



## Test Monitoring Center

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Sequence VID Information Letter 11-1  
Sequence Number 7  
May 12, 2011

***ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.***

TO: Sequence VI Mailing List

SUBJECT: 1. Correction of Valve Size for FCV150 C, D, E and F  
2. Camshaft Position Actuator Modification Drawing  
3. Non Phased Cam Gear Installation Procedure  
4. Hardcopies of Final Test Reports and Data Reporting Requirements

As a result of the March 22, 2011 Sequence VI Surveillance Panel conference call, the following changes to Test Method D7589 were approved by the Panel.

1. An error was noted in the Test Method, specifically , Section 6.6.5.3 (3) and (4) refer to solenoid valves FCV150 C, D, E and F as  $\frac{3}{4}$  in. valves. The correct size for these valves is  $\frac{1}{2}$  in. Also FCV150F was removed from 6.6.5.3 (4) since this valve is not required. Sections 6.65.3 (3) and (4) have been revised accordingly.
2. A modification to camshaft position actuators, to close the drain ports by welding them shut, was approved by the panel. Section 6.13.1 has been modified and section 9.4.22 and Annex A2.21 have been added.
3. The panel also agreed to include the procedure to install the non phased cam gears and modified camshaft position actuators, Annex A14 is now included in the test method. Section 9.4.20 has also been modified to reference Annex A14.
4. The panel agreed to no longer require final test reports to be mailed to the TMC and to require all tests run to completion be reported, regardless of validity. Sections 10.1.2 and 13.2 have been revised to reflect these changes.

The attached changes to Test Method D 7589 are effective March 22, 2011

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GM Powertrain Materials Engineering

Frank M. Farber  
Administrator  
ASTM Test Monitoring Center

Attachment

c: [ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/vid/procedure\\_and\\_ils/il11-1.pdf](ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencevi/vid/procedure_and_ils/il11-1.pdf)

Distribution: Email

*Add Annex to Table of Contents*

Non Phased Cam Gear and Position Actuator Installation Procedure

Annex

A14

6.6.5.3

(3) FCV-150C is a Burkert Type 251 piston-operated valve used with a Type 312 solenoid valve (or a Burkert Type 2000 piston-operated valve used with a Type 311, 312 or 330 solenoid valve) for actuation of air supply to the piston valve, solenoid valve direct-coupled to the piston valve, normally open, explosion proof (left to the discretion of the laboratory) and watertight, 1/2 in., 2-way, stainless steel NPT fitting.

(4) FCV-150D and FCV-150E are Burkert Type 251 piston-operated valves used with a Type 312 solenoid valve (or a Burkert Type 2000 piston-operated valve used with a Type 311, 312 or 330 solenoid valve) for actuation of air supply to the piston valve, solenoid valve direct-coupled to the piston valve, normally closed, explosion proof (left to the discretion of the laboratory), and watertight, 1/2 in., 2-way, stainless steel NPT fitting.

6.13.1 *Test Engine Configuration*—The test engine is equipped with fuel injection, and is a 2009 GM (LY7, HFV6) OHT6D-099-3 with a displacement of 3.6 L. Purchase the engine (the 2008 GM (LY7), OHT6D-099-1, and 2009 GM (LY7) OHT6D-099-2 V-6 engine are no longer available from the CPD but are acceptable to use) as a test ready unit (for procurement, see X1.3). The only changes allowed from the as-received test ready unit is the installation of the fixed timing gears, modified camshaft position actuators, and coolant system orifice.

9.4.20 *Non-Phased Camshaft Gears*—These gears (OHT6D-016-1 GEAR, CAMSHAFT, EXHAUST & OHT6D-017-1 GEAR, CAMSHAFT, INTAKE) will need to be installed by the end user prior to running the new engine break-in; they will be supplied with the engine when purchased. Install these gears in accordance with the instructions detailed in Annex A14.

9.4.22 *Camshaft Position Actuator Modification*--For Sequence VID test operation, the camshaft position actuator shall be in place to provide lubrication to the front camshaft journals. Close, by tig welding, the actuator drain ports to reduce excessive oil bleeding through the control valves during engine operation as the valves are positioned in a manner that allows complete drainage through the spool valves (see Fig. A2.21).

10.1.2 *Reporting of Reference Results*—Transmit the reference oil test results to the TMC (see Annex A1) using the appropriate forms as shown in Annex A6 immediately after completion of test. The TMC will review the transmitted reference oil test results and use the LTMS to determine test acceptability.

13.2 *Report Format*—For reference oil tests, the standardized report form set and data dictionary for reporting test results and for summarizing operational data are required. Report forms and the Data Dictionary are available from the TMC. Fill out the report forms according to the formats shown in the Data Dictionary. When transmitting data electronically, a Header Data Dictionary shall precede the Data Dictionary. The latest version of this Header Data Dictionary may be obtained from the TMC either by ftp (internet) or by calling the Test Engineer responsible for this particular item (see Annex A6). Use Practice E29 for rounding the data. Report test results from all test run to completion, regardless of validity.

## A2. DETAILED SPECIFICATIONS AND DRAWINGS OF APPARATUS

A2.1 Figs. A2.1-A2.21 present the detailed specifications and drawings of apparatus.

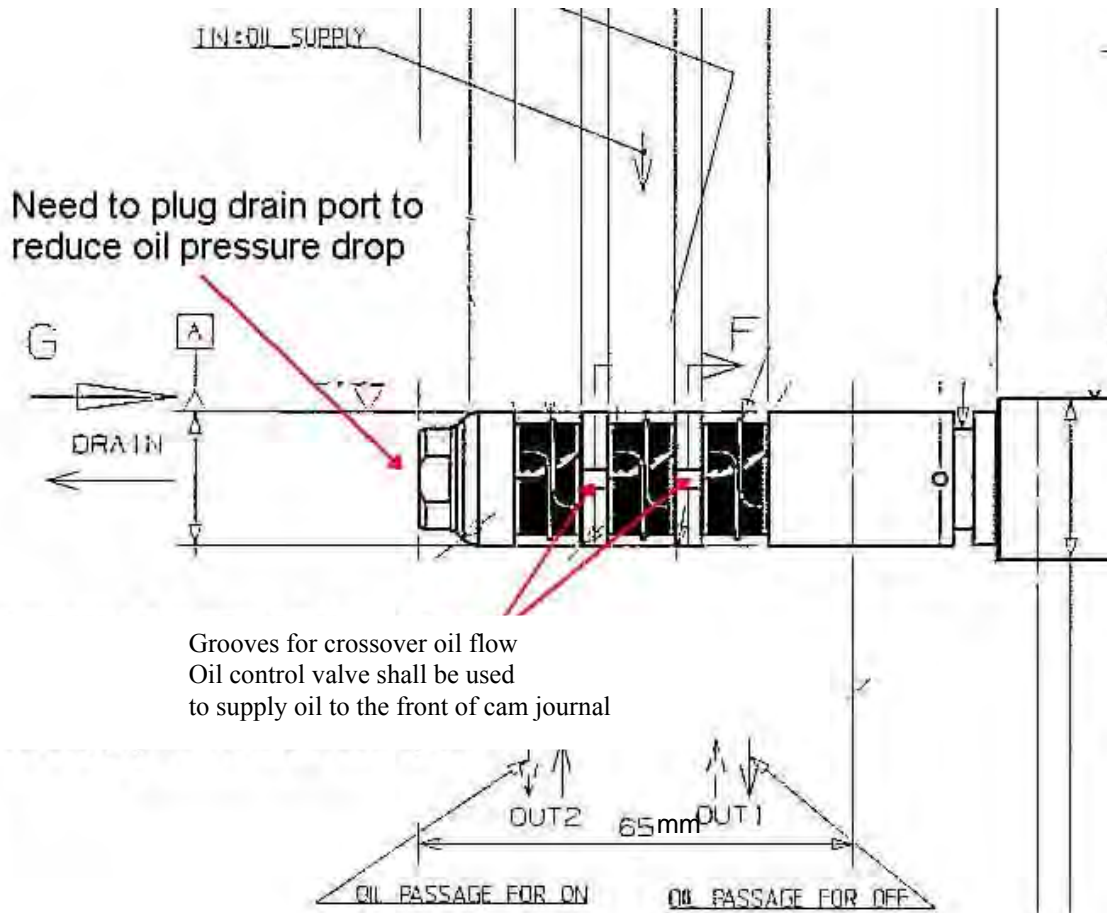


Fig. A2.21 Camshaft Position Actuator Modifications



## A14. Non Phased Cam Gear Installation Procedure

A14.1 Insure all four camshafts are positioned with flats parallel to rocker cover sealing surface. Positioning the flats parallel assures that the cam lobes are all on a portion of the base circle and the engine will thereby be a free spin so you can rotate the crankshaft without the pistons hitting the valves (See Fig. A14.1).

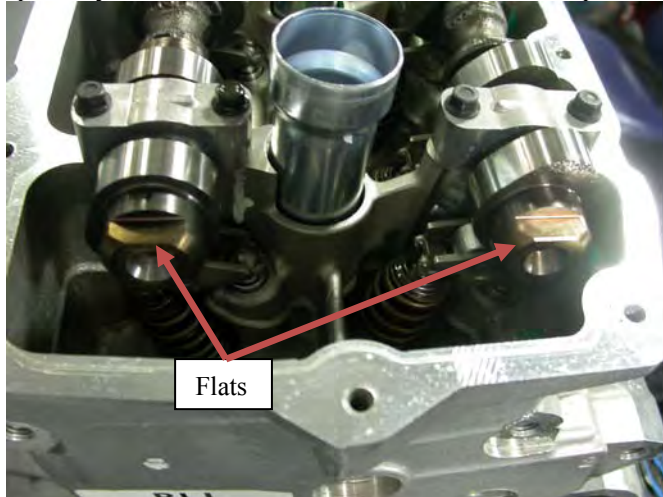


Fig A14.1 Locating Camshaft "Flats"

A14.2 Install all four camshaft sprockets, i.e., intakes on the inboard cams and exhausts on the outboard camshafts (see Fig A14.2).

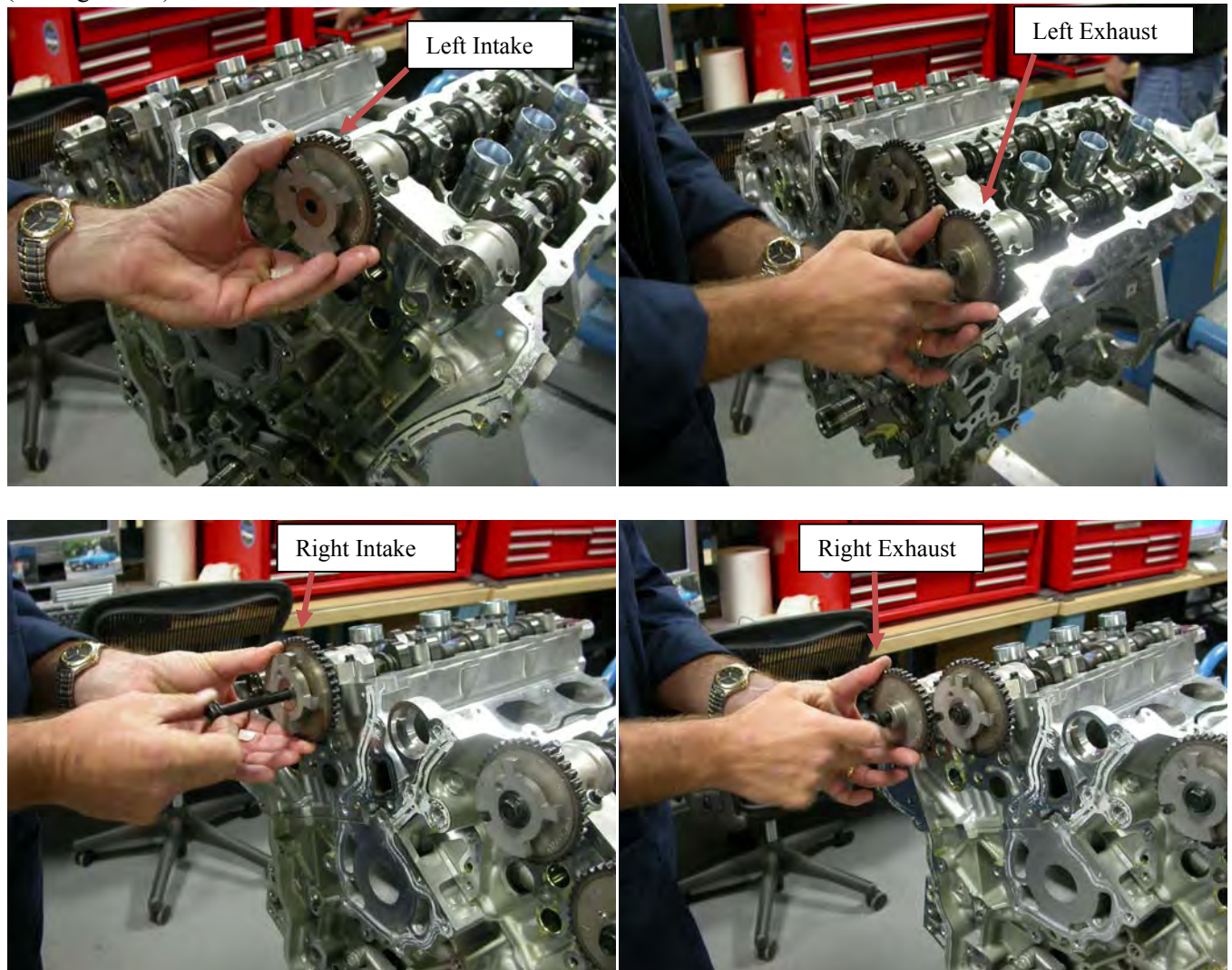


Fig. A14.2 Camshaft Sprocket Installation

A14.3 After installation of left side gears, torque all four fasteners to  $58 \pm 7 \text{ N}\cdot\text{m}$ , holding camshafts on hex with open end wrench (See Fig. A14.3)

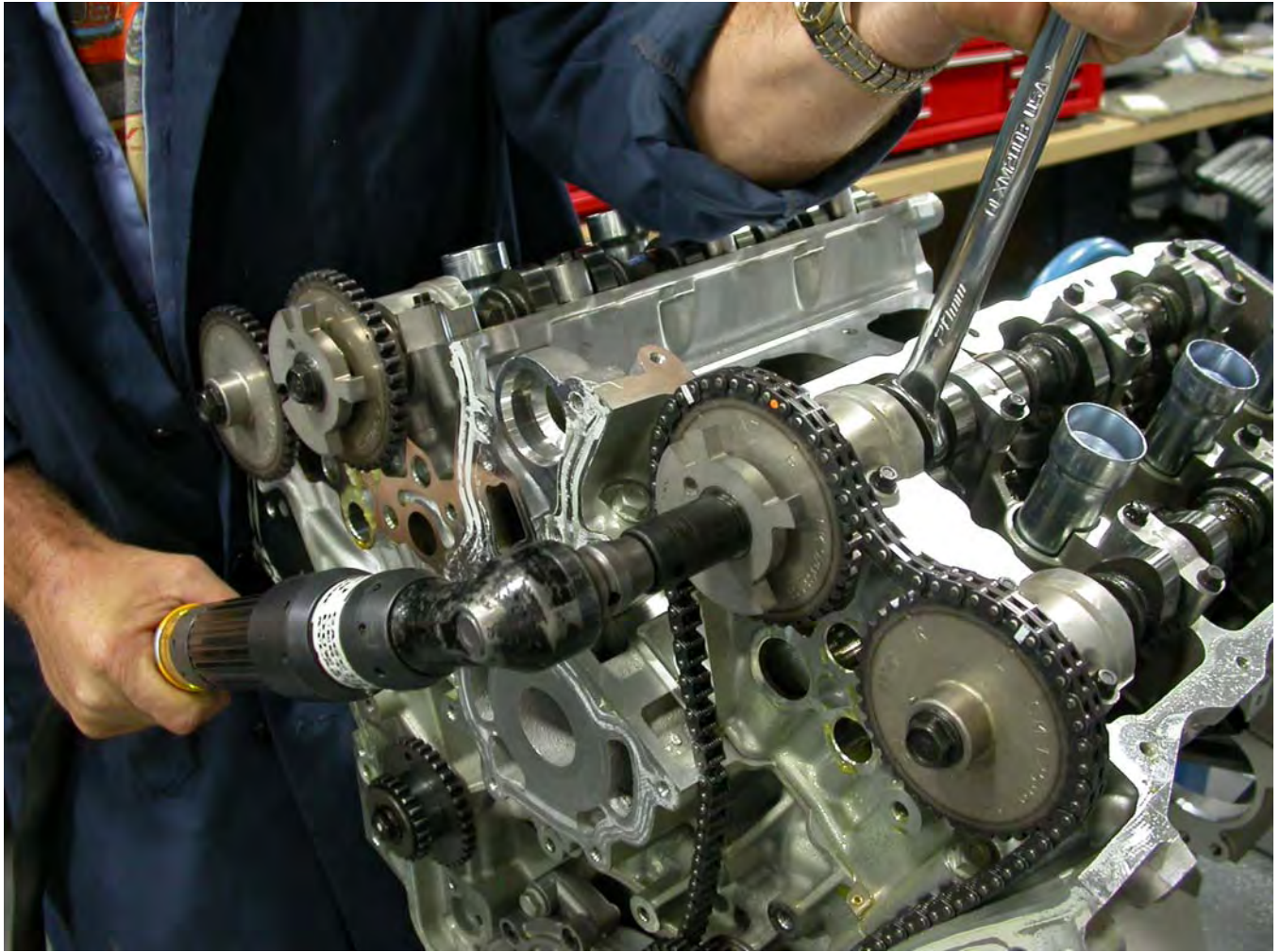


Fig A14.3 Torquing Camshaft Sprocket Fasteners.

A14.4 Install left chain assembly with left side idler gear (do not remove grenade pin), aligning white marks on chain with dots on camshaft gears identified as “L” Intake and “L” Exhaust on camshaft gears. Torque left side idler gear to  $58 \pm 7 \text{ N}\cdot\text{m}$  (See Fig. A14.4).



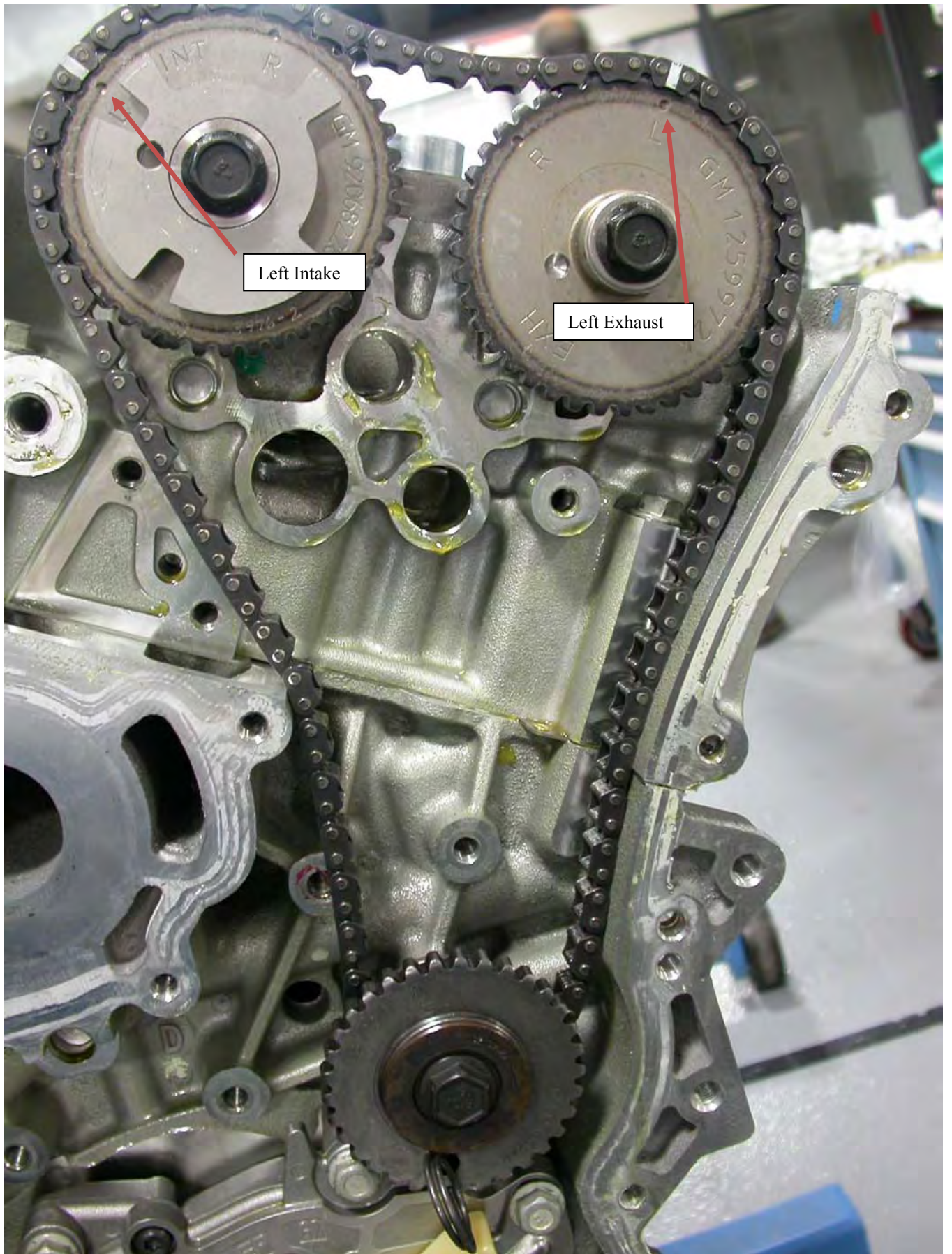


Fig. A14.4 Alignment of Timing Marks, Left Side, with Grenade Pin Installed



A14.5 Install left side chain guides, left side tensioner and gasket. Torque tensioner and chain guide fasteners to  $23 \pm 3 \text{ N}\cdot\text{m}$  (See Fig A14.5).

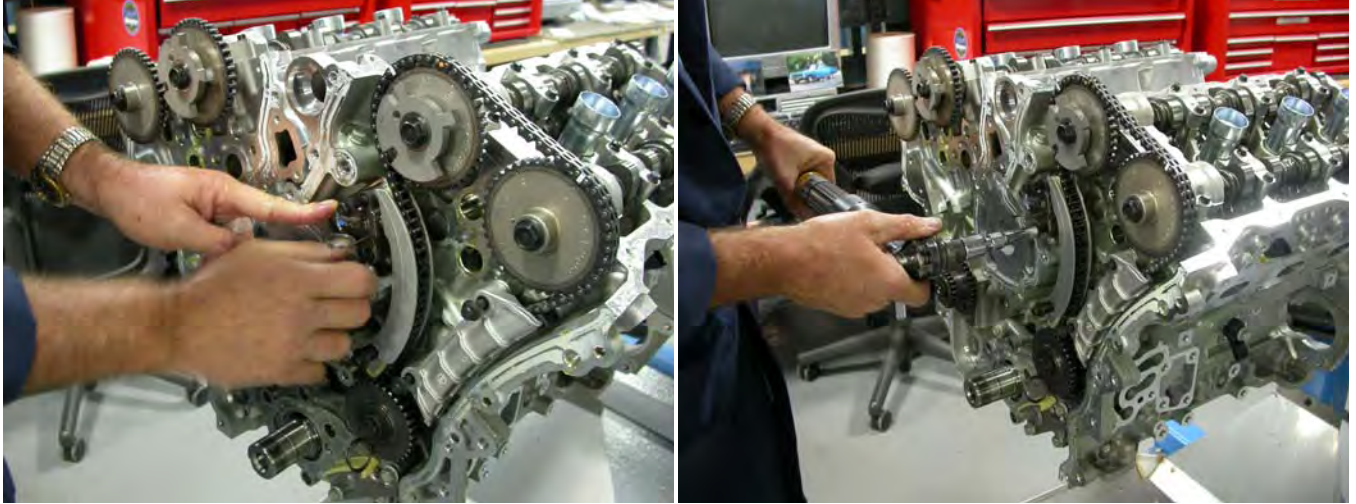


Fig A14.5 Installation of Chain Guide, Tensioner and Gasket, Left Side

A14.6 Install right side idler gear and torque to  $58 \pm 7 \text{ N}\cdot\text{m}$ . and verify the left side idler gear still has grenade pin holding chain assembly in proper position (See Figure A14.6).



Fig. A14.6 Installation of Right Side Idler Gear

A14.7 Install crankshaft gear and align dot for left side chain alignment (see Fig A14.7).

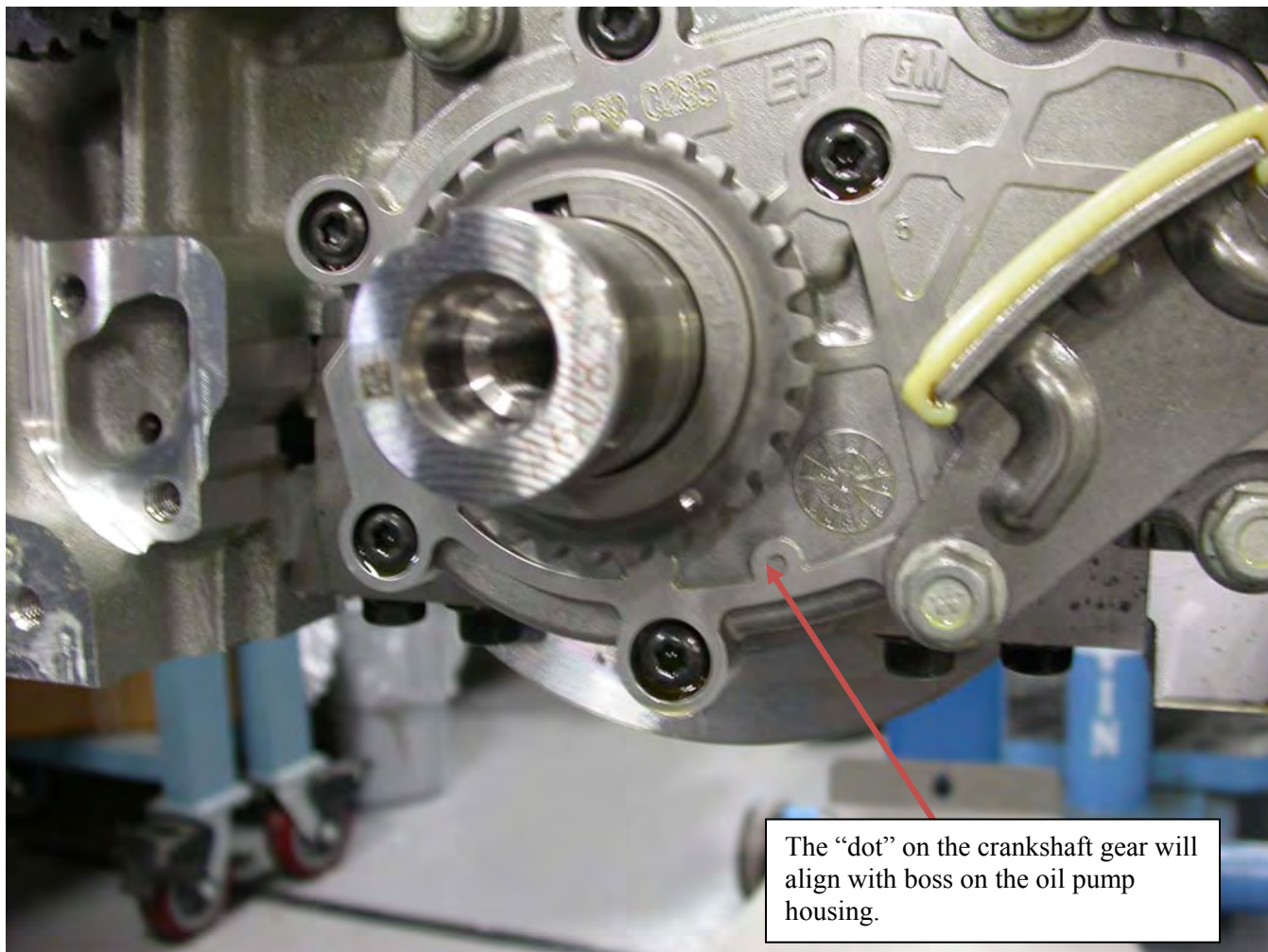


Fig A14.7 View Showing Installation and Alignment Marks.

A14.8 Install primary chain assembly over left, right idlers and crankshaft gears with white identification marks aligned with marks on all three gears (See Fig. A14.8).



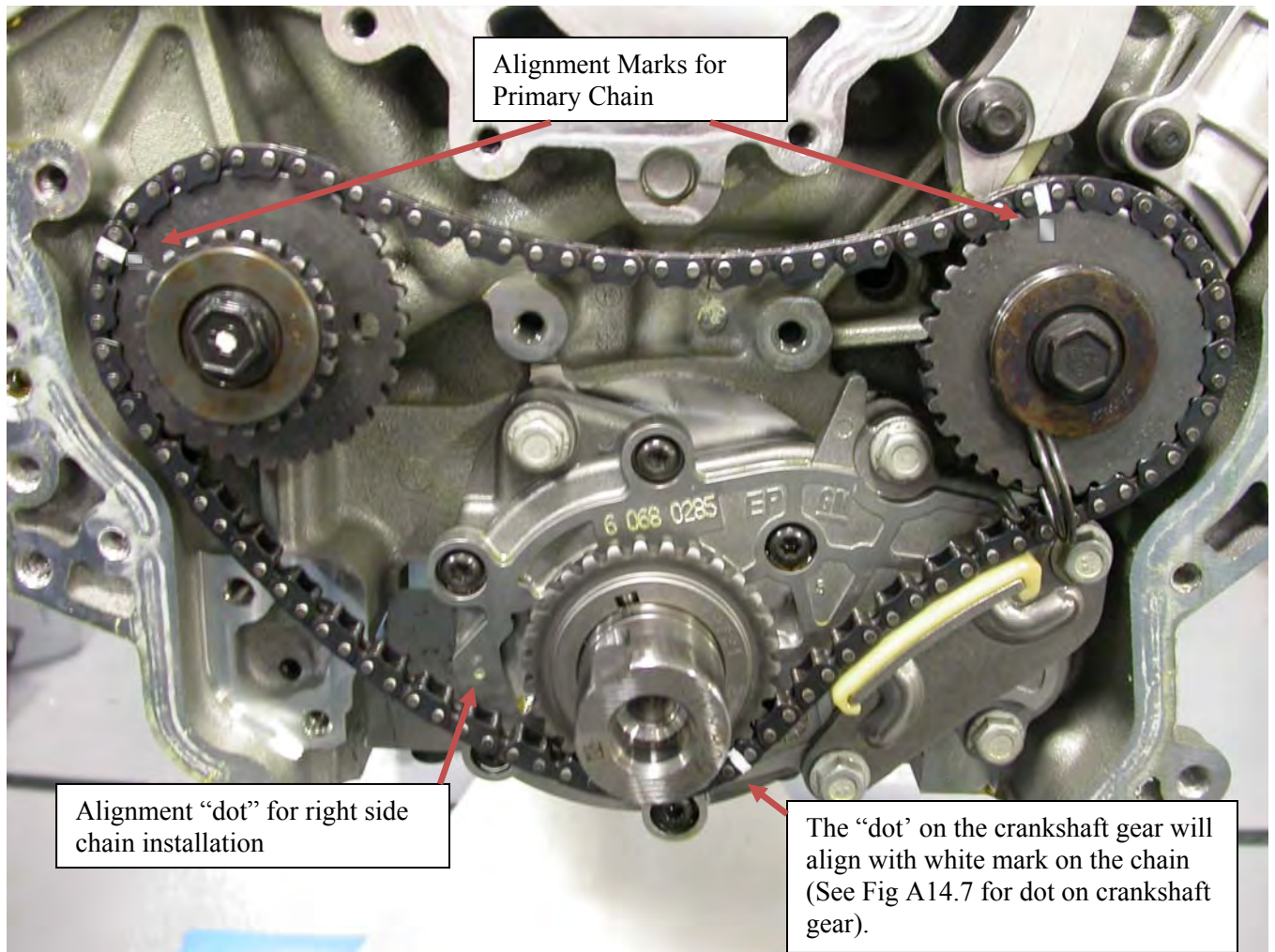


Fig. A14.8 Primary Chain Alignment Marks

A14.9 Install primary chain guides, primary chain tensioner and gasket. Torque tensioner and guide fasteners to  $23 \pm 3$  N·m. Torque right side idler gear to  $58 \pm 7$  N·m. (See Fig A14.9).



Fig. A14.9 View Showing Installation of Primary Chain Tensioner and Guides



A14.10 Remove grenade pin from left side idler and rotate crankshaft to right side alignment marks. Verify the dot on crankshaft gear aligns with the mark on timing chain and boss on oil pump housing (See Figs A14.8 and A14.10).

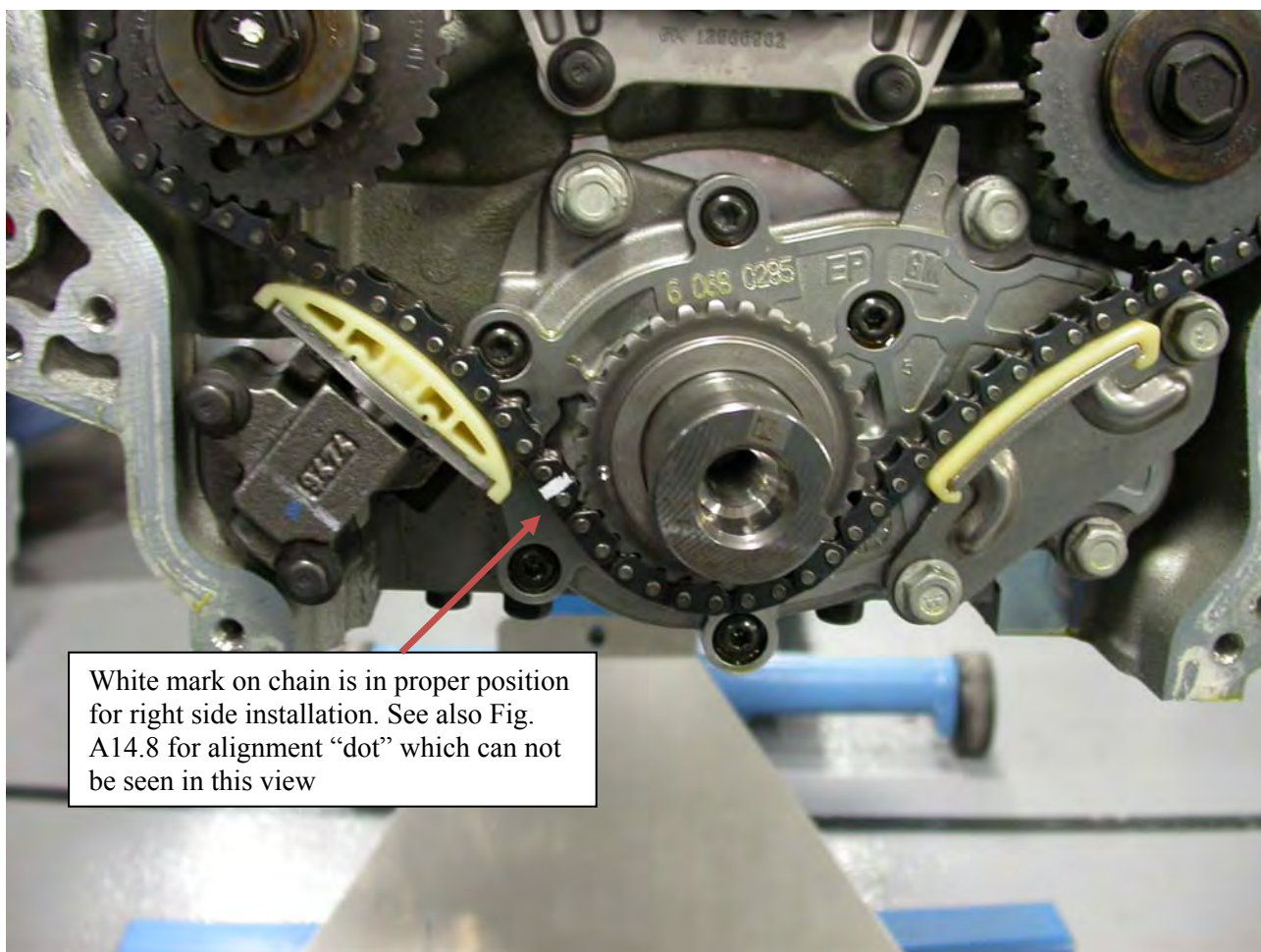
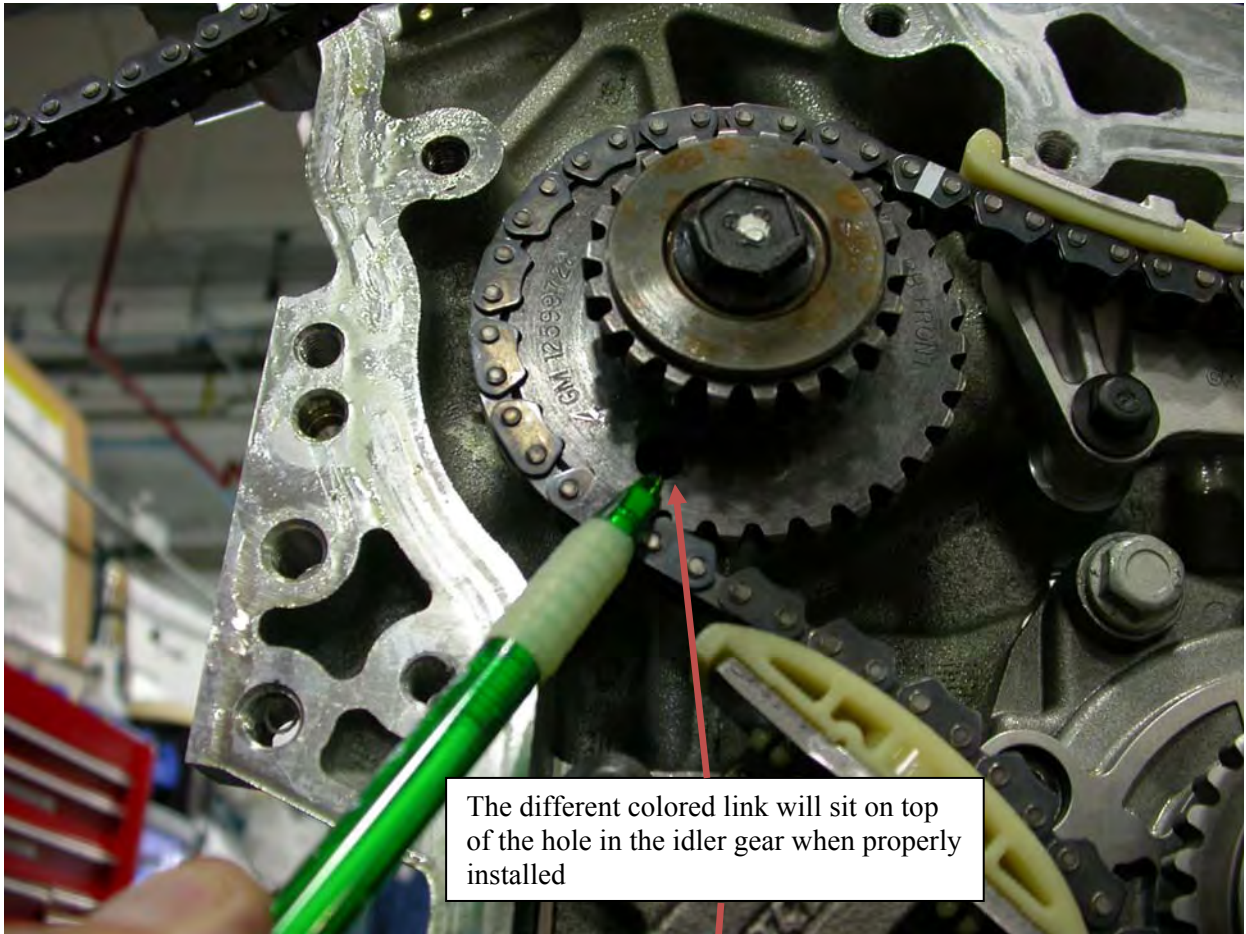


Fig. A14.10 View Showing Timing Proper Alignment

A14.11 Note hole in right side idler gear as noted by pen and align right side chain over idler with white link positioned at hole in right side idler and white marks positioned on cam gears at "R" Exhaust and "R" Intake (See Fig A14.11).



The different colored link will sit on top of the hole in the idler gear when properly installed

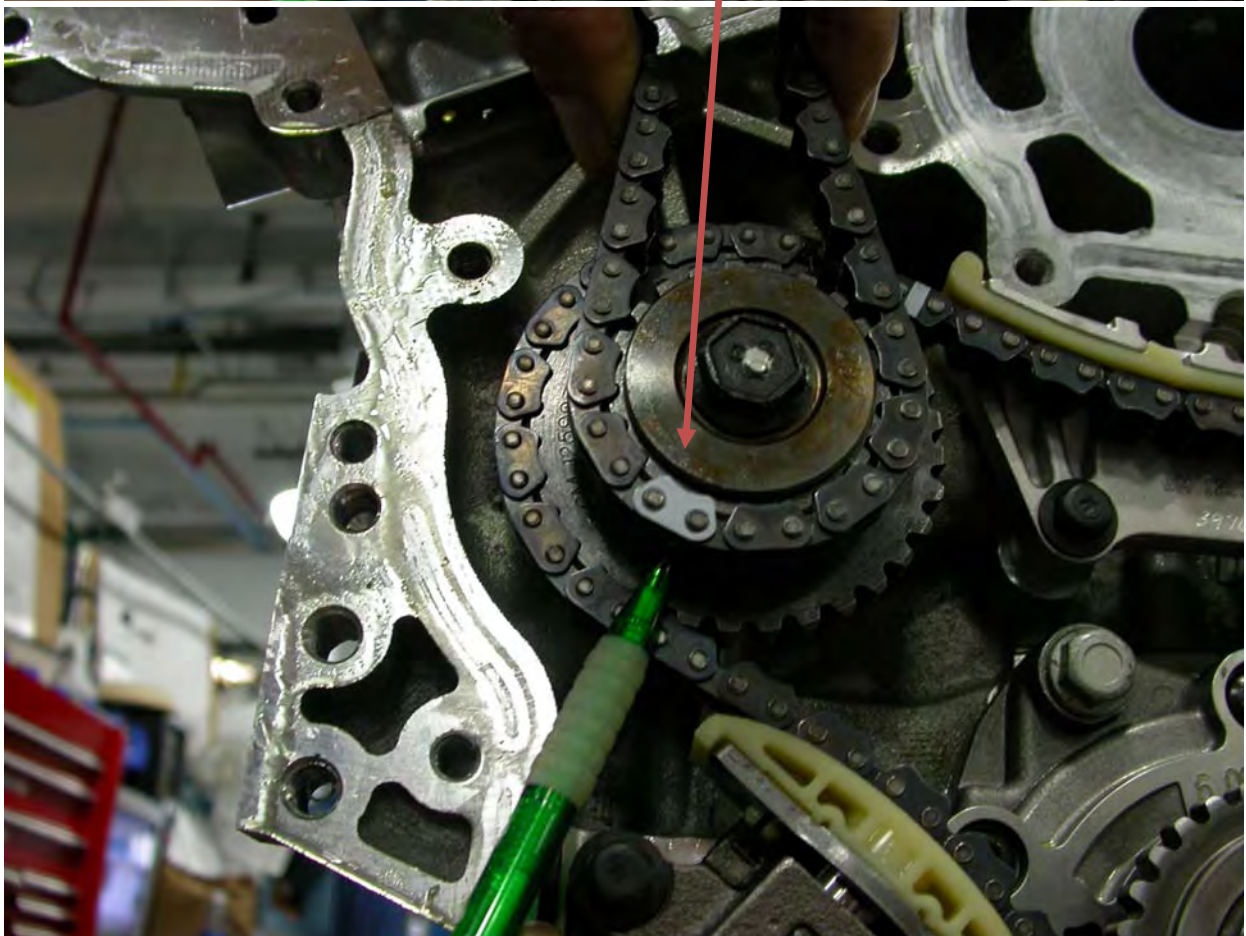


Fig. A14.11 View Showing Proper Gear Alignment for Right Side



A14.12 Holding chain together, install chain guides and tensioner. Note, the right bank is the hardest chain to keep tension on during the assembly process. Torque tensioner and chain guides to  $23 \pm 3 \text{ N}\cdot\text{m}$  (See Fig A14.12).

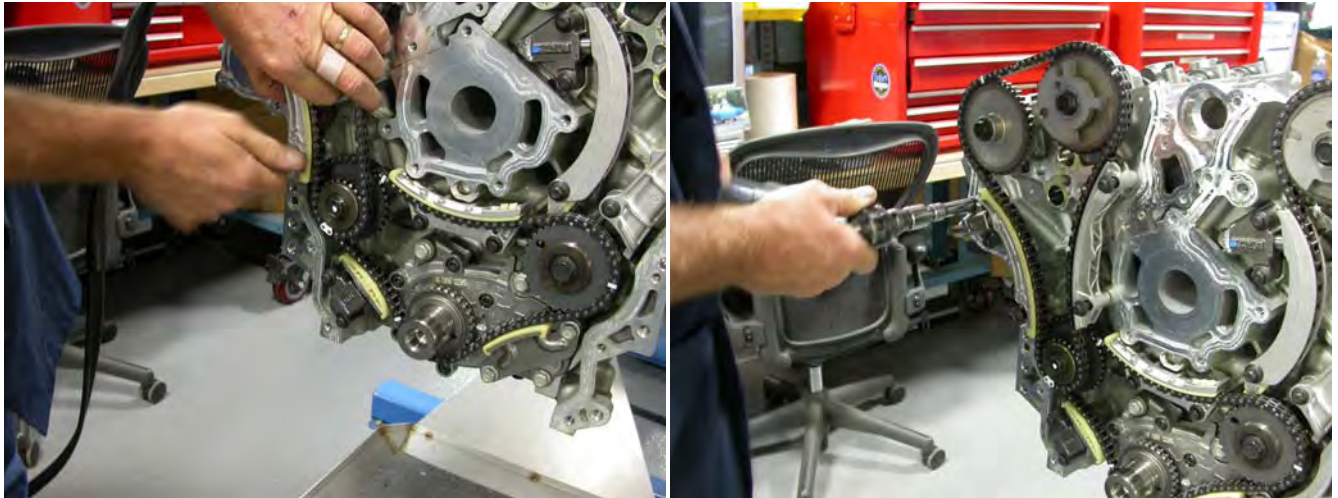


Fig. A14.12 View Showing Chain Guide and Tensioner Installation

A14.13 Remove grenade pin from right side chain tensioner (See Fig. A14.13).



Fig A14.13 View Showing Grenade Pins from Right Side Tensioner Removed



A14.14 Check alignment on all four cam gears, primary chain idlers, and crank gear (see Figs. A14.14 and A14.15).

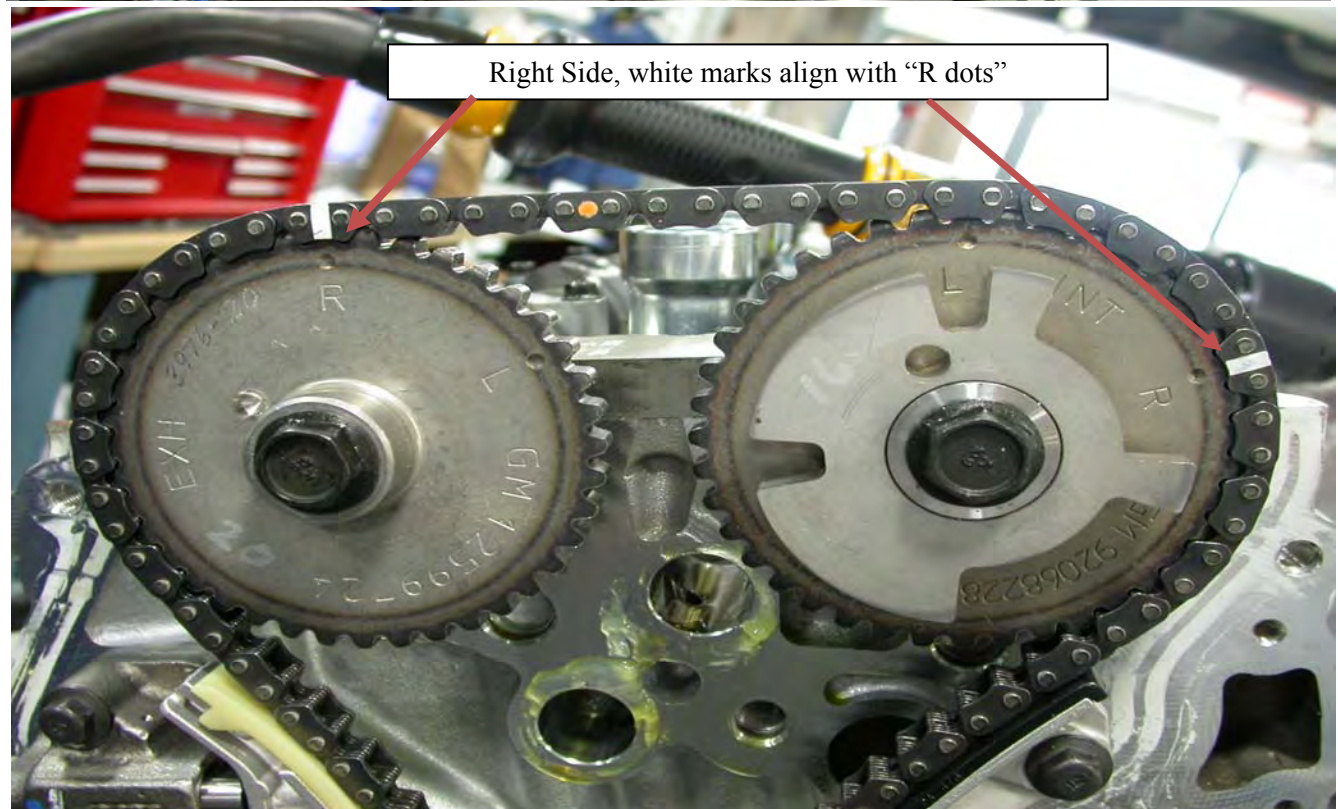
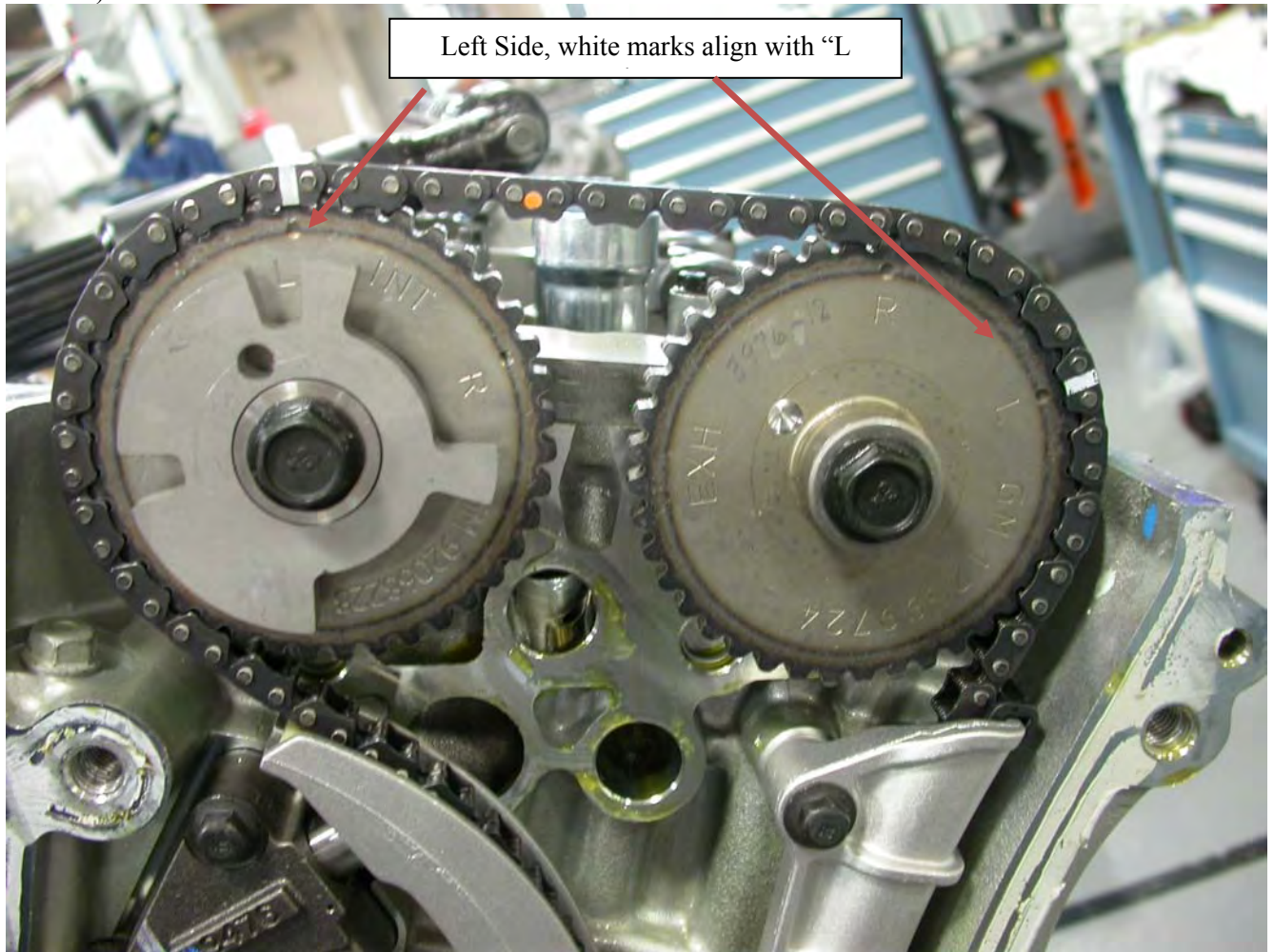


Fig. A14.14 Views Showing Proper Alignment, Left and Right Chains





Fig. A14.15 Right Side Chain and Idler Alignment Marks

A14.15 Rotate crankshaft backward (counter clockwise just past left side alignment and then back to left side alignment and check white marks for proper alignment. Rotate crankshaft clockwise to right side alignment and check marks. Ensure that chain assemblies do not jump on gears.

A14.16 Install 8 mm (0.315 in) guide pins into the cylinder block positions as shown in Fig.A14.16.

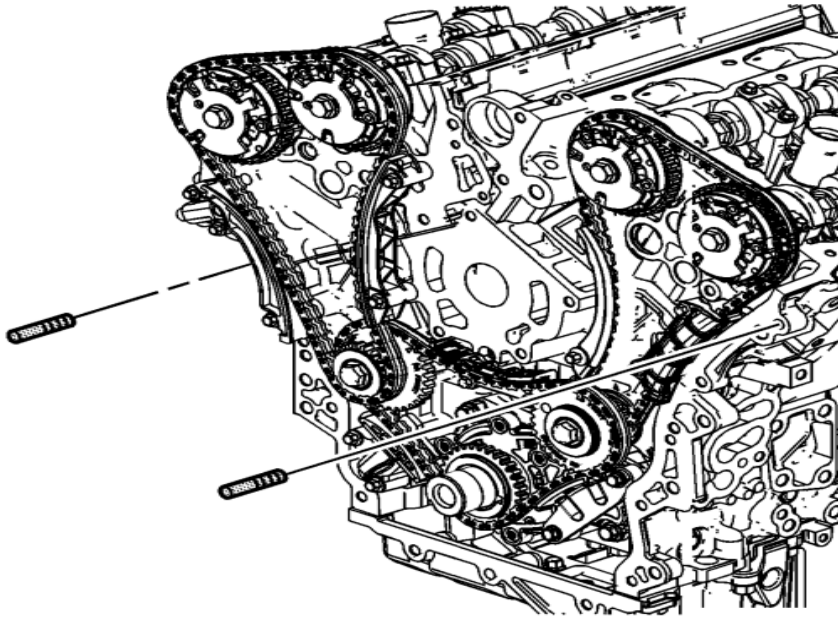


Fig. A14.16 Location of Guide Pins

A 14.17 Inspect front cover to cylinder block seal. Install existing seal or replace with a new seal if existing seal is damaged or otherwise unusable (See Figure A14.17).

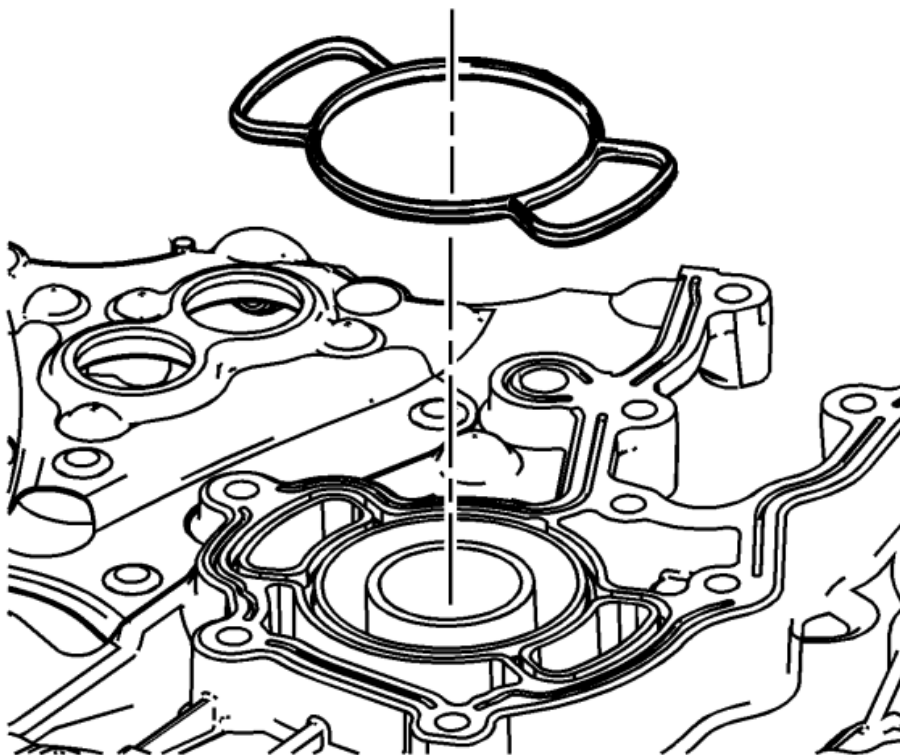


Fig. A14.17 Location of Front Cover Seal



A14.18 Place a 3 mm bead of RTV sealant, GM P/N 12378521 on the engine front cover as shown in Fig A14.18 (1).

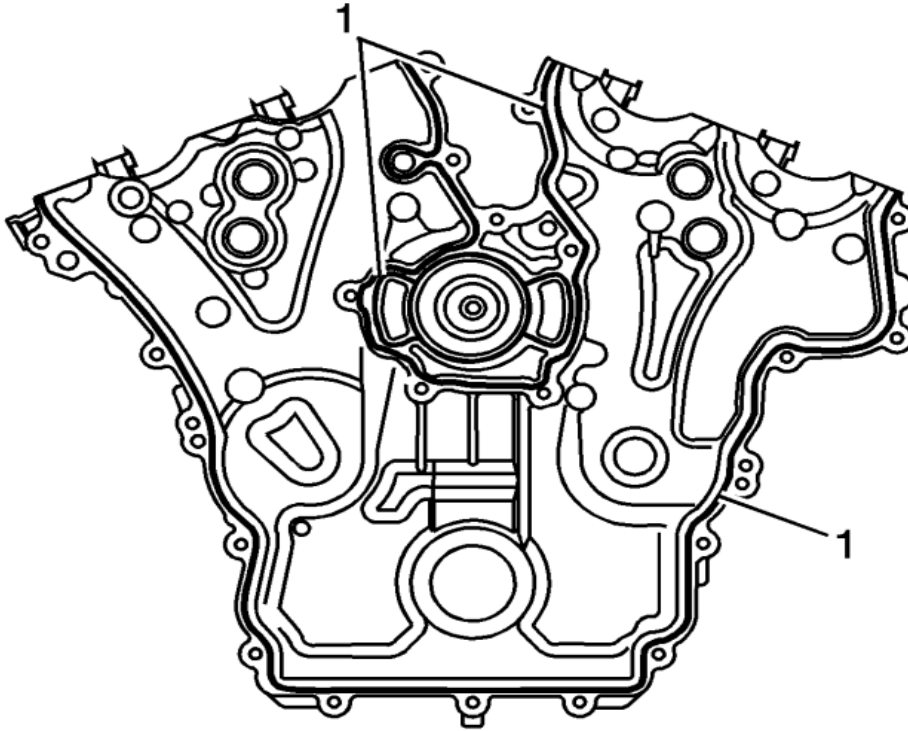


Fig. A14.18 Location of RTV Bead Placement

A14.19 Place the engine front cover onto the guide pins and slide into position (See Fig A14.19).

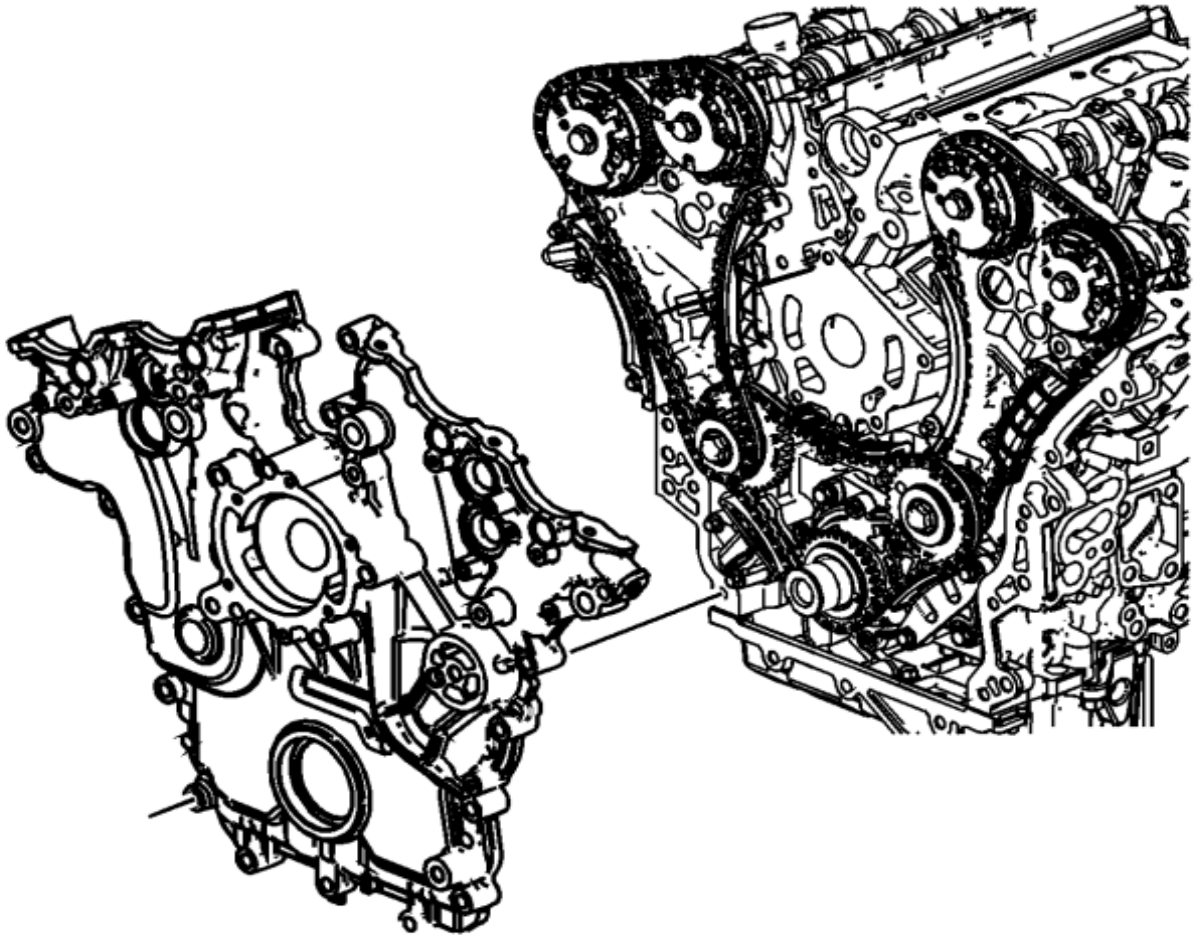


Fig A14.19 Installation of Front Cover

A14.20 Loosely install the front cover bolts and install the engine front cover sound deadener (See Fig. A14.20).

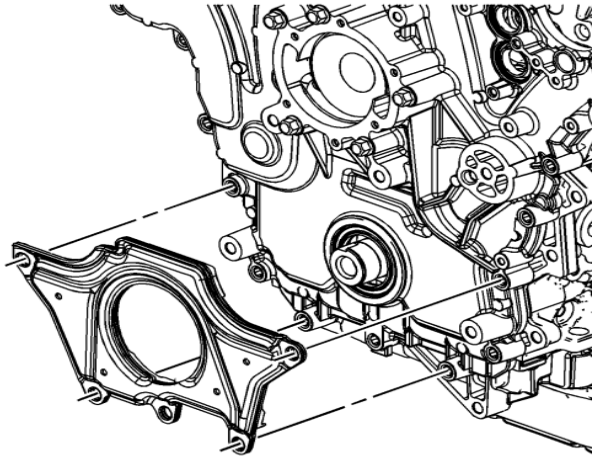


Fig A14.20 Front Cover Sound Deadener Installation

A14.21 Tighten the engine front cover bolts in the sequence shown in Fig A14.21 (1-22). Torque to 20 N·m. Tighten an additional 60° using the sequence shown (1-22)



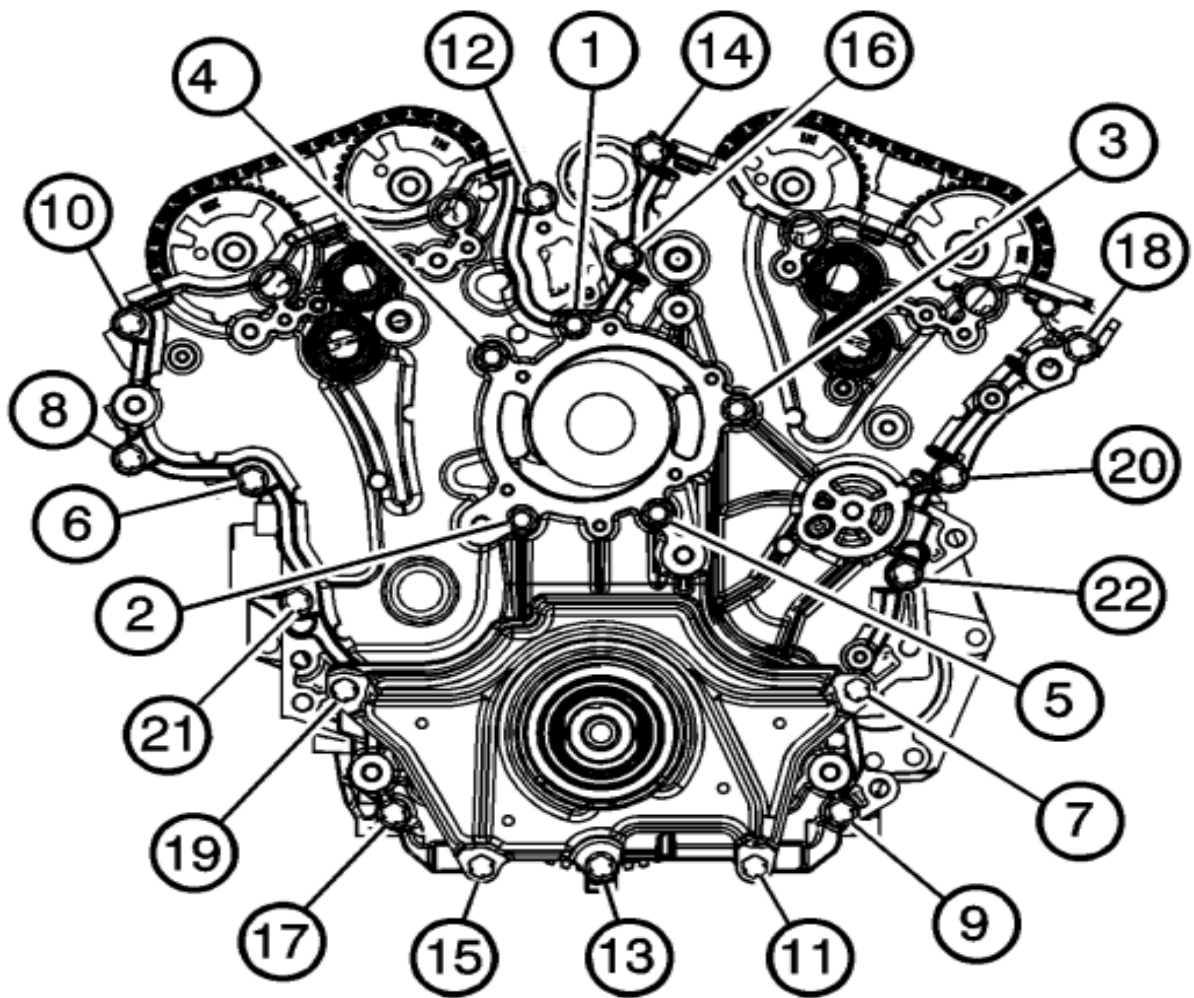


Fig A14.21 Tightening Sequence For Front Cover

A14.22 Install the modified Camshaft Position Actuators as shown in Fig. A14.22. Torque bolts to 10 N·m.

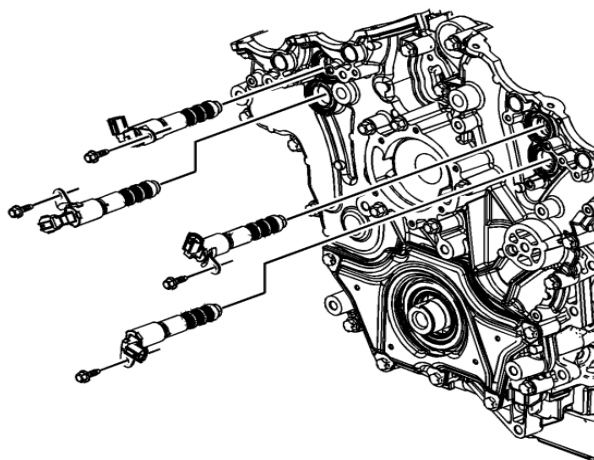


Fig A14.22 Cam Position Actuator Location