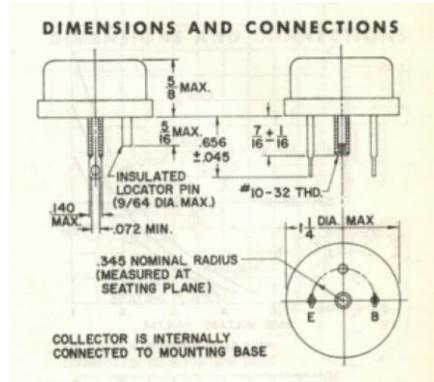
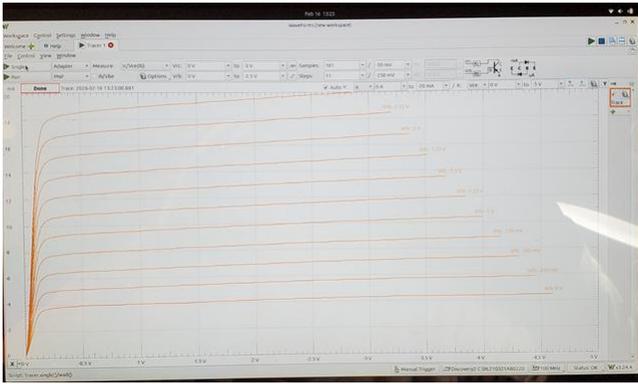
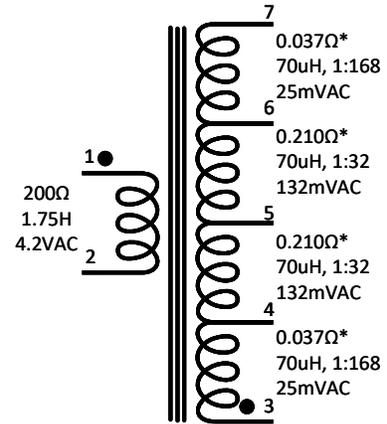
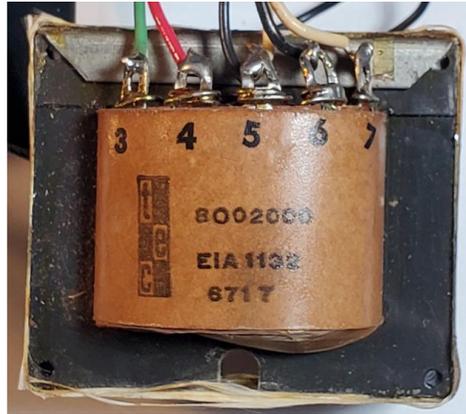
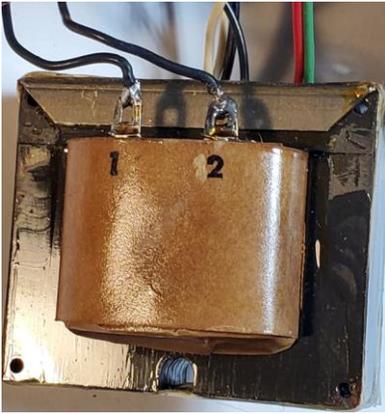


Identification of Components

Since there were no markings on the power transistors mounted to the case, I removed them from the circuit and used my curve tracer to identify them as PNP germanium power transistors. They are packaged in TO-36 packages. They are both functional. Here are the curves and the pinout:



The transformer markings include the Mfg number EIA1132 which means the mfg is Triad Magnetics. The date code, 6717, is WW17 of 1967. The part number is 8002000. The terminals are numbered 1 & 2 on one side and 3 through 7 on the other side. After characterizing the transformer, these are the results:



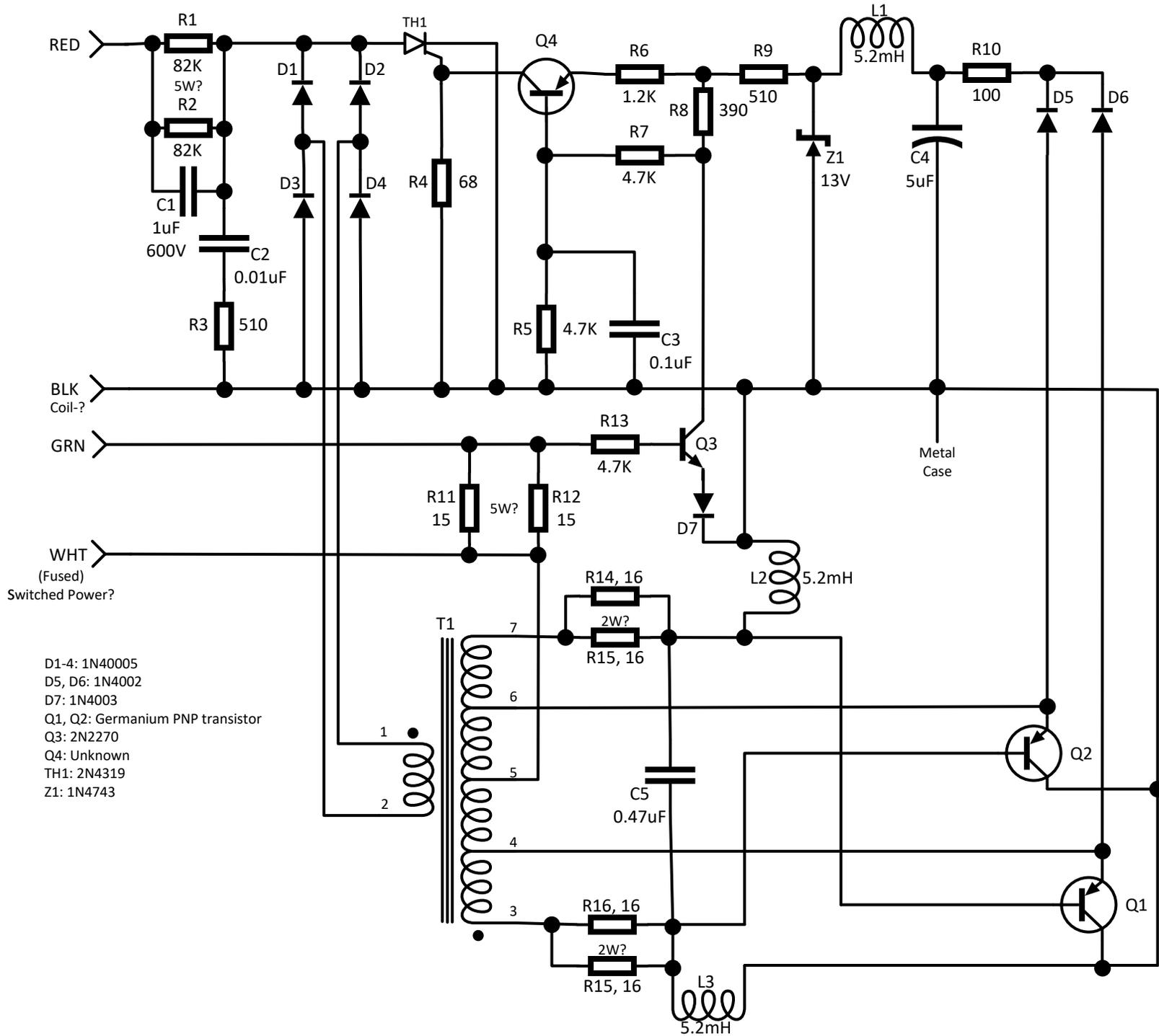
* 4-wire measurement.

The transistor marked Q3 is a 2N2270 NPN silicon transistor. No testing was done on it. TH1 is a 2N4319 thyristor. It tested good with a diode tester. Q4 is an unknown transistor. It appears that the component marking was accidentally double stamped. It may be a Fairchild logo and the part number appears to be some combination of the numeral 5 and the letters F and E. An internet search on different combinations of these digits was unsuccessful. Here is a photo of the markings:



Testing of this transistor in my curve tracer showed that this transistor is not functional either as PNP or NPN. The function of this transistor will have to be inferred from the schematics and testing. A diode tester showed a 1.2V drop across 2 to 1 and a 1.1V drop across 2 to 3. From the circuit, it appears that it is a PNP transistor.

Schematics



- D1-4: 1N4005
- D5, D6: 1N4002
- D7: 1N4003
- Q1, Q2: Germanium PNP transistor
- Q3: 2N2270
- Q4: Unknown
- TH1: 2N4319
- Z1: 1N4743

Analysis

This module turned out to be an early vintage electronic ignition system.

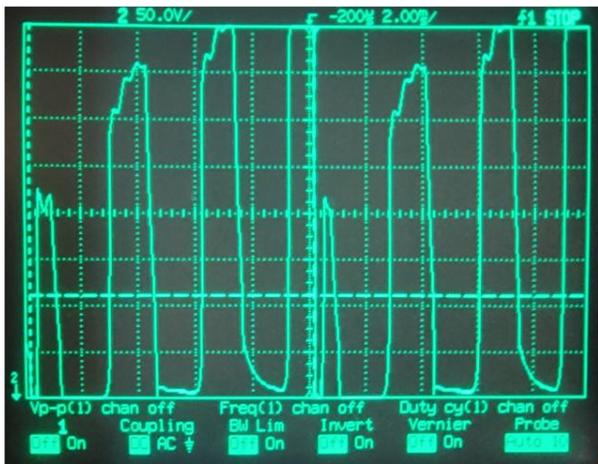
The BLK wire is ground and is electrically connected to the aluminum case. The WHT wire is positive battery voltage.

The GRN wire is the trigger input. It is not clear what kind of sensor was intended for use with this system. My guess is that it is points driven since the pullup resistor in the input circuit is two 5W, 15 ohm resistors in parallel for 7.5 ohms of resistance. My typical calibration signal sources were not strong enough to drive the unit. I had to use a special calibrator with a big power transistor to get the unit to trigger.

The RED wire is the output, going to the to the coil positive terminal. The coil negative terminal is grounded. Without the coil in the circuit, R3 gets very hot, so don't power this unit up without a coil attached. It is unknown if a ballast resistor is required with this unit or not. Tests showed that the unit does work with a ballast resistor in series with the coil. FYI, the unit self triggers at about 25 Hz with the input grounded or open.

A contributor on Reddit recognized the circuit in the bottom part of the circuit to be a Royer oscillator designed to create high voltage on pins 1 and 2 on the transformer. In the upper left part of the schematics, D1-4 rectifies that output and supplies it to the RED wire via R1, R2 and C1. TH1 shorts the high voltage supply to ground to fire the spark plug.

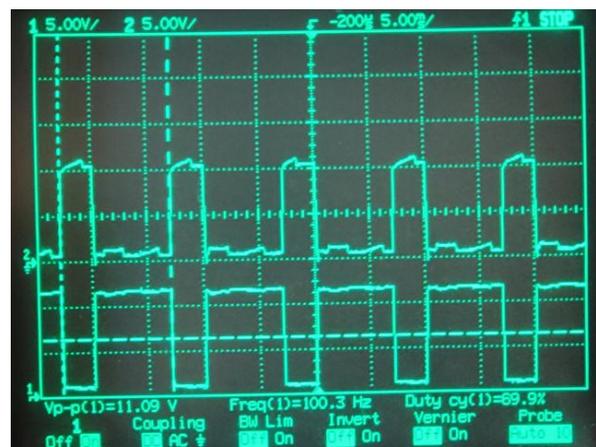
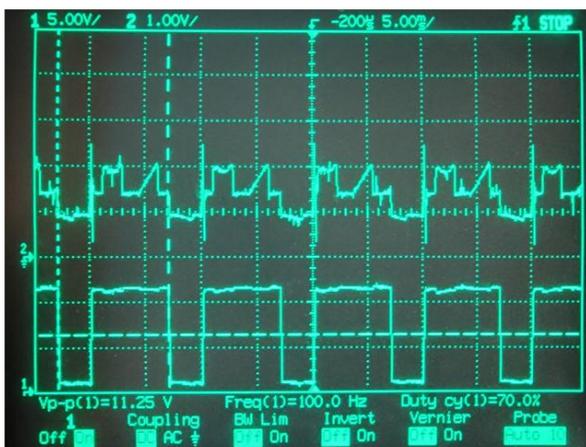
Here are the scope traces for T1 pin 1 (left) and for the output of the rectifier circuit (right):



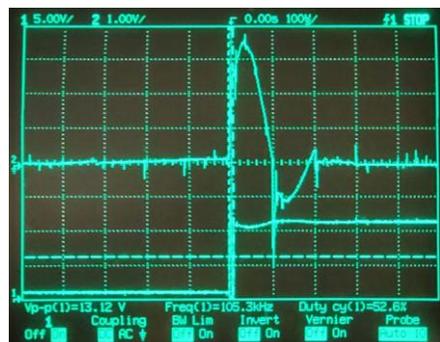
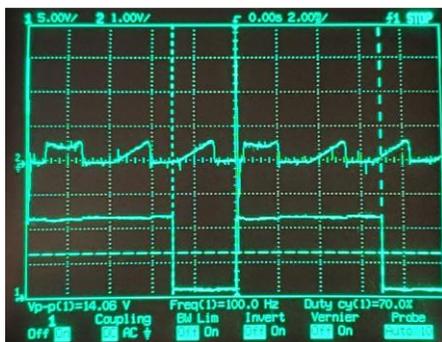
The unrectified signal goes to about 400V, the limit of my scope. The rectified signal has a scop offset of -250V so it peaks at about 450V. You can see the point where the thyristor turns on, which shorts the power supply to ground causing the plug to fire.

The circuit in the upper right part of the schematics is rectified and filtered from the low voltage side of the oscillator. It generates a nice clean supply of about 20V when the bench supply is at 12V. That supply is regulated down to 13V by Z1 to supply regulated power to the trigger circuitry.

The trigger circuitry occupies the middle of the schematics. A 12V square wave drives the green wire. The photo at the left shows the trigger signal on trace 1 at the bottom and the signal on trace 2 is the base of NPN Q3 on the top. The photo on the right shows the trigger signal on trace 1 on the bottom and the signal on trace 2 on top is the collector of Q3, so it is clear that Q3 is working well.



Q4 appears to be a PNP transistor that is controlled by the collector of Q3. In the photo on the left, the bottom trace 1 is the trigger signal and the top trace 2 is the signal from the base of Q4. In the photo in the middle, the bottom trace 1 is the trigger signal and the top trace 2 is the collector of Q4 zoomed in a bit. The photo on the right, is the same as the middle photo, but zoomed in close to the rising edge of the trigger (when the points open.)



The Q4 collector is connected to the gate of TH1 so the pulse when the points open, it triggers the gate of TH1, causing the spark. Also, when TH1 turns on, the anode goes to ground which is below the gate, turning TH1 off again.

Here is a photo of the spark coming from the system:



This document was written to help people to understand, diagnose and/or repair these vintage Saab electronic ignition systems. Please note that this system generates high voltages that can cause severe injury or death, so be very careful when working on these systems

Good luck with your project.