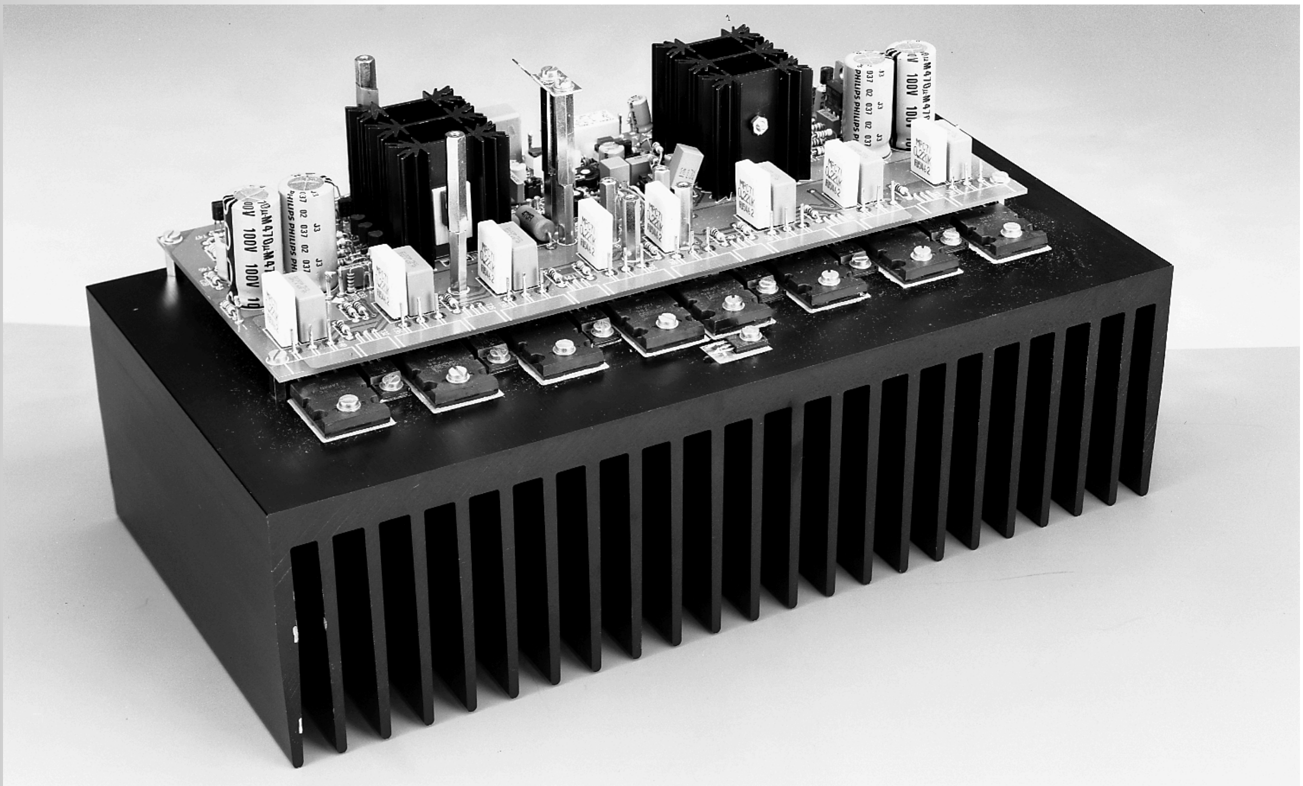
Titan 2000

Part 4: wiring and performance



This fourth of five parts deals primarily with the wiring up of the amplifier and ends with a brief resume of its performance and specifications. The fifth and final part of the article in a forthcoming issue will deal with the temperature control, bridge configuration and some other practical hints.

Design by T. Giesberts

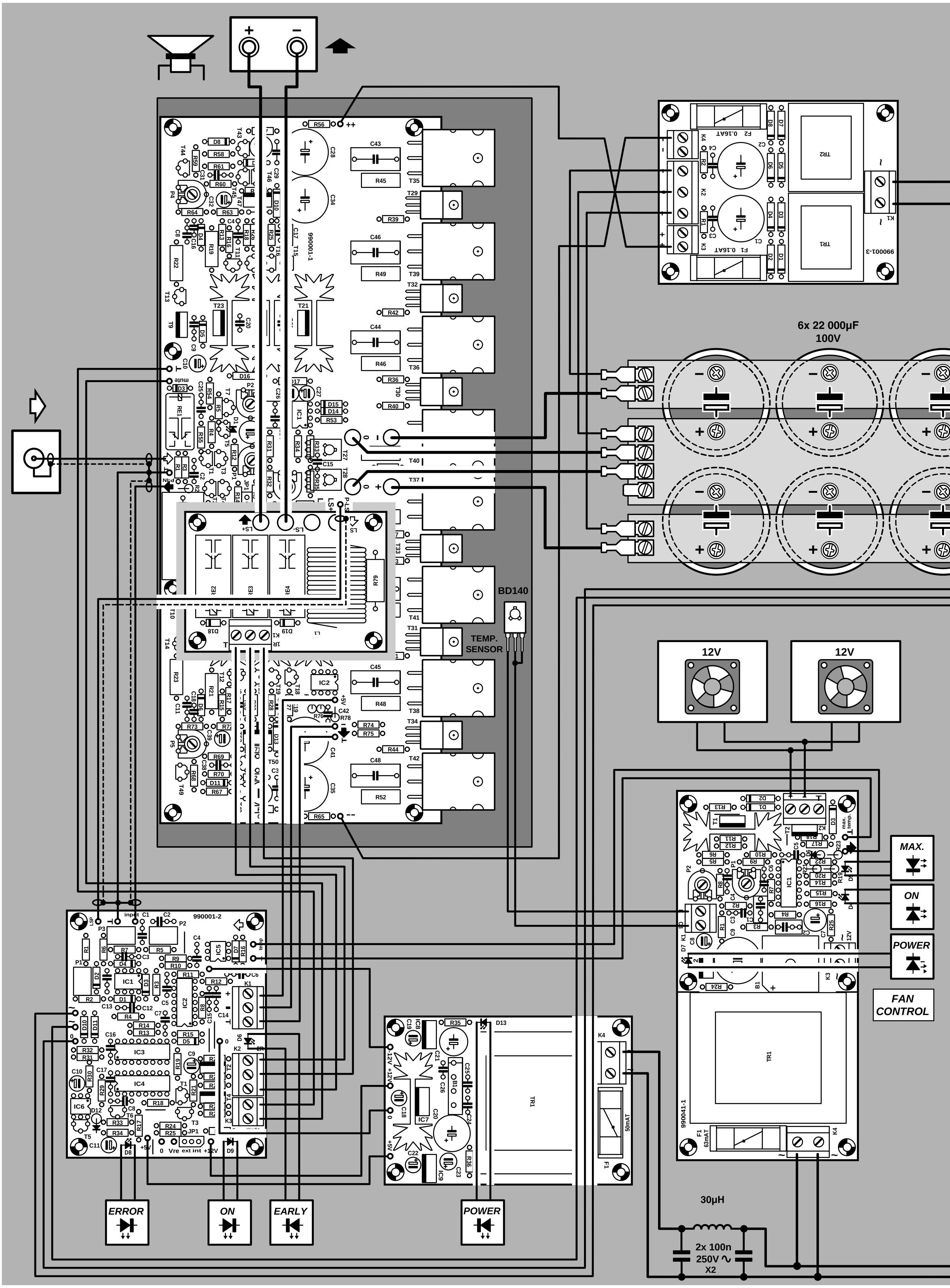
WIRING UP

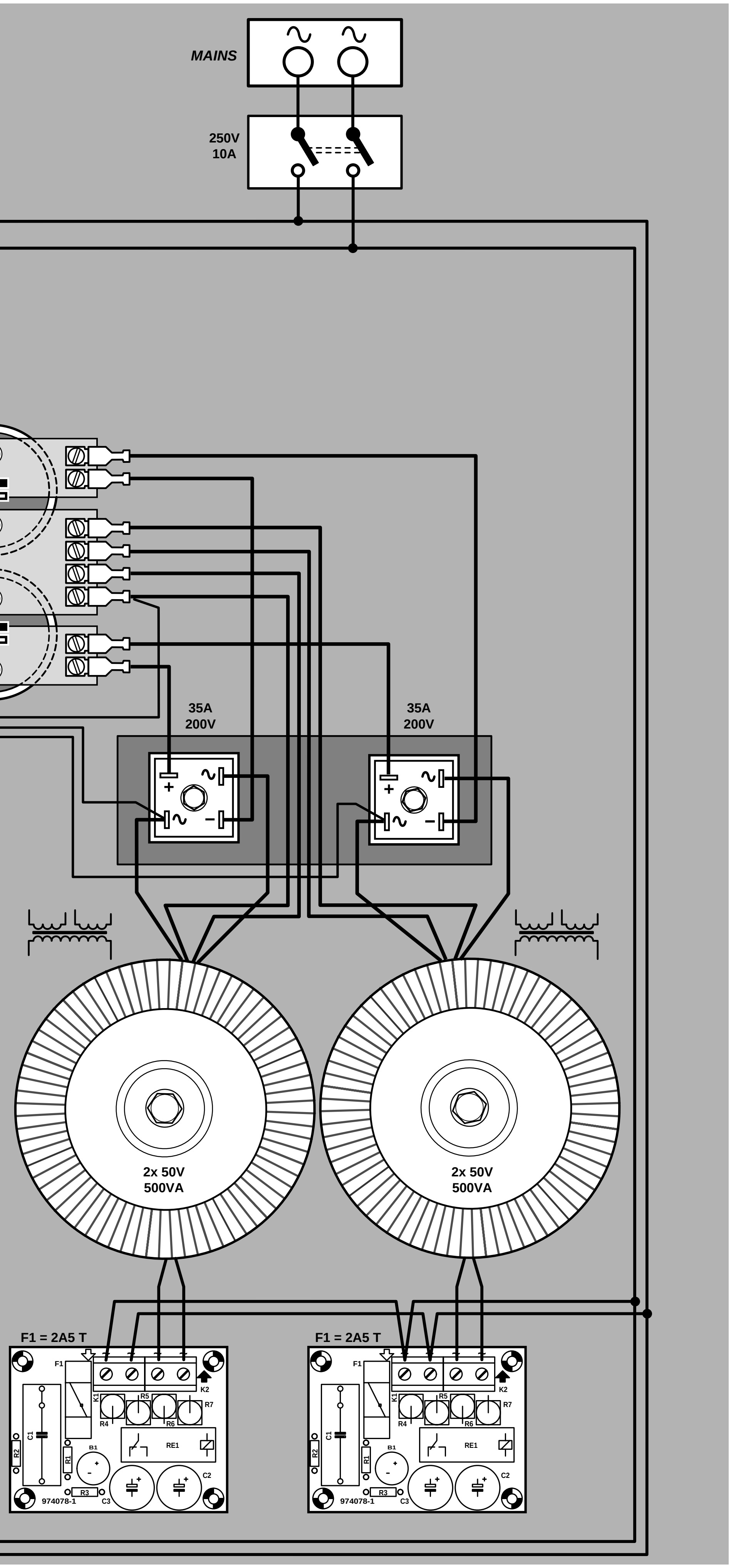
How the various board, power supplies, controls and terminals are combined into an effective and interference-free unit is shown in **Figure 16**.

As already mentioned in Part 2, all wiring carrying the main supply voltage (±70 V) must be insulated, high-current wire to BS6321 with a conductor size of 50/0.25 (2.5 mm²). This wire should also be used to link the output terminals of the power transistors and the loudspeaker terminals. Any wiring between smoothing capacitors and the board should not exceed 15 cm and be preferably much shorter. This kind of wire is best terminated into car-type connectors.

Other wiring may be made in light-duty, stranded, insulated hook-up wire. It is advisable (and may prove to be very helpful in case of problems) to use wire with different colour insulation for dissimilar functions.

The connections between the input socket and board must, of course, be in screened audio cable. To avoid earth loops, the socket should be isolated from a metal enclosure. Bear in mind that the supply earth and the enclosure are linked by metal spacers between the two ‘0’ terminals and the heat sink. It is, therefore, essential that the heat sink is firmly strapped to the metal enclosure.


6x 22 000µF
100V
BD140
TEMP.
SENSOR
12V
12V
MAX.
ON
POWER
FAN
CONTROL
ERROR
ON
EARLY
POWER
30µH
2x 100n
250V ~
X2
990001-1
990001-2
990001-3
990041-1



The on/off indicator, the functional indicators, and the mains on/off switch should, of course, be fitted on the front panel of the enclosure. The mains on/off switch must be a 10 A or 15 A type.

If the output power of the amplifier is limited to no more than 500 W, in which case the enclosure does not need fan cooling, the heat sink may be mounted at the outside of the enclosure or even form the sidewall or back of a home-made enclosure.

For greater output powers, cooling fans with relevant apertures at the front and back of the enclosure are a must. The heat sink must then be located in the enclosure in such a position that it is directly between the two fans, ensuring a continuous supply of cooling air.

PERFORMANCE

The specification and associated comments in the box cannot, of course, give a full impression of the performance of the amplifier. It is a well-known fact that amplifiers with an almost identical specification, and using identical loudspeakers, can sound quite different.

Particularly at low frequencies, the amplifier maintains good control over the loudspeaker, which results in a clean fast (i.e., taut over the whole audio range) sound, totally lacking in reverberation. High and medium frequencies were also reproduced with excellent definition and without any trace of tizziness.

The overall impression is that the amplifier has plenty of reserve and is not strained in any circumstances.

In next month's final instalment, the temperature control and possible bridge configuration will be discussed.

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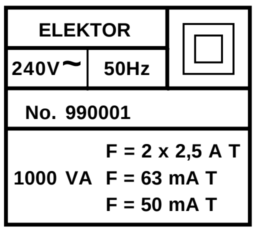

Figure 16. The wiring diagram clearly illustrates how the various parts of the amplifier are combined into a single unit.

Technical specifications

(Supply voltage = ±70 V; quiescent current = 200–400 mA)

Input sensitivity	1.1 V r.m.s.		
Input impedance	47.5 kΩ		
Sine-wave power output (0.1% THD)	280 W into 8 Ω; 500 W into 4 Ω; 800 W into 2 Ω		
Music power* (1% THD)	300 W into 8 Ω; 550 W into 4 Ω; 1000 W into 2 Ω		
Slew limiting	85 V μs^{-1}		
Open-loop bandwidth	53 kHz		
Open-loop amplification	×8600		
Power bandwidth	1.5 Hz – 220 kHz		
Signal-to-noise ratio (1 W into 8 Ω)	101 dB (A-weighted); 97 dB (B = 22 kHz)		
Damping factor (at 8 Ω)	>700 (1 kHz); >300 (20 kHz)		
Output impedance	1.6 Ω		
Harmonic distortion (THD) (B = 80 kHz)	8 Ω	4 Ω	2 Ω
at 1 kHz	0.003% (1 W)	0.0046% (1 W)	0.01% (1 W)
	0.005% (200 W)	0.0084% (400 W)	0.02% (700 W)
at 20 kHz	0.009% (200 W)	0.018% (400 W)	0.07% (700 W)
Intermodulation distortion (IM)			
(50 Hz:7 kHz = 4:1)	0.004% (1 W)	0.01% (1 W)	0.034% (1 W
	0.016% (150 W)	0.025% (300W)	0.07% (500 W)
Dynamic IM			
(square wave 3.15 kHz with sine wave 15 kHz)	0.003% (1 W)	0.0036% (1W)	0.0055% (1 W)
	0.003% (200 W)	0.005% (400 W)	0.0085% (700 W)

*See Part 1 about the validity of this meaningless quantity.

The specified figures were measured after the amplifier had been switched on for two hours. The figure show that the Titan 2000 compares favourably with most amplifiers. The slew limiting is a measure of the speed of the amplifier, which is exceptionally good in the Titan 2000.
Figure A shows the total harmonic distortion plus noise (THD+N) for an output of 1 W into 8 Ω (lower curve) and for 200 W into 8 Ω. The latter figure corresponds with 70% of the peak sine wave power and the curve shows that the distortion increases clearly only above 10 kHz.
Figure B shows the THD+N at 1 kHz as a function of the drive with an output impedance of 8 Ω. The curve is purposely drawn for a bandwidth of 22 kHz so that the noise above 20 kHz does not degrade the performance of the amplifier. From about 2 W, the distortion increases slightly with increasing drive, which is normal in most amplifiers.
Figure C shows the peak output of the amplifier at a constant distortion of 0.1% and a load of 4 Ω (upper curve) and 8 Ω. The bandwidth was 80 kHz.
Figure D shows a Fourier analysis of a reproduced 1 kHz signal at a level of 1 W into 8 Ω. It will be seen that the 2nd harmonics are down just about 100 dB, while the 3rd harmonics are down to –114 dB. Higher harmonics lie below the noise floor of –130 dB.