A TEST of BRAIDED STEEL REINFORCED BRAKE HOSES

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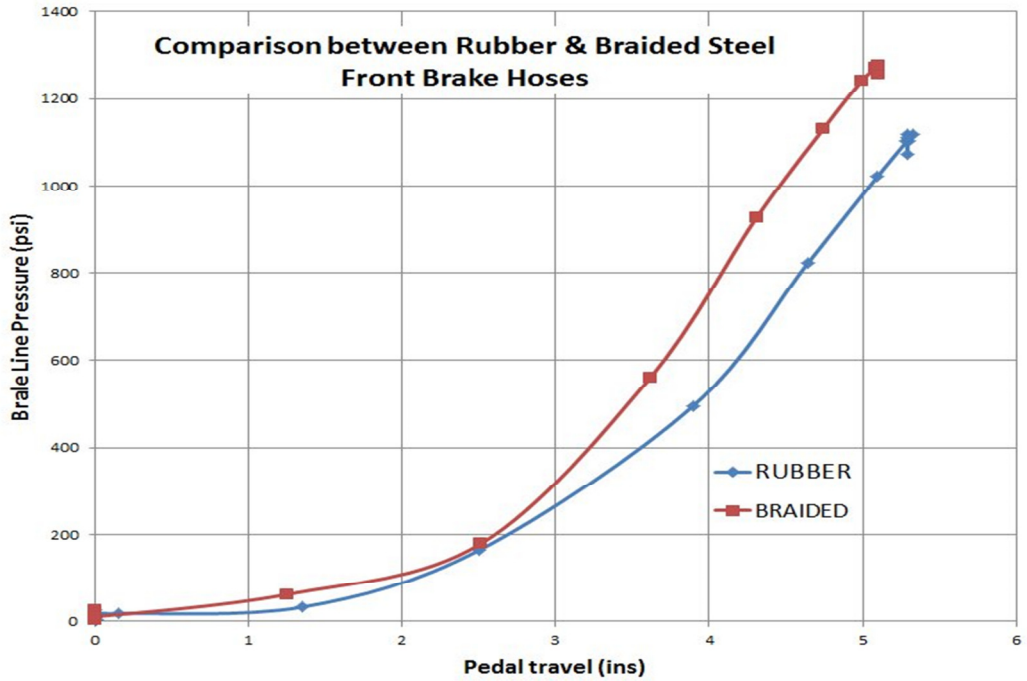
SUMMARY

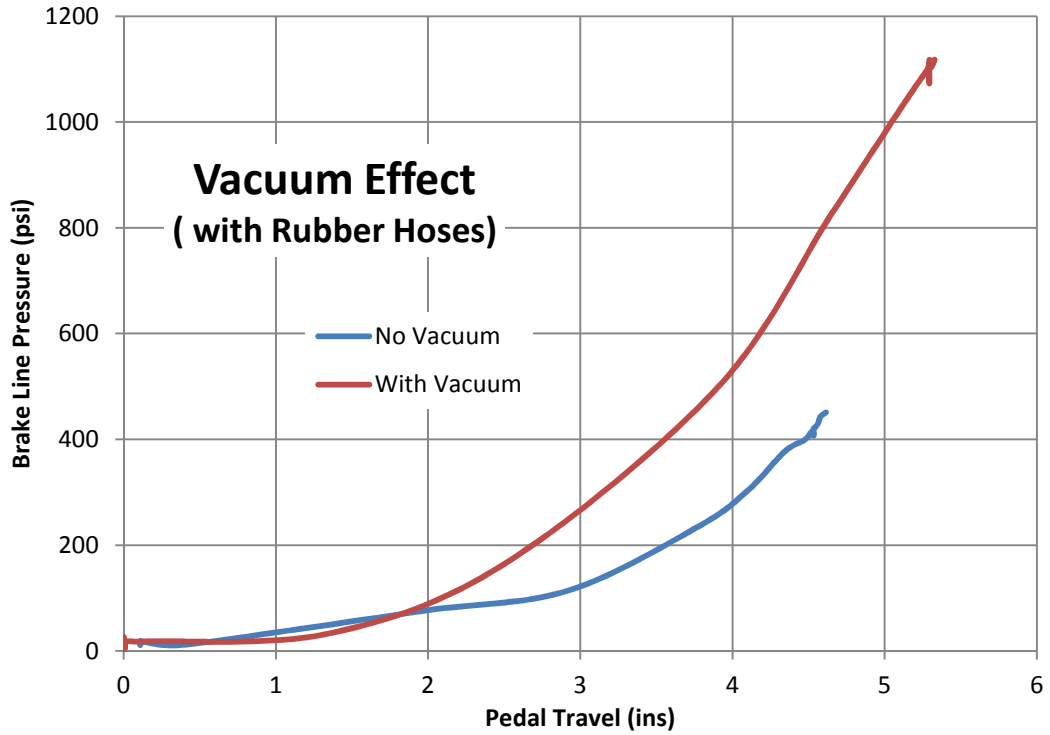
It is a widely held belief that braided stainless steel (BSS) brake hoses improve the responsiveness of the braking system. The argument is based on the idea that BSS hoses do not expand under pressure and thus result in a firmer pedal feel. However I am not aware of any published quantitative measurements of this effect and decided to see if in fact this can be demonstrated.

The plan was to measure the relation between brake pressure and pedal deflection. Presumably with the BSS hoses you would need less pedal travel to achieve a given pressure.

My Mark 2 has Wilwood calipers and was fitted with the standard Jaguar style rubber hoses for the first tests. It was then converted to BSS hoses, at the front only, and the tests repeated.



The effect of the BSS hose was to reduce the pedal travel by about ½" at high brake pressures. At low brake pressures up to 200 psi there is no real difference.
Between 200 and 1000psi, the pedal sensitivity is about 40% stiffer with the BSS hose and this was a very noticeable effect to the driver. Had the rear brake rubber hose been changed the result would have been even more marked but by a small amount.



This shows the action of the vacuum booster that comes into play at about 100 psi. So even if vacuum were lost there is still useful stopping pressure. The vacuum booster roughly doubles the brake pressure above 100 psi

A similar test with the BSS hoses was inconclusive and needs to be repeated.

MAJOR CONCLUSION

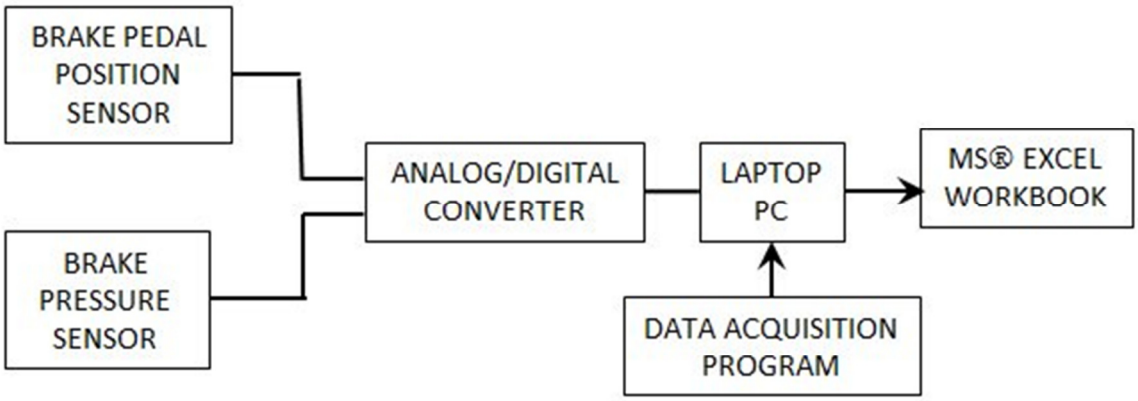
On my Jaguar Mark 2, compared to OEM style hoses, braided steel flex hoses provide significantly stiffer brake pedal operation

It is likely that this sort of improvement would result on other cars as well

EXPERIMENTAL METHOD

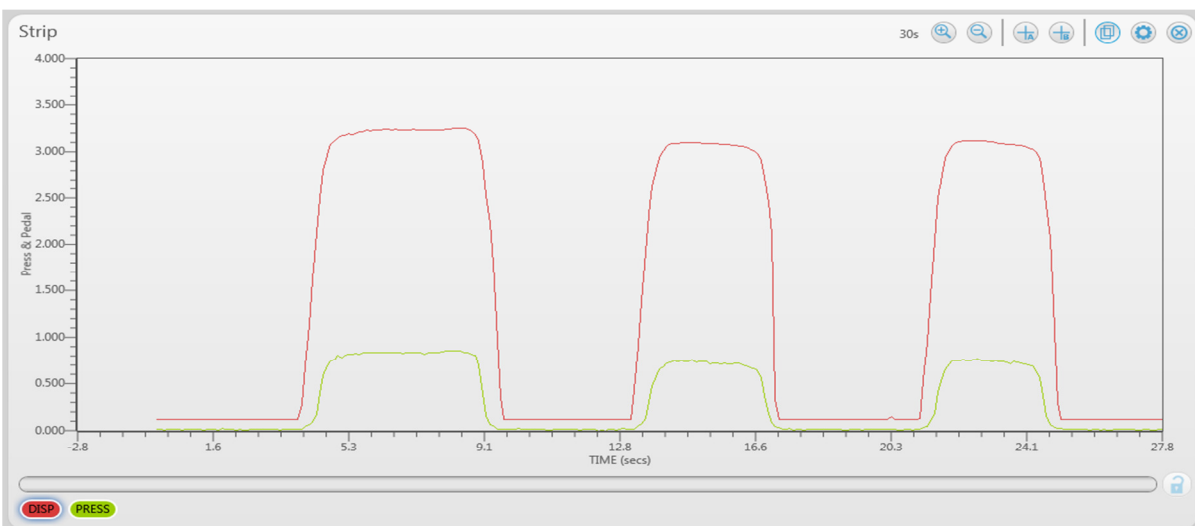
A pressure sensor was installed in place of the brake light switch and a linear slide potentiometer was fitted to the steering column with a string coupled to the brake pedal. The leads from these two transducers were connected to a “data- acquisition module” hooked up to a laptop PC via the USB port.

The diagram below shows the general set-up.



The data from the PC was exported to an Excel workbook to process the results and prepare plots.

To run a test, the PC was started to record the time history of the pedal deflection and the brake pressure. The picture below shows a typical laptop screen result during three applications of the pedal. Note that the vertical scale is not scaled correctly – it just shows the type of trace obtained.



TEST RUNS

The first tests were made with the original style OEM rubber brake hoses. These were made with the car stationary, the engine off i.e. no vacuum, and with multiple depressions of the brake pedal. This gave a very basic check of the way things looked.
The test was then repeated with the engine idling, (car stationary) and then followed by a road test at

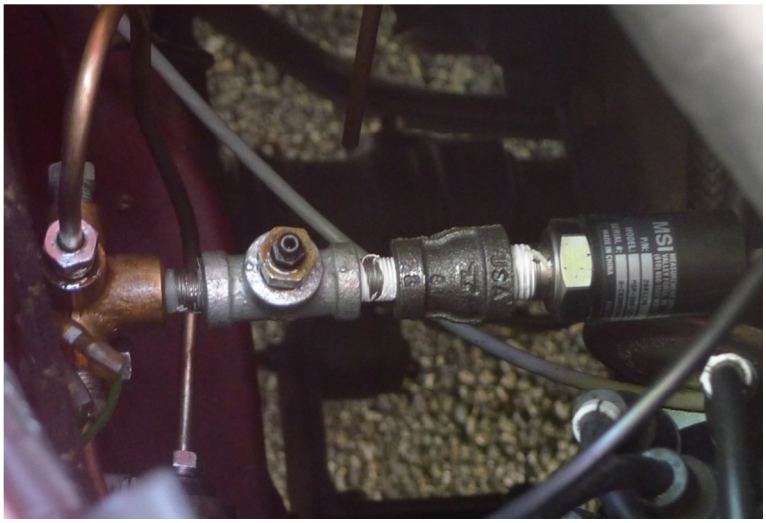
speeds up to about 30mph and with several very hard stops. One particular stop resulted in front brake lock-up on a dry road.

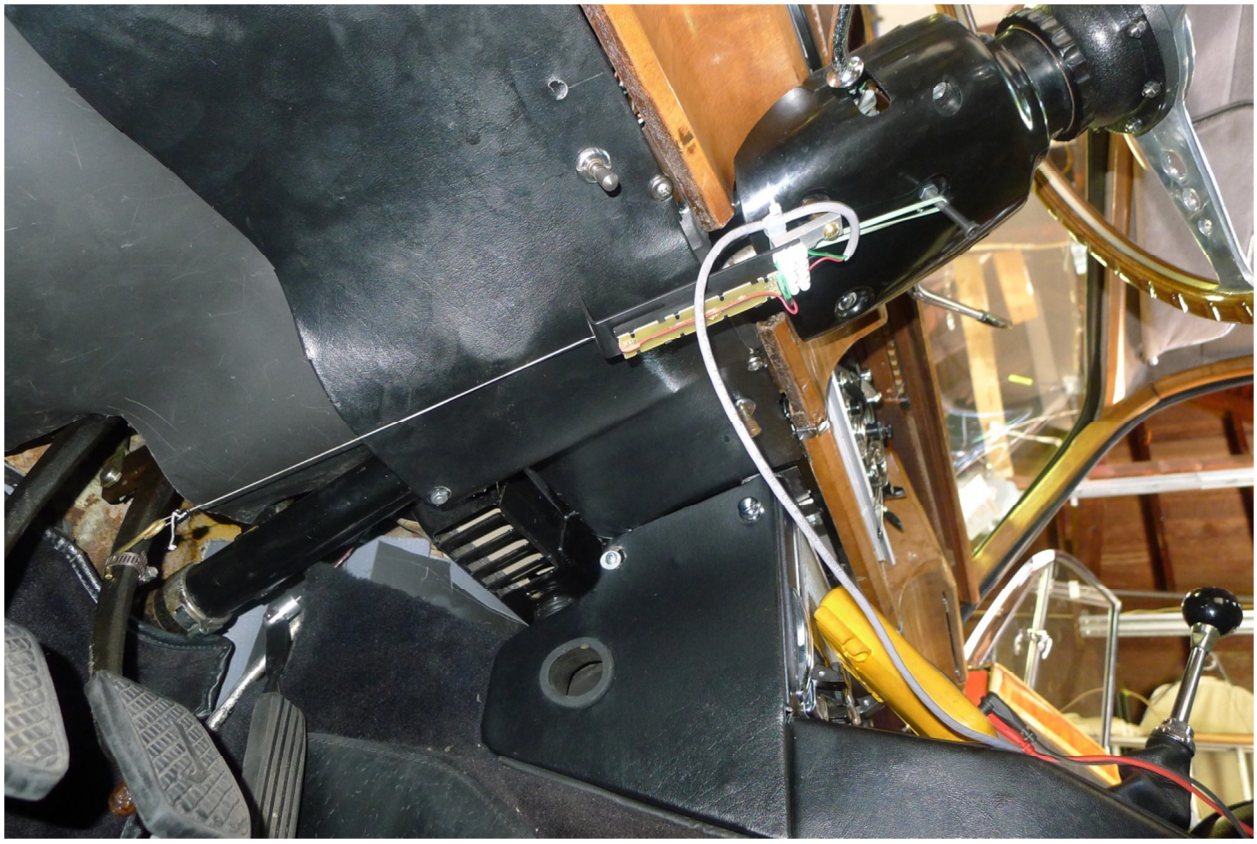
The second series of tests with the same routine were done after new BSS hoses were installed.

INSTRUMENTATION

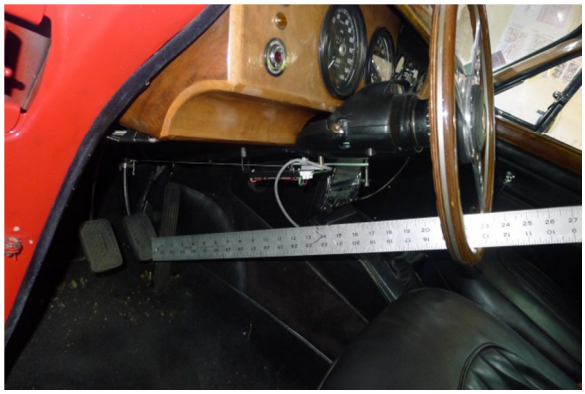
The pressure sensor fitted to the brake switch port is a solid state sensor with a range of 1500 psi. The adapter assembly included a bleed port to ensure no air bubbles would affect the readings.

The sensor is an MSP300 made by Measurement Specialties





The pedal sensor consists of a slide type variable resistor bolted to the steering column cover. A string goes from its slider to a hook attached to the brake pedal arm.



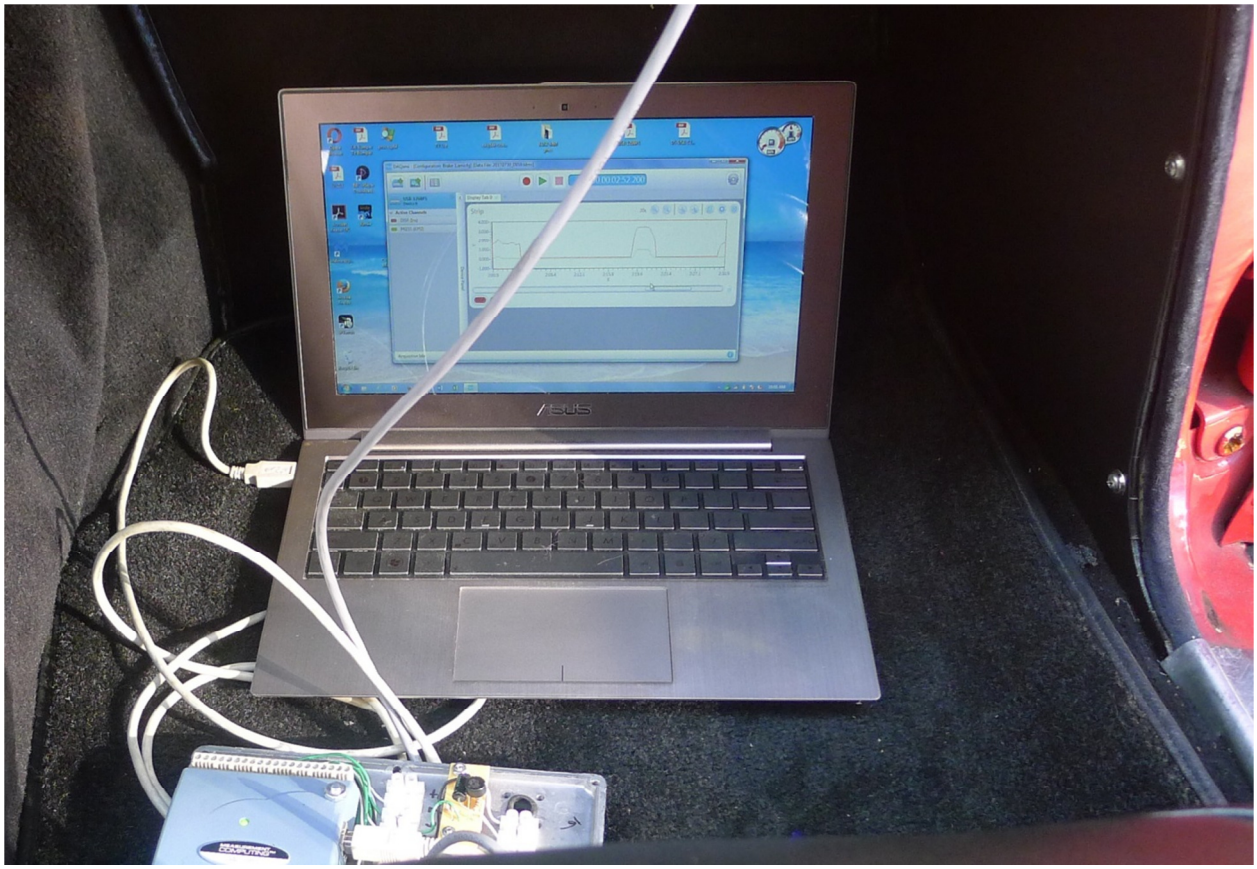
This set up was calibrated using a ruler to determine resistance versus pedal travel.

DATA ACQUISITION

A Windows Laptop PC was used together with a data acquisition module. It was originally sitting on the front seat until the first test stops!

The acquisition module is made by Measurement Computing Inc., Model USB-FS1208. The companion software for acquiring data is DAQami by the same company.

The FS1208 was used in a 2 channel differential input and at a sample rate of 10 Hz. This was chosen just to limit the size of the data files. The FS1208 also provided the 5V necessary to power the sensors.



CAR BRAKING SYSTEM

This Mark 2 has a basically standard brake system with the following exceptions:-

Wilwood front calipers	Model 120-6813	
Wilwood flexlines	Model 220-7686	
Allstar hose adapter	Model 50100	*this is used to adapt from an inverted flare to JIC*
Vacuum Booster	LR18230	

The end fitting of the rigid brake line was changed from the normal Girling nut and bubble flare to an SAE 45° inverted. This was needed to fit an adapter to connect the Wliwood flex line.