NATIONAL RADIO ASTRONOMY OBSERVATORY

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NOISE TUBE POWER SUPPLY

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1. General Description

This note describes a noise tube firing circuit that has recently been developed. An effort has been made to produce a reliable compact package containing a power supply, firing circuit, and current regulator. A printed circuit has been produced thereby enabling construction to be simple and fast.

2. Description of Operation

When the noise tube is non-conducting, the voltage out of the power supply is approximately 500 V. The zener diode ZDI goes into regulation and the unijunction relaxation oscillator produces a pulse that turns the SCR on. This discharges the 0.47 μF capacitor through the pulse transformer primary thereby applying a high voltage pulse to the noise tube. When the tube fires, the voltage across the tube drops to about 130 V, the zener diode ZDI comes out of regulation due to the 150 V UZ 5215, and the relaxation oscillator is shut off. If the tube remains non-conducting, the oscillator will continue at a rate of approximately one pulse per second.

The current through the tube is sampled by measuring the voltage across RI. A portion of this voltage is compared with the 6.8 V zener, 1N2970B and used to operate the shunt regulator consisting of Q1 and Q2. As the entire shunted current flows through the zener a low impedance is important. The impedance of the 1N2970B is about 5 ohms. The variation in tube current with and without the current regulator is shown in the graph.

The tube current may be monitored by a remote meter connected across the 50 ohm resistor. A 0-200 μA meter with 50 K in series reads 0-200 mA.

The tube may be fired remotely by a 28 V relay so arranged so that energizing the relay turns the noise tube off.

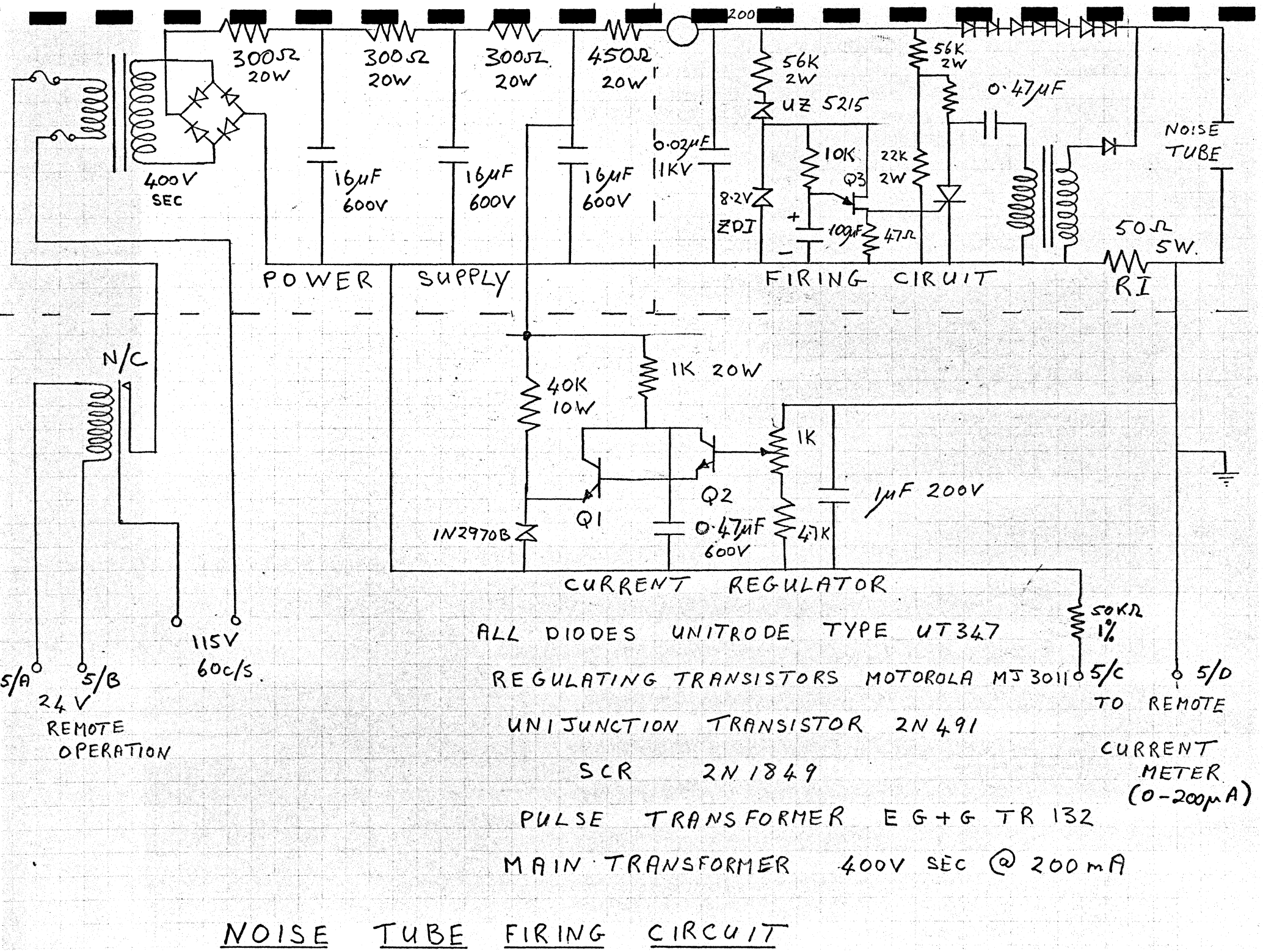
3. Tests

The prototype unit has been subjected to a test consisting of firing the unit once every 3 minutes for 30 seconds. No misfire took place during the 10-day duration of the test.

No tests have been made on the temperature performance. For good performance over a wide temperature range the zener diode should be selected to offset the V_{BE} variations in Q1 and Q2.

4. Mechanical Construction

The form of construction used may be seen from the photographs. The prototype model overheated slightly when run continuously at high line voltage and future models will have a built in heat sink. This will consist of a strip of finned material running along the top of the base. The dimensions of the unit are 3" x 5.5" x 12".



ALL DIODES UNITRODE TYPE UT347

REGULATING TRANSISTORS MOTOROLA MJ3011

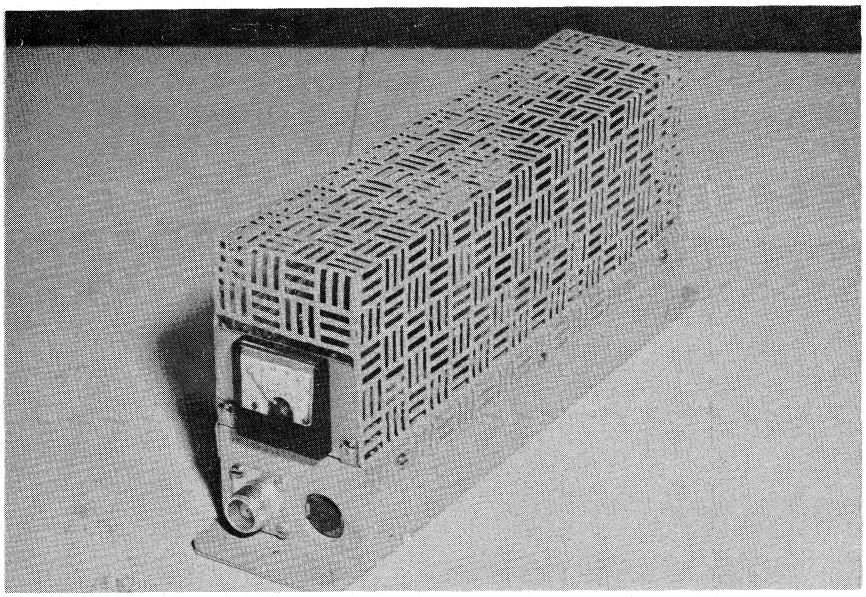
UNIJUNCTION TRANSISTOR 2N491

SCR 2N1849

PULSE TRANSFORMER E G+G TR 132

MAIN TRANSFORMER 400V SEC @ 200mA

NOISE TUBE FIRING CIRCUIT



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Complete unit.

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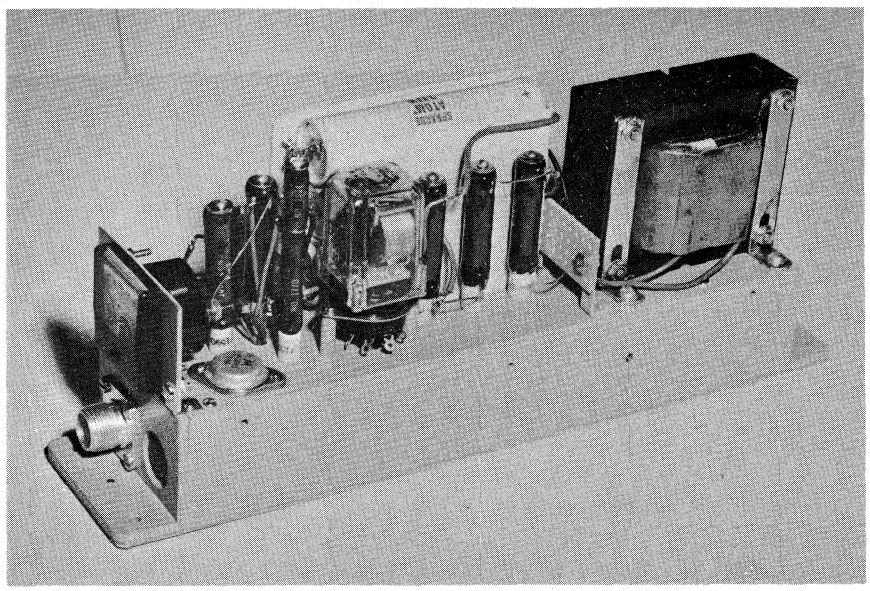
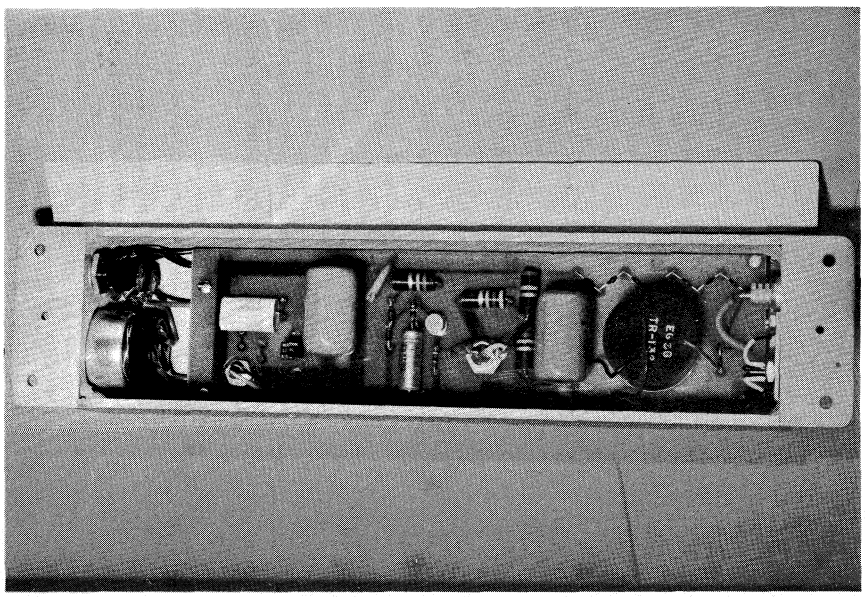
Unit with cover removed.





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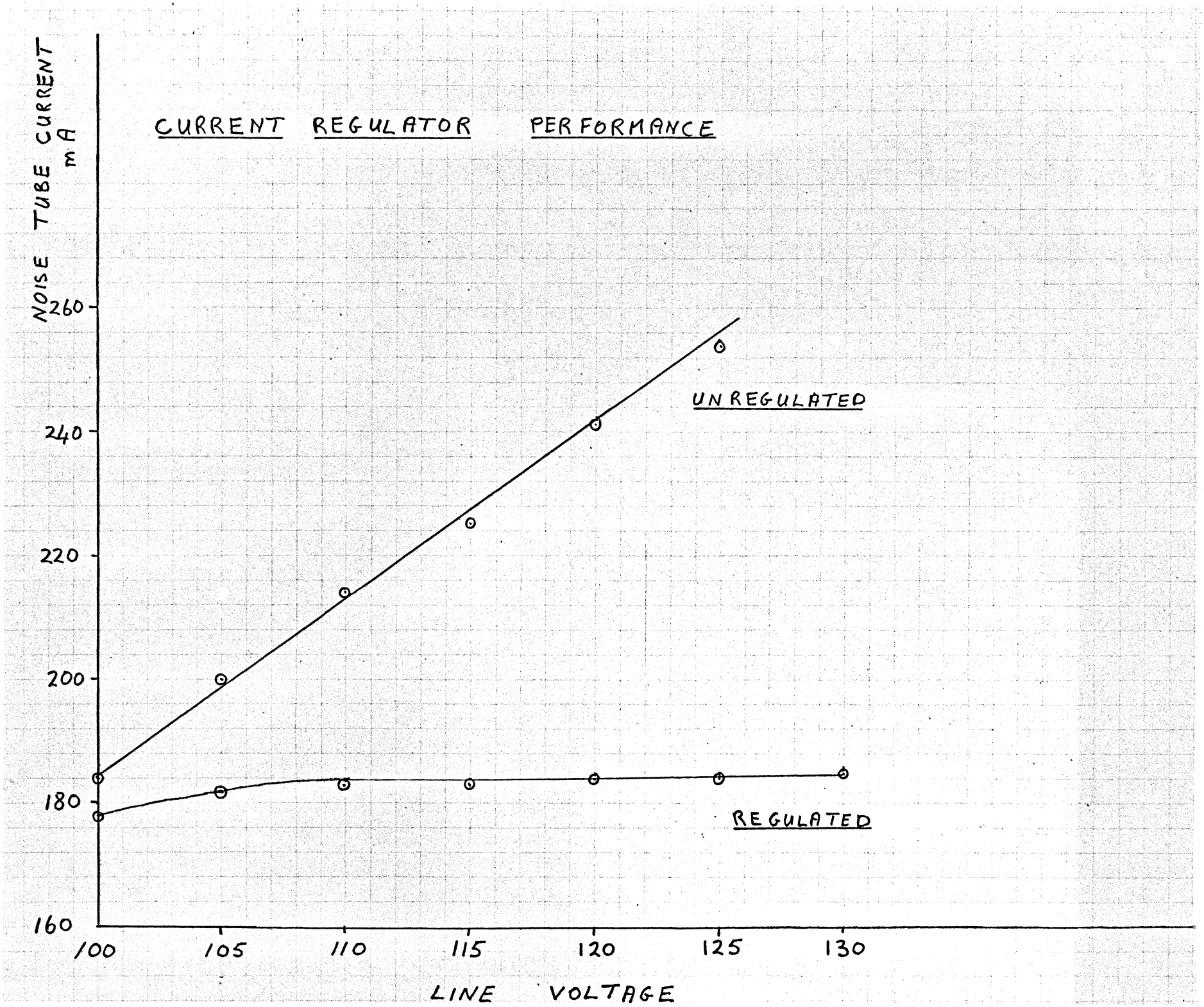
Printed circuit.


CURRENT REGULATOR PERFORMANCE
NOISE TUBE CURRENT mA
260
240
220
200
180
160
UNREGULATED
REGULATED
100
105
110
115
120
125
130
LINE VOLTAGE