CONTENTS

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

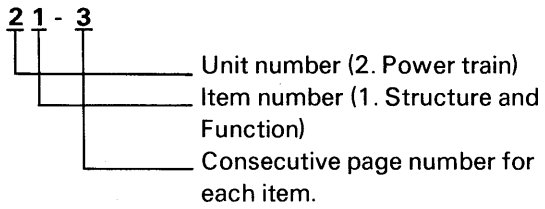
These various volumes are designed to avoid duplicating the same information. Therefore to deal with all repairs for any model, it is necessary that chassis, engine, electrical and attachment volumes are ready.

DISTRIBUTION AND UPDATING

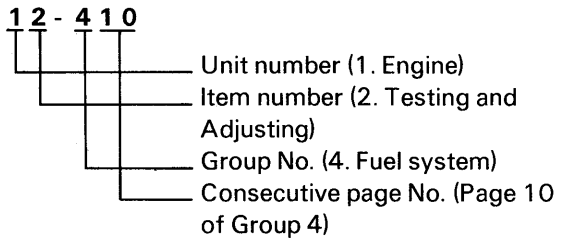
Any additions, amendments or other changes will be sent to KOMATSU distributers. Get the most up-to-date information before you start any work.

FILING METHOD

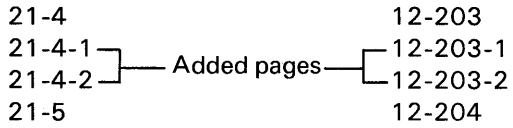
1. See the page number on the bottom of the page. File the pages in correct order.
2. Following examples show how to read the page number.
   Example 1 (Chassis volume):



   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 (①②③····)

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

REVISIONS

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

SYMBOLS

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

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
		Extra special safety precautions are necessary when performing the work because it is under internal pressure.
★	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.
	Weight	Weight of parts or systems. Caution necessary when selecting hoisting wire, or when working posture is important, etc.
	Tightening torque	Places that require special attention for 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.

3. DETERGENTS

1. Precautions for cleaning

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

2. Selection of detergents

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

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

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

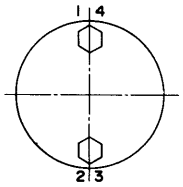
○: Immersion allowed for a short time only
X: Detergent detrimental to rubber

4. NUTS AND BOLTS

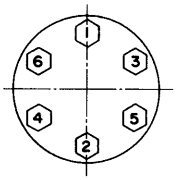
Unless otherwise specified in the DISASSEMBLY AND ASSEMBLY, tighten all bolts to a torque of page 00-29.

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

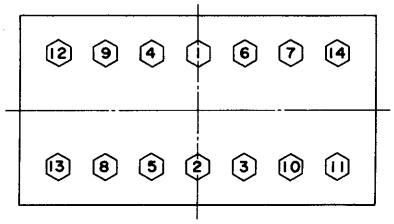
Tighten mutually opposing bolts alternately.



Tighten in turn on opposite sides.



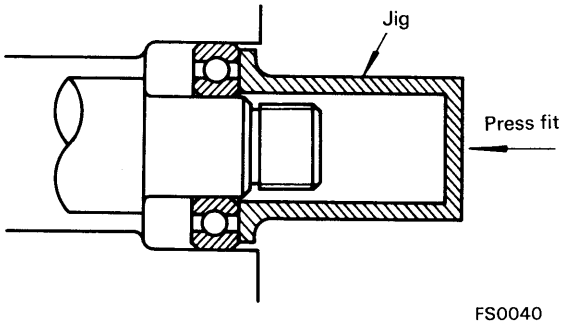
Tighten from the center outwards and on alternate sides.



FS0003

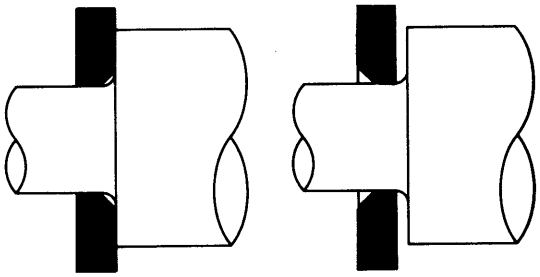
4) The Template Method is prescribed for tightening bolts on certain specific parts of the engine.
   The Template Method obtains good fittings of bolts with their seats and of bearings with their races to ensure uniform overall tightening. The bolts are tightened in stages, then loosened, and then tightened once more.

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



FS0040

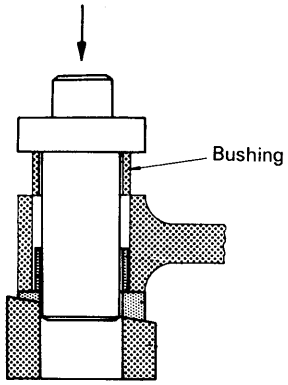
5) Thoroughly coat the bearing with oil before installing.
6) Install the bearing, spacer or washer with its chamfered surface facing the step on the shaft.



FS0041

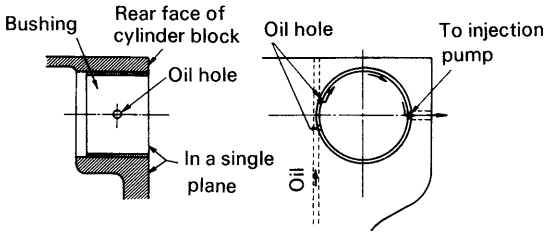
6. PRESS FITTING BUSHINGS

Do not drive in a bushing directly with a hammer. Use a press so that pressure is uniform over the entire circumference.
1) If no press is available, hammer in the bushing using a driving tool so that the force is distributed evenly.



FS0042

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



FS0043

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

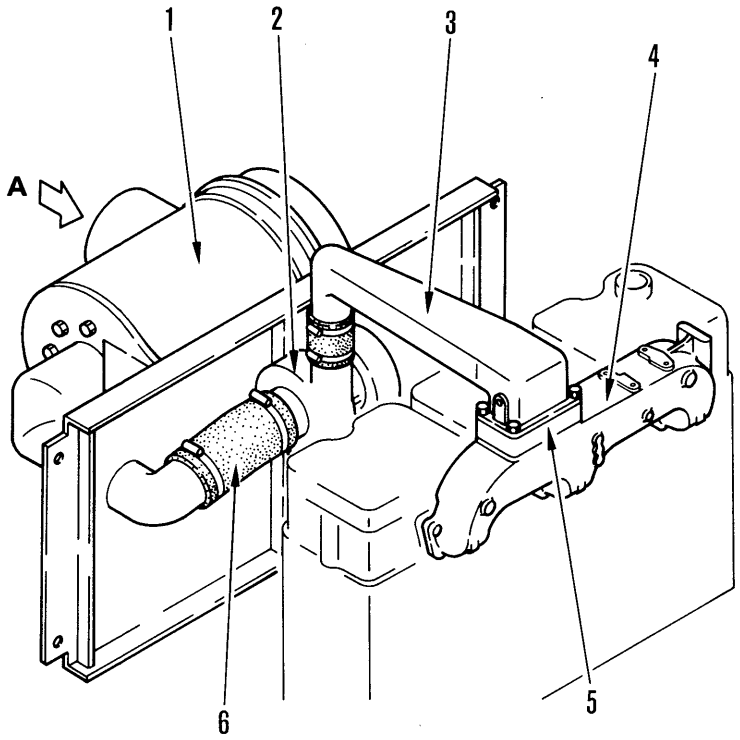
7. REMOVING SNAP RINGS

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

Engine model			NTA-855-C	
Applicable machine model			WS23-1	
Number of cylinder — Bore x Stroke		(mm)	6 — 139.7 x 152.4	
Total piston displacement		(cc)	14,010	
Firing order			1 — 5 — 3 — 6 — 2 — 4	
Dimensions	Overall length	(mm)		
	Overall width	(mm)		
	Overall height			
	(Excluding exhaust pipe)	(mm)		
	(Including exhaust pipe)	(mm)		
Performance	Flywheel horsepower	(HP/rpm)	364/2,100	
	Maximum torque	(kgm/rpm)	140/1,500	
	High idling speed	(rpm)	2,250 — 2,350	
	Low idling speed	(rpm)	610 — 650	
	Minimum fuel consumption ratio	(g/HPh)	175	
Dry weight		(kg)	1,570 (Front) 1,520 (Rear)	
Fuel pump			Cummins PT fuel pump	
Governor			Cummins VS governor (Centrifugal, all-speed type)	
Lubricating oil capacity (Refill capacity)		(ℓ)	43 (38)	
Cooling water capacity		(ℓ)	125	
Alternator			24V, 35A	
Starting motor			24V, 11kW	
Battery			12V 200Ah x 2	
Turbocharger			Cummins ST-50	
After-cooler			With	
Others			—	

NT-855-C (For PC400-1, PC400LC-1)

INTAKE SYSTEM

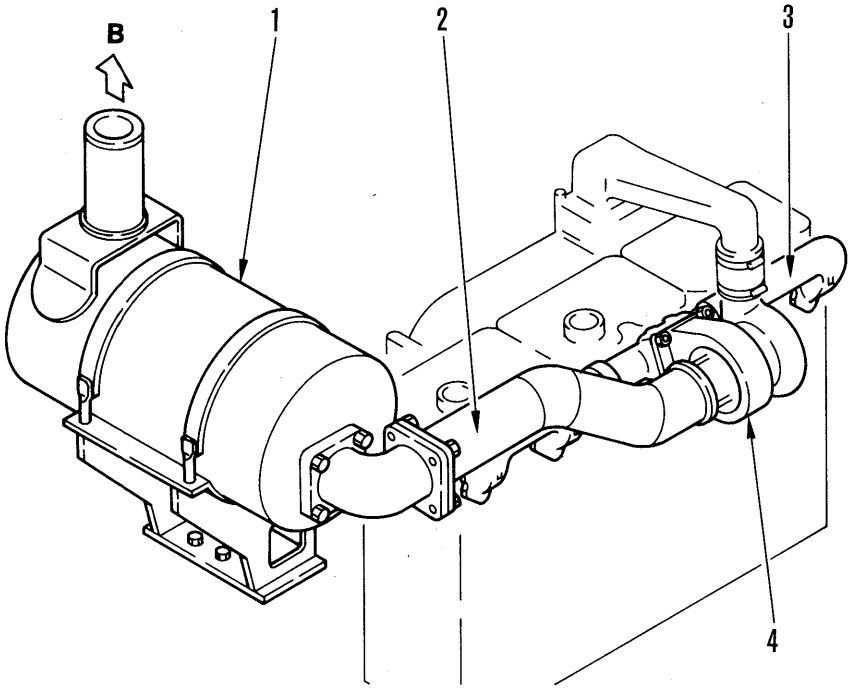


F6710A003

1. Air cleaner
2. Turbocharger
3. Intake connector pipe
4. Intake manifold
5. Electrical intake air heater
6. Intake connector pipe

A. Intake

EXHAUST SYSTEM



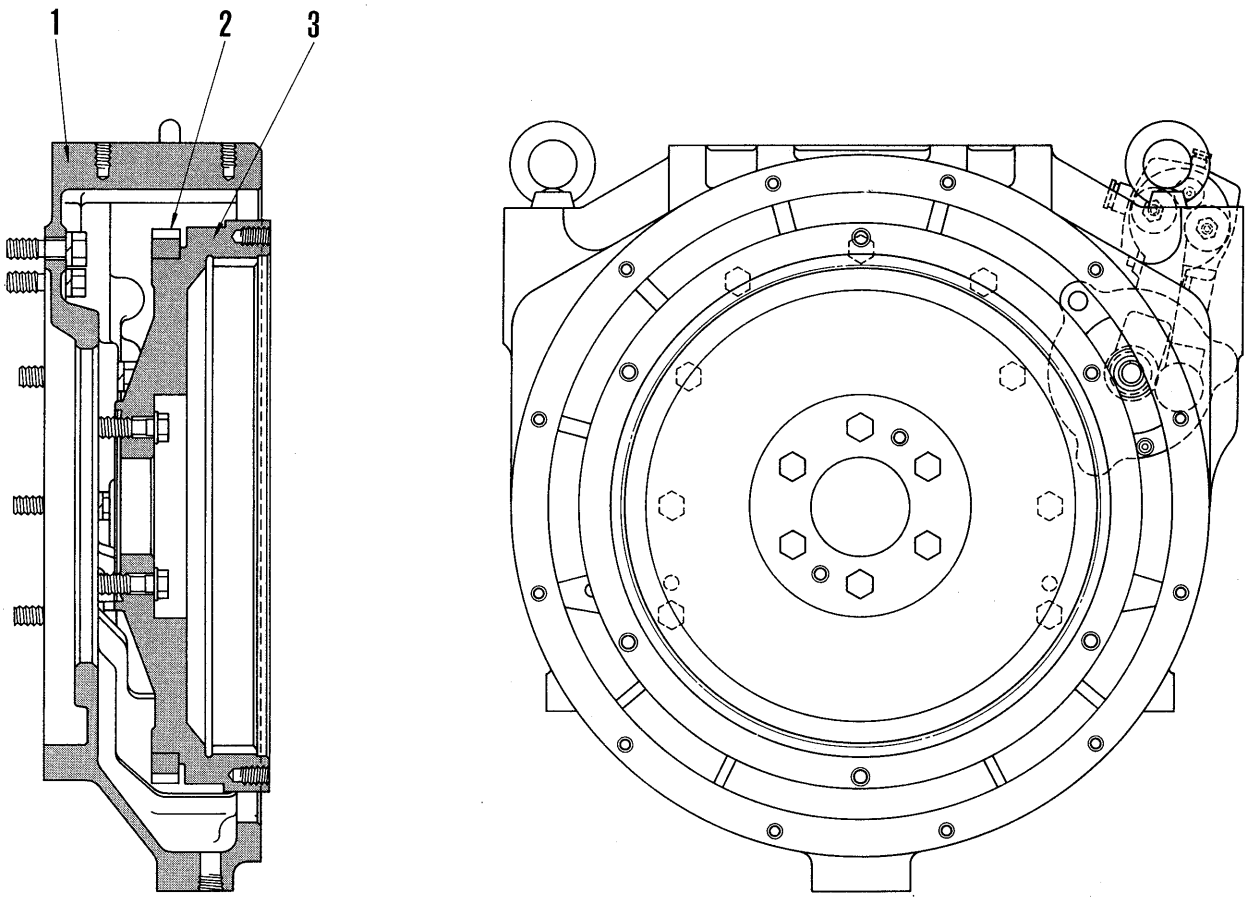
F6710A004

1. Muffler
2. Exhaust connector pipe
3. Exhaust manifold
4. Turbocharger

B. Exhaust

FLYWHEEL AND FLYWHEEL HOUSING

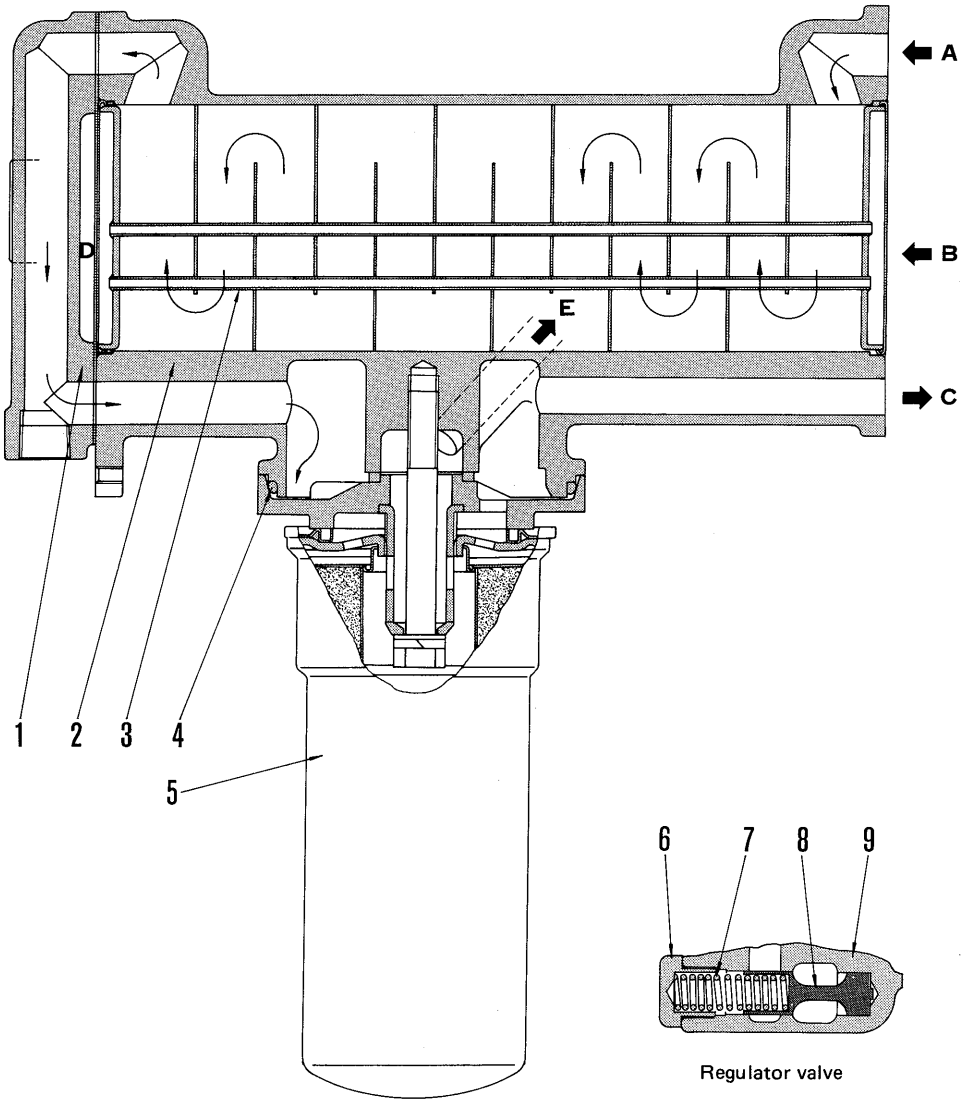
N-855-C (For PC300-1, 2 and PC300LC-1, 2)



6710F072-1

1. Flywheel housing
2. Ring gear (No. of teeth: 138)
3. Flywheel

NTA-855-C (HD320 Engine No. 26155099 and up)



Regulator valve

67I0F083A

1. Cooler cover
2. Cooler housing
3. Cooler element
4. Seal ring
5. Oil filter
6. Cap
7. Valve spring
8. Regulator valve
9. Water pump inlet housing

A. From oil pump (oil)
B. From water pump (water)
C. To regulator valve (oil)
D. To water manifold (water)
E. To main gallery (oil)

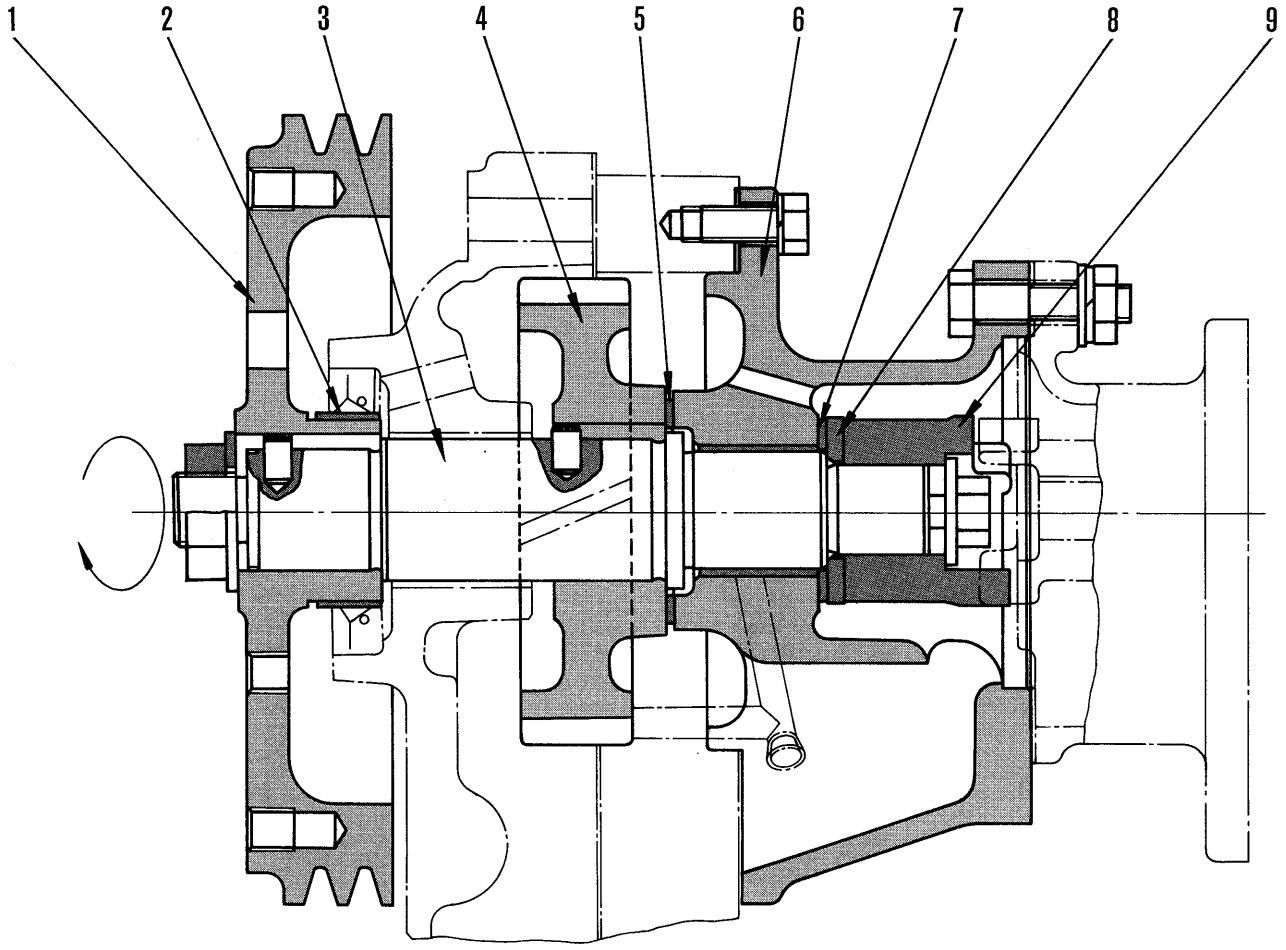
OIL FILTER
- Filtration area: 0.84 m^2

OIL COOLER
- Effective area: 1.37 m^2

REGULATOR VALVE
- Set pressure: 4.4 ± 0.4 kg/cm^2

WITHOUT AIR COMPRESSOR

NT-855-C (D80, 85-18, D95S-2)



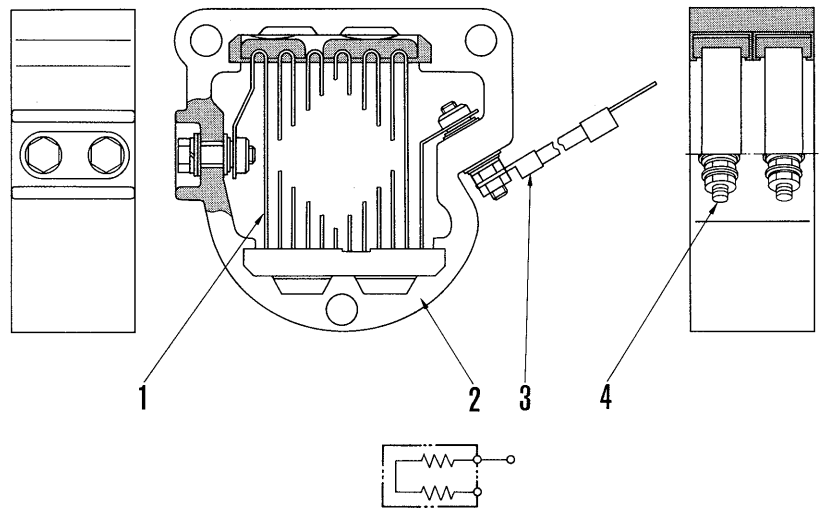
6710F092-1

1. Accessory drive pulley
2. Wear sleeve
3. Accessory drive shaft
4. Accessory drive gear (No. of teeth: 36)
5. Thrust washer
6. Drive case
7. Thrust washer
8. Washer
9. Coupling

ELECTRICAL INTAKE AIR HEATER

RIBBON TYPE

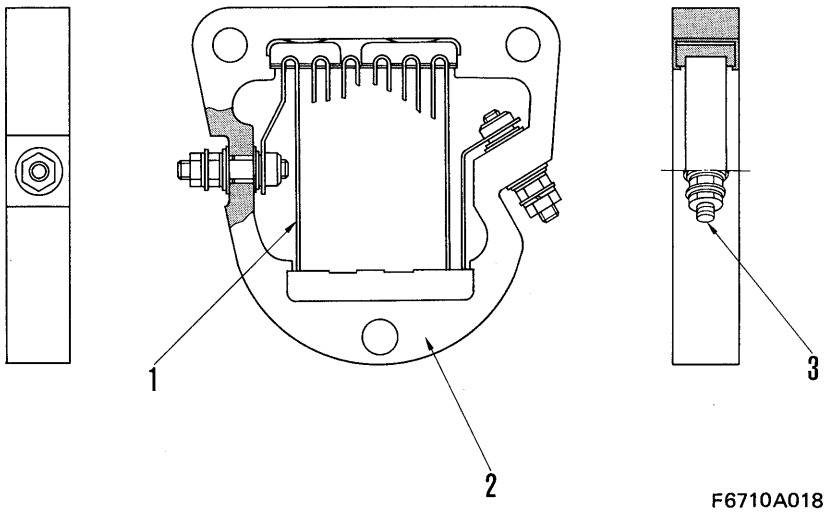
- SMALL SIZE (For PC300-1, 2, PC300LC-1, 2)



1. Heater coil
2. Heater body
3. Earth wire
4. Terminal

F6710A017

- SMALL SIZE (For PC400-1, PC400LC-1, W170-2, W180-1)



1. Heater coil
2. Heater body
3. Terminal

F6710A018

Pump Code	GR-J 144			
Machine Model	PC300-1 and PC300LC-1	Rated	HP/rpm	180/1850
Engine Model	N855-C	Max. Torque	kgm(ft.lb.)/rpm	85.8 (621)/1300
		High Idling	rpm	1985 to 2085
Pump P/N	6712-71-1020			

		Application					
Specification	1	Vacuum Set		mmHg(in.Hg)/rpm	127(5.0)/1850		
	2	Flow Meter Set		kg(lb.)/hour/rpm	122.4(270)/1850		
	3	Governor Cut-off		rpm	1970 to 2000 1920 to 1970		
	4	Governor Set at 2.8 kg/cm²(40 psi)			1990 to 2050		
	5	Governor Set at 1.4 kg/cm²(20 psi)			2010 to 2080		
	6	Intake Manifold Pressure		kg/cm²(psi)/rpm	9.1 (130)/1850		
	7	Check Point			6.3 to 6.7/1300 (89 to 95)		
	8	Weight Assist Set at 800 rpm		kg/cm²(psi)	3.0 to 3.5 (43 to 50)		
	9	Idle Speed Pressure at 500 rpm			1.8 (25)		
	10	Throttle Leakage		cc(in.³)/min./rpm	Non		
	11	AFC Set	Air	mmHg(in.Hg)	–		
				kg/cm²(psi)	–		
			Fuel	rpm	–		
				kg/cm²(psi)	–		
				kg(lb.)/hour	–		
	12	No Air Set		rpm	–		
				kg/cm² (psi)	–		
				kg(lb.)/hour	–		
Attached Parts	1	Governor Lever		Komatsu P/N	6680-71-3281		
				Cummins P/N	423641		
				Direction	Vertical		
				Place	Left, viewed from coupling		
	2	Fuel Inlet Elbow		Komatsu P/N	6691-71-2570		
				Cummins P/N			
	3	Coupling		Komatsu P/N	6710-71-2470		
				Cummins P/N	212613		
	4	Shut-off Valve		Komatsu P/N	6711-71-4100		
				Cummins P/N	3326200		
	5	Direction of Cooling Elbow			Away from coupling		

		Application				
Internal Parts	1	Idle Plunger	Komatsu P/N	6610-71-6550		
			Cummins P/N	140418		
			Code No.	#37		
	2	MVS Idle Spring	Komatsu P/N	6710-71-3260		
			Cummins P/N	70778		
	3	Governor Plunger	Komatsu P/N	6610-71-1411		
			Cummins P/N	169660		
	4	Governor Spring	Komatsu P/N	6610-71-5560		
			Cummins P/N	143252		
			Color Code	Red		
	5	Governor Spring Shims	mm(in.) x Q'ty	0.51(0.02) x 1 0.25(0.01) x 1		
	6	Torque Spring	Komatsu P/N	Non		
			Cummins P/N	Non		
			Color Code	Non		
	7	Torque Spring Shims	mm(in.) x Q'ty	Non		
	8	Weight Assist Spring	Komatsu P/N	6610-71-2140		
			Cummins P/N	143847		
			Color Code	Blue		
	9	Weight Assist Spring Shims	mm (in.) x Q'ty	Non		
	10	Weight Assist Protrusion	mm(in.)	22.3 to 22.8 (0.8 to 0.9)		
	11	MVS Governor Spring	Komatsu P/N	6610-71-6230		
			Cummins P/N	107787		
			Color Code	Blue-Yellow		
	12	MVS Governor Spring Shims	mm(in.) x Q'ty	Non		
	13	AFC Spring	Komatsu P/N	–		
			Cummins P/N	–		
			Color Code	–		

Torque (kgm)	Fuel pressure (kg/cm²)	Coolant temperature (°C)	Lubricating oil temperature (°C)	Lubricating oil pressure (kg/cm²)	Exhaust temperature (°C) (t = Intake air temp. −20°C)
–	14.6 – 15.6	70 – 95	80 – 110	3.5 – 5.5	Max. 700 + 3t
138.7 – 14.6.0	0	70 – 95	80 – 110	–	Max. 700 + 3t
0	0	70 – 95	80 – 110	–	–
0	0	70 – 95	Min. 80	Min. 1.0	–
–	14.6 – 15.6	70 – 95	80 – 110	3.5 – 5.5	Max. 700 + 3t
138.7 – 146.0	0	70 – 95	80 – 110	–	Max. 700 + 3t
0	0	70 – 95	80 – 110	–	–
0	0	70 – 95	Min. 80	Min. 1.0	–
–	12.4 – 13.2	70 – 95	80 – 110	3.5 – 5.5	Max. 650 + 3t
137.1 – 145.5	–	70 – 95	80 – 110	–	Max. 680 + 3t
0	–	70 – 95	80 – 110	–	–
0	–	70 – 95	Min. 80	Min. 1.0	–

17. Abnormal noise emitted.

★ When noises indicating internal damaged are being emitted continuing to operate the machine may make the damage worse.
★ As far as possible, classify the abnormal noise to make location of the cause easier.
Type of noise;
- Interference
- Abnormal combustion
- Gears
- Internal, external
- Engine, power train

The following symbols are used to indicate the action to be taken when a cause of failure is located.
X: Replace Δ: Repair
A: Adjust C: Clean

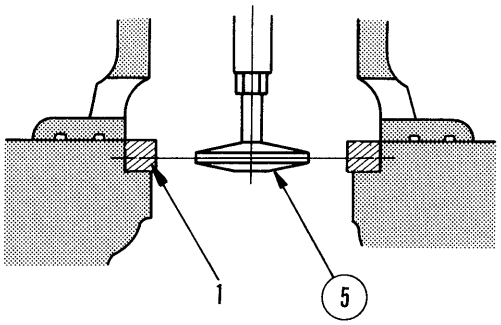
No.	Problems / Remedy	a Valve or piston broken X	b Valve stem stuck X	c Cam follower worn X	d Timing gear or P.T.O. gear or oil pump gear broken or worn X	e Bolt missing from connecting rod cap or main cap ΔX	f Cam bushing out of place XΔ	g Injector clogged CX	h Injector seized X	i Valve clearance defective A	j Piston, ring or liner worn X	k PT pump out of adjustment A	l Vibration damper defective X	m Thermostat defective X	n Interference of fan or fan belt; fan deformed ΔX
1	External or interference engine noise occurs.														○
2	Exhaust gas is black.							○		○	○	○		○	
3	Combustion noise is abnormal.							○	○			○		○	
4	Water temperature does not rise.													○	
5	Vibration damper is not warm to touch after operation; during operation, gear noise is also excessive.												○		
6	Fuel pressure (discharge pressure) is high. Seal of PT pump is abolished.											○			
7	Compression pressure is lack, blow-by is excessive.										○				
8	Valve clearance is too large or too small.									○					
9	Injector function is defective. (Plunger does not move up and down.)								○						
10	Injector injection spray is defective. (Remove it and check.)							○							
11	Remove oil pan. When checking it, internal engine noise is excessive.					○									
12	Remove gear cover. Gear noise is occurred.			○											
13	Remove cam follower housing. It is abnormal.		○												
14	When removing cylinder head, Internal engine noise is excessive.	○													

Unit: mm

No.	Check Item	Criteria				Remedy
2	Outside diameter of crank pin journal	Size	Standard size	Tolerance	Repair limit	Repair by using under size bearing or replace
		STD	79.00	+0.375 +0.337	79.30	
		0.25 U.S	78.75	+0.371 +0.346	79.05	
		0.50 U.S.	78.50	+0.367 +0.342	78.79	
		0.75 U.S.	78.25	+0.363 +0.338	78.54	
		1.00 U.S.	78.00	+0.359 +0.334	78.28	
3	Roundness of journal	Repair limit: Within 0.013 (Total indicator reading)				
4	End play of crankshaft	Standard clearance		Clearance limit		Repair by using over size bearing or replace
		0.18 – 0.43		0.56		
5	Width of journal at thrust journal	Size	Standard size	Tolerance	Repair limit	Repair by using over size bearing or replace.
		STD	76.20	+0.07 +0.02	76.35	
6	Thickness of main bearing	STD	3.10	+0.042 +0.024	3.09	Replace
7	Thickness of thrust bearing	STD	6.20	+0.07 +0.02	Determine by crankshaft end play	
		0.25 O.S.	6.45	+0.08 +0.03		
		0.50 O.S.	6.70	+0.08 +0.03		
8	Clearance of main journal	Standard clearance		Clearance limit		Repair by using under size bearing or replace.
		0.035 – 0.125		0.18		
	Clearance of crank pin journal	0.040 – 0.110		0.18		
9	Bend of crankshaft	Repair limit: 0.09 (Total indicator reading)				
10	Face runout of vibration damper	Repair limit: 0.25 (Total indicator reading)				Repair mounting flange or replace.
	Radial runout of vibration damper	Repair limit: 0.25 (Total indicator reading)				
11	Tightening torque of crankshaft pulley mounting bolt	26.5 ± 1.0 kgm				
12	Tightening torque of vibration damper mounting bolt	8.0 ± 0.2 kgm				

iii) Adjust the grinder position so that the horizontal center line of grindstone ⑤ is located at the center of valve seat insert (1), then secure the grinder by tightening the set screw.

iv) Fully open the grinder throttle valve and slowly move the rotating grindstone towards insert (1) until it comes into contact.



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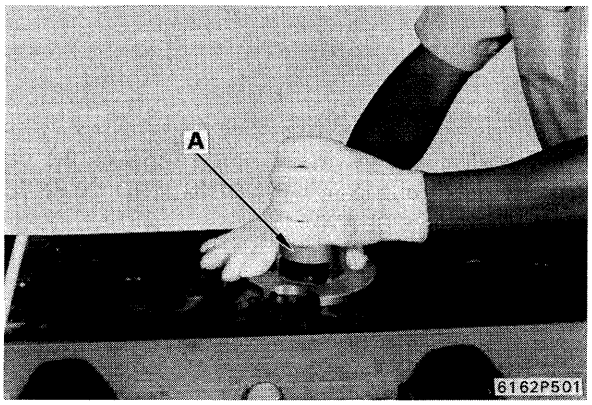
v) While pressing the grindstone lightly towards the inner surface of the insert, move the grindstone in a circle and make a groove in the circumference of the inner surface to a depth of about 1 mm.



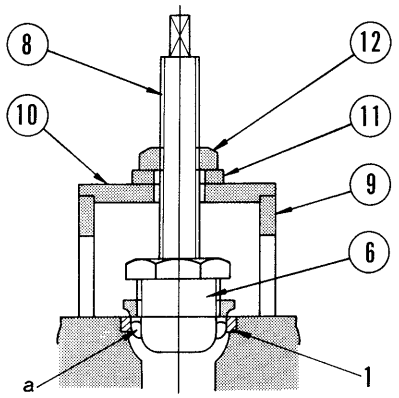
2) Using the puller head on valve seat puller **A**, remove the insert as follows:

i) Press three claws (a) on puller head ⑥ inside by hand and fit the puller head into insert (1).

ii) Tighten screw ⑧ so that the three claws will be pressed into the groove on the inside of the insert.

★ Stop tightening the screw as soon as the claws fit completely into the groove. If the screw is overtightened, the insert may get damaged and it will be difficult to remove.

iii) Place bridge ⑨ around the outside of the puller head, put plates ⑩ and ⑪ on the bridge, and tighten nut ⑫ until the insert is removed.



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