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NOISE TUBE POWER SUPPLY AND TRIGGER

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INTRODUCTION

Argon gas discharge noise tubes require a high voltage (typically 1-2 KV) to initiate ionization of the gas column, after which a lower voltage (approximately 200-300 VDC) is sufficient to sustain discharge. As a result of ionization the resistance of the tube drops from open circuit to a few thousand ohms, depending upon the type. The sustaining supply must be capable of delivering sufficient power to maintain discharge, and the current level must be adjusted to the manufacturer's specifications, usually in the 100 to 200 milliampere range.

The new supply and trigger is constructed as a single unit and is connected directly to the noise tube via a pair of conductors having insulation capable of withstanding 3,000 volts or more. This system has been successfully tested, using up to 400 feetof cable between supply and tube, and it is now in full time service on the 36 foot millimeter wave telescope in Tucson, Arizona.

Description and operation of the supply follows. Refer to the accompanying circuit diagram.

Switch S1 applies AC power to the B+ or sustaining supply and functions as the master power switch. The B+ supply consists of T_1, D_1, D_2, L_1, C_1, and C_3 in a full wave, capacitor input filter, D.C. power source. Capacitor input has been chosen since tight voltage regulation is not desired in this application. Resistors R_1, R_2, R_3, and R_4 are current-limiting resistors which further reduce voltage regulation and cause the supply to act

more like a current source. R_5 is a bleeder resistor to discharge C_1 and C_3 reducing shock hazard to personnel.

The ionization pulses are developed by T_2, R_6, and D_4. This is an unfiltered, half-wave supply capable of delivering 2400 volts. Its output consists of positive half cycles of the 60 Hz AC from T_2. These half cycles have a pulse width that is much greater than the minimum time required for the argon gas column to ionize. Cable capacitance should not affect triggering if the leakage resistance is high, since it (the capacitance) will act as a filter capacitor and virtually charge up to the peak voltage of the supply. R_6 also limits the current drain on the high voltage (T_2) supply. The pulse being positive, as well as the B voltage from the sustaining supply, diode D_3 remains non-conducting, and functions as a steering diode.

When the noise tube fires, current flows through K_1 contacts, meter M, and K_2 coil, to ground. If the current is in excess of 90 milliamperes K_2 is energized, and turns off the AC power to the primary of T_2, thereby stopping the trigger pulses. I_3 will also be turned on, indicating the noise tube has fired. Switch S_2 provides for local or remote firing. In the remote position a simple contact closure is required. With S_2 set for local operation, switch S_3 will turn the noise tube on and off. For remote operation S_3 has no effect.

Meter M_1 is placed in the ground return from the noise tube to the sustaining supply in order that it will measure the actual tube current and not the charge current of the filter capacitors nor the current flow through bleeder resistor R_5.

Resistors R_2, R_3, and R_4 are selected by S_4 as a coarse current adjustment, and fine adjustment of tube current is accomplished by rheostat R_1.

Thorough testing of this supply and trigger has demonstrated its greater reliability in firing waveguide and coaxial mounted noise tubes of all the UHF, microwave and millimeter ranges.

Features of this design are:

1. Reliability, resulting from simple circuitry.
2. Fast acting, usually the first positive half cycle fires the tube.
3. No additional components required at the front end.
4. Two-wire connection, although high voltage insulation is required.
5. A B+ supply current regulator is easily added.

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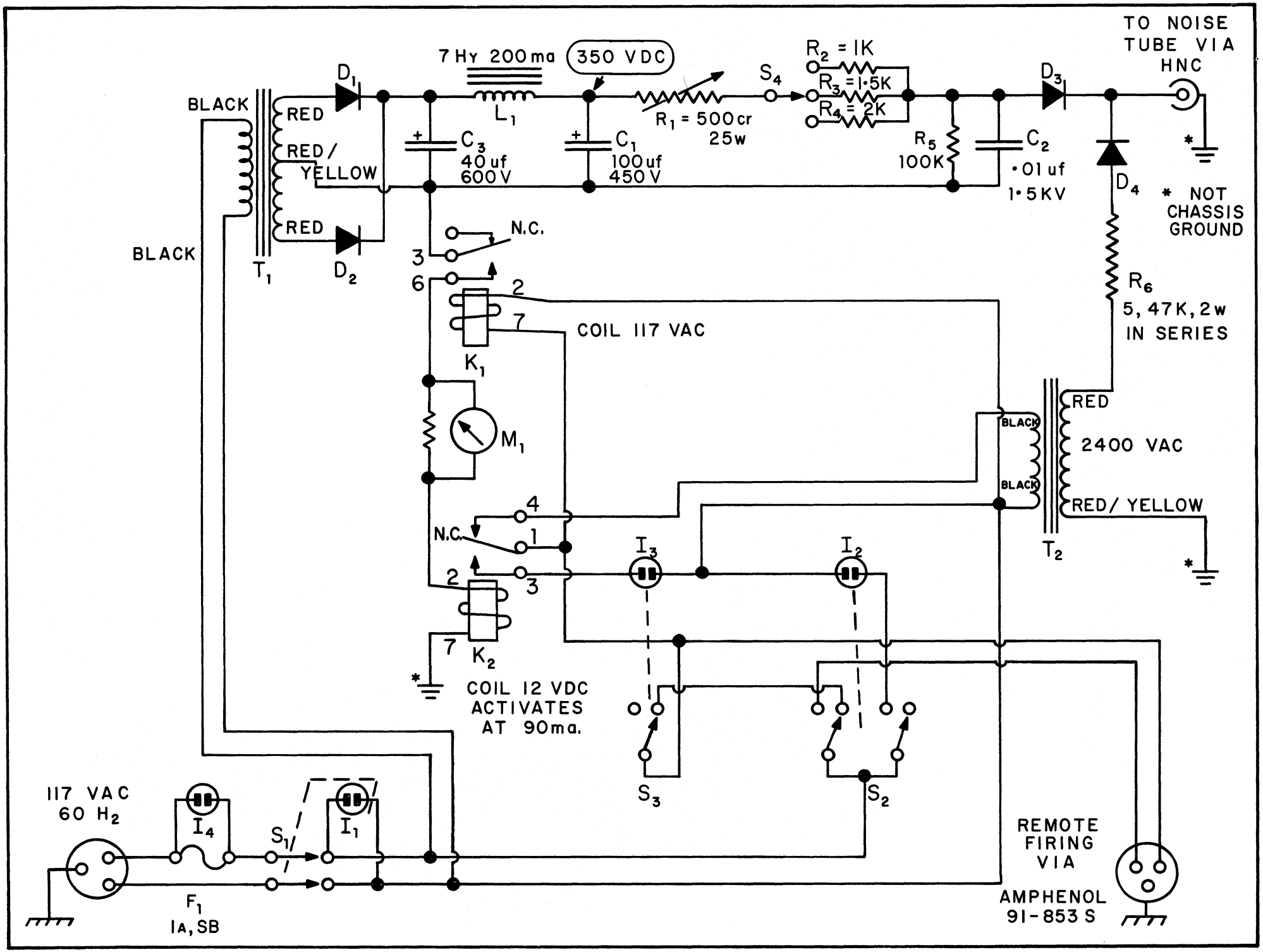

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