

Review of cascaded input gain stages strategies, applicable to 5F6-A based build

Park 1210 input stage (see figure 1)

Understanding that the Park is based fundamentally on Marshall designs, there are still some differences to explore. This is a 2-channel design, with the output of the “High Gain” channel’s gain stage feeding into the grid of the “Low Gain” channel’s input gain stage. The “Low Gain” channel circuit is independent of the “High Gain”, and the “High Gain” channel’s output is always routed through the “Low Gain” stage. (see figure 1). The tubes look to be Ecc83s (12ax7).

When “Input 1” (high gain) is in use, the incoming signal sees 1M to ground and no grid resistor. The signal drives the V1a grid. This is similar to the 5F6-A “Hi Input” channel, but the absence of a grid resistor seems unusual. Meanwhile, Input 2 ground is interrupted by the nifty Input 1 double switch jack.

The V1a cathode bias resistor and cap seem to be typical values for vintage Marshall – 2.7k and .68uF, and with a 100k plate R, likely resulting (depending on plate voltage) in a slightly cool bias.

Amplified signal from V1a travels through a .022uF coupling cap to a bypassed 1M gain control which sends signal on to the “Low” input circuit. The bypass caps look like 2kpF in parallel with 2kuF (?), but in all, this post-tube circuit looks to me like a high pass filter, and a voltage divider gain control that passes up to 100% of the signal voltage. It is followed by a 470k series resistor that forms a voltage divider with the 68k input resistor (just before the grid of V1b), reducing the signal voltage by about 85% prior to hitting V1b grid. And (if I’m using the Richard Kuehnel’s calculators correctly) ultimately, the output impedance and 470k resistor attenuate frequencies between 2kHz and 10kHz from 2dB to 10dB. It is then amplified through the remainder of that circuit, described below.

When “Input 2” (low gain) is in use, the incoming signal sees 68k plus parallel paths to ground (68k and 470k), so about 110k input resistance, and a voltage divider in the 68k and 68k||470k which cuts the signal about in half when it gets to the V1b grid. This seems fairly close to a typical 5F6-A “Lo input”. Meanwhile, Input 1 grid is grounded through its jack switch.

Signals from either input now enter V1b grid - I can’t quite read the values (820 / 330uF 10w?), but the V1b cathode bias resistor is bypassed, and the 100k plate resistor seems typical. The 3 digit cathode resistor value suggests it is warmly biased, perhaps (as Rob R. writes in his outstanding analyses on his website) to better preserve the now flipped undistorted lobes of the signal from the previous gain stage.

Amplified signal travels through a .022uF coupling cap to a bypassed 1M gain control and 470k series resistor which feeds the grid of next stage. The bypass caps look like 100uF followed by 1kpF, but the other component is illegible. I assume the CR network formed here bypasses some favorable spectrum of frequencies, and then uses a voltage divider gain control. The 470k resistor increases output impedance and attenuates un-bypassed portions of the signal prior to hitting the grid of the next stage, which is a plate-driven tone stack.

Questions:

(fig. 1, Park 1210 input stage)

Marshall JCM-800

This is a 2-channel design, with the output of the “High” channel’s gain stage feeding into the grid of the “Low” channel’s input gain stage (both 12ax7). The “Low” channel circuit is independent of the “High”, whereas the “High” channel’s output is always routed through the “Low” channel stage. (see figure 2).

When the “High” input is in use, the incoming signal sees 1M resistance to ground (the R2 grid leak resistor), and a 68k grid resistor (R3) – This is similar to the 5F6-A “Hi Input” channel.

The V1a cathode bias resistor and bypass cap seem to be typical values for vintage Marshall – 2.7k and .68uF, as is the 100k plate resistor. Amplified signal sees a path to ground through a 100pF cap (C2, to drain off unwanted signal highs?) then a coupling cap (C3) before it enters the top of the Low Input circuit, described next.

When the “Low” input is in use, the “High” jack/grid remain grounded. When the “Low” input OR the “High” input is in use, the incoming signal at the “Low” input sees variable resistance to ground through a bypassed 470k resistor (R5) and a 1M pot (VR1) – not sure how to calculate/deduce its resistance compared to other typical input circuits, but it seems to offer a range from high to low input impedance depending on frequency. At V1b, grid resistance is offered by the same circuit/components and varies with the 1M pot. The un-bypassed signal voltage (whether coming from the “High” channel or the “Low” input jack) at the V1b grid is attenuated by the 470k series resistor (R5) and all signal is attenuated variably by the 1M pot (VR1). I assume the CR network formed by C4, C5, R5 and VR1 bypasses some favorable spectrum of frequencies.

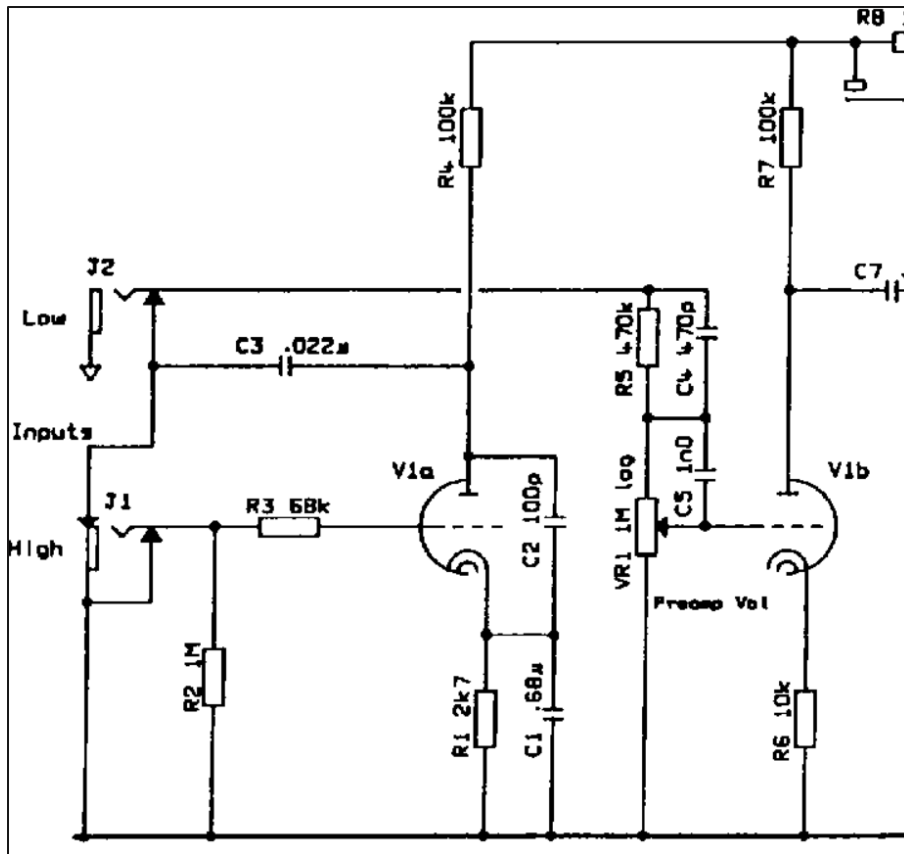
On the V1b tube the 10k cathode bias resistor pushes the operating point way toward cut-off – seems like the “cold clipper” I’ve read about, leaving something like 3V of positive swing on the grid before saturation and about .5V negative swing to cut-off. The amplified signal then goes through a coupling cap and on to a gain/CF driven tone stack.

Questions:

- Is the purpose of the 100pF cap (C2) on V1a’s plate to leak high frequencies, or other?
- The RC configuration immediately preceding V1b seems quite similar to the circuit preceding V2a in the Park 1210 – does it function in the same way? How do I figure out what’s going on there?

Features:

- Second (non-optional) stage has significant input resistance, though bypasses signal as well.
- Second (non-optional) stage has “Cold Clipper” bias.
- Filter / tone shaping and gain between stages.
- Driving a gain/CF stage into tone stack.
- Input Jumpering would not seem to provide other tone options because of signal imbalance.



(fig. 2, JCM-800 input stage)

Friedman BE-100

This is a single input multi-channel design – and gets very involved past the initial two stages of just one channel I’m examining here – which allows optional switching to bypass or include an additional gain stage. The switch at relay 1 determines whether or not the signal at the input jack is routed through the V1A stage, or around it and directly to the input of the V2A stage for this signal path (figure 3).

With the relay 1 switch in the “cascaded” position, the input signal sees the 1M input resistor (R1) and the 33k grid resistor (R2) of V1A, putting it in the realm of the 5F6-A “Hi input” channel values.

The V1A cathode bias resistor and bypass cap seem to be typical values for vintage Marshall – 2.7k and .68uF, but with a 220k plate resistor (R9) in series with a 500pF (C8) bypassed 100k resistor (R3) – without knowing plate V it’s hard to say, but it seems like it will be a slightly warm bias. (I note that the Friedman BE50’s similar front circuit has cathode R of 1.5k and plate R of 100k). The amplified signal then sees a coupling capacitor (C3) then a 1M / 68k voltage divider (R5/R6) that reduces the signal voltage by over 90% before it continues past the closed switch, and on to the input circuit described below. The 33k grid resistor at V2A will not affect audible frequencies of the now very small signal as it hits the grid. (There is a “clean” switch, not shown, that would divert the signal off to another circuit after R3, but I’m assuming for this analysis that switch is open).

With the relay 1 switch in the “bypassed” position, the input signal is diverted around the first stage described above and enters the circuit at the switch. In either case, the signal at this point sees 1M (R1) in parallel with 10M resistor (R11) for an input resistance of around 900k, and a 33k grid resistor, putting it in the realm of the 5F6-A “Hi input” channel values.

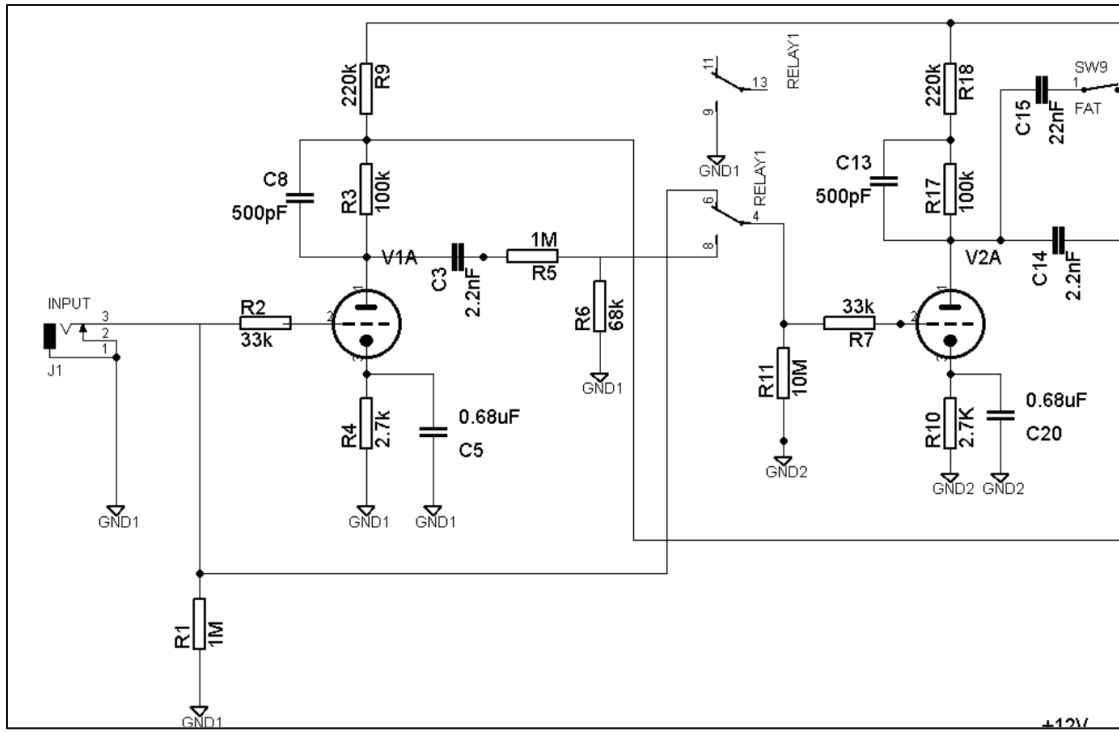
The V2A cathode bias resistor and bypass cap are the same as V1A: 2.7k and .68uF, with a 220k plate resistor in series with a 500pF bypassed 100k resistor. The amplified signal then carries on to some tone shaping and a CF tone stack driver.

Features:

- Second (non-optional) stage has significant input resistance, like “Hi” input.
- High plate load Rs on both tubes.
- Fixed voltage divider reduces first (optional) stage signal by 90%.
- No tone shaping between stages (though it does so in spades later on)
- Driving a gain/CF stage into a tone stack

Questions:

- Does the plate resistor actually read as 330k when making tube calcs?
- If you’re going to reduce the signal by 90% after stage 1, what’s the advantage in having that stage?



(fig. 3, BE-100 input stage)