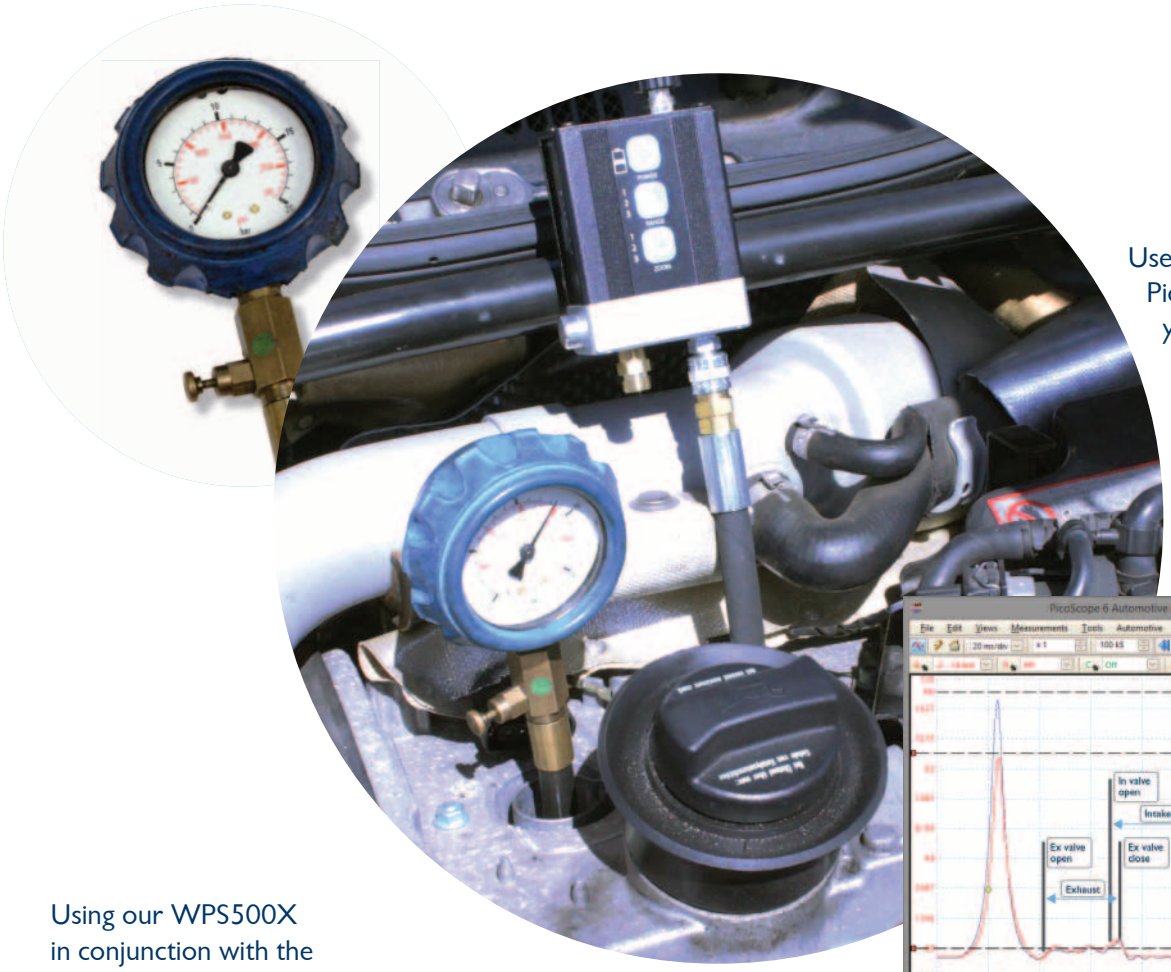
PicoScope®

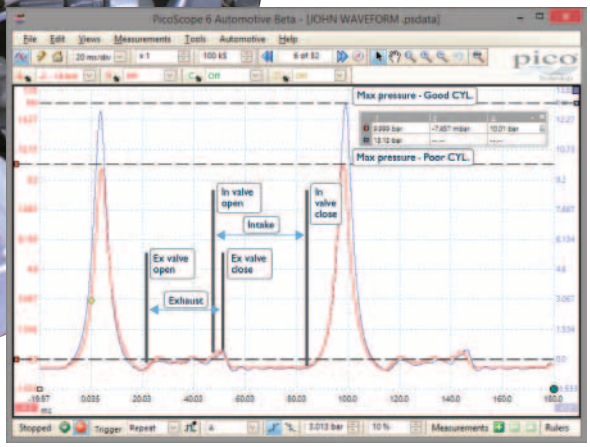
pico® Technology

See more with the WPS500X

Diagnostic pressure transducer



Use the WPS500X with PicoScope to reveal how your engine is actually performing with minimal intrusion. Compression, airflow, valve timing and back pressure can all be measured in one hit!



Using our WPS500X in conjunction with the award-winning PicoScope allows you to see compression like never before.

Automotive compression gauge

- Peak Compression
- Compression Stroke Only

VS

WPS500X diagnostic pressure transducer

- Top Dead Centre
- Bottom Dead Centre
- Max Vacuum
- Valve Timing
- Valve Sealing
- Valve Overlap
- Airflow
- High Resolution
- 4 Stroke Visibility
- Exhaust back pressure

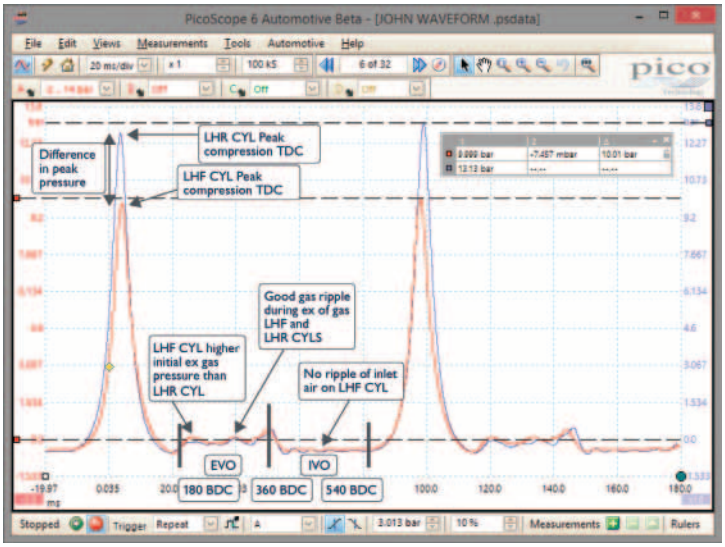
OVERVIEW

With the unbeatable resolution and accuracy of the WPS500X Automotive Pressure Transducer you can perform quick and accurate pressure analysis of many automotive systems. The WPS500X features an extremely fast 100 µs response rate and sensitivity down to 0.07 psi (5 mbar). This provides you with an accurate view of rapidly changing signals that span a broad pressure range.

CASE STUDY - SUBARU CYLINDER MISFIRE

ENGINE DETAILS: Subaru flat 4 port and direct injection, non-turbo
YEAR: 2012
SYMPTOM: An intermittent issue of the engine warning light illuminating and fault code “P0302 Cylinder 2 misfire” detected.

Following some detailed analysis (the full case study available: www.picoauto.com/tutorials/subaruDirectInjection.html) the WPS500X pressure transducer was installed into the LHR cylinder and the waveform acquired by cranking and running the engine, saved and kept as a reference to compare against the LHF cylinder under the same conditions.



Here we can see the reduced peak compression pressure of the LHF cylinder (red) in comparison to the underlying reference waveform of the LHR cylinder (light blue). LHF cylinder peak compression achieved 9.77 bar compared to the LHR at 12.75 bar, a difference of 2.98 bar as indicated by our relative compression test earlier. Using the phase markers of the PicoScope automotive software we were able to mark out the zero (TDC) and 720 degree (TDC) points of crankshaft rotation and then divide the distance between the phase markers equally using the phase marker partitions, enabling us to plot the events of the 4 stroke cycle.

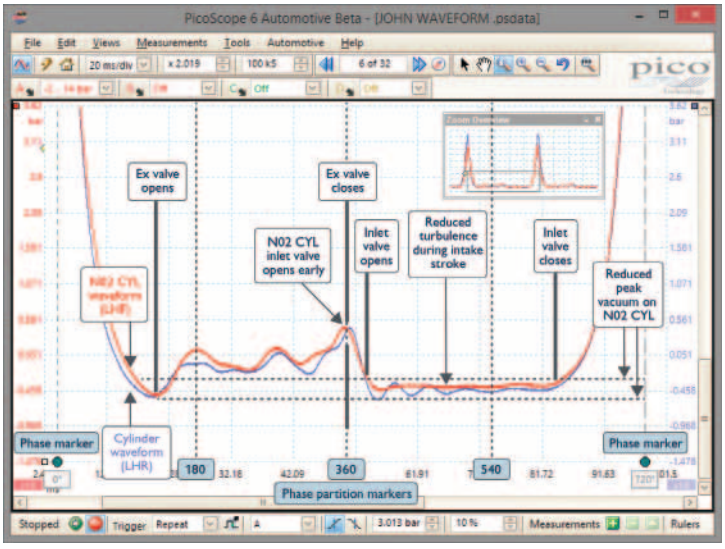
What became very apparent was the lack of “Ripple/ Turbulence” during the intake stroke of LHF cylinder in comparison to the reference waveform.

We always have to look for differences or anomalies between known good signals and here we can see good turbulence from both cylinders during the exhaust stroke indicating good airflow dynamics but a definite reduction in turbulence of the air flow during LHF cylinder intake stroke. We can also identify the early and prolonged opening of LHF cylinder inlet valve in comparison to the reference waveform and the reduction in peak vacuum, all linked to the condition revealed below.

The above engine varies the valve timing according to engine load conditions. During cranking and idling, valve overlap is eliminated to improve idle quality.

At this stage enough is enough as no further testing can be carried out with the engine installed. Sufficient evidence had been gathered and presented to the customer confirming we were now looking at a fault of a mechanical nature. Permission was then given to remove and dismantle the engine that finally revealed near zero valve clearance with LHF cylinder inlet valves at 0.03 mm and 0.00 mm.

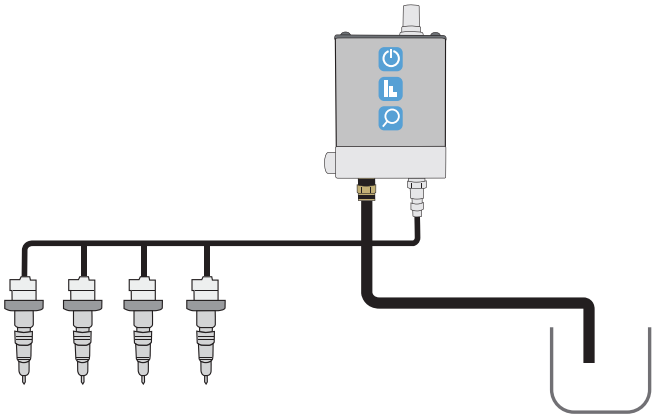
This confirmed why the misfire would be more pronounced at low engine speeds as the valve would have been seeping. As engine speed increased both the momentum and increase in pressure would disguise the misfire (no misfire count at

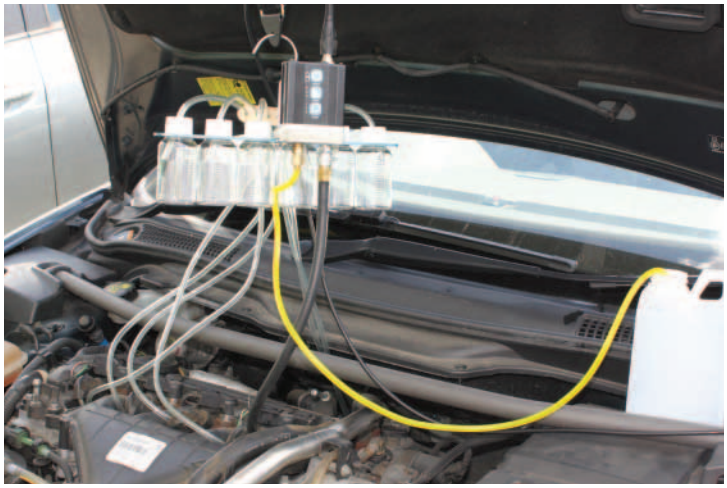


150 rpm above idle but near 50% misfire during relative compression test at 200 rpm). Looking back at the testing carried out the inlet valve could only have been marginally mis-seated as no misfire could be detected using cylinder cut or emission methods, yet the PCM had identified an anomaly with crankshaft rotational speed as did the relative compression test. The engine has since been reassembled with an inlet valve clearance of 0.12 mm and all is well with no misfire count or code apparent.

BACK LEAKAGE TESTING WITH WPS500X

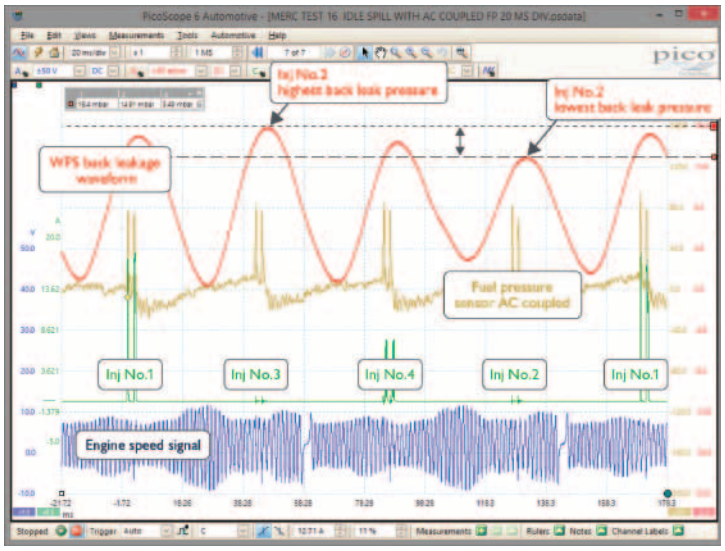
This will be added to the tests included within our Picoscope 6 software, including specific tests for the WPS500X.
To view all our guided tests download our free Picoscope 6 software today from www.picoauto.com





Run the back leakage test with WPS500X and see so much information clearly revealed.

- Accurately measure back leakage during numerous engine speed and load conditions
- Produce hard copy test results showing RPM, MAF, MAP and Fuel Pressure
- Needs only one connection into the back leakage return pipework
- Enables a back leakage test to be performed under road test conditions, enabling you to capture those elusive intermittent running issues



Possibly one of the most valuable and conclusive test procedures we have when diagnosing common rail diesel systems is the Back Leakage Test (commonly referred to as Spill Test). This is an essential feature of the common rail diesel systems confirming adequate lubrication of the injector assemblies, while providing a degree of cooling as a beneficial side effect.

Traditionally the volume of “back leakage” has been measured using graduated collection bottles, while monitoring both the rate and amount of “fill” during cranking or pre-set running conditions. This test will always remain relevant as manufacturers often specify the volume of back leakage against time, but the WPS500X will reveal intermittent issues under all driving and test conditions.

WPS500X TESTS

ENGINE
Cylinder compression testing (Cranking)
Cylinder compression testing (Idle)
Cylinder compression testing (WOT snap test)
Intake manifold pressure petrol and diesel
Exhaust gas pressure pulsations
Exhaust back pressure evaluations
Crankcase pressure pulsations
PCV valve operation when you have high crankcase pressures
Camshaft timing evaluation (Belt, Chain and Gear Driven)
Cylinder head valve sealing integrity
Engine oil pressure testing
Cooling system pressure evaluation-Head gasket failure
Radiator cap evaluation with over pressurized cooling systems
Vacuum pump efficiency

FUEL
Fuel delivery pressure, Petrol
Fuel pressure regulator test, Petrol
Fuel delivery residual pressure test, Petrol
Fuel delivery/priming pump efficiency, petrol and diesel
Fuel positive priming pressure, Diesel
Fuel negative priming pressure, Diesel
Fuel delivery residual pressure, Diesel
Fuel injector back leakage test, Diesel
Fuel injector contribution evaluation test, Petrol
“Evaporative loss” control vacuum circuits and solenoids

TURBO
Boost pressure evaluation (Variable vane errors)
Boost control vacuum circuits and solenoids
Waste gate operation

ENGINE MANAGEMENT
Variable induction system actuator/control integrity test.
Idle control damper integrity test.
Cruise control actuators, vacuum circuits and solenoids.

CHASSIS
Air suspension pump efficiency
Air suspension residual pressure testing
Air suspension control pneumatic circuits & solenoids
Brake servo evaluation and integrity test

TRANSMISSION
Auto transmission line pressure testing
Auto transmission governor pressure testing

WPS500X PRESSURE TRANSDUCER

• Accurately measure up to 500 psi • Ultra-fast 100 µs response time • Zoom function for enhanced analysis capabilities • Rechargeable Li-Po battery • Integrated pressure relief / bleed-off valve • Auto zeroing • High noise immunity • Temperature compensated

NOTHING COMPARES TO THE WPS500X

It is not unusual to require a different pressure transducer for each diagnostic test you want to run. The WPS500X eliminates this need by giving you one high-resolution transducer that can be used for a multitude of automotive diagnostic applications. With three pressure ranges, a zoom function, pressure relief valve and a rechargeable Li-Po battery all enclosed in a durable housing, the WPS500X is the cost-effective solution for pressure analysis.

When price, performance and versatility matter, there is nothing that compares to the WPS500X Automotive Pressure Transducer.

WHAT'S IN THE WPS500X PRESSURE TRANSDUCER KIT

- PA094 Carry case: WPS500X compression adaptors
- TA071 WPS500X pressure transducer calibrated & labelled
- TA081 Cable: USB A male to mini 5 pin 2m
- TA083 Fuel hose for WPS500X, large Schrader
- TA085 Vacuum hose for WPS500X pressure transducer
- TA086 Bleed hose for WPS500X pressure transducer
- TA087 Exhaust adaptor for WPS500X pressure transducer
- TA098 Cable: insulated BNC to insulated BNC 5m
- TA117 Fuel hose for WPS500X, small Schrader
- TA129 Universal vacuum adaptor
- TA142 Foster 2 series quick coupler female to ⅛ NPT male
- TA212 Standard compression hose for WPS500X
- TA213 Adaptor M10 short reach
- TA216 Adaptor M12 deep reach
- TA217 Adaptor M14 short reach
- TA218 Adaptor M14 deep reach

PRESSURE RANGES

THREE PRESSURE RANGES = PERFORMANCE AND VERSATILITY

The three pressure ranges of the WPS500X allow accurate measurement and analysis of many automotive pressures including cylinder compression, fuel pressure, intake manifold vacuum and even pulses from the exhaust.

RANGE 1

The first range gives you high resolution and accuracy for high-pressure tests such as cranking and running cylinder compression or fuel pressure testing. Not only is this test a great way for you to find compression issues, but it is also an excellent way to identify cam timing issues such as jumped timing belts and stretched timing chains. This is especially useful on multi-cam engines that may not have a cam sensor on each camshaft.

RANGE 2

The second range measures from -15 to 50 psi (approximately -1 to 3.45 bar). This range is ideal for vacuum tests and fuel system tests. When testing these systems you will find the zoom function is especially useful as it makes it easy to analyse the valves operating with the vacuum waveform, or the injectors through the fuel waveform.

RANGE 3

With the third range you can measure -5 to 5 psi (approximately -0.34 to 0.34 bar). This setting is sensitive enough to allow you to analyse small pressures or exhaust and other pulses.

Range	Pressure range	Accuracy	Response time	Output scaling
1	-15 to 500 psi -1 to 34.47 bar	1% of scale	100 µs	10 mV/1 psi (500 psi = 5 V)
2	-15 to 50 psi -1 to 3.45 bar	1% of scale	100 µs	100 mV/1 psi (50 psi = 5 V)
3	-5 to 5 psi -0.34 to 0.34 bar	5% of scale	filtered	1 V/1 psi (5 psi = 5 V)

ORDERING INFORMATION

ORDER CODE	DESCRIPTION
PP652	WPS500X Pressure Transducer
PP939	WPS500X Pressure Transducer kit

Tests shown relate to inbuilt PicoScope tests as of April 2014. Further releases of PicoScope may extend these tests.

The use of your PicoScope is not restricted to these pre-set tests, and any of our accessories can be added as you need them to further enhance your diagnostic capability. Get started with Picoscope today by choosing the kit that best meets your needs.

*Prices are correct at the time of publication. Please contact Pico Technology for the latest prices before ordering.

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THE QUEEN'S AWARDS FOR ENTERPRISE: INTERNATIONAL TRADE 2014

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