THE PORT ARTHUR RECTIFIER

When Leo Fender put four output tubes into the 5F8 Twin to produce an unheard of (pun intended) 80 watts, a breakthrough in guitar amps was made. Although it was the first high wattage guitar amplifier in history, there were still design deficiencies that would reveal themselves in due time. These deficiencies were mainly in the power supply. For one thing, the rectifier used was a GZ34 (or 5AR4 as the Americans sometimes called it.) The GZ34/5AR4, rated for 250 ma of current, was being used in an amp that could pull as much as 300 to 400 ma of current when dimed. Of course, back then, players were not playing as loudly and Fender was testing the amp with Fender guitars, which had the lower output single-coil pickups and therefore would not cause the output stage to draw as much current. In addition, no one was using tube screamers, fuzz boxes or linear boosters at that time.

When I began experimenting with this circuit, I noticed that the Tweed Twin circuit would eat most rectifier tubes for breakfast. If you were playing through humbucking pickups or used a tube screamer, only a Mullard GZ34 would hold up in that circuit. Mullard GZ34 tubes were almost impossible to find in the early 90s, and there were no viable rectifier tubes currently being made. The Russian 5V4 was being relabeled and marketed in the US as a GZ34, but the 5V4 is only rated for 175 ma. Not only that, the Tweed Twin circuit would not be fooled by mislabeled rectifiers!

WHAT IS A "PORT ARTHUR RECTIFIER"?

It was about this time that I was facing the same dilemma that Leo Fender and Jim Marshall had faced thirty years earlier. In 1960, Leo Fender scratched the tube rectifier design and opted for the solid-state rectifier on all new four-output tube amps. There would never be

another Fender Twin with a rectifier tube. Jim Marshall made the same choice with his four-output tube design.

Actually, many two output tube EL34 style amps draw more current than the GZ34 rectifier tube can handle safely. If you ever tried putting a tube rectifier in even a 50 watt Marshall, you would know that two EL34s, driven with sufficient gain, could easily cause rectifier tube failure.

I did not want to go solid state, so I invented what my friends and employees affectionately refer to as the "Port Arthur Rectifier" (so named because I was born and raised in Port Arthur).

My idea was to use a GZ34 style rectifier tube, but with a slight modification. I experimented with a solid-state rectifier circuit in series with a couple of high wattage wire-wound resistors until I ended up with a circuit that sounded like a tube rectifier. I would place this in parallel with the tube rectifier as a bypass circuit. My logic was this: If a small percentage of current was bypassed through a solid-state device designed to sound like a tube rectifier and the other current went through the tube rectifier; then I could still have the tube sound, but without the fear of constant rectifier tube failure. The solid-state device would take away enough of the current to allow the rectifier to operate within its design limitations!

HOW IT'S MADE

Although a GZ34 fits an 8 pin socket, only four of the pins are actually used (namely pins #2, #4, #6, #8). Pins #2 and #8 go to the 5 volt filament heater (usually yellow wires from the transformer) and pins #4 and #6 go to the B+ winding (usually red wires from the transformer). Pin #8 also connects to the standby switch.

For starters, we wire the rectifier socket the same way it would normally be wired for use with a GZ34 tube. We are going to add some parts to the socket wiring. We will use pins #1, #3, #5, and #7 as mounting terminals because as I said before, these pins are not used on a GZ34 tube socket. You will need these parts:

Four - 1N5399 solid state rectifiers

Two - 250 ohm 25 watt Wire Wound resistors

THEY ARE TO BE WIRED AS FOLLOWS:

One 1N5399 goes from pin #4 to pin #1, the cathode faces pin #1.

One 1N5399 goes from pin #6 to pin #7, the cathode faces pin #7.
One 1N5399 goes from pin #1 to pin #3, the cathode faces pin #3.
One 1N5399 goes from pin #7 to pin #5, the cathode faces pin #5.
One 250 ohm 25 watt resistor goes from pin # 8 to pin #3.
One 250 ohm 25 watt resistor goes from pin # 8 to pin #5.

I like to put spaghetti insulation on all 250 ohm 25 watt resistor leads. Although the resistors are mounted directly on the tube socket, the resistors are quite large and if you fail to insulate them, you will have exposed leads with high voltage on them. If one of those leads shorted to ground, you could easily fry the power transformer!

LET'S TEST IT

When you are done, put a GZ34 rectifier in the socket and you are good to go. If you do ever happen to blow the rectifier tube and do not have a spare GZ34 handy, you may remove the failed rectifier tube from the amp (replace the fuse you just blew) and the amp will function perfectly without a rectifier tube! This could really be of benefit in a pinch situation!

As another side benefit, you could use a 5U4 or a 5U4GB in the rectifier socket. These tubes are less expensive and easier to find than the GZ34. Ordinarily, I do not like the over-compression that the 5U4 style tube gives in a high powered amp circuit, however when used with "The Port Arthur Rectifier" circuit, it will have less sag and sound very similar to the popular GZ34.