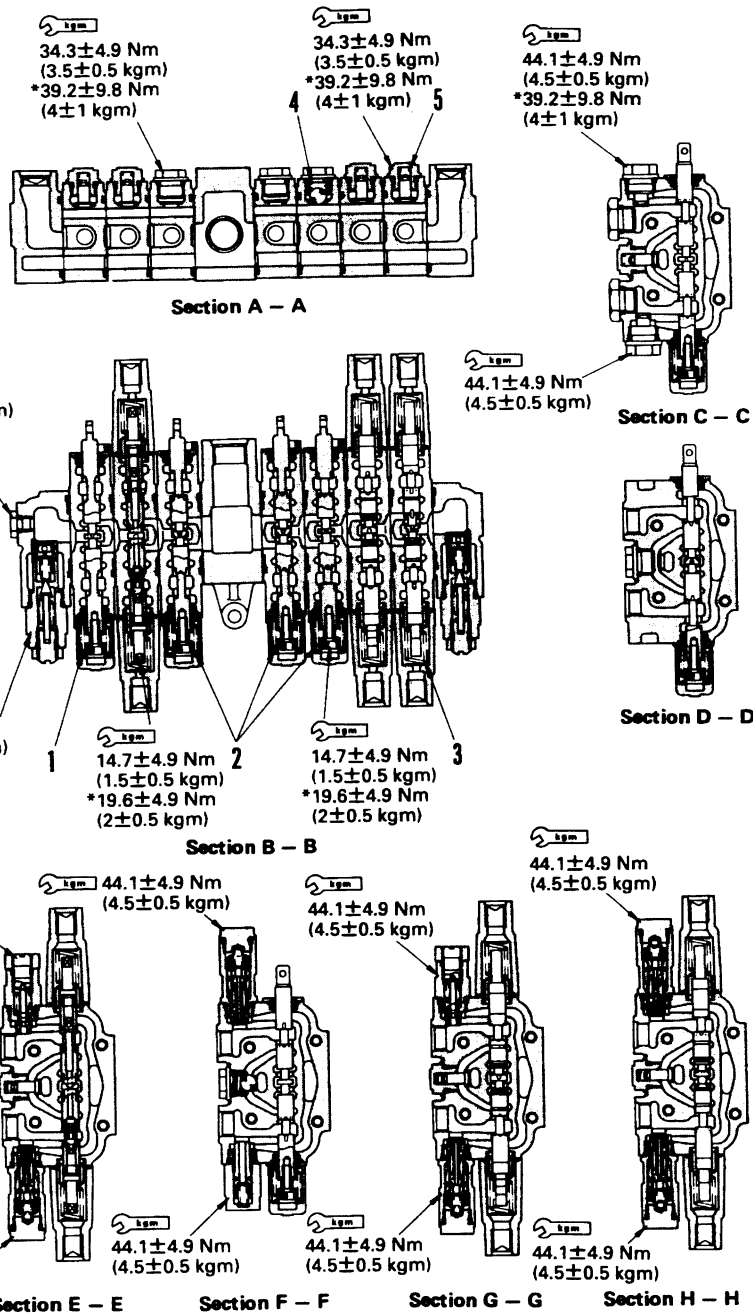
PC25-1, PC30-7, PC40-7

★ () shows PC40-7.



20TF01078

* shows PC45-1

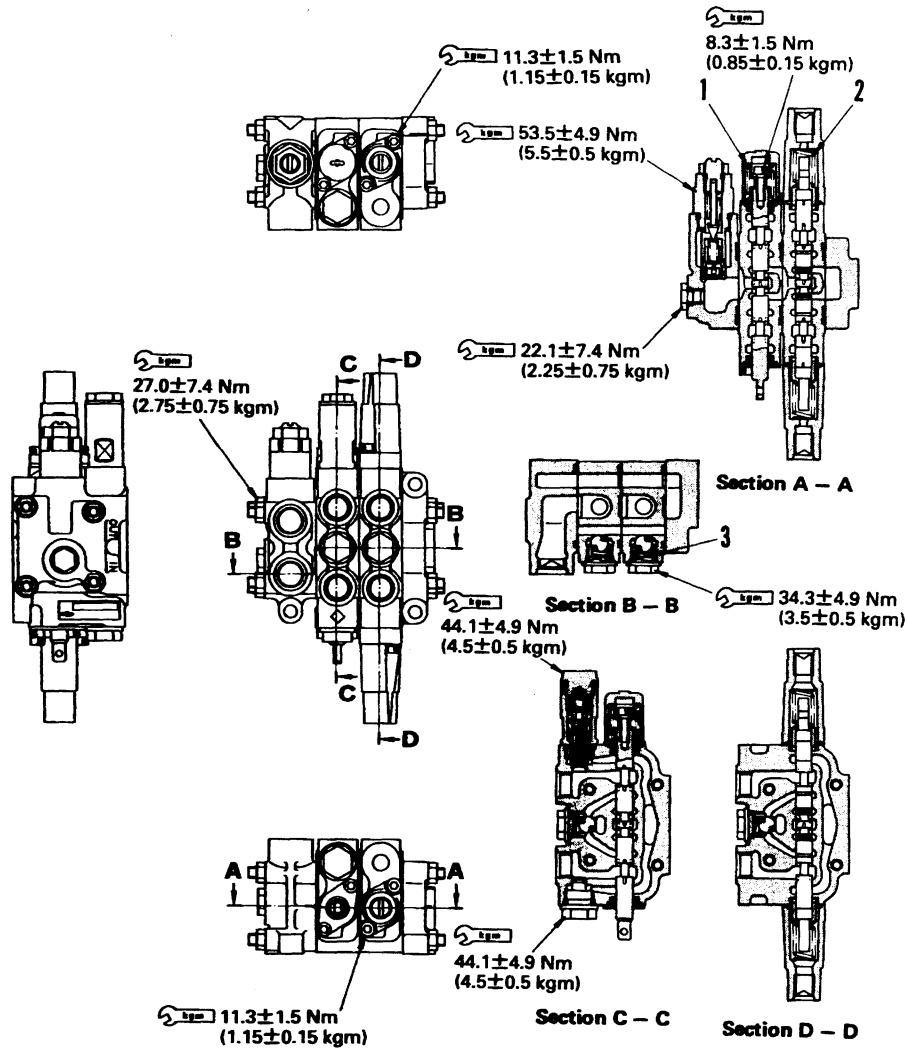


20TF01079 Unit: mm

No.	Check item	Criteria				Remedy
		Standard size		Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load
1	Spool return spring	46.2	25.4	98 ± 9.8 N (10 ± 1 kg)	-	-
2	Spool return spring	40.7	25.4	127.4 ± 9.8 N (13 ± 1 kg)	-	-
3	Spool return spring	29	25	179.3 ± 14.7 N (18.3 ± 1.5 kg)	-	-
4	Check valve spring	13.1	6	2.0 N (0.2 kg)	-	-
5	Check valve spring	13	9.5	2.0 N (0.2 kg)	-	-

020S07

2-SPOOL CONTROL VALVE



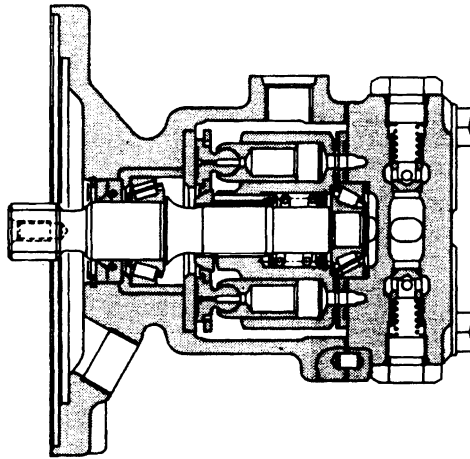
20TF01077

020S07

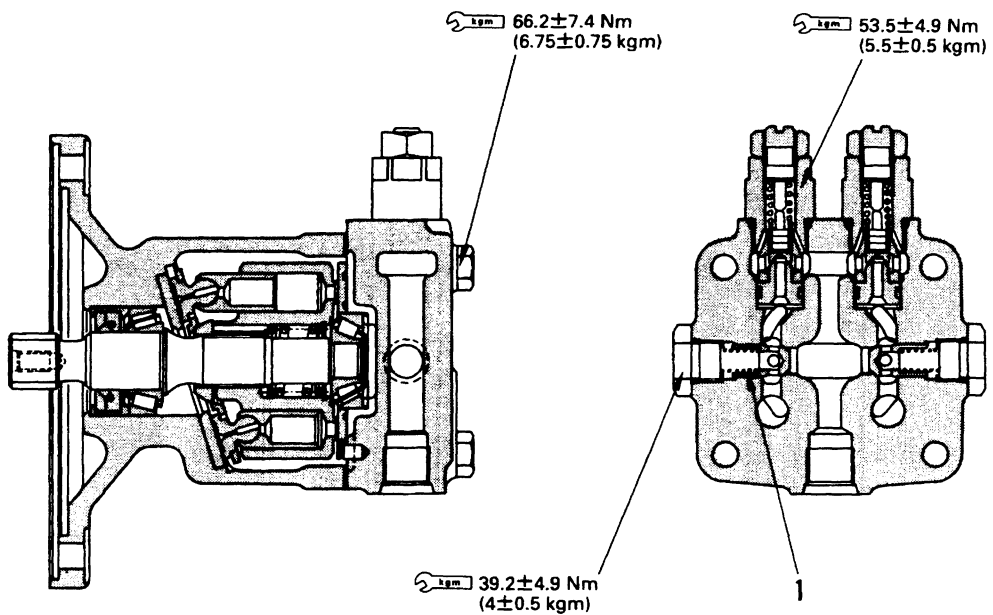
Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size		Repair limit			
		Free length	Installed length	Installed load	Free length	Installed load	
1	Spool return spring	46.2	25.4	98 ± 9.8 N (10 ± 1 kg)	—	—	Replace
2	Spool return spring	29	25	179.3 ± 14.7 N (18.3 ± 1.5 kg)	—	—	
3	Check valve spring	13.1	6	2.0 N (0.2 kg)	—	—	

SWING MOTOR



020507

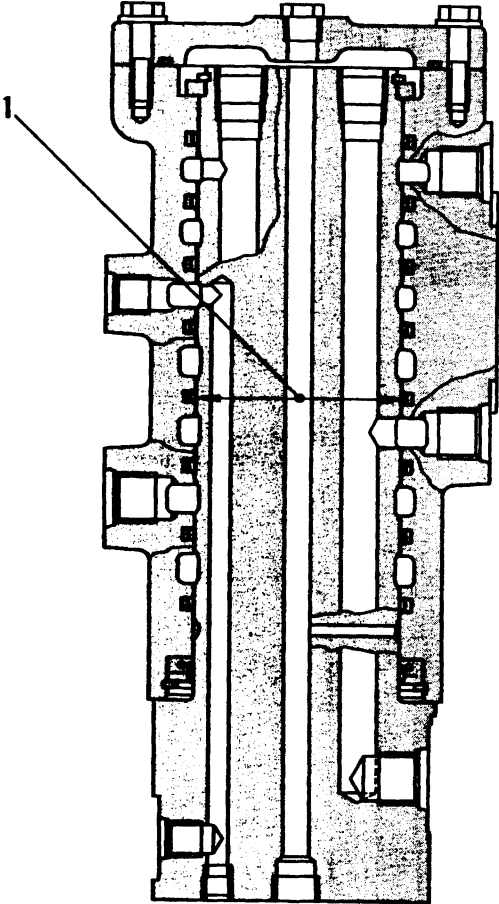


20PFA5037

Unit: mm

No.	Check item	Criteria				Remedy
		Standard size		Repair limit		
1	Valve return spring	Free length x O.D.	Installed length	Installed load	Free length	Replace spring if any damages or deforma- tions are found
		21.7 x 10.5	17.0	1.18 N (0.12 kg)	20.6	
					0.88 N (0.09 kg)	

CENTER SWIVEL JOINT



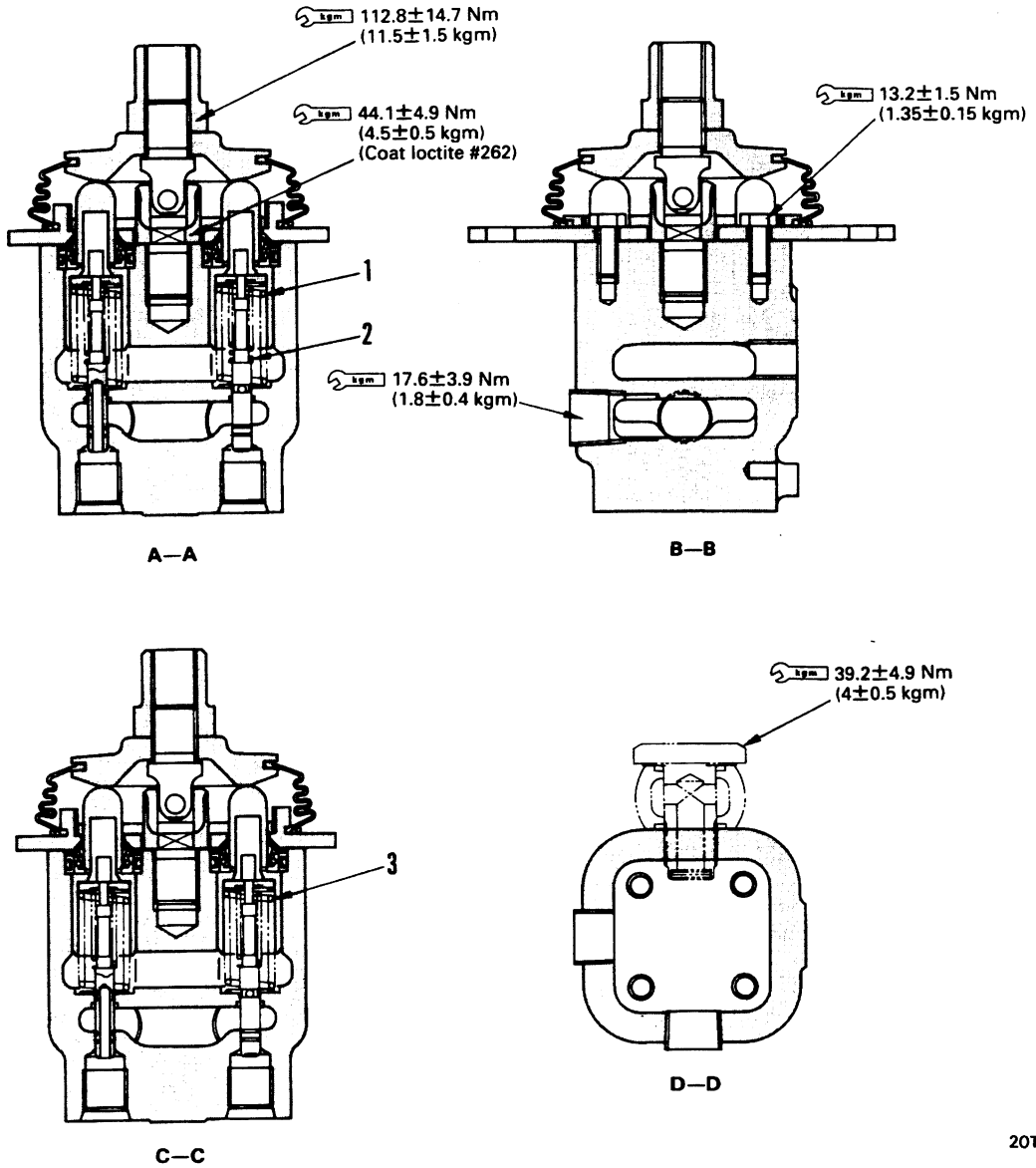
20TF01073

Unit: mm

No.	Check item	Criteria			Remedy
		Standard size	Standard size	Clearance limit	
1	Clearance between rotor and shaft	80	0.056 – 0.105	0.111	Replace

PPC VALVE

PC25-1 Serial No. 1001—5678
 PC30-7 Serial No. 18001—25054
 PC40-7 Serial No. 18001—23296
 PC45-1 Serial No. 1001—3014

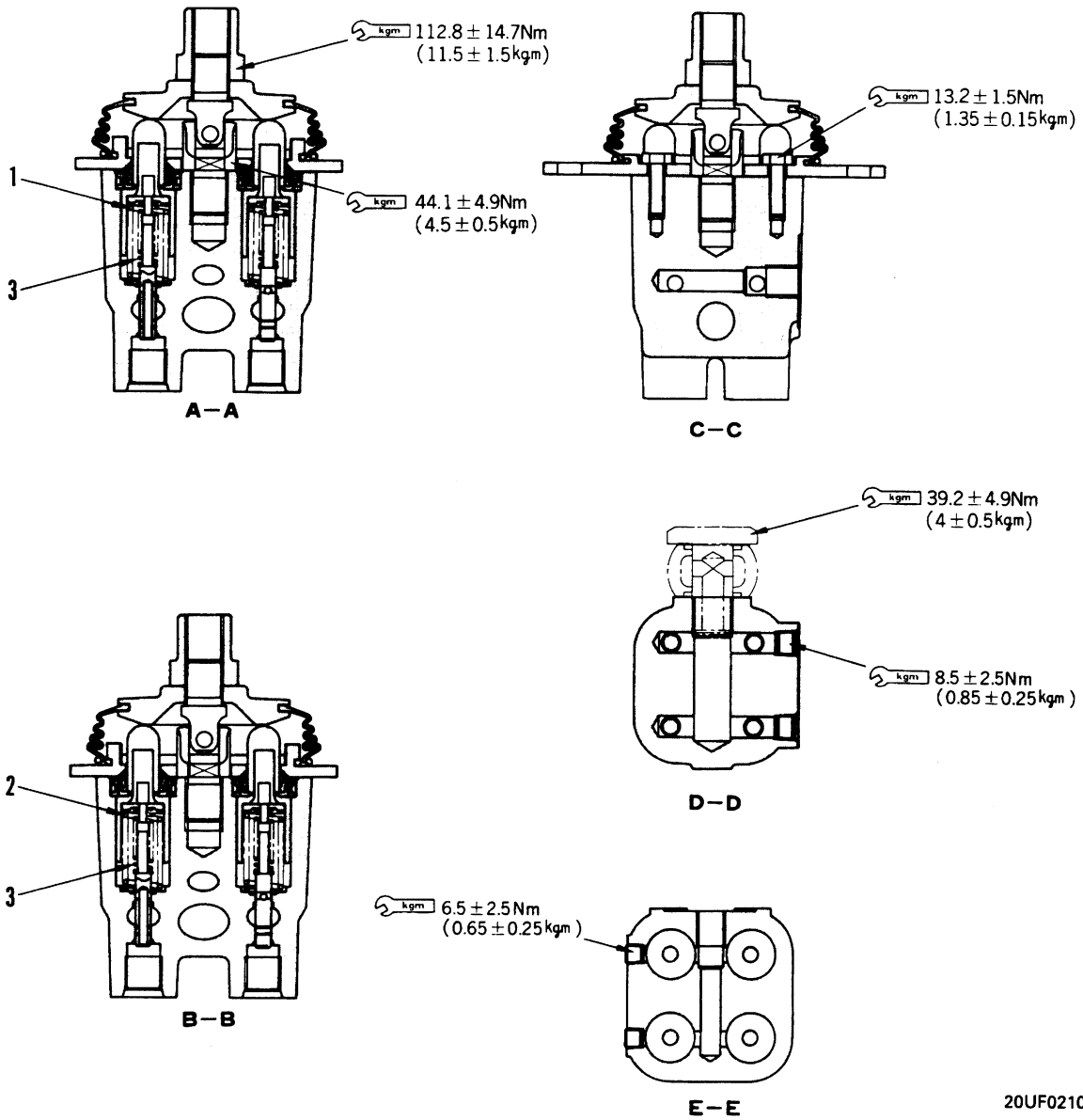


020S07

20TF01075
 Unit: mm

No.	Check item	Criteria				Remedy
		Free length x O.D.	Installed length	Installed load	Free length	
1	Centering spring (for P ₃ , P ₄ ports)	50.4 x 15.5	34	55.9 N (5.7 kg)	—	Replace spring if any damages or deformations are found
					45.1 N (4.6 kg)	
2	Metering spring	26.6 x 7.5	24.9	16.7 N (1.7 kg)	—	
3	Centering spring (for P ₁ , P ₂ ports)	50.1 x 15.5	34	71.5 N (7.3 kg)	—	56.8 N (5.8 kg)

PC25-1 Serial No. 5679 and up
PC30-7 Serial No. 25055 and up
PC40-7 Serial No. 23297 and up
PC45-1 Serial No. 3015 and up

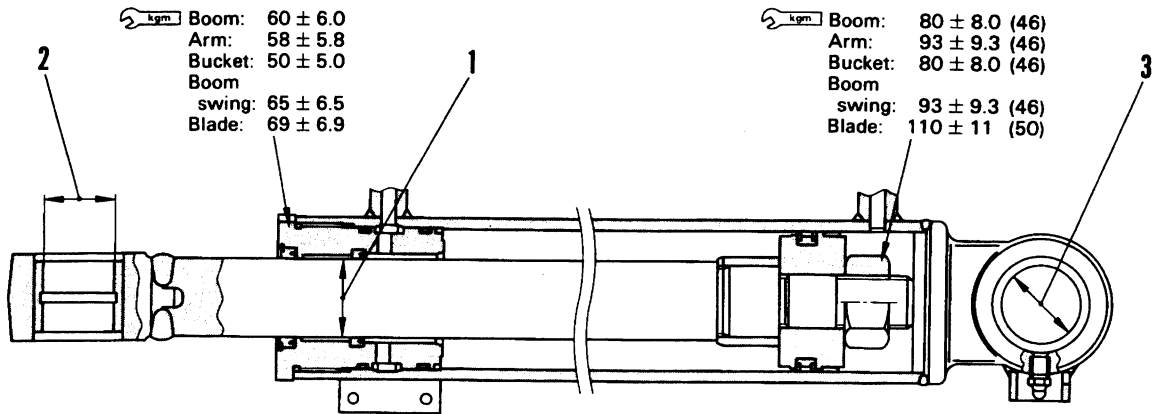


20UF02106A-K
Unit: mm

No.	Check item	Criteria					Remedy
		Free length x O.D.	Installed length	Installed load	Free length	Installed load	
1	Centering spring (for P ₃ , P ₄ ports)	42.4X15.5	34	29.4 N (3 kg)	-	23.5 N (2.4 kg)	Replace spring if any damages or deformations are found
		26.5X 8.2	24.9	16.7 N (1.7 kg)	-	13.7 N (1.4 kg)	
2	Metering spring	44.4X15.5	34	39.2 N (4 kg)	-	31.4 N (3.2 kg)	
3	Centering spring (for P ₁ , P ₂ ports)						

HYDRAULIC CYLINDER

PC25-1

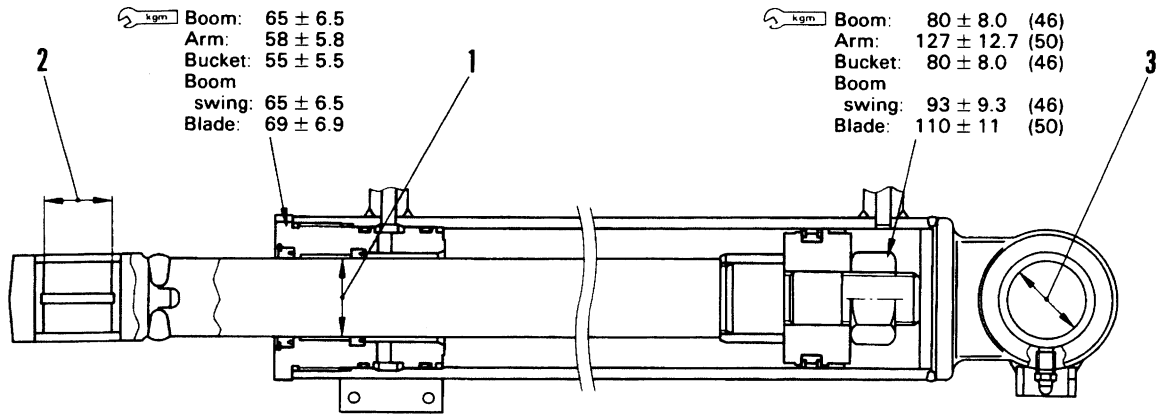


20TF01081

Unit: mm

No.	Check item	Criteria					Remedy	
		Cylinder	Standard size	Tolerance		Standard clearance		Clearance limit
				Shaft	Hole			
1	Clearance between piston rod and bushing	Boom	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539	
		Arm	40	-0.025 -0.087	+0.132 +0.006	0.031 – 0.219	0.519	
		Bucket	40	-0.025 -0.087	+0.132 +0.006	0.031 – 0.219	0.519	
		Boom swing	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539	
		Blade	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539	
2	Clearance between piston rod mounting pin and bushing	Boom	40	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	Replace bushing
		Arm	40	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Bucket	35	-0.170 -0.230	+0.142 +0.080	0.250 – 0.372	1.0	
		Boom swing	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Blade	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
3	Clearance between cylinder bottom mounting pin and bushing	Boom	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Arm	40	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Bucket	35	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Boom swing	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Blade	50	-0.025 -0.087	+0.142 +0.080	0.105 – 0.206	1.0	

PC30-7



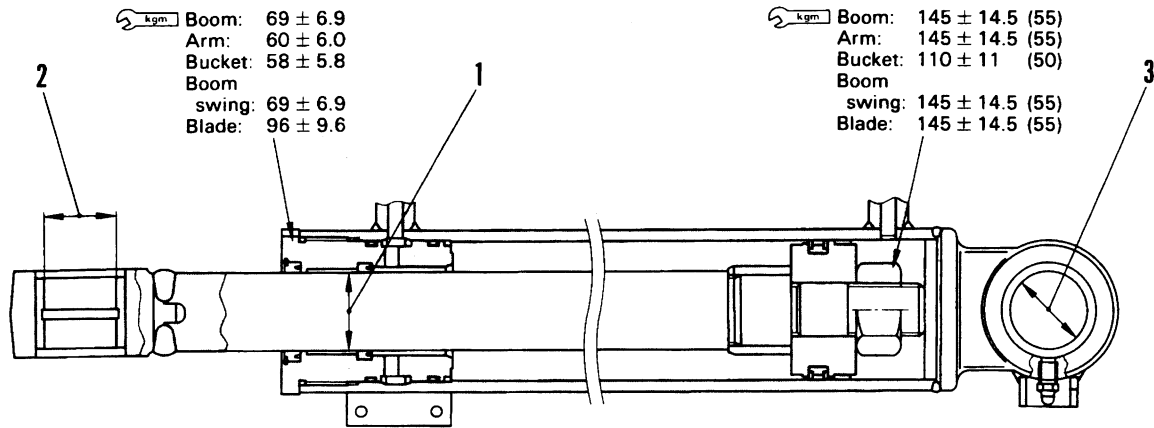
20TF01081

Unit: mm

No.	Check item	Criteria					Remedy	
		Cylinder	Standard size	Tolerance		Standard clearance		Clearance limit
Shaft	Hole							
1	Clearance between piston rod and bushing	Boom	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539	
		Arm	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539	
		Bucket	40	-0.025 -0.087	+0.132 +0.006	0.031 – 0.219	0.519	
		Boom swing	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539	
		Blade	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539	
2	Clearance between piston rod mounting pin and bushing	Boom	40	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	Replace bushing
		Arm	40	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Bucket	35	-0.170 -0.230	+0.142 +0.080	0.250 – 0.372	1.0	
		Boom swing	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Blade	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
3	Clearance between cylinder bottom mounting pin and bushing	Boom	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Arm	40	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Bucket	35	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Boom swing	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Blade	50	-0.025 -0.087	+0.142 +0.080	0.105 – 0.206	1.0	

020S07

PC40-7

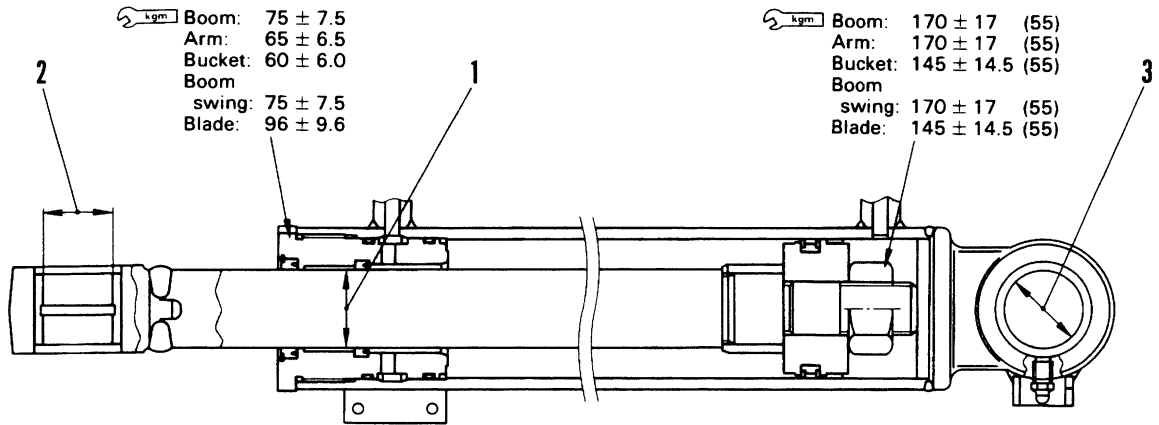


20TF01081

Unit: mm

No.	Check item	Criteria					Remedy
		Cylinder	Standard size	Tolerance		Standard clearance	
Shaft	Hole						
1	Clearance between piston rod and bushing	Boom	55	-0.030 -0.104	+0.163 +0.006	0.036 – 0.267	0.567
		Arm	50	-0.025 -0.087	+0.164 +0.007	0.032 – 0.251	0.551
		Bucket	45	-0.025 -0.087	+0.152 +0.007	0.032 – 0.239	0.539
		Boom swing	50	-0.025 -0.087	+0.164 +0.007	0.032 – 0.251	0.551
		Blade	50	-0.025 -0.087	+0.164 +0.007	0.032 – 0.251	0.551
		2	Clearance between piston rod mounting pin and bushing	Boom	50	-0.147 -0.209	+0.142 +0.080
Arm	45			-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0
Bucket	45			-0.170 -0.230	+0.142 +0.080	0.250 – 0.372	1.0
Boom swing	50			-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0
Blade	55			-0.030 -0.076	+0.174 +0.100	0.130 – 0.250	1.0
3	Clearance between cylinder bottom mounting pin and bushing	Boom	50	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0
		Arm	45	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0
		Bucket	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0
		Boom swing	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0
		Blade	55	-0.190 -0.264	+0.174 +0.100	0.290 – 0.438	1.0

PC45-1



20TF01081

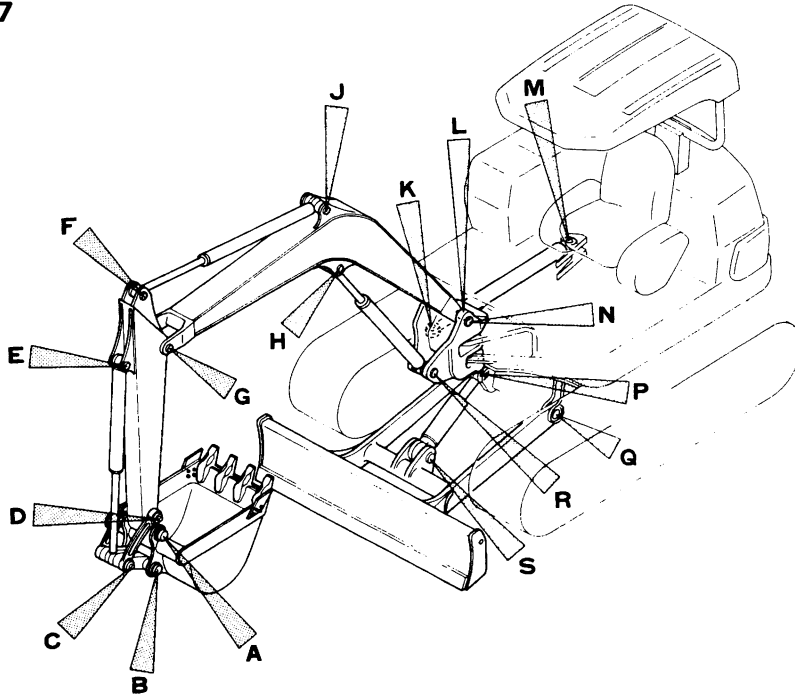
Unit: mm

No.	Check item	Criteria					Remedy	
		Cylinder	Standard size	Tolerance		Standard clearance		Clearance limit
Shaft	Hole							
1	Clearance between piston rod and bushing	Boom	55	-0.030 -0.104	+0.163 +0.006	0.036 – 0.267	0.567	
		Arm	50	-0.025 -0.087	+0.164 +0.007	0.032 – 0.251	0.551	
		Bucket	50	-0.025 -0.087	+0.164 +0.007	0.032 – 0.251	0.551	
		Boom swing	50	-0.025 -0.087	+0.164 +0.007	0.032 – 0.251	0.551	
		Blade	50	-0.025 -0.087	+0.164 +0.007	0.032 – 0.251	0.551	
		Blade	55	-0.030 -0.076	+0.174 +0.100	0.130 – 0.250	1.0	
2	Clearance between piston rod mounting pin and bushing	Boom	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	Replace bushing
		Arm	45	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Bucket	45	-0.170 -0.230	+0.142 +0.080	0.250 – 0.372	1.0	
		Boom swing	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Blade	55	-0.030 -0.076	+0.174 +0.100	0.130 – 0.250	1.0	
3	Clearance between cylinder bottom mounting pin and bushing	Boom	50	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Arm	45	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.0	
		Bucket	45	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Boom swing	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
		Blade	55	-0.190 -0.264	+0.174 +0.100	0.290 – 0.438	1.0	

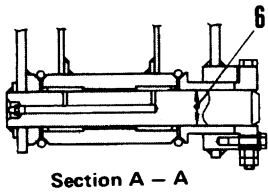
020S07

WORK EQUIPMENT

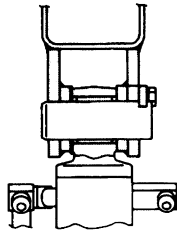
PC25-1, PC30-7



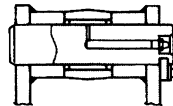
20TF01082



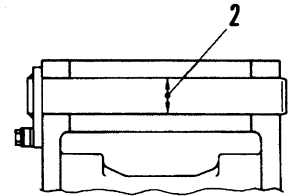
Section A - A



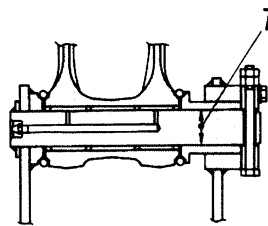
Section E - E



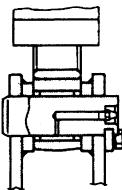
Section J - J



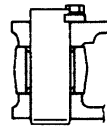
Section N - N



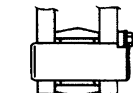
Section B - B



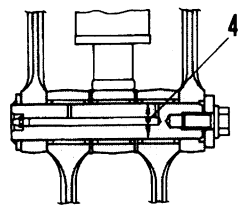
Section F - F



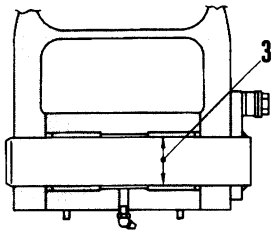
Section K - K



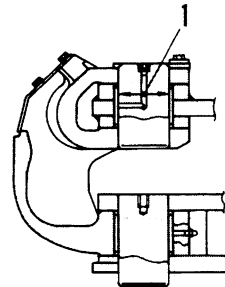
Section P - P



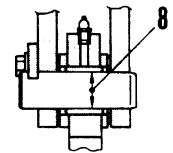
Section C - C



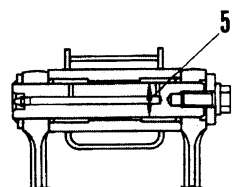
Section G - G



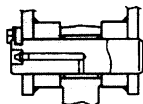
Section L - L



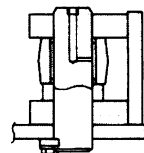
Section Q - Q



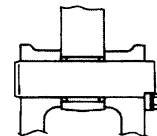
Section D - D



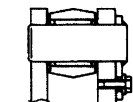
Section H - H



Section M - M



Section R - R



Section S - S

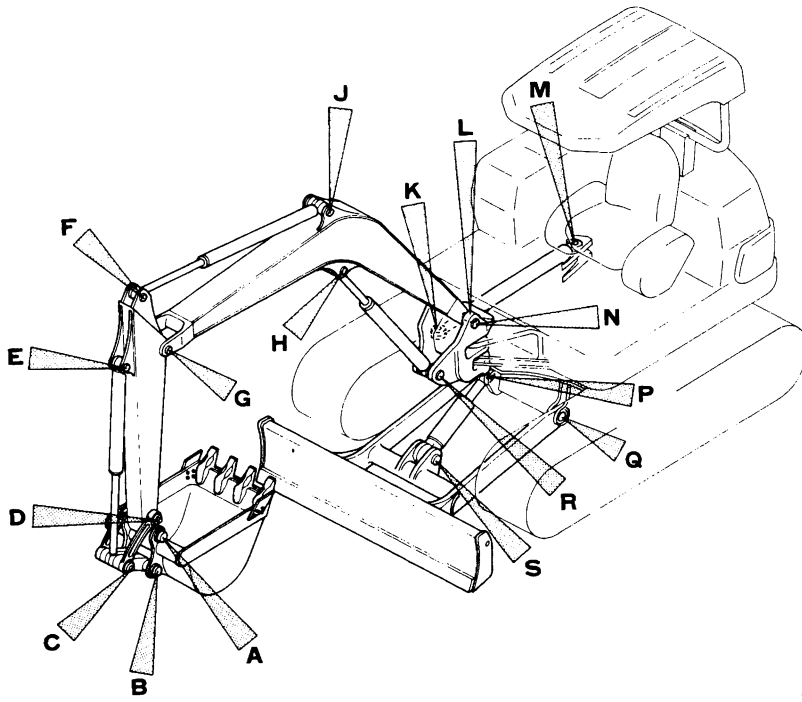
20TF01083A

LUSCUC

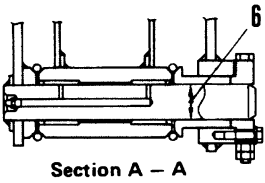
Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size	Tolerance		Standard clearance		Clearance limit
Shaft	Hole						
1	Clearance between bushing and connecting pin of revolving frame and swing bracket	85	-0.036 -0.090	+0.207 +0.120	0.156 – 0.297	1.0	Replace bushing
2	Clearance between bushing and connecting pin of swing bracket and boom	45	-0.025 -0.064	+0.128 +0.075	0.100 – 0.192	1.0	
3	Clearance between bushing and connecting pin of boom and arm	40	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0	
4	Clearance between bushing and connecting pin of link and link	35	-0.080 -0.142	-0.003 -0.052	0.028 – 0.139	1.0	
5	Clearance between bushing and connecting pin of arm and link	35	-0.080 -0.142	-0.003 -0.052	0.028 – 0.139	1.0	
6	Clearance between bushing and connecting pin of arm and bucket	35	-0.080 -0.142	-0.003 -0.052	0.028 – 0.139	1.0	
7	Clearance between bushing and connecting pin of link and bucket	35	-0.080 -0.142	-0.003 -0.052	0.028 – 0.139	1.0	
8	Clearance between bushing and connecting pin of blade and track frame	35	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.5	

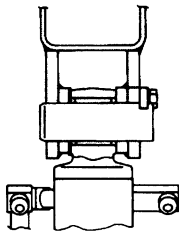
PC40-7, PC45-1



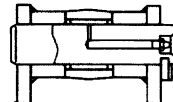
20TF01082



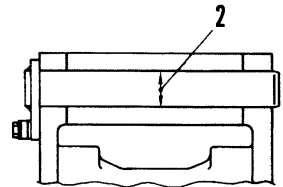
Section A - A



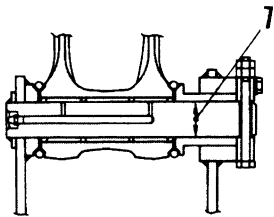
Section E - E



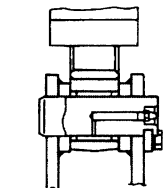
Section J - J



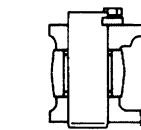
Section N - N



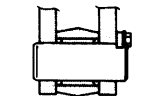
Section B - B



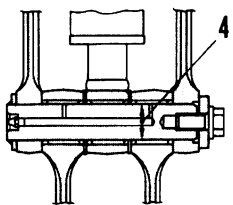
Section F - F



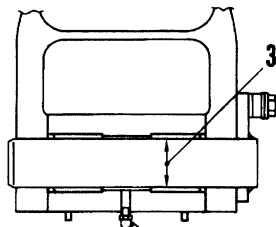
Section K - K



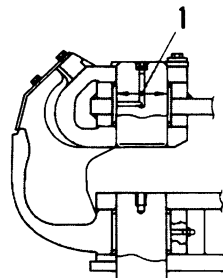
Section P - P



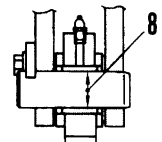
Section C - C



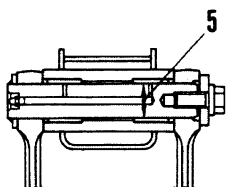
Section G - G



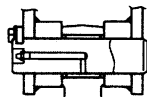
Section L - L



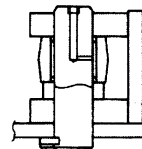
Section Q - Q



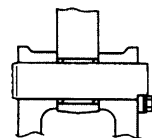
Section D - D



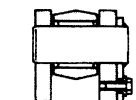
Section H - H



Section M - M



Section R - R



Section S - S

20TF01083A

020S07

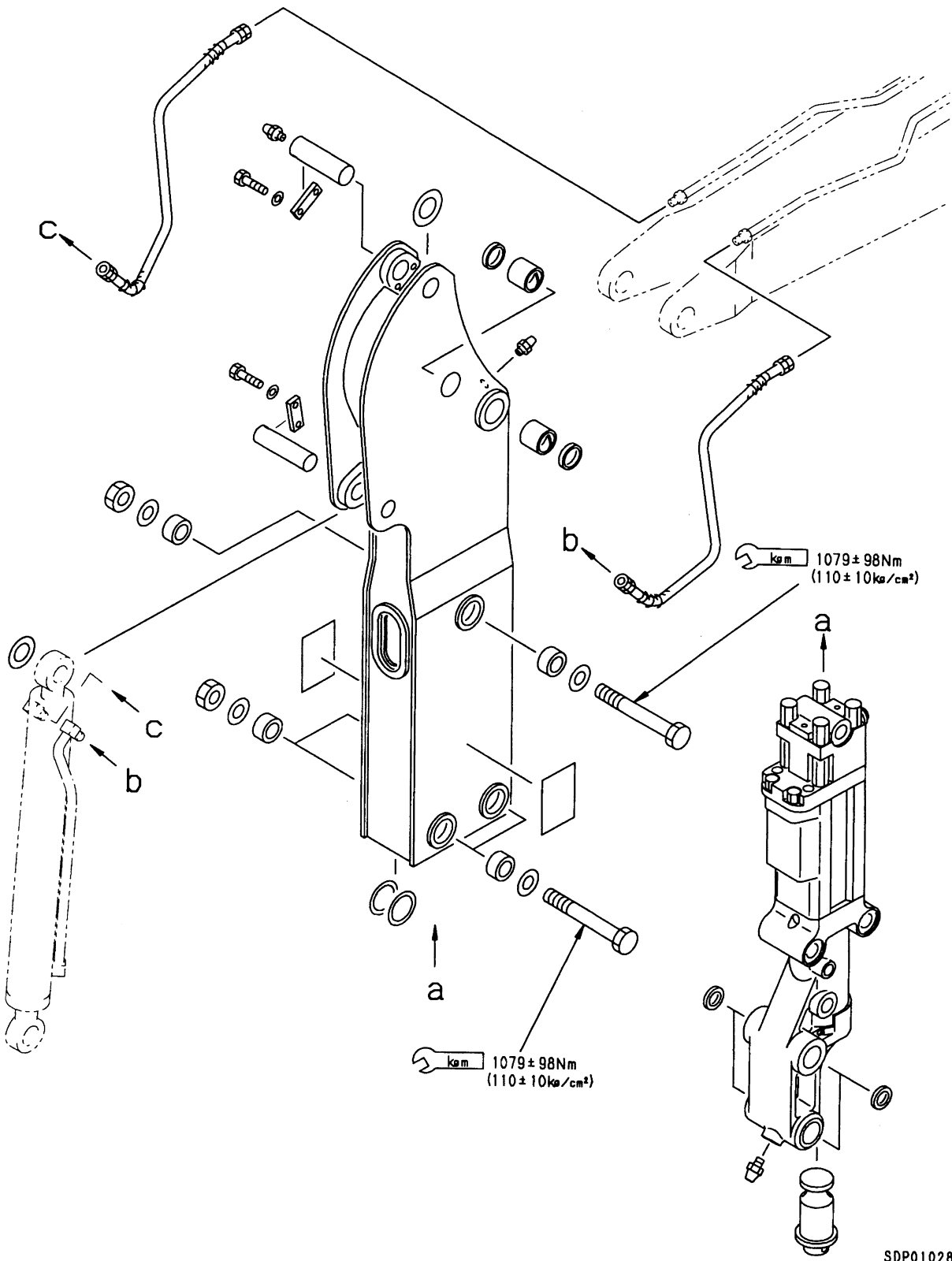
Unit: mm

No.	Check item	Criteria				Remedy
		Standard size	Tolerance		Standard clearance	
Shaft	Hole					
1	Clearance between bushing and connecting pin of revolving frame and swing bracket	100	-0.036	+0.207	0.156 – 0.297	1.0
			-0.090	+0.120		
2	Clearance between bushing and connecting pin of swing bracket and boom	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0
3	Clearance between bushing and connecting pin of boom and arm	50	-0.025 -0.064	+0.142 +0.080	0.105 – 0.206	1.0
4	Clearance between bushing and connecting pin of link and link	45	-0.180 -0.242	-0.012 -0.065	0.115 – 0.230	1.0
5	Clearance between bushing and connecting pin of arm and link	45	-0.180 -0.242	-0.012 -0.065	0.115 – 0.230	1.0
6	Clearance between bushing and connecting pin of arm and bucket	45	-0.180 -0.242	-0.012 -0.065	0.115 – 0.230	1.0
7	Clearance between bushing and connecting pin of link and bucket	45	-0.180 -0.242	-0.012 -0.065	0.115 – 0.230	1.0
8	Clearance between bushing and connecting pin of blade and track frame	35	-0.025 -0.087	+0.142 +0.080	0.105 – 0.229	1.5

Replace bushing

HYDRAULIC BREAKER

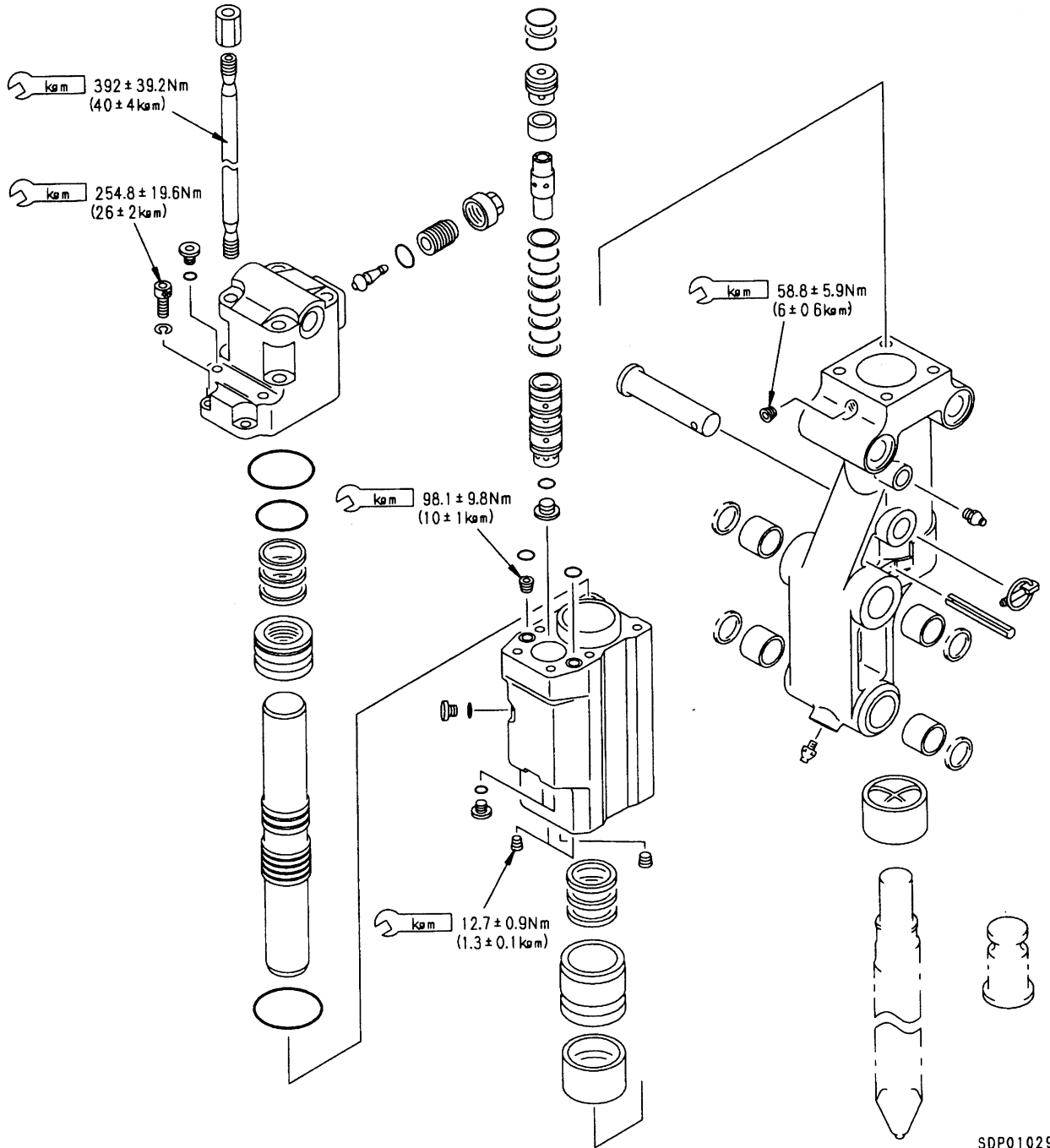
ARM



SDP01028

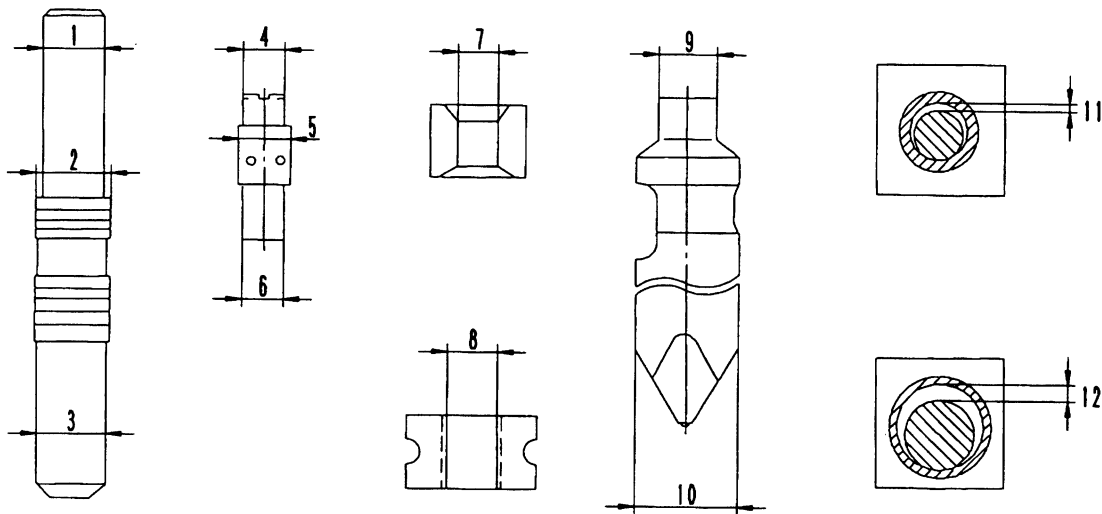
BREAKER

020S07



SDP01029

PISTON, CHISEL

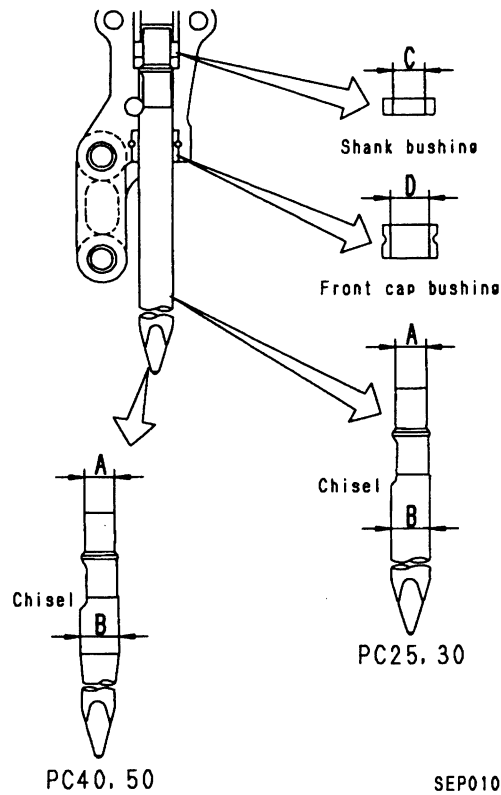


SEP01030

Unit: mm					
No.	Check item	Criteria			Remedy
		Standard size	Clearance limit or dimension	Surface roughness	
1	Wear limit of piston	47.97	47.87	3.2S	Replace
2	Wear limit of piston	55.48	55.45	12.5S	
3	Wear limit of piston	52.97	52.93	3.2S	
4	Wear limit of valve	25.48	25.46	6.3S	
5	Wear limit of valve	26.98	26.96	6.3S	
6	Wear limit of valve	23.48	23.46	6.3S	
7	Wear limit of shank bushing	45.7	48		
8	Wear limit of front cap bushing (PC30)	61.7	66		
9	Wear limit of chisel (PC30)	44.9	43		
10	Wear limit of chisel (PC30)	60.85	57		
11	Clearance between shank bushing and chisel	0.8	3		
12	Clearance between front cap bushing and chisel	0.85	5		

CHISEL

020S07



SEP01093

Unit: mm

No.	Check item	Criteria		Remedy		
		Standard size	Repair limit			
1	Wear of chisel	A		Replace		
		B	PC25,30		ø 45	ø 43
			PC40,45		ø 61	ø 57
2	Wear of shank bushing	C		ø 68	ø 64	
3	Wear of front cap bushing	D	PC25,30	ø 45	ø 48	
			PC40,45	ø 61	ø 66	
			ø 68	ø 73		

PROPOSAL FOR MANUAL REVISION

長 殿

受付 No. PMR-

教育研修資料部
(写)配布先(回答後)
KIP 取説資料課
KIP 部品資料課
KIP 整備資料課

PROPOSER	NAME OF COMPANY:	INFORMATION No.:			
	DEPARTMENT/SECTION:	ISSUED ON:			
	NAME:	事務所名:			
MANUAL NAME:		教育研修資料部	事務所		
MANUAL No.:		主査	担当	所長	担当
MACHINE MODEL:					

1. Details 2. Include your request or opinion? 3. Include user's opinion?

Attached photo or sketch.
If you need more space, use another sheet.

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REPLY

部 課			
			担当

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受 付	発 行
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	DEPARTMENT/SECTION:	ISSUED ON:			
	NAME:	事務所名:			
MANUAL NAME:		教育研修資料部	事 務 所		
MANUAL No.:		主査	担当	所長	担当
MACHINE MODEL:					

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REPLY

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				担当

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PROPOSER	NAME OF COMPANY :	INFORMATION No. :			
	DEPARTMENT/SECTION :	ISSUED ON :			
	NAME :	事務所名 :			
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MANUAL No. : <small>Given in upper right hand corner of cover.</small>		主査	担当	所長	担当
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