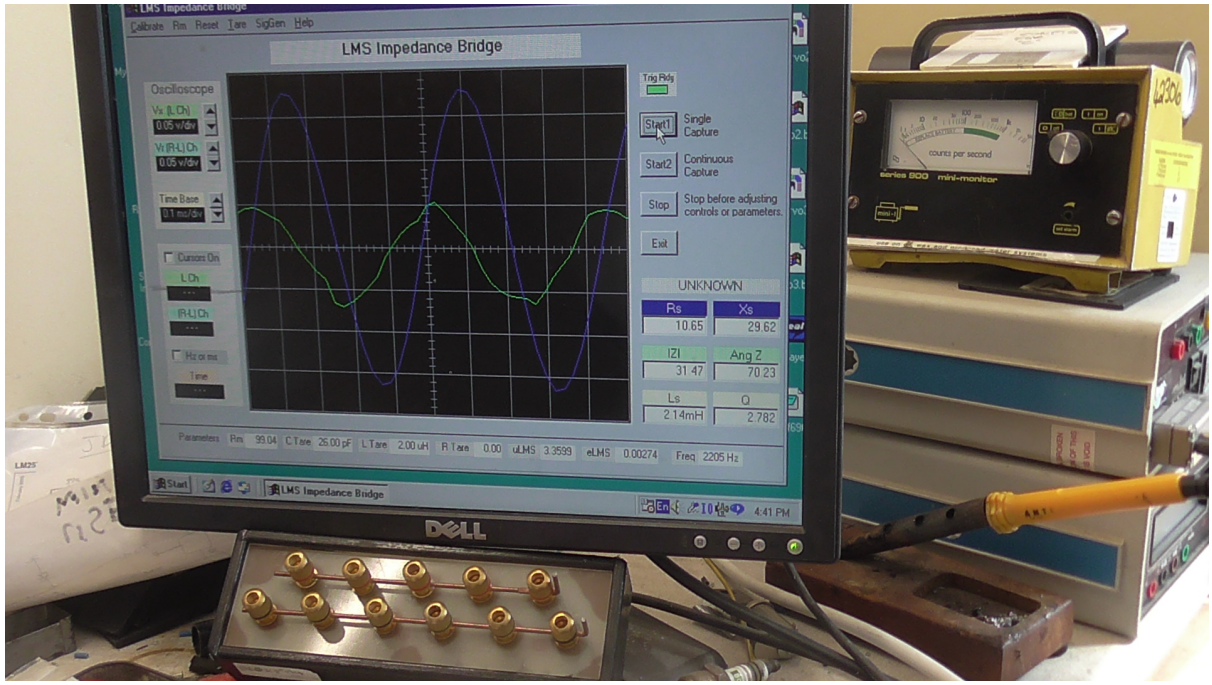
My LMS impedance bridge

Not being able to accurately measure capacitors puts one at the mercy of component manufacturers. Also winding inductors to the popular formula can be guesswork particularly with unknown ferrite cores. One solution would be to buy one of the LCR meters available on EBAY. Whilst these are cheap how can they be calibrated? The LMS bridge design by George Steber allows traceability for capacitance and inductance to resistance. This can be measured on an accurate DVM. This puts it amongst the instruments which are well worth constructing. Seen here with my home-made 10nF capacitance box.



My thanks to Dr George Steber for producing and sharing this most useful design. Having multi-meters for measuring only the resistance of components this design fills a vital area. You can buy LCR meters of course but the major attraction of this design is it makes capacitance and inductance traceable to resistance. Therefore the calibration is easy.

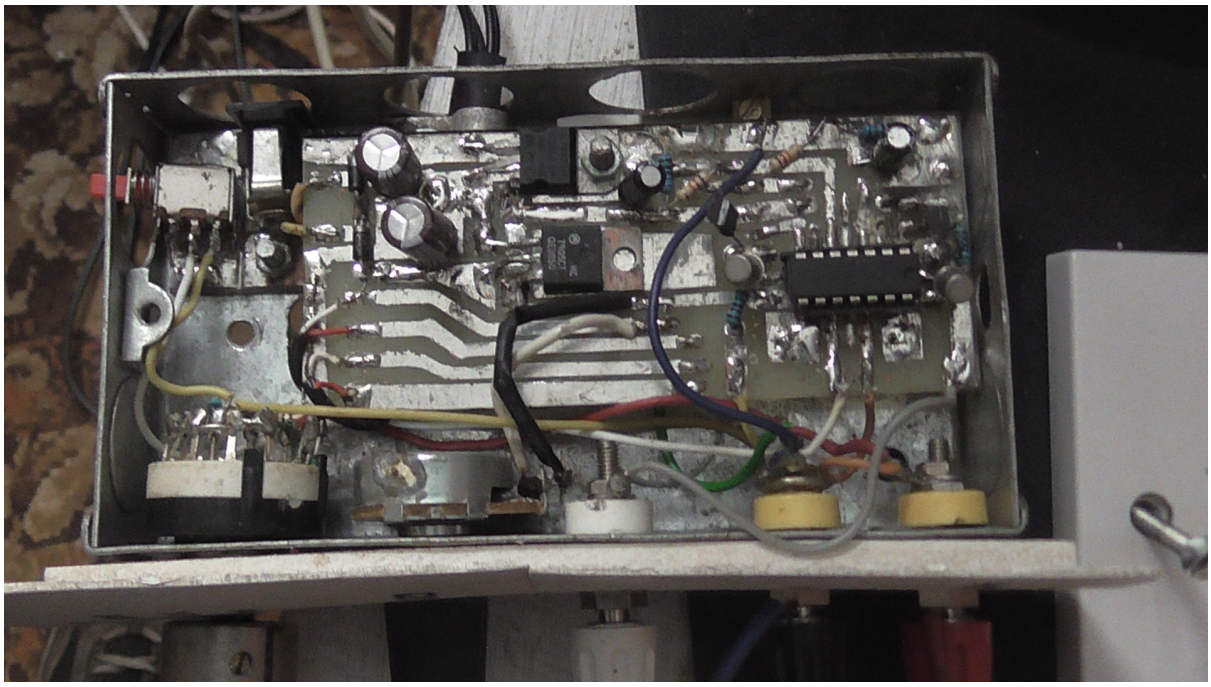
Some changes to the original circuit have been made to enable the hardware to be used with the variety of soundboard programmes available free for the downloading. The author has TGG test tone generator, zeldoscope etc. It was recognised that most modern soundcards would have an output impedance of 50 ohms which is adequate for headphones

but would have difficulty with driving a 10 ohm load. Therefore transistor buffered op-amps were used and power supplies now provided by an ac power block via linear regulators.

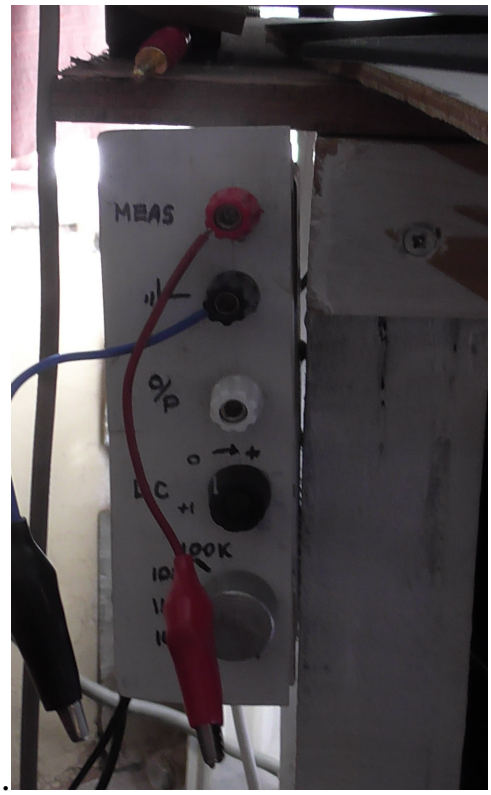
A proto-type was constructed which used LM324 this worked after a lot of fidling wth various sound cards and software. It was found that “Audio Station” had to be installed it would not work with basic sound card software, even though TTG “Test tone generator “ would. One section of the LM324 was used as an output buffer for the tone generated. The original design used a direct sound card output. Presumably this sound-card could drive a speaker directly (not many available like this). It would need to since there is appreciable loading when the 10ohm range is selected. However the LM324 as it was being supplied by a USB power supply is also incapable in this role.

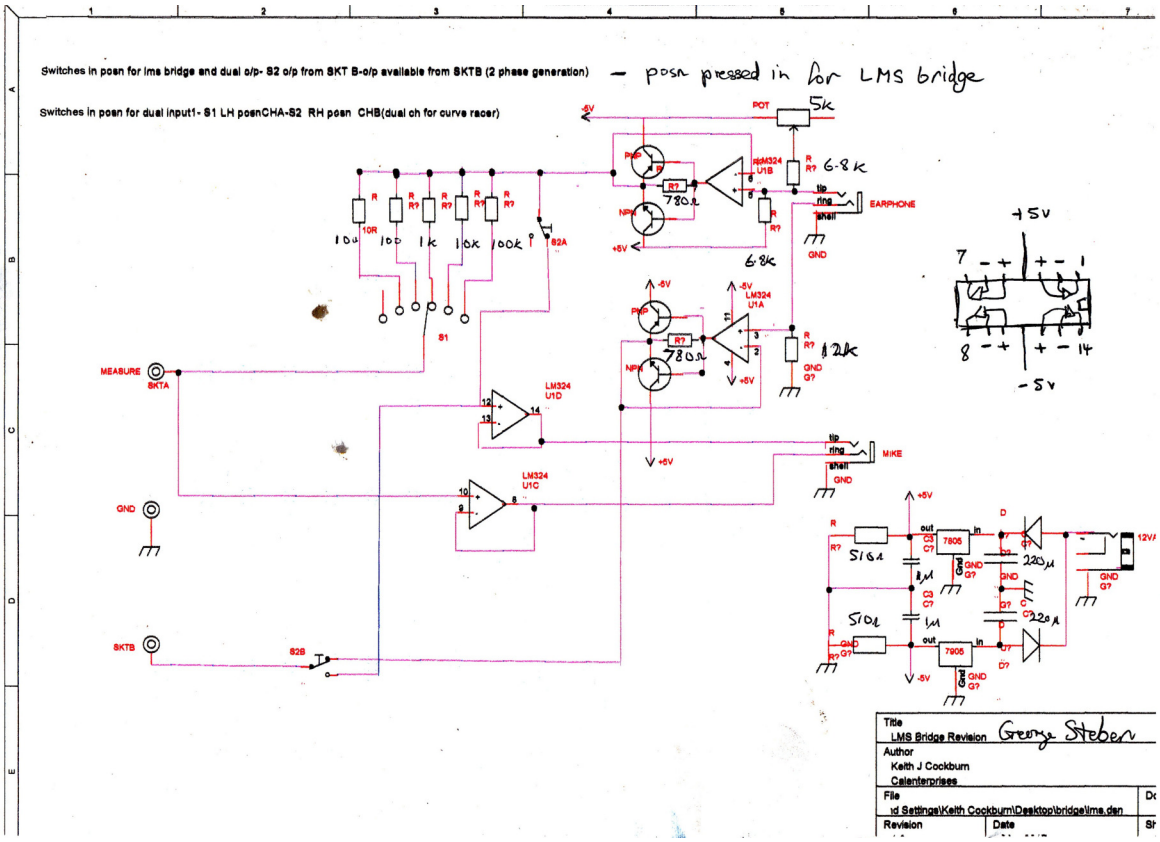
As the method is superior and traceable it was decided a more serious attempt than the original lash-up was warranted. Accordingly a PCB was designed using LM358 for the SC buffer and an LM386 audio amp for a low impedance output. An external 12v ac power brick with + and – regulators built in made up a much stiffer power supply.

Difficulties arise from the fact that the LM386 is a single supply device and gives an output offset which is acceptable when used in a radio but not in this application. Also it was felt that being coupled up to the sound-card their were a great many other applications which could be incorporated at some later date. The LM324 outputs can be supplemented with complimentary transistors so reducing output impedance. Having 4 op-amps available allows for buffering all 4 channels. The device can be built into a double 240v square pin socket back box with the convenience of being able to use a blanking plate as a cover.

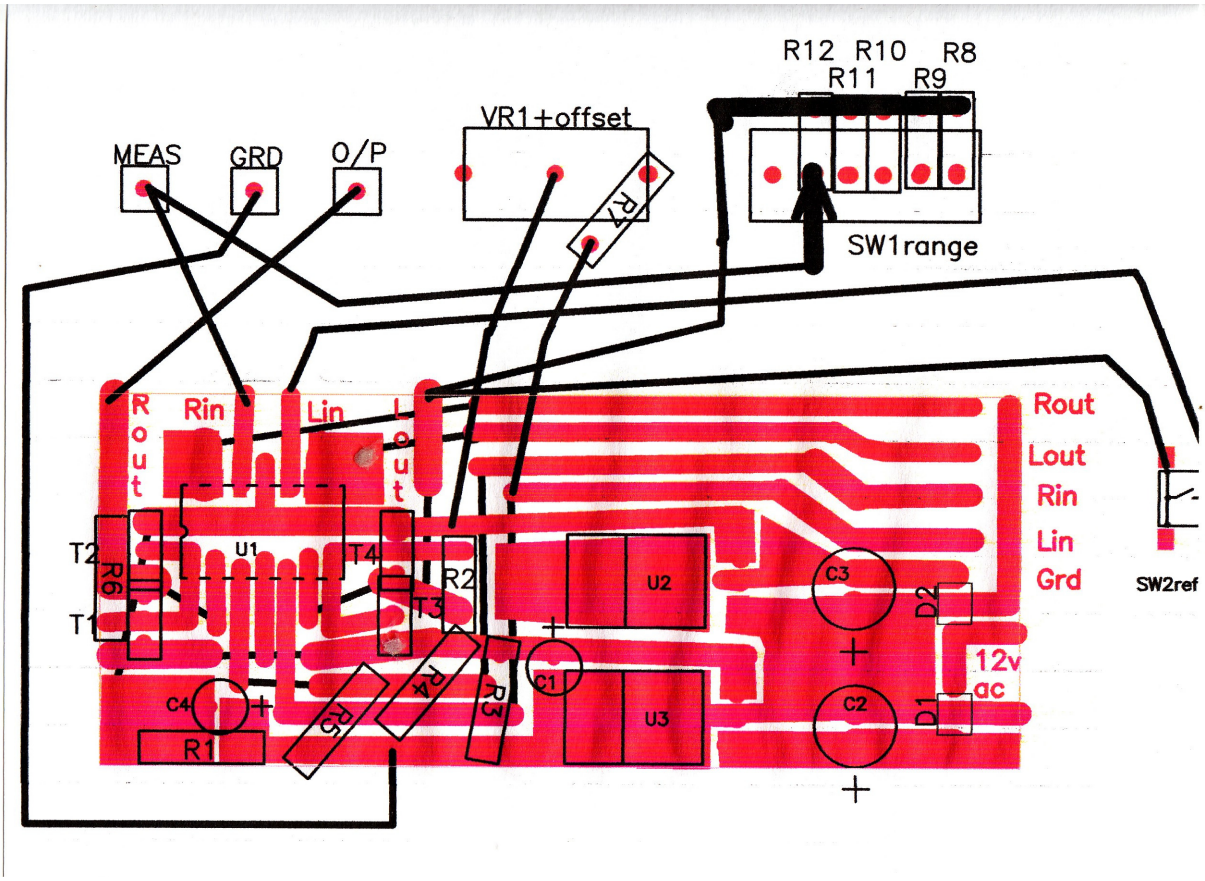


The completed instrument is mounted on the side of the mobile 19 inch equipment rack which houses my other computer controlled instruments.





The switch positions allow the unit to be used with my TTG (test tone generator) by Timo Esser, a small press button switch is used for this. Also there is a vacant position on resistor feed switch which allows two inputs to be used should I decide to build a transistor/tube curve tracer in the future. There are many ways of accessing the soundcard. Visual basic 6 is used here in win98. The unit requires “audio station to be set with the soud card”. Vr1 is a control which is used to generate a DC offset useful when electrolytic capacitors are measured.



This does not give the full switch wiring please reference the schematic.

Any queries let me know keith77777@calenterprises.co.uk

.