

LASHING OUT

AT THE

ANIMAL

By Robert Markiewicz

SETTING THE VALVE LASH ON YOUR RACE ENGINE



apart, and the second comes from wear of the related components. If the engine is taken apart or has had the head, rocker arms, or side cover removed in the tech barn, a valve lash check and possible adjustment are warranted. The main

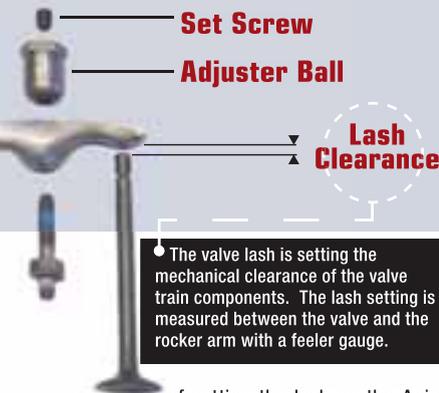
wear component of the valve train is the valve face and the seat. The valve opens and closes at a rate greater than 50 times a second at racing speeds. This constant pounding of the valve against the seat causes the valve to recess into the head. This is not a lot, but when the valve lash is only 3 thousandths of an inch to start with, it doesn't take much.

Though there are critics on both sides of the fence when it comes to the benefits of the new Animal engine, one thing that neither side can dispute is how much easier setting the valve lash is on the Animal. Anyone who has tried setting the valves on the Raptor will probably tell you that it is not their favorite feature of the engine. Not only is it time consuming, but it also requires special grinders to do the job. Plus, the Raptor requires the head and valve springs to be removed when a lash adjustment is required.

The Animal engine and most other Over Head Valve (OHV) engines only require a couple simple hand tools and a few minutes to successfully adjust the valve lash. Removal of the rocker cover and sparkplug are all that is needed to do the adjustment.

When you adjust the valve lash what you are doing is setting the mechanical clearance of the related valve train components. This clearance is either specified by the engine or cam manufacturer and is dictated by the design of the valve train. Because metal parts grow with heat from the running engine, their clearance is needed to prevent the valve from being forced open and allowing air to escape on the compression stroke. Other factors that go into the lash specification are related to the manufacturer's tolerances and the cam design

itself. The reason for pointing this out is not because it really affects the average engine builder or racer, but more to show that a lot went into deriving this critical measurement. So keeping it at its specific setting will help maximize your race engine's performance. There are two main factors that cause the lash setting to change; the first occurs if the engine or related components were taken



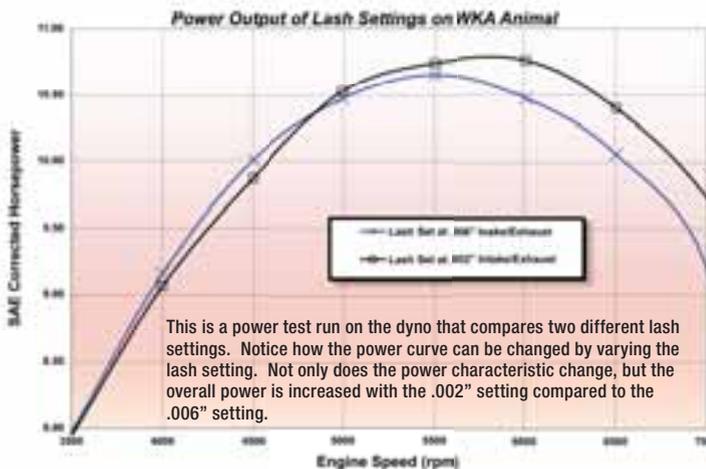
The valve lash is setting the mechanical clearance of the valve train components. The lash setting is measured between the valve and the rocker arm with a feeler gauge.

Above is a break down of setting the lash on the Animal race engine. Remember to always consult your engine builder before adjusting the lash. They are familiar with what setting will give you optimum power which may or may not be the same as specified by the cam manufacture. Lash can be used as a small tuning agent of your engine's power band; which your builder might have tweaked for your situation.

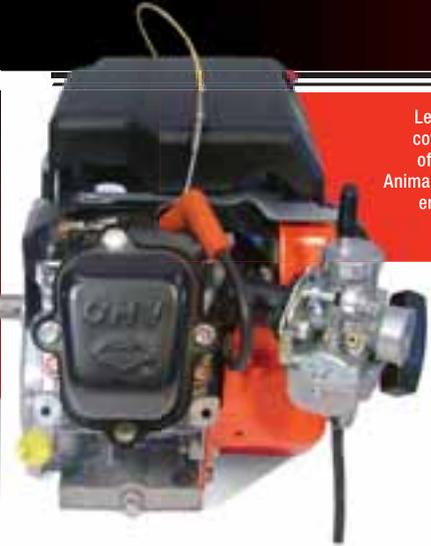
Remove the 4 valve cover bolts and remove the valve cover from the engine. In most cases the exhaust system can stay on the engine for setting the lash. The most complicated part of setting the lash is getting the cam in the right position to do so. The lash has to be set with the cam on the base-circle and not the lobes. In other words the cam has to be in the position when it is not lifting the valves. If the lash is adjusted in a position when the valve is being lifted the setting will not be right.



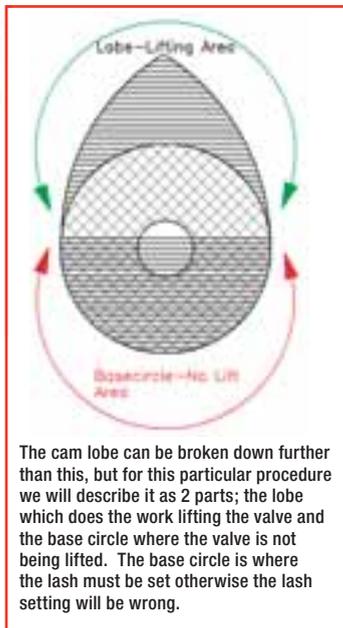
Only a couple of common tools are needed to set the lash on the Animal. A 5/8" std wrench, 1/8" Allen wrench, 10mm and/or 3/8" socket, spark plug socket, and feeler gauges.



This is a power test run on the dyno that compares two different lash settings. Notice how the power curve can be changed by varying the lash setting. Not only does the power characteristic change, but the overall power is increased with the .002" setting compared to the .006" setting.



Left: Remove the 4 bolt used to hold the valve cover on. Pay attention to what bolt came out of what hole. Through the development of the Animal there have been thread changes and some engines have both metric and American bolts depending on their location.

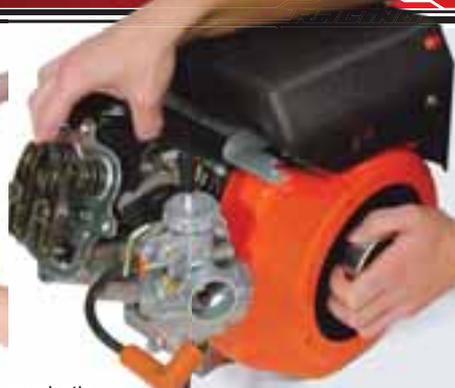


The easiest way to find when the valves are closed is to feel for the compression stroke. This is done by removing the spark plug and putting your thumb completely over the hole and sealing it off. By turning the engine over slowly by hand in a clockwise rotation (when looking at the flywheel), you can feel the engine start to make compression and feel air leak past your finger. Stop turning the engine at this point.

Remember that this is a 4 cycle engine, which means that it only makes compression on every other stroke. This means the piston will also reach top dead center (TDC) on the overlap phase of the cam, but if the lash is set at this point the setting will be dramatically off.

The engine is coming up on the compression stroke so you now must locate the piston at the top of its stroke or top dead center (TDC). The safest way to do

The spark plug should be removed to set the lash.



this is to reference the keyway in the crankshaft output shaft (PTO shaft). The keyway in the Animal, and most engines for that matter, are in line with the crank throw. This means that when the keyway is in line with the cylinder the piston is close enough to TDC to do your check. This

By putting your thumb over the spark plug hole and sealing it off you can turn over the engine and feel for the compression stroke. As soon as you feel air blowing past your finger stop turning the engine over.

Keyway lined up with Cylinder



can also be done by sticking a pencil in the spark plug hole and slowly turning the engine over until the engine reaches its highest position.

It is better to set the lash a little past TDC than before. Some cams have mechanical compression releases to make it possible to pull start the engine

You can use the keyway position to locate top dead center (TDC) by lining it up with the cylinder centerline. This is true because the keyway is always machined inline with the crank throw; so the piston travel follows it.

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If your clutch is still on the engine, you can also find TDC by inserting a wood pencil into the spark plug hole and slowly turning the engine back and forth until the highest position is found.



by hand. What this does is slightly lift the valve on the compression stroke to relieve some of the pressure so it can be turned over easily. This release then swings out of the way when the engine reaches operating speed. The lash can't be set on this compression release or the setting will be dramatically wrong. By setting the lash a little past TDC you eliminate the possibility of running into this.

Now the lash can be measured

Notice how the compression release sticks past the cam base circle which causes the lifter to lift the valve. When the engine reaches running speed it pivots out of the way and is no longer operational.

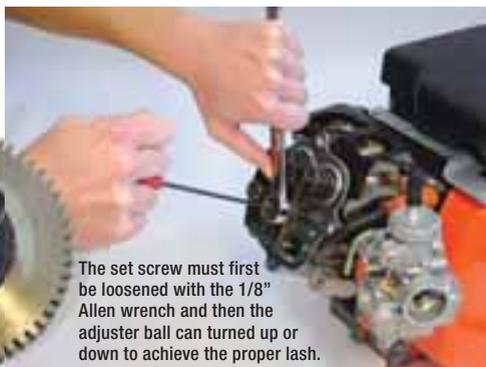


with a feeler gauge inserted between the valve tip and rocker arm. Try different sizes until you find the gauge that slides in with little friction but is neither tight nor loose. A good judgement of what is the right amount of friction is the gauge should have just a little friction if held by two fingers, and not just slide out. Likewise, if the gauge falls right out it is too loose. Once a feel for this is established, it will become second nature as to what is acceptable.



The feeler gauge is inserted between the rocker arm and the valve. Different feeler gauges should be tried until a little friction is felt but it cannot be sticky or loose, the size of this gauge is then your lash.

If an adjustment is needed then a 5/8" wrench and 1/8" Allen wrench come into play. The rocker



The set screw must first be loosened with the 1/8" Allen wrench and then the adjuster ball can be turned up or down to achieve the proper lash.



Use the adjuster ball while feeling the friction on the desired feeler gauge size.

MECHANIC'S TIP:

My personal procedure for tightening the set screw is to back the 5/8" wrench counter clockwise 1/8 of a turn from the correct lash position then turn the set screw moderately tight and then turn both the wrench and the Allen wrench clockwise back the 1/8 of a turn. This allows you to put a little more torque on the set screw than can normally be achieved with the little 1/8" Allen. Likewise when loosening the set screw it may be easier to turn the rocker adjuster first and then loosen the set screw.

Now that everything is tightened down do another check of your lash setting to make sure that it is at the correct clearance. It may take a couple of attempts to get the lash setting just right. But, getting it correct is essential to maximum performance so it is well worth the small effort.

This is a long explanation, but with some practice the procedure can be done in approx 5 minutes. Here is a quick reference to the above procedure that can be taped to your trackside toolbox to help out.

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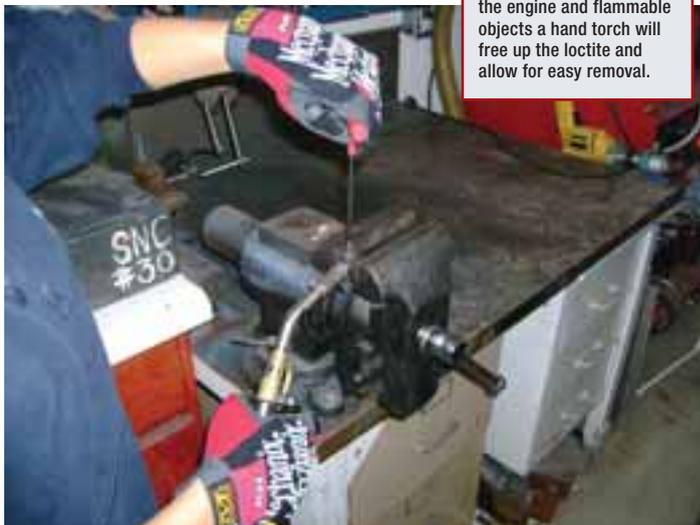
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adjuster ball is locked in place by the 1/4" set screw on top of the rocker. By holding the adjuster with your 5/8" wrench you can loosen the set screw with the 1/8" Allen wrench. Now the adjuster can be turned either clockwise to tighten the lash or counter-clockwise to loosen it. By inserting the feeler gauge of the right size between the valve and the rocker arm you can adjust the lash to achieve the correct feel of the feeler gauge. Once this is achieved the adjuster can be held in place by the 5/8" wrench while the set screw is tightened back down.

How often you should check your valve lash is probably best left up to your engine builder. My recommendation would be every 2 hours of run time would warrant checking the lash. In my experience if everything is working and built correctly, and the engine is past its break in period, seldom will it require adjustment.

Compared to the days of the past when specialty tools were needed to adjust lash the

Try using heat to loosen the stubborn set screws in the adjuster ball. Once the ball is safely away from the engine and flammable objects a hand torch will free up the loctite and allow for easy removal.



Animal Valve Lash Adjustment Quick Reference

Cut out and hang in toolbox

1. Remove valve cover and spark plug
2. Find TDC on the compression stroke (better to be slightly past TDC)
 - a. Use the thumb over the spark plug hole to locate compression stroke (turning engine over by hand in clockwise direction)
 - b. Use wood pencil or keyway position to find TDC on the compression stroke
3. Measure the current lash using feeler gauge
4. Loosen set screw and adjust rocker adjuster ball to achieve correct lash setting
5. Hold adjuster ball while tightening set screw
6. Final check of lash setting (readjust if necessary)
7. Reinstall the valve cover and spark plug to correct torque.

new OHV engines make the adjustment an easy addition to your pre-race prep. I wouldn't recommend doing this for the first time at the track because if you would have problems it could ruin your race day. Practice in the shop not just once, but a couple times until you are proficient at the process. Then have your work checked by an engine builder to make sure it is done correctly. When you feel comfortable with doing the adjustment, having the ability to do it quickly at the track could be a savior some day.

Tip: Though this procedure is an example of setting the lash on the Animal engine, most other OHV engines are much the same. This procedure can also be used to help with other manufacturers OHV lash adjustment.

Mechanics Tip- Briggs has installed a thread locker patch onto the adjuster ball set screw to help with reliability. This patch works so well that at times loosening the _" set screw with the little 1/8" Allen wrench can be difficult. When this is the case heat may be needed to loosen the patch. Do not heat the adjuster ball on the engine, use your 5/8" wrench to remove the ball with the set screw from the engine. Once the pieces are away from all flammable materials the adjuster ball can be heated up in a vice and have the set screw removed.



Alan Rudolph-SKUSA SuperPro Eastern Division Champion

Franklin Motorsports PCR/Swedetech Yamaha - Photo: Sean Buur



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