How To Figure Out What The Installed Spring Height Should Be

1. Using both top and bottom collars, place spring assembly in a vise and close the vise until the outer spring is solid. Be careful when compressing springs in a vise, they can be ejected with great velocity!

2. Now measure the distance between spring lands as in the diagram and write down the number for later use. This is the Solid Height.

3. Calculate INSTALLED SPRING HEIGHT (min.) as follows: INSTALLED HT. = Solid Height + .060" + Max. Valve Lift

4. Max. valve lift can be taken from catalog figures. For example, max. valve lift for an EV59 cam is .560".

5. For an EV51 cam, using Andrews Products springs and collars;
   
   INSTALLED SPRING HEIGHT = 1.190" + .060" + .510" = 1.760"

6. This technique will work for any cam and spring system as long as measurements are carefully made.

7. During installation, make sure that .050 minimum clearance is present between top of valve guide and bottom of upper spring collar at maximum cam lift.

8. Solid height + .560" (see diagram) refers to spring forces when the valve is seated. (.560" is an assumed spring travel).

How To Check For Possible Valve To Valve Interference

If your heads have large valves or new seats installed or if a new performance cam has been installed, being able to easily check for possible valve to valve interference is important. For all H/D heads (EV, FL, XL, etc.), a simple calculation can be done to see if valve to valve interference might be a problem which will need correcting before proceeding.

1. Andrews Products lists valve lifts at TDC (Top Dead Center) on all cam instruction sheets. For an EV51 cam, the TDC lift =.233" (see data on page 10).

2. Minimum valve to valve clearance should be .060".

3. Calculate the minimum valve separation distance as follows:
   
   Minimum Valve Separation Distance = TDC lift + clearance.

4. For EV51 cams, minimum Valve Separation = .233" + .06" = .293".

5. Measure minimum separation between the two valves when they are seated (as in diagram). If actual measurement is not at least .293", modifications will be necessary to avoid valve to valve interference. (Cut seats deeper or back cut valves.)

6. Remember, this technique is NOT for checking piston to valve clearance.

Compression Ratio Changes

One of the best ways to increase the efficiency of any internal combustion engine is to raise the compression ratio. As long as fuel with enough octane rating is available (so it will burn without detonation), raising the compression ratio is a very effective performance boost.

The amount of material which must be milled from heads (or cylinders) to change compression ratios can be calculated. Although the equations shown in the next column may look too simple, they are correct!

Also, correction factors of 1.4 must be used for EV heads and 1.6 for Twin Cam heads since the outline shapes of the combustion chambers are not circular.

The stroke length (SL) and initial and final compression ratios need to be known. As an example, how much must be milled off EV80 heads to raise the compression ratio from 8.5 to 9.0: Stroke length=4.25 for a stock EV80. With the formula, T=.056 (see next column). All of the values in the following table were calculated with this formula.

With this information, the amount (T), to be milled from the heads (or cylinders) can be calculated. But, if the bore is changed or different heads are used, the only way to be sure of the CR is to measure the combustion chamber volume on a complete, assembled engine and calculate the CR.

EV80: T = Stroke L x 1.4 x (1/[(original CR-1)-1/(new CR-1)])  
T = 4.25 x 1.4 x (1/8.5-1/9.0) = .080 in. (EV80, 9.73:1)  
Twin Cam: T = Stroke L x 1.6 x (1/[(original CR-1)-1/(new CR-1)])  
T = 4.00 x 1.6 x (1/8.9-1/9.5) = .045 in. (TW88, 10.09:1)  

For EV80 and Twin 88 (Stock bore & stroke):

<table>
<thead>
<tr>
<th>Head Milling (T)</th>
<th>EV80 Compression Ratio</th>
<th>Twin Cam*</th>
</tr>
</thead>
<tbody>
<tr>
<td>.000</td>
<td>8.50</td>
<td>9.00</td>
</tr>
<tr>
<td>.020</td>
<td>8.70</td>
<td>9.20</td>
</tr>
<tr>
<td>.040</td>
<td>8.90</td>
<td>9.40</td>
</tr>
<tr>
<td>.060</td>
<td>9.10</td>
<td>9.65</td>
</tr>
<tr>
<td>.080</td>
<td>9.34</td>
<td>9.90</td>
</tr>
<tr>
<td>.100</td>
<td>9.60</td>
<td>10.15</td>
</tr>
</tbody>
</table>

*Data shown for TC-88 engine *Data for TC-96 engines will be different