

AWA G231 Audio Oscillator, Type 1A94771, S.N. 129

July 2011

10Hz to 30kHz, 40 & 600 ohm source impedance; Balanced or unbalanced output; -60dB to +20dB switching in 10dB steps, with output level pot; large dBm and voltage meter; 24V and 48VDC powering.

Low distortion wide bandwidth output transformer: 37 ohm pri; sec configs either 40 ohm or 600 ohm; +26dBm (0.4W); ES; Trimax TA2411

Hendon electrolytics are dated Nov 1967 and May 1968, and Handbook revision is Dec 1970 and has some subtle circuit schematic differences to this unit, so given the low serial number, this unit is circa 1969 manufacture.

Service Manuals:

<https://www.kevinchant.com/awa1.html> Initial version and schematics

[http://www.tuberadio.com/robinson/Manuals/G231\\_AWA\\_osc.pdf](http://www.tuberadio.com/robinson/Manuals/G231_AWA_osc.pdf) 3rd Rev

## Initial condition:

From Telecom, Network Management Unit. Last tested 2001

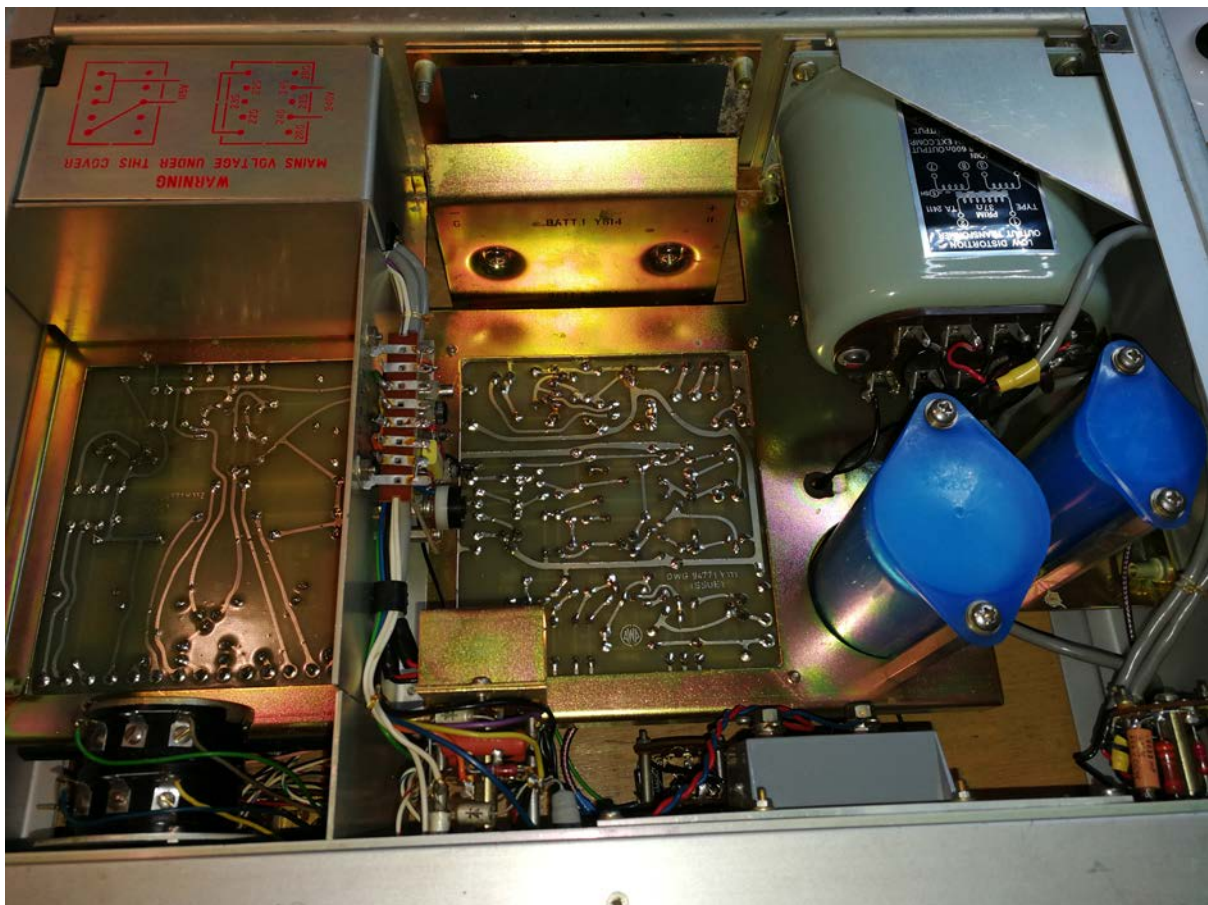
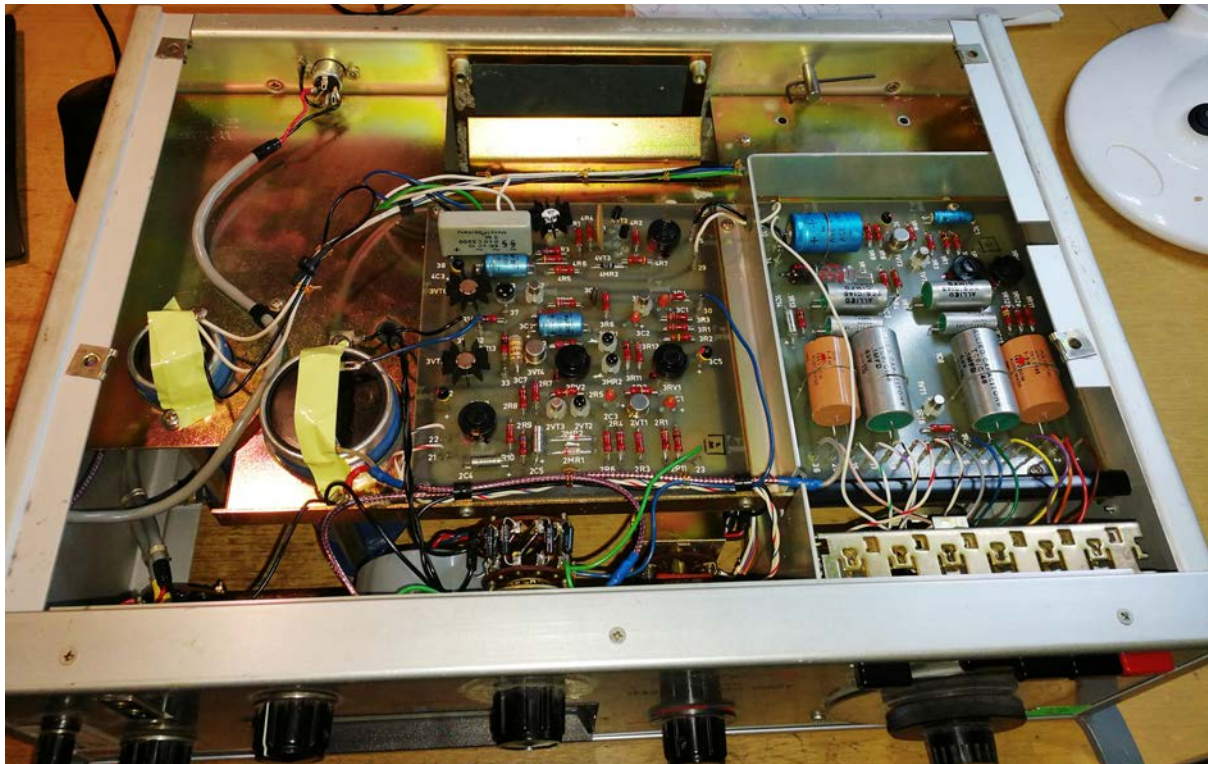
Mains fuse was wrong size - should be 2AG.

Mains power transformer failed.

18V power regulator failed

20 yr old NiCads





## Repairs

18V power regulator failed - all 3 transistors failed - replaced - now ok

2N4249 PNP; 60V; 100 hfe; 200mW; cbe

BC640 ECB - bar on top - pin view

2N4036 PNP; 65V; 1A; can cbe (c can)

2N3693 npn; 45V; to-106; 40 hfe at 10ma; cbe

bc639 npn; ecb - bar on top - pin view

Two battery strings removed (20 yr old NiCads). B-Y, G-R. 10x C size per string (1Ah).

Mains power transformer removed. Mains bulgin socket removed. Replaced by rubber grommet and external battery input lead. Not worth retrofitting a transformer and an IEC socket, as significant benefit from just using external 24Vdc VRLA (2x 12V monoblocks). AC shielded wiring to SWD disconnected and soldered together with FS1 and to gnd. Disconnected terminal 38 (C1 positive) to remove C1 charging, although MR2 does that function too.

External 24VDC supply connected to 1A 2AG FS2 fuse (along with rear panel 6-pin connection, and wiring to SWD/1R and 48V dropper resistors). FS2 connects to series (reverse polarity) protection diode MR1 located on SWD/3F - **note that external 24VDC battery positive is connected to chassis ground**. A series 10R 1W and 470uF 35V cap added to buffer and locally decouple the 18V regulator from an external battery. Only use a nominal 24Vdc battery or power supply - no undervoltage protection - no over-voltage protection.

Formed C2 (8,000uF 25V) to 23V. Checked capacitance at 9.9mF. Checked leakage current with 10V bias at <0.02uA.

Identified leaky 2C1, which may have affected some performance levels. Replaced 1C2, 3C4, 4C2, 2R8 whilst testing.

Contact cleaner sprayed in.

## Calibration

Confirmed 18.0V supply regulation.

Calibrated front panel voltmeter for 600ohm load.

- meter amplifier -9.1V midpoint was -10.2Vdc, but max ACV at that node is low so no issue.

Confirmed frequency settings (1RV1 and 1RV2).

- 1R11 needed to be increased (1k2 to 1k33) to allow 1RV1 to cal the top end.

Calibrated 3RV1 for min distortion (0.27% THD) with 30Hz and 150ohm load on 600 ohm output at 10Vrms.

Calibrated 3RV2 for 0.6Vdc with no load connected.

Checked distortion in to 600 ohm load with EMU0404 and 10:1 probe with loopback calibration file:

11Hz	-10dBm	0.089 %THD	+12dBm	0.027 %THD	
29Hz	-10dBm	0.057 %THD	+22dBm	0.14 %THD	0.010% 0.14%

20kHz	-10dBm	0.032 %THD	+22dBm	0.14 %THD	
30kHz	-10dBm	0.043 %THD	+22dBm	0.19 %THD	
1.1kHz	-10dBm	0.014 %THD	+22dBm	0.18 %THD	0.010% 0.15%

Didn't use 10Hz or 30Hz due to 5<sup>th</sup> harmonic.

## Operation

Current draw varies from about 65mA (oscillator off) to about 100-110mA with max output voltage.

Power switch:

- SWD AC/DC position connects MR1 through to 18V regulator.
- SWD BATT position connects output of battery protection unit (small pcb on internal divider wall) through to 18V regulator central main pcb. Without an internal battery, there is no connection to the protection unit.
- SWD CHARGE position connects meter voltage level at input to battery protection unit (2 diode drop from FS2), with no loading on DC supply.

Oscillator stage output (pin 36) is 1.08Vrms.

Distortion:

Raw oscillator output ; Noise floor about -110dB.

11Hz	0.10% THD
29Hz	0.061% THD
105Hz	0.027% THD
1kHz	0.025% THD
10kHz	0.032% THD
20kHz	0.045% THD

THD degrades when on +20dBm range and output level > 10Vrms (due to output stage clipping causing power rail corruption).

Output amp approaching clipping level causes rise in distortion, with clipping causing gross distortion.

Front dial hex key is accessed when removing bottom panel.

## External Oscillator Option

Replacing the oscillator stage with a USB soundcard interface line output set for 1.0Vrms would allow the G231 to provide gain and attenuator steps, and metering, with transformer isolated 40 and 600 ohm output.

The EMU0404 USB has a lower nominal distortion level than the G231 oscillator.

- REW setting of 500-900mV, output pot for 1.0Vrms, achieves about .0086 - 0.0090% THD with input level pot at min and 10:1 probe with cal file. Which can be reduced to 0.0015% by nulling H2.

- Loopback can be used for specific test frequency, and G231 output level, to null HD at the output of the G231 to very low levels.

Loopback sweeps from 2Hz to 96kHz show flat response except for below 10Hz and above 60kHz where deviation increases to -3dB and +3dB, however that is with the 10x probe with its calibration file, and the calibration file is likely the main form of deviation. Aim to repeat that test with 1x probe and calibration, given that probe won't load the output. With +20dB sweep, the output transformer shows a distinct roll-off below 10Hz, reducing to -12dB at 2Hz.

### To do:

- Replace rear panel battery socket with a more common polarised socket.
- Reconfigure battery input to go through battery protection unit.
- Add a rear panel for disconnecting internal oscillator and inserting external oscillator (eg. 3x RCA sockets with an external patch).
- Replace 3-way Siemens Halske type 9 output socket with 3-pin XLR.
- Loopback test with EMU0404 over 2Hz to 96kHz sweep with 1x probe.

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AGGH thread

<https://www.guitargear.net.au/discussion/index.php?topic=52837.0>

Lying dormant for 10 years, apart from an initial check of operation, I decided to see how well this AWA G231 10Hz - 30kHz audio oscillator performed.

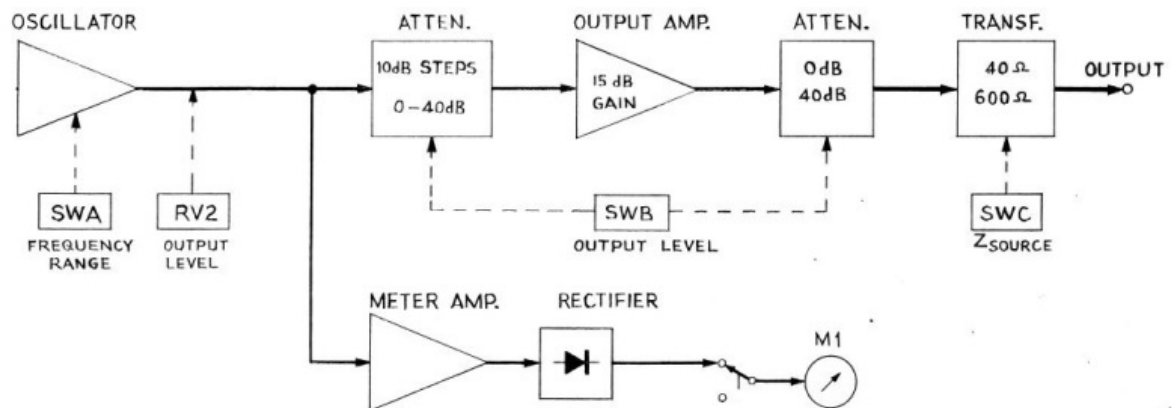
It came with a bad power transformer which I had stripped out, as it has a 24Vdc external battery feed (as well as an internal ni-cad pack, but that is no more). Fault-finding located a few caps that were leaky, and after calibration the unit keeps THD below 0.1% and functions quite well. It has 4 frequency ranges and an accurate setting dial, a nice attenuator/gain switch from -60dB to +20dB in 10dB steps, and a large meter for AC voltage and dBm display. The output is transformer isolated with settings for 40 or 600 ohm in either balanced or unbalanced configuration, as was typical back in 1969 for 600 ohm impedance work, and the unit is well shielded with a noise floor at least 110dB below 10V.

Like all vintage Wein bridge oscillators, the output level takes some time to stabilise after turn on, or when changing frequency, and the harmonic distortion may be excessive when testing modern equipment.

So this old workhorse can be 'modernised' with a heart bypass, based on using a modern USB soundcard interface used as the 'new' oscillator.

The block diagram of the equipment shows the oscillator feeding both a meter stage, and the main signal path including coupled attenuation and gain stages, and output transformer isolation. The oscillator stage generates a stable 1Vrms, and that is where an external oscillator can be easily inserted (and the oscillator can be turned off from the front panel switches).

[dalmura.com.au/projects/](http://dalmura.com.au/projects/)

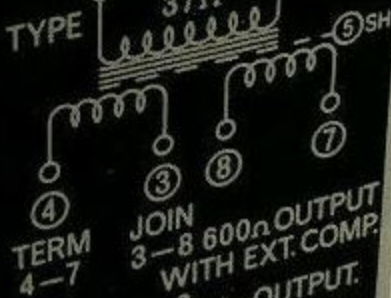


Not only does the soundcard provide a lower raw distortion oscillator, with THD now down at 0.01%, but software can null that down to 0.001% if needed, so not too shabby indeed for performance testing. And software can now allow this unit to be part of a bench setup performing many forms of noise and distortion testing including automated frequency sweeps, especially when there is a need for enhanced transformer signal isolation with low impedance drive capability, along with a signal level meter. About the only note is that the G231 hardware has a limited specified frequency range of 10Hz to 30kHz, with some expected fall-off beyond that range (which may be able to be calibrated out), given that modern soundcards can typically test out to 96kHz.



LOW DISTORTION  
OUTPUT TRANSFORMER

TYPE ① PRIM 37Ω TA 2411 ②



TERM 4-7 JOIN 3-8 600Ω OUTPUT WITH EXT. COMP.

4-3 4-8 40Ω OUTPUT.  
3-7

MAX. LEVEL +26 dbm  
FR. RESPONSE 30Hz-30KHz

L M ERICSSON PTY. LTD.  
TRIMAX DIVISION  
MELBOURNE AUSTRALIA

M 1313