

Renault Engines

1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER

GENERAL SPECIFICATIONS										
Year	Displ.		Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke	
	cu. ins.	cc					in.	mm	in.	mm
1969-72 821-02/04	95.5	1565	1x2-Bbl.	70@5200	85@2500	8.6-1	3.03	77	3.31	84
1971-73 821-10/11 821-15/16	95.5	1565	1x2-Bbl.	75.5@5000	95@3000	8.6-1	3.03	77	3.31	84
1973 841-10/11 841-15/16	100.5	1642	1x2-Bbl.	71@5000	89@5000	7.5-1	3.11	79	3.31	84

ENGINE IDENTIFICATION

Engine type and number are stamped on a plate riveted to left side of engine on R-12 and R-15 and on right side of engine of R-16. First five digits indicate engine type.

Model No.	Model Name	ⓐ Engine Type
R-1172	R-12	821-10/11
R-1331	R-12	821-10/11
R-1178	R-12	841-10/11
R-1332	R-12	841-10/11
R-1301	R-15	821-15/16
R-1304 (Calif. Only)	R-15	841-15/16
R-1152	R-16	821-02
R-1153	R-16	821-04

ⓐ — Number 11, 16 or 4 designates Automatic Transmission.

ENGINE REMOVAL

NOTE — Engine and transmission must be removed as an assembly on R-16 models.

R-16 Man. Trans. — 1) Disconnect battery and drain cooling system. Disconnect wires at fan motor relay, temperature switch, and hoses on water pump. Remove air filter and alternator.

2) Disconnect fuel inlet line, return pipe to fuel tank, and coil wires (if applicable). Disconnect carburetor linkage, temperature sending unit, and starter wires. Remove exhaust pipe clamp. Disconnect all vacuum lines and tachometer cable on centrifugal switch.

3) Remove ground wire on cylinder block and oil pressure sending unit wire. Disconnect left and right hand steering arms at adjustable end fittings. Remove two bolts from flexible coupling on steering column.

4) Remove four bolts securing crossmember to cowl sides and steering crossmember assembly. Disconnect back-up light switch, tachometer drive cable and gear selector. **NOTE** — If back-up light switch is mounted on top of transmission, remove it. Remove front mounting pad and bracket.

5) Using suitable drift (B. Vi. 31 B), punch out drive shaft roll pins. Place retaining clips on drive shaft. Place a jack between transmission and left side member; push transmission sideways to free drive shaft. After disconnecting clutch cable, free right side drive shaft, using same method.

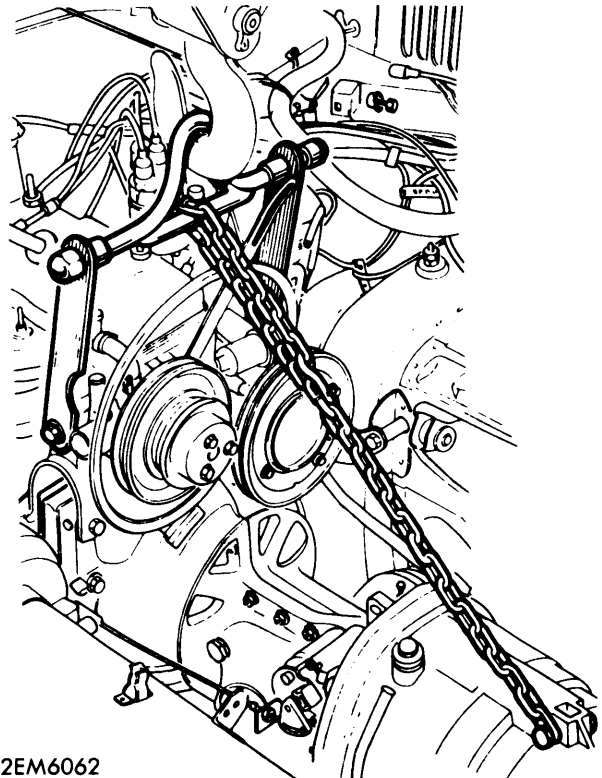
6) Attach suitable hoist (Mot. 367-01) to starter mounting bolt and ground wire location on cylinder block. **NOTE** — This is the only tool that manufacturer advises using. Take weight of

engine on hoist and remove side engine mounts. Lift engine and transmission assembly, bringing it forward. Hook chain in front hole on transmission to sufficiently tilt assembly. To install, reverse removal procedure.

R-16 Auto. Trans. — 1) Drain transmission and remove converter cover. Disconnect battery and remove wheelwell connecting bar. Remove camshaft pulley. Disconnect temperature switch on radiator and fan motor wires. Remove radiator.

2) From transmission, disconnect speedometer cable, selector lever, governor cable, electronic computer unit, ground wire and vacuum line. Disconnect left and right hand steering arms at steering box. Remove two bolts from flexible coupling on steering column. Remove steering box crossmember assembly.

3) Using suitable drift (B. Vi. 31 B), punch out roll pins from drive shafts. Fit retaining tool to drive shaft to prevent separa-



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SUPPORTING TRANSMISSION (R-16)

1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER (Cont.)

tion of couplings. Remove brake calipers, and using suitable tool (T. Av. 54-01), remove left and right hand upper ball joints.

4) Remove drive shafts from sun gears and cap drive shafts. Remove front mounting nuts and center radiator support.

5) Remove radiator, air filter, and alternator. Disconnect all hoses at water pump, wires at coil, fuel pump inlet line, and fuel return pipe.

6) Disconnect carburetor linkage, remaining electrical wiring, and vacuum lines. Attach suitable hoist (Mot. 367-01) at top starter bolt and cylinder head ground wire bolt. *NOTE - This is the only tool manufacturer advises using.* Attach a chain in hole at front of transmission (see illustration). Remove engine side mounts. Lift out engine and transmission assembly. To install, reverse removal procedure.

R-12 & R-15 - 1) Remove hood, disconnect battery and remove air filter. Drain cooling system. Disconnect all water hoses, electrical wires, and cable linkage. Remove radiator, starter, and camshaft pulley with drive belt.

2) Remove top bolt securing engine-transmission assembly. Remove tensioner, crankshaft pulley, fan and pulley. Disconnect exhaust pipe at exhaust manifold and rear transmission crossmember. Remove clutch shield.

3) Attach suitable hoist (Mot. 477) on each side of engine. From left and right side remove pad mounting bolts and three bolts from side member. Raise engine slightly and remove right bracket (with pad) and left bracket.

4) Further raise engine until top of transmission meets underside of steering crossmember. Suitably support transmission and remove two engine-transmission assembly bottom bolts. Pull engine forward and lift from vehicle. To install, reverse removal procedure.

MANIFOLD REMOVAL

R-12 & R-15 - 1) Disconnect battery and remove air filter and carburetor linkage. Disconnect all necessary hoses, lines and electrical wires.

2) Remove manifold nuts on exhaust pipe, warm air tube, timing cover reinforcing angle bracket (if applicable), and manifold. To install, reverse removal procedure.

R-16 - 1) Remove air filter. Disconnect battery, idle speed damper wire, accelerator linkage, all vacuum lines, temperature sending switch, and flame trap. Remove PCV valve and hose. Remove carburetor and vacuum support plate.

2) Remove exhaust pipe heat shield manifold and gasket. To install, reverse removal procedure.

CYLINDER HEAD

Removal - 1) Disconnect battery, drain cooling system and remove air filter. Disconnect all necessary water hoses, electrical wires and cable linkage. Remove distributor, alternator (with drive belt) and valve cover.

2) Remove water pump drive belt. Disconnect exhaust pipe at manifold and place out of way. Remove timing cover strengthening bracket if equipped.

3) Remove rocker arm assembly and push rods. Remove head bolts. Loosen cylinder head by tapping with a plastic hammer to rotate cylinder head in counterclockwise direction.

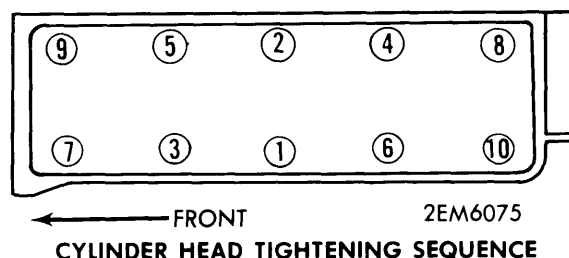
NOTE - Cylinder head gasket sticks to cylinder head, cylinder block and liners. No attempt must be made to lift cylinder head until it has been loosened, otherwise liner seats will be loosened and liner gaskets damaged.

4) Lift cylinder head slightly and remove tappets keeping them in order. Remove cylinder head. Install liner clamps to prevent any movement of liners.

Installation - 1) Remove liner clamp. *NOTE - All cylinder head bolt holes in cylinder block must be free of excess oil which would affect tightening.* Install new cylinder head gasket.

2) Install locating studs and fit new rubber tappet housing gasket. *NOTE - Since distributor gear alignment is dependent on correct cylinder head installation, care must be exercised while positioning cylinder head.*

3) Install tappets in cylinder head and place cylinder head in position. Remove locating studs and install lubricated cylinder head bolts, tightening in steps. Adjust valves and replace remaining components in reverse of removal.



VALVES							
Engine & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1969-73 821 & 841	Int.	1.378 (35)	45°	45°	.051-.063 (1.3-1.6)	.315 (8.0)	..... (.319)
	Exh.	1.220 (31)	45°	45°	.067-.079 (1.7-2.0)	.315 (8.0)	..... (.295)

Renault Engines

1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER (Cont.)

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E (front-to-rear).

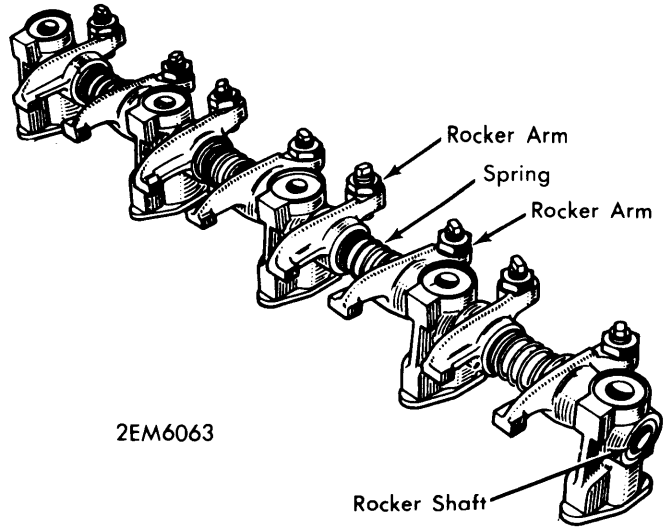
VALVE GUIDE SERVICING

1) After removing cylinder head, place it on suitable thrust plate (Mot.355). Press out worn guide, using suitable press mandrel. Check worn guide and measure its diameter. Standard size is .512" (no index groove). First oversize is .516" (one index groove) and second oversize is .522" (two index grooves). Always replace worn guide with closest oversize.

2) Secure head on thrust plate. Using suitable tool (mot.356), ream guide bore to fit oversize guide. Lubricate new valve guide and press it into place. Bottom of guide should be 1.14" (29 mm) from bottom of valve seat. Ream inside of valve guide, using suitable reamer (Mot.357) .315" (8.0 mm) diameter.

NOTE - After replacing valve guide, grind corresponding valve seat.

spring, and rocker arm. Align rocker shaft with oil holes facing push rod side. Bracket holes must line up with holes in rocker shaft.



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ROCKER SHAFT ASSEMBLY

VALVE SPRINGS			
Engine	Free Length In. (mm)	PRESSURE (LBS.) Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1969-73 821 & 841	Outer	.....	99@1.14 (45@29)
	Inner	20@.75 (9.1@19)	.....

VALVE SPRING REMOVAL

1) Disconnect battery. Remove air filter, valve cover and distributor or coil, if necessary. Remove spark plug, rocker arm and push rod corresponding to spring requiring maintenance.

2) Insert suitable valve retaining tool (Mot.61) in spark plug hole. Compress valve spring using suitable tool (Mot.382), and remove keepers, retainer and valve spring. To install, reverse removal procedure. **NOTE** - Install spring with larger coil gap toward cylinder head.

ROCKER ARM ASSEMBLY

After disassembling, cleaning, and inspecting rocker shaft components, ensure they are properly reassembled (see illustration). Correct order is: rocker shaft bracket, rocker arm,

VALVE TAPPET SERVICE

1) With tappets removed, thoroughly clean tappet bores in cylinder head and tappets. Check clearance between tappets and cylinder head bores.

2) If clearance is excessive, tappet bores must be reamed for oversize tappets. Tappets are available .008" oversize. Ream tappet bores to .480" if installing new tappets.

VALVE CLEARANCE ADJUSTMENT

Valve clearances must be adjusted according to table below. Rotate engine until exhaust valve shown in first column is fully open then adjust intake and exhaust valves indicated in second column. Adjust intake valves to .008" (.20 mm) and exhaust valves to .010" (.25 mm).

Valve Clearance Adjustment Sequence		
Exhaust Valve Open		Adjust
Exh. #1	.....	Int. #3 & Exh. #4
Exh. #3	.....	Int. #4 & Exh. #2
Exh. #4	.....	Int. #2 & Exh. #1
Exh. #2	.....	Int. #1 & Exh. #3

PISTONS, PINS, RINGS						
Engine	PISTONS		PINS		RINGS	
	Clearance	Piston Fit	Rod Fit	Rings	End Gap	Side Clearance
1969-73 821 & 841	Free Fit	Press Fit	.....	①	.....

① - Pre-set gap, do not alter.

OIL PAN REMOVAL

Raise vehicle and drain crankcase. Withdraw oil pan bolts and lift pan from car. Carefully scrape all gasket material from

pan before installing new gasket. Apply suitable sealer to gasket and reposition pan. Tighten oil pan bolts working from center outward. Refill crankcase.

1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER (Cont.)

CYLINDER LINERS

Removal - 1) Disconnect battery and drain cooling system and oil pan. Remove cylinder head and install liner clamps. Remove oil pan and oil pump.

2) Mark connecting rods on cam side, number one at clutch end. Remove connecting rod caps and bearings. Remove liner clamp and remove liner-piston-rod assembly.

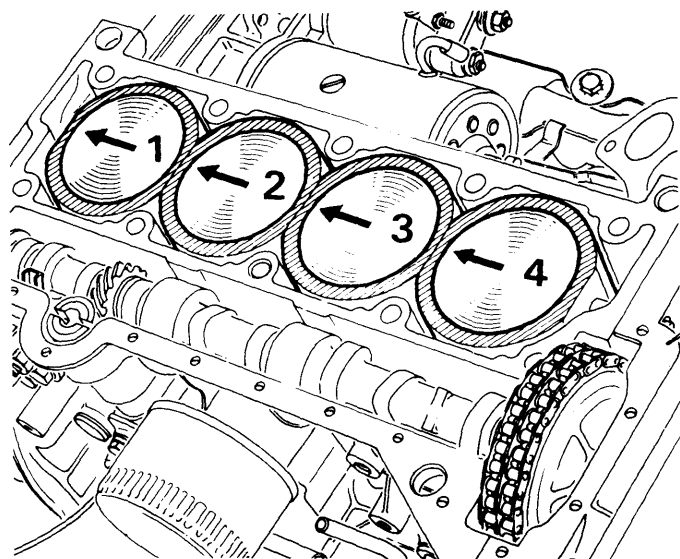
Installation - **NOTE** - Before installing pistons in liners, protrusion of liner above cylinder block gasket face must be checked.

1) On 821 engine, correct protrusion is .006-.008" checked with liner bottom seals installed. Seals are available .003" (blue spot), .004" (red spot), and .005" (green spot). Select correct seal to provide correct protrusion.

2) On 841 engine, correct protrusion is .0040-.0067" checked without "O" ring seal. No provision is made for adjusting protrusion.

3) Install piston and rod assembly in liner. See *Piston & Rod Assembly*. Install piston-rod-liner assembly into cylinder block. **NOTE** - Number one is at clutch end, arrow points to flywheel and number on connecting rod is on cam side.

4) Lubricate bearings and replace connecting rod caps. Replace remaining components in reverse of removal taking care not to disturb liner bottom seals.



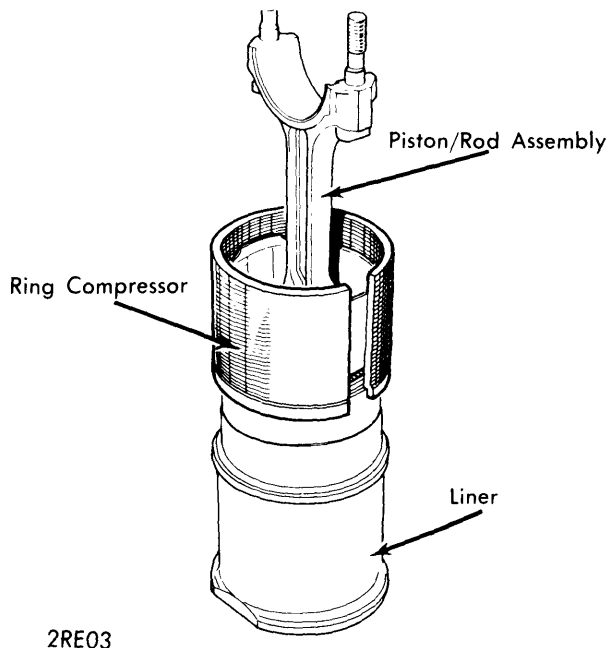
LINER INSTALLATION

PISTON & ROD ASSEMBLY

Removal - Piston and connecting rods are removed from cylinder block with cylinder liners. See *Cylinder Liners*. Remove piston through bottom of liner and remove rings, piston pin and connecting rod. See *Piston Pins*.

Installation - 1) Replace connecting rod and piston pin. **NOTE** - Piston must be assembled with arrow on piston pointing downward. NOTE - Number stamped on connecting rod journal must face right with top of piston toward installer.

2) Replace piston rings, spacing gaps 120° apart. See *Fitting Pistons*. Using suitable ring compressor (Mot.442) push piston through bottom of cylinder liner with flat on side of liner parallel with sides of connecting rod.



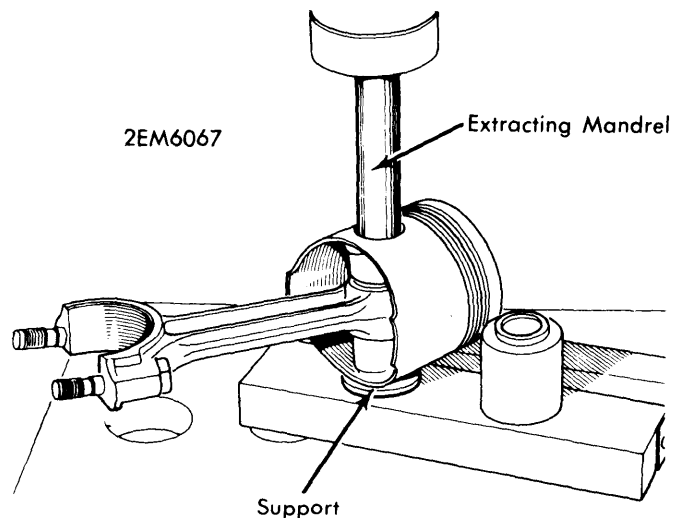
PISTON INSTALLATION

FITTING PISTONS

Pistons, rings and liners are matched set and must never be interchanged. All piston ring clearances and gaps are preset and must not be altered. See *Piston and Rod Assembly*.

PISTON PIN REPLACEMENT

1) After removing piston assembly from liner, remove rings. Using suitable tool (Mot. 255), as shown in illustration, piston



REMOVING PISTON PIN

Renault Engines

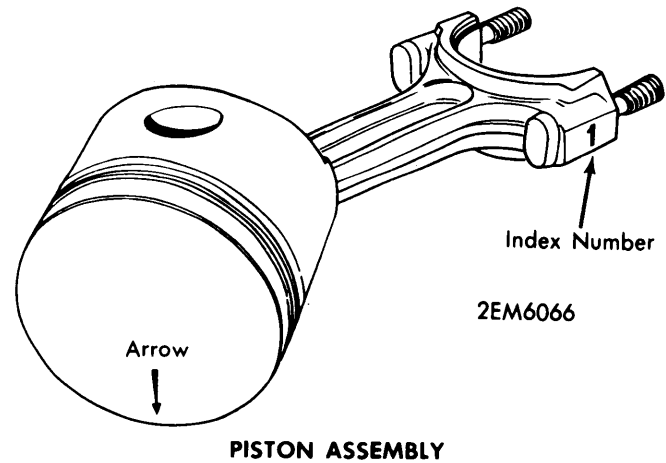
1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER (Cont.)

pin can be removed. Extract pin using hydraulic press and adaptors.

2) Check connecting rod for wear or damage. Before preparing new piston, ensure pin is a running fit in piston.

3) Heat connecting rod in water to boiling point or in an oven to 482°F.

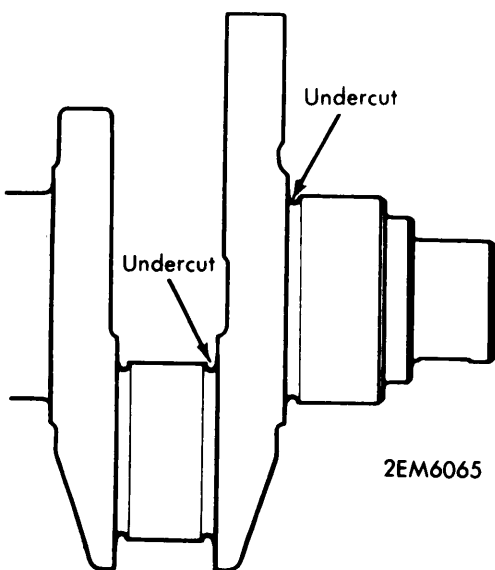
4) Slide new piston over installing mandrel and screw locating plug into place. Apply Molykote M 55 to piston pin. Push mandrel pin guide pin assembly through piston, by hand, until piston pin makes contact with connecting rod. Ensure piston and connecting rod are being fitted correctly (see illustration). Place assembly under hydraulic press and carefully seat pin into position.



CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1969-73 821 & 841	2.157 (54.80)	.....	No. 3	.002-.009 (.05-.23)	1.890 (48)	.....	.....

MAIN BEARING SERVICE

1) With cylinder head and oil pan removed, invert engine so crankshaft is exposed. Remove connecting rod bearing caps. Mark position of main bearing caps to cylinder block. Remove all except front main bearing cap.



CRANKSHAFT JOURNAL UNDERCUT

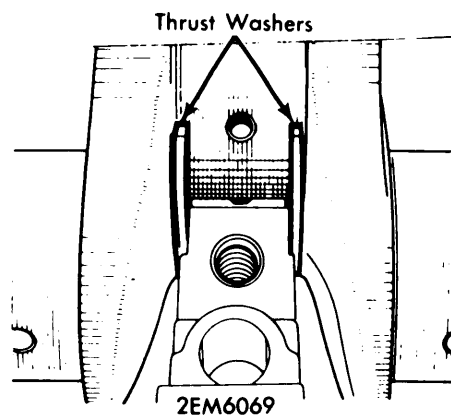
2) Push up front main bearing by lightly tapping on lower corners. Remove seal and bearing.

3) Remove crankshaft, bearings, and thrust washers. With crankshaft removed, pilot bearing can be replaced.

4) Check crankshaft, connecting rod bearings, and main bearings for wear. If crankshaft diameter is found out of

tolerance, it may be ground to fit .010" undersize main and connecting rod bearings.

NOTE - Crankshaft and connecting rod journals are roll hardened and undercut (see illustration).

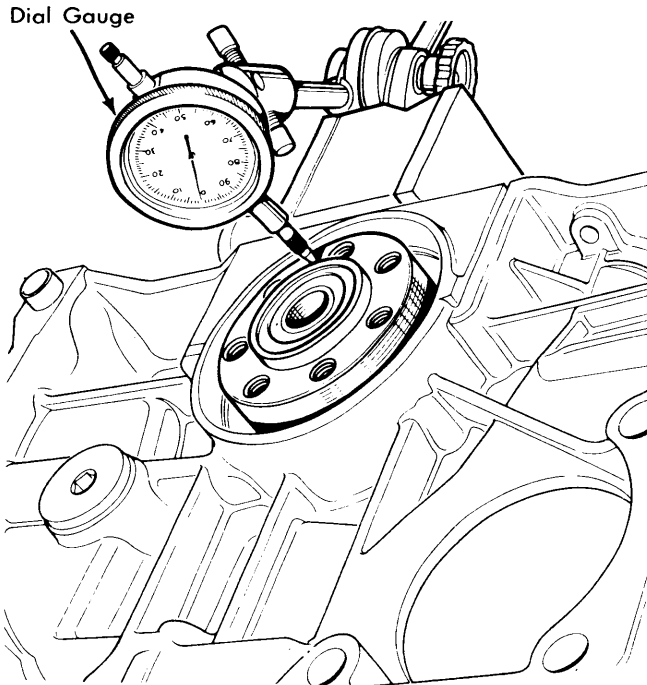


INSTALLING THRUST WASHERS

5) Fit upper main bearings (those with oil holes). Lubricate main bearing journals and fit crankshaft into position. Fit thrust washers, white metal toward crankshaft. Fit bearings to main bearing caps. Numbers 2,3,4, and 5 have no oil holes. Fit main bearing caps into position aligned with previously made reference marks. Carefully install No. 1 main bearing cap and seals. *NOTE - Correct fit of seal is imperative.*

6) Using a dial gauge, check crankshaft end play. Play must not exceed .009". If correct end play is not obtained, replace thrust washers. Thrust washers are available in standard (.110"), and two oversizes (.114" and .116").

1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER (Cont.)



CHECKING CRANKSHAFT END PLAY

REAR MAIN BEARING OIL SEAL

NOTE — Only fit a seal having grooves on the lip. Since lip of seal is extremely delicate, exercise caution.

Fit seal on suitable tool (Mot. 259-01) and lubricate outside. Install seal by lightly tapping shaft of installer tool. Seal is fully seated when tool just touches crankshaft.

TIMING CHAIN COVER

With engine removed and suitably supported, extract timing cover bolts. Remove two oil pan bolts that also secure timing cover. Lift cover and gasket off. To install, reverse removal procedure.

TIMING CHAIN COVER OIL SEAL

1) Loosen fan belt, remove crankshaft pulley by pushing engine rearward with a lever. Remove oil seal.

2) To install, place seal on locating sleeve of suitable tool (Mot. 525) and put assembly against timing chain cover. Draw seal up until sleeve just touches crankshaft. Install crankshaft pulley, tensioner and fan belt.

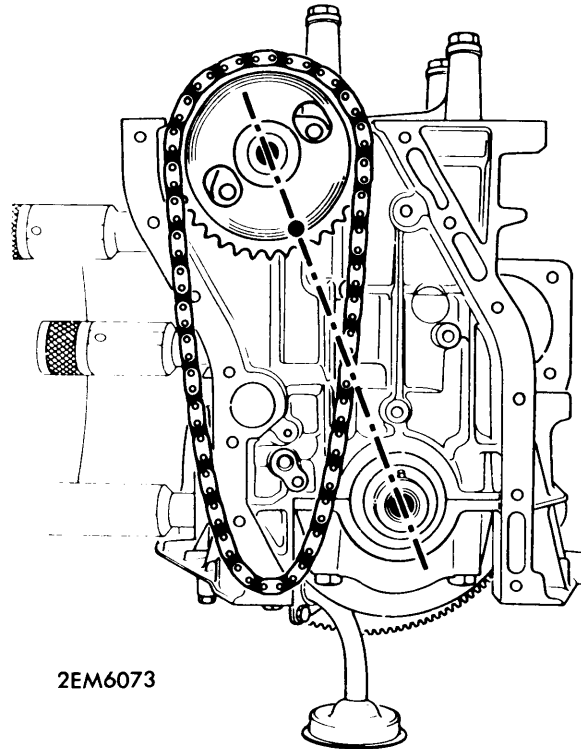
CAMSHAFT

NOTE — Camshaft specifications not available at time of publication.

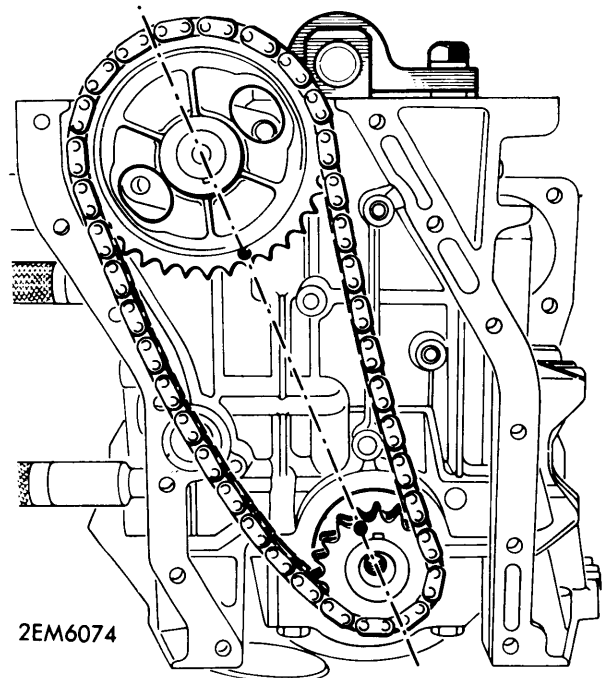
TIMING CHAIN

Removal — 1) With engine removed and suitably supported, remove timing cover. Remove timing chain tensioner. See *Camshaft Removal*. Remove camshaft sprocket retaining bolt, washer and thrust ring.

2) Remove chain damper and camshaft securing bolts. Withdraw crankshaft sprocket and chain, using suitable puller (Mot. 49), while easing camshaft forward. **NOTE** — It is not necessary to completely remove camshaft to remove chain.



CAMSHAFT SPROCKET ALIGNMENT



CORRECT POSITION — CRANKSHAFT & CAMSHAFT SPROCKETS

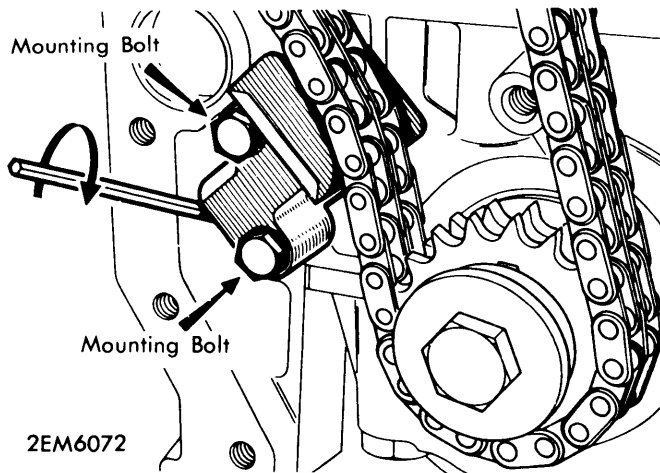
Renault Engines

1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER (Cont.)

Installation – 1) Position chain on camshaft sprocket. Align camshaft sprocket timing mark with centers of crankshaft and camshaft. Turn crankshaft, bringing key upward.

2) Fit crankshaft sprocket on chain (timing mark facing outward), keeping timing marks in line. Using suitable tool, install crankshaft sprocket while sliding camshaft into place.

3) Replace chain damper and camshaft securing bolts. Adjust chain tensioner, as shown in illustration. See *Valve Timing*.



TIMING CHAIN – CORRECT ADJUSTMENT

CAMSHAFT REMOVAL

NOTE – Camshaft end play should be .002-.005" (.05-.12 mm).

1) With engine removed and suitably supported remove cylinder head and distributor drive. Drain oil and remove oil pan. Remove timing chain cover and camshaft rear bearing.

2) Disengage timing chain tensioner by removing cap bolt: insert a 3 mm Allen wrench and turn wrench clockwise until tensioner is no longer in contact with chain. Remove tensioner.

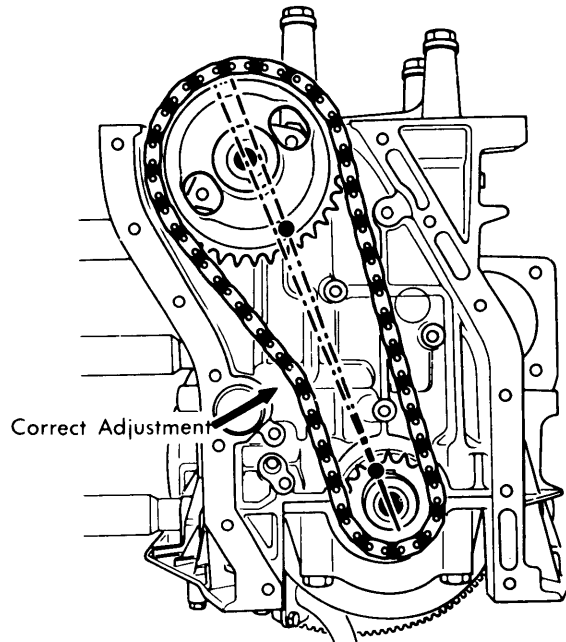
3) Remove crankshaft sprocket retaining bolt, washer, thrust ring, and chain damper. Remove the two camshaft securing

bolts. Withdraw crankshaft sprocket and chain, using suitable tool (Mot. 49), while easing camshaft forward.

VALVE TIMING				
Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
1969-73 821 & 841	10°	42°	46°	10°

VALVE TIMING

Ensure crankshaft sprockets are properly aligned, as shown in illustration. Check chain tensioner for correct adjustment.



CAMSHAFT & CRANKSHAFT ALIGNMENT

NOTE – When chain is in normal position, a line passing through timing marks will not quite bisect camshaft.

ENGINE OILING

Crankcase Capacity – All models, 4 1/4 quarts. With filter change add 1/4 quarts.

Oil Filter – Disposable canister type.

Normal Oil Pressure – 30 psi at idle, 60-70 psi at 4000 RPM.

OIL PUMP

1) With oil pan removed, oil pump can be removed. To disassemble, remove cotter pin retaining relief valve, and lift out cup, spring, spring guide, and piston.

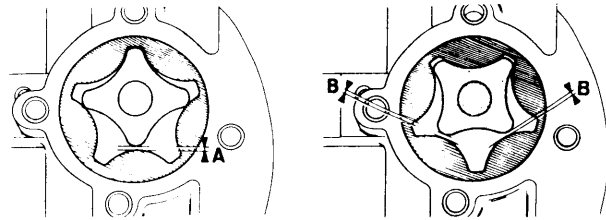
2) Clean all parts and inspect ball seat, and inner and outer rotors for wear.

1969-72 R-16, 1971-73 R-12 & 1973 R-15 (821 & 841) 4 CYLINDER (Cont.)

ENGINE OILING (Cont.)

3) Measure tip clearance in both positions, shown in illustration. Clearance in "POSITION 1" must be .002-.012" and .001-.006" in "POSITION 2". If either tolerance is exceeded, rotors must be changed.

4) To reassemble, fit piston, spring guide, spring, and cup in position. Install retaining cotter pin, strainer flange seal, strainer, and lock tab. Tighten all bolts.



POSITION 1 2EM6064 POSITION 2

MEASURING TIP CLEARANCE

NOTE — Oil pump cover and rotor can be removed without removing engine.

ENGINE COOLING

Cooling System Capacity — 7 qts.

WATER PUMP

Disconnect battery and drain cooling system. Disconnect all water hoses, and remove water pump and alternator drive

belts. Remove water pump and camshaft pulley. Extract mounting bolts and remove water pump. **NOTE** — If pump can not be freed by hand, tap lightly with a plastic hammer. To install, reverse removal procedure. **NOTE** — Install gasket dry.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (mkg)
Cylinder Head	
Step 1	30 (4.1)
Step 2	50-55 (6.9-7.6)
Final Torque ^①	60-65 (8.3-9.0)
Main Bearing	45 (6.2)
Connecting Rod	30 (4.1)
Crankshaft Bolt	45-50 (6.2-6.9)
Flywheel	40 (5.5)
Rocker Shaft Nuts	15-20 (2.1-2.8)
Manifold Nuts	10-20 (1.4-2.8)

① — After engine has run 10 min. and been allowed to cool exactly 50 min.