

Dyno Plus - Instructions for use:

Thank you for choosing Dyno Plus. Dyno Plus comprises a battery powered Dyno Plus accelerometer recorder, RACE software for download / analysis and and DynoLog software for capturing data live.

Warning!

As with any product for use within a vehicle, **DO NOT attempt to operate Dyno Plus or any attached PC while the vehicle is in motion. Do not allow testing to distract from full concentration on the road.**

This product is designed for motorsport use only and not whilst on public roads.

GAA will not be held responsible for any accident howsoever caused when using this product.

The safest way to use this and similar products is for a passenger to operate the device without distracting the driver.

Dyno Plus - What does it do?

Dyno Plus measures power and torque, cornering forces, handling and braking efficiency.

With Dyno Plus you can tune your engine, powertrain, tyres, handling setup and brakes!

Power / Torque:

A dynamometer is basically a device that measures the amount of power being developed by an engine. A good dyno can analyse the entire power band of any engine and present the user with the results in some type of readable format. In the past, if you wanted accurate information about the performance of your automobile engine, you had to take your car to a dyno facility and have it tested. A typical dyno test usually costs £75 and is only good for a single test.

Dyno Plus allows anyone to get accurate dyno results any time they wish. All you'll need is a flat section of roadway, usually less than 1/4 mile in length. How does it work? Well, basically the Dyno Plus is a precision accelerometer system that records hundreds of forward and sideways (lateral) measurements every second of vehicle movement.

From acceleration and time a lot of power torque etc data can be calculated.

The user must supply the car's weight, gear ratios, tyre sizes, and some other variables, but the rest is pure physics. This is **not a power estimating** program! Dyno Plus **measures** the **power** of your engine **directly** by making precise measurements. Dyno Plus is actually better than a rolling road - instead of measuring the amount of power required to accelerate a drum, you are measuring the amount of power required to accelerate the car. This is really what you are interested in anyway isn't it? Some cars may even perform differently on a chassis (stationary) dynamometer because the car is not actually moving. Accelerating the car has an effect on the fuel system, oil distribution through the engine, air resistance, turbo airflow etc, etc. Dyno Plus will allow you to accurately measure the amount of power your car is **putting on to the ground**, which is an invaluable tool when doing aftermarket modifications.

Cornering:

Dyno Plus also measures lateral (sideways) acceleration. By collecting data on the track, you can see the g force your car handled in cornering, or by driving a constant radius circle you can compare front / rear handling setups, check the results of adjustments toe in/out, camber and caster. Measure the maximum g forces and find out which brand of tyre is best.

Braking:

Dyno Plus is also invaluable for braking measurements –after all with that extra power you need to be sure you can stop. By measuring the deceleration, Dyno Plus can show braking effectiveness at various speeds and conditions.

There really is no other tool which can offer all these features!

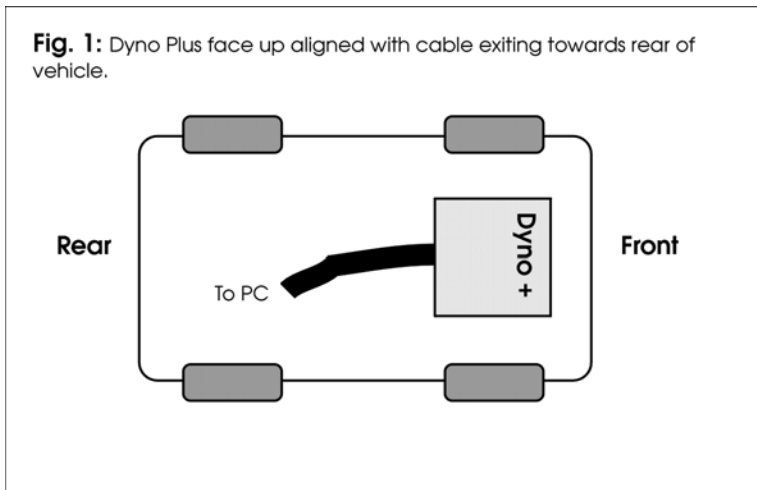
Mounting Dyno Plus:

Dyno Plus must be securely mounted in the car. Velcro or Low Tack putty such as "blu-tac" are ideal temporary mounting media. (Please note GAA cannot be responsible for any damage to vehicle interior caused by mounting Dyno Plus).

Resting it in the glove box or on a seat etc is not suitable, as it will result in erratic readings, as will mounting on any vibrating or resonant surface.

The dash is usually OK, or the bottom of the instrument binnacle often provides a suitable "niche" Please ensure that it is mounted in such a way as to be safe while driving.

Dyno Plus must be accurately mounted with the cables pointing towards the rear (see figure 1), and the recessed box surface up. More than a few degrees off will cause significant G-force errors.



Dyno Plus should be as near horizontal as possible – see "Zero" LED below.

Starting a Measurement:

Ensure your DynoPlus has a fresh PP3 / 1604 battery

If you plan to make derived measurements (power or distance dependant measurements such as speed - i.e. other than acceleration measurements), the vehicle must be at a total standstill before you start a test. A rolling start will result in incorrect timings.

In fact, you could start at any known speed, but in practice "0" is the only accurately known speed!

For accurate results, testing should be carried out on a level track. This should be straight for power or speed related measurements. If there is significant wind then repeating the run in opposite directions is advised.

Try to keep gear changes smooth if you want good power measurements – peak power will be too high if there is a surge of power form energy stored in the flywheel.

For pure acceleration measurements, you can start at any speed.

Mostly you will be doing this to check maximum braking force, or making cornering force measurements.

For cornering measurements it's good to drive in a constant circle (many tracks have these – or mark your own out somewhere suitable!) at a gradually increasing speed until the car breaks away (DO NOT do this unless you are confident and trained to handle a car under such conditions!). Then process the Dyno plus data and see the maximum g-force.

Setting Up:

Most people will only use Dyno Plus in memory mode.

Dyno Plus will store up to 5 minutes of acceleration data.

To use live data logging, please refer to appendix 1 "Setting up with Dynolog" below.

Switch Dyno Plus on. The "Power" LED will light, and the "Zero" light will light until the unit is accurately levelled. (It will go out when the front / rear acceleration is less than 0.02g).

When you're ready to make a run, flip the switch – gently! – to "Rec". the green power LED will flash to indicate recording.

At the end of the run, flip back to "On". Dyno Plus will record many runs up to a total of 5 minutes.

Please note: Dyno Plus will overwrite data if you switch it off between runs!!!

Once you have finished testing, it's ok to turn Dyno Plus off. The data is stored permanently until cleared or overwritten by new runs. Take it home and download the data for RACE!

RACE : Instructions for use:

RACE – the *R*oad *A*ccelerometer *C*onversion *E*ngine.

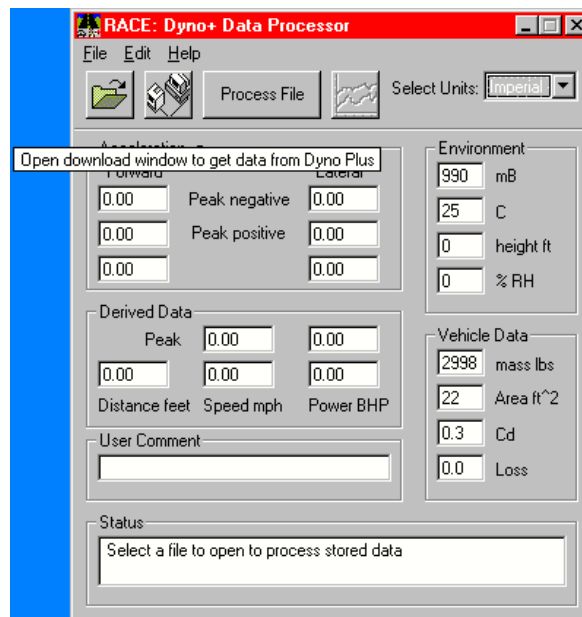
RACE is a software tool that enables various information to be derived from accelerometer data stored from the Dyno Plus Accelerometer module. This documentation assumes you are familiar with Dyno Plus use and have read the Dyno Plus instructions for use!

RACE Software:

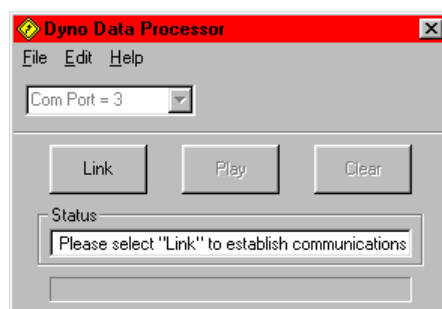
RACE is designed to analyse standing start data previously captured by Dyno Plus. Please observe all the warnings in the Dyno Plus documentation when making test runs! Please use the help and tips provided, and use tooltips – you can get help for operating the software by pausing the mouse over active (not greyed out) controls. RACE is designed to be flexible and simple to use. RACE is updated regularly with new features and improvements. Please check our website (www.microsmith.co.uk) for updates. Updates are password protected and passwords are only available on request by registered users – so please register RACE – send us an e-mail to racereg@microsmith.co.uk with where and when you purchased RACE to be included! RACE is installed with DynoLog from the supplied disks.

Using RACE:

First – record some data with Dyno Plus.
OK – so you have data! Run RACE, and you will see this screen:



Click the download button next to the file button to bring up the download window.



This will automatically extract all the runs in Dyno Plus memory to separate files for processing. First select the com port which you connected the Dyno to on your PC, with the pull down menu. (Showing com port 3 in the illustration).

Then click on Link to establish communication. Next, press Play to download data from the recorder to the PC. The program will prompt you when it needs to save the data. You can use the default promoted filename (derived from the date) or enter your own. Finally you can clear the recorder's memory if you want. It may be better to process the data first, in case of any problems.

Close the download window, and return to the main RACE screen (shown above).

All the controls, etc, have ToolTips to help you (just hover the mouse over each item) plus the "Status" box tells you what's happening – or sometimes what you've done wrong!
Please also read the help tips which RACE brings up – and read the Torque tips in the help menu.

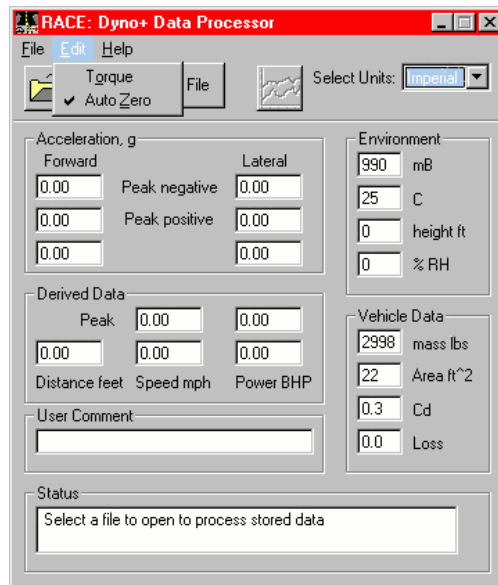
Click file, and open a Dyno Plus data file. This will be a "*.txt" (text) file for text format output from Dynolog, or a "*.tdx" file for binary data from Dynolog, or from downloaded data.

Next, fill out the boxes for the vehicle and environmental data. Add any information such as date or which car you used in the "user comment" field, and be sure to select the correct units – metric or imperial – from the pull down. All this information is stored in a "*.ini" file – with the same name as the data file – and it will subsequently be opened automatically with the data file.

You can also change the data at any time.

If there is already a "*.ini" file for this data, the values will be loaded automatically.

Now click the edit menu, and select the three options:

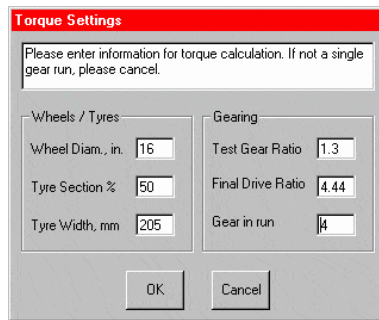


Torque:

Default is off.

If ticked, this will calculate RPM and Torque. When you process the file, a dialog box will open:

You need to give RACE this data to calculate RPM from speed. Torque is calculated from the fixed relationship between RPM and power. There are special considerations for torque measurements. Please read the contents of "Torque tips" in the help menu. This is also printed at the end of this guide for reference.



AutoZero:

Default is on.

It's difficult to mount Dyno Plus precisely level, so the acceleration for stationary vehicle needs to be corrected to zero by subtracting the zero offset.

This will automatically set the acceleration data zero offset. It does this by analysing the first two seconds of data, so to use this it's necessary to run Dynolog for a couple of seconds with the vehicle stationary before the run – see Dyno Plus documentation.

If AutoZero is off, you will be prompted to enter the zero offset value – if your data is in a Dyno Plus text file, you can do this by inspecting the data.

Note that RACE will produce a text file as it processes so if your data is binary, process with a zero offset of zero and then check the *.txt file for a better zero offset.

Process File:

You are now ready to process your file – so click the button.

The various displays on the RACE screen will update as the data is calculated. The status box at the bottom gives progress and error information.

Once it says "Done" you will have a set of output data files in the same folder as the run data file.

Output Data:

Each analysis will add the following files to the directory where the data file was opened. Assume your data file was "tara1.tdx". If you started with text data, then you will already have tara1.txt. You will find a set of sample "tara1" files in your RACE directory.

tara1.txt: This is the text equivalent of the binary input data, and is a text file you can open with notepad, etc, the same as a text Dynolog file.

tara1.tdp: This is the processed data output, and can be opened with notepad etc. Please see the RACE directory for sample.

tara1.ini: This file contains the vehicle and environmental data you entered. You should not need to alter this file.

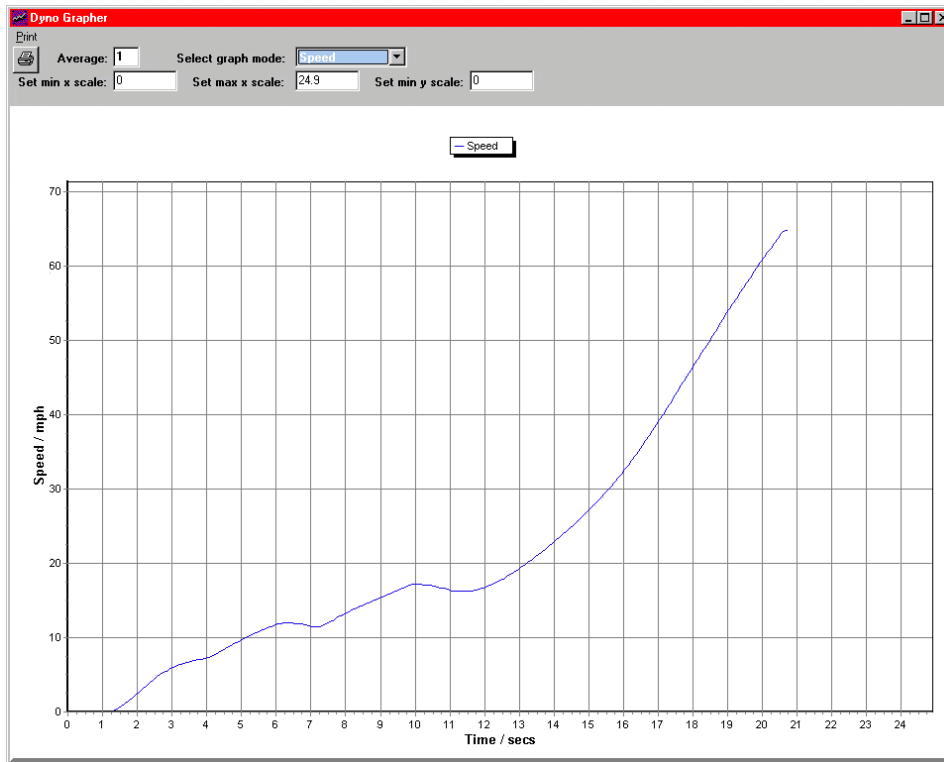
tara1.csv: This is all the output data in a format suitable for Excel or other spreadsheets. You can use this to create your own graphs, data sets etc. On most PCs double clicking a "*.csv" file will open your spreadsheet program.

Graphing the data:

Once the data is processed and the output data files created, you can use RACE's powerful graph tool to examine and print your results.

Click the now Graph button to the right of Process File. This button is greyed out until a file has been processed.

RACE's graph window will open. Please read the help tips that RACE displays.



You can select between Speed, Distance or Power graphed against time, or Dyno graph mode, showing Power and Torque vs. rpm.

For dyno mode you must have made a suitable Torque run, and processed the file with "Torque" checked in the edit menu of the main RACE window. (See "Gear in run" notes in the Torque Tips below).

To zoom in on the graph, enter new values for min and max "x" (Time or RPM) on the graph.

"Y" values are normally cropped to zero to make more readable graphs, but you can adjust this with the min y setting.

The "average" setting allows you to adjust the curve smoothing.

The graph will automatically re-plot with the new settings.

Hovering the mouse over the graph will display the curve exact values at the point.

To print a graph, you can use the Print menu, which allows print preview and printer setup.

To print a graph with the mouse over the graph, which will print the curve values as well, use "alt p"

Torque Tips:

To measure torque and power against RPM, DynoPlus needs to calculate RPM from the vehicle's speed. To do this you clearly need to know tyre size, section and width along with the gear and final drive ratios. RACE needs to be told the above information, and will request it if data is processed after the "Edit" "Torque" menu entry is clicked. As it says in the DynoPlus user guide, it's best to start accelerometer based measurements from a speed of zero - that's a well defined reference point! On the other hand, peak power measurements on the road are best done in third,

or second gear. Most cars will develop peak power in third, and that's the most useful power gear in normal driving. Third or second gear also makes it possible to redline the car in a legal way! So, the gear you wish to calculate RPM and Torque in is not the gear you start the measurement run in. RACE has to figure out when you are in the right gear, in order to display the data correctly on a "dyno" mode graph.

It is possible to start off in second, although you may not wish to do so!

When entering the torque calculation data, you will see a box labelled "Gear in run". This is where you tell RACE which gear change top look for.

For example, if you start up in first, then second then test in third, the gear in sequence is "3".

If you start in second and measure in second, then it's "1".

If you start in first, then block shift to third, it's "2".

In other words, it's the number of gear used to get to the test gear, NOT the test gear itself!

How to make a run for torque:

Find a suitably long, flat stretch of clear unused road or track on a still day.

Make sure DynoPlus is on, running and set up correctly as described in the user guide.

Start the car and move off gently. Change up through the gears as you wish, aiming to hit the test gear at about 1500 - 2000 RPM. It needs to be a figure that the car will pull cleanly from on a full throttle, without hesitating.

Then press the accelerator to the floor smoothly but quickly. Leave the accelerator floored until redline is reached, at which point you may release the accelerator and depress the clutch - and slow down!

Stop the vehicle safely and stop logging data.

That's all! A little practice will give good, repeatable results.