



# MANUAL ADS SOFTWARE

# LIKE PRESIDENT

KM/H

# DIAGNOSIS

# ADDITIVE

# ORSEPOWER

**OTOMOTIVE**

# TUNING

# ADJUSTABLE

# DUTCH

# HIGH QUALITY

# VEHICLE

# RELIABLE

# SOFTWARE

# HARDWARE

# SERVICE



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## GETTING STARTED

### SYSTEM REQUIREMENTS

- Minimum Intel i5 processor (or comparable)
- Minimum 8GB RAM / internal memory
- Windows 10 operating system recommended (minimum Windows 7)
- Minimum 500MB available for installation (excluding database)
- Minimum video card 250MB
- RS232 serial port or USB port with USB/RS232 converter
- Minimum screen resolution 1920x1080

### INSTALLATION GUIDE

Open the installation folder to the following file path: Dynostar Advanced Dyno Station V8 \ Advanced Dyno Station (RB3.40) \ V8.x.x \ Volume. When in the volume folder run the install.exe application, this will start the installation of the Advanced Dyno Station software on the PC. Follow the instructions during the installation and restart the PC after the installer has finished.

### UPGRADE TO ADS VERSION 8

When upgrading from version 7.9.8 or lower to version 8.0.0 or higher the database will have to be migrated to properly display all existing measurements. Versions older than 8.0.0 use a 4 folder system, newer versions use a 5<sup>th</sup> folder. To insert the extra folder the *Migration tool* is included in the installation files. This will automatically recognize if a migration is required. After installation the migration tool will automatically open. If the migration is required click *Start migration*. The program will make a backup first and convert the file structure to suit ADS V8. After the migration is completed the existing measurements can also be opened in version 8.

### FIRST START UP

When the software is installed on the computer and it has been restarted, open the software. During the start up the software will display a code, this code is required to generate the license code for the software. Please contact Dynostar to generate the license code. Once the license code has been entered the software will start up.

During the startup of the software it shows the startup status. At some point it will display "Opening communication port". After that it has to display "Dynostar Firmware 3.50RB", this means that there is communication between the DAS box and PC. If you get the message "no controller found" or "no port found" this means there is no communication. Make sure the DAS box is switched on and the correct COM port is selected in the general program settings. Which COM port is connected, can be seen in the Windows Device Manager. Select the correct COM port and restart the software, this should establish communication. After startup, go to *Program > Register options* and select the required options. *Dynamic measurement*, *Weather station* and *Transient test* are advised to be always selected.

## PID SETTINGS

The PID settings for retarder control as well as speed signal pickup can be configured in the PID settings menu. This menu can be accessed via *Test settings > PID settings*. When running ADS for the first time it is important that these settings are checked. Below is a list of the *RPM/Speed control settings* that have to be checked.

- P = 70
- I = 2
- D = -20
- Total tabs = 4
- Dead band = 5 rpm
- Control range = 150 rpm
- SlewRate = 255
- FilterFlags = none selected
- PIDFlags = 4 & 7 selected

Make sure to select *SET SETTINGS* after changes have been made. If PIDFlag 7 has been enabled for the first time, the DAS control box and ADS software have to be restarted to enable this setting.

After checking the PID setting it is also important to check the *Microprocessor settings*. Make sure *Use digital filter* is not enabled. *Dynamic run optical sensor configuration* has to be set to 4 *puls/360°*.

Make sure to select *Program special settings to uP* after making changes. Restarting the software and DAS is not required.

The screenshot shows the 'PID settings' menu with two main sections: 'RPM/SPEED control settings' and 'Nm control settings'. The 'RPM/SPEED control settings' section is highlighted with a red box and contains the following values: P=70, I=2, D=-20, Total Tabs=4, Dead Band=5 rpm, Control Range=150 rpm, SlewRate=255, FilterFlags (7, 6, 5, 4, 3, 2, 1, 0) all set to 0, and PIDFlags (7, 6, 5, 4, 3, 2, 1, 0) with 4 and 7 selected. The 'Nm control settings' section contains: P=0.1000, I=0.0000, D=-0.4000, Tolerance=1 Nm, Deter=1000, Start Voltage=0.5000 V, and Time (1/10)=10. At the bottom, there are buttons for 'SET SETTINGS', 'GET SETTINGS', and 'Microprocessor Settings'. A 'Close' button is in the bottom right corner.

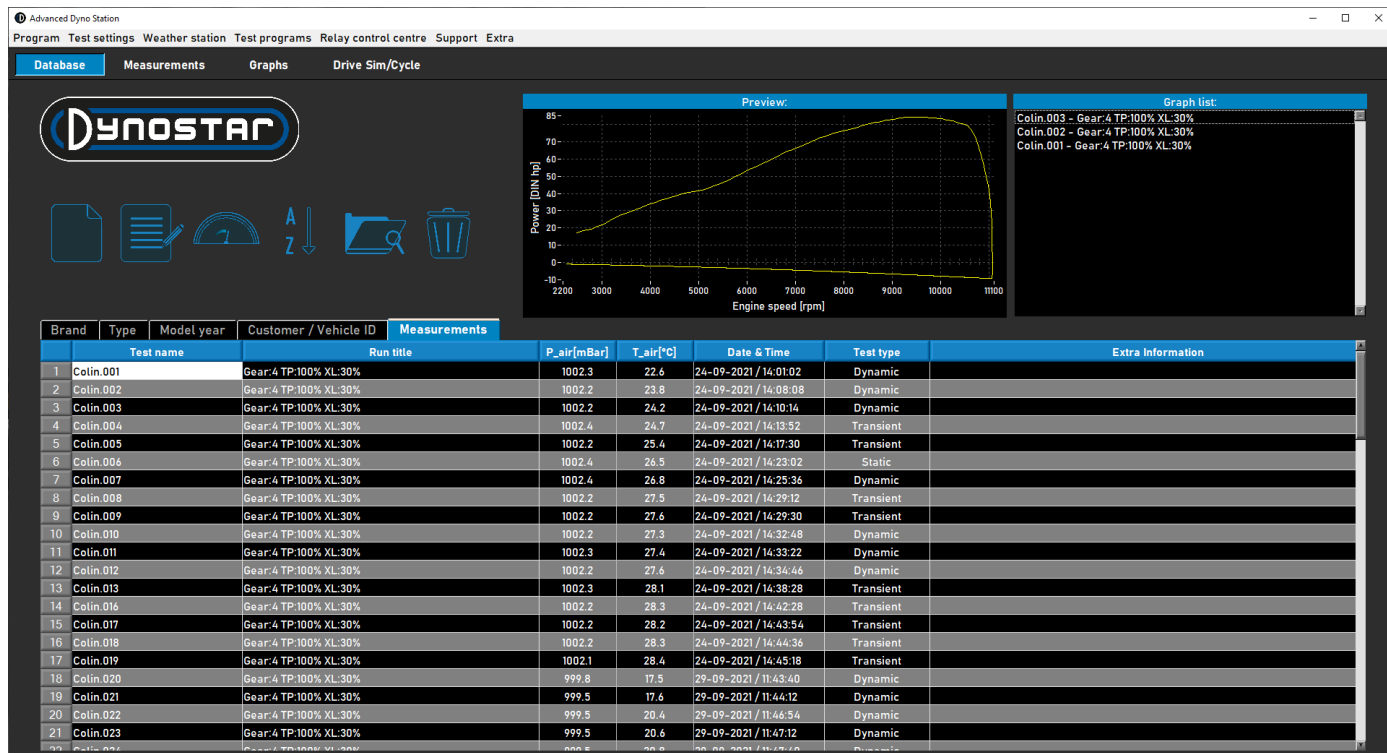
The screenshot shows the 'Microprocessor settings' menu with three main sections: 'Engine RPM', 'Drum RPM', and 'Enhanced PID'. The 'Engine RPM' section has a checkbox for 'Use digital Filter (4 to 1 converter)' which is unchecked. The 'Drum RPM' section has 'Dynamic Run optical sensor configuration' set to 4 *puls/360°*, 'Convert drum rpm to 5V. Output 5V @ km/h' set to 200.0, and 'Waittime before speed is zero' set to 5. The 'Enhanced PID' section has 'I-factor raise (normally = 2)' set to 2 and 'Default Zeropoint Firemodule(0-255)' set to 0. At the bottom, there are buttons for 'Program special settings to uP', 'Get special settings from uP', and 'Close'. A 'Close' button is also in the bottom right corner.

## DELETING THE PROGRAM

If the ADS software needs to be removed from the PC, **always** remove it via the configuration screen. Select Advanced Dyno Station and select remove, then follow the menu to remove the program. Never remove any files or applications related to ADS via Windows Explorer. This can corrupt the software which will make it very difficult to remove, update or re-install.

## MAIN SCREENS

### DATABASE



Making a test, starts at the database. The database consists of 5 folders and is designed in such a way that runs are stored in a ordered manner. Upon request it's even possible to change the name of each folder. The standard folders in the database are; *Brand*, *Type*, *Model year*, *Customer/vehicle ID* and *Measurements*. Above the folders are 6 control buttons/icons, used to navigate and work within the database. The functions are as follows;



*New*, for making up a new *Brand*, *Type*, etc. or test.



*Edit notes*, for editing information in a test. Can only be used in the folder *Measurements*.



*Wizard*, vehicle inertia calculator. See chapter [Vehicle inertia calculator](#).



*Sort ascending*, for sorting the folders in the database, ascending or descending.



*Select new data path*, for selecting an alternative database location.

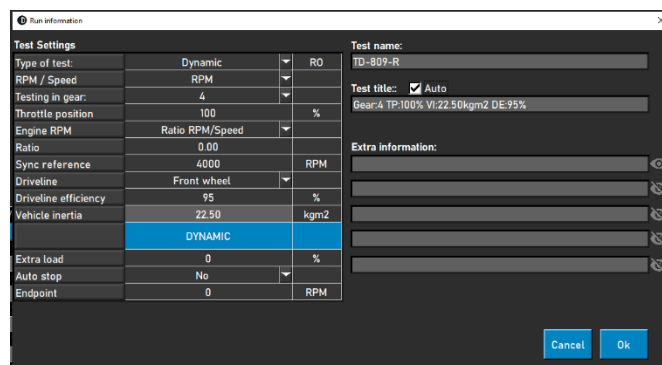


*Delete*, for deleting runs and folders in the database. Works only from bottom up and per file. Complete folders can't be removed at once. For deleting complete folders, please use the Windows Explorer, C:\Advanced Dyno Station\ Database\...\...

The first folders are straightforward and easy to understand. The last folder, *Measurements*, is more complicated and is where the actual run is set up. Every time a new run is started from the database, select *New* and the following menu is opened;

Start at the top of the menu *Test Settings* with *Type of test* and choose between, *Dynamic*, *Dynamic [variable transmission]*, *Static* or *Transient*.

*Dynamic* or *Dynamic [variable transmission]*; test based on inertia acceleration. The degree of acceleration determines the output of the vehicle. This is the most commonly used test and gives accurate and highly repeatable results. Normally used in one gear, but testing multiple gears is possible (RPM module required). The basic result of a dynamic test is wheel power, in order to measure engine power, the losses from the drive line have to be measured. When testing a vehicle with automatic transmission (CVT, etc.), select *Dynamic [variable transmission]*.



*Static*; test based on absorbing the engine power with a retarder and load cell. The test is performed at preset measuring points on speed or RPM. During the measurement the speed or RPM has to be stable (static) within preset boundaries. The absorbed power is measured with a calibrated load cell and processed for power and torque. Due to the calibrated load cell, this is a very accurate but also demanding test. Compared to a dynamic test, a static test takes more time, puts more load on the engine and requires sufficient cooling.

*Transient*; test based on a combination of static and dynamic testing. The rate of acceleration is controlled by the retarder. The result is based on inertia acceleration and load cell data. The main advantages are the shorter test duration in comparison to static testing, while keeping the accuracy of static testing. For testing charged engines, this is an ideal test. The control of the acceleration results in a smooth test, without uncontrolled acceleration when the boost rises and less load on the engine compared to a static test.

*RPM/Speed*; selection for testing based on speed or RPM. Speed is always logged and available in the graph screen.

*Testing in gear*; additional information for the database. This is not mandatory and for reference only.

*Throttle position*; additional information for the database. This is not mandatory and for reference only. When using the electrical throttle control actuator (ETB400 & ETB400Ti), this value sets the throttle position during automated tests.

*Engine RPM*; selection how to measure engine RPM. Choose between, *Inductive clamp*, *Ratio RPM/Speed*, *Ratio\*RPM/drum*, *EOBD*.

- Select *Inductive clamp*, when using a Dynostar RPM module.
- Select *Ratio RPM/Speed*, when calibrating the engine RPM with the tachometer and speed of the dyno (one gear only).
- Select *Ratio\*RPM/drum* when the total gear ratio from engine to wheel/shaft/sprocket is known (one gear only).
- Select *EOBD* when using a Dynostar EOBD module.

*Ignition pulses / Ratio*; When selecting *Inductive clamp*, select at *Ignition pulses*, the number of pulses per 2 rotations. This is necessary in order to get the correct engine RPM. Check at the measurement screen if the RPM is correct, if not set correct at the database or go to *Test settings/General program settings/RPM configuration*.

*Ratio*; When selecting *Ratio RPM/Speed*, do not fill in anything at *Ratio*, only fill in a calibration RPM at *Sync reference*. Once the Test Settings are saved, the software switches to the measurement screen and a calibration menu is opened to calibrate the engine RPM with the speed of the dyno in the designated gear. Advised is to choose the calibration RPM at about 75% of the full RPM range.





*Ratio*; When selecting *Ratio\*RPM/drum*, fill in the gear ratio between crankshaft and wheel / shaft / sprocket.

*Driveline*; For accurate measurement select the type of driveline of the tested vehicle.

*Driveline efficiency*; preset value based on the selected driveline. The numbers are default and can be altered if necessary. The numbers are based on numerous tests with a wide variety of vehicles. Changing this number will influence the output of the test.

*Vehicle inertia*; this number represents the inertia of the vehicle. Besides the inertia of the dyno, the inertia of the vehicle has to be taken into account. This number can be altered by hand to correct the inertia of the vehicle. It's advised to use the vehicle inertia calculator (*Test settings, vehicle inertia calculator*). Changing this number will influence the output of the test.

*DYNAMIC, Extra load*; when selecting a Dynamic run, it's possible to add extra load during a dynamic test (retarder is required). Use this feature if the duration of a test is too short or the load on the engine is too low. Normally the extra load is between 15-40%, depending on the vehicle.

*DYNAMIC, Auto stop*; use this option for ending each test at a fixed end point automatically.

*DYNAMIC, Endpoint*; if autostop is selected, fill in the desired endpoint, based on RPM or speed, depending on what's selected previous.

*STATIC, Starting point*; fill in (by double clicking) the desired starting point for a static test, based on RPM or speed, depending on what's selected previous. It's also possible to change the settings in [Test settings, General program settings, Static test](#).

*STATIC, Endpoint*; fill in (by double clicking) the desired endpoint for a static test, based on RPM or speed, depending on what's selected previous.

*STATIC, Measurement points*; fill in the amount of measuring points.

*STATIC, Step size*; this number is automatically calculated based on the starting point, endpoint and number of measuring point and represents the step between each measurement point.

*STATIC, Tolerance*; fill in the desired tolerance in which the measurement is valid. The more narrow the tolerance, the more time it can take before a valid measurement is made. If it takes too long increase the tolerance. Based on RPM or speed, depending on what's selected previous.

*STATIC, Time stable*; fill in the desired period of time, in which the measurement has to be within the tolerance. For good results, the minimum time is 2sec.

*STATIC, Measure losses*; select this option in case the driveline losses need to be measured to calculate engine power.

*TRANSIENT, Starting point*; fill in the desired starting point for a transient test, based on RPM or speed, depending on what's selected previous. It's also possible to change the settings in [Test settings, General program settings, Static test](#).

*TRANSIENT, Endpoint*; fill in the desired endpoint for a transient test, based on RPM or speed, depending on what's selected previous.

*TRANSIENT, Test duration*; fill in the desired total test time. Be aware that this heavily depends on the inertia and the retarder(s) fitted. If the retarder(s) are not strong enough, the test will be shorter.

*TRANSIENT, Acceleration*; this number is automatically calculated based on the starting point, endpoint and test duration and represents the average acceleration during the test.

*TRANSIENT, Measure losses*; select this option in case the driveline losses need to be measured to calculate for engine power.





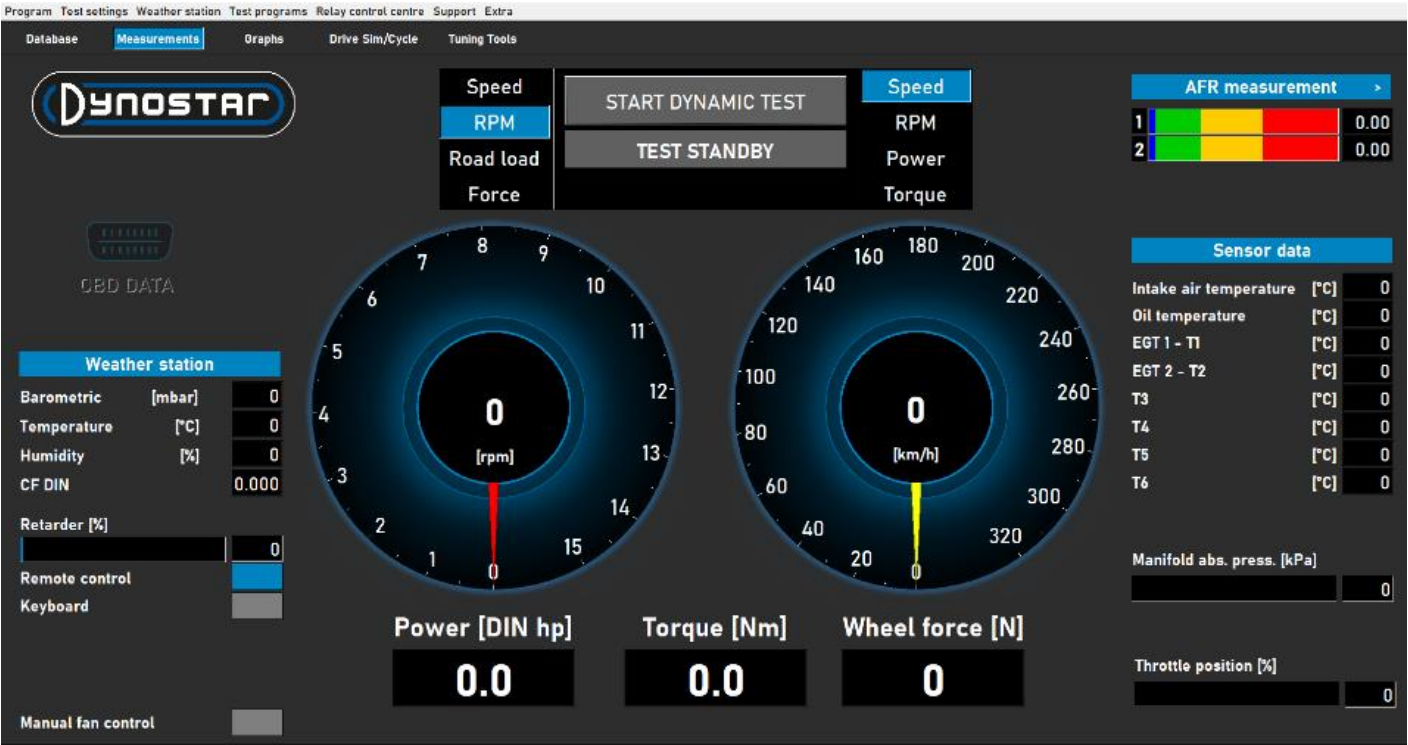
*Test name;* as default, the filled in type (database) is stated here and is the name the test is stored under in the database. By double clicking, the text can be altered.

*Test title;* as default, the test title is automatically based on settings made earlier and represents the most important test information. If auto is switched off, the information can be altered as desired. The test title is also visible at the graph screen and on the print out.

*Extra information;* use this field to add extra information. This information is stored and can always be altered afterwards. Be aware that only the first line is visible in the database. The rest of the extra information is only visible when using *Edit notes*.

Once all information is filled in, press *Ok* and the software will automatically switch to the Measurements screen

MEASUREMENTS



The *Measurements* screen, is the main operation screen. In this screen all live data are displayed and tests are performed. The center of the screen is formed by the two large gauges. These gauges can show the engine RPM, vehicle speed, power, torque, road load and force.

The left gauge has a double function and is also used for controlling the brake(s). While the yellow dial represents the vehicle, the red dial represents the brake(s). By using the knob on the Dynostar remote control or the scroll wheel on the keyboard, the brake(s) can be controlled.

Based on the selection, it has the following functions;

*Speed*; set the brake at the desired control point. Below the set point the brake is not active. When the set point is reached by the vehicle, the brake will be activated and will hold the vehicle at the set point, independent of the vehicle load (dependent on the brake capacity).

*RPM*; set the brake at the desired control point. Below the set point the brake is not active. When the set point is reached by the vehicle, the brake will be activated and will hold the vehicle at the set point, independent of the vehicle load (dependent on the brake capacity).

*Road load*; this simulates driving resistances as on the road (accuracy is less compared to drive cycle software). The faster the vehicle goes the more power is absorbed. Setting correctly is best done by changing the load and compare the result with actual data from the vehicle. For example, if the max. speed in 5<sup>th</sup> gear is 150 kph, change the load until the power absorbed results in the same figure on the dyno.

*Force*; this simulates for instance driving up a hill with constant speed. A fixed load (N) is applied and controlled with the load cell. The load is independent from the speed or engine RPM. As this function is slow compared to the three functions above, take care not to change the load rapidly.

When switching from one function to another, always turn the knob fully clockwise to prevent unexpected action from the brake.

The other gauge can be set as desired with the remote control, mouse or keyboard. Digital read-outs underneath the gauges show real-time *Power*, *Torque* and *Force*.

The left hand side of the screen shows the *Weather station*, with the *room temperature*, *barometric pressure* and *humidity*. The resulting correction factor (DIN, SAE or CEE) below that. The weather station is built in the Dynostar Data Acquisition System or DAS. An external temperature sensor is available as an option.

Weather station		
Barometric	[mbar]	0
Temperature	[°C]	0
Humidity	[%]	0
CF DIN		0.000

The *retarder %* shows the used capacity of the brake(s), at 100% maximum brake capacity is reached.

Retarder [%]	0
Remote control	<input checked="" type="checkbox"/>
Keyboard	<input type="checkbox"/>

It's possible to use the standard supplied Dynostar remote control or an optionally available wireless keyboard. Switch between *Remote control* or *Keyboard* depending on what is used. Switching from keyboard to remote control is only possible with the dyno at standstill.

The control of the cooling fan(s) can be done manually or automatically, relay controlled or inverter controlled. The basic settings are done in the [Relay control centre](#). The *Cooling fan %* shows the % of control of the inverter to the fan(s) and is speed dependent (set in the Relay control center). By switching on *Manual fan control*, it's possible to set the control level manually. The moment a test is activated, the fan(s) go automatically to 100%.

Cooling fan [%]	52
Manual fan control	<input checked="" type="checkbox"/>

*OBD Data* is a future development. The right hand side of the screen shows all sensor data, starting with the *AFR measurement*. Settings for the channels and type of sensors are set at [Test settings](#), [General program settings](#), [Oiltemp/ MAP / AFR](#). When pressing the > at the right corner, the bars can be switched from horizontally to vertically and vice versa.

AFR measurement			
1	<div><div></div></div>		0.00
2	<div><div></div></div>		0.00

*Sensor data* displays up to 8 different temperature sensors. The *Intake air temperature* and *Oil temperature* are fixed channels, followed by 2 K-type EGT channels and 4 PT-100 sensors. The last 6 channels can be customized at [Test settings](#), [General program settings](#), [Temperature sensors](#). Depending on settings the different channels can be made visible in the *Graph* screen.

Besides the temperature sensors, there is also the *Manifold abs. press. bar*. This graph bar indicates the intake air pressure in a range between 0 – 4bar absolute. Settings can be changed at [Test settings](#), [General program settings](#), [Oiltemp/ MAP / AFR](#). When double clicking on the bar, a separate circular gauge is shown, which can be randomly positioned. By pressing the zero button, the sensor is calibrated to current room pressure. Do not press zero when the sensor is already connected to the vehicle with a running engine.

Finally the *Throttle position %*, shows the throttle position from a TPS sensor or if supplied from the throttle actuator. By double clicking on the bar, a menu is opened, *Throttle control panel*. This panel is only available for the models ETB400 and ETB400Ti and can do automated testing when selecting a dynamic test. This menu is used for calibration and setting up automated testing. It's advised to use double screens and drag this panel to the other screen for improved performance.

*Enable Throttle Control*; select to enable the throttle actuator. Once enabled, the *Status* light will turn green.

*Dynamic TP (%)*; shows the throttle position when performing automated tests. The position is set at the database measurements screen.

*Total runs*; sets the amount of runs in a test sequence. Double click and set the amount of runs desired.

*Counter*; shows the runs made in the test sequence.

*Show Graph*; select to briefly show a graph of each run.

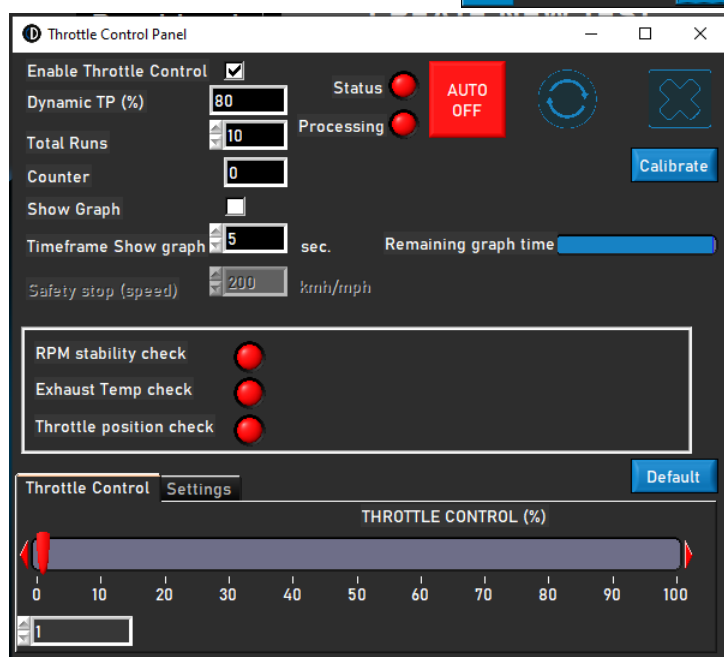
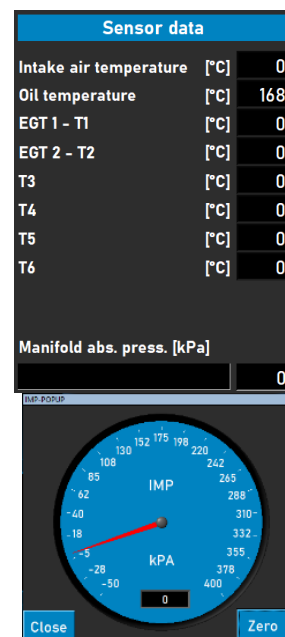
*Timeframe show graph*; set the time the graph is visible in between runs.

*Remaining graph time*; indicator for remaining time the graph is shown.

*RPM stability check*, *Exhaust Temp check* & *Throttle position check*; these three indicators show the pretest status of these variables. Once the values of these variables are within the limits set, the indicators turn green and the run will start. The settings of these variables can be changed at [Test settings](#), [Dynamic test settings](#). The RPM stability check is mandatory. The start RPM is set by using the control of the brake. Set the dial at the desired RPM as the start point. Take care not to set the limits to narrow as this will take more time before all the pretest limits are reached.

*Throttle Control*; use the mouse or the buttons of the remote control to move the slider and manually control the throttle. It's also possible to fill in the exact numerical value in the box below the slider to go to the desired throttle position.

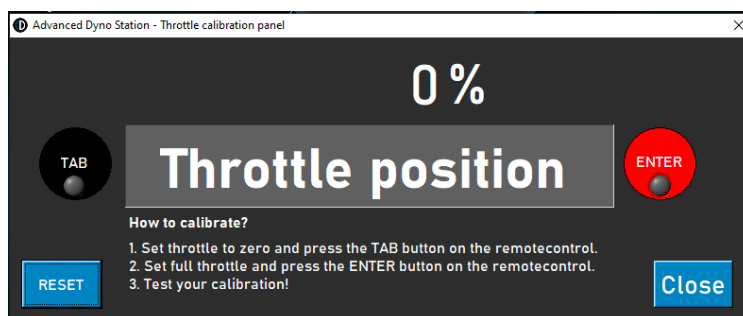
*Throttle Control, Settings*; shows the range the actuator is calibrated. By pressing Default, calibration values are deleted and the full range is set as default. The *Delta Value* can be changed to increase or decrease sensitivity. If the actuator is constantly adjusting the throttle position without any input, increase the delay.



**Calibrate;** when the actuator is used to control the throttle of the engine, it's important to calibrate the actuator. Open the Calibrate menu and follow the steps as indicated. When calibrating 100% throttle, take care not to overload the mechanism as the actuator can pull up to 300N.

**AUTO OFF/ON;** once all settings are done, a test is started at the database, engine runs in the correct gear at a desired TPS, start position is set by the brake, activate the automatic testing by pressing the **AUTO OFF** button. The button will turn from red to green and shows **AUTO ON**. The processing LED is blinking green/red to show that the automatic test is active.

For all other models the following panel is available. Using this function is only possible with a TPS sensor connected. The signal output must be between 0-5v. For correct functioning calibration is necessary. Follow the directions at the panel for correct calibration.



## GRAPHS



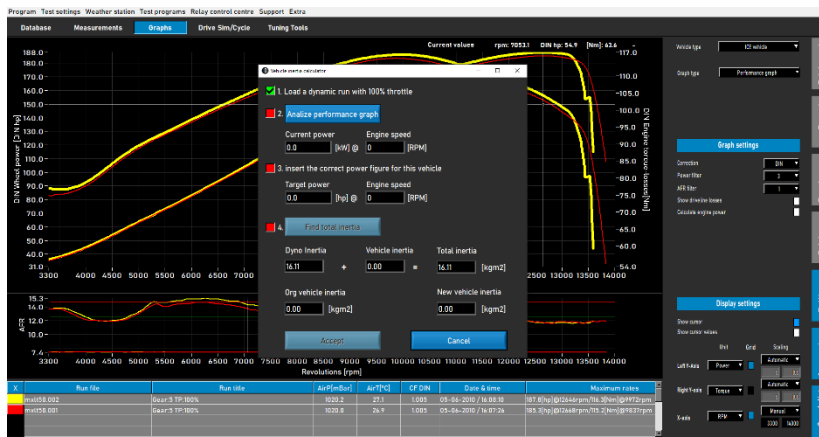
Once a test is made, automatically the graph screen is opened as shown above. The made test is plotted and previous tests are also visible. It's possible to load different tests from different brands and types from the database to show in the graph screen. Power (left Y-axis) is always displayed, besides torque (right Y-axis) and drive line losses which can be switched on and off by double clicking on the graph area. The X-axis can be either RPM, speed or time.

It's also possible to show sensor data and the graph list, by selecting **Sensor data** and **Graph list**, by activating from the menu bar at the right. When selecting **Sensor data**, an extra graph is opened showing AFR, MAP, EGT, current and voltage depending on what is selected. By double clicking on the graph area, selections can be made for the graph. It's possible to enlarge the sensor



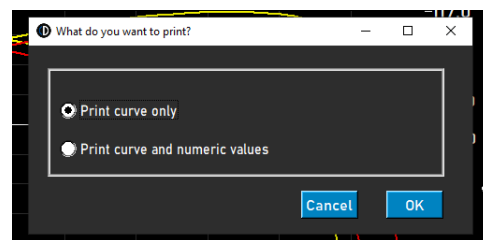
data graph area by grabbing the line between both graphs and move to the desired size. By double clicking on Sensor data, the graph size is back to default.

When selecting *Graph list*, it shows a list of the selected tests, together with the most important test data like weather station data, date and time, maximum rates for power and torque and driveline efficiency. When selecting one of the tests will result in highlighting that test. When clicking on the representing color of a test, will turn off the test in the graph. When clicking on the same area will turn it on again. When double clicking on the first run in the Graph list, will open up the *Vehicle inertia calculator*. This improves workflow efficiency and sets the correct data for following tests of that vehicle.



At the right hand side of the graph screen, a toolbar is visible to select different functions and settings.

*Print graph*; opens a menu to print the graph as represented. A selection can be made between only the graph and the graph with numerical values. When selecting numerical values, a table is printed with the numerical values of the selected test. This is only possible with static tests! The print-out is on white background to save costs. It's also possible to right click on the graph area to open up an extra menu that gives access to advanced print settings and export curves to CSV or BMP.



*Zoom in*; allows you to zoom in on a specific area of the graph. Use left mouse button and Ctrl at the same time to select the area to zoom in to.

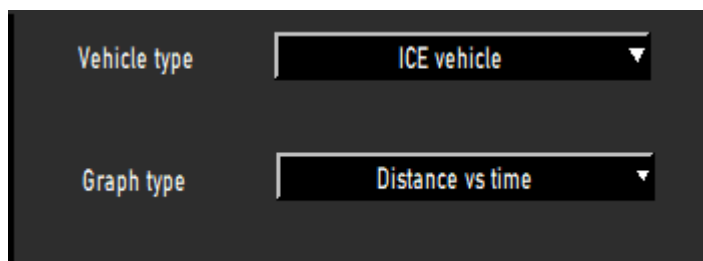
*Reset zoom*; press this button to restore the graph screen to original.

*Point snap*; use this tool to select a point on the curve and show the exact data corresponding with that point. The values are displayed above the graph area or if *Cursor values (double click graph area)* is selected, at the selected point.

*Settings*; use this menu for all graph related settings.

*Vehicle type*; select between ICE (internal combustion engine) or Electric vehicles. If selecting Electric vehicles, a different graph screen will appear.

*Graph type*; using this function allows to select different types of graphs, based upon the data from a selected run.



*GRAPH TYPE, Performance graph*; standard performance graph with RPM, speed or time at the X-axis and power and torque on the Y-axis.

*GRAPH TYPE, Power & RPM vs. speed*; ideal for vehicles with automatic transmissions. Shows the relationship between vehicle speed and engine speed. Behavior of the (centrifugal) clutch and transmission is made visible. Clutch slip can be easily made visible. A RPM module is mandatory.





**GRAPH TYPE, Speed & RPM vs. time;** shows the engine and vehicle speed against time. Makes acceleration of the vehicle and engine visible. For engine acceleration a RPM module is required.

**GRAPH TYPE, Distance vs. time;** used for 1/8 and 1/4 mile simulation. Data shows the elapsed time and distance and cross points for 1/8 and 1/4 mile.

**GRAPH TYPE, Supertuner data;** shows throttle position and various selectable data (left Y-axis) against engine RPM. Use the box at the left Y-axis to select the desired data. Is only suitable for Harley-Davidson motorcycles in conjunction with Supertuner module.

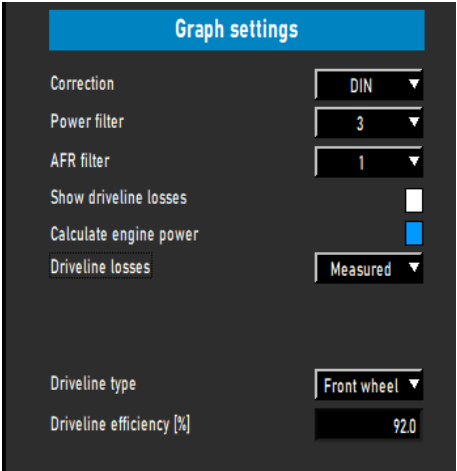
**VEHICLE TYPE, Electric vehicle;** if a electric vehicle is tested and in the graph screen selected, below screen will become visible. This screen shows all relevant data of testing an electric vehicle, incl. power, torque, current and voltages. It's possible to switch different channels on and off, as well as options for changing the scale. The use of a Dynostar EV module or EOBD is mandatory for correct functioning.



**GRAPH SETTINGS, Correction factor;** select the required correction factor, DIN, SAE or EEC/EWG. Weather station data is always recorded, changing before or after is therefore always possible. It's advised to always use a correction factor for correct data comparison.

**GRAPH SETTINGS, Power filter;** is used for filtering power and torque. It improves visual appearance of a test, which can be necessary due to different circumstances. A high level of filtering can also result in filtering out valuable data and therefore it's advised to choose the level of filtering as low as possible.

**GRAPH SETTINGS, AFR filter;** the same as above, only for the AFR graph.



**GRAPH SETTINGS, Show driveline losses;** if the driveline losses are measured during a test, they can be shown by using this option. By double clicking on the graph and select *Left Y-axis, Show wheel power and driveline losses*, the same function can be activated.

**GRAPH SETTINGS, Calculate engine power;** if the driveline losses are measured, select *Measured*, the measured losses are added to the wheel power to calculate for the engine power. The curves displayed are engine power and torque. Be aware that if the measured losses are shorter than the measured power (not over the full measured RPM range), this will result in a sharp drop in the engine power and torque curve, due to a lack of data. It's not always necessary to measure the driveline losses. It's advised to measure the losses during the first runs, when no changes are made to the vehicle and afterwards when all the tuning to the vehicle is done. This will save time and will show a clear difference between before and after. If there are losses added to calculate for engine power, a message appears at the top of the graph screen, mentioning losses are added and the value for the driveline efficiency. This is also displayed on a print-out.

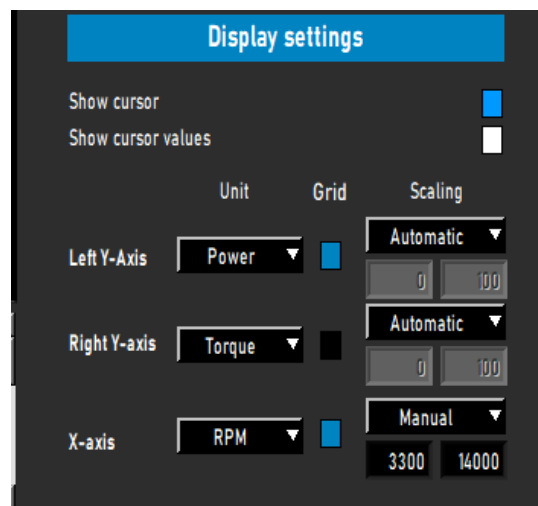
It's also possible to select *Custom*. In this case the engine power is calculated based upon a percentage [%] or ratio HP/KPH. Both are less accurate and require insight in the vehicle tested to prevent incorrect engine power. Using HP/KPH, requires only a short part of the actual driveline losses. Switch to speed on the X-axis and use Point snap to determine the losses (negative HP) at a certain speed in the losses curve. Calculate the ratio between losses and speed and fill in the number to calculate for engine power.

**GRAPH SETTINGS, Driveline losses;** when calculating for engine power with measured losses, it's important that the correct type of driveline is selected. Normally this is already done at the *Database, Measurements*, but if required the type of driveline can be changed using this option. If different vehicles with different type of driveline are compared, use *Load from run* to get the best results. This requires that the tests are performed with correct selection of the driveline during set up of the run in the database. The used values per driveline are defaults and can be changed if required. Changing the numbers will result in a different performance.

**GRAPH SETTINGS, Driveline efficiency [%];** if the type of drive line is changed, this numbers represents the driveline efficiency. By changing this number the default value for the loaded tests is changed. This will not change the default values.

**DISPLAY SETTINGS, show cursor;** select this to make the cursor visible in the graph. If the cursor is not activated, the *Point snap* function is not available!

**DISPLAY SETTINGS, show cursor values;** if *Show cursor* is activated, together with *Show cursor values*, actual values in the graph are displayed at the cursor.







## DYNAMIC TEST

Depending on which *Engine RPM* option is selected, the calibration menu for the engine RPM is opened. Calibrate the engine RPM in the correct gear. Run the vehicle at a low speed or RPM in the correct gear. It's possible to use the brake to run the vehicle against the brake, which allows more throttle at the start of the test. Press START DYNAMIC TEST and wait until TEST ACTIVE becomes green (when no extra load is used) or violet (when extra load is used), then open up the throttle. If *Auto stop* is selected, the test will automatically stop when the set point is passed. If Auto stop is not selected, the test is ended after pressing the Enter button of the remote control or press TEST ACTIVE. The moment the test is ended, the software switches to the *Graph* screen and the test is shown. Without any losses added this results in wheel power only.

To measure the driveline losses for calculating the engine power, the same procedure applies as described above. It's important not to select Auto stop, as this will end the test prematurely. Start the test as normal and run the vehicle up to the desired end point. Instead of pressing enter, press/pull the clutch pedal/lever and leave the vehicle in gear! Let the vehicle coast down until the start RPM or speed is reached and press enter to end the test. When testing non-CVT automatic transmissions, it's best to put the vehicle in neutral when measuring driveline losses. The measured losses can now be added to the measured wheel power and results in engine power. If extra load is used during the test and the inertia of the dyno is low, it's advised to turn off the load during coast down by pressing the tab button of the remote control or keyboard at the end point. This will result in a better measurement of the coast down. With high inertia dyno's this is not necessary.

### DYNAMIC A/T (VARIABLE TRANSMISSION) TEST

Performing a test is the same as described above. For overall best results with all kinds of transmissions, it's advised to always use a RPM module.



## STATIC TEST

Each test always starts at the *Database*. Select *New* or double click on *Brand*, *Type* etc. to go through the database. At *Measurements* select *New* or select a previous test by clicking once on the test and then select *New*. In this way the settings from the selected test are used in the new test. It's still possible to change the settings if required. If a complete new test is made, fill in the menu as described in *Database*. If all settings are correct, press Ok, the software automatically goes to the *Measurement* screen.

As a static test always has a fixed start and end point, performing the test is straightforward. Depending on which *Engine RPM* option is selected, the calibration menu for the engine RPM is opened. Calibrate the engine RPM in the correct gear. Press **START STATIC TEST**, the red dial will appear at the set start point and open up the throttle. The brake will hold the vehicle at the start point for the set period of time, measuring the output of the engine using the load cell. Once the measurement is valid it will go to the next measurement point and so on, until the last measurement point is reached. After that the test will be ended automatically and the graph screen is opened. If the option *Measure losses* is selected at the database, a message will appear to disengage the clutch. Press/pull the clutch pedal/lever until the message disappears and the software switches to the graph screen.

Performing a static test requires high capacity cooling of the engine, transmission and exhaust system. Observe coolant, oil and intake air temperature during testing to prevent overheating. A static test can always be aborted pressing the enter button or START STATIC TEST. Testing vehicles with automatic transmission is the same as described at DYNAMIC A/T TEST, a RPM module is mandatory.

## TRANSIENT TEST

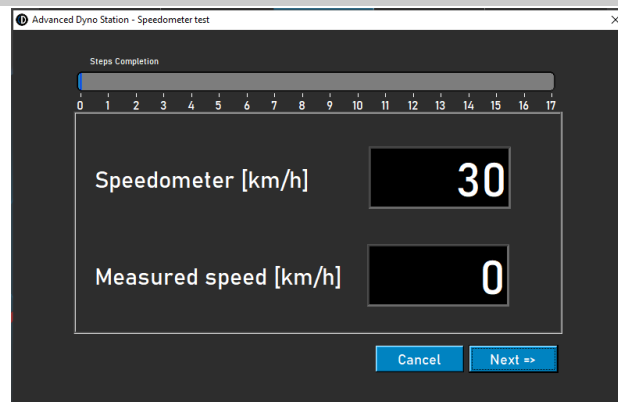
Each test always starts at the *Database*. Select *New* or double click on *Brand, Type* etc. to go through the database. At *Measurements* select *New* or select a previous test by clicking once on the test and then select *New*. In this way the settings from the selected test are used in the new test. It's still possible to change the settings if required. If a complete new test is made, fill in the menu as described in *Database*. If all settings are correct, press Ok, the software automatically goes to the *Measurement* screen.

As a transient test always has a fixed start and end point, performing the test is straightforward. Depending on which *Engine RPM* option is selected, the calibration menu for the engine RPM is opened. Calibrate the engine RPM in the correct gear. Use the brake to preload the vehicle at the set starting point, at about 20-30% TPS. Press START TRANSIENT TEST, the red dial will appear at the set start point and open up the throttle. The brake will control the acceleration of the vehicle as set and the load cell is used for measuring the output of the engine. Once the set end point is passed the test will be ended automatically and the graph screen is opened. If the option *Measure losses* is selected at the database, a message will appear to disengage the clutch. Press/pull the clutch pedal/lever until the message disappears and the software switches to the graph screen.

Performing a transient test requires high capacity cooling of the engine, transmission and exhaust system. Observe coolant, oil and intake air temperature during testing to prevent overheating. A transient test can always be aborted pressing the enter button or START TRANSIENT TEST. Testing vehicles with automatic transmission is the same as described at DYNAMIC A/T TEST, a RPM module is mandatory.

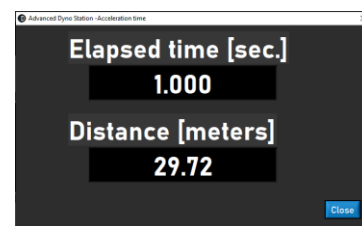
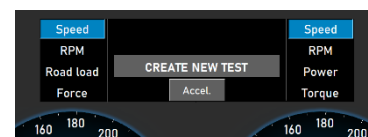
## SPEEDOMETER TEST

For performing a speedometer test, first go to [Speedometer test settings](#) and fill in the settings. Go to *Test programs* and select *Speedometer test*. The following menu is opened. Run the vehicle in the desired gear and keep it steady at the indicated speed on the screen, using the speedometer of the vehicle. If the vehicle speed is the same as indicated, press enter. Repeat this for all next indicated measurement points, until the test is ended. A resulting graph is shown and the test can be stored or plotted. Changing gears during the test is no problem. The test is not saved in the database!



## ACCELERATION TEST

For performing an acceleration test, first go to [Static test settings, Acceleration test](#) and fill in the settings. Set the left gauge to speed. Run the vehicle in the desired gear and keep it below the starting point. Activate the test by pressing *Accel.* underneath *CREATE NEW TEST*. This will put the test in standby. Open up the throttle, the test starts the moment the first point is passed and ends when the last point is passed. After that a window is opened, showing the elapsed time and distance. It's not possible to save or plot the result. Changing gears during the test is no problem.



## DURATION TEST

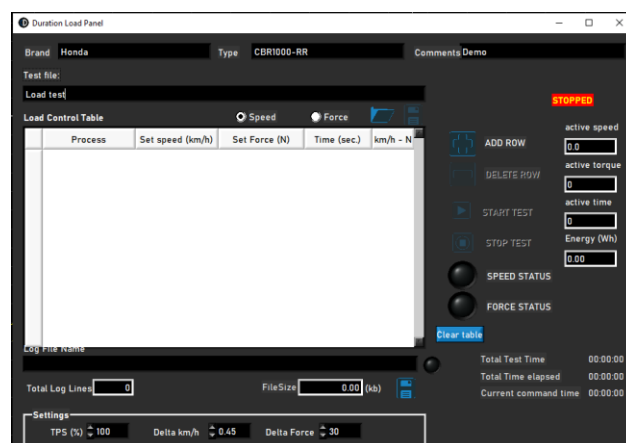
For performing a duration test, go to *Test programs* and select *Duration test*. A duration test is a semi-automatic test, based on a preset load profile. This profile can be based on speed or force and is independent of the throttle position. When selecting speed, the vehicle is kept stable by the brake at the set speed (km/h). When selecting force, a constant amount of force is applied by the brake according to the set force (N). The throttle is controlled manually. A duration test is ideal for running in engines under controlled circumstances or running a vehicle according to a prescribed load profile. Setting up a duration test starts by filling in the Duration Load Panel.

*Brand*; fill in the brand of the vehicle (not mandatory, will be saved).

*Type*; fill in the type of the vehicle (not mandatory, will be saved).

*Comments*; fill in comments if required (not mandatory, will be saved).

*Test file*; shows the name of the saved or loaded load profile.



**Load Control Table, Speed;** select speed if the load profile is based on a speed.

**Load Control Table, Force;** select force if the load profile is based on force.



**Open,** to load a saved load profile.



**Save,** for saving the current load profile in the Load Control Table or for saving the acquired data during a test (Save button at the bottom). The acquired data is saved in a .CSV file. Use this button before starting a test!



**Add row,** for adding a new command line to the Load Control Table.



**Delete row,** for removing the last command line from the Load Control Table.



**Clear table,** removes all command lines at the Load Control Table.

**Process;** select the required command for this command line. The commands available are END TEST, RUN, START LOOP, END LOOP and REPEAT.

**PROCESS, END TEST;** is a mandatory last command line of each Load Control Table and stops the test after all other command lines are performed.

**PROCESS, RUN;** is an actual run command based on speed or force. If selected, fill in the required *Set speed* or *Set Force* and the *Time* by double clicking on the box. The columns km/h – N and Trq.Adapt are not used! Multiple RUN commands can be added to make up a load profile.

**PROCESS, START LOOP;** is used to create a loop of one or more RUN commands. To create a loop, first add START LOOP, then followed by one or more RUN commands.

**PROCESS, END LOOP;** is used to end a loop and is selected after the last RUN command of a loop.

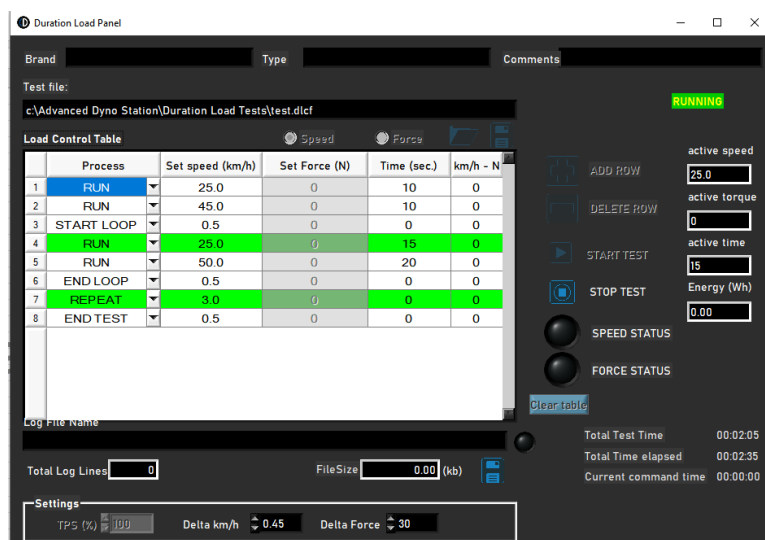
**PROCESS, REPEAT;** is used to repeat a loop and is selected after the END LOOP command. Fill in the number of repeats at the same column as Set speed or Set Force.

**Settings, TPS (%);** fill in the target TPS, this setting is for indication only. Double click to change.

**Settings, Delta km/h;** is the maximum allowed deviation for the speed during a speed controlled run. The smaller the deviation the more time it will take to stay within that delta. Double click to change.

**Settings, Delta Force;** is the maximum allowed deviation for the force during a force controlled run. The smaller the deviation the more time it will take to stay within that delta. Double click to change.

Once all settings are made, the vehicle is ready for the test, press **START TEST** and follow the command lines. If necessary the test can be stopped by pressing **STOP TEST**. Actual data during the test is made visible in the read-outs at the right. The actual command line is highlighted green. If a test is finished the data is automatically saved in the .CSV file.



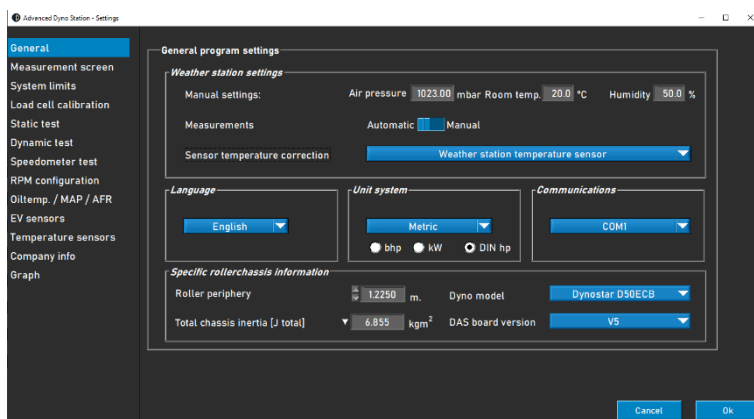


## PROGRAM SETTINGS

To access the settings of Advanced Dyno Station go to *Test settings > General program settings*. There are also two shortcuts to access the Dynamic and Static test settings directly.

### GENERAL

In *General* the basic settings like language, unit system, COM port and weather station settings can be changed. In the lower left corner of the menu the correct *Dyno model* and *DAS board version* have to be selected. New dyno's or upgrade kits will either come with our *V5 DAS board* (S.no. E001) or *MiniDAS V3* (S.no. E007/E008). Roller periphery and total inertia values will be set to the correct default values when the dyno model is selected. Only change the inertia and roller periphery settings when Dynostar indicates a change is required. For accurate test results it is essential these values are correct.



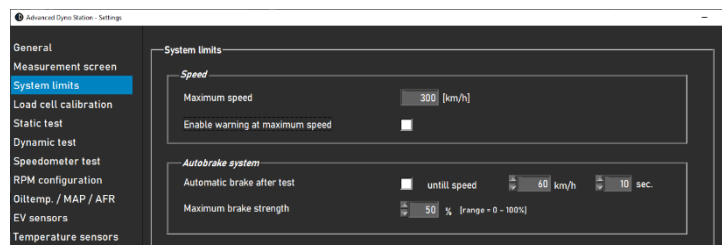
### MEASUREMENT SCREEN

In this screen the preferred gauge range for the dials in the measurement screen can be set. The maximum values of the gauges can be changed by clicking and dragging the white dot on the indicator.



### SYSTEM LIMITS

In the system limits menu it is possible to set a warning at the maximum speed of the dyno. Once the maximum speed is exceeded a message will appear on the screen. The dyno will not actively prevent the vehicle from exceeding the maximum speed to avoid unsafe situations (sudden braking) but a warning will be visible.



The autobrake feature can also be set up in the system limits menu. Enabling autobrake will automatically activate the retarder after ending a test. When the speed is above the set speed after completing a test, the dyno will activate the brake to lower the speed. The duration and maximum brake percentage can also be set, increasing the maximum brake strength will slow the dyno down faster and vice versa.

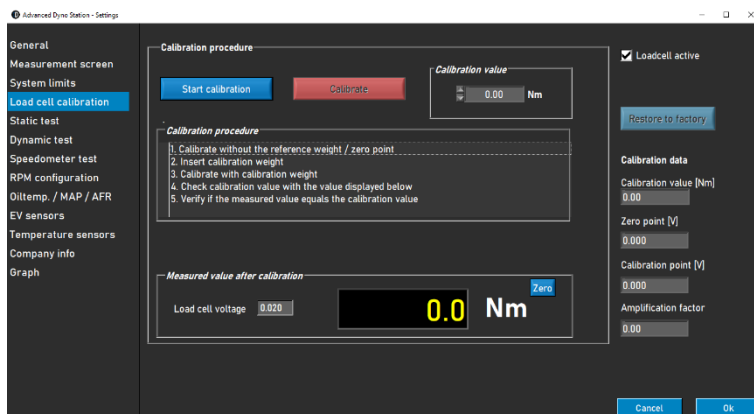
### LOAD CELL CALIBRATION



This menu is used to calibrate the loadcell. All Dynostar dyno's fitted with a retarder will have a loadcell. Before calibrating make sure that:

- "Loadcell active" is checked
- The correct calibration value is filled in
- Loadcell voltage is above 0.000V without load (will be set to approx. 0.020V from factory)

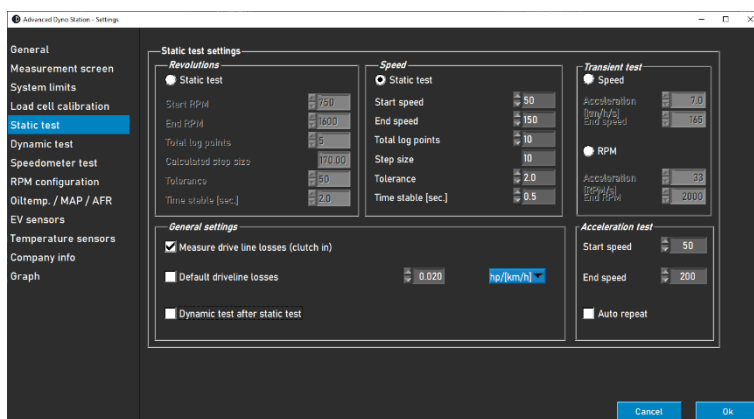
Follow the steps on the screen to calibrate the loadcell. On the right side of the screen the current calibration is displayed. Restart the software to finalize the calibration.



## STATIC TEST

In this menu the static, transient and acceleration test can be set up. For the static and transient tests the settings are presets for the database. The settings in this menu will be loaded as the default settings in the database when making a new run. These settings can be altered in the database as is explained in the *Database* chapter. In the lower half of the menu it is also possible to set up the driveline losses measurement.

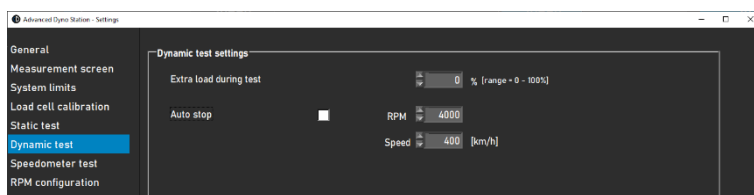
If *Dynamic test after static test* is selected the software will automatically load a dynamic test after completing a static test. You have to make sure that your *Dynamic test* settings are correct before using this function.



The *Acceleration test* can also be set up in this menu. The only parameters required are the *Start speed* and *End speed*. More information about the *Acceleration test* can be found in the *Tests* chapter.

## DYNAMIC TEST

The default value for additional retarder load can be set in this menu. Like the *Static test* settings this is a preset for the database that can be altered when making a new run. More information on the *Dynamic test* settings can be found in the *Tests* chapter.

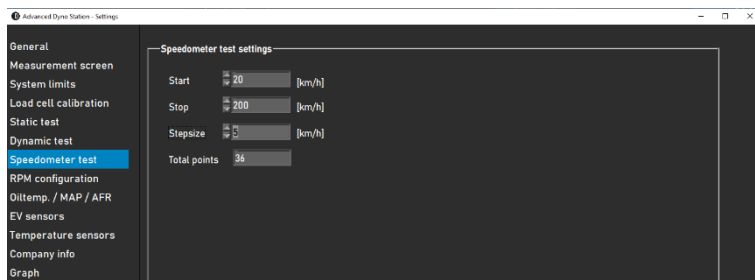


*Auto stop* is also a function that can be used during a dynamic measurement. This will end the measurement at the set speed or RPM automatically. All measurements will have the exact same endpoint as a result. Driveline losses can not be measured when using auto stop.

## SPEEDOMETER TEST

In this menu the speedometer test can be set up. This test is used to check the accuracy of the vehicle speedometer. The *start* and *stop* values determine the range that will be measured. With *stepsize* the amount and size of the measurement steps can be changed.

More information about the *Speedometer test* can be found in the *Tests* chapter.

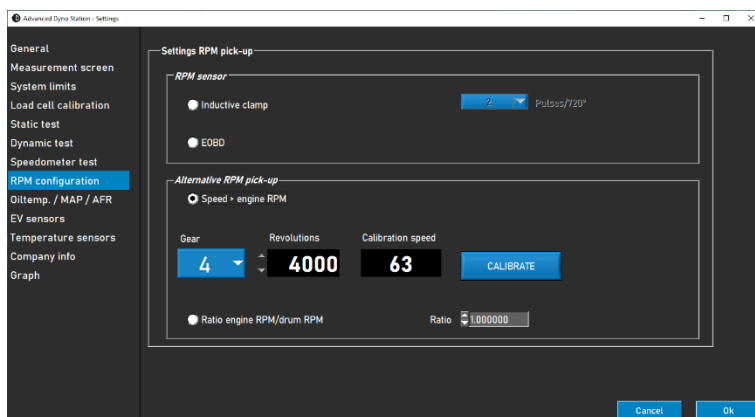


## RPM CONFIGURATION

The RPM configuration menu is used to configure the RPM pickup. Several options are available:

**INDUCTIVE CLAMP**, Engine RPM can be measured directly with the (optional) engine RPM module. For this option select *Inductive clamp*, further explanation of the settings can be found in the dedicated *Engine RPM* section of this manual.

**EOBD**, RPM measurement through OBD is also possible with an EOBD module. Select *EOBD* to use the EOBD module.



**SPEED > ENGINE RPM**, If the dyno is not equipped with one of the modules above it is also possible to do a speed based calibration. To perform the calibration select the gear and RPM to calibrate. Calibrating around 75% of the maximum engine RPM is recommended for an accurate calibration. Once the gear and RPM are set, start rolling and go to the desired gear and engine RPM. When the RPM is stable on the vehicle tachometer press *Enter* on the remote control or click *Calibrate* on the screen. The menu will close and the correct engine RPM will be displayed in the measurement screen. Check if the engine RPM is correct and recalibrate if necessary.

**RATIO ENGINE RPM/DRUM RPM**, Another option is calculating the ratio manually, this way the ratio between engine RPM and dyno RPM can be used. This option can be selected at the bottom of the menu by selecting *Ratio engine RPM/drum RPM*. Below an example is given on how to calculate the ratio.

*Gear ratio: 24/22 (1.09)*

*Final drive ratio: 67/18 (3.72)*

*Chain ratio: 33 /15 (2.2)*

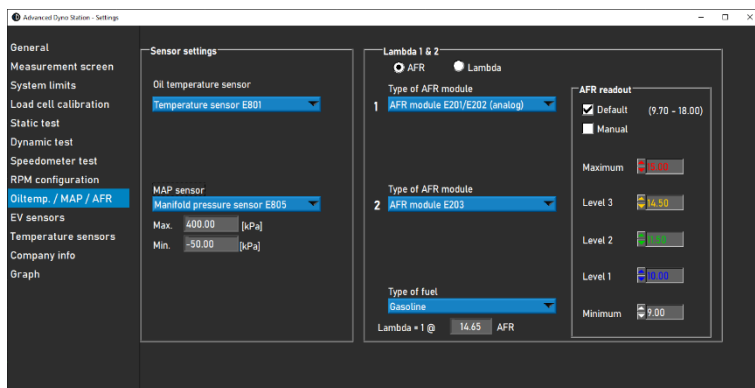
*Total ratio: 1.09\*3.72\*2.2 = 8.92*

This method of RPM pickup can only be used on direct drive setups where the engine is directly linked to the dyno with a chain or belt. Because of tire deformation it is not possible to use this on a chassis dyno where the wheel drives the dyno.

## OILTEMP. / MAP / AFR

In this menu various sensors settings can be changed. For the oil temperature and MAP sensors, only the correct sensor needs to be selected. The correct settings will automatically be loaded.

The AFR/Lambda sensor settings have more options. First it is important to select the correct module. More information can be found in the *AFR module* section of this manual. The scaling of the multi-color sliders in the measurement screen can be changed to personal preference on the right under *AFR readout*.

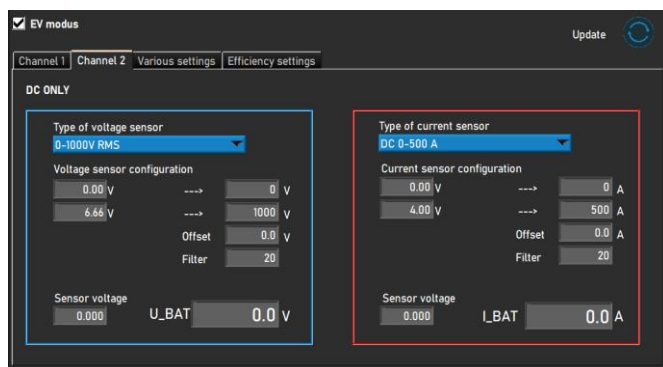


Also the type of fuel and stoichiometric value have to be set to the correct values on the bottom of the menu. Most fuels can be selected as standard. If the fuel type being used is not included in the *Type of fuel* drop-down menu, *Mix* can also be selected. This will make it possible to set the correct stoichiometric value in the text box.

## EV SENSORS

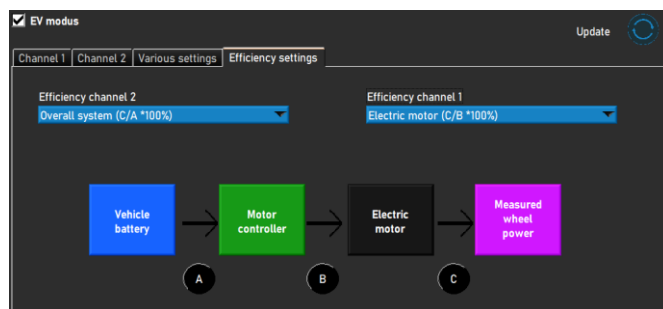
To perform measurement on electric vehicles the *EV module* can be used. First of all it is important that *EV modus* is selected. Also make sure that the AFR module is switched off if the dyno is equipped with it.

The channel 1 and channel 2 menu's are used to set up the voltage and current sensors. Make sure to select the correct voltage and current sensors in these menu's or the module will not produce the correct results. The correct sensor settings will automatically be loaded when selecting the sensor. Filtering and an offset can also be set in this menu when required.



Under the *Various settings* tab it is possible to set the number of decimals used for the power annotation in the *measurement screen*.

The EV module can also be used to calculate efficiency across different parts of the driveline. In the *Efficiency settings* menu the placement of the sensors has to be selected for correct efficiency measurement. Using the diagram and drop-down menu's the correct settings can be determined.

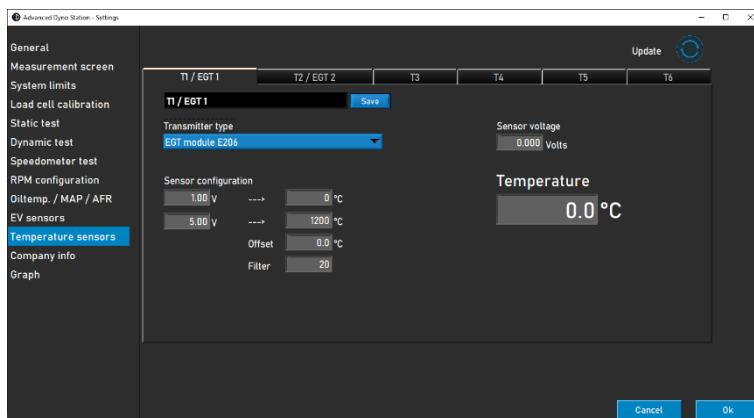


## TEMPERATURE SENSORS

When using an *EGT module* or *Temperature module* the sensor settings are configured in this menu. In total there are six temperature channels integrated in the ADS software. Channel 1 and 2 are dedicated for the *EGT module* and channels 3 to 6 are used for the *Temperature module*. Even though two different modules are used, all 6 settings tabs look the same.

Under *Transmitter type* the correct sensor can be selected in the drop-down menu. This will automatically load the correct settings for the selected sensor. In some cases it is required to also set and offset or adjust the filtering to correct and smooth out the signal. This can be done by changing the values behind *Offset* and *Filter*. When changes are made in the menu, click on the *Update* button at the top of the menu. This will update the sensor configuration.

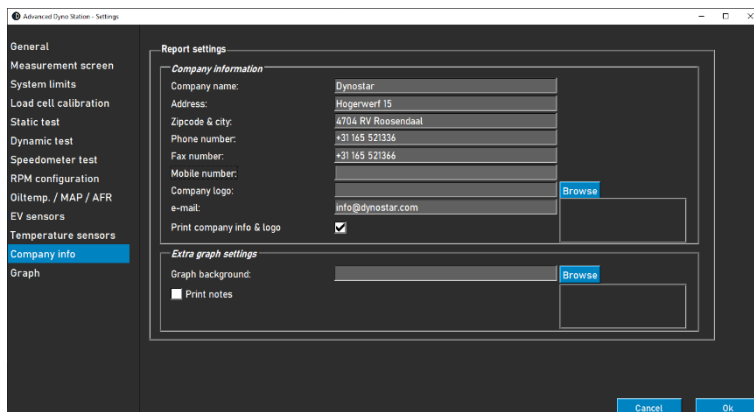
On the right side of the menu a readout is visible that displays sensor values. The current sensor voltage [0-5V] and temperature are displayed for calibration purposes.



## COMPANY INFO

The company information that is visible in this menu will be displayed on the graph printouts. It is also possible to use a customized logo for the graph background and on top of the printout. To use a custom logo select the image in Windows Explorer by clicking the *Browse* button behind *Company logo* and *Graph background*.

If *Print notes* is selected the first line of the notes in the database is displayed on the printout.



## GRAPH

The graph settings are split into three sections; *curve layout*, *sensor data* and *curve settings*.

In the *curve layout* section it is possible to change the appearance of the main performance graph:

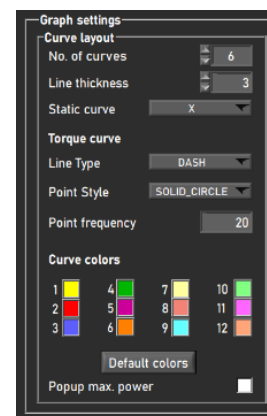
**NO. OF CURVES**, changes the maximum amount of curves to be displayed simultaneously.

**LINE THICKNESS**, thickness of the graph lines.

**STATIC CURVE**, select the markers on the static line.

**LINE TYPE**, select the line type of the torque curve.

**POINT STYLE**, select the markers on the torque curve.



**POINT FREQUENCY**, the amount of markers to be placed on the dynamic lines. E.g. a value of 20 will result in 1 marker for every 20 measuring points.

**CURVE COLORS**, changes the color of the graph lines. Default colors can also be selected with the *Default colors* button.

**POPUP MAX. POWER**, when this option is selected a pop-up with the maximum power will be displayed after completing a measurement.

There are also two sensor data sections in the graph settings. One for the left and one for the right Y-axis. These will change the appearance and settings of the sensor data graph.

**SHOW SENSOR DATA**, enabling this function will make the sensor data graph appear in the graph screen

**AFR CHANNEL 1**, display AFR channel 1. This will also make the AFR readout on the measurement screen appear/disappear.

**AFR CHANNEL 2**, display AFR channel 2. This will also make the AFR readout on the measurement screen appear/disappear.

**SHOW AFR LIMITS**, when selected two lines will appear in the sensor data graph to easily determine the AFR limits.

**UPPER AFR LIMIT**, set the color and value for the upper AFR limit line.

**LOWER AFR LIMIT**, set the color and value for the lower AFR limit line.

**SENSOR DATA RIGHT Y-AXIS**, select the sensor data to be displayed on the right y-axis of the sensor data graph. The range of the y-axis can also be selected. This can also be done by double clicking the top or bottom numbers in the graph screen.

The *Curve settings* section is used to determine the contents of the performance graph.

**SHOW TORQUE**, will enable the torque curve.

**STATIC DRIVELINE LOSSES**, driveline losses will be displayed for a static measurement when measured.

**DYNAMIC DRIVELINE LOSSES**, driveline losses will be displayed for a dynamic measurement when measured.

**CALCULATE ENGINE POWER**, this will include the driveline losses in the performance curve to determine engine power in conjunction with the driveline efficiency.

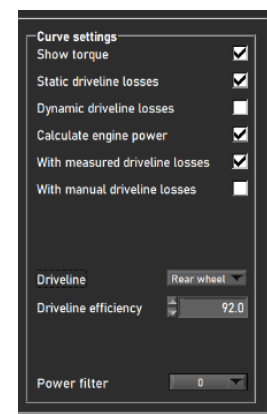
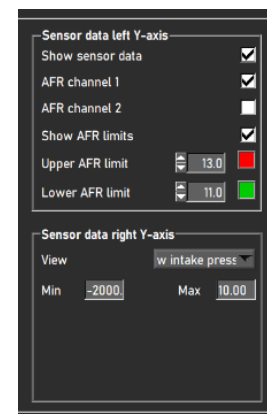
**WITH MEASURED DRIVELINE LOSSES**, use measured data from the run to determine engine power.

**WITH MANUAL DRIVELINE LOSSES**, use a manual value for the driveline losses to determine engine power.

**DRIVELINE**, used to select the correct driveline type. When *Use run data* is selected the driveline type selected in the database will be used for each individual run.

**DRIVELINE EFFICIENCY**, can be changed when desired. More information in the *Database* chapter.

**POWER FILTER**, smoothing of the performance graph.





## VEHICLE INERTIA CALCULATOR

It is possible that power figures can deviate from factory specs in some cases. This is normally due to the inertia of the vehicle driveline. This is different for every vehicle, but it does influence the measurement. The ADS software uses an average as a default. To be able to correct the measurement the *vehicle inertia calculator* has been introduced. Before using the *vehicle inertia calculator* two factors have to be checked to ensure correct test data.

- The technical condition of the vehicle has to be in order.
- The measurement is performed correctly.
  - Driveline losses measurement with clutch in or disengaged.
  - Correct type of driveline selected.
  - No slip on the rollers

Take note that the dyno inertia already includes a default value for driveline inertia, the figure displayed under vehicle inertia is only a correction on the total. The correction value can also be negative.

To use the vehicle inertia calculator go to *Test settings > vehicle inertia calculator* or double click on the first measurement in the *graph list* on the *graph screen*. Using the menu below the vehicle inertia can be adjusted. Select the measurement that needs to be adjusted by double clicking it in the database. When accessing the menu through the graph screen shortcut the run will automatically be loaded.

- When a measurement is successfully loaded the check box will turn green.
- Click on *analyze performance graph*. The graph screen will be opened and the maximum power figures will automatically be determined.
- Fill in the power and RPM the measurement needs to be corrected to.
- When *find total inertia* is selected the software will calculate the inertia correction and apply it to the measurement.
- Check the adjusted power figures and the vehicle inertia correction value.
  - When big power corrections need to be done this is mostly not due to driveline inertia. Check the vehicle and make sure everything is in order before adjusting. The user is responsible for correct use and interpretation of the vehicle inertia calculator. When in doubt please contact Dynostar support for further explanation.
- If the correction is correct select *Accept* to save the inertia correction. Following measurements on the same vehicle will now also use the corrected inertia value.

Vehicle inertia calculator

- ✓ 1. Load a dynamic run with 100% throttle
- ✓ 2. Analyze performance graph
 

Current power	Engine speed
69.9 [kW]	@ 9614 [RPM]
- ✓ 3. Insert the correct power figure for this vehicle
 

Target power	Engine speed
72.0 [kW]	@ 9614 [RPM]
- ✓ 4. Find total inertia
 

Dyno Inertia	Vehicle inertia	Total inertia
6.86	+ 0.21	= 7.06 [kgm2]
Org vehicle inertia		New vehicle inertia
0.00 [kgm2]		0.21 [kgm2]

Accept Cancel

## RELAY CONTROL CENTER

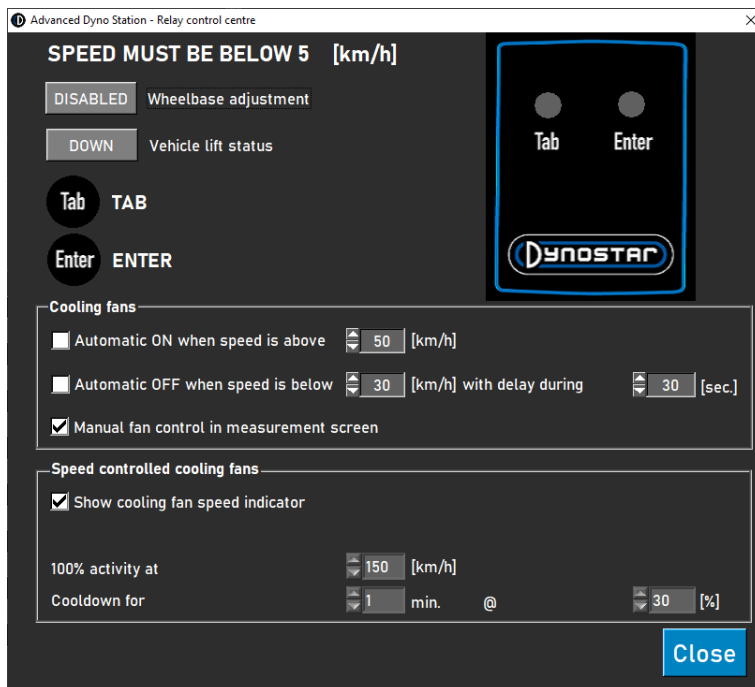
The relay control center is the menu where all the electrical systems of the dyno can be controlled. Not every dyno will require the use of the relay control center. If a dyno does not require the use of the relay control center it can be disabled in the register options menu. The functions that the relay control center controls are listed below:

- Wheelbase adjustment
- Vehicle lift beams
- Starter system
- Automatic cooling fans

The relay control center can only be used during standstill because of safety reasons.

### WHEELBASE ADJUSTMENT

To use the electrical wheelbase adjustment first click the “DISABLED” button, the text will change to “ENABLED”. The wheelbase of the dyno can now be changed by using the TAB and ENTER buttons on the remote control.



### VEHICLE LIFT BEAMS

When selecting the “DOWN” button the lift beams will immediately come up. The beam(s) will stay up until the relay control center is closed or the function is disabled by clicking the “UP” button.

### STARTER SYSTEM

The model D70 (including variants) and model 4T can be equipped with a starter system to be able to start bikes that are not fitted with a starter motor. To use the starter system on these dyno’s click the “ENABLED” button. When the ENTER button on the remote control is pressed the starter will start rotating the roller. Make sure to have the vehicle in 2<sup>nd</sup> gear or higher and have the clutch lever engaged. Wait to release the clutch until the roller is up to speed to start the vehicle.

### COOLING FANS

Automated cooling fan control can also be enabled in the relay control center. For some dyno models an automatic on/off function can be used. Enabling this function will automatically start the fans when the *Automatic ON* speed has been reached. They will be switched off after the speed is below the *Automatic OFF* speed. The delay for *Automatic OFF* will switch off the cooling fan after the set delay time has expired. This will provide the vehicle with extra cooling after testing.

When the cooling fans are equipped with a frequency inverter it is also possible to match the air speed to the roller speed. To set the ramp of the cooling fan speed *100% activity @* can be changed. Normally the maximum air speed of the fan is filled in here. A delay can also be set to provide additional cooling after testing. Both the duration and cooling fan speed can be set.



## ENGINE RPM MODULE E204

The engine RPM module can be used to measure engine RPM directly from the ignition system without the need to calibrate engine RPM with the roller speed or a calculated ratio. This will also make it possible to shift on the dyno and always have a correct RPM reading. Besides that the engine RPM module is also required to perform the Dynamic A/T (variable transmission) test for automatic and CVT vehicles because these vehicles do not have a fixed relation between speed and engine RPM.

### SENSOR LEADS

There are three ways to connect the engine RPM module to the ignition system. The RPM module can measure with two different inductive pick-up clamps as well as a digital input signal.

#### PRIMARY PICK-UP CLAMP

The first way is to connect the primary pick-up clamp (small blue clamp) to the signal wire of the coil. If the clamp is connected to the power or ground wire of the coil it will not measure an RPM signal. It may be necessary to remove/adjust some of the wiring loom wrap or finish to access these wires.



#### SECONDARY PICK-UP CLAMP

On conventional ignition systems that use spark plug wires the secondary pick-up (bigger black clamp) can also be used. The clamp has to be placed around the spark plug wire. The clamp also has a switch on the bottom that can adjust the sensitivity of the sensor. Adjusting this can help to get a clean RPM signal. When it is switched to the weaker side (small spark icon) it can help reduce noise on the signal. The stronger side (larger spark icon) can be helpful when the signal is simply too weak to read properly.



#### DIGITAL INPUT / TTL

The digital input set can also be used to measure engine RPM from another source. A pulsed signal with a level from 0-5v (TTL) to 0-24V can be measured. For example a tachometer signal or an output from an aftermarket ECU. The maximum frequency of the signal is limited to 300Hz. Connect the black wire to ground and the red wire to the signal wire or pin. Be careful not to exceed the maximum value of 24V or the RPM module may be damaged.



### SETUP IN ADS

To use the RPM module select *inductive clamp* in the *RPM configuration* menu. Make sure the correct number of pulses per cycle (720°) is selected. Further setup and finetuning can be done in the engine RPM software.

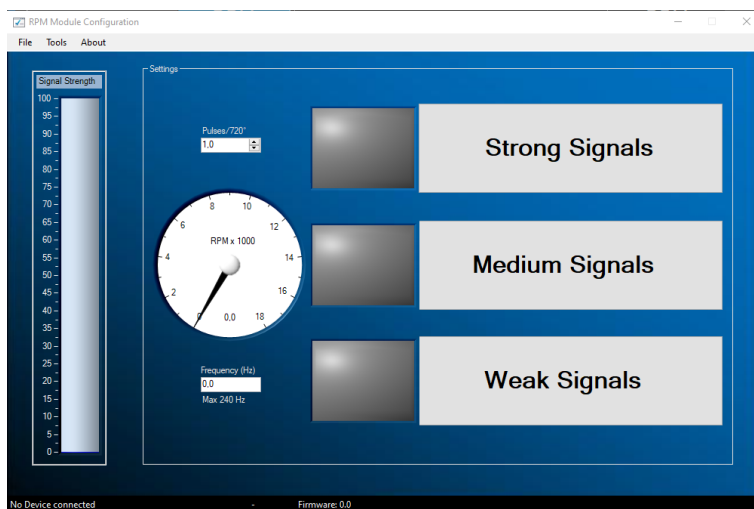
## ENGINE RPM SOFTWARE

The engine RPM software can be used to configure the signal processing of the ignition signal. Because there are a lot of variations of ignition systems these settings may need to be adjusted to accurately measure engine RPM on some engines.

To use the engine RPM software, connect the engine RPM module to the PC with a USB cable. Switch on the system and connect the USB cable between the PC and RPM module first. Then start the software and it will automatically connect to the module. When the module is communicating the text "Device connected" will appear in the lower left hand corner.

## SOFTWARE OVERVIEW

In the main screen the current engine RPM as well as the signal strength can be seen. The *Signal Strength* indicator shows the strength of the measured pulses. The higher the value, the clearer the signal is. Looking at this indicator can help to select the correct settings. Three buttons are used to change the base settings of the module according to the signal; strong, medium or weak. Select the setting with the best signal strength. These settings change the gain/amplification of the measured signal.



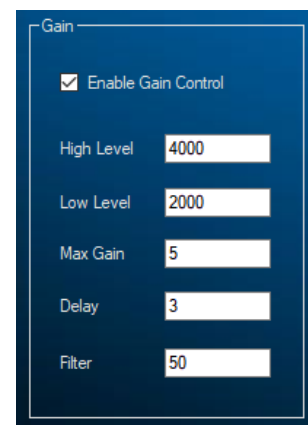
## ADVANCED SETTINGS

If it is not possible get the signal correct using the basic settings you can change the filter settings in the advanced settings. These can be accessed through Tools > Advanced Settings.

## GAIN CONTROL ENABLED

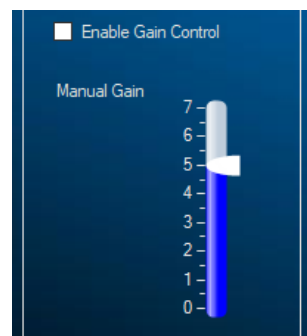
If the box "Enable gain control" is checked this means that the software will automatically amplify the signal to get the best possible signal out of it. This function is enabled as standard.

- High level – The maximum value of the signal in mV before the gain value is decreased.
- Low level – If the maximum signal does not exceed this value in mV the gain will be increased.
- Max gain – This will set the maximum gain factor from 1 to 7. In some cases, when there is a lot of noise, the gain must not be set too high because the noise will be amplified to an RPM signal.
- Delay – Determines how long the module will wait before changing the gain factor again.
- Filter – Changing this number will change the filtering of the measured pulse. A lower number will increase filtering.



## GAIN CONTROL DISABLED (AFBEELDING INVOEGEN)

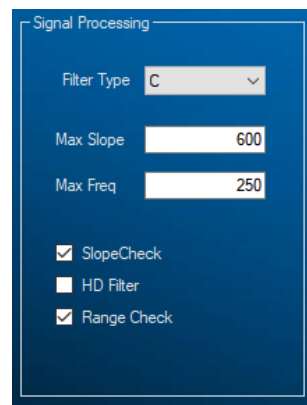
When there is excessive noise on the ignition signal sometimes the automatic gain control will not be able to filter out the desired pulses. In that case you can also disable the gain control and set a fixed manual gain. What the correct gain factor is for the engine you are testing at that time can only be determined by trial and error.



## SIGNAL PROCESSING

The signal processing settings can be used independently of the gain control settings to refine the signal even more.

- Filter type – Sets the type of filter that will be used.
- Max slope – Determines the maximum allowed change in frequency per second. If the signal changes faster it will be discarded as noise.
- Max freq – Determines the maximum signal frequency possible to measure, this can be calculated with max. engine RPM and no. of pulses per cycle.
- SlopeCheck – Determines if “Max slope” is used or not.
- HD filter – Can be used to filter out wasted spark signals.
- Range Check – Determines if “Max freq” is used or not.



## FILTERING

Because the amplitude of the RPM signal can change throughout the RPM range it is possible to use different filters based on signal amplitude. If only a single filter factor would be used this could result in signal loss at some points in the RPM range. Normally the amplitude of the ignition signal increases with engine RPM. This will increase the noise to signal ratio which requires less filtering than in the lower RPM range. The different filters can be changed to suit the characteristics of the engine and ignition system. Using the A, B or C filtering will make it possible to control the signal filtering in one, two or three stages. A lower filter coefficient will result in more filtering.

- Filter A coef – Basic filter, independent of signal amplitude.
- Filter B coef 1 – Filter value below the threshold value.
- Filter B coef 2 – Filter value above the threshold value.
- Filter B threshold – Amplitude of the switchover point between coefficient 1 and 2.
- Filter C coef 1 – Filter value between threshold 1 and 2.
- Filter C coef 2 – Filter value between threshold 2 and 3.
- Filter C coef 3 – Filter value above threshold 3.
- Filter C threshold 1 – Amplitude where filter coefficient 1 will be applied.
- Filter C threshold 2 – Amplitude of the switchover point between coefficient 1 and 2.
- Filter C threshold 3 – Amplitude of the switchover point between coefficient 2 and 3.



## AFR MODULES E201/E202

Two kinds multi-channel AFR modules are available. These are also known as *quad lambda module* or *QLB* for short. One has an integrated power supply and is normally used with car dyno's. The variant with an external power supply is normally only used on motorcycle dyno's. This is the only difference between these modules, both function exactly the same.

The module can be connected to either the DAS box directly or via the Junction Box. On car dyno's the module is normally connected to the DAS box, on motorcycle dyno's through the Junction Box on the side of the dyno. When a four channel module is used it has to be connected to the PC with a USB cable.

## ADS SETUP

To set up the module correctly in ADS go to *General program settings > Oiltemp. / MAP / AFR*. When a single or dual channel module is connected select *AFR module E201/E202 (analog)*. In the case of a four channel module select *AFR module E201/E202 (digital)*. In this menu the measurement screen preferences for the AFR readout sliders can also be set.

If the AFR sliders are not visible on the measurement screen go to the graph menu and make sure *AFR channel 1* and possibly *AFR channel 2* are selected. This does not apply for a four channel module, all four sliders will be visible when this option is selected.

When digital communication is selected the module has to be connected via USB to the PC and the *Quad lambda software* has to be running for communication purposes.

## LAMBDA SENSORS

All Dynostar AFR sensors are of the Bosch LSU 4.2 or LSU 4.9 type. Replacement sensors can be purchased from Dynostar. When in doubt about the sensor type please contact Dynostar.

There are two different ways to place the sensor in the exhaust of the vehicle that is being tested. The most accurate mounting option is to place the sensor directly into the exhaust that is fitted with a lambda bung. Some exhausts will have a bung available, otherwise one will have to be made available or welded into the exhaust.

If this is not possible the AFR sensor tube as (displayed on the right) can also be used. This can be inserted through the exhaust tip. The sensor itself will be mounted in the blue sensor holder. This is the easiest way to quickly measure the AFR of an engine. The downside of this type of sensor mounting is that it can cause a delay because the exhaust gas has to travel through the tube before it reaches the sensor. When using this method make sure the tube is inserted far enough into the exhaust.



Please note that a Lambda / AFR sensor always has to be mounted in **front** of a catalytic converter. Placing the sensor behind the catalytic converter will result in faulty measurements.

## EXTENDING SENSOR LIFE

Because a lambda sensor is a very sensitive measurement device some precaution can be taken to extend the life of the sensor.

- Do not expose the sensor to shocks and excessive vibration.
- Do not place the sensor in a cold exhaust, the condensation in the exhaust can decrease sensor life.
- Switch off the AFR module when the sensor is not in use.
  - The module will go into *sleep mode* when not in use, press the reset button to continue testing.

To make sure the sensor is stored properly and does not have to lay on the floor or workbench all the time, wall mounted brackets are supplied with all AFR measurement kits. The sensor tube with the lambda sensor can be slid into this bracket to safely store the sensor when not in use.

## STATUS LED'S

There are three status LED's on the front cover of the module. These indicate if the module is ready for use or not. In the diagram below the possible LED indications can be found.

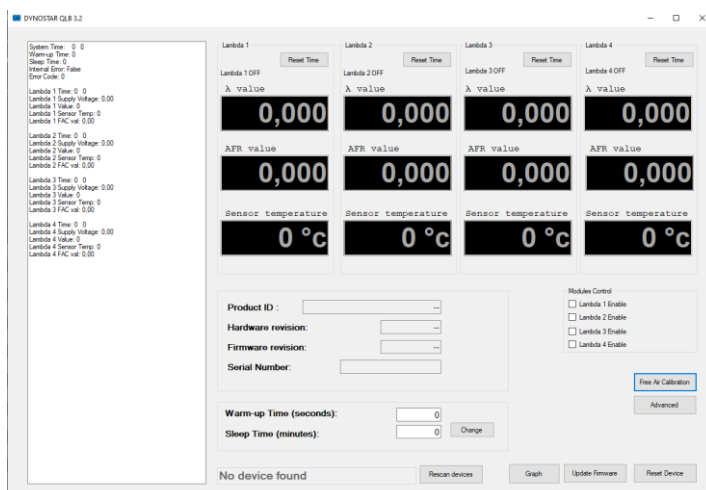
Module status	Stat. LED 1	Stat. LED 2	Stat. LED 3 / Error
Normal operation	On	Off (LSU4.2) / blinking (LSU4.9)	Off
Sensor heating up	1 sec. on, 1 sec. off	Off	Off
Sleep mode	Short flashes	Off	Off
Performing calibration	Alternating flashing		Off
Module error	Off	Diagnostics	On

## QUAD LAMBDA SOFTWARE

The QLB module also features a dedicated software package that can be used for diagnostics, calibration and additional sensor information as can be seen in the image on the right. To use the functions in this software package connect the module to the PC using a USB cable. Information and parameters like FAC value, sensor supply voltage, sensor temperature, etc. can be analyzed in the quad lambda software as well as sensor calibration.

The most important part of the QLB software is the Free Air Calibration. This makes it possible to calibrate the AFR sensor without the use of any kind of specialized gas. To perform the free air calibration place all sensors in free air, it is best to take the sensor out of the AFR sensor tube if that is in use. Make sure all sensors are fully heated up, the temperature readout will be red when the temperature is out of range. When all sensors are up to temperature the free air calibration can be started. Make sure to keep the sensor in free air until the calibration is finished.

After the free air calibration the *FAC value* will be changed. This value has to be between 0,9 and 1,1, when the value is out of range the software will also prompt an error. When a sensor is out of range it can mean the sensor is faulty or the wiring is damaged. Check the wiring, when no damage is found replace the sensor.





## AFR MODULE E203

Besides the multi channel AFR modules described previously, Dynostar also offers an alternative. This is the *basic AFR module* which is an Innovate LC-2 module that is modified to work with the DAS control box. In addition to the LC-2 module a sensor tube, wall support and sensor are included.

When a DAS Integrated system with an optional AFR channel is fitted to the dyno, this will also be equipped with the basic AFR module. The module is integrated into the control box housing.

Instructions in regards to sensor placement and sensor life can be found in the *AFR module E201/E202* manual. These principals apply to all Dynostar AFR modules as well as lambda systems in general.

An important note for the E203 module is to **never disconnect the sensor while the module is powered on**. This will damage the sensor heating circuit and the module will not work anymore.

### ADS SETUP

To set up the module correctly in ADS go to *General program settings > Oiltemp. / MAP / AFR*. Select *AFR module E203* under *Type of AFR module*. In this menu the measurement screen preferences for the AFR readout sliders can also be set.

If the AFR sliders are not visible on the measurement screen go to the graph menu and make sure *AFR channel 1* is selected.

### STATUS LED

The LC-2 module features a status LED on the front of the housing. This is also visible when the module is built into the Dynostar housing. Below an overview of the different module states can be found.

Status LED	Module status
No Light	No power to the module
GREEN, flashing twice a second	Sensor Warm-up
GREEN, series of quick flashes	Sensor Calibration
GREEN, solid	Lambda controller operational, taking readings.
RED, series of flashes followed by a pause	The number of flashes indicates an error condition. See Innovate LC-2 manual for details and troubleshooting.

### SENSOR CALIBRATION

The calibration procedure requires that the oxygen sensor be in **free air**, this means removed from the exhaust system/sensor tube completely.

- With the sensor disconnected, apply power to the module. When power is applied, the status light will light up green for 2 seconds while the controller initializes. The status light will then turn red and flash a two blink sequence indicating an error condition. This error state indicates that no sensor is detected. Leave unit powered on for a minimum of 30 seconds.
- Power down the module and attach the oxygen sensor to the sensor cable and the sensor cable to the LC-2. When making these connections, make sure they are fully seated and locked. Again, make sure that the sensor is in free air.
- Power on the module. The status light will light up green for 2 seconds while the system initializes. The status light will then start flashing green twice a second indicating that the sensor is heating up to its operating temperature. After 30-60 seconds, the status light will flash green for a series of very quick flashes indicating the sensor calibration is being performed. After calibration the light will light up solid green indicating that the unit is operational and ready to use.



## SUPPORT

Whenever support in regards to one of our dynamometers or upgraded dyno's running Dynostar electronics is desired please contact our support staff. The contact details of our support staff can be found below, they will be available for questions in regards to the functioning and/or use of the dynamometer.

Phone: +31 165 521336

E-mail: [info@dynostar.com](mailto:info@dynostar.com)

## REMOTE SUPPORT

Dynostar also offers remote support for all dyno systems using our ADS software and DAS electronics. The ADS software has a built in TeamViewer feature. It can be opened by clicking *Support > Open remote support*. This will open the *TeamViewer Quick Support* program, a subscription is not required to use this part of TeamViewer. Please send your ID and Password as displayed in the TeamViewer window to our support staff so they can access your PC remotely and assist you with any questions you may have.

