The Tune-Up and How To Do It

Last Updated Saturday, 29 March 2008

How To Stop Worrying
And Learn To Love Your SUs

by Rick Regan

The winter months are a great time to take a weekend and do a good thorough tune-up, oil change, lubrication and safety check on your pet. Doing it yourself provides another means to commune with the car, and may alert you to mechanical problems that can be taken care of before the next touring season.

Next month we will publish some tips on lubrication and suspension checks.

The Austin publication AKD 1995A “Schedule of Repair Times for Austin-Healey 3000 Mk II" allows 5 hr. 45 min. for tuning the engine by a dealer mechanic. While this time includes allowances for cleaning the filter in the fuel pump, cleaning spark plugs rather than just replacing them, and cleaning and reoiling the three air filters obviously this is not a job that B.M.C. intended anyone to cut any corners on.

Before You Start

The Factory Workshop Manuals go into the tune-up procedures in detail. I recommend that you read them carefully before proceeding and follow them as you work. Nevertheless, I would like to pass on a few tips which I have found useful in obtaining consistent, satisfactory results.

If this is the first time you have tuned your engine, or it has been a while since the engine has been tuned, you should first check to make sure the rocker shaft or rockers arc not worn, that the distributor shaft does not have excessive sideways play, and that the timing chain is not stretched or sloppy. Since any of these problems will render your results unpredictable and inconsistent, they should be dealt with before attempting any tuning.

The order in which you perform the tune-up steps is important.

FIRST, before we forget, remove and clean the filter screen in the fuel pump and reinstall. The screen will be in the inlet port of the fuel pump. (figure 1 and 2)

Adjusting the Valve Rockers and Points

If you are tuning an early BN4 with 4-port head, skip the next paragraph. We will adjust the valve rockers on the 4-port head after the

engine warms up.

With the engine cold,
preferably having sat overnight, begin by removing the rocker cover and adjusting the valve rockers to a loose 0.012” clearance. Consistency here is more important than the actual measurement. Regard 0.012” as a minimum. (figure 3)

Next, set the distributor points gap, after replacing the
points, if they arc obviously worn, and condenser if the points appear burnt. Set to a gap of precisely 0.016”. (figure 4) Very lightly grease the cam surface with wheel bearing grease (not graphite-based grease!). Put two drops of engine down the inside of the distributor shaft, and replace the felt plug if present. Check that the contact breaker plate assembly is not jammed by the screw securing the condenser. This can happen if there is no lock washer under the screw.

Setting the Timing

Now, set the timing as
follows. Disconnect the vacuum line at the distributor. Turn the vernier A/R adjustment knob to Full Retard. Set the crankshaft to the required static setting as stated in the Owner's Handbook or workshop manual. (figure 5) This can easily be done by rolling the car backwards with 4th gear engaged. On 6-cylinder Healeys, the diameter of the crankshaft pulley is such that each 1/16” from the T.D.C. notch equals one degree.

STATIC
TIMING SETTINGS

BN1 - BN2, BN4 (4 - port) BTDC	6o
BN4 (6 - port) - BN6 BTDC	8o
BN7 - BT7 BTDC	5o

BN7 - BT7
MkII, BJ7 12o
BTDC

BJ8 - 12o BTDC

Loosen the distributor, using the pinch bolt in the
securing clamp. Turn on the ignition. While holding the distributor shaft hard clockwise (to take up the slack), turn the distributor body counter clockwise, then clockwise until the points just spark. This is the point of opening and is the position to lock the distributor body. Do not over tighten the clamp pinch bolt; just snug should be sufficient. Turn off the ignition. Install a new rotor, making sure that it is not loose on the shaft. Clean the cap, particularly on the inside (replace if the electrodes are eroded or the centre carbon plunger is damaged or jammed) and reinstall. Reconnect the vacuum line.

Adjusting the
Carbureters

Remove
the air cleaners, wash in solvent, and blow dry. Coat the mesh with clean engine oil and set aside to drain.

Remove
the dashpot/piston assemblies, drain of oil, and clean. A spray “Tune-up Cleaner” works well here. Do not use any abrasives. Wipe dry with a rag and remove any lint. Check that the large piston return springs are identical and of the same free length. Stretch the short one slightly if necessary to achieve this. Remove the needles and ensure that they are the correct specification by the code letters on the shoulder. (figure 6) Check that they are not bent by rolling across a flat surface. Reinstall the needles, making sure that the base of the shoulder is exactly aligned with the lower face of the piston. Check that the piston slides smoothly and freely within its dashpot.

Remove the float needle chamber lids, and position check
for proper float level in each chamber. Consistency here is also important. Check that the needle and seat seals properly. Check that the floats have not sunk (that is, that they have no fuel in them). Replace as required. Ensure that on “H” and “HD” carbs (figure 7), the thimble strainers are in place behind the hollow “banjo” bolts on the lids. They are often missing.

If your car has the infamous electric choke (figure 8)
and it is still hooked up to the intake manifold (generally found only on very early 3000s), disconnect both ends of the wire between the switch on the manifold and the solenoid on the carbs.

Next,
disconnect the choke control linkage on the carb. Don't lose the cable end fittings! Using the mixture adjustment, bring up the jets to exactly flush with the surface of the “bridge” inside the carb throat. From here on, whatever adjustment is done to the mixture (jet position) of one carb must be done

identically to all carbs. An out of balance mixture setting is much more serious than an out of balance throttle setting. On “HD” carbs, press down on the jets slightly and make sure that they return smoothly to the flush position. Make the preliminary mixture setting for your model of S.U.s. This should result in lowering the jet by about 1/8".

Setting the Throttles

Follow the workshop manual to check the position of the accelerator linkage from the pedal up. Adjust if necessary. Check for play at all the joints and pivot points. Lubricate all joints and pivots lightly with engine oil. Disconnect the accelerator linkage from the carb throttle linkage. Set the throttles as per the manual and reconnect. On tricarbs, first set the rear pair of carbs, then set the front one to match. Watch for play of the throttle shafts in the carb bodies. Any noticeable play should be rectified as both mixture and throttle synchronization will be affected. (figure 10)

Now reinstall the dashpot assemblies and check each piston again for smoothness and freedom over its full travel. There should be no stickiness whatsoever. If there is, move the dashpot around on the carb body a little with the securing screws loose, until the stickiness is minimised. Hold it in this position while tightening the screws. If that doesn't work, try switching assemblies between carbs. They may have been switched previously. If this still doesn't work, double check everything else, then follow the jet-centering procedure in your workshop manual. Once piston movement is satisfactory, fill the dashpot about 2/3 full with clean engine oil, preferably 20W50. Anything thinner, like automatic transmission fluid, does not work as well, especially in hot weather. (Editor's note: From personal experience, automatic transmission fluid also granulates if the engine isn't run for several months, impeding piston travel and creating a frustrating problem to find.) Install the damper caps and start the engine. If the car has been standing out in cool or cold weather, you may have to partly block the carb inlets to start it, as the choke is still disconnected.

Once the engine has warmed up fully, change the oil and filter.

If you are tuning an early BN4 with a 4 - port head, now is a good time to remove the valve cover and set the valve clearances as described earlier, taking care not to let the engine cool too much before completion of the adjustment. Once done, restart the engine, check for leaks, and bring it up to full working temperature.

Checking and Replacing Spark Plugs

Now, shut off the engine and remove all the spark plugs, laying them out on your bench in order by cylinder. Carefully clean the flat ring around the plug hole in the head where the plug gasket seats. No dirt should be allowed to fall into the engine. If installing new plugs, make sure that you have the correct ones: for l00s Champion N5, the same for 4 - port BN4's, for all 6 - port 6 - cylinder models, Champion N11YC is the modern equivalent to the original specification. (figure 11)

All should be gapped to precisely 0.024”. Always check the gap on new plugs. Most of them are gapped to 0.035" at the factory, which is much too wide. Check that there are no burrs on the threads of the plugs, apply a very light coating of anti-seize compound to all but the two end threads of each plug, install and torque to 20 ft/lbs. Install the high-tension leads next, after making sure that there is no corrosion on the ends, particularly at the coil terminal or at thc distributor cap ends, and that the insulation has not become stiff with age. The ends should be a snug push-fit onto the plugs.

Idle, Mixture and Linkages

Disconnect the carb throttles from each other again and start the engine. Synchronize the throttles for even airflow at 1000 RPM. Use a UniSyn or other balance meter if available. Then set the mixture for the fastest idle, still maintaining 1000 RPM. Once attained, slowly lean out the mixture until you can hear a splashy misfire at the exhaust pipe. Then richen until it just disappears. Recheck if necessary. Set the idle to about 800 RPM. Reconnect the carb to throttle linkage, check that the specified clearances exist with the throttle closed, and that all throttles begin to move simultaneously.

On the electric choke models, reconnect the switch wire at the solenoid end, then ground the other end. Make sure that the needle moves freely and that the lead is well above the adjustment nut. Switch on the ignition and make sure that the needle lead is held down unto the nut. Start the engine and adjust the nut up to richen or down to weaken the mixture through the electric choke, until a slightly blackish exhaust is noticed and the engine starts to run a little rough. Stop the engine and reconnect the choke wire to the switch. Turn on the ignition and note that the solenoid should not operate. Let the engine cool down and check that the choke cuts in when the ignition is switched on with the water temperature at 35 degrees C. or less. With the engine running, the choke should cut out at this temperature.

Finally for the choke linkage. Once reconnected, all throttle and mixture controls must begin to move simultaneously. Set so that the first 3/8" of choke knob travel is throttle only, with any further travel operating the mixture controls, with exactly equal movement of each carb jet. Position the choke knob at 3/8" position and set the fast idle screws so that they just touch the cam. Then screw them in equally to give an engine speed of 1500 RPM. Push in the knob and make sure that the choke linkage returns fully to the off position, with a clearance under the fast-idle screws, especially on BJ8s.

Re-install the drained air cleaners, with a gasket under each, and you're done!

Some Additional Notes

When using unleaded premium fuel, you may find performance improved with the timing further advanced 2o-5o. Use the vernier on the distributor to adjust. Time your top gear acceleration for reference.

You may have noticed that I have not mentioned the "piston lifting pin". I have found that it is a dandy way to check if the piston is stuck, but that is about all. If you have found that it works for you, then fine, but if you haven't, ignore it.

You may also have noticed that I make no mention of a timing light. Such things are, or were, virtually unknown to the average English garage, and the necessary data, while published in several places, I consider to be suspect. The static setting method I have detailed works well enough that the differences in performance should be noticed when changing brands of gasoline or when driving in the cool of the night rather than the heat of day.

You will probably find, if you installed a new set of points or plugs, that the engine's performance will improve slightly after a few hundred miles, as these items “bed in” to their optimum working clearances. This is as it should be, and it means that no tuning should be needed during at least the next six months of normal daily use.

Enjoy

Rick Regan was a founding member of the Austin-Healey Club of British Columbia, continued to be on active member of Pacific Centre and the Concours Committee after moving to Toronto, and is now back in Vancouver, once again happily helping to maintain the breed with his own service and restoration business.

Austin-Healey Magazine - October 1988