

## Timing Chain: Service and Repair

### Timing Chain

#### REMOVAL

1. Remove upper intake manifold.
2. Remove cylinder head covers, crankshaft damper, and timing chain cover.

**CAUTION:** When aligning timing marks, always rotate engine by turning the crankshaft. Failure to do so will result in valve and/or piston damage.

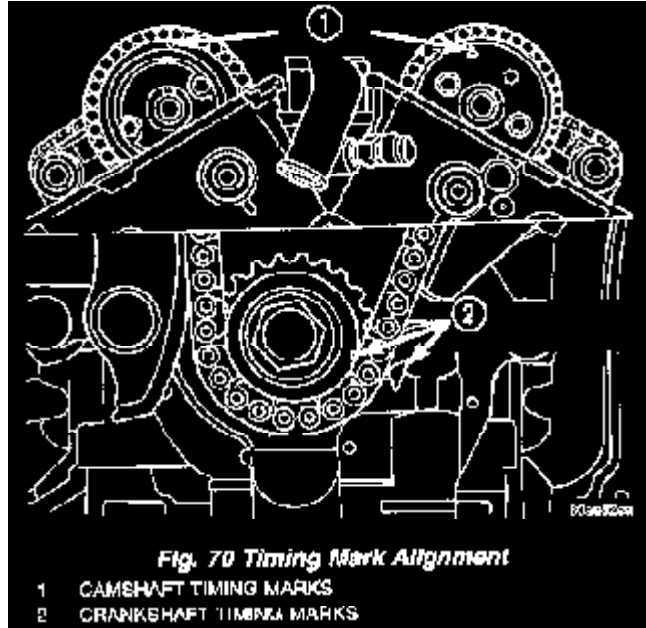
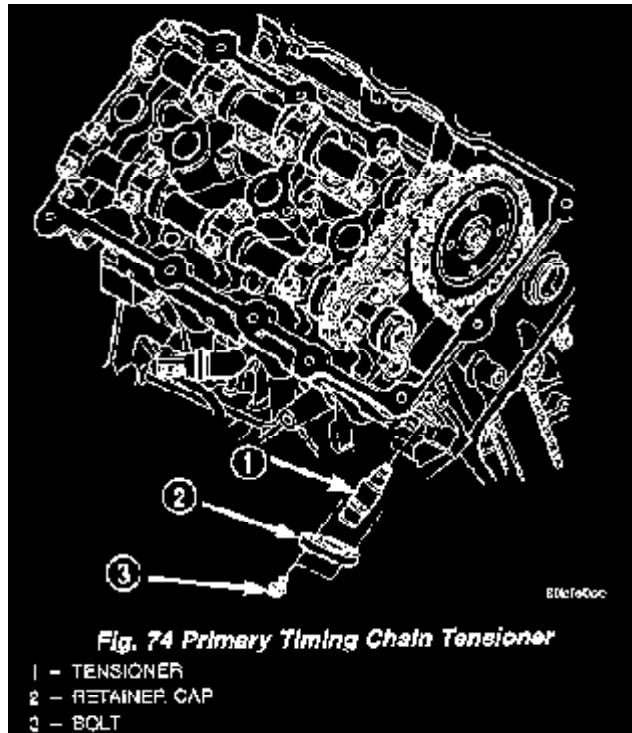


Fig. 70

3. Align crankshaft sprocket timing mark to mark on oil pump housing (Fig. 70). The mark on oil pump housing is 60° ATDC of #1 cylinder.

**CAUTION:** When the timing chain is removed and the cylinder heads are still installed, DO NOT rotate the camshafts or crankshaft without first locating the proper crankshaft position. Failure to do so will result in valve and/or piston damage.



**Fig. 74**

4. Remove primary timing chain tensioner from right cylinder head (Fig. 74).
5. Remove camshaft position sensor from left cylinder head (Fig. 69).

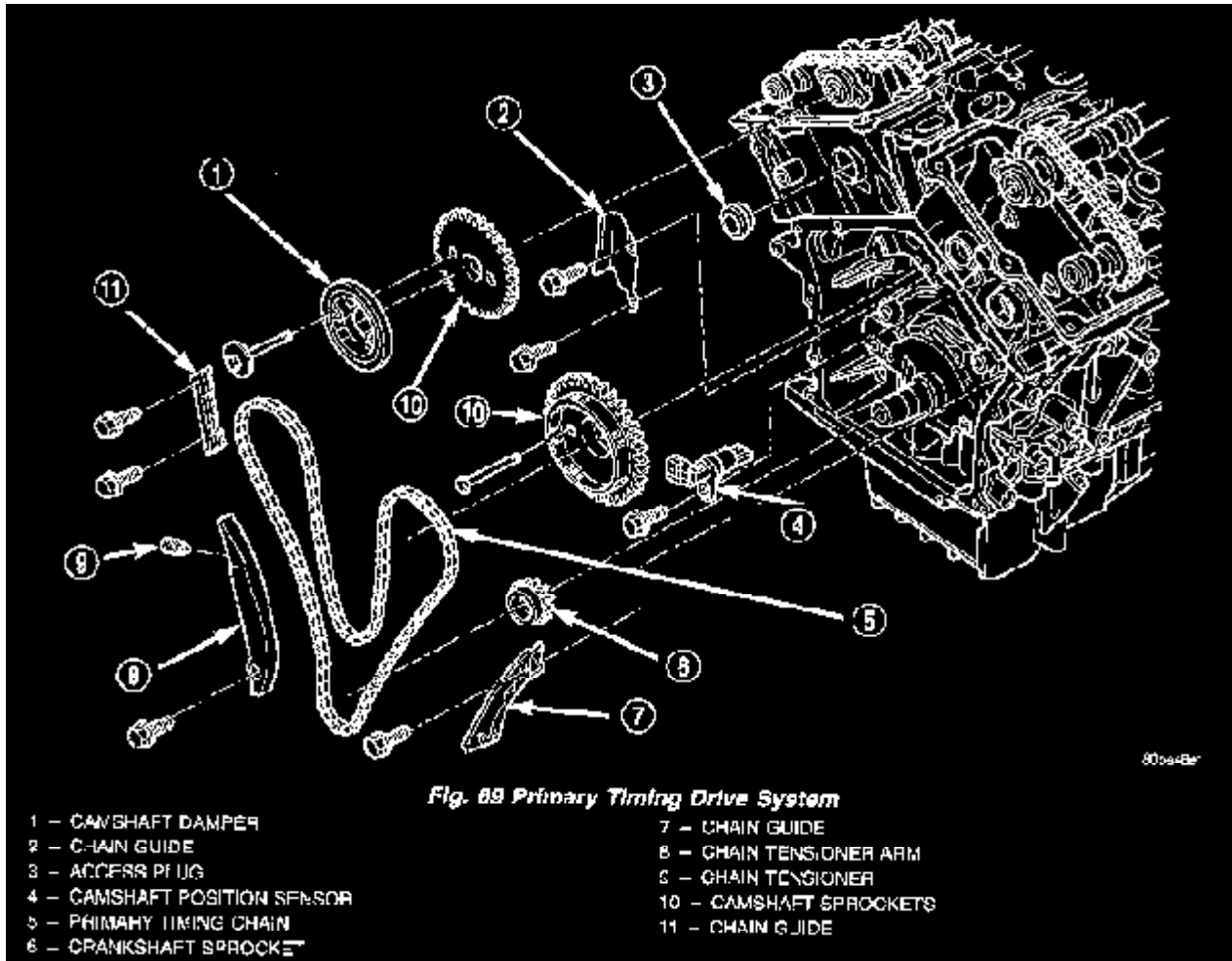


Fig. 69

6. Remove chain guide access plug from left cylinder head (Fig. 69).

**NOTE:** When camshaft sprocket bolts are removed, the camshafts will rotate in a clockwise direction.

7. Starting with the right camshaft sprocket, remove the sprocket attaching bolts. Remove camshaft damper and sprocket (Fig. 69).
8. Remove left side camshaft sprocket attaching bolts and remove sprocket (Fig. 69).
9. Remove lower chain guide and tensioner arm (Fig. 69).
10. Remove the primary timing chain.

#### INSTALLATION

1. Inspect all sprockets and chain guides. Replace if worn. Refer to Crankshaft Gear/Sprocket, for removal and installation procedures.
2. If removed, install right and left side short chain guides (Fig. 69). Tighten attaching bolts to **28 Nm (250 in. lbs.)**.

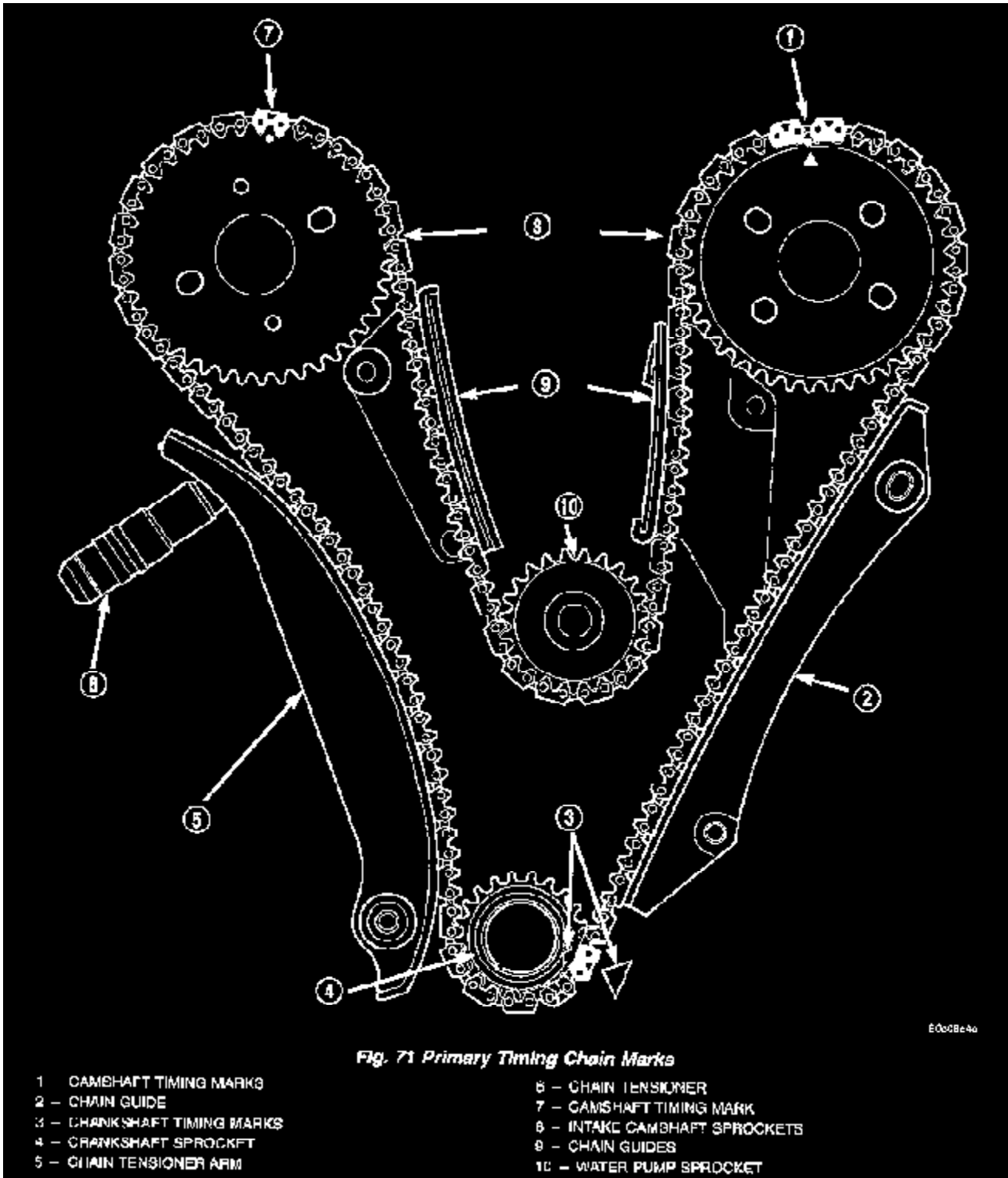


Fig. 71

- Align crankshaft sprocket timing mark to the mark on oil pump housing (Fig. 71).

**NOTE:** Lubricate timing chain and guides with engine oil before installation.

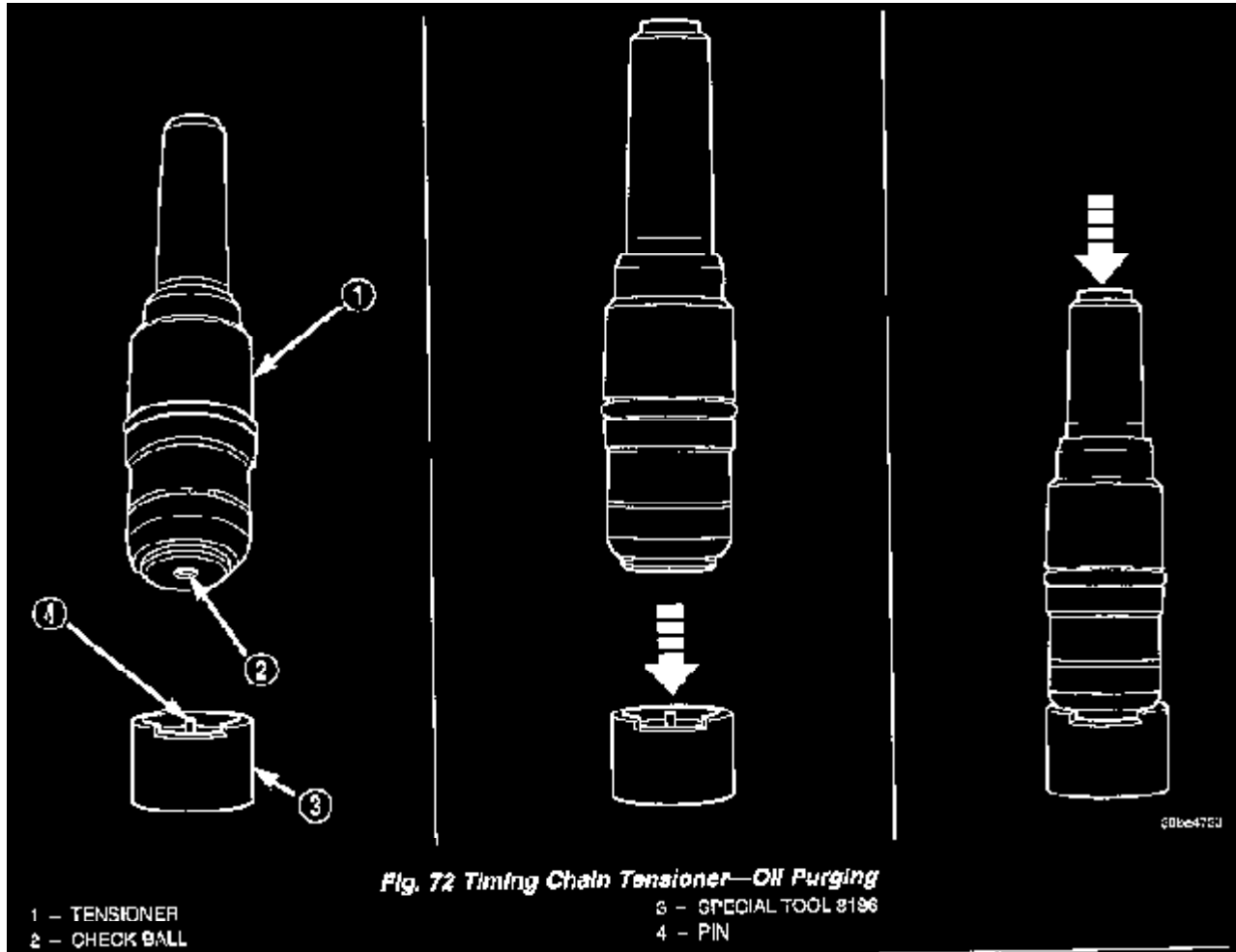
- Place left side primary chain sprocket onto the chain so that the timing mark is located in-between the two (plated) timing links (Fig. 71).
- Lower the primary chain with left side sprocket through the left cylinder head opening.

**NOTE:** The camshaft sprockets can be allowed to float on the camshaft hub during installation.

6. Loosely position left side camshaft sprocket over camshaft hub.
7. Align timing (plated) link to the crankshaft sprocket timing mark (Fig. 71).
8. Position primary chain onto water pump drive sprocket.
9. Align right camshaft sprocket timing mark to the timing (plated) link on the timing chain (Fig. 71) and loosely position over camshaft hub.
10. Verify that all chain timing (plated) links are properly aligned to the timing marks on all sprockets (Fig. 71).
11. Install left side lower chain guide and tensioner arm (Fig. 69). Tighten attaching bolts to **28 Nm (250 in. lbs.)**.

**NOTE:** Inspect oil ring on chain guide access plug before installing. Replace O-ring as necessary.

12. Install chain guide access plug to left side cylinder head (Fig. 69). Tighten plug to **20 Nm (15 ft. lbs.)**.



**Fig. 72**

**NOTE:** To reset the primary timing chain tensioner, engine oil will first need to be purged from the tensioner (Fig. 72).

13. Purge oil from timing chain tensioner using the following procedure:
  - a. Place the check ball end of tensioner into the shallow end of Special Tool 8186 (Fig. 72).
  - b. Using hand pressure, slowly depress tensioner until oil is purged from tensioner (Fig. 72).
14. Reset timing chain tensioner using the following procedure:

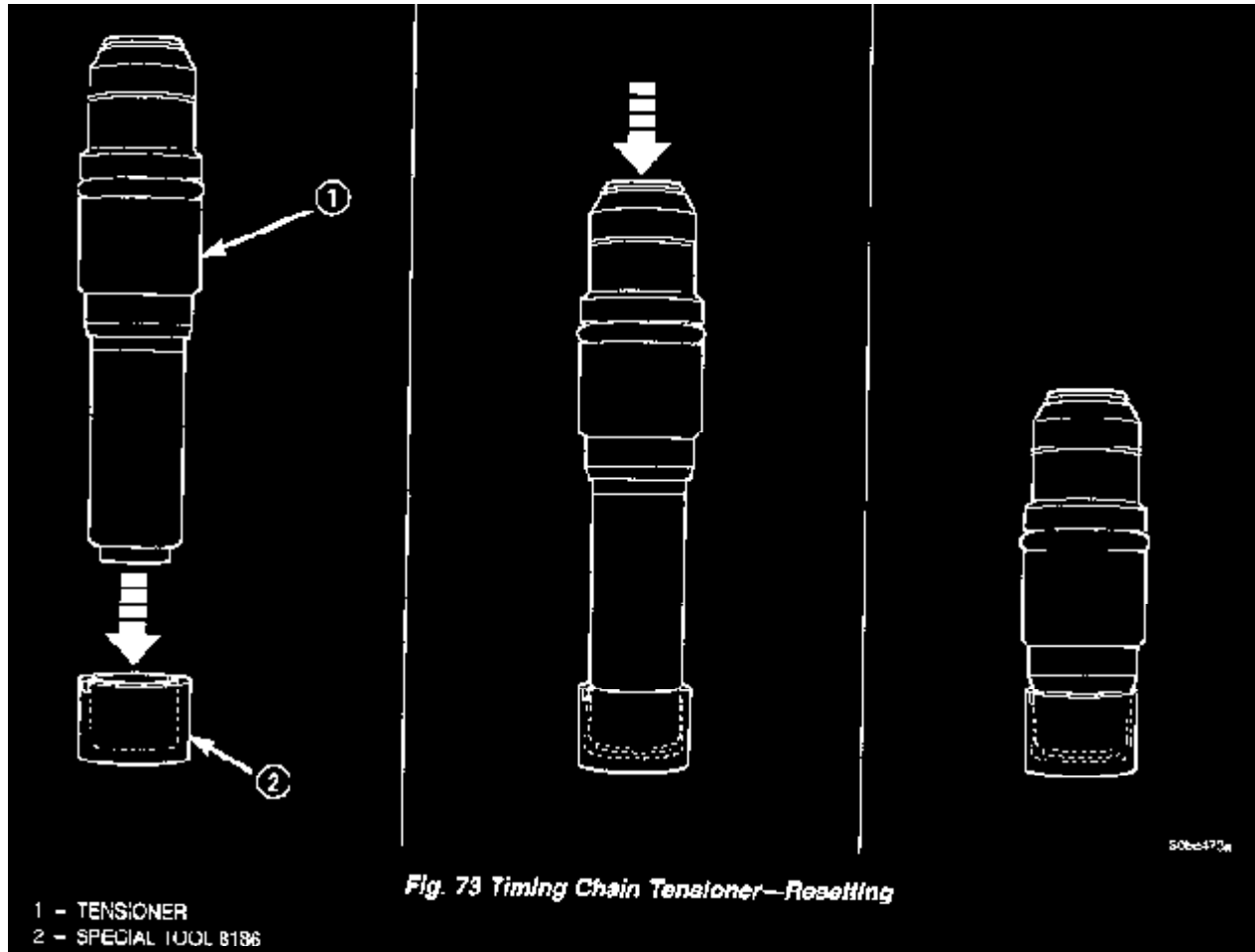


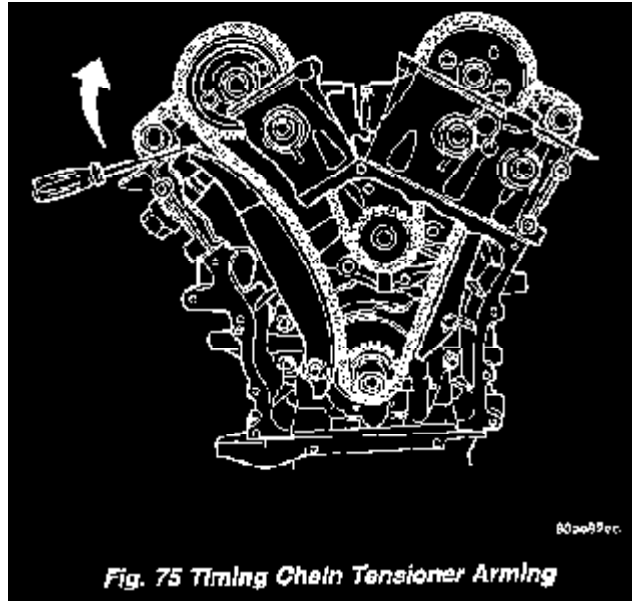
Fig. 73

- a. Position cylinder plunger into the deeper end of Special Wool 8186 (Fig. 73).
- b. Apply a downward force until tensioner is reset (Fig. 73).

**NOTE:** If oil was not first purged from the tensioner, use slight finger pressure to assist the center arm pin of Special Tool 8186 to unseat the tensioner's check ball.

**CAUTION:** Ensure the tensioner is properly reset. The tensioner body must bottom against the top edge of Special Tool 8186. Failure to properly perform the resetting procedure may cause tensioner jamming.

15. Install the reset chain tensioner into the right cylinder head (Fig. 74).
16. Position tensioner retaining plate and tighten bolts to **12 Nm (105 in. lbs.)** (Fig. 74).
17. Starting at the right cylinder bank, insert a 3/8" square drive extension with a breaker bar into intake camshaft drive hub. Rotate camshaft until the camshaft hub aligns to the camshaft sprocket and damper attaching holes. Install the sprocket attaching bolts and tighten to **28 Nm (250 in. lbs.)** (Fig. 71).
18. Turn the left side camshaft by inserting a 3/8" square drive extension with a breaker bar into intake camshaft drive hub and rotate camshaft until the sprocket attaching bolts can be installed. Tighten sprocket bolts to **28 Nm (250 in. lbs.)** (Fig. 71).
19. Rotate engine slightly clockwise to remove timing chain slack, if necessary.



**Fig. 75**

20. To arm the timing chain tensioner: Use a flat bladed pry tool to gently pry tensioner arm towards the tensioner slightly (Fig. 75). Then, release the tensioner arm. Verify the tensioner is armed (extends).
21. Install the timing chain cover, crankshaft damper, and cylinder head covers.
22. Install camshaft position sensor and connect electrical connector.
23. Install upper intake manifold. Refer Intake Manifold, Service and Repair.

**NOTE:** After installation of a reset tensioner, engine noise will occur after initial start-up. This noise will normally disappear within 5-10 seconds.