Dicktator

Engine Management System

Instruction Manual for:

Dicktator Std
Dicktator Wasted Spark
Dicktator 60-2 & 36-1

Accuracy you can depend on

Contents

1. Installation Guide

- ## <u>Computer Requirements</u>

The programming software requires a PC running Windows XP, Windows Millennium, Windows 2000, Windows 98 or Windows 95 release 2 along with the following specifications.

Minimum Requirements:

    133MHz processor
    16Mb of RAM memory
    20 MB of free Disk space
    VGA colour display 800x600 (preferably 1024x768)

Recommended:

    400MHz processor
    64Mb of RAM memory
    100 MB of free disk space
    VGA colour display 1024x768

- ## <u>Installing the Dicktator Software</u>

Installing the Dicktator software onto your PC is performed similar to any other Windows software package. These basic steps below should ensure correct installation of the software:

1.　Insert the CD-ROM disk into your PC's CD-ROM drive.

2.　Run the executable file "SETUP.EXE" from the CD-ROM drive.

3.   The installation program will startup with a welcome screen. Click on OK to continue.
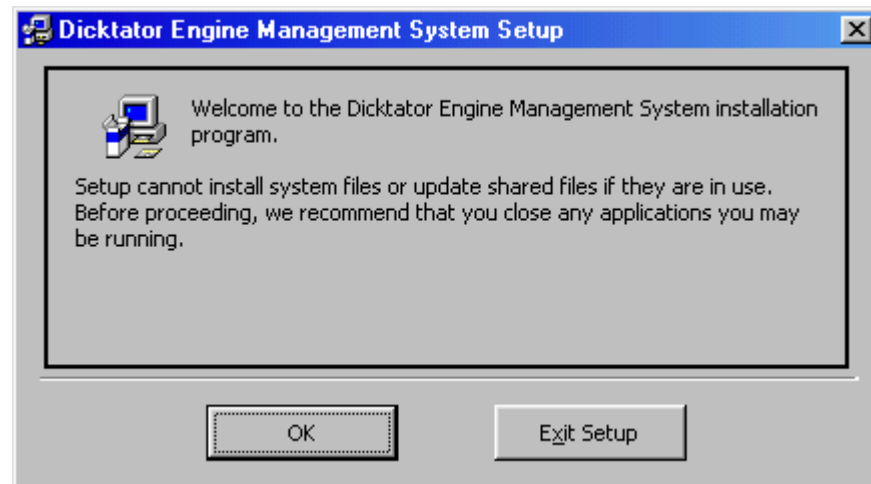
4.   On the Begin Installation Screen there is a big square button to start the process. Typically you should just press the button to continue. Otherwise, if you wish you can install the software into a specific folder on your hard drive. Click the Big square button to start the installation.
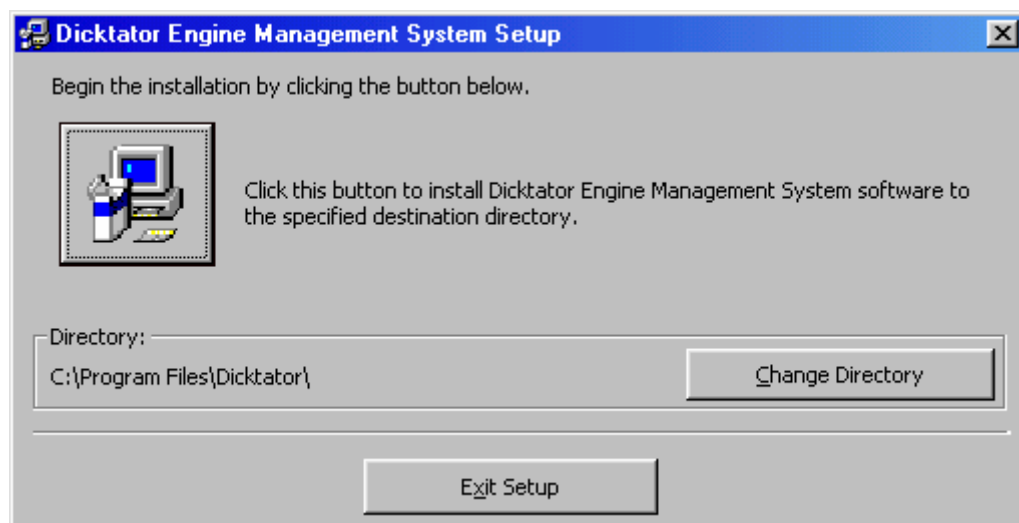
5.   With the icon screen you have the opportunity to place the icon in a specific place on the start menu. Typically you just press Continue and allow the software to place the icon automatically.
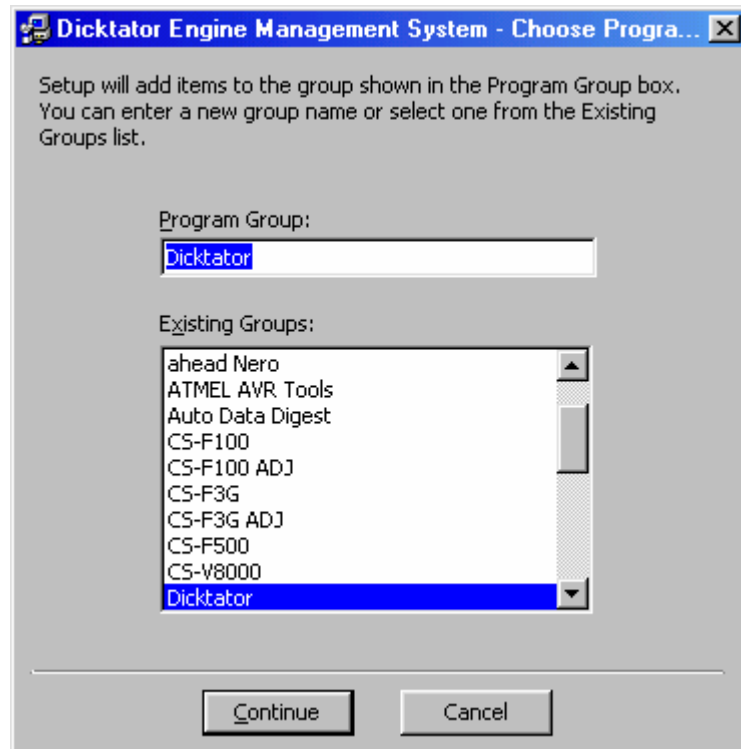
6.   The progress screen is just an informative screen to show you that the computer has not gotten stuck in a process. Do not do anything with this screen.
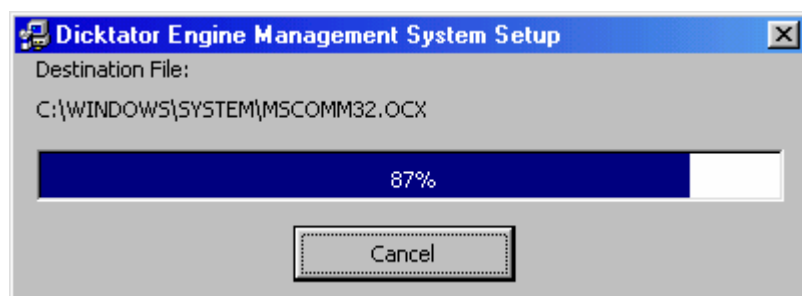
7.   This is the File Version Conflict Screen. This screen will only pop up if you already have a version of Dicktator on you computer. If it does, then exit the installation and remove the previous version of Dicktator software through the control panel.

Version Conflict

A file being copied is not newer than the file currently on your system. It is recommended that you keep your existing file.

File name: 'C:\Program Files\Dicktator\Setup.txt'

Description: "

Your version: "

Do you want to keep this file?

[Yes]   [No]   [No to All]
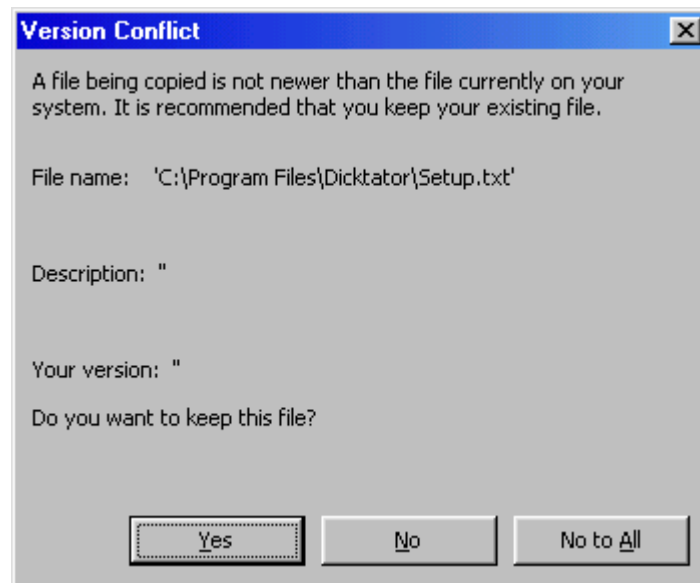
8.   Once the Installation has completed its task, the setup completion screen will appear. Just click OK and the installation is final.

Dicktator Engine Management System Setup

Dicktator Engine Management System Setup was completed successfully.

[OK]
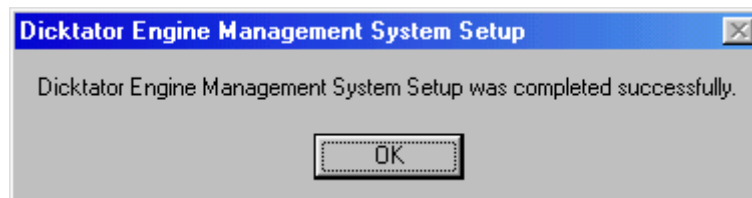
- <u>Finding the icon to start the Dicktator software</u>

1. Click on the Start button.

2. Click on programs.

3. Click on the Dicktator folder.

4. Click on the Dicktator Icon

- <u>How to connect the Dicktator to the PC software</u>

All you need is a standard RS232 serial comms cable. If you don't have a cable and want to make one, its still a simple job. You need a male and female 9 pin connector. Get a 3 core wire and connect pins 2-2, 3-3, 5-5 like in the diagram below.
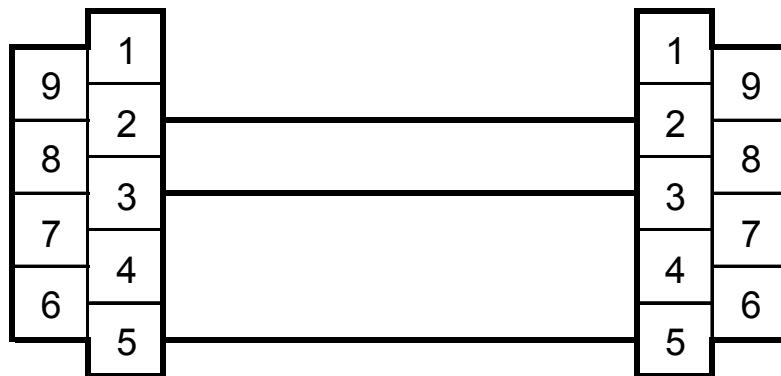
Once you have your cable, plug it in to the PC and Dicktator. Turn on your ignition and start the PC software. You will notice that on the Data Display Page is a bold red bar that will change to green as soon as there is a connection.

Dicktator Data Display Page - Ver :

Once the bar goes green, you are connected.

2. Using the PC Software

• Initial Setup of the ECU

Start up the Dicktator software, connect it to the ECU and turn the ignition on. Now press "M" to go to the Main Setup page. Here you tell the ECU the important settings it needs to work with your type of engine. Here is a description of all the settings.
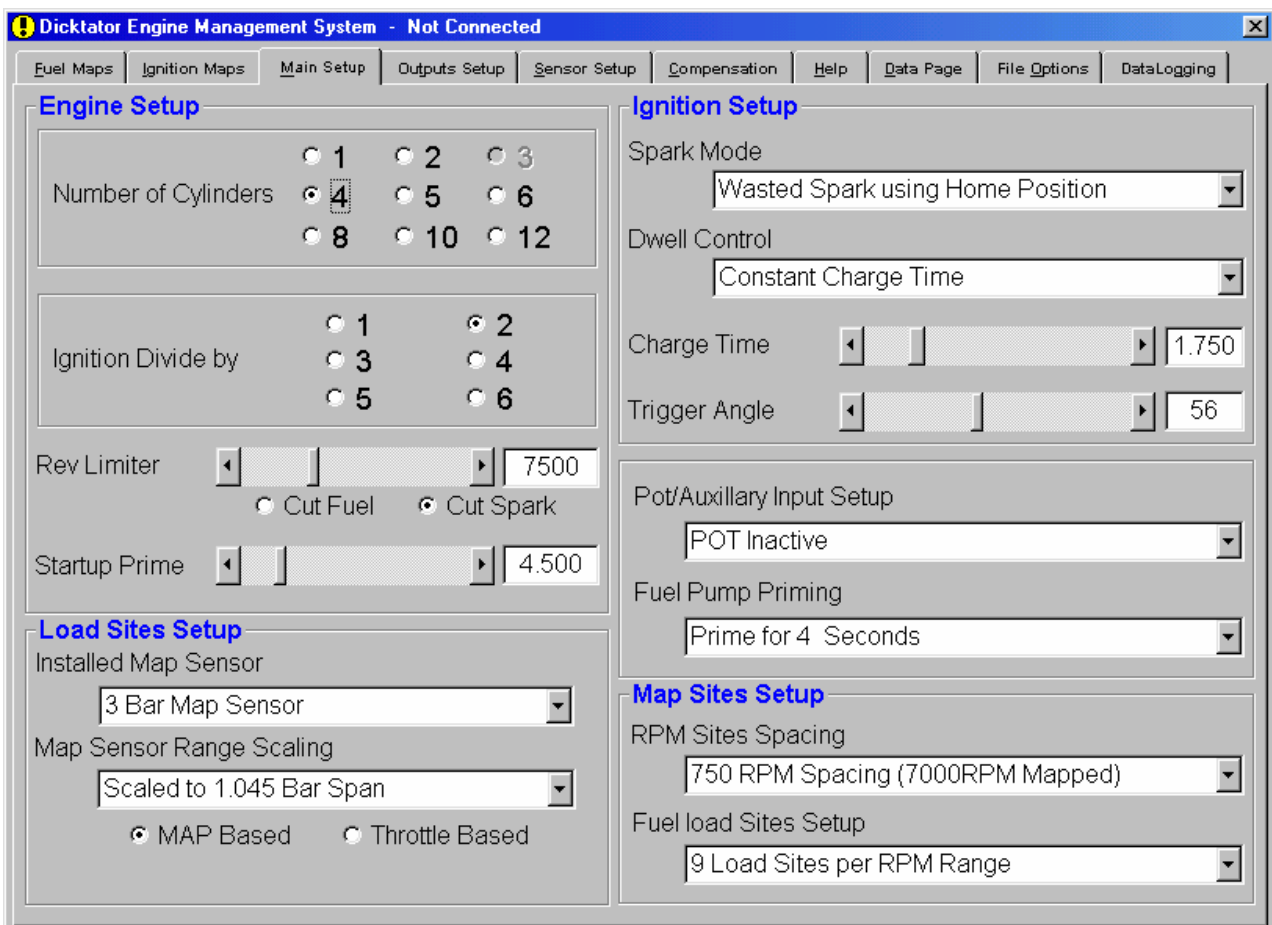
- ## Number of Cylinders:

This is quite self-explanatory. Select the number of cylinders your motor has to get the correct RPM reading. If you are using coil negative as a trigger on a wasted spark system then you will need to half the number of cylinders to correct the RPM reading.

- Ignition Divide by:

This number tells the ECU to fire the injectors every "number" of pulses. This is typically half the number of cylinders.

- Rev Limiter:

You can move the rev limiter to the desired RPM value in 100 RPM steps. If the motor exceeds this RPM the ECU will cut the output to what is selected in rev limiter type.

- Rev Limiter Type:

You have a choice between cutting fuel and spark as a rev limiter. It is advisable to cut spark as it provides a more positive and softer rev limiter. If you are using coil negative as a trigger then you will need to cut fuel as spark will not be controlled by the ECU.

- Startup Prime:

This value tells the ECU how much extra fuel to give at the initial 3 pulses of the injectors. The motor needs extra fuel to help quicken starting time. Typical values are from 2.5 ms to 5 ms.

- Installed MAP Sensor:

Default here is 3 bar

This setting tells the ECU what MAP sensor you have installed in the ECU. This is easy to check. Turn the ignition on but don't start the motor. If the correct MAP sensor is selected then the Boost reading on the Data Display Page will read between –0.04 and 0.04 at the coast and between –0.22 and –0.10 at altitude. If the reading is not in these ranges then keep selecting a different MAP sensor until it is.

- MAP Sensor Range Scaling:

This allows you to set the boost range of the map so you are able to tune using all your map load sites. For example, most ECU's will be sent out with 3 Bar MAP sensors but you only want to boost 1 bar. This would mean that you can only tune using the first 65% of the map. Now with this function you can scale the MAP sensor down to simulate, for example, a 2 bar MAP sensor without having to replace anything.

Never select a range that is lower than the maximum boost you are going to run. Never allow the Boost value on the Data Display Page to read OVER. That means the ECU will not supply the correct fuel and timing at those points.

- MAP Based or Throttle Based:

You can select if the ECU must use the MAP sensor for your primary load sensing or the Throttle Position Sensor (TPS). On Turbocharged cars you **must** use MAP based, and on normally aspirated cars it is preferable to use TPS Based. It is more time consuming to tune a TPS Based car, but the fuel economy gain on a car, with big cams for example, would be worth it. In Throttle based mode the vacuum pipe must be disconnected from the motor and left open to atmosphere.

- Enable Altitude Compensation:

This option will only appear if the "Map Based or Throttle Based" setting has been set to Throttle Based. In Throttle based mode, the ECU will not compensate for altitude changes unless this setting is enabled and the vacuum pipe coming out of the ECU is open to atmosphere. Please make sure that the vacuum pipe is **NOT** connected to the motor!

The reason we allowed the ECU to be able to disable the Altitude Compensation is that at higher altitudes the ECU will compensate the fuelling down (only in TPS mode) and not allow you to reach 100% duty cycle on the injectors. It is done

this way that there is enough duty cycle left in the injectors when the car does go to the coast. Some customers will never run the car at the coast and will require the ECU to reach 100% duty cycle on the injectors. This is easily done by disabling the altitude compensation. This is done at your own risk as the motor will run terribly lean going to the coast and permanently damage the motor.

- Spark Mode:

This tells the ECU if you are running a single coil or multiple coils in a wasted spark setup. If you are using multiple coils, you will require a home position signal as well.

- Dwell Control:

This tells the ECU what type of igniter you are using. Some igniters are "Dumb" igniters and need to be given a constant charge time signal; otherwise they overheat and stop working. A typical value here would be 2 ms to 4.5 ms. Other igniters are known as intelligent igniters and should be given a constant duty percentage signal. A Typical value would be 50%.

- Duty Percentage/Charge Time:

This is where you would set the constant charge time or duty percentage for your selected igniter.

- Trigger Angle:

When setting up this value, you need to use a timing light to check that the value in the Ignition map is what is actually shown on the timing light. For example to check this you would need to put 20 into the entire ignition map and check the actual timing on the motor. If the actual timing was 15 then you should change the trigger angle and check the actual value again until you get the actual to be 20. Your ignition

map is now calibrated, so whatever number you put in the ignition map, it will correspond to the actual timing value.

- <u>Pot/Auxiliary Input Setup:</u>

We believe that once the car is tuned you will have no need for a Pot but due to its great popularity we included the facility to connect a pot to the ECU to allow you to add or subtract a percentage of fuel at any time. We expanded on this function by making its range settable to your needs. The highest range would be +-50% with the smallest range being +-1.56% for super fine adjustment. We recommend that the POT be set to the "POT Inactive" setting so that it cannot have any affect on the tuning of the car because of being accidentally bumped into a different position.

The last option here is to allow the POT feature to be totally disabled and the plug used as the input for the Launch and Anti-Lag Control feature. The settings for this are found on the Outputs Setup Page.

- <u>Fuel Pump Priming:</u>

This tells the ECU how long to run the fuel pumps for once the ignition has been turned on as well as how long to take before turning them off after the motor stalls. This feature is for safety, incase you have an accident where you hit something that also cuts the fuel lines. The fuel pumps would turn off after a few seconds, stopping the fuel poring out and possibly catching fire.

- <u>RPM Sites Spacing:</u>

This is a decision you will need to make based on how much time you want to spend on the dyno mapping the car and how high you are going to rev the motor. There are 3 options which start at 1500 RPM spacing between ranges with a maximum tuning RPM of 12000 RPM. This option is the quickest to tune and due to the complex interpolation

calculations included in the ECU, we are still able to achieve excellent fuel economy and power figures with such a large RPM step. The next two options are closer spaced, but offer a lower maximum tuning RPM of 9000 for the second and 7000 for the smallest spacing.

- <u>Fuel Load Sites Setup:</u>

This setting is the same as the previous one but it changes the amount of load sites available for tuning for fuel. Again because of the complex interpolation we are able to achieve good figures with only 9 load sites per each RPM range. This cuts tuning time down dramatically and also the amount of strain put on the motor during dyno tuning as less time is spent running the motor hard while tuning.

- ## Calibrating the Sensors

- ## Throttle Position Sensor:

If you have chosen to use TPS Based load sensing then you need to calibrate the TPS Sensor. Click on Calibrate TPS and take your foot completely off the throttle and click on Accept Throttle Position. Now press the throttle open completely and click the same button again. The TPS sensor is now calibrated.

- <u>Water Temperature Sensor:</u>

The easiest way to calibrate these sensors is to look at the preset values list to see if your sensor is in the list. If it is click on it and the values will be inserted automatically. If not you will need to calibrate it manually. This requires you to first put the sensor in ice water and read the ohms on the sensor. You must always wait a bit for the sensor to stabilize to the new temperature. This will give you the 0 deg C value.

Now put some water in the kettle and boil it. Once it has boiled put the sensor in the water and measure the ohms. This will give you the 100 deg C value. Let the water cool using a thermometer to check the temperature. When the water gets to 80 deg C, check the value on the sensor. Do the same with 60, 40, 20 deg C. You will now have most of the calibrating values.

You will now need to put the values into the software. Using the left and right arrows on the keyboard, set the software to the closest value to what the real value is for that temperature. Then use the up or down arrows to go to the next temperature and do the same.

For the -20 deg C and 120 deg C, you will need to guess those values as you cannot check them. Look at how the values are going and guess what the value would be and set it. Your sensor is now calibrated.

- <u>Air Temperature Sensor:</u>

With the air temp sensor you will need to do the same thing as the water temperature sensor. Use water again to check the sensor.

- ## Setting up the Trigger Edges

- ### Input Trigger Edge:

For Std or Wasted Spark ECUs

The default setting here for most vehicles is falling edge. This edge can be changed to rising if there is a problem with the distributor phasing being too far out and the spark starts jumping to the incorrect poles in the distributor cap.

Changing this setting will move the phase point between 45 to 150 degrees depending on the input signal, so be careful with this setting.

For 60-2 or 36-1 ECUs

Default setting is falling edge. Changing to rising edge will advance the trigger angle and the timing 36 degrees for 60-2 and 40 degrees for 36-1

- ### Home Position Edge:

This Setting works exactly the same way, except it is for the home position signal. The main reason for changing this signal is to make sure the Dicktator sees home position a fair amount of degrees before the trigger signal. Normally this setting is set opposite to the trigger edge setting.

- ### Spark Trigger Edge:

This setting is crucial to get correct. If it is set incorrectly, permanent damage can occur to the ignition module and coil. This setting is almost always falling edge. The most common vehicle to have a rising edge module is Honda. There are still a few Hondas that have falling edge modules installed.

Dicktator does not take any responsibility whatsoever for damage to the ignition system.

- ## Setting the optional outputs
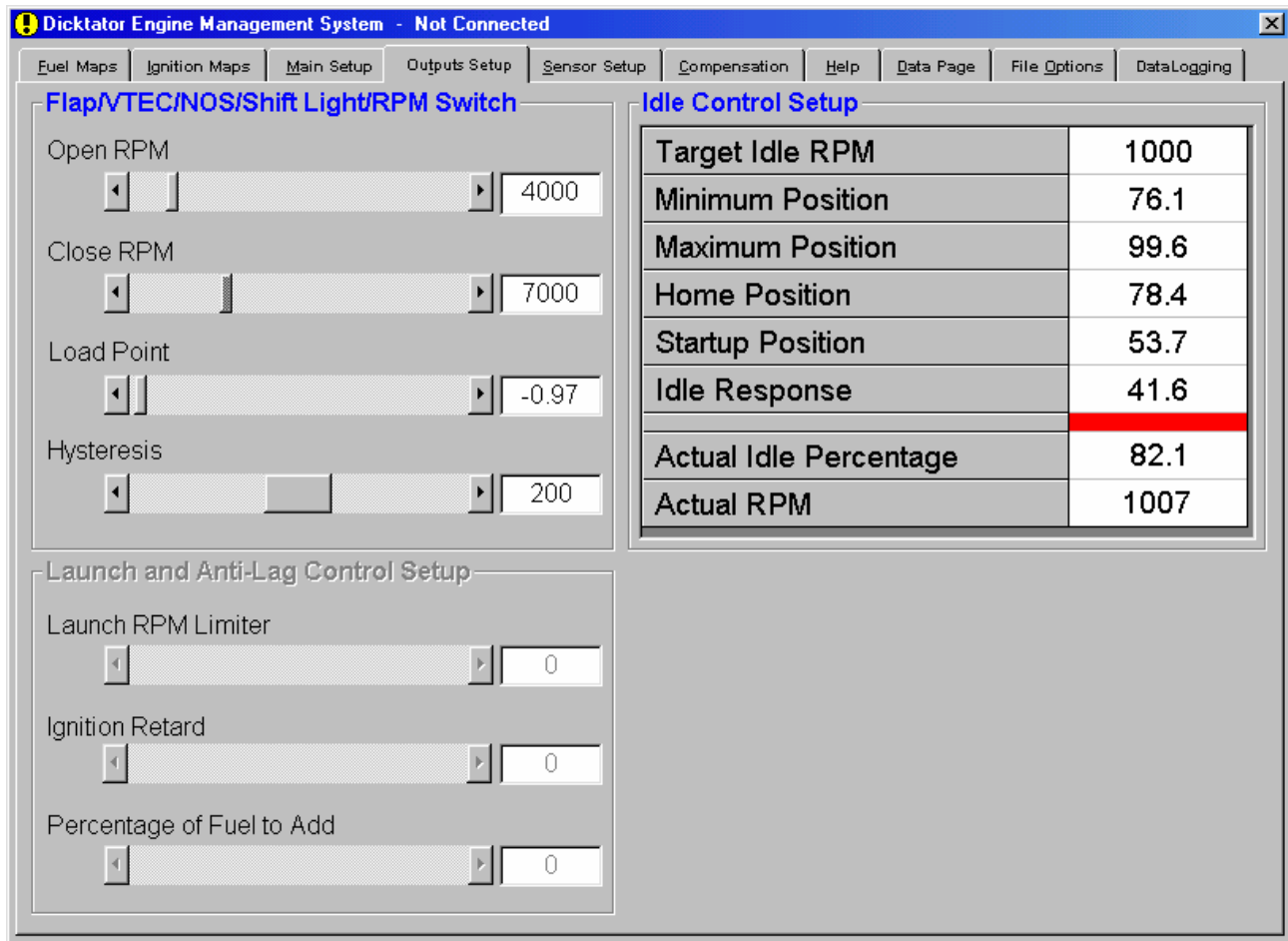
- Flap/VTEC/NOS/Shift Light/RPM Switch

Open RPM

When the engine RPM is higher than the Open RPM point then the output will be switched on. The output will not activate if the other parameters are not also met. All three parameters must be met.

Close RPM

When the engine RPM is higher than the Close RPM point then the output will be switched back off again. Therefore, you will notice that the engine RPM has to be between the Open RPM point and the Close RPM point. Remember that

the Close RPM point must always be higher than the Open RPM point. If you are using this output to control NOS, make sure that the close RPM point is about 300RPM below the set rev limiter to make sure you don't hit the limiter with the NOS active. Hitting the rev limiter with NOS active is dangerous to the motor.

Load Point

When the engine Load is higher than the Load Point setting and the other two parameters are met then the output will be activated. This can be used to switch NOS on at full throttle for example.

Hysteresis

This value is the difference in RPM where the output switches on and off. It is good practice to allow about 200RPM here to stop the output from switching on and off very quickly if you were holding the motor right on that point.

- ### Launch and Anti Lag Control Setup

Launch RPM

This is the Maximum RPM that the motor is allowed to go to while in Launch Control mode. It could also be used as a secondary rev limiter if ignition retard and percentage of fuel to add are both set to zero. The launch RPM cannot be set below 50% of the Rev Limiter value on the main setup page. Remember that the launch RPM can also be set higher than the standard rev limiter if wanted. Also remember that if the launch RPM is set too low, e.g. 2500RPM, there could not be enough energy to spool the turbo.

Ignition Retard

The purpose of having the ignition retard feature is to allow the turbo to spool up in neutral with no load on the motor. Use

this value to vary the amount of boost wanted in launch control mode.

Percentage of Fuel to Add

When in launch control mode the car will get hot fairly quickly and could also pop quite loudly out the exhaust. This is fixed with adding extra fuel. With the correct amount of extra fuel added, the motor will sound smooth in launch control mode.

- ## Idle Control Setup

Target Idle RPM:

This setting and the next 5 settings all control the way your idle control works. Set you target idle to where you want the motor to be controlled to.

Minimum Position:

This value will be a value a few percent down from the percentage the car needs to idle when it is hot. This setting stops the idle control from going too low which makes the motor want to stall after letting the throttle go.

Maximum Position:

This value stops the idle control from being too aggressive and revving the motor too high on a reaction to low revs.

Home Position:

This is the position that the idle motor will go to when you are not at closed throttle. If this value is too high the motor will not come down to Target idle RPM. If this value is too low then the car will want to stall every time you come to a stop sign.

<u>Startup Position:</u>

This value allows the idle control to open the idle motor enough to rev the car slightly under startup conditions to improve startup time.

<u>Idle Response:</u>

This value tells the ECU how quickly to react to the changes in RPM. The bigger the value the slower it will react. If the value is too big, the control may not catch the motor if it drops too low in RPM. If the response is too fast, the motor will rev and fall and rev again and again and never stabilize at target idle.

- <u>How to up set the Idle Control</u>

The most fool proof method would be to start by setting the minimum value to +- 3% and the maximum value to +-97%. This allows the idle valve to move the entire range. Then set the Idle Response value to about 20 so that there is enough response to start off with.

Allow the car to establish a relatively steady idle and look at the current idle %. Add about 3% to that and insert it into the Home Position value.

Then take the same current idle % and subtract about 4% and insert that into the Idle Minimum value. The maximum value can be set about 20% higher than that to allow the idle valve enough movement to be able to catch the motor if the RPM falls suddenly.

The startup value can be set to just below the Maximum Position value.

Now, take the Idle Response value and make it as small as possible before the idle control gets too aggressive and starts

to hunt up and down. Remember to rev the motor and check that the engine comes to idle smoothly.

- ## Working with Compensation Maps

Dicktator Engine Management System - Not Connected

Fuel Maps | Ignition Maps | Main Setup | Outputs Setup | Sensor Setup | Compensation | Help | Data Page | File Options | DataLogging

Battery Voltage

Volts	MS Added
7	1.328
8	1.000
9	0.680
10	0.344
11	0.168
12	0.056
13	0.000
14	0.000
15	0.000
16	0.000

Water Temp Compensation

Temp	Compensation at Temp
-20	60.2
0	55.1
20	50.0
40	38.3
60	9.4
80	1.2
100	0.0
120	0.0

Air Temp Compensation

Temp	Compensation at Temp
-20	8.0
0	4.0
20	-2.0
40	-7.0
60	-10.0
80	-11.0
100	-12.0
120	-12.8

Throttle Pump Comp

Increase	91.8
Decay	19.6
Dead Band	2.7
De-activate Over	-0.37

Ms	Water	Air	Batt	Pot
1.853	91	24	13.25	0.00

- Battery Voltage:

These values are set by us to default values which we have tested and found to be quite universal to all injectors. These values should not normally need to be changed unless you can thoroughly test that the values are incorrect. Do not change these values unless you are sure you know what to look for.

- Water Temperature Compensation:

These values have also been set to default values and have been found to be quite universal. If you wish to changes these

values then be sure that you only set these values after you have calibrated the sensors and have tuned the fuelling map completely. When setting these values, wait till the car is cold, start it, look at the current water temperature and set the corresponding value to the smallest value that allows the motor to run smoothly. As the car warms up, set the following values till the car is warm.

- Air Temperature Compensation:

Same as the water and battery maps, these values have been carefully chosen to how air behaves to heating and cooling. The Air temperature sensor is the final part of the fuel injection system that provides the best fuel economy and smoothness figures the system will see.

 If there is no air temperature sensor connected then these values should be all set to zero before any tuning is done.

- Throttle Pump Compensation:

 Increase:

This value is the amount of extra fuel the ECU will add when the throttle is quickly pressed. The ECU has an intelligent algorithm that watches how fast and how much the throttle is pressed. It then decides how much extra fuel to add according to the value you set here.

 Decay:

This is the rate at which the extra fuel added will return back to normal. The smaller the number the quicker the fuel returns to normal.

 Dead Band:

The dead band is the amount the throttle has to be moved before the ECU activates the Throttle Pump routine. If this

value is too small, the Throttle Pump will activate even while the car is cruising or idling. If the number is too large, the Throttle Pump function will not be activated.

De-Activate Over:

This value is the point at which the ECU will stop looking for throttle changes. Normally this value is set slightly lower than the atmospheric value. Try not to set this value to a value in boost as unpredictable results could appear that you might not see on the road.

• Working with the Fuel Maps

Fuel	-1.00	-0.87	-0.75	-0.62	-0.49	-0.37	-0.24	-0.11	0.02
7000	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
6250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
5500	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
4750	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
4000	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
3250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
2500	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
1750	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
1000	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
750	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000

All Ranges Up   Injector Duty Cycle = 90.06

RPM	Map	Ms	Ign	Wat	Air	Batt	Pot
3225	0.01	9.006	25.9	999	19	15.94	0.00

- <u>How to Navigate through the Map:</u>

There are two styles of fuel map display. The first is the numeric grid, and the second is the graphical floating balls with lines joining them. No matter which one you use, the keystrokes are identical.

The main difference between the two maps is the graphical map is easier to visualize. The numerical map shows you the entire map at once allowing you to see the values in the RPM ranges around where you are tuning.

If you wish to move left and right through the map (through the load sites), it is simply the left and right arrow. Simple enough. If you need to move up and down through the RPM ranges, then the "N" and "P" keys will be used. "N" stands for Next Range and "P" stands for Previous Range.

- <u>How to Tune or Change the Fuel Values in the Map:</u>

If you wish to add more fuel use the up arrow to add a little amount more, or PgUp to add huge amounts. The PgUp key is to allow you to get the values close to where you need to be and the up arrow is then for fine tuning.

If you would need to do any super-fine tuning, then use Shift-Up Arrow for half size changes and Alt-Up Arrow for 1/10th size steps. These super-fine steps are so small that most CO machines and AFR meters would not register a change.

If you wish to reduce the amount of fuel then the same would apply as to adding fuel but the keystrokes are:

    Down Arrow
    PgDn
    Shift-Down Arrow
    Alt-Down Arrow

Please remember it is good practice to start rich and lean out the mixture to what you desire than to start lean and richen to the desired value. This helps save the motor from being damaged. Please also read the "How to Tune" section to understand how tuning is performed on the Dicktator ECU.

- <u>Using the All Ranges Up Function:</u>

This function is a time saving function. The safest and easiest way to setup a fuel map is to take the car on a dyno and lock it at say 1750RPM and place the cursor block in the 1000 RPM range. To turn all ranges on/off you simple press Alt-A and a block will appear to show you it is active or not. The function makes all the values above the cursor block the same. So load the car at each load point in the 1750RPM range and set a slightly rich value for each. You have now built yourself a nice starting point to map from.

Working with the Ignition Maps

Ignition	-1.00	-0.75	-0.49	-0.24	0.02
7000	33.0	33.0	33.0	33.0	33.0
6250	32.0	32.0	32.0	32.0	32.0
5500	31.0	31.0	31.0	31.0	31.0
4750	30.0	30.0	30.0	30.0	30.0
4000	30.0	30.0	30.0	30.0	30.0
3250	26.0	26.0	26.0	26.0	26.0
2500	24.0	24.0	24.0	24.0	24.0
1750	16.0	16.0	16.0	16.0	16.0
1000	12.0	12.0	12.0	12.0	12.0
750	12.0	12.0	12.0	12.0	12.0
250	12.0	12.0	12.0	12.0	12.0

All Ranges Right

RPM	Map	Ms	Ign	Wat	Air	Batt	Pot
3230	0.01	9.008	25.9	999	19	15.94	0.00
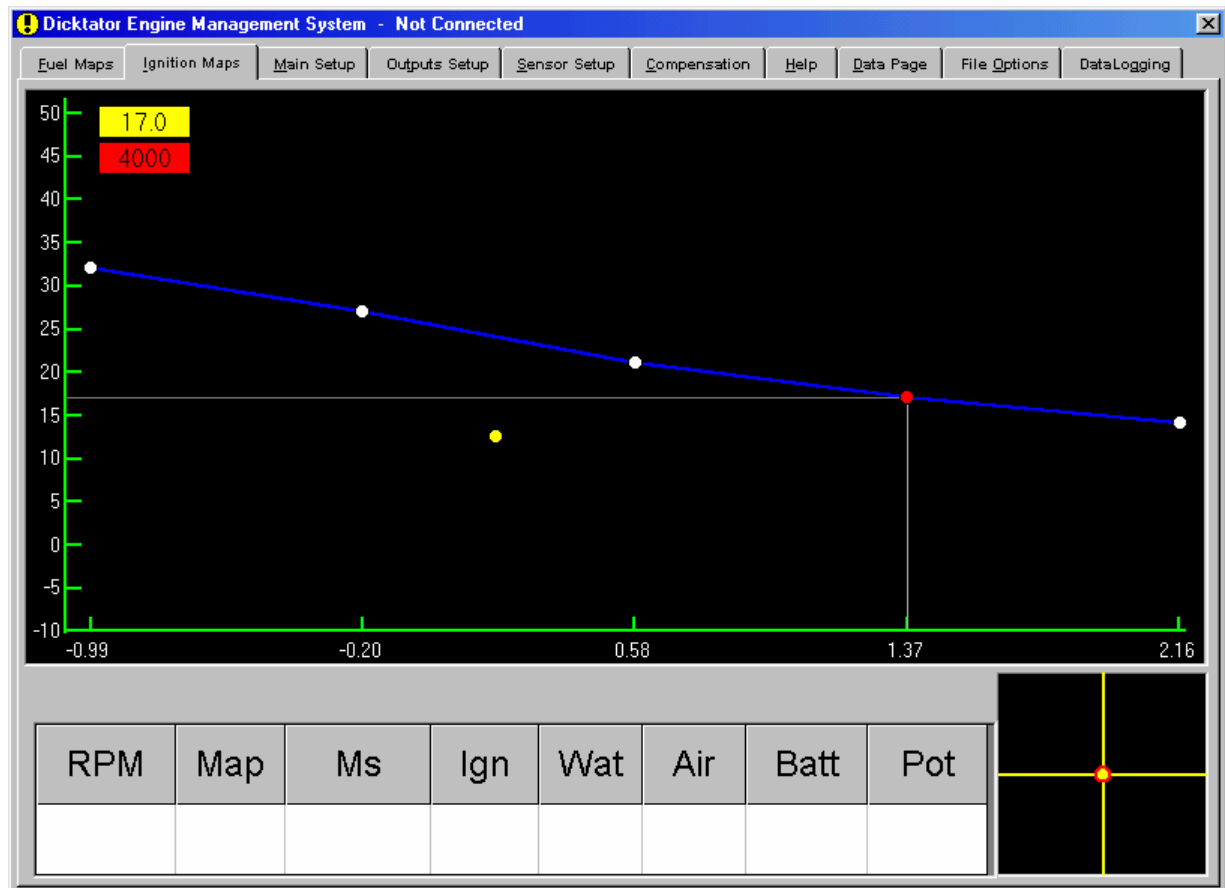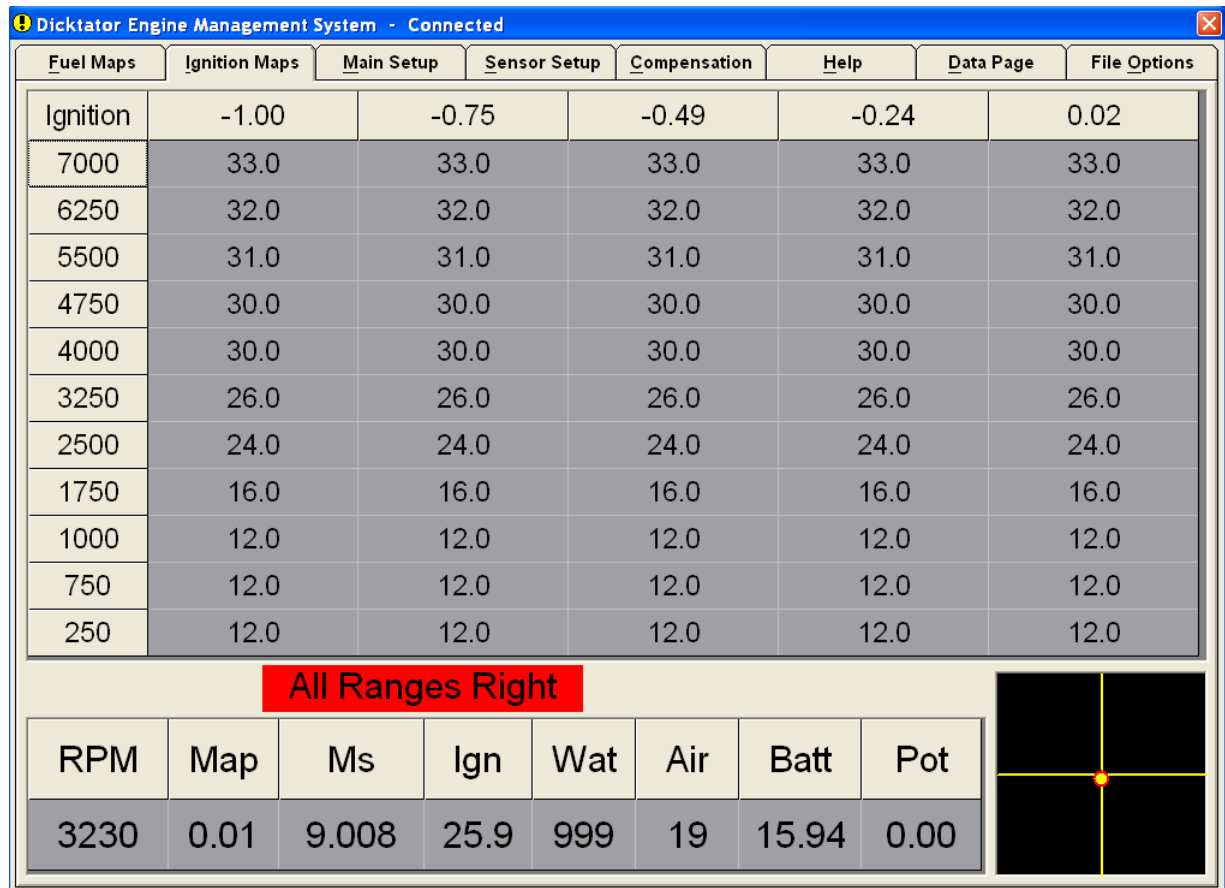
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- <u>How to Tune or Change the Fuel Values in the Map:</u>

If you wish to add more ignition timing use the up arrow to add a one degree, or PgUp to make big jumps of 3 degrees. The PgUp key is to allow you to get the values close to where you need to be and the up arrow is then for fine tuning. Please be careful of detonation!!

If you would need to do any super-fine tuning, then use Shift-Up Arrow for half size changes of 0.5 degrees. These super-fine steps are also very small that most dynos would not register a change in power. Generally 0.5 degree steps would be an overkill.

If you wish to reduce the amount of ignition timing then the same would apply as to adding ignition timing but the keystrokes are:

Down Arrow
PgDn
Shift-Down Arrow

Please remember it is good practice to start with slightly retarded timing and add timing until you notice no power gain with each degree or hear detonation. There is no point in running over advanced timing if you don't gain power. But running the timing over advanced will strain the motor excessively. So, rather save motor life from being unnecessarily shortened. Please also read the "How to Tune" section to understand how tuning is performed on the Dicktator ECU.

- Using the All Ranges Left Function:

This function is a time saving function. To turn all ranges on/off you simple press Alt-A and a block will appear to show you it is active or not. The function makes all the values to the left of the cursor block the same. Load the car at full throttle at say the 1750 RPM range and set the timing so that you achieve best power at that load site.(Remember to start low and work your way up) Move the cursor on the load site to the left of that block and drive the car at that site. Adjust that site and move to the left until you are finished with that RPM range. After the 1750 RPM range you can move to the 2500 RPM range and start at full throttle. Continue until the complete map is completed.

3. How to Tune

- ## What are the Crosshairs used for?

The Crosshairs are located at the bottom right of the fuel and ignition maps screen. They are the only way for a tuner to know if he/she is EXACTLY on a tuning site. The crosshairs are required because of the built in interpolation in the engine management system. I need to stress this point: **You will not tune a car correctly if you do not use the crosshairs!!!!!** The more accurate the engine management system the more accurate the tuning tools must become.

The crosshairs show the tuner where on the map he/she is. If the Dot is below the horizontal line then the engine is running slightly slower than the closest RPM range. If it's above then the engine is running slightly faster than the closest RPM range. You will have to adjust the speed on the dyno to get the dot on the horizontal line.

Once you have done that, you will need to check if the dot is to the left or right of the vertical line. If it's to the left, then you will need to press the throttle more till it is in the center of the crosshairs.

When its there, you can now tune that load site. The load site that the crosshairs are showing is the red block that moves around the map. To tune that site you will need to move the Tuning block over the red block so that the red block is now hidden. Use the left arrow, Right arrow, "N" and "P" to move the tuning block.

- ## What is Interpolation?

Interpolation is an algorithm in the engine management system that calculates all the extra fueling and ignition points that are not tuned by the user. This helps speed up the tuning

process due to fewer sites to tune and also helps with the smoothness of the drivability of the car. Because of interpolation, you have to use the crosshairs to make sure you are exactly on a site to tune it. Otherwise it will use some of the surrounding values to calculate the actual value.

- ## What Keys are used?

Up Arrow - Standard Tuning Increment
Down Arrow - Standard Tuning Decrement
Shift-Up Arrow - Fine Tuning Increment
Shift-Down Arrow - Fine Tuning Decrement
Alt-Up Arrow - Super Fine Tuning Increment
Alt-Down Arrow - Super Fine Tuning Decrement
PgUp - Large Tuning Increment
PgDown - Large Tuning Decrement
Left Arrow - Navigate Left
Right Arrow - Navigate Right
N - Next RPM Range
P - Previous RPM Range
L - Start/Stop Data logging
Tab - Change from one feature to the next

Alt-A - Enable All Ranges Up/Right
Alt-L - Enable Live Tuning Feature
Enter - Insert Live Tuning Fuel Value

- ## Tuning the Fuel Maps

Although the fuel maps are number based maps, tuning is still very easy. The number style allows the user to see the entire map at one time, not just one RPM range. This can easily show if there is an unusual number in the map that would need checking. To change values in the map does not require you to type numbers in, but to use the up and down arrows only. Therefore no time is wasted on the dyno.

- ## Tuning for Fuel Economy

Tuning for economy will depend on what type of setup your engine is running. For example: Normally aspirated or Turbocharged. On a normally aspirated car it is advisable to use the 17 load sites option to achieve the best fuel economy. Using this method you would tune up to approximately -0.33 to -0.39 to an Air Fuel Ratio (AFR) of 14.7 or CO% of 0.35%.

On a turbo car, you should tune the car slightly richer to help cool the motor and turbo that little bit extra. An AFR of 14.4 or CO% of 0,7% will be appropriate. On a turbo engine you can tune the first 25% of maximum boost to an AFR of approximately 13.7 or a CO% of 1,5% CO. Higher than that and you need to tune for power and richer values.

- ## Tuning for Power

When it comes to tuning for full power, you need to look at the mixtures you are running as well. On a normally aspirated car, full power AFR will be around 13.5 – 13.0 and CO% around 2.8% to 3.8%.

On a turbo car, the mixtures will be considerably higher, again for cooling. At full boost the AFR should be around 12.5 – 11.5 and CO% of 5% - 8% depending on how powerful the motor is and how much safety margin you are willing to run. Rather sacrifice 3 or 4 kW for a safer running engine. The richer mixture is safer.

- ## Tuning the Ignition Maps

Like the fuel maps, the ignition maps are also a number display. When tuning your car, it is advisable to tune the fueling side first. But you will need to put in a basic map first to run the car. Make sure that you have setup the trigger angle to get the timing on the motor and the timing in the maps the same. Now put in a timing map that is conservative

into the map for tuning the fuel. Once the fuel is tuned then you can come back the timing and fine tune it.

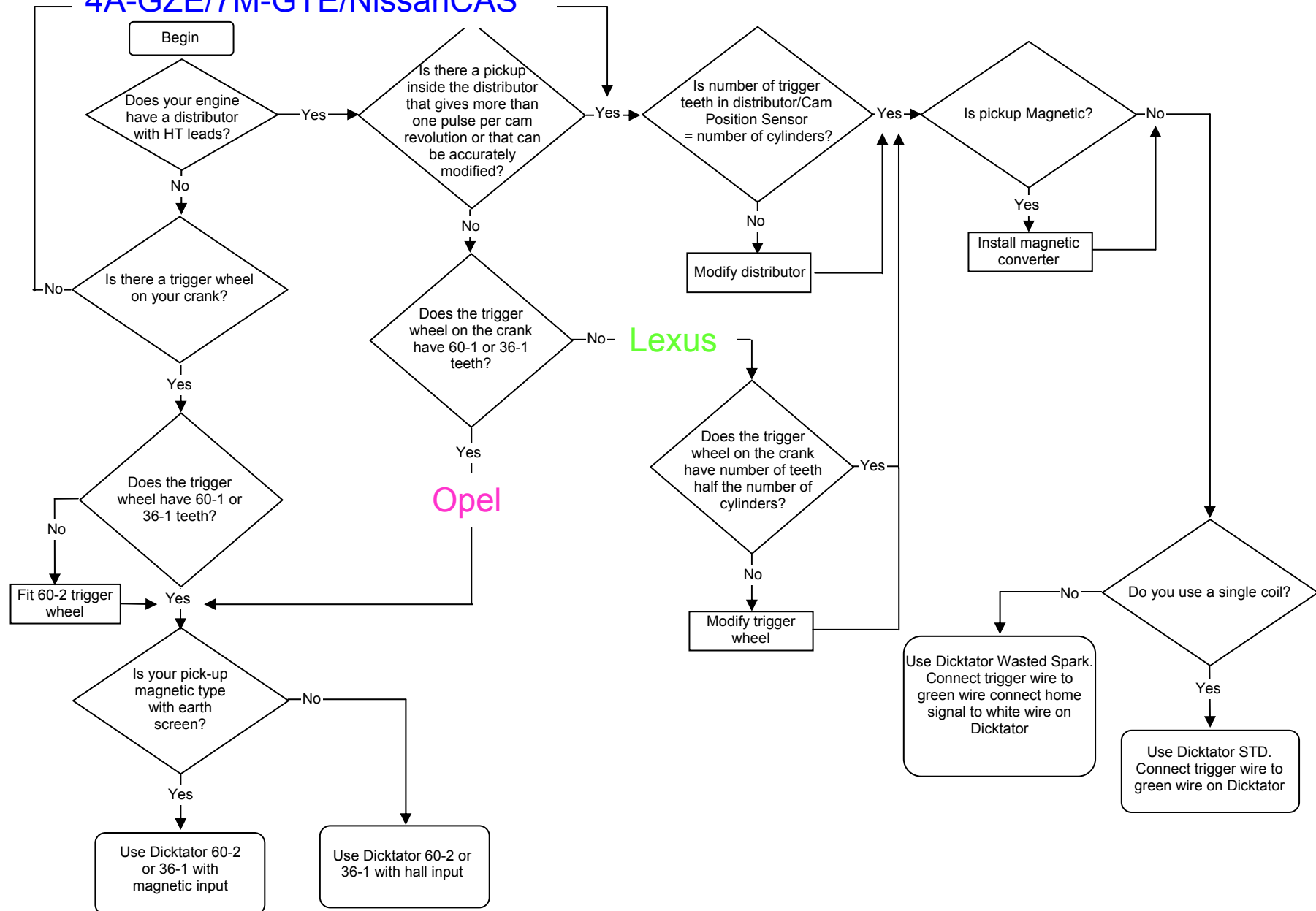## • <u>What is Detonation</u>

Detonation is most probably the biggest killer of turbo motors today. You need to be very careful in tuning a turbo motor. If you advance the timing too much the car will detonate and your motor will be destroyed before the day is finished.

The main causes for detonation are, too high boost pressures, not using high octane fuel and too far advanced ignition timing. When tuning your ignition maps, ALWAYS start with retarded timing and then advance the timing slowly. Watch the power figures on the dyno while you are doing this. If you advance the timing 1 degree and notice no or very little power gain, rather retard the timing back that 1 degree and save your motor. On high boost car of today, it is recommended that the full boost figures be in the region of 20 to 24 degrees, depending on what the motor wants.

If at any point you are tuning and you hear detonation, release the throttle IMMEDIATELY!!

4. What Dicktator to use

Begin

Does your engine have a distributor with HT leads? — **Yes** → Is there a pickup inside the distributor that gives more than one pulse per cam revolution or that can be accurately modified? — **Yes** → Is number of trigger teeth in distributor/Cam Position Sensor = number of cylinders?

No (from distributor question) ↓
Is there a trigger wheel on your crank?

No → (connects to top left / 4A-GZE/7M-GTE/NissanCAS path)

Yes ↓
Does the trigger wheel have 60-1 or 36-1 teeth?

No → Fit 60-2 trigger wheel → **Yes**

Yes ↓
Is your pick-up magnetic type with earth screen?

Yes ↓
Use Dicktator 60-2 or 36-1 with magnetic input

No → Use Dicktator 60-2 or 36-1 with hall input

4A-GZE/7M-GTE/NissanCAS

Is there a pickup inside the distributor... — **No** ↓
Does the trigger wheel on the crank have 60-1 or 36-1 teeth?

No — **Lexus**

Yes ↓ **Opel** → **Yes**

Is number of trigger teeth in distributor/Cam Position Sensor = number of cylinders?

Yes → Is pickup Magnetic?

No ↓
Modify distributor

Does the trigger wheel on the crank have number of teeth half the number of cylinders? — **Yes** →

No ↓
Modify trigger wheel →

Is pickup Magnetic?

Yes ↓
Install magnetic converter

No ↓

Do you use a single coil?

No → Use Dicktator Wasted Spark. Connect trigger wire to green wire connect home signal to white wire on Dicktator

Yes ↓
Use Dicktator STD. Connect trigger wire to green wire on Dicktator

5. Wiring up the System

- ## Where to start

  - Determine if you are going to use TPS or MAP based fuel map
  - Do you have a high pressure fuel pump installed?
  - Check for fuel leaks.
  - Do you have a fuel pressure regulator installed?
  - Are your fuel injectors capable to cope with your power expectations?
  - Are your fuel injectors high or low impedance?
  - What type of signal does your rev counter use?

- ## Tools you will need

  Soldering Iron.
  Side Cutter.
  Multi Meter.
  Crimping Tool.
  Wire Stripper.
  Oscilloscope (Only for advanced trouble shooting)
  Heat Gun.
  Timing Light.
  Heat Shrink Tubing
  Solder.
  Insulation Tape.
  Pre insulated Terminals.
  Cable Ties.

- ## What potential problems to look out for

  - ### Engine earth

  It is very important that your engine is properly earthed. Some components and wiring might be damaged if an engine is cranked without a good earth.

Always connect the earth of the igniter directly to the engine.

- Spark Plugs

It is important to have the right sparkplugs fitted to your engine, especially if it is turbo or supercharged. Some high performance imported engines were never released in your country. It is quite possible that your local spares shop does not list your specific engine and thus do not know what the correct sparkplugs for your engine are.
Try http://www.ngk.com you should find the correct plugs for your engine there.
Remember that all sparkplug manufacturers don't use the same heat range numbering system. The following manufacturers use a higher number for a hotter plug:

- Bosch
- Champion
- Autolite
- Splitfire

The following manufacturers use a higher number for a colder plug:

- NGK
- Denso

Sparkplug fouling is a common problem with standalone engine management systems. Fouling is when the sparkplug firing tip becomes coated with excessive fuel, oil or combustion deposits so that it is unable to produce a spark. The sparkplugs are fouled because people use a very rich mixture to try and start the engine for the first time. The problem is aggravated if the ignition timing is way out. The solution is to check your timing with a timing light with the engine cranking before you connect the injectors. Once the engine is properly tuned there shouldn't be a problem with fouled sparkplugs any more.

- Throttle Position Sensors (TPS)

A TPS is connected to the throttle shaft to measure throttle openings. It normally has three connections. There are sensors with more than three connections but the extra connectors are normally for Closed Throttle or Wide Open Switches.

The TPS is a Potentiometer. One terminal is connected to the 5 V supply, one to –VE and the third is the signal. It consists of a resistor that is connected between the 5 V supply and the ground. The signal connection is a wiper that wipes onto the resistor and the voltage at the signal connection changes with the position of the wiper. The TPS must be connected in such a way that the signal voltage increases when the throttle is opened and decreases when the throttle is closed.

How to determine which wire is which?

The first step is to find the Supply and Ground terminal.
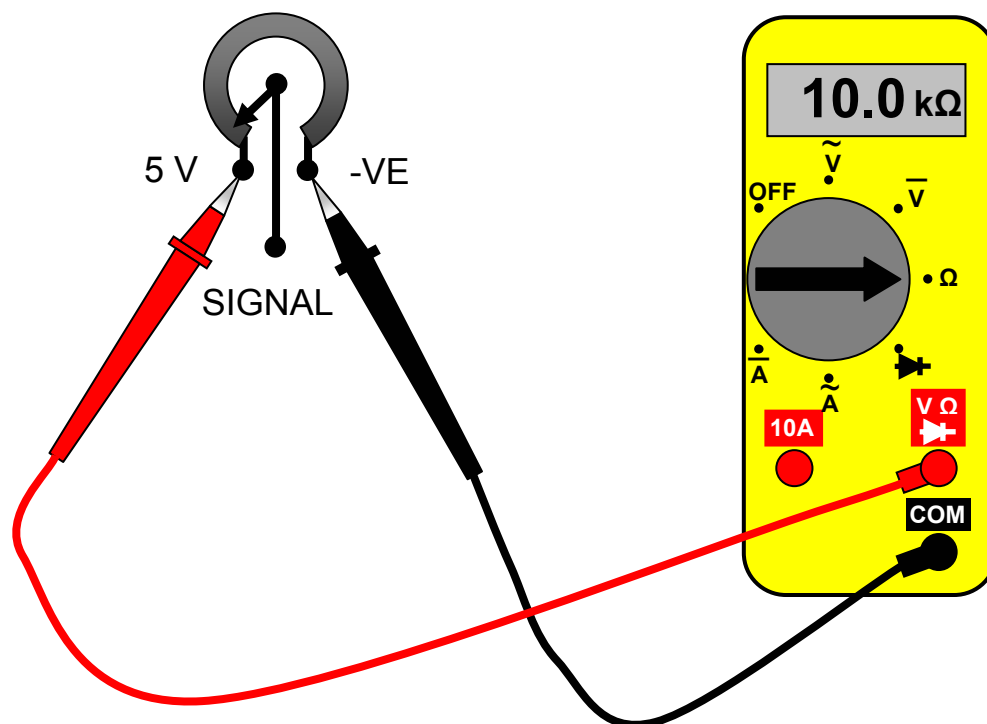
The value as seen on the multi meter (10 kΩ) is only an example and the Dicktator can be calibrated to accept a number of sensors. The value on the screen must not change when the TPS shaft is rotated.

The following two pictures show the tests and results when the throttle is fully open.
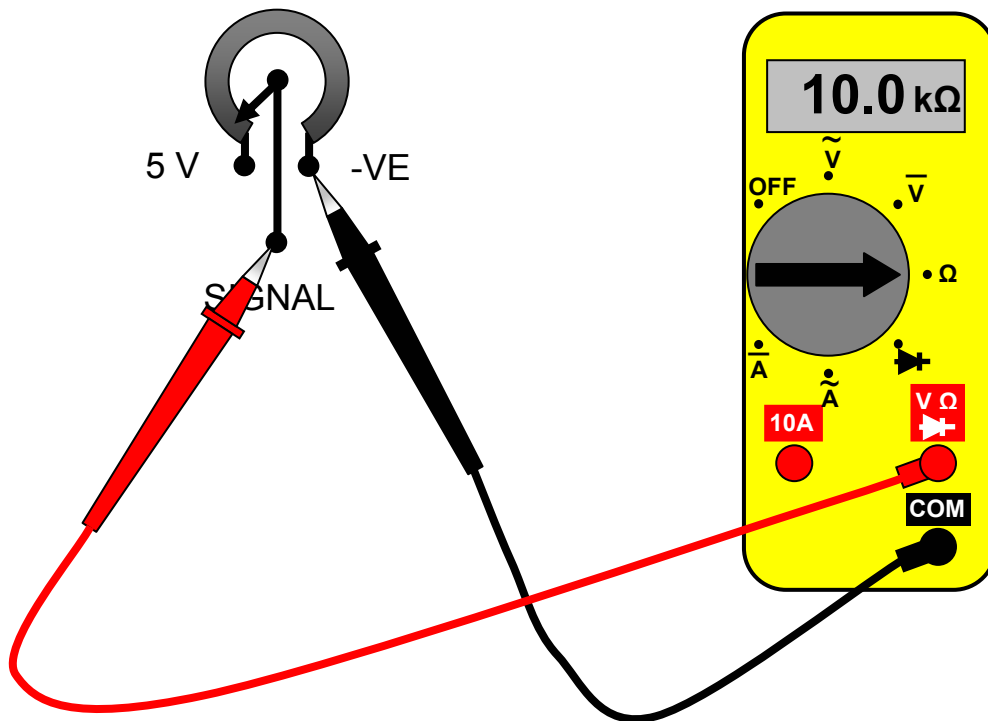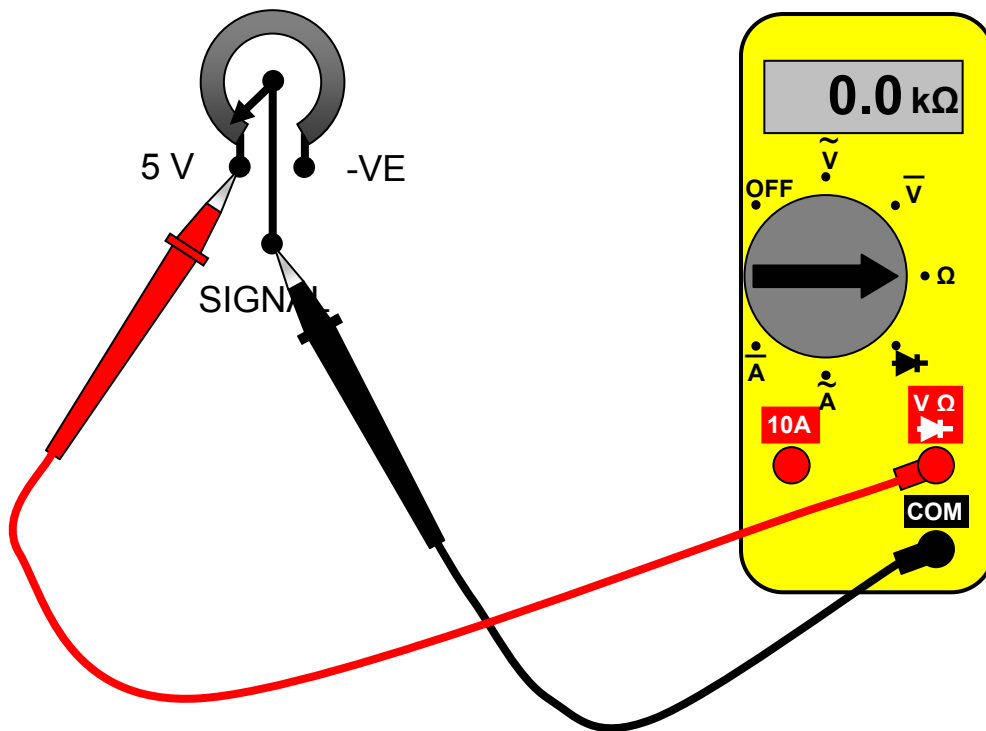
The following two pictures show the tests and results when the throttle is fully closed.
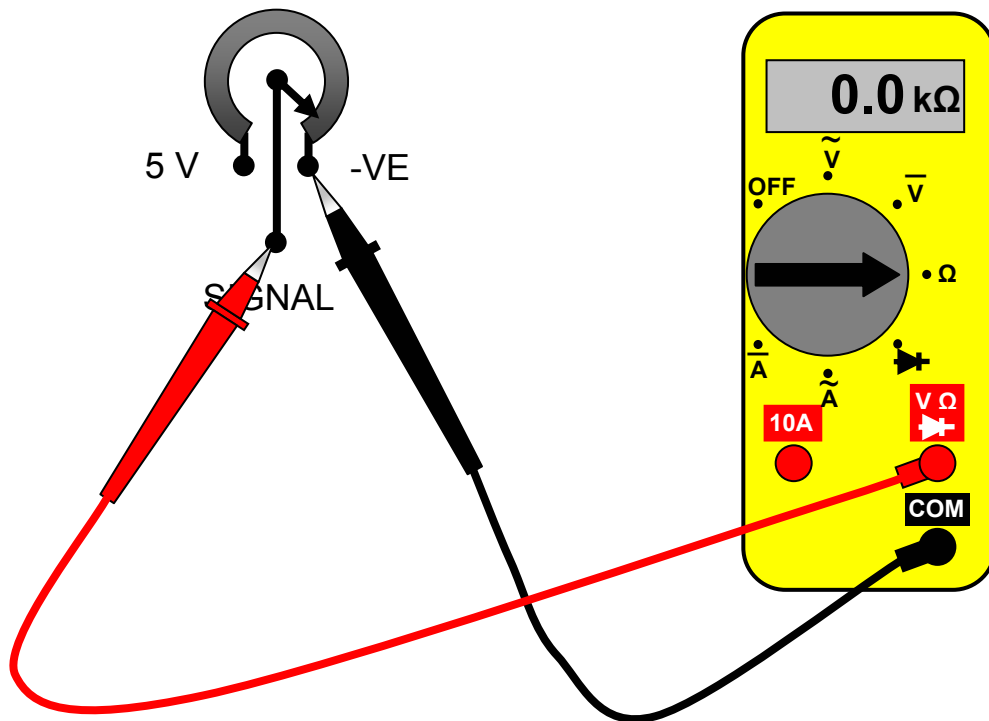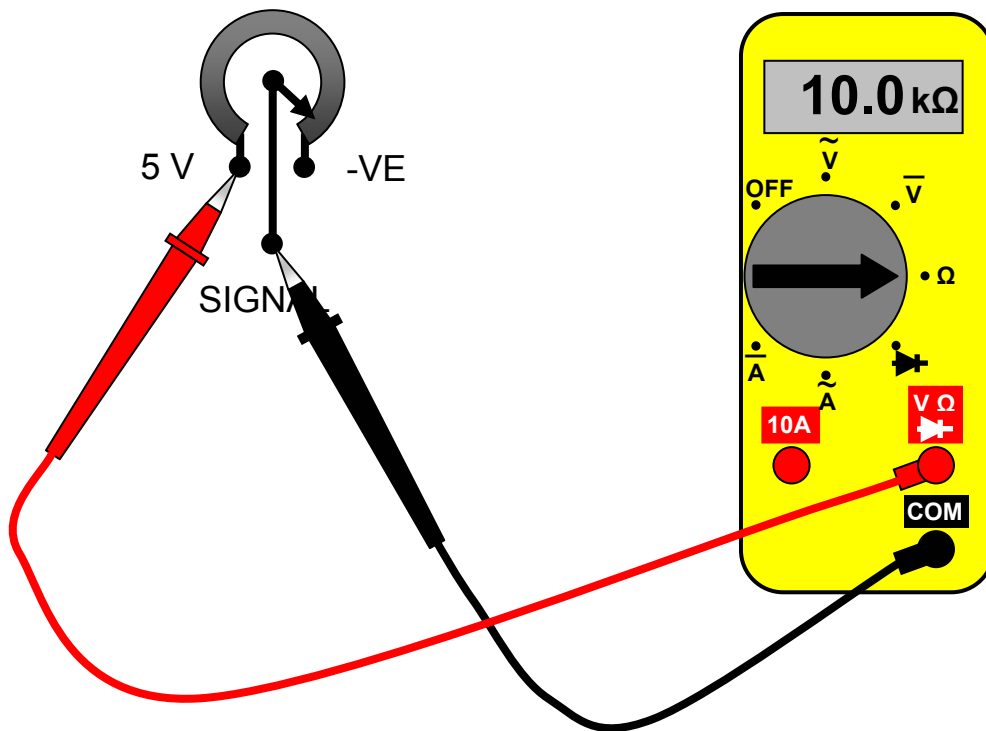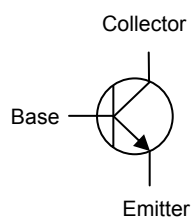
- <u>What type of pick-up do I need?</u>

The Dicktator Std and Wasted spark need a pull to ground (open collector) type of signal. What does that mean?
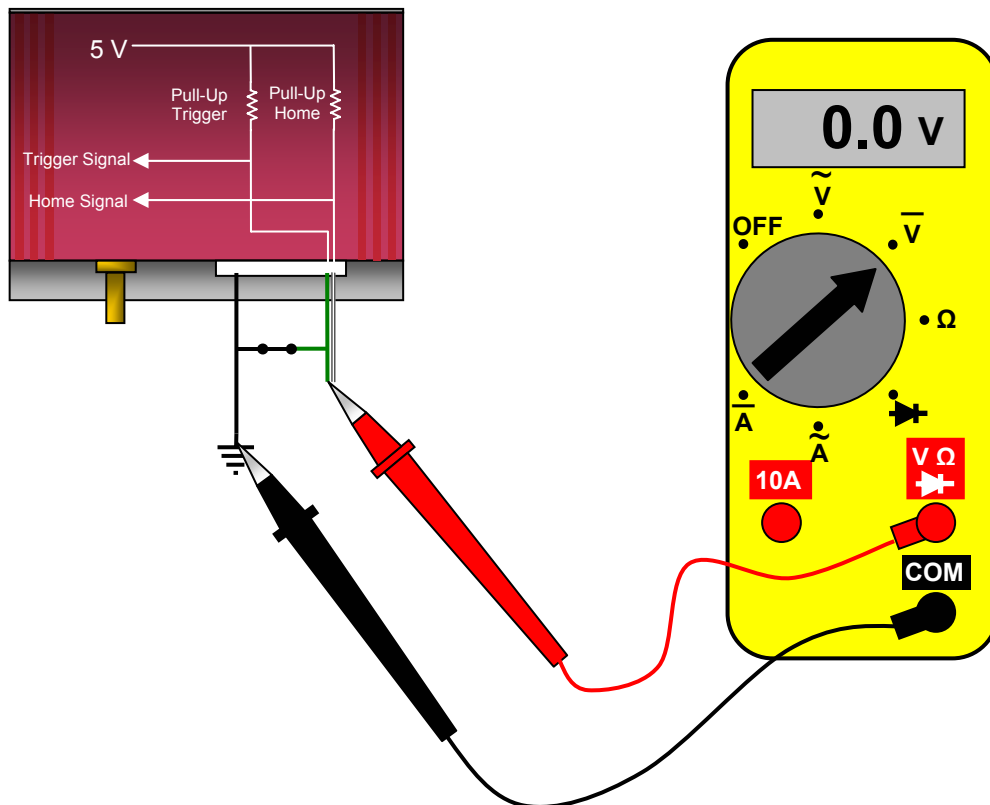
When voltage is measured through a resistor the supplied voltage is measured. The resistor is used to limit the current when the "switch" is turned on.
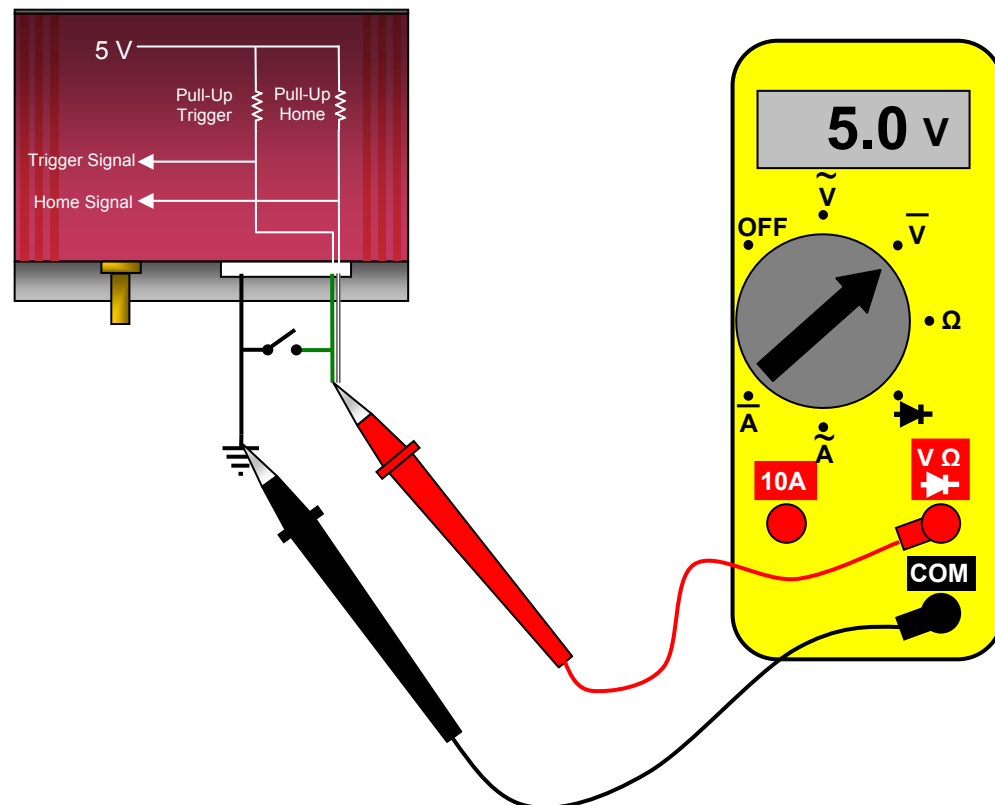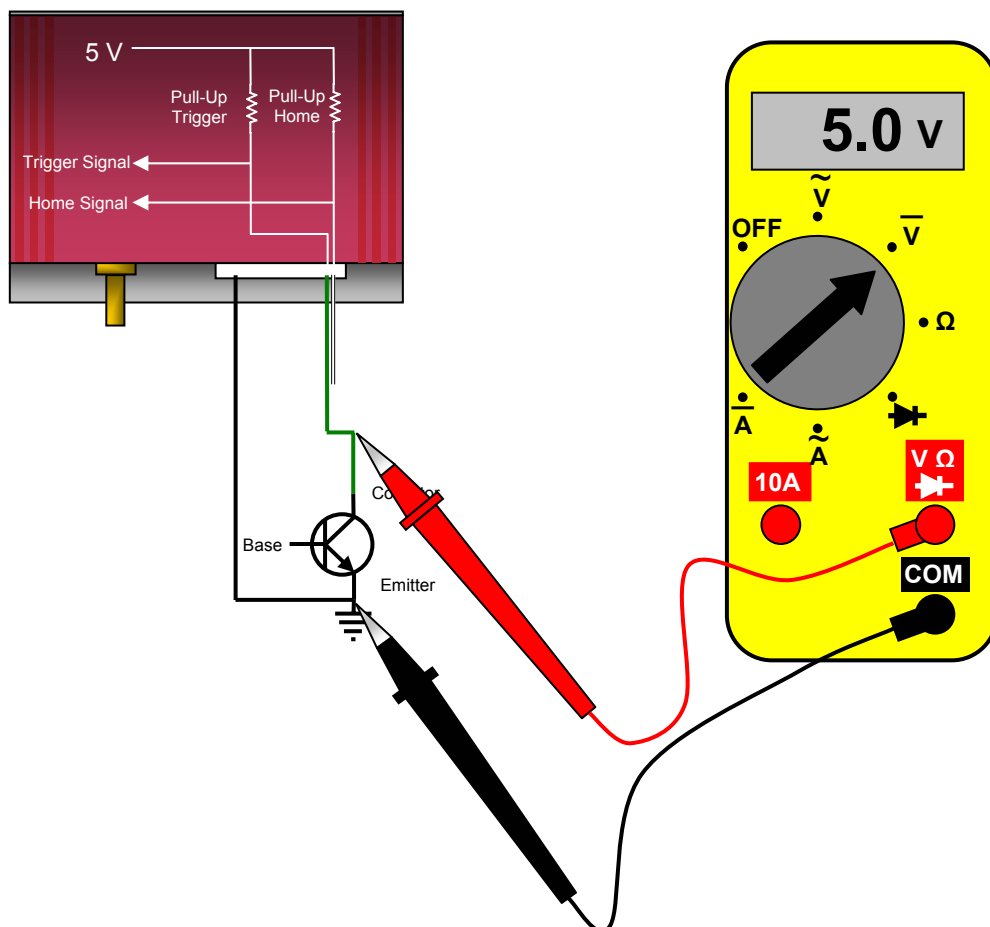

Bellow is the symbol for an "NPN" Transistor. The transistor acts as a switch in this application. The transistor is switched on and off by supplying voltage to the Base.

There is 0 Volt when the "switch" is in the on position.

5 V

Pull-Up
Trigger

Pull-Up
Home

Trigger Signal

Home Signal

0.0 v

$\sim \atop V$

OFF

$\overline{V}$

$\overline{A}$

Ω

$\sim \atop A$

10A

V Ω

COM

Transistor is switched off.

5 V

Pull-Up
Trigger

Pull-Up
Home

Trigger Signal

Home Signal

Collector

Base

Emitter

5.0 v

$\sim \atop V$

OFF

$\overline{V}$

$\overline{A}$

Ω

$\sim \atop A$

10A

V Ω

COM

Transistor is switched on.
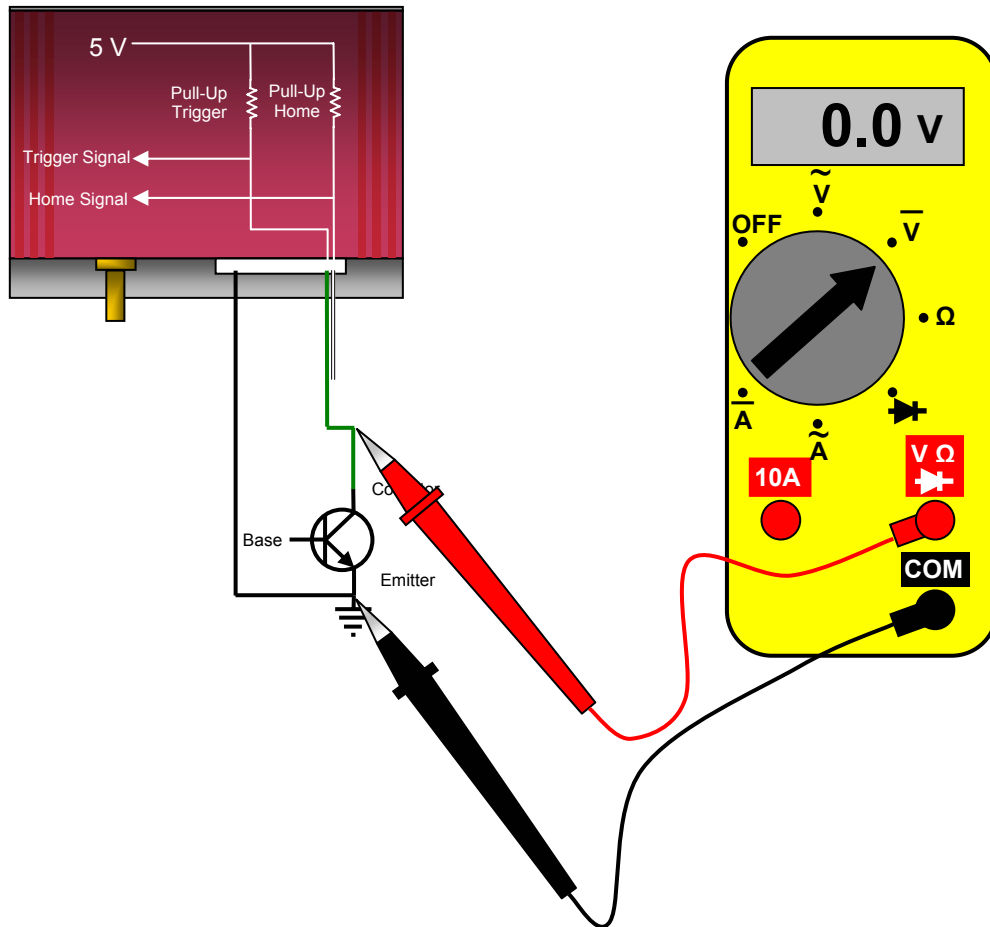
The output, as measured on the green trigger wire will look like this if the base of the transistor is pulsed by a rotating pick-up.

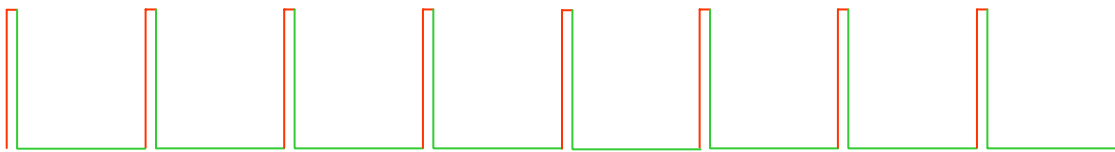The red line shows the transistor switched off and the green line shows the transistor switched on.

Hall Effect and Optical pickups are open collector type and don't need any modifications.

- <u>What type of pick-up do I have?</u>

There are three common distributor types in use:
- o Hall Effect (German manufacturers)
- o Optical (Nissan Mazda Mitsubishi)
- o Magnetic (Toyota GM)
- o Coil Negative

Bellow is examples of what a Hall Effect sensor looks like. They need a Power Supply of 9V or 12V and Ground to function correctly.

Typical chopper blade for Hall sensor

Bellow is an example of what an Optical sensor looks like. They need a Power Supply 5 V and Ground to function correctly.
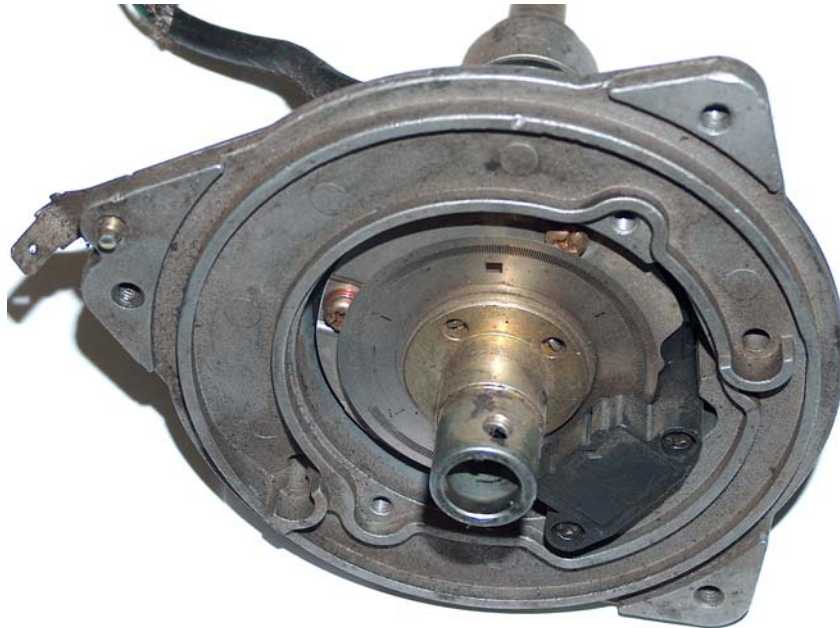
Below is a Nissan Crank angle sensor. Note the uneven slots on the trigger disk. Trigger disks with even spaced slots are available from your Dicktator agent for four and six cylinder Nissan engines.

Bellow is examples of what Magnetic sensors look like. They need a magnetic converter to function correctly. The best way to identify them is by looking for a coil in the pick-up. They do not need a Power Supply but must be grounded

GM Style Magnetic Pick-Up
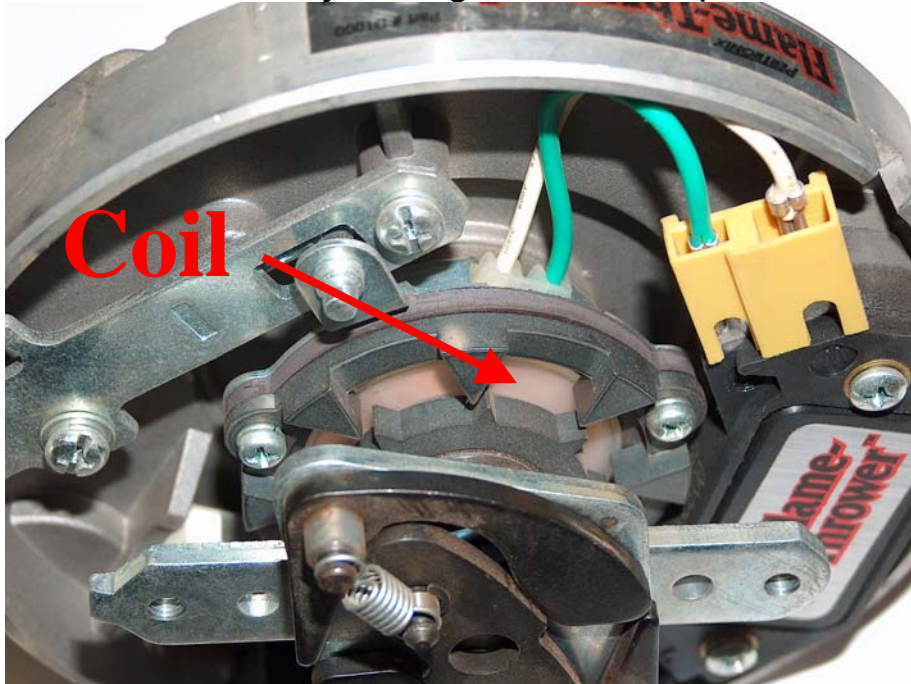
Toyota Style Magnetic Pick-Up
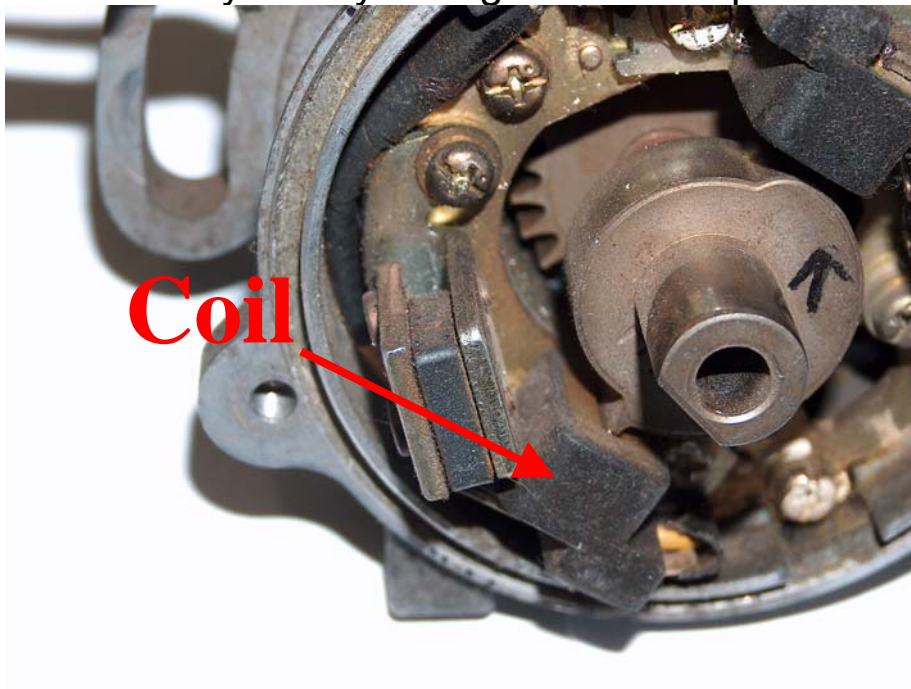
The above picture shows a Toyota Trigger wheel with 24 teeth. Below is a replacement Trigger wheel for a four cylinder Toyota with distributor. They are available for four and six cylinder engines. Contact you Dicktator agent for your requirements.

When you are using coil negative as trigger, you need to open the cover of the Dicktator. Use solder and join the two patches on the PC board.
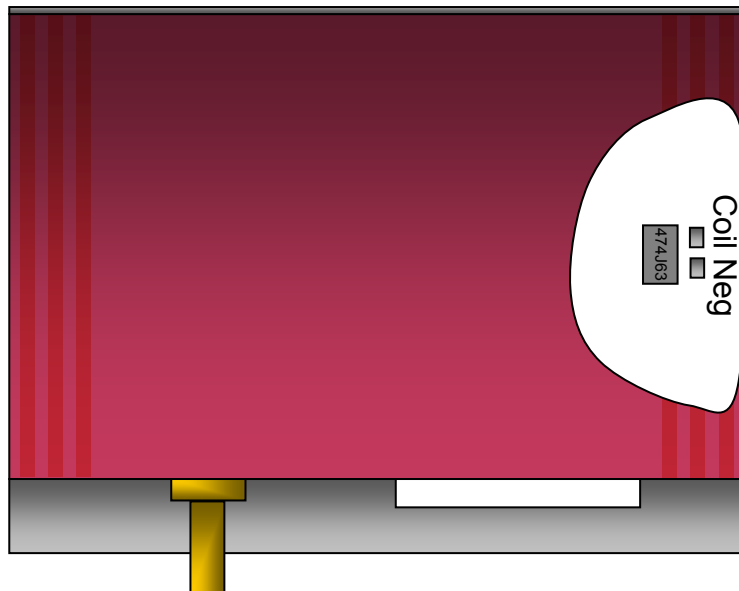
- <u>Do I need a magnetic converter?</u>

Only the magnetic type pick-up needs a magnetic converter to function correctly. There are different types of magnetic pick-ups. All the magnetic converter does is to convert a magnetic signal into an open collector type signal. Bellow is an example of a magnetic signal and what it looks like after it has been converted. *The 60-2 box with magnetic input doesn't need magnetic converters.*
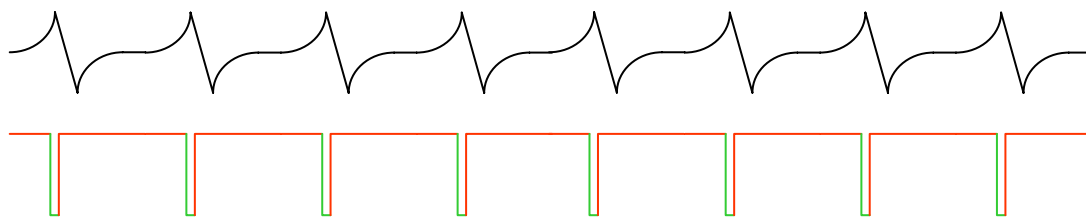
There are two common crank angle sensors in use:
- o Hall Effect (Mostly Siemens)
- o Magnetic (Bosch)

As a general rule the sensor plug will indicate what type it is.

Siemens (Hall)
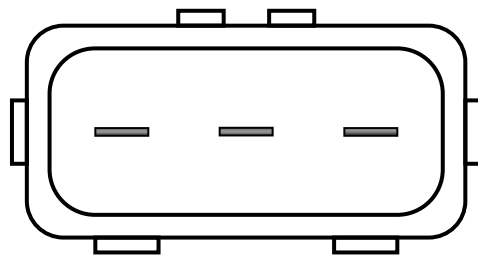
Bosch (Magnetic)
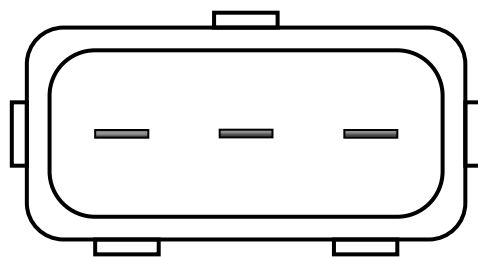
- Fuel pumps

If the car you are modifying was fuel injection before the modifications you shouldn't have a problem with your fuel pump. If the car was equipped with a carburetor or was running on Diesel before the conversion, it is very important to understand the following. Owners of very high output engines who need to modify the fuel supply to cater for the engines requirements should read as well.

At the coast water boils at 100°C and on top of Kilimanjaro water boils at 81°C…….SO WHAT?

The boiling point of a liquid is the temperature at which the vapour pressure of the liquid equals the environmental pressure surrounding the liquid. A liquid in a vacuum

environment has a lower boiling point than when the liquid is at atmospheric pressure. A liquid in a high pressure environment has a higher boiling point than when the liquid is at atmospheric pressure. In other words, the boiling point of liquids varies with and depends on the surrounding environmental pressure.

In short that means that your fuel pump should pump the fuel and not suck it:

- o Fit your fuel pump as close as possible to your fuel tank.
- o Fit your fuel pump below your fuel tank.
- o Reduce any pressure drops before the pump.
- o Shield your fuel pump and plumbing from heat.
- o Fit Fuel filter before the pump to protect the pump.
- o Fit high pressure filter after the pump to protect injectors.
- o Prevent suction from the top of the fuel tank.

If your metal fuel tank have to be modified to take suction from the bottom it can normally be done by your local radiator repair shop.

- Where to Dyno?

Very controversial question as you can imagine.
There are however a few things to look out for, to help you finding the right tuner for your car:
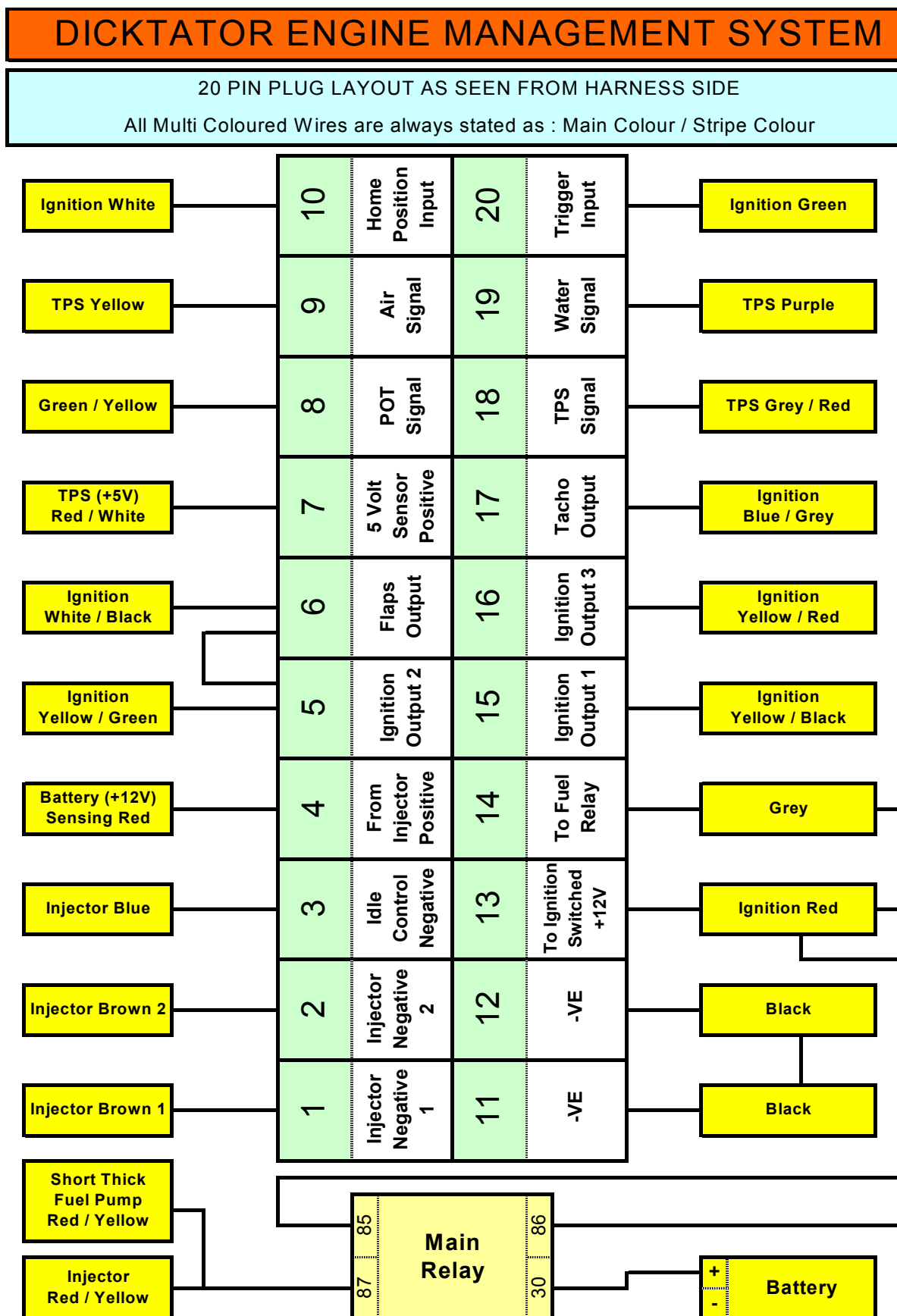
- o Does the tuner have a good quality *LOADING* dyno?
- o Does the tuner have a proper Air/Fuel ratio meter and not one of the cheapies that uses a narrowband lambda sensor? (LSM 11 excluded)
- o Does tuner have a 4 or 5 gas analyzer? (It is very important to spot problems during the tuning)
- o Does the tuner have a proper cooling fan with motor of at least 5 kW?

Connecting up the ECU

- Read and understand this manual.
- Disconnect your car's battery negative.
- Unplug the harness connector from the Dicktator.
- Locate the ECU, ensuring that the wiring harness is long enough to reach all components.
- Locate it away from any heat sources and prevent it from getting wet.
- Feed wires through firewall and protect the wire insulation against rubbing against the sharp metal edges by using rubber grommets.
- Feed vacuum/boost sense pipe through same grommet.
- Connect vacuum pipe to the inlet manifold. Pipe must be connected so that it senses manifold pressure with throttle fully closed and not only when throttle is partially open. (Do not connect vacuum pipe if TPS based map is used)
- The Dicktator wiring harnesses are supplied without any fuses. It is recommended that you fit a fuse at the positive power connection (20 Amp). A fuse can also be installed in the power supply to the fuel pump.
- Crimp pre insulated terminals to the thick red and thick black wires and connect it to the battery terminals.
- Find the original power supply to the coil and connect the thin red wire to it.
- Connect the harness connector to the Dicktator.
- Switch the ignition on.
- The red LED on the Dicktator should now be on.
- Now is a good time to connect your Laptop to the Dicktator and see if there is power. The Coil charge mode i.e. Constant charge time or constant duty percentage must now be set.
- Very important is to set the coil trigger edge as well before the coil is connected.
- Switch ignition off.
- Disconnect the battery negative.

- Extend the short red/yellow wire to the fuel pump, crimp a terminal onto it and connect the positive (Use wire of similar gage or thicker)
- Connect the fuel pump negative with similar gage wire to good earth.
- Connect the long red/yellow wire to all the positive sides of the injectors (The positive side is the side that is normally common on the original harness).
- Connect half the injectors to the one output (brown wire) and the rest of the injectors to the other brown wire
- Connect the purple wire to one side of the water temp sensor and a thin black wire to the other side.
- Connect the yellow wire to one side of the air temp sensor and a thin black wire to the other side. (The air temp sensor is not an absolute requirement for normally aspirated engines).
- Connect the TPS:
    o Red/White 5 V - positive
    o Gray/Red or Gray/Blue - signal
    o Thin Black – negative
- Connect the green trigger wire to the distributor or crank angle sensor. (See installation drawings)
- Connect the white home signal wire to the cam sensor or to the distributor with home signal. (Only required if wasted spark box is used)
- Connect ignition output to igniter or directly to coil if internal igniter is used.
- Determine if rev counter uses coil negative or 5 V signal. Connect rev counter to blue/grey wire if 5 V signal is used. If a wasted spark engine is fitted into a car that had a coil negative rev counter and the original rev counter is used, you might need a rev counter booster/adapter.
- If there is cam control or a flap, connect relay or VTEC driver. (See installation drawings)
- Connect the blue wire to one side of an idle control motor and injector positive to the other wire. (Three wire types can also be used????)

ECU Plug pin functions and wire colours diagram

DICKTATOR ENGINE MANAGEMENT SYSTEM

20 PIN PLUG LAYOUT AS SEEN FROM HARNESS SIDE

All Multi Coloured Wires are always stated as : Main Colour / Stripe Colour

Left Wire	Pin	Function	Pin	Function	Right Wire
Ignition White	10	Home Position Input	20	Trigger Input	Ignition Green
TPS Yellow	9	Air Signal	19	Water Signal	TPS Purple
Green / Yellow	8	POT Signal	18	TPS Signal	TPS Grey / Red
TPS (+5V) Red / White	7	5 Volt Sensor Positive	17	Tacho Output	Ignition Blue / Grey
Ignition White / Black	6	Flaps Output	16	Ignition Output 3	Ignition Yellow / Red
Ignition Yellow / Green	5	Ignition Output 2	15	Ignition Output 1	Ignition Yellow / Black
Battery (+12V) Sensing Red	4	From Injector Positive	14	To Fuel Relay	Grey
Injector Blue	3	Idle Control Negative	13	To Ignition Switched +12V	Ignition Red
Injector Brown 2	2	Injector Negative 2	12	-VE	Black
Injector Brown 1	1	Injector Negative 1	11	-VE	Black

Short Thick Fuel Pump Red / Yellow

Injector Red / Yellow

Main Relay — 85 / 86 / 87 / 30

Battery + / -

- ## What igniters to use

- ### Processor Controlled Ignitions (Smart Igniters)

Earlier type igniters are known as intelligent igniters. They have a processor inside the igniter to control things like charge time, rev limiters and immobilizers. The most popular of the intelligent igniters is the "TP 100". It was standard equipment on some German manufactured vehicles. Beware of the ones with the gray plastic cover, they are equipped with immobilizers and the pin configuration is different. When an intelligent igniter is used, it is preferred to set the Dwell Control to Constant Duty Percentage of 50%.

- ### Dumb Igniters

Modern igniters are all triggered from the car's ECU. The charge time of the ignition coils are controlled by the ECU and there is no processor inside the igniter. Great care should be taken when these are used because if the wrong Spark Trigger Edge is selected the igniter and ignition coil will most definitely be damaged. The Dwell Control is set to Constant Charge Time. Start with a low value of ± 2 ms. and increase this value if needed.

- ### Preferred Igniters

Dicktator manufactures a range of igniters. They are all Dumb igniters with current limiting. It is recommended that a Dicktator igniter is used together with your Dicktator ECU.

- ### Dicktator's Single, Twin, Triple and Quad Igniters

Dicktator manufactures igniters with 1, 2, 3, and four ignition channels. All the Dicktator igniters use the falling Spark Trigger Edge.

- <u>No Igniter Required</u>

In some cases the igniter is incorporated inside the ignition coil. In these cases an igniter is not required. Examples of ignition coils with internal igniters are:
- o Volkswagen COP coils with 4 pins.
- o New Volkswagen Polo with wasted spark coil.
- o Older Opel Corsa with wasted spark coil.

6. Glossary

AFR   -   Air/Fuel Ratio

ATDC   -   After Top Dead Center

BAC   -   Bypass Air Control

BTDC   -   Before Top Dead Center

COP   -   Coil On Plug

ECU   -   Engine Control Unit (Dicktator Box)

EMI   -   Electromagnetic Interference

IAC   -   Idle Air Control

IGN   -   Ignition

LED   -   Light Emitting Diode

MAP   -   Manifold Absolute Pressure

ms   -   Milliseconds

NOS   -   Nitrous Oxide

PC   -   Personal Computer

POT   -   Potentiometer (Electronic)

PWM   -   Pulse Width Modulation

RAM   -   Random Access Momory

RPM   -   Revolutions Per Minute

TDC   -   Top Dead Center

TPS   -   Throttle Position Sensor

VGA   -   Video Graphics Display

VTEC   -   Variable Valve-Timing and Lift Electronic Control

WAT   -   Water