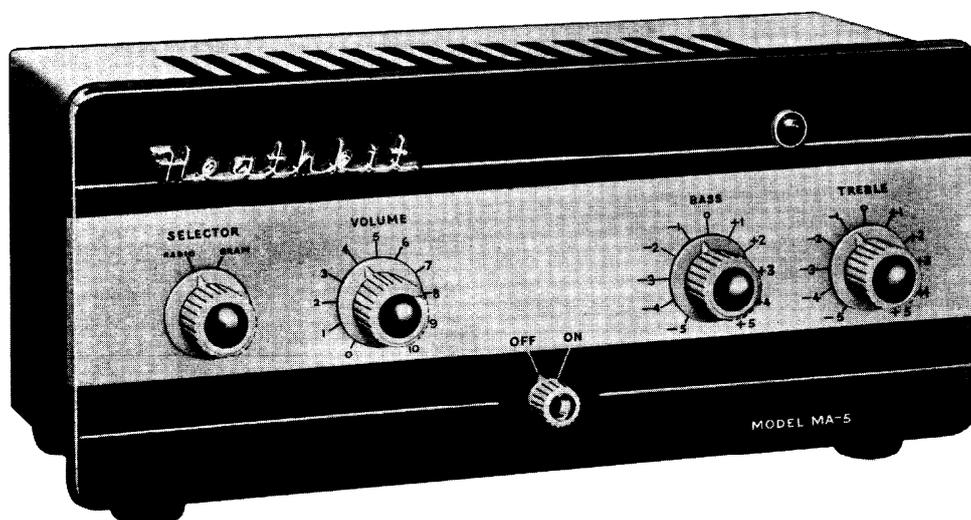




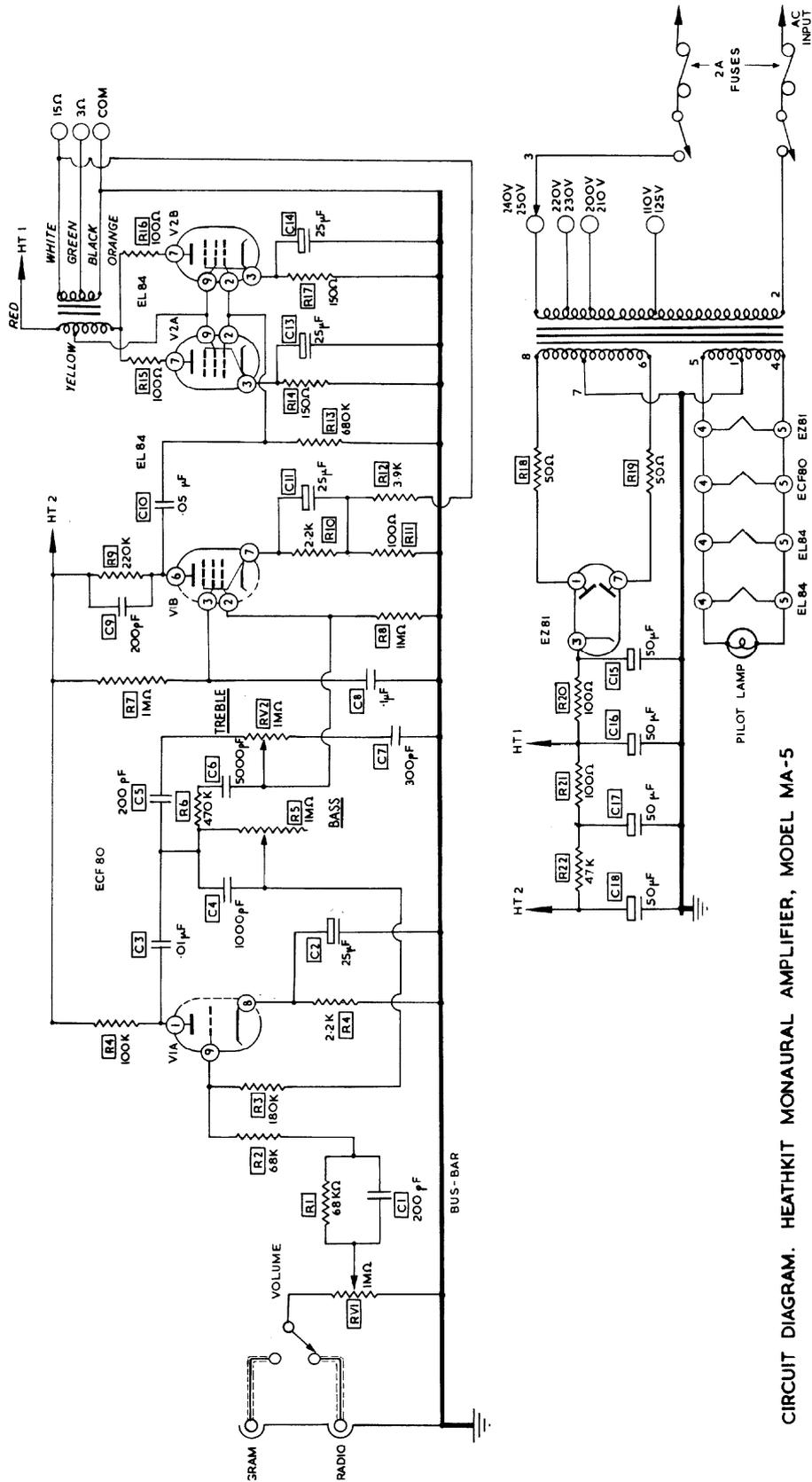
# Assembly and Operation of the Heathkit Monaural Amplifier

## MODEL MA-5



### SPECIFICATIONS

Power Requirements: .....	110 volts or 200-250v AC; 40-60 c/s; 100 watts
Power Output: .....	5 watts
Distortion: .....	Less than 0.5% at 5 watts
Sensitivity: .....	250 mV
Output Impedance: .....	2-4 and 14-16 ohms
Negative Feedback: .....	Main loop 20 dB
Hum and Noise: .....	Better than -60 dB
Valve Complement: .....	1 - ECF80, 2 - EL84, 1 - EZ81, Pilot lamp 6.3v, 0.1 amp
Controls: .....	Selector Switch - radio and gram. Volume Control ON-OFF Switch Bass lift and cut, 9 dB lift and 6 dB cut at 60 c/s Treble lift and cut, 6 dB lift and 15 dB cut at 9 Kc/s
Finish: .....	Stove enamelled, two-tone grey front panel and cadmium plated chassis
Dimensions: .....	11" x 6.5/8" x 4 3/4" high, front panel 11 3/4" x 5 1/4"
Net Weight: .....	11 1/2 lb.
Shipping Weight: .....	14 1/2 lb.



CIRCUIT DIAGRAM. HEATHKIT MONAURAL AMPLIFIER, MODEL MA-5

## GENERAL DESCRIPTION

The MA-5 is so designed that it can be mounted in a cabinet or simply stood on a bookshelf or room-divider. A flange at the rear of the chassis permits easy mounting when fitted in a cabinet. It is completely self-contained in that it will operate directly from a crystal pick-up or radio tuner such as the Heathkit FM or AM/FM Tuners.

To provide quality at very low cost the MA-5 uses virtually the same components as the extremely popular Model S-33 stereo amplifier. Certain circuit alterations have been made to enable the amplifier to deliver 5 watts.

The output transformer is a high quality sectionalised type allowing a high degree of negative feedback to be applied without sacrificing stability. Power output is maintained below 50 c.p.s. and a built-in filter minimises the effect of gramophone motor rumble.

## CIRCUIT DETAILS

The first valve is a triode pentode ECF80 with the triode section forming the tone control using negative feedback. The high pass or rumble filter is incorporated in this stage and is followed by the pentode section and then the output stage. The two EL84's are paralleled in the Ultra-Linear Circuit. Negative feedback is taken from the secondary of the output transformer and applied via a potential divider network to the cathode of the pentode section of the ECF80.

The power supply is a conventional resistance - capacitance smoothed circuit using a heavy duty rectifier type EZ81.

## HOW A CIRCUIT BOARD IS PRODUCED

It is important to understand how a circuit board is developed and manufactured so that you may fully realise its advantages. The board itself consists of a low-loss phenolic sheet. To one face of this sheet is bonded a layer of pure metallic copper. This bonding process is the result of years of research and development and has successfully passed the most rigid military requirements for electronic equipment. The bond is not affected by moisture, ageing, etching solutions or normal variations in temperature.

The circuit pattern is developed after many experimental circuit layouts are tried and refined. The circuit is finally reduced to a drawing, bearing in mind necessary clearances for voltage breakdown, capacity effects, elimination of undesired feedback possibilities and a minimum of cross-overs. The final drawing, enlarged several times for greater accuracy, is photographed and a negative of exact size is produced. The copper surface of the circuit board is sensitised and exposed to light through the master negative. An etching process then removes all the copper except that protected by the opaque areas of the negative. The result is a copper "print" of the circuit pattern, as originally drawn.

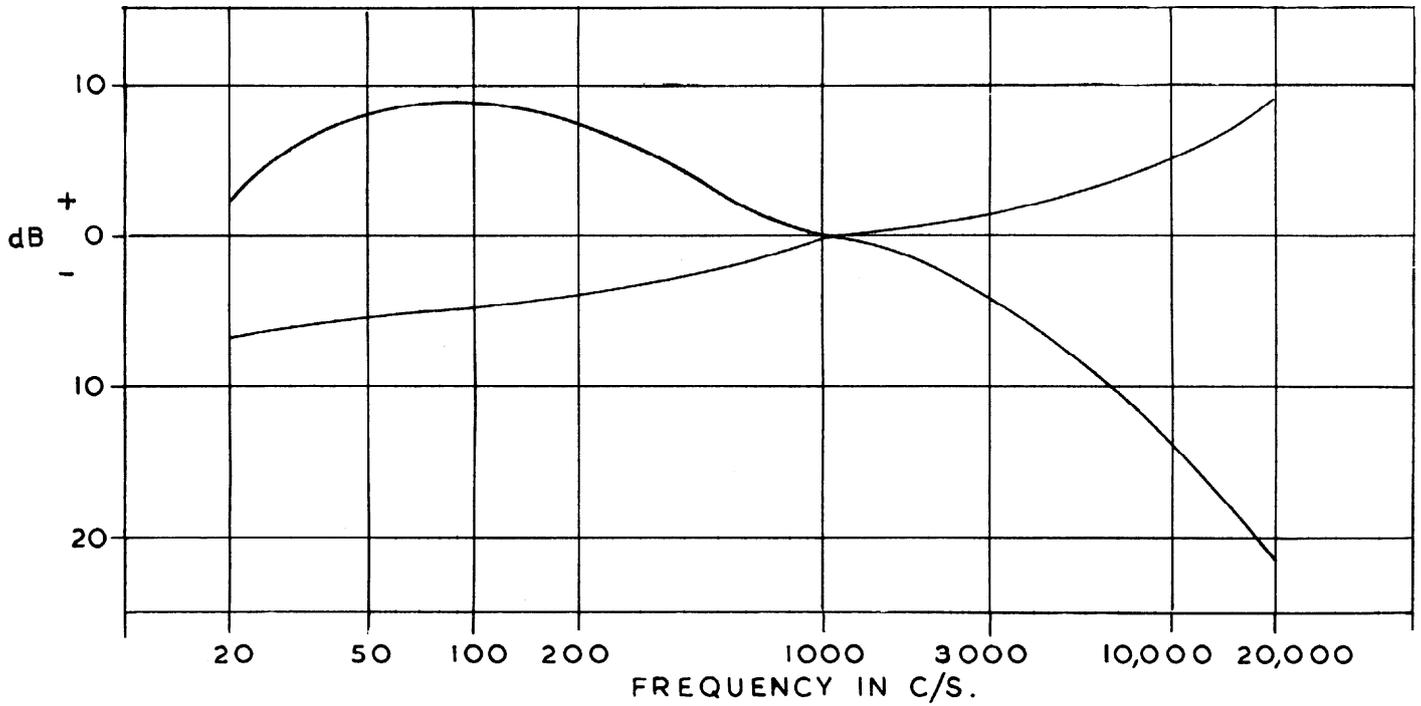
Necessary holes are punched through the circuit board and circuit components are then mounted. For physical support, these parts are generally mounted on the phenolic side of the board with their leads passed through holes and soldered directly to the pattern. Soldering is simple and quick, using conventional methods.

One word of caution; we recommend that a small iron be used for circuit board soldering. The amount of heat required is much less than that used for conventional wiring. Soldering pencils are ideal; a 25 or 50 watt iron is entirely adequate. Soldering guns should be used carefully, since they produce heat in direct ratio to length of time the switch is closed. Overheating can damage the circuit board and should be avoided. It is not necessary to "sweat" the connections. Any of the radio grades of solder work very well. **DO NOT USE SOLDER PASTES OR OTHER EXTERNAL FLUXES**, as they will completely ruin the circuit board.

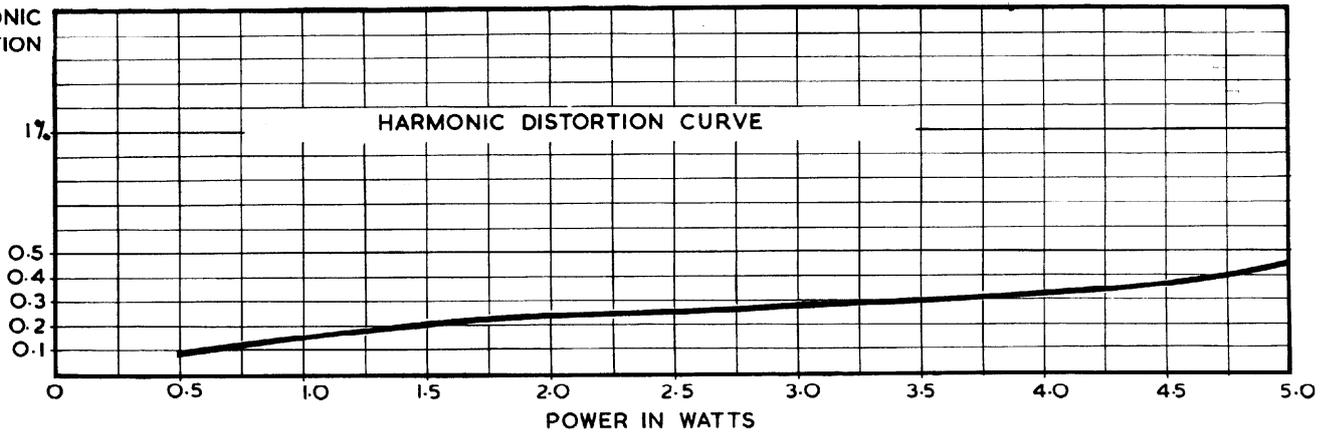


GRAPH NO-1

TONE CONTROL CURVE



HARMONIC DISTORTION



GRAPH 2. DISTORTION CURVE