Rocker Arm Geometry

First off what is rocker arm geometry and why should I care about it? Very simply put it is the relationship between the rocker arm and the valve stem. If you are using a cam that is larger than stock or you are using ratio rockers or both then you need to worry about achieving correct rocker arm geometry. The first consideration is called the rocker arm scrub angle. Simply defined as the relationship of the tip of the rocker arm to the tip of the valve at all positions during the valve lift cycle improper scrub angle will result in short valve guide life, loss of lift, loss of horsepower, tip wear, and even parts breakage. Rocker arms are a radial device being ordered to do a linear thing. They rotate on an axis, moving in a circle. They get their order from the camshaft, in the form of inline movement that they then have to rotate around an axis and then multiply it by some ratio, and finally transfer this result back to another inline movement.

There are many opinions on how to properly set rocker arm geometry, most of which give very acceptable results. We will share with you how to go about determining proper pushrod length that will give your valve train longevity while achieving correct lift per the cam card and the ratio of the rockers. You will need an adjustable push rod, preferably steel or chromoly like_______ and a devise to measure valve lift such as a dial indicator or micrometer. You want start off with no shims under the rockers and the adjuster screws properly positioned….which is generally 2-1/2 turns out. If the adjuster is more than 2-1/2 turns out the oiling hole will not be properly positioned and the adjuster may break do to the increased leverage on the adjuster stud sticking out as the rocker moves through its radial path. Now we want to measure total valve lift and compare that to the cam card. Example: valve lift @ the cam is .400" and we are using factory rockers (1.1 ratio). Multiply the cam lift (.400") by the ratio of the rocker arm (1.1 for this scenario) to determine TOTAL valve lift. If we were using 1.4 ratio rockers then we would multiply the cam lift by 1.4

Example: (.400X1.1) = .440" or with 1.4's (.400X1.4)= .560"

Once we know what our target total valve lift is and hopefully the rocker arms are true to their advertised ratio....we want to come close to that value which can be manipulated by pushrod length and/or shimming the rockers. For our example of .440" total lift, we will want to take a look at what everything looks like at ½ lift. In our case ½ of .440" is .220". Rotate the engine until you have reached ½ lift. Now is when we are going to start making changes. Imagine the valve stem continues on beyond the valve covers. What we want to try to achieve is that the valve stem and the adjuster are inline; meaning that the adjuster angle follows the imaginary continuation of the valve stem at ½ lift. If the adjuster is not as the same angle then we need to either add shims under the rocker and lengthen the pushrod or possibly machine down the rocker bosses on the head itself and shorten the pushrod. This procedure may take several tries to get the pushrod length with the appropriate shim (or lack thereof), to match the total lift on the cam card and the angle of the adjuster at ½ lift. If you are using rockers with the adjuster on the pushrod side then treat the pushrod as the valve stem. Lash caps and longer than stock valves can also be used to help obtain correct geometry.

Doing the above steps will get you better than 90% of other people who just bolt the rockers on and go……it will also make your valve train last much longer. There is another aspect of rocker geometry that we haven't paid much attention to yet and that is the sweep path on the valve stem itself, although following the above steps you're probably very close without knowing it. By positioning the rocker arm height in a certain way, the contact sweep path may or may not be centered on the valve stem. In a perfect world, this would be the case. But there are variations in the machining of the blocks, placement of the rocker studs, rotational length of different rocker arms, and lengths of the valves that will alter slightly the position of the rocker tip sweep path on the end of the valve stem. The critical element is not the positioning of the sweep path on the valve tip; it is the geometric angles of the rocker pivots to the valve stem, thus is why we try to mirror the angle of the valve stem at ½ lift. When we do this it helps insure that there will be equal forces exerted on the valve train as the rocker travels through its radial path.

When figuring out rocker arm geometry, it's also a good time to dial in side to side movement of the rocker arms as well as the positioning of the valve adjuster on the valve stem horizontally. The valve adjuster should be slightly off center on the valve stem to help promote valve spin. You do not want any part of the adjuster hanging off the valve stem. If this is the case and you cannot shim the rocker arm to correct this, then machining of the rocker arm itself or the rocker arm blocks may be necessary. Acceptable side clearance of the rocker arms fall into the .006-.010 range.