

# Crimson 275 Stereo Vacuum Tube Amplifier

Owner's Manual

## CIRCUIT DESCRIPTION

The input stage consists of a 12AX7 current sourced long-tailed class A amplifier, which is direct coupled to a long-tailed balanced pair comprised of a 12AT7. The 12AT7 drives the grids of the KT150/KT120 output tubes through a pair of coupling capacitors that provide low frequency loop-gain stability. A dual-diode DC restorer ensures that the bias voltage remains correct over the entire audio signal cycle.

*Bob Carver*

The output tubes are arranged in push-pull parallel, four in all. The screen grids are operated at approximately 340 Volts provided by a separate power supply formed by one-half of a voltage doubler supplying the plates with 685 Volts.

The power supply consists of a large power transformer, with energy storage that is far greater than necessary. AC filament voltage is biased to approximately 60 volts. Multiple decoupling filter sections are used with load regulation obtained through constant current loading.

Turn-on in-rush current limiting is provided by a thermistor, bias voltage adjustment by a bias control, and bias current is measured by a meter that simultaneously senses current for all four output tubes. A tube fuse is mounted on the rear apron and provides protection for the output section in the event of a catastrophic vacuum tube failure. Additionally, a rear mounted power line fuse provides overall protection for the amplifier.

## VACUUM TUBES

The output tubes do not need to be matched, as the sound of the amp does not at all depend on matched output tubes. That's because the DC restorer circuit eliminates the need to match tubes. The only caveat here is that the output tubes should all be the same type and vintage.

Looking at the amplifier from the front, from left to right: the first tube is a 12AT7, then a 12AX7, and finally a second 12AT7. The output tubes are KT120's. Any of the popular derivatives such as '88, '90, or '100 may also be installed. The mighty 6550 may be used as well, even the ubiquitous EL34. However, performance will suffer a bit with the EL34 because the design has been optimized for the KT88 / KT120 / 6550.

## FUSES

The rear panel line fuse is a 3 Ampere (1.5 Ampere for 240 volt operation), fast blow type, and should be replaced with the same type and rating if it ever needs replacing. Do not, *under any circumstances*, use a "slow-blow" fuse here. The (rear panel) vacuum tube cathode fuse is a 1.0 ampere and should be replaced with the same type and rating. If the fuse blows during bench testing, it may be *temporarily* replaced with a 1.25 or 1.5 ampere fuse. Normally, a 1.0 ampere fuse will be perfect for music because the peak-to-average

power ratio of speech and music is about 10:1. If you find that the 1.0 amp fuse blows with music, you may replace it with a 1.25 ampere fuse, or even a 1.5 ampere unit.

## ADJUSTING THE OUTPUT TUBE BIAS

The front panel incorporates a bias meter. Turn the preamp volume control all the way down while performing bias adjustments. Use a small screwdriver and adjust the bias control (located on the rear of the amplifier) for 80 mA after the unit has warmed up for about 20 minutes. The normal range to use is from 60 mA to 120 mA, and changes here will vary the damping factor of the amplifier slightly. More current increases the damping factor, whereas less current provides a softer more tube-like sound. The design center is 100 mA, and that should be your starting point if you want to experiment. Personally, I found that I loved the sound best on my speakers when I had it set for their design center of 80 mA. It will vary from speaker to speaker, and most importantly with your taste.

The meter reads the combined current for all four output tubes, and it is normal for this current to vary slightly with changes in power line voltage.

## SPEAKER CONNECTIONS

From the rear view: the black binding post is common, and the red post is two or four or eight ohms. The power curve is quite flat, hence the taps may be used for one ohm speakers, or for sixteen ohm speakers.

## POWER SWITCH

Up is on, down is off. There is no power-on indicator except for the glow of the tubes, so you will have to remember whether you turned it on for about 10 seconds until you can see the tubes glow. It is safe to switch the amplifier on and off at will.

## LINE VOLTAGE

This amplifier may be configured for operation with 120 volts or 240 volts, 50 / 60 Hz. The changeover must be performed by qualified personnel. It is a standard under the chassis wiring configuration. See the circuit diagram for details. When used with 240 volts, the AC line fuse must be replaced with a 1.5 Ampere unit.

## COOLING

Convection cooling. Cool air is drawn from under the chassis by the heat from the tubes acting as an air pump, and exhausting the warm air out the chassis through the vents. Do not place the amplifier on a carpet without something hard for it to sit on like a piece of nice glass cut to the same size as the unit. This will allow the feet to do their job by keeping the bottom raised, allowing unimpeded airflow. A glass shop can make such a base plate and in colors if you wish. A nice translucent brown, burgundy or smoke looks beautiful. It should be at least a quarter of an inch thick.

## MONITORING

Once the idling current has been set, it will normally not need to be adjusted for several years unless you want to experiment for different sound. Or if you install different output tubes, or the amplifier suddenly starts to sound funny. If you hear a POP and see a flash, yet the amp continues to play, you should first check the current and then the output tube fuse. If the fuses blow, the output current will drop to zero. If the tube fuse blows, replace it WITHOUT replacing any tubes. Turn the amp on and monitor the current. If it climbs to within the range you had set, and if the amp sounds good, all is well.

Often, an output tube has a speck of dust-like impurity, which comes into contact with an internal element, shorting the element, and is vaporized into gaseous oblivion. The getter, the mirror-like shiny plating on the inside of the tube does its job, absorbs the vaporized material and the tube is new again. All it takes is a new fuse.

If you install a new fuse and it blows again, you will need to determine which tube is the culprit. Proceed as follows: remove all output tubes and turn the preamp volume control all the way down. Turn the amp on and leave it on. While monitoring the current, put a pair of tubes into sockets number one and number two. Allow one minute on the clock for the two tubes to warm up. If the current comes up to about half the normal amount, both those tubes are good. Remove those tubes and install another pair, also in sockets three and four. Continue on until a fuse blows, or the tubes won't bias up.

Then borrow a known good tube from the other amplifier, and using it as a mate, place it temporarily in socket number five, use the process of elimination to figure out which of the last two tubes is bad. At this point, if you get lucky, only one trial will be needed. If you are not lucky, then it will take two trials. Now you can turn the amp off.

You will be able to install and remove the tubes with your bare fingers if you do it within about a minute or so of installing each fresh set. That's because it takes substantially longer than a minute for the tubes to get too hot to hold.

## TUBE TESTER

The front panel meter may be used to test the tubes. Remove all the power output tubes; plug the amp into the AC wall socket with the main rear panel power switch OFF.

Insert the tube you wish to test into socket four (the far-right large tube socket). Turn the bias control fully clockwise, then turn the main power switch ON. With a watch, time the warm-up period for exactly one and a half minutes and note the current reading. Turn the amplifier OFF,

Remove the tube and insert the next one. You can hold the tube with your bare fingers - it will not be too hot after only a minute and a half, provided it was cool to start with. Keep track of each reading, and repeat until all tubes have been checked. If any single tube does not bias up or "runs away" with its current climbing substantially higher,  $\approx 200\%$  than

the others, then it must be replaced. It is okay to turn the amp on and off at will. Return the bias control to its original position and put all the tubes back into their sockets. This completes the tube testing operation.

## MATCHING OUTPUT TUBES

Matching output tubes is not necessary, thanks to the DC restorer. But it's fun to do anyway. As noted above, as you wrote down each bias current, you will end up with six numbers. The goal is to select two groups of two whose sum (from any two tubes) is as close as you can get to the other group of two tubes. Install the first group in sockets two and four. Then install the other group into sockets one and three. The socket positions on the amp, from left to right, looking from the front are: #1, #2, #3, and #4.

The new KT120's are quite variable, and I recommend that when using the KT120 tube, one should go through the exercise of matching them as outlined above.

## NEW AMPLIFIER SMELL

Like a brand new car, this amplifier possesses a "new amplifier smell," even though it has been built from both new and vintage parts. When powered up for the first time, the fresh paint and recent skin oils on the tubes will create a new, hot amp smell. I find it sort of pleasant, but you may not. It will dissipate with use, usually requiring about four weeks of normal operation.

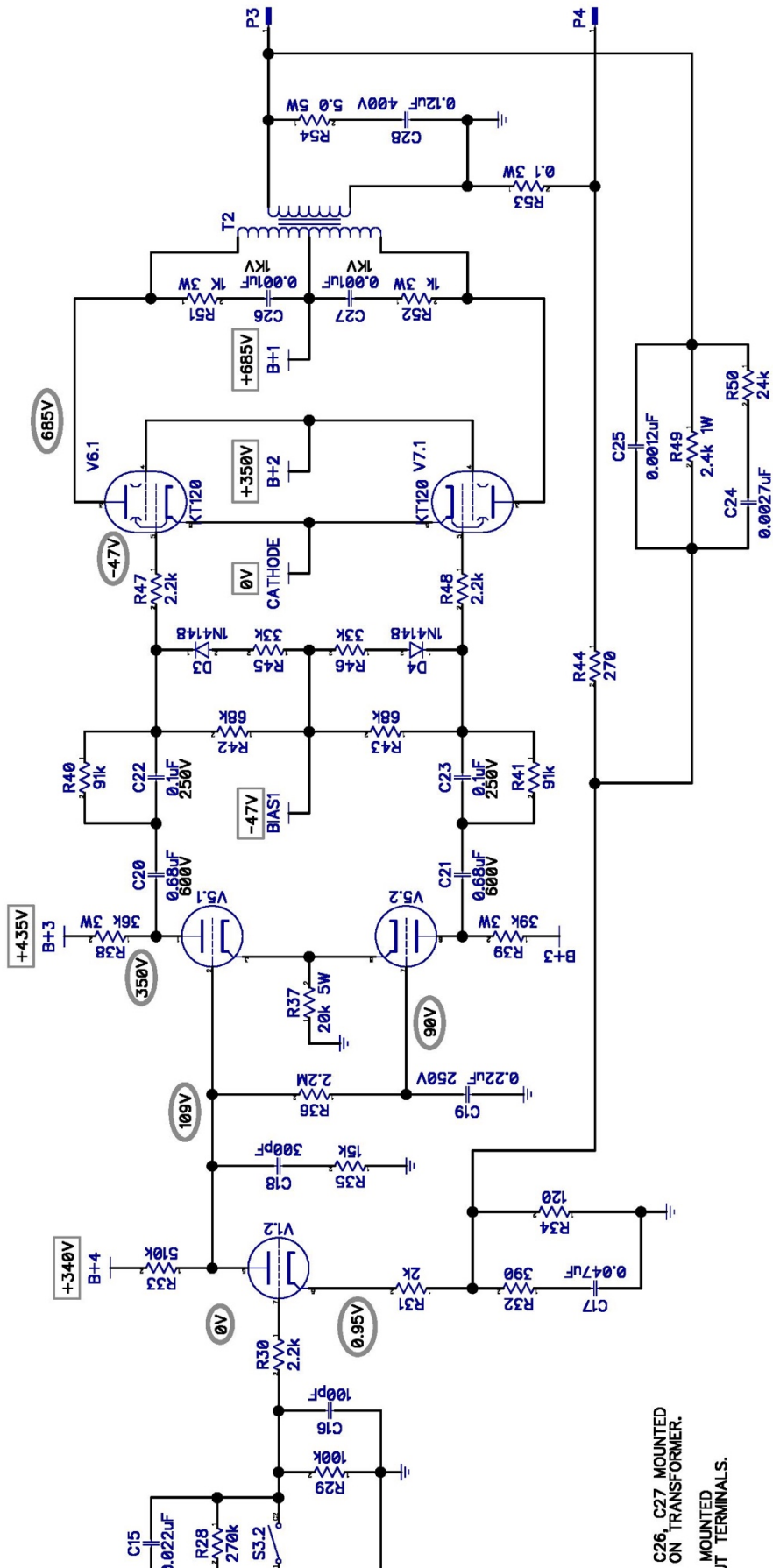
## SUBWOOFER SWITCH

When this amplifier is used with a system that includes a subwoofer, the subwoofer switch should be in the WITH SUBWOOFER position. If used as a full-range amplifier, the switch should be in the WITHOUT SUBWOOFER position. This removes frequencies below 80Hz from the amplifier, allowing increased output power with speech and music above 80Hz.

## SPECIFICATIONS

Gain	29 dB
Power	More than 75 Watts Per Channel, both channels driven at eight ohms, from 20Hz to 20kHz with no more than 1% total harmonic distortion. Distortion decreases at lower levels.  4Ω     75 Watts Per Channel 8Ω     75 Watts Per Channel 16Ω    60 Watts Per Channel
Noise	Better than 100 dB below 75 Watts, A-weighted.
Frequency response	+0, -3dB from 16Hz to 35kHz. Flat 20Hz – 20kHz $\pm 0.25$ dB
Distortion	Less than 1.0%.
Source Impedance	1.7 ohms
Vacuum tubes	KT120 / KT88 / 6550, 12AX7, 12AT7
AC Power	120 Volts, 60Hz (US) 240 Volts, 50Hz (EU)
Input impedance	100 kΩ
Weight	19 lbs
Color	Champagne Gold, Bright Chrome, Natural Aluminum and Sparkle Burgundy Red.





C26, C27 MOUNTED  
ON TRANSFORMER.  
MOUNTED  
AT TERMINALS.

CRIMSON 275

BOB  
CARVER  
CORPORATION

AMPLIFIER SCHEMATIC

REV  
309

8/25/2018 JORDON GERBER

AMP CH2

1

2

3

4

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