

Test Report

Date: 5th April, 2019

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Make: Nelson Pass (Pass Labs DIY kit from DIY Audio)

Model: M2x V.1b

Serial No. : n/a

Options fitted: Tucson V.1 unity gain buffer input stage.

Test Results

Parameter Measured		Left Channel	Right Channel	Notes
Mains Input Voltage	230v			Taken at the time of the measurements
d.c. + rail voltage		+22.1V	+22.1V	Under load with both channels connected
d.c. – rail voltage		-22.1V	-22.1V	Under load with both channels connected
Output Power @ 1kHz Watts RMS measured just below the onset of clipping.		24.85	24.85	8Ω resistive load both channels driven
		39.06	39.06	4Ω resistive load both channels driven
		24.85		8Ω resistive load left channel driven
			24.85	8Ω resistive load right channel driven
		39.06		4Ω resistive load left channel driven
			39.06	4Ω resistive load right channel driven
Frequency response 20Hz to 20kHz		± 0.2dB	± 0.2dB	8Ω resistive load
		± 0.2dB	± 0.2dB	4Ω resistive load
		See comments	See comments	
Signal to noise ratio unweighted w.r.t. full output power		72dB	76dB	8Ω resistive load left channel driven
		72dB	76dB	8Ω resistive load right channel driven
		74dB	78dB	4Ω resistive load left channel driven
		74dB	78dB	4Ω resistive load right channel driven
THD @ 1W RMS output				
@ 100Hz		0.078%	0.074%	8Ω resistive load both channels driven
@ 1KHz		0.05%	0.03%	
@ 10kHz		0.15%	0.13%	
@ 100Hz		0.086%	0.086%	4Ω resistive load both channels driven
@ 1KHz		0.062%	0.045%	
@ 10kHz		0.175%	0.145%	
THD @ full output measure just before the onset of clipping				
@ 100Hz		0.4%	0.5%	8Ω resistive load both channels driven
@ 1KHz		0.7%	0.85%	
@ 10kHz		5.3%	4.8%	
@ 100Hz		0.64%	0.7%	4Ω resistive load both channels driven
@ 1KHz		0.89%	0.9%	
@ 10kHz		4.3%	4.4%	
Sensitivity @ 1kHz		536mV RMS	539mV RMS	1 Watt RMS output into 8Ω resistive load
		396mV RMS	376mV RMS	1 Watt RMS output into 4Ω resistive load
		2.66V RMS	2.65V RMS	Full output into 8Ω resistive load
		2.48V RMS	2.55V RMS	Full output into 4Ω resistive load
Slew rate @ 1 kHz		1.5V/μS	1.5V/μS	8Ω resistive load 12V pk-pk square wave
Overshoot (ringing)		13% peak	13% peak	See pictures in comments section.
Channel balance		Within 0.2dB	Within 0.2dB	@ 1 Watt output / 8Ω
Safety 1000V IR Test	✓			Test Tag No. 005581 affixed.

Test results comments

All measurements were taken after a warm up period of 60 minutes. Output offset adjustments were checked to ensure the d.c. offset was $\leq \pm 1\text{mV}$ of 0V reference. The offset measurements were taken across the output terminals of each channel respectively.

Frequency response

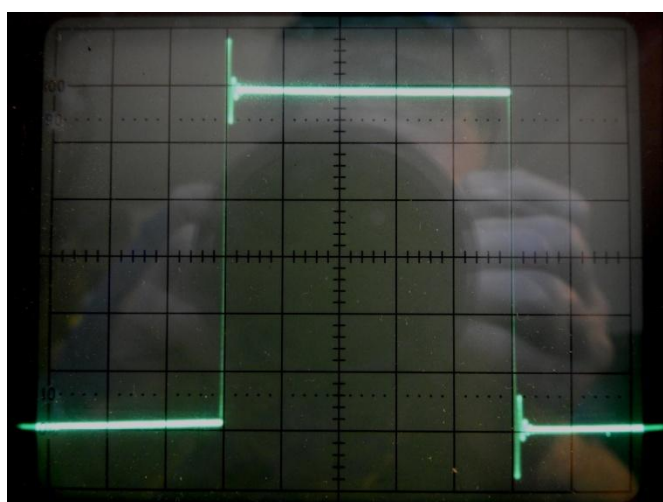
The amplifier exhibited an unusual frequency response compared to others I have measured. Unlike many other amplifiers that exhibit fairly flat response in the passband with a roll-off in the frequency response at the extremes of the audio spectrum this amplifier shows a slight gain at these points. There was a small difference between the left and right channel responses as can be seen in the table below.

All measurements were taken at an output of 1W_{RMS} . There was no difference in the frequency response results for both $4\ \Omega$ and $8\ \Omega$ resistive loads.

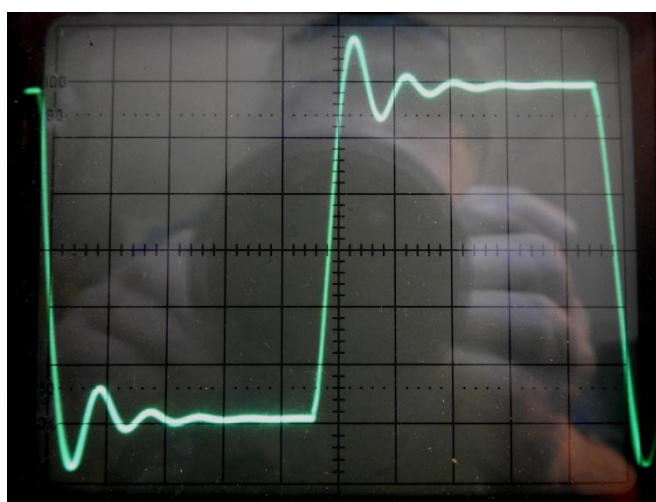
Frequency	Left Channel	Right Channel
10Hz	+1.1dB	+1.2dB
20Hz	+0.2dB	+0.2dB
1kHz (reference frequency)	0dB	0dB
20kHz	+0.1dB	-0.1dB
50kHz	+0.6dB	+0.3dB
100kHz	-2.0dB	-1.0dB

Square wave response, slew rate and overshoot

This amplifier exhibited a slew rate of $1.5\text{V}/\mu\text{s}$ when a 1kHz square wave signal was applied to the input. The input signal was adjusted to achieve a nominal output of $12\text{V}_{\text{pk-pk}}$ into an $8\ \Omega$ resistive load. There was significant overshoot (ringing) evident on the leading edges of the square wave output from the amplifier representing approximately 13% overshoot. It's not due to a fault as both channels exhibit identical results. It's more than likely a design quirk as the ringing is not present at the output of the Tucson board, but ringing is evident at the output of the EDCOR coupling transformer. The Zobel network of $R5 + C1$ ($10\text{k}\Omega + 680\text{pF}$) is part of the design.



1kHz square wave – $2\text{V} / \text{Div}$



10kHz square wave – $2\text{V} / \text{Div}$

Phase response

A slight phase shift was measured at 1kHz. The phase shift was more pronounced at 20kHz where the output signal lagged the input signal by approximately 30°.

Schedule of test equipment used

Instrument	Serial Number
AWA F242A Noise and Distortion Meter	No serial number
AWA G232 Low Distortion Oscillator	10031
BWD 824A CRO	62251
Fluke 8020A DMM	3245142
Metrix MX52 DMM	89072145
DER EE LCR Meter DE-5000	P0003199
FG30 Function Generator	20062343
4 x 8Ω 80W resistive loads	N/A
EM480A Insulation Resistance Tester	DF:3344978