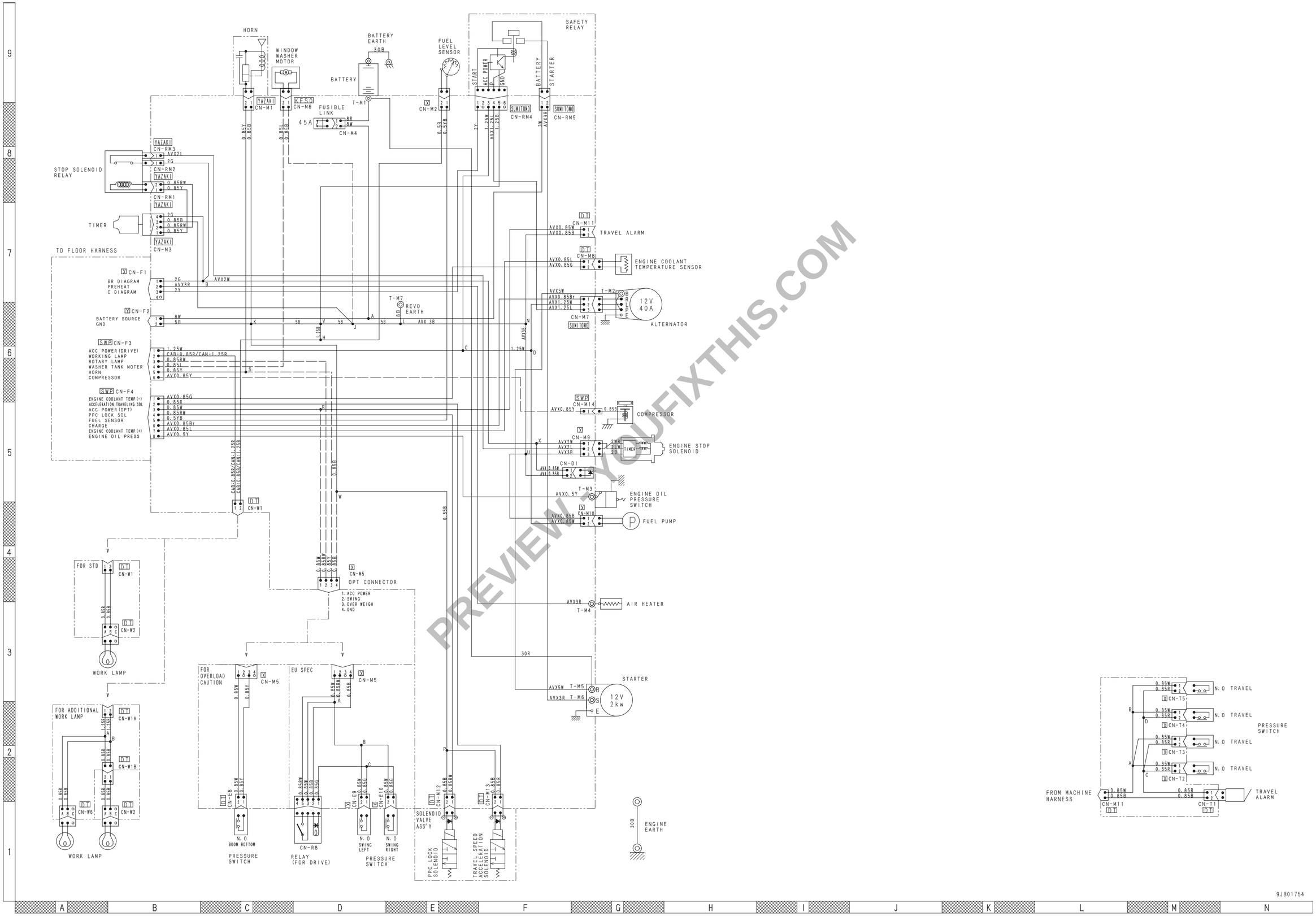
ELECTRICAL CIRCUIT DIAGRAM

PC27MR, 30MR-2
(2/2)

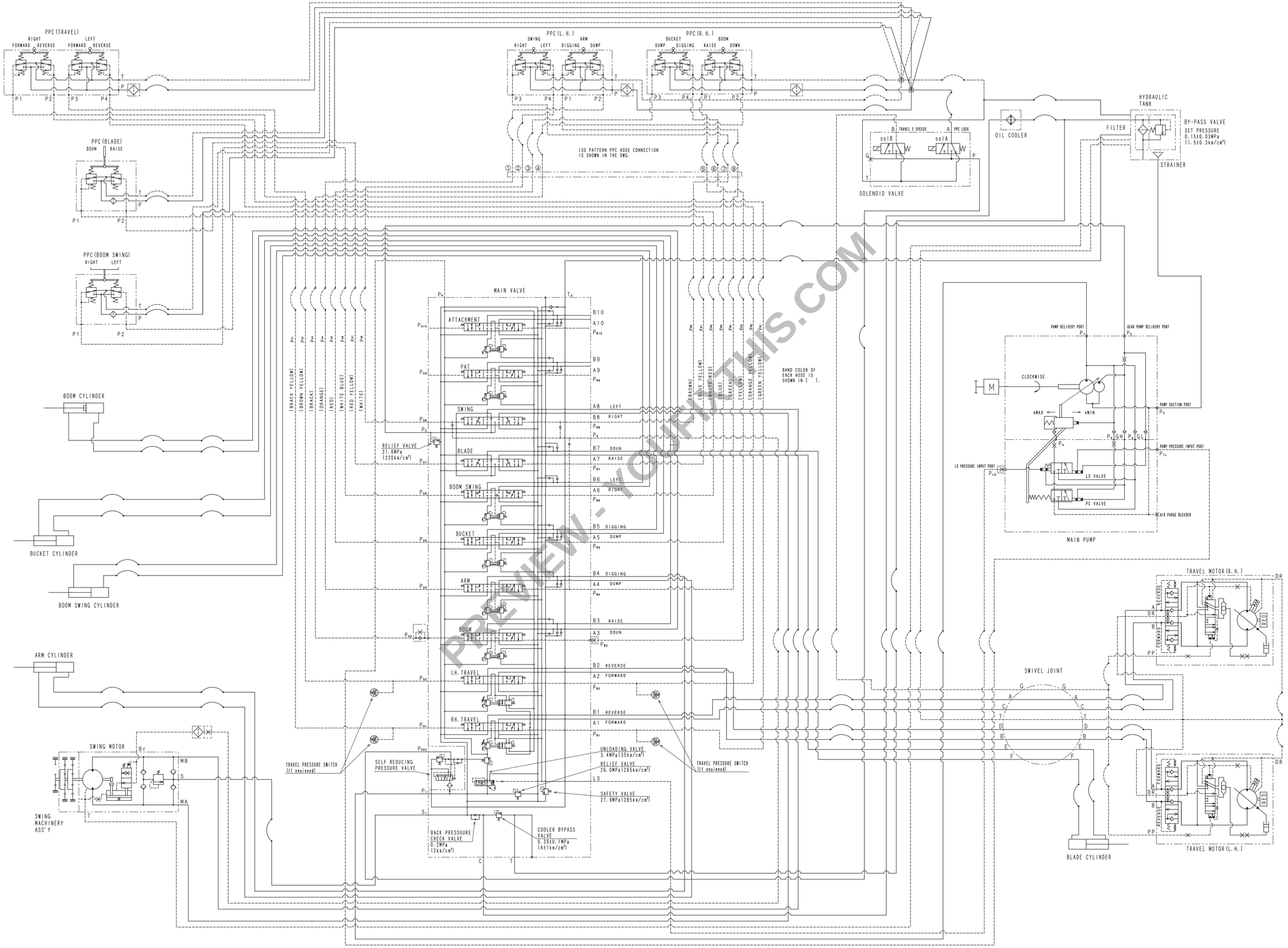


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HYDRAULIC CIRCUIT DIAGRAM

PC30MR-2



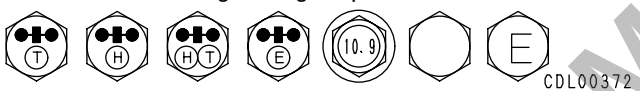
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STANDARD TIGHTENING TORQUE

STANDARD TIGHTENING TORQUE TABLE (WHEN USING TORQUE WRENCH)

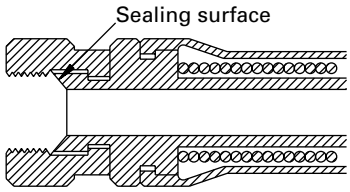
★ In the case of metric nuts and bolts for which there is no special instruction, tighten to the torque given in the table below.

Thread diameter of bolt	Width across flats	Tightening torque	
		 CDL00372	
mm	mm	Nm	kgm
6	10	11.8 – 14.7	1.2 – 1.5
8	13	27 – 34	2.8 – 3.5
10	17	59 – 74	6 – 7.5
12	19	98 – 123	10 – 12.5
14	22	153 – 190	15.5 – 19.5
16	24	235 – 285	23.5 – 29.5
18	27	320 – 400	33 – 41
20	30	455 – 565	46.5 – 58
22	32	610 – 765	62.5 – 78
24	36	785 – 980	80 – 100
27	41	1150 – 1440	118 – 147
30	46	1520 – 1910	155 – 195
33	50	1960 – 2450	200 – 250
36	55	2450 – 3040	250 – 310
39	60	2890 – 3630	295 – 370

Thread diameter of bolt	Width across flats	Tightening torque	
		 CDL00373	
mm	mm	Nm	kgm
6	10	5.9 – 9.8	0.6 – 1.0
8	13	13.7 – 23.5	1.4 – 2.4
10	14	34.3 – 46.1	3.5 – 4.7
12	27	74.5 – 90.2	7.6 – 9.2

TABLE OF TIGHTENING TORQUES FOR FLARED NUTS

★ In the case of flared nuts for which there is no special instruction, tighten to the torque given in the table below.



SAD00483

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

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POINTS TO REMEMBER WHEN TROUBLESHOOTING

⚠ Stop the machine in a level place, and check that the safety pin, blocks, and parking brake are securely fitted.

⚠ When carrying out the operation with two or more workers, keep strictly to the agreed signals, and do not allow any unauthorized person to come near.

⚠ If the radiator cap is removed when the engine is hot, hot water may spurt out and cause burns, so wait for the engine to cool down before starting troubleshooting.

⚠ Be extremely careful not to touch any hot parts or to get caught in any rotating parts.

⚠ When disconnecting wiring, always disconnect the negative (–) terminal of the battery first.

⚠ When removing the plug or cap from a location which is under pressure from oil, water, or air, always release the internal pressure first. When installing measuring equipment, be sure to connect it properly.

The aim of troubleshooting is to pinpoint the basic cause of the failure, to carry out repairs swiftly, and to prevent reoccurrence of the failure.
When carrying out troubleshooting, and important point is of course to understand the structure and function.
However, a short cut to effective troubleshooting is to ask the operator various questions to form some idea of possible causes of the failure that would produce the reported symptoms.

1. When carrying out troubleshooting, do not hurry to disassemble the components.
If components are disassembled immediately any failure occurs:
- Parts that have no connection with the failure or other unnecessary parts will be disassembled.
- It will become impossible to find the cause of the failure.

It will also cause a waste of manhours, parts, or oil or grease, and at the same time, will also lose the confidence of the user or operator.
For this reason, when carrying out troubleshooting, it is necessary to carry out thorough prior investigation and to carry out troubleshooting in accordance with the fixed procedure.

2. Points to ask user or operator
1) Have any other problems occurred apart from the problem that has been reported?
2) Was there anything strange about the machine before the failure occurred?
3) Did the failure occur suddenly, or were there problems with the machine condition before this?
4) Under what conditions did the failure occur?
5) Had any repairs been carried out before the failure?
When were these repairs carried out?
6) Has the same kind of failure occurred before?

3. Check before troubleshooting
1) Check the oil level
2) Check for any external leakage of oil from the piping or hydraulic equipment.
3) Check the travel of the control levers.
4) Check the stroke of the control valve spool.
5) Other maintenance items can be checked externally, so check any item that is considered to be necessary.

4. Confirming failure
- Confirm the extent of the failure yourself, and judge whether to handle it as a real failure or as a problem with the method of operation, etc.
  - ★ When operating the machine to reenact the troubleshooting symptoms, do not carry out any investigation or measurement that may make the problem worse.

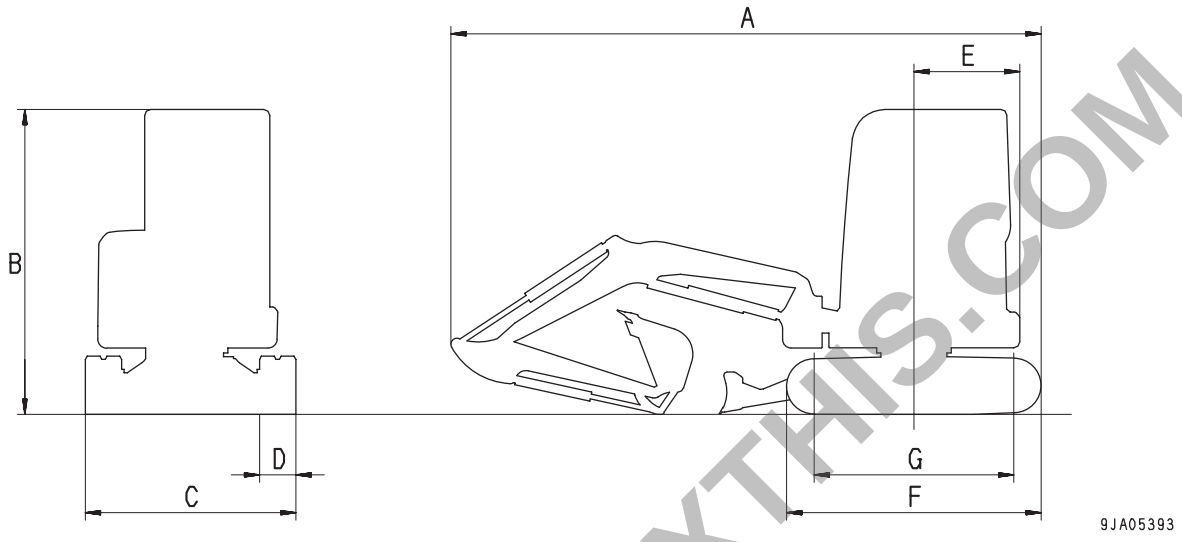
5. Troubleshooting
- Use the results of the investigation and inspection in Items 2 – 4 to narrow down the causes of failure, then use the troubleshooting flowchart to locate the position of the failure exactly.
  - ★ The basic procedure for troubleshooting is as follows.
    1) Start from the simple points.
    2) Start from the most likely points.
    3) Investigate other related parts or information.

6. Measures to remove root cause of failure
- Even if the failure is repaired, if the root cause of the failure is not repaired, the same failure will occur again.
To prevent this, always investigate why the problem occurred. Then, remove the root cause.

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SPECIFICATION DIMENSION DRAWING



	Item		Unit	PC27MR-2	PC30MR-2	PC35MR-2	PC35MR-2 (High altitude spec. S/No. 6736 and up)
	Operating weight	Canopy specification	kg	3,170 <2,980>	3,435 <3,245>	3,815 <3,655>	
		Cab specification		3,310 <3,120>	3,550 <3,360>	3,990 <3,855>	4,005 <3,845>
	Bucket capacity		m^3	0.08	0.09	0.11	
	Engine model		—	Komatsu 3D82AE-5M Diesel engine	Komatsu 3D84E-5N Diesel engine	Komatsu 3D88E-5P Diesel engine	Komatsu S3D84E-5PBA Diesel engine
	Rated engine output		kW{HP}/rpm	18.9 {25.3} / 2,600	20.6 {27.6} / 2,500	21.7 {29.1} / 2,400	23.9 {32.5} / 2,400
A	Overall length		mm	4,320	4,630	4,850	
B	Overall height		mm	2,530			
C	Overall width		mm	1,550		1,740	
D	Shoe width		mm	300			
E	Tail swing radius	Canopy specification	mm	855 <775>		950 <870>	
		Cab specification		885 <885>		950 <885>	
F	Overall length of track		mm	1,950	2,105		
G	Distance between tumbler centers		mm	1,485	1,650		
	Minimum ground clearance		mm	320		290	
	Travel speed (Low / High)		km/h	2.6 / 4.6		2.8 / 4.6	
	Continuous swing speed		rpm	9.2	9.3	9.0	

★ Values in < > are for the X-weightless specifications.
★ Operating weight of machine with full tank of fuel and an 75kg operator (ISO 6016).

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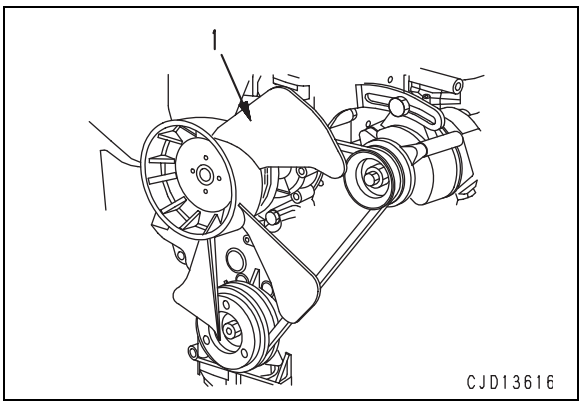
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REMOVAL AND INSTALLATION OF FUEL INJECTION PUMP ASSEMBLY

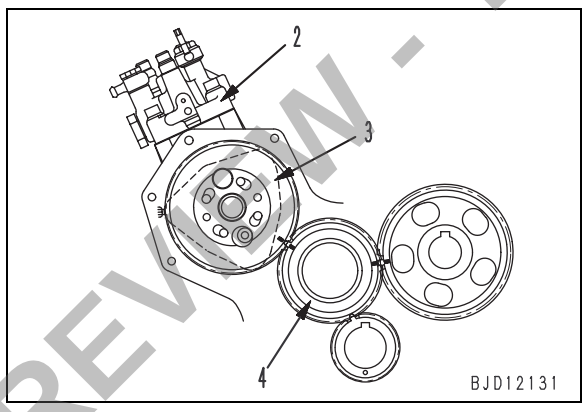
REMOVAL

1. Tilt up the floor frame.
   For details, see TESTING AND ADJUSTING, How to open and close (tilt) floor.

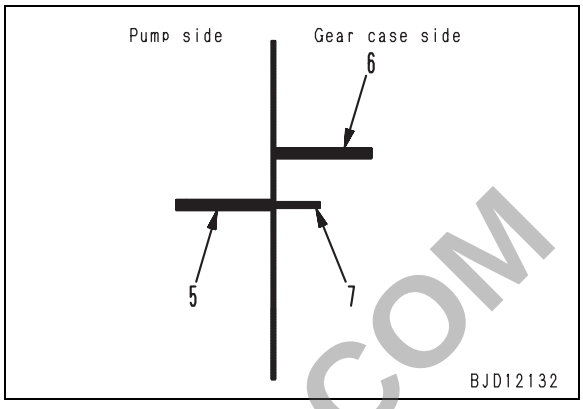
2. Loosen the fan belt and remove fan (1). [*1]
   ★ Before removing fan (1), make a match mark on it and mounting part.



3. Before removing fuel injection pump (2), remove the front cover of the timing gear case and make match marks with paint on the meshing parts of pump drive gear (3) and idle gear (4).

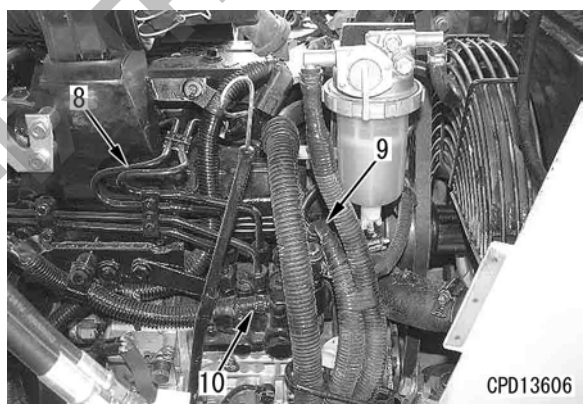


4. Take an accurate record of the positions of stamp line (5) of the fuel injection pump body and stamp line (6) of the gear case by making mark (7) on the gear case.

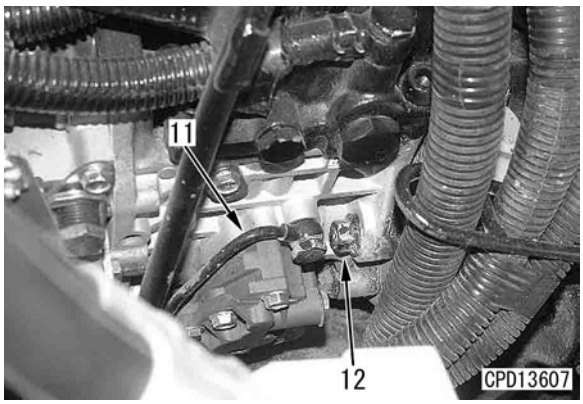


5. Remove fuel tube (8). [*2]

6. Disconnect fuel hoses (9) and (10) and engine stop solenoid connector.



7. Remove lubrication tube (11) and 3 fuel injection pump mounting nuts (12).

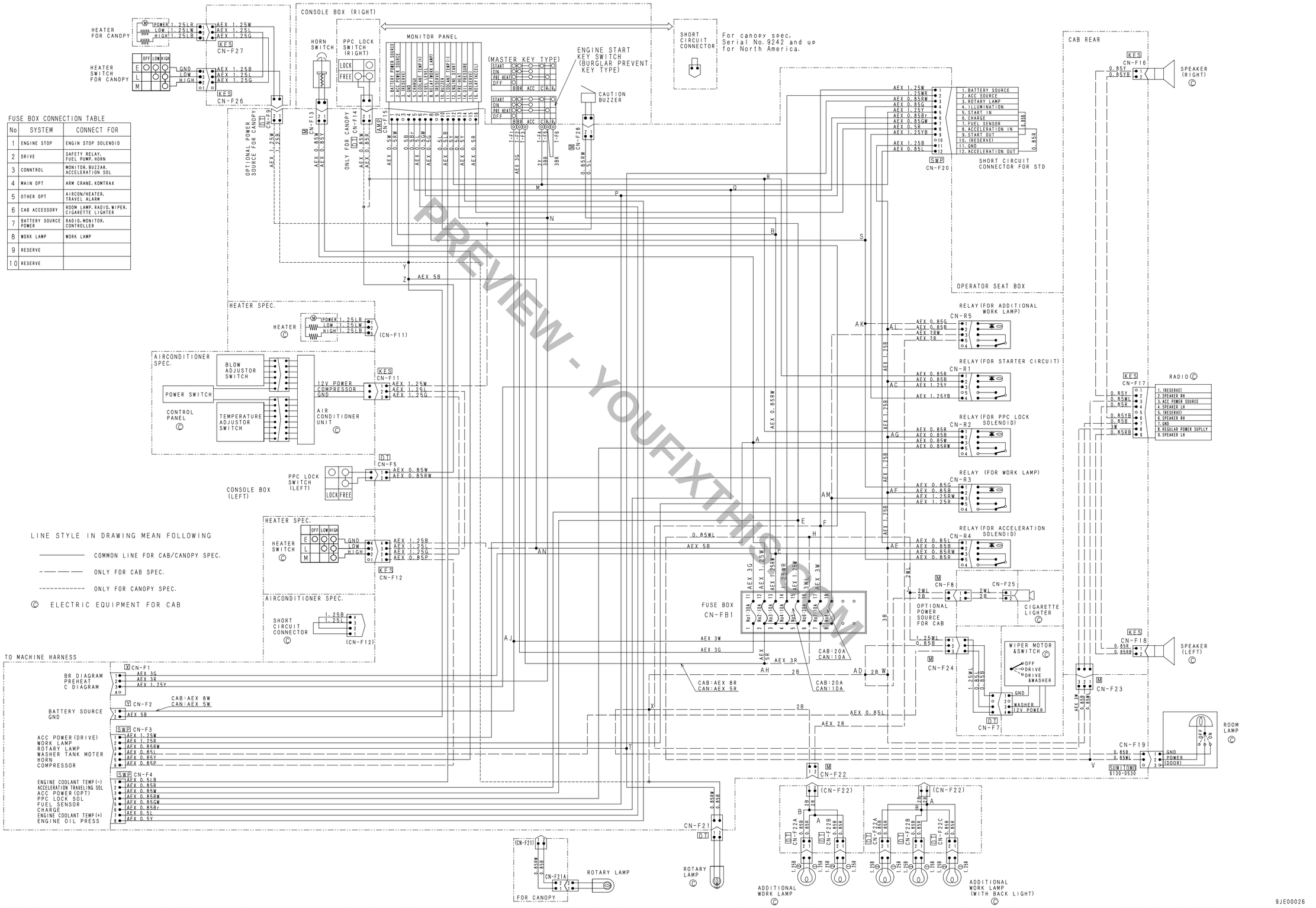


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ELECTRICAL CIRCUIT DIAGRAM

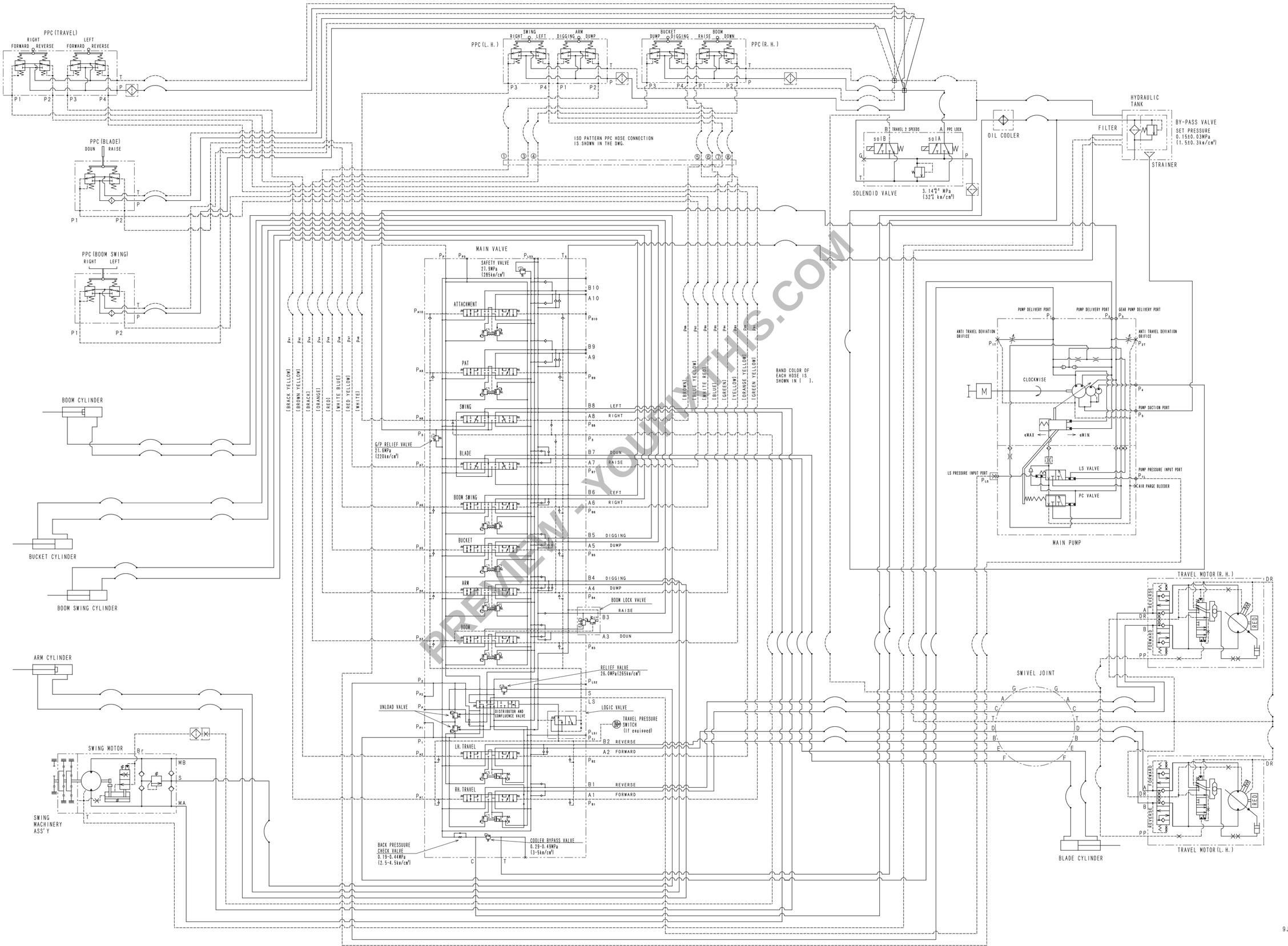
PC35MR-2
(1/2)



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HYDRAULIC CIRCUIT DIAGRAM

PC35MR-2



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TABLE OF TIGHTENING TORQUES FOR SPLIT FLANGE BOLTS

★ In the case of split flange bolts for which there is no special instruction, tighten to the torque given in the table below.

Thread diameter	Width across flat	Tightening torque	
mm	mm	Nm	kgm
10	14	59 – 74	6 – 7.5
12	17	98 – 123	10 – 12.5
16	22	235 – 285	23.5 – 29.5

TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PIPING JOINTS

★ Unless there are special instructions, tighten the O-ring boss piping joints to the torque below.

Norminal No.	Thread diameter	Width across flat	Tightening torque (Nm {kgm})	
	mm	mm	Range	Target
02	14	Varies depending on type of connector.	35 – 63 {3.5 – 6.5}	44 {4.5}
03, 04	20		84 – 132 {8.5 – 13.5}	103 {10.5}
05, 06	24		128 – 186 {13.0 – 19.0}	157 {16.0}
10, 12	33		363 – 480 {37.0 – 49.0}	422 {43.0}
14	42		746 – 1010 {76.0 – 103}	883 {90.0}

TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PLUGS

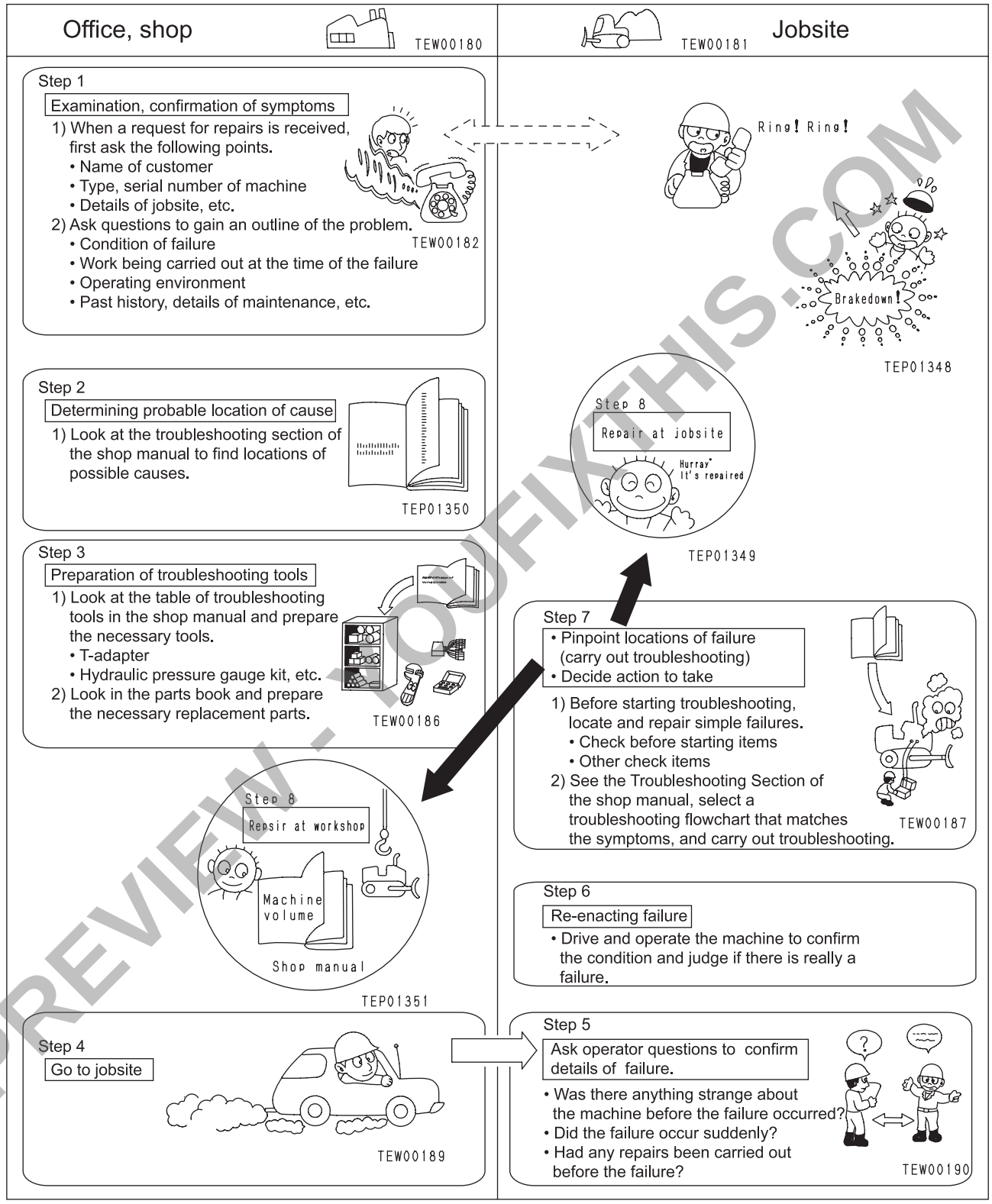
★ Unless there are special instructions, tighten the O-ring boss plugs to the torque below.

Norminal No.	Thread diameter	Width across flat	Tightening torque (Nm {kgm})	
	mm	mm	Range	Target
08	08	14	5.88 – 8.82 {0.6 – 0.9}	7.35 {0.75}
10	10	17	9.8 – 12.74 {1.0 – 1.3}	11.27 {1.15}
12	12	19	14.7 – 19.6 {1.5 – 2.0}	17.64 {1.8}
14	14	22	19.6 – 24.5 {2.0 – 2.5}	22.54 {2.3}
16	16	24	24.5 – 34.3 {2.5 – 3.5}	29.4 {3.0}
18	18	27	34.3 – 44.1 {3.5 – 4.5}	39.2 {4.0}
20	20	30	44.1 – 53.9 {4.5 – 5.5}	49.0 {5.0}
24	24	32	58.8 – 78.4 {6.0 – 8.0}	68.6 {7.0}
30	30	32	93.1 – 122.5 {9.5 – 12.5}	107.8 {11.0}
33	33	—	107.8 – 147.0 {11.0 – 15.0}	124.4 {13.0}
36	36	36	127.4 – 176.4 {13.0 – 18.0}	151.9 {15.5}
42	42	—	181.3 – 240.1 {18.5 – 24.5}	210.7 {21.5}
52	52	—	274.4 – 367.5 {28.0 – 37.5}	323.4 {33.0}

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SEQUENCE OF EVENTS IN TROUBLESHOOTING



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SPECIFICATIONS

Machine model				PC27MR-2	
				Canopy specification	Cab specification
Serial number				15001 and up	
Bucket capacity			m^3	0.08	0.08
Operating weight			kg	3,170 <2,980> [3,075]	3,310 <3,120> [3,215]
Performance	Working ranges	Max. digging depth	mm	2,650	2,650
		Max. vertical wall depth	mm	2,185	2,185
		Max. digging reach	mm	4,700	4,700
		Max. reach at ground level	mm	4,550	4,550
		Max. digging height	mm	4,500	4,500
		Max. dumping height	mm	3,230	3,230
		Bucket offset	mm	580 (L.H.), 845 (R.H.)	580 (L.H.), 845 (R.H.)
		Max. blade lifting height	mm	360	360
		Max. blade lowering depth	mm	315	315
	Max. digging force (bucket)		kN {kg}	21.9 {2,230}	21.9 {2,230}
	Continuous swing speed		rpm	9.2	9.2
	Swing max. slope angle		deg.	19.0	19.0
	Travel speed		km/h	2.6 (Lo) / 4.6 (Hi)	2.6 (Lo) / 4.6 (Hi)
	Gradeability		deg.	30	30
	Ground pressure		kPa {kg/cm^2}	31.7 {0.32} <29.8 {0.30}> [30.7 {0.31}]	33.1 {0.34} <31.2 {0.32}> [32.1 {0.33}]
Dimensions	Overall length (for transport)		mm	4,320	4,320
	Overall width		mm	1,550	1,550
	Overall height (for transport)		mm	2,530 [2,525]	2,530 [2,525]
	Ground clearance of conterweight		mm	545 [540]	545 [540]
	Min. ground clearance		mm	320 [320]	320 [320]
	Tail swing radius		mm	855 <775>	885 <885>
	Min. swing radius of work equipment (at boom swing)		mm	1,910 (1,510)	1,910 (1,510)
	Height of work equipment at min. swing radius		mm	3,440	3,440
	Overall width of crawler		mm	1,550	1,550
	Overall length of crawler		mm	1,950	1,950
	Distance between tumbler centers		mm	1,485	1,485
	Track gauge		mm	1,250	1,250
	Machine cab height		mm	1,380	1,380
	Blade width x height		mm	1,550 x 325	1,550 x 325

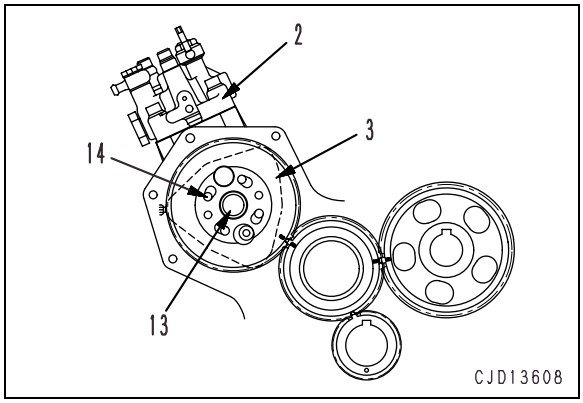
★ Values are common to all specifications, unless otherwise specified. (The values of the rubber shoe specification are shown.)
★ Values in < > are for the X-weightless specifications.
★ Values in [ ] are for the X-weightless and steel shoe specification.
★ Operating weight of machine with full tank of fuel and an 75kg operator (ISO 6016).

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8. Remove nut (13) from the end of the fuel injection pump drive shaft. [*3]
   ★ Take care not to drop the nut into the case.
   ★ Never loosen mounting bolts (14) of pump drive gear (3) and flange. (If the flange and pump drive gear move from each other, it becomes very difficult to adjust the injection timing.)

9. Using a puller, push out the pump drive shaft from the gear and remove fuel injection pump assembly (2). [*4]



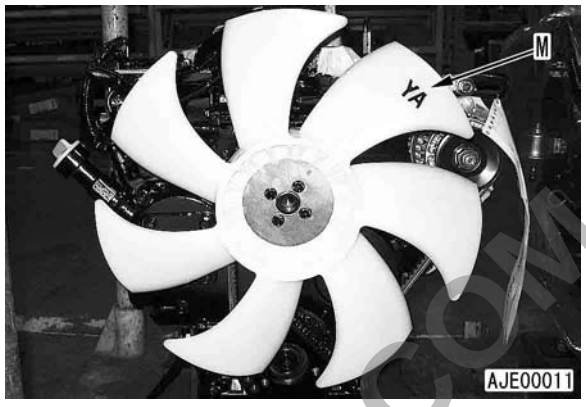
INSTALLATION

- Carry out installation in the reverse order to removal.

[*1]
★ When installing the fan, line up the match marks.
★ Check that the identification mark (M) of the fan is on outside.

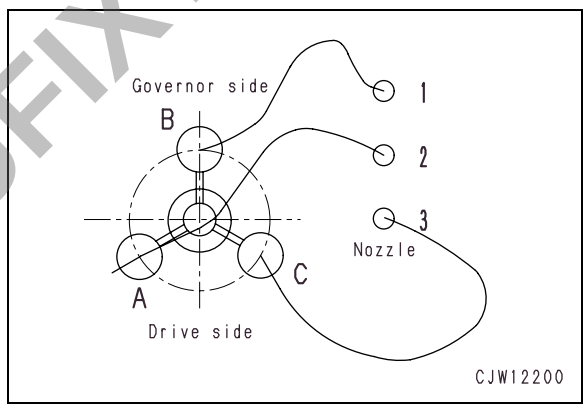
Machine model	Engine type	Identification mark (M)
PC27MR-2	3D82AE	T
PC30MR-2	3D84E	YA
PC35MR-2	S3D84E	YA
	3D88E	YA
PC40MR-2	4D88E	KS
PC50MR-2	4D88E	KS

- Sample of identification mark

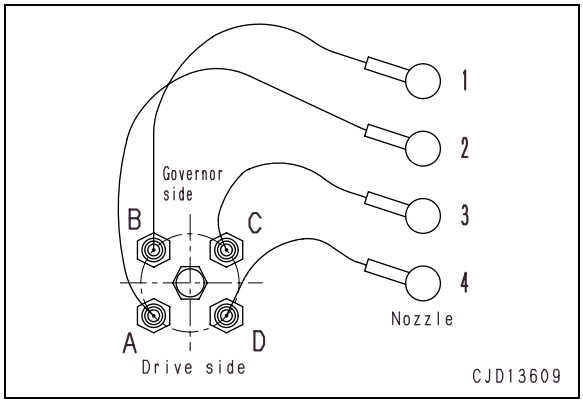


[*2]
★ Referring to the following figure, install the fuel tube.
★ The cylinder of the engine on the flywheel side is the No. 1 cylinder.

PC27, 30, 35MR-2



PC40, 50MR-2



[*3]
Nut at shaft end:
113 – 123 Nm {11.5 – 12.5 kgm}

[*4]
★ Install the fuel injection pump temporarily, and then tighten the nut at the shaft end first.
★ Adjust the injection angle. For details, see TESTING AND ADJUSTING, Testing and adjusting fuel injection timing.

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TIGHTENING TORQUE FOR 102 AND 114 ENGINE SERIES

1) BOLT AND NUTS

Use these torques for bolts and nuts (unit: mm) of Cummins Engine.

Thread diameter	Tightening torque	
mm	Nm	kgm
6	10 ± 2	1.02 ± 0.20
8	24 ± 4	2.45 ± 0.41
10	43 ± 6	4.38 ± 0.61
12	77 ± 12	7.85 ± 1.22

2) EYE JOINTS

Use these torques for eye joints (unit: mm) of Cummins Engine.

Thread diameter	Tightening torque	
mm	Nm	kgm
6	8 ± 2	0.81 ± 0.20
8	10 ± 2	1.02 ± 0.20
10	12 ± 2	1.22 ± 0.20
12	24 ± 4	2.45 ± 0.41
14	36 ± 5	3.67 ± 0.51

3) TAPERED SCREWS

Use these torques for tapered screws (unit: inch) of Cummins Engine.

Thread diameter	Tightening torque	
inch	Nm	kgm
1 / 16	3 ± 1	0.31 ± 0.10
1 / 8	8 ± 2	0.81 ± 0.20
1 / 4	12 ± 2	1.22 ± 0.20
3 / 8	15 ± 2	1.53 ± 0.20
1 / 2	24 ± 4	2.45 ± 0.41
3 / 4	36 ± 5	3.67 ± 0.51
1	60 ± 9	6.12 ± 0.92

TIGHTENING TORQUE TABLE FOR HOSES (TAPER SEAL TYPE AND FACE SEAL TYPE)

★ Tighten the hoses (taper seal type and face seal type) to the following torque, unless otherwise specified.

★ Apply the following torque when the threads are coated (wet) with engine oil.

Nominal size of hose	Width across flats	Tightening torque (Nm {kgm})		Taper seal type	Face seal type	
		Range	Target	Thread size (mm)	Nominal thread size - Threads per inch, Thread series	Root diameter (mm) (Reference)
02	19	34 – 54 {3.5 – 5.5}	44 {4.5}	–	$\frac{9}{16}$ – 18UN	14.3
		34 – 63 {3.5 – 6.5}	44 {4.5}	14	–	–
03	22	54 – 93 {5.5 – 9.5}	74 {7.5}	–	$\frac{11}{16}$ – 16UN	17.5
	24	59 – 98 {6.0 – 10.0}	78 {8.0}	18	–	–
04	27	84 – 132 {8.5 – 13.5}	103 {10.5}	22	$\frac{13}{16}$ – 16UN	20.6
05	32	128 – 186 {13.0 – 19.0}	157 {16.0}	24	1 – 14UNS	25.4
06	36	177 – 245 {18.0 – 25.0}	216 {22.0}	30	$1\frac{3}{16}$ – 12UN	30.2
(10)	41	177 – 245 {18.0 – 25.0}	216 {22.0}	33	–	–
(12)	46	197 – 294 {20.0 – 30.0}	245 {25.0}	36	–	–
(14)	55	246 – 343 {25.0 – 35.0}	294 {30.0}	42	–	–

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E-1 ENGINE DOES NOT START

1) Engine does not start (Starting motor does not rotate)

PC27, 30, 35MR-2

(*1): Except PC27MR-2, Serial No. 17902 and up, and PC35MR-2, Serial No. 9242 and up for North America.

Failure information	• Engine does not start (Starting motor does not rotated)
Relative information	• Since the engine starting circuit has a locking function, the engine cannot start if the PPC lock lever (lock lever) is not in the LOCK position. • The lock lever is installed to the right and left side of the canopy specification and to the left side of the cab specification.

<table>
<tr><td rowspan="20">Presumed cause and standard value in normalcy</td><td colspan="2">Cause</td><td colspan="3">Standard value in normalcy and references for troubleshooting</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Insufficient battery capacity</td><td>Battery voltage</td><td colspan="2">Electrolyte specific gravity</td></tr>
<tr><td>Min. 12 V</td><td colspan="2">Min. 1.26</td></tr>
<tr><td>2</td><td>Defective 45-A fusible link or fuse (12) or (13)</td><td colspan="3">If the fusible link or fuse is broken, the circuit probably has a grounding fault.</td></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Defective starting switch (Internal defective contact)</td><td colspan="3">1) Turn starting switch OFF.
2) Disconnect negative (–) terminal of battery.</td></tr>
<tr><td>Starting switch</td><td>Position</td><td>Resistance</td></tr>
<tr><td rowspan="2">Between (T-F1) terminal B and (T-F4) terminal C</td><td>OFF</td><td>Min. 1 MΩ</td></tr>
<tr><td>START</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="2">Between (T-F1) terminal B and (T-F3) terminal ACC</td><td>OFF</td><td>Min. 1 MΩ</td></tr>
<tr><td>ON</td><td>Max. 1 Ω</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Defective PPC lock switch (left)
(Internal defective contact)</td><td colspan="3">1) Turn starting switch OFF.
2) Disconnect connector F5.
3) Connect T-adapter to F5 (male).</td></tr>
<tr><td>F5 (male)</td><td>Lock lever position</td><td>Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (2)</td><td>FREE</td><td>Max. 1 Ω</td></tr>
<tr><td>LOCK</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Defective PPC lock switch (right)
(Internal defective contact)
* Only canopy specification (*1)</td><td colspan="3">1) Turn starting switch OFF.
2) Disconnect connector F14.
3) Connect T-adapter to F14 (male).</td></tr>
<tr><td>F14 (male)</td><td>Lock lever position</td><td>Resistance</td></tr>
<tr><td rowspan="2">Between (1) and (2)</td><td>FREE</td><td>Max. 1 Ω</td></tr>
<tr><td>LOCK</td><td>Min. 1 MΩ</td></tr>
<tr><td rowspan="6">6</td><td rowspan="6">Defective starting motor cut-out relay
(Internal disconnection, defective contact, or fixing)</td><td colspan="3">1) Turn starting switch OFF.
2) Disconnect relay R1.
3) Connect T-adapter to R1 (male).</td></tr>
<tr><td>R1 (male)</td><td colspan="2">Resistance</td></tr>
<tr><td>Between (1) and (2)</td><td colspan="2">86 – 106 Ω</td></tr>
<tr><td>Between (3) and (4)</td><td colspan="2">Max. 1 Ω</td></tr>
<tr><td>Between (3) and (5)</td><td colspan="2">Min. 1 MΩ</td></tr>
<tr><td colspan="3">1) Turn starting switch OFF.
2) Insert T-adapter in relay R1.
3) Turn starting switch ON.</td></tr>
<tr><td>R1</td><td colspan="2">Voltage</td></tr>
<tr><td>Between (4) and ground
(Set PPC lock lever in LOCK and starting switch in START)</td><td colspan="2">10 – 15 V</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Defective starting motor</td><td colspan="3">1) Turn starting switch from OFF to START for troubleshooting.
(If power supply and starting input/output are normal and starting motor does not rotate, starting motor is defective.)</td></tr>
<tr><td>Starting motor</td><td>Starting switch</td><td>Voltage</td></tr>
<tr><td>Power supply: Between terminal B and ground</td><td>ON</td><td>10 – 15 V</td></tr>
<tr><td>Starting input: Between terminal S and ground</td><td>START</td><td>10 – 15 V</td></tr>
</table>

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Machine model				PC27MR-2	
				Canopy specification	Cab specification
Serial number				15001 and up	
Engine	Model			3D82AE-5M	
	Type			4-cycle, water cooled, in-line direct injection type	
	No. of cylinders – bore x stroke		mm	3 – 82 x 84	
	Piston displacement		ℓ {cc}	1.330 {1,330}	
	Performance	Flywheel horsepower	kW/rpm {HP/rpm}	18.9 / 2,600 {25.7 / 2,600}	
		Maximum torque	Nm/rpm {kgm/rpm}	83.2 / 1,560 {8.4 / 1,560}	
		High idle speed	rpm	2,780	
		Low idle speed	rpm	1,250	
		Min. fuel consumption ratio	g/kWh {g/HPh}	235 {173}	
	Starting motor			12V, 2.0kW	
	Alternator			12V, 40A	
	Battery (*1)			12V, 58Ah x 1 (90D26L)	
	Radiator • Core type			CF34-1	
Under-carriage	Carrier roller			1 on each side	
	Track roller			4 on each side	
	Track shoe (Rubber shoe)			Unit-type rubber crawler	
	Track shoe (Steel shoe)			Assembly-type double grouser: 40 each side	
Hydraulic system	Hydraulic pump	Type x no.		Variable displacement piston type x 1, gear type x 1	
		Theoretical capacity	cm^3/rev	30 + 8.5	
		Set pressure			
		For travel, work equipment	MPa {kg/cm^2}	24.5 {250}	
		For swing	MPa {kg/cm^2}	17.2 {175}	
		For blade	MPa {kg/cm^2}	21.1 {215}	
	Control valve	Type x no.		9-spool type x 1	
		Control method		Hydraulic assist type	
	Hydraulic motor	Travel motor		Variable-displacement piston motor (with counterval-ance valve, parking brake) x 2	
		Swing motor		Fixed-displacement piston motor (with brake valve, swing shaft brake) x 1	
	Hydraulic tank			Box-shaped, open type	
	Hydraulic oil filter			Tank return side	
	Hydraulic oil cooler			Air cooled (Drawn-CUP)	
	Work equipment cylinder	Boom cylinder	Cylinder type	Double acting piston	
			Inside diameter of cylinder	mm	ø 75
			Outside diameter of piston rod	mm	ø 45
			Stroke	mm	552.5
			Max. distance between pins	mm	1,450
			Min. distance between pins	mm	897.5

*1: The battery capacity (Ah) is based on 5-hour rate.

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REMOVAL AND INSTALLATION OF RADIATOR AND HYDRAULIC OIL COOLER ASSEMBLY

PC27, 30, 35MR-2

REMOVAL

1. Release the air pressure in the hydraulic tank. For details, see TESTING AND ADJUSTING, Releasing air in hydraulic tank.

2. Tilt up the floor frame.
   For details, see TESTING AND ADJUSTING, How to open and close (tilt) floor.

3. Drain the coolant.
   Coolant: **3.3** ℓ

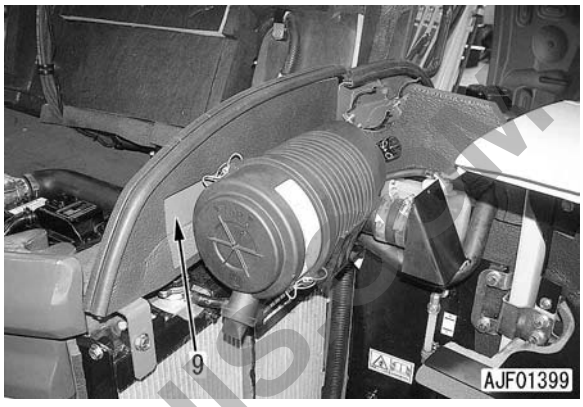
4. Remove cover (7).



5. Remove all the mounting bolts of plate (8) on the left side of the engine.
   ★ Since the plate cannot be removed, set it so that it can be removed.

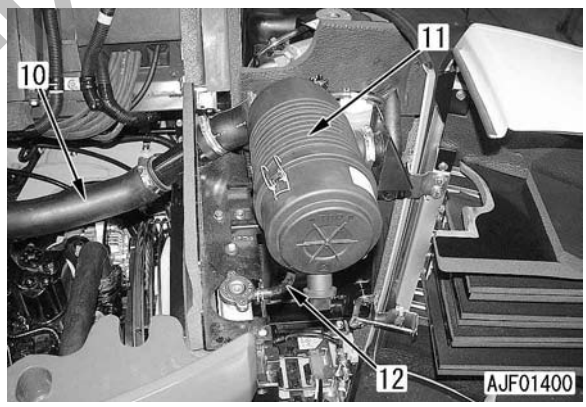


6. Open the rear cover of the machine and right side cover. Remove all the mounting bolts of plate (9) on the right side of the engine, and then raise the plate toward the front of the machine and secure it with ropes, etc.

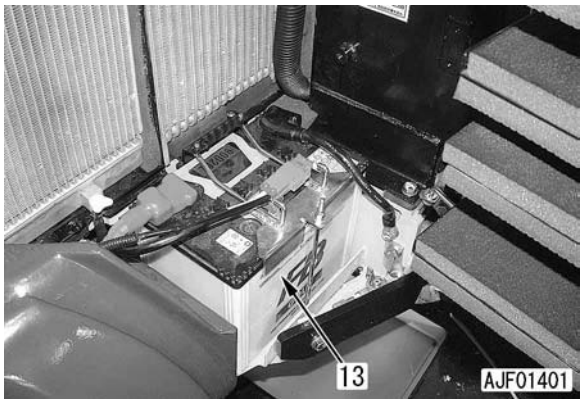


7. Remove air hose (10) and air cleaner case and bracket assembly (11).

8. Remove reservoir tank hose (12).



9. Remove battery (13).



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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, hand shield, 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.

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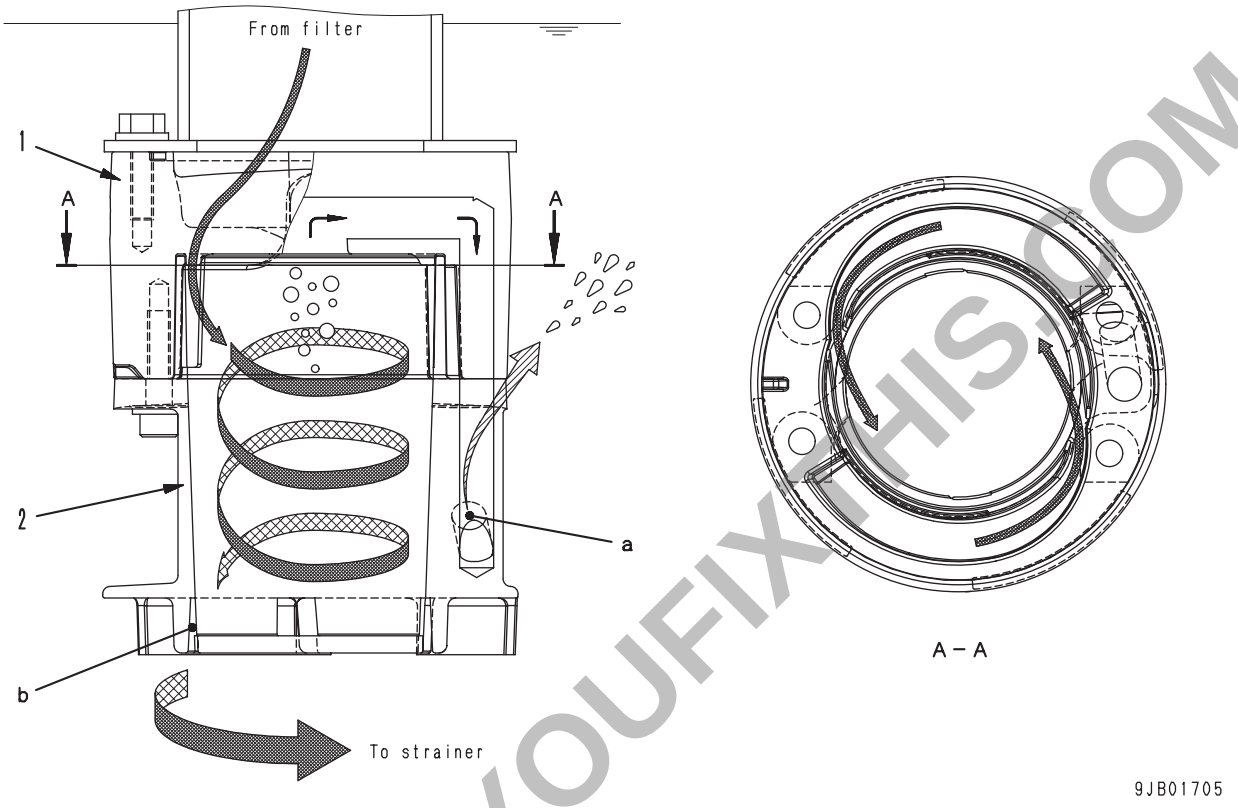
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OPERATION OF CYCLONE ASSEMBLY



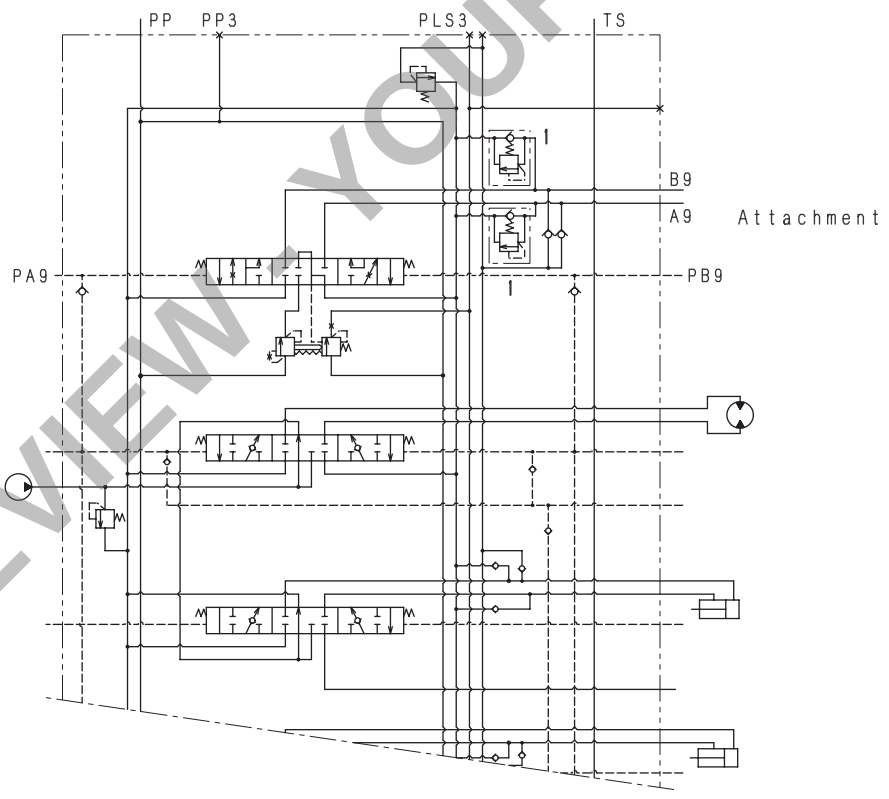
- The hydraulic oil returning from each actuator flows through the filter to block (1) of the cyclone assembly.
- When the hydraulic oil flows from block (1) into the cylindrical part of cyclone (2), it swirls and its speed is increased.
- Since the hydraulic oil swirls, a centrifugal force is generated and bubbles of low specific gravity gather to the center.
- The bubbles gathering to the center are discharged through the upper center of block (1) and outlet (**a**) on the side of cyclone (2) into the hydraulic oil in the tank. The hydraulic oil and air are separated in this way.
- The hydraulic oil containing no bubbles is discharged through outlet (**b**) at the bottom of cyclone (2), and then it flows through the strainer into the pump again.

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1. Unload valve
   Set pressure :
   LS pressure + 2.45 MPa {25.0 kg/cm^2}
2. Safety valve
   Set pressure : 28.0 MPa {285 kg/cm^2}
3. Main relief valve
   Set pressure : 26.0 MPa {265 kg/cm^2}
4. Merge-divider valve
5. Logic valve
6. Pressure compensation valve
7. Suction valve
8. Pilot pressure check valve
9. Check valve
10. Back pressure check valve
    Set pressure : 0.34 MPa {3.5 kg/cm^2}
11. Oil cooler bypass valve
    Set pressure : 0.39 MPa {4.0 kg/cm^2}
12. Swing relief valve
    (for gear pump)
    Set pressure : 21.6 MPa {220 kg/cm^2}
13. Boom lock valve

2. 9 spool valve



1. Port relief valve
   Set pressure (with stop valve): 20.6 MPa {210 kg/cm^2}
   Set pressure (with quick coupler): 17.2 MPa {175 kg/cm^2}

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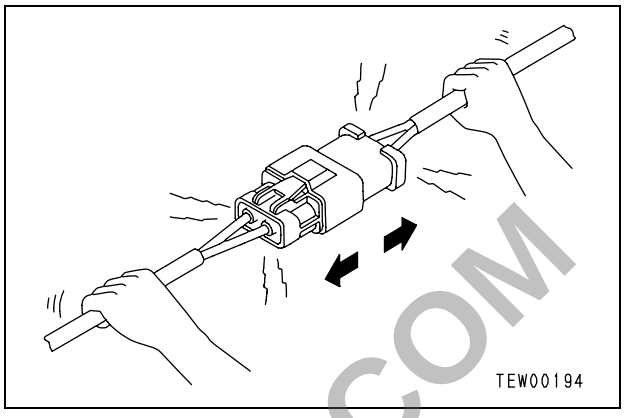
STANDARD VALUE TABLE FOR ENGINE RELATED PARTS

Applicable model			PC27MR-2	
Engine			3D82AE-5M	
Item	Measurement condition	Unit	Standard value for new machine	Service limit value
Engine speed	High idle	rpm	2,780 ± 25	—
	Low idle		1,250 $^{+50}_{0}$	—
	Rated speed		2,600	—
Exhaust gas color	At sudden acceleration	Bosch index	Max. 4.0	5.5
	At high idle		Max. 1.0	2.0
Valve clearance (Normal temperature)	Intake valve	mm	0.20	—
	Exhaust valve		0.20	—
Compression pressure	Oil temperature: 40 – 60°C Engine speed: 250rpm	MPa {kg/cm^2}	3.16 {32}	2.45 {25}
Blow-by pressure	(Coolant temperature: operating range) At high idle	kPa {mmH_2O}	— {—}	— {—}
Oil pressure (SAE30W)	(Coolant temperature: operating range) At high idle	MPa {kg/cm^2}	0.29 – 0.39 {3.0 – 4.0}	Min. 0.2 {Min. 2.0}
	At low idle		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
Fuel injection timing	Before Top Dead Center	°(degree)	16	—
Alternator belt tension	Deflection when pressed with finger force of approx. 98 N{10 kg}	mm	7 – 12	—

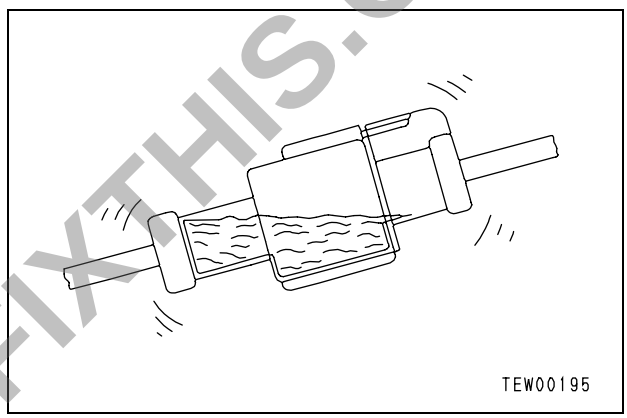
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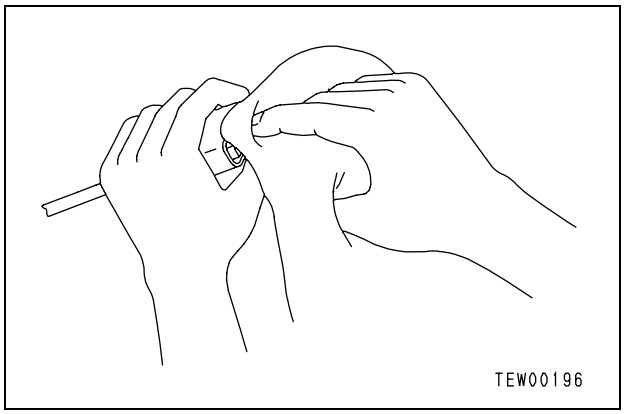
(3) Disconnections in wiring
If the wiring is held and the connectors are pulled apart, or components are lifted with a crane with the wiring still connected, or a heavy object hits the wiring, the crimping of the connector may separate, or the soldering may be damaged, or the wiring may be broken.



(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.
As already said, the connector is designed to prevent water from entering, but at the same time, if 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.



(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 stuck to the connector, wipe it off with a dry cloth or blow it dry with compressed 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.
★ If there is oil or water in the compressed air, the contacts will become even dirtier, so remove the oil and water from the compressed air completely before cleaning with compressed air.



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INFORMATION CONTAINED IN TROUBLESHOOTING TABLE

★ Troubleshooting Table collectively carry the following information. Carry out troubleshooting work after fully grasping their contents.

Failure information	Phenomena occurring on machine
Relative information	Information on occurred failures and troubleshooting

	Cause		Standard value in normalcy and references for troubleshooting
Presumed cause and standard value in normalcy	1	Cause for presumed failure (The attached No. for filing and reference purpose only. It does not stand for any priority)	<Contents> • The standard values in normalcy by which to judge "good" or "no good" about presumed causes. • References for making judgement of "good" or "no good"
	2		
	3		
	4		
	5		

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S-11 OIL IS IN COOLANT, OR WATER SPURTS BACK, OR WATER LEVEL GOES DOWN

General causes why oil is in coolant

- Internal leakage in lubrication system
- Internal leakage in cooling system

			Causes: Broken cylinder head, head gasket	Causes: Internal cracks in cylinder block
Questions	Confirm recent repair history			
	Degree of use of machine	Operated for long period		
	Oil level	Suddenly increased	○	
		Gradually increased		○
	Hard water is being used as coolant			
Check items	Engine oil level has risen, oil is cloudy white			○
	Excessive air bubbles inside radiator, spurts back		◎	
Trouble-shooting	Pressure-tightness test of cylinder head shows there is leakage		●	
	Remove oil pan and inspect directly			●
		Remedy	Replace	Replace

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