Ameritron GOP and Timer Overload 50-01172

W8JI 2022Jan7

I designed this board around 1983 for the AL1500 amplifier as Prime P/N FP-172 subassembly. The technology is from that era. MFJ/Ameritron later renamed the Prime/Ameritron sub-assembly as Ameritron PN 50-01172.

This is an overview of that board.

Circuit:

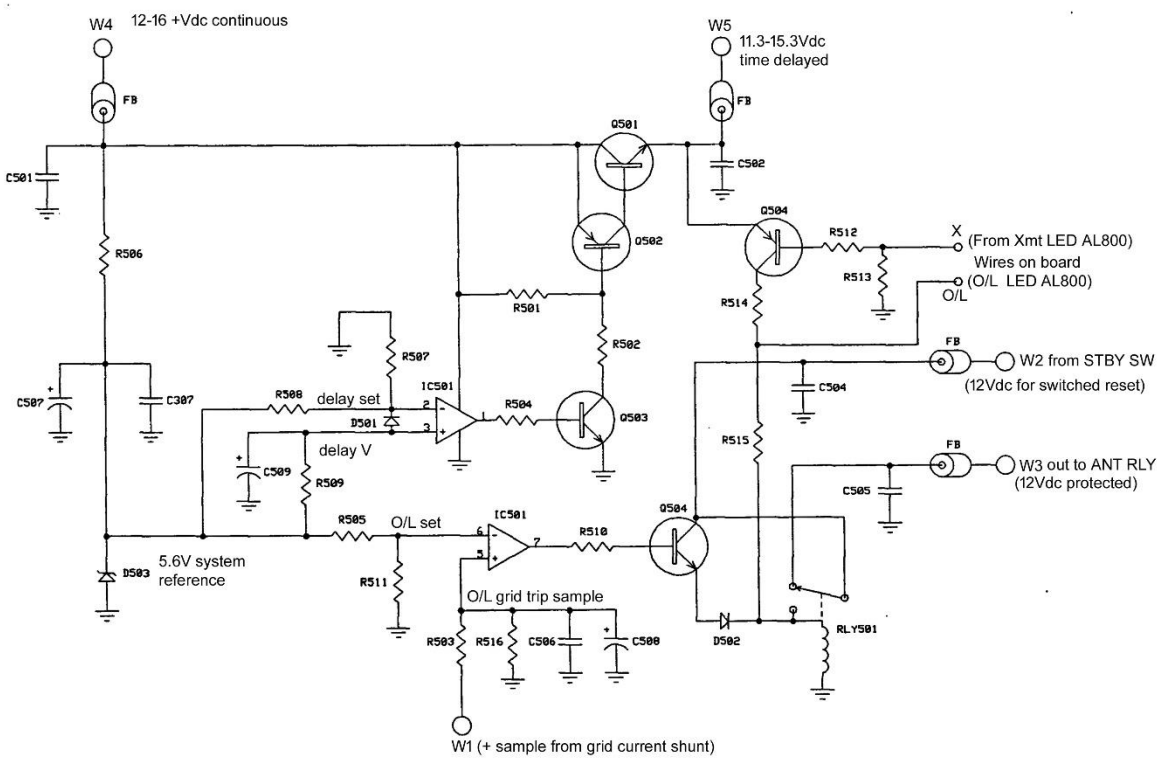

Figure 1 schematic TOL board

The “GOP” (as named by MFJ to make it an outboard product) was never designed to be a peak detecting circuit to prevent tank circuit arcs. It was intended to be a t<100 mS current limiter to prevent short term thermal damage to 8877/3CX1500A7 control grids. Only gold-plated grids have this type damage concern. All gold-plated power gridded tubes need a fast electronic protection.

R503 in conjunction with the sum of C508 and C506 (I’ll drop the board designated “5” and any leading zero from here onward to save time) integrates grid current peaks. This is not a peak detector like my TOF system. This system measures grid-shunt voltage-drop, just as the grid

current meter does. The slight voltage integration prevents trips from exciter overshoots or momentary faults in the system while still allowing short term thermal protection of the control grid. The GOP has far less arc and exciter overshoot damage mitigation than the TOF, but is more immune to fast transient trips such as arcs or exciter overshoots.

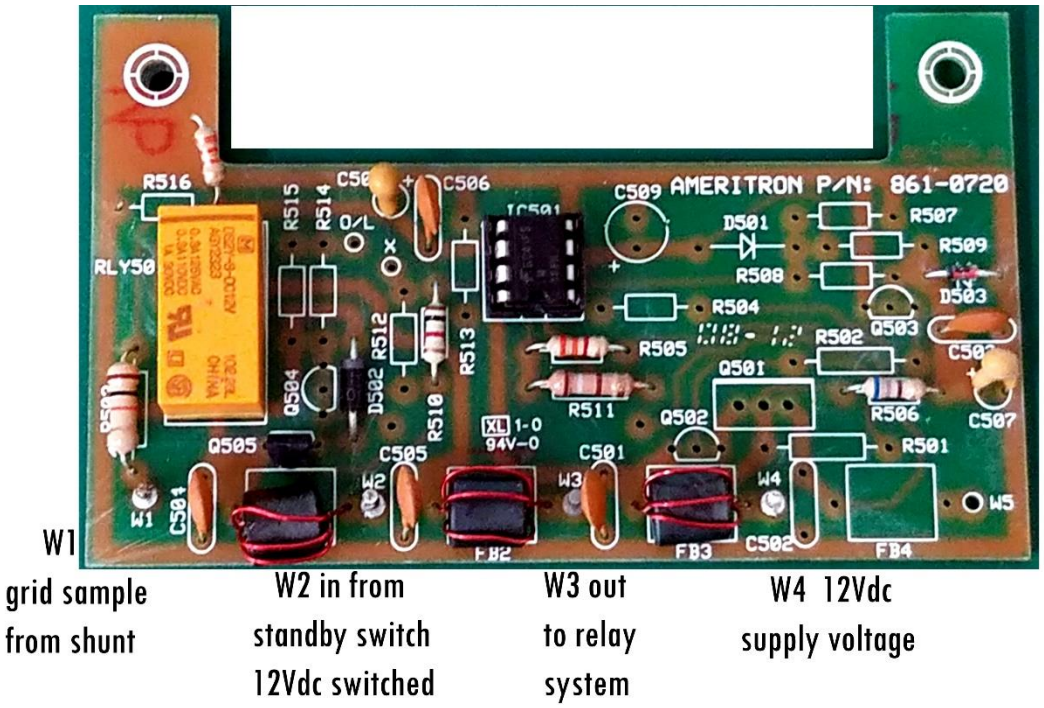

Figure 2 when sold as GOP system

Adjusting Trip and Time Delays

Trip

R5 and R11 form a conventional divider setting trip reference voltage on pin 6. This divider has 1.60mA nominal current, with just below .29V reference voltage on pin 6 in the AL1500. With a 300mV FS shunt of 1.5-ohms, trip is just below full scale on the AL1500 meter.

This divider must be adjusted for other applications. The ultimate goal is to trip at something just barely above maximum safe average grid current. Pin 6 divider voltage should equal the meter shunt millivolts required for trip.

Multiply grid shunt resistance times maximum desired smoothed grid current. The result become pin 6 target voltage. The divider is adjusted, typically with R11, to the proper shunt millivolts at trip.

Relay RLY1 is wired to latch when tripped. It removes keying voltage. RLY1 has to interrupt

supply voltage to the T/R relay coil or T/R system. RLY1 unlatches when W2 voltage is removed. Because this system was never intended to be openly marketed as a product, and because MFJ did not consider real world applications, external wiring might require additional components.

Time delay

Pass-through power-on time delay reference voltage is determined by changed by voltage divider R7 and R8 from the 5.6Vdc reference. This divider initially had 2.25mA nominal current producing around 1.54 volts on pin 3, or about 28% of 5.6Vdc supply charging voltage source of R9. This linearizes C9's charging time.

After application of 12Vdc + on W4, C9 starts to charge through R9. C9 and R9 time constant from a 5.6V supply to the reference voltage at pin 2 thus set the power on time delay.

When C9 charges to pin 2 reference the system provides dc output voltage on W5. Either R9 or C9 are appropriate for minor time changes.

Interfacing Other Systems

This unit was never intended to be anything except a timer and short-term average grid current overload system for the AL1500 amplifier. It was later modified for the AL800H and AL800.

MFJ/Ameritron has marketed this using for other amplifiers. The design could have been adapted for better universal function at that time. Unfortunately, that was not done. There are three major requirements interfacing to other units:

1. The 12V activate and reset from standby switch W2 must wire to switched 12V+ for run, and interrupt that 12V+ for reset
2. The relay interrupt system can only output 12Vdc+. If your device is not comparable with that you can use a 12Vdc low current buffer relay with its coil in direct parallel with GOP board relay coil. This will give you floating interrupt contacts
3. You must calculate a new divider voltage at pin 6 of the op-amp

Divider Calculations

Divider voltage is found by:

1. Grid trip milliamperes amperes times grid shunt resistance. This is the shunt voltage in millivolts for trip
2. Conventional voltage divider formulas to determine R11 (R511)
3. For small changes R11 (R511) is approximately shunt voltage in millivolts divided by 1.6

An additional isolated relay for different style T/R relay systems can be added by paralleling a small 12Vdc relay with 250-ohms or higher coil resistance across the existing GOP relay coil at any ground pad that is clear and any of the four tap points (+12V coil) shown below: