Image 1 - Static Pointer and Pulley Graduations

MGBGTV8 – confirming the position of the Top Dead Centre Identification

Jim Livingstone's purpose of writing up this procedure as a V8NOTE was to provide guidance for fellow owners should they be concerned by the rumours they may have heard or read of inaccuracy in the timing markings on Rover V8 engines. The investigation was in part self education and Jim consulted a professional engine test engineer on how he carried out this confirmation. Usually this check is a once in a lifetime activity and not one requiring repetition.

Introduction

The position of the crankshaft when the piston in no 1 cylinder is exactly at the top of its stroke or Top Dead Centre (TDC) is a basic engine reference point and is used to set ignition and camshaft events accurately. Its position is invariably identified by the engine manufacturer on either a crankshaft pulley or the flywheel with a corresponding static reference on the engine block. In the case of the MGBGTV8 there are graduations on the crankshaft pulley and a static pointer mounted on two bolts on the timing cover. A simple analysis of the variables involved reveals that the scope for inaccuracy is significant and the author took advantage of the recent removal of the left cylinder head on his V8 to confirm the accuracy of the identification.

The procedure described in this article involves rotating the engine to equal positions before and after TDC and marking the position of the static pointer on the crankshaft pulley at these points. True TDC is then at the midpoint of those markings. The actual rotations involved are arbitrary and are chosen to permit convenient marking. It will be noted that the displacement of the piston is relatively insensitive to crankshaft rotation around TDC, so a significant displacement is required for maximum accuracy. The relevance of the procedure is dependent on symmetrical rotations for compression and power strokes (i.e. no **piston pin offset or désaxé cylinders***) so is not universally applicable to all engines.

It is possible to carry out this procedure with the cylinder heads in place and a piston stop manufactured from an old spark plug with a tubular extension inserted. This is the method favoured by motorcyclists to align their engine timing discs. Professional engine tuners use the flywheel for their timing marks, but this is infeasible with an in situ engine.

Tools and Materials

- Plunger dial test indicator (**DTI**), depth gauge or piston stop.
- Bar or 15/16" AF socket and wrench to rotate the engine.
- Dividers.

Note:
As a precise measurement of stroke is not required a positive stop for the piston can be manufactured from flat bar and substituted for the indicator or gauge.

Procedure

Notes:

- This is an opportunity to clean, derust and paint the static pointer and crankshaft pulley and reapply any highlighter to them – **Image 1**.
- Clockwise rotation of the crankshaft is specified throughout the procedure. The reason is to avoid any risk of loosening the pulley bolt if a socket is used to rotate the engine and to eliminate backlash in the powertrain. Either eventuality is highly unlikely in this instance.
- A schematic of the process in shown in the final image on page 3 - **image 4**.
- As a starting point it is assumed that the cylinder head, all spark plugs and the alternator belt are removed and the engine rotated to Top Dead Centre (TDC).

1. Ensure that the static pointer is secure in the timing cover bolts. Minimise the gap (caused by hole clearances) between the tip of the pointer and the pulley to reduce parallax errors.
2. If using a DTI, insert a cylinder head bolt and attach suitable fixings to it.
3. Rotate the engine clockwise until it is approximately 30° after TDC.

Image 2 - DTI in Cylinder no 1

Image 3 - Marking position 1 on Crankshaft Pulley

4. Position the DTI to contact the piston crown and zero the dial – **Image 2**.
5. Mark the crankshaft pulley in line with the static pointer. This is position 1 – **Image 3**.
6. Rotate the engine clockwise until it is approximately 30° before TDC and the gauge reads zero.
7. Make a second mark on the crankshaft pulley in line with the static pointer. This is position 2.
8. Position one leg of the dividers on position 2 on the pulley and set the radius to the TDC mark.
9. Reposition the divider leg on position 1 and retaining the radius set in step 8 scribe a mark on the pulley adjacent to the TDC mark.
10. The true position of TDC is midway between the original TDC identification and the scribed mark.
11. Temporarily mark this position – **Image 4**.
12. Repeat this process and, when satisfied, establish a consistent position for the temporary mark.
13. Remove the indicator and rotate the engine clockwise until the pointer aligns with the temporary mark made in step 12.
14. Realign the static pointer with the original TDC mark on the pulley. It may be necessary to elongate the two mounting holes.

Conclusion

In the author's case the results showed a reassuring small error (<1° after TDC) which would probably not be significant in the setting of ignition timing.

***Explanation of Technical Terms**

Offset piston pins and désaxé cylinders are devices used by engine designers to counter noise and reduce loads on pistons. The former involves a displacement of the piston pin to move it from the centre of the piston and the latter a displacement of the cylinder axis so that it no longer passes through the crankshaft axis. In the context of this article both remove the symmetry between the upward stroke before TDC and the downward stroke after and invalidate the method. The original Buick 215 engine apparently employed neither and the author could find no evidence that the Rover designers changed that aspect of the design in the MGBGTV8 engines. It is possible that replacement pistons with offset pins have been fitted in which case the orientation will be marked on the crown.

Image 4 - Schematic of the Process