

**EVEN HARMONICS CANCELATION:**

This principle of even Harmonics Cancellation, I have seen it first published in the Ratheiser Books of the 1950's. Also, this was described in a practical way in one of Rainer zur Linde's books, for a design with the AD1 tube, the Queen of Triodes. (ISBN Book Nr 3928051024, Page 45). Some Japanese designers picked up this Principle independantly. We want to mention SAKUMA SAN here, for making many of such designs with the 211 and 845 tube.

I have demonstrated this to work very good with low to medium gain triodes of identical curves, when driver and output stage are similar constructed. For instance with the 6DN7 triode it works nice as well, the smaller triode driving the larger one. With this GM70 design, we work as pure as can be, using two fully indential stages, one driving the other.

**PARAFEED PRINCIPLE**

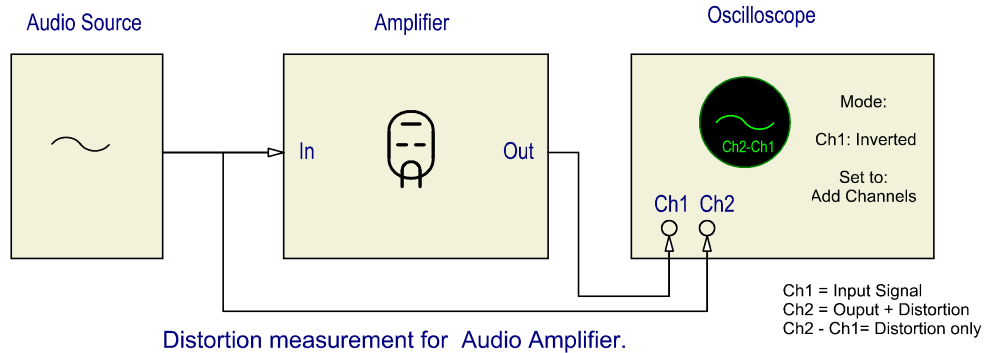
Parafeed means, a normal SE transformer is not used. Instead, an Audio choke is used, and a PPZ transformer. (Push-Pull-Zero-DC). A PPZ transformer will stay away much further from the saturation level. With the Lundahl transformers almost a factor two. These are specially made for Parafeed applications.

This principle is one of the best for the GM70, since transformer requirements for normal SE Class A, are very diffcult for this tube. This is a simular challenge as with to 845 or 211 tubes. With the parafeed, the Inductance function and impedance change function is split into two transformers. The trade off for the air gap of a normal SE output transformer is not needed, there is no airgap used with a parafeed. Note, a normal PP transformer (not PPZ) has also a small airgap. You can take a non compromise plate choke, and a non compromise output transformer which is now DC free. Overall behaviour of a Parafeed stage is much better than when using one SE transformer only.

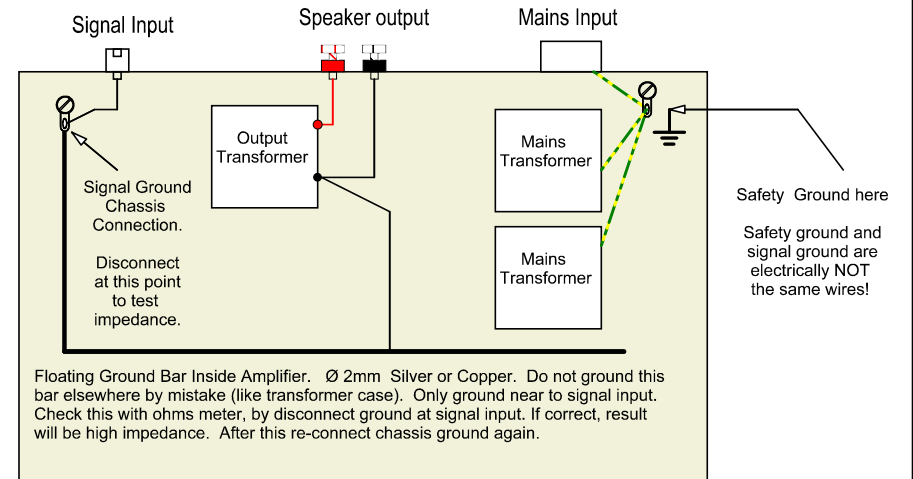
**ADJUSTMENT:**

It can be said distortion is reduced very much, still working without any feedback at all. This method is called compensation.

For adjustment of the driver stage, an overall harmonics meter can be used. Or use a two channel oscilloscope. Connect Channel A to input, Channel B to Output. Adjust Sensitivity such that A and B are shown with same amplitude. If done, Invert Channel A, and add A+B. Result is B-A. This is the distortion now displayed. Adjust sensitivity now for minimum signal. After this, the result is accurate on the screen.



If amplifier is non-inverting, use "Invert Ch1" on oscilloscope. Set attenuation of Ch2 for low signal, then start measurement. If you have not done this before, this measurement is very interesting and impressive! It can be done on any amplifier, not just this one. The set up is a bit simplified here, but basically this is how it's done. You need to experiment with the sensitivity (Volts/division) of Ch1 and Ch2. So to compensate exactly for the amplifier gain. If all set fine, you will see the distortion appear at high signal. Then set it for minimum, by changing the bias of the first GM70 tube.



Recommended Grounding Scheme

**Attention:**

You may publish this page, but only unchanged and with our company as source.  
Any form of commercial use needs our written permission  
JAC Music Company \* Horber Steige 25 \* Sulz \* Germany

Revisions		Date	Name
Date	Name	Drawn	JW
28.12.2017	V8.0		
Dipl. Ing. Jac van de Walle			

<b>Name:</b> GM70 Parafeed, Monoblock With even harmonics cancellation	
Copyright www.jacmusic.com	Page: 2 of 4
Drawing Nr.:	