

## **Thermionic Culture Earlybird ECC82 Calibration Procedure**

The first thing to mention before even thinking about opening up the Earlybird is: unless you are experienced with servicing electronic equipment, don't do it! Take it to a qualified tech/service engineer as there are potentially lethal (and at the very least, extremely painful) voltages of around 400V located inside, and Thermionic Culture accepts no liability for death/injury/ruined golfing careers as a result of careless hands touching the wrong component. You have been warned.

Firstly, turn the Earlybird off and let it cool down for ten minutes before removing the screws/lid. Looking at the PCB from the front of the unit, the valves are as follows: the front row of four contains two ECC83(12AX7)s on either end and two ECC82(12AU7)s in the middle, with one ECC82 at the back. The leftmost ECC83 is the channel 1 input valve, the ECC82 next to it is the channel 1 output valve and the two valves to the right are the same for channel 2 but in mirror image. The ECC82 at the back of the PCB on its own is the VU meter driver valve and, as long as both meters are working, will not need to be changed. It should be said at this point that if only the ECC83s are being changed there is no calibration needed.

Once the valves have been swapped, turn the Earlybird on and leave it for around an hour to warm up properly. To carry out the calibration procedure you will need an oscillator/signal generator, some form of mixer and, as the calibration is mainly done by ear at low frequency, a good monitor set up that works well between 50 and 100Hz. The aim is to adjust the Earlybird signal till the distortion is at its minimum level. Fortunately this can be achieved without a distortion analyser, as the minimum distortion point is also the point where the phase shift at 100Hz is at its lowest. Therefore it follows that when this signal is inverted and mixed with the original, the lowest phase shift point is where the most cancellation occurs (i.e. where the output from the mixer is at its quietest, with the lowest harmonic content).

In principle the calibration procedure is the same for all Earlybirds, but the set-up procedure is slightly different for the EB1.2 as this model doesn't have a line input. If you own a 2.1 or 2.2 then when the Earlybird has warmed up send a 1KHz sine wave into the 'Line' input of channel 1 with a level of +4dBu. Set the function to 'Line', the gain switch to '44 Mic 0 Line', make sure the EQ is flat and switched out and the output pot is turned fully clockwise. Also, set the 'Phase' switch located next to the output pot, to 'Invert'. If you own an Earlybird 1.2, the gain should be set to 45 dB and the oscillator signal should be sent to 'MIC IN 1' with a level of -40 dBu. Route this signal to one channel of your mixer, send the original oscillator signal to the adjacent mixer channel and adjust the level of the original until the two signals cancel each other out (there should be minimal phase shift at 1KHz regardless of calibration). Keeping the mixer levels the same, switch the oscillator output to a 100Hz sine wave (if your oscillator has set frequencies that don't include 100Hz, anything from 40-100Hz will be fine as long as your monitoring set-up can reproduce it cleanly) and you will notice that the signals no longer cancel each other out.

The adjustment is made using the blue and white 100 Ohm trim pot on the PCB (marked VR1 for channel 1 and VR2 for channel 2 on the Earlybird schematic), inbetween the ECC82 and ECC83 for each channel. This should be done using a 4mm or less flat headed, insulated screwdriver and great care must be taken as some of the surrounding components carry extremely high voltages. It is quite a fine adjustment, so ensure it is made gradually as the 'sweet spot' can be easily missed if the pot is turned too quickly. When the pot has been set at the point that corresponds to the lowest output from the mixer, repeat the steps above for channel two. The Earlybird should now be ready to fly, although it's advisable to repeat the procedure again a couple of days later as some drifting may have occurred.