We can only answer questions or remarks of general interest to our readers, concerning projects not older than two years and published in *Elektor Electronics*. In view of the amount of post received, it is not possible to answer all letters, and we are unable to respond to individual wishes and requests for modifications to, or additional information about, *Elektor Electronics* projects.

Valve Preamplifier

Dear Editor,

I have just finished reading the article on the Valve Preamp, and I feel that I would have to query the validity of the author's statement that using two 22 μF capacitors in parallel for the output capacitor, instead of one single 47 μF, benefits the HF transfer characteristic due to it halving the ESR.

Whilst it is true that the ESR of two capacitors in parallel will be half that of a single capacitor, this only holds true for a single capacitor of the individual value. ESR is directly related to capacitor value, thus, if a single 22 μF capacitor had an ESR of say 2 ohms, then paralleling two of these would result in an ESR of 1 ohm. However, if a single capacitor of theoretical value 44 μF from the **same manufacturer**, and from the **same series** were used, it too would have an ESR of 1 ohm on its own. This is borne out by examining the published data for capacitors of the values cited above. In fact, as the nearest value to two 22 μF's in parallel is 47 μF — i.e. slightly larger than 44 μF - the situation for a single capacitor is actually improved over the dual capacitor scheme in that this larger value consistently yields a lower published ESR value than two 22 μF's from the same series.

I would not have thought that the ESR of the output coupling was an issue anyway. At these sorts of values, the ESR of the caps is almost negligibly small compared to the load impedance of the following stage. Of far more importance, I would have thought, is the relatively high reactance (X_c) of these capacitors at low frequencies, which may well create noticeable effects, and the inherently poor HF performance of standard electrolytics.

If ESR is really an issue here, I would have expected to see a single electrolytic of perhaps 47 μF and of low ESR specification, as in electrolytics designed specifically for high frequency operation in switch mode power supplies, and perhaps for 'belt and braces' HF performance, a shunt capacitor of say 0.1 μF bypassing that single electrolytic.

Geoff R Darby, by email

The designer, Mr. Haas replies:

The sentence about halving the ESR was not well formulated. Halving the ESR may be implemented or not depending on the exact type of electrolytic capacitor available. In so far, Mr. Darby is right. The main reason for using two electrolytic caps of 22 μF each is that the total height of the devices is smaller and that the indicated types could be obtained as planned (by Mr. Haas, Ed.). This allows a more compact case to be employed, because the usual 47 μF/450 V electrolytics are taller. Also, axial electrolytics would have required more PCB space.

These days, high-voltage electrolytic capacitors are plagued by supply delays of up to 50 weeks. For this reason, I only applied components that are either available at reasonably short notice or always in stock (in Mr. Haas' company, Ed.).

As to the parallel connection of 0.1-μF capacitors, most readers have not done their sums and so failed to realize the relative importance of this equivalent capacitor in relation to a 47-μF electrolytic. Assuming a signal frequency of 20 kHz, the 47-μF capacitor represents Xc = 0.18 Ω. The typical ESR will be about 1.2 Ω. By comparison, a 0.1-μF represents Xc = 79.6 Ω at 20 kHz. Question: which, if any, effect does the parallel 0.1-μF capacitor have at 20 kHz?

An article like the one on the Valve Preamplifier always triggers discussion. The audience, however, should be advised that building and testing is more fun and productive than endless theoretical debates. Finally, the test data supplied by the Elektor Electronics sound laboratory prove that the Valve Preamplifier is not a bad performer.

G. Haas, by email

The debate continues…

Dear Editor,

With the publication of the second part this month, I would like to further take issue with the author regarding the "corrections to part 1" panel, where mention is made twice of grid 2 being the suppressor grid. It is not. Rather, it is the screen grid. The suppressor grid is grid 3, closest to the anode, and internally connected to the cathode. Its purpose is to suppress the secondary emission electrons from the anode and prevent them from being attracted back to the screen grid, which results in the well known 'tetrode kink'.

Having done a few quick calculations on the circuit, a concern has come to light regarding the operating conditions of the valve.

By looking at the quoted voltages in the HT section of the circuit, a standing current of around 44 mA give or take can be derived. This results in a voltage drop of some 147 volts across the anode load resistors leaving around 177 volts on the anode. The power dissipation in the resistors will be about 6.9 watts, which goes along with what the author suggests as the "not insignificant power dissipation" in these devices in his text.

According to my data books, the quoted typical screen grid current for a screen grid voltage of 250 volts is 6mA. This would result in a drop across the screen grid resistor, R9, of about 50 volts, resulting in a screen voltage of around 270 volts. Whilst this is slightly higher than the stated 250 volts for 6 mA current, it will not make the current significantly higher, so will not result in the screen grid voltage being much lower. Thus, by calculation, it would appear that the screen grid has a significantly higher voltage on it than the anode. I am not at all sure that this is a valid situation. It has been a long time since I learned my valve theory, but I'm sure I recall that the screen voltage should never be above the anode voltage, otherwise, all manner of unpredictable things can happen, including the screen grid trying to behave as the anode and over dissipating, and negative grid current flow.

Obviously, without having built and measured one of these designs, it is hard to say for sure if my calculations hold up in real life, but some aspects of the design do seem to me to fly in the face of convention, for instance it is unusual not to see the screen grid decoupled to ground with 0.1 μF or so. I assume that you have a finished version which your lab evaluated prior to acceptance for publication. I would be interested to know what your staff members make of my thoughts.

You are right — 'suppressor grid' was simply an incorrect translation, we should have used 'screen grid' — our apologies are due to you and Mr. Haas. As already mentioned, the test data obtained from a prototype (supplied ready-assembled to us by Mr. Haas) gave no reason for concern or, indeed, inspection of the actual valve operation conditions. Other readers are invited to comment.

Working with a Touch Screen

Dear Editor,

I found the article "Working with a Touch Screen" very interesting and, as usual, miles ahead the competition. However to date I have been unable to locate a supplier of touch screens. Can you help?

Kristof Dyrcz, by email

The author when queried informed us that he had obtained his touchscreen from a Dutch company by the name of Naamplaat B.V. On the Internet, they reside at http://www.naamplaat.nl

After trawling the Internet for the keyword 'touchscreen' we came across another supplier, IQ Automation, at http://www.iq-automation.de