

HEATHKIT[®] MANUAL

for the
COLOR GENERATOR
Model IG-5240

595-1875-2



HEATH COMPANY • BENTON HARBOR, MICHIGAN

INITIAL TESTS AND ADJUSTMENTS

NOTES:

1. A properly aligned and operating color television set is required for alignment of the Generator.
2. When the Generator is operating with the top housing removed, hand capacitance and stray radiation may distort the selected pattern display on the television screen. It may be necessary to lay the Generator down and/or position it in a particular direction after each adjustment.
3. The number of vertical and/or horizontal lines, color bars, and dots displayed on the television screen will depend on the overscan characteristics of the television used. The intensity ratio of vertical lines to horizontal lines will depend on the setting of the television video peaking and fine tuning.
4. If you do not obtain the specified results in the following steps, refer to the "In Case of Difficulty" section on Page 45.
 - () Turn your television set on and tune in a VHF station that has a good color signal.
 - () Switch off the user accessible automatic control circuits (automatic fine tuning, etc.). With these controls off, adjust the fine tuning, color, tint, contrast, and brightness controls for a good picture with correct flesh tones.

- () Disconnect the VHF antenna from the television set and connect the Generator 2-wire cable in its place. Then turn the television channel selector to channel 4 (channel 3 optional).

NOTE: The four slide switches on the video circuit board are used to program the output signal. The switch positions are identified by a 1 and a 0. When a switch is in position 1, the switch lever will be toward the batteries; in position 0, the lever will be away from the batteries.

When you are instructed to select a signal, the switch positions will be identified with a 1/0 code. For example, "1010" indicates that:

- The left switch is in position 1.
- The center left switch is in position 0.
- The center right switch is in position 1.
- The right switch is in position 0.

Locate the trim label; it identifies the approximate television picture produced by each switch program.

- () Refer to Figure 3 and preset the controls and switches as follows:

VIDEO LEVEL control R18 — 3/4-turn counterclockwise.

COLOR LEVEL control R17 — Fully counterclockwise.

COLOR ADJUST trimmer C9 — Disregard.

RF OSCILLATOR control inductor L2 — With the alignment tool supplied, turn the slug out until its end is flush with the end of the coil form.

Program switch SW104 — 1.
 Program switch SW103 — 0.
 Program switch SW102 — 1.
 Program switch SW101 — 0.
 ON pushbutton switch SW202 — Disregard.
 OFF pushbutton switch SW201 — Press momentarily.

- () Switch the Generator on (momentarily press ON pushbutton switch). Either a blank raster or snow will be displayed on the picture tube. If a blank raster display is visible, turn the tuning slug of RF Oscillator control inductor L2 out of the end of the coil form until a snow pattern is displayed. NOTE: After a period of time (five minutes minimum), the Generator will turn itself off. If you have not completed the test when this occurs, switch the Generator on again.
- () Slowly turn the tuning slug of inductor L2 clockwise until you observe a blank raster on the picture tube. Note the position of the slug. Then adjust the slug 1/4-turn clockwise. NOTE: It may be necessary to readjust the television fine tuning to produce a blank raster.
- () Switch the Generator off (momentarily press the OFF pushbutton switch). The blank raster should disappear.
- () Switch the Generator on. The blank raster should reappear.

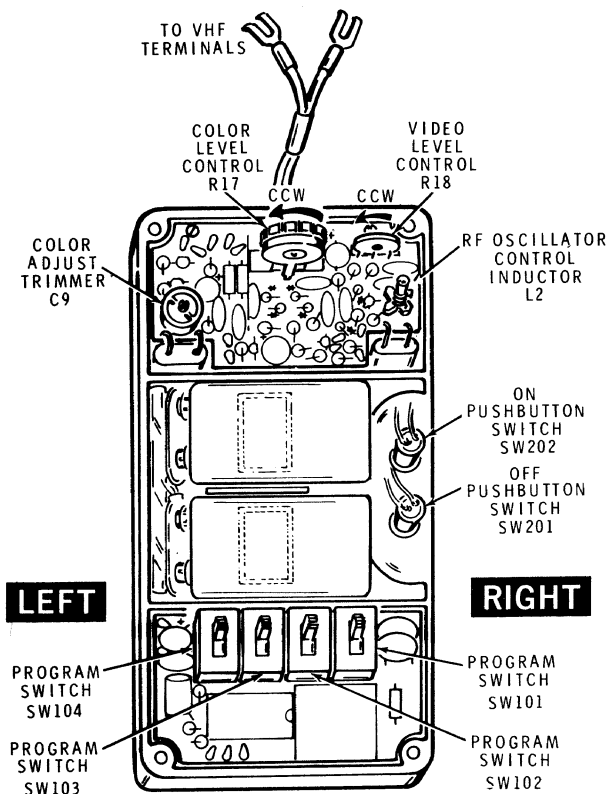


Figure 3

- () Change the program switches to "0101." The picture tube should display vertical and horizontal lines. NOTE: The vertical and horizontal lines may not have equal intensity, and it may be necessary to readjust the television brightness and fine tuning to see both lines.
- () Adjust the television fine tuning control and brightness control for maximum line intensity with equal line widths, and minimum line distortion.
- () Rotate the wiper of VIDEO LEVEL control R18 through its entire range and note where the display begins to distort. Then set the wiper to the center of its undistorted range.
- () Change the program switches to "0001." The picture tube should display up to ten vertical color bars that may or may not have a color hue. Turn COLOR ADJUST trimmer C9 so the color bars are as indicated in Figure 4 on Page 43. (You may only see eight or nine color bars.) It may be necessary to readjust the television fine tuning, color level, or color killer to obtain color.

- () Adjust the television fine tuning, inductor L2, and control R18 for minimum display distortion.
- () Turn trimmer C9 through its entire range and note where the color disappears from the display. Then set the trimmer to the center of its color range.

NOTE: It may be necessary to fine tune the television when switching between color and black and white patterns.

- () Using the trim label as a reference, program each of the sixteen output signals to verify their operation. NOTE: The illustrations showing more than one dot, horizontal line, vertical line, or cross-hatch indicate only the relative density of the pattern. They do not indicate the exact number displayed.
- () Press the OFF pushbutton.

This completes "Initial Tests and Adjustments." Proceed to "Final Assembly."

OPERATION

The Model IG-5240 Color Generator is a 16-function instrument capable of supplying the modulated RF signals necessary for television alignment. The RF carrier frequency is calibrated for channel 4 (channel 3 can be incorporated as an option). A unique control circuit* turns the Generator off after a 5-minute (minimum) interval. This helps to conserve battery power if the generator is accidentally left on.

BATTERY

Two 9-volt transistor batteries, NEDA #1604, are required for operation. To install: Remove the four screws that secure the housing halves, clip a battery to each connector, and resecure the two housing halves. Be careful not to pinch any wires.

Representative battery manufacturers and their type numbers are:

Eveready #216, P3
Burgess #2V6
Mallory #TR-146X (long life)
RCA #VS323
Hellesens #410
Varta #438
CEI #6F22

*Patent Pending

SWITCHES-CONTROL-OUTPUT

ON pushbutton switch — The Generator is turned on when this button is pressed momentarily. After a period of at least 5 minutes, the Generator will turn itself off.

OFF pushbutton switch — When this button is pressed momentarily, the Generator is turned off.

Program slide switches — These four switches are used to select the output signal. When a switch slide is moved toward the large trim label, it is in the "1" position. When the switch slide is moved toward the small Heathkit label, it is in the "0" position. The trim label illustrates the various signals that can be displayed on a television. Next to each illustration is the required switch program. **NOTE:** The illustrations on the trim label showing multiple patterns are only representative and do not show actual pattern density. The three color patterns are a rainbow (1111), three color bars (1100), and ten color bars (0001). Figure 4 illustrates the ten bar color sequence. You may not see all ten color bars on some television sets.

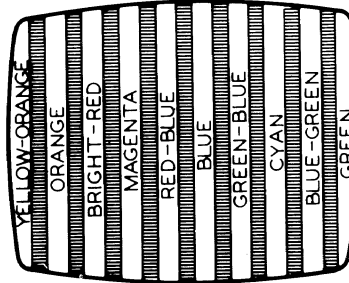


Figure 4

COLOR LEVEL control — Adjusts the color intensity of the three color patterns.

Output cable — Use to connect the generator signal to the VHF terminals of the television set. This is the only connection required. NOTE: The RF carrier frequency is calibrated for channel 4.

USER NOTES

1. Switch off the user accessible automatic control circuits (automatic fine tuning, etc.) while using the Color Generator.
2. When you switch between color and black and white patterns, it may be necessary to fine tune the television for best pattern display.
3. Successful use of the Color Generator requires a properly operating television. You may find, in some older televisions, a particular characteristic that distorts the Generator patterns and cannot be corrected by fine tuning the television. You can generally correct the problem by adjusting oscillator coil L2, inside the Generator. This problem is usually caused by excessive sync requirements, or improper adjustment of the IF and RF AGC in the television.

ALTERNATE CHANNEL OPERATION

The RF oscillator crystal of this Generator is selected for channel 4. If you encounter local interference on channel 4 (channel 4 television transmitter in your area), you can order an alternate crystal for channel 3 from a number of crystal manufacturers. This crystal is now available from the Heath Company under part number 404-601. The following is a list of specifications for the crystal in case you want to purchase it from a crystal manufacturer.

Case Style — HC-18.
Nominal Frequency — 61.25 MHz.
Frequency Tolerance — 0.005%.
Mode of Operation — Fifth overtone.
Maximum Crystal Output Capacitance — 7 pF.
Maximum Series Resistance — 80 Ω .
Load Capacitance — 13 pF.
Drive Level — 2 mW into 60 Ω .

For channel 3 operation, replace crystal Y1 (67.25 MHz) with a 61.25 MHz crystal and replace capacitor C4 (15 pF) with an 18 pF (part number 21-60) ceramic capacitor.

Troubleshooting Chart

| PROBLEM | POSSIBLE CAUSE |
|---|--|
| Generator will not turn on, or will not remain turned on. | <ol style="list-style-type: none">1. Batteries B201 and/or B202 discharged.2. Switch SW202 defective or incorrectly wired.3. Transistor Q2 or Q3 defective.4. Diode D1 reversed or defective.5. Capacitor C1 open. |
| Generator will not turn off using switch SW201. | <ol style="list-style-type: none">1. Switch SW201 defective or incorrectly wired.2. Resistor R5 open.3. Transistor Q2 shorted. |
| No RF output. | <ol style="list-style-type: none">1. Inductor L2 incorrectly adjusted.2. Crystal Y1 defective.3. Transistor Q1 defective.4. Capacitor C5 open. |

| PROBLEM | POSSIBLE CAUSE |
|--|---|
| RF output, but no video output (blank raster). | <ol style="list-style-type: none">1. Diode D2 defective.2. Control R18 incorrectly adjusted, or defective.3. Integrated circuit IC101 defective.4. Crystal Y101 defective.5. Raster switch program (1010) selected.6. Circuit boards incorrectly wired. |
| RF and video output, but no color. | <ol style="list-style-type: none">1. Trimmer capacitor C9 incorrectly adjusted.2. Crystal Y2 defective.3. Control R17 turned fully clockwise, or defective.4. Transistors Q4 or Q5 defective.5. Diodes D3, D4, D5, or D6 defective.6. Integrated circuit IC101 defective.7. Improper Color Killer adjustment and/or operation in the television set.8. Capacitor C12 open. |

| PROBLEM | POSSIBLE CAUSE |
|----------------------------------|---|
| Improper video display patterns. | <ol style="list-style-type: none"><li>1. Integrated circuit IC101 defective.<li>2. Program switches SW101, SW102, SW103, or SW104 defective. |

SPECIFICATIONS

Display Patterns*

| | |
|------------------------|--|
| Raster | Blank. |
| Horizontal Lines | 1, 7, 15. |
| Vertical Lines | 1, 11, 21. |
| Crosshatch | 1 × 1 matrix. 7 × 11 matrix. 15 × 21 matrix. |
| Dots | 1 × 1 matrix. 7 × 11 matrix. 15 × 21 matrix. |
| Rainbow | No luminance. |
| Gated Rainbow | 3 bars with luminance. 10 bars with luminance. |
| Chroma Carrier | 3563.795 kHz ±0.005%, crystal controlled. |
| Master Timer | 377.616 kHz ±0.005%, crystal controlled. |
| RF Carrier | Channel 4; 67.250 MHz ±0.005%, crystal controlled. Customer option Channel 3; 61.250 MHz ±0.005%, crystal controlled. |
| RF Output Level | 5000 μ V minimum into 300 Ω . |

*The density of the displayed pattern depends on the overscan characteristics of the television set.

| | |
|-----------------------------------|---|
| Video Modulation Percentage | 50% (approximately). |
| On Time Interval | 5 minutes minimum. OFF pushbutton switch overrides time-out. |
| Power Requirements | Two 9-volt transistor batteries with 180 mAh capacity (NEDA #1604). |
| Dimensions | 5.4" long × 2.75" wide × 1.15" high. (12.7 cm long × 6.99 cm wide × 2.91 cm high.) |
| Weight | 0.5 lb (0.225 kg). |

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

CIRCUIT DESCRIPTION

The Color Generator is composed of four basic circuits. Each will be described as a separate function.

POWER SOURCE

Two 9-volt batteries supply a +18 volts to the RF, color, and video generator circuits through a switch and time delay circuit. FET Q3 is turned on when ON switch SW202 is pressed. This turns on pass transistor Q2. Capacitor C1 slowly charges, which slowly reduces the gate potential of Q3. When the gate-to-source voltage of Q3 reaches cutoff, Q3 will turn off. This turns Q2 off and disconnects the supply voltage from the remaining circuits. If OFF switch SW201 is pressed, Q3 is cut off and C1 is rapidly discharged.

RF OSCILLATOR

FET Q1 and its associated components form a 67.250 MHz (channel 4 frequency) oscillator. The tuned circuit formed by inductor L2 and capacitor C4, load the oscillator to insure it will start when power is applied. RF noise is isolated from the supply line with the filter formed by capacitors C2, C3, and choke L1. The RF signal is coupled to "hot-carrier" diode D2, where it is modulated by the video signal.

COLOR GENERATOR

Transistor Q5 and its associated circuitry form a 3563.795 kHz color signal oscillator. Trimmer C9 adjusts the frequency, while control R17 adjusts the color level. Transistor Q4 serves as a supply voltage switch and is controlled by the video generator.








VIDEO GENERATOR

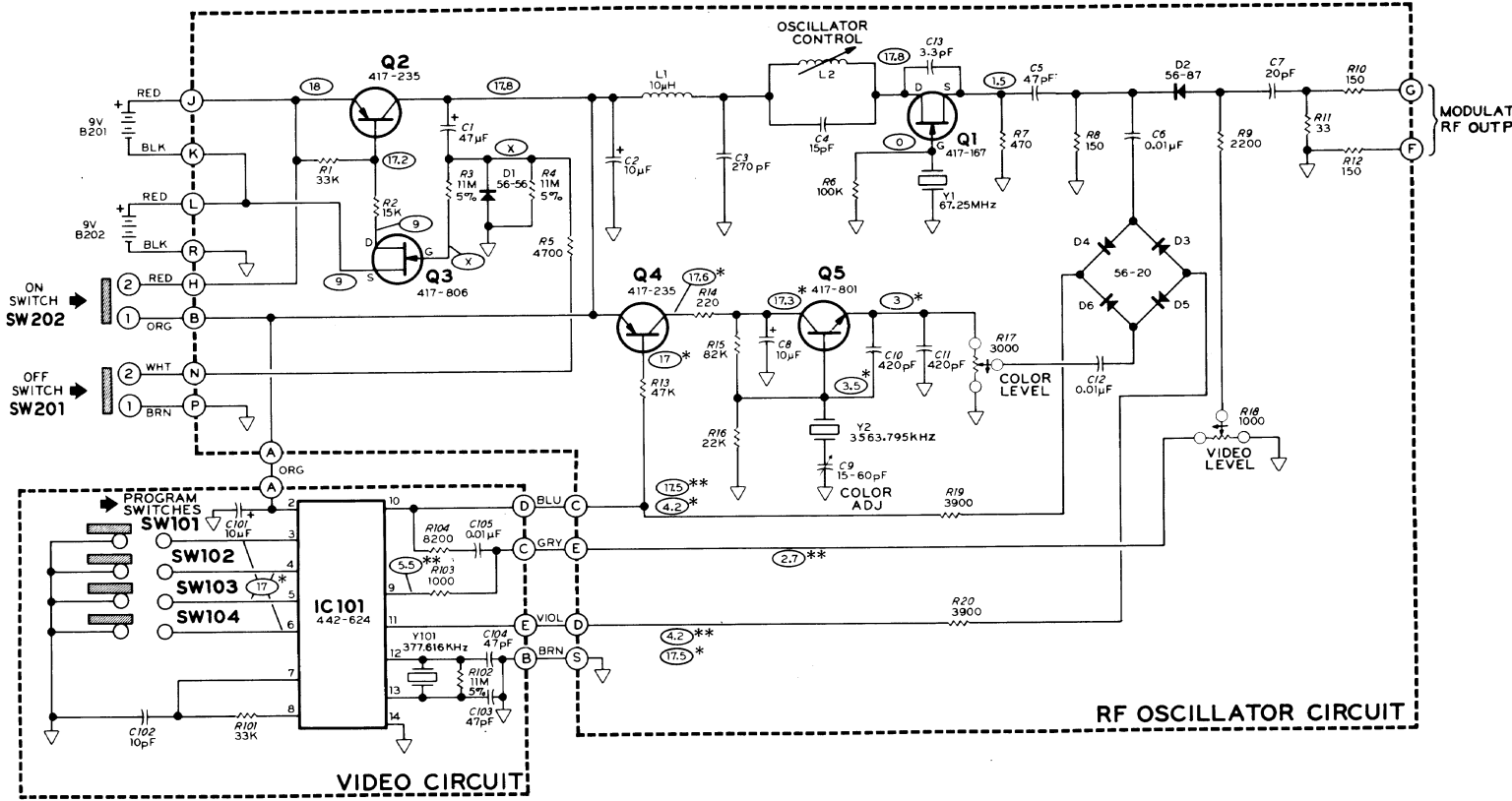
Integrated circuit IC101 is a complete dot-bar and color generation system. Crystal Y101 controls the internal oscillator that provides the various timing, synchronization, and video information required in the adjustment of color television receivers. Program switches SW101, SW102, SW103, and SW104 select the various video output signals. Two control signals are coupled to a switch formed by diodes D3, D4, D5, and D6, and transistor Q4. These two control signals switch the color generator and diode switch on and off as required.

The video signal is coupled through Video Level control R18 to diode D2, where it modulates the RF signal. When the Color Generator is turned on, its signal is mixed with the RF signal at D2. The modulated RF signal produced is then coupled through an impedance matching pad to the output cable.

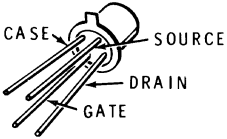
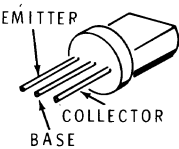
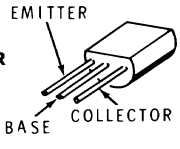
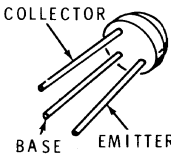
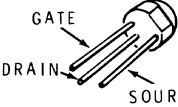
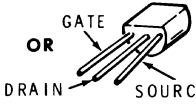
SCHEMATIC OF THE
HEATHKIT®
COLOR GENERATOR
MODEL IG-5240

SCHEMATIC NOTES:

1. ALL RESISTORS ARE 1/4-WATT, 10% UNLESS OTHERWISE NOTED.
RESISTOR VALUES ARE IN OHMS (K=1000, M=1,000,000).
2.  THIS SYMBOL INDICATES CIRCUIT GROUND.
3. ALL DC VOLTAGE MEASUREMENTS ARE MADE WITH A DC
VOLTMETER WITH 10 MEGOHM OR GREATER INPUT IMPEDENCE.
4.  THIS SYMBOL INDICATES A DC VOLTAGE MEASUREMENT TO
CIRCUIT GROUND, $\pm 10\%$, WITH THE GENERATOR TURNED ON,
REGARDLESS OF PROGRAM SWITCH POSITION.
5.  THIS SYMBOL INDICATES A DC VOLTAGE MEASUREMENT TO
CIRCUIT GROUND, $\pm 10\%$, WITH THE GENERATOR TURNED ON
AND A COLOR RAINBOW PATTERN PROGRAMMED (1111).
6.  THIS SYMBOL INDICATES A DC VOLTAGE MEASUREMENT TO
CIRCUIT GROUND, $\pm 10\%$, WITH THE GENERATOR TURNED ON,
AND A CROSSHATCH PATTERN PROGRAMMED (1101).
7.  THIS SYMBOL INDICATES THE DC VOLTAGE WILL DECREASE
WITH GENERATOR ON - TIME.
8.  THIS SYMBOL INDICATES A CIRCUIT BOARD WIRE
CONNECTION.
9.  ARROW INDICATES COUNTERCLOCKWISE CONTROL ROTATION.



TRANSISTORS

| CIRCUIT COMPONENT NUMBER | HEATH PART NUMBER | MAY BE REPLACED WITH | BASING DIAGRAM |
|-----------------------------|----------------------|-------------------------|---|
| Q1 | 417-167 | HEATH PART NUMBER |  |
| Q2, Q4 | 417-235 | 2N4121 |  OR  |
| Q5 | 417-801 | MPSA20 |  |
| Q3 | 417-806 | TIS75 |  OR  |

INTEGRATED CIRCUIT

| CIRCUIT COMPONENT NUMBER | HEATH PART NUMBER | MAY BE REPLACED WITH | BASING DIAGRAM |
|-----------------------------|----------------------|-------------------------------------|----------------|
| IC101 | 442-624 | NATIONAL SEMICONDUCTOR MM5322 | |