Since the original Currawong amplifier was published in November & December 2014 and January 2015, it has created quite a deal of interest and those who have built it have been most enthusiastic. However it had a complicated power supply employing two transformers – so now we present a much simplified circuit using a single power transformer, which also saves on the overall cost.

By Leo Simpson

A New Power Transformer for The Currawong 2 x 10W Stereo Valve Amplifier

All electronic design work involves maximising performance from the cheapest, readily available components.

That certainly applied to the power and output transformers used in the Currawong stereo valve amplifier. The output transformer used in both channels were actually a 100V audio line transformer with the multi-tapped 100V windings being used to provide an (almost) ultra-linear connection to the plates and screens of the 6L6 beam tetrodes.

It works surprisingly well for a cheap transformer.

And while we would have preferred to use a single transformer in the power supply, the fact was that there simply wasn't a suitable unit available, at the time.

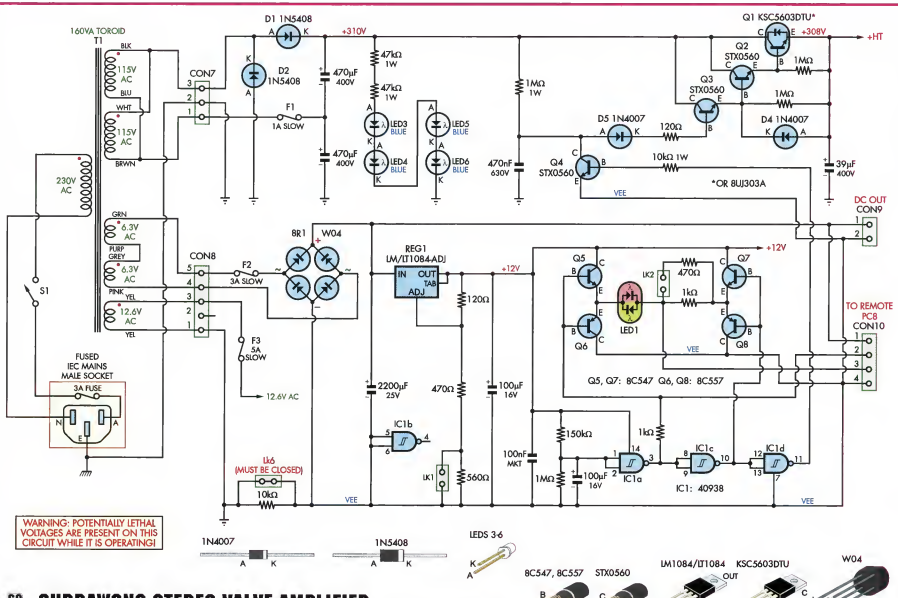
So we ended up using two toroidal power transformers, rated at 160VA and 80VA. We had their secondary windings connected to provide 114VAC for the HT supply and 12V for the series-connected tetrode heaters and the 12V regulated DC rail. This rail runs the heaters for the 12AX7 dual triodes, relay speaker switching and remote control circuitry.

The new 160VA transformer from Altronics. Note that this is a pre-production sample and lead colours in the stock item may be quite different.

New transformer

But the above 160VA transformer has since been discontinued, so we have now arranged with Altronics Distributors (who stock the Currawong amplifier kit) to source a new single transformer which will do the job by itself.

It is a 160VA toroidal unit (Altronics Cat MA5399) with two



SC 2014 CURRAWONG STEREO VALVE AMPLIFIER (POWER SUPPLY SECTION)

Fig.1: the 115VAC secondaries of transformer T1 are connected in parallel and rectified using a voltage doubler to produce a 310V HT rail. Most of the ripple is filtered out by a capacitance multiplier comprising high-voltage transistors Q1-Q3 and a 470nF polyester capacitor. T1's 12.6VAC secondary drives the 6L6 filaments directly in a series/parallel configuration. The two 6.3VAC windings are connected in series to drive bridge rectifier BR1, a 2200µF filter capacitor and linear regulator REG1 to produce a regulated 12V rail to run the 12AX7 filaments. IC1 provides an HT turn-on delay and soft start.

The new transformer mounted inside the same plinth as held the original two transformers. Again, ensure that any exposed mains wiring (for example, the IEC mains input socket) is properly covered, as shown here. NOTE: Altronics expect this transformer to be in stock from early to mid November.

115VAC 0.5A windings, two 6.3VAC 1A windings and a single 12.6VAC 2A winding. While that may seem like more windings than we actually need to run the Currawong, we have arranged it this way so that the transformer can be used in other applications, of which there are several (see panel).

However, the main game is to run it in the Currawong, as you can see from the power supply circuit shown in Fig.1.

Apart from the transformer connections and the connection for LK6, this circuit is identical the original version published in the November 2014 issue on page 32.

If you make comparisons between the two diagrams you will see that the connections for the new transformer are considerably simplified.

The two 115VAC windings are connected in parallel to pins 1 & 3 of CON7 and thence to the voltage doubler rectifier comprising diodes D1 & D2, together with the two 470µF 400V electrolytic capacitors.

The two 6.3VAC winding are connected in series and go to pins 4 & 5 of CON8 and then via a 3A slow blow fuse F2 to bridge rectifier BR1. The single 12.6VAC winding is connected to pins 1 & 3 of CON8 and then via slow blow fuse F3 to power the series-connected connected heaters of the 6L6 beam power tetrodes.

No change needs to be made to the componentry on the main PCB except for the fact that link LK6 must be fitted (the 10kΩ resistor that it shorts out can be omitted if you wish).

Wiring it up

Fig.2 shows the much simplified wiring inside the timber base of the Currawong and you should compare it with the photo on page 93 of the December 2014 issue, which shows the same details.

The transformer should be located as shown in the wiring diagram and in the photo. Leave enough room between the transformer and rear panel so that you can later reach behind the main PCB as it's being slid in and plug the various connectors into the underside (this requires more clearance than is available above the transformer).

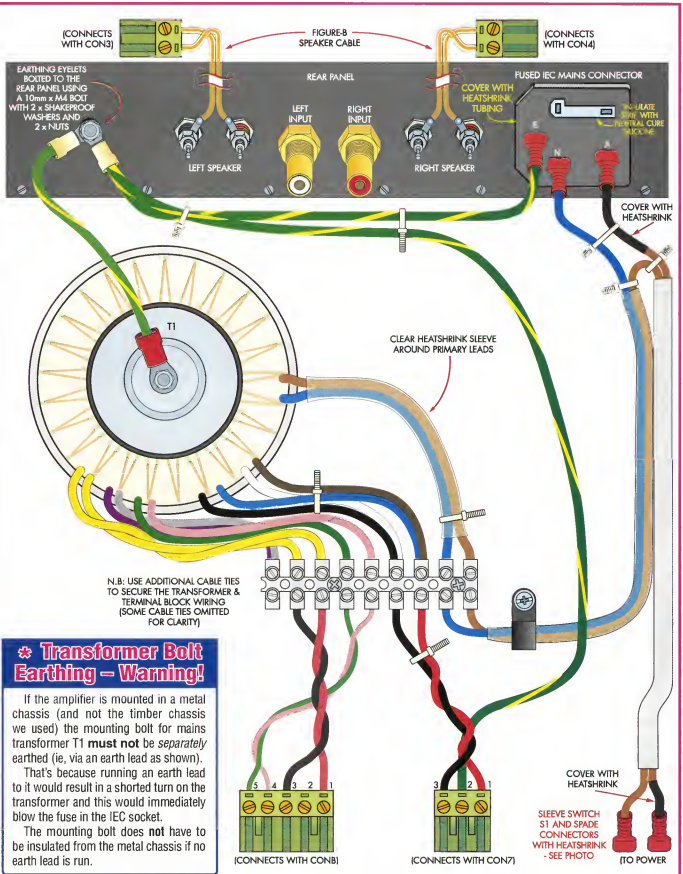
We suggest a gap of no less than 60mm between T1 and the rear of the case. In practice, this means positioning the transformer mounting bolt so that it is approximately 120mm from the back edge of the plinth (ie, about 100mm from the inside rear edge).

Mount the transformer using the supplied rubber mounting washers, metal plate and washers via a 6mm hole drilled in the bottom of the plinth but do not tighten nut at this stage.

Then position the 9-way terminal block, as shown in Fig.2. Use two 12mm self-tapping screws to hold it in place, as shown.

Wiring colours

It is important to note that the colours of the transformer connection wires shown in Fig.1 and Fig.2 are those on our pre-production trans-



✲ Transformer Bolt Earthing – Warning!

If the amplifier is mounted in a metal chassis (and not the timber chassis we used) the mounting bolt for mains transformer T1 **must not** be *separately* earthed (ie, via an earth lead as shown).

That's because running an earth lead to it would result in a shorted turn on the transformer and this would immediately blow the fuse in the IEC socket.

The mounting bolt does **not** have to be insulated from the metal chassis if no earth lead is run.

Fig.2: the Currawong wiring diagram with a single power transformer. Compare it closely with the transformer wiring in the circuit of Fig.1. Note that the IEC socket must be covered with heatshrink tubing (see photo). This diagram assumes a *timber* cabinet as per our prototype – see warning above re earthing if a metal chassis is used.

former. It is likely that these may change in the production transformers which will become available in the month of the November. So while we refer to particular colours in this article, to match those shown in the photo, it is important to look at the labelling of the supplied transformer to identify the particular winding colours.

For example, although our prototype transformer had two red wires for the 230VAC primary winding, it is likely (and preferable) that the production version will have blue and brown wires.

With that in mind, cut a length of 5mm diameter clear heatshrink tubing to cover the entire length of the primary winding wires, except for about 10mm at the ends. Then shrink the tubing down. Bend the wires so they run as shown on the wiring diagram and terminate them in the terminal block.

Now, twist the four 115VAC secondary wires together (black/blue and white/brown). This will help to minimise the radiated hum and buzz fields. Join the black and white wires together and connect them to one of the terminals of 9-way terminal block. Then do the same with the blue and white wires. Doing it in this way means that both 115V windings have the starts and finishes connected together. If you don't do this right, one winding will effectively short the other and the transformer would very rapidly overheat and (hopefully) blow the fuse.

On the other side of the 9-way terminal block, the 115VAC red & black wires are terminated at pins 1 & 3 of the green connector which mates with CON7 on the main PCB.

Now twist the four 6.3VAC wires (green, purple grey & pink) together in the same way and connect to the 9-way block. The green and pink wires provide 12.6VAC to pins 4 & 5 of the green connector which mates with CON8 on the main PCB. Then twist the yellow 12.6VAC wires together and connect to the 9-way block. These provide 12.6VAC to pins 1 & 3 on the same green connector.

Once all the wires are in place, measure the resistance between pins 1 & 3 on the CON7 connector.

You should get a reading of about 5Ω. There should be an infinite reading between pins 1 & 2 and pins 2 & 3.

Similarly, between pins 1 & 3 and pins 4 & 5 on the CON8 connector, you should get a very low value; less than 1Ω.

Any higher readings than these suggests at least one wire is not making good contact in the terminal block, so go over them again.

From this point on, you can follow the original wiring and assembly instructions which were featured in the December 2014 issue of SILICON CHIP.

However, before making connections to the main PCB via CON3, 4, 7 and 8, we suggest that you connect power to the transformer and check the voltages present at the green connectors for CON7 & CON8.

Remembering that the transformer has no load at this stage and assuming a mains input voltage of 230VAC, you should have about 127VAC at pins 1 & 3 of CON7 and 13.7VAC or thereabouts at pins 1 & 3 and 4 & 5 of CON8. SC

What else can you use this transformer for?

As described in the main article, the prime application of this new 160VA toroidal transformer is to power the Currawong valve amplifier. But it's quite a versatile transformer, offering a variety of other applications – nothing to do with the Currawong! Some of its possible uses include:

An Isolation Transformer

Fig.3(a) shows it with the two 115VAC windings connected in series so it can be used as a standard isolation transformer (ie, where you need to keep the device isolated from the mains supply) with a rating of about 150VA.

A Stepdown Transformer for 115V Equipment

Fig.3(b) shows it with the two 115VAC windings connected in parallel so it can be used as 230VAC to 115VAC transformer to run equipment rated up to about 150VA.

A Voltage Adjustment for High (or Low) Mains

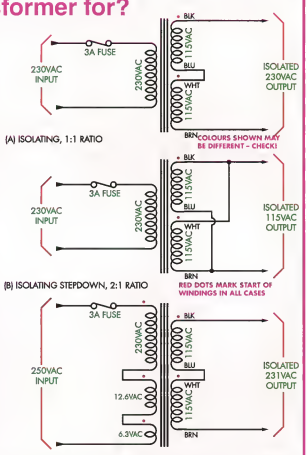
Fig.3(c) shows it with one 12.6VAC winding and one 6.3VAC winding connected in series across the incoming mains (primary) winding and with the two 115VAC windings connected in series.

You would use this connection if your mains voltage is very high at around 250VAC or more and you want to improve the reliability of connected equipment by running it at a much safer 230VAC, or thereabouts.

This arrangement can yield other voltages, eg, by using only one of the 12.5VAC or 6.3VAC windings in series with the primary (to yield a slightly higher output voltage than shown here) or connecting one or more of the low voltage windings in series with the 115VAC secondaries to step up the output voltage (eg, if you have a consistently low mains voltage).

However, you must ALWAYS check (carefully!) that you have the phasing of the windings correct – if the transformer gets hot or hums loudly, chances are they're wrong!

Above all, remember that you are dealing with lethal voltages!



As noted elsewhere, the Altronics catalog number is MA5399 and its recommended retail price is $79.95 including GST.