Modern Automotive Technology Chapter 15

Engine Front Construction

Learning Objectives

- Describe safety practices related to working on the front end of an engine
- Explain the function of the vibration damper
- Compare the three types of camshaft drives
- Summarize the construction of engine front covers, oil slingers, and other related parts
- Explain the construction of a timing gear, timing chain and timing belts assemblies

Engine Front End

- Consists of the parts that attach to the front of the engine
- These parts include:
  - Camshaft drive mechanism
  - Front cover-mounted oil pump
  - Water pump
  - Auxiliary shaft
  - Vibration damper

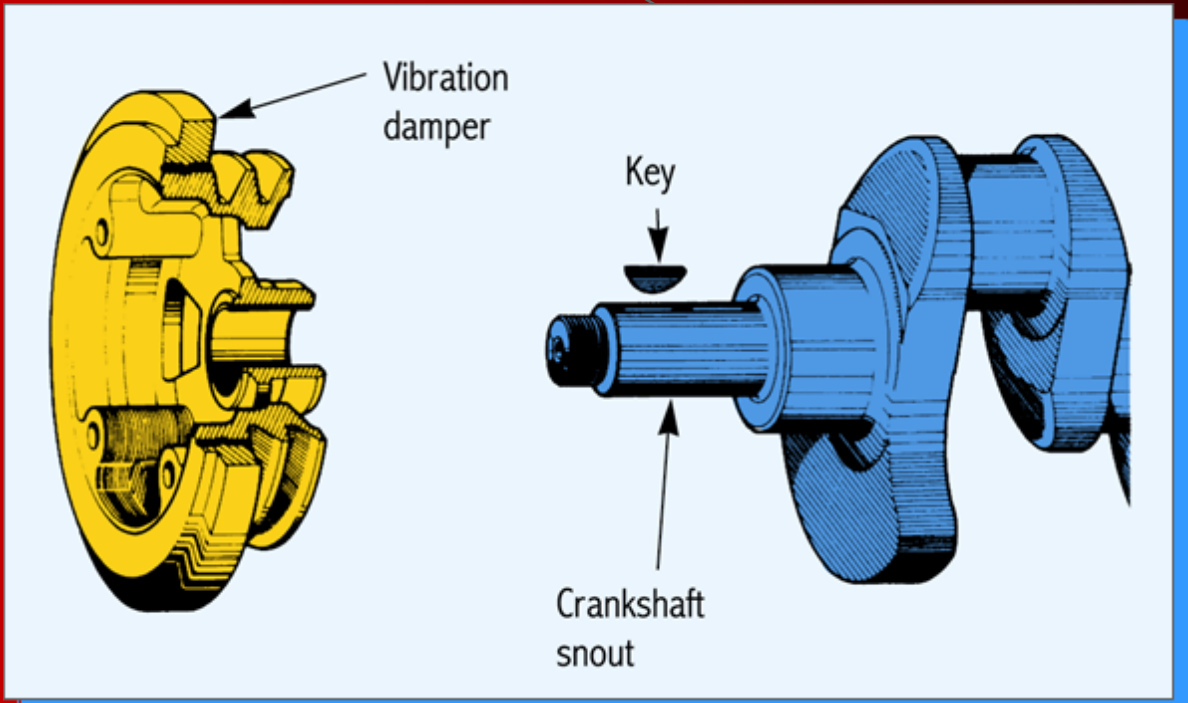
Vibration Damper Construction

- Harmonic vibration is a high-frequency movement resulting from twisting and untwisting of the crankshaft
- If harmonic vibration is not controlled, the crankshaft could vibrate, resulting in a broken crankshaft

Vibration Damper

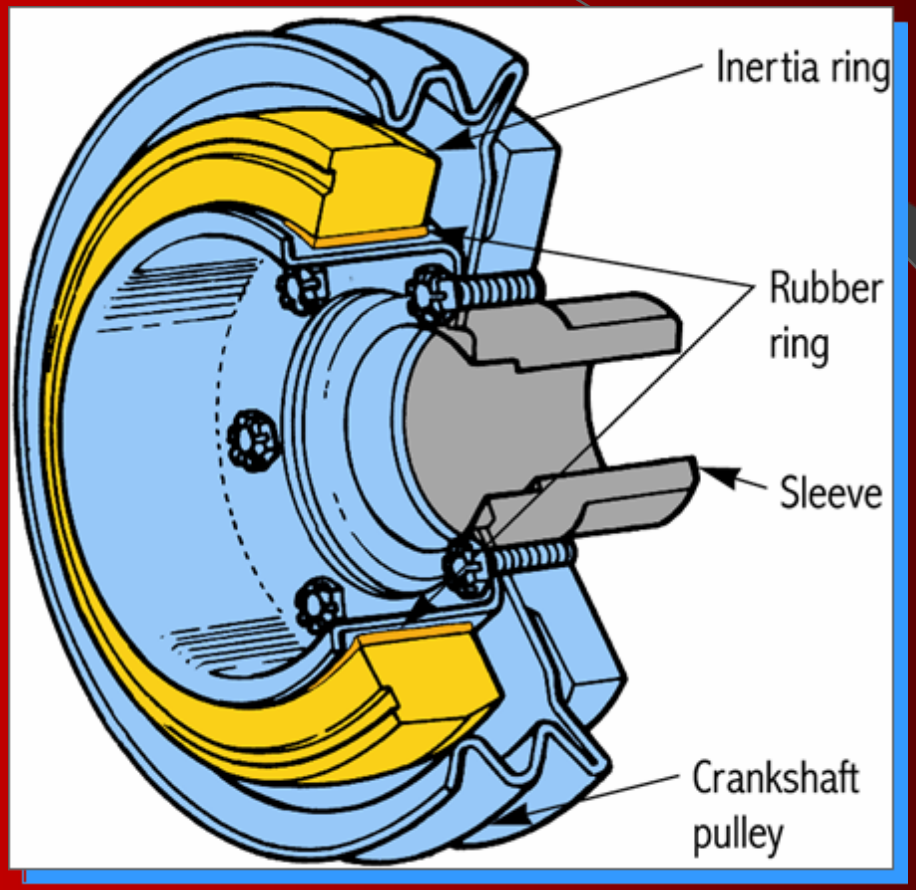
- Also called a harmonic balancer
- Keyed to the crankshaft snout
- Controls harmonic vibration
- Cuts load variation on the engine timing belt, chain, or gears, so these parts last longer

Vibration Damper



Constructed of a heavy wheel mounted in rubber

Vibration Damper



1. The BELT TENSIONER is a spring-loaded wheel that keeps the timing belt tight on its sprockets.
2. The TIMING MARKS show the technician how to install the gears properly.
3. The CHAIN TENSIONER is a spring-loaded plastic or fiber block that may be used to take up slack caused by wear.

Crankshaft Pulley

- Operates belts for the alternator, water pump, and other units
- May be part of the harmonic balancer, or bolted to the front of the balancer
- Provides either V or ribbed grooves for the belts

Camshaft Drive Construction

- Camshaft drive must turn the camshaft at one-half of the crankshaft speed
- There are three types of camshaft drives:
  - timing gears
  - timing chain and sprockets
  - timing belt and sprockets

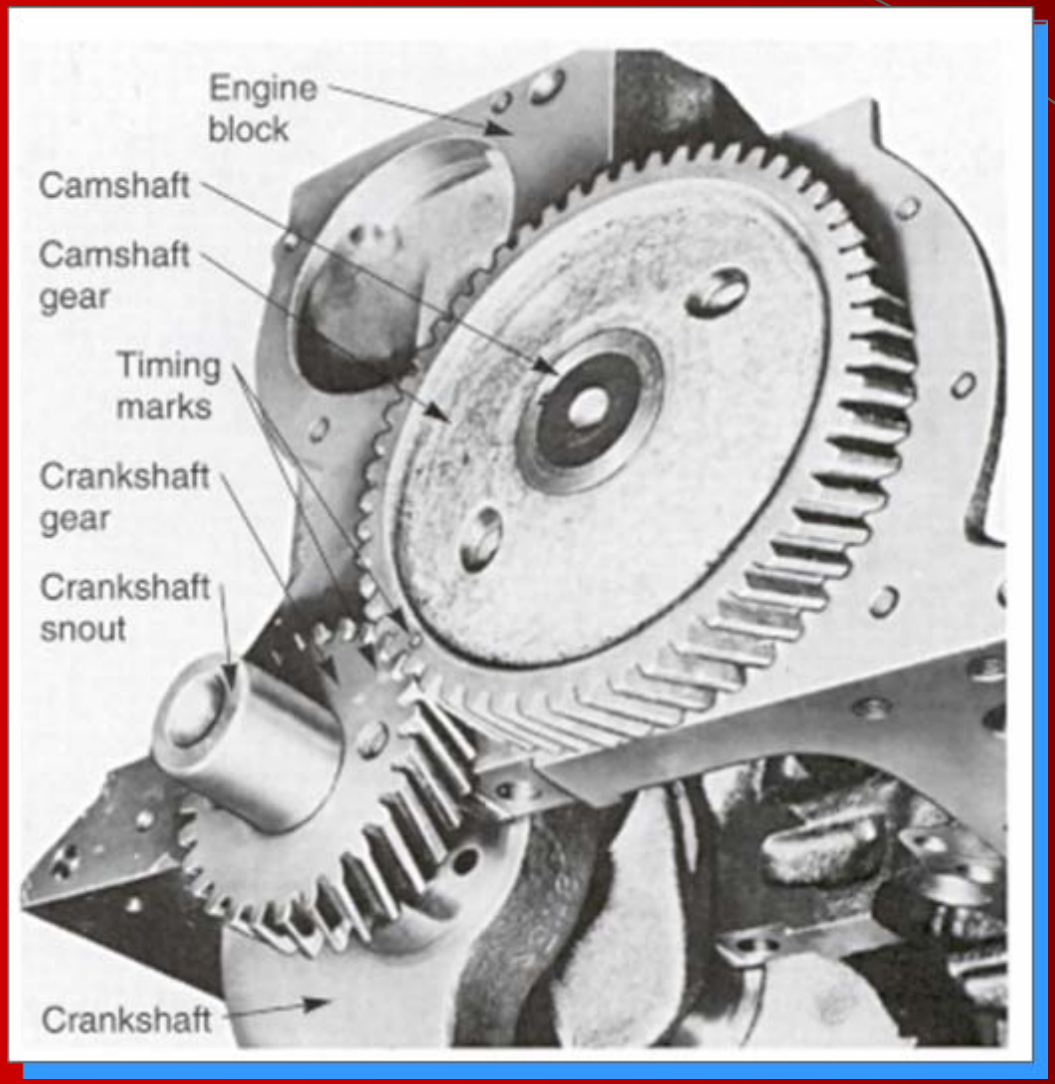
Timing Gears

- Commonly used for heavy-duty applications
  - trucks, taxicabs, and diesel engines
- Very dependable and long lasting design
- Noisier than a chain or belt drive

Timing Gears

- Two timing gears are used to drive the camshaft
  - one on the crankshaft and one on the camshaft
- Cam gear is twice the size of the crank gear
  - provides a 2:1 reduction

Timing Gears

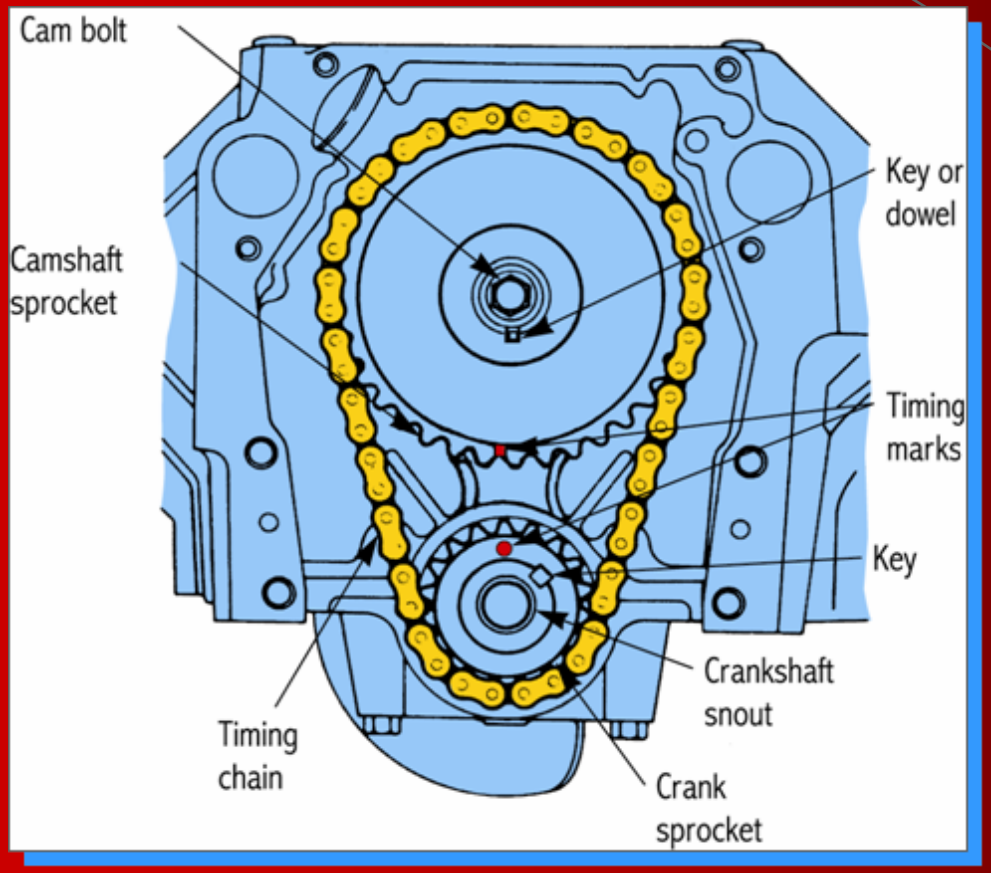


Timing marks show the technician how to install the gears properly

Timing Chain and Sprockets

- Used to turn the camshaft
- Crank sprocket is keyed to the crankshaft snout
- Cam sprocket, with either metal or plastic teeth, bolts to the camshaft
- Timing chain transfers power from the crank sprocket to the cam sprocket

Timing Chain and Sprockets

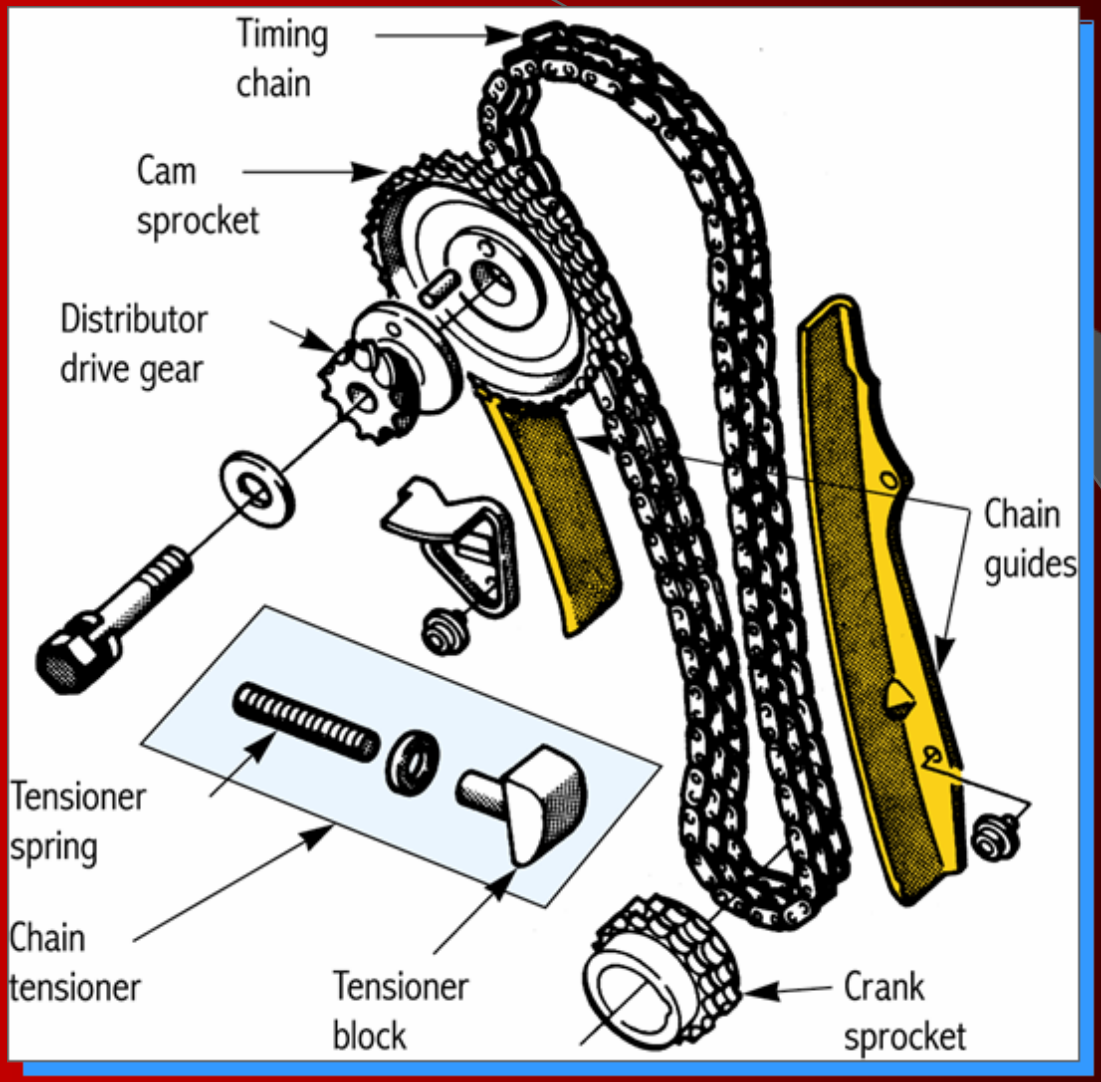


Timing marks must line up to time the camshaft with the crankshaft

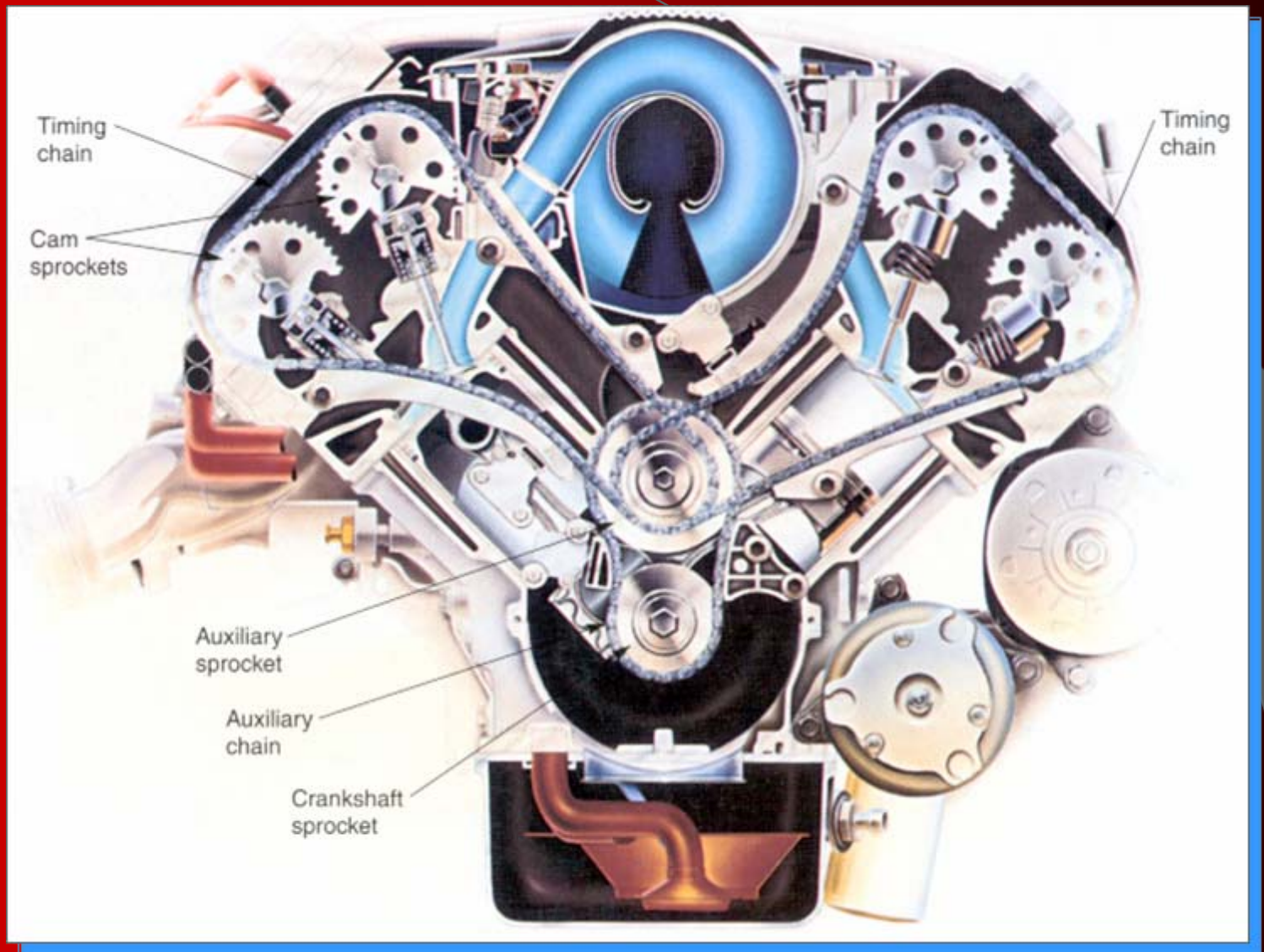
Timing Chain and Sprockets

- Chain guide
  - may be needed to prevent chain slap
- Chain tensioner
  - may be used to take up the slack in the chain as it and the sprockets wear
  - spring tension is used to push a plastic or fiber block outward, keeping a constant tension on the chain

OHC Timing Chain

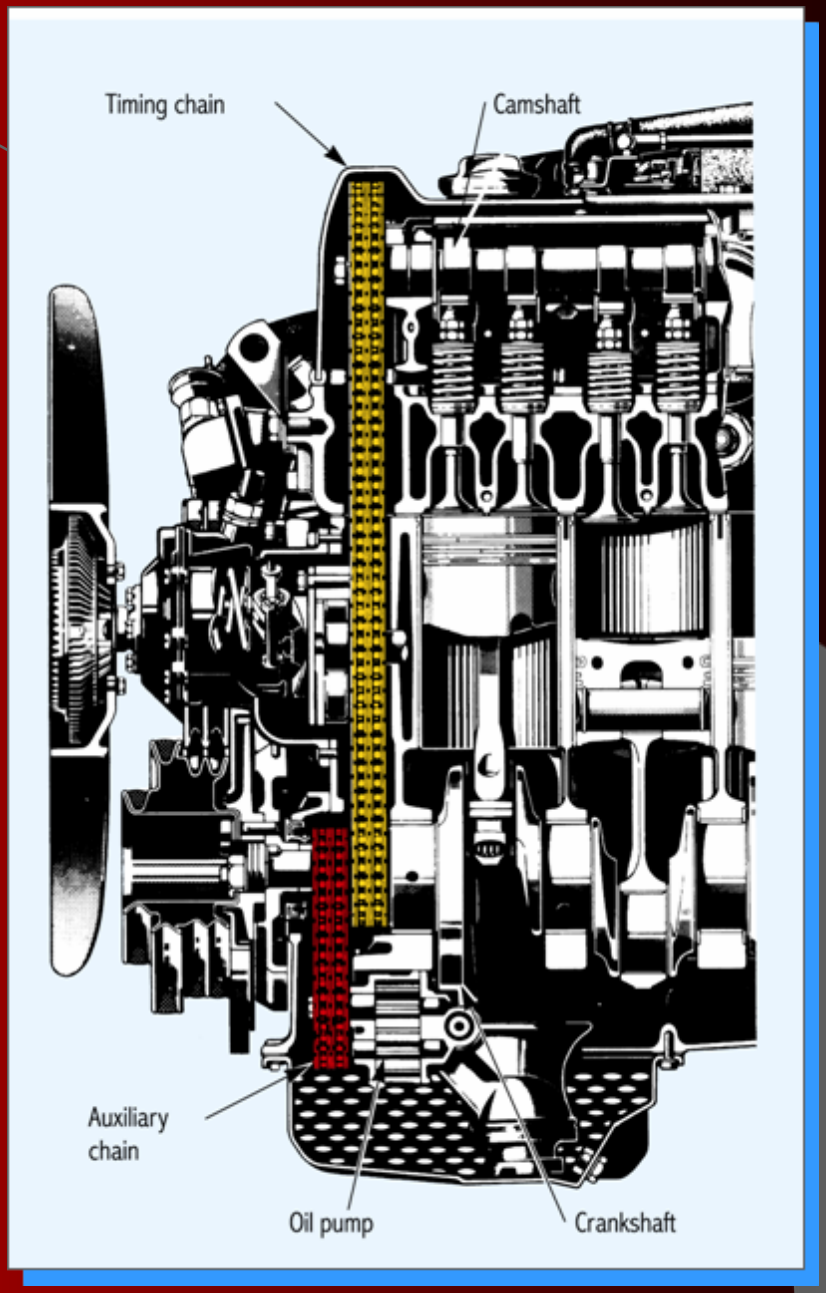


DOHC Timing Chain



Auxiliary Chain

- May be used to drive the engine oil pump, balancer shafts, and other units on the engine
- Driven by an extra sprocket, usually placed in front of the crankshaft timing chain sprocket

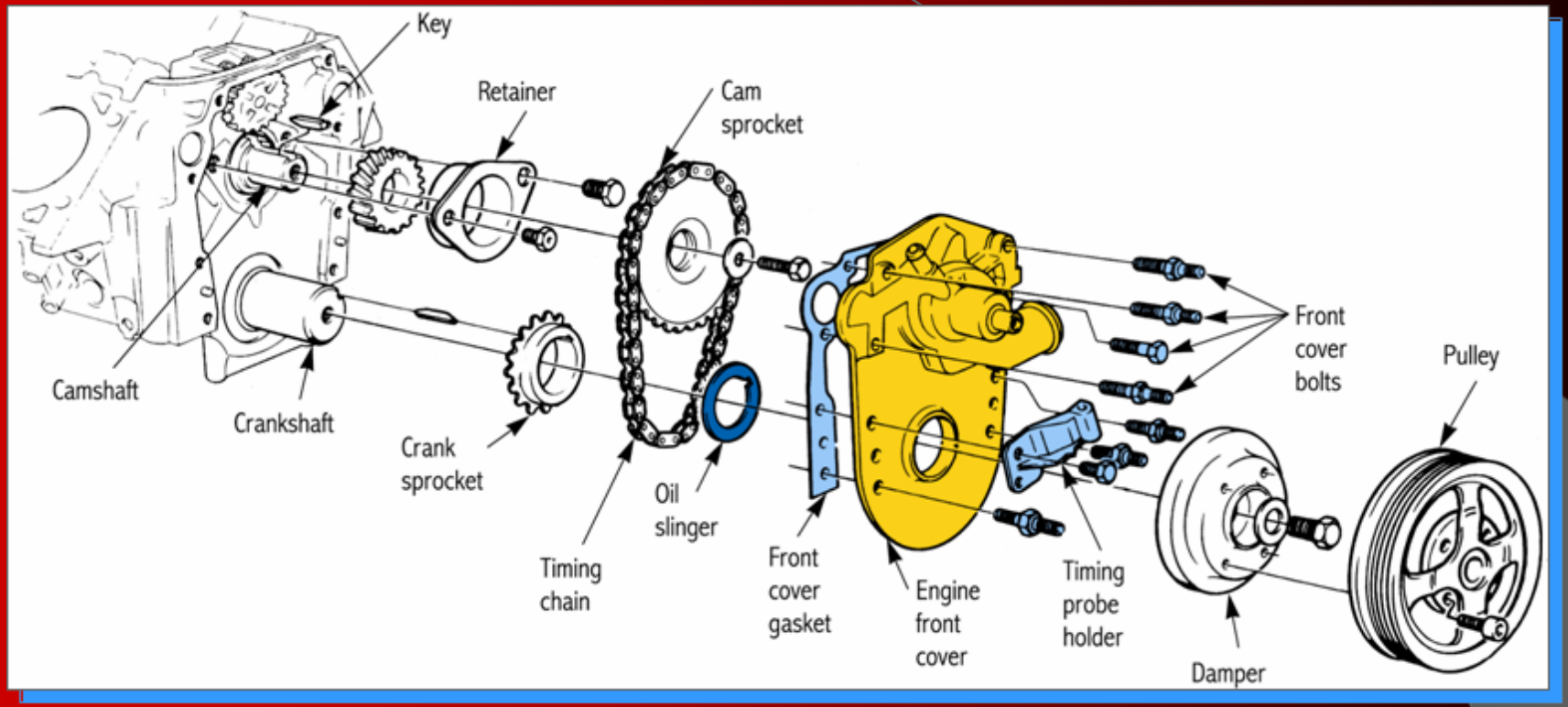


4. The HARMONIC BALANCER is a heavy wheel mounted in rubber to control vibration.
5. The OIL SLINGER is a washer-shaped part that fits in front of the crankshaft sprocket.
6. A CHAIN GUIDE is used to prevent chain slap.

Engine Front Cover

- Also called a timing cover
- Bolts to the front of the engine
- Encloses the timing chain or gear mechanism
- Prevents oil leakage from the front of the engine
- Made of thin, stamped steel, or cast aluminum

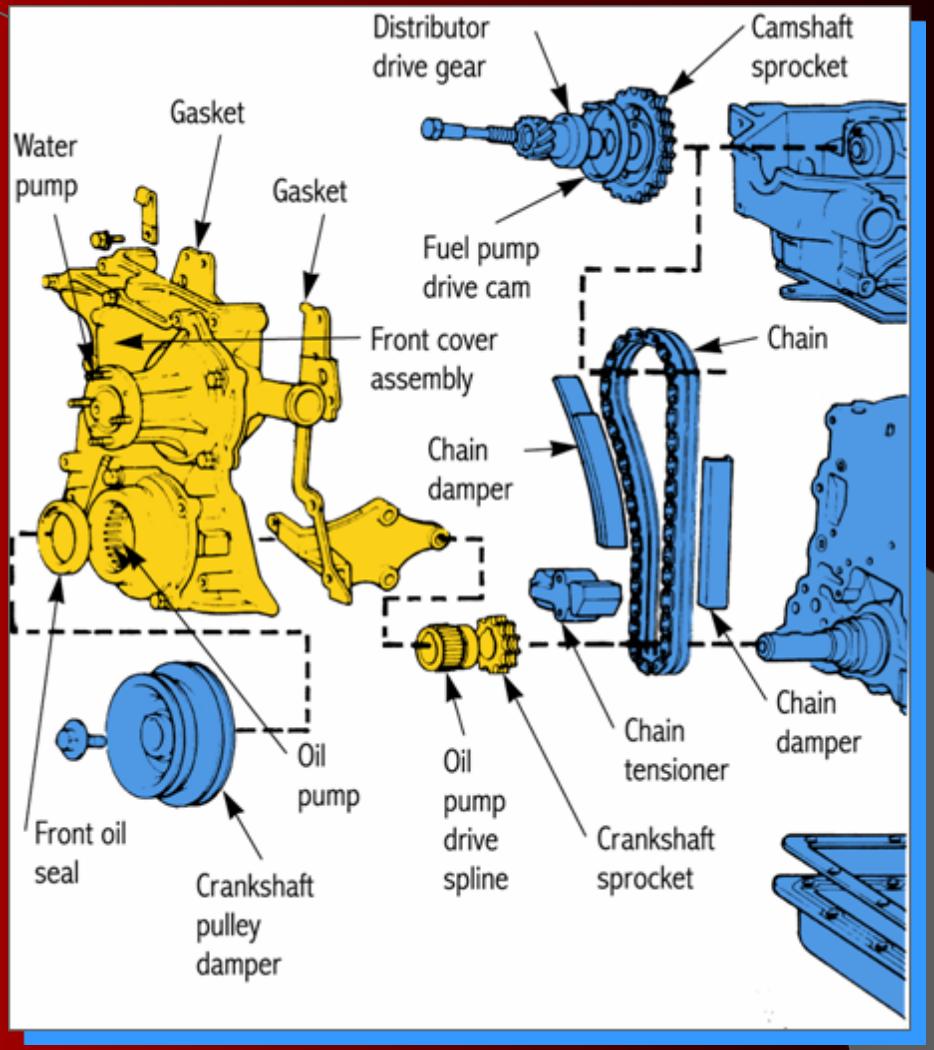
Engine Front Cover



Holds the front oil seal, timing pointer, probe holder, and other parts

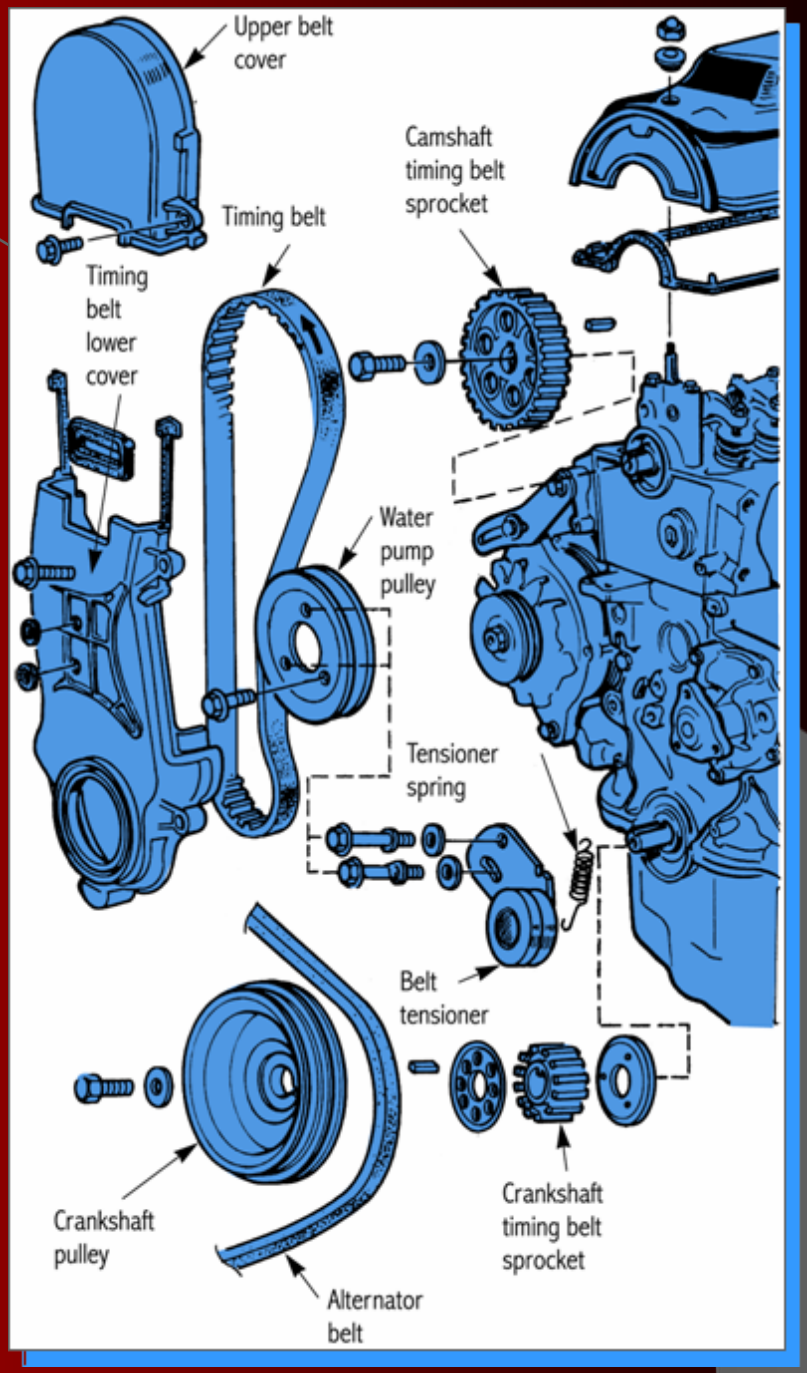
Engine Front Cover

This front cover houses the oil pump and water pump



Timing Belt and Sprockets

Used to drive the camshaft
on
OHC engines



Timing Belt

- Provides a very smooth and accurate method of turning the camshaft - most have a service life of 50,000 miles (80,000 km), and should be replaced as part of regularly scheduled maintenance
- Some belts are made of fiberglass-reinforced nitrile rubber
  - some have a service life of 100,000 miles (160, 000 km)

Timing Belt Sprockets

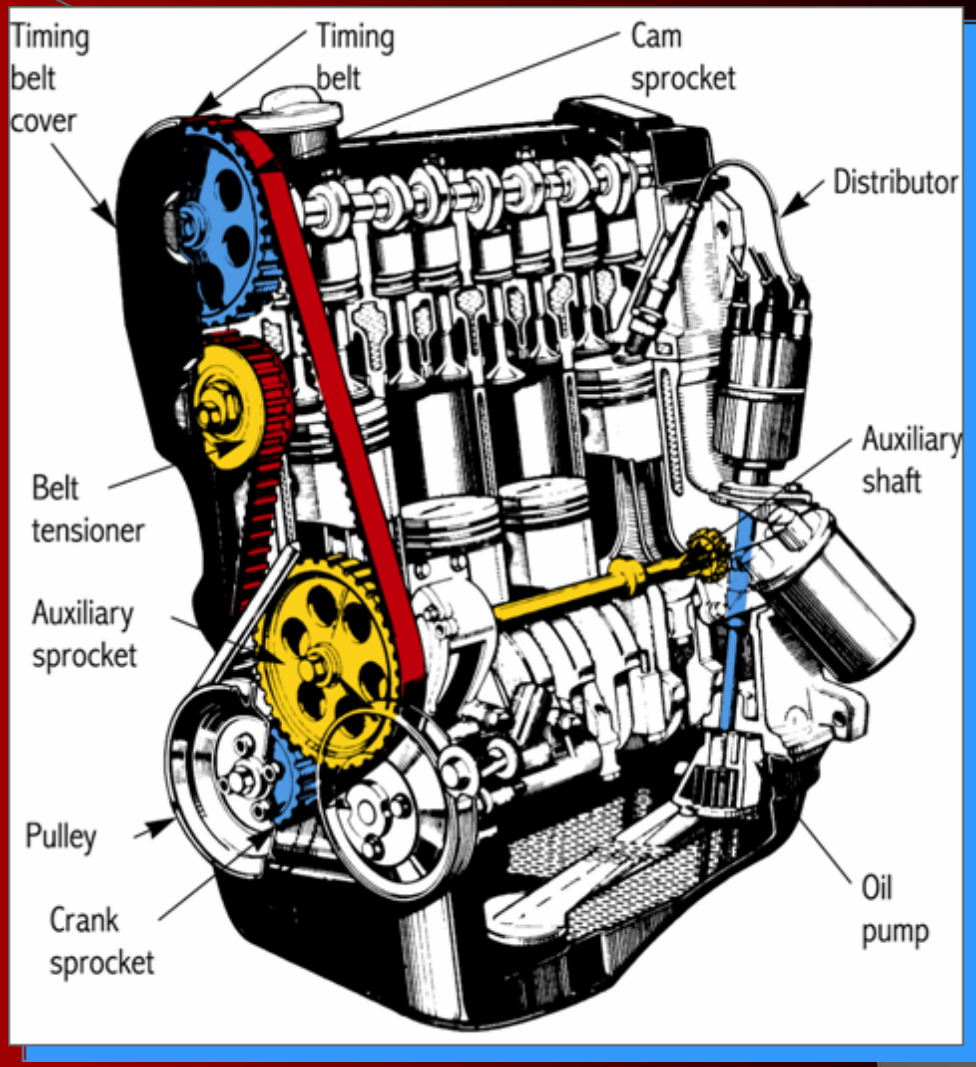
- Usually made of cast iron or aluminum
- Crank sprocket is keyed to the crankshaft snout
- Cam sprocket bolts to the camshaft
  - dowel pin may be used to position the sprocket correctly
- Timing marks must be aligned with specific points on the engine to properly time the opening of the valves

Belt Tensioner

- Some tensioners use both spring tension and hydraulic pressure
- Hydraulic tensioner adjusts the belt tension with engine speed
- At higher rpms, belt tension is increased to keep the belt from slipping or flying off
- Spring-loaded wheel that keeps the timing belt firmly seated on its sprockets
- Prevents the belt teeth from slipping the sprocket teeth

OHC Engine

This engine uses a belt-drive for the camshaft and the auxiliary shaft



Timing Belt Cover

- Protects the belt from damage
- Protects the technician from injury
- Made from sheet metal or plastic
- Tightly sealed at the bottom to keep road debris and water off the rubber belt

7. The CRANKSHAFT GEAR is keyed to the crankshaft snout, it turns a camshaft gear on the end of the camshaft.
8. An AUXAULIRY CHAIN is used to drive the engine oil pump, balancer shafts, and other units on the engine.
9. A TIMING BELT provides a very smooth and accurate method of turning the camshaft.
10. HARMONIC VIBRATION results from twisting and untwisting of the crankshaft.

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