Service Manual
Compact Tractors

7000, 7192, 7193, 7194, 7195, 7200, 7205, 7232, 7233,
7234, 7235, 7260, 7265, 7272, 7273, 7274, 7275, 7300, 7305.

SECTION 1
GENERAL

SAFETY

This a symbol means ATTENTION ! BECOME ALERT! YOUR SAFETY IS INVOLVED. The message that follows the symbol contains important information about safety. Carefully read the message. Make sure you fully understand the causes of possible injury or death. 1 1 C

To prevent injury always follow the Warning, Caution and Danger notes in this section and throughout the manual.

WARNING : *Read the operators manual to familiarize yourself with the correct control functions.* 46 27

WARNING : *Operate the machine and equipment controls from the seat position only. Any other method could result in serious injury.* 48 55

WARNING : *This is a one man machine ,no riders allowed.* 38 5

WARNING : *Before starting the engine, study the Operators Manual safety messages. Read all safety signs on the machine. Clear the area of other persons.Learn and practice safe use of controls before operating.*
It is your responsibility to understand and follow manufacturers instructions on machine operation, service, and to observe pertinant laws and regulations . 45 2

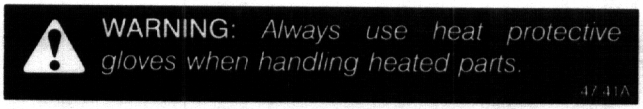
WARNING : *If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hats, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.* 45 3 A

WARNING :*When working in the area of the fan belt with the engine running avoid loose clothing if possible, and use extreme caution.* 35 4

WARNING :*When doing checks and testing on the equipment hydraulics, follow the procedures as they are written. DO NOT change the procedure* 47 44

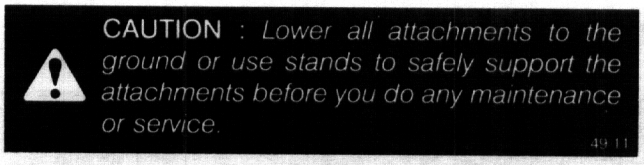
WARNING :*When putting the hydraulic cylinders on this machine through the necessary cycles to check operation or to remove air from a circuit, Make sure all people are out of the way.* 47 45

NOTE: *Operator's and Service Manuals may be obtained from your dealer.*



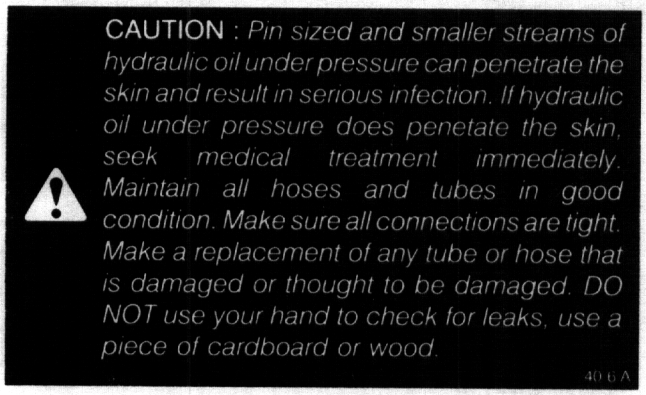
WARNING: *Always use heat protective gloves when handling heated parts.*

47.41A



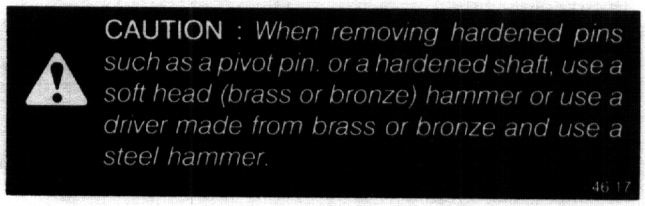
CAUTION : *Lower all attachments to the ground or use stands to safely support the attachments before you do any maintenance or service.*

49.11



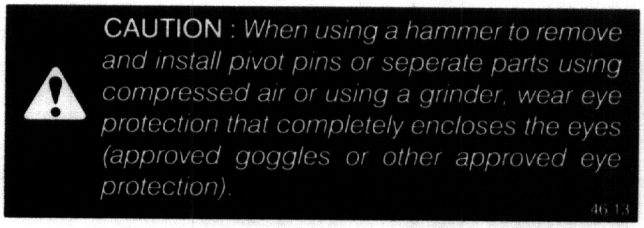
CAUTION : *Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. If hydraulic oil under pressure does penetate the skin, seek medical treatment immediately. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Make a replacement of any tube or hose that is damaged or thought to be damaged. DO NOT use your hand to check for leaks, use a piece of cardboard or wood.*

40.6A



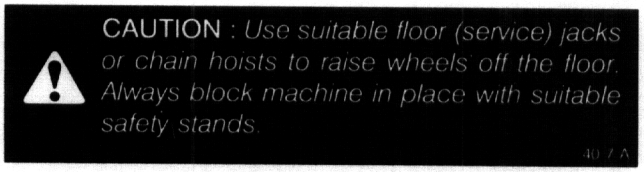
CAUTION : *When removing hardened pins such as a pivot pin. or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and use a steel hammer.*

46.17



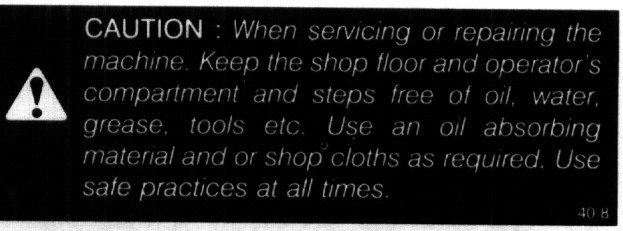
CAUTION : *When using a hammer to remove and install pivot pins or seperate parts using compressed air or using a grinder, wear eye protection that completely encloses the eyes (approved goggles or other approved eye protection).*

46.13



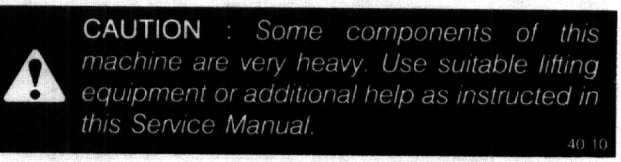
CAUTION : *Use suitable floor (service) jacks or chain hoists to raise wheels off the floor. Always block machine in place with suitable safety stands.*

40.7A



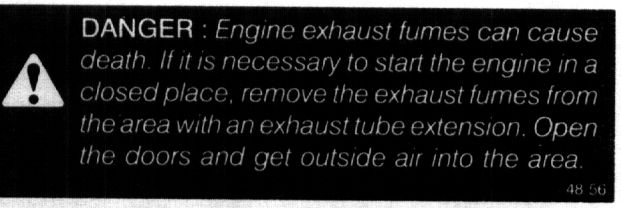
CAUTION : *When servicing or repairing the machine. Keep the shop floor and operator's compartment and steps free of oil, water, grease, tools etc. Use an oil absorbing material and or shop cloths as required. Use safe practices at all times.*

40.8



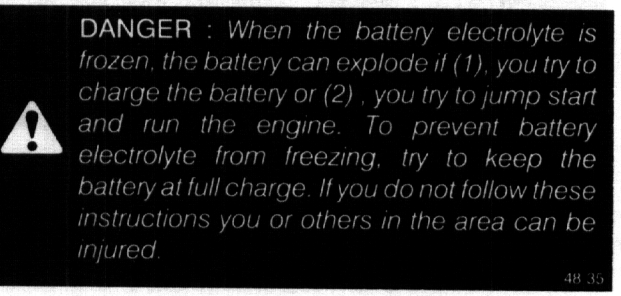
CAUTION : *Some components of this machine are very heavy. Use suitable lifting equipment or additional help as instructed in this Service Manual.*

40.10



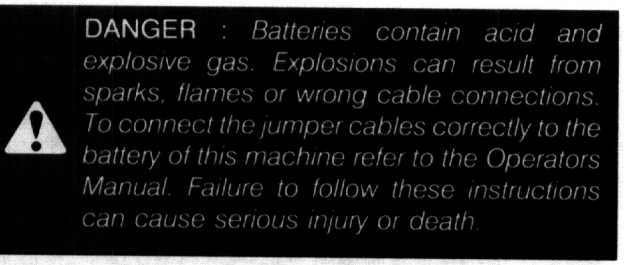
DANGER : *Engine exhaust fumes can cause death. If it is necessary to start the engine in a closed place, remove the exhaust fumes from the area with an exhaust tube extension. Open the doors and get outside air into the area.*

48.56



DANGER : *When the battery electrolyte is frozen, the battery can explode if (1), you try to charge the battery or (2) , you try to jump start and run the engine. To prevent battery electrolyte from freezing, try to keep the battery at full charge. If you do not follow these instructions you or others in the area can be injured.*

48.35



DANGER : *Batteries contain acid and explosive gas. Explosions can result from sparks, flames or wrong cable connections. To connect the jumper cables correctly to the battery of this machine refer to the Operators Manual. Failure to follow these instructions can cause serious injury or death.*

GENERAL INFORMATION

CLEANING

Clean all metal parts except bearings, in mineral spirits or by steam cleaning. Do not use caustic soda for steam cleaning. After cleaning, dry and put oil on all parts. Clean oil passages with compressed air. Clean bearings in kerosene, dry the bearings completely and put oil on the bearings.

INSPECTION

Check all parts when the parts are disassembled. Replace all parts that have wear or damage. Small scoring or grooves can be removed with a hone or crocus cloth. Complete visual inspection for indications of wear, pitting and the replacement of parts necessary, will prevent early failures.

BEARINGS

Check bearings for easy action. If bearings have a loose fit or rough action, replace the bearings. Wash bearings with a good solvent or kerosene and permit to air dry. DO NOT DRY BEARINGS WITH COMPRESSED AIR.

NEEDLE BEARINGS

Before you press needle bearings in a bore, always remove any metal protrusions in the bore or edge of the bore. Before you press bearings into position, put petroleum jelly on the inside and outside diameter of the bearings.

GEARS

Check all gears for wear and damage. Replace gears that have wear or damage.

OIL SEALS, O-RINGS AND GASKETS

Always install new oil seals, o-rings and gaskets. Put petroleum jelly on seals and o-rings.

SHAFTS

Check all shafts that have wear or damage. Check the bearing and oil seal surfaces of the shafts for damage.

SERVICE PARTS

Always install genuine Mitsubishi service parts. When ordering, refer to the Parts Catalog for the correct part number of the genuine replacement items. Failures due to the use of other than genuine Mitsubishi replacement parts are not covered by warranty.

LUBRICATION

Only use the oils and lubricants specified in the Operator's and Service Manuals. Failures due to the use of non-specified oils and lubricants are not covered by warranty.

STANDARD BOLT TORQUES

	Bolt Grade (Indicated on Bolt Head)			
Bolt Size	4T	6T	7T	8T
5 mm	2 to 3 Nm (1.5 to 2 lb ft)	4 to 5 Nm (3 to 4 lb ft)	5 to 6 Nm (4 to 4.5 lb ft)	6 to 7 Nm (4.5 to 5 lb ft)
6 mm	5 to 7 Nm (4 to 5 lb ft)	8 to 10 Nm (6 to 7.5 lb ft)	10 to 12 Nm (7.5 to 9 lb ft)	12 to 14 Nm (9 to 10.5 lb ft)
8 mm	12 to 17 Nm (9 to 12.5 lb ft)	20 to 25 Nm (15 to 18.5 lb ft)	25 to 29 Nm (18.5 to 21.5 lb ft)	29 to 34 Nm (21.5 to 25 lb ft)
10 mm	20 to 29 Nm (15 to 21.5 lb ft)	39 to 49 Nm (29 to 36 lb ft)	49 to 59 Nm (36 to 43.5 lb ft)	59 to 69 Nm (43.5 to 50 lb ft)
12 mm	44 to 54 Nm (32.5 to 40 lb ft)	69 to 78 Nm (50 to 58 lb ft)	83 to 93 Nm (61 to 68.5 lb ft)	93 to 107 Nm (69 to 79 lb ft)
14 mm	64 to 78 Nm (47 to 58 lb ft)	98 to 118 Nm (72.5 to 87 lb ft)	118 to 132 Nm (87 to 97.5 lb ft)	132 to 147 Nm (97.5 to 108.5 lb ft)
16 mm	88 to 108 Nm (65 to 80 lb ft)	127 to 147 Nm (94 to 108.5 lb ft)	152 to 172 Nm (112 to 127 lb ft)	176 to 196 Nm (130 to 144.5 lb ft)
18 mm	118 to 137 Nm (87 to 101 lb ft)	167 to 185 Nm (123 to 136.5 lb ft)	206 to 235 Nm (152 to 173.5 lb ft)	245 to 275 Nm (181 to 203 lb ft)
20 mm	147 to 167 Nm (108.5 to 123 lb ft)	196 to 216 Nm (144.5 to 159.5 lb ft)	235 to 275 Nm (173.5 to 203 lb ft)	314 to 353 Nm (231 to 260.5 lb ft)

STANDARD TORQUE DATA FOR REPLACEMENT NUTS AND BOLTS

Torque Specifications +/- 10%		
SIZE	GRADE 8.8	GRADE 10.9
5 mm	5.5 Nm (4 lb ft)	7.5 Nm (5.5 lb ft)
6 mm	9 Nm (7 lb ft)	12.5 Nm (9 lb ft)
8 mm	22.5 Nm (17 lb ft)	31.5 Nm (23 lb ft)
10 mm	44 Nm (32.5 lb ft)	62 Nm (46 lb ft)
12 mm	77.5 Nm (57 lb ft)	110 Nm (81 lb ft)
14 mm	120 Nm (88.5 lb ft)	170 Nm (125.5 lb ft)
16 mm	190 Nm (140 lb ft)	265 Nm (196 lb ft)
18 mm	260 Nm (192 lb ft)	365 Nm (269.5 lb ft)

GENERAL SPECIFICATIONS

Capacities

Engine oil capacity with filter change		
719 *	3.5 litres	3.7 US Quarts
723 *	3.5 litres	3.7 US Quarts
727 *	4.7 litres	5.0 US Quarts

NOTE: *Oil filter capacity is 0.5 litres (0.13 US Galls).*

Cooling System		
719 *	5.7 litres	6.0 US Quarts
723 *	5.3 litres	5.6 US Quarts
727 *	6.4 litres	6.8 US Quarts
Transmission & Hydraulic Oil		
719 *		
Gear Drive	19 litres	20.1 US Quarts
Hydrostatic Drive	18 litres	19.0 US Quarts
723 * and 727 *		
Gear Drive	24 litres	25.4 US Quarts
Hydrostatic Drive	22 litres	23.2 US Quarts
MFD Axle		
719 *	3.7 litres	3.9 US Quarts
723 * and 727 *	5 litres	5.3 US Quarts
Fuel Tank		
719 *	20 litres	5.2 US Gal
723 * and 727 *	30 litres	7.9 US Gal

NOTE: *Use the capacities listed above only as a guide. Always use the dipstick or level plug to make sure the units are filled to the correct level.*

Fuel Specifications

A.P.I. Gravity (Min)		34
Flash Point (Min)	60°C	140°F
Cloud Point (Wax Appearance Point) (Max)	-21°C	-5.8°F
Pour Point (Max)	-26°C	-14.8°F
Distillation Temperature, 90% Point	282 to 338°C	539 to 640°F
Viscosity at 38°C		
Centistokes		2.0 to 4.3
Saybolt seconds Universal		32 to 40
Cetane Number (Min)		43 (45 to 55 for winter or high altitudes)
Water and Sediment by Volume (Max)		0.05 of 1%
Sulfur, by weight (Max)		0.50 of 1%
Copper Strip Corrosion (Max)		No. 2
Ash, by weight (Max)		0.01 of 1%

Fuel Filter Cup Service Interval ..... Every 10 Hours
Fuel Filter Element Change ..... Replace when loss of power or misfiring occurs

Fuel Injectors
Valve Leakage Rate ..... No Leakage Permissible, Slight Moistening of the Nozzle Tip Is Allowed

Clutch Specifications

Type
Single ..... Diaphragm Type
Dual ..... Belleville Spring Type with Double Dry Plate

Plate Diameter

Single	200 mm	7.87 inch
Dual	215 mm	8.46 inch

Transmission Specifications

719 *
Gear Drive
Type ..... Partial Synchromesh, Selective Sliding Gear Type
Number of Gears ..... 6 forward, 2 reverse
Controls ..... 2 levers
Hydrostatic Drive
Type ..... Hydrostatic Transmission with two Selective Sliding Gear Type Range Shift Section
Number of Gears ..... 2 Speed Ranges
Controls ..... 1 Lever, 1 Pedal

723 * and 727 *
Gear Drive
Type ..... Synchromesh on Gear Shift with Three Ranges of Selective Sliding Gears
Number of Gears ..... 9 Forward, 3 Reverse
Controls ..... 2 Levers
Hydrostatic Drive
Type ..... Hydrostatic with Three Ranges of Selective Sliding Gears
Number of Gears ..... 3 Speed Ranges
Controls ..... 1 Lever, 1 Pedal

Hydraulic System Specifications

Hydraulic Pump Type ..... Front Mounted, Engine Driven, Pressure Loaded Gear Type

Maximum System Pressure
- Steering Pump ..... 13700 kPa 1987 psi
- (Main Pump) ..... 14700 kPa 2133 psi

Steering Pump Output at Rated Engine Speed
- 719 * ..... 11.9 L/min 3.1 US gpm
- 723 * and 727 * ..... 12.4 L/min 3.3 US gpm

Main Pump Output at Rated Engine Speed
- 719 * ..... 20.4 L/min 5.4 US gpm
- 723 * and 727 * ..... 27.6 L/min 7.3 US gpm

Remote Hydraulic Control Valve ..... One Double Acting Auxiliary Valve With Float Position

Electrical Specifications

Type of System ..... 12 Volts, Negative Ground

Batteries
- Number of Batteries Required 1
- Voltage of the Battery ..... 12 Volts
- Reserve Capacity ..... 70 Minutes
- Cold Cranking Capacity
  - 719 * ..... 410 Amperes
  - 723 * and 727 * ..... 480 Amperes

Starter Motor
- Manufacturer ..... Mitsubishi

	No Load Test at 20°C (68° F)				
	Voltage	Current Draw (Amps)	Armature Speed (rpm)	Minimum Brush Length	Armature End Play
719 * and 723 *	11	130	3850	13 mm (0.51 inch)	0 to 0.5 mm (0 to 0.02 inch)
727 *	11.5	100	3000	13 mm (0.51 inch)	0 to 0.5 mm (0 to 0.02 inch)

Alternator
- Manufacturer ..... Mitsubishi
- Output ..... 12 Volts at 40 Amperes

Steering Specifications

Type		Hydrostatic Type
Front Axle - MFD		
Toe-in adjustment	0 to 5 mm	0 to 0.20 inch
Steering Hand Pump		
Type		Eaton
Model		
719 *		261-9023-502
723 * and 727 *		261-9009-502
Displacement		
719 *	40 cm^3/rev	2.44 in^3/rev
723 * and 727 *	51 cm^3/rev	3.11 in^3/rev

ENGINE SPECIFICATIONS

Cylinder Block

Type		Sleeved
Material		Cast Iron
Bore		
719 *	76 mm	2.99 inch
723 *	82 mm	3.22 inch
727 *	84 mm	3.30 inch
Stroke		
719 *	78 mm	3.07 inch
723 *	78 mm	3.07 inch
727 *	90 mm	3.54 inch
Cylinder Liner out of Round (Maximum)	0.01 mm	0.0004 inch

Piston

Type		Solid
Material		Aluminium Alloy
Outside Diameter at Piston Skirt		
719 *	76 mm	2.99 inch
723 *	82 mm	3.22 inch
727 *	84 mm	3.30 inch

Piston Pin

Type		Full Floating
Diameter		
719 * and 723 *	23 mm	0.90 inch
727 *	27 mm	1.06 inch

Piston Ring Gap

Compression Rings

719 *	0.15 to 0.4 mm	0.006 to 0.016 inch
723 * and 727 *	0.2 to 0.4 mm	0.008 to 0.016 inch

Oil Control Ring

719 *	0.15 to 0.4 mm	0.006 to 0.016 inch
723 * and 727 *	0.3 to 0.45 mm	0.011 to 0.017 inch

Cylinder Head

Warpage (Maximum)	0.10 mm	0.004 inch

Connecting Rods

Connecting Rod Bushing ID

719 * and 723 *	23 mm	0.90 inch
727 *	27 mm	1.06 inch

Connecting Rod Bearing ID

719 * and 723 *	42 mm	1.65 inch
727 *	48 mm	1.89 inch

Bearing Oil Clearance	0.15 mm	0.006 inch
Connecting Rod Bend and Distortion (Maximum)	0.15 mm	0.006 inch

Camshaft

Valve Camshaft

Journal to Cylinder Block or Bush Clearance (Maximum)	0.15 mm	0.006 inch

Fuel Pump Camshaft

Camshaft Lobe Height	44 mm	1.73 inch

Gear Train

Backlash

Crankshaft Gear to Idler Gear	0.01 to 0.14 mm	0.0004 to 0.005 inch
Idler Gear to Valve Camshaft	0.01 to 0.14 mm	0.0004 to 0.005 inch
Idler Gear to Injection Pump Camshaft	0.01 to 0.14 mm	0.0004 to 0.005 inch

Intake Valve

Tappet Clearance (Cold)	0.25 mm	0.009 inch
Face Angle		45 degrees
Valve Head Edge Thickness (minimum)	0.5 mm	0.019 inch
Valve Recession Below Head Surface	0.5 mm	0.019 inch
Maximum Service Limit	1.5 mm	0.05 inch
Valve Stem to Guide Clearance	0.10 mm	0.003 inch

Exhaust Valve

Tappet Clearance (Cold)	0.25 mm	0.009 inch
Face Angle		45 degrees
Valve Head Edge Thickness (minimum)	0.5 mm	0.019 inch
Valve Recession Below Head Surface	0.5 mm	0.019 inch
Maximum Service Limit	1.5 mm	0.05 inch
Valve Stem to Guide Clearance	0.15 mm	0.005 inch

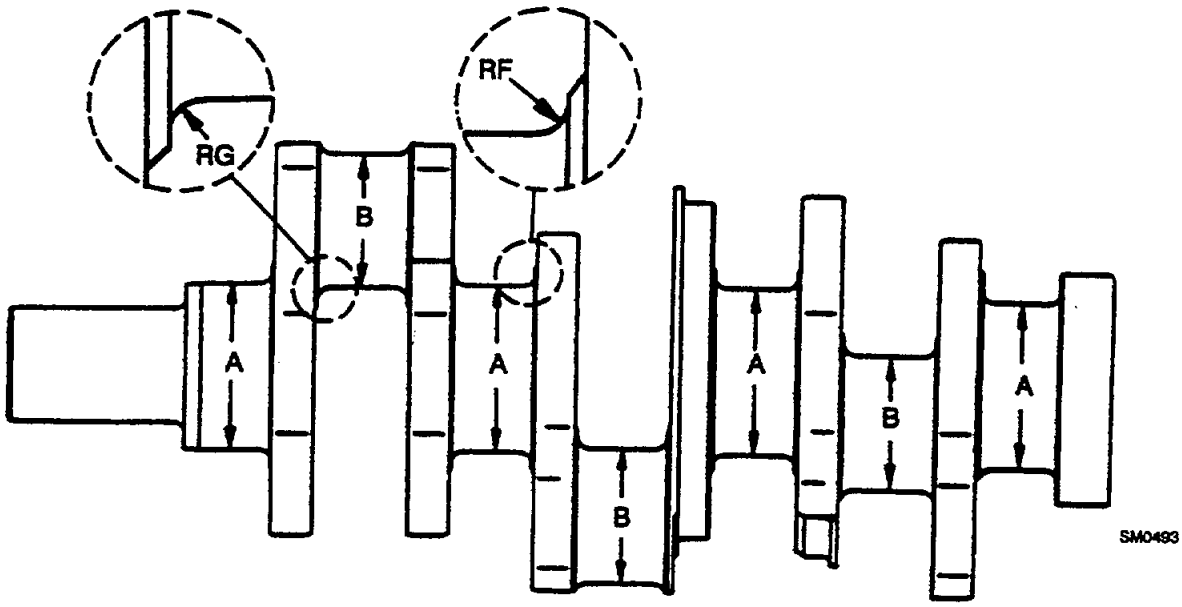
Valve Springs

Free Length		
719 * and 723 *	43 mm	1.69 inch
727 *	45.5 mm	1.79 inch

Crankshaft

Crankshaft Main Journals		
719 * and 723 *	52 mm	2.04 inch
727 *	58 mm	2.28 inch
Maximum Wear	0.85 mm	0.033 inch
Crankshaft Connecting Rod Journals		
719 * and 723 *	42 mm	1.65 inch
727 *	48 mm	1.88 inch
Maximum Wear	0.90 mm	0.035 inch
Crankshaft Main Bearing Clearance		
Service Limit	0.10 mm	0.003 inch
Crankshaft End Play		
719 * /723 * /727 *	0.05 to 0.205 mm	0.0019 to 0.008 inch
Connecting Rod Bearing Clearance		
Service Limit	0.15 mm	0.005 inch

Crankshaft Reconditioning Dimensions



Description	Limits for Undersize Crankshaft Grinding			
	719 * and 723 *		727 *	
	A	B	A	B
1st Undersize	51.750 mm (2.0374 inch)	41.750 mm (1.6437 inch)	56.710 mm (2.2327 inch)	47.750 mm (1.8799 inch)
0.25 mm (0.0098 inch)	51.650 mm (2.0334 inch)	41.735 mm (1.6431 inch)	56.695 mm (2.2321 inch)	47.600 mm (1.8740 inch)
2nd Undersize	51.500 mm (2.0275 inch)	41.500 mm (1.6338 inch)	56.460 mm (2.2228 inch)	47.500 mm (1.8700 inch)
0.50 mm (0.0196 inch)	51.400 mm (2.0236 inch)	41.485 mm (1.6332 inch)	56.445 mm (2.2222 inch)	47.350 mm (1.8641 inch)
3rd Undersize	51.250 mm (2.0177 inch)	41.250 mm (1.6240 inch)	56.210 mm (2.2130 inch)	47.250 mm (1.8602 inch)
0.75 mm (0.0295 inch)	51.150 mm (2.0137 inch)	41.235 mm (1.6234 inch)	56.195 mm (2.2124 inch)	47.100 mm (1.8543 inch)

Radius RF (Journals)	2.5 mm	0.098 inch
Radius RG (Crankpins)	2.5 mm	0.098 inch

SPECIAL TORQUES

Axle Support Bolts	49 to 59 Nm	36 to 43.5 lb ft
Clutch Cover Retaining Bolts	25 to 29 Nm	18.5 to 21.5 lb ft
Connecting Rod Nuts		
719 *	31 to 34 Nm	23 to 25 lb ft
723 *	31 to 34 Nm	23 to 25 lb ft
727 *	39 to 42 Nm	29 to 31 lb ft
Crankshaft Pulley Retaining Nut	197 to 245 Nm	145 to 181 lb ft
Cylinder Head Retaining Bolts		
M10	64 to 78 Nm	47 to 57.5 lb ft
M12	98 to 108 Nm	72 to 80 lb ft
M14	146 to 157 Nm	108 to 116 lb ft
Delivery Valve Holders	40 to 50 Nm	29.5 to 37 lb ft
Fender Support Bolts	83 to 93 Nm	61 to 69 lb ft
Fender Support to Axle Bolts	118 to 132 Nm	87 to 97.5 lb ft
Flywheel Retaining Bolts	112 to 122 Nm	82.5 to 90 lb ft
Front Wheel Bolts	118 to 132 Nm	87 to 97.5 lb ft
Fuel Injection Pump Retaining Bolts	10 to 13 Nm	7.5 to 9.5 lb ft
Fuel Tank Drain Bolt	12 to 17 Nm	9 to 12.5 lb ft
Glow Plug	13 to 19 Nm	9.5 to 14 lb ft
Injection Tube Nuts	24 to 34 Nm	18 to 25 lb ft
Injector Clamp Bolts	15 to 20 Nm	11 to 15 lb ft
Hitch Control Valve Retaining Bolts	19 to 24 Nm	14 to 18 lb ft
Hydraulic Lift Housing Retaining Bolts	49 to 59 Nm	36 to 43.5 lb ft
King Pin Lever Bolt	30 to 40 Nm	22 to 29.5 lb ft
Lift Cylinder Head Retaining Bolts		
719 *	83 to 93 Nm	61 to 68.5 lb ft
723 * and 727 *	206 to 225 Nm	152 to 166 lb ft
Main Bearing Cap Retaining Bolts	49 to 54 Nm	36 to 40 lb ft
MFD Differential Gear Retaining Bolts	41 to 49 Nm	30 to 36 lb ft
MFD Hub Retaining Bolts	49 to 59 Nm	36 to 43.5 lb ft
MFD Swivel Housing Retaining Bolts	49 to 59 Nm	36 to 43.5 lb ft
Power Arm Retaining Bolt	10 to 12 Nm	7.5 to 9 lb ft
Rear Axle Retaining Bolts		
719 *	83 to 93 Nm	61 to 69 lb ft
723 * and 727 *	118 to 132 Nm	87 to 97.5 lb ft
Remote Hydraulic Control Valve Retaining Bolts	19.5 Nm	14.5 lb ft
ROPS Bracket Bolts	83 to 93 Nm	61 to 69 lb ft
ROPS Frame Pivot Bolts	44 to 54 Nm	32.5 to 40 lb ft
ROPS Frame Lock Bolts	44 to 54 Nm	32.5 to 40 lb ft
Solenoid Locknut	40 to 50 Nm	29.5 to 37 lb ft
Starter Motor Mounting Bolts	49 to 59 Nm	36 to 43.5 lb ft
Steering Hand Pump End Cover Bolts	20 Nm	15 lb ft
Tie Rod Ball Joint Nut	30 to 40 Nm	22 to 29.5 lb ft
Tie Rod Locknuts	60 to 90 Nm	44 to 66.5 lb ft
Wrist Pin Retaining Bolts	10 to 12 Nm	7.5 to 9 lb ft

SECTION 2

ENGINE

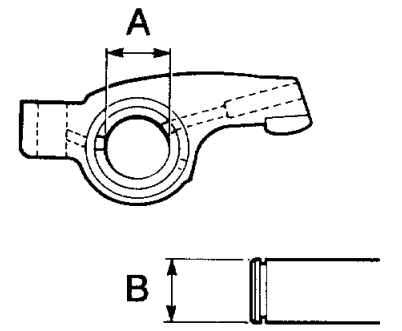
GENERAL ENGINE SPECIFICATIONS

Engine Type	
719 *	K3E-14R 3 Cylinder Diesel Indirect Injection
723 *	K3G-D14R 3 Cylinder Diesel Direct Injection
727 *	K3M-D14R 3 Cylinder Diesel Direct Injection
Number of Cylinders	3
Compression Ratio	
Direct Injection	18:1
Indirect Injection	23:1
Compression Between Each Cylinder	250 kPa 36 psi
Static Timming Advance	
Direct Injection - 723 * and 727 *	20° B T D C
Indirect Injection - 719 *	17°BTDC
Valve Clearance	
Cold	0.25 mm 0.0098 inch
Injection Order	1,3,2
Cylinder Head Gasket Material	
Direct Injection	Grafoil
Indirect Injection	Carbongraphite with Stainless Steel Grommets

SPECIFICATIONS

Rocker and Rocker Shaft

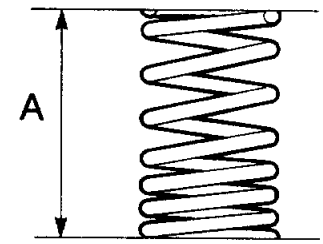
Dimension 'A'	18.8 to 18.9 mm 0.740 to 0.744 inch
Dimension 'B'	18.9 to 18.8 mm 0.744 to 0.740 inch



SM0552

Valve Springs

719 * and 723 *		
Free Length 'A'	42 mm	1.65 inch
727 * only		
Free Length 'A'	44.5 mm	1.75 inch

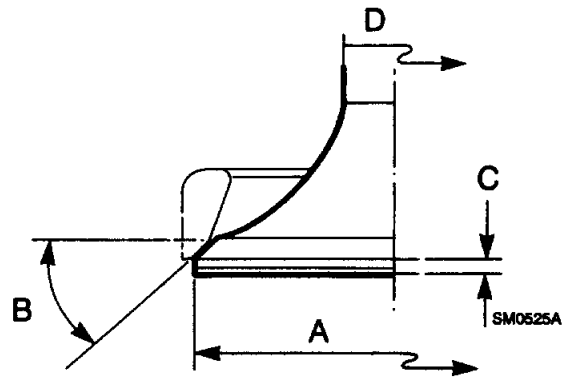


SM0553

Valves

Dimension

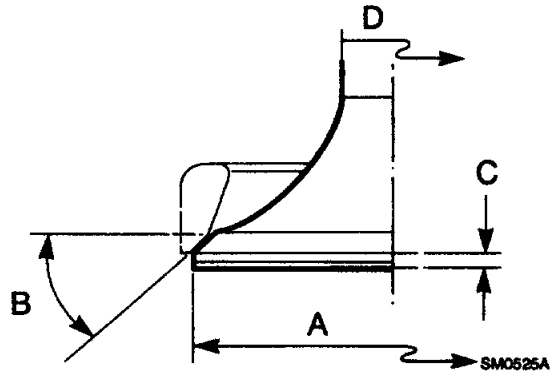
'A'(719 * and 723 *)	32.2 mm	1.27 inch
'A'(727 *)	34.0 mm	1.34 inch
'B'		45°
'C'		1.0 to 0.5 mm
		0.039 to 0.020 inch
'D'(719 * and 723 *)		6.0 to 6.55 mm
		0.24 to 0.26 inch
'D'(727 *)		8.0 to 7.95 mm
		0.314 to 0.312 inch



INTAKE VALVE

Dimension

'A'(719 * and 723 *)	27.2 mm	1.07 inch
'A'(727 *)	29.0 mm	1.14 inch
'B'		45°
'C'		1.0 to 0.5 mm
		0.039 to 0.020 inch
'D'(719 * and 723 *)		6.0 to 6.55 mm
		0.24 to 0.26 inch
'D'(727 *)		8.0 to 7.95 mm
		0.314 to 0.312 inch



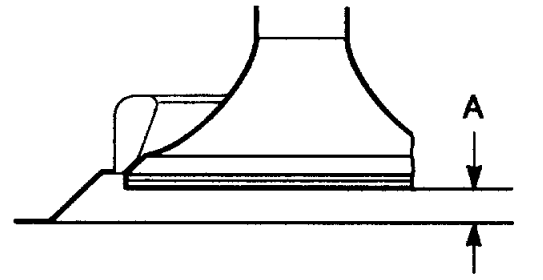
EXHAUST VALVE

Valve Seats

Valve Head Depth

Dimension 'A'	0.5 to 1.5 mm
	0.019 to 0.059 inch

NOTE: *To measure the valve seat dimension 'A' use a straight edge between the cylinder head surface and valve. A new valve must be used to achieve a correct measurement.*



Oil Pump

Type		Trochoid Pump
Drive		by the injection pump camshaft
Oil filter by-pass pressure	98 kPa	14.22 psi
Relief valve pressure	390 kPa	57 psi
Oil switch closing pressure	48 kPa	7 psi
Outer rotor to body clearance		
Dimension	0.15 to 0.3 mm	0.006 to 0.011 inch
Outer rotor to inner rotor clearance		
Dimension	0.05 to 0.24 mm	0.002 to 0.009 inch
Rotor to cover clearance		
Dimension	0.03 to 0.20 mm	0.001 to 0.007 inch

Pistons

Piston Ring End Gap

Compression Ring

719 * ..... 0.15 to 1.5 mm
0.006 to 0.060 inch

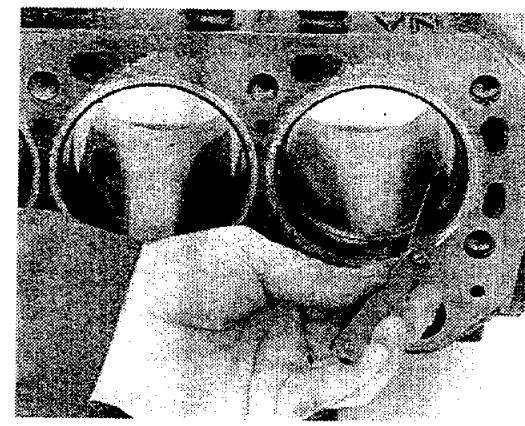
723 * and 727 * ..... 0.2 to 1.5 mm
0.007 to 0.060 inch

Oil Control Ring

719 * ..... 0.15 to 1.5 mm
0.006 to 0.060 inch

723 * and 727 * ..... 0.3 to 1.5 mm
0.011 to 0.060 inch

NOTE: *Make the measurement with new piston rings.*


E05022

Piston Ring Groove

719 *

1st compression ring groove 0.20 to 0.30 mm
0.0078 to 0.011 inch

2nd compression ring groove 0.05 to 0.20 mm
0.0019 to 0.0078 inch

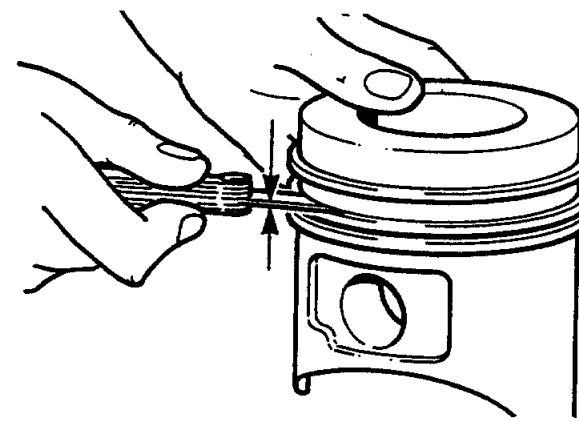
Oil control ring groove ..... 0.03 to 0.20 mm
0.0011 to 0.0078 inch

723 * and 727 *

1st compression ring groove 0.06 to 0.30 mm
0.0023 to 0.011 inch

2nd compression ring groove 0.07 to 0.20 mm
0.0027 to 0.0078 inch

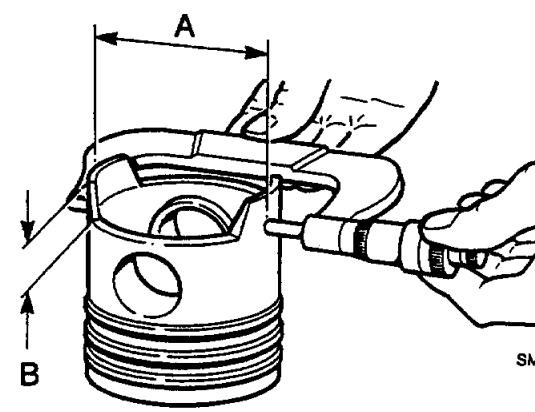
Oil control ring groove ..... 0.05 to 0.20 mm
0.0019 to 0.0078 inch


SM0527

Piston Diameter Wear

Out of round tolerance 'A' ..... 0.30 mm
0.011 inch

Measuring point 'B' ..... 10.0 mm
0.39 inch



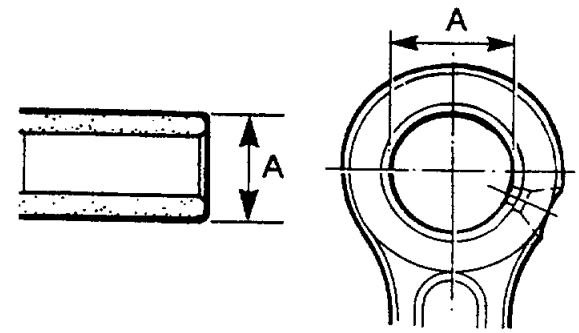
SM0528

Piston Pin and Small End Bushing

Dimension 'A''

719 * and 723 * .....23.041 to 22.991 mm
0.907 to 0.905 inch

727 * .....27.041 to 26.991 mm
1.064 to 1.062 inch



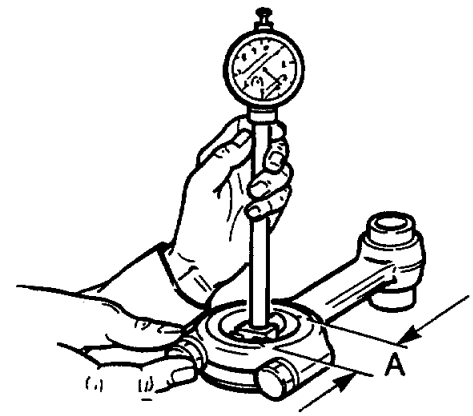
SM0554

Connecting Rod

Connecting Rod Bearings (with bearings 'A' installed)

719 * and 723 * ..... 42.0 to 42.15 mm
1.653 to 1.659 inch

727 * ..... 48.0 to 48.15 mm
1.889 to 1.895 inch



SM0535

Crankshaft

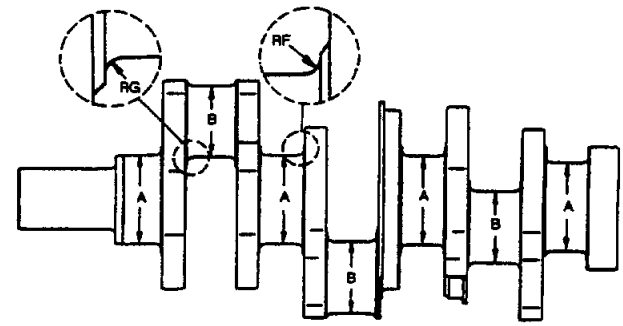
Material

Standard Crank: Made of carbon steel with journals, pins and oil seal areas induction hardened to improve wear resistance and durability.

Machining

Use the table showing the grinding tolerance to service the crankshaft.

NOTE: *All fillet radii (RG and RF) should be ground to 2.5 mm.*



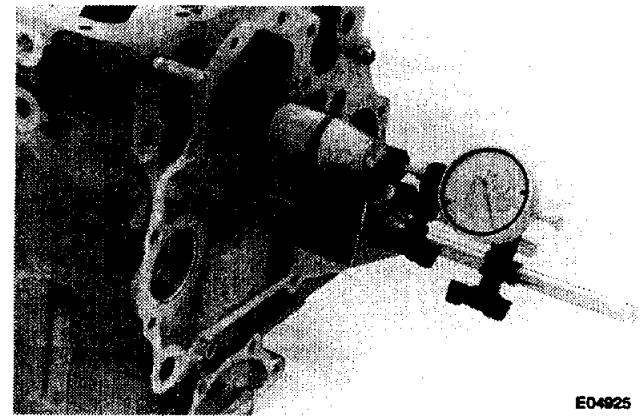
SM0493A

NOTE: *When checking for crankshaft wear measure as shown using a micrometer.*

Description	Limits for Undersize Crankshaft Grinding			
	719 * and 723 *		727 *	
	A	B	A	B
1st Undersize	51.750 mm (2.0374 inch)	41.750 mm (1.6437 inch)	**56.710 mm (2.2327 inch)**	47.750 mm (1.8799 inch)
0.25 mm (0.0098 inch)	51.650 mm (2.0334 inch)	41.735 mm (1.6431 inch)	**56.695 mm (2.2321 inch)**	47.600 mm (1.8740 inch)
2nd Undersize	51.500 mm (2.0275 inch)	41.500 mm (1.6338 inch)	**56.460 mm (2.2228 inch)**	47.500 mm (1.8700 inch)
0.50 mm (0.0196 inch)	51.400 mm (2.0236 inch)	41.485 mm (1.6332 inch)	**56.445 mm (2.2222 inch)**	47.350 mm (1.8641 inch)
3rd Undersize	51.250 mm (2.0177 inch)	41.250 mm (1.6240 inch)	**56.210 mm (2.2130 inch)**	47.250 mm (1.8602 inch)
0.75 mm (0.0295 inch)	51.150 mm (2.0137 inch)	41.235 mm (1.6234 inch)	**56.195 mm (2.2124 inch)**	47.100 mm (1.8543 inch)

Crankshaft End Play

End Play Tolerance ..... 0.05 to 0.50 mm
0.0019 to 0.019 inch



E04925

Camshaft

Engine Camshaft

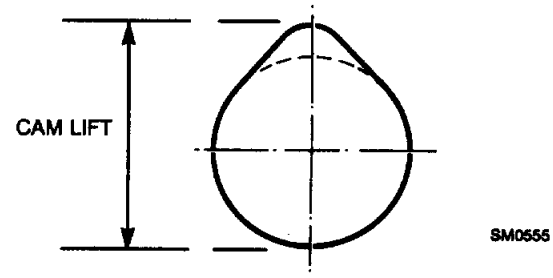
INTAKE and EXHAUST cam lift.
New
719 * ..... 35.76 to 34.76 mm
1.407 to 1.368 inch

723 * and 727 * ..... 35.72 to 34.72 mm
1.406 to 1.366 inch

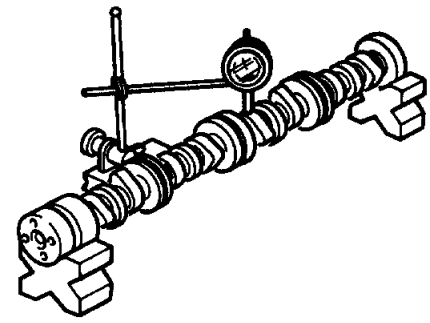
Camshaft Journal Tolerance
Front (bushing)..... 45.0 to 44.95 mm
1.771 to 1.769 inch

Center..... 44.0 to 43.925 mm
1.732 to 1.729 inch

Rear..... 34.0 to 33.925 mm
1.338 to 1.335 inch



SM0555



SM0530

CHECKING CAMSHAFT WEAR

Injection Pump Camshaft

Injection Pump Cam Lift.....44.0 to 43.0 mm
1.732 to 1.692 inch

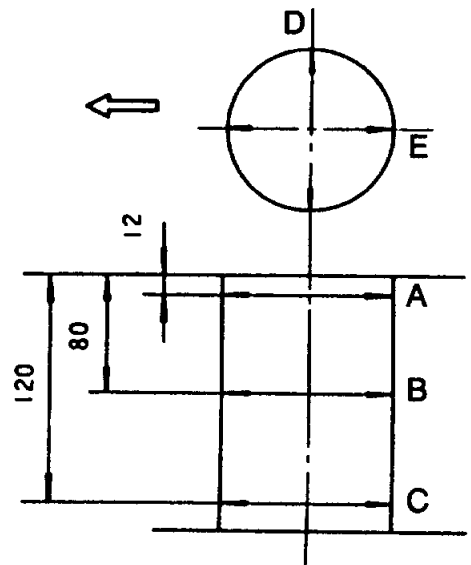
Camshaft Journal Tolerance
Rear..... 25.0 to 24.925 mm
0.984 to 0.981 inch

Coupling Groove Tolerance
Width ..... 5.0 to 4.5 mm
0.196 to 0.177 inch

Cylinder Block

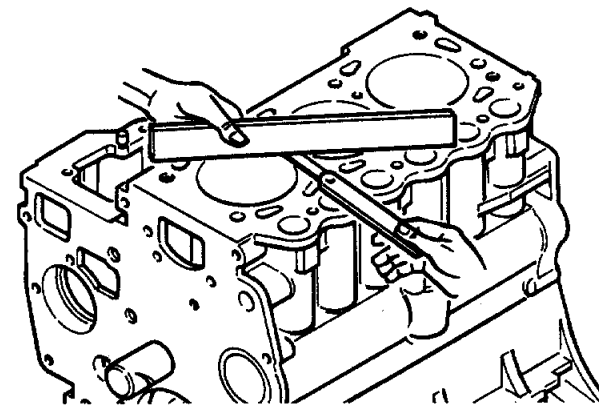
(A), (B), (C) to be within ..... 0.01 to 0.20 mm
0.00039 to 0.00787 inch

D & E Out of round ..... 0.01 mm
0.00039 inch



Cylinder Block (Cont.)

Cylinder Block Distortion ..... 0.05 to 0.10 mm
0.0019 to 0.0039 inch



SM0489

Cooling System

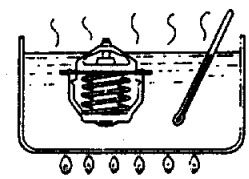
Thermostat (A) Wax Type
Start to open ..... 82.0 ± 1.5°C 179 ± 2.7°F

Fully open..... 8 mm lift at 95°C
0.135 inch lift at 203°F

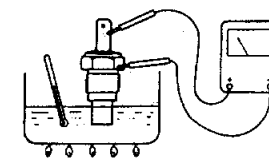
Sender unit (with water above 70°C (158°F))

Temperature	Resistance
70°C (158°F).....	104 ± 13.5 ohms
115°C (239°F).....	23.8 ± 2.5 ohms

Cooling Fan ..... 5 blades
Fan belt deflection with 10 Kg
(22 inch pounds) pull..... 10 to 12 mm
0.39 to 0.47 inch



SM0507A



SM0570

Fuel System

FUEL SYSTEM

Injection Order		1, 3, 2
Fuel Tank Capacity (719 *)	20 litres	5.28 U.K. gal
Fuel Tank Capacity (723 * and 727 *)	30 litres	7.93 U.K. gal

FUEL PUMP

Type		Electromagnetic Diaphram Type
Pump Delivery	370 cm^3/min	22.57 in^3/min

INJECTION PUMP

Type	Bosch M type
Model	ND-PFR3M
Pump Timing (719 *)	17° B.T.D.C.
Pump Timing (723 * and 727 *)	20° B.T.D.C.

INJECTOR

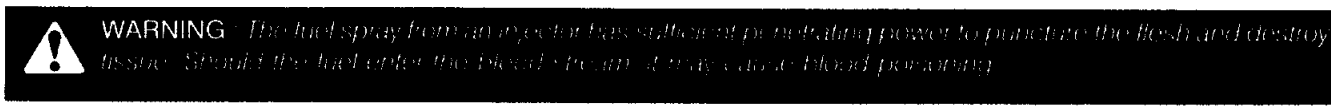
Nozzle Opening Pressure (719 *)	11800 to 12700 kPa	1706 to 1848 psi
Nozzle Opening Pressure (723 * and 727 *)	16700 to 17700 kPa	2418 to 2560 psi

SPECIAL TORQUES

Cylinder Head Retaining Bolt		
M14	146 to 157 Nm	107.7 to 115.8 lb ft
M12	98 to 108 Nm	72.3 to 79.7 lb ft
Crankshaft pulley retaining bolt	197 to 245 Nm	145.3 to 180.8 lb ft
Main bearing cap retaining bolt	49 to 54 Nm	36.1 to 39.8 lb ft
Connecting rod end cap retaining nut		
719 * and 723 *	31 to 34 Nm	22.8 to 25.0 lb ft
727 *	39 to 42 Nm	28.7 to 30.9 lb ft
Flywheel retaining bolt	127 to 135 Nm	93.7 to 99.6 lb ft
Glow plug	13 to 19 Nm	9.5 to 14.0 lb ft
Fuel Tank Drain Plug	12 to 17 Nm	9 to 12.5 lb ft
Fuel Injection Pump Retaining Bolts	10 to 13 Nm	7.5 to 9.5 lb ft
Delivery Valve Holders	40 to 50 Nm	29.5 to 37 lb ft
Fuel Injection Tube Nuts	24 to 34 Nm	18 to 25 lb ft
Injector Clamp Bolts	15 to 20 Nm	11 to 15 lb ft
Solenoid Locknut	40 to 50 Nm	29.5 to 37 lb ft

SAFETY RULES

IMPORTANT : *When testing or adjusting fuel injectors, do not place your hands or arms in front of the injector nozzles.*



In the event of the skin being punctured from the discharge of an injector, apply the following first aid immediately, then have the injury examined by a physician as quickly as possible.

Wash the injured part with a boric acid solution, support the injured finger or hand with a splint and sling so the injured part will remain absolutely at rest until a physician can examine it.

ENGINE REMOVAL

HOOD, PANELS, INSTRUMENT PANEL AND INSTRUMENT CLUSTER

Removal and Installation

[1]

Park the machine on hard, level ground. Apply the parking brake and stop the engine. Put blocks in front of and behind the rear wheels.

[2]

Disconnect the battery, negative (−) terminal first.

NOTE : *For Installation, install and tighten the positive (+) terminal first.*

[3]

Raise the hood and remove the side panels (1).

[4]

Remove nut (2) and remove the hood (3).

NOTE: *For Installation, tighten nut (2) and then back the nut off ¼ of a turn.*

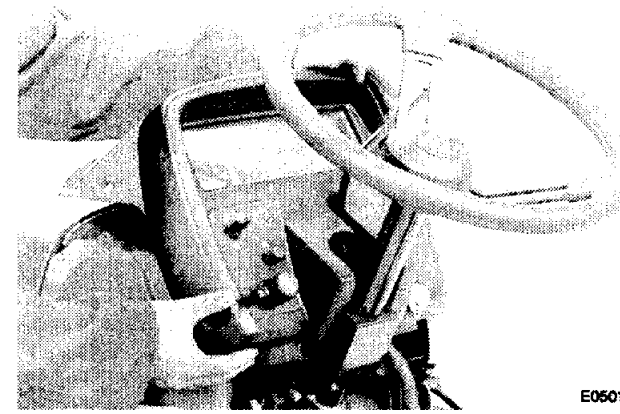
[5]

Remove bolts (4), disconnect the headlamps connectors from the front grille and remove the front grille (5).

[6]

Remove screws (6) and remove cover (7).

[7]



E05019

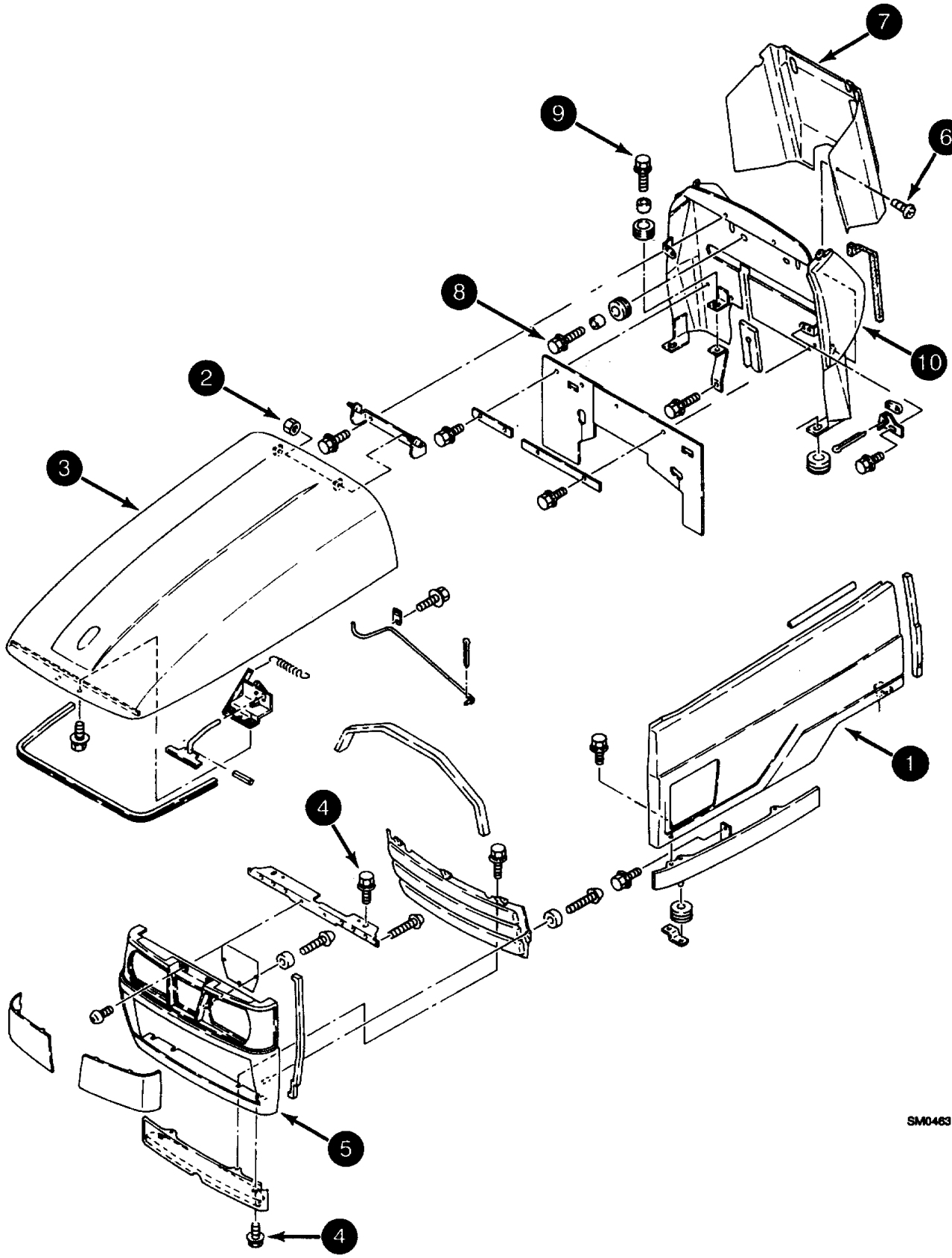
Remove the instrument cluster retaining screws and raise the instrument cluster slightly. Disconnect the tachometer cable and the engine harness. Remove the instrument cluster.

[8]

Remove the bolts (8 and 9) and remove the steering column cover (10).

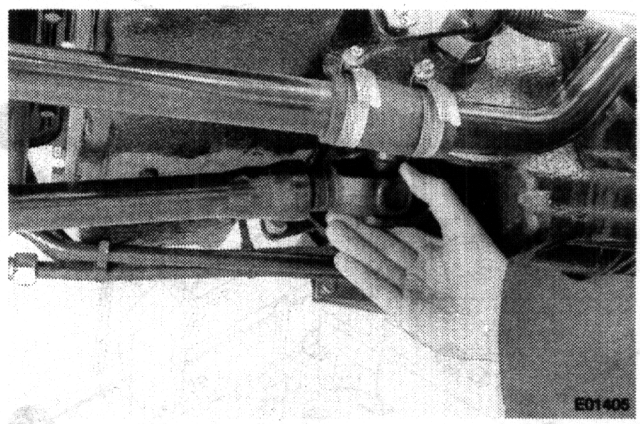
NOTE: *For Installation, follow the same procedure in reverse order.*

NOTE: *Items are numbered in order of Disassembly.*



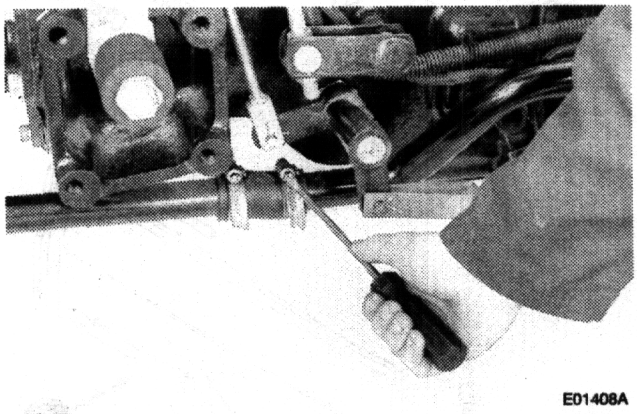
Separating the Engine from the Transmission

[1]



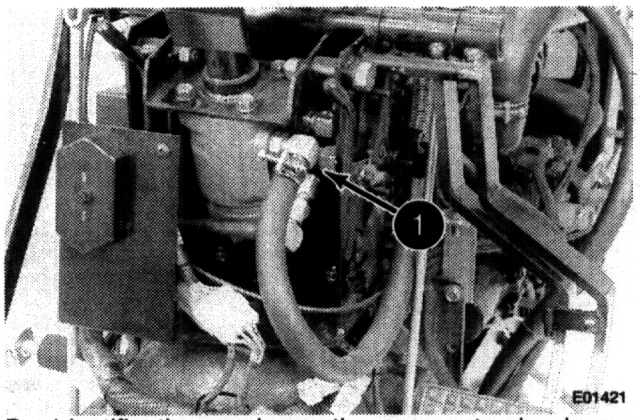
Remove the MFD drive shaft, refer to Section 6, Page 134.

[2]



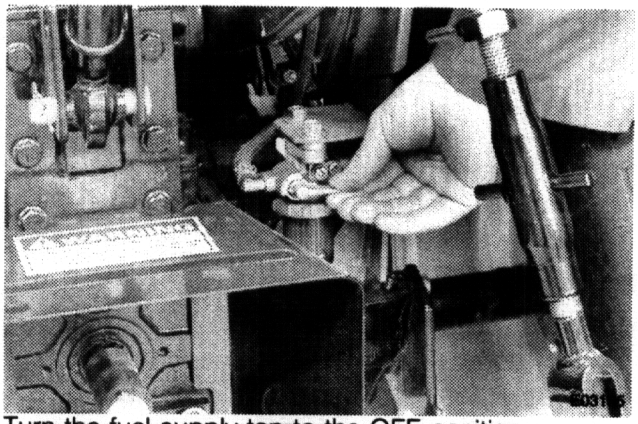
Disconnect and cap the hydraulic pump supply tube.

[3]



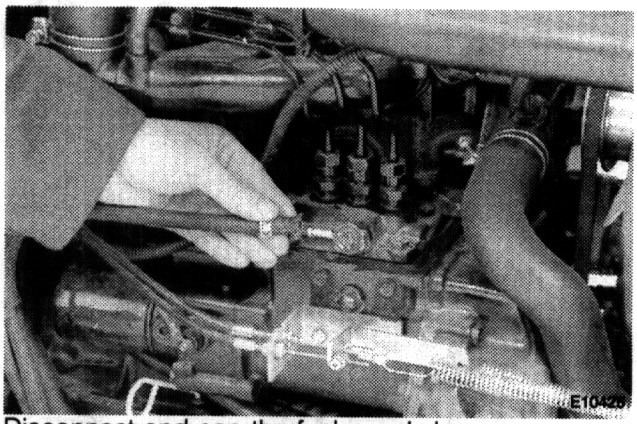
Put identification marks on the power steering hoses (1). Disconnect and cap the power steering hoses.

[4]



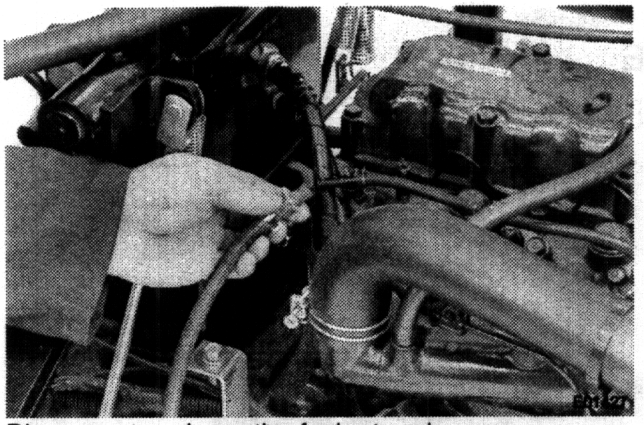
Turn the fuel supply tap to the OFF position.

[5]



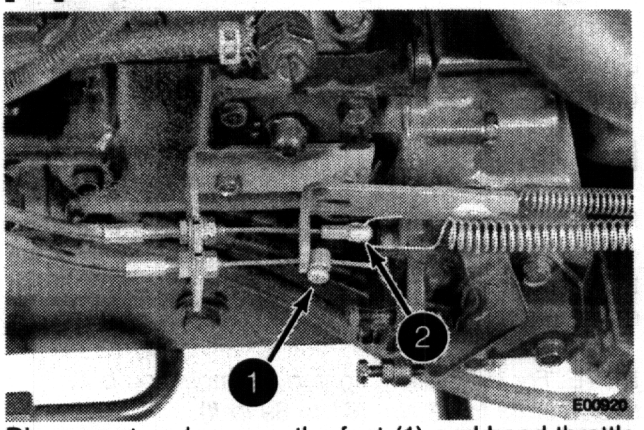
Disconnect and cap the fuel supply hose.

[6]



Disconnect and cap the fuel return hose.

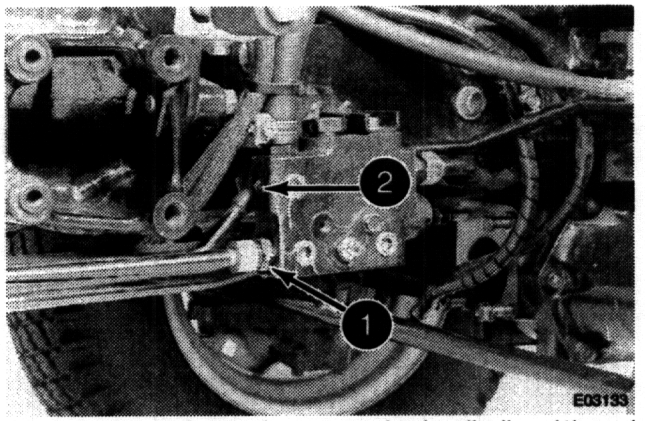
[7]



Disconnect and remove the foot (1) and hand throttle (2) cables.

NOTE: *For Installation, refer to Section 8 for Cable Adjustments.*

[8]



Disconnect and cap the tractor hydraulic line (1) and return tube (2).

[9]

Disconnect the main harness from the tractor engine.

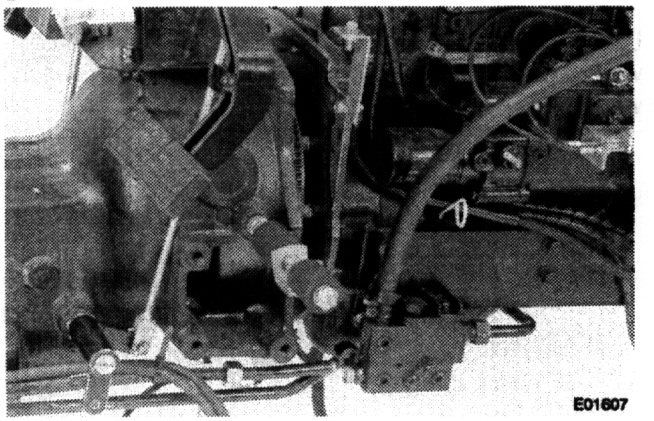
[10]

Put wooden wedges in between the front axle and the front bolster.

[11]

Support the tractor on suitable splitting stands.

[12]



Remove the clutch housing to engine retaining bolts and carefully separate the tractor.

[13]

Support the two halves of the tractor on suitable stands.

[14]

For Assembly, follow the same procedure in reverse order.

NOTE: *For Assembly, clean the engine and transmission mounting faces and apply a continuous bead of Loctite 515 to the engine mounting face.*

[1]

Remove the air inlet hose and the exhaust.

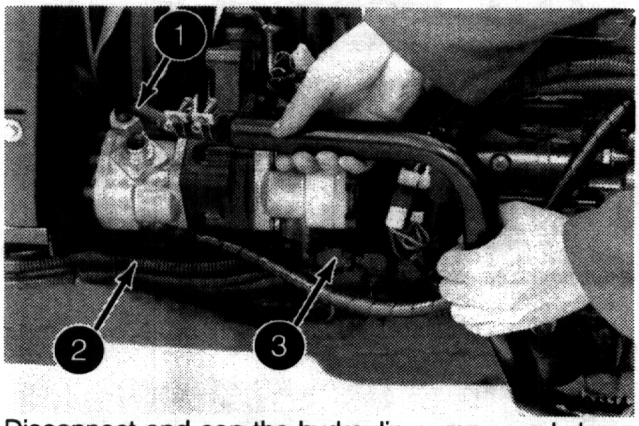
[2]

Remove the radiator, refer to Page 46.

[3]

Label and disconnect the starter motor, alternator, water temperature sender and oil pressure switch wires.

[4]



Disconnect and cap the hydraulic pump supply hose (1) and feed hoses (2) and (3).

[5]

Put blocks under the engine side rails and support the engine using suitable lifting equipment. Remove the two front and the four left hand and four right hand mounting bolts. Carefully remove the engine.

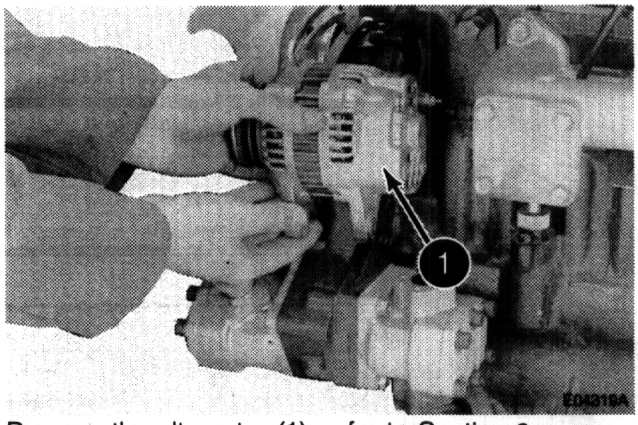
NOTE: *For Installation, tighten the mounting bolts to a torque of 83 to 93 Nm (61 to 69 lb ft).*

NOTE: *For Installation, follow the same procedure in reverse order.*

CYLINDER HEAD

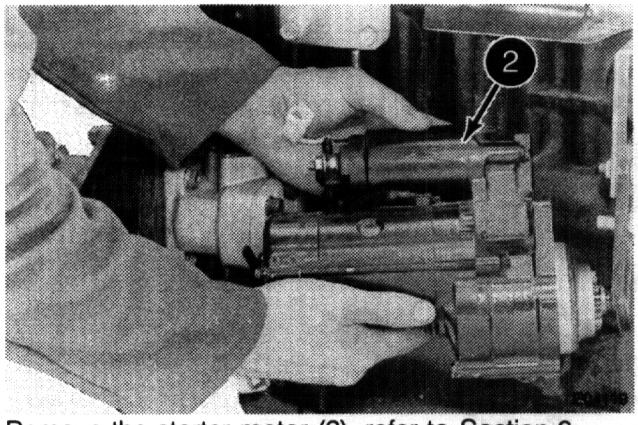
Removal and Installation

[1]



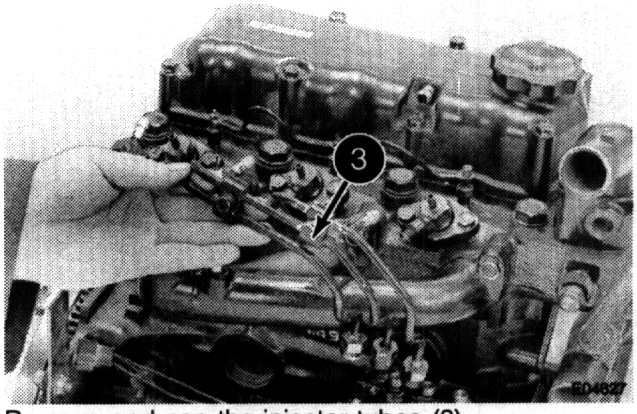
Remove the alternator (1), refer to Section 6.

[2]



Remove the starter motor (2), refer to Section 6.

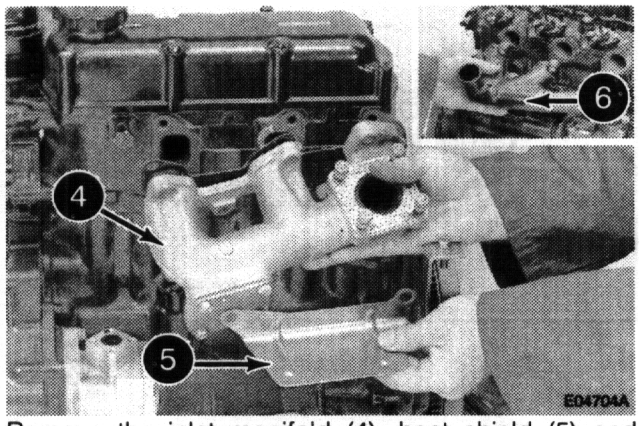
[3]



Remove and cap the injector tubes (3).

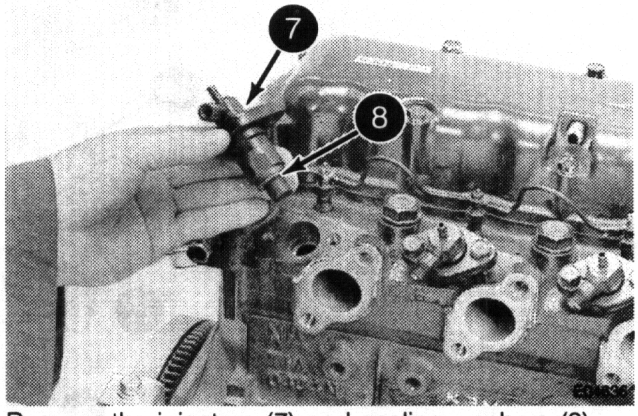
NOTE : *For Installation, tighten the injector tube nuts to a torque of 24 to 34 Nm (18 to 25 lb ft).*

[4]



Remove the inlet manifold (4), heat shield (5) and exhaust manifold (6).

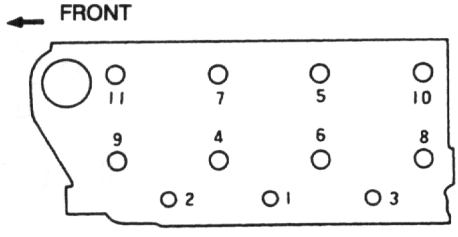
[5]



Remove the injectors (7) and sealing washers (8).

NOTE: *For Installation, install new sealing washers (8).*

[6]

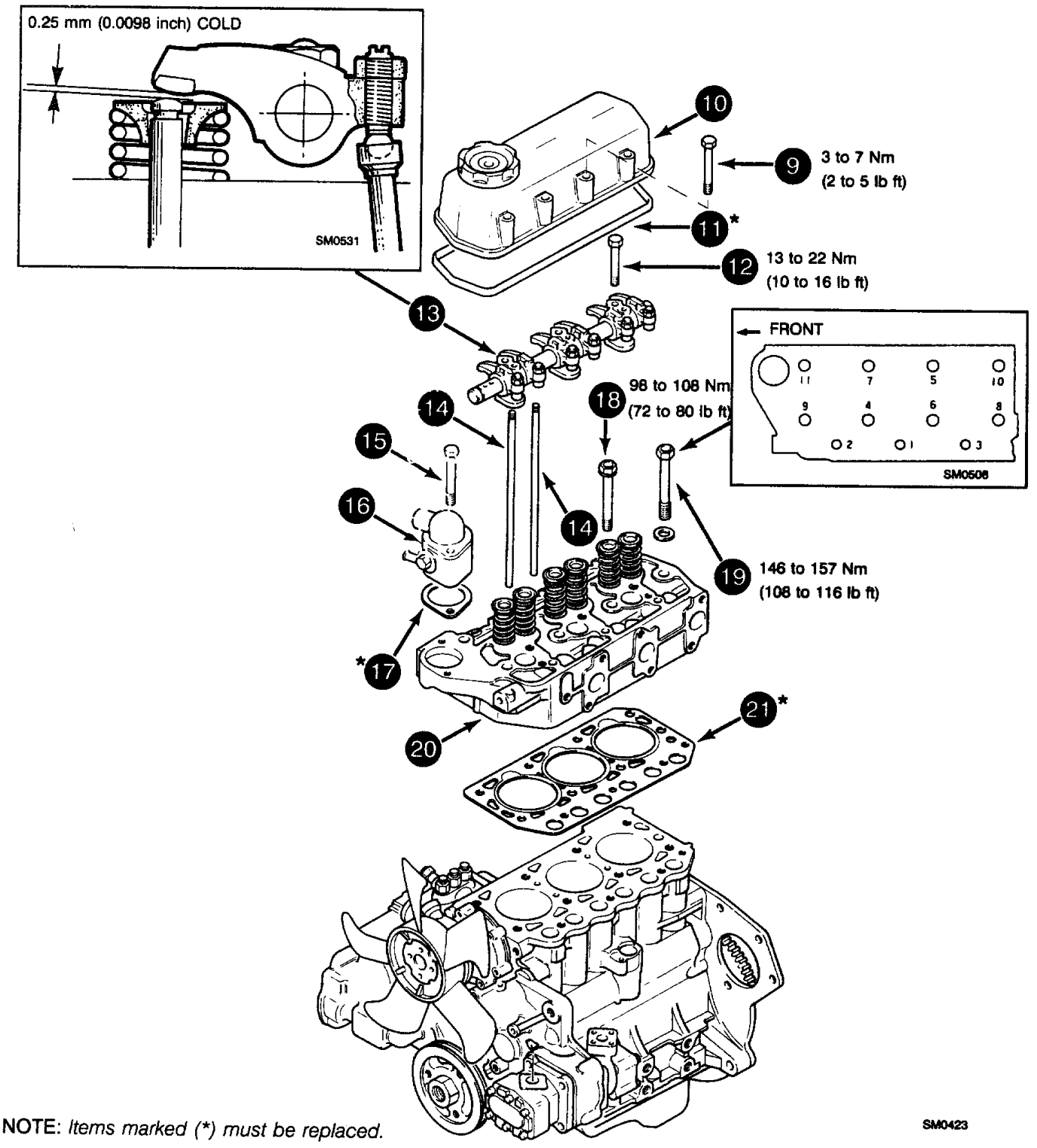


Remove items (9) to (21).

NOTE: *Tighten items (18) and (19) in the sequence shown.*

NOTE: *For Installation, tighten the cylinder head bolts (18) to a torque of 98 to 108 Nm (72 to 80 lb ft) and cylinder head bolts (19) to a torque of 146 to 157 Nm (108 to 116 lb ft).*

NOTE: *For Installation, follow the same procedure in reverse order.*



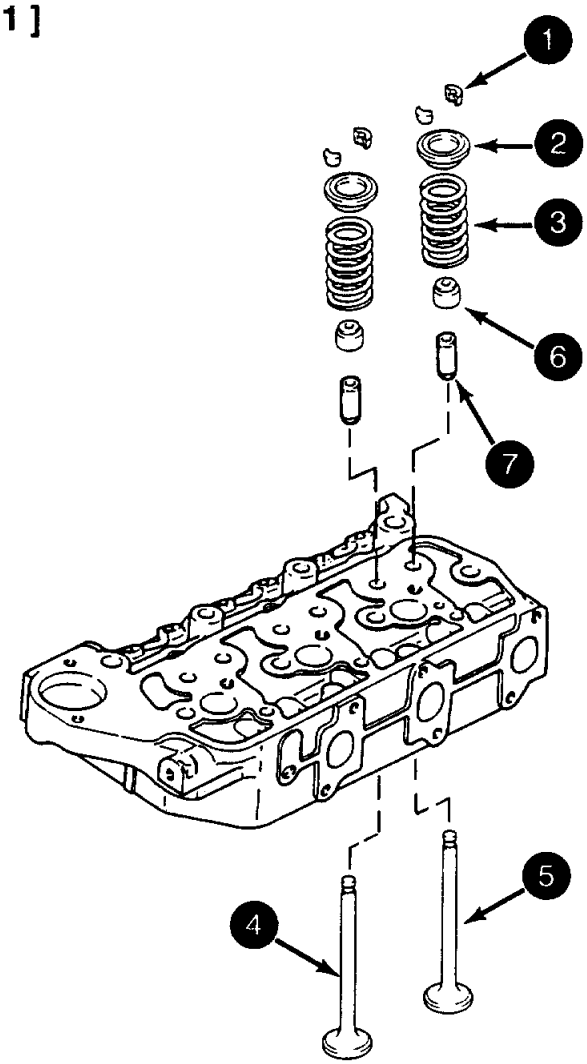
NOTE: *Items marked (*) must be replaced.*

NOTE: *Items are numbered in order of Removal.*

9. RETAINING BOLT
10. ROCKER COVER
11. GASKET
12. RETAINING BOLT
13. ROCKER ARM ASSEMBLY
14. PUSH RODS
15. RETAINING BOLT
16. THERMOSTAT HOUSING
17. GASKET
18. CYLINDER HEAD BOLT
19. CYLINDER HEAD BOLT
20. CYLINDER HEAD
21. CYLINDER HEAD GASKET

SERVICING THE CYLINDER HEAD

[1]

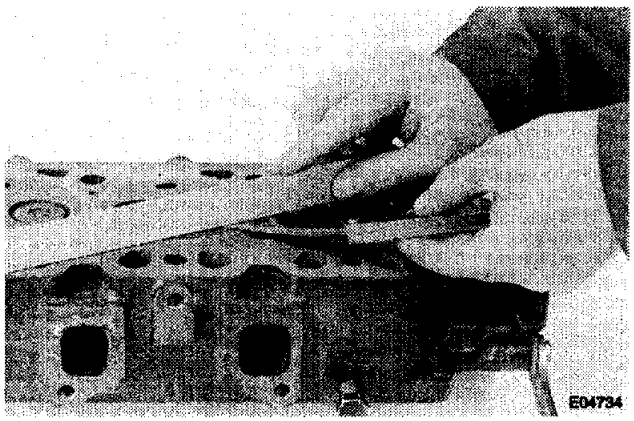


1. SPRING COLLETS
2. SPRING RETAINER
3. SPRING
4. INTAKE VALVE
5. EXHAUST VALVE
6. VALVE STEM OIL SEAL
7. VALVE GUIDE

Remove items (1 to 7). Use a valve spring compressor to remove item (3).

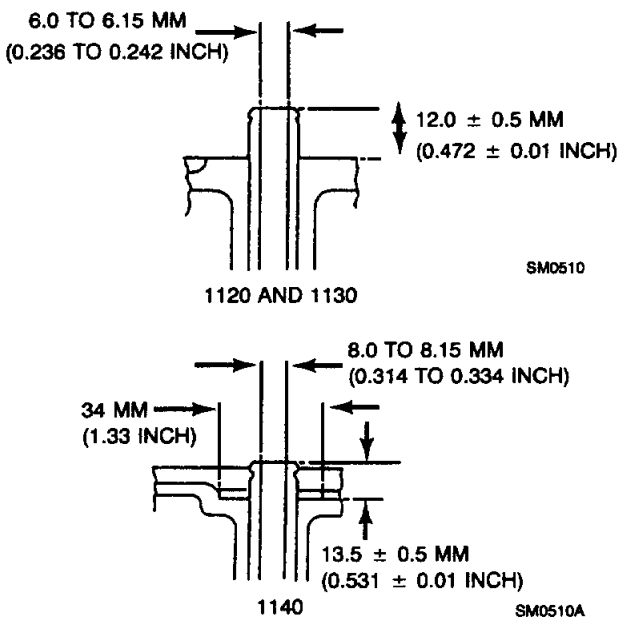
NOTE: *Repeat this procedure for the other valves.*

[2]



Using a straight edge and a feeler gauge check the cylinder head for warpage. If the warpage is more than 0.10 mm (0.0039 inch), replace the cylinder head.

[3]



If the valve guides are damaged or worn replace the valve guides.

IMPORTANT: *For valve guide installation, follow the procedure below.*

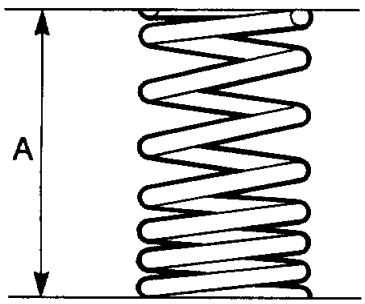
719 *

Use a hydraulic press, press in new valve guides to the dimensions shown above from the bottom of the cylinder head to the top of the valve guide.

723 * and 727 *

Use a hydraulic press, press in new valve guides to the dimensions shown above from the top of the cylinder head to the bottom of the valve guide.

[4]

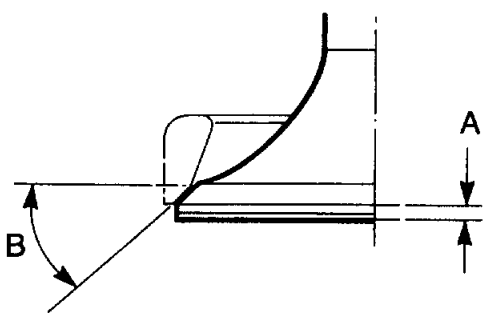


SM0553

Check the free length of the valve springs dimension 'A', replace the valve springs if the measurement is less than:

719 * and 723 *	42 mm	1.65 inch
727 *	44.5 mm	1.75 inch

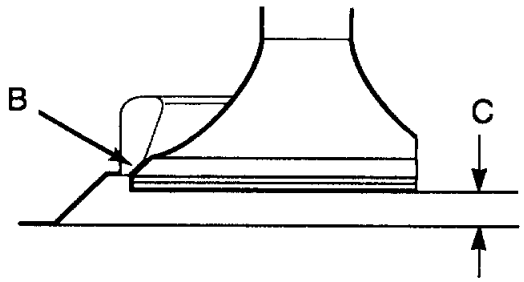
[5]



SM0525

Check the intake and exhaust valves for damage or wear. The valves can be cut to an angle of 45° 'B' using a valve cutting tool.
If after cutting the valve tolerance 'A' is 0.5 mm (0.01 inch) or less, the valve must be replaced.

[6]

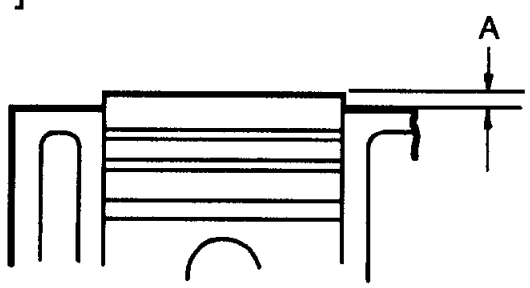


SM0512B

Check the valve seat 'B' for wear, cut the valve seat to an angle of 45° using a valve seat cutter.
Using a new valve check measurement 'C'. If measurement 'C' is more than 1.5 mm (0.060 inch), the cylinder head must be replaced.

NOTE: *For Assembly, follow the same procedure in reverse order.*

[7]



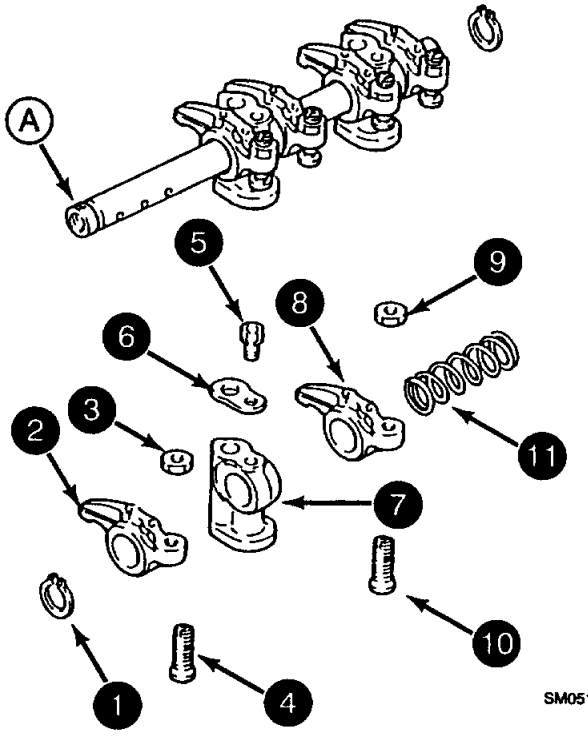
SM0598

With the piston at TDC use a dial gauge to check the piston protusion 'A'. If the piston protusion is more than 1.25 mm (0.049 inch) , check the connecting rod liners, refer to Page 27, piston pin and piston pin bushing for wear, refer to Page 39.

NOTE: *Use the same procedure to check each piston for protusion.*

Disassembly and Assembly

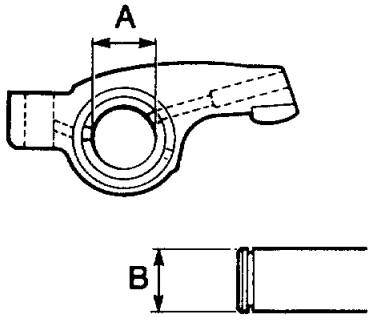
[1]



SM0513

Make a note of the position of the identification mark (A) on the rocker shaft and remove items (1) to (11). Repeat the procedure for all the rocker arms.

[2]



SM0552

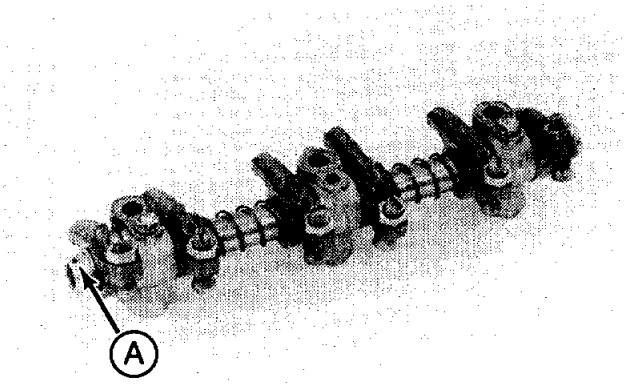
Check the rocker arm dimension 'A' and the rocker shaft dimension 'B'.

Dimension 'A' ..... 18.8 to 18.9 mm
0.740 to 0.744 inch

Dimension 'B' ..... 18.9 to 18.8 mm
0.744 to 0.740 inch

If dimensions 'A' or 'B' are out of tolerance, the worn parts must be replaced.

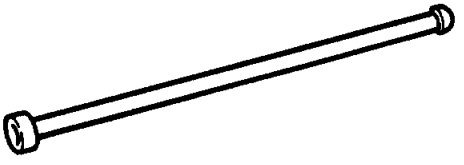
[3]



E04736

The rocker shaft identification mark (A) must be at the front on assembly as shown.

[4]



SM0556

Replace the push rod if it is found to be bent, damaged or worn.

NOTE: *For Assembly, follow the same procedure in reverse order. Use clean engine oil to lubricate all parts on assembly.*