

Repairing the Siemens RWN Series TWT Power Supply

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Many amateurs interested in the microwave bands have rescued surplus RWN series Siemens traveling wave tube amplifier systems to achieve higher power levels on 5.7 and 10GHz. Over the last 10 years or so these TWTAs have been replaced by solid state amplifiers or removed from commercial service that have gone to satellite. These aging amplifiers occasionally show up at hamfests or on eBay but are usually sold untested - "As-Is".

As expected, many of these amplifier systems are inoperable! Of the dozen or so these systems I have acquired over the last 10 years I have only ever had one or two defective tubes. The majority of the failures were of the power supplies, and by far the major problem has been in the low voltage regulator circuit.

These power supplies were designed to operate from an unregulated positive ground systems with voltages that range between -20 to -70V. This unregulated voltage is applied to a Flyback-Converter circuit that is actually a switching power supply that isolates and steps up the unregulated primary voltage to be used by yet another switching power supply circuit (30khz switching supply). This 30khz switching supply produces many rectified and highly regulated voltages required by the tube (helix, cathode, filament, collectors) and control circuits.

The Flyback-Converter and the 30khz supply are both pulse width modulated supplies that utilize active feedback to provide secondary regulation. An +18V regulated power supply known as the Auxiliary Supply provides the power required to start these pulse width modulators. This Auxiliary Supply is initially supplied by a zener diode referenced transistor regulator circuit that provides the +18V start up voltage from the unregulated primary power supply. Once the switching supplies start, the Auxiliary voltage is then supplied by the 30khz supply.

While spending many hours of troubleshooting time I have recognized a common problem with 90% of the failed supplies I have acquired, shorted filter capacitors on the +18V Auxiliary Supply buss. Once the capacitors short they cause catastrophic failure to the transistor regulator and cause the primary fuse to blow. Table 1 list the capacitors and values that have been the cause of failures.

Table1

<u>RWN 200</u>	<u>Board</u>	<u>Designation</u>	<u>Value</u>
	200	C200	6.8uf/40v
	“	C201	3.3uf/40v
	500	C501	6.8uf/40v
	“	C502	6.8uf/40v
	1000	C1000	6.8uf/40v
	“	C1002	6.8uf/40v
	“	C1003	22uf/16v

A simple ohmmeter test of these capacitors will show a shorted condition if they are defective. I have replaced the 3.3uf capacitors with 4.7uf at 50v units and the 6.8uf with 10uf at 50v and they have worked just fine.

Once the defective capacitors are tested and the defective ones replaced, the shorted +18v regulator transistor (T001) will require replacement. The original part is a BD649 which crossed to an NTE-263. In the event the zener reference diode (GR113) is shorted it can be replaced with a 19V 1/2W Zener diode. .

**BE CAREFUL WHEN WORKING ON THESE SUPPLIES
LETHAL VOLTAGES ARE INSIDE AND CAN CAUSE DEATH!**