TOYOTA

SERVICE SPECIFICATIONS

EXCEPT USA & CANADA
COMMERCIAL CARS

1977

TOYOTA MOTOR SALES CO., LTD.

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FOREWORD

This booklet contains service specifications for maintenance of all 1977 model Toyota Vehicle to except USA and Canada.

For proper servicing of the Toyota vehicles, this booklet should be utilized in conjunction with each repair manual already published.

All specifications contained herein were the most up-to-date at the time of printing, and please refer closely to the Service Bulletin for any changes which may be incorporated at a latter date.

November 1976

TOYOTA MOTOR SALES CO., LTD.

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STANDARD BOLT TIGHTENING TORQUE

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STANDARD BOLT TIGHTENING TORQUE

Class	Basic Dia. mm	Pitch mm	Standard Torque		Torque Limit	
			kg-m	ft-lb	kg-m	ft-lb
4T	6	1	0.47	3.4	0.4 – 0.6	2.9 – 5.0
	8	1.25	1.11	8.0	1.0 – 1.6	7.3 – 11.6
	10	1.25	2.25	16.3	1.9 – 3.1	13.7 – 22.4
	10	1.5	2.14	15.5	1.8 – 3.0	13.0 – 21.7
	12	1.25 (ISO)	4.40	31.8	3.5 – 5.5	25.3 – 39.8
	12	1.5	3.89	28.1	3.5 – 5.0	25.3 – 36.2
	12	1.75	3.74	27.0	3.0 – 5.0	21.7 – 36.2
	13	1.5	5.08	36.8	4.5 – 7.0	32.5 – 50.6
	14	1.5	6.33	45.8	5.0 – 8.0	36.2 – 57.8
	14	2	5.93	42.8	4.7 – 7.7	34.0 – 55.7
	16	1.5	9.57	69.2	7.5 – 11.0	54.2 – 79.6
	16	2	9.10	65.8	7.1 – 10.6	51.3 – 76.7
5T	6	1	0.71	5.1	0.6 – 0.9	4.4 – 6.5
	8	1.25	1.66	12.0	1.5 – 2.2	10.9 – 15.9
	10	1.25	3.34	24.1	3.0 – 4.5	21.7 – 32.5
	10	1.5	3.22	23.3	2.7 – 4.2	19.5 – 30.4
	12	1.25 (ISO)	6.60	47.7	5.0 – 8.0	36.2 – 57.8
	12	1.5	5.84	42.2	5.0 – 7.0	36.2 – 50.6
	12	1.75	5.61	40.6	4.8 – 6.8	34.7 – 49.2
	13	1.5	7.63	55.2	6.5 – 9.0	47.0 – 65.1
	14	1.5	9.50	68.7	7.5 – 11.0	54.2 – 79.6
	14	2	8.90	65.3	7.0 – 10.5	50.6 – 75.9
	16	1.5	14.36	103.8	12.0 – 17.0	86.8 – 123.0
	16	2	13.58	98.1	11.5 – 16.5	83.2 – 119.2
6T	6	1	0.71	5.1	0.6 – 0.9	4.4 – 6.5
	8	1.25	1.66	12.0	1.5 – 2.2	10.9 – 15.9
	10	1.25	3.37	24.0	3.0 – 4.5	21.7 – 32.5
	10	1.5	3.20	23.1	2.7 – 4.2	19.5 – 30.4
	12	1.25 (ISO)	6.60	47.7	5.0 – 8.0	36.2 – 57.8
	12	1.5	5.84	42.2	5.0 – 7.0	36.2 – 50.6
	12	1.75	5.61	40.6	4.8 – 6.8	34.7 – 49.2

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STANDARD BOLT TIGHTENING TORQUE (Cont'd)

7T	6	1	0.94	6.9	0.8 – 1.2	5.8 – 8.6
	8	1.25	2.21	16.1	2.0 – 3.0	14.5 – 21.7
	10	1.25	4.49	32.5	4.0 – 5.5	28.9 – 39.8
	10	1.5	4.29	31.0	3.7 – 5.2	26.8 – 37.6
	12	1.25 (ISO)	8.80	63.6	7.5 – 10.5	54.2 – 75.9
	12	1.5	7.78	56.2	7.0 – 9.0	50.6 – 65.1
	12	1.75	7.48	54.1	6.0 – 8.5	43.3 – 61.4
	13	1.5	10.17	73.5	8.0 – 12.0	57.8 – 86.8
	14	1.5	12.67	91.6	10.0 – 15.0	72.3 – 108.5
	14	2	11.86	85.8	9.5 – 14.0	68.7 – 101.2
	16	1.5	19.15	138.5	15.0 – 23.0	108.5 – 166.2
	16	2	18.11	131.0	14.0 – 22.0	101.2 – 159.0

Note:

The above specified tightening torque is applicable only for female threads in steel material.

If the female threads are for materials other than steel, and tightening surface is subjected to heat or vibrations, these specified tightening torque must be reconsidered.

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3K-J ENGINE

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MAIN PARTS TIGHTENING TORQUES

Tightening Parts	Tightening Torque	
	kg-m	ft-lb
Cylinder head	5.4 – 6.6	39.1 – 47.7
Rocker arm support	1.8 – 2.4	13.0 – 17.4
Camshaft thrust plate	0.6 – 0.9	4.3 – 6.5
Camshaft timing gear	5.4 – 6.6	39.1 – 47.7
Manifold	2.0 – 3.0	14.5 – 21.7
Connecting rod cap	4.0 – 5.2	28.9 – 37.6
Crankshaft bearing cap	5.4 – 6.6	39.1 – 47.7
Crankshaft pulley	4.5 – 6.5	32.5 – 39.8
Flywheel	5.4 – 6.6	39.1 – 47.7
Oil pan	0.3 – 0.4	2.2 – 2.9

ENGINE TUNE-UP

Fan belt deflection					
Fan – Alternator at 10 kg (22 lb)			8 – 13 mm		0.31 – 0.51 in.
Battery electrolyte gravity		at 20°C (68°F)	1.25 – 1.27		
Engine oil capacity		Crankcase	2.7 ℓ	2.9 US qt	2.4 Imp.qt
		Total	3.5 ℓ	3.7 US qt	3.1 Imp.qt
Coolant capacity	w/Heater	3K	5.7 ℓ	6.0 US qt	4.7 Imp.qt
Spark plug		Heat range	W16EP, W16EPR		
			BP5ES-L, BPR5ES		
Distributor		gap	0.8 mm		0.031 in.
		Dwell angle	50 – 54°		
		Point gap	0.4 – 0.5 mm		0.016 – 0.020 in.
Ignition timing			8° BTDC/idling		
Firing order			1–3–4–2		
Valve clearance	Hot	Intake	0.20 mm		0.0079 in.
		Exhaust	0.30 mm		0.0118 in.
	Cold	Intake	0.13 mm		0.0051 in.
		Exhaust	0.23 mm		0.0091 in.
Idle speed			900 ± 50 rpm		
Intake manifold vacuum at idle speed			More than 420 mm Hg		16.5 in. Hg
CO concentration at idling			0.5 – 1.5 %		

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ENGINE TUNE-UP (Cont'd)

Compression pressure at 250 rpm			
	STD	11.0 kg/cm²	156 psi
	Limit	9.0 kg/cm²	128 psi
Difference of pressure between cylinders		Less than 1.0 kg/cm²	14.2 psi

ENGINE

Cylinder Head

Surface warpage limit		0.1 mm	0.004 in.
Valve	Contacting surface angle	45°	
	Contacting width	1.2 – 1.6 mm	0.047 – 0.063 in.
	Refacing angle	30°, 45°, 65°	

Valve Guide Bushing

Protrusion from cylinder head		18 mm	0.71 in.
Inner diameter		8.01 – 8.03 mm	0.3154 – 0.3161 in.
Outer diameter	STD	13.035 – 13.045 mm	0.5132 – 0.5136 in.
	O/S 0.05	13.085 – 13.095 mm	0.5152 – 0.5156 in.
Replacing temperature (Cylinder head)		100 – 130°C	212 – 266°F

Valve

Valve overall length (Both intake and exhaust)		100.1 mm	3.491 in.
Valve head contacting face angle		45°	
Valve stem diameter	Intake	7.965 – 7.975 mm	0.3136 – 0.3140 in.
	Exhaust	7.960 – 7.975 mm	0.3134 – 0.3140 in.
Valve stem oil clearance	Intake	0.035 – 0.065 mm	0.0014 – 0.0026 in.
	Exhaust	0.035 – 0.070 mm	0.0014 – 0.0028 in.
Valve stem oil clearance limit	Intake	0.08 mm	0.0031 in.
	Exhaust	0.10 mm	0.0039 in.
Valve head edge thickness limit	Intake	0.8 mm	0.031 in.
	Exhaust	0.9 mm	0.035 in.

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Valve Spring

Free length		46.5 mm	1.831 in.
Installed length		38.4 mm	1.512 in.
Installed tension			
	STD	31.8 kg	70.1 lb
	Limit	25.0 kg	55.1 lb
Squareness limit		1.6 mm	0.063 in.

Camshaft

Bent limit		0.03 mm	0.0012 in.
Thrust clearance	STD	0.07 – 0.14 mm	0.0028 – 0.0056 in.
	Limit	0.3 mm	0.00118 in.
Oil clearance	STD	0.025 – 0.066 mm	0.0010 – 0.0026 in.
	Limit	0.1 mm	0.004 in.
Journal diameter			
STD	No. 1 (from front)	43.209 – 43.225 mm	1.7011 – 1.7018 in.
	2	42.954 – 42.970 mm	1.6911 – 1.6917 in.
	3	42.704 – 42.720 mm	1.6813 – 1.6819 in.
	4	42.459 – 42.475 mm	1.6716 – 1.6722 in.
Bearing U/S Type		0.125, 0.250	
Cam height	Intake	36.469 – 36.569 mm	1.4358 – 1.4397 in.
	Exhaust	36.369 – 36.469 mm	1.4318 – 1.4358 in.
Cam height limit	Intake	36.17 mm	1.4240 in.
	Exhaust	36.07 mm	1.4201 in.

Valve Rocker Arm and Shaft

Oil clearance	STD	0.02 – 0.04 mm	0.0008 – 0.0016 in.
	Limit	0.06 mm	0.0024 in.

Valve Lifter

Lifter to lifter bore clearance	STD	0.015 – 0.029 mm	0.0006 – 0.0011 in.
	Limit	0.1 mm	0.004 in.
Outer diameter	STD	19.978 – 19.999 mm	0.7865 – 0.7874 in.
	O/S 0.05	20.028 – 20.049 mm	0.7885 – 0.7893 in.

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Timing Chain Tensioner and Damper

Chain slack limit at 10 kg (22 lb)	13.5 mm	0.531 in.
Tensioner plunger head thickness limit	12.0 mm	0.472 in.
Vibration damper thickness limit	7.0 mm	0.276 in.

Chain and Gear

Chain slack limit at 10 kg (22 lb)	13.5 mm	0.531 in.
Chain elongation limit	272.7 mm	10.736 in.
Crankshaft gear wear limit	59.4 mm	2.339 in.
Camshaft gear wear limit	113.8 mm	4.480 in.

Manifold

Installing surface warpage limit	0.2 mm	0.008 in.

Cylinder Block

Warpage limit	0.05 mm	0.0020 in.
Cylinder bore diameter STD	75.00 – 75.05 mm	2.9528 – 2.9547 in.
Wear limit	0.2 mm	0.008 in.
Taper, out-of-round limit	Less than 0.02 mm	0.0008 in.
Difference of bore limit between cylinders	Less than 0.05 mm	0.0020 in.
Lifter bore diameter		
STD	20.000 – 20.021 mm	0.7874 – 0.7882 in.
O/S 0.05	20.050 – 20.071 mm	0.7894 – 0.7902 in.

Piston and Piston Ring

Piston outer diameter	STD	74.96 – 75.01 mm	2.9512 – 2.9531 in.
	O/S type.	0.25, 0.50, 0.75, 1.00	
Cylinder to piston clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.
Piston pin installing temperature		70 – 80°C	158 – 176°F
Piston ring end gap	Compression ring No. 1	0.10 – 0.28 mm	0.0039 – 0.0110 in.
	Compression ring No. 2	0.10 – 0.28 mm	0.0039 – 0.0110 in.
	Oil ring	0.2 – 0.9 mm	0.0079 – 0.0354 in.
Piston ring to ring groove	Comp. ring No. 1	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Clearance	Comp. ring No. 2	0.02 – 0.06 mm	0.0008 – 0.0024 in.

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Connecting Rod and Bearing

Big end thrust clearance	STD	0.110 – 0.214 mm	0.0043 – 0.0084 in.
	Limit	0.3 mm	0.012 in.
Bearing oil clearance	STD	0.024 – 0.048 mm	0.0009 – 0.0019 in.
	Limit	0.10 mm	0.0039 in.
Bearing U/S Type		0.25, 0.50, 0.75	
Bushing to piston pin oil clearance			
	STD	0.004 – 0.008 mm	0.0002 – 0.0003 in.
	Limit	0.05 mm	0.0020 in.

Crankshaft

Bent limit		0.03 mm	0.0012 in.
Thrust clearance	STD	0.040 – 0.222 mm	0.0016 – 0.0087 in.
	Limit	0.3 mm	0.012 in.
Taper and out-of-round limit (Journal & Crank pin)		0.01 mm	0.0004 in.
Main journal diameter	STD	49.976 – 50.000 mm	1.9676 – 1.9685 in.
U/S finished diameter	U/S 0.25	49.733 – 49.743 mm	1.9580 – 1.9584 in.
	0.50	49.483 – 49.493 mm	1.9482 – 1.9485 in.
	0.75	49.233 – 49.243 mm	1.9383 – 1.9387 in.
Main journal oil clearance	STD	0.016 – 0.040 mm	0.0006 – 0.0016 in.
	Limit	0.10 mm	0.0039 in.
Crankpin diameter	STD	41.976 – 42.000 mm	1.6526 – 1.6535 in.
U/S finished diameter	U/S 0.25	41.723 – 41.733 mm	1.6426 – 1.6430 in.
	0.50	41.473 – 41.483 mm	1.6328 – 1.6332 in.
	0.75	41.223 – 41.233 mm	1.6229 – 1.6233 in.
Crankpin oil clearance	STD	0.024 – 0.048 mm	0.0009 – 0.0019 in.
	Limit	0.1 mm	0.004 in.
Thrust washer thickness	STD	2.43 – 2.48 mm	0.0957 – 0.0976 in.
	O/S 0.125	2.49 – 2.54 mm	0.0980 – 0.1000 in.
	O/S 0.250	2.55 – 2.60 mm	0.1004 – 0.1024 in.

Flywheel

Run-out limit	0.1 mm	0.004 in.

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FUEL SYSTEM

Carburetor

Accelerating pump stroke		3.25 mm	0.128 in.
Float level	Raised	6.0 mm	0.24 in.
	Lower	0.9 mm	0.035 in.
Primary throttle valve closed angle		9°	
Second touch angle (from bore surface)		59°	
Primary throttle valve fully opened angle		90°	
Secondary throttle valve closed angle		20°	
Secondary throttle valve fully opened angle		90°	
Fast idle (at choke valve fully closed)		1.43 mm	0.0562 in.
Choke valve fully closed angle		20°	
Idle mixture adjusting screw preset position		Screw out 3 turns	

LUBRICATING SYSTEM

Oil Pump

Tip clearance	STD	0.04 – 0.16 mm	0.0016 – 0.0063 in.
	Limit	0.2 mm	0.008 in.
Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
	Limit	0.15 mm	0.0059 in.
Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
	Limit	0.2 mm	0.008 in.

COOLING SYSTEM

Radiator

Relief valve opening pressure	STD	0.9 kg/cm²	12.8 psi
	Limit	0.6 kg/cm²	8.5 psi

Water Pump

Bearing fitting temperature	75 – 85°C	167 – 185°F

Thermostat

Valve opening temperature		
Start to open at	86 – 90°C	187 – 194°F
Fully opens at	100°C	212°F
Valve opening travel	8 mm	0.31 in.

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STARTING SYSTEM

Starter

Rating voltage & output power				12V., 0.8 KW	12V., 0.6 KW
No load characteristic			Ampere	Less than 50 A at 11 V	Less than 55 A at 11 V
			Revolution	5000 rpm	3500 rpm
Armature shaft					
	Outer diameters			12.43 – 12.44 mm	0.4893 – 0.4897 in.
	Bushing bore			12.54 – 12.56 mm	0.4937 – 0.4945 in.
	Bushing to shaft clearance			0.10 – 0.14 mm	0.0039 – 0.0055 in.
	Bushing to shaft clearance limit			0.2 mm	0.008 in.
	Thrust clearance limit			1 mm	0.04 in.
Commutator					
	Outer diameter			32.7 mm	1.287 in.
	Outer diameter limit			30.7 mm	1.209 in.
	Run-out			0.1 mm	0.004 in maximum
	Run-out limit			0.3 mm	0.012 in.
	Mica depth			0.5 – 0.8 mm	0.020 – 0.032 in.
	Mica depth limit			0.2 mm	0.008 in.
Brush	0.6 KW	Length	STD	19 mm	0.75 in.
			Limit	12 mm	0.47 in.
	0.8 KW	Length	STD	16 mm	0.63 in.
			Limit	10 mm	0.39 in.
Pinion end to stop collar clearance				1 – 4 mm	0.04 – 0.16 in.

IGNITION SYSTEM

Distributor

Point gap				0.4 – 0.5 mm	0.016 – 0.020 in.
Dwell angle				50 – 54°	
Governor shaft thrust clearance				0.15 – 0.50 mm	0.0059 – 0.0197 in.

	Governor Advance Angle		Vacuum Advance Angle		
	Dis. rpm	Advance Angle	mm Hg.	in. Hg	Advance Angle
Distributor advance angle	650	Advance begins	100	3.94	Advance begins
	1700	9.5°	170	6.69	4.6°
	3100	13.5°	240	9.45	8.0°

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Ignition Coil

Primary coil resistance	About 1.4Ω
Secondary coil resistance	About 8.5 kΩ
External resistor resistance	1.3 – 1.7Ω
Insulation resistance at 500V	Over 10 MΩ

High Tension Cord

End to end resistance	Less than 25 kΩ

Spark Plug

Heat range		W16EP, W16EPR (ND) BP5ES-L, BPR5ES-L (NGK)	
Plug gap		0.7 – 0.8 mm	0.028 – 0.031 in.

CHARGING SYSTEM

Alternator

Maximum output ampere		40A	
Rotor coil resistance		4.1 – 4.3Ω	
Brush length	STD	12.5 mm	0.49 in.
	Limit	5.5 mm	0.22 in.

Alternator Regulator

Voltage regulating voltage	13.8 – 14.8 V

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5R ENGINE

3

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MAIN PARTS TIGHTENING TORQUES

Tightening Parts	Tightening Torque	
	kg-m	ft-lb
Cylinder head bolt	10.3 – 11.7	74.5 – 84.6
Rocker arm support	1.5 – 2.1	10.9 – 15.2
Manifold	1.5 – 2.1	10.9 – 15.2
Camshaft timing sprocket	3.0 – 4.0	21.7 – 28.9
Crankshaft pulley	13.0 – 15.0	94.0 – 108.5
Connecting rod cap	6.0 – 7.0	43.4 – 50.6
Crankshaft bearing cap	10.3 – 11.7	74.5 – 84.6
Flywheel	8.0 – 9.0	57.9 – 65.1
Oil pan	0.3 – 0.4	2.2 – 2.9

ENGINE TUNE-UP

Drive belt tension at 10 kg (22 lb)		10 – 12 mm		0.39 – 0.47 in.
Battery specific gravity	at 20°C (68°F)	1.25 – 1.27		
Engine oil capacity	Total	4.8 Liter	5.1 US qt	4.2 Imp.qt
	Crankcase	4.0 Liter	4.2 US qt	3.5 Imp.qt
Coolant capacity		10.3 Liter	10.9 US qt	9.1 Imp.qt
Spark plug	Heat range	W14EX, W16EPR		
		BP5EZ, BPR5ES		
	Spark plug gap	1.0 mm		0.04 in.
Distributor	Dwell angle	50 – 54°		
	Point gap	0.45 mm		0.018 in.
Ignition timing at idling		10° BTDC		
Firing order		1–2–4–3		
Valve clearance (Hot)	Intake	0.20 mm		0.008 in.
	Exhaust	0.36 mm		0.014 in.
Idle speed		600 rpm		
Manifold vacuum at initial idle speed		420 mm Hg		16.5 in. Hg
Fast idle		1800 rpm		
CO concentration at idle speed		1 – 4 %		
Compression pressure at 200 rpm				
	STD	11.0 kg/cm²		156.0 psi
	Limit	9.0 kg/cm²		128.0 psi
Difference of pressure between cylinders		Less than 1.0 kg/cm²		14.2 psi

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ENGINE

Cylinder Head

Surface warpage limit		0.05 mm	0.0020 in.
Valve	Contacting angle	45°	
	Contacting width	1.2 – 1.6 mm	0.047 – 0.063 in.
	Refacing angle	30°, 45°, 65°	

Valve Guide Bushing

Inner diameter	8.51 – 8.53 mm	0.3350 – 0.3358 in.
Outer diameter	14.023 – 14.031 mm	0.5520 – 0.5524 in.
Projection from cylinder head	19.5 – 20.5 mm	0.77 – 0.81 in.
Installing temperature	20°C	68°F

Valve

Valve overall length		STD	109.5 mm	4.31 in.
		Limit	109.0 mm	4.291 in.
Valve face angle			45°	
Stem diameter	STD	Intake	8.470 – 8.485 mm	0.3335 – 0.3341 in.
		Exhaust	8.460 – 8.475 mm	0.3331 – 0.3337 in.
Stem oil clearance	STD	Intake	0.025 – 0.060 mm	0.0010 – 0.0024 in.
		Exhaust	0.035 – 0.070 mm	0.0014 – 0.0028 in.
	Limit	Intake	0.1 mm	0.004 in.
		Exhaust	0.1 mm	0.004 in.
Valve head edge thickness limit			0.6 mm	0.024 in.

Valve Spring

Free length		45.1 mm	1.78 in.
Installed length		39.4 mm	1.55 in.
Installed tension	STD	24.2	53.4 lb
	Limit	21.8	48.0 lb
Squareness limit		1.6 mm	0.063 in.

Camshaft

Bend limit		0.05 mm	0.0020 in.
Thrust clearance	STD	0.06 – 0.13 mm	0.0024 – 0.0051 in.
	Limit	0.25 mm	0.0098 in.

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Camshaft (Cont'd)

Bearing oil clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Camshaft runout limit	Limit	0.1 mm	0.004 in.
Camshaft journal diameter	No.1	46.459 – 46.475 mm	1.8291 – 1.8297 in.
	No.2	46.209 – 46.225 mm	1.8193 – 1.8199 in.
	No.3	45.959 – 45.975 mm	1.8094 – 1.8100 in.
	No.4	45.709 – 45.725 mm	1.7996 – 1.8002 in.
	No.5	45.459 – 45.475 mm	1.7897 – 1.7904 in.
Bearing U/S Type		0.125, 0.25	
Cam lobe height limit	Intake	38.27 mm	1.5067 in.
	Exhaust	38.15 mm	1.5026 in.

Timing Chain Tensioner and Damper

Chain slack limit at 10 kg (22 lb)	12.0 mm	0.472 in.
Tensioner plunger head thickness limit	8.0 mm	0.315 in.
Vibration damper thickness limit	3.6 mm	0.142 in.

Chain and Gear

Chain elongation limit	253.8 mm	9.992 in.
Crankshaft gear wear limit	59.0 mm	2.323 in.
Camshaft gear wear limit	113.8 mm	4.480 in.

Cylinder Block

Warpage limit	0.05 mm	0.0020 in.
Cylinder bore	88.00 – 88.03 mm	3.4646 – 3.4657 in.
Cylinder bore wear limit	0.2 mm	0.008 in.
Difference of bore limit between cylinders	0.05 mm	0.002 in.
Taper and out-or-round	0.02 mm	0.0008 in.

Valve Lifter

Oil clearance	STD	0.015 – 0.029 mm	0.0006 – 0.0011 in.
	Limit	0.1 mm	0.004 in.
Outer diameter	STD	22.178 – 22.199 mm	0.8731 – 0.8740 in.
	O/S Type	0.05	

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Piston And Ring

Piston diameter	STD	87.96 – 87.99 mm	3.4630 – 3.4642 in.
	O/S Type	0.50, 0.75, 1.00	
Piston clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.
Piston ring end gap	Top and 2nd	0.18 – 0.33 mm	0.0071 – 0.0130 in.
	Oil	0.20 – 0.70 mm	0.0079 – 0.028 in.
Piston ring to ring groove clearance		0.03 – 0.07 mm	0.0012 – 0.0028 in.
Piston pin installing temperature		70 – 80°C	158 – 176°F

Connecting Rod & Bearing

Big end thrust clearance	STD	0.170 – 0.282 mm	0.0067 – 0.0110 in.
	Limit	0.4 mm	0.016 in.
Bearing oil clearance	STD	0.025 – 0.055 mm	0.0010 – 0.0020 in.
	Limit	0.08 mm	0.0032 in.
Bearing U/S Type		0.05, 0.25, 0.50	

Rocker Arm And Shaft

Shaft to arm clearance	STD	0.07 – 0.041 mm	0.0028 – 0.0016 in.
	Limit	0.08 mm	0.0031 in.

Manifold

Manifold surface warpage limit	0.4 mm	0.016 in.

Flywheel

Flywheel run-out limit	0.2 mm	0.008 in.

Crankshaft

Bent limit		0.03 mm	0.0012 in.
Thrust clearance	STD	0.02 – 0.12 mm	0.0008 – 0.0047 in.
	Limit	0.21 mm	0.0083 in.
Taper and out-of-round limit (Journal & Crank pin)		0.02 mm	0.0008 in.
Main journal oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
	Limit	0.08 mm	0.0032 in.
U/S bearing type		0.25, 0.50, 0.75	

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Crankshaft (Cont'd)

Main journal diameter	STD	59.97 – 60.00 mm	2.3610 – 2.3622 in.
	U/S 0.25	59.470 – 59.750 mm	2.3520 – 2.3524 in.
	0.50	59.490 – 59.500 mm	2.3421 – 2.3425 in.
	0.75	59.240 – 59.250 mm	2.3323 – 2.3327 in.
Crankpin oil clearance	STD	0.025 – 0.055 mm	0.0010 – 0.0022 in.
	Limit	0.08 mm	0.0032 in.
U/S bearing type		0.25, 0.50, 0.75, 1.00	
Crankpin diameter	STD	54.960 – 54.990 mm	2.1638 – 2.1650 in.
	U/S 0.25	54.730 – 54.740 mm	2.1547 – 2.1551 in.
	0.50	54.480 – 54.490 mm	2.1449 – 2.1453 in.
	0.75	54.230 – 54.240 mm	2.1350 – 2.1354 in.
	1.00	53.980 – 53.99 mm	2.1252 – 2.1256 in.
Thrust washer O/S Type		0.05, 0.25, 0.75	

LUBRICATING SYSTEM

Oil Pump

Tip clearance	STD	0.07 – 0.12 mm	0.0028 – 0.0047 in.
	Limit	0.2 mm	0.008 in.
Side clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
	Limit	0.15 mm	0.0059 in.
Body clearance	STD	0.10 – 0.15 mm	0.0039 – 0.0059 in.
	Limit	0.2 mm	0.008 in.

COOLING SYSTEM

Radiator

Relief valve opening pressure	STD	0.9 kg/cm²	12.8 psi
	Limit	0.6 kg/cm²	8.5 psi

Water Pump

Bearing fitting temperature	75 – 85°C	167 – 185°F

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Thermostat

Valve opening temperature		
Starts to open at	80.5 – 83.5°C	177 – 182°F
Fully opens at	95°C	203°F
Valve opening travel	8 mm	0.31 in.

FUEL SYSTEM

Carburetor

Float level Raised position	5 mm	0.20 in.
Lowered position	1 mm	0.04 in.
Throttle valve fully open angle	90° from bore	
Kick up	0.2 mm	0.008 in.
Fast idle	1.0 mm	0.039 in.
Unloader	42° from bore	
Idle mixture adjusting screw initial setting	Screw out 1½ turn	
Accelerating pump stroke	4.5 mm	0.177 in.

STARTING SYSTEM

Starter

No load characteristics	28100-33011	Less than 50A, at 11.5V, More than 5000 rpm	
	28100-41013		
	28100-34010	Less than 45A at 11.5V, More than 6000 rpm	
	28100-44010	Less than 50A at 11.5V, More than 5000 rpm	
Armature shaft to bushing clearance	STD	0.05 mm	0.0020 in.
	Limit	0.2 mm	0.008 in.
Armature shaft thrust clearance	STD	0.05 – 0.60 mm	0.002 – 0.024 in.
	Limit	0.8 mm	0.032 in.
Brush length	STD	16 mm	0.63 in.
	Limit	12 mm	0.47 in.
28100-44010	STD	19 mm	0.75 in.
	Limit	13 mm	0.51 in.
Commutator runout	STD	Less than 0.1 mm	0.004 in.
	Limit	0.3 mm	0.012 in.
Commutator diameter	STD	32.7 mm	1.287 in.
	Limit	30.7 mm	1.209 in.

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Starter (Cont'd)

Mica depth	STD	0.5 – 0.8 mm	0.020 – 0.031 in.
	Limit	0.2 mm	0.008 in.
Pinion end to stop collar clearance		0.2 – 4.0 mm	0.008 – 0.158 in.
Moving stud length (Reference only)		34 mm	1.34 in.

IGNITION SYSTEM

Distributor

Point gap		0.4 – 0.5 mm	0.016 – 0.020 in.
Dwell angle		50° – 54°	
Damping spring gap		0.1 – 0.4 mm	0.004 – 0.016 in.
Shaft thrust clearance		0.15 – 0.5 mm	0.006 – 0.020 in.

	Governor Advance Angle		Vacuum Advance Angle		
	Dis. rpm	Advance Angle	mm Hg	in. Hg	Advance Angle
19100-44020	500	Advance begins	170	5.51	Advance begins
	900	4°	240	9.45	2.1°
	2400	15°	320	12.60	3.6°
			400	15.75	5.0°
19100-44050	500	Advance begins	240	9.45	Advance begins
	900	4°	300	11.81	2.0°
	2400	15°	400	15.75	5.0°
19100-44080	450	Advance begins	240	9.45	Advance begins
	900	4°	300	11.81	2.0°
	2400	15°	400	15.75	5.0°
19100-44090	480	Advance begins	236	9.30	Advance begins
	900	4.0°	300	11.81	2.0°
	2400	15.0°	400	15.75	5.0°
	3000	14.8°			

Ignition Coil

Primary coil resistance	1.4 – 1.6 Ω
Secondary coil resistance	12.4 kΩ
Register resistance	1.3 – 1.7 Ω
Insulation resistance (With a 500 V megohm meter)	More than 100 MΩ

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High Tension Cord

Resistance limit	Less than 25 kΩ

Spark Plug

Heat range		W14EX	W16EPR
		BP5EZ	BPR5ES
Spark plug gap	W14EX, BP5EZ	1.0 mm	0.039 in.
	W16EPR, BPR5ES	0.8 mm	0.031 in.

CHARGING SYSTEM

Alternator

Maximum output ampere		45 A	
Brush length	STD	12.5 mm	0.492 in.
	Limit	5.5 mm	0.217 in.
Rotor coil resistance		4.1 – 4.3 Ω	

Alternator Regulator

Voltage regulator regulating voltage	13.8 – 14.8 V

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MEMO

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12R ENGINE

4

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MAIN PARTS TIGHTENING TORQUES

Tightening Parts	Tightening Torque	
	kg-m	ft-lb
Cylinder head bolt	10.3 – 11.7	74.5 – 84.6
Rocker support	1.75 – 2.45	12.7 – 17.7
Camshaft thrust plate	1.0 – 1.6	7.2 – 11.6
Camshaft timing gear	1.0 – 1.6	7.2 – 11.6
Manifold	2.9 – 4.1	21.0 – 29.7
Connecting rod cap	4.0 – 5.0	28.9 – 36.2
Crankshaft bearing cap	9.8 – 11.2	70.9 – 81.0
Crankshaft pulley	5.3 – 6.7	38.3 – 48.5
Flywheel	5.8 – 6.6	42.0 – 47.7
Oil pan	0.4 – 0.8	2.9 – 5.8

ENGINE TUNE-UP

Fan belt deflection				
Fan – Alternator at 10 kg (22 lb)		8 – 13 mm		0.31 – 0.51 in.
Cooler – Compressor – Crank		15 – 18 mm		0.59 – 0.70 in.
Battery electrolyte gravity	at 20°C (68°F)	1.25 – 1.27		
Engine oil capacity	Crankcase	3.3 ℓ	3.5 US qt	2.9 Imp.qt
	Total	4.2 ℓ	4.4 US qt	3.7 Imp.qt
Coolant capacity		8.0 ℓ	8.4 US qt	7.0 Imp.qt
Spark plug	Heat range	W16EP, W16EPR		
		BP5ES-L, BPR5ES		
Distributor	gap	0.9 – 1.0 mm		0.035 – 0.039 in.
	Dwell angle	50 – 54°		
	Point gap	0.4 – 0.5 mm		0.016 – 0.020 in.
Ignition timing		8° BTDC/700 rpm		
Firing order		1–3–4–2		
Valve clearance (Hot)	Intake	0.20 mm		0.0079 in.
	Exhaust	0.36 mm		0.0142 in.
Idle speed		700 ± 50 rpm		
Intake manifold vacuum at idle speed		More than 430 mm Hg		16.9 in. Hg
CO concentration at idle speed		1 – 4 %		
Compression pressure at 250 rpm	STD	11.0 kg/cm²		156 psi
	Limit	8.0 kg/cm²		114 psi
Difference of pressure between cylinders		Less than 1.0 kg/cm²		14.2 psi

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ENGINE

Cylinder Head

Surface warpage limit		0.1 mm	0.004 in.
Valve	Contacting surface angle	45°	
	Contacting width	1.2 – 1.6 mm	0.047 – 0.063 in.
	Refacing angle	30°, 45°, 65°	

Valve Guide Bushing

Inner diameter	Both intake and exhaust	8.01 – 8.03 mm	0.3154 – 0.3161 in.
Outer diameter	STD	14.02 – 14.04 mm	0.5520 – 0.5528 in.
	O/S Type	0.05	
Projection from cylinder head		17 mm	0.67 in.
Installing temperature		20°C	68°F

Valve

Valve overall length	STD	IN & EX	109.0 mm	4.291 in.
	Limit	IN & EX	108.4 mm	4.268 in.
Valve face angle			44.5°	
Stem diameter		Intake	7.97 – 7.99 mm	0.3138 – 0.3145 in.
		Exhaust	7.96 – 7.98 mm	0.3134 – 0.3142 in.
Stem oil clearance	STD	Intake	0.025 – 0.060 mm	0.0010 – 0.0024 in.
		Exhaust	0.035 – 0.070 mm	0.0014 – 0.0028 in.
	Limit	Intake	0.08 mm	0.0031 in.
		Exhaust	0.10 mm	0.0030 in.
Valve head edge thickness		IN & EX	0.50 mm	0.0197 in.

Valve Spring

Free length		46.3 mm	1.823 in.
Installed length		39.4 mm	1.551 in.
Installed tension	STD	30.3 kg	66.8 lb
	Limit	24.3 kg	60.2 lb
Squareness limit		1.6 mm	0.063 in.

Rocker Arm and Shaft

Shaft to arm clearance	STD	0.013 – 0.041 mm	0.0005 – 0.0016 in.
	Limit	0.08 mm	

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Manifold

Manifold surface warpage limit	0.3 mm	0.0118 in.

Flywheel

Flywheel runout limit	0.2 mm	0.008 in.

Timing Gear

Backlash	STD	0.02 – 0.13 mm	0.0020 – 0.0051 in.
	Limit	0.3 mm	0.0118 in.

Camshaft

Bend limit			0.15 mm	0.0059 in.
Thrust clearance		STD	0.05 – 0.13 mm	0.0020 – 0.0051 in.
		Limit	0.2 mm	0.008 in.
Bearing oil clearance			0.025 – 0.066 mm	0.0010 – 0.0026 in.
Camshaft runout limit			0.1 mm	0.004 in.
Camshaft journal diameter		No. 1	46.459 – 46.475 mm	1.8291 – 1.8297 in.
		No. 2	46.209 – 46.225 mm	1.8193 – 1.8199 in.
		No. 3	45.959 – 45.975 mm	1.8094 – 1.8100 in.
Bearing U/S Type			0.125, 0.25, 0.50	
Cam height	STD	Intake	38.405 – 38.415 mm	1.5120 – 1.5124 in.
		Exhaust	38.295 – 38.305 mm	1.5077 – 1.5081 in.
	Limit	Intake	38.29 mm	1.507 in.
		Exhaust	38.18 mm	1.503 in.

Cylinder Block

Warpage limit		0.05 mm	0.0020 in.
Cylinder	Bore diameter (STD)	80.50 – 80.55 mm	3.1693 – 3.1713 in.
	Wear limit	0.2 mm	0.008 in.
	Taper, out-of-round limit	Less than 0.02 mm	0.0008 in.
	Difference of bore limit between cylinders	Less than 0.05 mm	0.0020 in.

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Valve Lifter

Oil clearance	STD	0.015 – 0.029 mm	0.0006 – 0.0020 in.
	Limit	0.05 mm	0.0019 in.
Outer diameter	STD	22.178 – 22.199 mm	0.8731 – 0.8740 in.
	O/S Type	0.05	

Piston and Ring

Piston diameter	STD	80.45 – 80.50 mm	3.167 – 3.169 in.
	O/S Type	0.25, 0.50, 0.75, 1.00, 1.25, 1.50	
Piston clearance		0.04 – 0.06 mm	0.0015 – 0.0023 in.
Piston ring end gap	Top and 2nd	0.03 – 0.07 mm	0.0012 – 0.0028 in.
	Oil ring	0.025 – 0.070 mm	0.0010 – 0.0028 in.
Piston ring to ring groove clearance	Top	0.08 – 0.26 mm	0.0031 – 0.0102 in.
	2nd	0.10 – 0.30 mm	0.0039 – 0.0118 in.
	Oil ring	0.10 – 0.30 mm	0.0039 – 0.0118 in.
Piston pin installing temperature		70 – 80°C	158 – 176°F

Connecting Rod & Bearing

Big end thrust clearance	STD	0.08 – 0.24 mm	0.003 – 0.10 in.
	Limit	0.3 mm	0.012 in.
Piston pin oil clearance	STD	0.006 – 0.010 mm	0.0002 – 0.0004 in.
	Limit	0.015 mm	0.0006 in.
Bearing oil clearance	STD	0.024 – 0.048 mm	0.0009 – 0.0019 in.
	Limit	0.08 mm	0.003 in.
Bearing U/S Type		0.25, 0.50, 0.75, 1.00	

Crankshaft

Bent limit		0.03 mm	0.0012 in.
Thrust clearance	STD	0.05 – 0.13 mm	0.0020 – 0.0051 in.
	Limit	0.20 mm	0.0079 in.
Taper and out-of-round limit (Journal & Crank pin)		0.02 mm	0.0008 in.
Main journal diameter	STD	57.976 – 58.000 mm	2.2825 – 2.2835 in.
U/S finished diameter	U/S 0.25	57.75 – 57.76 mm	2.2736 – 2.2740 in.
	0.50	57.50 – 57.51 mm	2.2638 – 2.2642 in.
	0.75	57.25 – 57.26 mm	2.2539 – 2.2543 in.
	1.00	57.00 – 57.01 mm	2.2441 – 2.2445 in.

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Crankshaft (Cont'd)

Main journal oil clearance	STD	0.028 – 0.052 mm	0.0011 – 0.0022 in.
	Limit	0.08 mm	0.0031 in.
Crankpin diameter	STD	49.976 – 50.000 mm	1.966 – 1.9685 in.
U/S finished diameter	U/S 0.25	49.75 – 49.77 mm	1.9587 – 1.9594 in.
	0.50	49.50 – 49.52 mm	1.9488 – 1.9496 in.
	0.75	49.25 – 49.27 mm	1.9390 – 1.9398 in.
	1.00	49.00 – 49.02 mm	1.9291 – 1.9299 in.
Crankpin oil clearance	STD	0.024 – 0.048 mm	0.0009 – 0.0019 in.
	Limit	0.08 mm	0.0031 in.
Thrust washer thickness	STD	2.950 – 3.000 mm	0.11614 – 0.11811 in.
	O/S Type	0.125, 0.250, 0.500	

LUBRICATING SYSTEM

Oil Pump

Tip clearance	STD	0.07 – 0.12 mm	0.0028 – 0.0047 in.
	Limit	0.2 mm	0.008 in.
Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
	Limit	0.15 mm	0.0059 in.
Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
	Limit	0.2 mm	0.008 in.

COOLING SYSTEM

Radiator

Relief valve opening pressure	STD	0.9 kg/cm²	12.8 psi
	Limit	0.6 kg/cm²	8.5 psi

Water Pump

Bearing fitting temperature	75 – 85°C	167 – 185°F

Thermostat

Valve opening temperature			
	Starts to open at	80.5 – 83.5°C	177 – 182°F
	Fully opens at	95°C	203°F
Valve opening travel		8 mm	0.31 in.

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FUEL SYSTEM

Carburetor

Float level	Raised position	3.5 mm	0.14 in.
	Lowered position	1.2 mm	0.05 in.
Seco-touch angle		57°	
Fast idle		1.2 mm	0.05 in.
Accelerating pump stroke		5.0 mm	0.20 in.
Idle mixture adjusting acrew preset position		Screw out 1½ turns	

STARTING SYSTEM

Starter

No load characteristics	Ampere	Less than 50A at 11.5V	
	RPM	More than 5000	
Armature shaft to bushing clearance	STD	0.05 mm	0.002 in.
	Limit	0.2 mm	0.008 in.
Armature shaft thrust clearance	Limit	0.6 mm	0.024 in.
Brush length	STD	16 mm	0.63 in.
	Limit	10 mm	0.39 in.
Commutator runout	STD	0.1 mm	0.004 in.
	Limit	0.3 mm	0.012 in.
Commutator diameter	STD	32.7 mm	1.287 in.
	Limit	30.7 mm	1.209 in.
Mica depth	STD	0.5 – 0.9 mm	0.020 – 0.035 in.
	Limit	0.2 mm	0.008 in.
Pinion end to stop collar clearance		1 – 4 mm	0.04 – 0.16 in.
Moving stud length (Reference only)		34 mm	1.34 in.

IGNITION SYSTEM

Distributor

Shaft thrust clearance	0.15 – 0.5 mm	0.006 – 0.020 in.
Point gap	0.45 mm	0.018 in.
Dwell angle	50 – 54°	

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Distributor (Cont'd)

Advance characteristics (19100-31021)			
Vacuum advance angle	mm Hg	in. Hg	Dis. advance angle Degress
	120	4.72	Advance begins
	200	7.87	6.5°
	280	11.02	11.0°
Governor advance angle	Distributor rpm		Dis. advance angle Degree
	500		Advance begins
	1400		9.5°
	2500		16.0°

Ignition Coil

Primary coil resistance	1.3 – 1.6Ω
Secondary coil resistance	9.5 – 14.5 kΩ
External resistor resistance	1.3 – 1.7Ω
Insulation resistance (With a 500V megohm meter)	More than 10 MΩ

High Tension Cord

Resistance limit	Less than 25 kΩ

Spark Plug

Spark plug gap	1.0 mm	0.039 in.
Heat range	W16EP	BP5ES-L
	W16EPR	BPR5ES

CHARGING SYSTEM

Alternator

Rotor coil resistance		4.1 – 4.3Ω	
Brush length	STD	12.5 mm	0.49 in.
	Limit	5.5 mm	0.22 in.

Alternator Regulator

Voltage regulator regulating voltage	13.8 – 14.8 V

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18R ENGINE

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MAIN PART TIGHTENING TORQUES

Tightening Parts		Tightening Torque	
		kg-m	ft-lb
Cylinder head	13 mm bolt	10.0 – 12.0	72.3 – 86.8
Valve rocker support		1.7 – 2.3	12.3 – 16.6
Manifold		4.2 – 4.8	30.4 – 34.7
Camshaft bearing cap		1.7 – 2.3	12.3 – 16.6
Camshaft timing gear		1.7 – 2.3	12.3 – 16.6
Camshaft drive gear		8.0 – 10.0	57.7 – 72.3
Crankshaft bearing cap		9.5 – 11.5	68.7 – 83.2
Connecting rod cap		5.4 – 6.6	39.1 – 47.7
Oil pan		0.4 – 0.8	2.9 – 5.8
Crankshaft pulley		9.5 – 11.0	68.7 – 79.6
Flywheel		7.5 – 8.5	54.3 – 61.5
Thermo switch		3.0 – 4.0	21.7 – 28.9

ENGINE TUNE-UP

Drive belt tension at 10 kg (22 lb)				
	Fan – Alternator	8 – 12 mm		0.31 – 0.47 in.
	A/C Compressor – Crankshaft	15 – 18 mm		0.59 – 0.71 in.
Battery specific gravity at 20°C (70°F)		1.25 – 1.27		
Engine oil capacity				
	RN Total	5.0 Liter	5.3 US qt	4.4 Imp.qt
	Crankcase	4.1 Liter	4.3 US qt	3.6 Imp.qt
Coolant capacity (w/heater)		8.0 Liter	8.5 US qt	7.5 Imp.qt
Spark plug heat range				
	ND	W20EPR		W20EP
	NGK	BPR6ES		BP6ES
Spark plug gap		0.8 mm		0.03 in.
Distributor				
	Dwell angle	50 – 54°		
	Point gap	0.4 – 0.5 mm		0.016 – 0.020 in.
	Damping spring gap	0.1 – 0.4 mm		0.004 – 0.168 in.
Ignition timing		7° BTDC/idling		
Firing order		1–3–4–2		

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ENGINE TUNE-UP (Cont'd)

Valve clearance	Hot	Intake	0.20 mm	0.0079 in.
		Exhaust	0.36 mm	0.0141 in.
	Cold	Intake	0.18 mm	0.0071 in.
		Exhaust	0.33 mm	0.0130 in.
Idle speed			650 ± 50 rpm	
Manifold vacuum at idle speed			More than 415 mm Hg 16.3 in. Hg	
Fast idle speed			2600 ± 200 rpm	
Compression pressure (at 250 rpm)				
		STD	12.0 kg/cm²	170.0 psi
		Limit	9.0 kg/cm²	127.8 psi
Difference of pressure between cylinders			Less than 1.0 kg/cm²	14.2 psi

ENGINE

Cylinder Head

Surface warpage limit		0.05 mm	0.0019 in.
Valve	Contacting surface angle	45°	
	Contacting width	1.2 – 1.6 mm	0.047 – 0.063 in.
	Refacing angle	30°, 45°, 60°	

Valve Guide Bushing

Inner diameter		8.01 – 8.03 mm	0.3154 – 0.3161 in.
Outer diameter	STD	14.02 – 14.04 mm	0.5513 – 0.5528 in.
	O/S 0.05	14.07 – 14.09 mm	0.5548 – 0.5551 in.
Protrusion from cylinder head		15.8 – 16.2 mm	0.622 – 0.638 in.

Valve

Valve overall length limit (Both intake and exhaust)		112.7 mm	4.437 in.
Valve head contacting face angle		45°	
Valve stem diameter	Intake	7.970 – 7.985 mm	0.3138 – 0.3144 in.
	Exhaust	7.960 – 7.975 mm	0.3139 – 0.3140 in.
Valve sterm oil clearance	Intake	0.03 – 0.06 mm	0.0012 – 0.0024 in.
	Exhaust	0.04 – 0.08 mm	0.0016 – 0.0032 in.
Limit	Intake	0.08 mm	0.0032 in.
	Exhaust	0.10 mm	0.0039 in.

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Valve (Cont'd)

Valve head edge thickness limit (Both intake and exhaust)	0.6 mm	0.024 in.

Valve Spring

Free length		Inner	44.1 mm	1.736 in.
		Outer	46.5 mm	1.830 in.
Installed length		Inner	37.5 mm	1.476 in.
		Outer	41.5 mm	1.634 in.
Installed tension	STD	Inner	6.9 kg	15.21 lb
		Outer	23.0 kg	50.71 lb
	Limit	Inner	6.0 kg	13.23 lb
		Outer	19.0 kg	41.89 lb
Squareness	Limit	Inner	1.6 mm	0.063 in.
		Outer	1.9 mm	0.075 in.

Camshaft

Bent limit			0.10 mm	0.004 in.
Thrust clearance		STD	0.04 – 0.17 mm	0.0056 – 0.0067 in.
		Limit	0.25 mm	0.0098 in.
Journal oil clearance		STD	0.03 – 0.06 mm	0.0012 – 0.0024 in.
		Limit	0.1 mm	0.0039 in.
Journal diameter			34.97 – 35.00 mm	1.3768 – 1.3780 in.
Bearing U/S Type			0.125, 0.25	
Cam height	STD	Intake	44.04 mm	1.7339 in.
		Exhaust	44.14 mm	1.7378 in.
	Limit	Intake	43.7 mm	1.720 in.
		Exhaust	43.8 mm	1.724 in.

Valve Rocker Arm and Shaft

Oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
	Limit	0.08 mm	0.0032 in.

Manifold

Manifold surface warpage limit	0.4 mm	0.016 in.

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Timing Chain

Elongation limit	No. 1	291.4 mm	11.47 in.
	No. 2 (17 Links)	147.0 mm	5.79 in.

Timing Gear

Wear limit	Crankshaft gear	60.0 mm	2.362 in.
	Pump drive shaft gear	114.5 mm	4.508 in.
	Camshaft drive gear	78.2 mm	3.079 in.
	Camshaft timing gear	78.2 mm	3.079 in.

Chain Tensioner and Vibration Damper

Wear limit	No. 1 tensioner	11.5 mm	0.45 in.
	No. 1 damper	5.0 mm	0.20 in.
	No. 2 damper	5.0 mm	0.20 in.
	Tensioner slipper	6.8 mm	0.26 in.

Pump Drive Shaft and Bearing

Thrust clearance	STD	0.06 – 0.13 mm	0.0024 – 0.0051 in.
	Limit	0.3 mm	0.012 in.
Journal diameter	Front	45.96 – 45.98 mm	1.8098 – 1.8106 in.
	Rear	40.96 – 40.98 mm	1.6126 – 1.6134 in.
Oil clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
	Limit	0.08 mm	0.0032 in.
Bearing fitting tolerance		0.02 – 0.06 mm	0.0008 – 0.0024 in.

Cylinder Block

Warpage limit		0.05 mm	0.0019 in.
Cylinder bore	STD	88.50 – 88.55 mm	3.4843 – 3.4862 in.
Cylinder bore wear limit		0.2 mm	0.008 in.
Difference of bore limit between cylinders		0.05 mm	0.002 in.
Taper and out-of-round		0.02 mm	0.0008 in.

Crankshaft

Runout limit	0.1 mm	0.0040 in.
Crank journal taper and out-of-round limit	0.01 mm	0.0004 in.
Crankpin journal taper and out-of-round limit	0.01 mm	0.0004 in.

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Crankshaft (Cont'd)

Thrust clearance	STD	0.02 – 0.20 mm	0.0008 – 0.0079 in.
	Limit	0.3 mm	0.0118 in.
Crankpin journal oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
	Limit	0.08 mm	0.0032 in.
Bearing U/S type		0.05, 0.25, 0.50	
Journal diameter	STD	52.976 – 53.000 mm	2.0857 – 2.0866 in.
	U/S 0.25	52.70 – 52.71 mm	2.0749 – 2.0751 in.
	U/S 0.50	52.45 – 52.46 mm	2.0650 – 2.0654 in.
Crank journal oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
	Limit	0.08 mm	0.0032 in.
Bearing U/S type		0.05, 0.25, 0.50	
Journal diameter	STD	59.976 – 60.000 mm	2.3613 – 2.3622 in.
	U/S 0.25	59.70 – 59.71 mm	2.3504 – 2.3508 in.
	U/S 0.50	59.45 – 59.46 mm	2.3406 – 2.3409 in.

Piston and Piston Ring

Piston outer diameter	STD	88.44 – 88.49 mm	3.4819 – 3.4839 in.
	O/S	0.50, 1.00	
Cylinder to piston clearance		0.05 – 0.07 mm	0.0020 – 0.0028 in.
Piston pin installing temperature		100°C	212°F
Piston ring end gap	Compression ring No. 1	0.10 – 0.30 mm	0.0039 – 0.0118 in.
	Compression ring No. 2	0.10 – 0.30 mm	0.0039 – 0.0118 in.
	Oil ring	0.2 – 0.5 mm	0.008 – 0.020 in.
Piston ring to ring groove clearance	Comp. ring No. 1	0.02 – 0.06 mm	0.0008 – 0.0024 in.
	Comp. ring No. 2	0.02 – 0.06 mm	0.0008 – 0.0024 in.

Connecting Rod and Bearing

Big end thrust clearance	STD	0.16 – 0.26 mm	0.0063 – 0.0102 in.
	Limit	0.3 mm	0.012 in.
Bearing oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
	Limit	0.08 mm	0.0031 in.
Bearing U/S type		0.05, 0.25, 0.50, 0.75, 1.00	
Bushing oil clearance	STD	0.005 – 0.014 mm	0.00020 – 0.00055
	Limit	0.015 mm	0.00059 in.

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Flywheel

Runout limit	0.2 mm	0.008 in.

LUBRICATING SYSTEM

Oil Pump

Tip clearance	STD	0.10 – 0.15 mm	0.0039 – 0.0059 in.
	Limit	0.2 mm	0.008 in.
Side clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
	Limit	0.15 mm	0.0059 in.
Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
	Limit	0.2 mm	0.008 in.

COOLING SYSTEM

Water Pump

Bearing fitting temperature	100°C	212°F

Fluid Coupling

Silicon oil viscosity	6000 cst
w/Temperature controled coupling	3000 cst
Capacity	25 cc
w/Temperature controled coupling	35 cc

Thermostat

Valve opening temperature		
Starts to open at	80.5 – 83.5°C	177 – 182°F
only 18R-C	86.5 – 89.5°C	188 – 193°F
Fully opens at	95°C	203°F
only 18R-C	100°C	212°F
Valve opening travel	8 mm	0.31 in.

Radiator

Relief valve opening pressure	STD	0.9 kg/cm²	12.8 psi
	Limit	0.6 kg/cm²	8.5 psi

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FUEL SYSTEM

Carburetor

Float level	Raised position	5.0 mm	0.197 in.
	Lowered position	1.0 mm	0.040 in.
Throttle valve fully opened angle (from bore)		90°	
Kick up	Secondary throttle valve to body clearance	0.2 mm	0.008 in.
	Primary throttle opening angle (from bore)	64 – 90°	
Fast idle (clearance)		1.1 mm	0.043 in.
Unloader angle (from bore)		47°	
Accelerating pump stroke		4.5 mm	0.0173 in.
Idle mixture adjusting screw preset position		Screw out 2½ turns	
Choke valve fully closed temperature		below 25°C	77°F

STARTING SYSTEM

Starter

No load characteristics	Ampere	Less than 50 A at 11.5 V	
	RPM	More than 5000 rpm	
Armature shaft to bushing clearance	STD	0.1 – 0.14 mm	0.0039 – 0.0055 in.
	Limit	0.2 mm	0.008 in.
Armature shaft thrust clearance	Limit	0.8 mm	0.032 in.
Brush length	STD	16 mm	0.63 in.
	Limit	12 mm	0.47 in.
Commutator runout	STD	Less than 0.05	0.002 in.
	Limit	0.4 mm	0.016 in.
Commutator diameter	STD	32.7 mm	1.287 in.
	Limit	31 mm	1.22 in.
Mica depth	STD	0.5 – 0.8 mm	0.020 – 0.031 in.
	Limit	0.2 mm	0.008 in.
Pinion end to stop collar clearance		1.0 – 4.0 mm	0.04 – 0.16 in.
Moving stud length (Reference only)		34 mm	1.34 in.

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IGNITION SYSTEM

Distributor

Shaft thrust clearance	0.15 – 0.50 mm	0.006 – 0.020 in.
Point gap	0.45 mm	0.018 in.
Dwell angle	50 – 54°	
Damping spring gap	0.1 – 0.4 mm	0.004 – 0.016 in.

Advance characteristics 19100-33013

Vacuum advance angle	mm Hg	in. Hg	Dis. advance angle Degress
	80	3.15	Advance begins
	140	5.51	3.6°
	240	9.45	8.5°
	360	14.17	12.0°

Governor advance angle M/T	Distributor rpm	Dis. advance angle Degree
	500	Advance begins
	160	10.0°
	2800	15.0°

Ignition Coil

Primary coil resistance	About 1.4Ω
Secondary coil resistance	About 8.5 kΩ
External resistor resistance	1.3 – 1.7Ω
Insulation resistance at 500V	Over 10 MΩ

High Tension Cord

End to end resistance	Less than 25 kΩ

Spark Plug

Heat range	W20EP	W20EPR	
	BP6ES	BPR6ES	
Plug gap	0.8 mm		0.031 in.

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CHARGING SYSTEM

Alternator

Maximum output ampere		40A	
Rotor coil resistance		4.1 – 4.3Ω	
Brush length	STD	12.5 mm	0.49 in.
	Limit	5.5 mm	0.22 in.

Alternator Regulator

Voltage regulator regulating voltage	13.8 – 14.8 V

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2F ENGINE

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MAIN PARTS TIGHTENING TORQUES

Components		Torque	
		kg-m	ft-lb
Cylinder head		11.5 – 13.5	83 – 98
Rocker arm support	10 mm bolt	3.0 – 4.5	21.7 – 32.6
	8 mm bolt	2.0 – 3.0	14.5 – 21.7
Manifold		3.9 – 5.1	28 – 37
Manifold (for calif.)		5.0 – 7.0	36.2 – 50.6
Camshaft thrust plate		1.0 – 1.6	7 – 12
Crankshaft pulley		16 – 20	116 – 145
Piston pin		5.4 – 7.0	39 – 51
Connecting rod cap		4.8 – 7.6	35 – 55
Crankshaft bearing cap	No. 1 – No. 3	12.5 – 15.0	90 – 108
	No. 4	10.5 – 13.0	76 – 94
Flywheel		8.1 – 8.5	5.9 – 62
Oil pan		0.6 – 1.2	4.3 – 8.7
Thermo switch at cylinder head		3 – 4	21.7 – 28.9

ENGINE TUNE-UP

Drive belt tension at 10 kg (22 lb)				
Fan pulley – Alternator		13 – 15 mm		0.51 – 0.59 in.
A/C compressor – Crankshaft		15 – 12.7 mm		0.59 – 0.71 in.
Battery specific gravity	at 20°C (68°F)	1.25 – 1.27		
Engine oil capacity	Total	8 Liter	8.5 US qt	7.0 Imp.qt
	Crankcase	7 Liter	7.4 US qt	6.2 Imp.qt
Coolant capacity	FJ40	16.0 Liter	4.2 US gal	3.5 Imp.gal
	FJ55	16.5 Liter	4.4 US gal	3.6 Imp.gal
Spark plug	Heat range	W14EP, W14EPR		
		B5ES, BR5ES		
	Spark plug gap	0.8 mm		0.03 in.
Distributor Dwell angle		38 – 44°		
Point rubbing block gap		0.3 mm		0.012 in. (reference only)
(Between rubbing block and cam)				
Ignition timing at idling		7° BTDC/650 rpm		
Firing order		1–5–3–6–2–4		
Valve clearance (Hot)	Intake	0.20 mm		0.008 in.
	Exhaust	0.35 mm		0.014 in.

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ENGINE TUNE-UP (Cont'd)

Initial idle speed at T/M in N range		650 ± 50 rpm	
Manifold vacuum at initial idle speed		More than 420 mm Hg	16.5 in. Hg
Fast idle speed		1800 ± 200 rpm	
Throttle positioner setting speed		1200 ± 100 rpm	
Compression pressure at 200 rpm	STD	10.5 kg/cm²	149.3 psi
	Limit	8.0 kg/cm²	113.8 psi
Difference of pressure between cylinders		Less than 1.0 kg/cm²	14.2 psi

ENGINE

Cylinder Head

Head surface warpage limit		0.05 mm	0.0020 in.
Valve seat	Refacing angle	65°, 45°, 30°	
	Contacting angle	45°	
Contacting width	Intake	1.4 mm	0.055 in.
	Exhaust	1.7 mm	0.067 in.

Valve Guide Bushing

Length	Intake	54 mm	2.13 in.
	Exhaust	59 mm	2.32 in.
Inner diameter	Both intake and exhaust	8.01 – 8.03 mm	0.3154 – 0.3161 in.
Outer diameter	STD	25.097 – 25.128 mm	0.988 – 0.989 in.
	O/S Type	0.05	
Protrusion from cylinder head		17 mm	0.67 in.

Valve

Valve overall length limit		Intake	124.3 mm	4.89 in.
		Exhaust	124.5 mm	4.90 in.
Valve face angle			45°	
Stem diameter		Intake	7.97 – 7.985 mm	0.3138 – 0.3144 in.
		Exhaust	7.96 – 7.975 mm	0.3134 – 0.3140 in.
Stem oil clearance	STD	Intake	0.03 – 0.06 mm	0.0012 – 0.0024 in.
		Exhaust	0.04 – 0.07 mm	0.0016 – 0.0028 in.
	Limit	Intake	0.10 mm	0.0039 in.
		Exhaust	0.12 mm	0.0047 in.

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Valve (Cont'd)

Valve head edge thickness	Intake	0.8 mm	0.031 in.
	Exhaust	1.0 mm	0.039 in.

Valve Spring

Free length		51.5 mm	2.028 in.
Installed length		43.0 mm	1.693 in.
Installed tension	STD	32.5 kg	71.6 lb
	Limit	27 kg	59.5 lb
Squareness limit		1.8 mm	0.071 in.

Rocker Arm and Shaft

Shaft to arm clearance	0.017 – 0.037 mm	0.00011 – 0.0015 in.

Manifold

Manifold surface warpage limit	2.0 mm	0.08 in.

Flywheel

Flywheel runout limit	0.1 mm	0.004 in.

Timing Gear

Backlash	0.05 – 0.13 mm	0.0020 – 0.0051 in.
Backlash limit	0.2 mm	0.008 in.

Camshaft

Thrust clearance	STD	0.09 – 0.15 mm	0.0035 – 0.0059 in.
	Limit	0.2 mm	0.008 in.
Bearing oil clearance		0.025 – 0.075 mm	0.0010 – 0.0030 in.
Camshaft runout limit		0.15 mm	0.0059 in.
Camshaft journal diameter	No. 1	47.955 – 47.975 mm	1.8810 – 1.8888 in.
	No. 2	46.455 – 46.475 mm	1.8289 – 1.8297 in.
	No. 3	44.955 – 44.975 mm	1.7699 – 1.7707 in.
	No. 4	43.455 – 43.475 mm	1.7108 – 1.7116 in.
Bearing U/S Type		0.25, 0.50	
Cam height limit	Intake	38.0 mm	1.496 in.
	Exhaust	37.9 mm	1.492 in.

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Cylinder Block

Warpage limit	0.15 mm	0.0059 in.
Cylinder bore	94.00 – 94.05 mm	3.7008 – 3.7027 in.
Cylinder bore wear limit	0.2 mm	0.008 in.
Difference of bore limit between cylinders	0.05 mm	0.002 in.
Taper and out-of-round	0.02 mm	0.0008 in.

Valve Lifter

Valve lifter diameter	STD	25.15 mm	0.99 in.
	O/S Type	0.05	

Piston and Ring

Piston diameter	STD	93.96 – 94.01 mm	3.6992 – 37.012 in.
	O/S Type	0.5, 1.00, 1.50	
Piston clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.
Piston ring end gap	Top and 2nd	0.20 – 0.40 mm	0.0079 – 0.0157 in.
Piston ring to ring groove clearance			
	Top	0.03 – 0.06 mm	0.0012 – 0.0024 in.
	2nd	0.02 – 0.06 mm	0.0008 – 0.0024 in.
Piston pin to piston oil clearance		0.008 – 0.012 mm	0.0003 – 0.0005 in.

Connecting Rod and Bearing

Thrust clearance	STD	0.11 – 0.23 mm	0.0043 – 0.0091 in.
	Limit	0.3 mm	0.012 in.
Bearing oil clearance		0.02 – 0.06 mm	0.0008 – 0.0024 in.
Bearing U/S Type		0.05, 0.25, 0.50	

Crankshaft and Bearing

Thrust clearance	STD	0.06 – 0.16 mm	0.0024 – 0.0063 in.
	Limit	0.3 mm	0.012 in.
Runout limit		0.1 mm	0.004 in.
Main journal oil clearance		0.020 – 0.044 mm	0.0008 – 0.0017 in.
Crank pin diameter		53.98 – 54.00 mm	2.1252 – 2.1260 in.
Main journal diameter	No. 1	66.972 – 66.996 mm	2.6367 – 2.6376 in.
	No. 2	68.472 – 68.496 mm	2.6957 – 2.6967 in.
	No. 3	69.972 – 69.996 mm	2.7548 – 2.7557 in.
	No. 4	71.472 – 71.496 mm	2.8139 – 2.8148 in.

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Crankshaft and Bearing (Cont'd)

Main journal U/S bearings Type	0.05, 0.25, 0.50	
Bend limit	0.04 mm	0.0016 in.
Journal taper and out-of-round limit	0.01 mm	0.0004 in.
Crankpin journal taper and out-of-round limit	0.01 mm	0.0004 in.

LUBRICATING SYSTEM

Oil Pump

Gear backlash	STD	0.05 – 0.07 mm	0.0020 – 0.0028 in.
	Limit	0.95 mm	0.0374 in.
Tip clearance	STD	0.03 – 0.11 mm	0.0012 – 0.0043 in.
	Limit	0.2 mm	0.008 in.
Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
	Limit	0.15 mm	0.0059 in.
Cover wear limit		0.15 mm	0.0059 in.

COOLING SYSTEM

Radiator

Relief valve opening pressure	STD	0.9 kg/cm²	12.8 psi
	Limit	0.6 kg/cm²	8.5 psi

Fluid Coupling

Silicone oil viscosity	3000 cst	
Silicone oil capacity	50 cc	3.1 cu.in.

Water Pump

Bearing fitting temperature	20°C	68°F

Thermostat

Valve opening temperature		
Start to open at	80 – 84°C	176 – 183°F
Fully opens at	95°C	203°F
Valve opening travel	8 mm	0.31 in.

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FUEL SYSTEM

Carburetor

Float level	Raised position	7.5 mm	0.295 in.
	Lowered position	1.1 mm	0.043 in.
Throttle valve full open angle		90° from bore	
Seco-touch angle		57°	
Kick up		25° from bore	
Fast idle		1.3 mm	0.051 in.
Throttle positioner		0.8 mm	0.031 in.
Accelerating pump stroke		9.5 mm	0.374 in.
Choke breaker		38° from bore	
Idle mixture adjusting screw initial setting (Reference only)		Screw out 1½ turns.	

STARTING SYSTEM

Starter

No load characteristics	Ampere	Less than 50 at 11.5V	
	RPM	More than 5000 rpm	
Armature shaft to bushing clearance	STD	0.05 mm	0.002 in.
	Limit	0.2 mm	0.008 in.
Armature shaft thrust clearance		0.05 – 0.35 mm	0.002 – 0.0138 in.
Brush length	STD	19 mm	0.75 in.
	Limit	13 mm	0.51 in.
Commutator runout	STD	Less than 0.05 mm	0.002 in.
	Limit	0.4 mm	0.016 in.
Commutator diameter	STD	32.7 mm	1.287 in.
	Limit	31 mm	1.22 in.
Mica depth	STD	0.5 – 0.8 mm	0.020 – 0.031 in.
	Limit	0.2 mm	0.008 in.
Pinion end to stop collar clearance		0.2 – 4.0 mm	0.008 – 0.158 in.
Moving stud length (Reference only)		34 mm	1.34 in.

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IGNITION SYSTEM

Distributor

Shaft thrust clearance	0.15 – 0.5 mm	0.006 – 0.020 in.
Point rubbing block gap	0.3 mm	0.012 in.
Dwell angle	38° – 44°	
Damping spring gap	0.1 – 0.4 mm	0.004 – 0.016 in.

Advance characteristics 19100-61010			
Distributor vacuum advance angle	Vacuum mm Hg	in. Hg	Dis. Advance Angle
	100	3.94	Advance begins
	200	7.87	5.0°
	300	11.81	8.5°
Distributor governor advance angle	Dis. rpm		Dis. Advance Angle
	450		Advance begins
	900		9.0°
	160		15.0°

Advance characteristics 19100-61040			
Distributor vacuum retard angle	Vacuum mm Hg	in. Hg	Dis. Advance Angle
	100	3.94	Advance begins
	200	7.87	5.0°
	300	11.81	8.5°
Distributor governor advance angle	Dis. rpm		Dis. Advance Angle
	750		Advance begins
	1800		12.0°

Advance characteristics 19100-61070			
Vacuum advance angle	mm Hg	in. Hg	Dis. Advance Angle
	100	3.94	Advance begins
	150	5.91	4.3°
	210	8.27	8.0°
Governor advance angle	Dis. rpm		Dis. Advance Angle
	600		Advance begins
	950		6.0°
	1800		10.0°
	3000		9.7°

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Ignition Coil

Primary coil resistance	1.3 – 1.6Ω
Secondary coil resistance	9.5 – 14.5Ω
External resistor resistance	1.3 – 1.7Ω
Insulation resistance (With a 500V megohm meter)	More than 10 MΩ

High Tension Cord

Resistance limit	Less than 25 kΩ

Spark Plug

Spark plug gap	0.8 mm	0.031 in.
Heat range	W14EP	B5ES
	W14EPR	BR5ES

CHARGING SYSTEM

Alternator

Type		Conventional type w/Vacuum pump		Heavy duty type	
Maximum output	Ampere	40A, 50A		50A, 55A	
Brush exposed length	STD	12.5 mm	0.49 in.	–	
	Limit	5.5 mm	0.22 in.	–	
Brush length	STD			18.5 mm	0.73 in.
	Limit			8.0 mm	0.31 in.
Rotor coil resistance		4.1 – 4.3Ω			

Alternator Regulator

Regulating voltage	13.8 – 14.8 V

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MEMO

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B ENGINE

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MAIN PARTS TIGHTENING TORQUES

Tightening Parts	Torque	
	kg-m	ft-lb
Cylinder head	11.5 – 12.0	83.2 – 86.8
Valve rocker support	1.0 – 1.6	7.2 – 11.6
Manifold	1.5 – 2.2	10.8 – 15.9
Camshaft x Camshaft gear	3.0 – 4.5	21.7 – 32.5
Camshaft thrust plate	1.0 – 1.6	7.2 – 11.6
Idle gear	3.0 – 4.5	21.7 – 32.5
Timing gear cover	1.5 – 2.2	10.8 – 15.9
Crankshaft pulley	11.0 – 15.0	79.6 – 108.5
Crankshaft bearing cap	9.8 – 11.2	70.9 – 81.0
Connecting rod cap	6.5 – 7.5	47.0 – 54.2
Flywheel	6.5 – 7.5	47.0 – 54.2
Nozzle holder x Cylinder head	6.0 – 8.0	43.4 – 57.9
Nozzle retaining nut	6.0 – 8.0	43.4 – 57.9
Injection pipe union nut	1.0 – 1.6	7.2 – 11.6
Delivery valve holder	2.5 – 3.5	18.1 – 25.3

ENGINE TUNE-UP

Battery	Specific gravity	1.260 (at 20°C)		
Cooling water capacity (w/o heater)		16 ℓ	16.9 US qt	14.1 Imp.qt
Fan belt deflection (Crank pulley x Alternator)		11 – 14 mm (0.4 – 0.6 in.) at 10 kg (22 lb) pressure		
Injection period		10° BTDC (stationary)		
Idling speed		600 – 650 rpm		
Maximum no load speed	Momentary	4,000 rpm		
	At 3rd speed	60 km/h	37.5 mph	
Compression at 260 rpm	Limit	20 kg/cm²	284.4 psi	
	STD	30 kg/cm²	426.6 psi	
	Variation limit between cylinders	2.0 kg/cm²	28.4 psi	
Valve clearance (hot)	Intake	0.20 mm	0.008 in.	
	Exhaust	0.36 mm	0.014 in.	
Engine oil pressure (idling)		0.8 kg/cm²	11.4 psi	
Engine oil capacity	Total	8.0 ℓ	8.6 US qt	7.0 Imp.qt
	Oil pan	7.0 ℓ	7.4 US qt	6.2 Imp.qt

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ENGINE

Cylinder Head

Underside surface warpage limit		0.05 mm	0.0020 in.
Manifold mounting surface warpage limit		0.2 mm	0.008 in.
Valve seat	Seating width	1.4 mm	0.055 in.
	Seating angle	45°	
	Refacing angles	15°, 75°	

Valve Guide Bushing

Overall length		62 mm	2.44 in.
Protrusion above head upper surface (From valve spring contact surface)		16.6 – 17.4 mm	0.654 – 0.685 in.
Valve stem to guide bushing clearance			
	Limit Intake	0.10 mm	0.0039 in.
	Exhaust	0.12 mm	0.0047 in.
	STD Intake	0.02 – 0.06 mm	0.0008 – 0.0024 in.
	Exhaust	0.04 – 0.08 mm	0.0016 – 0.0031 in.

Valve

Head outside diameter	Intake	44.8 – 45.2 mm	1.764 – 1.780 in.
	Exhaust	37.3 – 37.7 mm	1.469 – 1.484 in.
Overall length	Intake	127.95 mm	5.0374 in.
	Exhaust	127.75 mm	5.0295 in.
Stem end refacing limit		0.5 mm	0.020 in.
Stem outside diameter	Intake	8.97 – 8.99 mm	0.3531 – 0.3539 in.
	Exhaust	8.95 – 8.97 mm	0.3524 – 0.3531 in.
Valve seating angle		45°	
Head edge thickness limit	Intake	0.9 mm	0.035 in.
	Exhaust	1.0 mm	0.039 in.

Valve Spring

Free height	45.7 mm	1.799 in.
Installed height	39.4 mm	1.551 in.
Installed load limit	23.1 kg	50.9 lb
Installed load	27.1 kg	59.8 lb
Squareness limit	1.6 mm	0.063 in.

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Valve Rocker Shaft and Arm

Shaft diameter limit		18.44 mm	0.7260 in.
Rocker arm bore limit		18.60 mm	0.7323 in.
Rocker arm bushing to shaft oil clearance			
	Limit	0.1 mm	0.004 in.
	STD	0.02 – 0.06 mm	0.0008 – 0.0024 in.

Valve Lifter and Push Rod

Lifter diameter	STD	23.97 – 23.98 mm	0.9437 – 0.9441 in.
Lifter to block bore clearance	Limit	0.1 mm	0.004 in.
	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
Push rod bend limit		0.5 mm	0.020 in.

Manifold

Cylinder head mounting surface warpage limit	0.4 mm	0.016 in.

Cylinder Block

Block upper surface warpage limit		0.05 mm	0.0020 in.
Valve lifter bore	STD	24.00 – 24.02 mm	0.9449 – 0.9457 in.
Cylinder bore	STD	95.00 – 95.03 mm	3.7402 – 3.7413 in.
Liner	Max. wear limit	0.6 mm	0.024 in.
	Protrusion	0.01 – 0.10 mm	0.0004 – 0.0039 in.

Crankshaft

Bend limit		0.03 mm	0.0012 in.
Thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.07 – 0.18 mm	0.0028 – 0.0071 in.
Main journal oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Journal diameter			
U/S finished diameter	STD	69.98 – 70.00 mm	2.7551 – 2.7559 in.
	U/S 0.25	69.74 – 69.75 mm	2.7457 – 2.7461 in.
	U/S 0.50	69.49 – 69.50 mm	2.7358 – 2.7362 in.
	U/S 1.00	68.99 – 69.00 mm	2.7161 – 2.7165 in.
Journal and crankpin	Tapered limit	0.02 mm	0.0008 in.
	Out-of-round limit	0.02 mm	0.0008 in.

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Crankshaft (Cont'd)

Crankpin oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Crankpin diameter			
U/S finished diameter	STD	58.98 – 59.00 mm	2.3220 – 2.3228 in.
	U/S 0.25	58.74 – 58.75 mm	2.3126 – 2.3130 in.
	U/S 0.50	58.49 – 58.50 mm	2.3028 – 2.3031 in.
	U/S 1.00	57.99 – 58.00 mm	2.2831 – 2.2835 in.

Flywheel

Runout limit	0.2 mm	0.008 in.

Connecting Rod

Large end thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.08 – 0.20 mm	0.0031 – 0.0079 in.
Solid bushing to pin clearance		0.004 – 0.012 mm	0.0002 – 0.0005 in.
Connecting rod bearing	Limit	0.1 mm	0.004 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.

Piston and Piston Pin

Piston diameter	STD	94.88 – 94.91 mm	3.7354 – 3.7366 in.
	O/S 1.00	95.88 – 95.91 mm	3.7748 – 3.7760 in.
Piston to cylinder clearance		0.11 – 0.13 mm	0.0043 – 0.0051 in.
Pin diameter		29.00 – 29.01 mm	1.1417 – 1.1421 in.
Pin fitting temperature		60°C	140°F
Piston ring end gap	No. 1	0.30 – 0.50 mm	0.0118 – 0.0197 in.
	No. 2	0.30 – 0.50 mm	0.0118 – 0.0197 in.
	No. 3	0.30 – 0.50 mm	0.0118 – 0.0197 in.
	Oil ring	0.30 – 0.50 mm	0.0118 – 0.0197 in.
Piston ring to groove clearance	No. 1	0.06 – 0.10 mm	0.0024 – 0.0039 in.
	No. 2	0.05 – 0.09 mm	0.0020 – 0.0035 in.
	No. 3	0.04 – 0.08 mm	0.0016 – 0.0031 in.
	Oil ring	0.03 – 0.07 mm	0.0012 – 0.0028 in.

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Timing and Idle Gear

Gear backlash			
Idle gear, cam gear, timer drive gear	Limit	0.3 mm	0.012 in.
	STD	0.06 – 0.09 mm	0.0024 – 0.0035 in.
Crankshaft gear to idle gear	Limit	0.3 mm	0.012 in.
	STD	0.06 – 0.09 mm	0.0024 – 0.0035 in.
Idle gear thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.03 – 0.15 mm	0.0012 – 0.0059 in.
Idle gear oil clearance	Limit	0.3 mm	0.012 in.
	STD	0.04 – 0.09 mm	0.0016 – 0.0035 in.
Idle gear bore		45.00 – 45.03 mm	1.7717 – 1.7728 in.
Idle gear shaft diameter	Limit	44.91 mm	1.7681 in.
	STD	44.94 – 44.96 mm	1.7693 – 1.7701 in.

Camshaft and Bearing

Bend limit		0.02 mm	0.0008 in.
Thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.06 – 0.13 mm	0.0024 – 0.0051 in.
Oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Cam height limit	Intake	39.0 mm	1.535 in.
	Exhaust		
Cam height standard	Intake	39.47 – 39.56 mm	1.5539 – 1.5575
	Exhaust		
Journal diameter STD	No. 1	47.16 – 47.18 mm	1.8567 – 1.8575 in.
	No. 2	46.96 – 46.98 mm	1.8488 – 1.8496 in.
	No. 3	46.76 – 46.78 mm	1.8409 – 1.8417 in.

FUEL SYSTEM

Fuel Pump Performance Test

Suction test	Suction pipe spec. Inside dia. 8 mm (0.31 in.) Length 2 m (78.7 in.) Height 1 m (39.4 in.)	Feed pump : Start discharge within 40 seconds at 150 rpm Priming pump : Start discharge within 25-strokes when pumped at 60 stroke/min

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Fuel Pump Performance Test (Cont'd)

Discharge test	600 rpm	1.8 – 2.2 kg/cm²	25.6 – 31.3 psi
	600 rpm	Discharge quantity More than 900 cc/min	(54.9 cu.in.)
		(Discharge nozzle diameter 1.54 mm (0.0606 in.)	

Fuel Feed Pump

Housing to piston clearance	0.009 – 0.013 mm	0.0004 – 0.0005 in.
Housing to push rod clearance	0.003 – 0.006 mm	0.0001 – 0.0002 in.
Feed pump tappet stroke	8 mm	0.31 in.
Priming pump stroke	25 mm	0.98 in.

Injection Pump

Direction of rotation		Clockwise as seen from drive side	
Cam lift		8 mm	0.31 in.
Injection order		1–3–4–2	
Control rack sliding resistance			
	Pump stopped	Less than 150 g	5.3 oz
	Pump at 1,000 rpm	Less than 50 g	1.8 oz
Pre-stroke		1.9 – 2.0 mm	0.075 – 0.079 in.
Injection interval angle		89.5 – 90.5°	
Tappet clearance		More than 0.2 mm	0.008 in.
Camshaft thrust clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.
Camshaft shim plate thickness		0.10, 0.12, 0.14, 0.16, 0.18, 0.50 mm	0.0039 in.
		0.0047, 0.0055, 0.0063, 0.0071, 0.0197 in.	
Camshaft spring	Free height STD	49.4 mm	1.945 in.
	Installed length	44.0 mm	1.732 in.
	Installed load	15.1 kg	33.3 lb
Delivery valve spring	Free height STD	37.0 mm	1.457 in.
	Installed height	25.9 mm	1.020 in.
	Installed load	4.42 kg	9.7 lb

Pneumatic Governor

Main spring	Free height	126 mm	4.96 in.
	Installed height	37 mm	1.46 in.
	Installed load	978 g	34.5 oz
	Adjust shim thickness	0.5, 1.0, 2.0, 3.0 mm	
		0.020, 0.039, 0.079, 0.118 in.	

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Pneumatic Governor (Cont'd)

Idling spring free height STD	24.7 mm	0.972 in.
Idling capsule shim & washer thickness	0.1, 0.2, 0.5, 1.0 mm	
	0.004, 0.008, 0.020, 0.039 in.	

Injection Pipe

Overall length	470 – 480 mm	18.50 – 18.90 in.
Outside diameter	6 mm	0.24 in.
Inside diameter	2 mm	0.08 in.

Nozzle and Nozzle Holder

Nozzle Opening pressure	115 – 125 kg/cm²	1635 – 1776 psi
Injection angle	Approx. 4°	
Adjust washer thickness	1.00 . . . 1.95 mm	0.0394 . . . 0.0768 in.
(For adjusting nozzle opening pressure)	[20 sizes in 0.05 mm (0.0020 in.) increments]	

Automatic Timer

Timer advance angle (Timer rpm)	400 rpm	Advance begins
	500 rpm	0 – 0.5°
	700 rpm	2 – 3°
	900 rpm	4.5 – 5.5°
	1,200 rpm	6 – 7°
	1,600 rpm	8 – 9°
Timer spring adjust washer thickness	0.1, 0.2, 0.5, 1.0, 1.5 mm	
	0.004, 0.008, 0.020, 0.039, 0.059 in.	

INJECTION PUMP ADJUSTMENT AND TEST

Pressure Test

Plunger pressure	More than 150 kg/cm² (2133 psi) (Pump at 200 rpm)
Delivery valve pressure	More than 5 seconds for holder internal pressure to drop 10 kg/cm² (142 psi) (Holder internal pressure more than 150 kg/cm² (2133 psi)

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Injection Quantity Adjustment

Rack Position mm (in.)	Pump Speed (rpm)	Measured Strokes (stroke)	Injection Quantity cc (cu.in.)	Variation Limit cc (cu.in.)	Remarks Test Bench
10.5 (0.413)	1000	200	8.1 – 8.7 (0.494 – 0.531)	0.4 (0.024)	Nozzle opening pressure 120 kg/cm² (1706 psi)
8.0 (0.315)	1000	200	4.3 – 5.1 (0.262 – 0.311)	0.4 (0.024)	Delivery pressure 0.5 kg/cm² (7.1 psi)
6.5 (0.256)	300	500	2.5 – 4.5 (0.153 – 0.275)	1.0 (0.061)	Nozzle high press. pipe O.D. 6 mm (0.24 in.)
16.0 (0.630)	100	200	14.0 – 16.0 (0.854 – 0.976)	1.2 maximum (0.073)	I.D. 2.0 mm (0.079 in.) Length 600 mm (23.62 in.)

Governor Adjustment

Test & Adjustments	Pump Speed (rpm)	Vacuum mm (in.) Aq	Rack Position mm (in.)	Time (Second)	Remarks
Governor air tightness	600	500 → 480 (19.69 → 18.90)		10 minimum	
Main spring adjustment	600	500 (19.69)	11.5 – 11.7 (0.453 – 0.461)		Initial rack set : 11.7 mm at 480 mm Aq (0.461 in. at 18.90 in. Aq)
		520 (20.47)	9.5 – 10.8 (0.374 – 0.425)		
		550 (21.65)	6.0 – 8.5 (0.236 – 0.335)		
Idling spring adjustment	600	600 (23.62)	9.7 – 10.2 (0.382 – 0.402)		Lever positioned at idling state (Cam actuating)
		1000 (39.37)	8.2 – 8.5 (0.323 – 0.335)		

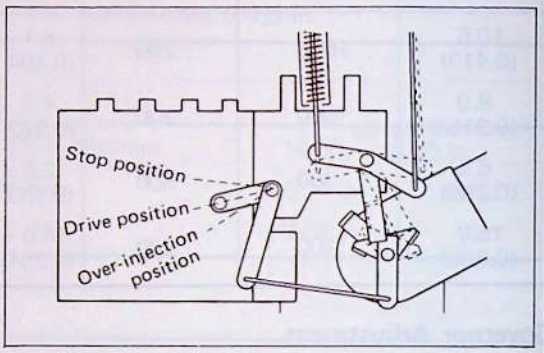
Overall Injection Quantity Adjustment (Rack Set)

Pump Speed (rpm)	Vacuum mm (in.) Aq	Measures Strokes (stroke)	Injection Quantity cc (cu.in.)/4 cyl.
1100	200 (7.87)	500	109 – 113 (6.65 – 6.89)

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ELECTRONIC DIESEL INJECTION CONTROL

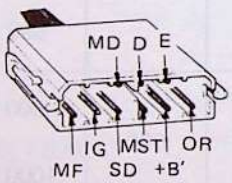
Operational Check

Fuel control motor lever position	

Engine Speed Sensor

Coil resistance	52 – 58Ω
Generated voltage at engine 3000 rpm	9.5 – 11.5 V

Fuel Control Relay

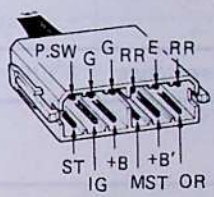
With connector disconnected	
Between terminals	
+B' – MF	**0Ω**
D – E	**0Ω**
D – MF	**Infinity Ω**
MST – E	**Infinity Ω**
IG – OR	**Approx. 220Ω**
SD – E	**Approx. 120Ω**
Impress 24 V between terminal IG and OR	
Between terminals	
+B – MD	**0Ω**
+B – MF	**Infinity**

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Fuel Control Relay (Cont'd)

Impress 24V between terminal SD and E		
Between terminals		
D – MF	**0Ω**	
MST – E	**0Ω**	
D – E	**Infinity**	
Point gap	0.7 – 1.0 mm	0.028 – 0.039 in.

Fuel Controller

With connector disconnected		
Between terminals		
ST – E	**Approx. 90Ω**	
+B – +B'	**0Ω**	
RR – RR	**0Ω**	
Impress 24V between terminal ST and E		
Between terminals		
+B – +B'	**Infinity**	
+B – MST	**0Ω**	

Fuel Control Motor Link

Stop lever to drive lever rod length	Approx. 90 mm	3.54 in.

LUBRICATING SYSTEM

Oil Pump and Oil Cleaner

Oil clearance	Drive shaft	0.02 – 0.06 mm	0.0008 – 0.0024 in.
	Driven shaft	0.01 – 0.05 mm	0.0004 – 0.0020 in.
Tip clearance	Limit	0.2 mm	0.008 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Side clearance	Limit	0.2 mm	0.008 in.
	STD	0.03 – 0.10 mm	0.0012 – 0.0039 in.
Relief valve	Valve opening pressure	5 – 6 kg/cm²	71 – 85 psi
Check valve	Valve opening pressure	0.8 – 1.2 kg/cm²	11.4 – 17.1 psi

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COOLING SYSTEM

Radiator

Overall cooling water capacity w/o heater		16 ℓ	16.9 US qt	14.1 Imp.qt
Cooling water capacity		4 ℓ	4.2 US qt	3.5 Imp.qt
Radiator cap valve opening pressure	STD	0.9 kg/cm²	12.8 psi	
	Limit	0.6 kg/cm²	8.5 psi	

Water Pump

Bearing fitting temperature	80°C	180°F

Thermostat

Full open temperature	95°C 203°F	90°C 194°F
Valve opening temperature	80° – 84°C 176° – 183°F	74.5° – 78.5°C 166.0° – 173.5°F
Valve lift	10 mm 0.39 in.	10 mm 0.39 in.

STARTING SYSTEM

Starter

Type			24 V type	12 V type
Rated output			3.2 kW	1.8 kW
No load characteristics			60A max. and 4000 rpm min. at 23V	100A max. and 6000 rpm min. at 11.5V
Armature shaft to bushing clearance				
	STD	Housing side	0.05 mm	0.0020 in.
		Pinion side	0.1 mm	0.004 in.
		Center part	0.05 mm	0.0020 in.
		End frame part	0.05 mm	0.0020 in.
	Limit		0.2 mm	0.008 in.
Thrust clearance		Limit	1.0 mm	0.039 in.
		STD	0.05 – 0.50 mm	0.063 – 0.079 in.
Commutator outside diameter		Limit	41 mm	1.61 in.
		STD	43 mm	1.69 in.
Mica depth		Limit	0.2 mm 0.008 in.	0.2 mm 0.008 in.
		STD	0.5 – 0.9 mm 0.020 – 0.035 in.	0.5 – 0.8 mm 0.020 – 0.031 in.

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Starter (Cont'd)

Brush length	Limit	14 mm	0.55 in.
	STD	22 mm	0.87 in.
Magnetic switch	Pull in voltage	16V max.	8V max.
	Holding voltage	16V	8V

Glow Plug

Type	24 V type	12 V type
Rated voltage	20.5 V	8.5 V
Rated current	4.0 – 5.6 A	7.6 – 10.4 A
Heater temperature (after 90 sec.)	1000° – 1100°C	←
	1830° – 2010°F	←

Glow Plug Controller

Type	24 V type	12 V type
Rated current	19 A	36 A
Rated voltage	23.5 V	11.5 V
Heater temperature	850° – 950°C 1560° – 1740°F	890° – 990°C 1634° – 1814°F
Time required to glow (normal state)	About 15 sec.	←

Glow Plug Relay

Type	24 V type	12 V type
Rated voltage	24 V	12 V
Rated coil current	0.4 – 0.6 A	0.8 – 1.2 A
Maximum current capacity	40 A	60 A
Contact pressure	500 g 17.6 oz min.	←

Overinjection Magnet

Type	24 V type	12 V type
Rated voltage	24 V	12 V
Current	10 A max.	20 A max.
Time rating	30 seconds	←

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Overinjection Magnet (Cont'd)

Pull in force	At 4.7 mm (0.185 in.) gap (marks aligned)	5 kg 11.0 lb minimum	←
	At 0 gap	8 kg 17.6 lb minimum	←
Stroke		14 – 17 mm 0.55 – 0.67 in.	←

CHARGING SYSTEM

Alternator

Type		24 V type	12 V type
Nominal voltage		24 V	12 V
Maximum output		15 A 28 V hot	30 A 14 V hot
Output speed		2000 rpm max.	2500 rpm max.
		28V cold 15 A	14 V cold 30 A
Rotor coil resistance		19 – 19.5 Ω	Approx. 4.2 Ω
Brush length	Limit	5.5 mm 0.217 in.	←
	STD	12.5 mm 0.492 in.	←

Generator Regulator

Type	24 V type	12 V type
Regulating voltage	27.8 – 28.6 V	13.8 – 14.8 V
Relay actuating voltage	5.2 – 5.8 V	4.5 – 5.8 V

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2J ENGINE

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MAIN PARTS TIGHTENING TORQUES

Tightening Parts	Torque	
	kg-m	ft-lb
Cylinder head	11.5 – 12.0	83.2 – 86.8
Valve rocker support	1.5 – 2.2	10.8 – 15.9
Manifold	1.5 – 2.2	10.8 – 15.9
Camshaft x Camshaft gear	3.0 – 4.5	21.7 – 32.5
Camshaft thrust plate	1.5 – 2.2	10.8 – 15.9
Idle gear	3.0 – 4.5	21.7 – 32.5
Timing gear cover	1.5 – 2.2	10.8 – 15.9
Crankshaft pulley	11.0 – 15.0	79.6 – 108.5
Crankshaft bearing cap	9.8 – 11.2	70.9 – 81.0
Connecting rod cap	6.5 – 7.5	47.0 – 54.2
Flywheel	11.5 – 12.5	83.2 – 90.4
Nozzle holder x Cylinder head	6.0 – 8.0	43.4 – 57.9
Nozzle retaining nut	6.0 – 8.0	43.4 – 57.9
Injection pipe union nut	2.3 – 3.7	16.6 – 26.8
Delivery valve holder	2.5 – 3.5	18.1 – 25.3

ENGINE TUNE-UP

Drive belt tension	at 10 kg (22 lb)	11 – 14 mm		0.43 – 0.55 in.
Battery specific gravity	at 20°C (70°F)	1.25 – 1.27		
Engine oil capacity	Total	7.0 liter	7.4 US qt	6.2 Imp.qt
	Crankcase	6.0 liter	6.3 US qt	5.3 Imp.qt
Coolant capacity		13.3 liter	14.1 US qt	11.7 Imp.qt
Injection order		1–2–4–3		
Injection timing		10° BTDC (Stationary)		
Idle speed		650 rpm		
Maximum speed		3900 rpm		
Valve clearance (Hot)	Intake	0.20 mm		0.008 in.
	Exhaust	0.36 mm		0.014 in.
Compression pressure	STD	27 kg/cm²		383.9 psi
	Limit	20.0 kg/cm²		284.4 psi
Difference of pressure between cylinder		2.0 kg/cm²		28.5 psi

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ENGINE

Cylinder Head

Lower surface warpage limit		0.05 mm	0.0020 in.
Manifold installing surface warpage limit		0.2 mm	0.008 in.
Valve seat:	Contacting width	1.3 – 1.6 mm	0.051 – 0.063 in.
	Contacting surface angle	45°	
	Surface correcting angle	15°, 75°	

Valve Guide Bushing

Overall length:	Intake	56 mm	2.20 in.
	Exhaust	60 mm	2.36 in.
Diameter		14.02 – 14.04 mm	0.5520 – 0.5528 in.
Protrusion from head top surface (from valve spring installing surface)		16.6 – 17.4 mm	0.654 – 0.685 in.
Clearance between valve stem:			
Clearance limit:	Intake	0.10 mm	0.0039 in.
	Exhaust	0.12 mm	0.0047 in.
Specified clearance:	Intake	0.02 – 0.06 mm	0.0008 – 0.0024 in.
	Exhaust	0.04 – 0.08 mm	0.0016 – 0.0031 in.

Valve

Head diameter:	Intake	40.3 – 40.7 mm	1.587 – 1.602 in.
	Exhaust	33.3 – 33.7 mm	1.311 – 1.327 in.
Overall length:	Intake	120.6 mm	4.748 in.
	Exhaust	120.4 mm	4.740 in.
Stem end surface corretction limit		0.5 mm	0.020 in.
Stem diameter:	Intake	8.97 – 8.99 mm	0.3531 – 0.3539 in.
	Exhaust	8.95 – 8.97 mm	0.3524 – 0.3531 in.
Valve contacting surface angle		45°	
Head edge thickness limit:	Intake	0.9 mm	0.035 in.
	Exhaust	1.0 mm	0.039 in.

Valve Compression Spring

Free length	45.1 mm	1.776 in.
Installed length	40.0 mm	1.575 in.
Installed load limit	18.5 kg	40.8 lb
Installed load	21.7 kg	47.8 lb
Squareness limit	1.6 mm	0.063 in.

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Valve Roker Shaft and Arm

Rocker arm bushing to shaft oil clearance			
	Limit	0.1 mm	0.004 in.
	STD	0.01 – 0.05 mm	0.0004 – 0.0020 in.

Valve Lifter

Lifter diameter	STD	22.17 – 22.19 mm	0.8728 – 0.8736 in.
	O/S	0.05	
Lifter to block bore clearance	Limit	0.1 mm	0.004 in.
	STD	0.01 – 0.05 mm	0.0004 – 0.0020 in.

Manifold

Warpage limit	0.4 mm	0.016 in.

Timing Gear and Idle Gear

Backlash			
Crankshaft to camshaft gear	Limit	0.3 mm	0.012 in.
	STD	0.1 mm	0.004 in.
Crankshaft to idler gear	Limit	0.3 mm	0.012 in.
	STD	0.1 mm	0.004 in.
Idler gear to timer drive gear	Limit	0.3 mm	0.012 in.
	STD	0.1 mm	0.004 in.
Idler gear thrust clearance	Limit	0.35 mm	0.0138 in.
	STD	0.08 – 0.18 mm	0.0031 – 0.0071 in.
Idler gear oil clearance	Limit	0.3 mm	0.012 in.
	STD	0.04 – 0.09 mm	0.0016 – 0.0035 in.
Idler gear bore		50.00 – 50.03 mm	1.9685 – 1.9697 in.
Idler gear shaft diameter	Limit	49.90 mm	1.9646 in.
	STD	49.94 – 49.96 mm	1.9661 – 1.9670 in.

Camshaft and Bearing

Camshaft bending limit		0.02 mm	0.0008 in.
Thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.06 – 0.13 mm	0.0024 – 0.0051 in.
Oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.025 – 0.065 mm	0.0010 – 0.0026 in.

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Camshaft and Bearing (Cont'd)

Cam height	STD	Intake	39.467 – 39.557 mm	1.5538 – 1.5574 in.
		Exhaust	39.465 – 39.555 mm	1.5537 – 1.5573 in.
	Limit	Both	39.0 mm	1.535 in.
Journal diameter	STD No. 1		47.159 – 47.175 mm	1.8567 – 1.8573 in.
	No. 2		46.959 – 46.975 mm	1.8488 – 1.8494 in.
	No. 3		46.759 – 46.775 mm	1.8409 – 1.8415 in.
	No. 4		46.559 – 46.575 mm	1.8330 – 1.8337 in.
Journal bearings U/S species			0.125, 0.25, 0.50	

Cylinder Block

Block top surface warpage limit		0.05 mm	0.0020 in.
Cylinder bore			
	STD	88.00 – 88.03 mm	3.4646 – 3.4657 in.
	Maximum wear limit	0.3 mm	0.012 in.
Liner	Insertion limit	0.04 – 0.08 mm	0.0016 – 0.0031 in.
	Insertion pressure	5,000 kg	11000 lb
	Protrusion	0.03 – 0.12 mm	0.0012 – 0.0047 in.
Liner shim thickness		0.05, 0.10 mm	

Valve Lifter

Oil clearance	Limit	0.01 – 0.05 mm	0.0004 – 0.0020 in.
	STD	0.1 mm	0.004 in.

Piston and Piston Ring

Piston	Diameter	STD	87.88 – 87.91 mm	3.4598 – 3.4610 in.
		O/S 1.00	88.88 – 88.91 mm	3.4992 – 3.5004 in.
			0.11 – 0.13 mm	0.0043 – 0.0051 in.
Pin fitting temperature			60°C	140°F
Piston rings		No. 1	0.25 – 0.45 mm	0.0098 – 0.0177 in.
		No. 2	0.25 – 0.45 mm	0.0098 – 0.0177 in.
		No. 3	0.20 – 0.40 mm	0.0079 – 0.0157 in.
		Oil ring	0.20 – 0.40 mm	0.0079 – 0.0157 in.
Piston ring to groove clearance		No. 1	0.06 – 0.10 mm	0.0024 – 0.0039 in.
		No. 2	0.05 – 0.09 mm	0.0020 – 0.0035 in.
		No. 3	0.03 – 0.07 mm	0.0012 – 0.0028 in.
		Oil ring	0.03 – 0.07 mm	0.0012 – 0.0028 in.

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Connecting Rod

Thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.08 – 0.20 mm	0.0031 – 0.0079 in.
Piston pin clearance		0.04 – 0.012 mm	0.0002 – 0.0005 in.
Crank pin oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.

Crankshaft

Bending limit		0.03 mm	0.0012in.
Thrust clearance	Limit	0.35 mm	0.0138 in.
	STD	0.04 – 0.25 mm	0.0016 – 0.0098 in.
Thrust bearing thickness	STD	2.93 – 2.98 mm	0.1154 – 0.1173 in.
	O/S type	0.125, 0.250	
Main journal oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Main journal diameter	STD	69.98 – 70.00 mm	2.7551 – 2.7559 in.
	U/S 0.05	–	–
U/S finished diameter	U/S 0.25	69.73 – 69.75 mm	2.7453 – 2.7461 in.
	U/S 0.50	69.48 – 69.50 mm	2.7354 – 2.7362 in.
	U/S 0.75	69.23 – 69.25 mm	2.7256 – 2.7264 in.
	U/S 1.00	68.98 – 69.00 mm	2.7157 – 2.7165 in.
Crank pin oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
Crank pin diameter	STD	54.98 – 55.00 mm	2.1646 – 2.1654 in.
	U/S 0.05	–	–
U/S finished diameter	U/S 0.25	54.73 – 54.75 mm	2.1547 – 2.1555 in.
	U/S 0.50	54.48 – 54.50 mm	2.1449 – 2.1457 in.
	U/S 0.75	54.23 – 54.25 mm	2.1350 – 2.1358 in.
	U/S 1.00	53.98 – 54.00 mm	2.1252 – 2.1260 in.
Main journal and crankpin			
Taper and out-of roundness limit		0.02 mm	0.0008 in.

Flywheel

Warpage limit	0.2 mm	0.008 in.

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LUBRICATING SYSTEM

Oil Pump

Tip clearance	Limit	0.2 mm	0.008 in.
	STD	0.03 – 0.06 mm	0.0012 – 0.0024 in.
Side clearance	Limit	0.2 mm	0.008 in.
	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.

COOLING SYSTEM

Radiator

Radiator coolant capacity		3.6 liter	3.8 US qt.	3.2 Imp.qt.
Radiator cap valve opening pressure	STD	0.9 kg/cm²	128 psi	
	Limit	0.6 kg/cm²	8.5 psi	

Water Pump

Bearing replacement temperature	80°C	176°F

Thermostat

Type	Wax	
Opening temperature (initial)	75°C	167°F
Full opening temperature	85°C	185°F
Valve stroke (at full opening)	8 mm	0.31 in.

FUEL SYSTEM

Feed Pump

Housing to piston clearance	0.009 – 0.013 mm	0.0004 – 0.0005 in.
Housing to push rod clearance	0.003 – 0.006 mm	0.0001 – 0.0002 in.

Fuel Pump Performance Test

Suction test	Suction pipe spec.			Feed pump
	Inside dia.	8 mm	0.31 in.	Start discharge within 40 seconds at 150 rpm
	Length	2 m	78.7 in.	Priming pump
	Height	1 m	39.4 in.	Start discharge within 25-strokes when pumped at 60 stroke/min

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Fuel Pump Performance Test (Cont'd)

Discharge test	600 rpm	Discharge pressure	1.8 to 2.2 kg/cm² (25.6 to 31.3 psi)
	1000 rpm	Discharge quantity	More than 900 cc/min (54.9 cu.in.)
		(Discharge nozzle diameter	1.54 mm) (0.0606 in.)

Nozzle

Nozzle	Type	Throttle	
	Opening pressure	115 – 125 kg/cm²	1631 – 1781 psi
	Injection angle	Approx. 4°	
Injection pressure adjusting washer thickness		1.00 – 1.95 mm	0.039 – 0.077 in.
	Variation	20 types in 0.05 mm	0.0020 in.

Automatic Timer

Timer advance angles	Timer rpm	Advance angle
	450 – 550	Advance begin
	800	2.5 – 3.0°
	1050	5.0 – 6.0°
	1500	6.2 – 7.2°
	1800	7.0 – 8.0°
Adjusting washer thickness	0.1, 0.2, 0.5, 1.0, 1.5 mm	
	0.004, 0.008, 0.020, 0.039, 0.059 in.	

Injection Pump

Camshaft housing oil capacity		100 c.c.	6.1 cu-in.
Cam lift	STD	8.0 mm	0.315 in.
	Limit	7.8 mm	0.307 in.
Pump element	Bore	7 mm	0.28 in.
	Shape	Lift-hand lead	
Injection order		1–2–4–3	
Control rack sliding resistance			
	Pump stopped	Less than 150 g	5.30 oz
	Pump at 1,000 rpm	Less than 50 g	1.80 oz
Tappet overall looseness limit		0.3 mm	0.012 in.
Pre-stroke		1.9 – 2.0 mm	0.075 – 0.079 in.
Injection interval angle		89.5 – 90.5 degrees	

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Injection Pump (Cont'd)

Tappet clearance		More than 0.2 mm	0.008 in.
Tappet adjusting shim thickness		0.1 – 1.4 mm	0.004 – 0.055 in.
	Variation	14 types in 0.1 mm	0.004 in.
Camshaft thrust clearance	STD	0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Limit	0.1 mm	0.0039 in.
Adjusting shim thickness		0.1, 0.12, 0.14, 0.16, 0.18, 0.50 mm	
		0.0039, 0.0047, 0.0055, 0.0063, 0.0071, 0.0197 in.	
Plunger spring	Free length	49.4 mm	1.945 in.
	Installed length	44.0 mm	1.732 in.
	Installed load	15.1 kg	33.3 lb
Delivery valve spring	Free length	37.0 mm	1.457 in.
	Installed length	25.9 mm	1.020 in.
	Installed load	4.42 kg	9.1 lb

Pneumatic Governor

Type		MN type	
Main spring	Free length	102 mm	4.02 in.
	Adjust shim thickness	0.5, 1.0, 2.0, 3.0 mm	
		0.020, 0.039, 0.079, 0.118 in.	
Idling spring capsule pushrod clearance		More than 0.3 mm	0.012 in.
Idling spring	Shim & washer thickness	0.1, 0.2, 0.5, 1.0 mm	
	(for idling capsule)	0.004, 0.008, 0.020, 0.039 in.	

INJECTION PUMP ADJUSTMENT AND TEST

Preparations Before Test

Nozzle type		4 SD-24	
Nozzle	Opening pressure	115 – 125 kg/cm²	1631 – 1781 psi
Injection pipe	Outer diameter	6 mm	0.24 in.
	Inner diameter	1.6 mm	0.06 in.
	Length	600 mm	23.62 in.
	Minimum bending radius	More than 25 mm	0.98 in.

Control Rack Sliding Resistance

Pump r.p.m.	Sliding Resistance	
0	Less than 150 g	(5.30 z)
1000	50 g	(1.80 z)

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Injection Timing

Pre-stroke	1.9 – 2.0 mm 0.075 – 0.079 in.
Injection interval	90° ± 30'
Tappet clearance	More than 0.2 mm 0.008 in.
Tappet adjusting shim thickness	0.1 – 0.4 mm with alternation of 0.1 mm (0.0039 – 0.0551 in.) (0.0039 in.)

Injection Volume

Pump rpm	Control rack position	Measuring stroke	Injection volume	Allowable difference
1000	10.5 mm 0.413 in.	200	8.2 – 8.8 c.c. 0.502 – 0.539 cu-in.	0.4 c.c. 0.024 cu-in.
1000	8.0 mm 0.315 in.	200	4.3 – 5.1 c.c. 0.263 – 0.312 cu-in.	0.4 c.c. 0.024 cu-in.
300	6.5 mm 0.256 in.	500	2.5 – 4.5 c.c. 0.153 – 0.275 cu-in.	1.0 c.c. 0.061 cu-in.
100	16.0 mm 0.630 in.	100	7.0 – 8.0 c.c. 0.428 – 0.490 cu-in.	0.6 c.c. 0.037 cu-in.

Pressure Test

Plunger pressure	More than 150 kg/cm² (2133 psi) (Pump speed at 200 rpm, Rack position at 7 mm, 0.276 in.)
Delivery valve pressure	More than 5 seconds for holder internal pressure to drop 10 kg/cm² (142 psi) [Holder internal pressure more than 150 kg/cm² (2133 psi), Control rack position at 0 mm].

Pneumatic Governor Adjustment

Adapter stroke	0.4 mm 0.016 in.
Governor air tightness	From 500 mm Aq to 480 mm Aq (19.69 in.Aq) (18.90 in.Aq) More than 10 seconds

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Main Spring

Pump r.p.m.	Vacuum		Control Rack Position	
600	350 mm Aq	13.78 in.Aq	10.3 mm	0.406 in.
	380 mm Aq	14.96 in.Aq	10.1 – 10.3 mm	0.398 – 0.406 in.
	400 mm Aq	15.75 in.Aq	8.3 – 9.7 mm	0.327 – 0.382 in.
	420 mm Aq	16.54 in.Aq	6.2 – 8.0 mm	0.244 – 0.315 in.
Adjusting shim thickness			0.5, 1.0, 2.0, 3.0 mm 0.02, 0.04, 0.08, 0.12 in.	

Idling Spring

Pump r.p.m.	Vacuum		Control Rack Position	
600	600 mm Aq	23.62 in.Aq	8.6 – 9.2 mm	0.339 – 0.362 in.
	1000 mm Aq	39.37 in.Aq	7.2 – 7.5 mm	0.283 – 0.295 in.
Adjusting shim and washer thickness			0.1, 0.2, 0.5, 1.0 mm 0.004, 0.008, 0.002, 0.04 in.	

Total Injection Volume

Measuring strokes	Pump r.p.m.	Vacuum		Total Injection Volume	
500	1100	200 mm Aq	7.87 in.Aq	88 – 92 c.c.	5.4 – 5.6 cu-in.

STARTING SYSTEM

Over-injection Magnet

Rated voltage		12V	
Current		Less than 20A	
Time rating		30 seconds	
Pull in force	Gap at 4.7 mm (0.185 in.) with marks at aligned position	Over 5 kg	11.0 lb
	Gap at 0 mm	Over 8 kg	17.6 lb
Stroke		14 – 17 mm	0.55 – 0.67 in.

Glow Plug

Rated voltage		8V	
Rated current		12.3A	
Heating temperature	after 90 second	1020°C	1868°F

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Glow Plug Controller

Rated voltage		1.22V	
Rated current		49A	
Heating temperature	after 90 second	940°C	1724°F
Time required to redden in normal condition		About 20 seconds	

Glow Plug Relay

Rated voltage		12V	
Rated coil current		1A	
Maximum current capacity		60A	
Contact point tension		Over 500 grams	17.6 oz

Starter

Type			12V type	
Rated output			1.8 kW	
No load characteristics			80A wax. and 6000 rpm min at 12V	
Armature shaft to bushing clearance limit				
		Housing side	0.2 mm	0.008 in.
		Pinion side	0.2 mm	0.008 in.
		Center	0.3 mm	0.012 in.
		End frame side	0.2 mm	0.008 in.
Armature shaft	Thrust clearance	STD	0.05 – 0.50 mm	0.0020 – 0.0197 in.
		Limit	1.0 mm	0.039 in.
	Thrust washer thickness		1.6, 2.0 mm	0.063, 0.079 in.
Commutator	Outside diameter	Limit	41 mm	1.61 in.
		STD	43 mm	1.69 in.
	Mica depth	Limit	0.2 mm	0.008 in.
		STD	0.5 – 0.8 mm	0.020 – 0.032 in.
Commutator runout		Limit	0.40 mm	0.016 in.
		STD	0.05 mm	0.002 in.
Brush	Length	Limit	14 mm	0.55 in.
		STD	22 mm	0.87 in.
Pinion end to stop collar clearance			0.1 – 0.4 mm	0.004 – 0.157 in.

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CHARGING SYSTEM

Performance Test

No-load performance	Engine speed	Idling – 2000 rpm
	Regulated voltage	13.8 – 14.8 V
	Current	Less than 15 A (Reference)
Load performance	Engine speed at 2000 rpm	
	Regulated voltage	12 V
	Current	More than 20 A
"N" terminal voltage		1/2 "B" terminal voltage (Reference)

Alternator

Maximum output ampere		35 A	
Rotor coil resistance		4.1 – 4.3Ω	
Brush length	STD	12.5 mm	0.49 in.
	Limit	5.5 mm	0.22 in.

Alternator Regulator

Voltage regulator regulating voltage	13.8 – 14.8 V

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H ENGINE

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MAIN PARTS TIGHTENING TORQUES

Tightening Parts	Torque	
	kg-m	ft-lb
Cylinder head	12.8 – 14.2	92.6 – 102.7
Valve rocker support	1.5 – 2.2	10.9 – 15.9
Manifold	1.5 – 2.2	10.9 – 15.9
Camshaft x Camshaft gear	3.0 – 4.5	21.7 – 32.6
Camshaft thrust plate	1.5 – 2.2	10.9 – 15.9
Idle gear	3.0 – 4.5	21.7 – 32.6
Timing gear cover	1.5 – 2.2	10.9 – 15.9
Crankshaft pully	16.0 – 20.0	115.7 – 144.7
Crankshaft bearing cap	9.8 – 11.2	70.9 – 81.0
Connecting rod cap	6.5 – 7.5	47.0 – 54.3
Flywheel	11.5 – 12.5	83.2 – 90.4
Nozzle holder x Cylinder head	6.0 – 8.0	43.4 – 57.9
Nozzle retaining nut	4.0 – 6.0	28.9 – 43.4
Injection pipe union nut	2.3 – 3.7	16.6 – 26.8
Mechanical governor gear round nut	2.0 – 3.0	14.5 – 21.7
Delivery valve holder	2.5 – 3.5	18.1 – 25.3

ENGINE TUNE-UP

Drive belt tension		at 10 kg (22 lb)	11 – 14 mm		0.43 – 0.55 in.
Battery specific gravity		at 20°C (70°F)	1.260		
Engine oil capacity	HU	Total	9.1 liter	9.6 US qt	8.0 Imp.qt
		Crankcase	8.1 liter	8.6 US qt	6.7 Imp.qt
	HJ	Total	8.6 liter	9.1 US qt	7.6 Imp.qt
		Crankcase	7.6 liter	8.0 US qt	6.7 Imp.qt
Coolant capacity		HU	17.3 liter	18.3 US qt	15.2 Imp.qt
		HJ	12.5 liter	13.2 US qt	11.0 Imp.qt
Injection order			1–4–2–6–3–5		
Injection timing			12° BTDC (stationary)		
Idle speed			650 rpm		
Maximum speed			3950 rpm		
Valve clearance (Hot)		Intake	0.20 mm		0.008 in.
		Exhaust	0.36 mm		0.014 in.
Compression pressure at 320 rpm		STD	30 kg/cm²		427 psi
		Limit	20 kg/cm²		284 psi
Difference of pressure between cylinder			2.0 kg/cm²		28 psi

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ENGINE

Cylinder Head

Underside surface warpage limit		0.2 mm	0.008 in.
Valve seat	Seating width	1.3 – 1.6 mm	0.051 – 0.063 in.
	Seating angle	45°	
	Refacing angle	15°, 75°	

Valve Guide Bushing

Overall length		Intake	56 mm	2.21 in.
		Exhaust	60 mm	2.36 in.
Valve stem oil clearance	Limit	Intake	0.10 mm	0.0039 in.
		Exhaust	0.12 mm	0.0047 in.
	STD	Intake	0.021 – 0.057 mm	0.00083 – 0.00224 in.
		Exhaust	0.040 – 0.076 mm	0.00157 – 0.00299 in.

Valve

Head outside diameter	Intake	40.3 – 40.7 mm	1.587 – 1.602 in.
	Exhaust	33.3 – 33.7 mm	1.311 – 1.327 in.
Overall length	Intake	120.6 mm	4.748 in.
	Exhaust	120.4 mm	4.740 in.
Stem outside diameter	Intake	8.97 – 8.99 mm	0.3531 – 0.3539 in.
	Exhaust	8.95 – 8.97 mm	0.3523 – 0.3531 in.
Stem end refacing correction limit		0.5 mm	0.02 in.
Valve seating angle		45°	
Head edge thickness limit	Intake	0.9 mm	0.035 in.
	Exhaust	1.0 mm	0.039 in.

Compression Spring (Valve)

Free height	45.1 mm	1.776 in.
Installed height	40.0 mm	1.575 in.
Installed load limit	18.5 kg	40.8 lb
Installed load	21.7 kg	47.8 lb
Squareness limit	1.6 mm	0.063 in.

Valve Rocker Shaft and Arm

Rocker arm bushing to shaft oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.007 – 0.049 mm	0.00028 – 0.00193 in.

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Valve Lifter

Lifter diameter	STD	22.170 – 22.190 mm	0.87283 – 0.87362 in.
	O/S type	0.05	
Lifter to block bore clearance	Limit	0.1 mm	0.004 in.
	STD	0.010 – 0.051 mm	0.00039 – 0.00201 in.

Manifold

Warpage limit	Intake	0.3 mm	0.012 in.
	Exhaust	0.5 mm	0.020 in.

Timing and Idle Gear

Backlash	Crankshaft to idle gear	Limit	0.3 mm	0.012 in.
		STD	0.1 mm	0.004 in.
	Crankshaft to idle gear	Limit	0.3 mm	0.012 in.
		STD	0.1 mm	0.004 in.
	Idle gear to timer gear	Limit	0.3 mm	0.012 in.
		STD	0.1 mm	0.004 in.
Idle gear thrust clearance		Limit	0.25 mm	0.01 in.
		STD	0.08 – 0.18 mm	0.0032 – 0.0071 in.
Idle gear oil clearance		Limit	0.15 mm	0.0059 in.
		STD	0.04 – 0.09 mm	0.0016 – 0.0035 in.
Idle gear inner diameter			50.00 – 50.03 mm	1.9685 – 1.9697 in.
Idle gear shaft diameter		Limit	49.90 mm	1.9646 in.
		STD	49.94 – 49.96 mm	1.9661 – 1.9669 in.

Camshaft and Bearing

Bend limit			0.03 mm	0.0012 in.
Thrust clearance		Limit	0.3 mm	0.012 in.
		STD	0.06 – 0.13 mm	0.0024 – 0.0051 in.
Oil clearance		Limit	0.1 mm	0.004 in.
		STD	0.025 – 0.066 mm	0.0010 – 0.0026 in.
Cam height limit	Limit	Intake	38,92 mm	1.5323 in.
		Exhaust	38.91 mm	1.5319 in.
	STD	Intake	39.467 – 39.557 mm	1.5538 – 1.5574 in.
		Exhaust	39.465 – 39.555 mm	1.5537 – 1.5573 in.

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Camshaft and Bearing (Cont'd)

Journal diameter (STD)	No. 1	47.159 – 47.175 mm	1.8566 – 1.8573 in.
	No. 2	46.959 – 46.975 mm	1.8488 – 1.8494 in.
	No. 3	46.759 – 46.775 mm	1.8409 – 1.8415 in.
	No. 4	46.559 – 46.575 mm	1.8330 – 1.8337 in.
Journal bearing U/S type		0.125, 0.50, 0.500	

Cylinder Block

Black upper surface warpage	Limit	0.15 mm	0.0059 in.
Cylinder line bore	STD	88.00 – 88.03 mm	3.4646 – 3.4657 in.
Liner	Max. wear, limit	0.6 mm	0.024 in.
	Protrusion	0.03 – 0.12 mm	0.0012 – 0.0047 in.
Difference of each cylinder		0.03 mm	0.001 in.
Liner shim thickness		0.05 mm	0.0020 in.
		0.10 mm	0.039 in.
Liner pressing load		3000 – 5000 kg	6614 – 11023 psi
Valve lifter bore	STD	22.20 – 22.22 mm	0.8740 – 0.8748 in.

Valve Lifter

Outer diameter	STD	22.17 – 22.19 mm	0.8728 – 0.8736 in.
Oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.010 – 0.051 mm	0.00039 – 0.00201 in.
O/S Type		0.05	

Piston and Piston Ring

Piston diameter	STD	87.81 – 87.84 mm	3.4571 – 3.4583 in.
	O/S 1.00	88.81 – 88.84 mm	3.4964 – 3.4976 in.
Piston to cylinder clearance		0.23 – 0.25 mm	0.0091 – 0.0098 in.
Pin to piston clearance limit		0.05 mm	0.002 in.
Pin fitting temperature		60°C	140°F
Piston ring end gap	No. 1	0.25 – 0.45 mm	0.0098 – 0.0177 in.
	No. 2	0.25 – 0.45 mm	0.0098 – 0.0177 in.
	No. 3	0.20 – 0.40 mm	0.0079 – 0.0157 in.
Piston ring to groove clearance	No. 1	0.01 – 0.06 mm	0.0004 – 0.0024 in.
	No. 2	0.05 – 0.09 mm	0.0020 – 0.0035 in.
	No. 3	0.03 – 0.07 mm	0.0012 – 0.0028 in.

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Connecting Rod

Thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.08 – 0.16 mm	0.0031 – 0.0063 in.
Piston pin clearance	Limit	0.05 mm	0.002 in.
	STD	0.04 – 0.012 mm	0.0002 – 0.0005 in.
Crank pin oil clearance	Limit	0.10 mm	0.0039 in.
	STD	0.030 – 0.070 mm	0.0012 – 0.0028 in.

Crankshaft

Bend limit		0.04 mm	0.0016 in.
Thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.04 – 0.24 mm	0.0016 – 0.0095 in.
Thrust washer thickness	STD	2.93 – 2.98 mm	0.1154 – 0.1173 in.
	O/S type	0.125, 0.250	
Main journal diameter	STD	69.98 – 70.00 mm	2.7551 – 2.7559 in.
	U/S 0.05	–	–
U/S finished diameter	U/S 0.25	69.74 – 69.75 mm	2.7457 – 2.7461 in.
	U/S 0.50	69.49 – 69.50 mm	2.7358 – 2.7362 in.
	U/S 0.75	69.24 – 69.25 mm	2.7260 – 2.7264 in.
	U/S 1.00	68.99 – 69.00 mm	2.7161 – 2.7165 in.
U/S bearing type		0.05, 0.25, 0.50, 0.75, 1.00	
Oil clearance	STD	0.030 – 0.072 mm	0.0012 – 0.0028 in.
	Limit	0.10 mm	0.0039 in.
Crankpin journal diameter	STD	54.98 – 55.00 mm	2.1646 – 2.1654 in.
	U/S 0.05	–	–
U/S finished diameter	U/S 0.25	54.74 – 54.75 mm	2.1551 – 2.1555 in.
	U/S 0.50	54.49 – 54.50 mm	2.1453 – 2.1457 in.
	U/S 0.75	54.24 – 54.25 mm	2.1354 – 2.1358 in.
	U/S 1.00	53.99 – 54.00 mm	2.1256 – 2.1260 in.
U/S bearing type		0.05, 0.25, 0.50, 0.75, 1.00	
Oil clearance	STD	0.030 – 0.070 mm	0.0012 – 0.0028 in.
	Limit	0.10 mm	0.0039 in.
Main journal and crankpin	Tapered limit	0.05 mm	0.0020 in.
	Out-of-round limit	0.02 mm	0.0008 in.

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Flywheel

Runout limit	0.5 mm	0.020 in.

LUBRICATING SYSTEM

Oil Pump

Pump shaft outer diameter	Drive	12.453 – 12.471 mm	0.4868 – 0.4875 in.
	Driven	13.961 – 13.968 mm	0.5458 – 0.5461 in.
Oil clearance	Drive shaft	0.013 – 0.051 mm	0.00051 – 0.00200 in.
	Driven shaft	0.014 – 0.042 mm	0.00055 – 0.00165 in.
Tip clearance	Limit	0.2 mm	0.008 in.
	STD	0.025 – 0.105 mm	0.0010 – 0.0041 in.
Side clearance	Limit	0.2 mm	0.008 in.
	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.

COOLING SYSTEM

Radiator

Coolant capacity		3.5 liters	3.7 US qt	3.1 Imp.qt
Relief valve opening pressure	STD	0.9 kg/cm²	12.8 psi	
	Limit	0.6 kg/cm²	8.5 psi	

Thermostat

Type	Wax	
Full open temperature	90°C	194°F
Valve opening temperature	74.5 – 78.5°C	166 – 173°F
Valve lift	10 mm Min.	0.4 in.

Water Pump

Bearing replacement temperature	80°C	176°F

FUEL SYSTEM

Fuel Pump

Housing to piston clearance	0.009 – 0.013 mm	0.0004 – 0.0005 in.
Housing to push rod clearance	0.003 – 0.006 mm	0.0001 – 0.0002 in.

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Fuel Pump Performance Test

Suction test	Suction pipe spec.			Feed pump	
	Inside dia.	8 mm	0.31 in.	Start discharge within 40 seconds at 150 rpm	
	Length	2 m	78.7 in.	Priming pump	
	Height	1 m	39.4 in.	Start discharge within 25-strokes when pumped at 60 stroke/min	
Discharge test		600 rpm		Discharge pressure	1.8 to 2.2 kg/cm² (25.6 – 31.3 psi)
		1000 rpm		Discharge quantity	More than 900 cc/min (54.9 cu.in.)
				(Discharge nozzle diameter 1.54 mm)	(0.0606 in.)

Nozzle

Nozzle	Type	Throttle	
	Opening pressure	115 – 125 kg/cm²	1631 – 1781 psi
	Injection angle	Approx. 4°	
Injection pressure adjusting washer thickness		1.00 – 1.95 mm	0.0394 – 0.076 in.
	Variation	20 types in 0.05 mm	0.0020 in.

Automatic Timer

Timer advance angles	Timer rpm	Advance angle
	45 – 550	Advance begin
	800	3°
	1050	5.5°
	1800	7.5°
Adjusting washer thickness	0.1, 0.2, 0.5, 1.0, 1.5 mm	
	0.004, 0.008, 0.020, 0.039, 0.059 in.	

Injection Pump

Camshaft housing oil capacity		170 c.c.	10.3 cu-in.
Cam lift	STD	6.0 mm	0.236 in.
	Limit	5.8 mm	0.228 in.
Pump element	Bore	7 mm	0.28 in.
	Shape	Lift-hand lead	
Injection order		1–4–2–6–3–5	

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Injection Pump (Cont'd)

Control rack sliding resistance			
	Pump stopped	Less than 150 g	5.30 oz
	Pump at 1000 rpm	Less than 50 g	1.80 oz
Tappet overall looseness limit		0.3 mm	0.012 in.
Pre-stroke		1.9 – 2.0 mm	0.075 – 0.079 in.
Injection interval angle		59.5 – 60.5 degrees	
Tappet clearance		More than 0.2 mm	0.008 in.
Camshaft thrust clearance	STD	0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Limit	0.1 mm	0.0039 in.
Pluger spring	Free length	49.4 mm	1.945 in.
	Installed length	44.0 mm	1.732 in.
	Installed load	15.1 kg	33.3 lb
Delivery valve spring	Free length	37.0 mm	1.457 in.
	Installed length	25.9 mm	1.020 in.
	Installed load	4.42 kg	9.7 lb

Pneumatic Governor

Type		MN type	
Main spring	Free length	107.0 mm	4.213 in.
	Adjust shim thickness	0.5, 1.0, 2.0, 3.0 mm	
		0.020, 0.039, 0.079, 0.118 in.	
Idling spring capsule push rod clearance		More than 0.3 mm	0.012 in.
Idling spring	Shim & washer thickness	0.1, 0.2, 0.5, 1.0 mm	
	(for idling capsule)	0.004, 0.008, 0.020, 0.039 in.	

Mechanical Governor

Type		RU type	
Governor housing oil capacity		170 c.c.	10.3 cu-in.
Governor gear slip torque	Limit	25 kg-cm	21.7 in.-lb
	STD	40 – 60 kg-cm	34.7 – 52.1 in.-lb
Governor gear to thrust bearing clearance		0.35 – 0.85 mm	0.0138 – 0.0335 in.
Idling spring			
Inner spring free length		12.53 mm	0.4933 in.
Adjusting shim		0.1 mm	0.004 in.
Outer spring free length		14.7 mm	0.5787 in.
Adjusting shim		0.1, 0.3 mm	0.004, 0.012 in.

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INJECTION PUMP ADJUSTMENT AND TEST

Preparations Before Test

Nozzle type		4 SD-24	
Nozzle	opening pressure	115 – 125 kg/cm²	1631 – 1781 psi
Injection pipe	Outer diameter	6 mm	0.24 in.
	Inner diameter	1.6 mm	0.06 in.
	Length	600 mm	23.62 in.
	Minimum bending radius	More than 25 mm	0.98 in.

Control Rack Sliding Resistance

Pump r.p.m.	Sliding resistance	
0	Less than 150 g	5.3 oz
1000	50 g	1.8 oz

Injection Timing

Pre-stroke	1.9 – 2.0 mm	0.075 – 0.079 in.
Injection interval	60° ± 30′	
Tappet clearance	More than 0.2 mm	0.008 in.
Tappet adjusting shim thickness	0.1 – 1.4 mm with alternation of 0.1 mm	
	(0.0039 – 0.0551 in.)	(0.0039)

Injection Volume

Pump rpm	Control rack position	Measuring storke	Injection volume	Allowable difference
1000	10.5 mm 0.413 in.	200	8.2 – 8.8 c.c. 0.502 – 0.539 cu-in.	0.4 c.c. 0.024 cu-in.
1000	8.0 mm 0.315 in.	200	4.3 – 5.1 c.c. 0.263 – 0.312 cu-in.	0.4 c.c. 0.024 cu-in.
300	6.5 mm 0.256 in.	500	2.5 – 4.5 c.c. 0.153 – 0.275 cu-in.	1.0 c.c. 0.061 cu-in.
100	16.0 mm 0.630 in.	100	7.0 – 8.0 c.c. 0.428 – 0.490 cu-in.	0.6 c.c. 0.037 cu-in.

Pressure Test

Plunger pressure	More than 150 kg/cm² (2133 psi) (Pump speed at 200 rpm, Rack position at 7 mm, 0.276 in.)

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Pressure Test (Cont'd)

Delivery valve pressure	More than 5 seconds for holder internal pressure to drop 10 kg/cm² (142 psi) [Holder internal pressure more than 150 kg/cm² (2133 psi), Control rack position at 0 mm].

Pneumatic Governor Adjustment

Adapter stroke	0.4 mm 0.016 in.
Governor air tightness	From 1600 mm Aq to 1580 mm Aq (65.3 in.Aq) (52.2 in.Aq) More than 10 seconds

Main Spring

Pump r.p.m.	Vacuum		Control Rack Position	
600	550 mm Aq	21.85 in.Aq	6.5 – 8.2 mm	0.256 – 0.323 in.
	600 mm Aq	23.62 in.Aq	4.0 – 5.5 mm	0.157 – 0.217 in.
	510 mm Aq	20.08 in.Aq	9.8 – 10.1 mm	0.386 – 0.398 in.
	500 mm Aq	19.69 in.Aq	10.1 mm	0.398 in.
Adjusting shim thickness			0.5, 1.0, 2.0, 3.0 mm 0.02, 0.04, 0.08, 0.12 in.	

Idling Spring

Pump r.p.m	Vacuum		Control Rack Position	
600	600 mm Aq	23.62 in.Aq	9.2 – 9.6 mm	0.362 – 0.378 in.
	1000 mm Aq	39.37 in.Aq	7.7 – 7.9 mm	0.303 – 0.311 in.
Adjusting shim and washer thickness			0.1, 0.2, 0.5, 1.0 mm 0.004, 0.008, 0.02, 0.04 in.	

Total Injection Volume

Measuring strokes	Pump r.p.m.	Vacuum		Total Injection Volume
500 times/min.	1100	1500 mm Aq	5.90 in.Aq	115.5 – 121.5 c.c. 7.04 – 7.41 cu-in.

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MECHANICAL GOVERNOR ADJUSTMENT

Low Speed Control

Pump rpm	Control rack position		Remark
800	Less than 2.0 mm	0.079 in.	Preset position Adjusting level angle +23° ± 7°
100	Mere than 11.0 mm	0.433 in.	
300	6.6 – 7.0 mm	0.260 – 0.0276 in.	
400	4.6 – 5.5 mm	0.181 – 0.197 in.	
600	2.2 – 2.6 mm	0.086 – 0.102 in.	

Maximum Speed Control Adjustment

Pump rpm	Control rack position		Remark
1600	10.1 mm	0.398 in.	Adjusting level angle –9° ± 7°
1800	10.0 – 10.1 mm	0.394 – 0.398 in.	
1950	Less than 5.5 mm	0.217 in.	

Damper Spring Adjustment

Pump rpm	Control rack position		Remark
400	4.8 – 5.2 mm	0.189 – 0.207 in.	Adjusting lever angle +23° ± 7°
600	3.8 – 4.2 mm	0.150 – 0.268 in.	
800	Less than 3.1 mm	0.122 in.	

Total Injection Volume Adjustment

Adjusting lever set angle	Measuring stroke	Pump rpm	Total injection volume
–9° ± 7°	500	1100	115.5 – 121.5 c.c. 7.05 – 7.41 cu-in.

Spring Capsule Adjustment

Adjusting lever set angle	Pump rpm	Control rack position	
–9° ± 7°	500	10.3 mm	0.406 in.

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STARTING SYSTEM

Glow Plug Controller

Rated current	74A	
Rated voltage	0.30 – 0.38V	
Heater temperature	930 – 1030°C	1706 – 1886°F
Time required to glow (normal state)	90 secd	

Glow Plug Relay

Rated voltage	12V
Rated coil current	0.8 – 1.2A
Maximum current capacity	80A

Starter

Rated output			2.5 kW	
No load characteristics			100A wax. and 4500 rpm min at 11.5V	
Armature shaft to bushing clearance				
	Housing side	STD	0.05 mm	0.0020 in.
		Limit	0.2 mm	0.008 in.
	Pinion side	STD	0.1 mm	0.004 in.
		Limit	0.2 mm	0.008 in.
	Center bearing	STD	0.05 mm	0.002 in.
		Limit	0.3 mm	0.012 in.
Armature shaft	Thrust clearance	STD	0.05 – 0.35 mm	0.0020 – 0.014 in.
		Limit	0.8 mm	0.039 in.
	Thrust washer thickness		0.2, 0.5 1.0, 2.0 mm	
			0.008, 0.020, 0.039, 0.079 in.	
Commutator	Outside diameter	Limit	46.2 mm	1.819 in.
		STD	48.2 mm	1.898 in.
	Mica depth	Limit	0.2 mm	0.008 in.
		STD	0.5 – 0.8 mm	0.020 – 0.032 in.
Commutator runout		Limit	0.40 mm	0.016 in.
		STD	0.05 mm	0.002 in.
Brush length		Limit	13 mm	0.51 in.
		STD	20 mm	0.79 in.
Pinion end to stop collar clearance			0.1 – 6.0 mm	0.004 – 0.236 in.
Drive lever wear limit	Magnetic S/W side		13 mm	0.51 in.
	Armature shaft side		11 mm	0.43 in.

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CHARGING SYSTEM

Performance Test

No-load performance	Engine speed	Idling – 2000 rpm
	Regulated voltage	13.8 – 14.8V
	Current	Less than 15A (Reference)
Load performance	Engine speed at 2000 rpm	
	Regulated voltage	12V
	Current	More than 20A (Reference)
"N" terminal voltage		1/2 "B" terminal voltage

Alternator

Maximum output ampere		40A	
Rotor coil resistance		4.1 – 4.3Ω	
Brush length	STD	12.5 mm	0.49 in.
	Limit	5.5 mm	0.22 in.

Alternator Regulator

Voltage regulator regulating voltage	13.8 – 14.8V

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2D ENGINE

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MAIN PARTS TIGHTENING TORQUES

Tightening Part		Torque	
		kg-m	ft-lb
Cylinder head	16 mm Bolt	16.0 – 18.0	115.7 – 130.2
	10 mm Bolt	5.0 – 6.0	36.2 – 43.4
Valve rocker support		5.0 – 7.2	36.2 – 52.1
Manifold	Bolt	2.0 – 3.4	14.5 – 24.6
	Nut	3.4 – 5.4	24.0 – 39.1
Crankshaft balance weight		6.2 – 8.2	44.8 – 59.3
Crankshaft pully		34.0 – 38.0	245.9 – 274.9
Crankshaft bearing cap		12.5 – 15.0	90.4 – 108.5
Connecting rod cap		7.0 – 8.0	50.6 – 57.9
Flywheel housing		6.2 – 8.2	44.8 – 59.3
Flywheel		9.0 – 11.0	65.1 – 79.6
Oil filter element guide bolt		2.0 – 2.5	14.5 – 18.1
Nozzle retaining nut		6.0 – 8.0	43.4 – 57.9
Combustion chamber clamp flange nut		2.0 – 2.6	14.5 – 18.8
Injection nozzle flange nut		1.3 – 1.9	9.4 – 13.7
Injection pipe union nut		2.0 – 3.4	14.5 – 24.6
Automatic timer round nut		5.5 – 7.0	39.8 – 50.6
Governer weight round nut		6.0	43.4
Delivery valve holder		2.5 – 3.5	18.1 – 25.3
Combustion chamber nozzle seat		5.0 – 7.0	36.2 – 50.6

ENGINE TUNE-UP

Coolant capacity		21.5 liter	22.7 US qts	18.9 Imp.qts
Drive belt tension	at 10 kg (22 lb)	12 – 14 mm	0.47 – 0.55 in.	
Battery specific gravity	at 20°C (70°F)	1.25 – 1.27		
Engine oil capacity	Total	12.0 liter	12.7 US qts	10.6 Imp.qts
	Crankcase	9.0 liter	9.5 US qts	7.9 Imp.qts
Injection order		1–4–2–3–5–6		
Injection timing		20°BTDC (Stationary)		
Idle speed		450 – 500 rpm		
Maximum speed		2620 – 2680 rpm		
Valve clearance (Hot)		0.4 mm	0.0157 in.	
Compression pressure	STD	25.5 kg/cm²	363.0 psi	
	Limit	20.0 kg/cm²	285.0 psi	
Difference of pressure between cylinder		2.0 kg/cm²	28.5 psi	

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ENGINE

Cylinder Head

Underside surface warpage limit		0.05 mm	0.0020 in.
Valve seat	Seating width	2 mm	0.08 in.
	Seating angle	45°	
	Refacing angle	15°, 75°	

Valve Guide Bushing

Protrusion amount			20 mm	0.79 in.
Valve stem to guide bushing clearance	Limit		0.20 mm	0.008 in.
	STD	Intake	0.04 – 0.08 mm	0.0016 – 0.0032 in.
		Exhaust	0.05 – 0.08 mm	0.0018 – 0.0032 in.

Valve

Overall length limit	161.0 mm	6.34 in.
Valve seating angle	45°	
Stem end refacing limit	0.5 mm	0.020 in.
Head thickness limit	1.0 mm	0.039 in.

Compression Spring (Valve)

Free height	61.5 mm	2.42 in.
Installed height	49.5 mm	1.95 in.
Installed load limit	26.0 kg	57.2 lb
Installed load	31.3 kg	68.9 lb
Squareness limit	18 mm	0.71 in.

Valve Rocker Shaft and Arm

Rocker arm bushing to shaft oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.058 mm	0.002 in.

Manifold

Cylinder head mounting surface warpage limit	0.8 mm	0.32 in.

Flywheel

Run-out limit	0.2 mm	0.008 in.

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Gear Backlash

Crankshaft to camshaft limit	0.30 mm	0.118 in.

Camshaft and Bearing

Bend limit			0.03 mm	0.0012 in.
Thrust clearance		Limit	0.2 mm	0.008 in.
		STD	0.06 – 0.10 mm	0.0023 – 0.0039 in.
Camshaft end plate shims			0.05, 0.10, 0.20, 0.30 mm	
			0.002, 0.004, 0.008, 0.012 in.	
Journal oil clearance	Limit		0.15 mm	0.0059 in.
	STD	No.1, No.2, No.3	0.032 – 0.100 mm	0.0013 – 0.0039 in.
		No.4	0.025 – 0.085 mm	0.0010 – 0.0033 in.
Journal bearing U/S Type			0.25, 0.50	
Cam height limit			42.7 mm	1.68 in.

Cylinder Block

Black upper surface warpage	Limit	0.15 mm	0.0059 in.
Cylinder liner bore	Mark 1	105.000 – 105.010 mm	4.1339 – 4.1343 in.
	2	105.010 – 105.025 mm	4.1343 – 4.1348 in.
	3	105.025 – 105.040 mm	4.1348 – 4.1354 in.
Liner	Max. wear, limit	0.8 mm	0.032 in.
	Protrusion	0.06 – 0.15 mm	0.002 – 0.006 in.
Difference of each cylinder		0.03 mm	0.001 in.
Liner shim thickness	No.1	0.05 mm	0.0020 in.
	No.2	0.10 mm	0.0039 in.

Valve Lifter

Outer diameter	STD	27.96 – 27.98 mm	1.1008 – 1.1016 in.
Oil clearance	Limit	0.1 mm	0.004 in.
	STD	0.02 – 0.061 mm	0.0008 – 0.0024 in.
O/S Type		0.075, 0.100	

Piston and Piston Pin

Piston	Diameter	Mark 1	104.895 – 104.905 mm	4.1297 – 4.1301 in.
		2	104.905 – 104.915 mm	4.1301 – 4.1305 in.
		3	104.915 – 104.925 mm	4.1305 – 4.1309 in.

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Piston and Piston Pin (Cont'd)

Piston clearance		0.095 – 0.125 mm	0.0037 – 0.0049 in.
Piston clearance limit		0.80 mm	0.0315 in.
Pin fitting temperature		100°C	212°F
Piston ring end gap	No.1 – 4	0.30 – 0.50 mm	0.0118 – 0.0197 in.
Piston ring to groove clearance	No.1	0.06 – 0.10 mm	0.0024 – 0.0039 in.
	No.2 – 4	0.05 – 0.09 mm	0.0020 – 0.0035 in.

Connecting Rod

Thrust clearance	Limit	0.3 mm	0.012 in.
	STD	0.11 – 0.23 mm	0.0043 – 0.0091 in.
Piston pin clearance		0.015 – 0.025 mm	0.00059 – 0.0010 in.
Crank pin oil clearance	Limit	0.08 mm	0.0032 in.
	STD	0.039 – 0.081 mm	0.0015 – 0.0032 in.

Crankshaft

Bend limit			0.03 mm	0.0012 in.
Thrust clearance		Limit	0.3 mm	0.012 in.
		STD	0.04 – 0.25 mm	0.0016 – 0.0098 in.
Main journal diameter		STD	74.970 – 74.990 mm	2.9516 – 2.9524 in.
		U/S 0.25	74.725 – 74.735 mm	2.9419 – 2.9423 in.
		U/S 0.50	74.475 – 74.485 mm	2.9321 – 2.9325 in.
		U/S 0.75	74.225 – 74.235 mm	2.9222 – 2.9226 in.
		U/S 1.00	73.975 – 73.985 mm	2.9124 – 2.9128 in.
	U/S bearing type		0.05, 0.25, 0.50, 0.75, 1.00	
	Oil clearance	Limit	0.1 mm	0.004 in.
		STD	0.039 – 0.081 mm	0.0015 – 0.0032 in.
Crank pin	Diameter	STD	61.970 – 61.990 mm	2.4398 – 2.4405 in.
		U/S 0.25	61.725 – 61.735 mm	2.4301 – 2.4305 in.
		U/S 0.50	61.475 – 61.485 mm	2.4203 – 2.4207 in.
		U/S 0.75	61.225 – 61.235 mm	2.4104 – 2.4108 in.
		U/S 1.00	60.975 – 60.985 mm	2.4006 – 2.4010 in.
	U/S bearing type		0.05, 0.25, 0.50, 0.75, 1.00	
	Oil clearance	Limit	0.1 mm	0.04 in.
		STD	0.039 – 0.081 mm	0.0015 – 0.0032 in.
Main journal taper and out of round limit			0.03 mm	0.0012 in.
Crank pin journal taper and out of round limit			0.03 mm	0.0012 in.

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LUBRICATING SYSTEM

Oil Pump

Type		Gear pump	
Tip clearance	Limit	0.20 mm	0.008 in.
	STD	0.025 – 0.065 mm	0.001 – 0.002 in.
Side clearance	Limit	0.15 mm	0.0059 in.
	STD	0.06 – 0.13 mm	0.002 – 0.005 in.
Gear backlash	Limit	0.25 mm	0.01 in.
	STD	0.10 – 0.25 mm	0.004 – 0.01 in.
Cover wear	Limit	0.15 mm	0.0059 in.

COOLING SYSTEM

Radiator

Relief valve opening pressure	STD	0.9 kg/cm²	12.8 psi
	Limit	0.6 kg/cm²	8.5 psi

Thermostat

Type	Wax	
Full open temperature	95°C	203°F
Valve opening temperature	80.5 – 83.5°C	177 – 182°F
Valve lift	10 mm Min.	0.4 in.

FUEL SYSTEM

Fuel Pump

Housing to piston clearance	0.009 – 0.013 mm	0.0004 – 0.005 in.
Housing to push rod clearance	0.003 – 0.006 mm	0.0001 – 0.0002 in.

Fuel Pump Performance Test

Suction test	Suction pipe spec.:			Feed pump:
	Inside dia.	8 mm	0.31 in.	Start discharge within 40 seconds at 150 rpm
	Length	2 m	78.7 in.	Priming pump:
	Height	1 m	39.4 in.	Start discharge within 25-strokes when pumped at 60 stroke/min

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Fuel Pump Performance Test (Cont'd)

Discharge test	600 rpm	Discharge pressure	2.5 to 3.5 kg/cm² (35.6 to 49.8 psi)
	1000 rpm	Discharge quantity	More than 900 cc/min (54.9 cu.in.)
		(Discharge nozzle diameter	1.54 mm) (0.0606 in.)

Nozzle

Nozzle	Type	Throttle	
	Opening pressure	115 – 125 kg/cm²	1631 – 1781 psi
	Injection angle	Approx. 4°	

Automatic Timer

Timer advance angles	Timer rpm	Advance angle
	200	Advance begin
	500	1.50
	800	3.00
Adjusting washer thickness	0.1, 0.2, 0.5, 1.0, 1.5 mm	0.004, 0.008, 0.020, 0.039, 0.059 in.

Injection Pump

Camshaft housing oil capacity		170 c.c.	10.3 cu-in.
Cam lift	STD	8.0 mm	0.315 in.
	Limit	7.8 mm	0.307 in.
Pump element	Bore	7 mm	0.28 in.
	Shape	Lift-hand lead	
Injection order		1–4–2–6–3–5	
Control rack sliding	Pump stopped	Less than 150 g	5.30 oz
Resistance	Pump at 1,000 rpm	Less than 50 g	1.80 oz
Tappet everall looseness limit		0.3 mm	0.012 in.
Pre-stroke		1.9 – 2.0 mm	0.075 – 0.079 in.
Injection interval angle		59.5 – 60.5 degrees	
Tappet clearance		More than 0.2 mm	0.008 in.
Camshaft thrust clearance	STD	0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Limit	0.1 mm	0.0039 in.

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Injection Pump (Cont'd)

Plunger spring	Free length	49.0 mm	1.929 in.
	Installed length	26.5 mm	1.024 in.
	Installed load	21.1 kg	46.52 lb
Delivery valve spring	Free length	32.0 mm	1.260 in.
	Installed length	24.0 mm	0.945 in.
	Installed load	3.12 kg	6.89 lb

Pneumatic Governor

Type		MN type	
Main spring	Free length	107.0 mm	4.213 in.
	Installed length	35.6 mm	1.402 in.
	Installed load	1.135 kg	40.0402 lb
	Adjust shim thickness	0.5, 1.0, 2.0, 3.0 mm	
			0.020, 0.039, 0.079, 0.118 in.
Idling spring	Shim & washer thickness	0.1, 0.2, 0.5, 1.0 mm	
	(for idling capsule)		0.004, 0.008, 0.020, 0.039 in.

Mechanical Governor

Type	R721 type	
Governor housing oil capacity	250 c.c.	15.2 cu-in.
Control block position	10.2 – 10.4 mm	0.402 – 0.409 in.
Adjust shim thickness	0.1, 0.2, 0.4, 1.0 mm	
		0.004, 0.008, 0.016, 0.040 in.
Adjust lever thrust clearance	0.05 – 0.20 mm	0.020 – 0.0079 in.
Adjusting shim thickness	0.1, 0.25, 0.30, 1.0 mm	
		0.004, 0.010, 0.012, 0.040 in.

INJECTION PUMP ADJUSTMENT AND TEST

Preparations before Test

Nozzle type		4 SD-24	
Nozzle opening pressure		115 – 125 kg/cm²	1631 – 1781 psi
Injection pipe	Outer diameter	6 mm	0.24 in.
	Inner diameter	1.6 mm	0.06 in.
	Length	600 mm	23.62 in.
	Minimum bending radius	More than 25 mm	0.98 in.

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Control Rack Sliding Resistance

Pump r.p.m.	Sliding resistance	
0	Less than 150 g	5.3 oz
1000	50 g	1.8 oz

Injection Timing

Pre-stroke	1.9 – 2.0 mm	0.075 – 0.079 in.
Injection interval	60° ± 30′	
Tappet clearance	More than 0.3 mm	0.012 in.

Injection Volume

Pump rpm	Control rack position		Measuring stroke	Injection volume	Allowable difference	
1300	12.7 mm	0.500 in.	200 times/min.	14.2 – 15.0 c.c. 0.87 – 0.97 cu-in.	0.6 c.c.	0.04 cu-in.
1000	12.0 mm	0.472 in.	200 times/min.	13.6 – 14.2 c.c. 0.83 – 0.87 cu-in.	0.6 c.c.	0.04 cu-in.
200	6.0 mm	0.236 in.	500 times/min.	5.0 – 9.0 c.c. 0.31 – 0.55 cu-in.	1.0 c.c.	0.06 cu-in.

Pressure Test

Plunger pressure	More than 150 kg/cm² (2133 psi) (Pump speed at 200 rpm, Rack position at 7 mm)
Delivery valve pressure	More than 5 seconds for holder internal pressure to drop 10 kg/cm² (142 psi) [Holder internal pressure more than 150 kg/cm² (2133 psi), Rack position at 0 mm].

Pneumatic Governor Adjustment

Adapter stroke	0.4 mm 0.016 in.
Governor air tightness	From 1600 mm Aq to 1580 mm Aq (65.3 in Aq) (52.2 in Aq) More than 10 seconds

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Main Spring

Pump r.p.m.	Vacuum		Control Rack Position	
600	520 mm Aq	20.47 in.Aq	12.6 mm	0.49 in.
	550 mm Aq	21.65 in.Aq	9.0 – 12.6 mm	0.35 – 0.49 in.
	600 mm Aq	23.62 in.Aq	5.0 – 9.0 mm	0.19 – 0.35 in.
Adjusting shim thickness			0.5, 1.0, 2.0, 3.0 mm 0.02, 0.04, 0.08, 0.12 in.	

Adapter Spring

Pump r.p.m.	Vacuum		Control Rack Position	
600	25 mm Aq	0.98 in.Aq	13.0 mm	0.51 in.
	65 mm Aq	2.55 in.Aq	12.7 – 13.0 mm	0.50 – 0.51 in.
Adjusting shim thickness			0.2, 0.3, 0.5, 1.0 mm 0.008, 0.012, 0.02, 0.04 in.	

Idling Spring

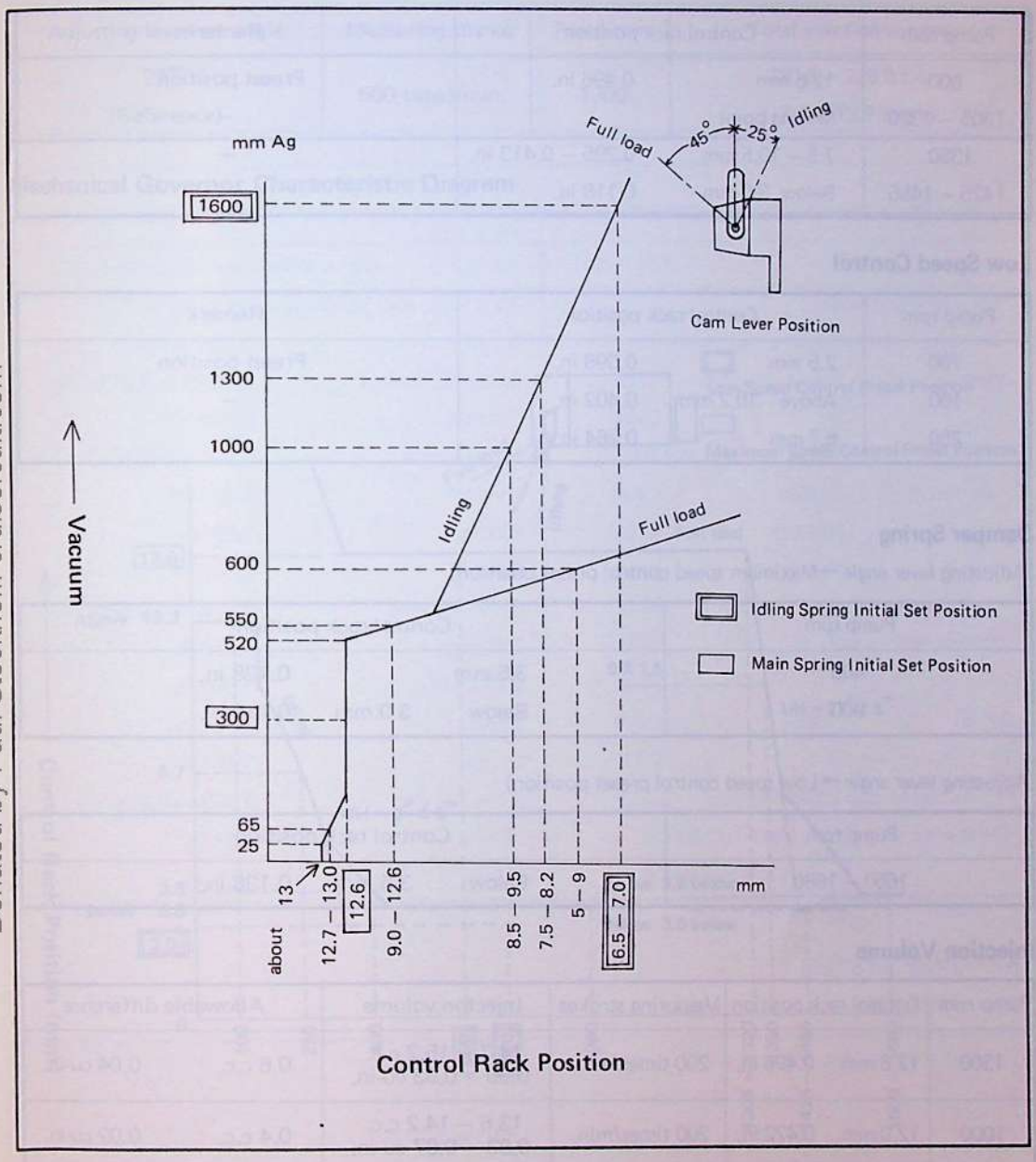
Pump r.p.m.	Vacuum		Control Rack Position	
600	1000 mm Aq	39.37 in.Aq	8.5 – 9.5 mm	0.33 – 0.37 in.
	1300 mm Aq	51.18 in.Aq	7.5 – 8.2 mm	0.29 – 0.32 in.
	1600 mm Aq	62.99 in.Aq	6.5 – 7.0 mm	0.25 – 0.27 in.
Adjusting shim and washer thickness			0.1, 0.2, 0.5, 1.0 mm 0.004, 0.008, 0.02, 0.04 in.	

Total Injection Volume

Measuring strokes	Pump r.p.m.	Vacuum		Total Injection Volume
500 times/min.	500	65 mm Aq	2.56 in.Aq	213.0–222.0 c.c. 13.03–13.58 cu-in.
	700	130 mm Aq	5.12 in.Aq	222.0–231.0 c.c. 13.58–14.13 cu-in.
	1300	520 mm Aq	20.47 in.Aq	220.5–228.0 c.c. 13.72–13.95 cu-in.

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Pheumatic Governor Characteristic Diagram



Mechanical Governor Adjustment

Idling stroke (at stationary)	9.3 – 9.7 mm	0.362 – 0.382 in.

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Maximum Speed Control

Pump rpm	Control rack position		Remark
600	12.6 mm	0.496 in.	Preset position
1305 – 1320	Moving point		–
1350	7.5 – 10.5 mm	0.295 – 0.413 in.	–
1425 – 1455	Below 3.0 mm	0.118 in.	–

Low Speed Control

Pump rpm	Control rack position		Remark
700	2.5 mm	0.098 in.	Preset position
100	Above 10.2 mm	0.402 in.	–
250	6.7 mm	0.264 in.	–

Damper Spring

(Adjusting lever angle → Maximum speed control preset position)

Pump rpm	Control rack position	
400	3.5 mm	0.138 in.
900	Below 3.0 mm	0.118 in.

(Adjusting lever angle → Low speed control preset position)

Pump rpm	Control rack position	
1650 – 1680	Below 3.5 mm	0.138 in.

Injection Volume

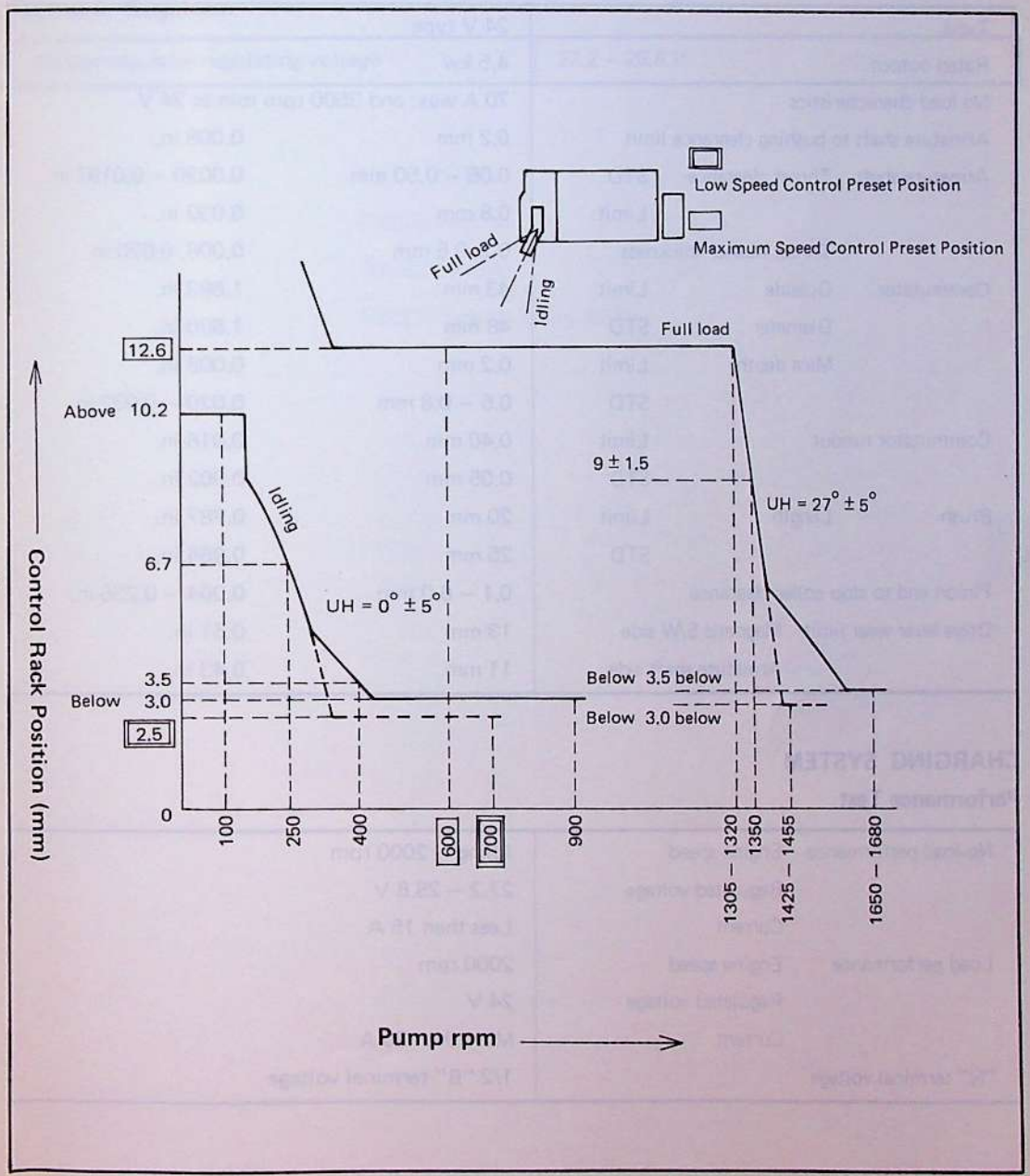
Pump rpm	Control rack position		Measuring strokes	Injecton volume	Allowable difference	
1300	12.6 mm	0.496 in.	200 times/min.	14.7 – 15.2 c.c. 0.90 – 0.93 cu-in.	0.6 c.c.	0.04 cu-in.
1000	12.0 mm	0.472 in.	200 times/min.	13.6 – 14.2 c.c. 0.83 – 0.87 cu-in.	0.4 c.c.	0.02 cu-in.
200	6.0 mm	0.236 in.	500 times/min.	5.0 – 9.0 c.c. 0.31 – 0.53 cu-in.	1.0 c.c.	0.06 cu-in.

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Total Injection Volume

Adjusting lever set angle	Measuring stroke	Pump rpm	Total injection volume
27° (Reference)	500 times/min.	1300	220.5 – 228.0 c.c. (13.7 – 13.9 cu-in.)

Mechanical Governor Characteristic Diagram



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STARTING SYSTEM

Glow time	20 seconds (Reference)
Load ampere	30 A
Glow plug resistance	3.8 Ω

Starter

Type			24 V type	
Rated output			4.5 kw	
No load characteristics			70 A wax. and 3500 rpm min at 24 V	
Armature shaft to bushing clearance limit			0.2 mm	0.008 in.
Armature shaft	Thrust clearance	STD	0.05 – 0.50 mm	0.0020 – 0.0197 in.
		Limit	0.8 mm	0.039 in.
	Thrust washer thickness		0.2, 0.5 mm	0.008, 0.020 in.
Commutator	Outside	Limit	43 mm	1.693 in.
	Diameter	STD	48 mm	1.890 in.
	Mica depth	Limit	0.2 mm	0.008 in.
		STD	0.5 – 0.8 mm	0.020 – 0.032 in.
Commutator runout		Limit	0.40 mm	0.016 in.
		STD	0.05 mm	0.002 in.
Brush	Length	Limit	20 mm	0.787 in.
		STD	25 mm	0.984 in.
Pinion end to stop coller clearance			0.1 – 6.0 mm	0.004 – 0.236 in.
Drive lever wear limit	Magnetic S/W side		13 mm	0.51 in.
	Armature shaft side		11 mm	0.43 in.

CHARGING SYSTEM

Performance Test

No-load performance	Engine speed	Idling – 2000 rpm
	Regulated voltage	27.2 – 28.8 V
	Current	Less than 15 A
Load performance	Engine speed	2000 rpm
	Regulated voltage	24 V
	Current	More than 20 A
"N" terminal voltage		1/2 "B" terminal voltage

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Alternator

Maximum output ampere		40 A	
Rotor coil resistence		19.0 – 19.5 Ω	
Brush length	STD	12.5 mm	0.49 in.
	Limit	5.5 mm	0.22 in.

Alternator Regulator

Voltage regulator regulating voltage	27.2 – 28.8 V

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MEMO

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RN CHASSIS

INCLUDES

RN20 Pickup

RN22 Pickup

RN25 Pickup Long Body

11

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts	kg-m	ft-lb
Clutch cover x Flywheel	1.5 – 2.2	10.9 – 15.9
Clutch housing x Engine	5.0 – 7.0	26.2 – 50.6
Master cylinder reservoir set bolt	2.0 – 3.0	14.0 – 22.0
Strap x Clutch plate	1.5 – 2.2	10.9 – 15.9

Manual Transmission (L42)

Tightening Parts	kg-m	ft-lb
Transmission case x Clutch housing	5.0 – 7.0	36.2 – 50.6
Extension housing x Transmission case	3.0 – 4.5	21.7 – 32.6
Front bearing retainer x Transmission case	0.4 – 0.7	2.9 – 5.1

Automatic Transmission 3-speed (A-30)

Tightening Parts	kg-m	ft-lb
First and reverse drum x Planetary carrier	3.5 – 4.5	25.3 – 32.6
Front oil pump body x Stator shaft 6 mm bolt	0.6 – 0.9	4.3 – 6.5
8 mm bolt	1.9 – 2.2	13.7 – 15.9
Front oil pump x Transmission case	1.4 – 1.8	10.1 – 13.0
Valve body x Transmission case	1.0 – 1.2	7.2 – 8.8
Front servo body x Transmission case	1.8 – 2.0	13.0 – 14.5
Rear servo body x Transmission case	2.5 – 3.0	18.1 – 21.7
Transmission case x Oil pan	0.5 – 0.8	3.6 – 5.8
Rear oil pump x Transmission case	0.4 – 0.7	2.9 – 5.0
Governor body x Governor body support	0.6 – 0.9	4.3 – 6.5
Extension housing x Transmission case	1.8 – 2.0	13.0 – 14.5
Drive plate with ring gear x Crankshaft	8.0 – 9.0	57.9 – 65.1
Transmission housing x Engine	5.0 – 7.0	36.2 – 50.6

Propeller Shaft

Tightening Parts	kg-m	ft-lb
Universal joint flange yoke x Companion flange	1.5 – 2.2	10.9 – 15.9
Center bearing bracket x Member	1.5 – 2.2	10.9 – 15.9

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Propeller Shaft (Cont'd)

Intermediate shaft x Center bearing x Joint flange			
	1st step	16.6 – 21.0	120.1 – 151.9
	2nd step	Loosen nut	
	3rd step	2.5 – 3.5	18.1 – 25.3

Rear Axle and Suspension

Tightening Parts	kg-m	ft-lb
Differential case x Ring gear	9.2 – 10.5	66.5 – 75.9
Differential drive pinion x Companion flange	17.0 – 21.0	123.0 – 151.9
Differential bearing cap x Differential carrier	7.0 – 9.0	50.6 – 65.1
Differential carrier x Rear axle housing	2.0 – 3.0	14.5 – 21.7
Rear axle housing x Backing plate & retainer	6.0 – 8.0	43.3 – 57.8
U bolt	8.0 – 12.0	57.8 – 86.8
Spring bracket pin	7.5 – 11.0	54.2 – 79.6
Wheel nut	9.0 – 12.0	65.1 – 86.8

Front Axle and Suspension

Tightening Parts	kg-m	ft-lb
Upper arm shaft x Suspension member	13.0 – 21.0	94.0 – 151.9
Lower arm shaft x Suspension member	4.5 – 6.0	32.5 – 43.3
Upper ball joint x Steering knuckle	9.0 – 13.0	65.1 – 94.0
Lower ball joint x Steering knuckle	12.0 – 17.0	86.8 – 123.0
Lower ball joint x Lower arm	3.0 – 4.5	21.7 – 32.5
Upper ball joint x Upper arm	2.0 – 3.0	14.5 – 21.7
Steering knuckle x Disc brake caliper	9.3 – 12.0	67.3 – 86.8
Steering knuckle x Knuckle arm	9.0 – 13.0	65.1 – 94.0
Wheel nut	9.0 – 12.0	65.1 – 86.8

Steering

Tightening Parts	kg-m	ft-lb
Steering main shaft x Steering wheel	2.0 – 3.0	14.5 – 21.7
Steering main shaft x Flexible coupling	2.0 – 3.0	14.5 – 21.7
Steering gear housing x Frame	3.5 – 5.0	25.3 – 36.2
Sector shaft end cover x Steering gear housing	1.5 – 2.2	10.8 – 15.9
Lock nut x Gear housing	8.0 – 10.0	57.8 – 72.3

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Steering (Cont'd)

Pitman arm x Sector shaft	11.0 – 12.5	79.6 – 90.4
Steering idler arm support x Steering idler arm	8.0 – 12.0	57.9 – 86.8
Steering idler arm support x Frame	3.5 – 5.0	25.3 – 36.2
Steering idler arm x Steering relay rod	7.5 – 11.0	54.2 – 79.6
Steering relay rod x Steering pitman arm	7.5 – 11.0	54.2 – 79.6
Steering relay rod x Steering tie-rod	7.5 – 11.0	54.2 – 79.6
Steering knuckle arm x Steering tie-rod	7.5 – 11.0	54.2 – 79.6
Tie-rod end clamp	2.0 – 3.0	14.5 – 21.7
Flexible coupling yoke x Steering worm	2.0 – 3.0	14.5 – 21.7
Steering column clamp x Instrument panel	1.5 – 2.2	10.9 – 15.9

Brake

Tightening Parts	kg-m	ft-lb
Reservoir set bolt x Master cylinder	2.0 – 3.0	14.5 – 21.7
Master cylinder x Outlet plug	11.0 – 13.0	79.6 – 94.0
Brake tube union nut	1.3 – 1.8	9.4 – 13.0
Flexible hose x Union	2.0 – 2.5	14.5 – 18.1
Disc x Hub	4.0 – 5.5	28.9 – 39.8
Disc brake caliper x Steering knuckle	9.3 – 12.0	67.3 – 86.8

CLUTCH

Clutch pedal height (from toeboard)	160 mm	6.3 in.
Clutch pedal free play	25 – 50 mm	1 – 2 in.
Release fork end play	2.0 – 3.0 mm	0.08 – 0.12 in.
Disc thickness limit, surface to rivet	0.3 mm	0.012 in.
Disc runout limit	0.8 mm	0.03 in.
Diaphragm spring out-of alignment limit	0.6 mm	0.024 in.

MANUAL TRANSMISSION 4-SPEED (L42)

Thrust clearance	STD	0.10 – 0.25 mm	0.004 – 0.010 in.
	Limit	0.25 mm	0.010 in.
Backlash	STD	0.1 – 0.2 mm	0.004 – 0.008 in.
	Limit	0.2 mm	0.008 in.
3rd gear to output shaft oil clearance	STD	0.06 – 0.11 mm	0.0024 – 0.0043 in.
	Limit	0.11 mm	0.0043 in.

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MANUAL TRANSMISSION 4-SPEED (L42) (Cont'd)

2nd gear to output shaft oil clearance	STD	0.06 – 0.11 mm	0.0024 – 0.0043 in.
	Limit	0.11 mm	0.0043 in.
1st gear to roller & bushing oil clearance			
	STD	0.009 – 0.064 mm	0.00035 – 0.00252 in.
	Limit	0.064 mm	0.00252 in.
Counter gear to roller & shaft oil	STD	0.018 – 0.066 mm	0.00071 – 0.00260 in.
	Limit	0.66 mm	0.00260 in.
Reverse idler gear to shaft oil clearance			
	STD	0.060 – 0.096 mm	0.00236 – 0.00378 in.
	Limit	0.096 mm	0.00378 in.
Synchronizer ring to gear clearance limit		0.8 mm	0.031 in.
Shift fork to hub sleeve clearance limit		1.0 mm	0.039 in.
Output shaft runout limit		0.03 mm	0.001 in.
Thrust washer thickness (for counter gear)			
Rear	33441-26011	2.25 mm	0.0886 in.
	33441-26021	2.35 mm	0.0925 in.
	33441-26031	2.45 mm	0.0965 in.
	33441-26041	2.55 mm	0.1004 in.
	33441-26051	2.65 mm	0.1043 in.
Front	33441-26061	2.21 mm	0.0870 in.
Output shaft snap ring thickness (for extension housing)			
	90520-68181	1.35 – 1.45 mm	0.0531 – 0.0571 in.
	90520-68182	1.45 – 1.55 mm	0.0571 – 0.0610 in.
	90520-68183	1.55 – 1.65 mm	0.0610 – 0.0650 in.
	90520-68184	1.65 – 1.75 mm	0.0650 – 0.0689 in.
	90520-68185	1.75 – 1.85 mm	0.0689 – 0.0728 in.
Output shaft snap ring thickness (for front)			
	90520-28242	1.50 – 1.55 mm	0.0591 – 0.0610 in.
	90520-28243	1.60 – 1.65 mm	0.0630 – 0.0650 in.
	90520-28244	1.70 – 1.75 mm	0.0669 – 0.0689 in.
	90520-28245	1.80 – 1.85 mm	0.0709 – 0.0728 in.

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MANUAL TRANSMISSION 4-SPEED (L42) (Cont'd)

Input shaft snap ring thickness		
90520-33168	2.05 – 2.10 mm	0.0807 – 0.0827 in.
90520-33169	2.10 – 2.15 mm	0.0827 – 0.0846 in.
90520-33170	2.15 – 2.20 mm	0.0846 – 0.0866 in.
90520-33171	2.20 – 2.25 mm	0.0866 – 0.0886 in.
90520-33172	2.25 – 2.30 mm	0.0886 – 0.0906 in.
90520-33107	2.30 – 2.35 mm	0.0906 – 0.0925 in.
Output shaft snap ring thickness (for rear)		
90520-28242	1.50 – 1.55 mm	0.0591 – 0.0610 in.
90520-28243	1.60 – 1.65 mm	0.0630 – 0.0650 in.
90520-28244	1.70 – 1.75 mm	0.0669 – 0.0689 in.
90520-28245	1.80 – 1.85 mm	0.0709 – 0.0728 in.
90520-28246	1.90 – 1.95 mm	0.0748 – 0.0768 in.
Extension housing heating temperature (at bimetal formed bushing replacement)	80 – 100°C	176 – 212°F

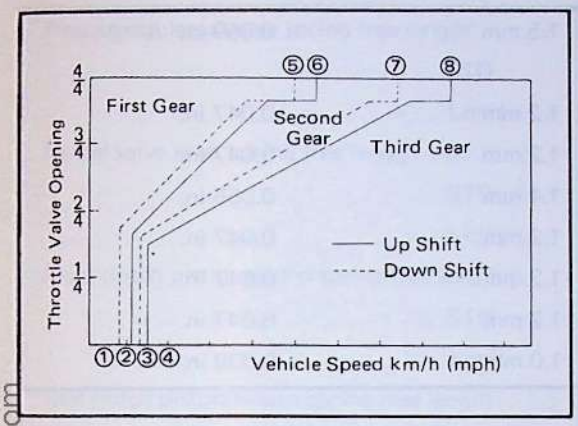
AUTOMATIC TRANSMISSION 3-SPEED (A-30)

Adjustment

Front brake band	When prying the apply lever towards the band a screwdriver, the gap between the end of the piston rod and the apply bolt should be below. 3.0 mm 0.118 in.
Rear brake band	Tighten the anchor bolt at 0.5 kg-m (3.6 ft-lb), then loosen it exactly one-turn.
Transmission end play	0.5 – 0.9 mm 0.020 – 0.035 in.
Front clutch disc thrust clearance (Input shaft to clutch disc clearance)	0.4 – 0.7 mm 0.016 – 0.028 in.
Safety & reverse switch	The engine should start only with the transmission selector lever in "N" or "P" range. The back-up light should glow only with the transmission selector lever "R" range.
Throttle link connecting rod	The indicator on the throttle valve lever should align with the mark on the transmission case with the carburator throttle valve at fully opened position.

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Shift Point



①	2 – 9 mph
②	7 – 11 mph
③	7 – 12 mph
④	11 – 17 mph
⑤	27 – 38 mph
⑥	34 – 43 mph
⑦	45 – 54 mph
⑧	54 – 67 mph

Test

Front oil pump discharge pressure (at stall)			
	L, 2, D range	9.0 – 11.0 kg/cm²	128 – 156 psi
	R range	13.0 – 15.0 kg/cm²	185 – 213 psi
Rear oil pump discharge pressure			
[vehicle speed 50 – 60 km/h (30 – 40 mph)]		5.0 – 6.3 kg/cm²	71 – 90 psi
Governor pressure	Output shaft 1000 rpm	1.6 – 2.1 kg/cm²	23 – 30 psi
	Output shaft 1800 rpm	2.4 – 3.0 kg/cm²	34 – 43 psi
	Output shaft 3500 rpm	5.8 – 7.0 kg/cm²	82 – 100 psi
Stall test revolution (engine rpm)		1750 – 2050 rpm	

Thrust Washers

Governor body spacer thickness	1.2 mm	0.047 in.
Front clutch drum thrust washer thickness		
35616-30021	1.2 – 1.3 mm	0.0472 – 0.0512 in.
35616-30031	0.8 – 0.9 mm	0.0314 – 0.0354 in.
35616-30040	1.0 – 1.1 mm	0.0394 – 0.0433 in.
Front clutch hub thrust washer thickness		
STD	1.6 mm	0.063 in.
Limit	1.2 mm	0.047 in.
Planetary carrier thrust washer thickness		
STD	2.0 mm	0.079 in.
Limit	1.6 mm	0.063 in.
Rear multiple disc clutch washer thickness		
STD	4.0 mm	0.157 in.
Limit	3.6 mm	0.142 in.

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Snap Rings

Rear clutch spring seat snap ring thickness	1.5 mm	0.059 in.
Front clutch piston return spring snap ring thickness	1.2 mm	0.047 in.
Front clutch flange hole snap ring thickness	1.2 mm	0.047 in.
	1.4 mm	0.055 in.
Rear clutch plate hole snap ring thickness	1.2 mm	0.047 in.
One-way clutch race set hole snap ring thickness	1.2 mm	0.047 in.
Front servo body snap ring thickness	1.2 mm	0.047 in.
Pressure regulator valve set hole snapring	1.0 mm	0.039 in.

Springs

1-2 shift valve spring free length			
Black	STD	16.52 mm	0.6504 in.
	Limit	15.5 mm	0.610 in.
Red	STD	18.25 mm	0.7185 in.
	Limit	17.25 mm	0.679 in.
Blue	STD	18.6 mm	0.732 in.
	Limit	17.5 mm	0.689 in.
2-3 shift valve spring free length	STD	27.65 mm	1.0886 in.
	Limit	26.5 mm	1.043 in.
Orifice control valve spring free length			
	STD	25.8 mm	1.016 in.
	Limit	23.0 mm	0.906 in.
Throttle valve front spring free length			
	STD	22.5 mm	0.886 in.
	Limit	21.0 mm	0.827 in.
Throttle valve rear spring length			
	STD	16.9 mm	0.665 in.
	Limit	16.0 mm	0.630 in.
Throttle relay valve spring free length			
	STD	19.0 mm	0.748 in.
	Limit	16.0 mm	0.630 in.
Governor valve spring free length			
	STD	17.2 mm	0.677 in.
	Limit	16.2 mm	0.638 in.

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Springs

Pressure regulator valve spring free length			
	STD	52.8 mm	2.079 in.
	Limit	50.0 mm	1.968 in.
Manual valve lever spring free length			
	STD	33.0 mm	1.299 in.
	Limit	30.0 mm	1.181 in.
Front clutch piston return spring free length			
	STD	7.0 mm	0.276 in.
	Limit	6.5 mm	0.256 in.
Rear clutch piston return spring free length			
	STD	43.4 mm	1.709 in.
	Limit	41.0 mm	1.614 in.
Plyming valve spring free length		23.8 mm	0.937 in.
Oil pump check valve spring free length		16.4 mm	0.646 in.
Front servo piston return spring free length		41 mm	1.614 in.
Front servo piston cushion spring free length		23.6 mm	0.929 in.

Front Oil Pump

Body clearance	Limit	0.3 mm	0.012 in.
	STD	0.120 – 0.209 mm	0.0047 – 0.0082 in.
Tip clearance	Limit	0.5 mm	0.020 in.
	STD	0.222 – 0.374 mm	0.0087 – 0.0147 in.
Side clearance	Limit	0.1 mm	0.0039 in.
	STD	0.030 – 0.059 mm	0.0012 – 0.0023 in.

Rear Oil Pump

Body clearance	Limit	0.3 mm	0.012 in.
	STD	0.100 – 0.176 mm	0.0039 – 0.0069 in.
Tip clearance	Limit	0.5 mm	0.020 in.
	STD	0.227 – 0.367 mm	0.0089 – 0.0144 in.
Side clearance	Limit	0.1 mm	0.0039 in.
	STD	0.030 – 0.059 mm	0.0012 – 0.0023 in.

Bushing, Front Clutch, Rear Clutch

Transmission case bushing inner diameter	42.025 – 42.075 mm	1.6545 – 1.6565 in.
Extension housing bushing inner diameter	38.025 – 38.075 mm	1.4970 – 1.4990 in.

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Bushing, Front Clutch, Rear Clutch (Cont'd)

Front clutch disc thickness		2.40 – 2.60 mm	0.0945 – 0.1024 in.
Front clutch plate thickness			
	35634-30040	1.30 – 1.45 mm	0.0512 – 0.0571 in.
	35634-30020	1.50 – 1.65 mm	0.0591 – 0.0650 in.
	35634-30050	1.70 – 1.85 mm	0.0669 – 0.0728 in.
Rear clutch disc thickness		2.40 – 2.60 mm	0.0945 – 0.1024 in.
Rear clutch plate thickness		1.50 – 1.65 mm	0.0591 – 0.0650 in.
Rear clutch cushion plate thickness		1.9 – 2.1 mm	0.075 – 0.083 in.
Gap between clutch piston & check valve (Front or Rear)		0.8 – 1.1 mm	0.031 – 0.043 in.
Extension housing heating temperature (at bimetal formed bushing replacement)		80 – 100°C	176 – 212°F

PROPELLER SHAFT

Spider bearing insertion hole diameter			
	w/o mark	26.000 – 26.021 mm	1.0236 – 1.0244 in.
	w/ mark	26.021 – 26.042 mm	1.0244 – 1.0253 in.
Spider bearing outside diameter	w/o mark	26.015 – 26.028 mm	1.0242 – 1.0247 in.
	w/ mark	26.036 – 26.049 mm	1.0250 – 1.0256 in.
Hole snap ring thickness			
	90521-27001	1.175 – 1.225 mm	0.0463 – 0.0482 in.
	90521-27002	1.225 – 1.275 mm	0.0482 – 0.0502 in.
	90521-27003	1.275 – 1.325 mm	0.0502 – 0.0522 in.
	90521-27004	1.325 – 1.375 mm	0.0522 – 0.0541 in.
Spider shaft axial play		0.05 mm Max.	0.002 in Max.

DIFFERENTIAL

Drive pinion bearing preload (starting)			
	New bearing	19 – 26 kg-cm	16.5 – 22.6 in.-lb
	Reused bearing	9 – 13 kg-cm	7.8 – 11.3 in.-lb
Total preload		Add drive pinion hearing preload	
		4 – 6 kg-cm	3.5 – 5.2 in.-lb
Drive pinion to ring gear backlash		0.13 – 0.18 mm	0.005 – 0.007 in.
Ring gear installed temperature		90 – 110°C	194 – 230°F
Ring gear runout limit		0.1 mm	0.004 in.
Differential case runout limit		0.05 mm	0.002 in.

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DIFFERENTIAL (Cont'd)

Side gear backlash	0.05 – 0.20 mm	0.002 – 0.008 in.
Drive pinion adjusting shim thickness (Rear)		
90201-35497	1.69 – 1.71 mm	0.0665 – 0.0673 in.
90201-35498	1.72 – 1.74 mm	0.0677 – 0.0685 in.
90201-35499	1.75 – 1.77 mm	0.0689 – 0.0697 in.
90201-35500	1.78 – 1.80 mm	0.0701 – 0.0709 in.
90201-35501	1.81 – 1.83 mm	0.0713 – 0.0720 in.
90201-35502	1.84 – 1.86 mm	0.0724 – 0.0732 in.
90201-35503	1.87 – 1.89 mm	0.0736 – 0.0744 in.
90201-35504	1.90 – 1.92 mm	0.0748 – 0.0756 in.
90201-35505	1.93 – 1.95 mm	0.0760 – 0.0768 in.
90201-35506	1.96 – 1.98 mm	0.0772 – 0.0780 in.
90201-35507	1.99 – 2.01 mm	0.0783 – 0.0791 in.
90201-35508	2.02 – 2.04 mm	0.0795 – 0.0803 in.
90201-35509	2.05 – 2.07 mm	0.0807 – 0.0815 in.
90201-35510	2.08 – 2.10 mm	0.0819 – 0.0827 in.
90201-35511	2.11 – 2.13 mm	0.0830 – 0.0839 in.
90201-35512	2.14 – 2.16 mm	0.0843 – 0.0850 in.
90201-35513	2.17 – 2.19 mm	0.0854 – 0.0862 in.
90201-35514	2.20 – 2.22 mm	0.0866 – 0.0874 in.
90201-35515	2.23 – 2.25 mm	0.0878 – 0.0886 in.
90201-35516	2.26 – 2.28 mm	0.0890 – 0.0898 in.
90201-35517	2.29 – 2.31 mm	0.0902 – 0.0909 in.
90201-35518	2.32 – 2.34 mm	0.0913 – 0.0921 in.
Drive pinion spacer adjusting shim thickness (Front)		
90564-30035	0.25 mm	0.0098 in.
90564-30193	0.30 mm	0.0118 in.
90564-30194	0.35 mm	0.0138 in.
90564-30195	0.40 mm	0.0157 in.
90564-30063	0.45 mm	0.0177 in.
Side gear thrust washer thickness		
41361-40020	1.55 – 1.65 mm	0.0610 – 0.0650 in.
41362-40020	1.65 – 1.75 mm	0.0650 – 0.0689 in.
41363-40020	1.75 – 1.85 mm	0.0689 – 0.0728 in.

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FRONT AXLE AND SUSPENSION

Front end alignment				
Camber			1° ± 30′	
Caster			30′ ± 30′	
Axis inclination			7°15′	
Turning angle	Inner	Bias tire	32°15′ – 34°15′	
		Radial tire	30° – 32°	
	Outer	Bias tire	26°30′ – 28°30′	
		Radial tire	25°15′ – 27°15′	
Toe-in			5 – 7 mm	0.20 – 0.27 in.
Side slip			Within 3 mm at 1 meter	Within 0.12 in. at 3.3 ft
Wheel bearing preload (turning load at hub bolt)			0.3 – 0.9 kg	0.66 – 1.98 lb

TIRE INFLATION PRESSURE

Tire Size	Load	Condition	Inflation Pressure	
7.00 – 14, 6PR 185SR 14	Without	Luggage	1.4 kg/cm²	20 psi

STEERING

Steering wheel free play		within 30 mm	1.2 in.
Sector shaft to bushing clearance			
	Upper	0.007 – 0.049 mm	0.0003 – 0.0019 in.
	Center	0.007 – 0.049 mm	0.0003 – 0.0019 in.
	Lower	0.027 – 0.069 mm	0.0010 – 0.0027 in.
Bushing bore			
	Upper	28.000 – 28.025 mm	1.1024 – 1.1033 in.
	Center	28.000 – 28.025 mm	1.1024 – 1.1033 in.
	Lower	28.020 – 28.045 mm	1.1031 – 1.1041 in.
Sector shaft outside diameter		27.976 – 27.993 mm	1.1014 – 1.1021 in.
Sector shaft thrust clearance		within 0.05 mm	0.002 in.
Sector shaft thrust washer thickness			
	45353-20010	1.95 mm	0.077 in.
	45352-20010	2.00 mm	0.079 in.
	45354-20010	2.05 mm	0.081 in.
	45355-20010	2.10 mm	0.083 in.
	45356-20010	2.15 mm	0.085 in.

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STEERING (Cont'd)

Worm bearing preload	w/o sector shaft	3.0 – 6.0 kg-cm	2.6 – 5.2 in.-lb
	w/ sector shaft	7.0 – 11.0 kg-cm	6.1 – 8.7 in.-lb

BRAKE

Brake Pedal

Pedal height (from toe-board)	(for M/T)	160 mm	6.3 in.
Pedal height (from toe-board)	(for A/T)	166 mm	6.5 in.
Pedal play		3 – 6 mm	0.12 – 0.24 in.
Pedal reserve distance		More than 60 mm	2.4 in.

Brake Booster

Booster push rod to piston clearance	0.1 – 0.5 mm	0.004 – 0.020 in.

Front Brake (Disc)

Disc thickness limit	11.5 mm	0.453 in.
Disc runout limit	0.15 mm	0.0059 in.
Pad thickness limit	1 mm	0.04 in.

Rear Brake (Drum)

Drum inside diameter limit	256.0 mm	10.08 in.
Lining thickness limit	1.0 mm	0.04 in.

Parking Brake

Parking brake lever travel	8 – 12 notches

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MEMO

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RK CHASSIS

INCLUDES

RK101 Pickup

RK101 Double Cab.

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts	kg-m	ft-lb
Release fork support set bolt	2.0 – 3.0	14.5 – 21.7
Clutch cover x Flywheel	0.8 – 1.3	5.8 – 9.4

Transmission

Tightening Parts	kg-m	ft-lb
Counter shaft front bearing lock nut	15.0 – 16.0	108.5 – 115.7
Front bearing retainer	1.0 – 1.5	7.2 – 10.9
Gear shift fork set bolt	3.0 – 4.0	21.7 – 28.9
Rear bearing retainer	1.0 – 1.5	7.2 – 10.9
Case cover	1.0 – 1.5	7.2 – 10.9
Parking brake drum	20.0	144.7

Propeller Shaft

Tightening Parts	kg-m	ft-lb
Joint flange	1.5 – 2.2	10.9 – 15.9
Center bearing support	1.0 – 1.6	7.2 – 11.6

Differential

Tightening Parts	kg-m	ft-lb
Ring gear	10.0 – 12.0	72.3 – 86.8
Side bearing cap	7.0 – 9.0	50.6 – 65.1
Drive pinion x Companion flange	17.0 – 20.0	123.0 – 144.7
Rear axle housing x Differential	1.7	12.3

Axle & Suspension

Tightening Parts	kg-m	ft-lb
U bolt	14.0 – 16.5	101.3 – 119.3
Leaf spring bracket & shackle	7.5 – 11.0	54.3 – 79.6

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Steering

Tightening Parts	kg-m	ft-lb
Steering wheel	2.0 – 3.0	14.5 – 21.7
Sector shaft end cover	1.5 – 2.2	10.9 – 15.9
Gear housing end cover	1.5 – 2.2	10.9 – 15.9
Gear housing bracket cap	10.0 – 12.0	72.3 – 86.8
Steering knuckle	9.0 – 12.0	65.1 – 86.8
Tie rod end castle nut	5.0 – 6.0	36.2 – 43.4
Pitman arm	19.5	141.0

Brake

Tightening Parts	kg-m	ft-lb
Brake tube	1.0	7.2

CLUTCH

Pedal height	185 mm	7.28 in.
Release fork tip play	5.0 mm	0.20 in.
Release lever height	5.0 mm	0.20 in.
Clutch disc runout	0.5 mm	0.02 in.
Clutch disc thickness limit	0.3 mm	0.012 in.

TRANSMISSION

Gear backlash	1st	0.23 mm	0.0090 in.
	2nd	0.19 mm	0.0075 in.
	3rd	0.19 mm	0.0075 in.
	4th	0.23 mm	0.0090 in.
	Reverse	0.23 mm	0.0098 in.
Synchronizer ring to gear clearance limit		0.8 mm	0.031 in.
Shift fork to groove clearance limit		1.0 mm	0.039 in.
Reverse shift fork to arm groove clearance		0.25 – 0.55 mm	0.010 – 0.022 in.
Gear thrust clearance		0.2 – 0.3 mm	0.008 – 0.012 in.

DIFFERENTIAL

Dirve pinion preload	w/ SST	3.8 – 5.2 kg	8.4 – 11.4 lb
Ring gear backlash		0.15 – 0.20 mm	0.006 – 0.008 in.

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FRONT WHEEL ALIGNMENT

Toe-in		3 – 4 mm	0.12 – 0.16 in.
Caster		1°30′	
Camber		2°	
King pin inclination		7°	
Steering angle	Inner	38°	
	Outer	29°	

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KM CHASSIS

INCLUDES

KM10V Delivery Van

KM10V-Z Delivery Van High Roof

KM10B Pickup

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts	kg-m	ft-lb
Clutch cover x Flywheel	1.5 – 1.6	7.2 – 11.6
Clutch housing x Engine	5.0 – 7.0	36.1 – 50.5
Release fork support x Transmission case	1.9 – 3.1	13.7 – 22.4
Clutch pedal and brake pedal installing bolt	3.0 – 4.5	21.7 – 32.5

Transmission

Tightening Parts	kg-m	ft-lb
Front bearing retainer x Transmission case	0.4 – 0.7	2.9 – 5.1
Extension housing x Transmission case	3.0 – 4.5	21.7 – 32.5
Transmission case cover x Transmission case	1.5 – 2.2	10.8 – 15.9
Clutch housing x Transmission case	5.0 – 7.0	36.1 – 50.5

Propeller Shaft

Tightening Parts	kg-m	ft-lb
Universal joint flange yoke x Universal joint flange	1.5 – 2.2	10.8 – 15.9

Rear Axle, Rear Suspension

Tightening Parts	kg-m	ft-lb
Differential case x Ring gear	9.2 – 10.5	66.4 – 75.8
Differential drive pinion x Universal joint	17.0 – 20.0	122.7 – 144.4
Differential bearing cap x Differential carrier	7.0 – 9.0	50.5 – 65.0
Differential carrier x Rear axle housing	1.5 – 2.2	10.8 – 15.9
Rear axle housing end x Backing plate x Retainer	4.0 – 5.0	28.9 – 36.1
U bolt nut	7.0 – 9.0	50.5 – 65.0

Front Suspension

Tightening Parts	kg-m	ft-lb
Upper suspension x Suspension member	4.5 – 6.0	32.5 – 43.3
Lower arm x Suspension member	7.0 – 9.0	50.5 – 65.0
Upper ball joint x Steering knuckle	5.5 – 7.0	39.7 – 50.5
Lower ball joint x Steering knuckle	5.5 – 7.0	39.7 – 50.5
Steering knuckle arm x Steering knuckle	5.5 – 7.0	39.7 – 50.5

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Front Suspension (Cont'd)

Steering knuckle x Backing plate	5.5 – 7.0	39.7 – 50.5
Front spring bumper No. 1 x Suspension member	1.0 – 1.8	7.2 – 13.0
Front spring bumper No. 2 x Upper arm	1.0 – 1.8	7.2 – 13.0
Shock absorber, upper x Suspension member	1.9 – 3.1	13.7 – 22.4
Shock absorber, lower x Lower arm	1.5 – 2.2	10.8 – 15.9
Wheel nut x Front wheel hub	9.0 – 12.0	65.0 – 86.6

Steering

Tightening Parts	kg-m	ft-lb
Steering main shaft x Steering wheel	2.0 – 3.0	14.4 – 21.7
Steering gear housing x Frame	5.0 – 7.0	36.1 – 50.5
Sector shaft end cover x Steering gear housing	1.5 – 2.0	10.8 – 14.4
Pitman arm x Steering sector shaft	11.0 – 14.0	79.4 – 101.1
Steering idler arm support x Steering idler arm	8.0 – 12.0	57.8 – 86.6
Steering idler arm support x Frame	3.0 – 4.5	21.7 – 32.5
Steering relay rod x Steering idler arm / Steering center arm	5.0 – 7.0	36.1 – 50.5
Steering knuckle arm x Steering tie-rod	5.0 – 7.0	36.1 – 50.5
Drag ring x Center arm	5.0 – 7.0	36.1 – 50.5
Drag ring x Pitman arm	5.0 – 7.0	36.1 – 50.5
Center arm bracket x Frame	4.0 – 5.5	28.9 – 39.7
Center arm bracket x Center arm	7.0 – 11.0	50.5 – 79.4

Brake

Tightening Parts	kg-m	ft-lb
Cowl panel x Pedal bracket	1.0 – 1.6	7.2 – 11.6
Brake backing plate x Wheel brake cylinder	0.8 – 1.2	5.8 – 8.7
Union bolt x Wheel brake cylinder	2.7 – 3.5	19.5 – 25.3
Bleeder plug x Wheel brake cylinder	1.0 – 1.3	7.2 – 9.4
Flexible hose x Brake tube	1.3 – 1.8	9.4 – 13.0
Brake and clutch pedal installing bolts	3.0 – 4.5	14.4 – 32.5

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CLUTCH

Pedal height	150 mm	5.9 in.
Pedal play	20 – 35 mm	0.8 – 1.4 in.
Release fork end play	4.5 – 5.5 mm	0.18 – 0.22 in.
Clutch facing thickness limit	0.3 mm	0.012 in.
Clutch disc runout limit	0.5 mm	0.02 in.
Installed road	285 – 335 kg	649 – 737 lb

TRANSMISSION

Counter gear thrust clearance		0.05 – 0.15 mm	0.002 – 0.006 in.
First gear thrust clearance	Limit	0.26 mm	0.010 in.
	STD	0.10 – 0.20 mm	0.004 – 0.008 in.
Second gear thrust clearance	Limit	0.26 mm	0.010 in.
	STD	0.10 – 0.20 mm	0.004 – 0.008 in.
Third gear thrust clearance	Limit	0.26 mm	0.010 in.
	STD	0.10 – 0.20 mm	0.004 – 0.008 in.
Counter gear thrust washer thickness			
	No. 1	1.25 – 1.30 mm	0.049 – 0.051 in.
	No. 2	1.30 – 1.35 mm	0.051 – 0.053 in.
	No. 3	1.35 – 1.40 mm	0.053 – 0.055 in.
	No. 4	1.40 – 1.45 mm	0.055 – 0.057 in.
	No. 5	1.45 – 1.50 mm	0.057 – 0.059 in.
	No. 6	1.50 – 1.55 mm	0.059 – 0.061 in.
	No. 7	1.55 – 1.60 mm	0.061 – 0.063 in.
	No. 8	1.60 – 1.65 mm	0.063 – 0.065 in.
	No. 9	1.65 – 1.70 mm	0.065 – 0.067 in.
	No. 10	1.70 – 1.75 mm	0.067 – 0.069 in.
	No. 11	1.75 – 1.80 mm	0.069 – 0.071 in.
	No. 12	1.80 – 1.85 mm	0.071 – 0.073 in.
	No. 13	1.85 – 1.90 mm	0.073 – 0.075 in.
	No. 14	1.20 – 1.25 mm	0.047 – 0.049 in.
Input shaft snap ring thickness			
	No. 1	2.43 – 2.57 mm	0.096 – 0.101 in.
	No. 2	2.30 – 2.42 mm	0.091 – 0.095 in.
Output shaft front snap ring thickness			
	No. 1	2.30 – 2.35 mm	0.091 – 0.093 in.
	No. 2	2.35 – 2.40 mm	0.093 – 0.094 in.

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TRANSMISSION (Cont'd)

	No. 3	2.40 – 2.45 mm	0.094 – 0.096 in.
	No. 4	2.45 – 2.50 mm	0.096 – 0.098 in.
	No. 5	2.50 – 2.55 mm	0.098 – 0.100 in.
	No. 6	2.55 – 2.60 mm	0.100 – 0.102 in.
	No. 7	2.60 – 2.65 mm	0.102 – 0.104 in.
	No. 8	2.65 – 2.70 mm	0.104 – 0.106 in.
	No. 9	2.70 – 2.75 mm	0.106 – 0.108 in.
	No. 10	2.75 – 2.80 mm	0.108 – 0.110 in.
Output shaft rear snap ring thickness			
	No. 1	2.20 – 2.25 mm	0.087 – 0.089 in.
	No. 2	2.25 – 2.30 mm	0.089 – 0.091 in.
	No. 3	2.30 – 2.35 mm	0.091 – 0.093 in.
	No. 4	2.35 – 2.40 mm	0.093 – 0.094 in.
	No. 5	2.40 – 2.45 mm	0.094 – 0.096 in.
	No. 6	2.45 – 2.50 mm	0.096 – 0.098 in.
Output shaft rear bearing snap ring thickness			
	No. 1	1.40 – 1.50 mm	0.055 – 0.059 in.
	No. 2	1.60 – 1.70 mm	0.063 – 0.067 in.
Synchronizer ring to gear clearance limit		1.2 mm	0.047 in.
Shift fork and hub sleeve clearance limit		1.2 mm	0.047 in.

PROPELLER SHAFT

Spider bearing boss inner diameter			
	No. 1	26.000 – 26.021 mm	1.0236 – 1.0244 in.
	No. 2	26.021 – 26.042 mm	1.0244 – 1.0253 in.

UNIVERSAL JOINT

Spider bearing diameter			
	No. 1	26.015 – 26.028 mm	1.0242 – 1.0247 in.
	No. 2	26.036 – 26.049 mm	1.0250 – 1.0256 in.
Hole snap ring thickness			
	No. 1	1.175 – 1.225 mm	0.0463 – 0.0482 in.
	No. 2	1.225 – 1.275 mm	0.0482 – 0.0502 in.
	No. 3	1.275 – 1.325 mm	0.0502 – 0.0522 in.
	No. 4	1.325 – 1.375 mm	0.0522 – 0.0541 in.

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UNIVERSAL JOINT (Cont'd)

Spider thrust play	Less than 0.05 mm	0.002 in.
Spider diameter	13.466 – 13.484 mm	0.5302 – 0.0309 in.

DIFFERENTIAL

Drive pinion bearing preload	New bearing	16 – 22 kg-cm	1.2 – 1.6 ft-lb
	"	3.2 – 4.4 kg	7.0 – 9.7 lb W/SST
	Reused bearing	0.4 – 1.2 kg	0.9 – 2.6 lb W/SST
Total preload	New bearing	0.4 – 0.8 kg	0.9 – 1.8 lb W/SST
	Reused bearing	0.2 – 0.4 kg	0.4 – 0.9 lb W/SST
Differential side bearing preload		Tighten both nuts until ring gear has no play, then tighten one side nut additionally, 1.0 – 1.5 notches.	
Drive pinion to ring gear backlash		0.13 – 0.18 mm	0.005 – 0.007 in.
Ring gear runout limit		0.1 mm	0.004 in.
Differential case runout limit		0.05 mm	0.002 in.
Side gear backlash		0.02 – 0.20 mm	0.001 – 0.008 in.
Side gear thrust clearance		0.05 – 0.20 mm	0.002 – 0.008 in.
Drive pinion bearing spacer thickness			
	No. 1	61.000 – 61.025 mm	2.4016 – 2.4026 in.
	No. 2	61.045 – 61.070 mm	2.4033 – 2.4043 in.
	No. 3	61.090 – 61.115 mm	2.4051 – 2.4061 in.
	No. 4	61.135 – 61.160 mm	2.4069 – 2.4079 in.
	No. 5	61.180 – 61.205 mm	2.4087 – 2.4096 in.
	No. 6	61.225 – 61.250 mm	2.4104 – 2.4114 in.
Spacer adjusting shim thickness		0.3 mm	0.012 in.
Drive pinion adjusting plate thickness			
	No. 1	2.99 – 3.01 mm	0.1177 – 0.1185 in.
	No. 2	3.02 – 3.04 mm	0.1189 – 0.1197 in.
	No. 3	3.05 – 3.07 mm	0.1201 – 0.1209 in.
	No. 4	3.08 – 3.10 mm	0.1213 – 0.1220 in.
	No. 5	3.11 – 3.13 mm	0.1224 – 0.1232 in.
	No. 6	3.14 – 3.16 mm	0.1236 – 0.1244 in.
	No. 7	3.17 – 3.19 mm	0.1248 – 0.1256 in.
	No. 8	3.20 – 3.22 mm	0.1260 – 0.1268 in.
	No. 9	3.23 – 3.25 mm	0.1271 – 0.1280 in.
	No. 10	3.26 – 3.28 mm	0.1283 – 0.1291 in.

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DIFFERENTIAL (Cont'd)

Drive pinion adjusting shim thickness		0.3 mm	0.012 in.
Side gear thrust washer thickness			
	No. 1	1.4 – 1.5 mm	0.055 – 0.059 in.
	No. 2	1.5 – 1.6 mm	0.059 – 0.063 in.
	No. 3	1.6 – 1.7 mm	0.063 – 0.067 in.
	No. 4	1.7 – 1.8 mm	0.067 – 0.071 in.
Differential pinion thrust washer thickness		1.0 mm	0.04 in.

FRONT AXLE

Toe-in		2 – 6 mm	0.08 – 0.24 in.
Camber		40' ± 45'	
Caster		20' ± 45'	
Axis inclination		7°30'	
Turning angle	Inside	38 ± 1°	
	Outside	33 ± 1°	
Side slip		Less than 3 mm (0.12 in.) at moving distance 1 m (3.3 ft)	
Wheel bearing preload		Tighten the castle nut to 2.6 – 3.2 m-kg (18.80 – 23.14 ft-lbs) torque, rotate the drum 2 – 3 turns, and loosen the nut until it turns with the fingers. Insert a box wrench, and tighten the nut with the box wrench by the hand.	
Camber adjusting shim thickness			
	No. 1	2.3 mm	0.091 in.
	No. 2	1.6 mm	0.063 in.
	No. 3	1.2 mm	0.047 in.
Allowable difference of front and rear camber adjusting shim thickness		4 mm	0.16 in.

WHEELS

Disc wheel runout limit	3 mm	0.12 in.

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STEERING

Plug at wheel circumference		0 – 20 mm	0 – 0.8 in.
Sector shaft to bushing clearance			
	No. 1	0.027 – 0.069 mm	0.0011 – 0.0027 in.
	No. 2	0.007 – 0.049 mm	0.0003 – 0.0019 in.
Sector shaft outer diameter		27.976 – 27.993 mm	1.1014 – 1.1021 in.
Sector shaft thrust clearance		Less than 0.09 mm	0.004 in.
Sector shaft thrust washer thickness	No. 1	2.00 mm	0.079 in.
	No. 2	2.05 mm	0.081 in.
	No. 3	2.10 mm	0.083 in.
	No. 4	2.15 mm	0.085 in.
	No. 5	2.20 mm	0.087 in.
Worm bearing w/o sector shaft		3.0 – 6.0 kg	6.6 – 13.2 lb
preload w/ sector shaft		8.0 – 11.0 kg	17.6 – 24.2 lb

BRAKE

Brake Pedal

Pedal height from floor mat	145 – 155 mm	5.7 – 6.1 in.
Pedal free play	0.5 – 5.0 mm	0.02 – 0.20 in.
Effect pedal stroke	Over than 55 mm	2.17 in.

Brake Adjustment

Parking brake lever	4 – 12 clicks

Drum Brake

Inner diameter	Limit	230.6 mm	9.079 in.
	STD	228.5 – 228.7 mm	8.996 – 9.003 in.
Lining wear limit		1.5 mm	0.06 in.

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RH CHASSIS

INCLUDES

RH11 Pickup

RH11 Pickup Flatbed

RH11P Double Cab.

RH11G Station Wagon

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts	kg-m	ft-lb
Clutch cover x Flywheel	1.5 – 2.2	10.8 – 15.9

Transmission (L42)

Tightening Parts	kg-m	ft-lb
Transmission case x Engine	3.0 – 4.5	21.7 – 32.6
Extension housing x Transmission case	3.0 – 4.5	21.7 – 32.6
Front bearing retainer x Transmission case	0.6 – 0.9	4.3 – 6.5

Propeller Shaft

Tightening Parts	kg-m	ft-lb
Universal joint flange yoke x Companion flange	1.5 – 2.2	10.9 – 15.9

Rear Axle and Suspension

Tightening Parts	kg-m	ft-lb
Differential case x Ring gear	9.2 – 10.5	66.5 – 76.0
Differential drive pinion x Companion flange	17.0 – 21.0	123.0 – 151.9
Differential bearing cap x Differential carrier	7.0 – 9.0	50.6 – 65.1
Differential carrier x Rear axle housing	2.0 – 3.0	14.5 – 21.7
Rear axle housing x Backing plate & retainer	6.0 – 8.0	43.3 – 57.8
U bolt	6.9 – 9.7	49.9 – 70.2
Spring bracket pin	7.5 – 11.0	54.2 – 79.6
Wheel nut	9.0 – 12.0	65.1 – 86.8

Front Axle and Suspension

Tightening Parts	kg-m	ft-lb
Upper arm shaft x Suspension member	10.0 – 15.0	72.3 – 108.5
Lower arm shaft x Suspension member	7.0 – 9.0	50.6 – 65.1
Upper ball joint x Steering knuckle	9.0 – 13.0	65.1 – 94.0
Lower ball joint x Steering knuckle	12.0 – 17.0	86.8 – 123.0
Lower ball joint x Lower arm	3.0 – 4.0	21.7 – 28.9
Front spring bumper x Lower arm	4.0 – 5.0	28.9 – 36.2
Upper ball joint x Upper arm	2.0 – 3.0	14.5 – 21.7

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Front Axle and Suspension (Cont'd)

Front spring bumper x Upper arm	1.9 – 3.1	13.7 – 22.4
Steering knuckle x Knuckle arm x Backing plate	7.0 – 9.0	50.6 – 65.1
Wheel nut	9.0 – 12.0	65.1 – 86.8

Steering

Tightening Parts	kg-m	ft-lb
Steering main shaft x Steering wheel	2.0 – 3.0	14.5 – 21.7
Steering main shaft x Flexible coupling	2.0 – 3.0	14.5 – 21.7
Steering gear housing x Frame	4.0 – 5.5	28.9 – 39.8
Sector shaft end cover x Steering gear housing	3.0 – 4.5	21.7 – 32.6
Lock nut x Gear housing	3.5 – 5.0	25.3 – 36.2
Pitman arm x Sector shaft	16.0 – 19.0	115.7 – 137.4
Steering idler arm support x Steering idler arm	8.0 – 12.0	57.9 – 86.8
Steering idler arm support x Frame	4.0 – 5.5	28.9 – 39.8
Steering idler arm x Steering relay rod	5.0 – 7.0	36.2 – 50.6
Steering center arm x Steering relay rod	7.5 – 11.0	54.2 – 79.6
Steering drag link x Steering pitman arm	7.5 – 11.0	54.2 – 79.6
Steering drag link x Center arm	7.5 – 11.0	54.2 – 79.6
Steering relay rod x Steering tie-rod	7.5 – 11.0	54.2 – 79.6
Steering knuckle arm x Steering tie-rod	7.5 – 11.0	54.2 – 79.6
Tie-rod end clamp	1.5 – 3.0	10.9 – 21.7
Flexible coupling yoke x Steering worm	2.0 – 3.0	14.5 – 21.7
Steering column clamp x Instrument panel	1.0 – 1.6	8.0 – 11.6
Steering center arm shaft x Steering center arm	7.0 – 11.0	50.6 – 79.6
Steering center arm bracket x Frame	4.0 – 5.5	28.9 – 39.8

Brake

Tightening Parts	kg-m	ft-lb
Master cylinder x Union bolt	4.0 – 9.0	28.9 – 65.1
Master cylinder x Outlet plug	11.0 – 18.0	79.6 – 130.2
Brake tube union nut	1.3 – 1.8	9.4 – 13.0
Flexible hose x Union	2.0 – 2.7	14.5 – 19.5

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CLUTCH

Pedal height (From toe board)	185 mm	7.28 in.
Pedal play (At pedal top)	0.5 – 5.0 mm	0.02 – 0.20 in.
Release fork tip play	3.5 – 5.0 mm	0.14 – 0.20 in.
Clutch disc		
Revet head depth limit	0.3 mm	0.012 in.
Runout limit	0.8 mm	0.032 in.
Clutch diaphragm spring		
Out-of alignment limit	0.6 mm	0.024 in.

TRANSMISSION (L42)

Gear thrust clearance				
	1st, 2nd & 3rd gear		0.10 – 0.25 mm	0.004 – 0.0098 in.
	Counter gear		0.10 – 0.20 mm	0.004 – 0.0079 in.
Hub sleeve to shift fork clearance limit			1.0 mm	0.039 in.
Synchronizor ring to gear clearance limit			0.8 mm	0.032 in.
Output shaft bearing to bearing retainer				
	clearance limit		0.1 mm	0.004 in.
Clutch hub No. 2 to snap ring clearance limit			0.15 mm	0.0059 in.
Input shaft to bearing clearance limit			0.05 mm	0.0020 in.
Gear oil clearance limit			0.11 mm	0.0043 in.
Bimetal formed bushing to propeller oil				
	clearance limit		0.08 mm	0.0030 in.
Output shaft runout limit			0.03 mm	0.0012 in.
Snap ring thickness				
Output shaft snap ring thickness				
(for rear bearing)	Mark			
	1	90520-68181	1.35 – 1.45 mm	0.0531 – 0.0571 in.
	2	90520-68182	1.45 – 1.55 mm	0.0571 – 0.0610 in.
	3	90520-68183	1.55 – 1.65 mm	0.0610 – 0.0650 in.
	4	90520-68184	1.65 – 1.75 mm	0.0650 – 0.0689 in.
	5	90520-68185	1.75 – 1.85 mm	0.0689 – 0.0728 in.
Output shaft snap ring (For clutch hub No. 2)				
(for front)	Mark			
	A	90520-28242	1.50 – 1.55 mm	0.0591 – 0.0610 in.
	B	90520-28243	1.60 – 1.65 mm	0.0630 – 0.0650 in.
	C	90520-28244	1.70 – 1.75 mm	0.0669 – 0.0689 in.
	D	90520-28245	1.80 – 1.85 mm	0.0709 – 0.0728 in.

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TRANSMISSION (L42) (Cont'd)

Speedometer drive gear snap ring thickness			
Mark			
1	90520-28137	2.20 – 2.25 mm	0.0866 – 0.0886 in.
A	90520-28242	1.50 – 1.55 mm	0.0591 – 0.0610 in.
B	90502-28243	1.60 – 1.65 mm	0.0630 – 0.0650 in.
C	90520-28244	1.70 – 1.75 mm	0.0669 – 0.0689 in.
D	90520-28245	1.80 – 1.85 mm	0.0709 – 0.0728 in.
E	90520-28246	1.90 – 1.95 mm	0.0748 – 0.0768 in.
F	90520-28248	2.00 – 2.05 mm	0.0787 – 0.0807 in.
G	90520-28249	2.10 – 2.15 mm	0.0827 – 0.0847 in.
Input shaft bearing snap ring thickness			
Mark			
11	90520-33107	2.30 – 2.35 mm	0.0906 – 0.0925 in.
1	90502-33168	2.05 – 2.10 mm	0.0807 – 0.0827 in.
2	90520-33169	2.10 – 2.15 mm	0.0827 – 0.0846 in.
3	90520-33170	2.15 – 2.20 mm	0.0846 – 0.0866 in.
4	90520-33171	2.20 – 2.25 mm	0.0866 – 0.0886 in.
5	90520-33172	2.25 – 2.30 mm	0.0886 – 0.0906 in.
Counter gear thrust washer thickness			
(for rear) Mark			
0	33441-26011	2.25 – 2.30 mm	0.0886 – 0.0906 in.
1	33441-26021	2.35 – 2.40 mm	0.0925 – 0.0945 in.
2	33441-26031	2.45 – 2.50 mm	0.0965 – 0.0984 in.
3	33441-26041	2.55 – 2.60 mm	0.1004 – 0.1024 in.
4	33441-26051	2.65 – 2.70 mm	0.1043 – 0.1063 in.
	33441-26061	2.16 – 2.26 mm	0.0850 – 0.0890 in.
Extension housing heating temperature (at bimetal formed bushing replacement)		80 – 100°C	177 – 220°F

PROPELLER SHAFT

Spider thrust play		Less than 0.05 mm	0.002 in.
Spider bearing insertion hole diameter			
	w/o mark	26.000 – 26.021 mm	1.0236 – 1.0244 in.
	w/ mark	26.021 – 26.042 mm	1.0244 – 1.0253 in.
Spider bearing outside diameter			
	w/o mark	26.015 – 26.028 mm	1.0242 – 1.0247 in.
	w/ mark	26.036 – 26.049 mm	1.0250 – 1.0256 in.

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PROPELLER SHAFT (Cont'd)

Snap ring thickness	90521-27001	1.175 – 1.225 mm	0.0463 – 0.0482 in.
	90521-27002	1.225 – 1.275 mm	0.0482 – 0.0502 in.
	90521-27003	1.275 – 1.325 mm	0.0502 – 0.0522 in.
	90521-27004	1.325 – 1.375 mm	0.0522 – 0.0541 in.

DIFFERENTIAL

Drive pinion preload (at starting)			
	New bearing	19 – 26 kg-cm	16.5 – 22.6 in.-lb
	Reused bearing	5 – 15 kg-cm	4.3 – 13.0 in.-lb
Total preload	New bearing	23 – 32 kg-cm	20.0 – 27.8 in.-lb
	Reused bearing	8 – 24 kg-cm	6.9 – 20.8 in.-lb
Gear backlash	Pinion gear to side gear	0.05 – 0.20 mm	0.002 – 0.008 in.
	Ring gear	0.13 – 0.18 mm	0.0051 – 0.0071 in.
Ring gear installed temperature		90 – 110°C	194 – 230°F
Differential case runout limit		0.05 mm	0.002 in.
Drive pinion spacer adjusting shim (For drive pinion preload)			
	90564-30035	0.25 mm	0.0098 in.
	90564-30193	0.30 mm	0.0118 in.
	90564-30194	0.35 mm	0.0138 in.
	90564-30195	0.40 mm	0.0157 in.
	90564-30063	0.45 mm	0.0177 in.
Side gear thrust washer	41361-40020	1.55 – 1.65 mm	0.0610 – 0.0650 in.
	41362-40020	1.65 – 1.75 mm	0.0650 – 0.0689 in.
	41363-40020	1.75 – 1.85 mm	0.0689 – 0.0728 in.
Drive pinion adjusting shim (For drive pinion positioning)			
	90201-35497	1.70 mm	0.0670 in.
	90201-35498	1.73 mm	0.0681 in.
	90201-35499	1.76 mm	0.0693 in.
	90201-35500	1.79 mm	0.0705 in.
	90201-35501	1.82 mm	0.0717 in.
	90201-35502	1.85 mm	0.0728 in.
	90201-35503	1.88 mm	0.0740 in.
	90201-35504	1.91 mm	0.0752 in.
	90201-35505	1.94 mm	0.0764 in.

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DIFFERENTIAL (Cont'd)

90201-35506	1.97 mm	0.0776 in.
90201-35507	2.00 mm	0.0788 in.
90201-35508	2.03 mm	0.0799 in.
90201-35509	2.06 mm	0.0811 in.
90201-35510	2.09 mm	0.0823 in.
90201-35511	2.12 mm	0.0835 in.
90201-35512	2.15 mm	0.0847 in.
90201-35513	2.18 mm	0.0858 in.
90201-35514	2.21 mm	0.0870 in.
90201-35515	2.24 mm	0.0882 in.
90201-35516	2.27 mm	0.0894 in.
90201-35517	2.30 mm	0.0906 in.
90201-35518	2.33 mm	0.0917 in.

FRONT AXLE AND SUSPENSION

Front end alignment (Unloaded)		RH11(L), RH11P	RH11 (L)V, RH11 (L)B, RH11G, RH16B
Camber		35' ± 30'	←
Caster		35' ± 30'	1°05' ± 30'
Axis inclination		7°40'	←
Turning angle	Inner	31°	←
	Outer	30°	←
Toe-in	Bias tire	9 ± 1 mm 0.354 ± 0.039 in.	←
	Radial tire	[redacted] 1 mm ±1 0.236 ± 0.039 in.	←
Side slip		Within 3 mm at 1 meter Within 0.12 in. at 3.3 ft	←
Wheel bearing preload (Starting load at hub bolt)		0.53 – 1.75 kg	1.2 – 3.9 lb

TIRE INFLATION PRESSURE

Tire Size		Inflation Pressure	
6.00 – 14, 6PR, LT		2.0 kg/cm²	28.4 psi
6.00 – 14, 8PR, LT		2.4 kg/cm²	34.1 psi
7.00 – 14C, 6PR		2.0 kg/cm²	28.4 psi
185R14C, 6PR	Front tire	2.2 kg/cm²	31.3 psi
	Rear tire	2.5 kg/cm²	35.6 psi

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STEERING

Steering wheel free play		0 – 25 mm	0 – 0.98 in.
Sector shaft to bushing clearance	STD	0.01 – 0.06 mm	0.0004 – 0.0024 in.
	Limit	0.1 mm	0.004 in.
Sector shaft thrust clearance limit		0.05 mm	0.002 in.
Sector shaft bushing bore	STD	32.00 – 32.03 mm	1.2600 – 1.2612 in.
	Limit	32.07 mm	1.2628 in.
Sector shaft outside diameter	STD	31.970 – 31.992 mm	1.2588 – 1.2596 in.
	Limit	31.95 mm	1.258 in.
Worm shaft preload (Starting)			
	w/o sector shaft	3.5 – 6.5 kg	7.7 – 14.3 lb
	w/ sector shaft	8.0 – 11.0 kg	17.6 – 24.3 lb
Sector shaft thrust washer thickness			
	45352-36010	2.00 mm	0.0788 in.
	45353-36010	2.05 mm	0.0807 in.
	45354-36010	2.10 mm	0.0827 in.
	45355-36010	2.15 mm	0.0847 in.
	45356-36010	2.20 mm	0.0866 in.
Sector shaft end cover gasket thickness			
	45323-36010	0.05 mm	0.0020 in.
	45323-36020	0.07 mm	0.0028 in.
	45323-36030	0.08 mm	0.0032 in.
	45323-36040	0.10 mm	0.0039 in.
	45323-36050	0.20 mm	0.0079 in.
	45323-36060	0.50 mm	0.0197 in.
	45323-36070	0.06 mm	0.0024 in.
	45323-36080	0.09 mm	0.0035 in.

BRAKE

Brake pedal (w/ Brake booster)			
Height (From toe-board)		183 mm	7.21 in.
Play		3.0 – 6.0 mm	0.12 – 0.24 in.
Reserve distance	STD	105 mm	4.13 in.
While run the engine and pedal pressure			
at 50 kg (110 lb)	Limit	65 mm	2.56 in.

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BRAKE (Cont'd)

Brake pedal (w/o Brake booster)		
Height (From toe-board)	185 mm	7.28 in.
Play	0.5 – 5.0 mm	0.02 – 0.20 in.
Reserve distance STD	95 mm	3.74 in.
While run the engine and pedal pressure at 50 kg (110 lb) Limit	65 mm	2.56 in.
Brake booster push rod to piston clearance	0.1 – 0.5 mm	0.004 – 0.020 in.
Brake drum inside diameter limit	256.0 mm	10.08 in.
Brake lining thickness limit	1.0 mm	0.04 in.
Parking brake control handle travel	8 – 12 notches	

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MEMO

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RY & JY CHASSIS

INCLUDES

RY10	Pickup
RY10J	Pickup Flatbed
RY12	Pickup
RY12J	Pickup Flatbed
RY16	Pickup Long
RY16J	Pickup Flatbed Long
JY16J	Pickup Long
JY16J	Pickup Flatbed Long
JY16J	Pickup Long

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts		kg-m	ft-lb
Clutch cover x Flywheel	RY	1.0 – 1.6	7.2 – 11.6
	JY	1.5 – 2.2	10.8 – 15.9
Clutch housing x Engine	RY	3.0 – 4.5	21.7 – 32.5
	JY	5.0 – 7.0	36.2 – 50.6
Release fork support x Transmission case		1.9 – 3.1	13.7 – 22.4
Clutch pedal and brake pedal mounting bolt		3.0 – 4.5	21.7 – 32.5

Transmission (R40)

Tightening Parts	kg-m	ft-lb
Front bearing retainer x Transmission case	1.0 – 1.6	7.2 – 11.6
Extension housing x Transmission case	2.0 – 3.0	14.5 – 21.7
Transmission case cover x Transmission case	2.5 – 3.0	18.1 – 21.7

Transmission (M40)

Tightening Parts	kg-m	ft-lb
Front bearing cover x Transmission case	1.5 – 2.5	10.8 – 18.1
Clutch housing x Transmission case	5.0 – 7.0	36.2 – 50.6
Gearshift arm pivot x Transmission case	1.7 – 3.1	12.3 – 22.4
Countershaft lock plate x Countershaft	1.5 – 2.2	10.8 – 15.9
Countershaft bolt	5.0 – 7.0	36.2 – 50.6
Rear bearing retainer x Transmission case	1.5 – 2.2	10.8 – 15.9
Extension housing x Transmission case	5.0 – 7.0	36.2 – 50.6
Parking brake plate x Rear bearing retainer	1.5 – 2.2	10.8 – 15.9
Output shaft x Parking brake drum	10.0 – 14.0	72.3 – 101.3
Gearshift lever shaft housing x Transmission case cover	1.5 – 2.2	10.8 – 15.9
Transmission case cover x Transmission case	3.0 – 4.5	21.7 – 32.5
Power take-off cover x Transmission case	2.2 – 2.8	15.9 – 20.3

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Propeller Shaft

Tightening Parts		kg-m	ft-lb
Universal joint flange yoke x Universal joint flange		1.5 – 2.2	10.8 – 15.9
Joint flange	2 Joint	4.0 – 5.5	28.9 – 39.8

Rear Axle and Suspension

Tightening Parts		kg-m	ft-lb
Rear axle shaft x Rear axle hub		4.0 – 5.5	28.9 – 39.8
Steering knuckle arm x Steering knuckle		30.0 – 50.0	217.0 – 362.0
Spring U bolt x Axle housing	RY16, JY16	13.8 – 16.6	99.8 – 120.1
	RY10, 12	6.9 – 9.7	49.9 – 70.2
Dise wheel x Axle hub (hub nut)		20.0 – 25.0	144.7 – 180.8

Differential (8.0 in., 9.5 in.)

Tightening Parts		kg-m	ft-lb
Side bearing cap	9.5 in.	9.0 – 11.0	65.1 – 79.6
	8.0 in.	7.0 – 9.0	50.6 – 65.1
Ring gear x Case		13.0 – 14.5	94.0 – 104.9
Drive pinion x Companing flange		20.0 – 24.0	144.7 – 173.6
Differential assemble x Axle housing		3.0 – 4.5	21.7 – 32.5

Differential (10.5 in.)

Tightening Parts	kg-m	ft-lb
Side bearing cap	11.0 – 15.0	79.6 – 108.5
Differential case RH x LH	4.4 – 5.5	31.8 – 39.8
Ring gear x Case	15.0 – 18.0	108.5 – 130.2
Drive pinion x Companion flange	20.0 – 24.0	144.7 – 173.6
Differential assembly x Axle housing	3.0 – 4.5	21.7 – 32.5

Front Suspension (RY12)

Tightening Parts	kg-m	ft-lb
Steering knuckle arm x Steering knuckle	10.0 – 15.0	72.3 – 108.5
Steering knuckle x Backing plate	10.0 – 15.0	72.3 – 108.5
Wheel nut x Wheel hub	10.0 – 15.0	72.3 – 108.5

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Front Suspension (RY16, JY16)

Tightening Parts	kg-m	ft-lb
Rear axle shaft x Rear axle hub	4.0 – 5.5	28.9 – 39.8
Steering knuckle arm x Steering knuckle	30.0 – 50.0	217 – 362
Spring U bolt x Axle housing	13.8 – 16.6	99.8 – 120.1
Disc wheel x Axle hub (hub nut)	20.0 – 25.0	144.7 – 180.8

Steering (RY10, 12)

Tightening Parts	kg-m	ft-lb
Steering main shaft x Steering wheel	2.0 – 3.0	14.5 – 21.7
Steering gear housing x Frame	5.0 – 7.0	36.2 – 50.6
Sector shaft end cover x Steering gear housing	1.5 – 2.2	10.8 – 15.9
Pitman arm x Steering sector shaft	16.5 – 19.5	119.3 – 141.0
Steering knuckle arm x Steering tie rod	7.5 – 11.0	54.2 – 79.6

Steering (RY16, JY16)

Tightening Parts	kg-m	ft-lb
Intermediate shaft x Flexible coupling	2.0 – 3.0	14.5 – 21.7
Steering wheel x Steering main shaft	2.0 – 3.0	14.5 – 21.7
Gear housing end cover x Gear housing	3.0 – 4.5	21.7 – 32.5
Gear housing x Frame	4.0 – 5.5	28.9 – 39.8
Sector shaft x Pitman arm	16.5 – 19.5	119.3 – 141.0
Sector shaft end cover x Gear housing	3.0 – 4.5	21.7 – 32.5
Tie rod end x Steering knuckle	7.5 – 11.0	54.2 – 79.6

Brake (RY10, 12)

Tightening Parts	kg-m	ft-lb
Cowl panel x Pedal bracket	3.5 – 8.5	25.3 – 61.5
Brake backing plate x Wheel brake cylinder	1.5 – 2.2	10.8 – 15.9
Bleeder plug x Wheel brake cylinder	1.3 – 1.8	9.4 – 13.0
Flexible hose x Brake tube	1.3 – 1.8	9.4 – 13.0
Brake pedal and clutch pedal mounting bolt	3.0 – 4.5	21.7 – 32.5

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Brake (RY16, JY16)

Tightening Parts		kg-m	ft-lb)
Brake booster x Pedal bracket		1.0 – 1.6	7.2 – 11.6
Stop bolt x Master cylinder		0.8 – 1.2	5.8 – 8.7
Outlet plug x Master cylinder		11.0 – 18.0	79.6 – 130.2
Union x Master cylinder		4.0 – 7.0	28.9 – 50.6
Tube connection	tube of 6.35 mm O.D	2.0 – 2.9	14.5 – 21.0
	tube of 4.76 mm O.D	1.3 – 1.8	9.4 – 13.0
Flexible hose x Union (flare type)		2.0 – 2.7	14.5 – 19.5
Front backing plate x Steering knuckle		7.0 – 9.0	50.6 – 65.1
Rear backing plate x Rear axle housing		4.0 – 5.5	28.9 – 39.8

CLUTCH

Pedal height (from floor panel)		198 mm	7.80 in.
Pedal play	RY12	30 – 55 mm	1.18 – 2.17 in.
	RY16, JY16	35 – 65 mm	1.38 – 2.56 in.
Release fork tip play	RY12	3.5 – 5.0 mm	0.14 – 0.20 in.
(On pedal)	RY16, JY16	1.0 – 5.0 mm	0.04 – 0.20 in.
Clutch disc facing thickness limit (rivet depth)		0.3 mm	0.012 in.
Clutch disc runout limit		0.5 mm	0.020 in.
Clutch lever height	RY12, 16	5.0 mm	0.20 in.
	JY16	12.0 mm	0.47 in.
Clutch pressure spring	RY10, 12		
	Free length	48.8 mm	1.921 in.
	Installed length	32.6 mm	1.283 in.
	Installed load	50.4 kg	111.2 lb
	Installed load limit	43 kg	94.8 lb
	JY16, RY16		
	Free length	46.6 mm	1.835 in.
	Installed length	35.1 mm	1.382 in.
	Installed load	49 kg	108.0 lb
	Installed load limit	48.5 kg	106.9 lb

TRANSMISSION (M40)

Gear thrust clearance	1st gear	Limit	0.30 mm	0.0118 in.
		STD	0.15 – 0.25 mm	0.0059 – 0.0098 in.

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TRANSMISSION (M40) (Cont'd)

Gear oil clearance	2nd gear	Limit	0.30 mm	0.0118 in.
		STD	0.15 – 0.30 mm	0.0059 – 0.0118 in.
	3rd gear	Limit	0.30 mm	0.0118 in.
		STD	0.15 – 0.30 mm	0.0059 – 0.0118 in.
	1st gear	Limit	0.062 mm	0.0024 in.
		STD	0.009 – 0.062 mm	0.0004 – 0.0024 in.
	2nd gear	Limit	0.062 mm	0.0024 in.
		STD	0.009 – 0.062 mm	0.0004 – 0.0024 in.
	3rd gear	Limit	0.115 mm	0.0045 in.
		STD	0.065 – 0.115 mm	0.0026 – 0.0045 in.
	Idle gear	Limit	0.15 mm	0.0059 in.
		STD	0.064 – 0.103 mm	0.0025 – 0.0041 in.
Shift fork to hub clearance limit			1.0 mm	0.039 in.
Synchronizer ring to gear clearance limit			0.8 mm	0.031 in.
Gear shift arm shoe to groove clearance limit			0.6 mm	0.024 in.
Input shaft bearing snap ring thickness			2.30 – 2.35 mm	0.0906 – 0.0925 in.
			2.35 – 2.40 mm	0.0925 – 0.0945 in.
			2.40 – 2.45 mm	0.0945 – 0.0965 in.
			2.45 – 2.50 mm	0.0965 – 0.0984 in.
			2.50 – 2.55 mm	0.0984 – 0.1004 in.
			2.55 – 2.60 mm	0.1004 – 0.1024 in.
Output shaft front snap ring thickness			2.40 – 2.45 mm	0.0945 – 0.0965 in.
			2.45 – 2.50 mm	0.0965 – 0.0984 in.
			2.50 – 2.55 mm	0.0984 – 0.1004 in.
			2.55 – 2.60 mm	0.1004 – 0.1024 in.
			2.60 – 2.65 mm	0.1025 – 0.1043 in.
			2.65 – 2.70 mm	0.1043 – 0.1063 in.

TRANSMISSION (R40)

Gear thrust clearance	2nd gear	Limit	0.50 mm	0.020 in.
		STD	0.15 – 0.45 mm	0.0059 – 0.0177 in.
	3rd gear	Limit	0.50 mm	0.020 in.
		STD	0.15 – 0.45 mm	0.0059 – 0.0177 in.
Gear oil clearance	2nd gear	Limit	0.2 mm	0.008 in.
		STD	0.035 – 0.080 mm	0.0014 – 0.0031 in.

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TRANSMISSION (R40) (Cont'd)

3rd gear	Limit	0.2 mm	0.08 in.
	STD	0.035 – 0.080 mm	0.0014 – 0.0031 in.
Idle gear	Limit	0.3 mm	0.012 in.
	STD	0.13 – 0.23 mm	0.0052 – 0.0091 in.
Shift fork to hub clearance limit		0.5 mm	0.020 in.
Synchronizer ring to gear clearance limit		0.5 mm	0.020 in.
Gear shift arm shoe to groove clearance limit		0.5 mm	0.020 in.
Input shaft bearing snap ring thickness		2.30 – 2.35 mm	0.0906 – 0.0925 in.
		2.35 – 2.40 mm	0.0925 – 0.0945 in.
Output shaft front snap ring thickness		2.40 – 2.45 mm	0.0945 – 0.0965 in.
		2.45 – 2.50 mm	0.0965 – 0.0984 in.

PROPELLER SHAFT AND UNIVERSAL JOINT (RY16, JY16)

Bend limit		0.25 mm	0.0098 in.
Spider axial play		Less than 0.05 mm	0.0020 in.
Snap ring thickness		1.40 mm	0.0551 in.
		1.45 mm	0.0571 in.
		1.50 mm	0.0591 in.
		1.55 mm	0.0610 in.
Needle roller cup outer diameter			
	Without identification	28.515 – 28.528 mm	1.1226 – 1.1231 in.
	With identification	28.536 – 28.549 mm	1.1235 – 1.1240 in.
Yoke hole inner diameter	Without identification	28.500 – 28.521 mm	1.1220 – 1.1229 in.
	With identification	28.521 – 28.542 mm	1.1229 – 1.1237 in.

PROPELLER SHAFT AND UNIVERSAL JOINT (RY10, 12)

Spider bearing insertion hole diameter			
	No. 1	26.000 – 26.021 mm	1.0236 – 1.0244 in.
	No. 2	26.036 – 26.049 mm	1.0250 – 1.0256 in.
Spider bearing outside diameter	No. 1	26.015 – 26.028 mm	1.0242 – 1.0247 in.
	No. 2	26.036 – 26.049 mm	1.0250 – 1.0256 in.
Hole snap ring thickness	No. 1	1.175 – 1.225 mm	0.0463 – 0.0482 in.
	No. 2	1.225 – 1.275 mm	0.0482 – 0.0502 in.
	No. 3	1.275 – 1.325 mm	0.0502 – 0.0522 in.
	No. 4	1.325 – 1.375 mm	0.0522 – 0.0541 in.

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PROPELLER SHAFT AND UNIVERSAL JOINT (RY10, 12) (Cont'd)

Side shaft axial play	0.05 mm	0.0020 in.
Spider outside diameter	13.5 mm	0.531 in.

DIFFERENTIAL (8 in.)

Drive pinion bearing preload (rotating)		
New bearing	19 – 26 kg-cm	16.8 – 22.8 in.-lb
w/SST	3.8 – 5.2 kg	8.4 – 11.4 lb
Reused bearing	10 – 15 kg-cm	8.4 – 13.2 in.-lb
w/SST	2.0 – 3.0 kg	4.4 – 6.6 lb
Total preload (rotating)		
New bearing	22 – 30.7 kg-cm	19.2 – 28.8 in.-lb
w/SST	4.2 – 6.0 kg	9.2 – 13.2 lb
Reused bearing	11 – 17 kg-cm	9.6 – 14.4 in.-lb
w/SST	2.2 – 3.4 kg	4.9 – 7.5 lb
Ring gear backlash	0.13 – 0.18 mm	0.005 – 0.007 in.
Ring gear runout limit	0.1 mm	0.004 in.
Differential case runout limit	0.05 mm	0.002 in.
Side gear backlash	0.13 – 0.18 mm	0.005 – 0.007 in.
Side gear thrust clearance	0.15 – 0.35 mm	0.006 – 0.014 in.
Drive pinion projection adjusting shim thickness	1.70 mm	0.0669 in.
	1.73 mm	0.0681 in.
	1.76 mm	0.0693 in.
	1.79 mm	0.0705 in.
	1.82 mm	0.0717 in.
	1.85 mm	0.0728 in.
	1.88 mm	0.0740 in.
	1.91 mm	0.0752 in.
	1.94 mm	0.0764 in.
	1.97 mm	0.0776 in.
	2.00 mm	0.0787 in.
	2.03 mm	0.0799 in.
	2.06 mm	0.0811 in.
	2.09 mm	0.0823 in.
	2.12 mm	0.0835 in.
	2.15 mm	0.0846 in.

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DIFFERENTIAL (8 in.) (Cont'd)

	2.18 mm	0.0858 in.
	2.21 mm	0.0870 in.
	2.24 mm	0.0882 in.
	2.27 mm	0.0894 in.
	2.30 mm	0.0906 in.
	2.33 mm	0.0917 in.
Drive pinion preload adjusting shim thickness	0.28 – 0.32 mm	0.0110 – 0.0126 in.
	0.33 – 0.37 mm	0.0130 – 0.0146 in.
	0.38 – 0.42 mm	0.0150 – 0.0165 in.
	0.43 – 0.47 mm	0.0169 – 0.0185 in.
Side gear thrust washer thickness	1.6 mm	0.0630 in.
	1.7 mm	0.0670 in.
	1.8 mm	0.0709 in.

DIFFERENTIAL (9.5 in.)

Drive pinion preload (Rotating)		
New bearing	19 – 26 kg-cm	16.8 – 22.8 in.-lb
w/SST	3.8 – 5.2 kg	8.4 – 11.4 lb
Reused bearing	10 – 15 kg-cm	8.4 – 13.2 in.-lb
w/SST	2.0 – 3.0 kg	4.4 – 6.6 lb
Total preload (Rotating)		
New bearing	21 – 30 kg-cm	18.0 – 26.4 in.-lb
w/SST	4.2 – 6.0 kg	9.2 – 13.2 lb
Reused bearing	11.5 – 16.5 kg-cm	9.6 – 14.4 in.-lb
w/SST	2.3 – 3.3 kg	5.1 – 7.3 lb
Ring gear backlash	0.15 – 0.20 mm	0.006 – 0.008 in.
Ring gear runout limit	0.1 mm	0.004 in.
Differential case runout limit	0.05 mm	0.002 in.
Side gear backlash	0.15 – 0.20 mm	0.006 – 0.008 in.
Side gear thrust clearance	0.15 – 0.35 mm	0.006 – 0.014 in.
Rear axle end to pinion shaft spacer clearance		
STD	0.06 – 0.47 mm	0.002 – 0.018 in.
Limit	0.5 mm	0.020 in.
Drive pinion thrust spacer thickness	2.74 – 2.76 mm	0.1079 – 0.1087 in.
	2.77 – 2.79 mm	0.1091 – 0.1098 in.
	2.80 – 2.82 mm	0.1102 – 0.1110 in.

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DIFFERENTIAL (9.5 in.) (Cont'd)

	2.83 – 2.85 mm	0.1114 – 0.1122 in.
	2.86 – 2.88 mm	0.1126 – 0.1134 in.
	2.89 – 2.91 mm	0.1138 – 0.1146 in.
	2.92 – 2.94 mm	0.1150 – 0.1157 in.
	2.95 – 2.97 mm	0.1161 – 0.1169 in.
	2.98 – 3.00 mm	0.1173 – 0.1181 in.
Drive pinion spacer rear adjusting shim thickness	0.25 mm	0.0098 in.
	0.30 mm	0.0118 in.
	0.35 mm	0.0138 in.
	0.40 mm	0.0157 in.
	0.45 mm	0.0177 in.
Side gear thrust washer thickness	1.60 mm	0.0630 in.
	1.75 mm	0.0689 in.
	1.90 mm	0.0748 in.
	2.05 mm	
Pinion shaft spacer thickness	29.8 mm	1.1732 in.
	30.2 mm	1.1890 in.
	36.6 mm	1.2047 in.

DIFFERENTIAL (10.5 in.)

Drive pinion preload (Rotating)			
	New bearing	19 – 26 kg-cm	16.5 – 22.6 in.-lb
	w/SST	3.8 – 5.2 kg	8.4 – 11.4 lb
	Reused bearing	3 – 10 kg-cm	2.6 – 8.4 in.-lb.
	w/SST	0.6 – 2.0 kg	1.3 – 4.4 lb
Total preload	New bearing	21 – 30 kg-cm	18.2 – 26.0 in.-lb
	w/SST	4.2 – 6.0 kg	9.3 – 13.2 lb
	Reused bearing	4 – 12 kg-cm	3.5 – 10.4 in.-lb
	w/SST	0.8 – 2.4 kg	1.8 – 5.3 lb
Ring gear backlash		0.18 – 0.23 mm	0.0071 – 0.0091 in.
Ring gear runout limit		0.1 mm	0.004 in.
Differential case runout limit		0.06 mm	0.0024 in.
Side gear thrust clearance		0.05 – 0.35 mm	0.0020 – 0.0138 in.
Drive pinion projection adjusting shim thickness		1.05 mm	0.0413 in.
		1.10 mm	0.0433 in.
		1.15 mm	0.0453 in.

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DIFFERENTIAL (10.5 in.) (Cont'd)

	1.20 mm	0.0472 in.
	1.25 mm	0.0492 in.
	1.35 mm	0.0531 in.
	1.40 mm	0.0551 in.
	1.45 mm	0.0571 in.
	1.50 mm	0.0591 in.
	1.55 mm	0.0610 in.
Drive pinion spacer front adjusting shim thickness	0.25 mm	0.0098 in.
	0.30 mm	0.0118 in.
	0.35 mm	0.0138 in.
	0.40 mm	0.0157 in.
	0.45 mm	0.0177 in.

REAR AXLE (RY16, JY16)

Wheel bearing preload	Back off nut by 1/6 turn after tightening bearing lock nut to 550 – 600 kg-cm (39.8 – 43.4 ft-lb) while slowly turning brake drum.

FRONT AXLE (RJ10, 12)

King pin to bushing clearance	Limit	0.2 mm	0.008 in.
	STD	0.01 – 0.04 mm	0.0004 – 0.0016 in.
Knuckle to I beam axial clearance		0.02 – 0.12 mm	0.0008 – 0.0047 in.
Adjusting shim thickness		0.05 mm	0.002 in.
		0.10 mm	0.004 in.
		0.15 mm	0.006 in.
		0.20 mm	0.008 in.
		0.25 mm	0.010 in.
Knuckle rotating resistance		Less than 4 kg	8.8 lb
Wheel bearing adjustment		(1) Tighten the castel nut to about 5 m-kg (36 ft-lb), and turn the drum back and forth a few times to allow the bearings to settle down.	
		(2) Unscrew the nut to finger-tightness and retighten again to about 5 m-kg. Then unscrew the nut 1/6 – 1/3 turn and lock it.	

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FRONT AXLE (RJ16, JY16)

King pin to bushing clearance	Limit	0.1 mm	0.004 in.
	STD	0.007 – 0.041 mm	0.0003 – 0.0016 in.
Knuckle to I beam axial clearance		0.02 – 0.12 mm	0.0008 – 0.0047 in.
Adjusting shim thickness		0.05 mm	0.002 in.
		0.10 mm	0.004 in.
		0.25 mm	0.010 in.
Wheel bearing adjustment		(1) Torque the wheel bearing lock nut to 200 – 300 kg-cm (18.1 – 21.7 ft-lb), and turn the drum back and forth a few times to allow the bearings to settle down.	
		(2) Unscrew the nut to finger-tightness and retighten again to 200 – 300 kg-cm (18.1 – 21.7 ft-lb). Then unscrew the nut 1/6 turn and lock it.	

FRONT WHEEL ALIGNMENT (RY10, 12)

Toe-in			3 – 4 mm	0.12 – 0.16 in.
Camber			2°	
Caster			2°	
King pin angle			7°	
Steering angle	RY10	Inside	41°	
		Outside	31°	
	RY12	Inside	38°	
		Outside	29°	
Side slip			Less than 3 mm per 1 m	0.12 in. per 3 ft

FRONT WHEEL ALIGNMENT (RY16, JY16)

Toe-in		3 ± 3 mm	0.12 ± 0.12 in.
Camber		2° ± 45′	
Caster (without load)		45′ ± 45′	
King pin inclination		7°	
Steering angle	Inner	35°30′	
	Outer	26°30′	
Side slip		Less than 3 mm per 1 m (0.12 in. per 3 ft)	

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STEERING (JY10, 12)

Play at steering wheel rim		5 – 25 mm	0.20 – 0.98 in.
Sector shaft to bushing clearance		0.009 – 0.060 mm	0.0004 – 0.0024 in.
Bushing finished bore		31.985 – 32.055 mm	1.2593 – 1.2620 in.
Sector shaft outside diameter		31.970 – 31.991 mm	1.2587 – 1.2595 in.
Sector shaft thrust clearance		0.2 mm	0.008 in.
Sector shaft adjust shims		0.31, 0.5, 1.0 mm	
		0.012, 0.020, 0.039 in.	
Worm bearing			
Preload	(Rotating)	0.15 – 0.25 kg	(5 – 8 oz)
(w/o sector shaft, at wheel rim)	(Starting)	2.0 – 4.0 kg	(4.4 – 8.8 lb)
Adjust shim thickness		0.1, 0.2, 0.5 mm	
		0.004, 0.008, 0.020 in.	
Housing end cover gasket		0.1, 0.2, 0.3, 0.5 mm	
		0.004, 0.008, 0.012, 0.020 in.	

STEERING (RY16, JY16)

Wheel play at outer circumference		40 mm	1.57 in.
Sector shaft outer diameter			
(housing side and end cover side)	Limit	31.95 mm	1.2579 in.
	STD	31.970 – 31.991 mm	1.2586 – 1.2596 in.
Bushing inner diameter			
(housing side and end cover side)	Limit	32.070 mm	1.2626 in.
	STD	32.000 – 32.030 mm	1.2598 – 1.2610 in.
Oil clearance			
(housing side and end cover side)	Limit	0.1 mm	0.004 in.
	STD	0.009 – 0.060 mm	0.0004 – 0.0024 in.
Worm bearing preload (when starting)		4 – 6 kg-cm	3.5 – 5.2 in.-lb
Total preload (when starting)		8 – 11 kg-cm	6.9 – 9.5 in.-lb
Thickness of shim		0.05, 0.06, 0.07, 0.08, 0.09, 0.10, 0.20, 0.50 mm	
(for adjusting bearing preload)		(0.0020, 0.0024, 0.0028, 0.0031, 0.0035, 0.0039,	
		0.0079, 0.020 in.)	
Thickness of thrust washer		2.00, 2.05, 2.10, 2.15, 2.20 mm	
(for adjusting sector shaft)		(0.0787, 0.0807, 0.0827, 0.0846, 0.0866 in.)	

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BRAKE

Brake Pedal (RY10, 12)

Pedal height	w/ booster	204 – 224 mm	8.0 – 8.8 in.
	w/o booster	188 – 208 mm	7.4 – 8.2 in.
Pedal play		0.5 – 5.0 mm	0.02 – 0.20 in.
Pedal reserve travel at 50 kg 110 lb		More than 55 mm	2.2 in.

Brake Pedal (RY16, JY16)

Pedal height		223 mm	8.78 in.
Pedal play		0 mm	0 in.
Pedal reserve travel at 50 kg 110 lb		More than 127 mm	5.0 in.

Wheel Brake (RY10, 12)

Drum inner diameter	Limit	292 mm	11.496 in.
	STD	290.0 – 290.3 mm	10.236 – 11.429 in.
Lining thickness	Limit	3.0 mm	0.12 in.
	STD	6.5 mm	0.26 in.

Wheel Brake (RY16, JY16)

Drum inner diameter	Limit	323 mm	12.72 in.
	STD	320 mm	12.60 in.
Lining thickness	Limit	4.2 mm	0.165 in.
	STD	8.0 mm	0.315 in.

Parking Brake (RY10, 12)

Parking brake reserve pull		7 – 15 notches	
Drum inside diameter	Limit	163 mm	6.741 in.
	STD	160 mm	6.299 in.
Lining thickness	Limit	1.5 mm	0.06 in.
	STD	4 mm	0.16 in.

Parking Brake (RY16, JY16)

Parking brake reserve pull (notches)		9 – 14 notches	
Drum inside diameter	Limit	161 mm	6.34 in.
	STD	160 mm	6.30 in.
Lining thickness	Limit	1.5 mm	0.059 in.
	STD	3.5 mm	0.138 in.

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Brake Booster

Piston to push rod clearance	0.1 – 0.5 mm	0.004 – 0.020 in.

Vacuum Pump

Casing bore wear limit		58.19 mm	2.291 in.
Bushing bore wear limit		16.14 mm	0.6354 in.
Rotor to spline play limit		2.4 mm	0.095 in.
Blade	Height limit	12.0 mm	0.47 in.
	Width limit	0.92 mm	0.272 in.
	Length limit	34.98 mm	1.377 in.

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MEMO

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RU, JU & BU CHASSIS

INCLUDES

RU10	Pickup
RU12	Pickup Flatbed Double Tire
RU15	Pickup Flatbed Long Body
BU10	Pickup
BU12	Pickup Flatbed Double Tire
BU15	Pickup Flatbed Long Body
RU10P	Double Cab. Pickup
RU15P	Double Cab. Pickup Long Wheel Base
RU10V	Van 3-Seater
RU10VB	Van 6-Seater
RU19H	26-Seater
RU19HB	22-Seater
BU19H	26-Seater
BU19HB	22-Seater

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts	kg-m (ft-lb)			
Engine type	B	2J	H	R
Clutch strap x Pressure plate	1.5 – 2.8 (10.8 – 20.3)	–	–	–
Pressure lever pin x Clutch cover	–	–	4.0 – 5.5 (28.9 – 39.8)	–
Clutch cover x Flywheel	1.5 – 2.2 (10.8 – 15.9)	←	←	1.0 – 1.6 (7.2 – 11.6)
Clutch housing x Flywheel housing	3.0 – 4.5 (21.7 – 32.5)	←	←	←

Transmission

Tightening Parts	kg-m (ft-lb)	kg-m (ft-lb)
Transmission type	MD	HD
Front bearing cover x Transmission case	1.5 – 2.5 (10.8 – 18.1)	1.0 – 1.6 (7.2 – 11.6)
Clutch housing x Transmission case	5.0 – 7.0 (36.2 – 50.6)	←
Gearshift arm pivot x Transmission case	1.7 – 3.1 (12.3 – 22.4)	←
Countershaft lock plate x Countershaft	–	1.5 – 2.2 (10.8 – 15.9)
Countershaft bolt	5.0 – 7.0 (36.2 – 50.6)	–
Rear bearing retainer x Transmission case	1.5 – 2.2 (10.8 – 15.9)	4.8 – 6.8 (34.7 – 49.2)
Entension housing x Transmission case	5.0 – 7.0 (36.2 – 50.6)	–
Parking brake plate x Rear bearing retainer	1.5 – 2.2 (10.8 – 15.9)	←
Output shaft x Parking brake drum	10.0 – 14.0 (72.3 – 101.3)	14.0 – 17.0 (101.3 – 123.0)
Gearshift lever shaft housing x Transmission case cover	1.5 – 2.2 (10.8 – 15.9)	1.0 – 1.6 (7.2 – 11.6)
Transmission case cover x Transmission case	3.0 – 4.5 (21.7 – 32.5)	←
Power take-off cover x Transmission case	2.2 – 2.8 (15.9 – 20.3)	←

Propeller Shaft

Tightening Parts	kg-m (ft-lb)	kg-m (ft-lb)
Propeller shaft type	2 Joint type	3 Joint type
Joint flange	4.0 – 5.5 (28.9 – 39.8)	←
Joint shaft x Intermediate shaft	–	16.6 – 21.0 (120.1 – 151.9)

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Differential

Tightening Parts \ Differential type	2 Pinion (9.5 in.)	4 Pinion (10.5 in.)
Bearing x Carrier	9.0 – 11.0 (65.1 – 79.6)	11.0 – 15.0 (79.6 – 108.5)
Right case x Left case	–	4.4 – 5.5 (31.8 – 39.8)
Ring gear x Case	13.0 – 14.5 (94.0 – 104.9)	15.0 – 18.0 (108.5 – 130.2)
Drive pinion x Companion flange	20.0 – 24.0 (144.7 – 173.6)	←
Rear axle housing x Carrier	3.0 – 4.5 (21.7 – 32.5)	←

Axle and Suspension

Tightening Parts	kg-m (ft-lb)
Rear axle shaft x Rear axle hub	4.0 – 5.5 (28.9 – 39.8)
Steering knuckle arm x Steering knuckle	30.0 – 50.0 (217 – 362)
Spring U bolt x Axle housing	13.8 – 16.6 (99.8 – 120.1)
Disc wheel x Axle hub (hub nut)	20.0 – 25.0 (144.7 – 180.8)

Steering

Tightening Parts \ Vehicle type	kg-m (ft-lb)	
	DYNA (Except HU15)	COASTER & HU15
Intermediate shaft x Flexible coupling	2.0 – 3.0 (14.5 – 21.7)	←
Steering wheel x Steering main shaft	2.0 – 3.0 (14.5 – 21.7)	←
Gear housing end cover x Gear housing	3.0 – 4.5 (21.7 – 32.5)	4.5 – 5.5 (32.5 – 39.8)
Gear housing x Frame	4.0 – 5.5 (28.9 – 39.8)	7.0 – 9.0 (50.6 – 65.1)
Sector shaft x Pitman arm	16.5 – 19.5 (119.3 – 141.0)	22.0 – 28.0 (159.1 – 202.5)
Sector shaft end cover x Gear housing	3.0 – 4.5 (21.7 – 32.5)	4.5 – 5.5 (32.5 – 39.8)
Tie rod end x Steering knuckle	7.5 – 11.0 (54.2 – 79.6)	←

Brake

Tightening Parts	kg-m (ft-lb)
Brake booster x Pedal bracket	1.0 – 1.6 (7.2 – 11.6)
Stop bolt x Master cylinder	0.8 – 1.2 (5.8 – 8.7)
Plug x Master cylinder	20.0 – 18.0 (144.7 – 202.5)

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Brake (Cont'd)

Outlet plug x Master cylinder		11.0 – 18.0 (79.6 – 130.2)
Union x Master cylinder		4.0 – 7.0 (28.9 – 50.6)
Warning light switch x Master cylinder		3.0 – 4.5 (21.7 – 32.5)
Bleeder plug x Master cylinder		0.9 – 1.3 (6.5 – 9.4)
Tube connection	tube of 6.35 mm O.D.	2.0 – 2.9 (14.5 – 21.0)
	tube of 4.76 mm O.D.	1.3 – 1.8 (9.4 – 13.0)
Flexible hose x Union (flare type)		2.0 – 2.7 (14.5 – 19.5)
Front backing plate x Steering knuckle		7.0 – 9.0 (50.6 – 65.1)
Rear backing plate x Rear axle housing		4.0 – 5.5 (28.9 – 39.8)
Front wheel cylinder x Backing plate		3.0 – 4.5 (21.7 – 32.5)
Rear wheel cylinder x Backing plate		3.0 – 4.5 (21.7 – 32.5)

CLUTCH

Item \ Vehicle type			RU Series	JU Series	BU Series	HU Series
Clutch pedal height	DYNA	mm (in.)	221 (8.70)	←	←	←
	COASTER	mm (in.)	200 (7.87)	–	←	←
Pedal play		mm (in.)	40–70 (1.57–2.76)	←	←	←
Push rod play (on pedal)		mm (in.)	0.8–3.1 (0.031–0.122)	←	←	←
Release cylinder push rod play		mm (in.)	2.0–3.0 (0.079–0.118)	←	←	3.5–4.5 (0.138–0.177)
Clutch disc thickness limit (Rivet head depth)		mm (in.)	0.3 (0.012) (rivet head depth)	←	←	←
Clutch disc runout limit		mm (in.)	0.5 (0.020)	←	←	0.7 (0.028)
Release lever height (from cover top surface)		mm (in.)	5 (0.20)	12.0 (0.47)	12.0 (0.47)	16.2 (0.638)
Release bearing plate inclination		mm (in.)	Less than 0.2 (0.008)	←	Less than 0.4 (0.016)	Less than 0.5 (0.020)
Clutch pressure spring						
Q'ty			6 + 3	9	12	9
Free length		mm (in.)	46.6, 48.8 (1.835, 1.921)	46.6 (1.835)	58.4 (2.299)	60 (2.36)
Installed length		mm (in.)	32.6 (1.283)	33.1 (1.303)	37.1 (1.461)	43.5 (1.713)
Installed load	Limit	kg (lb)	49, 43 (108.0, 94.8)	49 (108.0)	39 (86.0)	53 (46.9)
	STD	kg (lb)	57.1, 50.4 (125.9, 111.17)	57.1 (125.9)	44.6 (98.3)	62.2 (137.2)
Squareness		mm (in.)	Less than 2.5 (0.098)	←	Less than 3 (0.12)	←

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TRANSMISSION

Item \ Transmission type			MD 4-speed	MD 5-speed	HD 4-speed	HD 5-speed
Gear backlash						
Input shaft gear		mm (in.)	0.06–0.18 (0.0024–0.0071)	←	0.090 (0.0035)	←
1st gear		mm (in.)	0.06–0.18 (0.0024–0.0071)	←	0.109 (0.0043)	←
2nd gear		mm (in.)	0.06–0.18 (0.0024–0.0071)	←	0.108 (0.0043)	←
3rd gear		mm (in.)	0.06–0.18 (0.0024–0.0071)	←	0.090 (0.0035)	←
4th gear		mm (in.)	–	0.06–0.18 (0.0024–0.0071)	–	0.05 (0.0020)
Reverse idler gear		mm (in.)	0.06–0.18 (0.0024–0.0071)	←	0.120 (0.0047)	←
Thrust clearance						
1st gear	Limit	mm (in.)	0.30 (0.0118)	←	←	0.35 (0.0138)
	STD	mm (in.)	0.15–0.25 (0.0059–0.0098)	←	0.10–0.25 (0.0039–0.0098)	0.175–0.325 (0.0069 – 0.0128)
2nd gear	Limit	mm (in.)	0.30 (0.0118)	←	0.30 (0.0118)	0.35 (0.0138)
	STD	mm (in.)	0.15–0.30 (0.0059–0.0098)	←	0.10–0.25 (0.0039–0.0098)	0.175–0.325 (0.0069 – 0.0128)
3rd gear	Limit	mm (in.)	0.30 (0.0118)	←	0.45 (0.0177)	0.30 (0.0118)
	STD	mm (in.)	0.15–0.30 (0.0059–0.0118)	←	0.10–0.40 (0.0039–0.0157)	0.125–0.275 (0.0049 – 0.0108)
5th gear	Limit	mm (in.)	–	0.30 (0.0118)	–	0.30 (0.0118)
	STD	mm (in.)	–	0.15–0.25 (0.0059–0.0098)	–	0.15–0.25 (0.0059–0.0098)
Clutch hub No.2 snap ring thickness			2.40–2.45 (0.0945–0.0965)	←	2.40–2.50 (0.0945–0.0984)	2.40–2.45 (0.0945–0.0965)
			2.45–2.50 (0.0965–0.0984)	←	2.50–2.60 (0.0984–0.1024)	2.45–2.50 (0.0965–0.0984)
			2.50–2.55 (0.0984–0.1004)	←	2.60–2.70 (0.1024–0.1063)	2.50–2.55 (0.0984–0.1004)
			2.55–2.60 (0.1004–0.1024)	←		2.55–2.60 (0.1004–0.1024)
			2.60–2.65 (0.1024–0.1043)	←		2.60–2.65 (0.1024–0.1043)
		mm (in.)	2.65–2.70 (0.1043–0.1063)	←		2.65–2.70 (0.1043–0.1063)
2nd gear snap ring thickness					2.45–2.55 (0.0965–0.1004)	–
			–	–	2.55–2.65 (0.1004–0.1043)	–
		mm (in.)			2.65–2.75 (0.1043–0.1083)	–
Input shaft snap ring thickness			2.30–2.35 (0.0906–0.0925)	←	3.20–3.31 (0.1260–0.1303)	←
			2.35–2.40 (0.0925–0.0945)	←	3.31–3.42 (0.1303–0.1346)	←
			2.40–2.45 (0.0945–0.0965)	←		

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TRANSMISSION (Cont'd)

Item \ Transmission type			MD 4-speed	MD 5-speed	HD 4-speed	HD 5-speed
		mm (in.)	2.45–2.50 (0.0965–0.0984)	←		
		mm (in.)	2.50–2.55 (0.0984–0.1004)	←		
		mm (in.)	2.55–2.60 (0.1004–0.1024)	←		
Oil clearance						
1st gear	Limit	mm (in.)	0.062 (0.0024)	←	←	←
	STD	mm (in.)	0.009–0.062 (0.0004–0.0024)	←	0.009–0.061 (0.0004–0.0024)	←
2nd gear	Limit	mm (in.)	0.062 (0.0024)	←	0.2 (0.008)	←
	STD	mm (in.)	0.009–0.062 (0.0004–0.0024)	←	0.080–0.121 (0.0031–0.0048)	←
3rd gear	Limit	mm (in.)	0.115 (0.0045)	←	0.2 (0.008)	←
	STD	mm (in.)	0.065–0.115 (0.0026–0.0045)	←	0.080–0.121 (0.0031–0.0048)	←
4th gear	Limit	mm (in.)	–	0.115 (0.0045)	–	0.115 (0.0045)
	STD	mm (in.)	–	0.065–0.115 (0.0026–0.0045)	–	0.065–0.115 (0.0026–0.0045)
Idle gear	Limit	mm (in.)	0.15 (0.0059)	←	0.3 (0.012)	←
	STD	mm (in.)	0.064–0.103 (0.0025–0.0041)	←	0.115–0.153 (0.0045–0.0060)	←
Third and fourth shift fork to groove clearance						
	Limit	mm (in.)	1.0 (0.039)	←	←	0.8 (0.031)
	STD	mm (in.)	0.2–0.4 (0.008–0.016)	←	←	←
First and second shift fork to groove clearance						
	Limit	mm (in.)	1.0 (0.039)	←	←	0.8 (0.031)
	STD	mm (in.)	0.2–0.4 (0.008–0.016)	←	←	←
Fifth shift fork to groove clearance						
	Limit	mm (in.)	–	1.0 (0.039)	–	0.8 (0.031)
	STD	mm (in.)	–	0.2–0.4 (0.008–0.016)	–	0.2–0.4 (0.008–0.016)
Gearshift arm shoe end thickness						
	Limit	mm (in.)	7.9 (0.311)	←	8.1 (0.319)	←
Gearshift arm shoe to groove clearance						
	Limit	mm (in.)	0.6 (0.024)	←	←	0.70 (0.028)
Synchronizer inner to outer protrusion						
	Limit	mm (in.)	–	–	0.7 (0.028)	←
	STD	mm (in.)	–	–	0.1–0.5 (0.004–0.020)	←
First gear to synchronizer ring clearance						
	Limit	mm (in.)	0.8 (0.031)	←	0.7 (0.028)	←
	STD	mm (in.)	1.10–1.90 (0.0433–0.0748)	←	0.1–0.5 (0.004–0.020)	←

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TRANSMISSION (Cont'd)

Item \ Transmission type	MD 4-speed	MD 5-speed	HD 4-speed	HD 5-speed
Second gear to synchronizer ring clearance				
Limit mm (in.)	0.8 (0.031)	←	0.7 (0.028)	←
STD mm (in.)	1.10–1.90 (0.0433–0.0748)	←	0.1–0.5 (0.004–0.020)	←
Third gear to synchronizer ring clearance				
Limit mm (in.)	0.8 (0.031)	←	←	←
STD mm (in.)	1.10–1.90 (0.0433–0.0748)	←	1.27–2.09 (0.0500–0.0823)	←
Fifth gear to synchronizer ring clearance				
Limit mm (in.)	–	0.8 (0.031)	–	0.8 (0.031)
STD mm (in.)	–	1.10–1.90 (0.0433–0.0748)	–	–
Input shaft to synchronizer ring ring clearance				
Limit mm (in.)	0.8 (0.031)	←	←	←
STD mm (in.)	1.10–1.90 (0.0433–0.0748)	←	1.37–1.99 (0.0539–0.0783)	←

PROPELLER SHAFT AND UNIVERSAL JOINT

Bend limit	0.25 mm	0.0098 in.
Spider axial play	Less than 0.05 mm	0.0020 in.
Snap ring thickness	1.40 mm	0.0551 in.
	1.45 mm	0.0571 in.
	1.50 mm	0.0591 in.
	1.55 mm	0.0610 in.
Needle roller cup outer diameter w/o identification	28.515 – 28.528 mm	1.1226 – 1.1231 in.
Needle roller cup outer diameter w/ identification	28.536 – 28.549 mm	1.1235 – 1.1240 in.
Yoke hole inner diameter w/o identification	28.500 – 28.521 mm	1.1220 – 1.1229 in.
Yoke hole inner diameter w/ identification	28.521 – 28.542 mm	1.1229 – 1.1237 in.

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REAR AXLE

Rear axle shaft		
Shaft type		Full floating
Runout limit of flange surface	mm (in.)	0.2 (0.008)
Runout limit of shaft	mm (in.)	2 (0.08)
Wheel bearing preload		Back off nut by 1/6 turn after tightening bearing lock nut to 550 – 600 kg-cm (39.8 – 43.4 ft-lb) while slowly turning brake drum.

DIFFERENTIAL

Item \ Vehicle type		RU10, RU10–B, RU15, RU12, All BU series JU10 series RU15–H	RU19 series RU10V RU10V–B RU10P	HU15–HQ
Ring gear size	in.	10.5	9.5	10.5
Ring gear runout limit	mm (in.)	0.1 (0.004)	←	←
Ring gear backlash	mm (in.)	0.18–0.23 (0.0071–0.0091)	0.15–0.2 (0.0059–0.0079)	←
Runout limit of flange of differential case	mm (in.)	0.06 (0.0024)	0.05 (0.0020)	0.06 (0.0024)
Differential pinion				
Q'ty		4	2	4
Limit of I.D.	mm (in.)	21 (0.83)	←	←
Limit of pinion shaft O.D.	mm (in.)	20 (0.79)	←	←
Side gear				
Limit of boss O.D.	mm (in.)	45 (1.77)	←	←
Thrust clearance	mm (in.)	0.05–0.35 (0.0020–0.0138)	←	←
Drive pinion preload (rotating)	kg-cm (in.-lb)			
New bearing		19–26 (16.5–22.6)	←	←
Reused bearing		3–10 (2.6–8.7)	←	←
Side bearing preload		Turn in by 1.0–2.0 notch from zero play	1–1.5 notch	1–2 notch
Total preload (rotating)	kg-cm (in.-lb)			
New bearing		21–30 (18.2–26.0)	←	←
Reused bearing		4–12 (3.5–10.4)	←	←

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DIFFERENTIAL (Cont'd)

Thickness of shim (for adjusting position of drive pinion) mm (in.)	0.30, 0.35, 0.40 0.45, 0.50, 0.55 (0.0118, 0.0138 0.0157, 0.0177, 0.0197, 0.0217)	0.25, 0.30, 0.35 0.40, 0.45 (0.0098, 0.0118, 0.0138, 0.0157, 0.0177)	0.30, 0.35, 0.40 0.45, 0.50, 0.55 (0.0118, 0.0138, 0.0157, 0.0177, 0.0197, 0.0217)
Thickness of spacer (for adjusting preload) mm (in.)	47.10 (1.8543)	2.75, 2.78, 2.80, 2.84, 2.87, 2.90, 2.93, 2.96, 2.99 (0.1083, 0.1094, 0.1102, 0.1118, 0.1130, 0.1142, 0.1154, 0.1165, 0.1177)	47.10 (1.8543)
Thickness of shim (for adjusting preload) mm (in.)	0.25, 0.30, 0.35 0.40, 0.45 (0.0098, 0.0118, 0.0138, 0.0157, 0.0177)	0.25 (0.0098)	0.25, 0.30, 0.35 0.40, 0.45 (0.0098, 0.0118, 0.0138, 0.0157, 0.0177)
Thickness of side gear thrust washer mm (in.)	1.5–1.7 (0.059–0.067)	←	←
Thickness of pinion thrust washer mm (in.)	1.5–1.7 (0.059–0.067)	←	←

FRONT AXLE

King pin outer diameter		24.987 – 25.000 mm	0.9837 – 0.9843 in.
Clearance to bushing	Limit	0.1 mm	0.004 in.
	STD	0.007 – 0.041 mm	0.0003 – 0.0016 in.
Axial clearance between knuckle to I beam		0.02 – 0.12 mm	0.0008 – 0.0047 in.
Thickness of shim for king pin		0.05 mm	0.0020 in.
(Note: 0 – 2 pieces shall be used on each side. However, it is not permitted to use one only of 0.05 mm (0.0020 in.)		0.10 mm	0.0039 in.
		0.25 mm	0.0098 in.
Wheel bearing preload		Back off nut by 1/6 turn after tightening the nut to 250 – 300 kg-cm (18.1 – 21.7 ft-lb)	

STEERING

Item \ Vehicle type	DYNA (except HU15)	COASTER & HU15
Outer diameter of wheel	430 mm (16.9 in.)	←
Wheel play at outer circumference	20–40 mm (0.79–1.57 in.)	←

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STEERING (Cont'd)

Sector shaft outer diameter (housing side and end cover side)				
	Limit	mm (in.)	31.95 (1.2579)	35.95 (1.4154)
	STD	mm (in.)	31.970–31.991 (1.2586–1.2596)	35.96–35.99 (1.4157–1.4169)
Bush inner diameter (housing side and end cover side)				
	Limit	mm (in.)	32.070 (1.2626)	36.07 (1.4201)
	STD	mm (in.)	32.000–32.030 (1.2598–1.2610)	36.00–36.025 (1.4173–1.4183)
Oil clearance (housing side and end cover side)				
	Limit	mm (in.)	0.1 (0.004)	0.2 (0.008)
	STD	mm (in.)	0.009–0.060 (0.0004–0.0024)	0.010–0.065 (0.0004–0.0026)
Worm bearing preload (when starting)			4–6 kg-cm (3.5–5.2 in.-lb)	
Total preload (when starting)			8–11 kg-cm (6.9–9.5 in.-lb)	
Thickness of shim (for adjusting bearing preload)		mm (in.)	0.05 (0.0020)	0.05 (0.0020)
			0.07 (0.0028)	0.06 (0.0024)
			0.08 (0.0031)	0.07 (0.0028)
			0.1 (0.004)	0.1 (0.004)
			0.2 (0.008)	0.2 (0.008)
			0.5 (0.020)	0.5 (0.020)
Thickness of thrust washer (for adjusting sector shaft)		mm (in.)	2.00 (0.0787)	1.95 (0.0768)
			2.05 (0.0807)	2.00 (0.0787)
			2.10 (0.0827)	2.05 (0.0807)
			2.15 (0.0846)	–
			2.20 (0.0866)	–

FRONT WHEEL ALIGNMENT

Toe-in		3 – 4 mm (0.12 – 0.16 in.)	
Camber		2°	
Caster	Without load	* (1) 1°30′	* (2) 30′
	With load	* (1) 2°	* (2) 1°
King pin inclination		7°	

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FRONT WHEEL ALIGNMENT (Cont'd)

Steering angle	Inner	Double tire 36°30'	Single tire 38°
	Outer	Double tire 26°	Single tire 27°
Side slip		3 mm (0.12 in.) or less (per 1 m or 3')	

*(1) For vehicle equipped with single tires and RU19-HC

*(2) For all the vehicles other than those specified for *(1)

TIRE INFLATION PRESSURE

kg/cm² (psi)

Vehicle model	Unloaded			Loaded		
	Front	Rear		Front	Rear	
		inner	outer		inner	outer
RU10(L), RU10(L)-B	1.8 (26)	2.4 (34)		2.8 (40)	5.3 (75)	
RU10(L)V	1.8 (26)	2.4 (34)		3.0 (43)	5.3 (75)	
RU10(L)V-B	1.8 (26)	2.4 (34)		2.6 (37)	5.8 (82)	
RU10(L)P	1.8 (26)	2.4 (34)		2.0 (29)	5.8 (82)	
RU12(L)	1.8 (26)	1.8 (26)	1.8 (26)	2.8 (40)	3.0 (43)	3.3 (47)
RU15(L)	2.0 (29)	2.4 (34)		3.3 (47)	6.5 (92)	
RU15(L)-H	2.4 (34)	2.4 (34)	2.4 (34)	3.5 (50)	4.0 (57)	4.3 (61)

kg/cm² (psi)

Vehicle model	Unloaded			Loaded		
	Front	Rear		Front	Rear	
		inner	outer		inner	outer
JU10(L), JU10(L)-B	2.0 (29)	2.4 (34)		3.3 (47)	5.3 (75)	
JU12(L)	2.0 (29)	1.8 (26)	1.8 (26)	3.3 (47)	3.0 (43)	3.3 (47)
BU10(L), BU10(L)-B	2.0 (29)	2.4 (34)		3.3 (47)	5.3 (75)	
BU12(L)	2.2 (31)	1.8 (26)	1.8 (26)	3.3 (47)	3.0 (43)	3.3 (47)
BU15(L)	2.4 (34)	2.4 (34)		3.8 (54)	6.5 (92)	
BU15(L)-H	2.4 (34)	2.4 (34)	2.4 (34)	4.3 (61)	4.0 (57)	4.3 (61)
HU15-HQ	2.4 (34)	2.4 (34)	2.4 (34)	4.0 (57)	4.0 (57)	4.3 (61)

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BRAKE

Pedal

Pedal height	DYNA	221 mm	8.70 in.
	COASTER	220 mm	8.65 in.
Pedal free play		0 mm; idle stroke 10 – 15 mm	0.39 – 0.59 in.
		Note: Idle strokes is the stroke before power piston starts moving when brake pedal is depressed without vacuum.	
Pedal reserve distance		Over 108 mm/50 kg (Over 4.25 in./110 lb)	

Master Cylinder

Piston to booster push rod clearance	0.1 – 0.5 mm	0.004 – 0.020 in.

Wheel Brake

Brake drum inner diameter	Limit	323 mm	12.72 in.
	STD	320 mm	12.60 in.
Lining width	Single tire	65 mm	2.56 in.
	Double tire	Front 65 mm 2.56 in.	Rear 85 mm 3.35 in.
Lining thickness	Limit	3.2 mm	0.126 in.
	STD	8.0 mm	0.315 in.
	O/S 0.5	8.5 mm	0.335 in.
	O/S 1.0	9.0 mm	0.354 in.

Parking Brake

Drum inner diameter	Limit	162 mm	6.38 in.
	STD	160 mm	6.30 in.
Standard lever travel at 25 kg (55 lb)		9 – 14 notches	
Thickness of lining	Limit	1.5 mm	0.059 in.
	STD	3.5 mm	0.138 in.

Vacuum Pump

Item \ Engine type		B, 2J	H
Delivery rate (liter/min.)		310 ℓ/min (10000 rpm) • The time required to evacuate a 5 liter tank to –550 mm Hg at 900 rpm should be 60 sec. or less. • The time required to evacuate a 5 liter tank to –690 mm Hg at 8000 rpm should be 30 sec. or less.	330 ℓ/min (10000 rpm) ←
Casing inner diameter			
	Limit	58.19 mm 2.2909 in.	40.16 mm 1.5811 in.
	STD	58.00 – 58.06 mm 2.2835 – 2.2858 in.	40.00 – 40.06 mm 1.5748 – 1.5772 in.
Blade height	Limit	12 mm 0.47 in.	8 mm 0.31 in.
	STD	13.4 – 13.6 mm 0.528 – 0.535 in.	9.8 – 10.2 mm 0.386 – 0.402 in.

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Vacuum Pump (Cont'd)

Blade width	Limit	6.92 mm 0.2724 in.	4.95 mm 0.1949 in.
	STD	7.03 – 7.09 mm	5.03 – 5.09 mm
		0.2768 – 0.2791 in.	0.1980 – 0.2004 in.
Blade length	Limit	34.98 mm 1.3772 in.	61.95 mm 2.4390 in.
	STD	35.01 – 35.04 mm	61.97 – 62.02 mm
		1.3783 – 1.3795 in.	2.4398 – 2.4417 in.
Reservoir tank capacity		7.5 ℓ 7.9 US qt. 6.6 Imp.qt.	

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MEMO

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FJ, BJ & HJ CHASSIS

INCLUDES

FJ40 Softtop

FJ40 Hardtop

FJ43 Softtop

FJ45 Pickup

FJ55 Station Wagon

HJ45 Diesel Pickup

BJ40 Diesel Softtop

BJ40 Diesel Hardtop

BJ43 Diesel Softtop

HJ45P Diesel Pickup

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts	kg-m	ft-lb
Engine x Clutch housing	5.0 – 8.0	36 – 58
Clutch cover x Flywheel	1.5 – 2.2	10.9 – 15.9
Reservoir	2.0 – 3.0	14.5 – 21.7

Transmission & Transfer

Tightening Parts	kg-m	ft-lb
Case cover (for 4 Speed)	3.0 – 4.5	21.7 – 32.6
Front bearing retainer	1.0 – 1.6	7.2 – 11.6
Transmission x Transfer	5.0 – 8.0	36 – 58
Clutch housing x Transmission case	5.0 – 8.0	36 – 58
Output shaft rear nut (for 4 Speed)	11.0 – 14.0	80 – 101
(for 3 Speed)	14.0 – 15.0	101 – 109
Transmission and transfer support	5.0 – 8.0	36 – 58
Transfer companion flange nut	11.0 – 14.0	80 – 101
Parking brake backing plate	2.0 – 3.0	14 – 22
Parking brake drum nut	11.0 – 14.0	80 – 101

Rear Axle

Tightening Parts	kg-m	ft-lb
Propeller shaft x Differential	6.0 – 7.5	43.4 – 54.3
Backing plate x Rear axle housing	4.0 – 5.5	28.9 – 39.8
U Bolt nut	6.9 – 9.7	50 – 70
Wheel nut	9.0 – 12.0	65.1 – 86.8
Hub x Flange	2.8 – 4.0	20.3 – 28.9
Bearing lock nut	8.0 – 10.0	57.8 – 72.1

Differential

Tightening Parts	kg-m	ft-lb
Ring gear	10.5 – 12	75.9 – 86.8
Companion flange nut	20 – 24	144 – 173
Side bearing cap	9 – 11	65.1 – 79.6

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Front Axle

Tightening Parts	kg-m	ft-lb
Steering knuckle arm to housing	6 – 7	43 – 50.5
Bearing cap x Housing	6 – 7	43 – 50.5
"U" Bolt	6.9 – 9.7	50 – 70
Wheel nut	9.0 – 12.0	65.1 – 86.8
Hub x Flange	2.8 – 3.5	20.3 – 25.3
Adjusting nut	8.0 – 10.0	57.8 – 72.1

Steering

Tightening Parts	kg-m	ft-lb
Steering wheel	3.0 – 4.0	21.7 – 28.9
Colum upper bracket	1.0 – 1.6	7.2 – 11.6
Worm gear end cover	3.0 – 4.5	21.7 – 32.5
Sector shaft end cover	3.0 – 4.5	21.7 – 32.5
Gear box set bolt	4.0 – 5.5	28.9 – 39.8
Center arm bracket	4.0 – 5.5	28.9 – 39.8
Pitman arm	16.5 – 19.5	119 – 141
Linkage castle nut	5.0 – 7.0	36.2 – 50.6

Brake

Tightening Parts	kg-m	ft-lb
Disc brake cariper set nut	7.5 – 10.5	54.3 – 76.0
Dust cover	4.0 – 5.5	28.9 – 39.8
Disc x Hub	4.0 – 5.5	28.9 – 39.8
Drum brake backing plate	4.0 – 5.5	28.9 – 39.8
Tube union nut	1.3 – 1.8	9.4 – 13.0
Flexible hose	2.0 – 2.7	14.5 – 19.5
Parking brake backing plate	2.0 – 3.9	14.5 – 28.2
Drum	11 – 14	80 – 101

Power Take Off

Tightening Parts	kg-m	ft-lb
Joint flange to output shaft	1.5 – 2.2	10.9 – 15.9

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Winch

Tightening Parts	kg-m	ft-lb
Worm shaft retainer	1.9 – 3.1	14 – 22

CLUTCH

		W/ Brake Booster	W/O Brake Booster
Pedal height	FJ40 series	215 mm 8.47 in.	198 mm 7.80 in.
	FJ55 series	185 mm 7.28 in.	172 mm 6.77 in.
Pedal play		0.5 – 3.0 mm	0.02 – 0.12 in.
Fork tip play		3 – 4 mm	0.12 – 0.16 in.
Clutch	Rivet head depth limit	0.3 mm	0.012 in.
	Runout limit	1.0 mm	0.04 in.

3-SPEED TRANSMISSION (J30)

Oil clearance, 2nd gear limit		0.09 mm	0.0035 in.
Thrust clearance, 2nd gear	STD	0.08 – 0.23 mm	0.0032 – 0.0091 in.
	Limit	0.4 mm	0.016 in.
Counter gear	STD	0.05 – 0.2 mm	0.002 – 0.0079 in.
	Limit	0.4 mm	0.016 in.
Synchronizer ring to gear clearance limit		0.8 mm	0.032 in.
Hub sleeve to shift fork clearance limit		0.8 mm	0.032 in.
Snap ring or washer thickness			
Input shaft bearing	90520-33010	2.43 – 2.57 mm	0.0957 – 0.1012 in.
	90520-33011	2.30 – 2.42 mm	0.0906 – 0.0953 in.
Output shaft front	90520-33132	2.35 – 2.40 mm	0.0925 – 0.0945 in.
	90520-33172	2.25 – 2.30 mm	0.0886 – 0.0906 in.
Counter gear	33441-61010	1.45 – 1.50 mm	0.0571 – 0.0591 in.
	33442-61010	1.50 – 1.55 mm	0.0591 – 0.0610 in.
	33443-61010	1.55 – 1.60 mm	0.0610 – 0.0630 in.

4-SPEED TRANSMISSION (H41, H42)

Oil clearance, 3rd gear	STD	0.07 – 0.12 mm	0.0028 – 0.0047 in.
	Limit	0.12 mm	0.0047 in.
Reverse idle gear limit		0.16 mm	0.0063 in.
Thrust clearance, 3rd gear	STD	0.13 – 0.28 mm	0.0051 – 0.011 in.
	Limit	0.35 mm	0.0138 in.

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4-SPEED TRANSMISSION (H41, H42) (Cont'd)

Synchronizer ring to gear clearance limit			
3rd, 4th gear		0.8 mm	0.032 in.
Synchronizer ring dimension limit			
2nd gear		1.8 mm	0.071 in.
1st gear		2.8 mm	0.110 in.
Hub sleeve to shift fork clearance limit		0.8 mm	0.032 in.
Reverse idle gear shift arm shoe thickness limit		0.7 mm	0.028 in.
Snap ring or washer thickness			
Input shaft bearing	90520-36015	3.31 – 3.42 mm	0.1303 – 0.1346 in.
	90520-36016	3.20 – 3.31 mm	0.1260 – 0.1303 in.
Output shaft front	No. 0	2.40 – 2.45 mm	0.0945 – 0.0965 in.
	1	2.45 – 2.50 mm	0.0965 – 0.0984 in.
	2	2.50 – 2.55 mm	0.0984 – 0.1004 in.
	3	2.55 – 2.60 mm	0.1004 – 0.1024 in.
	4	2.60 – 2.65 mm	0.1024 – 0.1043 in.
	5	2.65 – 2.70 mm	0.1043 – 0.1063 in.
Counter shaft	No. 1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	3	2.25 – 2.30 mm	0.0886 – 0.0906 in.

TRANSFER

Oil clearance, high and low gear	STD	0.035 – 0.081 mm	0.0014 – 0.0032 in.
	Limit	0.09 mm	0.004 in.
Thrust clearance, idle gear	STD	0.125 – 0.475 mm	0.00492 – 0.01870 in.
	Limit	0.5 mm	0.020 in.
Hub sleeve to shift fork clearance	Limit	1.0 mm	0.04 in.
Preload, output shaft bearing	New bearing	1.2 – 4.1 kg	2.6 – 9.0 lb
(While rotating)	Reused bearing	More than 0.47 kg	1.04 lb
Idle gear thrust spacer thickness			
	36261-60010	1.2 – 1.3 mm	0.047 – 0.051 in.
	36262-60010	1.3 – 1.4 mm	0.051 – 0.055 in.
	36263-60010	1.4 – 1.5 mm	0.055 – 0.059 in.

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TRANSFER (Cont'd)

Output shaft bearing preload			
Adjust shim thickness	90564-64017	0.10 mm	0.0039 in.
	90564-64023	0.15 mm	0.0059 in.
	90564-64024	0.20 mm	0.0079 in.
	90564-64025	0.25 mm	0.0098 in.

PROPELLER SHAFT

Spider thrust play		Less than 0.05 mm	0.002 in.
Snap ring thickness	90520-29286	1.475 – 1.525 mm	0.05807 – 0.06004 in.
	90520-29287	1.525 – 1.575 mm	0.06004 – 0.0620 in.
	90520-29288	1.575 – 1.625 mm	0.06201 – 0.06397 in.

DIFFERENTIAL

Drive pinion bearing preload (Starting)	New bearing	19 – 26 kg-cm	16.5 – 22.6 in.-lb
	Reused bearing	9 – 13 kg-cm	7.8 – 11.3 in.-lb
Total preload (Starting)			
For both New and Reused bearing		Add drive pinion bearing preload	
		4 – 6 kg-cm	3.5 – 5.2 in.-lb
Backlash Pinion gear x Side gear		0.02 – 0.20 mm	0.0008 – 0.0079 in.
Ring gear x Drive pinion		0.15 – 0.20 mm	0.0059 – 0.0079 in.
Rear axle shaft end clearance		0.06 – 0.46 mm	0.0024 – 0.0181 in.
Ring gear runout limit		0.1 mm	0.004 in.
Drive pinion preload adj. spacer			
(for Bearing preload)	90560-30184	2.75 mm	0.1083 in.
	90560-30185	2.78 mm	0.1094 in.
	90560-30186	2.81 mm	0.1106 in.
	90560-30187	2.84 mm	0.1118 in.
	09560-30188	2.87 mm	0.1130 in.
	09560-30190	2.90 mm	0.1142 in.
	09560-30191	2.93 mm	0.1154 in.
	09560-30192	2.96 mm	0.1165 in.
	90560-30199	2.99 mm	0.1177 in.
Drive pinion preload adj. shim			
	90564-30035	0.25 mm	0.0098 in.

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DIFFERENTIAL (Cont'd)

Drive pinion protrusion adj. shim			
	90564-70101	0.25 mm	0.0098 in.
	90564-70102	0.30 mm	0.0118 in.
	90564-70103	0.35 mm	0.0138 in.
	90564-70104	0.45 mm	0.0177 in.
	90564-70121	0.40 mm	0.0158 in.
Pinion shaft spacer	41344-35010	29.8 mm	1.173 in.
(for Rear axle shaft end	41345-35010	30.2 mm	1.189 in.
clearance)	41356-35010	30.6 mm	1.204 in.
	41357-35010	29.0 mm	1.142 in.
	41358-35010	29.4 mm	1.157 in.
Side gear thrust washer	41361-35010	1.60 mm	0.063 in.
	41362-35010	1.75 mm	0.069 in.
	41363-35010	1.90 mm	0.075 in.
	41364-35010	2.05 mm	0.081 in.

FRONT AXLE

Steering knuckle bearing preload (Rotating)		1.8 – 2.3 kg (Use SST)	3.9 – 5.0 lb (Use SST)
Steering knuckle preload adj. shim			
	43233-60010	0.2 mm	0.008 in.
	43234-60010	0.5 mm	0.020 in.
	43233-60021	1.0 mm	0.040 in.
Wheel bearing preload for both front and rear		1. Tighten the adjusting nut to 6 kg-m (43 ft-lb). 2. Unscrew the lock nut 1/8 – 1/5 turn.	

FRONT WHEEL ALIGNMENT

Toe-in		3 – 5 mm	0.12 – 0.20 in.
Camber		1°	
Caster		1°	
King pin inclination		9°30'	
Turning angle	Inside	32°	
	Outside	30°	
for 9.00-15 Tire	Inside	26°	
	Outside	24°	

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TIRE INFLATION PRESSURE

FJ40 Series. Tire Size H78-15. 4PR

Driving Condition	Normal Driving	High Speed Driving	Sand Driving
Front	1.6 kg/cm² 22 psi	1.8 kg/cm² 26 psi	1.6 kg/cm² 22 psi
Rear	1.8 kg/cm² 26 psi	2.1 kg/cm² 30 psi	1.8 kg/cm² 26 psi

FJ55 Series. Tire Size H78-15. 4PR

Driving Condition	Normal Driving	High Speed Driving	Sand Driving
Front	1.7 kg/cm² 24 psi	2.0 kg/cm² 28 psi	1.7 kg/cm² 24 psi
Rear	2.1 kg/cm² 30 psi	2.2 kg/cm² 31 psi	2.1 kg/cm² 30 psi

FJ45 Series. Tire Size 7.50-16-8 PRLT

Driving Condition	Normal Driving	High Speed Driving	Sand Driving
Front	2.4 kg/cm² 35 psi	2.4 kg/cm² 35 psi	2.4 kg/cm² 35 psi
Rear	3.25 kg/cm² 45 psi	3.75 kg/cm² 55 psi	3.25 kg/cm² 45 psi

STEERING

Steering wheel free play		0 – 25 mm	0 – 0.98 in.
Sector shaft oil clearance	STD	0.009 – 0.060 mm	0.0004 – 0.0024 in.
	Limit	0.1 mm	0.004 in.
Sector shaft thrust clearance	Limit	0.05 mm	0.0020 in.
Worm bearing preload W/O sector shaft		3.5 – 6.5 kg-cm	0.25 – 0.47 lb
W/ sector shaft		8 – 11 kg-cm	0.58 – 0.79 lb
Steering relay rod	FJ40	827 mm	32.56 in.
	FJ55	827 mm	32.56 in.
Tie-rod		1205 mm	47.44 in.
Steering drag link	FJ40	855 mm	33.66 in.
	FJ55	500 mm	19.69 in.
Intermediate shaft snap ring	90521-22011	1.20 mm	0.0424 in.
	90521-22012	1.25 mm	0.0492 in.
	90521-22013	1.30 mm	0.0512 in.
Sector shaft thrust washer	Mark 1	2.00 mm	0.0787 in.
	2	2.05 mm	0.0807 in.
	3	2.10 mm	0.0827 in.
	4	2.15 mm	0.0846 in.
	5	2.20 mm	0.0866 in.

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STEERING (Cont'd)

End cover shim	Mark 1	0.05 mm	0.0020 in.
(for Worm bearing preload)	2	0.07 mm	0.0028 in.
	3	0.08 mm	0.0031 in.
	4	0.10 mm	0.0039 in.
	5	0.20 mm	0.0079 in.
	6	0.50 mm	0.0197 in.
	7	0.06 mm	0.0024 in.
	8	0.09 mm	0.0035 in.

BRAKE

Pedal height	FJ40 series	215 mm	8.46 in.
	FJ55 series	185 mm	7.28 in.
Pedal play		3 – 6 mm	0.12 – 0.23 in.
Pedal reserve distance	FJ40 series	More than 80 mm	3.15 in.
	FJ55 series	More than 70 mm	2.76 in.
Booster push rod to master cylinder piston clearance		0.1 – 0.5 mm	0.004 – 0.020 in.
Disc brake — Disc thickness limit		19 mm	0.74 in.
Disc runout limit		0.12 mm	0.0047 in.
Pad thickness limit		1 mm	0.039 in.
Front drum inner diameter limit		295 mm	11.70 in.
Rear drum inner diameter limit		292 mm	11.50 in.
only for FJ45, FJ55 (Fire truck) limit		297 mm	11.70 in.
Lining thickness (Foot & parking) limit		1.5 mm	0.06 in.
Drum brake adjustment			
Number of notches to be returned			
	Foot brake	4 – 5 Notches	
	Parking brake	1 – 2 Notches	
Parking brake lever travel		7 – 12 Notches	

VACUUM PUMP

Casing bore wear limit	58.19 mm	2.291 in.
Bushing bore wear limit	16.14 mm	0.6354 in.
Rotor to spline play limit	2.4 mm	0.095 in.

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VACUUM PUMP (Cont'd)

Blade	Height limit	12.0 mm	0.47 in.
	Width limit	0.92 mm	0.272 in.
	Length limit	34.98 mm	1.377 in.

FRONT WINCH

Worm bearing preload adj. shim	0.228 mm	0.009 in.
	0.5 mm	0.020 in.

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DA & FA CHASSIS

INCLUDES

DA110 Truck Diesel

DA110D Dump Diesel

DA115 Truck Diesel

DA116 Truck Diesel

FA100 Truck

FA100D Dump

FA110 Truck

FA110D Dump

FA115 Truck

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MAIN PARTS TIGHTENING TORQUES

Clutch

Tightening Parts	kg-m	ft-lb
Clutch cover x Flywheel	3.0 – 4.5	21.7 – 32.5
Crankshaft x Flywheel	9.0 – 11.0	65.1 – 79.6
Clutch master cylinder cap	15 – 20	108.5 – 144.7

Transmission

Tightening Parts		kg-m	ft-lb
Engine x Clutch housing		5 – 7	36 – 51
Transmission case x Clutch housing		6.5 – 9.0	47 – 65
Transmission output shaft	4-speed :	13.8 – 23.5	100 – 170
x Parking brake drum x Nut	5-speed :	35 – 48	253 – 347
Rear bearing retainer x Parking brake backing plate		4.8 – 6.2	35 – 45

Propeller Shaft

Tightening Parts	kg-m	ft-lb
Propeller shaft x Flange yoke x Nut	25 – 40	181 – 289
Propeller shaft flange yoke x Flange	7 – 9	51 – 65
Parking brake drum x Flange yoke	7 – 9	51 – 65
Differential flange x Flange yoke	7 – 9	51 – 65
Frame x Center support	4.0 – 5.5	29 – 40

Front Axle and Suspension

Tightening Parts	kg-m	ft-lb
Steering knuckle x Knuckle arm	12 – 17	87 – 123
Steering knuckle x Brake backing plate	10 – 15	72 – 108
Front leaf spring center bolt	8	58
"U" Bolt nut	25 – 30	181 – 217
Shock absorber pivot pin x I-beam	11.5 – 16.0	83.2 – 115.7
Wheel nut	35 – 40	253 – 289

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Rear Axle and Suspension

Tightening Parts	kg-m	ft-lb
"U" Bolt nut	25.0 – 30.0	181 – 217
Differential carrier x Rear axle housing	7.0 – 9.0	51 – 65
Rear axle housing x Backing plate and shoe anchor bracket	15.5 – 21.0	112 – 152
Rear axle bearing lock nut (inner)	9.0 – 10.0	65 – 72
" (outer)	25.0 – 30.0	181 – 217
Rear axle shaft flange nut	75. – 11.0	54 – 80
[14 in. Type differential]		
Differential case x Ring gear	29.0 – 33.0	210 – 239
Differential case (RH side) x Differential case (LH side)	9.0 – 13.0	65 – 94
Differential drive pinion x Companion flange	25.0 – 40.0	181 – 289
Differential drive pinion x Differential carrier	7.5 – 12.0	54 – 87
Differential bearing cap x Differential carrier	16.0 – 24.0	116 – 174
Thrust screw lock nut	20.0 – 30.0	145 – 217
[15.5 in. Type differential]		
Differential case x Ring gear	25.0 – 33.0	181 – 239
Differential case (RH side) x Differential case (LH side)	20.0 – 25.0	145 – 181
Differential drive pinion x Companion flange	60.0 – 80.0	434 – 579
Differential drive pinion x Differential carrier	6.5 – 8.7	47 – 63
Differential bearing cap x Differential carrier	28.0 – 36.0	202 – 260
[2-speed Type differential]		
Crossshaft thrust plate	5.0 – 7.0	36 – 50
High speed gear x Differential case	30.0 – 33.0	217 – 238
Low speed gear x Differential case	30.0 – 33.0	217 – 238
Differential case (RH side) x Differential case (LH side)	30.0 – 33.0	217 – 238
Differential drive pinion x Companion flange	28.0 – 40.0	202 – 289
Bearing cage x Differential carrier	10.0 – 15.0	72 – 108
Bearing retainer x Differential carrier	10.0 – 15.0	72 – 108
Differential drive pinion x Differential carrier	10.0 – 15.0	72 – 108
Diaphragm chamber x Differential carrier	3.0 – 4.5	22 – 32
Differential bearing cap x Differential carrier	30.0 – 33.0	217 – 238
Wheel nut Inside	30.0 – 35.0	217 – 253
Outside	35.0 – 40.0	253 – 289

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Steering

Tightening Parts	kg-m	ft-lb
Steering gear housing x Gear housing end cover	6.2 – 9.4	45 – 68
Steering gear housing x Sector shaft end cover	3.4 – 5.2	25 – 37
Steering gear housing x Frame	7.5 – 11.0	54 – 80
Sector shaft x Pitman arm	16 – 28	116 – 203
Tie rod end x Knuckle arm	16 – 24	115.7 – 173.6
Main shaft x Steering wheel x Nut	2.0 – 3.0	14.5 – 21.7

Brake

Tightening Parts	kg-m	ft-lb
[Single brake booster]		
Hydraulic cylinder plug x Hydraulic cylinder	10.0 – 15.0	72 – 108
Relay valve fitting x End plate	3.5 – 5.5	25 – 40
End plate x Hook bolt	0.4 – 1.0	2.8 – 7.2
Hydraulic cylinder lock nut	6.0 – 10.0	43 – 72
[Split brake booster]		
Outlet union	8.0 – 11.0	58 – 80
Booster hydraulic cylinder end plug	10.0 – 14.0	72 – 101
Booster sub-cylinder plug	15.0 – 20.0	102 – 14.5
Piston rod guide x Booster body No. 1	3.0 – 4.5	22 – 32
Booster band	0.4 – 0.7	3 – 5
[Front brake]		
Brake drum x Axle hub	25.0 – 30.0	181 – 217
Backing plate x Steering knuckle	10.0 – 15.0	72 – 108
Wheel cylinder x Backing plate Bolt 14 mm	7.7 – 11.0	56 – 80
Bolt 8 mm	1.8 – 2.7	12 – 20
[Rear brake]		
Brake drum x Axle hub	25.0 – 30.0	181 – 217
Backing plate x Rear axle housing	15.5 – 21.0	112 – 152
Wheel cylinder x Backing plate	2.5 – 3.1	18 – 22
[Parking brake]		
Backing plate x Transmission	4.8 – 6.2	35 – 45
Brake drum x Transmission output shaft		
4-speed T/M	13.8 – 23.5	100 – 170
5-speed T/M	35.0 – 48.0	253 – 347
[Exhaust brake]		
Fuel cut-off solenoid	0.6 – 0.7	4.3 – 5.0

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CLUTCH

Pedal height	(From toe-board)	280 mm	11.0 in.
Pedal play	(At pedal top)	1 – 5 mm	0.04 – 0.20 in.
Release for tip play		3 – 5 mm	0.12 – 0.20 in.
Clutch disc:	Rivet head depth limit	0.3 mm	0.012 in.
	Runout limit	1.0 mm	0.04 in.
Compression spring:	Installed length	43.5 mm	1.713 in.
	Installed load	60.2 – 65.2 mm	132.7 – 143.7 in.
	Installed load limit	53 mm	117 in.
Clutch lever height		16.2 mm	0.638 in.

4-SPEED TRANSMISSION (F40)

2nd gear thrust clearance			
	STD	0.25 – 0.65 mm	0.0098 – 0.0256 in.
	Limit	0.8 mm	0.032 in.
3rd gear thrust clearance			
	STD	0.20 – 0.40 mm	0.0079 – 0.0158 in.
	Limit	0.8 mm	0.032 in.
2nd gear oil clearance			
	STD	0.05 – 0.10 mm	0.0020 – 0.0039 in.
	Limit	0.5 mm	0.020 in.
3rd gear oil clearance			
	STD	0.06 – 0.10 mm	0.0024 – 0.0039 in.
	Limit	0.5 mm	0.020 in.
Reverse idle gear oil clearance			
	STD	0.13 – 0.15 mm	0.0051 – 0.0059 in.
	Limit	0.3 mm	0.012 in.
Shift fork to hub sleeve clearance			
	Limit	1.0 mm	0.04 in.
Synchronizer ring to gear clearance			
	Limit	0.8 mm	0.03 in.
2nd synchronizing corn depth			
	Limit	8.0 mm	0.3 in.
Reverse shift arm to reverse idle gear groove clearance			
	Limit	1.0 mm	0.04 in.

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4-SPEED TRANSMISSION (F40) (Cont'd)

Snap ring thickness:			
	Part No.		
For input shaft bearing	90520-36015	3.31 – 3.42 mm	0.1303 – 0.1346 in.
	90520-36016	3.20 – 3.31 mm	0.1260 – 0.1303 in.
For output shaft front	90520-34013	2.5 mm	0.098 in.
	90520-34014	2.3 mm	0.091 in.
For counter gear front	90520-42019	3.2 mm	0.126 in.
	90520-42020	3.0 mm	0.118 in.
	90520-42021	2.8 mm	0.110 in.

5-SPEED TRANSMISSION (D50, 51, 53)

2nd gear thrust clearance			
	STD	0.10 – 0.35 mm	0.0039 – 0.0138 in.
	Limit	0.8 mm	0.032 in.
3rd gear thrust clearance			
	STD	0.10 – 0.40 mm	0.039 – 0.0158 in.
	Limit	0.8 mm	0.032 in.
4th gear thrust clearance			
	STD	0.05 – 0.55 mm	0.0020 – 0.0217 in.
	Limit	0.8 mm	0.0315 in.
Reverse idle gear thrust clearance			
	STD	0.05 – 0.40 mm	0.0020 – 0.0158 in.
	Limit	1.0 mm	0.040 in.
2nd & 3rd gears oil clearance			
	STD	0.10 – 0.15 mm	0.0039 – 0.0059 in.
	Limit	0.5 mm	0.02 in.
4th gear oil clearance			
	STD	0.08 – 0.12 mm	0.0032 – 0.0047 in.
	Limit	0.5 mm	0.02 in.
Shift fork to hub sleeve clearance			
	Limit	1.0 mm	0.04 in.
Synchronizer ring depth			
	Limit	0.8 mm	0.032 in.
Reverse shift arm to shift fork clearance			
	Limit	1.0 mm	0.04 in.
Reverse shift arm to arm head slot clearance			
	Limit	1.0 mm	0.04 in.

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DIFFERENTIAL (14 in.)

Drive pinion bearing preload (starting)		
New bearing	18 – 27 kg-cm	1.30 – 1.95 in.-lb
" (w/SST)	3.1 – 4.7 kg	6.8 – 10.4 lb
Reused bearing	9 – 14 kg-cm	0.65 – 1.01 in.-lb
" (w/SST)	1.6 – 2.4 kg	3.5 – 5.3 lb
Total preload	Add drive pinion hearing preload	
	6 – 12 mm	0.4 – 0.9 in.
Backlash:		
Pinion gear or side gear	0.20 – 0.25 mm	0.0079 – 0.0098 in.
Ring gear	0.25 – 0.33 mm	0.0098 – 0.0130 in.
Ring gear runout limit	0.15 mm	0.006 in.
Thrust screw cap thickness limit	13.0 mm	0.512 in.
Drive pinion spacer adjusting shim thickness:		
(For drive pinion preload)		
90564-50044	0.03 mm	0.0012 in.
90564-50045	0.1 mm	0.0039 in.
90564-50046	0.25 mm	0.0098 in.
90564-50047	0.45 mm	0.0181 in.
Drive pinion depth adjusting shim thickness:		
41153-55020	0.10 mm	0.0039 in.
41154-55010	0.15 mm	0.0059 in.
41155-55010	0.25 mm	0.0098 in.
41156-55010	0.45 mm	0.0177 in.
Drive pinion specified depth	141.86 mm	5.5850 in.

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DIFFERENTIAL (15.5 in.)

Drive pinion bearing preload (starting)		
New bearing	10 – 20 kg-cm	0.72 – 1.45 in.-lb
" (w/SST)	1.5 – 3.0 kg	3.3 – 6.6 lb
Reused bearing	6 – 16 kg-cm	0.43 – 1.16 in.-lb
" (w/SST)	0.9 – 2.4 kg	2.0 – 5.3 lb
Total preload	Add drive pinion hearing preload	
New bearing	3.5 – 4.5 kg	0.25 – 0.33 lb
Reused bearing	2.5 – 3.5 kg	0.18 – 0.25 lb
Backlash:		
Pinion gear or side gear	0.21 – 0.27 mm	0.0083 – 0.0106 in.
Ring gear	0.25 – 0.33 mm	0.0098 – 0.0130 in.

DIFFERENTIAL (15.5 in.) (Cont'd)

Ring gear runout limit	0.15 mm	0.006 in.
Drive pinion spacer adjusting shim thickness:		
(For drive pinion preload)		
41123-89201	0.4 mm	0.0157 in.
41123-89202	0.5 mm	0.0197 in.
41123-89203	0.45 mm	0.0177 in.
Drive pinion depth adjusting shim thickness:		
41153-89203	0.3 mm	0.0118 in.
41153-89201	0.4 mm	0.0157 in.
41153-89202	0.5 mm	0.0196 in.
Drive pinion specified depth	152.0 mm	5.9843 in.

DIFFERENTIAL (2-SPEED)

Drive pinion bearing preload (starting)		
New bearing	20 – 30 kg-cm	1.4 – 2.2 in.-lb
" (w/SST)	3.4 – 5.2 kg	7.5 – 11.4 lb
Reused bearing	10 – 15 kg-cm	0.7 – 1.1 in.-lb
" (w/SST)	1.7 – 2.6 kg	3.7 – 5.7 lb
Crossshaft bearing	Add drive pinion hearing preload	
	3.1 – 4.7 kg	6.8 – 10.4 lb
Backlash:		
Pinion gear or side gear	0.10 – 0.40 mm	0.0039 – 0.0157 in.
Ring gear	0.25 – 0.40 mm	0.0098 – 0.0157 in.
Drive pinion spacer adjusting shim thickness:		
(For drive pinion preload)		
90564-55178	0.03 mm	0.0012 in.
90564-55179	0.1 mm	0.0039 in.
90564-55180	0.25 mm	0.0098 in.
90564-55181	0.45 mm	0.0177 in.
90564-55182	0.70 mm	0.0276 in.
Drive pinion depth adjusting shim thickness:		
41124-55020	0.1 mm	0.0039 in.
41125-55020	0.25 mm	0.0098 in.
41126-55020	0.45 mm	0.0177 in.

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DIFFERENTIAL (2-SPEED) (Cont'd)

Crossshaft preload adjusting shim thickness:			
Bearing cage side			
	41133-55020	0.13 mm	0.0051 in.
	41134-55020	0.10 mm	0.0039 in.
	41135-55020	0.25 mm	0.0098 in.
	41136-55020	0.45 mm	0.0177 in.
Bearing retainer side			
	41143-55020	0.13 mm	0.0051 in.
	41144-55020	0.10 mm	0.0039 in.
	41145-55020	0.25 mm	0.0098 in.
	41146-55020	0.45 mm	0.0177 in.
Shift fork shaft adjusting shim thickness:			
	41445-55010	0.05 mm	0.0020 in.
	41446-55010	0.1 mm	0.0039 in.
	41447-55010	0.25 mm	0.0098 in.
High speed gear or low speed gear			
Thrust clearance		More than 1.5 mm	0.06 in.
Pinion shift collar and shift fork clearance		0 – 0.5 mm	0 – 0.0196 in.
Drive pinion specified depth		103 mm	4.0551 in.

REAR AXLE

Wheel bearing preload		Back off by 1/8 – 1/6 turn after tightening the nut to 9.0 – 10.0 kg-m (65 – 72 ft-lb) while slowly turning the wheel.	
Rear leaf spring:			
Pin diameter	STD	32.0 mm	1.260 in.
	Limit	31.8 mm	1.252 in.
Pin to bushing clearance	STD	0.02 – 0.15 mm	0.0008 – 0.0059 in.
	Limit	0.5 mm	0.020 in.

FRONT AXLE

Wheel bearing preload		Back off by 1/8 – 1/6 turn after tightening the nut to 3.5 – 4.0 kg-m (25 – 29 ft-lb) while slowly truning the wheel.	
King pin to bushing clearance	STD	0.016 – 0.054 mm	0.0006 – 0.0021 in.
	Limit	0.25 mm	0.098 in.

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FRONT AXLE (Cont'd)

Shim (for King pin) thickness:			
	Part No.		
	90560-40136	2.00 mm	0.0787 in.
	90560-40121	2.05 mm	0.0807 in.
	90560-40115	2.10 mm	0.0827 in.
	90560-40122	2.15 mm	0.0846 in.
	90560-40116	2.20 mm	0.0866 in.
	90560-40123	2.25 mm	0.0886 in.
	90560-40117	2.30 mm	0.0906 in.
	90560-40124	2.35 mm	0.0925 in.
	90560-40118	2.40 mm	0.0945 in.
	90560-40125	2.45 mm	0.0965 in.
	90560-40119	2.50 mm	0.0984 in.
	90560-40126	2.55 mm	0.1004 in.
	90560-40120	2.60 mm	0.1024 in.
Leaf spring pin to bushing clearance			
	STD	0.02 – 0.13 mm	0.0008 – 0.0051 in.
	Limit	0.5 mm	0.020 in.
Leaf spring pin diameter	STD	28.0 mm	1.102 in.
	Limit	27.8 mm	1.094 in.
Front wheel alignment: Toe-in		4 – 6 mm	0.16 – 0.24 in.
Camber		1°30′	
Caster		30′	
King pin angle		4°	
Steering turning angle	Inside	31°30′ (27°20′ for 9.00 – 20 ply tire)	
	Outside	38° (33° for 9.00 – 20 ply tire)	

STEERING

Steering wheel freeplay	0 – 50 mm	0 – 2.0 in.
Sector shaft diameter limit	41.375 mm	1.6289 in.
Sector shaft thrust clearance limit	0.1 mm	0.004 in.
Worm bearing preload		
w/o Sector shaft	7.5 – 20.0 kg	16 – 44 lb
w Sector shaft	7.5 – 21.0 kg	16 – 46 lb
Tie-rod length	1403 mm	55.236 in.

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STEERING (Cont'd)

Intermediate shaft snap ring thickness			
	90521-22011	1.20 mm	0.0424 in.
	90521-22012	1.25 mm	0.0492 in.
	90521-22013	1.30 mm	0.0512 in.
End cover shim thickness			
(For worm bearing preload)	45323-55020	0.06 mm	0.0020 in.
	45323-55030	0.07 mm	0.0028 in.
	45323-55040	0.08 mm	0.0032 in.
	45323-55050	0.10 mm	0.0039 in.
	45323-55060	0.20 mm	0.0079 in.
	45323-55070	0.50 mm	0.0097 in.
Sector shaft thrust washer thickness			
	45352-55030	2.515 – 2.535 mm	0.09902 – 0.09980 in.
	45352-55040	2.545 – 2.565 mm	0.10020 – 0.10098 in.
	45352-55050	2.575 – 2.595 mm	0.10138 – 0.10217 in.
	45352-55060	2.605 – 2.625 mm	0.10256 – 0.10335 in.
	45352-55070	2.635 – 2.655 mm	0.10374 – 0.10453 in.

FOOT BRAKE

Brake pedal:			
Height (From toe-board)		280 mm	11.0 in.
Play		2 – 10 mm	0.08 – 0.39 in.
Reserve distance	STD	More than 50 mm	1.97 in.
Brake drum inside diameter			
Front side	STD	393.7 mm	14.96 in.
	Limit	396.7 mm	15.12 in.
Rear side	STD	406.4 mm	16.00 in.
	Limit	410.4 mm	16.16 in.
Brake lining thickness limit		5.5 mm	0.394 in.
Brake drum to lining clearance		0.2 – 0.5 mm	0.008 – 0.020 in.
Rear brake shoe web and washer clearance		0.15 – 0.35 mm	0.0059 – 0.0138 in.

PARKING BRAKE

Brake lever travel		6 – 8 notches	
Brake drum iside diameter			
	Limit	258 mm	10.15 in.

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PARKING BRAKE (Cont'd)

Brake lining thickness limit	3.5 mm	0.14 in.
Reference number of notches to be returned	7 notches	

VACUUM PUMP

Casing bore wear limit		67.1 mm	2.641 in.
Rotor to spline play limit		0.28 mm	0.0110 in.
End cover oil clearance limit		0.1 mm	0.004 in.
Blade	Height limit	15.5 mm	0.610 in.
	Width limit	6.9 mm	0.272 in.
	Length limit	61.9 mm	2.437 in.

EXHAUST BRAKE

Brake valve cloosing clearance	0.5 mm	0.020 in.
Exhaust brake relay:		
Rating voltage	D.C 24V	
Premissible voltage	D.C 20 to 32V	
Current with load Maximum amperage	20 to 30A	
Holding amperage	1.5 to 3A	
Recovery revolution (at engine revolution)	650 – 750 rpm	
Operating revolution (at engine revolution)	800 – 900 rpm	
Regulated reduction speed adjusting limit (at engine revolution)	340 – 460 rpm	
Regulated reduction detective revolution (at engine revolution)	1,000 rpm (Reference)	
Point pressure	More than 100 g (3.5 oz)	
Point gap	More than 0.5 mm	0.020 in.
Armature gap	More than 0.15 mm	0.006 in.

– Note –

Revolution ratio of the engine and generator is 2 to 1.

(Example: 400 rpm at engine is equal to 200 rpm at generator.)

Exhaust brake generator:	
Voltage	A.C 8.5V at 1,060 rpm (at engine) with no load under the normal temperature.
Maximum permissible revolution	4,000 rpm (at engine)

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LUBRICANT

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HILUX – RN

Item			Capacity			Classification
			Liter	US qt	Imp. qt	
Engine	12R	Total	4.2	4.4	3.7	API SE
		Crankcase	3.3	3.5	2.9	
	18R	Total	5.0	5.3	4.4	
		Crankcase	4.1	4.3	3.6	
Transmission		L43	1.9	2.0	1.7	API GL-4 SAE 90
		W-50	2.6	2.8	2.3	
Automatic transmission fluid			6.6	7.0	5.8	ATF type F
Differential oil			1.6	1.7	1.4	API GL-5, SAE 90
Steering gear oil			320 cc	19.5 cu.in.		API GL-4, SAE 90
Ball joint grease			–			NLG No. 1 or No. 2
Wheel bearing grease			–			NLGI No. 2
Brake fluid			–			DOT 3 or DOT 4
Antifreeze			–			Anti-rust type ethylene glycol base coolant

STOUT – RK

Item		Capacity			Classification
		Liter	US qt	Imp. qt	
Engine oil	Total	4.8	5.1	4.2	API SE
	Crankcase	4.0	4.2	3.5	
Transmission oil		1.8	1.9	1.6	API GL-4, SAE 90
Differential oil		3.1	3.3	2.7	API GL-5, SAE 90
Steering gear oil		230 – 250 cc	14.0 – 15.3 cu.in.		API GL-4, SAE 90
Ball joint grease		–			NLGI No. 1 or No. 2
Wheel bearing grease		–			NLGI No. 2
Brake fluid		–			DOT 3 or DOT 4
Antifreeze		–			Anti-rust type ethylene glycol base coolant

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LITE ACE – KM

Item		Capacity			Classification
		Liter	US qt	Imp. qt	
Engine coil	Total	3.5	3.7	3.1	API service SE
	Crankcase	2.7	2.9	2.4	
Transmission oil		1.8	1.9	1.6	API GL-4, SAE 90
Differential oil		1.2	1.3	1.1	API GL-5, SAE 90
Steering gear oil		230 – 250 cc 14.0 – 15.3 cu.in.			API GL-4, SAE 90
Ball joint grease		–			NLGI No. 1 or No. 2
Wheel bearing grease		–			NLGI No. 2
Brake fluid		–			DOT 3 or DOT 4
Antifreeze		–			Anti-rust type ethylene glycol base coolant

HI ACE – RH

Item		Oil Capacity			Classification
		Liter	US qt	Imp. qt	
Engine oil	Total	4.2	4.4	3.7	API SE
	Crankcase	3.3	3.5	2.9	
Transmission		1.9	2.9	1.7	API GL-4, SAE 90
Steering		0.6	0.6	0.5	
Differential		1.6	1.7	1.4	API GL-4, SAE80W or 85W below – 23°C (–10°F) SAE90 above –23°C (–10°F)
Ball joint & propeller shaft spider grease					NLGI No. 1 or No. 2
Wheel bearing grease					NLGI No. 2
Brake fluid					DOT 3 or SAEJ 1703 (SAE 70R-3)

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DYNA, COSTER – RU, BU, JU

Item		Liter	US qt	Imp. qt	
Engine (total capacity)	B Total	8.0	8.5	7.0	Diesel engine oil API CC or CD
	Crankcase	7.0	7.4	6.2	
	2J Total	7.0	7.4	6.2	
	Crankcase	6.0	6.3	5.3	
	H Total	9.1	9.6	8.0	
	Crankcase	8.1	8.6	6.7	
	5R Total	4.8	5.1	4.2	Gasoline engine oil API SC or SD
	Crankcase	4.0	4.2	3.5	
Injection pump	B	1300 cc (7.9 cu.in.)			Diesel engine oil
	2J	1300 cc (7.9 cu.in.)			
	H	1500 cc (9.2 cu.in.)			
Governor diaphragm	B, 2J	2 – 4 drops			Diaphragm oil
Governor oil	H	170 cc (10.4 cu.in.)			Engine oil
Transmission	HD – 4	2.5	2.6	2.2	API GL-4 SAE 90
	HD – 5	3.4	3.6	3.0	
	MD – 5	2.5	2.6	2.2	
	MD – 5	3.0	3.2	2.6	
Differential	9.5 in.	2.5	2.6	2.2	API GL-5 SAE 90
	10.5 in.	3.1	3.3	2.7	
Steering gear housing	DYNA	0.6	0.6	0.5	API GL-4 SAE 90
	COASTER	0.8	0.8	0.7	
Ball joint grease		–			NLGI No. 1 or No. 2
Wheel bearing grease		–			NLGI No. 2
Brake fluid		–			DOT 3 or DOT 4
Antifreeze		–			Anti-rust type ethylene glycol base coolant
Steering knuckle & axle shaft grease		–			Molybodemum disulphide lithium base grease

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TOYO ACE – RY, JY

Item			Capacity			Classification
			Liter	US qt	Imp. qt	
Engine	12R	Total	4.2	4.4	3.7	API service SE
		Crankcase	3.3	3.5	2.9	
	5R	Total	4.8	5.1	4.2	
		Crankcase	4.0	4.2	3.5	
	2J	Total	7.0	7.4	6.2	API CC or CD
		Crankcase	6.0	6.3	5.3	
Injection pump (2J)			130 c.c. 7.9 cu-in.			Diesel engine oil
Governor diaphragm			2 – 3 drops			Diaphragm oil
Governor			170 c.c. 10.4 cu-in.			Diesel engine oil
Transmission		R40	1.8	1.9	1.6	API GL-4 SAE 90
		M40	2.5	2.6	2.2	
Differential oil		RY10, 12	2.5	2.6	2.2	API GL-5 SAE 90
		RY16, JY16	3.1	3.3	2.7	
Steering gear box		RY10, 12	0.35	0.40	0.30	
		RY16, JY16	0.6	0.6	0.5	
Ball joint grease			–			NLGI No. 1 or No. 2
Wheel bearing grease			–			NLGI No. 2
Brake fluid			–			DOT3 or DOT4
Antifreeze			–			Anti-rust type enthylene glycol base coolant

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LAND CRUISER – FJ, BJ, HJ

Item			Capacity			Classification
			Liter	US qt	Imp. qt	
Engine oil	2F	Total	8.0	8.5	7.0	API service SE
		Crankcase	7.8	7.4	6.2	
	B	Total	8.0	8.5	7.0	API CC or CD
		Crankcase	7.0	7.4	6.2	
	2J	Total	7.0	7.4	6.2	
		Crankcase	6.0	6.3	5.3	
Injection pump			130 c.c. 7.9 cu-in.			Diesel engine oil
Governor diaphragm			2 – 3 drops			Diaphragm oil
Governor			170 c.c. 10.4 cu-in.			Diesel engine oil

LAND CRUISER – FJ, BJ, HJ (Cont'd)

Transmission oil	4-Speed	3.1	3.3	2.7	API GL-4, SAE 90
	3-Speed	1.7	1.8	1.5	
Transfer oil		1.7	1.8	1.5	API GL-4, SAE 90
Differential oil		2.5	2.6	2.2	API GL-5, SAE 90
Steering oil		0.6	0.6	0.5	API GL-4, SAE 90
Front winch oil		0.6	0.6	0.5	API GL-4, SAE 90
Ball joint grease			–		NLGI No. 1 or No. 2
Wheel bearing grease			–		NLGI No. 2
Brake fluid			–		DOT3 or DOT4
Antifreeze			–		Anti-rust type ethylene glycol base coolant
Steering knuckle & axle shaft grease			–		Molybodemum disulphide lithium base grease

TRUCK – DA, FA

Item			Capacity			Classification
			Liter	US qt	Imp. qt	
Engine	2F	Total	4.5	4.8	4.0	API service SE
		Crankcase	3.7	3.9	3.3	
	2D	Total	12.0	12.7	10.6	API CC or CD
		Crankcase	9.0	9.5	7.9	
Injection pump			170 c.c. 10.3 cu-in.			Siesel engine oil
Governor diaphragm			2 – 4 drops			Diaphragm oil
Mechanical governor			250 c.c. 15.2 cu-in.			Siecel engine oil
Transmission		4-Speed	3.3	3.5	2.9	API GL-4 SAE 90
		5-Speed	6.9	7.3	6.1	
Steering			1.2	1.3	1.1	
Differential		14" Type	6.0	6.3	5.3	API GL-4 SAE 90
		15.5 " Type	11.0	11.6	9.7	
		2-Speed	12.0	12.7	10.6	
Suspension & propeller shaft spider grease						NLGI No. 1 or No. 2
Wheel bearing grease						NLGI No. 2
Brake fluid						DOT3 or SAE J-1703

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