

MODEL

# IG-37 FM Stereo Generator

# HEATHKIT<sup>®</sup> ASSEMBLY MANUAL



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RICE \$2.00

595-1204-05

## INTRODUCTION

The Heathkit Model IG-37 FM Stereo Generator provides "on-the-air-type" signals for aligning monophonic and stereophonic FM receivers. It is a compact, accurate instrument which will produce the following output signals:

- A composite stereo signal for either left or right channel alignment.
- A phase test signal (left plus right channel) for accurate adjustment of subcarrier transformers.
- A pilot signal with adjustable output level for checking the lock-in range of stereo receivers.
- A monophonic FM signal that may be modulated by any one of three modulation frequencies.
- A variable RF oscillator signal with adjustable sweep width and a nominal frequency of 100 MHz.
- Four marker frequencies for RF alignment checks.
- Two SCA (Subsidiary communications authorization) signal frequencies for SCA filter adjustments.
- Completely shielded and selective RF attenuation.

The pilot signal and marker frequencies are crystal controlled for maximum accuracy and minimum frequency drift.

The IG-37 FM Stereo Generator is a precision instrument for service or engineering personnel and other individuals who need an accurate source of signals for the complete alignment of monophonic or stereophonic FM receiving equipment. The Generator is attractive, small in size, and ruggedly built, and it should provide you with many years of trouble-free operation.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

## PARTS LIST

The numbers in parentheses are keyed to the numbers in the Parts Pictorial (fold-out from Pages 3, 4, and 5). NOTE: When more than one number is on a package, disregard all but the part number, as listed below.

To order a replacement part, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual.

PART No.	PARTS Per Kit	DESCRIPTION
<b>RESISTORS</b>		
<b>1/2 Watt</b>		
(1) 1-123	8	100 $\Omega$ (brown-black-brown-gold)
1-66	2	150 $\Omega$ (brown-green-brown)
1-48	2	390 $\Omega$ (orange-white-brown)
1-63	3	510 $\Omega$ (green-brown-brown-gold)
1-8	2	820 $\Omega$ (gray-red-brown)
1-11	4	1500 $\Omega$ (brown-green-red)
1-14	2	3300 $\Omega$ (orange-orange-red)
1-43	6	4700 $\Omega$ (yellow-violet-red-gold)
1-20	3	10 K $\Omega$ (brown-black-orange)
1-69	1	18 K $\Omega$ (brown-gray-orange)
1-22	1	22 K $\Omega$ (red-red-orange)
1-25	2	47 K $\Omega$ (yellow-violet-orange)
1-60	1	68 K $\Omega$ (blue-gray-orange)
1-26	2	100 K $\Omega$ (brown-black-yellow)
1-27	3	150 K $\Omega$ (brown-green-yellow)
1-35	4	1 megohm (brown-black-green)
1-40	1	10 megohm (brown-black-blue)
<b>1/2 Watt Precision 1%</b>		
(2) 2-141	1	166 $\Omega$
2-178	1	1470 $\Omega$ (1.47 K)
2-67	1	2725 $\Omega$ (2,725 K)
2-180	1	2940 $\Omega$ (2,94 K)
2-69	1	4590 $\Omega$ (4,59 K)
2-181	1	5490 $\Omega$ (5,49 K)
2-155	1	13.5 K $\Omega$
2-182	1	22.1 K $\Omega$
2-183	1	44.2 K $\Omega$
2-184	1	110 K $\Omega$
2-185	1	222 K $\Omega$
2-186	1	280 K $\Omega$
2-187	1	536 K $\Omega$
<b>2 Watt</b>		
(3) 1-16-2	1	330 $\Omega$ (orange-orange-brown)

<b>CAPACITORS</b>		
<b>Disc</b>		
(4) 21-3	1	10 pf

PART No.	PARTS Per Kit	DESCRIPTION
<b>Disc (cont'd.)</b>		
21-6	2	27 pf
21-75	1	100 pf
21-22	1	220 pf
21-140	5	.001 $\mu$ fd
21-35	2	.005 $\mu$ fd, 1600 V (1.6 KV)
21-95	1	.1 $\mu$ fd
21-99	1	.2 $\mu$ fd
<b>Molded Mica</b>		
NOTE: These capacitors may be color coded, or the value may be printed on them. If necessary, refer to the capacitor color code chart and example to help identify these capacitors. Capacitors with the value stamped on them may have a body that is any color.		
(5) 20-39	1	220 pf (red-red-brown)
20-43	1	390 pf (orange-white-brown)
20-89	2	817 pf
20-74	2	4000 pf (yellow-black-red)
<b>Silver Mica</b>		
(6) 20-133	2	430 pf
20-134	1	680 pf
20-122	1	1000 pf
20-137	2	1800 pf
<b>Mylar*</b>		
(7) 27-27	5	.022 $\mu$ fd
27-28	2	.1 $\mu$ fd
<b>Electrolytic</b>		
(8) 25-39	1	2 $\mu$ fd, 150 V
25-20	2	40 $\mu$ fd, 150 V
(9) 25-178	1	100/40/40 $\mu$ fd, tab mount
<b>Other Capacitors</b>		
(10) 26-115	1	6.2 pf, variable
(11) 31-9	1	Ceramic trimmer
(12) 31-18	1	Dual ceramic trimmer
(13) 21-142	1	100 pf (brown-black-brown) feedthrough
21-53	2	1000 pf (brown-black-red) feedthrough
(14) 23-74	1	.04 $\mu$ fd tubular
(15) 28-2	1	1 pf phenolic (brown-black-white-silver)

\*DuPont Registered Trademark

<u>PART No.</u>	<u>PARTS Per Kit</u>	<u>DESCRIPTION</u>	<u>PART No.</u>	<u>PARTS Per Kit</u>	<u>DESCRIPTION</u>
<b>CONTROLS</b>			<b>CONNECTORS-PLUG-SOCKETS-STRIPS</b>		
(16)10-214	1	5000 $\Omega$	(32)432-1	1	Female connector
(17)19-109	1	5000 $\Omega$ control with SPST switch	(33)432-3	2	Male chassis connector
(18)10-52	1	2000 $\Omega$ tab mount	(34)438-10	1	300 $\Omega$ twin lead plug
10-57	2	10 K $\Omega$ tab mount	(35)434-77	5	Wafer 9-pin tube socket
			(36)434-36	1	Ceramic 9-pin tube socket
			(37)434-74	2	Crystal socket
			(38)434-38	1	Output socket
			434-23	1	Lamp socket
			(39)431-15	3	1-lug terminal strip
			(40)431-50	1	1-lug terminal strip
			431-14	1	2-lug terminal strip
			(41)431-12	1	4-lug terminal strip
			(42)431-40	1	4-lug terminal strip
			431-11	1	5-lug terminal strip
			431-55	2	6-lug terminal strip
<b>SWITCHES</b>			<b>CRYSTALS-DIODES-LAMPS-TUBES</b>		
(19)60-1	1	SPST slide	(43)404-245	1	5.35 MHz crystal
60-2	3	DPDT slide	(44)404-244	1	19 kHz crystal
(20)63-445	1	5-position 1-wafer rotary	(45)56-26	2	Crystal diode
(21)63-446	1	6-position 2-wafer rotary	(46)57-27	1	Silicon diode
			412-2	1	120 volt 3-watt lamp
			(47)412-15	1	Neon pilot lamp (NE-2H)
			411-68	1	6AN8 tube
			411-114	1	6AU8 tube
			411-25	3	12AU7 tube
			411-24	1	12AT7 tube
<b>COILS-TRANSFORMERS</b>			<b>CABLE-SLEEVING-WIRE</b>		
<b>Coils</b>			347-2	1	300 $\Omega$ twin lead
(22)45-39	1	RF choke	343-2	1	Coaxial cable
(23)40-607	1	19 kHz oscillator	89-23	1	Line cord with plug
40-608	2	38 kHz doubler and buffer	346-1	1	Sleeving
40-610	2	Low-pass input and output filter	340-8	1	Bare wire
40-611	1	Low-pass center-leg filter	344-52	1	Red wire
40-612	1	100 MHz oscillator	344-53	1	Orange wire
(24)40-609	1	19 kHz phasing	344-55	1	Green wire
			344-59	1	White wire
			344-56	1	Blue wire
			344-54	1	Yellow wire
			344-50	1	Black wire
<b>Transformers</b>			<b>NOTE: The black wire is extra and is to be used if additional wire is needed. For instance, you may possibly cut one of the lengths too short. If this should occur, use the black wire for this entire length instead of splicing two pieces together.</b>		
(25)52-80	2	38 kHz balanced modulator			
54-117-24	1	Power			
<b>GROMMETS-INSULATORS-CLAMPS-CLIPS</b>					
(26)73-43	2	3/8" plastic grommet			
73-45	1	1/2" plastic grommet			
(27)73-20	1	Red test clip insulator			
73-21	1	Black test clip insulator			
(28)75-71	1	Line cord strain relief			
75-30	1	Line cord strain relief *(for round line cord)			
(29)260-1	4	Alligator clip			
(30)260-7	1	Coil mounting clip			
260-8	1	Clothespin antenna clip			
(31)260-29	2	Crystal clip			

\*This strain relief is to be used in areas, mainly outside of the U.S.A., where 2 or 3-wire round line cords are required.

PART No.	PARTS Per Kit	DESCRIPTION	PART No.	PARTS Per Kit	DESCRIPTION
<b>HARDWARE</b>			<b>METAL PARTS</b>		
<b>#3 Hardware</b>			(78)200-486-1	1	Chassis
(48)250-49	12	3-48 x 1/4" screw	(79)203-480-1	1	Front panel
(49)250-133	2	3-48 x 7/16" bronze screw	(80)203-481-1	1	Rear panel
(50)250-311	1	3-48 x 5/8" screw	(81)90-350-4	2	Cabinet half-shell
(51)252-1	15	3-48 nut	(82)204-774-1	1	Left siderail
(52)254-7	15	#3 lockwasher	(83)204-775-1	1	Right siderail
<b>#6 Hardware</b>			(84)204-759-1	4	Siderail end cap
(53)250-270	4	6-32 x 3/8" black screw	(85)206-341	1	Oscillator shield
(54)250-56	17	6-32 x 1/4" screw	(86)206-342	1	Oscillator shield cover
(55)250-229	14	6-32 x 1/4" phillips screw	(87)206-343	1	Attenuator shield
(56)250-89	3	6-32 x 3/8" screw	(88)206-344	2	Attenuator shield divider
(57)250-162	4	6-32 x 1/2" screw	(89)210-35	1	Bezel
(58)250-365	4	#6 x 1/4" sheet metal screw	<b>GENERAL</b>		
(59)250-8	10	#6 x 3/8" sheet metal screw	75-90	1	Insulating paper
(60)252-3	18	6-32 nut	(90)206-3	1	Tube shield
(61)254-1	33	#6 lockwasher	(91)211-33	2	Handle
(62)259-1	7	#6 large solder lug	(92)261-30	2	Line cord retainer
(63)259-6	1	#6 small solder lug	(93)261-28	4	Foot
(64)250-535	4	6-32 decorative head screw	(94)413-10	1	Red lens
(65)250-304	4	6-32 mounting stud-spacer	(95)462-245	5	Knob
<b>#8 Hardware</b>			(96)481-1	1	Capacitor mounting wafer
(66)250-137	2	8-32 x 3/8" screw	(97)391-34	1	Blue and white label
(67)252-4	2	8-32 nut	(98)490-1	1	Plastic alignment tool
(68)253-9	2	#8 flat washer	(99)490-5	1	Nut starter
(69)254-2	2	#8 lockwasher	597-260	1	Parts Order Form
<b>Other Hardware</b>			597-308	1	Kit Builders Guide
(70)250-3	3	4-40 x 3/16" screw		1	Manual (See front cover for part number.)
(71)254-9	3	#4 lockwasher			Solder
(72)252-7	6	Control nut			
(73)254-4	3	Control lockwasher			
(74)259-10	2	Control solder lug			
(75)253-10	4	Control flat washer			
(76)252-32	1	Push-on speednut			
(77)455-50	5	Knob bushing			

NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rate of exchange.

## GENERATOR ALIGNMENT

Before starting the alignment procedure, carefully study the operation of each control and switch as described in Figure 1 (fold-out from this page).

### EQUIPMENT REQUIRED

1. AC VTVM.
2. FM tuner or receiver.
3. Oscilloscope.

Refer to Figure 2 (fold-out from Page 39) for the adjustment locations and to Figure 3 (fold-out from Page 39) for the test point locations. If you do not obtain the proper results in the following tests, or if improper operation occurs, refer to the In Case Of Difficulty section on Page 43.

### 19 kHz OSCILLATOR ADJUSTMENT

- ( ) Turn on the Generator with the PILOT LEVEL control. The PWR ON lamp and all tube filaments should glow. The 3 watt lamp should not light. If everything appears normal, proceed with the following steps.
- ( ) Place the FUNCTION switch in the AUDIO/MONO FM position and the FREQUENCY switch in the 5000 Hz position. Allow the Generator and test equipment to reach normal operating temperature.
- ( ) Connect either an AC VTVM or Oscilloscope (or both) to test point TP-1. A 19 kHz waveform with an amplitude of at least 1 volt rms should be present.
- ( ) Adjust the slug in coil L1 clockwise (viewed from the bottom of the chassis) until the 19 kHz oscillator stops oscillating as indicated by a sharp decrease in the voltage or oscilloscope signal at test point TP-1.
- ( ) Adjust the slug in coil L1 counterclockwise until the oscillator just starts to oscillate. Now turn the slug one full turn counterclockwise. If the voltage reading is greater than 3 volts rms, continue to turn the coil counterclockwise until the voltage decreases to 3 volts rms. If you cannot adjust the voltage down to 3 volts rms, or if the reading is below 1 volt rms, refer to the In Case Of Difficulty section.

### AUDIO OSCILLATOR ADJUSTMENT

- ( ) Connect the AC VTVM or Oscilloscope (or both) to the COMPOSITE SIG/AUDIO connector on the front panel.
- ( ) Turn the FUNCTION LEVEL control fully clockwise.
- ( ) Adjust the OSC ADJUST control (top of chassis) until oscillation occurs as shown by a reading on the AC VTVM or a waveform on the oscilloscope.
- ( ) Turn the FREQUENCY switch to the 19 kHz position. The voltage should be between .95 and 2 volts rms. Note the voltage reading. Now turn the FREQUENCY switch back to the 5000 Hz position and adjust the OSC ADJUST control until the same voltage reading, as noted in the 19 kHz position, is obtained.
- ( ) Turn off the Generator and disconnect the AC VTVM and Oscilloscope.

### AUDIO OSCILLATOR CALIBRATION

The audio oscillator calibration requires temporarily connecting two precision resistors in its circuit. After calibration, the oscillator circuit will be returned to its normal configuration.

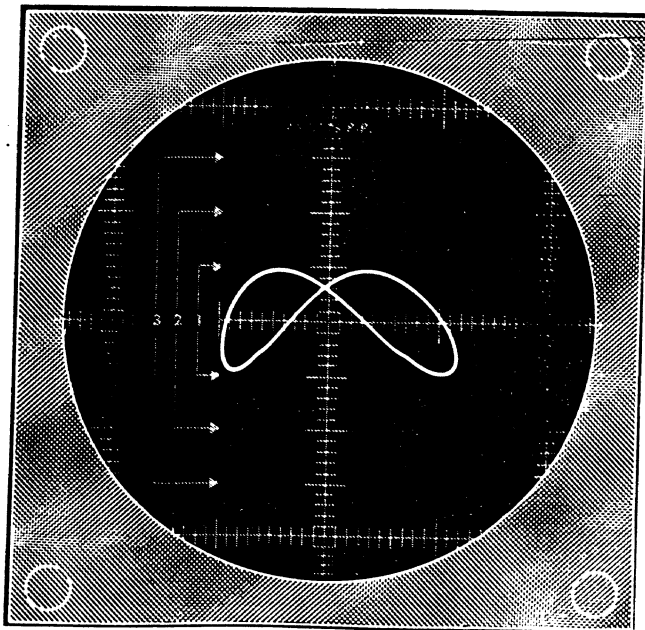
Refer to Figure 3 for the following steps.

- ( ) Disconnect the white wire at lug 2 of trimmer capacitor BF. Move this wire up out of the way.
- ( ) Unsolder the lead of the 1000 pf silver mica capacitor connected to lug 6 on wafer B of switch AA.
- ( ) Locate the 4590  $\Omega$  and the 13.5 K $\Omega$  precision resistors. Twist together and solder the leads at one end of these precision resistors.
- ( ) Tack-solder the twisted-together leads to test point TP-2 (lug 2 of trimmer capacitor BF).

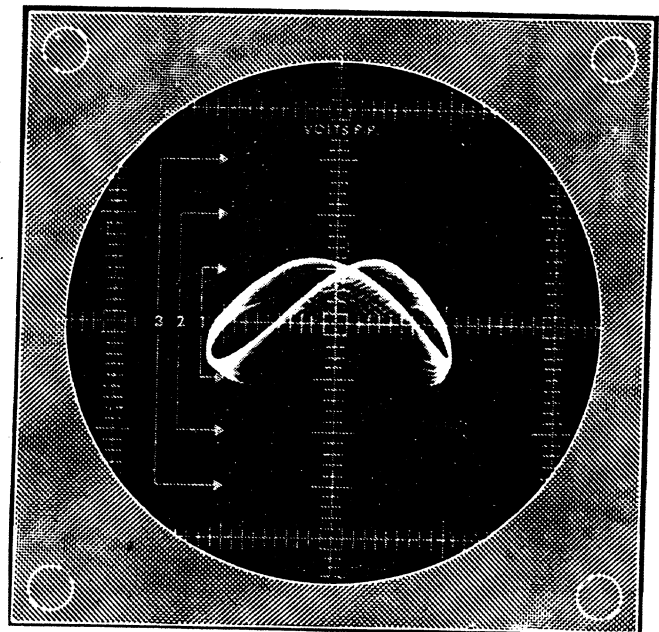
- ( ) Tack-solder the free lead of the 13.5 K $\Omega$  precision resistor to lug 1 of trimmer capacitor BF.
- ( ) Tack-solder together the free lead of the 4590  $\Omega$  precision resistor and the free lead of the 1000 pf silver mica capacitor as shown in Figure 3. This is test point TP-3.
- ( ) Connect the horizontal input of the oscilloscope to testpoint TP-1. Set the oscilloscope horizontal sweep control to the external sweep position.
- ( ) Connect the vertical input of the oscilloscope to the COMPOSITE SIG/AUDIO output connector on the front panel.
- ( ) Turn on the Generator and adjust the FREQ ADJUST trimmer, from the top of the chassis, until the oscilloscope trace becomes a circle (a type of Lissajous figure) indicating a beat of 1 Hz or less.
- ( ) Turn off the Generator and disconnect the oscilloscope leads. Then remove the precision resistors.
- ( ) Permanently reconnect the white wire to lug 2 of trimmer capacitor BF.
- ( ) Permanently reconnect the 1000 pf resin capacitor to lug 6 on wafer B of switch AA.

**38 kHz SYNC ADJUSTMENT**

- ( ) Connect the oscilloscope or AC VTVM to test point TP-4.
- ( ) Turn on the generator.
- ( ) Adjust the slugs in coils L2 and L3 for a maximum voltage indication. This voltage should have an amplitude of 1 to 2 volts rms.
- ( ) Disconnect the oscilloscope or AC VTVM that is connected to test point TP-4.
- ( ) Connect the oscilloscope horizontal input to test point TP-1 and the vertical input to the COMPOSITE SIG/AUDIO connector on the front panel.
- ( ) Turn on the Generator and place the FREQUENCY switch in the 38 kHz position.
- ( ) Adjust the 38 kHz SYNC trimmer capacitor (on the rear panel) until a steady trace appears on the oscilloscope. This trimmer should be adjusted to the lowest capacitance necessary to maintain a steady trace on the oscilloscope. See Figure 4. NOTE: The trimmer capacitance is decreased by turning the screw counterclockwise.



**CORRECT**



**INCORRECT**

**Figure 4**

