

1. Summary

ENCEL X1212 stereophonic amplifier.

March 2017.

1.1 Original Amplifier

Made in Japan. Sold by ENCEL. Very good condition, but a bit greasy (pots and contacts had been sprayed). Only two valves not original. Unmodified condition – complete. Nice production manufactured amp.

12AX7 phono stage each channel, 12AX7 for both channels to tone and Vol. 6GW8 triodes for feedback gain stage and concertina phase splitter. 6GW8 pentode PP common 130Ω 10W cathode biased output stage, with all screens taken to screen supply. 12W output rated.

Front panel: On/off power wafer switch. Aux/Tuner/Phono wafer switch. Left/right/stereo/reverse mode wafer switch. Treble, bass, volume stereo pots. Power indicator. Rumble filter switch.

Normal/reverse phase switch. Speaker/phones switch and jack.

Rear panel: 8Ω/16Ω switch. Line fuse. AC 2-pin outlet. Ceramic/mag RCA inputs with shorting plugs. Aux/Tuner/To RCA inputs. Hum pots elevated off each output stage cathode bias.

Full-wave rectifier to 40uF 350V, then 500Ω 10W to screens. 100uF main cap to CT, 100uF to preamps. 2A heater for 1 output channel, tone 12AX7 and 1 phono channel. 1.7A heater for 1 output channel and 1 phono channel. 5V heater for 5AR4.

Components

Power Transformer ? , TP-15A, 7302; 0-115V, 0-115V; 270-CT-270V 190mA, 6V3 2A, 6V3 1.7A, 5V 1.9A; E.S.

Output Transformers 6304SS. TO-012; ?k PP; 8Ω, 16Ω.

Tubes 12AX7 Miniwatt I6 CIK (Hendon Works, 1961, Nov)

12AX7 Matsushita 3K E T

12AX7 Matsushita 3K E T

6GW8 Miniwatt 542

6GW8 Matsushita 3F K E

6GW8 Matsushita 4D N B W

6GW8 Matsushita 4D N B E

5AR4 Matsushita 31 X 2

CAPs RUBY; STAR TV1200 A - (M); RUBYCON

NITTA electrolytics 4610; 4602

Resistors RWH10G ceramic tube WW

KOA WW.

MEC mica

POTs Noble VR51, VR-59, VR-52

Issues:

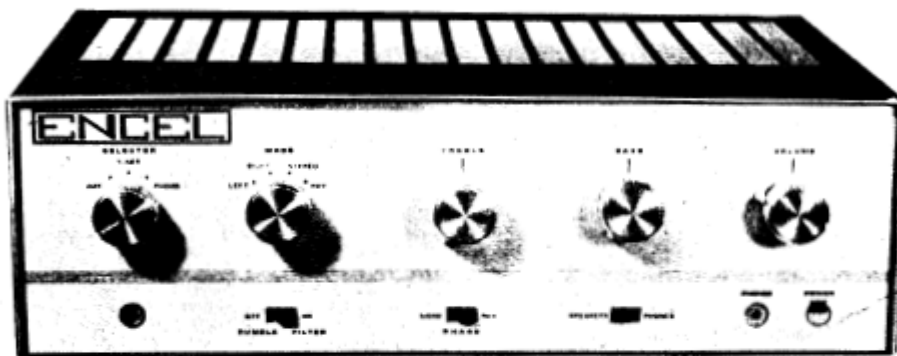
Replaced mains lead – earth not connected to chassis – neutral switched – active poorly soldered and to wrong end of fuse. AC outlet unfused. 2nF capacitors between each AC mains to E.S. which is grounded. Noble 125VAC rated mains on switch. Chassis cutout for mains transformer not accurate. Almost shorting B+ wire. Burnt headphone limiting resistor. Output impedance switch missing screw and bent. Chassis hole for OT wires unprotected. Old electrolytics. AC mains wiring not completely separated. Speaker wiring through multiple slider switch contacts (phase/rev, speaker/phones, 8/16Ω). Leaky coupling caps (STAR TV1200). Worn out 6GW8's (one red-plating). Cramped spacing for 6GW8's.

Power grounding not the best. Star chassis grounding of circuits. Cable layout could be better.

'N' marking under chassis. Appears to be from first batch of X1212, introduced about Sept 1964. Encel operated from 1960.

What's in a name?

When we looked for an amplifier to carry the name "Encel" we wondered how we should make our selection. Should we take the easy path and make an ultimate-type and naturally expensive amplifier or choose the difficult road and manufacture a very good one at a low price? We decided we would bring good stereo reproduction to thousands of music lovers . . . and in the lower price category. And so we present to you the Encel Model X1212 Stereo Amplifier . . . just look at the features—and the price! We believe that there is no finer amplifier available anywhere in Australia in this price bracket.



THE ENCEL STEREO AMPLIFIER — MODEL X1212

The Encel Model X1212 combines dual pre-amplifiers and power amplifiers on one chassis, with all controls necessary for flexibility of operation. Our research revealed one simple fact: the majority of stereo purchasers prefer an amplifier in this price range and with all the facilities the X1212 has to offer. Until now it has not been possible to purchase such an amplifier.

Provision is made for use of stereo tuners and tape deck. Two pickup inputs are available for magnetic and crystal stereo cartridges. A rumble filter and phase switch are standard equipment in the Encel X1212. Separate bass and treble controls are fitted with concentric knobs so that each channel may be adjusted independently if necessary. Frequency response is plus or minus 2 db between 50 c/s and 20 kc/s.

SPECIFICATIONS

- Power output: 12 watts in each channel.
- Frequency response: Plus or minus 2 dB 50 c/s to 20 kc/s.
- Speaker connections: 8 or 16 ohms.
- Provision is made for Stereo Headphones.
- Sensitivity: Magnetic or crystal pickups.
- Stereo tuners or tape decks may be connected.
- Mode Switch: Connections for Stereo, Reverse Stereo, Mono L and Mono R.
- Bass and Treble Controls: Continuously variable and independent for both channels. When set at 12 o'clock response is flat.
- Rumble filter:

- Switches in low frequency filter to reduce turntable noise.
- Volume control and AC switch are separated for LOWER HUM CONTENT and simplified use.
- Hum and Noise: Mag. PU 56 dB below rated output.
- Distortion: Less than 1 per cent at 12 watts. Write now for full details.

PRICE

£47.10.0

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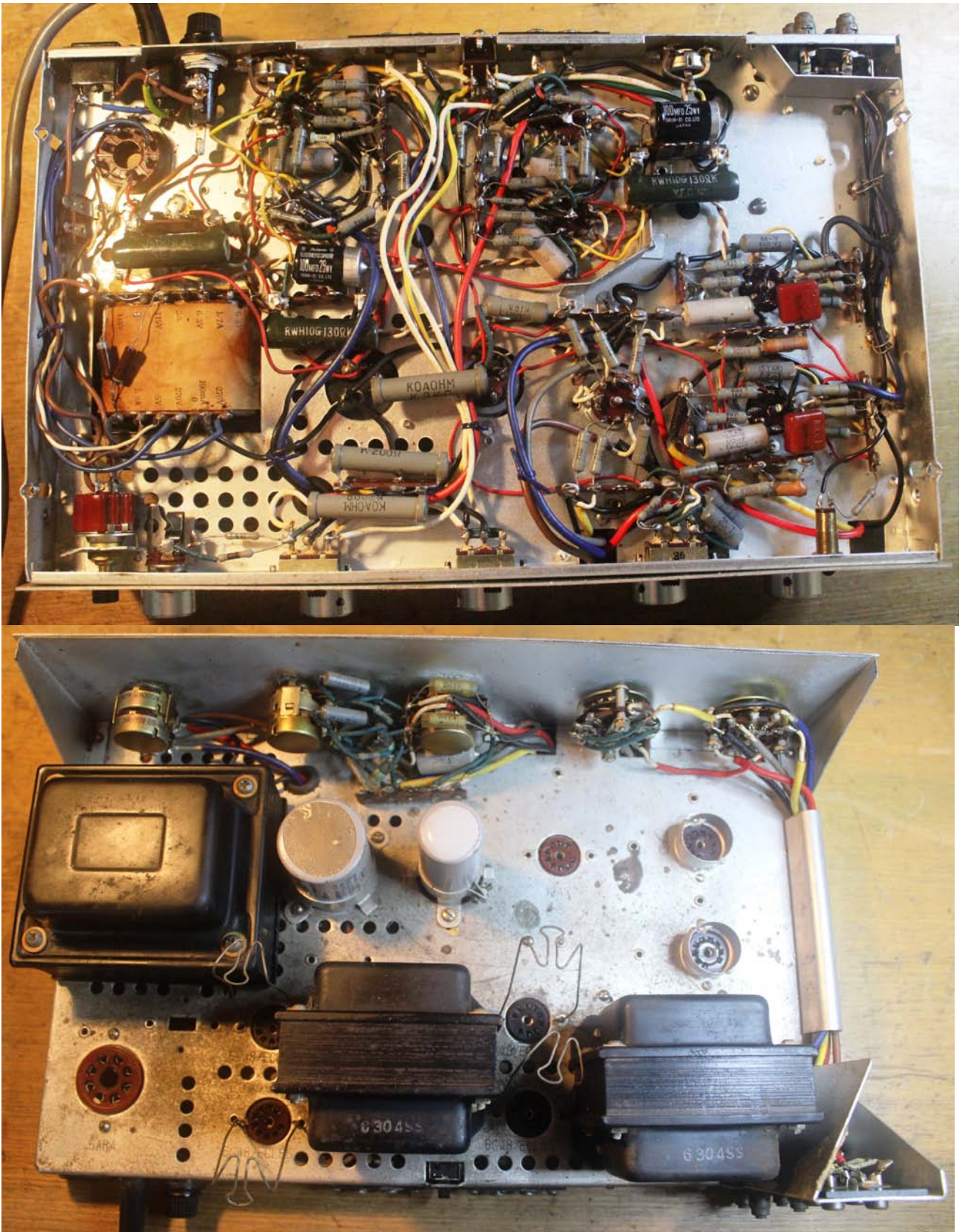
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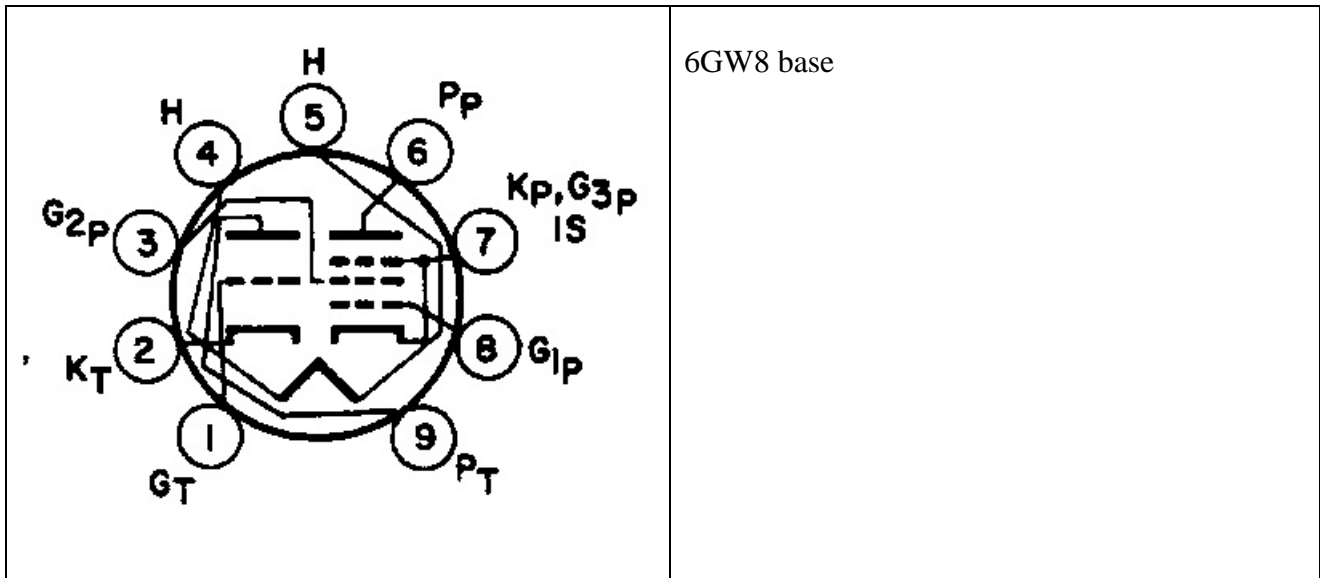
2. Modifications

- New mains cord and earthing.
- Removed mains caps to earth. E.S. taken to chassis.
- Removed power transformer and enlarged chassis cutout to align with transformer.

- Separated and sleeved mains wiring.
- 431KD10 MOV across primary winding.
- Added PT secondary CT fuse (0.4A T IEC).
- Protection UF4007 for valve diodes.
- Replaced all electrolytics. Increased C1A,B from 40uF to 100uF 400V VS1. VS2 screens 100uF 400V. 3k 10W dropper to 68uF 400V VS3. 10k 2W dropper to 47uF 400V VS4. 30k 1W to 33uF 400V VS5.
- Hard-wire speaker socket to 16Ω tap.
- Tidied up wiring.
- Re-arranged power grounding.
- Removed NORM/REV phase, and Speakers/Phones and 8/16 ohm switches from speaker output path.
- Added 1Ω cathode current sense resistors to each 6GW8.
- 100kΩ bleed resistor added to VS3.
- Increased common cathode resistance from 130Ω to 157Ω (can be easily modified), to lower idle power dissipation to max design rating with 245Vac mains.

To do:

- Add 1k grid stopper, and 100Ω screen stopper, to alleviate failure surges and blocking.
- Check bias conditions with NOS valves – supply voltage may be lower (300V). May need to raise common cathode resistance from 130, or lower VS2.
- Remove 2x 12AX7 if record player not being used.
- External voltage rail sensing.



3. Measurements

PT megger tested ok.

Rail	Idle (245Vrms mains)
VS1	335V (2.9Vrms)
VS2	321V (100mVrms)
VS3	290V
VS4	237V
VS5	156V
Cathode	10.3V (32+33mA) 10.7W 10.3V (32+33mA) 10.7W
PI stage	106V, 185V
Heater	6.7, 6.7
Sec HT	285-0-285

Power transformer primary DC resistance: 0-115-0-115V 12Ω.

Power transformer secondary DC resistance: 80Ω + 76Ω.

Output transformer k PP primary DC resistance: 93+93=186Ω plate-to-plate.

Clipping at abt 12.5W.

Noise 2mVrms with Vol min; 5mV Vol max and input shorted; 10mV Vol max and input not shorted – mainly due to 150Hz;

500Hz sine input – max volume pot – flat tone – 15.7Ω resistive load.

Config	1,6 in L-ch		1,6 in R-ch		IM 60/7k	(250/8k)
Rear,Front	1W 3.96V	10W 12.5V	1W 3.96V	10W 12.5V	1W 3.96V	10W 12.5V
1,6	.21%	2.1%	.26%	2.3%		
6,1	.28%	2.8%				
3,7	0.11%	1.7%	.36%	5.4%		
7,3	0.41%	5.5%	.08%	1.6%	0.95% (0.96)	6.2% (6.3)

Left channel and Right channel swap the circuit location of the input triode.

Rear = valve towards rear connectors.

Results are consistent with 6GW8 triode having noticeable gain variation, which affects feedback level and distortion – so well worth tube rolling.

Measurement plots show response is flat within +/-0.5dB between +0.5dB peak at 15Hz, and upper roll-off starting about 10kHz, and -3dB about 16kHz.

Min bass control gives -6dB at 200Hz.

Min treble control gives -6dB at 2.5kHz.

To do:

- Check high frequency response using EMU0404.
- Check humdinger variation.
- Check pot scratchiness with speakers.

4. Power Supplies

A standard CT full-wave rectifier circuit with 5AR4 diodes is used with 270-0-270V secondary HT windings with 40uF capacitor input filter. 0.825A continuous peak, 3.7Apk, ratings.

The effective source resistance is comprised of the reflected power transformer primary resistance = $12\Omega \times (270/230)^2 = 16\Omega$; plus the secondary resistance = 76Ω ; which sums to 92Ω .

Heater 1 6V3 2A: $2 \times 0.66 + 3 \times 0.3 = 2A$.

Heater 2 6V3 1.7A: $2 \times 0.66 = 1.4A$.

Heater 3 5V-0V 1.9A:

Only alternative to 5AR4 is GZ34. GZ32 needs 5V 2.3A.

Simulation with max current.

Simulate period in PSUD2	10ms	50ms	continuous
Simulated RMS current	1.8A	1.3A	0.34A
Multiplier (based on 0.5A fuse rating)	3.6	2.6	0.68
IEC60127-2 Quick-acting F min limit multiplier	4	2.75	1

Simulate period in PSUD2	20ms	150ms	600ms	continuous
Simulated RMS current	1.6A	0.87A	0.51A	0.34A
Multiplier (based on 0.4A fuse rating)	4	2.2	1.3	0.85
IEC60127-2 Time-lag T min limit multiplier	10	4	2.75	1