INSTALLING THE SOFTWARE

Important: Do not connect the 123\TUNE until you have installed the software!

Go to the site www.123ignition-conversions.com and download the latest version of the 123\TUNE software. This software package is designed for Windows XP and onwards. Connect the USB cable and run the software. Wait till the software is ready. Click on "YES" and wait till you see "CONNECTED TO 123TUNE" AND the letter "V" following with some MARKS is on the screen. In the top center you will see two grey tabs with 'DASHBOARD' and 'SETTING' by clicking 'SETTING' you will see the page where you can edit your centrifugal and vacuum advance curves and where you can "STORE" them into the 123\TUNE. Click 'DASHBOARD' again and you will see the electronic dashboard again. Note the red dot in the bottom left corner. This indicates that there is presently no connection. Now connect your 123\TUNE (use a shielded USB cable ONLY; Belkin is a good brand) and you will see this dot become green, accompanied by an audible signal.

For programming the 123\TUNE will be powered from the USB port in your computer.

Important keys to memorize:

Alt-F4 → closes the program
F8 → switches the RPM stopwatch on and off
F11 → switches to an from "Full screen" (which is nice for the dashboard feature)

HOW TO START

With the 123\TUNE connected go to the 'SETTINGS' tab and press the 'curve 1' button. The curve that is presently stored in the 123\TUNE will appear in the screen. (Of course you can select the 'curve 2' button too, and see which curve is stored in your 123.

Each curve consists of a maximum of 10 so called "points": for the upper curve, each point consists of two numbers: "crankshaft-revolutions-per-minute" and "crankshaft-degrees-advance". For the lower curve this is: absolute manifold pressure in kP and "crankshaft-degrees-advance".

Go to the "centrifugal Advance" curve and left click on one of the points in the curve. Note that you can drag this point up- and down whilst doing this. (At the same time the points list will be updated, as you see.) By right clicking on one of the points in the curve you can "delete a point" from the curve. If you want to add a point simply move your mouse to the required position, right click and select "insert point". If you only want to change the horizontal position of a point you can go to the point list and fill in a different number. (Respectively for "revolution-per-minute" or "abs. manifold - pressure"). Note that after entering the number the curve will be updated immediately.

WIRING THE 123\TUNE

The 123\TUNE-4-R-V and the 123\TUNE-6-R-V can be used on cars with ‘battery-minus’ connected to the body of the car (“NEG_EARTH”), but also on cars with ‘battery plus’ connected to the body of the car (“POS-EARTH”). The 8 cylinder version however (123\TUNE-*-R-V can only be used on cars with the ‘battery-minus’ connected to the body of the car. (This is also called ‘NEG-EARTH’.)
Check the diagrams at the last page of this manual for proper wiring. Sometimes the blue wire is already connected to earth inside the distributor. The 123\TUNE-8-R-V is suitable for 12 Volt cars only; the 123\TUNE4-R-V and the 123\TUNE-6-R-V can be used on cars with 6 and 12 Volt batteries.

MOUNTING THE 123\TUNE IN YOUR CAR

Check before removing the old distributor from the car in which direction the rotor is moving. (You can do this by first removing the wired from the distributor to the coil. Then remove the cap and ask someone to look at the rotor whilst you activate the starter motor.) Now you know if the rotor rotates clockwise (CW) or counter clockwise (CCW) seen from the top that is. (Put that on a little note together with the proper ignition sequence.) The next thing; bring the engine to the static timing point, at the end of the compression-stroke, for cylinder number 1. (The rotor on the old distributor should point to the cable that connects to the sparkplug of cylinder number 1.

After having done all this, you can now put your 123\TUNE in the car and find a position where the cables, the USB-plug and the vacuum-nipple come out convenience. Connect the wires according to the proper diagram and for now do not yet connect the black wire.

Turn on the ignition.

A timing LED shines through one of the holes in the aluminium disc. (123\TUNE-8 the LED shines outside the disc) Rotate the body until the LED is off. Now slowly rotate the OPPOSITE to the direction that you have found earlier, until the green LED just lights up. While turning the body, also press the rotor in the same direction to remove any free play in the driving gear. Now tighten the 123ignition securely.

Turn off the ignition.

Now connect the black wire to the coil according to the schematic. Connect the spark plug leads in the proper sequence to the cap, starting with the wire for the number one cylinder at the position pointed to by the rotor of the ‘123’.

Also connect the high voltage wire from the coil to the centre position of the cap. Attach the cap to the distributor. Route all wires, inclusive the USB (!), well away from high voltage leads and away from moving parts, using tie-wraps or other suitable means.

Connect the vacuum tube (if there is one) from the carburettor to the nipple on the ‘123’. Older engines may have a screw connection for the vacuum advance diaphragm. In this case you can use a short length of rubber hose to connect to the 123, or remove the hard line to the carburettor and replace it completely with thick walled rubber vacuum hose. ALLWAYS CHECK THE MAXIMUM ADVANCE WITH A TIMING LIGHT.

If you loaded the proper advance curve before, you can now start your engine!

LOADING CURVES INTO THE 123\TUNE

Connect the 123\TUNE to your computer and start the 123\TUNE software

Example 1

Go to: ‘File’ → ‘Import from file’ → select ‘example1.xml’ and “Import”. This example demonstrates the (quite unpractical) use of maximum of maximum 10 points for each curve. The rev. limiter for this curve is set to 6000 rpm. The MAP start (the speed above which the vacuum curve will be active) is set to 1500 rpm.

The vertical grey line in the manifold advance curve, indicates atmospheric pressure. (1 bar equals 100 kPascal) The more you go to the left the lower the abs. pressure gets, or the higher the vacuum, hence the vacuum advance sits in the left upper part of this curve

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Example 2

This demonstrates how to set the unit in a real-life situation, using the original data from the ‘one-fits-all’ Bosch distributor 0.231.170.034 for Volkswagen. (See the picture at the last page of this manual.) As the original data is VERY often based on distributor speed and distributor advance you have to be aware, that both numbers have to be multiplied by a factor 2. in order to get to speed crankshaft and advance crankshaft. If we now look at the 0.231.170.034 we see that the advance starts at 500 rpm distributor. In the list you will find this as point no 2 (1000;0.0). Than it advances to say 4.5 degrees at 750 rpm and you will find this in the list as point no 2 (1500;9.0). After that, the slope gets less steep and the advance ends at 10.5 degrees at 1750 rpm after which it remains constant. Hence you will find point no 4 (3500;21.0) and point no 5 (8000;21.0).

The vacuum curve is a little more complicated. The horizontal axis indicates the vacuum, but it does that relative to the atmospheric pressure and millimetres-HG. (This is not a standardized value.) 123 ignition uses the kP (kiloPascal) and absolute manifold pressure.)

Here is the conversion table:

<table>
<thead>
<tr>
<th>mmHg</th>
<th>kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>300</td>
<td>60</td>
</tr>
<tr>
<td>600</td>
<td>20</td>
</tr>
<tr>
<td>100 mmHg</td>
<td>87 kPa</td>
</tr>
<tr>
<td>400 mmHg</td>
<td>47 kPa</td>
</tr>
<tr>
<td>700 mmHg</td>
<td>7 kPa</td>
</tr>
<tr>
<td>200 mmHg</td>
<td>73 kPa</td>
</tr>
<tr>
<td>500 mmHg</td>
<td>33 kPa</td>
</tr>
<tr>
<td>600 mmHg</td>
<td>20 kPa</td>
</tr>
<tr>
<td>700 mmHg</td>
<td>7 kPa</td>
</tr>
<tr>
<td>400 mmHg</td>
<td>47 kPa</td>
</tr>
<tr>
<td>700 mmHg</td>
<td>7 kPa</td>
</tr>
</tbody>
</table>

Back to the 0.231.170.034: the vacuum advance starts at 100 mmHg below atmospheric. In the list you will find this as point no 3 (87;0.0). It then advances to a maximum of 5.0 degrees at 200 mmHg, which translates to point no 2 (73;10.0) and point no 1 (0;10.0)! The MAP-start is set to 1500 rpm: the vacuum part of the advance thus only comes into play above 1500 rpm. The RPM-limit is set to 8000 rpm indicating that no rev. limiting is active.

Example 3

This demonstrates how to set the unit in a real-life situation using the original data from a Bosch distributor 0.231.116.051 (see picture at the last page of this manual.) This distributor was kind of special because it had ‘negative vacuum’, e.g. the more vacuum the less advance. This ‘trick’ was used in two situations:

a. European car manufactures were faced with more stringent emission rules in the USA and Canada. Retarding the advance around idle was a popular solution to improve emissions.
b. Cars with automatic gearboxes: once set in “neutral” the advance was retarded thereby keeping the engine speed acceptably low.

Back to the 0.231.116.051: the vacuum retard starts at say 100 mmHg below atmospheric. But how can we retard? Simple as ‘123’! In the list you see point no 3 (99;11.0); it is important to use only 99 kPa to archive this!

The 123\textit{TUNE} will now produce 11.0 degrees advance, immediately after starting the engine. That is why \textit{off course} the MAP-start is set here to zero! The advance then begins to drop around 100 mmHg, point no 4 (85;11.0) to eventually 400 mmHg at point no 2 (50;0.0).

Example 4

This demonstrates how to use the centrifugal advance to get idle control; the engine will tend to stay in the dip around 1100 rpm. In the vacuum curve you can see an example of how to achieve so called ‘gear-shift-retard’.. if the absolute pressure in the manifold get below 37 kP, the advance will fall to zero. The result is that if you release the throttle (and the engine begins to produce vacuum) you ether want to engine brake or to shift gears. In both situations don’t want to create anymore ... hence the removal of the (in this example)10.0 degrees advance does exactly that.

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Example 5

This demonstrates how to set the unit in a real life situation using the original data from the Bosch distributor 0.231.129.009 / 0.231.173.009; also referred to as the ‘009’. As this distributor did not offer vacuum advance, the manifold pressure curve shows a straight line at zero degrees (see the picture at the last page in this manual). For the air cooled VW engine and ‘009’ distributor the maximum advance MUST be between 28 and 32 degrees at 3000+ rpm; so if you use this example curve, you should start by setting it statically to 7 degrees. This way it would reach exactly 28 degrees at 2600 rpm; at idle it would show 5 plus 7 degrees is 12 degrees. This is a safe way to start the tuning process: the advance at idle is not really important. (An engine will never be damaged at idle.) Too much advance at high revs will eventually ruin an engine.... always be aware of this! This example also indicates that it is possible to integrate (part of) the static advance into the 123\TUNE.

TUNING WITH THE 123\TUNE

- Switch from curve 1 to curve 2
  A very nice and easy way to interactively check, is to switch over from curve 1 to curve 2 with the yellow wire. (see the drawings at the end of this manual : please note the difference for NEG and POS Earth cars.

- Enable tuning
  When the engine is running you could press the ‘T’ to enable real time ‘TUNING’ mode (The curve indicator light on the dashboard will blink ‘TUNE’, to indicate that the tuning mode is active. By pressing ‘A’ (advance) you can increase the total amount of advance with a maximum of 5.0 degrees crankshaft in steps of 0.1 degrees. By pressing ‘R’ (retard) you can decrease the total amount of advance with a maximum of 5.0 degrees crankshaft in steps of 0.1 degrees

  This feature will com in handy if you have your car on a roller and want to optimize the engine power. The advance or retard found is not stored in any way so you have to remind your finding and adapt the active advance curve accordingly.

- ROM stopwatch
  If you don’t have a roller available it is also possible to use a flat piece of road. Here is what you should do: drive until the engine is warmed up, remove the vacuum hose and activate the RPM stopwatch. Enter the two engine speeds to the area of you interest. Drive the car at maximum power (and in one gear) through that road and measure the time needed. (This time will be displayed in steps of 0.1 seconds.) After having changed the centrifugal advance curve you can work your way towards a minimum time indicating you have found the optimum power in this specific area.
Diagram for cars with NEG. EARTH

Diagram for cars with POS. EARTH