Calibration the Linear Audio Autoranger V1.5

Procedures

To get the best performance out of the autoranger, a full calibration should be performed. The unit will work fine without, but the attenuation may not be fully accurate with frequency and with level.

The following Calibration Procedure guides you through the procedure. It is not difficult or time consuming and will improve the accuracy of the unit. There are 3 calibrations that should be performed. The correct order is first to do the level meter accuracy and common mode adjustments, and then the frequency response adjustments for single ended and balanced inputs. To perform the calibration procedure, the cover of the unit has to be removed and test signals inserted and/or measured at internal test points as indicated in the calibration procedure (**see figure 1**).

1 Level meter accuracy adjustment.

The AR has a build-in AC RMS voltmeter to help in assessing the *signal level going into the sound card*. This indication is *not* meant to replace the soundcard/software measurement capability but it gives additional confidence that the Unit Under Test (UUT) is operating correctly, and it can be calibrated for better than 1% accuracy at 1kHz and nominal output level. The final accuracy depends on the accuracy of the AC voltmeter used at the 1V scale. *Nevertheless, during use, the measurement software level indication should always take precedence*!

The AR display also shows the *input* level it receives from the UUT. This level is calculated from the measured output level going into the sound card and the attenuator/gain setting in effect. It is shown both as Vin in Vrms and the dB attenuation or gain the input signal is subjected to.

The actual accuracy caliobration procedure involves inputting a signal and adjusting its level as accurate as possible for a 1V or 0.4V indication on the voltmeter.

2 Common mode suppression adjustment

This requires a pair of adjustments for maximum common mode suppression, and can be executed with a 1kHz signal generator and a sensitive AC voltmeter. In this procedure the same signal is connected to both sides of the balanced input, and a trimmer is adjusted for minimum output. This is performed both at 0dB and -48dB attenuations.

3 Attenuator frequency response adjustment

For low and medium frequencies, the accuracy of the attenuation and gain steps is +/- 0.1dB by design. This can be extended to 100kHz by performing the frequency response calibration. This can be done with any signal generator that has the required frequency range, and a wideband RMS voltmeter. The method followed is first to measure the attenuation at a low frequency to establish the voltmeter ratio accuracy, and then adjusting a capacitive trimmer for the same attenuation at a high frequency. A total of 6 adjustments are needed, at -16dB, -32dB and -48dB for both single-ended and balanced operation.

Requirements for the calibration equipment.

As noted, the calibration procedures are performed with the aid of a signal generator and an AC RMS voltmeter.

Signal generator

In the calibration procedure the signal generator is called upon to supply output levels up to 10V or more, at frequencies up to 100kHz. Not all signal generators will be able to output 10VRMS. If possible, try to use an external (pre)amplifier; this does not need to be low distortion as signal wave shape is not important.

If you cannot provide 10V levels, you can perform the calibration at lower levels like 5V. In this case, all instances of '10V level' in the calibration procedures should be read as '5V level' or whatever you have selected, but do no change should be made to the procedure to maintain future compatibility.

For the display accuracy calibration, the signal generator should have a fine adjust of the output level so as to get the 1V indication on the voltmeter as accurate as possible.

At one point in the CMRR calibration a 'maximum signal level, but not higher than 100V RMS' is called out. This will normally not be available and the procedure can be done with the maximum level available, if possible via an external amplifier.

AC RMS voltmeter

The AC RMS voltmeter is called upon various tasks:

For the display accuracy calibration, the AC voltmeter should be able to measure a 1V signal at 1kHz at preferably better than 1%.

For the CMRR ration a null adjustments is done, and the AC voltmeter should be able to measure down to the mV level at 1kHz.

For the frequency response flatness adjustment, the AC voltmeter should have a bandwidth extending to a high frequency, preferably 100kHz. Absolute accuracy is less critical here as the measurements are relative to levels. However, if the AC RMS bandwidth does not extend to 100kHz, the measurement should be performed at the meter -3dB bandwidth as the 'high frequency' called out in the calibration procedure. If you wish to do this, all instances of '100kHz' in the calibration procedure should be read as '50kHz' or whatever you have selected, but no change should be made to the procedure to maintain future compatibility.

Summary: the calibration can be performed with a reasonable signal generator and a good, wideband AC RMS voltmeter. No other or specialized equipment is required.

Location of test points and adjustment controls

Finally, **figure 1** shows all test point locations as well as the various trimmers called out in the calibration procedure.

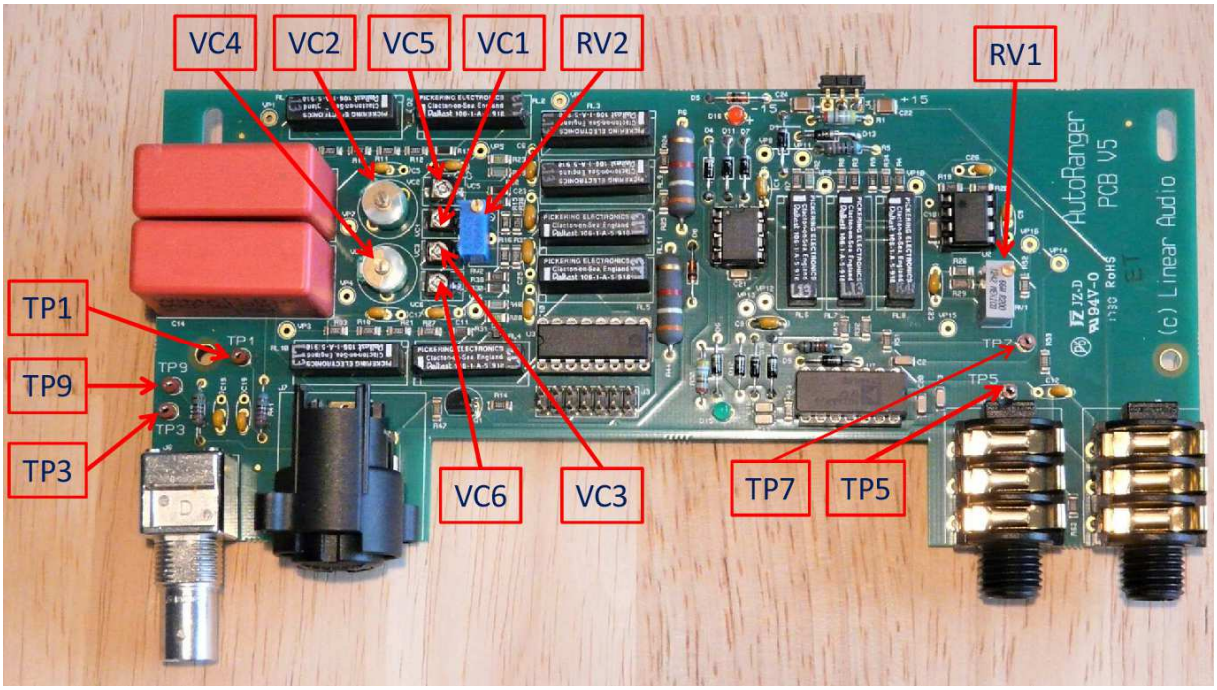

Figure 1 Location of test points and trimmers.