

Vacuum Tube 1 Hz relay timebase

This circuit closes a relay for about 100 milliseconds once per second. The time reference is the mains frequency. It was designed in Australia with 50Hz mains but can be adjusted to be used in the USA. All the active devices are tubes.

Mains frequency timing pulses are generated by the NE-2 neon tube. As it ignites every half cycle there is a short spike generated as the tube voltage falls from the striking voltage to the maintaining voltage. Positive going spikes are differentiated by the 0.001 uf capacitor and resistive bias network composed of the 39K and 12K resistors, and applied to the grid of the 6J6 amplifier/inverter tube. This tube does not respond to negative going spikes as it is biased at cutoff.

Negative going spikes at the plate of the 6J6 are applied through the 1N4004 diode to the plate of the 6AS6, a special dual control pentode connected as a Phantastron. This tube acts as a divide-by-5 to produce an output at 10 Hz. The division ratio is set by the 100K pot which should be an insulated type capable of withstanding the +300 volt B+ supply. It can be adjusted to divide by 6 for use in the USA.

The screen of the 6AS6 develops positive pulses at 10 Hz which are differentiated and applied to the guide electrodes of a 6802 dekatron. The dekatron spins at 1 rev/sec and produces a rectangular positive output pulse at cathode once per second. This pulse is differentiated, clamped, amplified and inverted in the second half of the 6J6 resulting in positive spikes at 1 Hz which are used to trigger the 2D21 thyratron.

The thyratron discharges the 4 uf capacitor into the relay causing it to close for about 100 mS. The time is extended slightly by the 5.6K resistor which increases the discharge time constant. One set of relay contacts removes the positive supply from the thyratron plate and shorts it to ground, thus switching it off. The other set is used as the output. Between pulses the capacitor recharges through the 120K plate resistor and the relay coil.

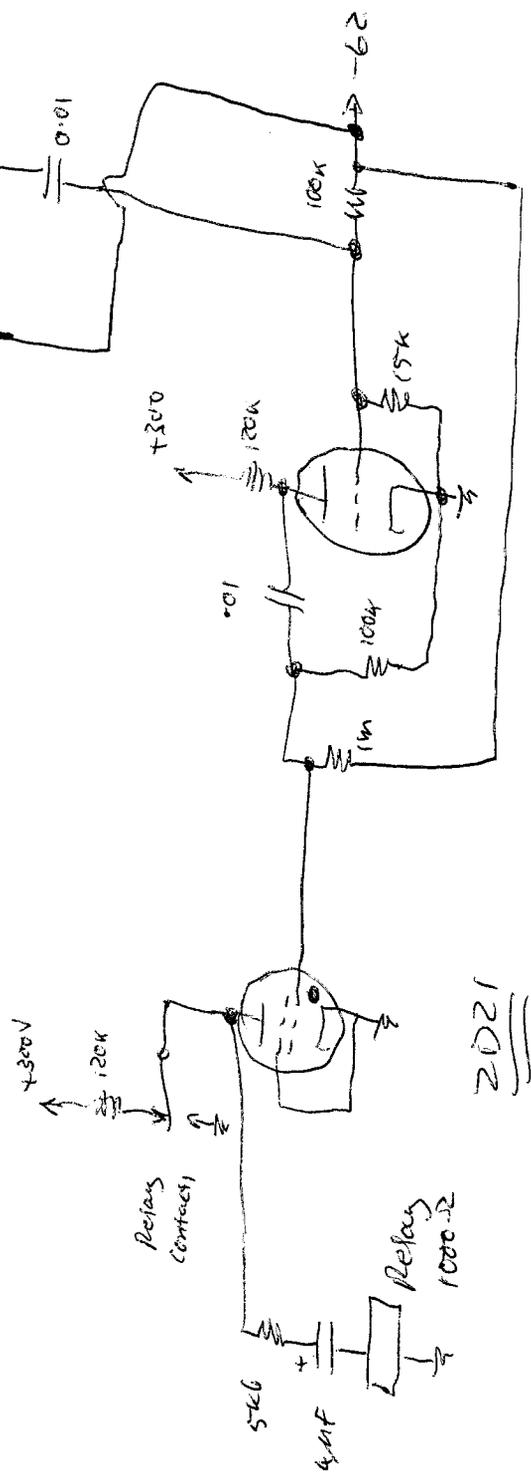
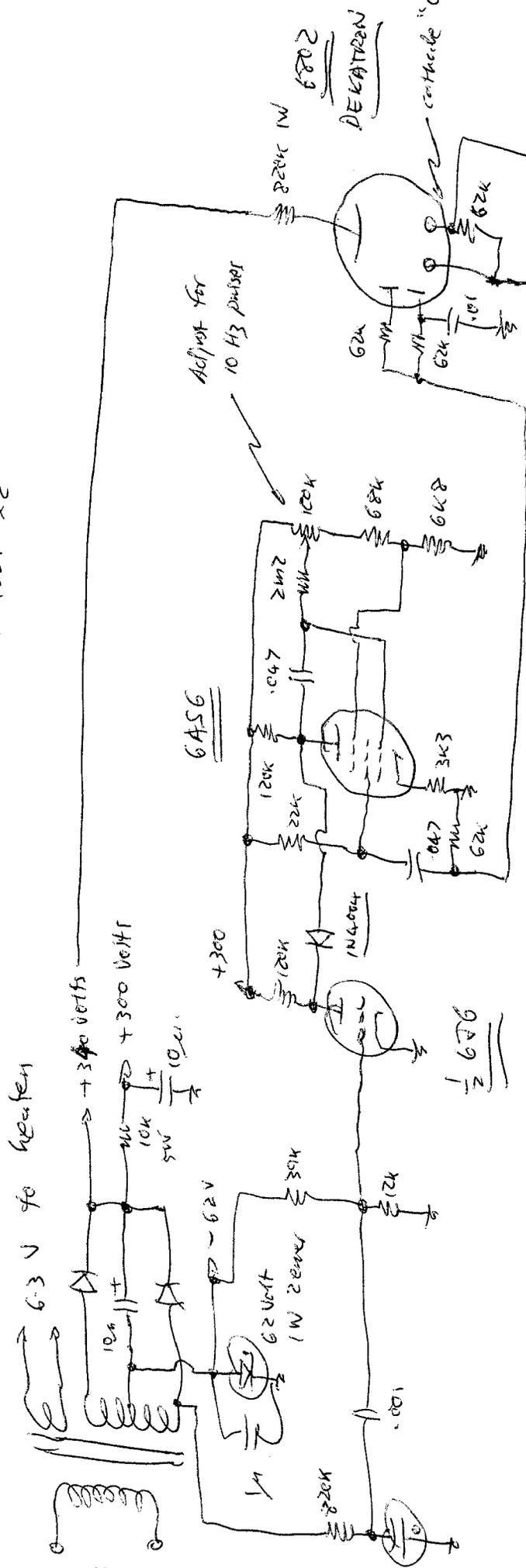
The power supply is a tube radio power transformer and runs under a very small load. It needs to be able to produce a total of at least 400 volts under minimum mains conditions to ensure the dekatron triggers properly.

Other triodes such as a 12AU7 can be substituted for the 6J6 and different dekatrons appropriately connected could be used instead of the 6802. The 6AS6 is a special tube intended to be used as a phantastron. The octal 6SA7 may be a substitute but some component values may need to be changed. "Ordinary" pentodes are probably not suitable.

For purists who don't want any silicon other than tube envelopes, a 0A3/VR75 could be substituted for the zener and a 6X5 or similar could replace the 1N4007 diodes (although the transformer voltage may need to be higher to accommodate the increased voltage drop). A directly heated rectifier such as a 5Y3 could also be used if the transformer has a 5 volt filament winding. The phantastron coupling diode could be half a 6AL5, a 6H6, or even a small signal triode or pentode with the grid(s) connected to the plate.

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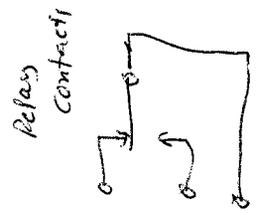
Power transformer B + winding 280-0-280 volts
 Rectifier diodes 1N4007 x 2



2676

2D21

Thyatron



second mains derived
 relay timebase

Morris Ocell 16/12/03