

CarbOnBal Quick-Start Guide

As of version 1.5.4

This QSG assumes you have already built a working CarbOnBal and are setting it up for use on your engine. This means the display comes on the splash screen runs and the readings vary according to the suction or vacuum applied on each of the hoses. If this doesn't work you have a problem that won't be fixed by reading this QSG.

Menu entries and settings you choose on screen will be displayed in the **HD44780 Font**. Step one is to power up and let the demo (press any key to continue) and self-tests run.

If you are having difficulty reading the display, press the Left / Up button to bring up the contrast menu. Using the left / right keys you can then adjust the contrast to get the best possible image. Press OK to keep the new settings, press Cancel to discard and return to the original setting.

The Right / Down button allows you to adjust the brightness of the backlight in the same way.

Note: All settings you change are immediately saved on pressing OK.

Now, with the display readable, use the OK / Menu button to enter the main menu.

The first step to take is to calibrate the sensors. Use the OK button to enter the menu and navigate to **Calibration / Calibrate Sensors**.

The numbers 2, 3 and 4 sensors are each calibrated to match sensor 1's readings. For this procedure you will need a "Y"-shaped hose so you can apply suction to sensor 1 and the sensor to calibrate at the same time (sensor 1 does not need to be calibrated, it's our reference). Choose a sensor to calibrate from the menu, press OK and then make sure to apply suction / vacuum to both the sensor to be calibrated and sensor number 1 at the same time. Take care these are joined without leaks and the hose lengths and diameters are equal for both sensors. Repeated calibration yields increasing accuracy to a point because readings are averaged internally. Calibration can be done orally, via engine vacuum or using a vacuum pump.

After calibration is finished you are presented with some statistics. A keypress then takes you on to the review screen, where you can scroll right and left through the recorded values. 256 values are recorded per sensor but the lowest values may be blank because these low values are never achieved by an engine in practice.

After calibrating the three sensors it's time to connect the vacuum hoses to the carbs or throttle bodies. All the usual precautions apply when working around hot, sharp, heavy and moving parts.

You can connect them any way you like and it's possible to set the master carb from the menu:

Settings / Hardware / Master Cylinder

This is used to indicate which carb is fixed on this engine. It affects the relative display mode in which the vacuum differences between the carbs are indicated with respect to the master cylinder. The Absolute display mode is a bar graph, much like a regular fluid filled hose. It just displays the current values for each cylinder without comparing them against each other.

It is recommended to use the absolute display mode at first because the relative display mode highlights tiny differences making it much harder to use. Relative display modes are an option to use after initial tuning using the absolute display.

Change this display option under **Display / Graph Type**

You are now ready to use CarbOnBal. Because engines differ there are some settings in the menu which will probably need to be tweaked in order to set the display up according to your own preferences.

In the menu go to **Settings / Software** Here you will find the settings **Dampin9** and **RPM Dampin9**.

Damping controls how quickly the display tracks changes to the vacuum pressure. Like the restrictor valves on a set of meters, but this setting affects all sensors equally.

0% means the display will be updated so quickly it becomes impossible to read. 100% damping means the display will never react. I suggest settings around the middle of the range.

RPM Damping is the same but is applied to the RPM value. It affects the sluggishness of the RPM needle as it were.

With those settings it should be possible to tune carbs or balance throttle bodies!

Menu settings:

Display

Graph Type

"Absolute", "Centered", "Diagnostic"

This selects how the values are presented. Absolute is a bar graph showing values between absolute vacuum and the ambient air pressure at your location (affected by altitude & weather mainly, calibrated automatically on startup.)

Centered is a relative display where the master carb is considered the reference and its value is always shown centered. The other values fluctuate around that value depending on their adjustment. Depending on the zoom range this can either help to get the utmost accuracy out of your tuning or drive you insane.

Diagnostic can be used to test the function of your unit and may be needed to debug hardware errors etc.

Contrast

0-128 in steps of 1. Sets the display contrast or clarity. Most displays work best at 5V (Arduino) when this is set to a low value but YMMV!

Brightness

0-255 in steps of 10. Sets the brightness of the display. Most units work best when this is set to a high value, but if you are tuning in dim light, turning it down might be easier on the eyes.

Details *

"Enabled", "Disabled"

When enabled This shows numerical values over the bar graphs. These may be preferred by some but are not needed for an accurate balance.

RPM Display

Shows an RPM display with bar graph and numerical readout

Units *

"Raw values", "Raw, descending", "Millibar / hPa", "mBar / hPa Desc.", "cm Hg", "cm Hg Descending", "Inches of mercury", "Inch. Hg desc."

Sets the units used for displaying values. Units do not affect the actual measurement or accuracy. Values can be set ascending or descending depending on personal preference. Descending values are calibrated on startup based on an averaged measurement of the ambient air pressure.

Max zoom range * (values shown in the selected units)

"100 = max", "200", "300", "600", "1024 = no zoom"

Zoom range is used by relative displays to zoom in on tiny differences in pressures. This value represents the "full screen deflection" of the metered display. That is what the difference is between the far left and far right values on the display. Max zoom is about 2 ½ inches of mercury or 84 HectoPascal. Each individual line on the display represents 100th of the total screen width but you will quickly find that it is not possible to balance a carb to anywhere near that degree due to mechanical variations!

Settings

Software

Damping

0-100% in 6% increments. This is like a flow restrictor valve on a set of meters, except this value affects all the sensors equally. It prevents the display from jumping around too much. A heavily damped display ultimately yields a more accurate tune but can be trying in practice. See the "Reset Measurement" function for a possible solution or just use less damping.

RPM Damping *

0-100% in 6% increments. Same as Damping, but only affects the RPM display.

Hardware

Cylinder count

1-4

Used to set the number of sensors you have in your unit or the number of carbs you need to balance.

Master Cylinder

1-4 (or less if less cylinders selected). There is always one carb that can't be adjusted. This is the reference carb or master carb. The sensor connected to this carb can be set here. This is especially important when using relative display mode.

Buttons

Contrast Button

"Contrast", "Reset Measurement", "Damping"

when set to "Contrast" this button adjusts the display contrast (default setting). "Reset measurement" immediately discards and damping and then proceeds to restore it to its normal setting slowly. This is useful with higher damping values to check the momentary values. High damping is accurate but can be sluggish and feel suspect. Using this lets you be sure the indicated averages are representative of the current situation and not influenced by outliers or outdated values etc. "Damping" allows you to quickly adjust the damping.

Brightness Button

"Brightness", "RPM Display", "RPM Damping"

"Brightness" adjusts the brightness of the LED backlight in the display. Adjust to taste but note that low values might be impossible to see without a very bright flashlight!

Cancel Button

"Freeze Display", "Reset Measurement", "RPM Display"

"Freeze Display" Literally freezes the display so you can read rapidly updating numbers and bar graphs or take a picture with your phone. A small * is displayed in the top right hand corner of the display to indicate this mode.

Extra

Device Info

Gives you information on the version of the software, free memory etc

Advanced Menu

"Enabled", "Disabled"

allows you to hide detailed settings not needed for normal use.

Splash Screen *

"Enabled", "Disabled"

Enables or disables the splash screen intro on startup.

'Factory' reset *

Returns ALL settings to their default values (no effect on calibration data)

Calibration

View Calibrations

View Sensor 2

Scrollable graph of calibration values for this sensor. Scroll right and left through all the values and you will see a graph of the full calibration curves. Gives you an idea if the sensors are still functioning normally and calibration is yielding normal looking results. A vertical bar is shown when a calibrated value is out of the currently selected calibration (zoom) range.

View Sensor 3

Scrollable graph of calibration values for this sensor.

View Sensor 4

Scrollable graph of calibration values for this sensor.

Calibration Range *

Sets the vertical scale of the calibration View Graph in units. Any value that falls above or below this value is displayed as a vertical line (up or down respectively).

Calibrate Sensors

Calibrate Sensor 2

Updates the calibration data for this sensor.

Calibrate Sensor 3

Updates the calibration data for this sensor.

Calibrate Sensor 4

Updates the calibration data for this sensor.

Clear Calibrations *

Clear Sensor 2

Clears the calibration data for this sensor.

Clear Sensor 3

Clears the calibration data for this sensor.

Clear Sensor 4

Clears the calibration data for this sensor.

Clear All Sensors

Wipes all calibration data at once.