



in association with



and



911-CDI+

Dyno Test Report

Issue 1.0

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Overview

The Classic Retrofit CDI+ box employs a dual discharge sparking system, firing two sparks for every ignition cycle. Customers who have fitted the unit have repeatedly given us feedback that the engine feels smoother, the engine pickup is improved and the car is generally more driveable.

Multi spark ignition units are not a new idea. Many, however, cannot provide more than one spark beyond 3000 RPM. The CDI+ unit can provide 2 sparks across the entire rev range. It is true to say that the 'worth' of the second spark diminishes at very high RPM but we believe there is merit to having two sparks beyond 3000 RPM.

Although the CDI+ units *can* be programmed with custom ignition timing, the change is noticeable **without** making changes to the ignition timing.

The objective of this report is to see what changes in engine performance are seen when using a 'straight of the box' CDI+ when compared to a standard Bosch unit.



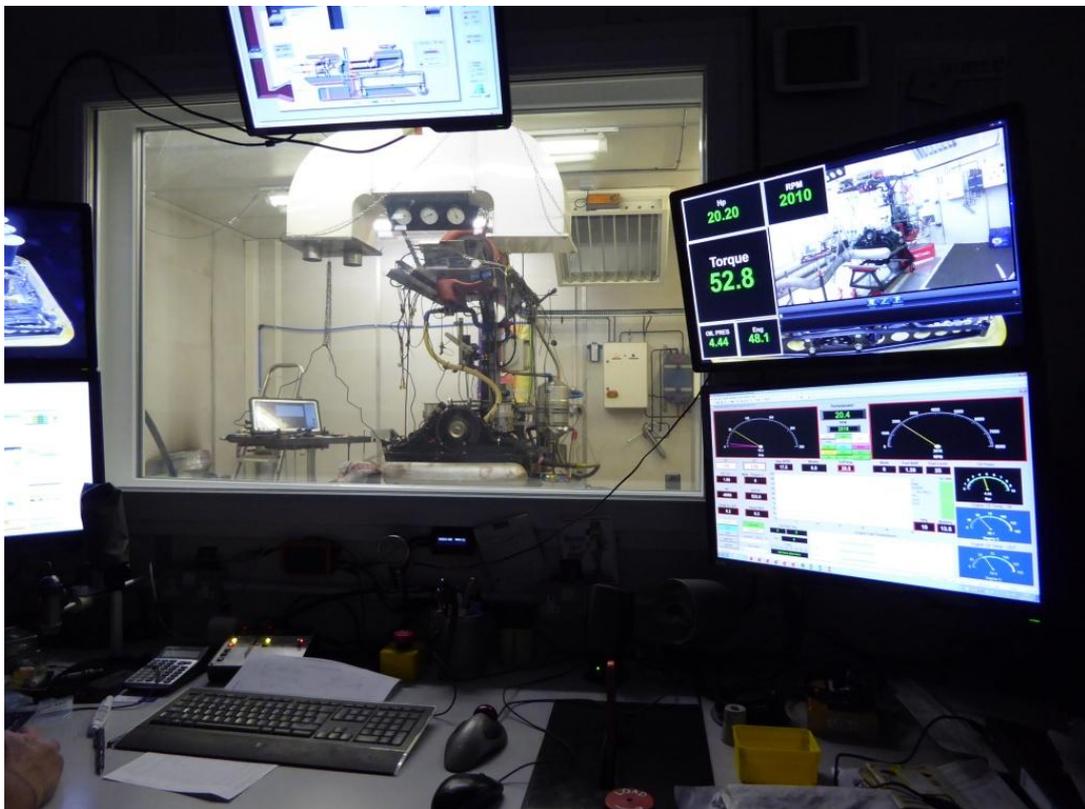
CDI+ Basic Unit as used in the tests.

The Test Cell

The tests were conducted on a fully balanced engine test cell at BS Motorsport. The cell is operated by Neil Bainbridge and is used to setup engines built by BS Motorsport. Installed in 2008, the cell incorporates a 2000 bhp water brake dynamometer.

"We have at the moment 56 logging channels [with to option of a further 56] logging twin wide band lambda – 5 gas Exhaust Analyser - Engine Knock on two channels – Temperatures and Pressures as required- Engine "Blow-By" – Fuel Flow and Pressure - Engine Combustion Pressure can also be logged as well as real time spark advance even on early points type distributors giving a true advance curve." - Neil Bainbridge

The cell was previously used by the Hyundai World Rally Championship team.



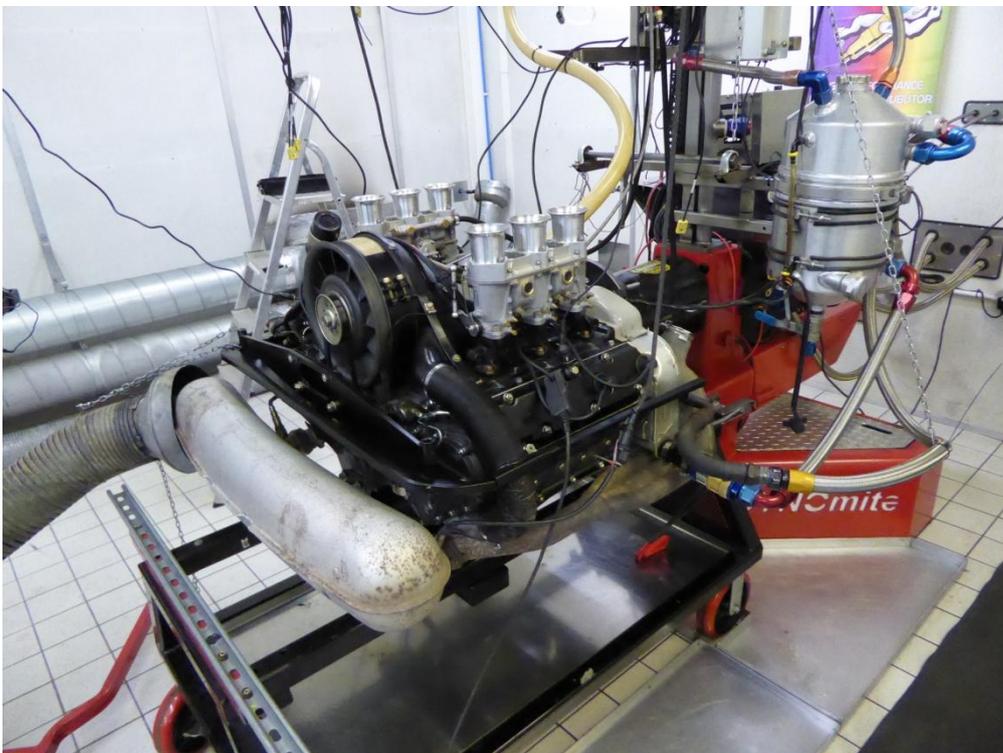
Looking into the test cell from the control room

The Test Engine

The engine chosen was a freshly built 2.4T motor. The motor specification was as follows:

- 2.4 litre displacement
- Hi compression pistons
- 'S' cams
- PMO carburetors
- Standard distributor with weights/spring controlling advance.
- Pertronix in place of points.

The motor was 'run-in' prior to the test session.



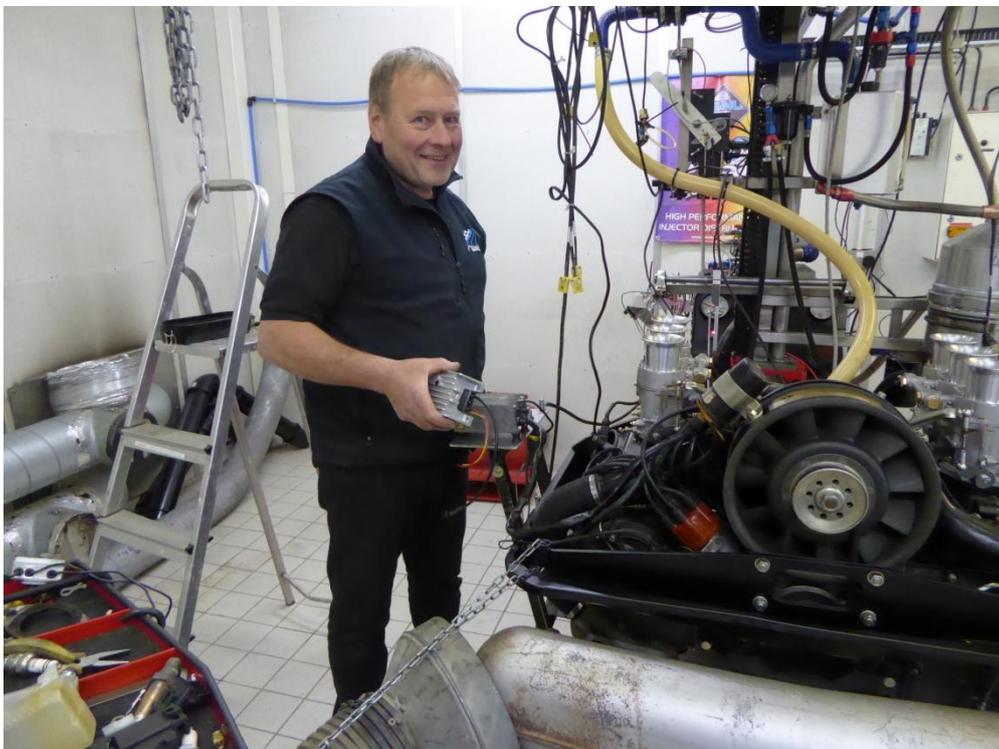
Freshly built and 'run in' 2.4T Motor

The Tests

The tests were conducted over 2 days, 13th and 14th March 2016.

Prior to each test run, the engine was brought to the same temperature and the environmental conditions in the cell were balanced.

The original Bosch unit was checked for healthy output on a test kit.



Always smiling, Neil Bainbridge swaps over to the CDI+

Day One

Those present:

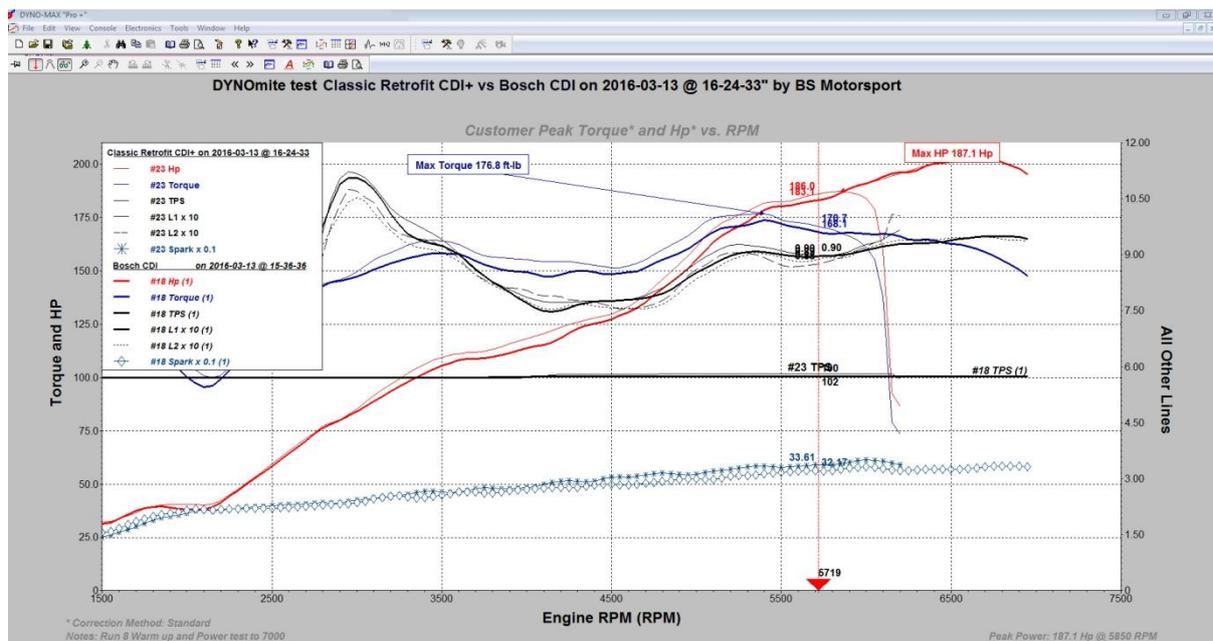
- Neil Bainbridge - Owner / Engineer, BS Motorsport
- Chris Horton - Technical Writer, 911 & Porsche World

Having been run in, the engine was subject to several full RPM power runs on the original Bosch unit. The CDI+ was then installed and power runs repeated. Care was taken that engine temperatures and environmental conditions were the same between runs. Finally, the Bosch CDI was reinstalled and the tests repeated.

The best case Bosch (bold lines) and the best case CDI+ (thin lines) are shown below. Blue is torque, red is horsepower.

Independently recorded advance is the bottom light blue line. Stars are CDI+, diamonds are Bosch.

The CDI+ had (mistakenly) been preconfigured with its rev limiter set at 5700 RPM. This clearly shows in the graph with the sudden drop off in power.



With the CDI+ installed, the plots show an increase in torque and power across the rev range.

Note that the timing is still controlled by the weights and springs in the distributor. The base timing for both CDI+ and Bosch units has been set as closely as possible (within 1 deg).

Due to the mechanical nature of the weights/springs no two runs will be exactly the same from an advance point of view. This particular run shows a CDI+ run very slightly 'ahead' of the Bosch run but note that even when the two are precisely matched, the torque is still increased (e.g. at 3200 and 3700 RPM).

Day Two

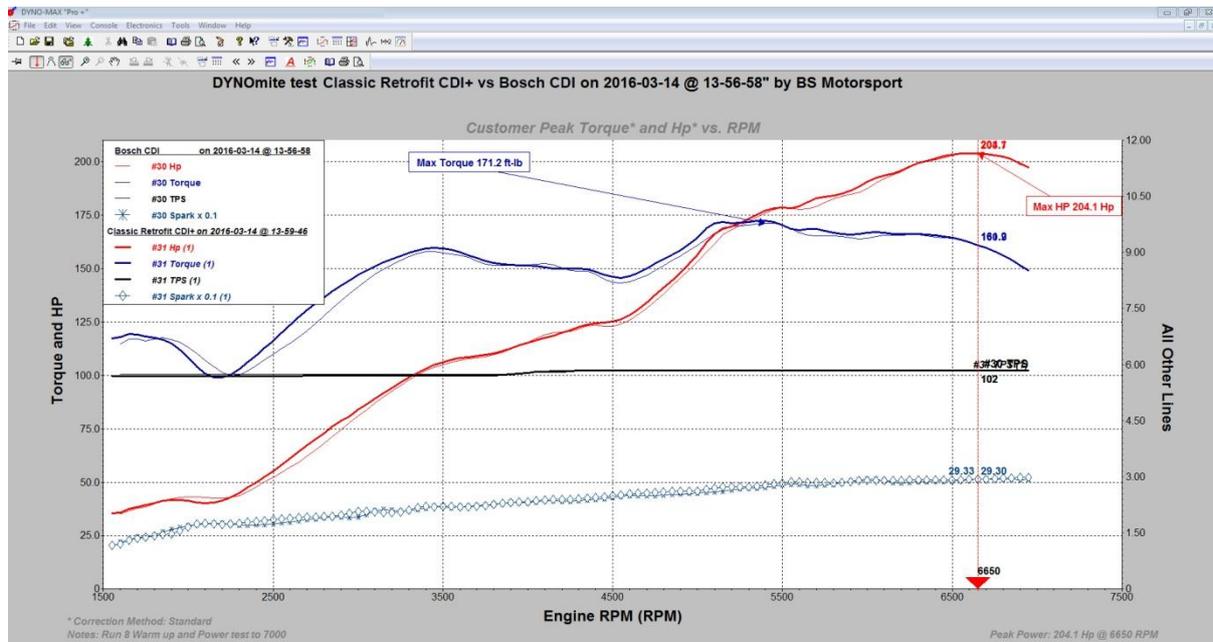
Those present:

- Neil Bainbridge - Owner / Engineer, BS Motorsport
- Chris Horton - Technical Writer, 911 & Porsche World
- Jonny Hart - Owner / Engineer, Classic Retrofit

On the second day a jetting adjustment was made to the PMO carburetors to improve the fuelling.

Having adjusted the CDI+ rev limiter to investigate top end performance, the test runs were repeated.

The best case Bosch (thin lines) and the best case CDI+ (bold lines) are shown below:



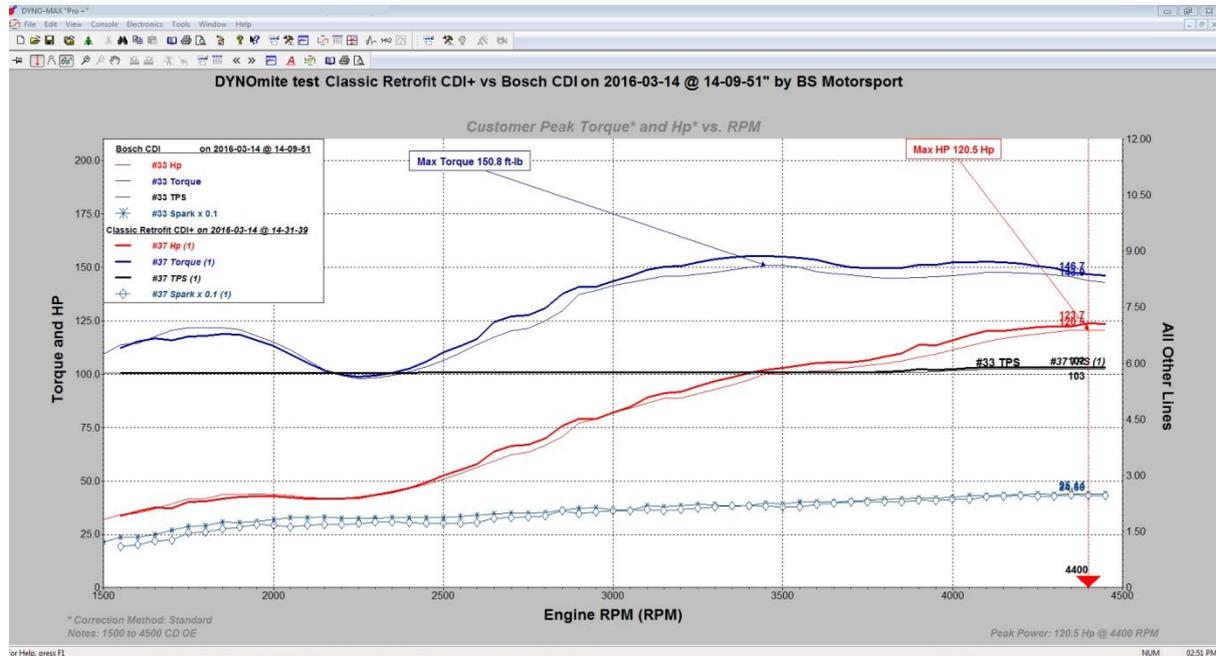
Note that the timing is near identical across the rev range -as near as makes no difference in performance terms. On repeated tests, the CDI+ was set up with a slight disadvantage (retarded) and the results were the same.

The bump in torque up to 3500 RPM is very noticeable, 10 ft-lbs in places. Beyond that, there are gains to be had up to 6200 RPM. Beyond 6200 RPM, the CDI+ and Bosch units were comparable.

It was decided to focus on the mid range output. To get a more accurate plot, the dyno was set to 100 RPM/s climb up to 4500 RPM. This is effectively 'climbing Everest' for this little motor.

Again, CDI+ / Bosch were swapped, compared, swapped again.

We present the best runs for CDI+ (bold lines) vs Bosch (thin lines):



In this plot we see more detail for the increase in torque/hp between 1500 and 4500 RPM.

You can also see that the CDI+ is slightly disadvantaged as it is running slight less advance compared to the Bosch unit.

Summary

"The Classic Retrofit CDI+ shows a distinct increase in power even when using the timing offered by a standard distributor. Gains of up to 10ft-lbs of torque were recorded under controlled conditions in our engine test cell. On the road and track this bump in power will certainly be noticeable. We are happy to endorse this product, there is no question that it improved the power output. It was noticeable that the engine under test ran smoother and was more responsive "

- Neil Bainbridge

Thanks

Classic Retrofit would like to personally thank Neil Bainbridge and his staff at BS Motorsport for their valued input into this project.



BS Motorsport
421 Gasoline Alley
Westcott Venture Park
Westcott
Buckinghamshire
HP18 0XB
United Kingdom



Classic Retrofit
The Old Forge
Butchers Cross
Five Ashes
East Sussex
TN20 6JN
United Kingdom