

CUSTOMPERFORMANCE

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MZR 2.3 DISI Standback™ v1.0

cp-e™, Inc.
6802 Mid Cities Avenue
Beltsville, MD 20705

www.cp-e.com

Brief Technical Summary

By: Luigi Faustini

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The cp-e™ Standback™ engine control system is a very flexible yet sophisticated engine control and data acquisition system. The system is designed to allow the user to adjust fuel and timing parameters without the need to re-flash or re-program the factory ECU. This is accomplished by intercepting and “scaling” critical sensor signals. The signals that are scaled are MAF, MAP, and Fuel pressure sensor inputs to the factory ECU, as well as the crankshaft position sensor pattern. All of the new signals are generated in real time. The Standback™ control system also includes a very sophisticated full PID feedback control loop for accurate and responsive turbo boost pressure control, (output is direct PWM wastegate solenoid drive).

The Standback™ controller interfaces with the user via Windows Graphical User Interface (GUI), connected to the PC via USB. All “maps” are stored on the Standback™ controller, the Windows software is only needed if the user wishes to tune / analyze engine operation. Timing adjustments are accomplished by entering in the desired timing change in degrees, on a 30x30 grid (900 points per map, with 0.1 degree adjustment granularity). The grid’s axes are RPMs vs. TPS, however future GUI versions will allow for scaling of RPM vs. [TPS, MAP, or MAF] (using current stand-back hardware). A similar 30x30 grid may be used to scale MAF voltages (voltage may be changed by adding / removing a percentage of actual MAF voltage, with .01% granularity), again the axis for this grid are RPM vs. TPS, with future GUI version supporting RPMs vs. [TPS, MAP, or MAF] (using current stand-back hardware). Fuel pressure is scaled with its “axis” being input MAF voltage (50 entry chart). All adjustments may be made with the engine running, and take effect in real time. The software incorporates a “dot” that is dynamically positioned on the grids in real-time to assist the engine tuner in “knowing where the engine is” in relation to the adjustments being made on the grid.

MAP pressure is not scaled, however the user may program the MAP output to be “clamped” at a desired pressure, (i.e. to avoid “over-boost” error codes from the factory ECU). The MAP sensor data is also used by the Standback™ controller for boost control. Boost is easy to adjust, the user simply inputs the desired boost pressure, and the Standback™ controller dynamically modulates the wastegate to achieve the desired boost pressure. It is simple and easy to program, and automatically compensates very well with changing engine conditions such as the opening of an exhaust cut-out.

There are “two sets” of the above 30x30 maps, and target boost pressures, and the user may switch between tuning map sets via grounding one of the inputs to the Standback™ controller. This allows the user to have a “regular driving” set of maps and parameters, and an additional set that the user may wish to switch to if perhaps the user were to occasionally fill the car with very high octane race fuel.

The Standback™ controller is a very powerful data acquisition system as well as a tuning solution. The Standback™ controller has the ability to record all of the following parameters:

1. Engine RPM's
2. Actual ignition timing, (as in when the spark happened).
3. Injector timing, (open and close time relative to crankshaft degrees).
4. Injector duration, (milliseconds, with sub-microsecond accuracy).
5. Injector duty cycle, (percent).
6. Ignition dwell time, (currently not supported in the GUI, but is a work in progress).
7. TPS voltage
8. Intake manifold MAP pressure / voltage.
9. Newly generated MAP pressure / voltage.
10. Fuel pressure.
11. Newly generated fuel pressure.
12. MAF voltage
13. Newly generated MAF voltage.
14. Wideband O2 (exhaust gas lambda), (with the use of cp-e's wideband oxygen sensor).
15. Battery voltage
16. 8 additional analog inputs (With the use of cp-e's additional analog-input expander box. Allowing the user to log / analyze data from sensors such as EGT sensors, linear actuators / accelerometers or whatever else the user may imagine).

All of the above parameters may be viewed in real-time on a scrolling-set of graphs via the Windows GUI. In addition all of the above data may be exported to a "CSV" file that is easily imported into programs like Microsoft Excel, to allow the engine tuner to go through detailed post-run analysis.

The Standback™ controller hardware also incorporates an internal data log, where all of the above parameters are constantly being stored in an internal memory, (at user selectable rate of 5, 10, or 20 samples per second), allowing the user to retrieve the last 40, 20, or 10 minutes of engine operation without the need to have had a lap-top computer connected during the drive, (This feature is currently under development but is supported by this version of the stand-back hardware).

Future versions of the Standback™ will support direct drive of fuel injectors and ignition components, as well as additional control systems for drive-by-wire devices such as electronic throttle controls; however this is a moving target, and is still under development. Even more sophisticated, exciting, analysis tools will be incorporated in to the next versions of the hardware, as the engineers at cp-e™ never stop thinking, "how can we do this better?" – while working late into the night.

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