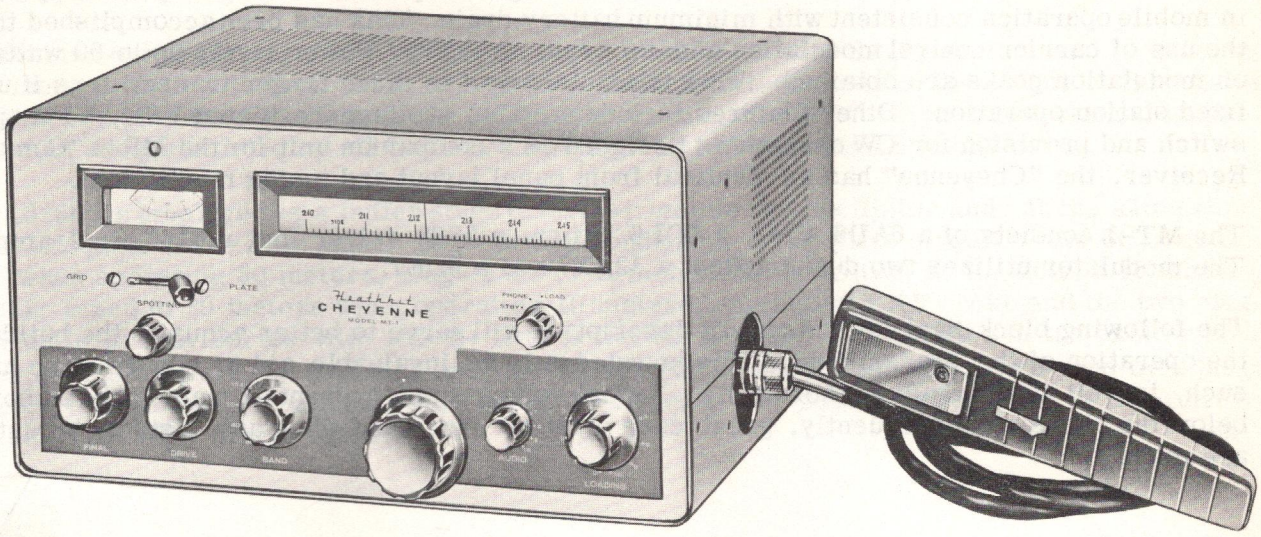
# HEATHKIT "CHEYENNE" MOBILE TRANSMITTER
## MODEL MT-1




### SPECIFICATIONS

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|---|---|
| Power Input: | 90 watt peak carrier controlled phone and CW. |
| Output Impedance: | 50 - 72 Ω. |
| Output Coupling: | Pi network (coaxial). |
| Band Coverage: | |
| 80 Meter Band: | 3.5 - 4.0 mc. |
| 40 Meter Band: | 7.0 - 7.3 mc. |
| 20 Meter Band: | 14.0 - 14.35 mc. |
| 15 Meter Band: | 21.0 - 21.5 mc. |
| 10 Meter Band: | 28.0 - 29.7 mc. |
| Panel Controls: | Meter Switch.<br>Spotting Switch.<br>Final Tuning.<br>Drive Tuning.<br>Band Switch.<br>VFO Tuning.<br>Audio (gain).<br>Loading.<br>Function Switch. |
| Tube Complement: | 12AX7 Speech Amplifier.<br>6DE7 Carrier Control Modulator.<br>6AU6 VFO.<br>6CL6 Buffer.<br>5763 Driver.<br>6146 Final Amplifier.<br>OA2 Voltage Regulator. |

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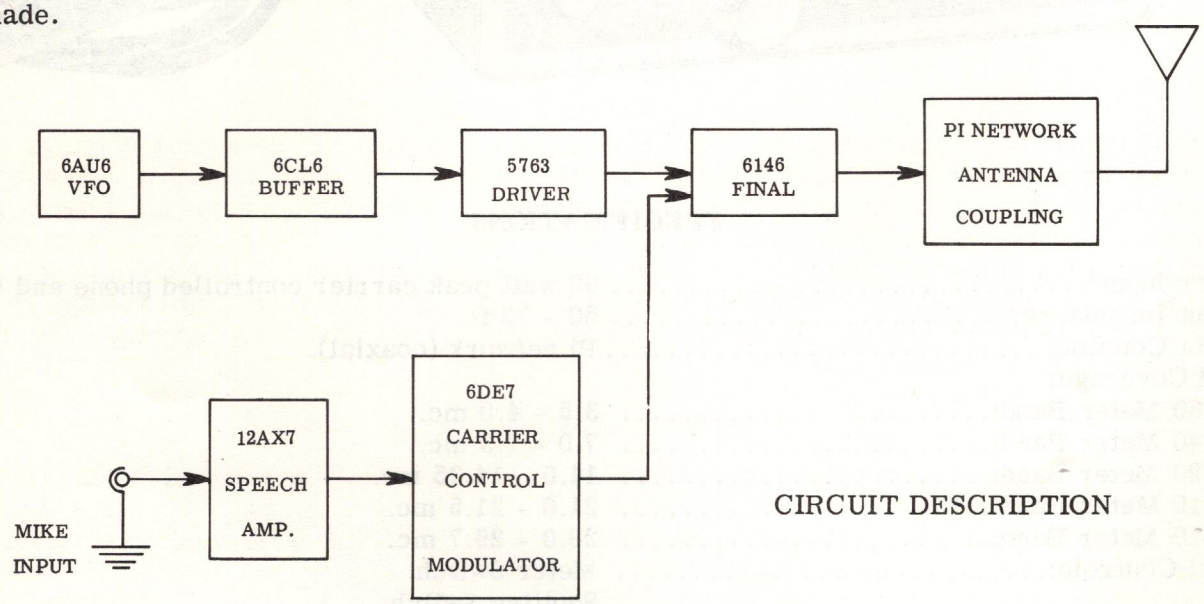
| Power Requirements: | |
| Filaments: ..... | 6.3 Volts at 4.7 amperes AC or DC.<br>12.6 Volts at 2.35 amperes AC or DC. |
| B+: ..... | 500-600 Volts DC at 150 ma.<br>300 Volts DC at 100 ma. |
| Cabinet Size: ..... | 6 1/8" high x 12 1/8" wide x 9 15/16" deep. |
| Net Weight: ..... | 15 1/2 lbs. |
| Shipping Weight: ..... | 19 lbs. |

## INTRODUCTION

The Heathkit MT-1 "Cheyenne" Transmitter was designed to provide maximum power capabilities in mobile operation consistent with minimum battery drain. This has been accomplished through the use of carrier control modulation and low drain circuitry. Power levels up to 90 watts input on modulation peaks are obtained. This is ample output to drive larger transmitters if used in fixed station operation. Other features include a stable, voltage-regulated VFO, VFO spotting switch and provision for CW operation. Designed as a companion unit for the MR-1 "Comanche" Receiver, the "Cheyenne" has an identical front panel layout and tuning mechanism.

The MT-1 consists of a 6AU6 VFO, a 6CL6 buffer, a 5763 driver and a 6146 final amplifier. The modulator utilizes two dual triodes: a 12AX7 and a 6DE7.

The following block diagram and circuit description will serve to better acquaint the builder with the operation of the Transmitter. This knowledge is an invaluable aid to construction and, as such, is well worth reading thoroughly. Lethal voltages are present at many points above and below the chassis, consequently, great care must be exercised when any tests or adjustments are made.




## CIRCUIT DESCRIPTION

### VFO

The VFO circuit consists of a 6AU6 tube operating as a Clapp oscillator in the frequency ranges of 1750 to 2000 kc, 7000 to 7175 kc, and 7000 to 7425 kc. The tube is mounted on top of the rigid enclosed chassis partition, thus placing all heat generating components outside the VFO enclosure. A double bearing ceramic insulated tuning capacitor is used as a frequency control. The VFO tuning capacitor, consisting of two stator assemblies of different capacities, permits a large bandspread at both high and low frequencies.

The coils are wound on heavy ceramic slug-tuned coil forms, heavily doped and baked. The result is a high Q coil upon which varying ambient conditions have a minimum effect. Careful placement of temperature compensating capacitors near the coils tends to cancel drift due to coil heating. In addition, a temperature compensating capacitor across the grid circuit of the tube, carefully positioned physically, provides additional compensation for other varying inductive parameters.

The VFO switch is operated by an interrupted switching mechanism on the band switch. VFO output frequency is correlated with the band in use as follows: 80 meters - 1750 to 2000 kc; 40 meters - 7000 to 7425 kc; 20 meters - 7000 to 7175 kc; 15 meters - 7000 to 7175 kc; and 10 meters - 7000 to 7425 kc. This unique switching system, coupled with the vernier slide rule full gear dial drive mechanism, provides more than adequate frequency spread on all bands.

The Clapp or series tuned Colpitts oscillator circuit presents a very low impedance to the tube grid at resonance. This minimizes the effect of shift in tube capacitance upon the output frequency. The capacitive voltage divider, necessary for operation of the Colpitts circuit, also lessens the effect of tube capacitance upon frequency. Both screen and plate voltages are stabilized by an OA2 regulator tube.

The untuned output circuit of the VFO operates at 80 meters when the 80-meter band is used and at 40 meters when all other bands are used. This circuit consists of the output coaxial cable capacitance, plus the RF choke in the VFO plate circuit. The VFO output thus obtained insures more than adequate drive on all bands. The output is fed to the 6CL6 buffer stage.

A 6CL6 tube is employed as a buffer stage to further isolate the oscillator and, at the same time, insure adequate drive even under low battery conditions. The plate circuit of the 6CL6 is untuned when operating 80 meters, slug-tuned to 40 meters for operation at 40, 20 and 15 meters, and slug-tuned to 20 meters when operating 10 meters. An untuned RF choke and the two slug-tuned coils are in series with the B+ lead to the 6CL6 plate. One section of the exciter band switch shorts out the coils not being used for a given band. The RF ground is provided by a large capacitor, since a direct ground would short the B+ lead. The output of the 6CL6 is capacitively coupled to the 5763 driver stage.

## Driver

A 5763 tube is employed as a driver for the 6146 final amplifier. Pi network interstage coupling is used between the driver and the final amplifier, with the input capacitor of the pi section variable, and the output capacitor fixed. The pi section inductance is tapped and the proper tap for each band is selected by a section of the exciter band switch. The use of a pi network interstage coupling helps reduce the harmonic output of the Transmitter. The fixed output capacitor of the pi interstage coupling appears from grid to ground of the final amplifier and shorts out the higher frequency harmonics. The driver is keyed in the cathode circuit along with the final amplifier for CW operation.

## Final Amplifier

The plate circuit of the final amplifier is shunt fed with a 2.5 mh RF choke and is capacity coupled into the pi network tank circuit. A tapped inductance is used for tuning all bands and the tap is selected by the band switch. In the 80-meter position, a 68 mmf 4 KV capacitor is automatically paralleled with the plate tuning capacitor. The loading capacitor consists of a three-gang, 450 mmf per section, variable capacitor with the sections in parallel.

## Modulator

The 12AX7 tube is used as a high-gain two stage resistance-coupled speech amplifier. The output of the speech amplifier is coupled to the 6DE7 modulator tube through a low capacity coupling capacitor. This low coupling capacity serves in shaping the response to favor the voice frequencies, thus allowing a higher average level to be maintained at frequencies where it will be most effective.

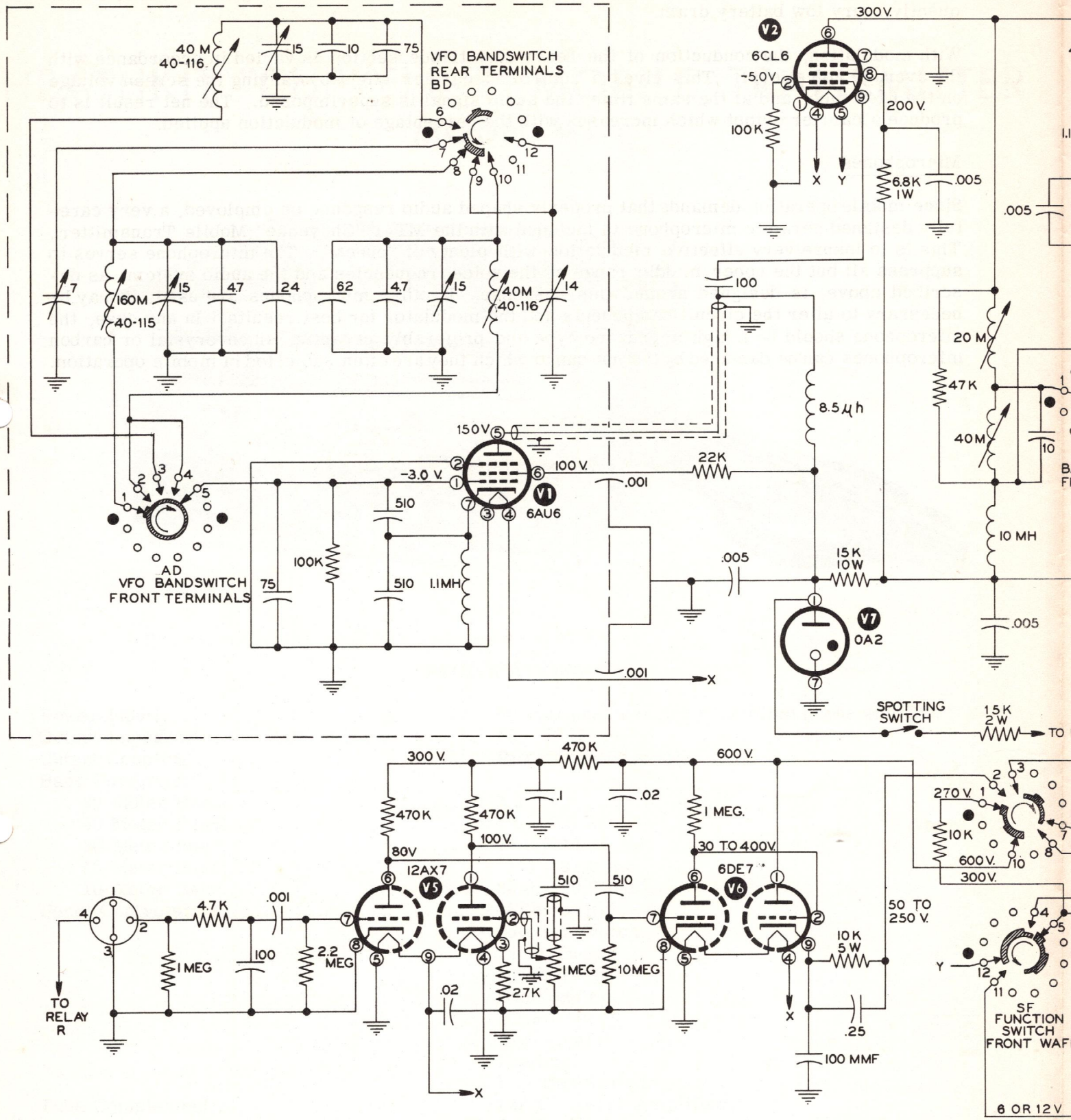
The audio energy from the speech amplifier is coupled to the grid of one triode section of a 6DE7. This tube contains two dissimilar triode sections: one triode section is rated at 1.5 watts dissipation, and the other at 7 watts dissipation. The lower rated triode is used as a direct coupled driver, its plate being tied to the control grid of the heavier duty triode, which forms the modulator. The heavy duty triode is biased sufficiently to limit its conduction, and therefore

the screen voltage on the final 6146 amplifier. This results in a low resting carrier and, consequently, very low battery drain.

With modulation, the conduction of the heavy duty triode section is varied in accordance with the average voice level. This gives a controlled carrier effect by varying the screen voltage on the 6146 tube, and at the same time, the audio signal is superimposed. The net result is to produce a carrier output which increases with the percentage of modulation applied.

## Microphones

Since mobile operation demands that properly shaped audio response be employed, a very carefully designed ceramic microphone is included with the MT-1 "Cheyenne" Mobile Transmitter. This is to insure very effective modulation with plenty of "punch". The microphone serves to suppress all but the upper middle range of the voice frequencies and the audio system, as described above, is designed around this response. If other microphones are used, it may be necessary to alter the circuit components and the modulator for best results. In any case, the microphone should be a high impedance type and preferably ceramic, since crystal or carbon microphones can be damaged by the hot sun to which they are often subjected in mobile operation.




GENERAL INFORMATION

THE BANDSWITCH S-3 IS SHOWN IN THE 80 METER POSITION.

THE FUNCTION SWITCH S-2 IS SHOWN IN THE "OFF" POSITION.

THE METER SWITCH IS SHOWN IN THE "PLATE" POSITION.

TROUBLESHOOTING INFORMATION.

VOLTAGES TAKEN IN THE "PHONE" POSITION. BANDSWITCH IN 40 METER POSITION.

PINS 2 AND 6 OF TUBE V6 AND PIN 3 OF TUBE V4 VARY IN VOLTAGE WITH MODULATION PEAKS AS INDICATED.

NOTE: ALL VOLTAGES ARE APPROXIMATE AND WILL VARY UNDER VARYING BATTERY CONDITIONS.

# SCHEMATIC
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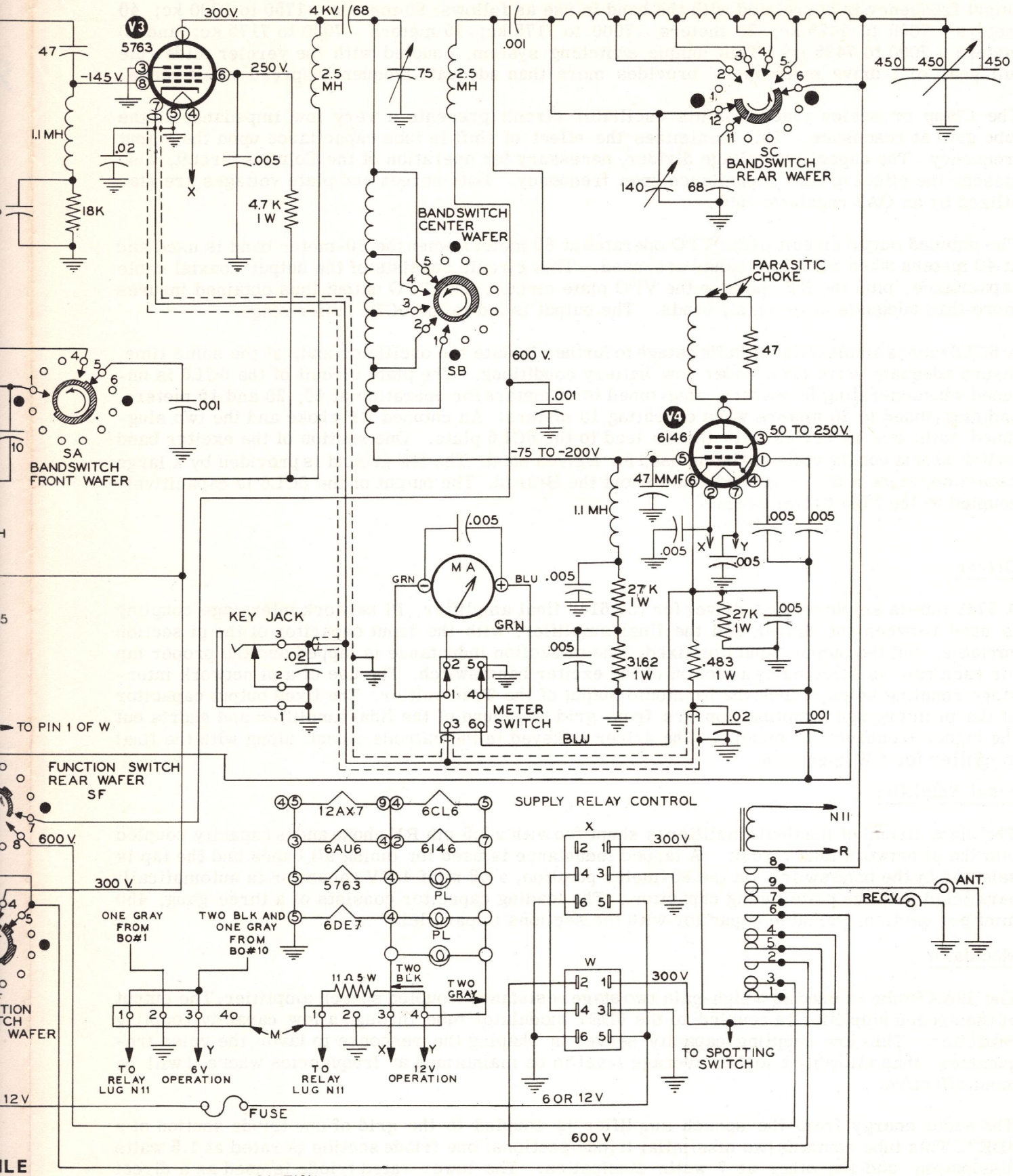


**CAUTION**

CONNECTIONS TO POWER PLUGS X AND W ARE FOR NEGATIVE GROUNDED VEHICLES.

FOR POSITIVE GROUNDED VEHICLES SEE MODIFICATION SHEET ENCLOSED BEFORE WIRING THESE PLUGS.