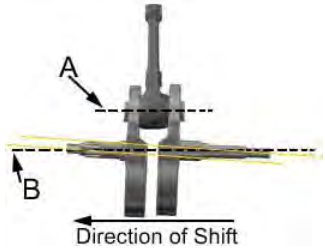
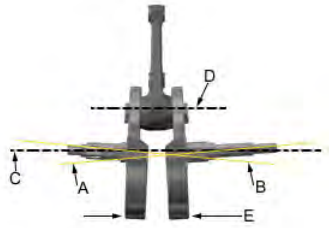
TT352 – December 3, 2007 - Twin Cam Crankshaft Assembly Run-Out Inspection

As a follow up to Tech Tip #324, this Tech Tip and the attached video demonstration ("PLAY VIDEO" button) will provide you with a review of some theory and demonstrate the correct methods for inspecting a Twin Cam crankshaft assembly on the bench.

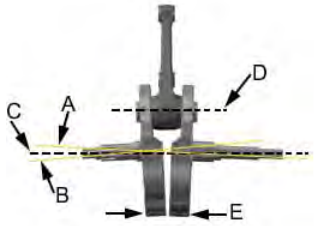
With the exception of a bent shaft, there are four ways a crankshaft assembly can be skewed, or out of true: Cocked, Spread, Pinched, or Shifted ("Scissored").



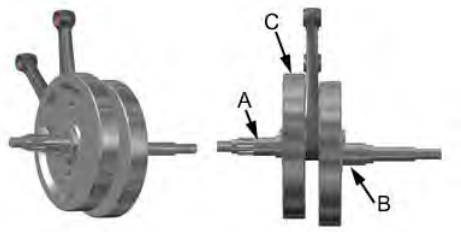
Cocked:
A cocked crankshaft occurs when the flywheel halves are shifted in the same direction in relation to the crankpin, putting them in line with each other but non-parallel with the crankpin.
In the example shown, when measured at the crankpin area, the left side dial indicator needle would move to the right (clockwise) showing the sprocket shaft is titled upward and the right side dial indicator needle would move to the left (counterclockwise) indicating the right crankshaft is titled downward.



Spread:
A spread condition is when the flywheel halves are not parallel with each other and the widest separation between the two halves occurs away from the crank pin, putting the shafts out of line with each other.
In the example shown, when measured at the crankpin area, the left and right side dial indicator needles would both move to the right (clockwise) indicating they are titled upward. In a spread condition the dial indicators will move in unison and in the same direction, registering high and low points at the same areas.



Pinched:
Very similar to a spread, a pinched condition is when the flywheel halves are not parallel with each other but the widest separation between the two halves occurs at the crank pin.
In the example shown, when measured at the crankpin area, the left and right side dial indicator needles would both move to the left (counterclockwise) indicating they are titled downward. In a pinched condition the dial indicators will move in unison and in the same direction, registering high and low points at the same areas.



Shifted:
A shifted or scissored crankshaft occurs when the flywheel halves are shifted at the crankpin, putting the shafts out of line with each other 90° from the crankpin.
In the example shown, when measured 90°from the crankpin, the left side dial indicator needle would move to the right (clockwise) showing the sprocket shaft is higher and the right side dial indicator needle would move to the left (counterclockwise) indicating the right crankshaft is lower.

There are several other common concepts and techniques we should also review:

- Dial indicators must be set up and zeroed out perpendicular to the shaft
  As close as possible to 90° when viewed from straight on and from the side.
- Measurements are taken on the bearing journal or race
  The Service Wear Limit Specification should be compared to the greatest misalignment reading obtained when rotating the crankshaft assembly 360°.
- Run-out is determined by total travel off zero of both dial indicators
  After you zero the dial indicators you need to note the readings to the left and right of zero of both gauges at any one spot.

The basic concepts behind verifying the state of true of a set of Harley-Davidson flywheels have not changed much since 1903. The service procedures however changed dramatically in 1999 with the introduction of the first Twin Cam crankshaft assembly.

The two major differences in checking a Twin Cam crankshaft and an EVO flywheel . . .

1. Twin Cam flywheels are NOT serviceable and should not be trued or reworked.
   Any out of true condition found during inspection cannot be corrected.
   This would compromise the integrity of the crankpin's press joint.
2. Twin Cam crankshaft's MUST rotate on the bearing races / journal during inspection.
   You cannot rotate the Twin Cam flywheels using centers or the ends of the shafts to rotate the wheels. The shafts are different sizes and the end points and threaded holes are not specified to be centered or relational to the crankpin's center. Therefore, inspection of the Twin Cam crankshaft requires a different truing stand set up.

Twin Cam Crankshaft Inspection Summary:

1. Examine the bearing races and shaft journals for damage.
   There is no sense in measuring run-out on an obviously damaged shaft that requires replacement. A damaged or excessively worn race should be replaced before continuing inspection as the flywheels must rotate on the race and the indicators will be reading off the race's surface.
2. Inspection of the crankshaft run-out requires two dial indicators, two indicator mounts, and a truing stand with the roller supports spaced so that they are capable of supporting the flywheels level directly on the bearing area.
3. Position the crankshaft bearing races on the truing stand's roller supports.
4. Position the indicators on the bearing races (at approximately 90°) to ensure an accurate reading, and zero them out.
5. Slowly rotate the crankshaft assembly and note the location of greatest run-out.
6. Take the greatest run-out indicated and compare it to the service specifications:
   For new flywheels the maximum total run-out specification is 0.004"
   For used flywheels the Service Wear Limit is 0.005"

PLAY VIDEO