

ENGINE MECHANICAL

REFER TO 1988 CELICA REPAIR MANUAL (Pub. No. RM071U)

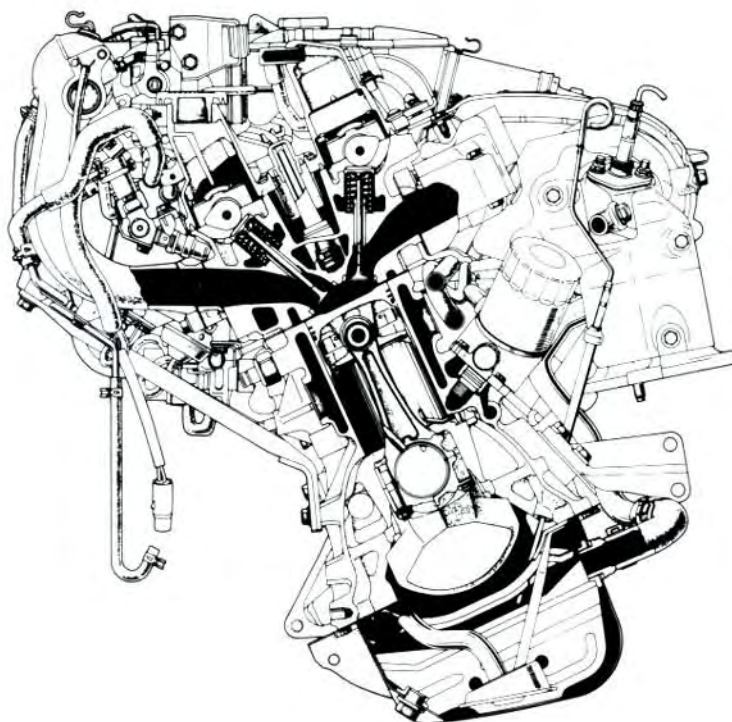
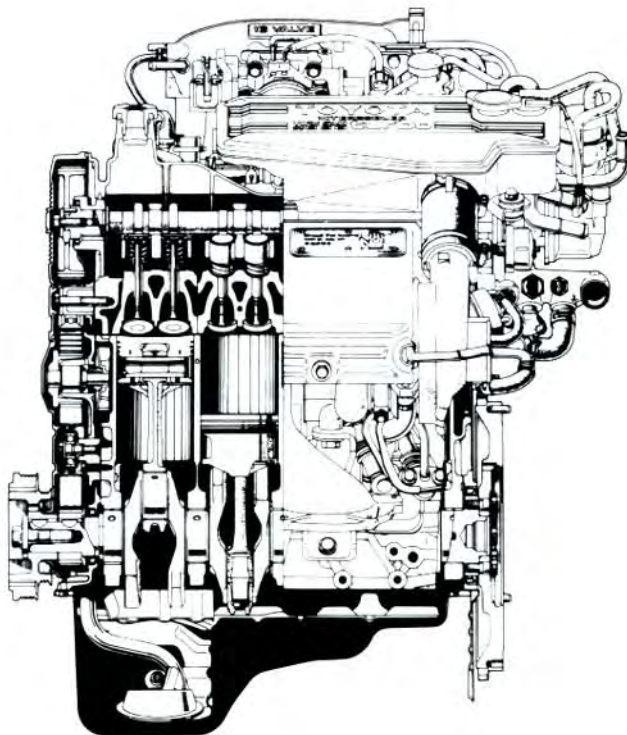
NOTE: The following pages contain only the points which differ from the above listed manual.

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EM

DESCRIPTION

The 3S-GTE engine is an in-line 4-cylinder 2.0 liter DOHC 16 valve engine.



The 3S-GTE engine is an in-line 4-cylinder engine with the cylinders numbered 1 — 2 — 3 — 4 from the front. The crankshaft is supported by 5 bearings specified by the inside of the crankcase. These bearings are made of aluminum alloy.

The crankshaft is integrated with 8 weights which are cast along with it for balancing. Oil holes are built into the center of the crankshaft for supplying oil to the connecting rods, pistons and other components.

This engine's ignition order is 1 — 3 — 4 — 2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

The intake manifold has 8 independent long ports and utilizes the inertial super-charging effect to improve engine torque at low and medium speeds.

Exhaust and intake valves are equipped with irregular pitch springs made of oil tempered silicon chrome steel wire which are capable of following the valves even at high engine speeds.

Both the exhaust side cam shaft and the intake side cam shaft are driven by a single timing belt. The cam journal is supported at 5 places between the valve lifters of each cylinder and on the front end of the cylinder head of front end. Lubrication of the cam journal and cam is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of an outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.

The resin timing belt cover is made in 2 pieces. A service hole is provided in the No.2 belt cover for adjusting the timing belt tension.

Pistons are made of highly temperature-resistant aluminum alloy, and a depression is built into the piston head to prevent interference with valves.

Piston pins are the full-floating type, with the pins fastened to neither the piston boss nor the connecting rods. Instead, snap rings are fitted on both ends of the pins, preventing the pins from falling out.

The No.1 compression ring is made of steel and the No.2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No.1 and No.2 work to prevent the leakage of gas from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chamber.

The cylinder block is made of cast iron. It has 4 cylinders which are approximately 2 times the length of the piston stroke. The top of the cylinders is closed off by the cylinder head and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. This dividing plate also prevents the oil from making waves when the vehicle is stopped suddenly and thus shifting the oil away from the oil pump suction pipe.

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	*ST-2
Engine will not start/ hard to start (cranks OK)	No fuel supply to injector • No fuel in tank • Fuel pump no working • Fuel filter clogged • Fuel line clogged or leaking EFI system problems Ignition problems • Ignition coil • Igniter • Distributor Spark plug faulty High-tension cord disconnected or broken Vacuum leaks • PCV line • EGR line • Intake manifold • Intake air control valve • Throttle body • ISC valve • Brake booster line Pulling in air between air flow meter and throttle body Low compression	Troubleshoot EFI system Repair as necessary Perform spark test Inspect plugs Inspect cords Repair as necessary Repair as necessary Check compression	FI-4 IG-4 IG-5 IG-5 EM-10

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plug faulty	Inspect plugs	IG-5
	High-tension cords faulty	Inspect cords	IG-5
	Ignition problems		
	● Ignition coil	Inspect coil	IG-7
	● Igniter	Inspect igniter	IG-7
	● Distributor	Inspect distributor	IG-7
	Incorrect ignition timing	Reset timing	IG-9
	Vacuum leaks	Repair as necessary	
	● PCV line		
	● EGR line		
● Intake manifold			

ROUGH IDLING (Cont'd)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (Cont'd)	Vacuum leaks (Cont'd)		
	● Intake air control valve ● Throttle body ● ISC valve ● Brake booster line		
	Pulling in air between air flow meter and throttle body		
	Incorrect idle speed	Check ISC system	FI-44
	Incorrect valve clearance	Adjust valve clearance	EM-15
	EFI system problems	Repair as necessary	.
	Engine overheats	Check cooling system	*CO-4
	Low compression	Check compression	EM-10

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ poor acceleration	Spark plug faulty	Inspect plugs	IG-5
	High-tension cord faulty	Inspect cords	IG-5
	Vacuum leaks	Repair as necessary	
	● PCV line ● EGR line ● Intake manifold ● Intake air control valve ● Throttle body ● ISC valve ● Brake booster line		
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-9
	Incorrect valve clearance	Adjust valve clearance	EM-15
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air cleaner	MA-4
	EFI system problems	Repair as necessary	
	Emission control system problem (cold engine)		
	● EGR system always on	Check EGR system	EC-8
	Engine overheats	Check cooling system	*CO-4
	Low compression	Check compression	EM-10

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine diesels (runs after ignition switch is turned off)	EFI system problems	Repair as necessary	IG-9
	Incorrect ignition timing	Reset timing	EC-8
	EGR system faulty	Check EGR system	

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	
Muffler explosion (after fire) all the time	Air cleaner clogged	Check air cleaner	MA-4
	EFI system problem	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-9
Engine backfires	EFI system problem	Repair as necessary	
	Vacuum leak	Check hoses and repair as necessary	
	● PCV line ● EGR line ● Intake manifold ● Intake air control valve ● Throttle body ● ISC valve ● Brake booster line		
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	FI-4
	Incorrect ignition timing	Reset timing	IG-9
	Incorrect valve clearance	Adjust valve clearance	*EM-15
	Carbon deposits in combustion chambers	Inspect cylinder head	*EM-85

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	
	Piston ring worn or damaged	Check rings	*EM-119
	Valve stem and guide bushing worn	Check valves and guide bushing	*EM-86
	Valve stem oil seal worn	Check seals	

EXCESSIVE FUEL CONSUMPTION

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air cleaner	MA-4
	Incorrect ignition timing	Reset timing	IG-9
	EFI system problems	Repair as necessary	
	● Injector faulty ● Deceleration fuel cut system faulty		
	Idle speed too high	Check ISC system	FI-44
	Spark plug faulty	Inspect plugs	IG-5
	EGR system always on	Check EGR system	EC-8
	Low compression	Check compression	EM-10
	Tires improperly inflated	Inflate tires to proper pressure	
	Clutch slips	Troubleshoot clutch	
	Brakes drag	Troubleshoot brakes	

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed	Check ISC system	FI-44
	Incorrect ignition timing	Reset timing	IG-9
	Vacuum leaks	Repair as necessary	
	● PCV line ● EGR line ● Intake manifold ● Intake air control valve ● Throttle body ● ISC valve ● Brake booster line		
	EFI system problems	Repair as necessary	

ENGINE TUNE-UP

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page CO-4)

INSPECTION OF INTERCOOLER COOLANT

(See steps 1 and 2 on page TC-7)

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page LU-4)

INSPECTION OF BATTERY

(See Pub. No. RM071U, steps 1 and 2 on page CH-3)

Standard specific gravity:

1.25 — 1.27 when fully charged at 20°C (68°F)

INSPECTION OF AIR FILTER

(See step 3 on page MA-4)

INSPECTION OF HIGH-TENSION CORDS

(See page IG-5)

Maximum resistance: 25 k Ω per cord

INSPECTION OF SPARK PLUGS

(See page IG-5)

Correct electrode gap of new plug:

0.8 mm (0.031 in.)

Maximum electrode gap: 1.0 mm (0.039 in.)

Recommended spark plugs:

ND PQ16R8
NGK BCPR5EP8

INSPECTION OF ALTERNATOR DRIVE BELT

(See Pub. No. RM071U, step 3 on page CH-3)

Drive belt tension:

w/ A/C	New belt	175 $\pm$ 5 lb
	Used belt	115 $\pm$ 20 lb
w/o A/C	New belt	150 $\pm$ 25 lb
	Used belt	130 $\pm$ 25 lb

ADJUSTMENT OF VALVE CLEARANCE

(See Pub. No. RM071U on pages EM-11 and 14)

Valve clearance (Cold):

Intake	0.15 — 0.25 mm (0.006 — 0.010 in.)
Exhaust	0.20 — 0.30 mm (0.008 — 0.012 in.)

ADJUSTMENT OF IGNITION TIMING

(See steps 7 to 10 on pages IG-9 and 10)

Ignition timing:

10° BTDC @ idle

(w/ Terminals T and E1 short-circuited)

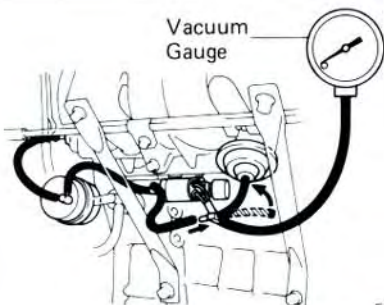
INSPECTION OF IDLE SPEED

(See page FI-44)

Idle speed: 750 $\pm$ 50 rpm

IDLE HC/CO CONCENTRATION CHECK METHOD

(See Pub. No. RM071U on pages EM-21 and 22)

Vacuum
Gauge

EM4763

INSPECTION OF TOYOTA-VARIABLE INDUCTION SYSTEM (T-VIS)

1. WARM UP AND STOP ENGINE

Allow the engine to reach normal operating temperature.

2. CONNECT TACHOMETER (See page IG-9)

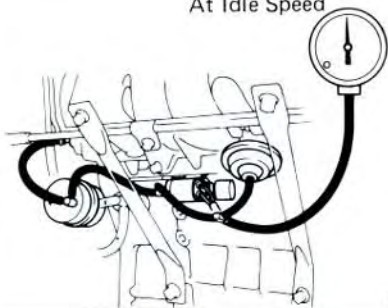
3. CONNECT VACUUM GAUGE

Using a 3-way connector, connect the vacuum gauge to the hose between the VSV and actuator.

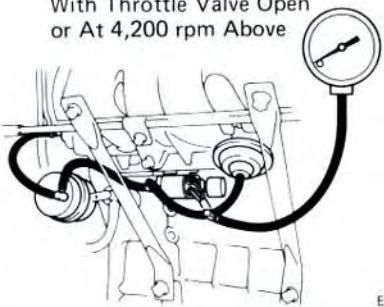
4. INSPECT T-VIS OPERATION

- (a) Check that the vacuum gauge indicates vacuum at idle speed.

At Idle Speed



EM4764

With Throttle Valve Open
or At 4,200 rpm Above

EM4765

- (b) (w/ Regular Gasoline)

Check that the vacuum gauge indicates zero with throttle valve open.

- (c) (w/ Premium Gasoline)

Check that the vacuum gauge indicates zero at 4,200 rpm above.

COMPRESSION CHECK

NOTE: If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

Allow the engine to reach normal operating temperature.

2. REMOVE INTERCOOLER

(See steps 3 and 7 on pages TC-9 and 10)

3. DISCONNECT SOLENOID RESISTOR CONNECTOR

4. DISCONNECT COLD START INJECTOR CONNECTOR

5. DISCONNECT DISTRIBUTOR CONNECTOR

6. REMOVE SPARK PLUGS (See page IG-6)

7. CHECK CYLINDER COMPRESSION PRESSURE

- Insert a compression gauge into the spark plug hole.
- Fully open the throttle.
- While cranking the engine, measure the compression pressure.

NOTE: Always use a fully charged battery to obtain engine revolution of 250 rpm or more.

- Repeat steps (a) through (c) for each cylinder.

CAUTION: This measurement must be done in as short a time as possible.

Compression pressure:

12.5 kg/cm² (178 psi, 1,226 kPa) or more

Minimum pressure:

9.0 kg/cm² (128 psi, 883 kPa)

Difference between each cylinder:

1.0 kg/cm² (14 psi, 98 kPa) or less

- If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for the cylinder with low compression.
 - If adding oil helps the compression chances are that the piston rings and/or cylinder bore are worn or damaged.
 - If pressure stays low, a valve may be sticking or seating improperly, or there may be leakage past the gasket.

8. REINSTALL SPARK PLUGS (See page IG-6)

Torque: 180 kg-cm(13 ft-lb, 18 N·m)

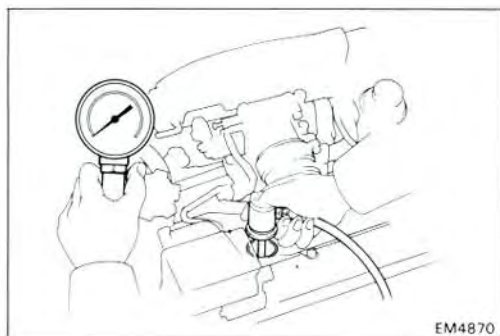
9. RECONNECT DISTRIBUTOR CONNECTOR

10. RECONNECT COLD START INJECTOR CONNECTOR

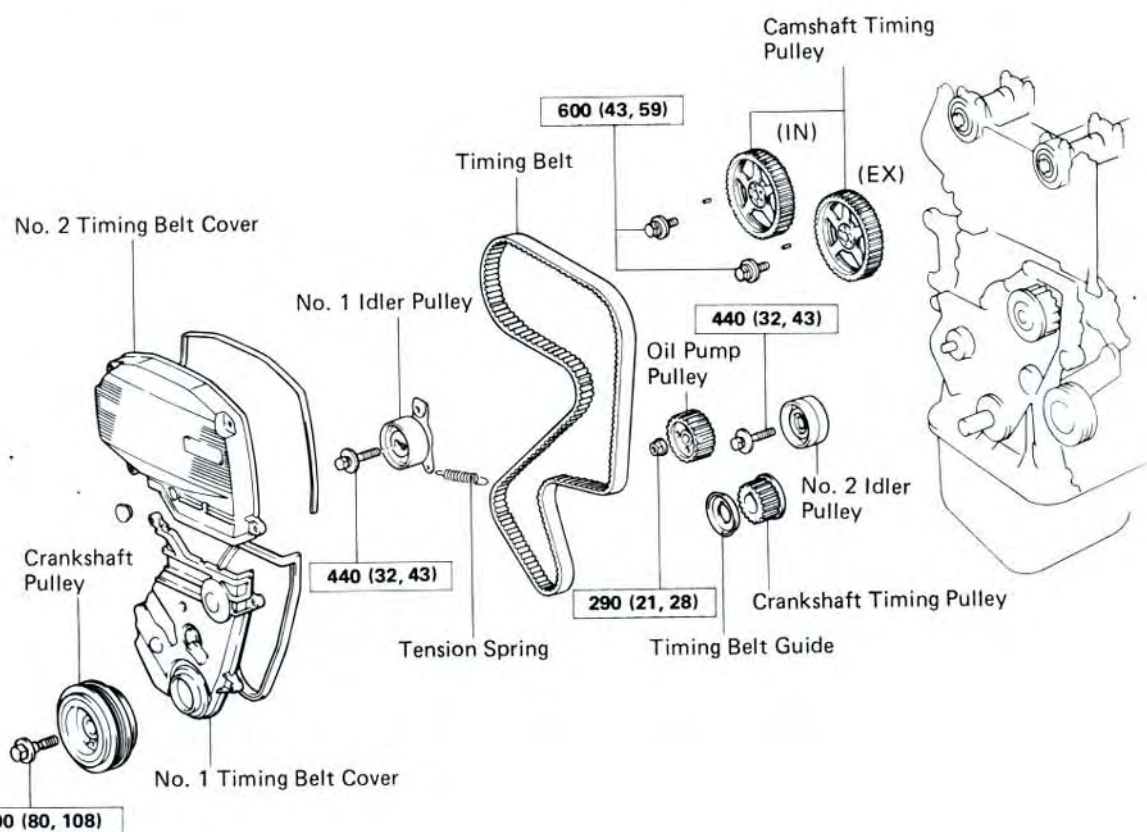
11. RECONNECT SOLENOID RESISTOR CONNECTOR

12. REINSTALL INTERCOOLER

(See steps 11, 16 and 18 on page TC-14)



TIMING BELT COMPONENTS

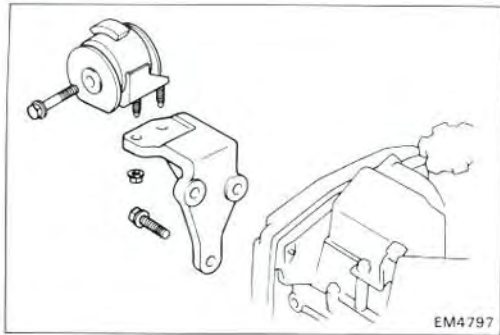


kg-cm (ft-lb, N-m) : Specified torque

EM4825

REMOVAL OF TIMING BELT

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE RH FRONT WHEEL
3. REMOVE ENGINE RH UNDER COVER
4. REMOVE RADIATOR RESERVOIR TANK
5. LOOSEN POWER STEERING OIL RESERVOIR TANK
Remove the two bolts and reservoir tank without disconnecting the hoses.
6. REMOVE DRIVE BELTS
7. REMOVE ALTERNATOR
8. REMOVE ALTERNATOR BRACKETS
(See steps 15 on page EM-28)



9. JACK UP ENGINE SLIGHTLY

Raise the engine enough to remove the weight from the engine mounting on the right side.

10. REMOVE ENGINE RH MOUNTING INSULATOR AND BRACKET

- (a) Remove the through bolt, two nuts and mounting insulator.
- (b) Remove the three bolts and bracket.

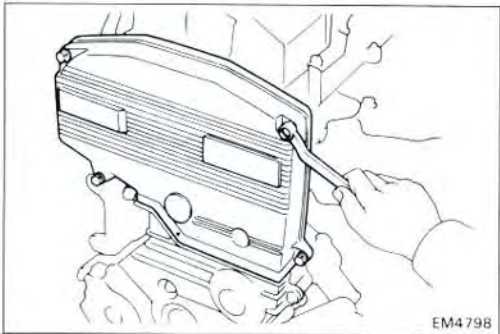
11. REMOVE THROTTLE BODY

(See steps 1 to 10 on page FI-41)

12. REMOVE NO.2 TIMING BELT COVER

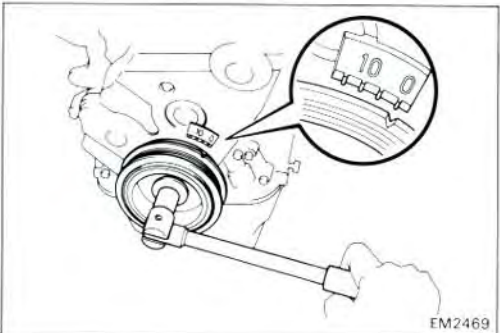
Remove the five screws, belt cover and gasket.

13. REMOVE SPARK PLUGS (See page IG-6)



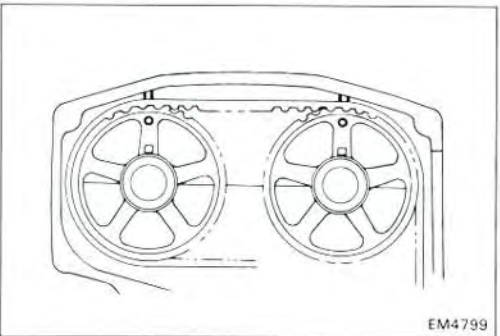
14. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley and align its groove with mark "0" of the No.1 timing belt cover.



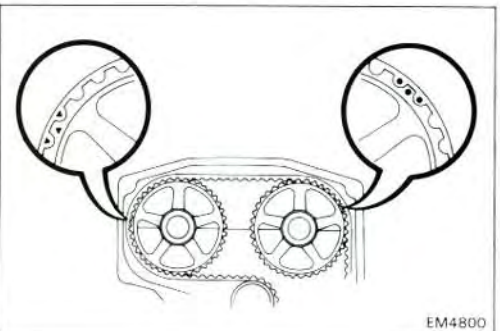
- (b) Check that the alignment marks of the camshaft timing pulleys and No.3 timing belt cover are aligned.

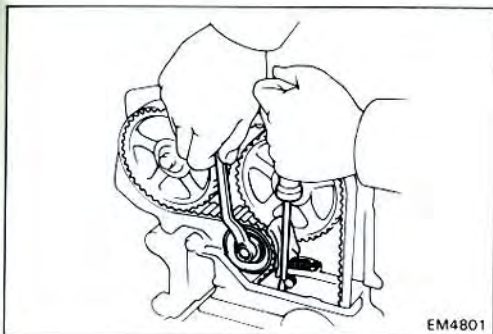
If not, turn the crankshaft one revolution (360°).



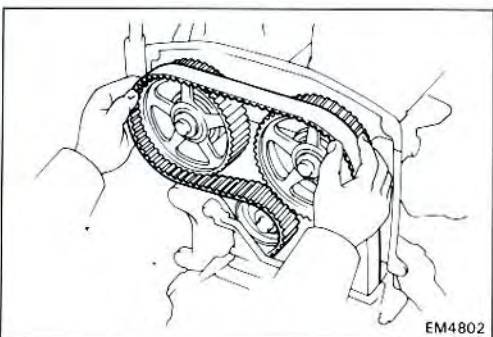
15. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEYS

NOTE: If reusing the timing belt, place matchmarks on the camshaft timing pulleys and belt.





- (a) Loosen the No.1 idler pulley bolt and shift it left as far as it will go.
- (b) Temporarily tighten the pulley bolt and then relieve the timing belt tension.



- (c) Remove the timing belt from the camshaft timing pulley.

NOTE:

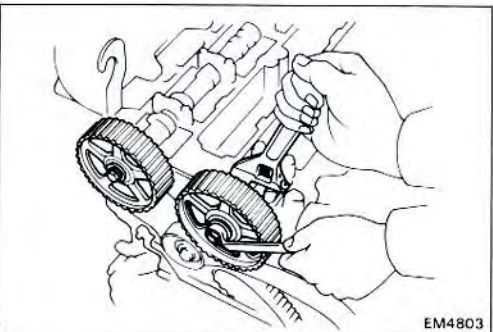
- Support the belt so the meshing of the crankshaft timing pulley and timing belt does not shift.
- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come into contact with oil, water and dust.

16. REMOVE CYLINDER HEAD COVER
(See steps 39 on page EM-31)

17. REMOVE CAMSHAFT TIMING PULLEYS

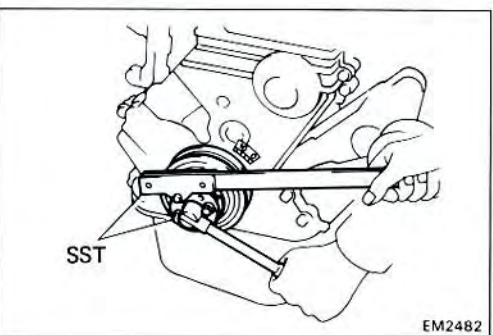
- (a) Hold the hexagonal wrench head portion of the camshaft with a wrench, and remove the pulley mount bolts.
- (b) Remove the camshaft pulleys and pins.

NOTE: Arrange the intake and exhaust pulleys.

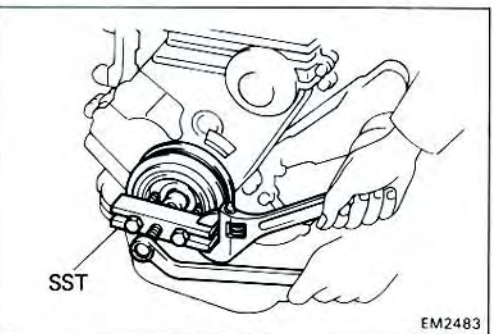


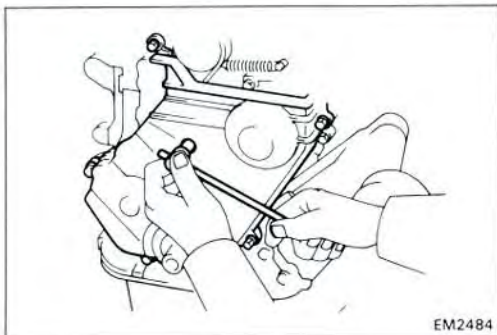
18. REMOVE CRANKSHAFT PULLEY

- (a) Using SST, remove the pulley bolt.
SST 09213-14010 and 09330-00021



- (b) Using SST, remove the pulley.
SST 09213-31021

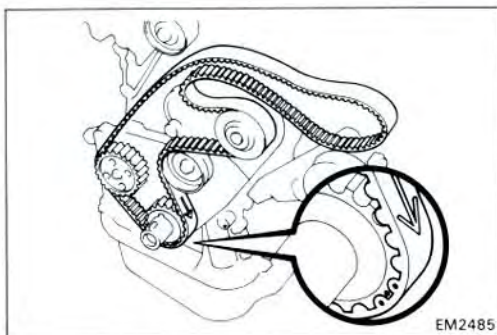




19. REMOVE NO.1 TIMING BELT COVERS

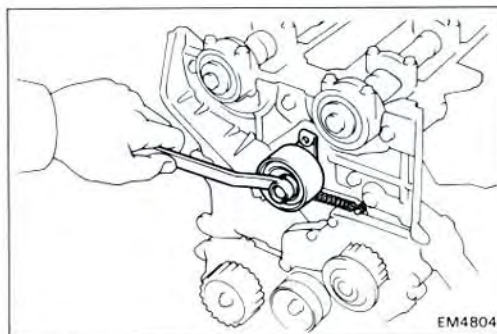
Remove the six bolts, belt cover and gaskets.

20. REMOVE TIMING BELT GUIDE



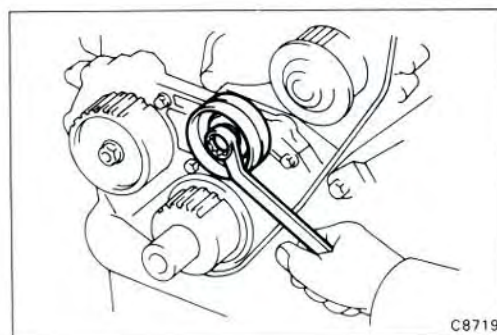
21. REMOVE TIMING BELT

NOTE: If reusing the timing belt, draw a direction arrow on the timing belt (in direction of engine revolution), and place matchmarks on the timing belt and crankshaft timing pulley.



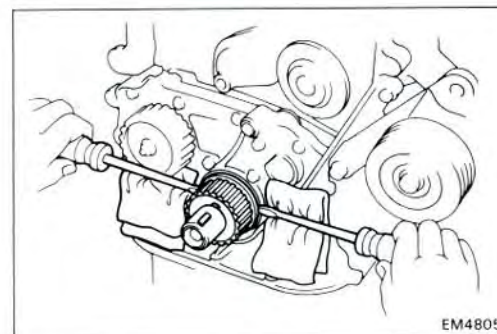
22. REMOVE NO.1 IDLER PULLEY AND TENSION SPRING

Remove the bolt, pulley and tension spring.



23. REMOVE NO.2 IDLER PULLEY

Remove the bolt and pulley.



24. REMOVE CRANKSHAFT TIMING PULLEY

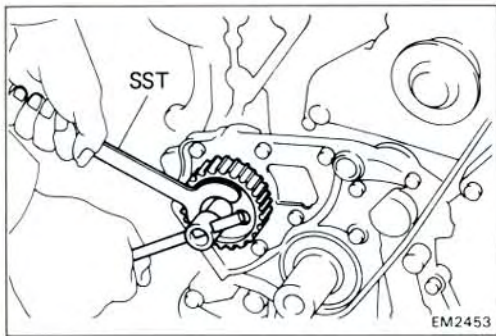
If the pulley cannot be removed by hand, use two screwdrivers.

NOTE: Position shop rags as shown to prevent damage.

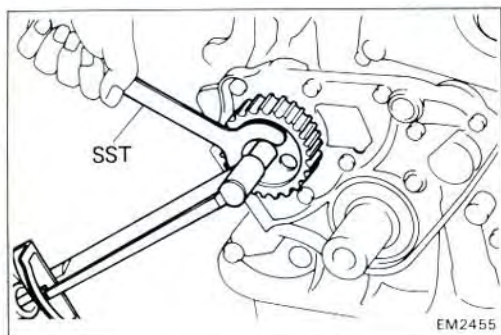
25. REMOVE OIL PUMP PULLEY

Using SST, remove the nut and pulley.

SST 09616-30011

**INSPECTION OF COMPONENTS**

(See Pub. No. RM071U on pages EM-40 and 41)



INSTALLATION OF TIMING BELT

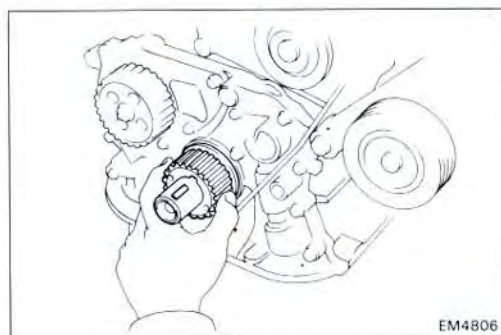
(See page EM-11)

1. INSTALL OIL PUMP PULLEY

- Align the cutouts of the pulley and shaft, and slide the pulley.
- Using SST, install and torque the nut.

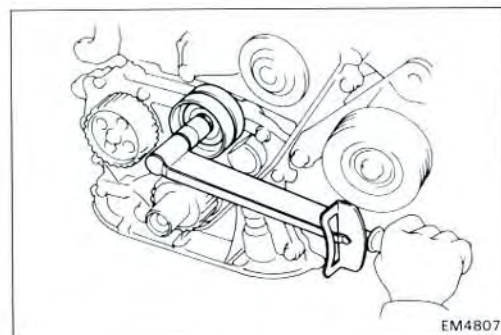
SST 09616-30011

Torque: 290 kg-cm (21 ft-lb, 28 N·m)



2. INSTALL CRANKSHAFT TIMING PULLEY

Align the pulley set key with the key groove of the pulley, slide the pulley.

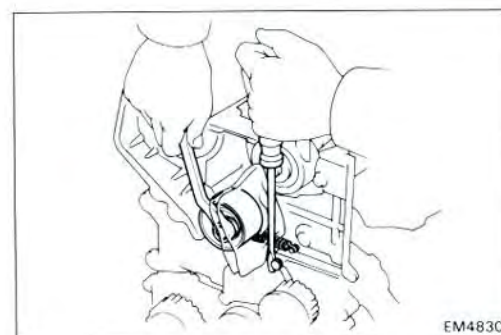


3. INSTALL NO.2 IDLER PULLEY

- Install the pulley with the bolt. Torque the bolt.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)

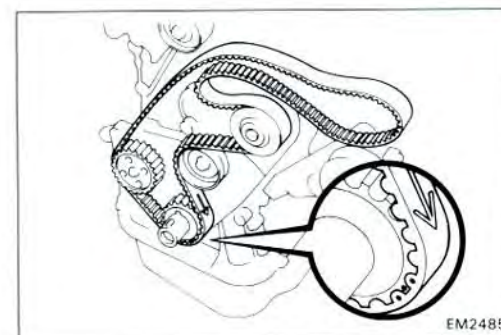
- Check that the pulley moves smoothly.



4. TEMPORARILY INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

- Install the pulley with the bolt. Do not tighten the bolt yet.
- Install the tension spring.
- Pry the pulley toward the left as far as it will go and tighten it.

NOTE: Remove any oil or water on the idler pulley and keep it clean.

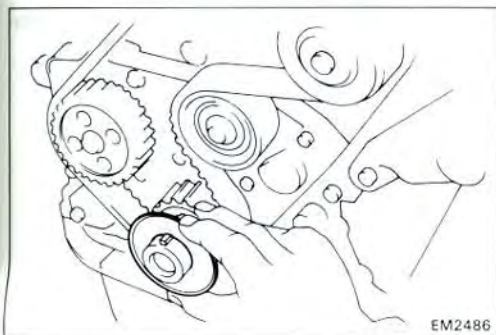


5. TEMPORARILY INSTALL TIMING BELT

CAUTION: The engine should be cold.

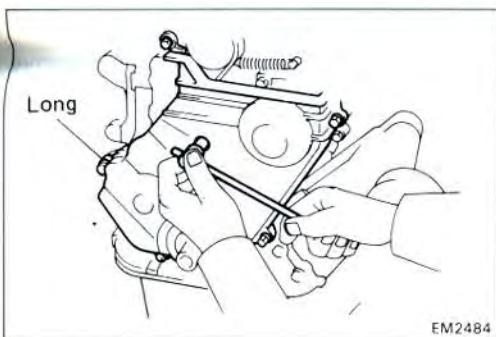
Install the timing belt on the crankshaft timing, oil pump, No.2 idler and water pump pulleys.

NOTE: If reusing the timing belt, align the points marked during removal, and install the belt with the arrow pointing in the direction of engine revolution.



6. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.

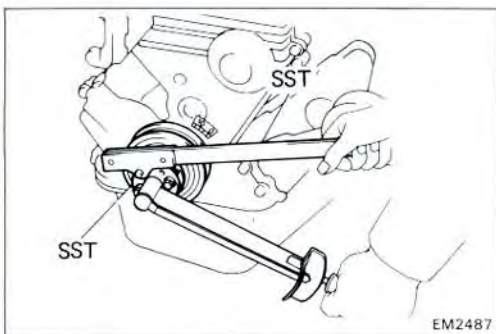


7. INSTALL NO.1 TIMING BELT COVER

(a) Install the gasket to the belt cover.

(b) Install the belt cover with the six bolts.

Torque: 90 kg-cm (78 in.-lb, 8.8 N·m)



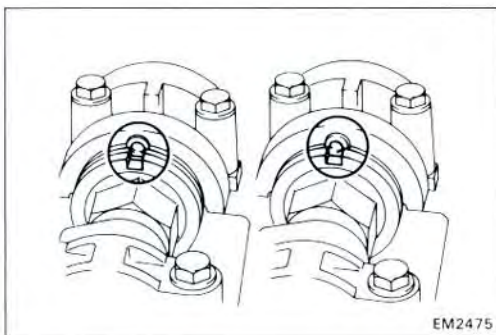
8. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, slide the pulley.

(b) Using SST, install and torque the bolt.

SST 09213-14010 and 09330-00021

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)

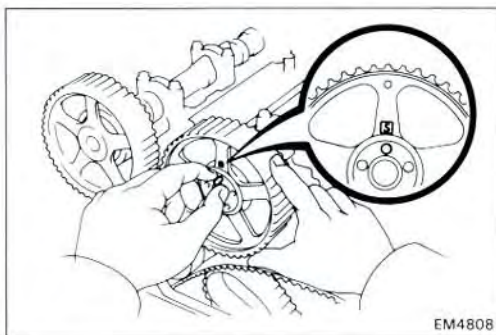


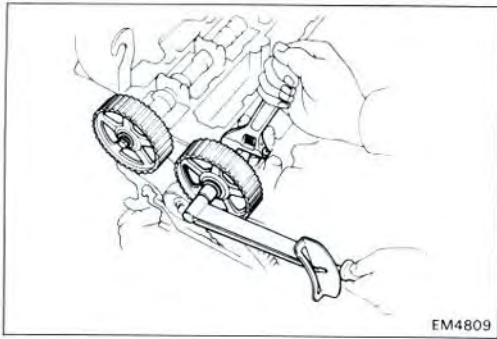
9. INSTALL CAMSHAFT TIMING PULLEYS

(a) Using a wrench, turn and align the groove of the camshaft with the drilled mark of the No.1 camshaft bearing cap.

(b) Slide the timing pulley onto the camshaft, facing mark "S" upward.

(c) Align the pin holes of the camshaft and timing pulley, insert the knock pin.

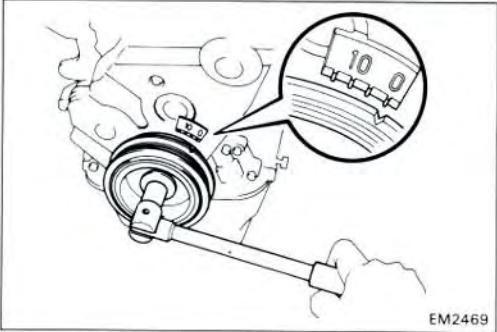




- (d) Hold the hexagonal wrench head portion of the camshaft with a wrench, and tighten the bolts.

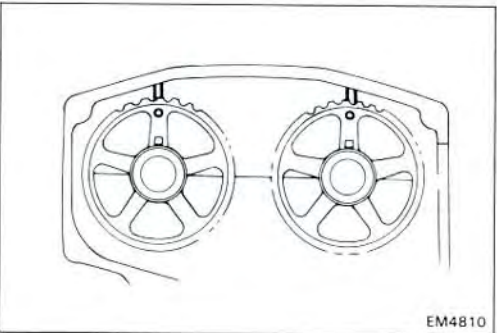
Torque: 600 kg-cm (43 ft-lb, 59 N·m)

10. INSTALL CYLINDER HEAD COVER (See step 7 on page EM-36)

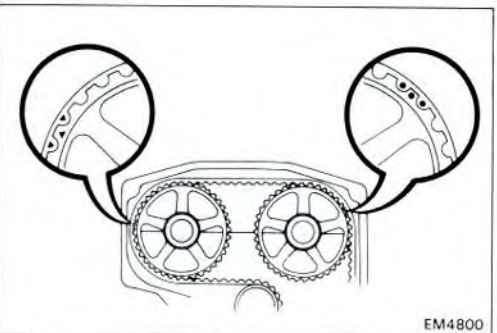


11. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley, and align the its groove with mark "0" of the No.1 timing belt cover.

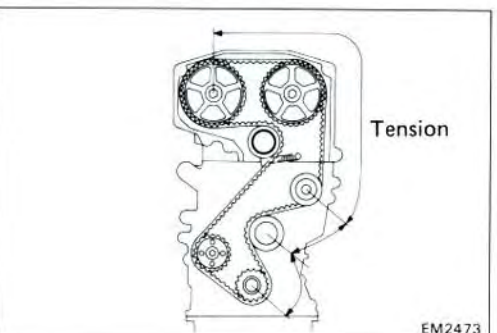


- (b) Turn the camshaft, and align the alignment marks of the camshaft timing pulley and cylinder head cover.

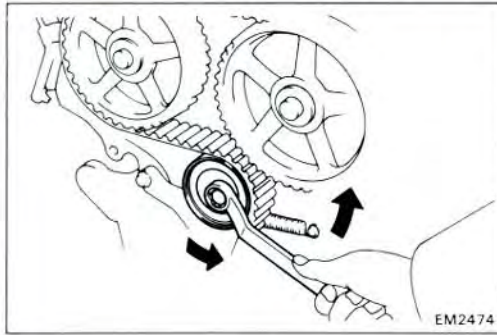


12. INSTALL TIMING BELT

NOTE: If reusing the timing belt, first align the match-marks of the camshaft timing pulleys and belt.



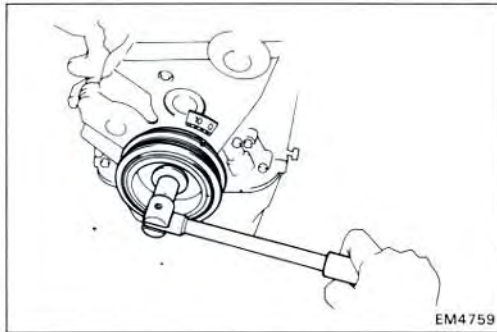
Install the timing belt, insuring the tension between the crankshaft and intake camshaft timing pulleys.



13. CHECK VALVE TIMING

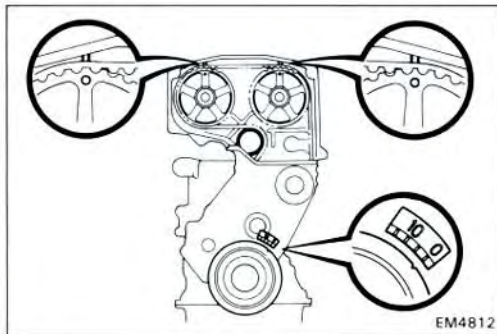
- (a) Loosen the No. 1 idler pulley bolt and stretch the timing belt.

NOTE: Do not loosen the pulley bolt further than the point where the idler returns.



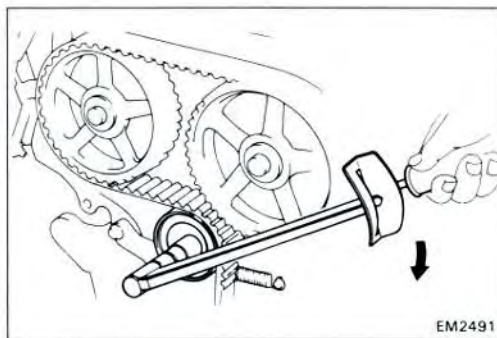
- (b) Slowly turn the crankshaft pulley two revolutions from TDC to TDC.

NOTE: Always turn the crankshaft clockwise.



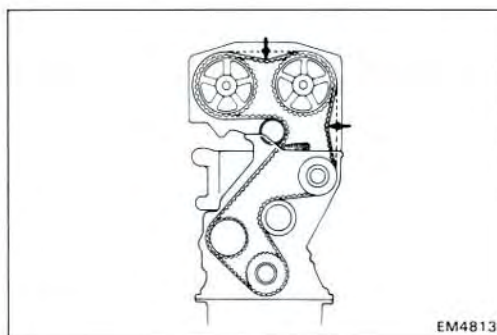
- (c) Check that each pulley aligns with the timing marks as shown in the figure.

If the marks do not align, remove the timing belt and reinstall it.

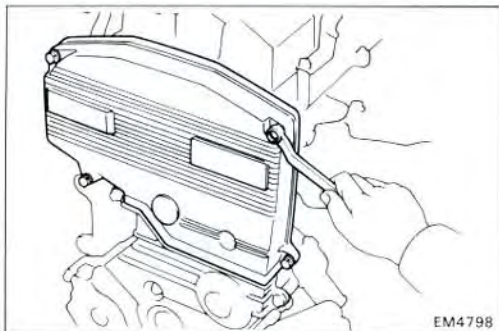


- (d) Torque the No. 1 idler pulley bolt.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)



- (e) Check that the belt has tension between the crankshaft and intake camshaft timing pulleys.

**14. INSTALL NO.2 TIMING BELT COVER**

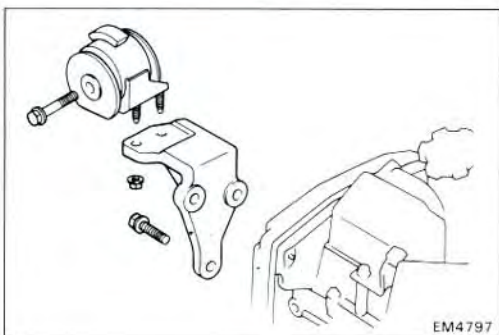
- (a) Install the gasket to the belt cover.
- (b) Install the belt cover with the five bolts.

15. INSTALL SPARK PLUGS (See page IG-6)

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

16. INSTALL THROTTLE BODY

(See steps 2 to 12 on page FI-43)

**17. INSTALL ENGINE RH MOUNTING INSULATOR AND BRACKET**

- (a) Install the bracket with the three bolts.
Torque the bolts.

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

- (b) Install the mounting insulator with the two nuts and through bolt.

Torque:

Bolt 800 kg-cm (58 ft-lb, 78 N·m)

Nut 530 kg-cm (38 ft-lb, 52 N·m)

18. LOWER ENGINE**19. INSTALL POWER STEERING PUMP****20. INSTALL ALTERNATOR BRACKETS**

(See step 15 on page EM-28)

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

21. INSTALL ALTERNATOR**22. INSTALL DRIVE BELTS**

Adjust the drive belts.

(See Pub. No. RM071U on page CH-3 or AC-19)

Drive belt tension:

Alternator

w/ Air con.	New belt	175 ± 5 lb
	Used belt	115 ± 20 lb
w/o Air con.	New belt	150 ± 25 lb
	Used belt	130 ± 25 lb

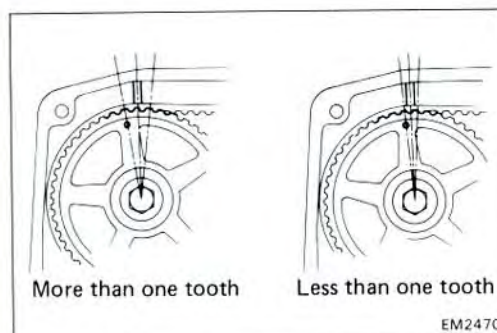
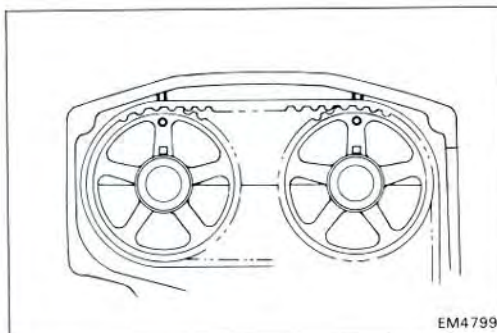
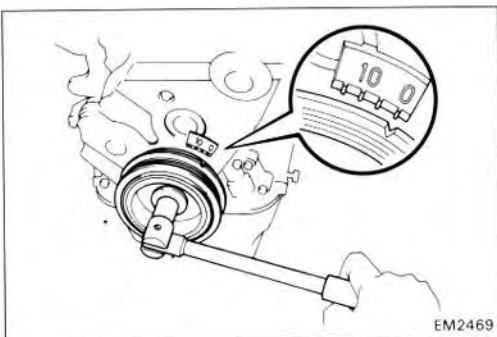
PS pump

New belt	125 ± 25 lb
Used belt	80 ± 20 lb

23. INSTALL POWER STEERING OIL RESERVOIR TANK**24. INSTALL RADIATOR RESERVOIR TANK****25. INSTALL ENGINE RH UNDER COVER****26. INSTALL RH FRONT WHEEL****27. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

ADJUSTMENT OF VALVE TIMING

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE RH FRONT WHEEL
3. REMOVE ENGINE RH UNDER COVER
4. REMOVE SPARK PLUGS (See page IG-6)
5. REMOVE INTERCOOLER
(See steps 3 and 7 on pages TC-9 and 10)
6. REMOVE NO.2 TIMING BELT COVER
(See step 12 on page EM-12)
7. CHECK CAMSHAFT TIMING PULLEY MARKS
 - (a) Turn the crankshaft pulley and align its groove with mark "0" of the No.1 timing belt cover.

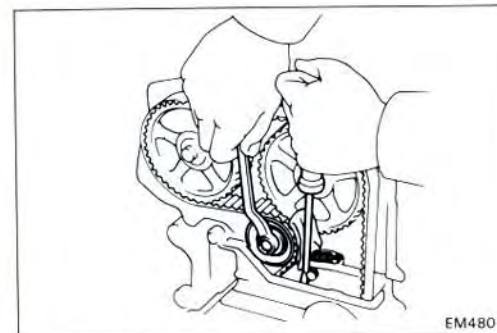


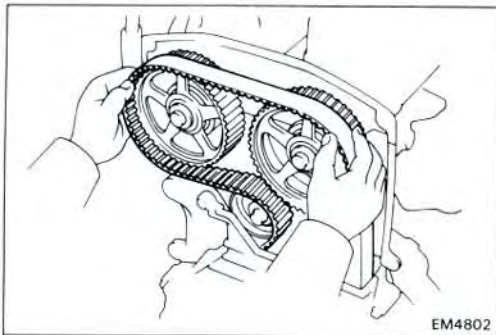
- (b) Check that the alignment marks of the camshaft timing pulleys are aligned with the those of the No.3 timing belt cover.

- If there is more than one timing pulley tooth between the alignment marks, realign the alignment marks in accordance with step 8.
- If the alignment marks are aligned or the difference is less than one timing pulley tooth, proceed to step 9.

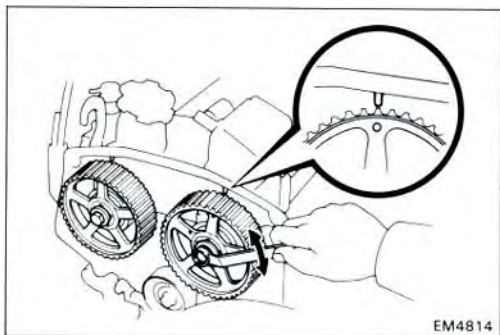
8. ADJUST CAMSHAFT TIMING PULLEY ALIGNMENT MARKS

- (a) Loosen the No.1 idler pulley bolt and shift the pulley toward the left as far as it will go, and temporarily tighten it.

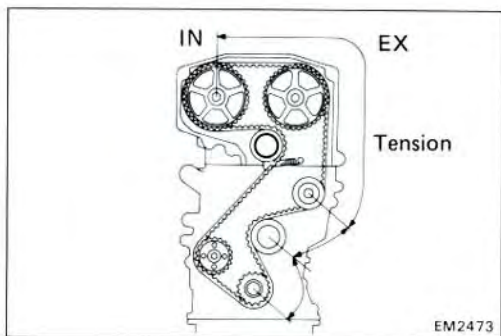




- (b) Remove the timing belt from the camshaft timing pulleys.

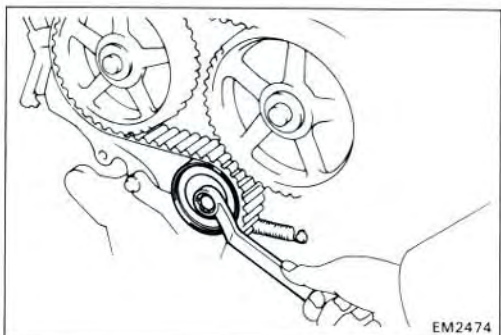


- (c) Rotate the camshaft with a wrench and align the alignment marks of the camshaft and cylinder head cover.



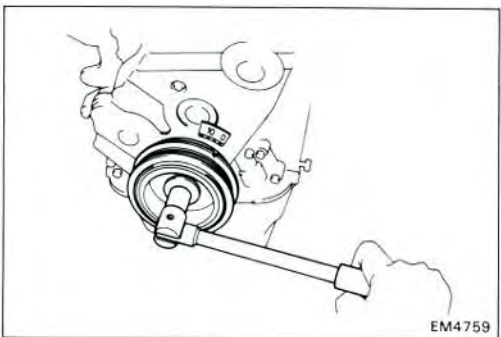
- (d) Install the timing belt, insuring the tension between the crankshaft and intake camshaft timing pulleys.

CAUTION: Install the timing belt when the engine is cold.



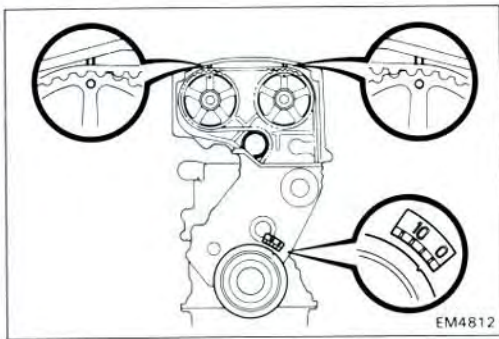
- (e) Loosen the No.1 idler pulley bolt and stretch the timing belt.

NOTE: Do not loosen the bolt further than the point where the idler returns.

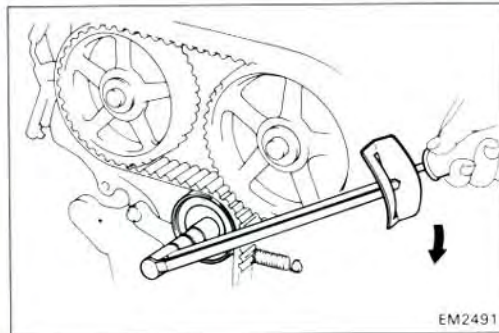


- (f) Turn the crankshaft pulley two revolutions from TDC to TDC.

NOTE: Always turn the crankshaft clockwise.



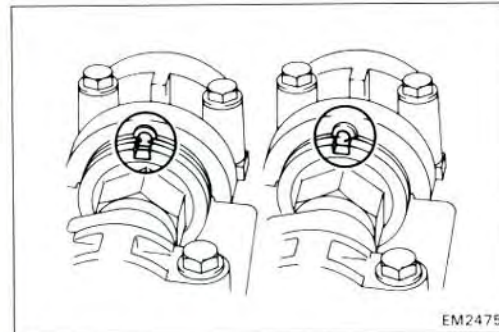
- (g) Check that each pulleys with the timing marks as shown in the figure.



- (h) Tighten the No.1 idler pulley bolt.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)

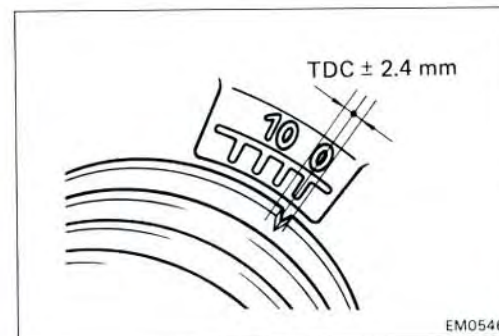
9. REMOVE THROTTLE BODY
(See steps 1 to 10 on page FI-41)
10. REMOVE CYLINDER HEAD COVER
(See step 39 on page EM-31)



11. CHECK VALVE TIMING

- (a) Using a wrench, turn and align the groove of the camshaft with the drilled mark of the No.1 camshaft bearing cap.

NOTE: Always turn the crankshaft clockwise.



- (b) Next make a note of the crankshaft pulley angle on the No.1 timing belt cover.

NOTE: Perform this check separately for the IN and EX sides.

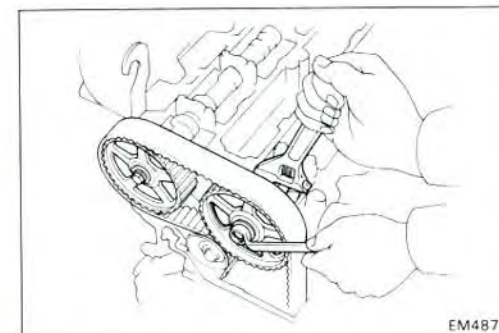
If the crankshaft pulley movement is within ± 2.4 mm (0.094 in.) of TDC it is correct.

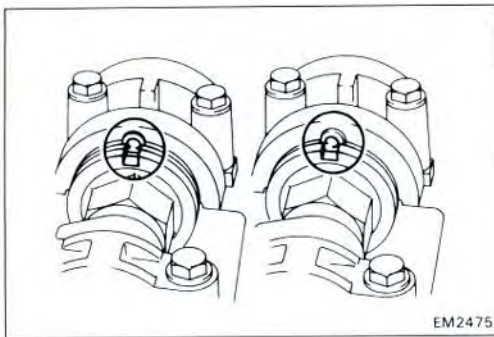
If it is greater than 2.4 mm (0.094 in.), go back to step 7.

12. ADJUST VALVE TIMING

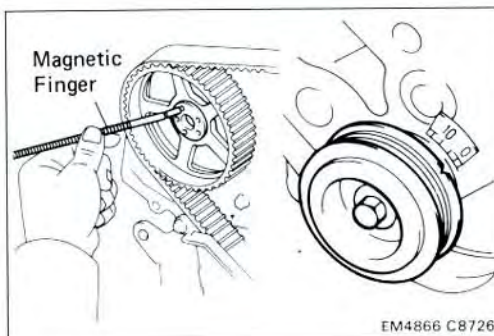
- (a) Hold the of the hexagonal wrench head portion of the camshaft with a wrench, and remove the pulley mount bolts.

CAUTION: Do not make use of the timing belt tension when loosening the bolt.

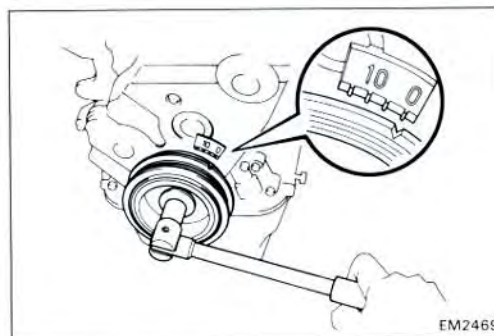




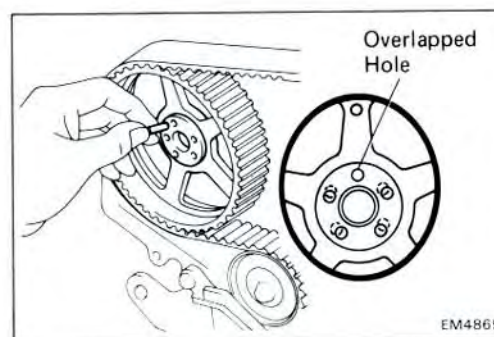
- (b) Check that the camshaft grooves are aligned with the drilled mark of the No.1 camshaft bearing cap.



- (c) Using a magnetic finger, remove the knock pin from the pin hole of camshaft timing pulley.



- (d) Turn the crankshaft pulley and align its groove with mark "0" of the No.1 timing belt cover.



- (e) There are five pin holes of the camshaft and timing pulley. Select one overlapped hole and insert the match pin into it.

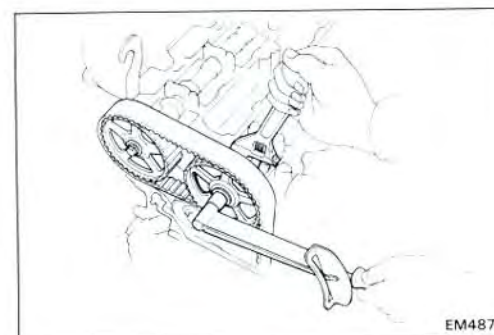
NOTE:

- If there is not an overlapped hole, rotate the crankshaft a little and insert the pin into the hole nearly overlapped.
- By changing the pin hole to the next one, the crankshaft pulley angle can be adjusted by approx. 2° .
- By changing the pin hole to the next two, the crankshaft pulley angle can be adjusted by approx. 5° .

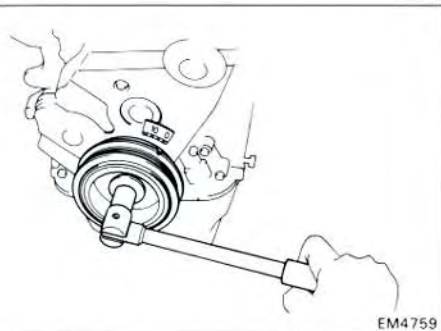
- (f) Hold the hexagonal wrench head portion of the camshaft with a wrench, and install the pulley bolt.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

CAUTION: Do not make use of the timing belt tension when tightening the bolt.



- (g) Turn the crankshaft clockwise two revolutions from TDC to TDC.
- (h) Recheck the valve timing.
(See step 10 on page EM-23)



13. REINSTALL NO.2 TIMING BELT COVER
(See step 20 page EM-20)

14. REINSTALL SPARK PLUGS (See page IG-6)
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

15. REINSTALL CYLINDER HEAD COVER
(See step 7 on page EM-36)

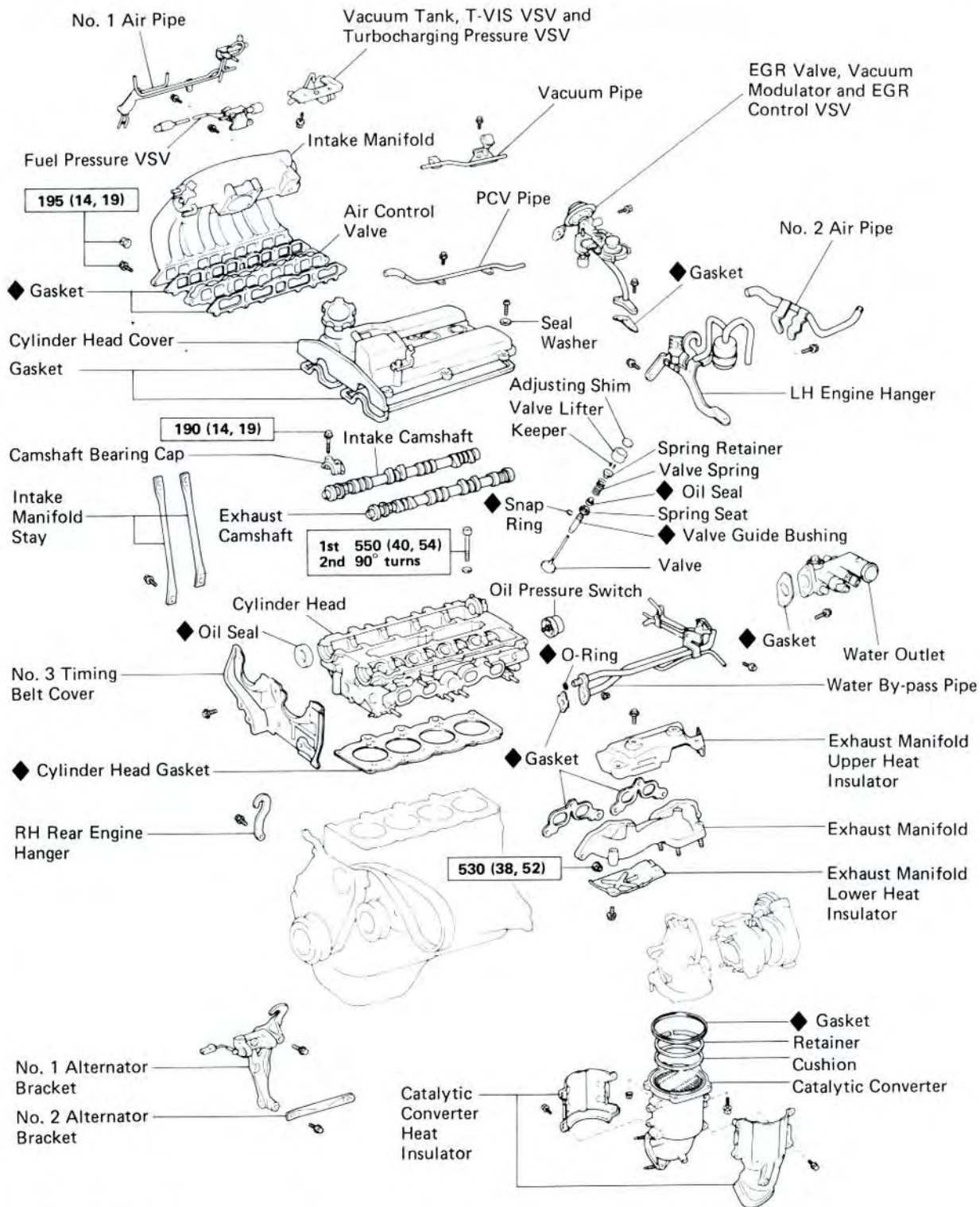
16. REINSTALL THROTTLE BODY
(See steps 2 to 12 on page FI-41)

17. REINSTALL ENGINE RH UNDER COVER

18. REINSTALL RH FRONT WHEEL

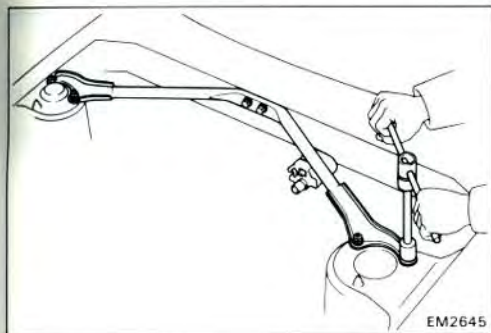
19. RECONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CYLINDER HEAD COMPONENTS



kg-cm (ft-lb, N-m) : Specified torque

◆ Non-reusable part

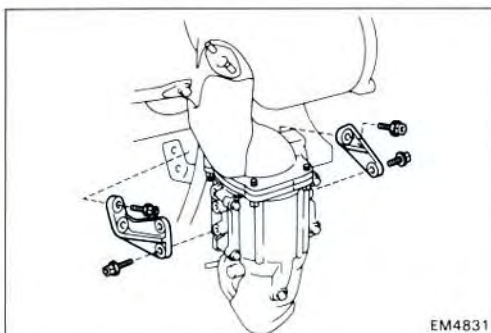


EM2645

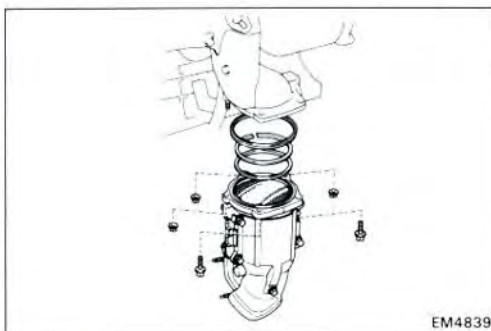
REMOVE OF CYLINDER HEAD

(See page EM-26)

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
2. **DRAIN ENGINE COOLANT** (See page CO-4)
3. **DRAIN INTERCOOLER COOLANT** (See page TC-7)
4. **REMOVE SUSPENSION UPPER BRACE**
 - (a) Disconnect the ignition coil connector and high-tension cord from the ignition coil.
 - (b) Remove the four nuts, two bolts and upper brace.
5. **DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY**
6. **REMOVE RADIATOR RESERVOIR TANK**
7. **REMOVE AIR CLEANER ASSEMBLY**
(See step 11 on page EM-43)
8. **REMOVE ALTERNATOR**
9. **RAISE VEHICLE**
CAUTION: Be sure the vehicle is securely supported.
10. **REMOVE RH FRONT WHEEL**
11. **REMOVE ENGINE UNDER COVERS**
12. **REMOVE SUSPENSION LOWER CROSSMEMBER**
(See step 21 on page EM-44)
13. **REMOVE FRONT EXHAUST PIPE**
(See step 25 on page EM-45)
14. **REMOVE CATALYTIC CONVERTER**
 - (a) Remove the six bolts and two converter stays.

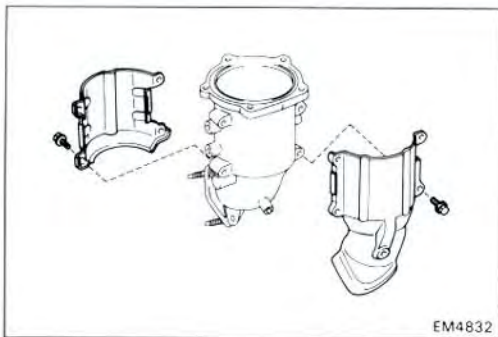


EM4831

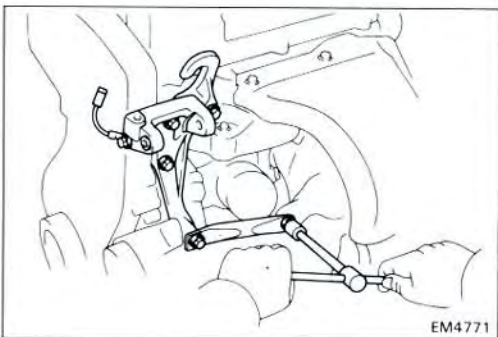


EM4839

- (b) Remove the three bolts, two nuts and catalytic converter. Remove the gasket, retainer and cushion.



(c) Remove the nine bolts and two heat insulators.

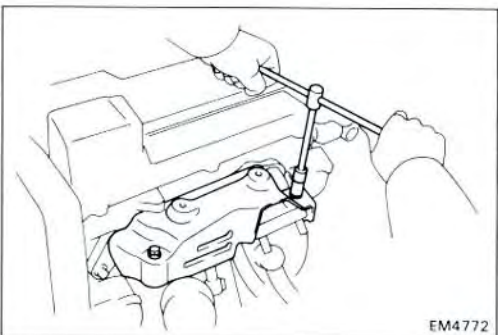


15. REMOVE ALTERNATOR BRACKETS

Remove the five bolts, No.1 and No.2 brackets.

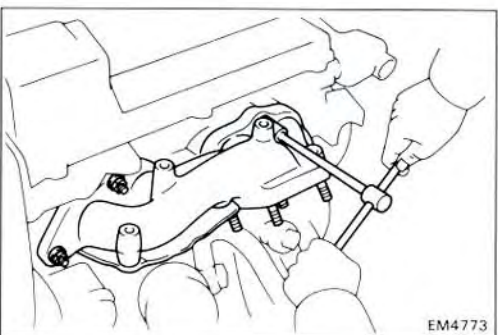
16. REMOVE TURBOCHARGER

(See steps 6, 7 to 14 on pages TC-9 to 11)

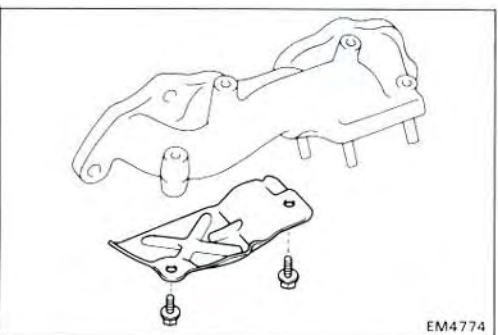


17. REMOVE EXHAUST MANIFOLD

(a) Remove the two bolts and upper heat insulator.

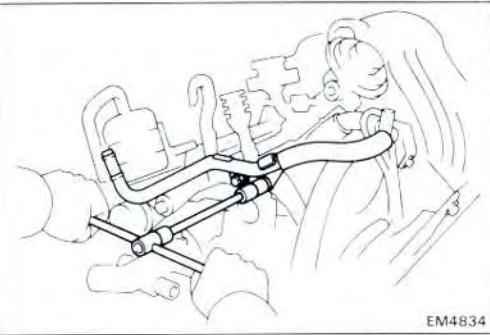


(b) Remove the six nuts, exhaust manifold and two gasket.



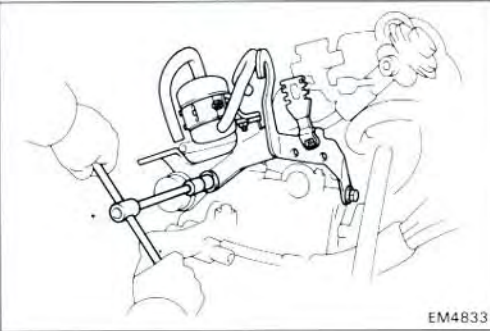
(c) Remove the two bolts and lower heat insulator.

18. REMOVE DISTRIBUTOR (See page IG-8)



19. REMOVE NO.2 AIR PIPE

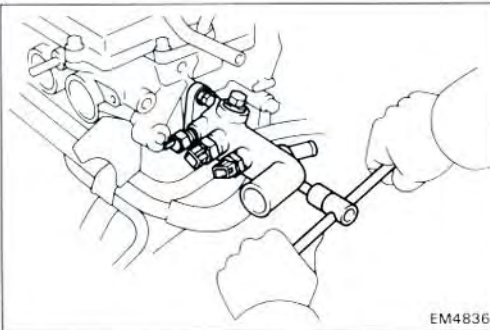
- (a) Disconnect the air hose.
- (b) Remove the two bolts and air pipe.



20. REMOVE LH ENGINE HANGER

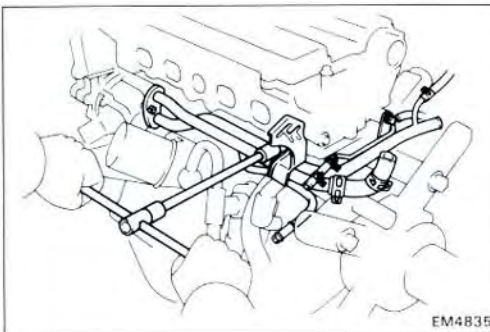
Remove the two bolts and engine hanger together with the reservoir tank.

21. REMOVE OIL PRESSURE SWITCH



22. REMOVE WATER OUTLET

- (a) Disconnect the following connectors and hoses:
 - (1) Water temperature sender gauge connector
 - (2) Water temperature sensor connector
 - (3) Cold start injector time switch connector
 - (4) No.1 air pipe water by-pass hose
 - (5) Radiator upper hose
 - (6) Water by-pass pipe hose
 - (7) Heater water by-pass hose
 - (8) Emission control vacuum hoses
- (b) Remove the two bolts, water outlet and gasket.



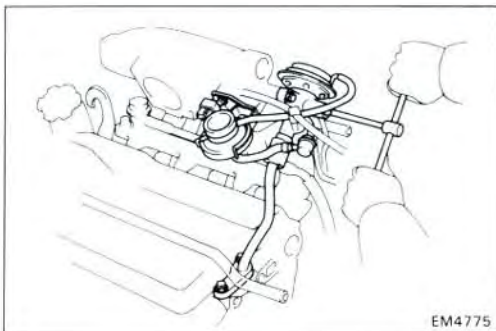
23. REMOVE WATER BY-PASS PIPE

- (a) Disconnect the following hoses:
 - (1) Oil cooler water by-pass hoses
 - (2) Heater water by-pass hose
 - (3) No.1 air pipe water by-pass hose
 - (4) Water by-pass hose from cylinder block
 - (5) Turbocharging pressure VSV vacuum hose
- (b) Remove the two bolts, nuts, water by-pass pipe, gasket and O-ring.

24. REMOVE THROTTLE BODY

(See steps 6 to 10 on page FI-41)

25. DISCONNECT COLD START INJECTOR CONNECTOR

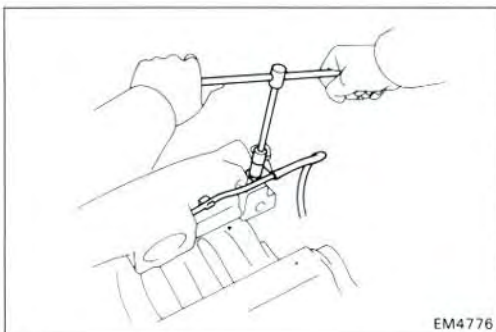


EM4775

26. REMOVE EGR VALVE, VACUUM MODULATOR AND EGR CONTROL VSV

Remove the five bolts, the EGR valve, pipe, vacuum modulator and control VSV assembly.

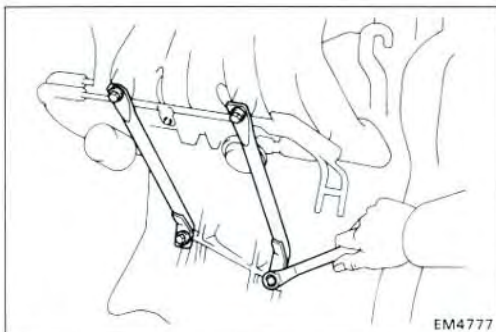
27. REMOVE DELIVERY PIPE AND INJECTORS (See steps 4 to 6 on page FI-35)



EM4776

28. REMOVE VACUUM PIPE

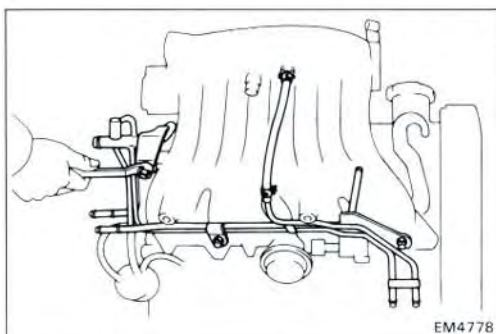
- (a) Disconnect the vacuum hose from the EGR vacuum modulator.
- (b) Remove the bolt and vacuum pipe.



EM4777

29. REMOVE INTAKE MANIFOLD STAYS

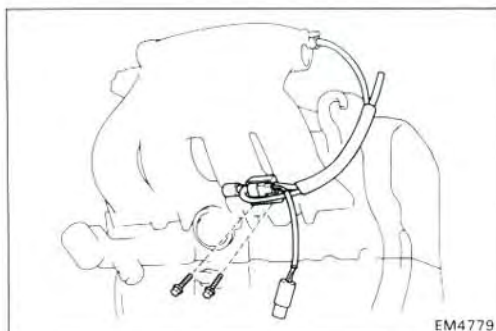
Remove the four bolts and two manifold stays.



EM4778

30. REMOVE NO.1 AIR PIPE

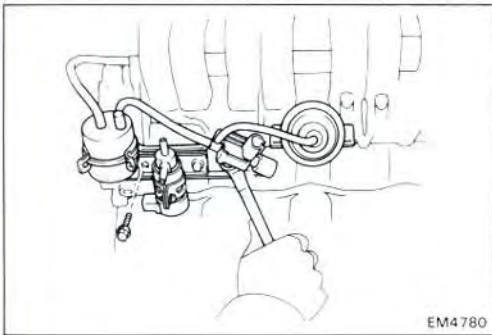
- (a) Disconnect the following hoses:
 - (1) Intake manifold vacuum hose
 - (2) Turbocharging pressure VSV vacuum hose
 - (3) Two PS pump vacuum hoses
- (b) Remove the three bolts and air pipe.



EM4779

31. REMOVE FUEL PRESSURE VSV

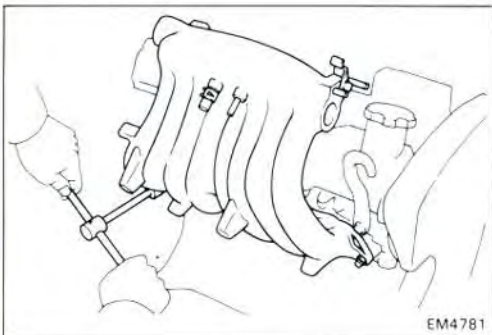
- (a) Disconnect the vacuum hose from the intake manifold.
- (b) Remove the two bolts and VSV together with hoses.



EM4780

32. REMOVE T-VIS VSV, VACUUM TANK AND TURBOCHARGING PRESSURE VSV

- (a) Disconnect the following hoses:
 - (1) Intake manifold vacuum hose
 - (2) T-VIS actuator vacuum hose
- (b) Remove the two bolts, the T-VIS VSV, vacuum tank and turbocharging pressure VSV assembly.



EM4781

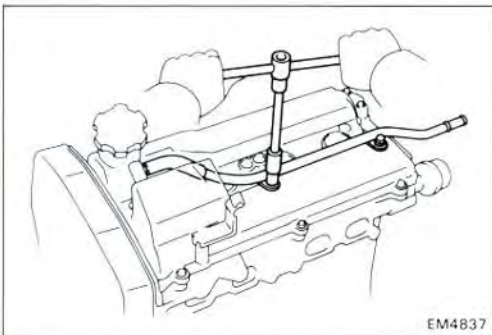
33. REMOVE INTAKE MANIFOLD AND AIR CONTROL VALVE

Remove the four bolts and three nuts, intake manifold, gasket, air control valve and gasket.

34. REMOVE POWER STEERING OIL RESERVOIR TANK WITHOUT DISCONNECTING HOSES

35. REMOVE SPARK PLUGS (See page IG-6)

36. REMOVE NO.2 TIMING BELT COVER (See step 12 on page EM-12)



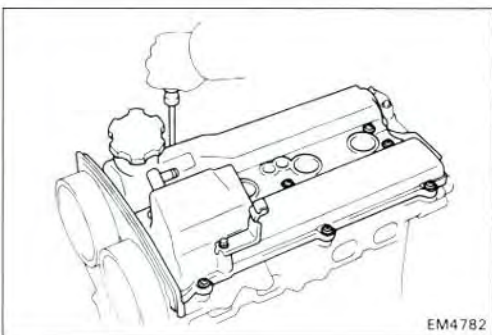
EM4837

37. REMOVE TIMING BELT

(See steps 14 and 15 on pages EM-12 and 13)

38. REMOVE PCV PIPE

- (a) Disconnect the air hose from the cylinder head cover.
- (b) Remove the two bolts and PCV pipe.



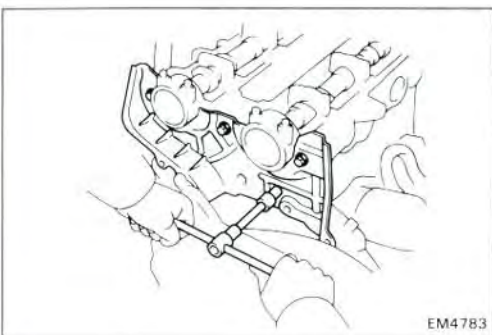
EM4782

39. REMOVE CYLINDER HEAD COVER

Remove the twelve screws, seal washers, head cover and two gaskets.

40. REMOVE CAMSHAFT TIMING PULLEYS (See step 17 on page EM-13)

41. REMOVE NO.1 IDLER PULLEY AND TENSION SPRING (See step 22 on page EM-14)



EM4783

42. REMOVE NO.3 TIMING BELT COVER

Remove the five bolts and timing belt cover.

NOTE:

- Support the belt so the meshing of the crankshaft timing pulley and timing belt does not shift.
- Be careful not to drop anything inside the timing belt cover.
- Do not allow the belt to come into contact with oil, water or dust.

43. REMOVE INTAKE AND EXHAUST CAMSHAFTS

- (a) Uniformly loosen and remove the twenty bearing cap bolts in several passes, in the sequence shown.
- (b) Remove the ten bearing caps, two oil seal and two camshafts.

NOTE: Arrange the intake and exhaust camshafts.

44. REMOVE RH REAR ENGINE HANGER**45. REMOVE CYLINDER HEAD**

- (a) Using SST, uniformly loosen and remove the ten cylinder head bolts in several passes, in the sequence shown.

SST 09043-38100

CAUTION: Head warpage or cracking could result from removing the bolts in incorrect order.

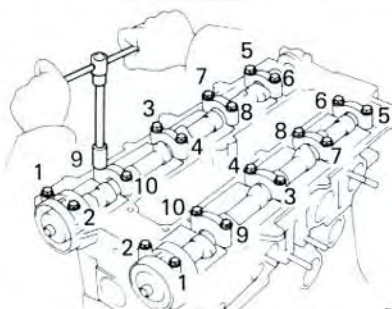
- (b) Lift the cylinder head from the dowels on the cylinder block and place it on wooden blocks on a bench.

NOTE: If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block saliences.

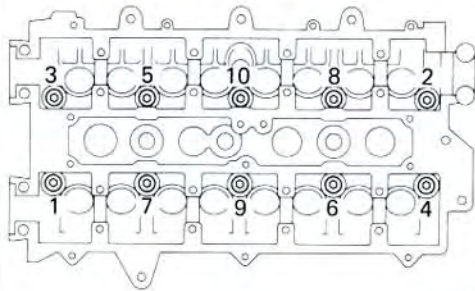
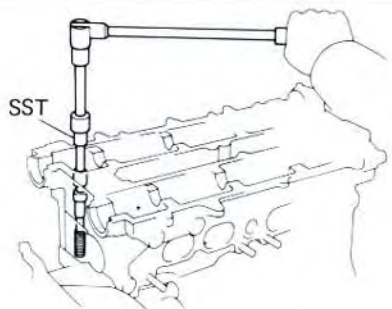
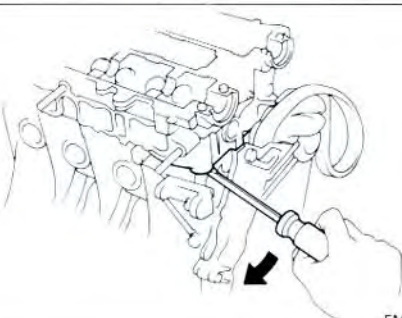
CAUTION: Be careful not to damage the cylinder head and block surface on the cylinder and head gasket sides.

DISASSEMBLY OF CYLINDER HEAD

(See Pub. No. RM071U on page EM-84)



EM4784

EM4785
EM4786

EM2199

INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

(See Pub. No. RM071U on pages EM-85 to 93)

INSPECTION OF TOYOTA — VARIABLE INDUCTION SYSTEM (T-VIS)

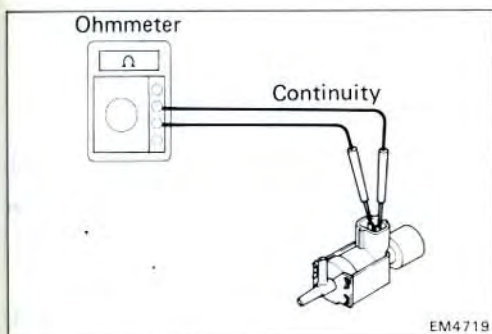
1. INSPECT AIR CONTROL VALVE
(See Pub. No. RM071U, step 1 on page EM-93)
2. INSPECT VACUUM TANK
(See Pub. No. RM071U, step 2 on page EM-93)
3. INSPECT VACUUM SWITCHING VALVE (VSV)

A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold): 33 — 39 Ω

If there is no continuity, replace the VSV.

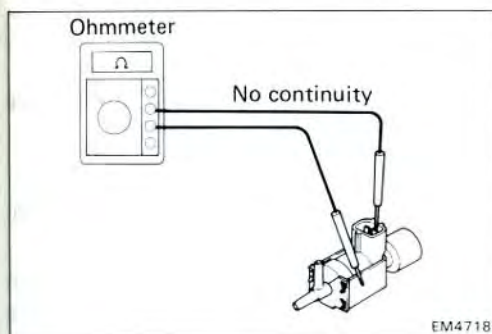


EM4719

B. Inspect VSV for ground

Using an ohmmeter, check that there is no continuity between each terminal and the VSV body.

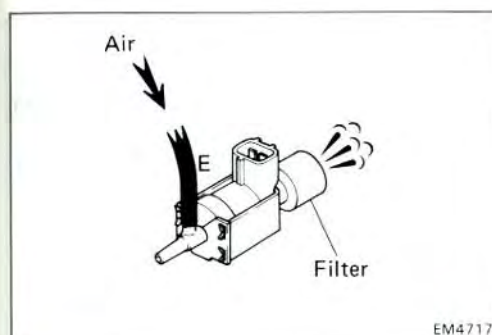
If there is continuity, replace the VSV.



EM4718

C. Inspect VSV operation

- (a) Check that air flows from pipe E to the filter.

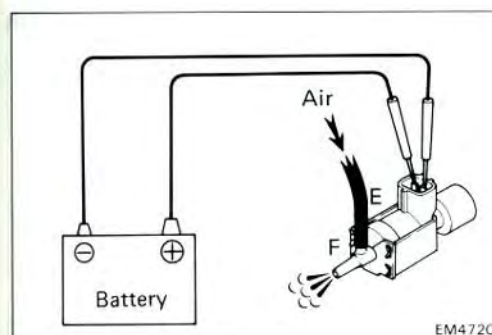


EM4717

- (b) Apply battery voltage across the terminals.

- (c) Check that air flows from pipes E to F.

If operation is not as specified, replace the VSV.



EM4720

ASSEMBLY OF CYLINDER HEAD

(See Pub. No. RM071U on pages EM-85 and 96)

INSTALLATION OF CYLINDER HEAD

(See page EM-26)

1. INSTALL CYLINDER HEAD

A. Place cylinder head on cylinder block

- (a) Place a new cylinder head gasket on the cylinder block.

CAUTION: Be careful of the installation.

- (b) Place the cylinder head on the cylinder head gasket.

B. Tighten cylinder head bolts

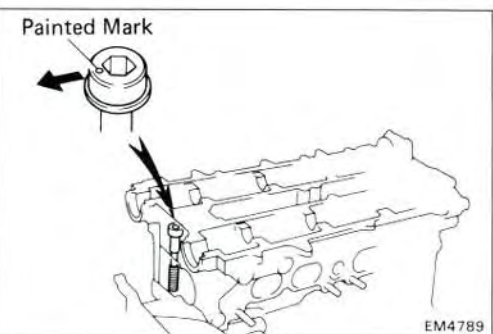
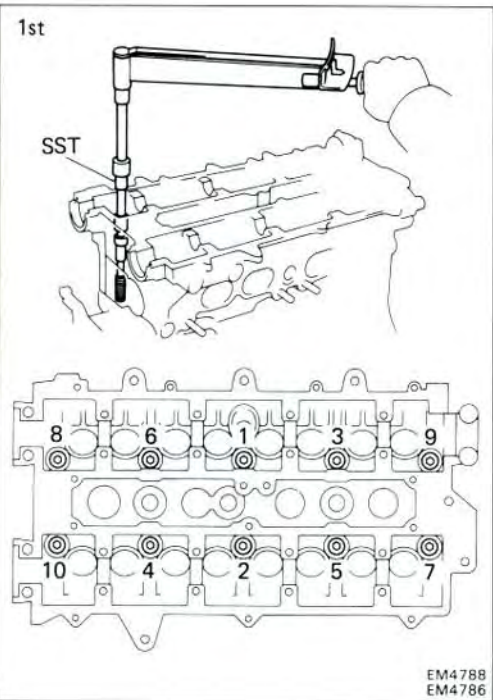
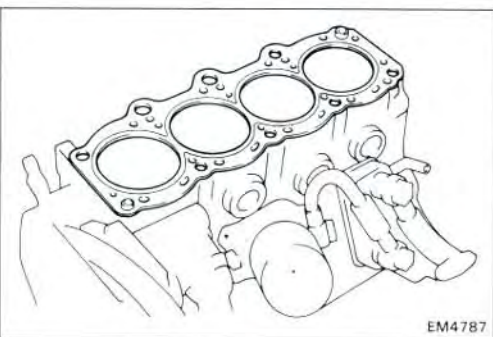
NOTE:

- The cylinder head bolts are tighten in two progressive steps.
 - If any of bolts break or deform, replace them.
- (a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
 - (b) First, using SST, install and uniformly tighten the ten cylinder head bolts in several passes, in the sequence shown.

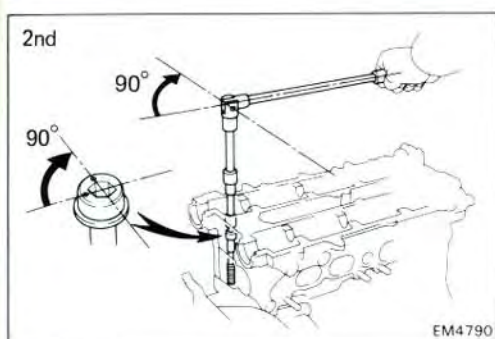
SST 09043-38100

Torque: 550 kg-cm (40 ft-lb, 54 N·m)

If any one of the bolts not meet the torque specification, replace the bolt.



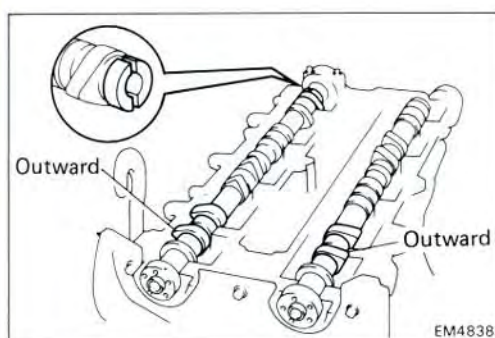
- (c) Mark the front of the cylinder head bolt head with paint.



- (d) Second, retighten the ten cylinder head bolts 90° in the numerical order shown.
- (e) Check that the painted mark is now at a 90° angle to the front.

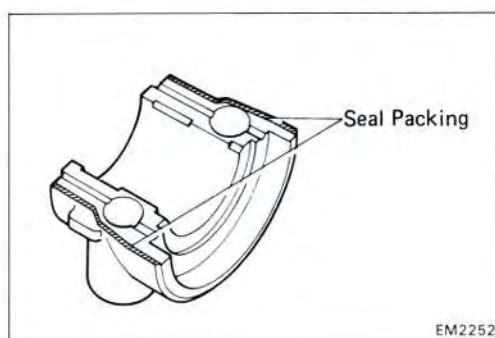
2. INSTALL RH REAR ENGINE HANGER

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



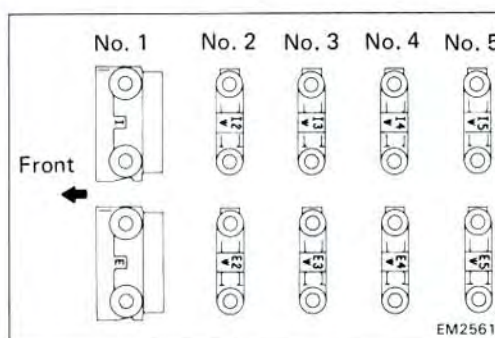
3. INSTALL INTAKE AND EXHAUST CAMSHAFTS

- (a) Place the camshaft on the cylinder head with the No. 1 cam lobe facing outward as shown.



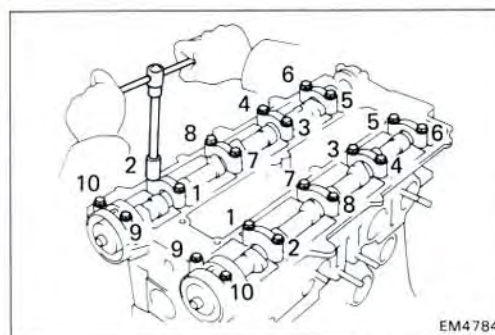
- (b) Apply seal packing to the No. 1 bearing cap as shown.

Seal packing: Part No.08826-00080 or equivalent



- (c) Install the bearing caps in the their proper locations.

NOTE: Each bearing cap has a number and front mark.



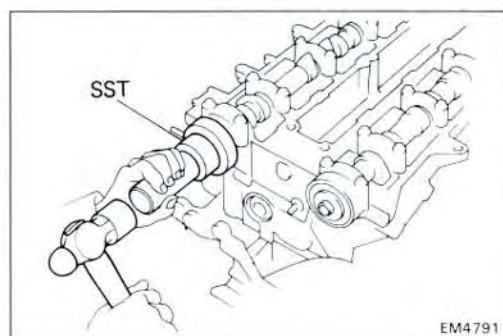
- (d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

- (e) Install and uniformly tighten the twenty bearing cap bolts in several passes, in the sequence shown.

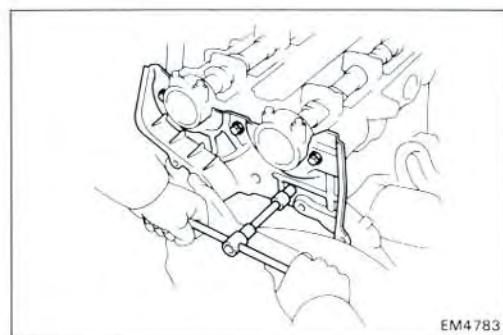
Torque: 190 kg-cm (14 ft-lb, 19 N·m)



(f) Apply MP grease to a new oil seal lip.



(g) Using SST, tap in the two camshaft oil seals.
SST 09223-50010

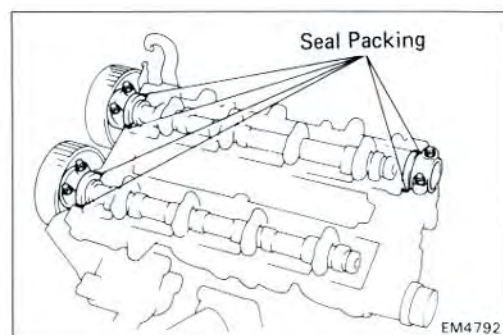


4. INSTALL NO.3 TIMING BELT COVER

Install the No.3 belt cover with the five bolts.

5. INSTALL NO.1 IDLER PULLEY AND TENSION SPRING (See step 4 on page EM-16)

6. INSTALL CAMSHAFT TIMING PULLEYS (See step 9 on page EM-17)



7. INSTALL CYLINDER HEAD COVERS

(a) Apply seal packing to the cylinder head as shown in the figure.

Seal packing: Part No.08826-00080 or equivalent

(b) Install the two gaskets to the head cover.

(c) Install the head cover with the twelve seal washers and screws.

Torque: 25 kg-cm (21 in.-lb, 2.5 N)

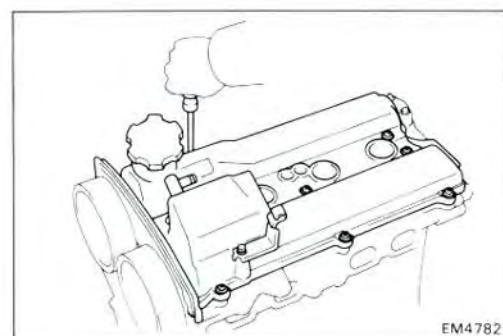
8. INSTALL TIMING BELT (See steps 11 to 13 on pages EM-18 and 19)

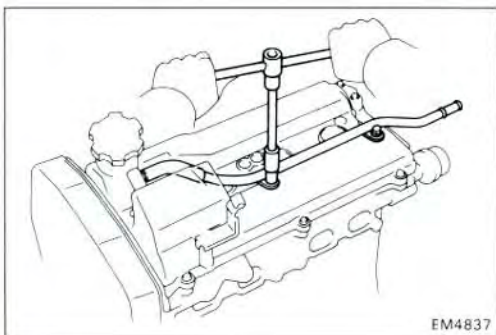
9. INSTALL NO.2 TIMING BELT COVER (See page 14 on page EM-20)

10. INSTALL SPARK PLUGS (See page IG-6)

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

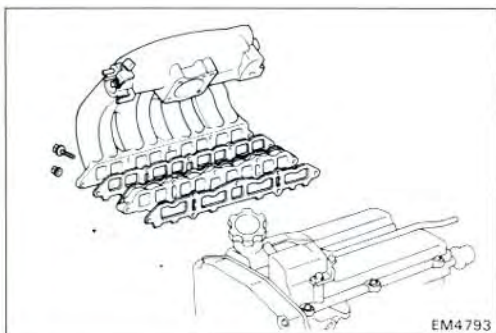
11. INSTALL POWER STEERING OIL RESERVOIR TANK





12. INSTALL PCV PIPE

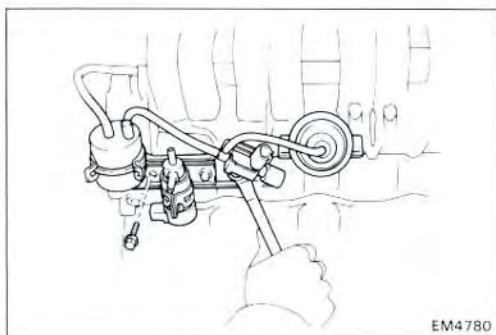
- (a) Connect the hose to the cylinder head cover.
- (b) Install the PCV pipe with the two bolts.



13. INSTALL AIR CONTROL VALVE AND INTAKE MANIFOLD

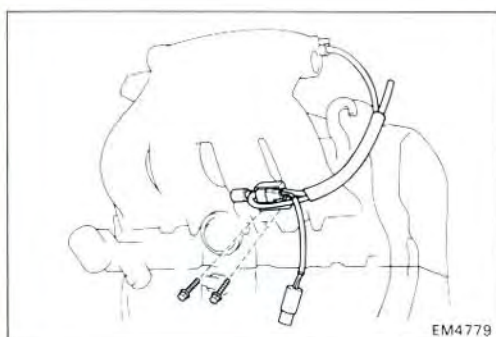
Install a new gasket, the air control valve, a new gasket and the intake manifold with the four bolts and three nuts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



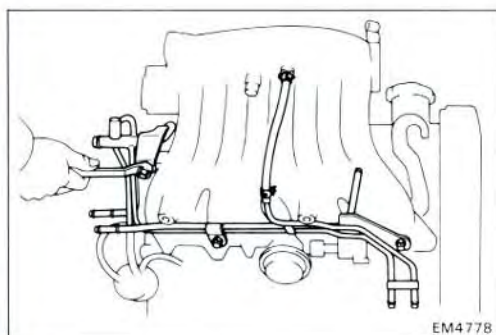
14. INSTALL T-VIS VSV, VACUUM TANK AND TURBOCHARGING PRESSURE VSV

- (a) Install the T-VIS, vacuum tank and turbocharging pressure VSV assembly with the two bolts.
- (b) Connect the hoses:
 - (1) Intake manifold vacuum hose
 - (2) T-VIS actuator vacuum hose



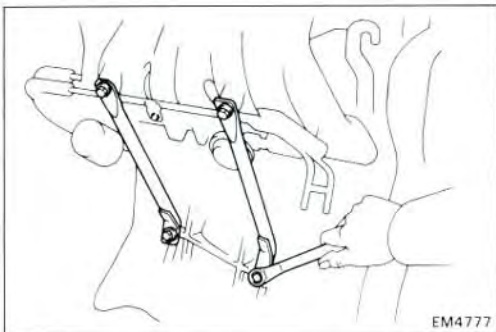
15. INSTALL FUEL PRESSURE VSV

- (a) Install the VSV with the two bolts.
- (b) Connect the vacuum hose to the intake manifold:



16. INSTALL NO.1 AIR PIPE

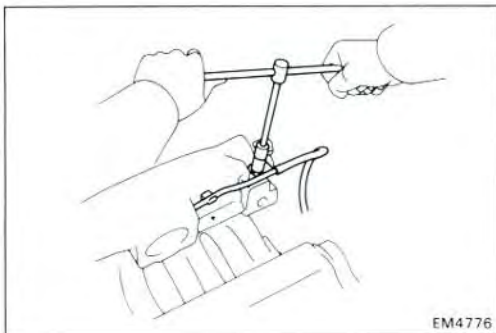
- (a) Install the air pipe with the two bolts.
- (b) Connect the hose:
 - (1) Intake manifold vacuum hose
 - (2) Turbocharging pressure VSV vacuum hose
 - (3) Two PS pump vacuum hoses



17. INSTALL INTAKE MANIFOLD STAYS

Install the two manifold stays with the four bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)



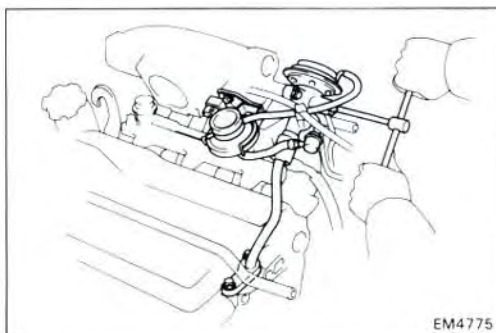
18. INSTALL VACUUM PIPE

(a) Install the vacuum pipe with the bolt.

(b) Connect the vacuum hose to the EGR vacuum modulator.

19. INSTALL DELIVERY PIPE AND INJECTORS

(See steps 2 to 4 on page FI-37 and 38)



20. INSTALL EGR VALVE, VACUUM MODULATOR AND EGR CONTROL VSV

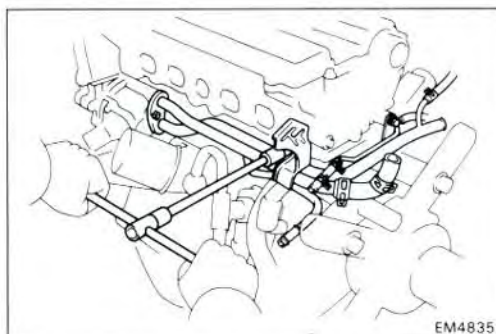
Install the EGR valve, pipe, vacuum modulator and control VSV assembly with the five bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

21. CONNECT COLD START INJECTOR CONNECTOR

22. INSTALL THROTTLE BODY

(See steps 2 to 6 on page FI-43)



23. INSTALL WATER BY-PASS PIPE

(a) Install a new O-ring to the pipe.

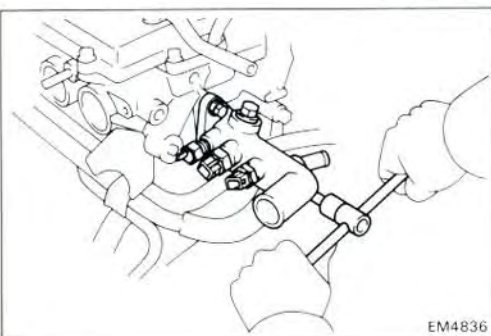
(b) Install a new gasket to the water pump.

(c) Install the water by-pass pipe with the two bolts and nuts.

(d) Connect the following hoses:

- (1) Oil cooler water by-pass hoses
- (2) Heater water by-pass hose
- (3) No.1 air pipe water by-pass hose
- (4) Water by-pass hose to cylinder block
- (5) Turbocharging pressure VSV vacuum hose

Torque (Nuts): 80 kg-cm (69 in.-lb, 7.8 N·m)



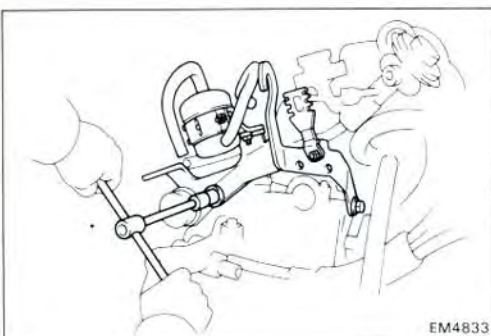
EM4836

24. INSTALL WATER OUTLET

- (a) Install a new gasket and water outlet with the two bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

- (b) Connect the following connectors and hoses:
- (1) Water temperature sender gauge connector
 - (2) Water temperature sensor connector
 - (3) Cold start injector time switch connector
 - (4) No.1 air pipe water by-pass hose
 - (5) Radiator upper hose
 - (6) Water by-pass pipe hose
 - (7) Heater water by-pass hose
 - (8) Emission control vacuum hoses



EM4833

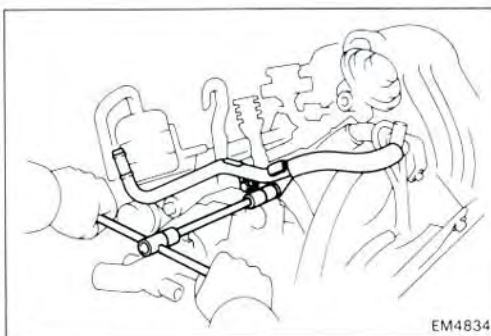
25. INSTALL OIL PRESSURE SWITCH**26. INSTALL LH ENGINE HANGER**

Install the LH engine hanger and reservoir tank with the two bolts.

Torque:

12 mm bolt head 130 kg-cm (9 ft-lb, 13 N·m)

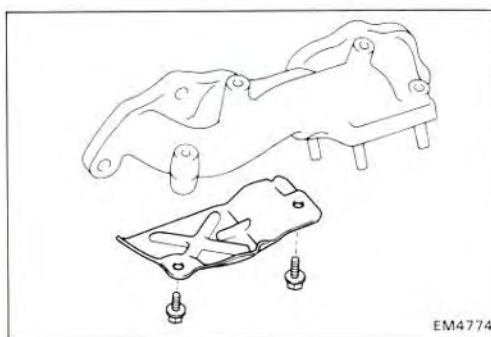
14 mm bolt head 195 kg-cm (14 ft-lb, 19 N·m)



EM4834

27. INSTALL NO.2 AIR PIPE

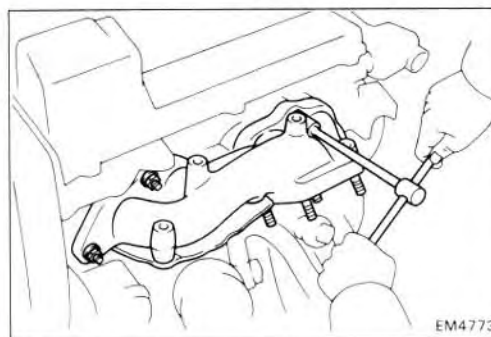
- (a) Install the air pipe with the two bolts.
- (b) Connect the air hose.

28. INSTALL DISTRIBUTOR (See page IG-9)

EM4774

29. INSTALL EXHAUST MANIFOLD

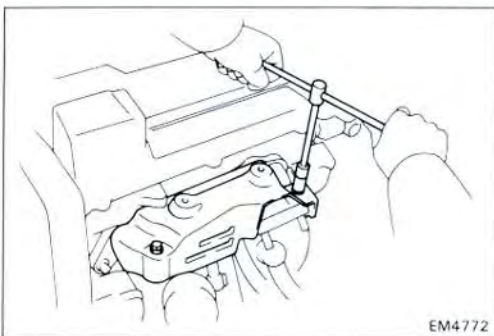
- (a) install the lower heat insulator with the two bolts.



EM4773

- (b) Install new two gaskets and the exhaust manifold with the six nuts.

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

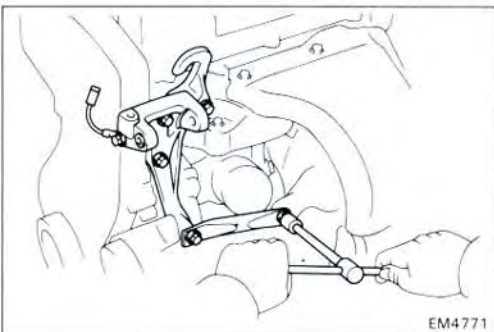


EM4772

(c) Install the upper heat insulator with the two bolts.

30. INSTALL TURBOCHARGER

(See steps 4 to 11 on pages TC-13 and 14)



EM4771

31. INSTALL ALTERNATOR BRACKETS

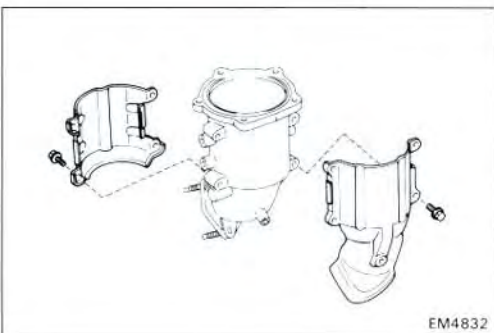
Install the No.1 and No.2 brackets with the five bolts.

Torque:

To turbine outlet elbow

440 kg-cm (32 ft-lb, 43 N·m)

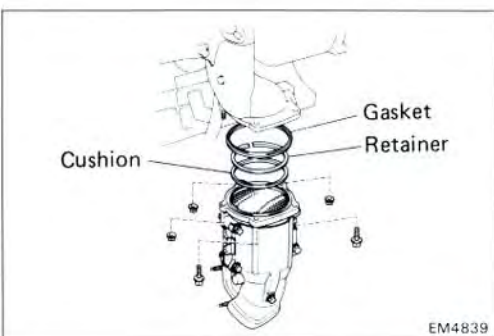
Others 400 kg-cm (29 ft-lb, 39 N·m)



EM4832

32. INSTALL CATALYTIC CONVERTER

(a) Install the two heat insulator with the nine bolts.

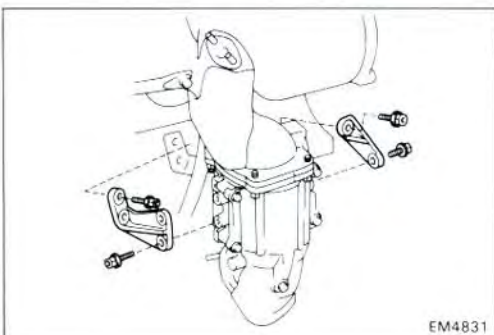


EM4839

(b) Install new cushion, the retainer and gasket to the catalytic converter.

(c) Install the catalytic converter with the three bolts and two nuts.

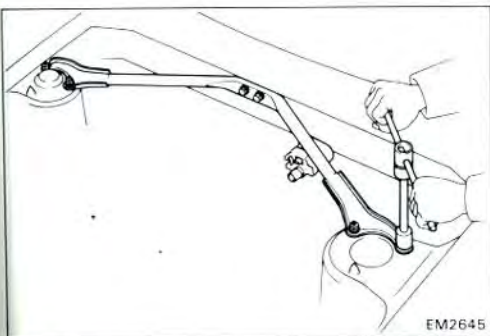
Torque: 300 kg-cm (22 ft-lb, 29 N·m)



EM4831

(d) Install the two converter stays with the six bolts.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)



33. **INSTALL EXHAUST FRONT PIPE**
(See step 7 on page EM-50)
34. **INSTALL SUSPENSION LOWER CROSSMEMBER**
(See step 6 page EM-50)
35. **INSTALL ENGINE UNDER COVER**
36. **INSTALL RH FRONT WHEEL**
37. **LOWER VEHICLE**
38. **INSTALL ALTERNATOR**
39. **INSTALL AIR CLEANER ASSEMBLY**
(See step 21 on page EM-51)
40. **INSTALL CRUISE CONTROL ACTUATOR**
(See step 51 on page EM-22)
41. **INSTALL RADIATOR RESERVOIR TANK**
42. **INSTALL ACCELERATOR CABLE AND ADJUST IT**
43. **INSTALL SUSPENSION UPPER BRACE**
 - (a) Install the upper brace with the four nuts and two bolts.
 - (b) Connect the ignition coil connector and high-tension cord.
44. **FILL ENGINE WITH COOLANT (See page CO-4)**

Capacity (w/ Heater):
8.0 liters (8.5 US qts, 7.0 Imp. qts)
45. **FILL INTERCOOLER WITH COOLANT (See page TC-7)**

Capacity:
1.7 liters (1.8 US qts, 1.5 Imp. qts)
46. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**
47. **START ENGINE AND FOR LEAKS**
48. **PERFORM ENGINE ADJUSTMENT**
 - (a) Adjust the valve clearance.
(See Pub. No. RM071U on page EM-15)

Valve clearance (Cold):

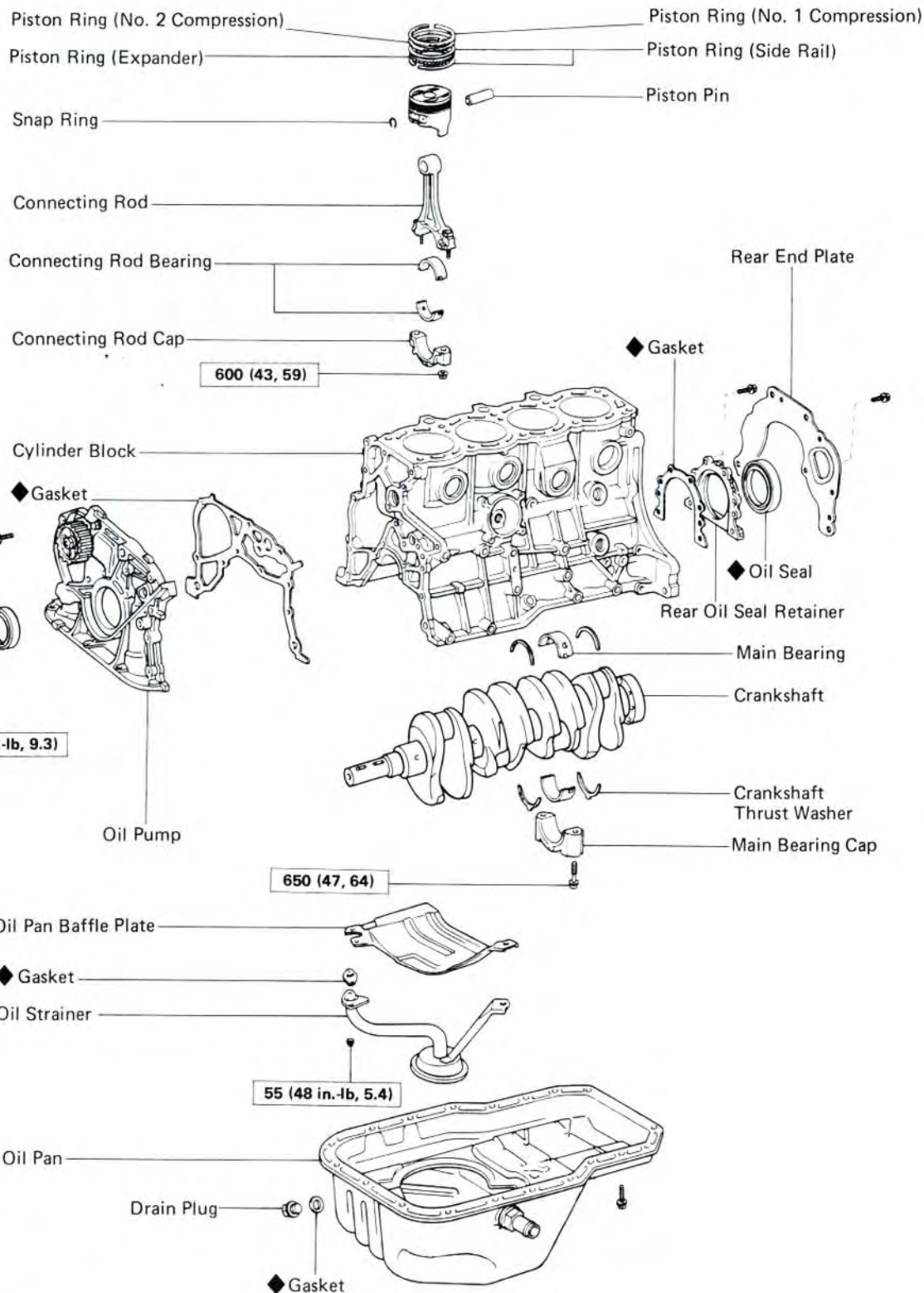
Intake	0.15 — 0.25 mm (0.006 — 0.010 in.)
Exhaust	0.20 — 0.30 mm (0.008 — 0.012 in.)

 - (b) Adjust the ignition timing.
(See steps 7 to 10 on pages IG-9 and 10)

Ignition timing:
10° BTDC @ idle
(w/ Terminals T and E1 short-circuited)
49. **CHECK TOE-IN**
50. **PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
51. **RECHECK ENGINE, INTERCOOLER COOLANT AND OIL LEVELS**

CYLINDER BLOCK COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

REMOVAL OF ENGINE

1. REMOVE BATTERY
2. DRAIN ENGINE COOLANT (See page CO-4)
3. DRAIN INTERCOOLER COOLANT (See page TC-7)
4. REMOVE HOOD
5. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY
6. REMOVE ENGINE RADIATOR
(See Pub. No. RM071U on page CO-11)
7. DISCONNECT INTERCOOLER WATER HOSES
8. DISCONNECT HEATER HOSES
9. DISCONNECT FUEL HOSES

- (a) Disconnect the inlet hose from the fuel filter.
- (b) Disconnect the return hose from the fuel return pipe.

CAUTION: Catch leaking fuel in a container.

10. REMOVE CRUISE CONTROL ACTUATOR

- (a) Disconnect the ground strap connector.
- (b) Remove the actuator cover.
- (c) Disconnect the actuator vacuum hose.
- (d) Disconnect the actuator connector.
- (e) Remove the actuator together with the bracket.

11. REMOVE AIR CLEANER ASSEMBLY

- (a) Disconnect the air flow meter connector.
- (b) Disconnect the two air hoses.
- (c) Disconnect the four clips of the air cleaner cap.
- (d) Loosen the hose clamp and disconnect the air cleaner hose from the turbocharger, and remove the air cleaner cap together with the air cleaner hoses, air connector pipe and air flow meter.
- (e) Remove the air cleaner element.
- (f) Remove the three bolts and air cleaner case.

12. REMOVE CLUTCH RELEASE CYLINDER AND HOSE BRACKET WITHOUT DISCONNECTING TUBE AND HOSE

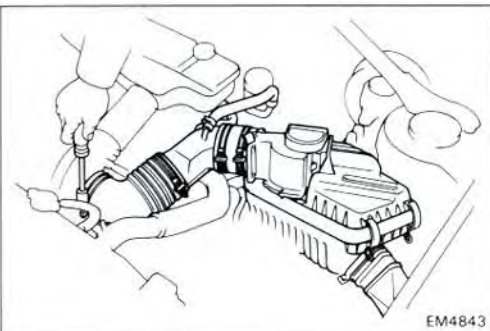
13. DISCONNECT SPEEDOMETER CABLE

14. DISCONNECT TRANSAXLE CONTROL CABLES

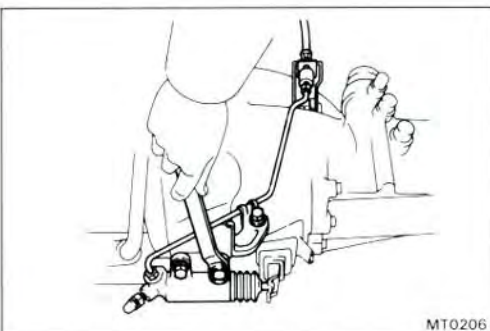
15. REMOVE ALTERNATOR



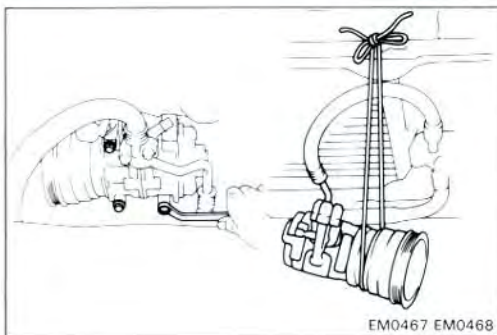
EM2638



EM4843



MT0206



16. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

- (a) Disconnect the two connectors.
- (b) Loosen the adjusting bolt for alternator drive belt, and remove the drive belt.
- (c) Remove the three compressor mounting bolts.
- (d) Put aside the compressor, and suspend it to the radiator support with string.

17. DISCONNECT WIRE, CONNECTORS AND VACUUM HOSES:

- (a) Check connector
- (b) Ground straps from LH fender apron
- (c) Connectors from No.2 junction block
- (d) Ignition coil connector and high-tension cord
- (e) Solenoid resistor connector
- (f) Fuel pump relay connector
- (g) Fuel pump resistor connector
- (h) Brake booster vacuum hose
- (i) A/C idle-up vacuum hoses
- (j) Charcoal canister vacuum hose

18. RAISE VEHICLE

CAUTION: Be sure the vehicle is securely supported.

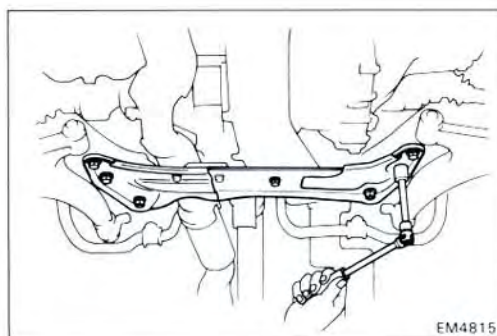
19. DRAIN ENGINE OIL

20. REMOVE ENGINE UNDER COVERS

21. REMOVE SUSPENSION LOWER CROSSMEMBER

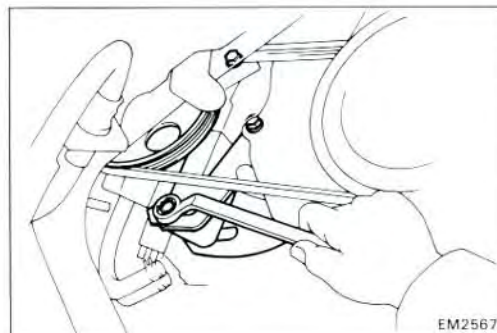
22. REMOVE FRONT DRIVE SHAFTS (See page FA-8)

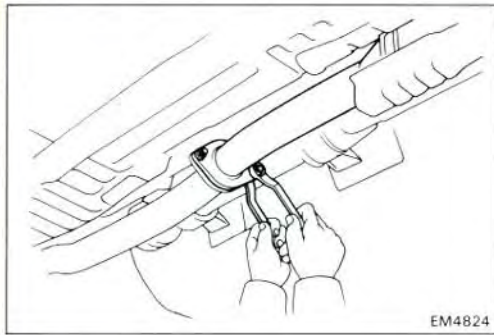
23. REMOVE PROPELLER SHAFT (See page PR-4)



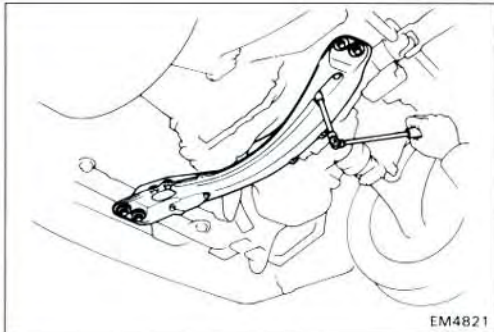
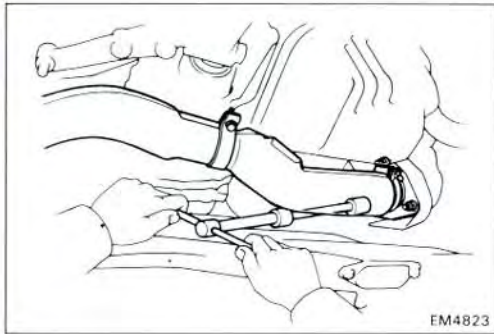
24. REMOVE POWER STEERING PUMP FROM BRACKET WITHOUT DISCONNECTING HOSES

- (a) Disconnect the two vacuum hoses.
- (b) Remove the drive belt.
- (c) Remove the three bolts and PS pump.
- (d) Put aside the pump and suspend it to the cowl with the string.



**25. REMOVE FRONT EXHAUST PIPE**

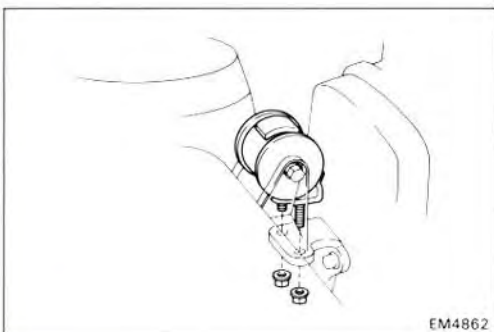
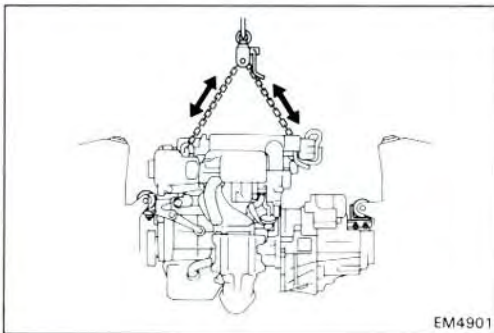
- (a) Remove the two bolts, and disconnect the front exhaust pipe from the rear exhaust pipe.
- (b) Loosen the bolt and nut, and disconnect the clamp from the bracket.
- (c) Remove the three nuts and the front exhaust pipe.

**26. REMOVE ENGINE MOUNTING CENTER MEMBER****27. LOWER VEHICLE****28. PULL OUT TCCS ECU CONNECTORS AT ENGINE COMPARTMENT**

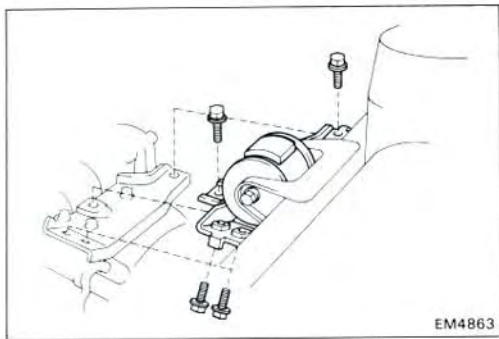
- (a) Disconnect the three connectors from the TCCS ECU.
- (b) Remove the two screws and pull out the TCCS ECU connectors from cowl panel.

29. REMOVE POWER STEERING PUMP RESERVOIR TANK MOUNTING BOLTS**30. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE**

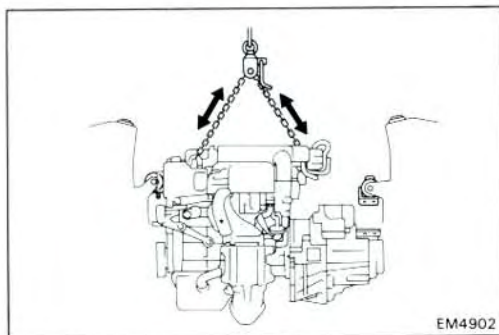
- (a) Attach the engine hoist chain to the lift brackets on the engine.



- (b) Remove the two bolts holding the RH mounting insulator to the mounting bracket.



- (d) Remove the four bolt holding the LH mounting insulator to the mounting bracket.



- (e) Lower the engine out of the vehicle slowly and carefully.

CAUTION: Be careful not to hit the power steering gear housing.

- (f) Make sure the engine is clear of all wiring, hoses and cables.
- (g) Place the engine and transaxle assembly onto the stand.

31. REMOVE TRANSAXLE FROM ENGINE (See page MT-7)

PREPARATION FOR DISASSEMBLY

1. REMOVE CLUTCH COVER AND DISC
2. REMOVE FLYWHEEL
3. REMOVE REAR END PLATE
4. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
5. REMOVE ALTERNATOR
6. REMOVE TURBOCHARGER (See page TC-9)
7. REMOVE DISTRIBUTOR (See page IG-8)
8. REMOVE TIMING BELT AND PULLEYS
(See page EM-17)
9. REMOVE CYLINDER HEAD
(See page EM-34)
10. REMOVE WATER PUMP
(See Pub. No. RM071U on page CO-6)
11. REMOVE OIL PAN AND OIL PUMP
(See Pub. No. RM071U on page LU-7)

DISASSEMBLY OF CYLINDER BLOCK

(See Pub. No. RM071U on pages EM-110 to 115)

INSPECTION OF CYLINDER BLOCK

(See Pub. No. RM071U on pages EM-110 to 115)

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

(See Pub. No. RM071U, for 3S-GE on pages EM-116 and 117)

INSPECTION AND REPAIR OF PISTON AND CONNECTING ROD ASSEMBLIES

(See Pub. No. RM071U, for 3S-GE on pages EM-118 to 121)

INSPECTION OF CRANKSHAFT

(See Pub. No. RM071U, for 3S-GE on pages EM-122)

REPLACEMENT OF CRANKSHAFT OIL SEALS

(See Pub. No. RM071U on pages EM-123 and 124)

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

(See Pub. No. RM071U, for 3S-GE on pages EM-125 and 126)

ASSEMBLY OF CYLINDER BLOCK

(See Pub. No. RM071U on pages EM-127 to 129)

POST ASSEMBLY

1. INSTALL OIL PUMP AND OIL PAN
(See Pub. No. RM071U on page LU-12)
2. INSTALL WATER PUMP
(See Pub. No. RM071U on page CO-8)
3. INSTALL CYLINDER HEAD
(See page EM-34)
4. INSTALL PULLEYS AND TIMING BELT
(See page EM-16)
5. INSTALL DISTRIBUTOR (See page IG-9)
6. INSTALL ALTERNATOR
7. REMOVE ENGINE STAND
8. INSTALL REAR END PLATE
Torque: 95 kg-cm (82 ft-lb, 9.3 N·m)
9. INSTALL FLYWHEEL
(See Pub. No. RM071U, for 3S-GE on page EM-130)
Torque:

New bolt	900 kg-cm (65 ft-lb, 88 N·m)
Reused bolt	950 kg-cm (69 ft-lb, 93 N·m)
10. INSTALL CLUTCH DISC AND COVER

INSTALLATION OF ENGINE

1. INSTALL TRANSAXLE TO ENGINE

(See page MT-7)

2. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

- (a) Attach the engine hoist chain to the lifting brackets on the engine.
- (b) Raise the engine into the engine compartment.

CAUTION: Be careful not to hit the power steering gear housing.

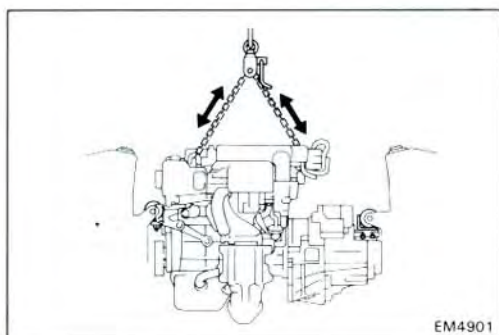
- (c) Keep the engine level, and align each mounting with the bracket.

- (d) Attach the RH mounting bracket to the mounting insulator, and temporarily install the two bolts.

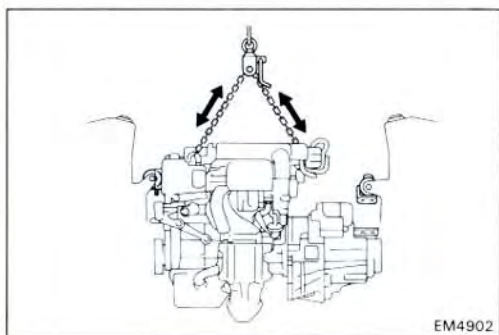
- (e) Attach the LH mounting bracket to the mounting insulator, and temporarily install the four bolts.
- (f) Torque the RH and LH mounting bracket bolts and nuts.

Torque: 530 kg-cm (38 ft-lb, 52 N·m)

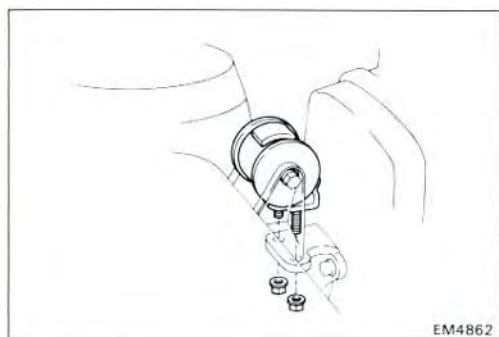
- (g) Remove the hoist chain from the engine.



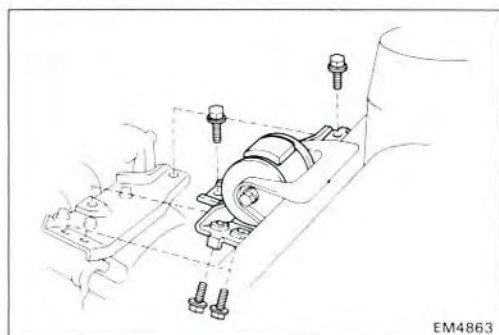
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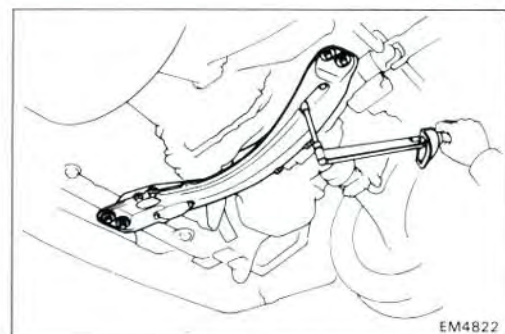
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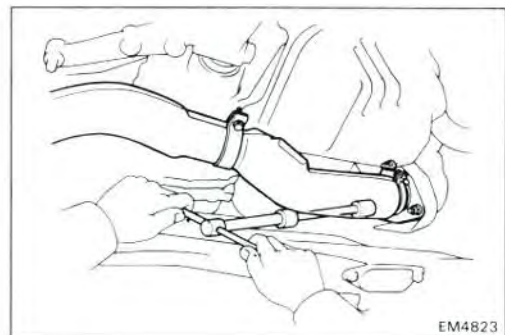
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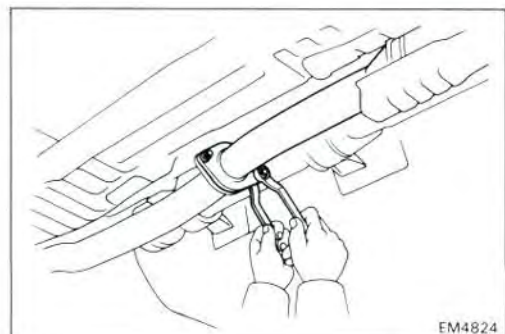
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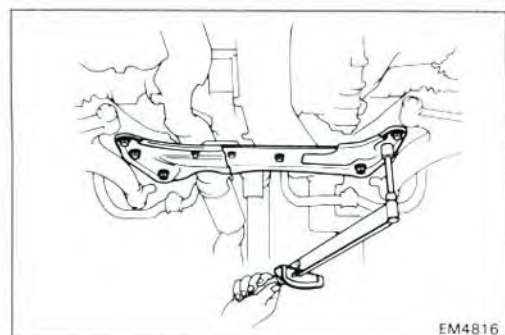
EM4822



EM4823



EM4824



EM4816

3. INSTALL POWER STEERING PUMP RESERVOIR TANK MOUNTING BOLTS

4. CONNECT TCCS ECU CONNECTORS

5. RAISE VEHICLE

CAUTION: Be sure the vehicle is securely supported.

6. INSTALL ENGINE MOUNTING CENTER MEMBER

Torque:

To body 400 kg-cm (29 ft-lb, 39 N·m)

Others 530 kg-cm (38 ft-lb, 52 N·m)

7. INSTALL FRONT EXHAUST PIPE

(a) Place new gaskets on the exhaust pipe.

(b) Connect the exhaust pipe with new three nuts.

Torque: 630 kg-cm (46 ft-lb, 62 N·m)

(c) Install the clamp with the bolt and nut.

8. INSTALL POWER STEERING PUMP TO BRACKET

Install the pump onto the bracket with the adjusting stay at the lower position.

9. INSTALL PROPELLER SHAFT (See page PR-16)

10. INSTALL FRONT DRIVE SHAFTS (See page FA-15)

11. INSTALL SUSPENSION LOWER CROSSMEMBER

Torque:

To body 2,125 kg-cm (154 ft-lb, 208 N·m)

Others 400 kg-cm (29 ft-lb, 39 N·m)

12. INSTALL ENGINE UNDER COVERS

13. LOWER VEHICLE

14. CONNECT VACUUM HOSES, WIRE AND CONNECTOR

(a) Check connector

(b) Ground straps to the LH fender apron

(c) Connectors to No.2 junction block

(d) Ignition coil connector and high-tension cord

(e) Solenoid resistor connector

(f) Fuel pump relay connector

(g) Fuel pump resistor connector

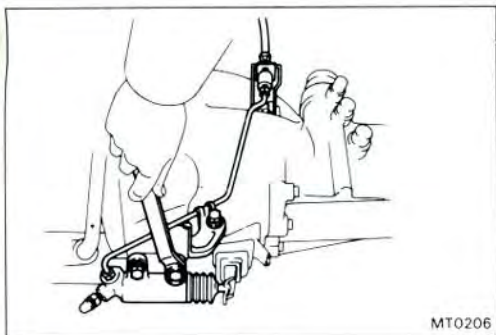
(h) Brake booster vacuum hose

(i) A/C idle-up vacuum hoses

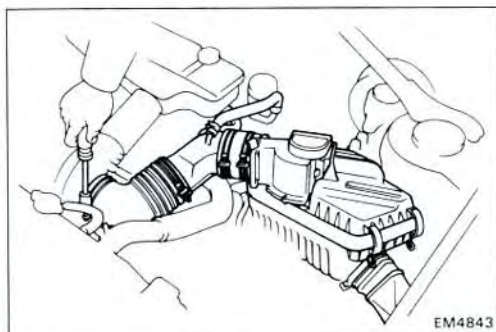
(j) Charcoal canister vacuum hose

15. INSTALL A/C COMPRESSOR

- (a) Install the compressor with the three bolts.
- (b) Install the drive belt.

16. INSTALL ALTERNATOR**17. CONNECT TRANSAXLE CONTROL CABLE****18. CONNECT SPEEDOMETER CABLE****19. INSTALL CLUTCH RELEASE CYLINDER AND HOSE BRACKET****20. INSTALL AIR CLEANER ASSEMBLY**

- (a) Install the air cleaner case with the three bolts.
- (b) Install air cleaner element.
- (c) Install the air cleaner cap, air flow meter, air connector pipe and air cleaner hoses.
- (d) Connect the air flow meter connector.

**21. INSTALL CRUISE CONTROL ACTUATOR**

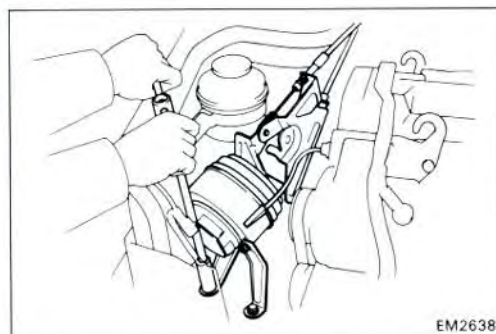
- (a) Install the actuator and the bracket.
- (b) Connect the actuator connector.
- (c) Connect the actuator vacuum hose.
- (d) Install the actuator cover.
- (e) Connect the ground strap connector.

22. CONNECT FUEL HOSES

- (a) Fuel inlet hose
- (b) Fuel return hose

23. CONNECT HEATER WATER HOSES**24. CONNECT INTERCOOLER WATER HOSES****25. INSTALL ENGINE RADIATOR**

(See Pub. No. RM071U on page CO-15)

26. INSTALL ACCELERATOR CABLE AND ADJUST IT**27. INSTALL BATTERY**

28. FILL ENGINE WITH COOLANT (See page CO-4)

Capacity (w/ Heater):

8.0 liters (8.5 US qts, 7.0 Imp. qts)

29. FILL INTERCOOLER WITH COOLANT (See page TC-7)

Capacity: 1.7 liters (1.8 US qts, 1.5 Imp. qts)

30. FILL WITH ENGINE OIL (See page LU-5)

Capacity:

Drain and refill

w/ Oil filter change

3.6 liters (3.8 US qts, 3.2 Imp. qts)

w/o Oil filter change

3.3 liters (3.6 US qts, 2.9 Imp. qts)

Dry fill 4.6 liters (4.9 US qts, 4.0 Imp. qts)

31. START ENGINE AND CHECK FOR LEAKS**32. PERFORM ENGINE ADJUSTMENT**

(a) Adjust the drive belt.

(See Pub. No. RM071U on page CH-3 and AC-19)

Drive belt tension:

Alternator

w/ Air con.	New belt	175 ± 5 lb
	Used belt	115 ± 20 lb

w/o Air con.	New belt	150 ± 25 lb
	Used belt	130 ± 25 lb

PS pump	New belt	125 ± 25 lb
	Used belt	80 ± 20 lb

(b) Adjust valve clearance.

(See Pub. No. RM071U on page EM-15)

Valve clearance:

Intake 0.15 — 0.25 mm (0.006 — 0.010 in.)

Exhaust 0.20 — 0.30 mm (0.008 — 0.012 in.)

(c) Adjust ignition timing.

(See steps 7 to 10 on pages IG-9 and 10)

Ignition timing:

10° BTDC @ idle

(w/ Terminals T and E1 short-circuited)

33. INSTALL HOOD**34. CHECK TOE-IN****35. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

36. RECHECK ENGINE, INTERCOOLER COOLANT AND ENGINE OIL LEVELS