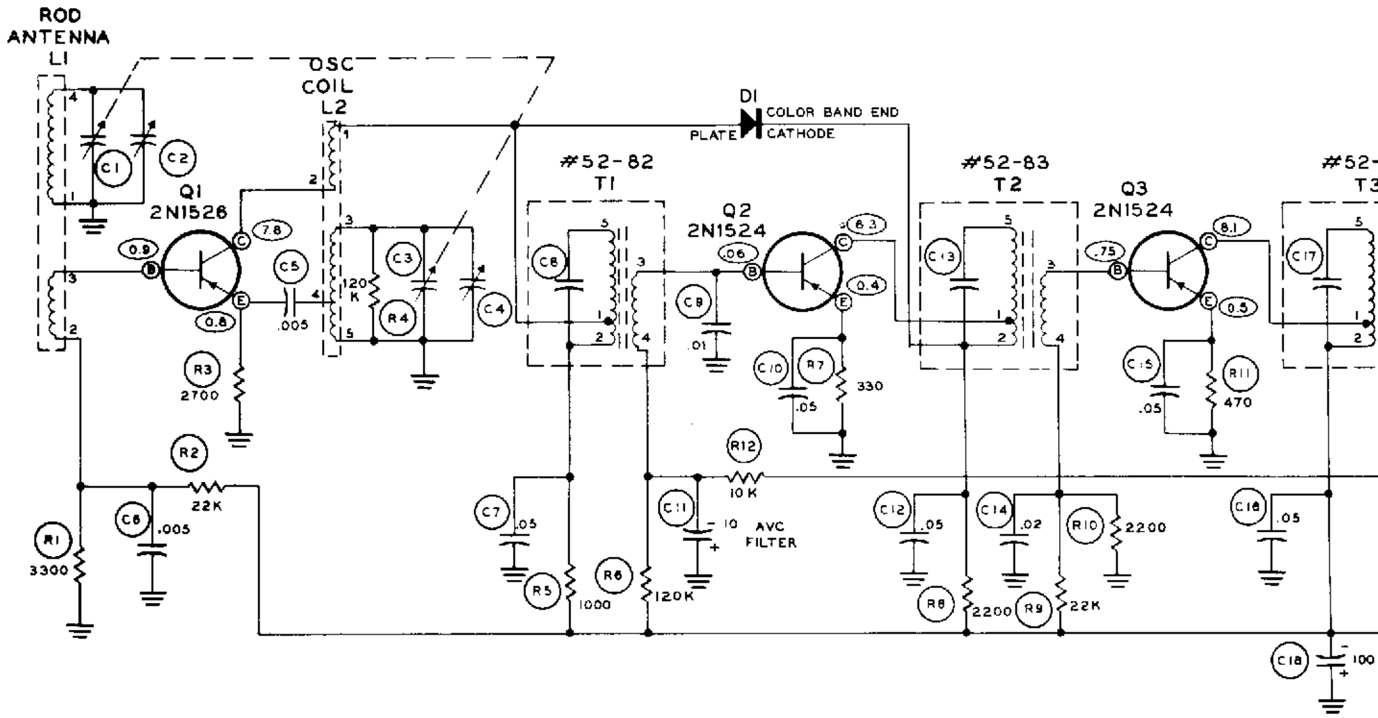

SCHEMATIC O

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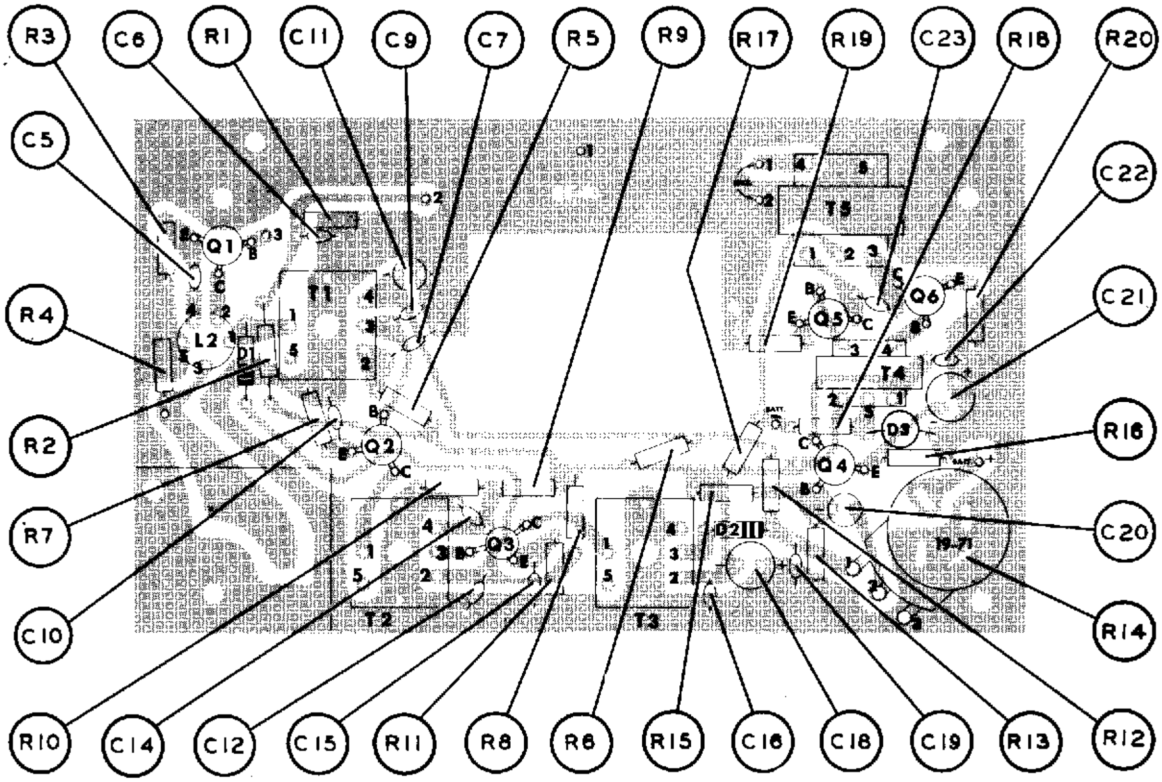
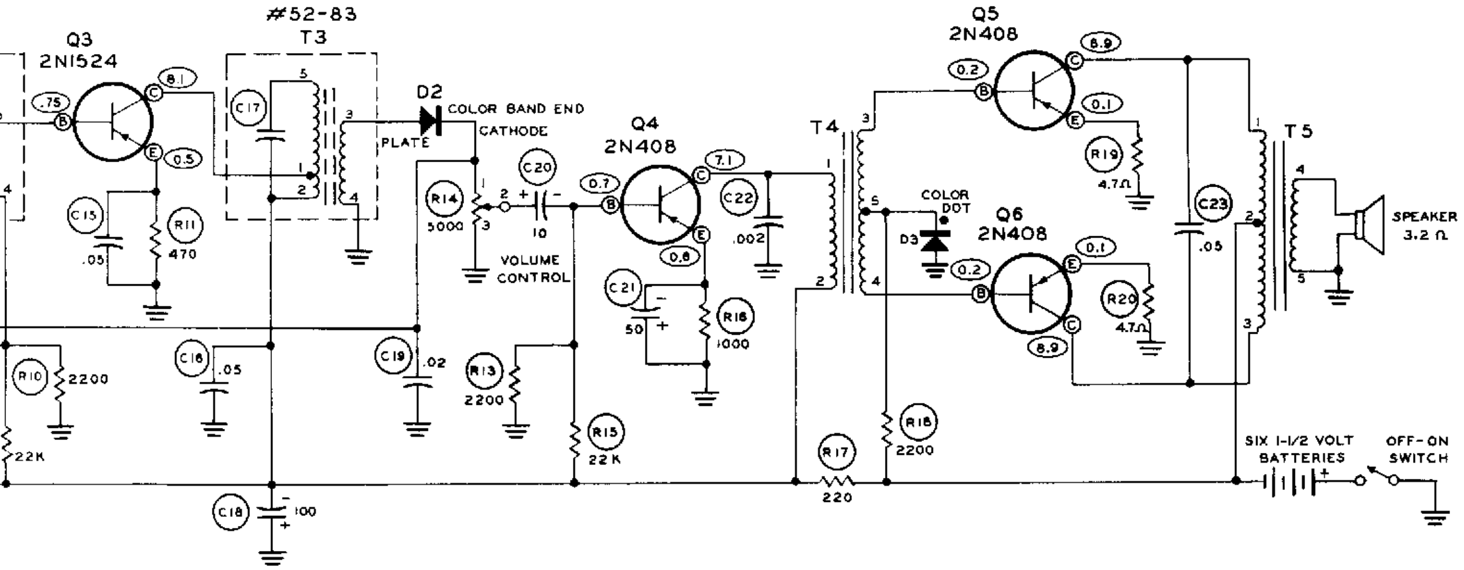
MODEL GR-1





SCHEMATIC OF THE HEATHKIT PORTABLE TRANSISTOR RADIO MODEL GR-151B

ALL RESISTOR VALUES ARE IN Ω; K = 1000 Ω.

ALL RESISTORS ARE 1/2 WATT.

ALL CAPACITORS ARE IN μfd.

(oval) INDICATES NEGATIVE DC VOLTAGE MEASUREMENT FROM POINT MARKED TO POSITIVE (+) BATTERY TERMINAL.

ALL VOLTAGES ARE MEASURED WITH AN 11 MEGOHM IMPEDANCE VTVM, WITH NO SIGNAL.

ALIGNMENT

Advance the volume control to turn on the Radio, then turn this control until you hear a slight rushing sound or static. If no sound is heard, turn off the Radio and refer to the In Case Of Difficulty section of the manual. If operation seems normal, proceed with the alignment steps.

Read each of the following steps completely through before performing the adjustments described.

Refer to Figure 1 for the following steps.

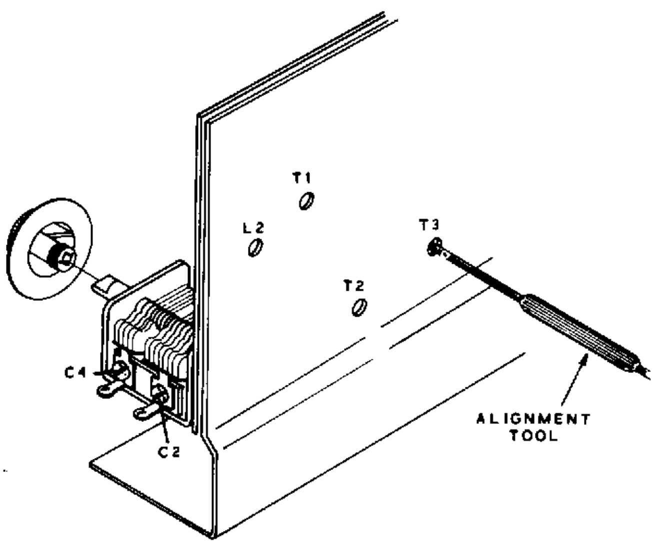


Figure 1

STEP ONE

A. Turn BOTH adjusting screws, C2 and C4, on the variable capacitor down snugly in a clockwise direction without forcing them.

B. Loosen EACH screw a fraction (about 1/16) of a turn.

STEP TWO

This procedure will adjust the IF amplifiers for maximum gain.

A. Tune in a weak station near the low frequency end of the dial (tuning control near full counterclockwise).

B. Using the alignment tool provided, carefully turn the internal adjustment of transformer T3 left or right to obtain maximum volume. Now adjust T2 and T1 in a similar manner. Repeat the procedure.

STEP THREE

This step will adjust the signal and oscillator circuits to 455 kc separation at the low frequency end of the dial.

A. Turn on a source of "noise" such as a fluorescent lamp, electric shaver, or a mixer.

B. Place the Radio near the noise source so that static will be heard. Turn the tuning control almost fully counterclockwise, but not to a station.

C. Adjust oscillator coil L2 to obtain maximum noise volume. If a station should appear during this adjustment, slightly retune the dial so that only the noise will be heard.

STEP FOUR

This step will provide maximum sensitivity at the high end of the dial by adjusting the signal circuit to 455 kc separation from the oscillator circuit.

A. Tune in a weak station at the high frequency end of the dial (tuning control near full clockwise).

B. Adjust screw C2 on the variable capacitor to obtain maximum volume.

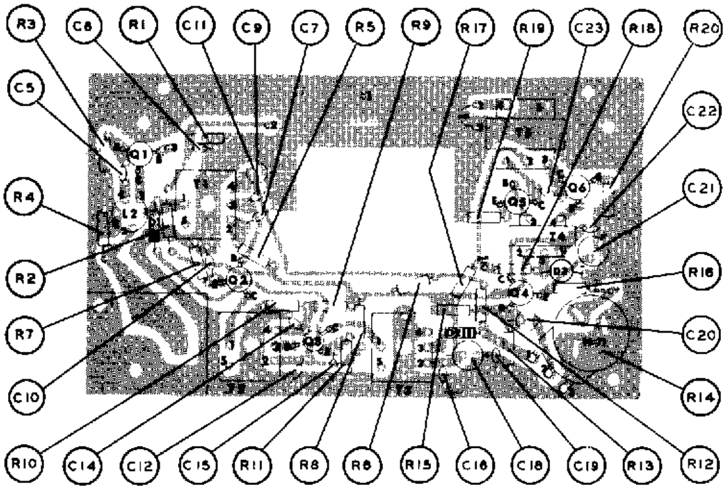
D. Place the Radio back in the cabinet and check the dial setting.

E. Repeat the above until proper dial calibration is obtained.

F. Since the adjustments interact slightly, you may repeat step 4 of the alignment to obtain best results.

G. Install the radio back in the cabinet.

THIS X-RAY VIEW OF THE CIRCUIT BOARD IS PROVIDED TO AID IN TROUBLESHOOTING AND LOCATING ALIGNMENT POINTS.



CIRCUIT DESCRIPTION

The Circuit Description is provided to give the novice, as well as the technical kit builder, a better understanding of what is happening in the different stages of the receiver. By tracing through the Schematic Diagram when reading the Circuit Description, you can become better acquainted with the Radio.

The "Introduction To Transistors" and the "Glossary Of Radio Terms" in the following section of the manual will help to explain some of the terms used.

The 6-transistor circuit of the receiver consists of an autodyne converter, two IF amplifier stages, a Diode Detector, an overload circuit, and a Class-B audio power output stage.

The radio signals transmitted by a broadcasting station are picked up in the Radio by rod antenna L1. The desired signal is selected by the large section of variable capacitor C1 and the inductance of L1. The desired station signal is then coupled from the large antenna coil to the small antenna coil. This signal is then fed to the base of transistor Q1, the converter. It is noted on the Schematic that capacitors C1 and C3 of the variable capacitor are tied together. C3 tunes an oscillator circuit, consisting of oscillator coil L2 and transistor Q1. Thus, when tuning in a station with the variable capacitor C1 and C3, heterodyne (also see superheterodyne in Glossary) action develops a 455 kc difference frequency.

The resultant difference frequency of 455 kc is coupled to the base of transistor Q2, the first IF amplifier, through IF transformer T1. The signal is amplified by Q2 and is coupled to the base of transistor Q3, the second IF amplifier, through IF transformer T2. The amplified IF signal from Q3 is coupled to the detector circuit, which consists of diode D2 and capacitor C20. Control R14 is the diode load as well as the volume control.

AVC voltage is developed by the detector diode. This voltage is filtered by resistor R12 and capacitor C11, and is applied to the base return of the IF amplifier stage Q2 to provide less amplification for strong signals. Resistor R6 provides a bias voltage to the base of Q2.

Before following the audio signal further, the operation of the overload circuit will be described.

First, a diode will not conduct unless the voltage on the cathode becomes more negative than the voltage on the plate. The diode works much like a switch, in that it is "on" only when it conducts. Diode D1 serves just this function in the receiver.

When a signal of normal level is received by the Radio, D1 is open because the AVC voltage is quite low, letting Q2 amplify almost at its maximum capabilities. However, when an extra high level signal is received, an exceptionally high positive AVC voltage is developed. This high positive AVC voltage tends to reduce the amount of negative supply voltage at the base of Q2, thus reducing its amplification and power requirements. This action permits the negative supply voltage at the cathode of diode D1 to get higher than (or more negative than) the voltage on its plate. D1 conducts and essentially connects the collector of Q1 to ground through C12. This action detunes transformer T1, thus coupling less signal to the base of Q2, preventing an overload in this stage which would cause distortion in the speaker.

The signal from the first IF transformer T2 is amplified by IF amplifier Q3 and is fed to the second IF transformer T3.

Detection is accomplished by diode D2. RF frequencies are filtered from the detected audio signal by capacitor C19.

The audio signal is taken from control R14. Turning the control clockwise couples more signal to the base of Q4, the driver amplifier stage, through capacitor C20. The audio signal from Q4 is coupled by driver transformer T4 to push-pull output amplifiers Q5 and Q6. These transistors are operated Class B, which means that they require very little power except when a signal is present, resulting in maximum battery life. The speaker is coupled to amplifiers Q5 and Q6 by output transformer T5, which provides proper matching between the transistors and speaker.

Diode D3 operates as a voltage and temperature compensating device to maintain maximum efficiency in output stages Q5 and Q6. If transistors Q5 and Q6 start to heat and draw excessive current, D3 will respond to return the base bias of the transistors back to the proper level. This saves the transistors from self-destruction due to overheating.

As the battery becomes weaker and its voltage drops, D3 will compensate and allow the proper bias voltage to be applied to the bases of transistors Q5 and Q6. This action provides a more constant output for the life of the battery.

Resistor R17 and capacitor C18 provide isolation between circuits to increase stability of operation.

Power for the Radio is supplied by six 1-1/2 volt size C batteries. The off-on switch is connected between the positive terminal of the batteries and circuit ground.