Reproduction Distributor Main Shaft Auto Cams

The 53-82 GM Parts Manual has 19 listings for distributor main shafts with auto cams depending on the year, engine type, and options. These various shafts are listed under Group 2.372. There is some duplication in application, for example main shaft part number 1968080 is used on several applications from 1966 to 1971 small block engines.

At present, only two of the non-TI main shafts with auto cams are being reproduced. These are listed in the various catalogs as either high performance or low performance shafts.

Figure 1. High Performance Reproduction Auto Cam

Figure 2. Low Performance Reproduction Auto Cam

Basically, here is how it works. The mechanical connection between the engine driven main shaft/auto cam and the weight plate/distributor cam is the two springs. If the springs and weights are removed, the weight plate/cam will rotate independently.

As distributor RPM increases, centrifugal force acting on the weights move the weights outward. This results in a force being applied to the weight pivot pulling the weight plate counter clockwise against the rotation of the distributor main shaft. By moving the weight plate/cam opposite the distributor rotation, increasing the angular displacement between the main shaft and weight plate, the points open earlier and the ignition timing is advanced from the initial set point.

The springs exert a counter force on the weight plate pivot trying to rotate the weight plate in the clockwise direction of distributor main shaft rotation. When these forces are equal and opposite, the angular displacement between the main shaft and the weight plate remains constant. By changing weights and springs, the mechanical advance can be altered to bring the advance in at lower or higher distributor RPM.

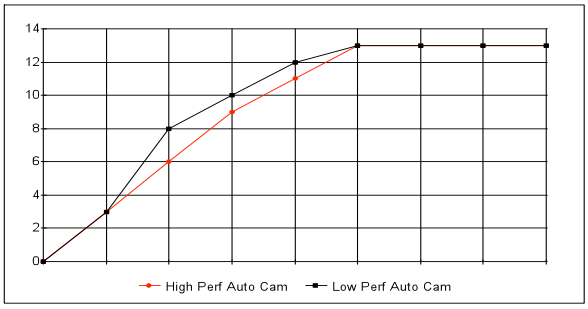
The profile of the auto cam on the short leg side of the weight controls the shape of the advance curve.

If a non-TI distributor is being overhauled and the main shaft needs to be replaced due to wear or tach drive gear failure, you only have the two options in reproduction shafts. The question then becomes what the advance curves look like for the two available auto cams.

To attempt to answer this question we used a recently overhauled stock GM tach drive distributor to run advance curves on each of the two shafts. To eliminate any systemic errors the only change was the main shaft. Several runs were made using a Sun Distributor Tester on each shaft. Sun machine tachometers are primitive at best and to ensure accurate rpm numbers we used an optical tachometer to cross check the Sun machine tachometer.

The results of the runs are presented in the table below. The table values are in distributor degrees and distributor rpm. To get crankshaft values these numbers must be doubled. The table values were converted to graphical data which more clearly shows the differences in the shape of the advance curves between the two non-TI reproduction auto cams tested.

| Distributor RPM | Hi-Po Auto Cam Degrees | Lo-Po Auto Cam Degrees |
|---|---|---|
| 250 | 0 | 0 |
| 500 | 3 | 3 |
| 750 | 6 | 8 |
| 1000 | 9 | 10 |
| 1250 | 11 | 12 |
| 1500 | 13 | 13 |
| 1750 | 13 | 13 |




In the above and following graphs, the horizontal axis is distributor rpm as shown in the associated chart. The vertical axis is mechanical advance in distributor degrees.

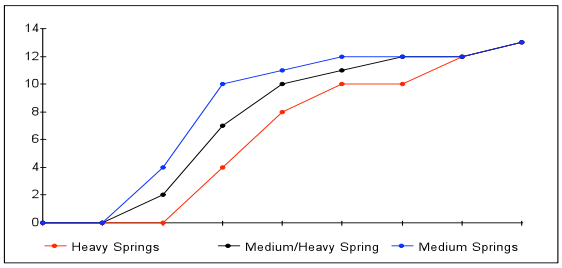
There are several distributor cam/weight plates of various slot lengths which, along with the bushing, limit the total mechanical advance. There is a three digit number and CCW stamped on the underside of the weight plate. To insure we obtained repeatable results the same cam/weight plate, weights, springs and stop bushing were used on each test.

The table values and the curves show the low performance auto cam has a more aggressive advance curve. This means the advance is brought in at a lower rpm than the high performance auto cam. This appears to be opposite of what the advance curves should be. High performance engine camshafts with late closing intake valves (degrees ABDC) have lower Dynamic Compression Ratios (DCR) and can tolerate more low rpm advance without causing detonation.

Mechanical advance specs for the various years, engines, and options are published in any number of GM publications such as the Chassis Service Manuals and AMA specs for any given year. These published specs do not reproduce the entire advance curve but list the degrees advance (in crankshaft degrees) for three or four points on the curve. Bear in mind the installed weights, springs, slot length, bushing material and diameter have a significant effect on the actual advance curve.

To get some idea of the effect of various springs on the shape of the advance curves we used the low performance auto cam main shaft and just changed what we will call medium and heavy springs.

| Distributor RPM | 2- Heavy Springs | 1 Medium/ Heavy Spring | 2- Medium Springs |
|---|---|---|---|
| 250 | 0 | 0 | 0 |
| 500 | 0 | 0 | 0 |
| 750 | 0 | 2 | 4 |
| 1000 | 4 | 7 | 10 |
| 1250 | 8 | 10 | 11 |
| 1500 | 10 | 11 | 12 |
| 1750 | 10 | 12 | 12 |
| 2000 | 12 | 12 | 12 |



As would be expected, the lighter spring combinations permit the advance to begin at a lower RPM, in this case the advance begins about 500 distributor RPM for the two lighter combinations and at 750 RPM for the heavy springs. The heavier springs also bring the advance curve in more slowly. These curves can be compared to the previous curves which used the silver light springs

Given enough time and combinations of weights, slot length, bushings, and springs, an experienced operator can duplicate almost any advance curve. If a distributor is overhauled and any of the parts that can affect the advance curve are replaced, the distributor needs to be checked on a Sun machine by someone knowledgeable and experienced to ensure the advance curve is what the owner wants it to be.

Thanks to Mike at LAB Distributor Service for permitting use of his Sun machine and to raid his stock of distributors and parts to run this test.