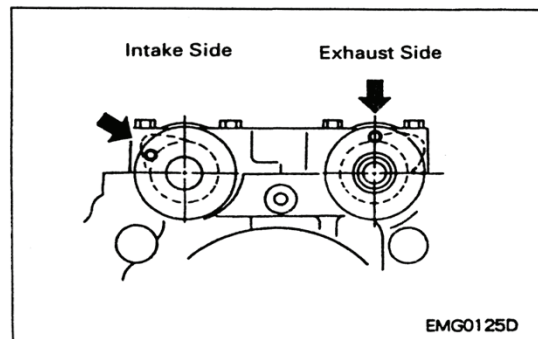
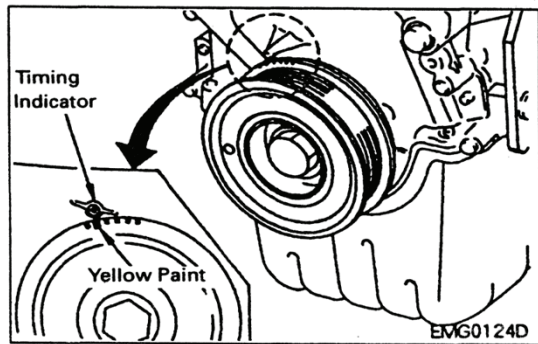


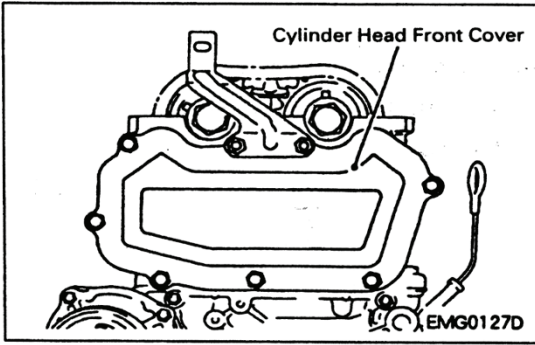
**Removal**

Reference: For removal and installation of the upper timing chain complete, it is mentioned in "Lower Timing Chain" because it needs removal of the front cover. In this text, operation of removal and installation of the cylinder head in engine room is mentioned together with the related matters.

1. Remove the (-)terminal of the battery.
2. In the case of removing the cylinder head, drain coolant.
3. Remove the rocker cover. Refer to "Rocker Cover".
4. Position the cylinder No.1 at TDC (Top Dead Center).
  - Align the mark (Yellow paint) of the crankshaft pulley with the indicator of the front cover.

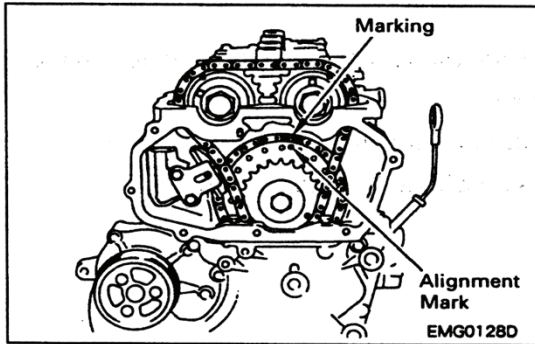


- At that time, confirm that both cam noses on the cylinder No.1, intake and exhaust, direct outside.



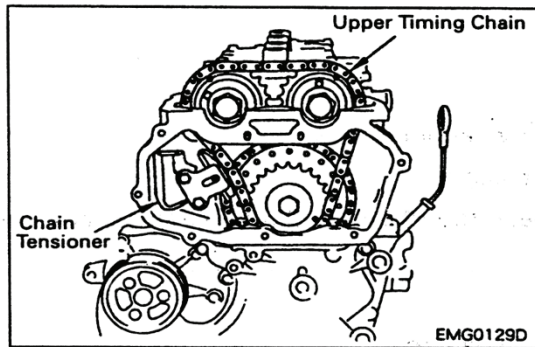
**Removal (Continued)**

5. Remove the cylinder head front cover.

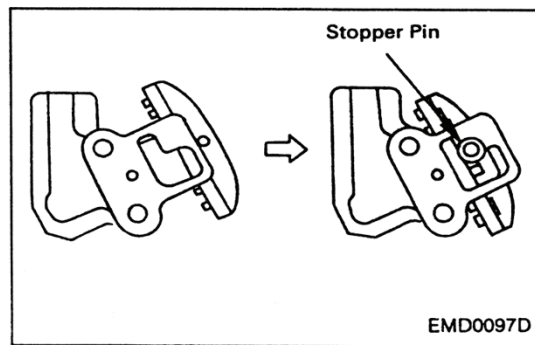


6. Remove the upper timing chain from the camshaft in the following manner.

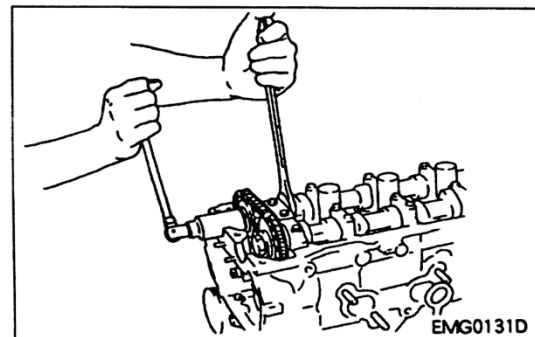
(1) Put a mark of the lower timing chain in line with the alignment mark on the large diameter side of the idler sprocket.



(2) Remove the chain tensioner.



(3) Push down the sleeve to insert a stopper pin(2 φ ) as illustrated in the left, then remove.



(4) Remove the camshaft sprocket.

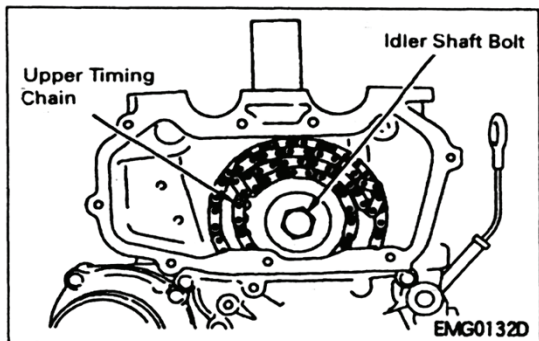
- Fix the camshaft in its hexagonal part with a spanner(22mm) to remove the bolt on the camshaft sprocket.

**Precaution: Do not remove the bolt by making use of chain tension or by fixing any part other than the camshaft.**

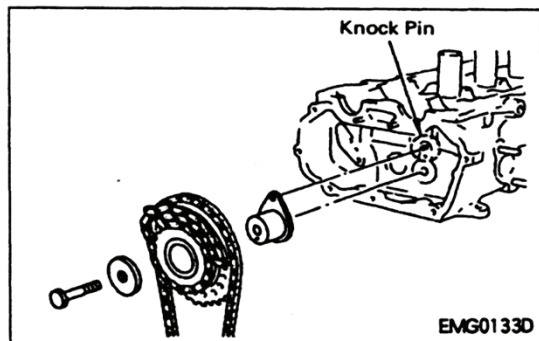
**Removal (Continued)**

7. Remove the cylinder head in the following manner.

- (1) Wind the upper timing chain round the idler sprocket.
- (2) Remove the bolt on the idler shaft.



- (3) Remove the idler shaft from the knock pin on the cylinder head to make the idler sprocket free.
- (4) Remove the camshaft. Refer to "Camshaft".
- (5) Remove the cylinder head. Refer to "Cylinder Head".



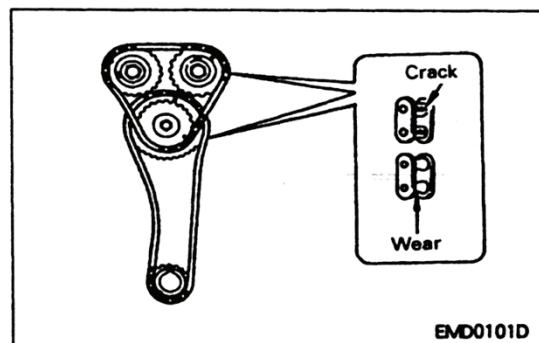
**Inspection**

**Timing chain**

- Check the timing chain for wear or crack.
- If any, replace the timing chain.
- When any failure has been found on the timing chain, check the sprocket, too.

**Sprocket**

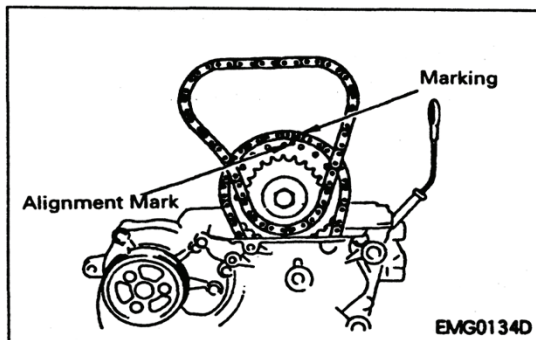
- Check each sprocket for any damage.



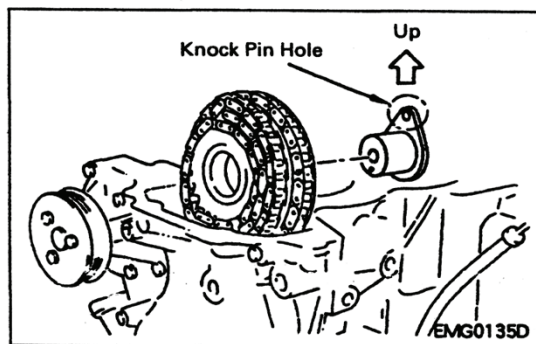
**Removal**

1. Install the cylinder head in the following manner.

(1) Position the crankshaft to the TDC position of the cylinder No.1.



(2) Align the mark of the lower timing chain with the alignment mark at the large diameter side of the idler sprocket.

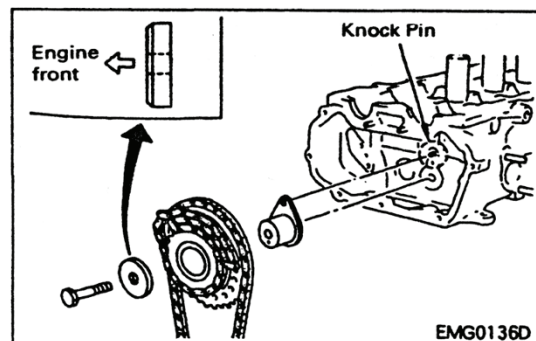


(3) Apply engine oil to the idler shaft to insert it into the idler sprocket from the rear side.

- Install so that the knock pin hole comes upward.

(4) Install the cylinder head gasket. Refer to "Cylinder Head".

(5) Install the cylinder head. Refer to "Cylinder Head".



(6) Align the knock pin hole of the idler sprocket with the knock pin on the cylinder head to insert.

(7) Tighten the bolt on the idler sprocket.

- Install the washer facing its chamfered side to the front.

**Tightening torque N-m (kg-m): 43-58 (4.4-5.9)**



**Installation (Continued)**

2. Install the camshaft. Refer to "Camshaft".

3. Install the upper timing chain in the following manner.

(1) Align the gold-colored link of the upper timing chain with the alignment mark at the small diameter side of the idler sprocket.

(2) Align the mark of the upper timing chain with the one of the camshaft sprocket to install to the camshaft sprocket.

- Confirm that the related positions of the alignment marks of each sprocket with the ones of each timing chain are as illustrated in the left.

(3) Install the camshaft sprocket.

- Install the washer facing the chamfered surface to engine front.

- Apply oil to the seat and thread of the fitting bolt of the camshaft sprocket.

- Fix the camshaft at the hexagonal part with a spanner (22mm) to tighten the bolt on the camshaft sprocket.

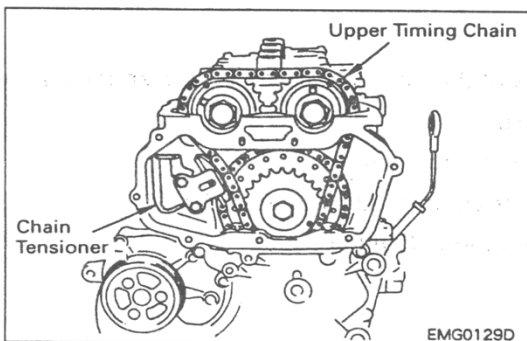
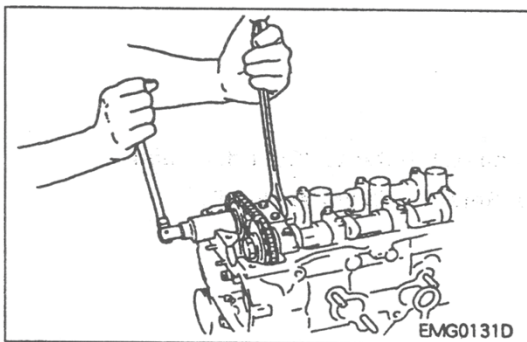
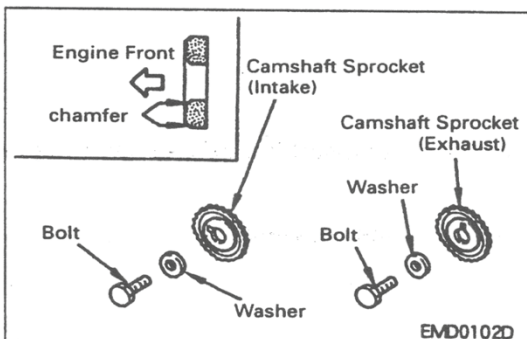
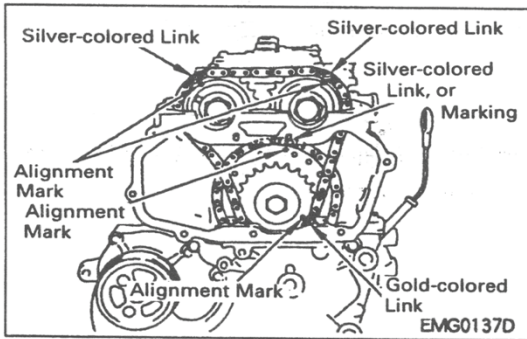
**Tightening torque N-m {kg-m}: 98-127 {10-13}**

**Precaution: Do not install the bolt by making use of chain tension or by fixing any part other than the camshaft.**

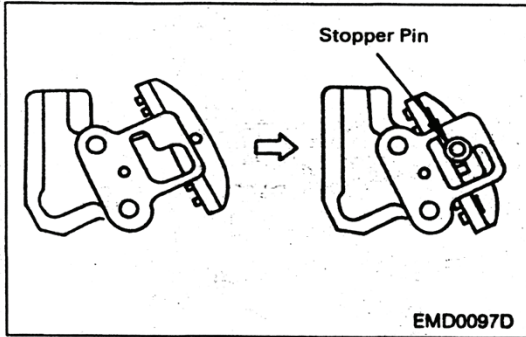
(4) Install the upper timing chain tensioner.

**Tightening torque N-m {kg-m}: 6.3-8.3 {0.64-0.85}**

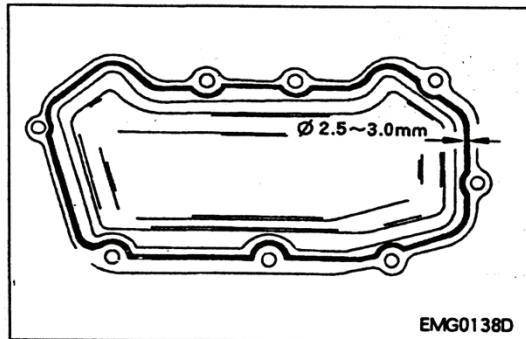
- Apply engine oil to the timing chain and the sliding part.



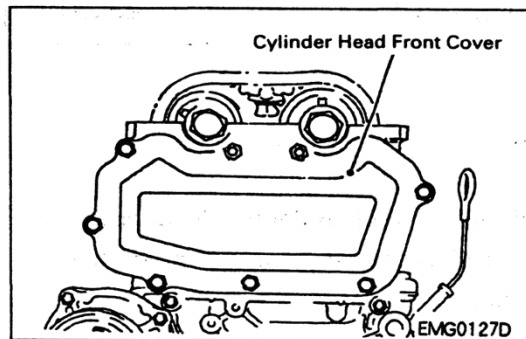
**Installation (Continued)**



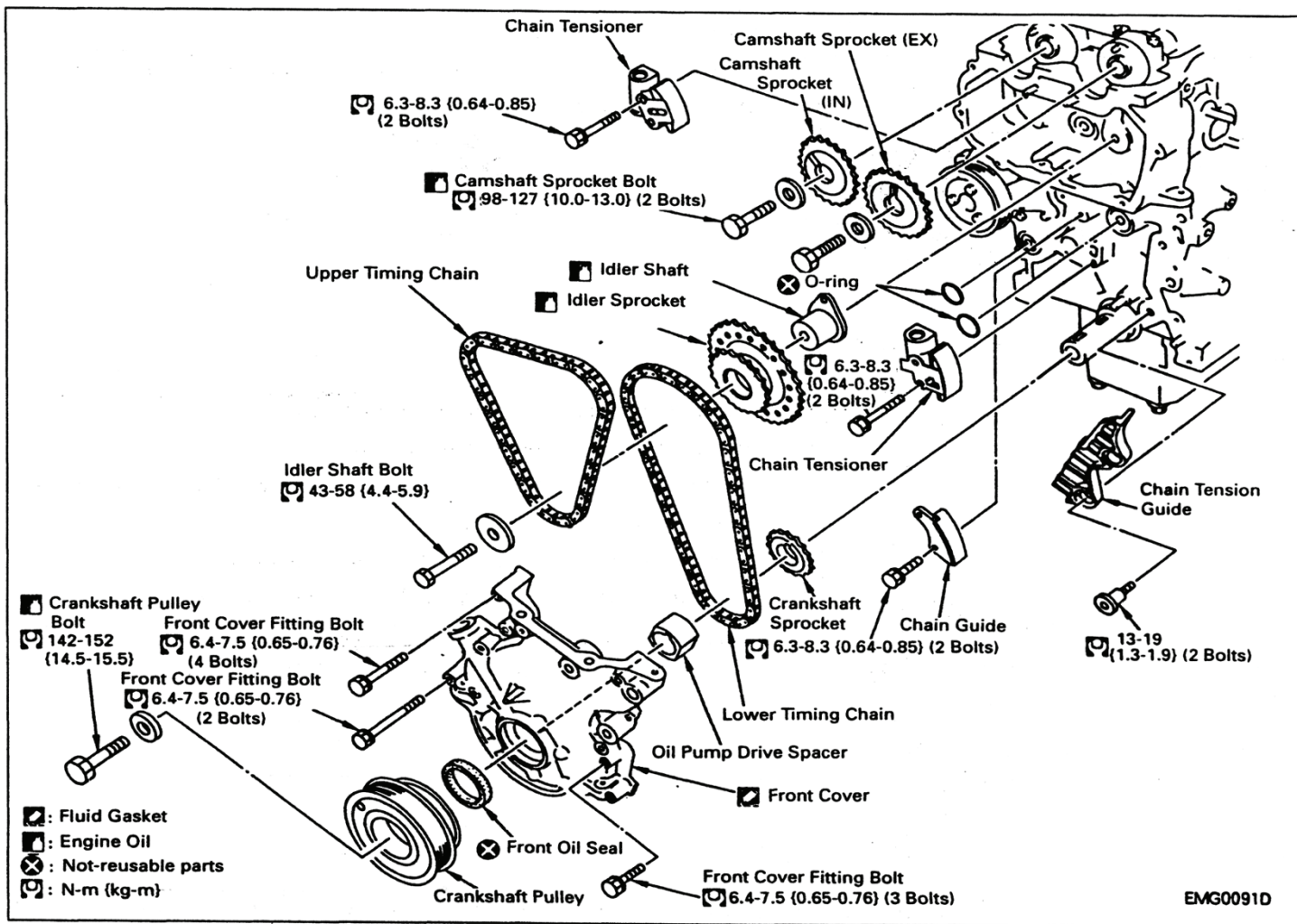
- Install the upper timing chain tensioner with the pin, and remove the pin after installation.



4. Install the rocker cover. Refer to "Rocker Cover".
5. Install the cylinder head front cover.
  - Completely take away fluid gasket on the cylinder head front cover using a scraper.
  - Clean the joint surface, too, with white gasoline.
  - Clean the joint surface of the cylinder head, too.
  - Apply 2.5-3.0mm  $\phi$  fluid gasket (KP510 00150 or equivalent) to the location illustrated in the left without break.

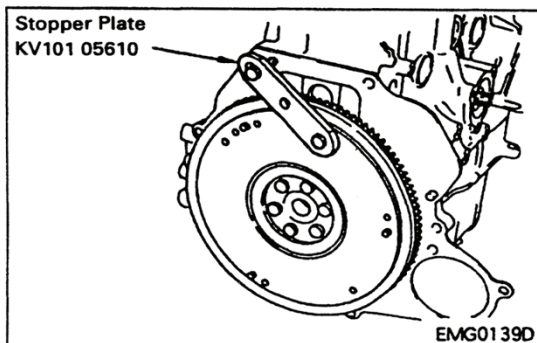


- Tighten the fitting bolts diagonally from inside to outside.  
Tightening torque N-m (kg-m): 3.7-5.0 (0.38-0.51)
- 6. After this, install in the reverse order of removal.



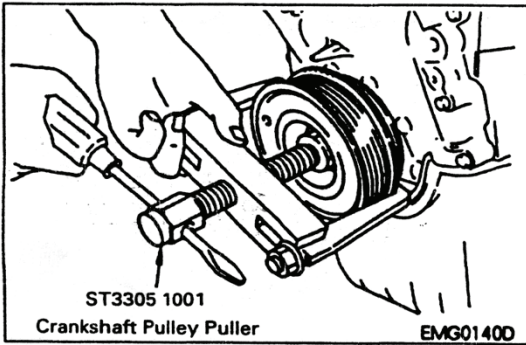
**Removal**

1. Completely drain coolant.
2. Drain engine oil.
3. Install to the engine stand (Special tool). Refer to "Cylinder Block".
4. Position the cylinder No.1 at TDC. Refer to "Upper Timing Chain".
5. Remove the crankshaft pulley.
  - Fix the flywheel with the stopper plate (Special tool) to loosen the bolt on the crankshaft pulley.



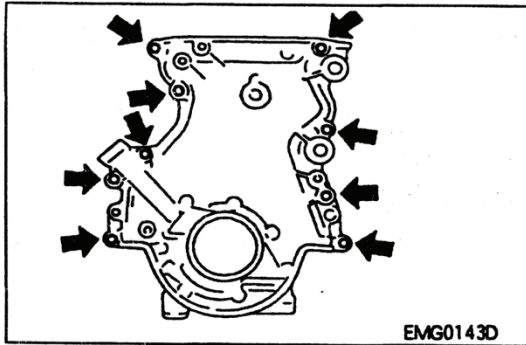
**Removal (Continued)**

- Hang the claws of the crankshaft pulley puller (Special tool) on the crankshaft pulley in the back to pull it out from the crankshaft.

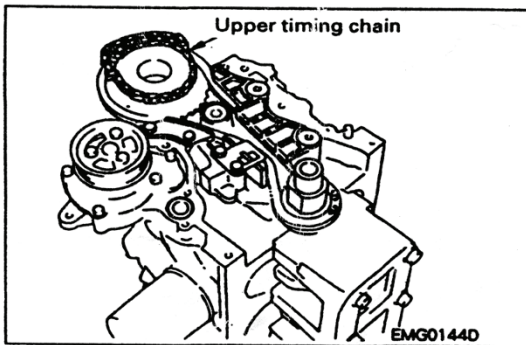


6. Remove the rocker cover. Refer to "Rocker Cover".
7. Remove the camshaft. Refer to "Camshaft".
8. Remove the cylinder head. Refer to "Cylinder Head".
9. Remove the oil pan. Refer to "Oil Pan".
10. Take out the front cover.

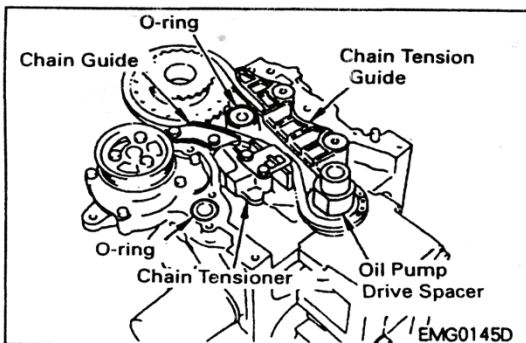
- Loosen the fitting bolts diagonally to remove.



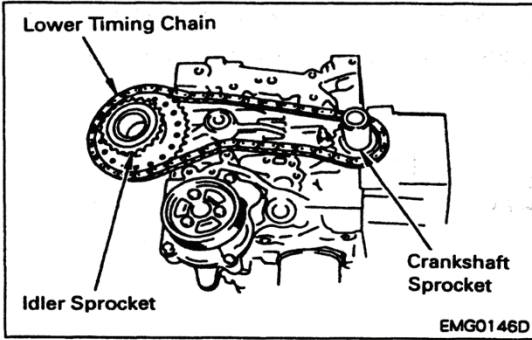
11. Remove the upper timing chain from the idler sprocket.



12. Remove the oil pump drive spacer, chain guide, chain tension guide, chain tensioner, and O-ring.

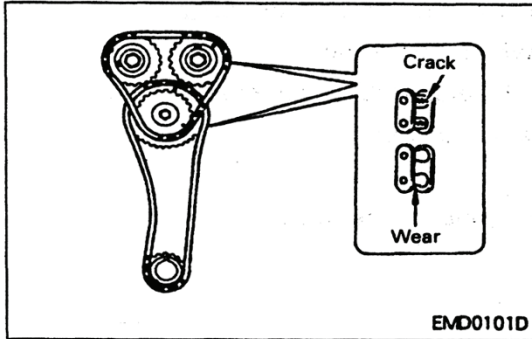






**Removal (Continued)**

13. Remove the idler sprocket, lower timing chain, and crankshaft sprocket.



**Inspection**

**Timing Chain**

- Check the timing chain for wear and crack.
- If any failure, replace the timing chain.
- When any failure is found on the timing chain, check the sprocket, too.

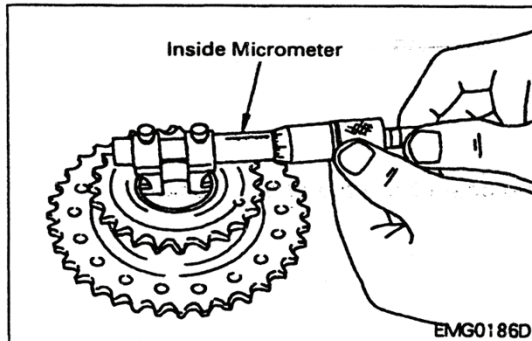
**Sprocket**

- Check each sprocket for any damage.

**Oil clearance on the idler sprocket**

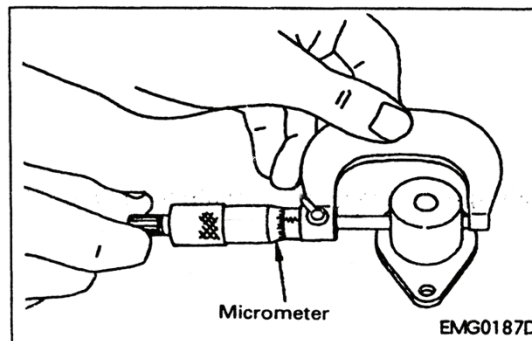
- Measure the inner diameter of the idler sprocket using an inside micrometer.

**Standard (mm): 29.025-29.050**



- Measure the outer diameter of the idler shaft using a micrometer.

**Standard (mm): 28.987-29.000**



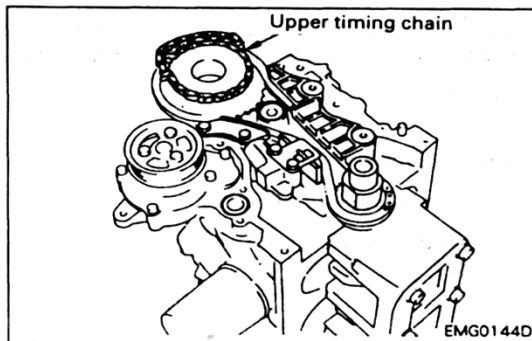
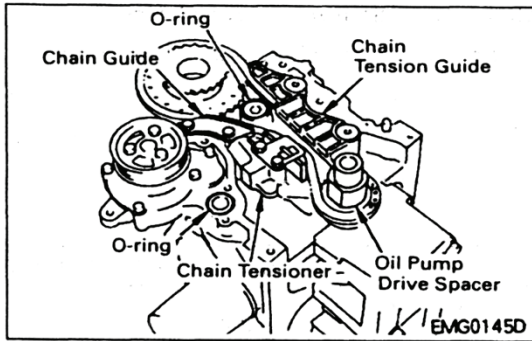
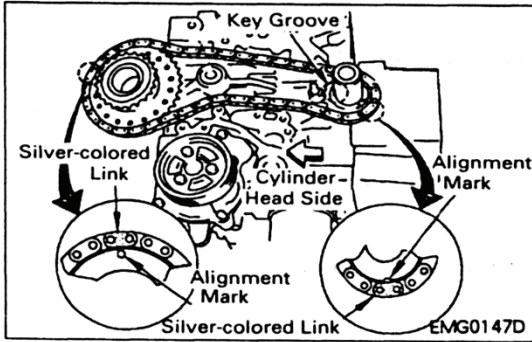
- Calculate the oil clearance on the idler sprocket by subtracting the outer diameter of the idler shaft from the inner diameter of the idler sprocket.

**Standard (mm): 0.025-0.063**

**Inspection (Continued)**

**Installation**

Reference: The working becomes easy by facing the joint surface of the front cover upward. When working with engine in the upright position, pay special attention to the alignment mark so as not to slip out of place and to O-ring (2 pieces) so as not to drop off when installing the front cover.



1. Install the lower timing chain.

- Direct the key on the crankshaft upward (to the cylinder head). (Cylinder No.1 in the TDC position)
- Install the crankshaft sprocket with the alignment mark side facing to engine front.
- Align one of the silver-colored links of the lower timing chain to the mark of the crankshaft sprocket.
- Align another silver-colored link to the mark at the large diameter side of the idler sprocket.

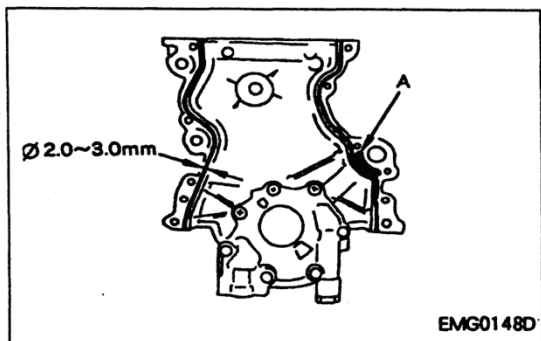
2. Install the oil pump drive spacer, chain guide, chain tension guide, chain tensioner, and O-ring (2 pieces).

- Replace the O-ring with new one.

3. Install the upper timing chain to the small diameter side of the idler sprocket.

- Install so that the alignment mark link comes in the front.

Reference: After installing the cylinder head, take alignment of the idler sprocket and the camshaft sprocket with the cylinder head.



**Installation (Continued)**

4. Install the front cover.

- Take away any stale fluid gasket on the joint surface of the front cover using a scraper.
- Clean the joint surface with white gasoline.
- Clean the joint surface of the cylinder block, too.
- Apply fluid gasket (KP510 00150 or equivalent) in the size illustrated in the left without break.

**Precaution: Do not apply fluid gasket to the groove A at the side of oil gallery.**

- After application, install within 5 minutes.
- After installation, leave it for more than 30 minutes.
- Install the front cover, aligning the direction of the bifacial width on the oil pump inner rotor to the bifacial width on the oil pump drive spacer.

**Precaution: (1) Install so that the alignment marks of the lower timing chain and each sprocket do not slip out of place.**

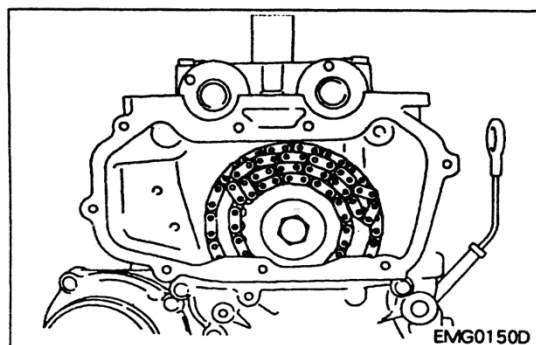
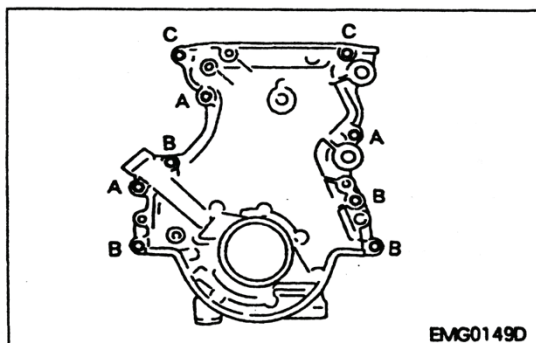
**(2) Install so that the O-ring (2 pieces) do not drop off.**

Reference: After installing the front cover, the alignment marks on the lower timing chain and each sprocket do not slip out of place.

- Pay attention to misassembling because the bolt length is different by the fitting position.

Fitting position	Nominal length of bolt (mm)	Quantity	Tightening torque (N-m {kg-m})
A	25	3	6.4 ~ 7.5 {0.65 ~ 0.76}
B	40	4	
C	50	2	

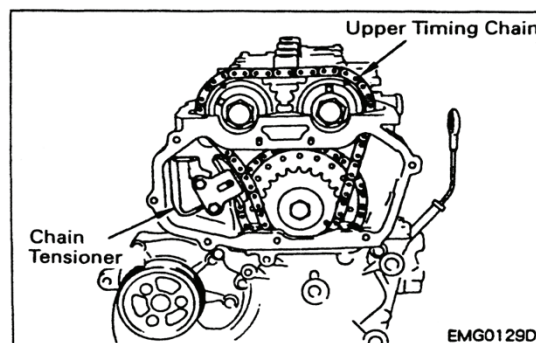
- Completely wipe off fluid gasket forced out between the joint surface of the cylinder head and oil pan.



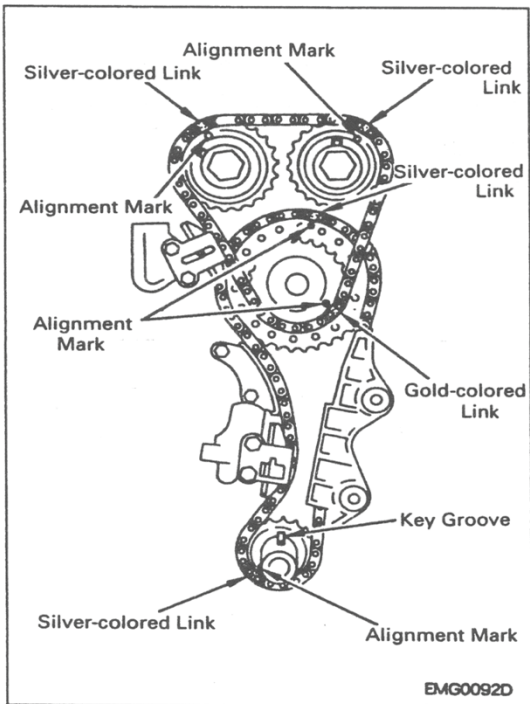
5. Restore engine to the upright position.

6. Install the cylinder head. Refer to "Cylinder Head".

7. Install the camshaft. Refer to "Camshaft".

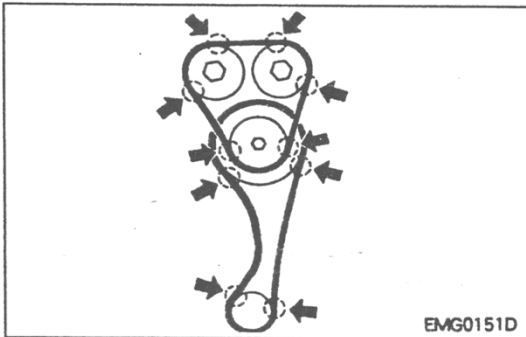


8. Install the upper timing chain on the idler sprocket and camshaft sprocket. Refer to "Upper Timing Chain".

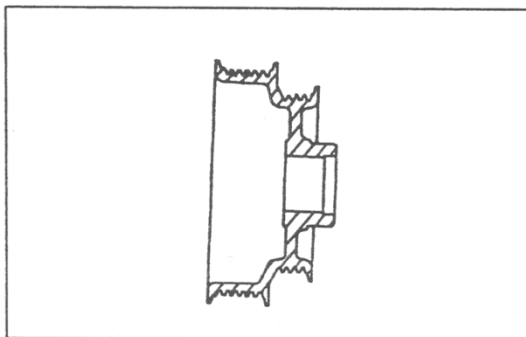


**Installation (Continued)**

- Confirm that the related position of the alignment marks on each sprocket with the ones on each timing chain is as illustrated in the left.

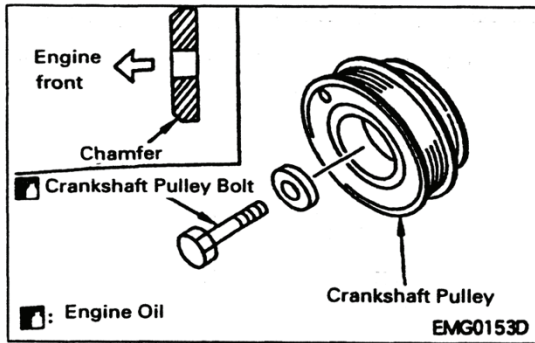


- Confirm that the timing chain engages each sprocket securely in the arrow positions illustrated in the left.



9. Install the crankshaft pulley.



**Installation (Continued)**

- Install the washer facing its chamfer surface to engine front.
- Apply engine oil to the fitting bolt on the crankshaft pulley to install.

**Tightening torque N-m (kg-m): 142-152 (14.5-15.5)**

10. After this, install in the reverse order of removal.