



**\*\*\*\*WARNING\*\*\*\***

**You're doing this at your own risk. I am not a certified Yamaha mechanic and am only expressing my thoughts and views on adjusting valves. If for any reason you don't feel comfortable doing this, take it to your Yamaha certified mechanic.**

**\*\*\*NOTES\*\*\***

1. Make sure during this process you don't drop anything into the engine. Common things include bolts for covers, O rings for covers, Allen tools or sockets. I would use a rag and cover everything when your not directly in that spot. I do suggest you pick up a telescoping magnet to help retrieve anything that could fall just in case.
2. Let me explain some theory here on valve adjusting...like how tight should I put in on that scale etc.

When adjusting valves the whole reason you're doing this is to keep clearances in acceptable ranges. If valve clearances get too tight, the valves never close completely and can burn up or lead to the valves hitting the piston. If they get too loose then you'll have slop which leads to less HP because your valves are not opening as much which will limit the air traveling through. There are 2 parts to a cam that are important. You have duration and you have lift. The duration is "at the highest point of opening" the total time the valve remains there allowing air in. The lift is "total valve height opening" which allows the air to flow through creating HP.

Now the reason you purchase aftermarket cams is to both increase lift and duration to increase HP. The reason you need aftermarket springs is to compensate for the increased lift and prevent floating of the valves when using more radical cams that have a different ramp leading to the peak point. If you adjust your stock cam on the tight side it will provide more lift increasing HP but will require attention sooner. The main thing you DON'T want to do is create too little gap and create PSI losses which burns valves because your looking for that little extra lift. Hence the reason you have the minimum specs. I would always adjust them for the lighter side because as valve and seat wear happens the valves move closer to the tappet requiring more adjustment.

There's not much to this style of adjusting other than taking the time to do it properly. Keep everything clean and always put bolts back into the holes so you're not playing the guessing game during reassembly. Listed below are the tools needed for the job. **The complete thing takes about 3-4 hours and is very easy guys/gals.**

1. 3/8 Drive Ratchet
2. 3/8 Drive Torque wrench that measures in "IN-LBS"
3. 3/8 Swivel
4. 3/8 Drive 8mm, 10mm and 22mm sockets (22mm should be deep well)
5. 3/8 Drive 6" extension
6. 4mm, 6mm and 14mm Allen wrenches
7. 8mm, 10mm, 14mm combination wrenches
8. Stock spark plug tool
9. Small Standard screwdriver and large Phillips screwdriver
10. Taper set of metric feeler gauges..."Dealership"
11. Tappet adjusting tool "Dealership"
12. Telescoping magnet
13. Set of "CROWS FEET" to tighten the adjusting nut on valves

**\*\*\*TORQUE SPECS\*\*\***

- |  |           |               |
|--|-----------|---------------|
| 1. Locknut for valves-----                   | 10 FT LBS | or 120 IN lbs |
| 2. Timing Mark Acc Screw-----                | 4.3 LBS   | or 51 IN lbs  |
| 3. Crankshaft End cover-----                 | 7.2 LBS   | or 86 IN lbs  |
| 4. Spark Plug-----                           | 9.4 LBS   | or 113 IN lbs |
| 5. Camshaft Sprocket cover-----              | 7.2 LBS   | or 86 IN lbs  |
| 6. Valve covers both intake and exhaust----- | 7.2 LBS   | or 86 IN lbs  |

1. Make sure your machine is clean prior to starting this task. It's very easy to get dirt, grime and mud into the valleys where the valves are. It's never fun to work on something dirty and I suggest giving her a bath prior to starting anything below. Also be sure you have a clean work area for those bolts that fall out or could roll away.
2. Please remember you're working with gas and removing fuel lines with gas vapors. It only takes a spark and boom, your machine is in flames. Also keep good ventilation going to help keep your mind clear and your body healthy.
3. Start by removing the seat by pushing against the plastic latch until you pop the seat up.
4. Remove the positive battery cable prior to anything to help prevent sparks which is located under the black rubber cover under the seat. This will require a large Phillips head screwdriver.
5. Remove the front radiator cover which is secured by the 2 Allen screws directly under the handle bars. Once the 2 bolts are out, slide the cover toward the rear of the machine which will allow the "feet" to come out of the groove.
6. Next on the list is removing the tank cover which is only held on by plastic inserts and the gas cap.
7. Next let's remove the front fenders by removing the bolts and plastic inserts that bolt everything down. This will consist of 2 Allens with 10mm nuts and 3 other 10mm head bolts "2 under fender" and one directly in the front of the radiator. Lastly there are 2 more that secure the front and rear fenders near the battery tray.
8. There is a clear vent tube that you must remove near the bars and then unplug the display unit's feed "witch" to allow removal of the complete front section.
9. Gas tank removal requires you take the four 10mm bolts out and removal of the fuel pump power connector and the fuel line itself. When removing this remove the black retainer plastic which will allow you access to the orange clip. Take your time and slowly pull back the arms which will allow it to slide away from the line and gain you the space needed to pull the line off. I would strongly suggest you get a zip loc bag and place it into there to help prevent spillage of fuel. Lastly, remove the 2 plastic inserts near the rubber and then remove the tank.
10. Next and hardest is the heat shield for the tank. There are grooves cut in the front that hold the wires near the stem. Remove these and the vent tube in the bottom. Take your time as this part is difficult to remove without damaging it. Once you get the lines free pull it to the rear to remove it.

**\*\*Now for the easy stuff, VALVE adjustments!\*\***

11. Please clean all around the covers....dirt will always find it's way into these areas!!!!!!
12. Remove the Timing Mark cover screw with the Allen tool.
  
13. Remove the crankshaft end cover which will allow you to turn the engine over. This will require a 14mm Allen or you can also use the other end of your spark plug tool.
14. Remove the spark plug with the tool kit you have in the rear.
15. There are 3 covers that need to be removed. They are held by 8mm head bolts. These are on the top near the FI, another near the exhaust pipes and then the one where your timing chain is located.
16. Now since the Raptor is a 4 stroke "Intake- Compression-Power-Exhaust" we need to get the engine to TDC or top dead center on the compression stroke. This is easily done by using the 22mm deep well socket and rotate the engine counter-clockwise until 2 things happen. First you need to align up the mark on the flywheel with the mark on the case. There are 2 marks... the "H" which is used for timing and then a plain "I" mark which is used to identify TDC. You will know your on the right stroke because near the timing chain you will see the line on the cam gear and the case also match up. there should be very little resistance once you're there and the plug is out. Wiggle the rockers and they should be semi loose. If you have zero clearance you're not on the correct stroke.
16. Now get your taper feeler gauges out which should be in MM to measure these engines. Start with the intake and measure each one. If correct, there should be .09 mm- .13mm. When you measure there should be a slight resistance when sliding it through. If it's tight then you know you need to loosen the nut and turn the tappet adjuster counter clockwise to loosen it slightly or vice versa. Once you can slip in the feeler gauges and feel just a slight resistance, hold the tool still and tighten up the nut and recheck it one more time. Next go to the other valve and follow the same procedures again without turning the engine over. Adjust this one accordingly.
17. After adjusting the intake side I would rotate the engine a few times counter-clockwise and recheck these once you've found TDC again to ensure you have it perfect.
18. Next move on to the exhaust and follow the same procedures except this time you want clearances to be .16mm - .20mm so you will need to switch out your gauges for the next size up. The small taper set you can order really help out here when trying to do your valves. Once you've done both exhaust valves, rotate the engine over a few times and locate TDC and recheck them.
19. Once you're certain you've got them correct, spin the engine about 20 times and then locate TDC once again and check them all once again as a triple check...then button her up.
20. Reinstall in the reverse order and I would suggest an oil / filter change to top off the job after your start it and warm it up to flush any possible contamination away into the filter.

**I hope this helps everyone along and feel free to email me with any questions at [Mpeavler@cfl.rr.com](mailto:Mpeavler@cfl.rr.com) or the boards!**

**Take care,**

**Mike Peavler**

1. Rear seat clip



2. The two Allen screws holding the cover on



3. Front fender bolts w/ 10mm nuts on back



4. Front fender other side



5. 10mm nuts on back of Allen screws



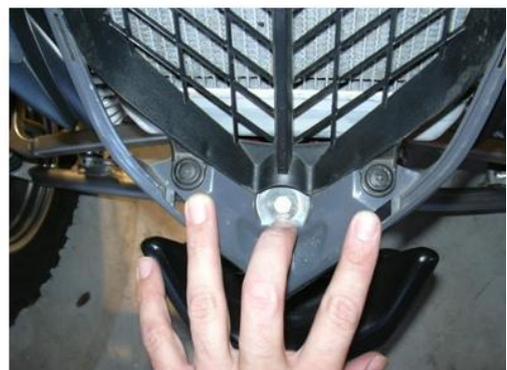
6. 10mm bolts



7. Front cover taken off



8. Only remove the center 10mm bolt



9. Plastic inserts, use fingers to twist out



10. 10mm rear bolts for front fender



11. Gas cap must be removed



12. Cover off the gas tank



13. Top of gas tank showing connections that need to be removed



14. Unclip this and remove clear tube prior to removing front fender



15. Front fender off the machine



16. Naked but ready for the next step



17. 10mm rear gas tank bolts



18. Front gas tank bolts (watch for metal inserts that will fall out)



19. A few of the last things holding up tank removal



20. Clip removal for fuel line and connections for fuel pump. Take your time, no tools, just hands



21. Plastic inserts, use fingers to turn 1/4 turn and pull up



22. Tank off the bike, ready for cleaning!



23. The hardest part, heat shield removal



24. 10mm bolts if you want to remove the battery to clean the rubber shielding



25. Under this plastic is a vent tube that must also be removed. In the front there are openings for cables, tube, etc. Take your time, no need to rush this little part.



26. Notice the openings in the front. You must guide the wires/tubes out of there prior to pulling it away and around the stem. There is also a cable that runs through this you can just slide over.

27. At this point I would take a few minutes to relax and clean around the valve covers while the engine is still "closed up".



28. This is the INTAKE side valve cover. The intake valves are directly behind this cover, use an 8mm to remove the cover bolts.

29. Exhaust side valve cover. You will get some oil that comes out of this side, cover the headers and oil tank to prevent a mess.



30. Both of these plugs come out. One is 6mm and the other is 14mm. The stock spark plug tool is 14mm on one end if you don't have a 14mm Allen wrench/socket.

31. This is how I kept fuel dripping under control and fuel line free of dirt. Nothing fancy, but it works!



32. Spark plug removal. Notice the 14mm end that can be used in the previous step.

33. Timing mark lined up. Notice it's not the "H" mark but the "I" mark.



34. Intake valves ready for checking

35. This is where the camshaft sprocket is located. The cover is held on by two 8mm bolts. It will seem stuck because there's an O-ring holding it in place. Wiggle it out to reveal what's behind door #3! ☺



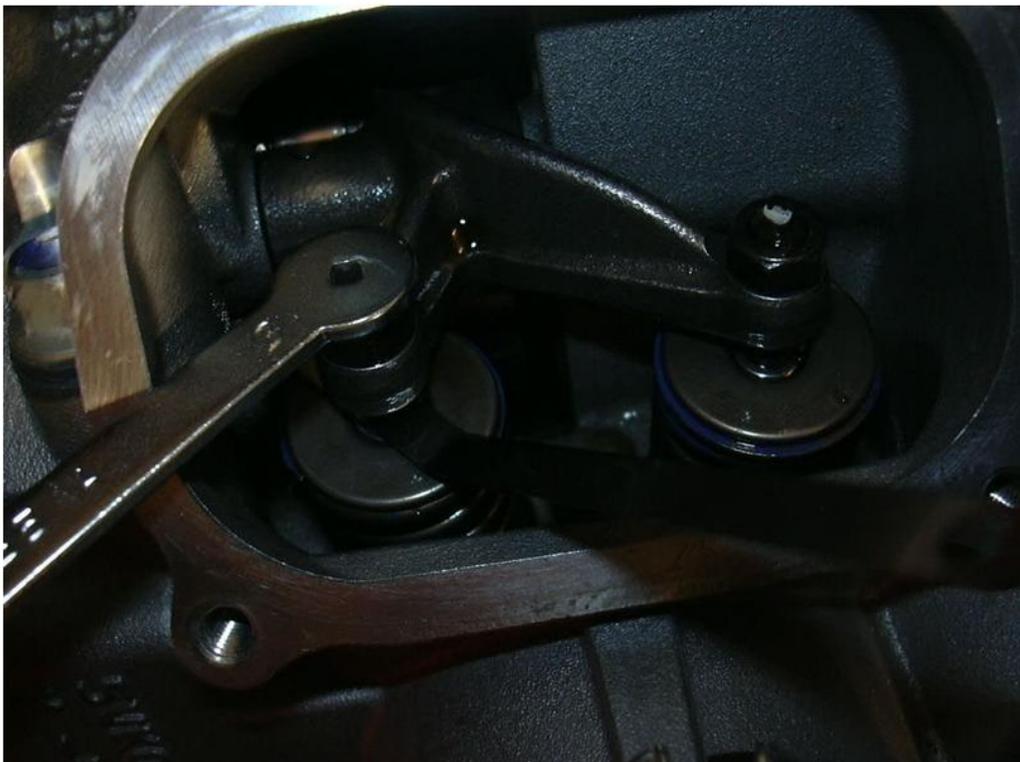
36. Notice the line on the cam sprocket. It should be facing up and lined up with the case marking.

37. Close up of the intake valves and adjusters. These are 10mm bolts and once they're loosened you can use the special tool that is basically a 3mm box.



38. Checking for the proper clearances between the 2 parts. Remember to check the back side where it will be the tightest.

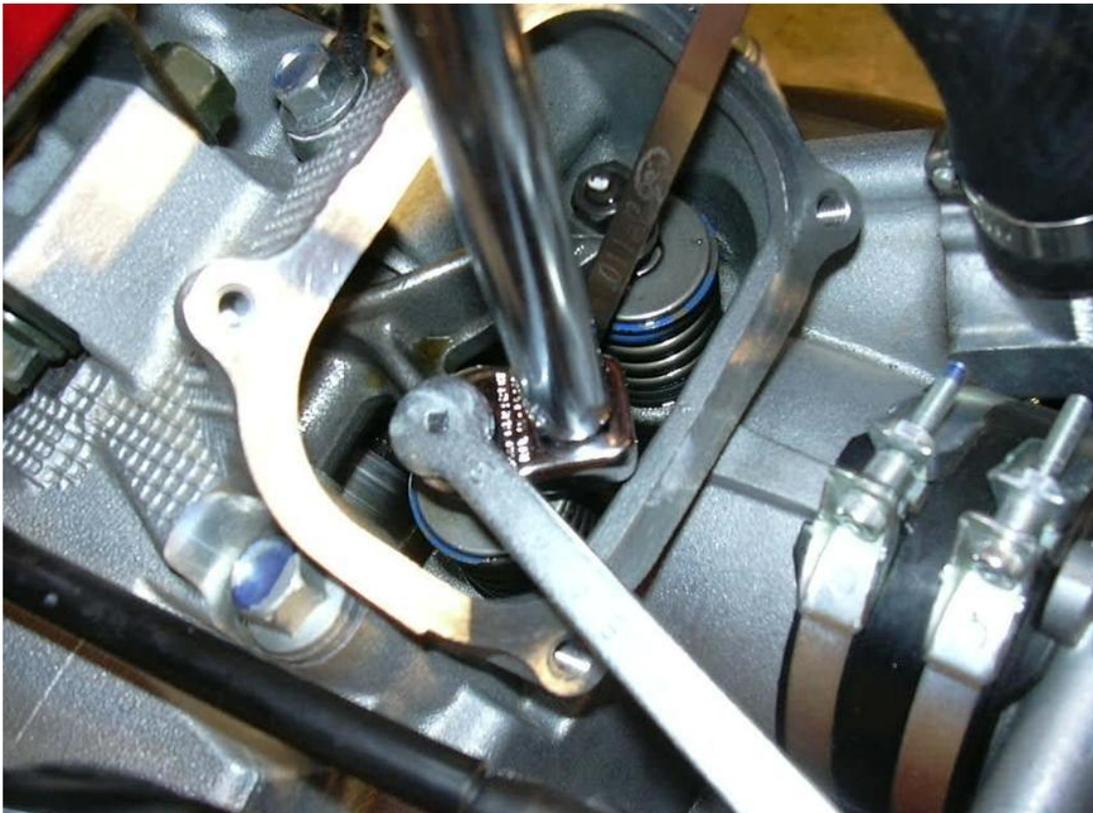
39. Once you adjust the clearance to the desired range, place the tool on the valve adjuster and then use the 10mm crows feet to tighten things up. Once done recheck the clearance. Play with the rocker arm to make sure it's at the highest point.



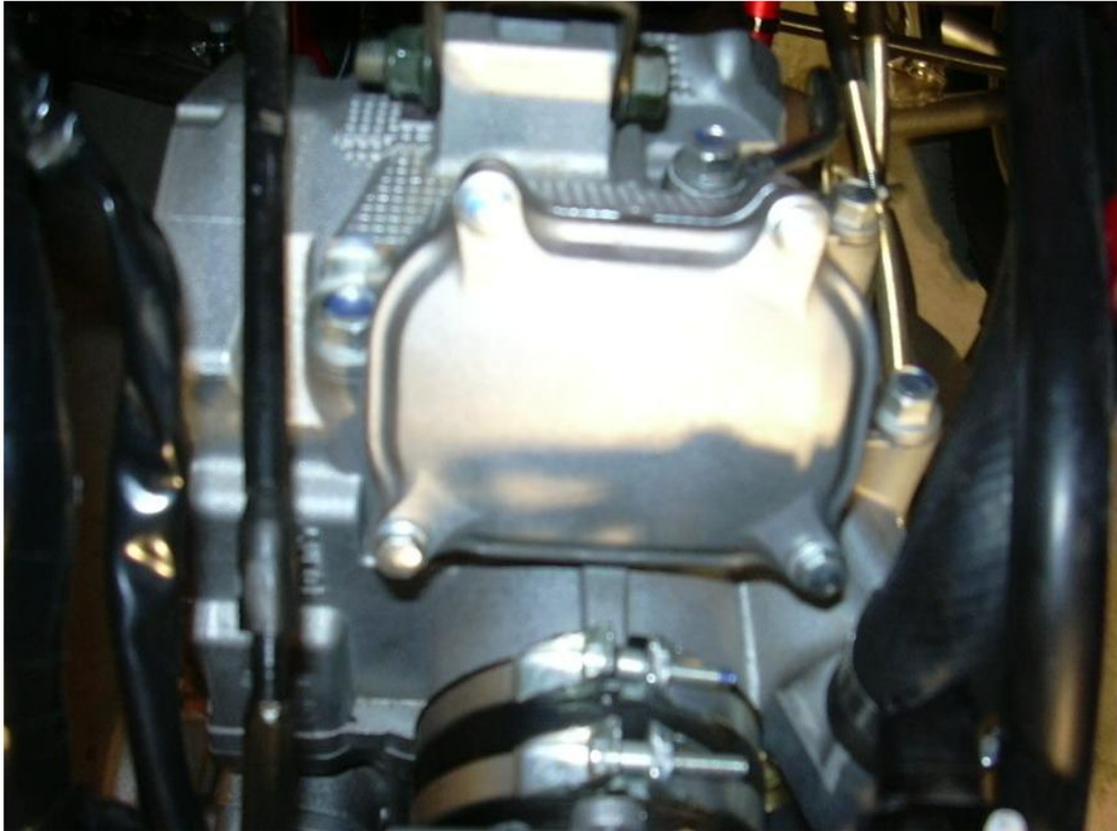
40. Just another shot of the taper feeler gauges and the special tool you can get from a dealership for the job.



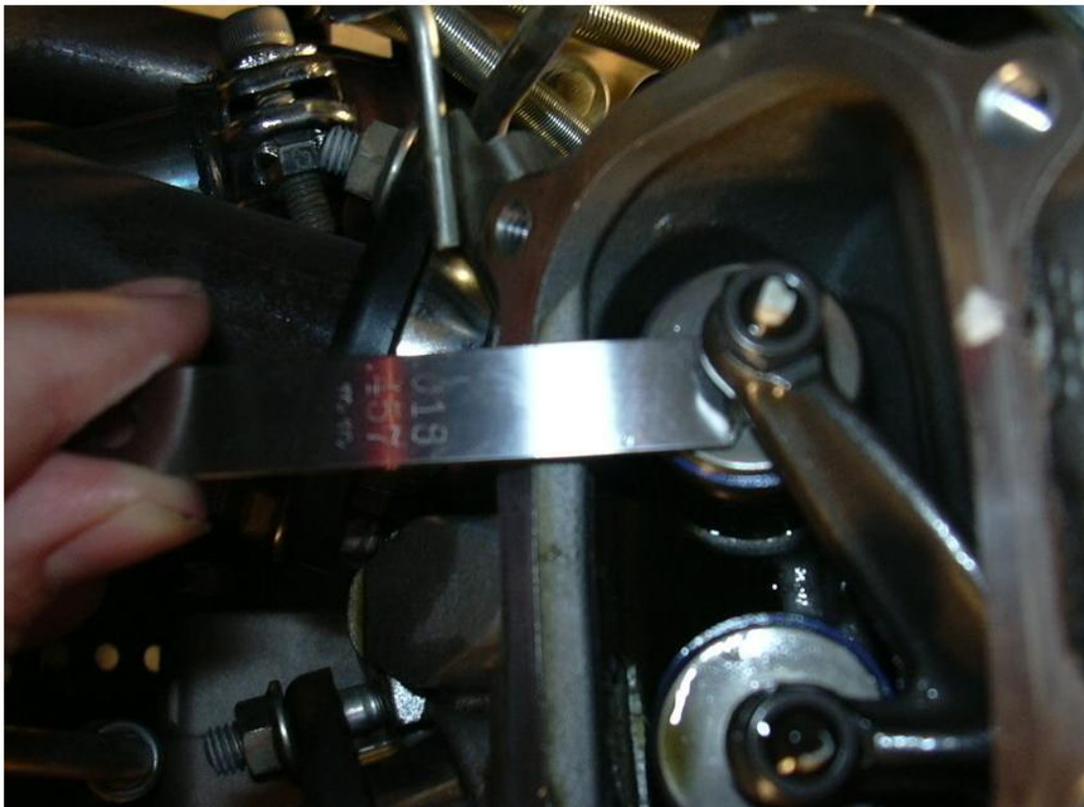
41. Kind of busy section when you have the 3 tools in the intake area. Start with the feeler gauge, then crows feet, then the tappet adjusting tool. An extra hand helps!



42. Intake cover back on after rechecking a few times. Now move to the exhaust side!



43. Same thing with the exhaust valves, just make sure you're back at TDC.  
This side requires a thicker gauge, DON'T FORGET!!



Hope all of you have some confidence now to save yourself some money. The biggest thing to remember is to **DOUBLE CHECK** everything before wrapping it all up. Now as you put everything back on, **ESPECIALLY THE HEAT SHIELD**, which you can use as a guide to get the hoses routed correctly. Don't forget the underside one as well.

You're welcome to email me or call me with questions.  
1-407-709-5623 (prior to 11pm EST please!)  
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## FAQs

- **How often should this be done?**
  - After the first 20 hours and then every 75-80 hours or so. The manual says less frequently, but it's free, so why not?
- **Should I lean toward .09mm or .13mm on intake and .16mm or .20mm on exhaust?**
  - I set mine at .12mm intake and .18mm exhaust. If you go tighter it will make them quieter but will require more frequent attention because they tighten up over time on their own.
- **Can the timing chain be adjusted if it is loose or too tight?**
  - No the chain on the 700 is garbage period. It has so much stretch to it that it doesn't even come close to lining up. Make sure you use the crank as your mark and not the cam sprocket.

