



**HK IB**

**"PERSONALIZED"**

**KEYER**

**TECHNICAL  
DESCRIPTION  
AND  
OPERATING  
INSTRUCTIONS**

**HAMMARLUND**

**Hammarlund Manufacturing Company, Inc.**

*A Giannini Scientific Co.*

53 West 23rd Street, New York 10, N. Y.

Export Department 13 East 40th Street, New York 16, N. Y.

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## TECHNICAL SPECIFICATIONS

Power Source . . . . . 22½ volt Battery Burgess  
#4156 RCA VS102 or equivalent  
(not supplied)

Speed Range. . . . . Approximately 8 WPM to 50 WPM

Keying Monitor . . . . . Self contained tone generator with  
built-in PM type speaker

Transmitter Keying . . . . . Keying relay SPST., contacts rated  
at 1 ampere with proper contact  
spark suppression.

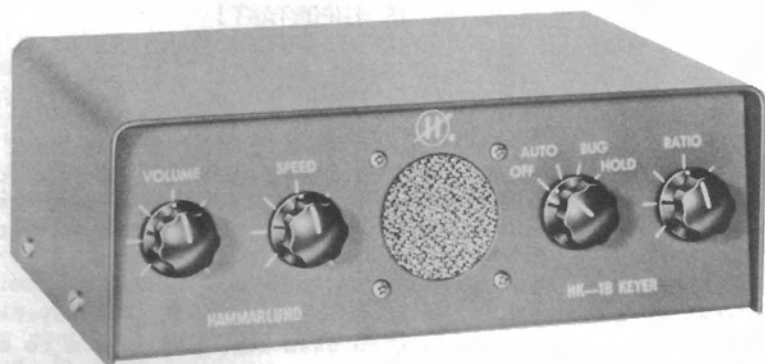
Transmitter Control. . . . . 2 Terminals on rear marked  
keying Hi & Lo

Dimensions . . . . . 7" long, 4¼" deep overall x 2½" high

Net Weight . . . . . 2.5 pounds less battery

Shipping weight. . . . . 3.4 pounds

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## HAMMARLUND KEYER

### INTRODUCTION:

1. The Hammarlund Keyer Model HK1B is a compact, efficient transistor code generator with a self contained battery power supply, which in conjunction with any of the several key paddles available, generates smooth effortless code transmission. From approximately 8 wpm to 50 wpm.

Additional features are a pleasing sidetone signal with volume adjustable for monitoring or code practice with side tone muting if desired, and wide speed range with adjustable dot/dash ratio to please every taste. Since it is battery operated there is no warm-up time or bothersome power cord to add to the rats nest behind the table -- making the unit truly independent of ext. power for both excellent stability and true portability -- just the thing for field day exercises.

### 2. Installation.

After unpacking note carefully if there is any damage which may have occurred during shipping. Should damage be apparent file claim with carrier immediately, stating extent.

Battery installation notes. A 22½ volt Burgess type 4156 or equivalent is required for this unit.

## THE FOLLOWING IS IMPORTANT!

When unit is opened, two leads with lugs attached will be visible. One is red, the other is black. The red lead must be connected to the positive (+) terminal of battery - The black to the negative (-). It is possible that damage to the transistors may occur if leads are connected to the battery incorrectly.

2a. The keyer may be placed in any convenient location barring excessively warm or hot spots such as near heating vents, radiators or stoves.

### 3. REAR PANEL TERMINAL BOARD.

Lugs marked dash-com-dot are used to connect paddle to keyer (dot contact to dot lug, dash contact to dash lug, paddle arm to com.) Terminals marked Key Jack or terminals to transmitter to Keying jack on your rig. If a phone plug is used connect hot terminal to tip and ground or low side to sleeve of plug. This ties keyer chassis to transmitter chassis and eliminates possibility of shock. A weight control is also located on rear apron to adjust mark/space ratio.

### 3a. RELAY CONTACT PROTECTION NETWORK.

Relay contacts must be provided with a resistor capacitor network to prevent arcing and pitting of the contacts which would eventually impair the keying accuracy. This network is shown in fig. 3 and should be installed on the Hi-Low keying terminals on TB102. Choose the values for your particular requirements from table (see fig. 3)

Example: Keyed CKT voltage 150 v.  
Keyed CKT current 80 ma.  
R = 400 c = .001 mfd.

### 4. FRONT PANEL CONTROLS.

Function control is a four position rotary switch with following positions.

- Pos. 1 - Off
- 2 - On - Automatic Dots & Dashes
- 3 - Bug - Auto Dots - Manual Dashes
- 4 - Hold - For transmitter tuning - Key down Condition

Speed Control:

Adjusts keying speed between approximately 8 to 50 wpm.

Volume Control:

Adjusts loudness of side tone from speaker.

Dot/Dash Ratio Control:

This control sets the relative duration of dot and space to dash length and has been made adjustable in order to please the widely varying preferences of different operators.

## 5. MODES OF OPERATION:

Turn function switch to Auto - this turns on keyer in full automatic standby position. If key paddle is now moved to left a string of dashes will be produced, if moved to right a string of dots will be produced. The speed control will change the number of dots and dashes produced per second, equivalent to changing the operating speed of keyer. The standard word is equal to 24 dots and spaces. 10 wpm is equal to 4 dots per second or 240 dots per minute. The spacing between dots and dashes are always uniform. A convenient way to calibrate your keyer speed is to count the number of dashes in 5 seconds on your watch - this will be equivalent to the speed in words per minute.

5a. Code similar to a mechanical "bug" can be obtained by moving function switch to bug pos. In this position the dots are still automatically produced but the dash is now continuous and can be manually controlled as you would on any bug type of key. The speed control now equivalent to the sliding weight on the bug should be set to produce a dot speed consistent with your ability to produce smooth code in this mode of operation.

5b. The hold pos. closes transmit contacts and turns on side tone as a reminder to turn off after tune up.

## 6. ADJUSTMENT.

The weight control on the rear apron should be adjusted for an overall one to one mark space ratio. The most accurate way to do this is to connect an oscilloscope to the transmitter output so that the keyed output may be seen. However setting by ear is entirely satisfactory. The keyer was adjusted for the proper ratio at the factory and the rear panel control allows finer adjustment if it is deemed necessary by the operator.

## 7. THEORY OF OPERATION.

The design of this keyer provides exceptionally stable operation as no multivibrators or other critical circuitry is used. Transistor Q1 acts as the pulse generator in conjunction with Relay K1 but draws no current until the key is closed. At the moment the key is closed either on dash side or dot side the full battery voltage is applied through the back contact on Relay 1 to the base of Q1 through the timing networks and the speed control. This causes Q1 to conduct pulling in relay K1 - breaking the back contact from the battery and allowing Q1 to cut off again. The time Q1 conducts is determined by which timing capacitor is charged and the resistance in the base of Q1. The timing capacitor discharges through the ratio control, the speed control and the base emitter diode of Q1. The Dot/Dash ratio control is between each timing capacitor and allows the proper differential to be set. Transistor Q2, the keying generator, is connected to the base of Q1 and does not conduct until Q1 conducts. The Relay K2 in the collector of Q2 keys the transmitter and turns on the side tone oscillator, Q3.

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A variable resistance (the weight control) across the coil of K2 shunts some of the collector current around the coil so as to cause K2 to drop out slightly before K1. This provides adjustment for proper mark/space ratio.

The collector and emitter of Q3 is shunted across Q2 but its base is brought out to the function switch through a 27K resistor for the bug mode of operation. Q4 is connected as a Hartley oscillator to provide side tone. Its base is normally reversed biased to cut off, on the back contact of the keying relay K2. When K2 is energized its armature which is at positive potentials (reverse biasing Q4) moves away from the back contact and allows Q4 to oscillate. The forward contact is closed keying the transmitter. Note that all the transistors are in cut off cond. when unit is on but key is not closed. In this condition the standby drain from the battery is approximately 1 ma. When key is closed all transistors conduct and the total peak current drain from the battery is approximately 8 to 10 ma. A large capacity battery is used and when the negligible standby current is considered, the result is exceptionally long battery life.

#### 8. SERVICE

The chassis can be exposed upon removing the cabinet cover. Good accessibility was provided in the design of the cabinet and all components can be easily reached. This keyer should provide very long service life. However if a malfunction occurs the schematic diagram and the discussion of operating theory in section 7 will help in locating the trouble.

#### NOTE:

For further information regarding operation or servicing of the keyer contact the dealer from whom the unit was purchased or write directly to the Hammarlund Mfg. Co., Inc. Service Dept. 53 West 23rd St., New York 10, N.Y.

Do not ship defective units to the factory without first requesting authorization, as the Hammarlund Mfg. Co. will not accept responsibility for unauthorized shipments.

We reserve the right to make revisions in production of equipment and assume no obligation to incorporate such versions in earlier models.

**NOTE**  
**DO NOT AT ANY TIME SHIP**  
**EQUIPMENT TO NEW YORK ADDRESS**  
**UNLESS REQUESTED TO DO SO.**

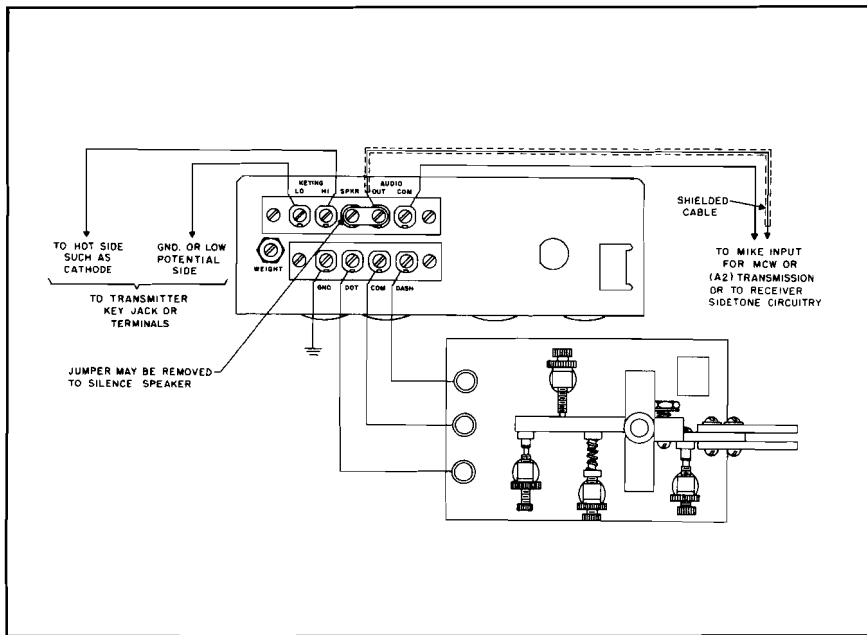


Figure 1 - Paddle Connections

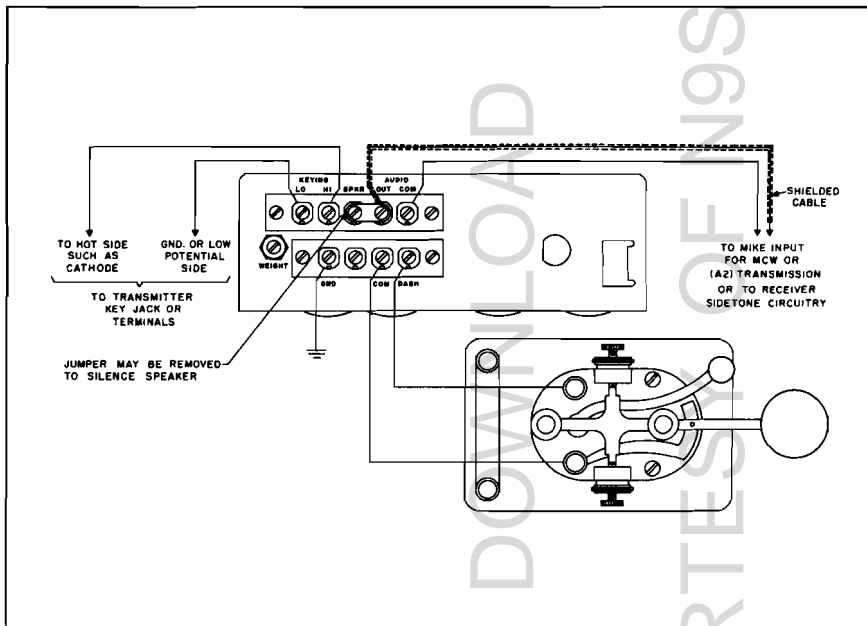


Figure 2 - Straight Key Connections with Switch in Bug Position

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CURRENT - MILLIAMPERES		VOLTAGE																							
		5		10		20		30		50		70		100		150		200		300		400		500	
		R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C
20															2500	.001	2750	.001	3000	.001	3250	.001	3500	.001	
30													1800	.001	1400	.001	1500	.001	1750	.001	1800	.001	2250	.001	
40											1800	.001	1250	.001	1000	.001	1100	.001	1750	.001	1450	.001	1750	.001	
50									2500	.001	1500	.001	1000	.001	800	.001	900	.001	1000	.001	1250	.001	1500	.001	
60									1500	.001	1000	.001	750	.001	600	.001	700	.001	800	.001	950	.001	1500	.001	
70							3500	.001	1100	.001	700	.001	600	.001	500	.001	600	.001	700	.001	800	.001	1000	.001	
80							2500	.001	800	.001	600	.001	500	.001	400	.001	500	.001	600	.001	700	.001	800	.001	
90							1750	.001	600	.001	450	.001	400	.001	350	.001	400	.001	500	.001	600	.001	750	.001	
100							1250	.001	550	.001	400	.001	350	.001	300	.001	375	.001	450	.001	500	.001	650	.001	
150					2500	.0025	450	.0025	250	.0025	175	.0025	175	.0025	175	.0025	225	.0025	300	.0025	350	.0025	400	.0025	
200				800	.004	225	.004	125	.004	125	.004	125	.004	125	.004	150	.004	200	.004	250	.004	300	.004		
300			1250	.01	200	.01	75	.01	50	.01	50	.01	60	.01	75	.01	90	.01	125	.01	150	.01	200	.01	
400			200	.015	60	.015	30	.015	30	.015	30	.015	40	.015	50	.015	60	.015	85	.015	100	.015	150	.015	
500	2500	.02	70	.02	30	.02	20	.02	20	.02	20	.02	30	.02	35	.02	50	.02	70	.02	90	.02	100	.02	
600	200	.04	20	.04	12	.04	12	.04	15	.04	17	.04	20	.04	30	.04	35	.04	55	.04	70	.04	80	.04	
700	30	.05	8	.05	7.5	.05	7.5	.05	10	.05	12	.05	17	.05	25	.05	30	.05	45	.05	60	.05	70	.05	
800	5.5	.07	3.6	.07	4.2	.07	5.0	.07	7.5	.07	10	.07	14	.07	18	.07	25	.07	40	.07	50	.07	60	.07	
900	1.0	.09	1.5	.09	2.5	.09	3.6	.09	5	.09	7	.09	12	.09	15	.09	20	.09	30	.09	40	.09	50	.09	
1000	0	.12	1.0	.12	1.7	.12	2.7	.12	4.5	.12	6	.12	10	.12	12	.12	18	.12	27	.12	37	.12	47	.12	

R = RESISTANCE IN OHMS  
C = CAPACITY IN MFD

Figure 3 - Resistance and Capacity Chart for Keying Relay Contacts.

PARTS LIST & SCHEMATICS - LOCATION OF PARTS, ETC.

Schematic Designation	Description	Hammarlund Part No.
C101, C104	Capacitor, Electrolytic 1 MFD 40V	K23932-5
C102	Capacitor, Electrolytic 3.2 mfd 40V	K23932-6
C103	Capacitor, Disc Ceramic .1 mfd +80% -20% 100V	M23034-29
C105	Capacitor, Electrolytic 100 mfd 40V	K23932-7
K101, K102	Relay, Miniature	K40411-1
Q101, Q102)	Transistors RCA 2N404	K40774-1
Q103, Q104)	All	
R101	Resistor, Variable 20 ohm $\pm 10\%$ W. (VOLUME)	K15372-4
R102	Resistor, Fixed 3.3 ohm $\pm 10\%$ $\frac{1}{2}$ W.	M19302-81
R103	Resistor, Variable 10K $\pm 20\%$ $\frac{1}{2}$ W. (RATIO)	K26218-12
R104	Resistor, Variable 50K $\pm 20\%$ $\frac{1}{2}$ W. (SPEED)	K26218-14
R105	Resistor, Fixed 470 ohm $\pm 10\%$ $\frac{1}{2}$ W.	K19309-41
R106, R107	Resistor, Fixed 27K $\pm 10\%$ $\frac{1}{2}$ W.	K19309-83
R108	Resistor, Fixed, 5.1K $\pm 5\%$ $\frac{1}{2}$ W.	K19309-214
R109	Resistor, Variable 25K $\pm 30\%$ .2 W. (WEIGHT)	K15383-3
R110	Resistor, Fixed 27K $\pm 10\%$ $\frac{1}{2}$ W.	K19309-83
S101	Switch, Function	K52017-1
SP101	Speaker, Miniature	K39087-1
T101	Transformer, Output	K40047-1
TB101	Terminal Strip	K51032-1
TB102	Terminal Strip	K51031-1

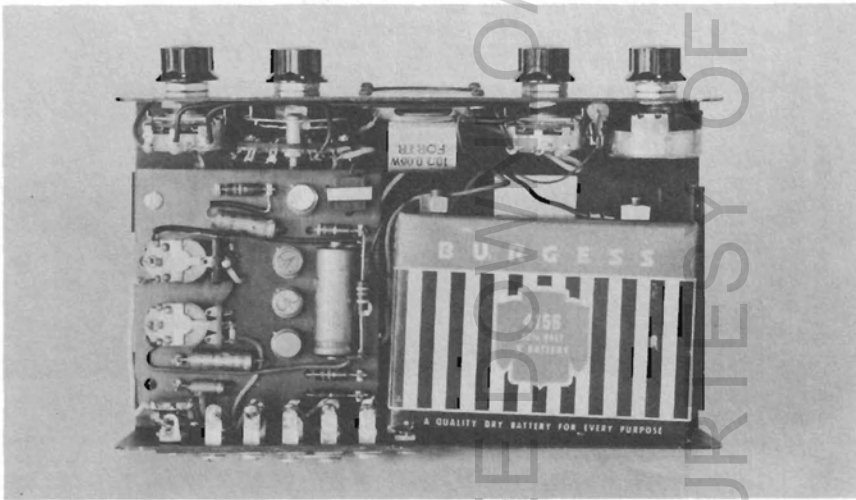


Figure 4 - Inside view showing battery in place.

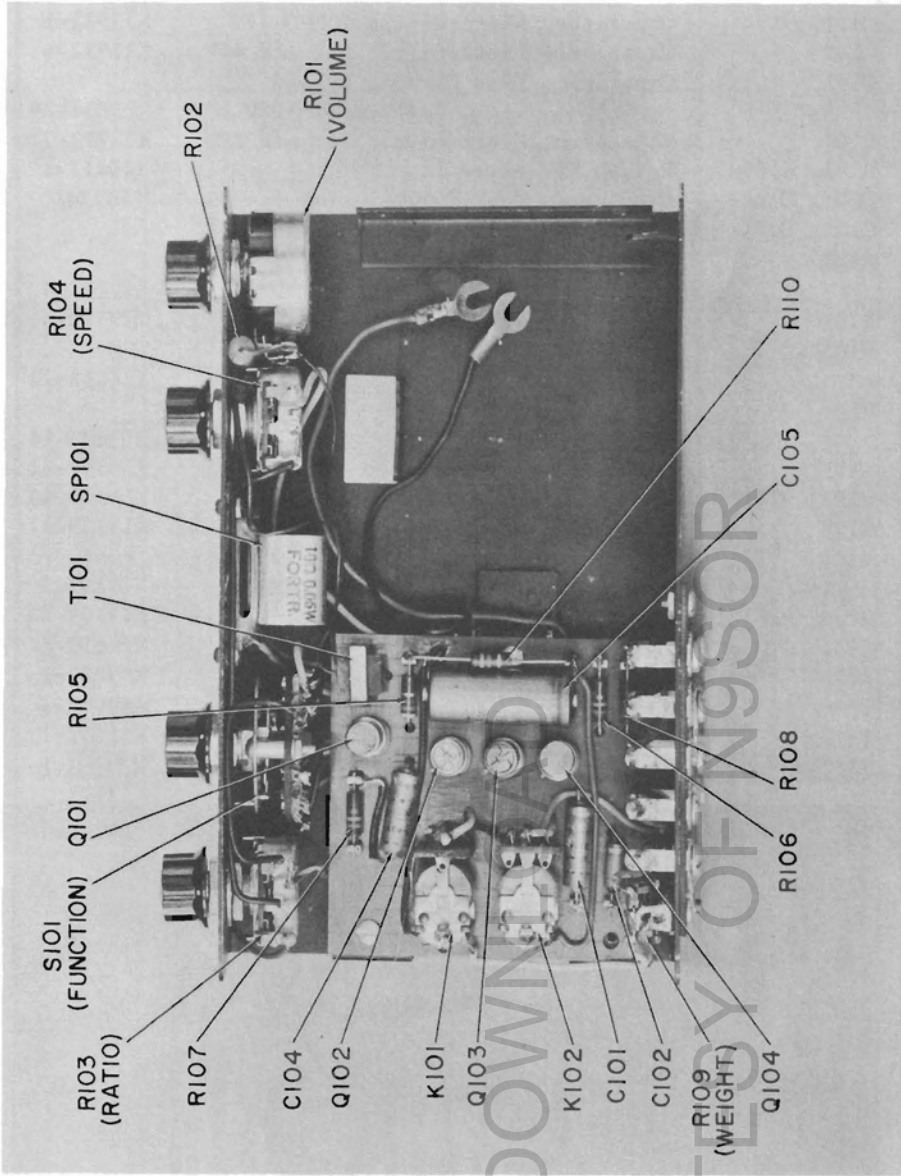


Figure 5 - Parts Identification

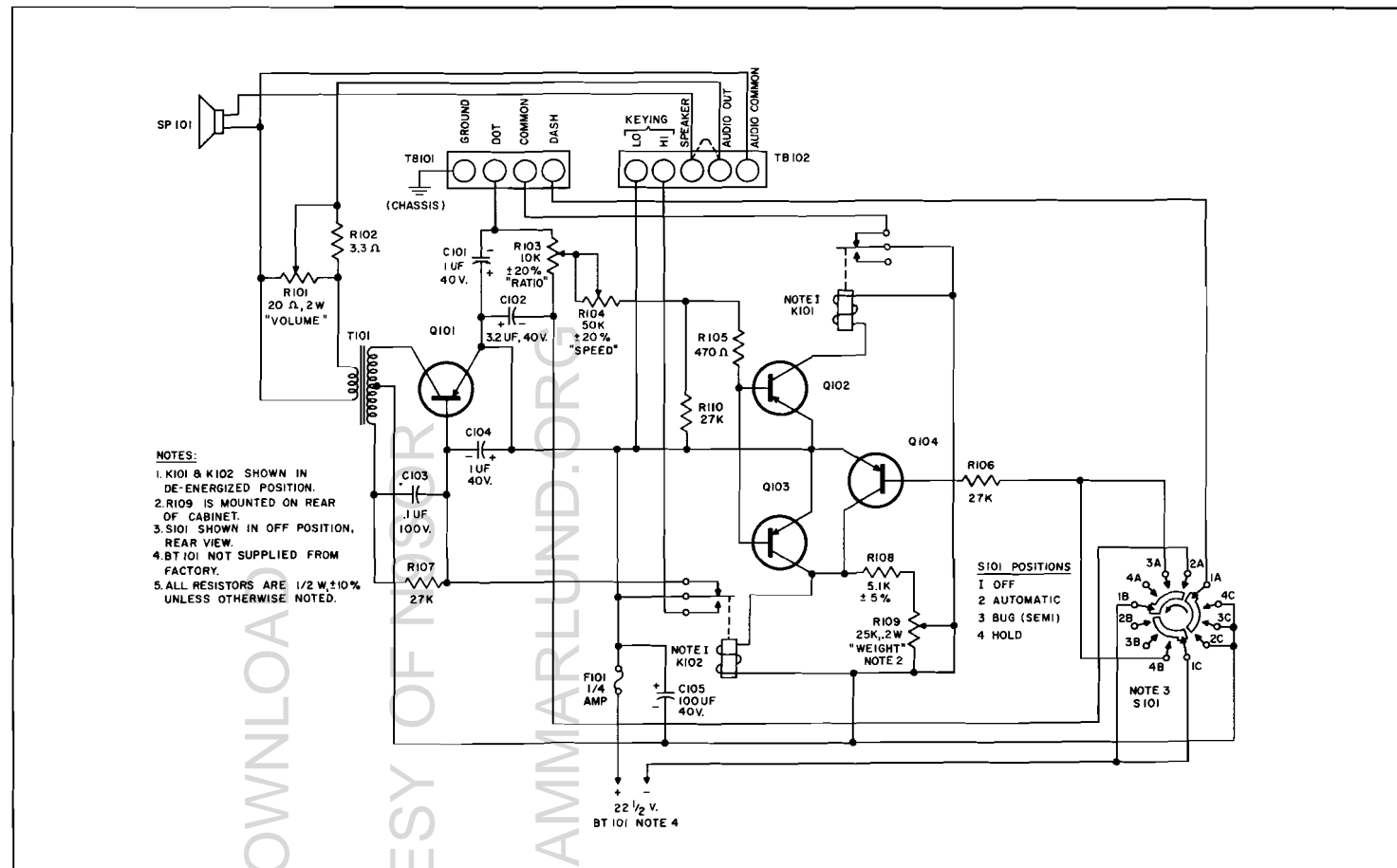


Figure 6 - Schematic Diagram Keyer HK-1B

## SERVICE NOTES

**Relays Sticking:** All cases so far, have been traced to some kind of RF feeding into the keyer. Usually, excessive S.W.R. in the transmission line will feed RF back at the keyer. The use of shielded lead from key paddle to keyer and from transmitter to keyer is strongly advised, also the keyer chassis must be directly grounded to the transmitter. Leads should be kept short as possible to prevent picking up stray RF. Addition of a RFC choke in series with the "HI" lead of the "HI-LOW" leads at the keyer end will usually be all that is necessary. If not, install the RFC at the transmitter end at the beginning of the keyer leads. Each station setup has its own individuality and the circuit sometimes must be played with. After obtaining maximum results with the RFC, and relays do not follow properly, add a .01 600 Volt capacitor from the HI side of the terminals marked "HI-LOW" to the ground terminal of the keyer. Also a .01 600 Volt disc capacitor should be placed from the HI lead to the ground of the transmitter at the transmitter end.

**Protective Relay Network:** If applicable, the resistor/capacitor network as described on page 4 of the manual should be hooked up in series and then placed across the "HI-LOW" terminals.

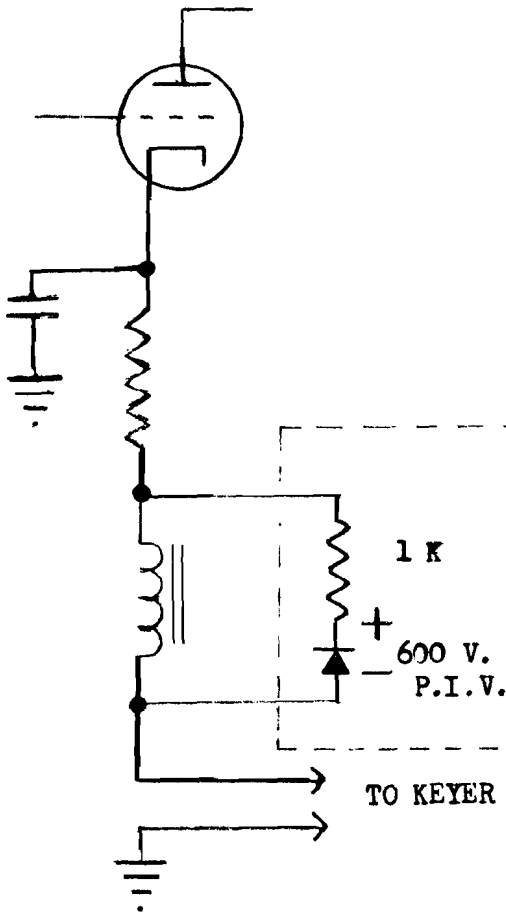
**Speed/Weight/Ratio:** In most cases the desired speed, weight and ratio can be obtained by adjusting the proper control which are located externally on the keyer. However, if the desired speed, within the keyer specifications, cannot be obtained, or other adjustments not obtainable within specification, interchanging the transistors in their sockets will be all that is necessary. Since all transistors are the same each is interchangeable with another. However, care should be taken not to break the transistor leads and be sure they are replaced properly in the socket.

IN CASE OF DIFFICULTY.....

When keying the HK-1B Keyer with transmitters using a cathode keyed circuit, in some instance, a voltage spike across the choke in the transmitters' cathode circuit causes the keyer relays to pitt, resulting in the relays sticking. The spike voltage will interfere with the operation of the keyer regardless of the protection network used as shown in the instruction manual.

For those transmitters using cathode keying we suggest the installation of a 1K 1 watt resistor and 600 volt PIV diode in series hooked across the choke. This is shown in the diagram below.

After the installation of the diode and resistor network, the relays may not work due to previous pitting of the relays. Therefore, use a piece of bond paper and with a buffing action, clean the contact points of the keyer. Do not try to adjust or change the spacing of the relay contacts. Dress the braided armature wire away from the relay spring. In some instances, the armature may tangle with the spring causing the relay to stop operating.



1 K 1 WATT  
DIODE 600V. P.I.V.  
ELIMINATES SPIKE

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**THE HAMMARLUND MANUFACTURING COMPANY, INC.**

**Standard Warranty**

The Hammarlund Manufacturing Company, Inc., warrants this equipment to be free from defects in workmanship and materials under normal and proper use and service for the uses and purposes for which it is designed, and agrees to repair or replace, without charge, all parts thereof showing such defects which are returned for inspection to the Company's factory, transportation prepaid, within a period of 90 days from date of delivery, provided such inspection discloses to the satisfaction of the Company that the defects are as claimed, and provided also, that the equipment has not been altered, repaired, subjected to misuse, negligence or accident, or damaged by lightning, excessive current or otherwise, or had its serial number or any part thereof altered, defaced, or removed. Tubes shall be deemed to be covered by the manufacturer's standard warranty applicable thereto, and such items shall be and are hereby excluded from the provisions of this warranty. Pilot lamps and fuses are not guaranteed for length of service.

Except as herein specifically provided, no warranty, express or implied, other than that of title, shall apply to any equipment sold hereunder. In no event shall the Company be liable for damages by reason of the failure of the equipment to function properly or for any consequential damages.

This Warranty is valid for the original owner of the equipment, and is contingent upon receipt of the Warranty Registration Card by the Company. No equipment shall be returned to the factory for repairs under warranty unless written authorization is obtained by the Company, and the equipment is shipped prepaid by the owner. The Company maintains Authorized Service Stations, names and locations of which will be sent upon request of the owner.

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THE HAMMARLUND MFG. CO.  
53 West 23rd Street  
New York 10, N.Y.

Subject.....HK1B keyer.

Dear OM:

This is to acknowledge your recent inquiry requesting additional information on the HK1B keyer. Below are listed some of the suggestions made to previous inquiries. We trust that this information will be of assistance.

Relays Sticking: All cases so far, have been traced to some kind of RF feeding into the keyer. Usually, excessive S.W.R. in the transmission line will feed RF back at the keyer. The use of shielded lead from key paddle to keyer and from transmitter to keyer is strongly advised, also the keyer chassis must be directly grounded to the transmitter. Leads should be kept short as possible to prevent picking up stray RF. Addition of a RFC choke in series with the "HI" lead of the "HI-LOW" leads at the keyer end will usually be all that is necessary. If not, install the RFC at the transmitter end at the beginning of the keyer leads. Each station setup has its own individuality and the circuit sometimes must be played with. After obtaining maximum results with the RFC, and relays do not follow properly, add a .01 600 Volt capacitor from the HI side of the terminals marked "HI-LOW" to the ground terminal of the keyer. Also a .01 600 Volt disc capacitor should be placed from the HI lead to the ground of the transmitter at the transmitter end.

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Trusting that the above information will be of assistance to you and provide proper operation of you unit, however, should there be any question about proper operation of the HK1B, please do not hesitate to write this department for assistance.

Very truly yours,

THE HAMMARLUND MFG. CO.

*Steve M. Fried*  
Steve M. Fried, K2PTS  
Service Manager, Communication Products