

DIY Verus Pressure Transducer.

Having watched a number of the ScannerDanner videos on Youtube where Paul gets out the Fluke PV350, I've grown increasingly envious of him being able to see cylinder pressures in real time and comparing them to spark plug firing times.

I've looked around at the prices for the Fluke (£200) or the Snap-On (couldn't find it on their website, but I probably couldn't afford it anyway).

I decided to go my own way. I did some testing with a signal generator, and concluded that the Verus (and also my Vantage Pro) expect a transducer which outputs 0.5v (for zero PSI) and goes to 4.5v (for maximum reading) and that is powered with 5v DC. This is the case for the 100, 500 and 5000psi transducer settings in the Verus.

I dabbled briefly with the 'Vacuum 100' transducer setting which is completely different, but as you're never going to get a vacuum below 14.7 PSI in any conceivable circumstances I lost interest quite quickly.



A quick look around Ebay led me to this listing:

http://www.ebay.co.uk/itm/181976328917?_trksid=p2060353.m2749.l2649&ssPageName=STRK%3AMEBIDX%3AIT

where I purchased a 0-500PSI transducer with the necessary 0.5v -> 4.5v output, with a claimed 1% accuracy for a very reasonable £13.66 delivered to my door. (In principle all you need to search for is

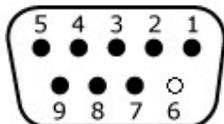
“pressure transducer 0.5v 4.5v” with the PSI rating you desire. As long as it’s 5v powered, it’ll work.) I suspect that all of the 500psi ones will work down to a vacuum.



It comes with a three-pin connector on the sensor, and a short cable with a mating plug on one end. There are three cores to the cable - +5V in (red), 0v ground (black) and signal out (green).



The Verus and the Vantage Pro both have a 9-pin d-type on the top labelled AUX. An email to Snap-On didn’t get me any more details on the connections, so I had a poke around with a multimeter and learned the following (picture is the socket on the Verus from the outside, or alternatively the solder side of the mating male plug):



Pin 1 +5.21v with respect to pins 5 and 9 when in pressure transducer mode

Pin 2 Unknown

Pin 3 Unknown

Pin 4 Input from inductive spark plug lead pickup (wrt pins 5 and 9)

Pin 5 Power ground (floating with respect to scope input ground) Common to pin 9

Pin 6 Blanking plug fitted so N/C

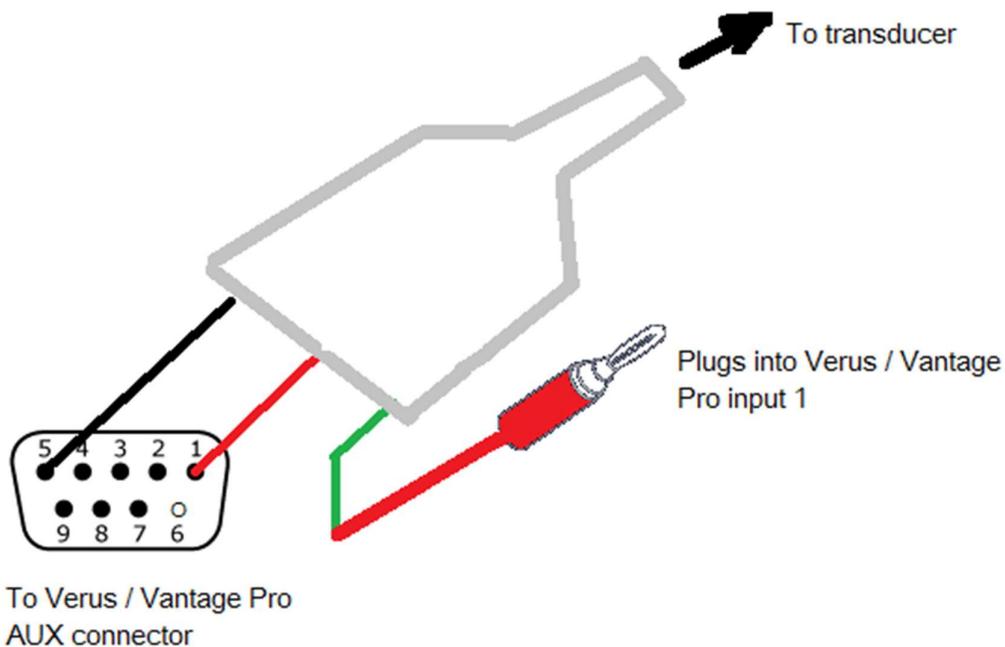
Pin 7 Unknown

Pin 8 +5.16v at all (?) times

Pin 9 Power ground (floating with respect to scope input ground) Common to pin 5

The body of my transducer was laser-etched to say Red= 5v, Black=Ground, Green=Signal. If your one has different coloured wires, you'll need to take that into account.

Knowing this, it was a quick run with the soldering iron to fit a plug to the bare end of the transducer cable. Red core goes to pin 1, black core goes to pin 5. The green core which carries the output signal got a short length of red wire soldered to it as an extension with a 4mm banana plug on the end.



Pin 6 was removed from the plug by means of heating it with a soldering iron to soften the plastic shell slightly and violently pulling it out (from the back of the plug) with a pair of pliers.

It took quite a lot of research to get the right bodywork for the 9-pin plug. Snap-On have used a system called 'SlideLock'. Strictly speaking you don't need a locking body for the plug – any normal one will work, but I wanted to get this exactly as per the factory sensor.

If you're in the UK, this lot:

<http://www.dtl-connectors.co.uk/store/165x11279x-d-sub-plastic-hood-with-slide-lock-shell-size-9.html>

will sell you one for £3.64.

That's all of the electronics done.



The next part of the job is mechanically connecting the sensor to an engine.

Again, I wanted to do a nice job of this, so I bought a cheap compression tester kit to dismantle - one of these:



for £12.49 from ebay:

<http://www.ebay.co.uk/itm/182110278063?trksid=p2060353.m2749.l2648&ssPageName=STRK%3AMEBIDX%3AIT>

This has a gauge which is on a 1/8NPT thread (the same as the pressure transducer) so it was simply a case of unscrew and dispose of the gauge.



With a bit of PTFE thread sealing tape I screwed the pressure transducer onto the end of the quick-release connector from the kit:



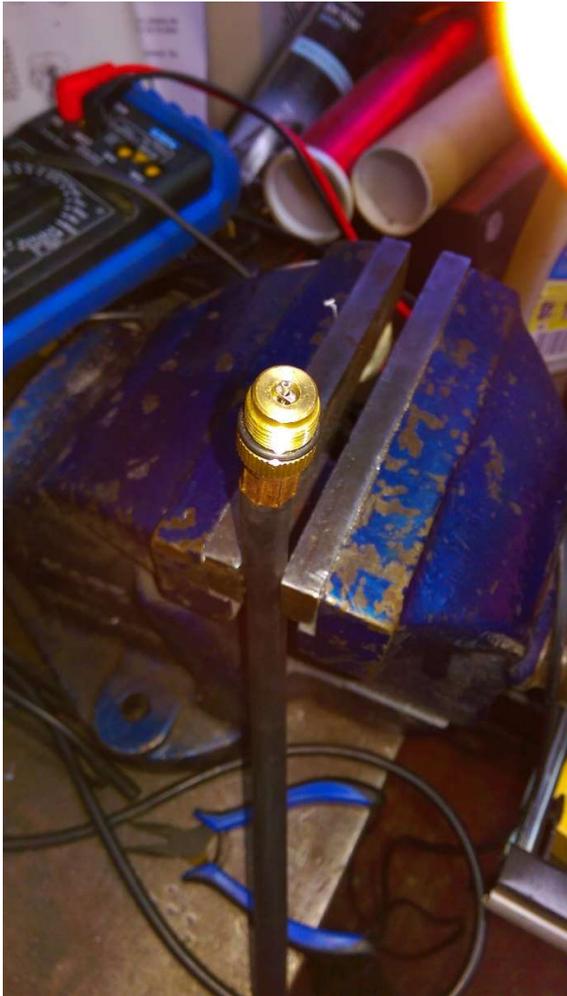
And now it plugs into the hose with the spark-plug fitting on the end from the kit.

One important thing to know is that there's a one-way valve in the end of the hose (and the two push-in adaptors) which you need to unscrew and remove – it's a Schrader valve core as found in car tyre valves.

It's necessary to have it in place if you want to do a compression test (for peak pressure reading) as the volume of the hose, coupler and sensor is sufficient to throw off the absolute PSI reading. This is

why compression testers have these valves. The engine acts literally as an air pump and 'pumps up' the pressure in the chamber in the head along with the hose and sensor until you get max pressure.

For our purposes (scoping pressure peaks with respect to spark timing, or simply to look and see if there are any funnies going on), we're not so bothered about exact absolute pressure – more the shape of the pressure curve as the piston moves up and down, including the vacuum on the intake stroke. It is for this reason that you'll need to remove the Schrader valve core.



I did some testing of the transducer. I can pull a near vacuum with my Mityvac vacuum pressure pump and I'm pleased to report that the 500 PSI sensor is actually a -14.6 PSI to 500 PSI sensor. I pressurised it to 150 PSI with my compressor, and the output from the sensor (measured on my Vantage Pro) tracked the digi-gauge on my tyre inflator to within 1.1 PSI across 0 to 150 PSI.

I'm calling it done and accurate.

Cost breakdown:

Transducer - £13.66

D-type plug – lying around, so free but they're less than a pound each if you buy one.

Slide-lock d-type body – I bought a load of these because I have other projects for the Verus in mind but with postage they worked out at about £4 each

Piece of red wire, length of heatshrink – lying around so free, but pennies if I'd bought them.

Compression testing kit - £12.49

Total - just under £31 all in. Time taken was about an hour total (ordering all the bits and then assembly)

It's great – the transducer even fits in the cut-out in the case the compression tester came in.

