HW-101 Refurb

How a Club Loaner Rig Becomes New Again.

I purchased the rig and power supply for $75 from a **W5FC** club sale of some old gear. The radio worked, having been gone through by the venerable OM, Don (W9VE). However, a few issues cropped up, including an un-nulled carrier and a significant difference in USB and LSB - USB is very muddy sounding and power output was low; LSB was completely normal and contacts on 40m were made every time the rig was powered up! In addition, CW output was almost nil with the CW filter in. Both the USB and CW issues pointed to the center frequency of those two modes being outside the filter passband. Still, it was quite a buy, since the HP-23B power supply can be found for well over $75 all the time on eBay.

The rig has stickers from the Heathkit factory where apparently it had been shipped to correct some problems. These stickers date the rig's assembly at before 1972. The rig works well with a Turner mic (also from the same W5FC sale) and a later, fortunate fined was a brand new Electro-Voice 719 microphone with the box, **instructions**, and (blank) registration card for $9.99 on eBay.

Subsequently found an SB-600 speaker, with an additional HP-23A inside for cheap. This had been originally built by WB8LOL - now K5LOL, Thomas, who'd built it originally built the unit in Detroit. He, and the rig, found their way to Texas and via K5BJI (Mike Goidl), I obtained the supply.

Replace most the electronic parts with the HP-23RL board from **The Heathkit Shop**

The front panel was dirty and worn from about 35 years of use and storage.

The new panel was found on eBay for about $11 and makes the old boatanchor look new.

Parts Sources

As a result of all the research, I've found some superb resources for part. Here are a few.

- **McMaster-Carr** - superb online catalog and search tool
  - 9540K33 7/8" x 5/8" w/washers - feet for HD-10
  - 9540K56 25/32" x 9/16" w/washers - feet for HW-101 - fits #6 machine screw
- Elliots Hardware - great stock of fasters (McMaster-Carr Numbers)
  - 90054A148 - #6 1/2" Hex Washer sheet metal screw

- 90054A146 - #6 3/8" Hex Washer sheet metal screw
- 90053A144 - #6 1/4" Sheet Metal - for RF Cage

- **Ralphs Electronics**
  - Amphenol 2-pin, Mic Plug - http://www.ralphselectronics.com/ProductDetails.aspx?itemnumber=AMPH-80MC2M
  - Amphenol 2-pin, Panel Jack - http://www.ralphselectronics.com/ProductDetails.aspx?itemnumber=AMPH-80PC2F
- **TriodeStore.com**
  - Type 86-3-24 - strain relief cover - http://store.triodestore.com/strainrelcov.html
  - Type 86-CP11- 11-pin Plug - http://store.triodestore.com/86cp11.html
  - Type 78-S11 - 11-pin Socket - http://store.triodestore.com/11pinamsoc.html
  - Panel Mount of 78-S11 requires - http://store.triodestore.com/12-001-03.html
  - Plain Cover - http://store.triodestore.com/86-3-13.html
- **Leeds Radio** in New York.
  - http://www.leedsradio.com/parts-sockets.html (78-S11)
  - http://www.leedsradio.com/parts-connectors.html (86-CP11)

Current Status

There appear to always be a few items remaining to do, but the HW-101 operates properly now and I've had two contacts so far: first on 20m (WA7ND) and the USB appears to work, but the Electro-Voice mic connector shorted out temporarily ending that QSO. Secondly, on 80m with KC9MOS and the ElectroVoice mic cord appeared to be working again for the duration. I'll continue to be looking for bad out-of-spec parts that might show up in performance, but the rig is working nicely!

Completed Appearance Improvements

- Replaced the front panel with a fresh, clean one.
- Replaced the rubber feet - McMaster-Carr 9540K56 is a perfect fit for the HW-101
- Replaced some missing cabinet screws.

Completed Functional Mods and Improvements

- Improved the power supply with a re-cap via the HP-23RL board, cleaning up some poor assembly and soldering.
- Converted to handle Low-Z headphones - external speaker now mutes properly with "modern" 32-ohm headphones.
- Improved the CW operation by increasing drive to the VOX relay
- Killed most of the CW side-tone audio on key-up by dumping sidetone to ground.
- Some mods had already been done, including the meter zeroing issue and some TX/RX improvements.
- Replaced the poorly soldered Amphenol MIC jack.
- Rebuilt the old power cord to supply 120V AC to the Power Switch on the HW-101

Final Completed Items - December 2008

- Replace the USB and CW carrier oscillator crystals - bringing the CW and USB right back into IF passband, probably within 100hz or so.
- Replace the old RCA RF Out jack with a BNC connector. The BNC is better than either the old RCA or a 'UHF' connector, plus the single-hole, bulkhead mount BNC didn't require enlarging the hole.
- Actually found a nearly broken output connection while replacing the RCA antenna connector - fixed.
- Decided to not add a volume control to the side-tone. Maybe at a later date.
- Replaced the grotty old 1/4 inch headphone jack.
- Replace the Carrier Null pot with a new 200 ohm trimpot

Continuing Updates - May 2009

- Swapped the 6EA8 Speech Amplifier (V1) with the 6GH8A which is a higher output version.

Optimizing the Heathkit HW-101, SB100-102 Transceivers

The Heathkit HW/SB series of transceivers were very popular in the late 60's through 70's and are fairly plentiful on the used market even today, nearly 30 years later. This series of modifications will increase the audio quality of both receive and transmit, improve operation on CW, enhance strong signal handling of the rigs, and make the units useable with the low-Z headphones so often used today. All of these changes require no hole drilling or mechanical changes at all, and the rig can be easily restored to its original configuration at anytime if desired. The text deals with the HW-101, but the changes are applicable to the above mentioned SB-series as well.

Conversion to Low-Z Headphones:

These rigs are designed to be used with Hi-Z headphones, but if low-Z phones are used the outboard speaker will not mute completely with the phones connected. To convert to low-Z phones, make the following wiring changes referring to ***(Figure 1)*** of this document, and pictorial 8-4 (foldout from page 53), and pictorial 8-5 (foldout from page 67) of the HW-101 manual:

1.) Remove the black wire from terminal strip BA lug 2 and reconnect it to lug 3 (ground).
2.) Remove the green wire and the 100Ω resistor from jack AB (speaker).
3.) Connect the green wire to terminal strip BA lug 2.
4.) Connect the 100Ω resistor removed in step 2 to lugs 2 and 3 of terminal strip BA.
5.) Remove the jumper wire from lugs 1 and 2 of headphone jack L.
6.) Run a NEW wire along the wiring harness from speaker jack AB lug 1 to the headphone jack lug 2.

Now the external speaker should mute completely when low-Z phones are used.

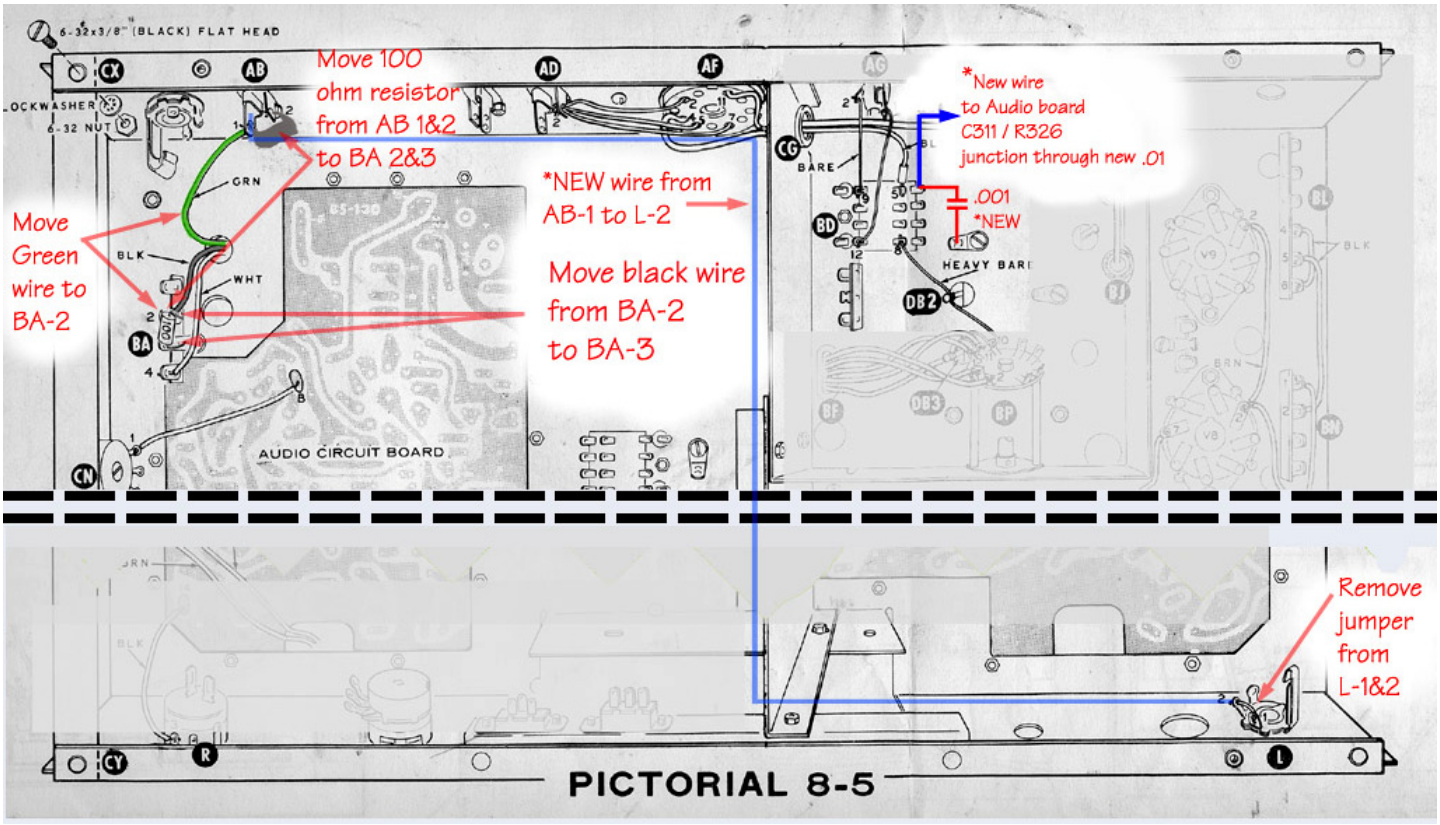

Figure 1

Improved CW Operation:

In the CW mode the rig's relays are energized by the CW sidetone amplifier's sidetone output driving the vox relay amplifier. The audio (sidetone) drive to the vox amp is a bit on the low side for fast relay action, and at speeds approaching 20 wpm the first dot sent is heard in the sidetone but isn't transmitted due to the slow relay response time. Correcting this is a very simple modification – simply replace the 470KΩ resistor R328 on the audio board with a 1KΩ resistor ***(Figure 2)***. This increases the drive to the vox amp enough to cause the relays to pull in quicker. Now the rig will key reliably at 20 wpm. The first dot tends to become shortened at 25 wpm but the rig is useable at this speed.

Another annoying problem with these rigs is the fact the sidetone can be heard when the rig is in the CW mode without the key actually being pressed. Although the sidetone amplifier is in deep cutoff, there is enough coupling through the inter-electrode capacitance of the tube to allow the output of the sidetone oscillator to be heard at a constant low level even when the key isn't being pressed. Fortunately this is also fairly easy to correct:

1) Connect a .001 µfd disk capacitor (DO NOT use a higher value) from relay RL1 pin 1, to ground ***(Figure 1).***
2) Connect a piece of wire about 8" long from pin 1 of RL1 and run this wire through the same opening in the shield as the wiring harness.
3) On the audio circuit board, replace 1MΩ resistor R326 with a 2.2MΩ resistor ***(Figure 2).***
4) At the circuit board junction of R326 and C311, connect one side of a .005 µfd 500v disk capacitor, and connect the other side of this capacitor to the wire from RL1 pin 1.

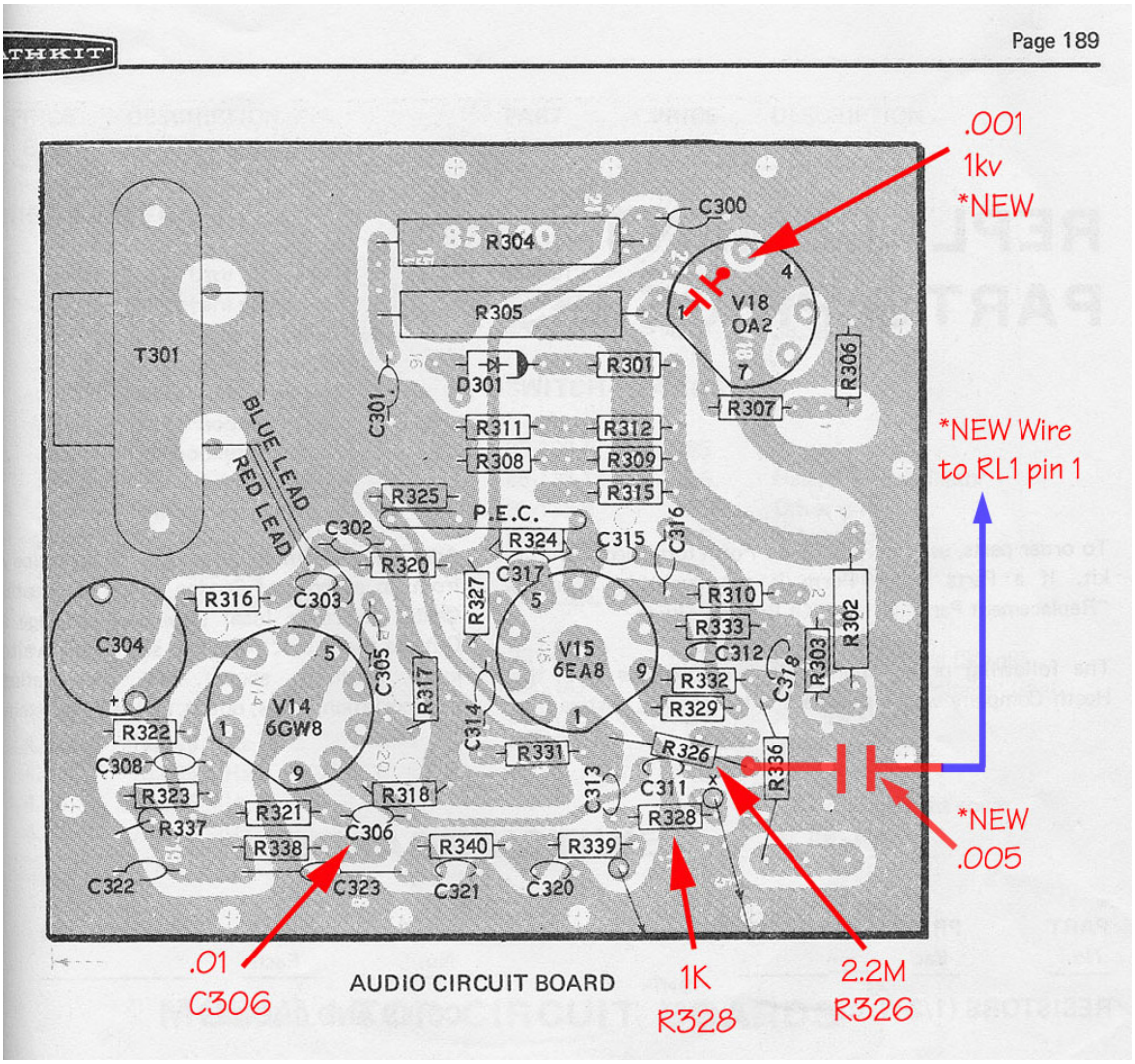

Figure 2

Now during receive, the sidetone will be bypassed to ground by the normally closed contact on RL1. During transmit, RL1 opens and the sidetone works normally.

Transmit Improvements:

The transmitter audio quality can be improved by changing the value of coupling capacitor C11 on the modulator board from .001 µfd to .01 µfd ***(Figure 4)***. This will increase the low frequency response and give the transmit audio a little more "body".

If 10KΩ resistor R202 is present between the I.F. circuit board (L101 pin 4) and the bandpass circuit board (V5 pin 2), remove and replace it with a piece of insulated hook up wire ***(Figure 3)***. This will increase drive to the 1st transmit mixer. This change is already incorporated in later model HW-101s.

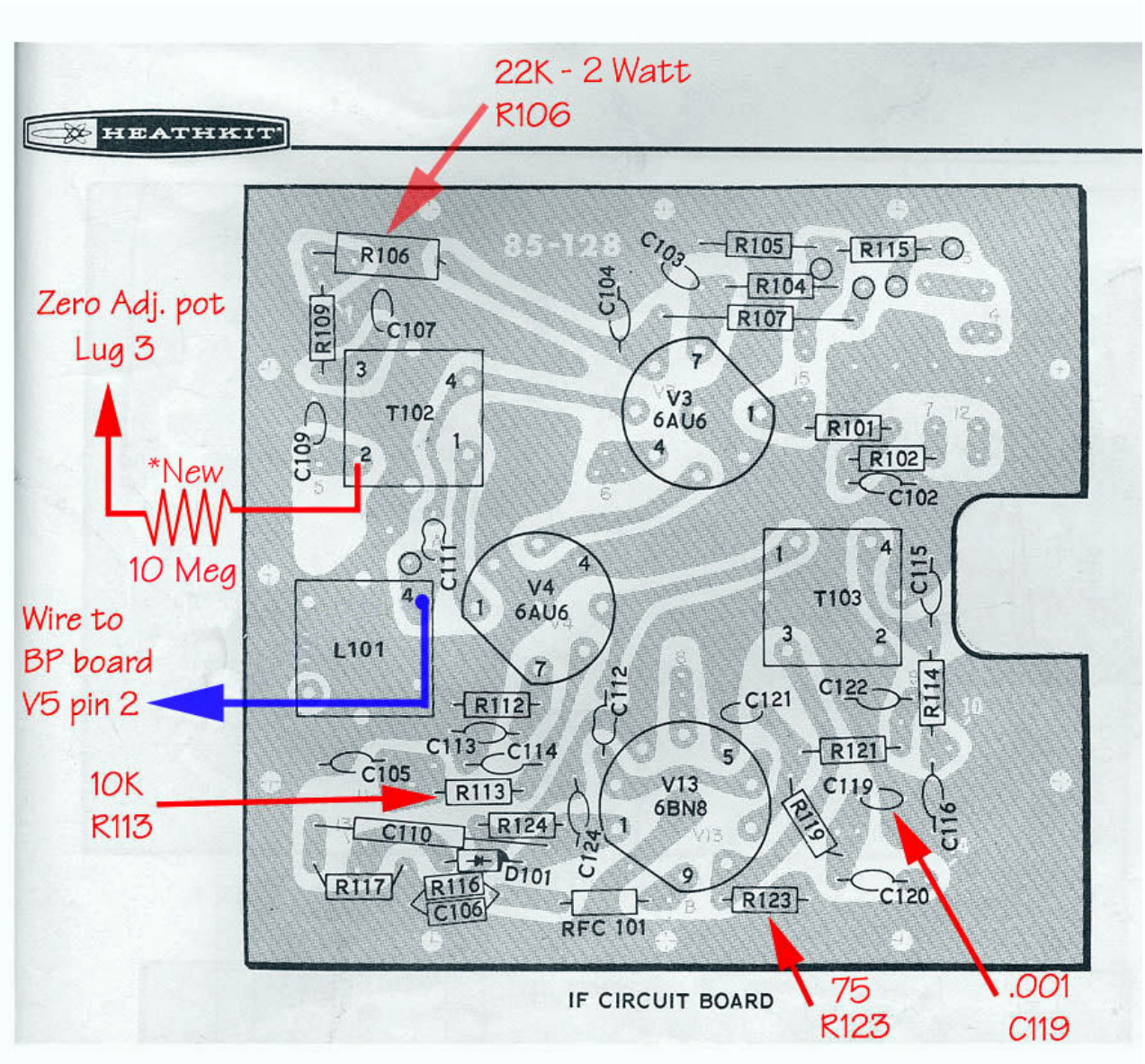

Figure 3

Receive Improvements:

The receiver's strong signal-handling capability and audio quality can be vastly improved by the following changes:

During alignment check to see if, while adjusting T-102 ***(Figure 3)***, there are two points where the transformer can be peaked -- one spot for transmit and a slightly different setting for receive. If so, peak the transformer for maximum transmit drive instead of maximum receive gain. The receiver has an abundance of gain, however the transmitter could use a little extra. This will get rid of some of the receiver gain but WILL NOT affect receiver sensitivity.

Also change the value of the screen dropping resistor R113 in the second I.F. amplifier V4 from 1KΩ to 10KΩ ***(Figure 3)***. This will reduce the gain of this stage a bit and improve gain distribution.

The next step in receive improvements is to increase the BFO drive to the product detector. The BFO (carrier oscillator) injection to the product detector should be about five times the level of the I.F. signal for low distortion. On these rigs, the I.F. signal can equal the BFO injection level under strong signal conditions resulting in a very raspy, distorted audio quality. I have even noted at times some pulling of the BFO oscillator frequency. The major problem is that during receive, the BFO signal is coupled to the product detector cathode through C17, a 12pf silver mica capacitor which is connected to a piece of coax running to the product detector cathode. The capacitance of the coax cable exceeds the value of coupling capacitor C17, and the combination of the two acts as a voltage divider, greatly reducing BFO drive level to the product detector V13C. Correcting this involves increasing BFO drive and decreasing the I.F. drive to V13C.

To increase BFO drive, simply replace coupling capacitor C17 on the modulator board with a 100pf silver mica, and replace the 33KΩ resistors R6 and R7 on the modulator board with 27KΩ resistors ***(Figure 4)***. To reduce I.F. drive, change resistor R123 on the I.F. board from 470Ω to 75Ω ***(Figure 3)***.

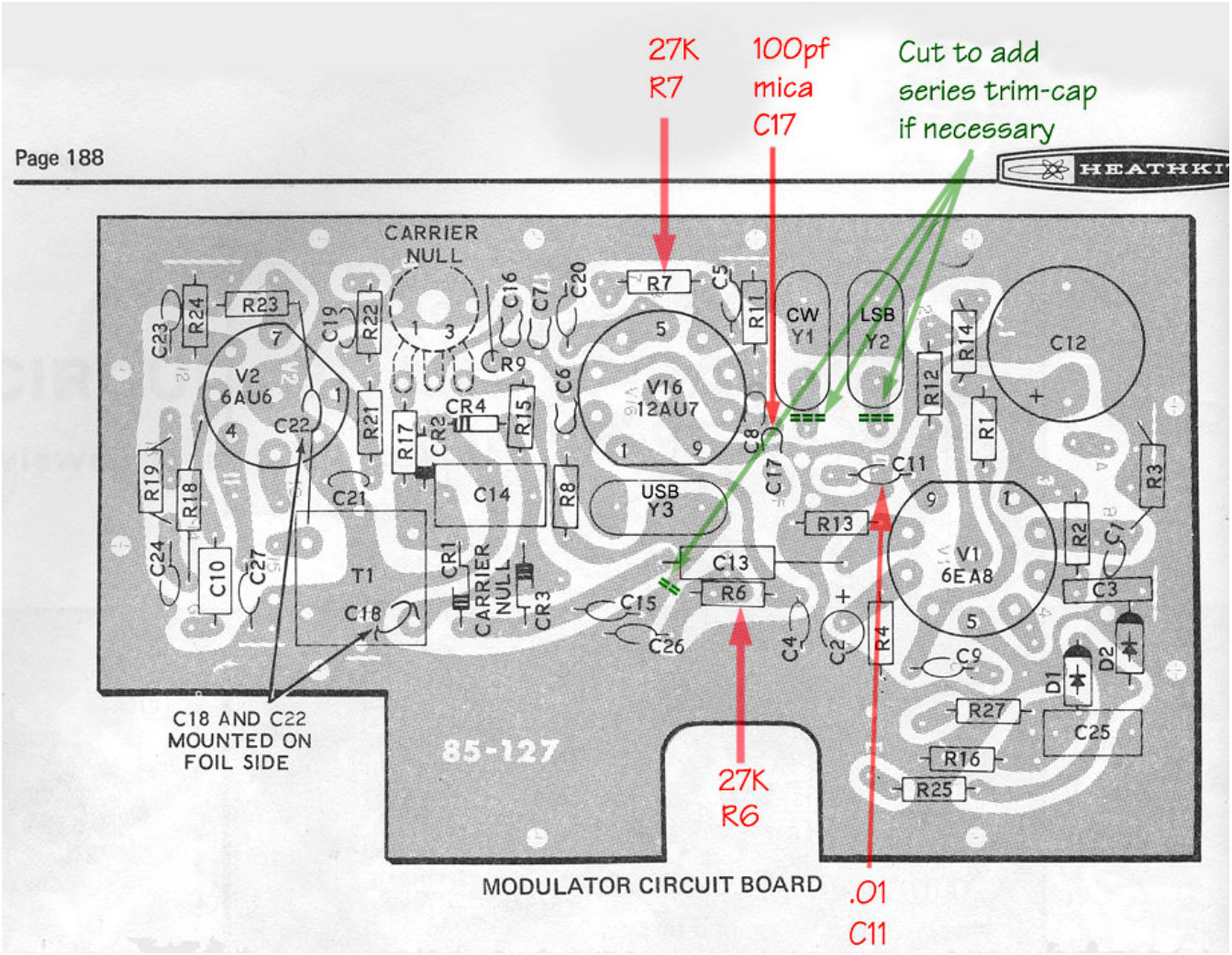

Figure 4

Additional rolloff of the high frequency response will remove the raspy nature of the receive audio, and this is accomplished by changing the value of capacitor C119 on the I.F. board from 500pf to .001 µfd ***(Figure 3)***. The low-end audio response of the audio amplifier increases slightly by replacing coupling capacitor C306 on the audio board with a .01 µfd disk capacitor ***(Figure 2)***.

Any possibility of voltage regulator hash being generated by V18 is reduced by connecting a .001 µfd 500V disk capacitor from V18 pin 1 to the ground foil on the audio board.

Some of the 'birdies' and other internally-generated signals heard in the tuning range of the receiver are reduced considerably by bypassing the filament string to ground with a .01 µfd capacitor connected from the common filament point on the bandpass circuit board to ground. This is the point where the four brown wires connect about an inch below pin 1 of V19 ***(Figure 5)***.

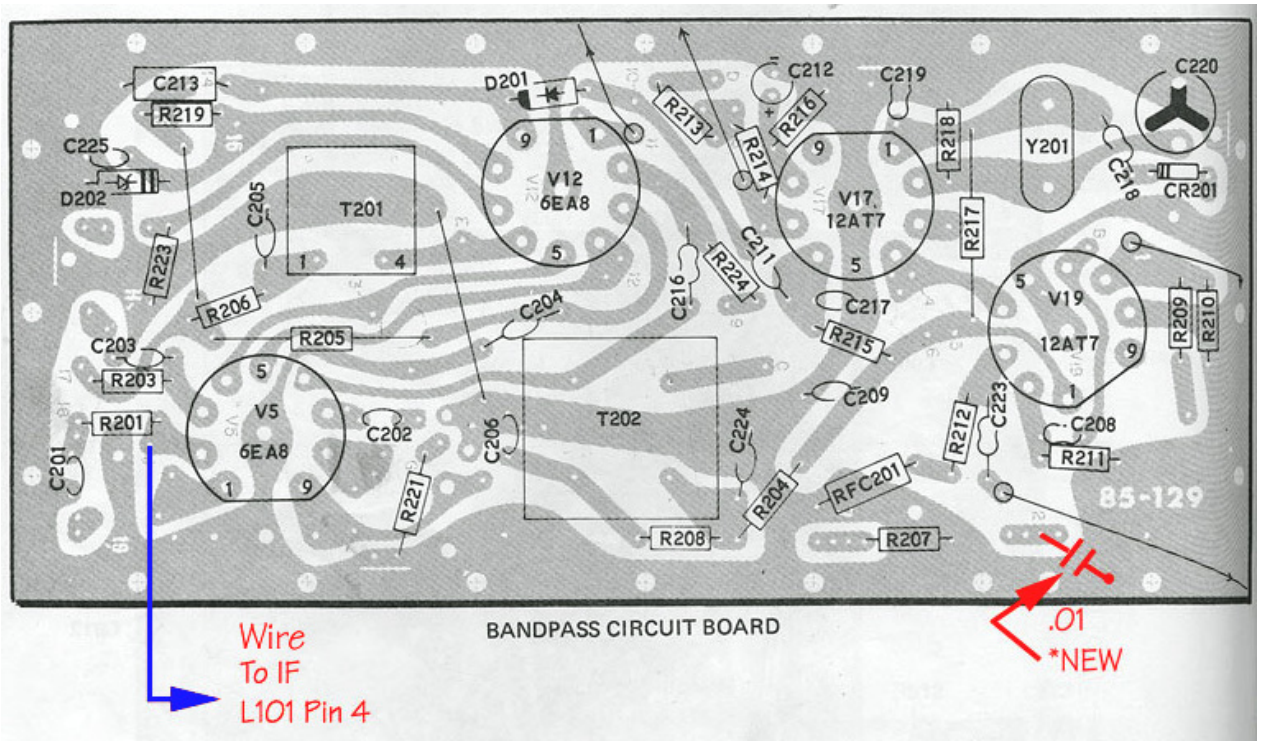

Figure 5

I.F. Filter Passband Improvements:

I believe the crystals that Heath supplied for the carrier oscillator were of fairly wide tolerance, thus the frequencies of the LSB/USB/CW carrier injection may not be properly positioned on the slope of the I.F. filter. This can affect both the receive and transmit audio response to a great degree. Telltale signs of this are not having the same audio response on USB and LSB, and reduced CW power output when using the CW filter.

It is relatively easy to tell if the USB/LSB carrier insertion points aren't placed equidistant from the center of the I.F. filter passband. After the rig reaches a stable operating temperature (1/2 hour) disconnect any antenna and peak the preselector for maximum receiver gain. Next turn up the volume control to a slightly higher than normal level and listen closely to the hiss coming from the speaker. Then switch to the opposite sideband. The pitch of the receiver background noise should be the same if the USB & LSB carriers are both placed equidistant from the filter center frequency.

If the carrier oscillator frequency is placed too far from the filter passband, the receive and transmit signals will lack "lows" but the opposite sideband rejection will be high. If the carrier oscillator frequency is placed too close to the filter center frequency, the receive and transmit signals will have excessive "lows" and the opposite sideband rejection and carrier suppression will suffer. Balance is the key.

On my particular HW-101, the actual measured carrier oscillator frequencies were 3393.8 kHz LSB, 3395.9 kHz USB, and 3395.17 kHz for CW. This resulted in a "tinny" sounding audio response in LSB compared to USB, and a very "bassy" sounding USB. The CW power output while using the SSB filter was 110 watts, but since the CW carrier oscillator injection was so far from the CW filter center-frequency of 3395.4 kHz, the CW power output was 50 watts while using the CW filter!

Heath's intended frequencies for the carrier oscillator were 3393.6 kHz LSB, 3396.6 kHz USB, and 3395.4 kHz for CW. With the specified filter center-frequency of 3395.0 kHz the USB & LSB carrier positions would be 1.6 kHz each side of the filter center-frequency. Unfortunately, the filter center-frequency may not be exactly 3395.0 kHz, so simply placing the carrier injection points equally-spaced from 3395 kHz may not have the intended result. In order to determine the filter center-frequency one must balance the audio response between both sidebands, measure the USB and LSB carrier frequencies, and finally subtract ½ the difference between the USB & LSB frequencies from the USB carrier frequency. The result will be the I.F. filter center-frequency as it exists within your particular rig. For example, if the audio response is exactly the same between USB/LSB, and the measured USB carrier frequency is 3396.31 kHz while the LSB carrier frequency measures 3393.51 kHz, then the difference is 3396.31 - 3393.51 = 2.8 kHz. One-half the difference is 2.8 ÷ 2, or 1.4 kHz. Then the USB frequency of 3396.31 kHz - 1.4 kHz = 3394.91 kHz, which in this example is the actual SSB filter center frequency.

I like audio with a tad bit more bottom end response, so I placed my carrier points just a little closer to the filter center frequency than the Heath spec., i.e., rather than 1.6 kHz off center I went with 1.4 kHz. The frequency of the oscillator is lowered by placing a small amount of capacitance in parallel with the crystal, and the frequency is raised by putting capacitance in series with the crystal. To put a capacitor in series with the crystal simply cut one circuit board trace just before the crystal pin as indicated, and solder the capacitor across the opened trace ***(Figure 4)***. A 100 pf capacitor in series will move the crystal frequency up about 100 Hz, but the same frequency change in the downward direction would only require about 10 pf connected in parallel with the crystal.

On my HW-101 I put the capacitors (silver mica's) directly on the circuit board foils. I got one sideband to sound the way I liked, and then simply adjusted the other sideband to match it in audio response. I wound up using a 10 pf cap in parallel with the LSB crystal, 100 pf in series with the USB crystal, and 80 pf in series with the CW carrier crystal. Following these changes, the new carrier oscillator frequencies for my rig are 3393.51 kHz LSB, 3396.31 kHz USB, and 3395.38 for CW. The audio is perfectly balanced when switching between sidebands, indicating a true I.F. filter center frequency of

3394.91 kHz. The CW power output while using the CW filter went from 50 watts to 110 watts. I also soldered a short loop of wire to the center lug of the carrier null pot to serve as a test point to measure the carrier oscillator frequency. Be sure that once you have determined the filter center-frequency, you place the oscillator frequencies no closer than about 1.4 kHz and no further than 1.6 kHz from the filter center-frequency.

To recap, we are actually matching the response between USB & LSB by ear, then verifying with a frequency counter that the carriers are no closer to the filter passband than 1.4 kHz, and no further than 1.6 kHz. Even though we can match the pitch between USB and LSB with our ear, we can't tell exactly WHERE they are -- only that they are at the same point on the filter slope.

When the carrier oscillator frequencies are changed, the signal level of the oscillator outputs may consequently change and therefore should be adjusted to be equal. Connect a scope or RF probe to the carrier null pot center lug test point and switch between sideband modes, checking for equality in level. If need be, adjust the value of R6 or R7 to achieve equality. The level should be at least 1 volt RMS, or 3 volts P-P.

Stabilizing Meter Zero Settings:

S-meter zero setting instability is mainly caused by heat-related resistance changes in the R106 22KΩ 1-watt resistor on the I.F. board. Replace R106 with a 22KΩ 2-watt wirewound ***(Figure 3)***.

The problem of the meter reading below zero during transmit while in the ALC position is corrected by connecting a 10MΩ resistor from the meter Zero-Adjust pot pin 3, to pin 2 of T-102 on the I.F. board (hints from N4NRW).

After all the above mentioned changes are made, give the rig a touch up alignment and enjoy a much improved vintage rig!

Many thanks to Lenny WB8JCJ for his help in editing, image scanning, input, and implementation of these changes into his HW-101. His help was indispensable.

Mark WB8JKR

Improving The Heathkit HW-101 Transceiver

The HW-101 is probably one of the most popular s.s.b. transceiver kits and, despite its relatively low price, it is an excellent performer when properly put together and operated.

This article has been written in an attempt to describe a few improvements carried out by the author which can add in performance without detracting from its appearance and basic design either electrically or mechanically. Naturally, it is assumed that the kit has been assembled as per the instruction book and that it performs reasonably well to begin with.

After using the HW-101 for several months the writer felt that some items could stand some improvement; these items are listed below, together with the appropriate comment and procedure.

I.F. SCREEN VOLTAGE

The screen voltage dropping resistor at V_4 (2nd i.f. amplifier) identified as R_{113} in fig. 1 is 1K, which seems too low and should be changed to 10K ½ watt. This improves the operation of the i.f. chain somewhat in that it lowers the gain some, bringing about better product detector action and a lower heat dissipation at V_4, thus avoiding its early failure. The overall gain may still be too high and can be lowered further as will be seen later.

BANDPASS TRANSFORMER RE-ALIGNMENT

The bandpass transformer T_{202} is a constant-K network using three toroid coils (see fig. 2) and comes adjusted from the factory. Nevertheless, it is possible for it to drift out of adjustment during shipment or after prolonger use. If this is suspected, it can be checked as follows: connect the transceiver antenna connector to a 50 ohm non-inductive resistor, set the bandswitch to the 3.5 to 4.0 MHz band, turn the calibrator on and check the S-meter readings, keeping the preselector peaked for maximum throughout the band. If the readings are within one S unit from one end to the other, the transformer is probably OK. If not, it should be adjusted by removing the shield temporarily and peaking all trimmers found inside with the set tuned to 3.75 MHz (a signal generator is needed for this adjustment, but it can be approximated using the calibrator at either 3.7 or 3.8 MHz mark). After the adjustment, replace the shield and check to see

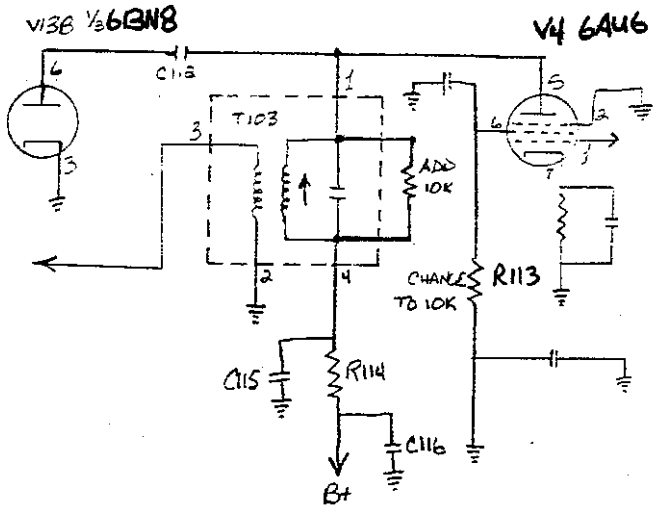

Fig. 1—Changes to the second i.f. amplifier stage, V4, reduce overall gain of the HW-101 to useable levels and make S9 meter readings 50 μV.

that the calibrator signal readings hold through the band. It is important to use an insulated tool for this adjustment.

REPLACING V10 and V11

The HW-101 specifies 6HS6 tubes for the receiver r.f. and first mixer stages (V_{10} and V_{11}), these are very high transconductance tubes and will provide an excellent signal-to-noise performance; however, they are rather susceptible to cross modulation and blocking effects when operating near very strong signals from local stations. Also, in this set they are operated very close to their maximum rated plate

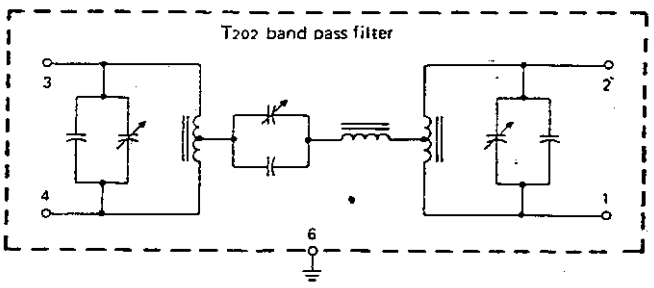

Fig. 2—Bandpass filter T_{202} may require re-adjustment after long use. Peaking the three trimmers at the center of the 80 meter band should provide flat coverage across the entire band.

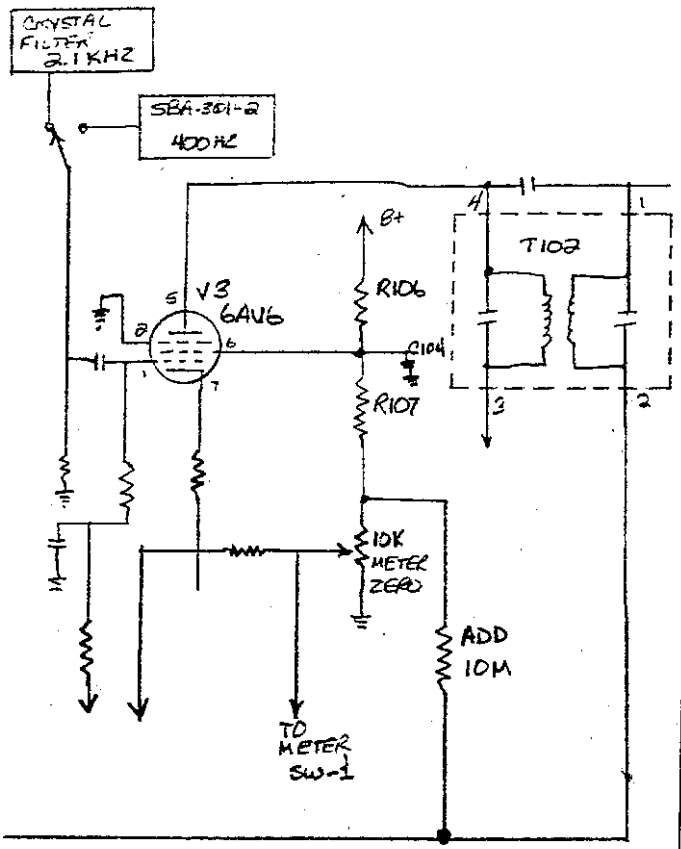

Fig. 3—Adding a 10 meg resistor as shown will raise the zero point of the meter when reading a.l.c. voltage.

dissipation and in fact may even exceed it at times. Therefore they get extremely hot and consequently do not last very long. These tubes can be directly replaced by 6AU6 without any modification and it is up to the individual operator to decide which is more suitable to his needs. If they are replaced, it is necessary to peak the "Driver" and "Mixer" coils for each band, following the Heath recommended procedure as stated in the manual.

VFO STABILITY

The v.f.o. coil (L_{941}) is a ferrite core, adjustable inductor with two windings in series. When properly set up, the frequency stability is excellent, but if the core is positioned towards the high side (hot end) of the frequency determining part, the stability will be degraded and the warm-up drift will be in the vicinity of 2 kHz or more. To correct this, the slug should be positioned near the ground end of the winding and the dial re-calibrated. The v.f.o. trimmers will probably have to be readjusted and it is possible that C_{951} may have to be lowered in value, but keeping the same temperature coefficient; a value of 10 pf (N750) has been found suitable. The total drift will be less than 1 kHz this way.

ALC/S-METER ZERO

During transmitting, the S-meter measures the a.l.c. action when the meter switch is set to a.l.c. However, the zero setting offsets considerably, keeping the indications at very low values. This is easily corrected by adding a 10 meg ½ watt resistor between lug 3 (hot end) of the zero adjusting potentiometer and pin 2 of T_{102} where the a.g.c. is connected to. This compensates automatically between transmit and receive with no ill effects except that the a.g.c. discharge time is shortened slightly. The potentiometer action is less critical now and more towards the middle of the range. If a large discrepancy remains in the zero settings it is probably due to gassy tubes in the a.g.c. stages. For proper modulation, the mic. gain should be adjusted so that the a.l.c. swings up to about S-6 (with the meter in the a.l.c. position). Refer to fig. 3.

VFO TUNING MECHANISM

The v.f.o. tuning system of the HW-101 works very smoothly when properly installed; however, with time, as with most v.f.o.s, some irregularities may show up due to either wear or oxidation. If scratchiness is observed, a little contact cleaner or penetrating oil (such as "Mystery" brand) may be put in the rotor wiper contact and in the spring loaded split gear of the variable capacitor. If excessive play or backlash is observed, it is usually due to the ball bearing drives. Spare ones can be obtained from the factory for replacement but in some cases it is possible to tighten them by squeezing the metal fingers that hold the assembly together. This is not really too recommendable since if too much pressure is put on the fingers, the mechanism may not work well and the drives will have to be replaced anyway. When removing and installing the v.f.o. assembly, it must be done very carefully so that the shafts are aligned exactly. If this is not done, the v.f.o. knob may be too hard to move in certain positions and too easy in others; a most annoying situation. Beware of using any oil lubrication in the drives, they use a special type of grease that should last the life of the drive. Also, one should be very careful about using any kind of spray cleaners or lubricants in the v.f.o. compartment as they might contaminate the frequency determining components and degrade the stability.

ERRATIC TRANSMIT/RECEIVE ACTION

This may be caused by carbon deposits between the contacts of the relay RL_2 and is simply cured by blowing this deposit away. The contacts may be burnished with a special tool or with a small strip of white bond paper passed between the contacts with the set off (there are dangerous voltages here). Do not use abrasives or oily substances to clean the contacts. However, a non-residual cleaner may be used sparingly. Another cause of instability may be caused by one or more of the circuit boards becom-

ing loose or developing a poor connection between the ground foil and the chassis frame. Re-tightening the screws that hold the boards to the chassis should suffice, but for a more permanent solution, adding a few #4 flat solder lugs held by the nuts and washers used to hold the boards and soldering them to the board's ground foil at various points, will insure a better ground.

S-METER READINGS

As stated before, the i.f. gain of the set is quite high, tending to make the S-meter readings a bit too generous (even after replacing the 6HS6 with 6AU6). Also, during reception of very strong signals there may be some distortion due to product detector overload. The above can be corrected by soldering a small (¼ watt will suffice) 10 K resistor across the primary winding of the last i.f. transformer T_{103}. This will bring the S-9 reading to correspond to about 50 microvolts and the value of each S unit to between 4 and 5 db. At the same time the audio will be cleaner with strong signals.

BIRDIES

Some birdies show up on reception at 3.65, 3.74, 14.24 and 21.2 MHz. Although they normally are of no consequence, most can be reduced considerably by adding a .01 mf capacitor between contact no. 2 and ground foil of the bandpass board. This is the point where three brown filament wires are soldered.

PILOT LAMPS

The assembly instructions and part list received by the writer called for the use of #44 pilot lamps (probably due to a printing error). This should be corrected to #47 lamps in order to maintain proper current balance in the filament circuits. The #47 lamps have brown identifying beads and draw .15 a. at 6.3 volts, each. The set should never be operated except with both these lamps on.

INCREASE OUTPUT GAIN

This can be done by removing resistor R202 (see fig. 4) and replacing it with a jummper wire. This change has been made by Heath in all new HW-101 being sold. Output gain will be noticeable mostly on 40-meters, but less noticeable on other bands.

STOP S-METER DRIFT

After some warm-up the S-meter will start indicating a lower reading in the receive mode. This is caused by resistor R107 (see fig 3 overheating and thus causing its resistence to drop. R107 should be replaced by a 100K 1-watt. Also resistor R106 should be changed to a 33K 1-watt, this reduces voltage feeding meter circuitry, thus causing less heat in R107.

BAD 6AU6 TUBES

Heath got a hold of a bad shipment of 6AU6 tubes. The problem is that they have 4 volt filaments. This causes the tube to overheat. If your rig was purchased between jan. 1976 and june 1977 and V3 and/or V4 have a brand name of EL-MENCO call Heath and they will send you two replacement tubes.

HEATHKIT

HEATH COMPANY

Phone 616-983-3961 • TWX-616-983-3897 • Benton Harbor, Michigan 49022

ALTERNATE METHOD OF NEUTRALIZING THE FINAL AMPLIFIERS

NOTE: Be sure unit is off and power supply high voltage capacitors are discharged.

1. Disconnect final plates and screen grid **
2. Turn unit on.
3. Rotate the BAND switch to 28.5
4. Place the VTVM RF probe in the ANTENNA connector.*
5. Set the FUNCTION switch to TUNE
6. Rotate the LEVEL control fully clockwise.
7. Adjust the PRESELECTOR control for a maximum indication on the VTVM
8. Adjust the FINAL control for a maximum indication on the VTVM, with the LOAD control set at the 50Ω position.
9. Using an insulated screwdriver, adjust neutralizing capacitor for a minimum indication on the VTVM.
10. Readjust the neutralizing capacitor for a minimum indication on the VTVM.
11. Turn the FUNCTION switch to the OFF position.
12. Discharge high voltage power supply capacitors.
13. Reconnect final plates and screen grid.

* VTVM and RF probe will be needed.

** To remove screen voltage in SB-100, SB-101, HW-100 and HW-101 Disconnect R920 (100 ohm resistor) from buss wire between pins 3 of V8 & V9. In the SB-102 removal of accessory plug is all that's required. To remove high voltage in SB-100, SB-101 and SB-102 disconnect red wire at Lug 4(in SB-100 Lug 3) of terminal strip BK that goes to grommet BL. In HW-100 & HW-101 disconnect red wire going to Lug 1 of RF choke in final cage.

NOTE: Take adequate steps to eliminate any possible contact with B+ or B+ shorts to chassis after disconnecting wire and resistor.

FEBRUARY 11, 1971

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-1

VFO DRIFT

The vfo coil has been changed to improve the drift problem experienced in many units. The old coil [PN 40-810] should be replaced by the new coil [PN 40-1976] whenever a unit displays excessive drift. This has been made a permanent change in all future production.

SEPTEMBER 14, 1972

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-2

REPEATED HETERDODYNE OSCILLATOR TUBE FAILURE

INADEQUATE USB-LSB FREQUENCY DRIFT

Change: R-212 from 220 Ohm to 330 Ohm 1/2 watt resistor [PN 1-4]. Lack of VFO shift range can be corrected by changing the value of the FET source resistor.

Change: R-947 from 470 Ohm to 1000 Ohm [PN 1-9].

FEBRUARY 16, 1973

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-3

CARRIER NULL CONTROL FAILURE

Recently an improved mounting method was devised for the [PN 10-147] controls in kit models SB-102, SB-401 and HW-101. Current production utilizes a fiber washer for greater clearance and the case of the control is grounded by a separate wire. We are anxious to know if this will reduce the failure rate. Please make note of any change, good or bad, and keep us posted.

OCTOBER 29, 1973

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-4

LOW OUTPUT ON 40 METERS

1. REMOVE the 1-1/2" bare wire from hole 1 on the DRIVER PLATE circuit board & the ground foil

of the RF DRIVER board.

2. Connect a 3/4" bare wire between the ground foils of these same two boards.

3. REMOVE the 1-3/4" bare wire from hole 1 in the DRIVE GRID circuit board & the ground foil of

the RF DRIVER board.

4. Connect a 3/4" bare wire between the ground foils of these same two boards.

5. REMOVE the 2-3/4" bare wire which ties the ground foils of the circuit boards to the shields.

6. REMOVE the coil cover. Then REMOVE four of the light spring clips & their hardware as shown:

[[[NOTE: The pictorial shows removal of the set of clips & hardware located directly down from the 2 holes in the cover; the other set to be removed is directly across and down from the 3 holes in the cover.]]]

7. Readjust the driver grid & drive plate coils as instructed in the HW-101manual.

MAY 23, 1974

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-5

ALTERNATE METHOD OF NEUTRALIZING THE FINAL AMPLIFIERS

NOTE: Be sure unit is off and power supply high voltage capacitors are discharged.

1. Disconnect final plates and screen grid. **

2. Turn unit on.

3. Rotate the band switch to 28.5.

4. Place the VTVM RF probe in the antenna connector.*

5. Set the function switch to tune.

6. Rotate the level control fully clockwise.

7. Adjust the preselector control for a maximum indication on the VTVM.

8. Adjust the final control for a maximum indication on the VTVM, with the load control set at the 50 ohm position.

9. Using an insulated screwdriver, adjust neutralizing capacitor for a minimum indication on the VTVM.

10. Readjust the neutralizing capacitor for a minimum indication on the VTVM.

11. Turn the function switch to the off position.

12. Discharge high voltage power supply capacitors.

13. Reconnect final plates and screen grid.

* VTVM and RF probe will be needed.

**To remove screen voltage in SB-100, HW-100 and HW-101 disconnect R920 [100 ohm resistor] from buss wire between pins of V8 and V9. In the SB-102 removal of accessory plug is all that's required. To remove high voltage in SB-100, SB-101 and SB-102 disconnect red wire at lug 4 [in SB-100 lug 3] of terminal strip BK that goes to grommet BL. In HW-100 and HW-101 disconnect red wire going to lug 1 of RF choke in final cage.

NOTE: Take adequate steps to eliminate any possible contact with B+ or B+ shorts to chassis after disconnecting wire and resistor.

MAY 23, 1974

HW-101 BULLETIN NO:

service

SSB TRANSCEIVER HW-101-6

SB & HW SERIES AUDIO PREAMPLIFIER & VOX CIRCUIT

TROUBLESHOOTING GUIDE

It is assumed that the basic steps such as making DC voltage measurement, checking tubes & reviewing the soldering have been completed.

The following information was compiled from the above transceivers in the 80M LSB position. The mike level control was at the 9:00 o'clock poisition.

AC signal voltages are listed below. These voltages were measured from the microphone connector through the VOX circuit. All measurements were made with a VTVM. A microphone or audio generator for .1V @ 1KHZ can be used as the signal source.

Mike Connector Lug 1 .1VAC

Pin 2 of V1 .02VAC

Pin 6 of V1 10-15VAC

Pin 6 Level Control 10-15VAC

Pin 5 Level Control .5VAC

Pin 9 of V1 .2VAC

Pin 8 of V1 .1 - .3VAC

Center Arm of VOX Sensitivity Control 5-15VAC

Pin 7 of V17 5-10VAC

Pin 6 of V17 40-50VAC

Junction of C211-D201 40-50VAC

Pin 9 of V12 9-15VAC

By tracing the AC signal from stage to stage the point of trouble can be isolated & steps taken to correct it.

POSSIBLE TROUBLE AREAS

- Check each of the shielded cables for a possible open or poorly grounded shield.

- Check for continuity through each of the shielded cables.

- Check for a proper ground at the mike control level.

- If the frequency response of the audio stage is not within specifications check the values & installation

service

of C1, C2, C3 & C9.

- A change in VOX delay after operating for a period of time can be caused by leakage in diode D201. The other possibility is a change in value of capacitor C213. Either component could experience a change in operation characteristics due to heat.

MAY 23, 1974

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-7

SB & HW SERIES INSTABILITY & CORRECTIVE INFORMATION

We suggest you check for each of the following possible causes:

1. Intermittent, rosin or cold solder joints.
2. Loose hardware at the tube sockets, terminal strips, circuit boards, shields and rear panel sockets.
3. Poor lead dress at tube sockets V8 & V9. The component leads must be short as possible.
4. Check C925 (Final tune capacitor) to be sure it is isolated from the tuning shaft. This is to prevent RF from traveling on the shaft to the front panel.
5. Check all edges of the final enclosures for proper grounding to the main chassis.
6. Check the hardware for the side rails to be sure a good ground is being provided.
7. Be sure that all the ground clips on the coil cover are making good contact with the switch shields.
8. Check the soldering of the switch shields to the center pins of tube sockets V6, V7, V10 & V11.
9. Check the ground leads from the switch board & shields, to be sure they are going to ground foil & not to the preselector capacitor foil pods on the RF driver board.
10. Check for broken or shorted pigtails on each of the shielded cables in the unit.
11. Check RFC801 & L901 for any signs of deterioration or physical damage, (burn spots). If apparent replace the part.
12. Improper adjustment of the Het. Osc. coils could cause improper mixing action, resulting in the final operating at a different frequency appearing as instability.
13. Change driver & final tubes then reneutralize per manual instructions.
14. Check driver tube shield to be sure that it has a good ground contact with the socket spring clip.
15. Check for a good ground between the front panel & chassis.
16. Check the SWR of the antenna system at the frequency of operation. Should be below 2:1.
17. Check the antenna coax for leakage, poor connectors & broken shield connections.

18. Is the transmitter properly grounded?

19. Be sure all shields & tube shields are installed.

20. Realign using a properly terminated 50 ohm non-reactive dummy load. NOTE: This does not include a light bulb.

21. Check for normal Het. Osc. test-point voltage.

22. Check for proper LMO injection voltage 1.0-1.5 VRF.

23. Check for a high AC ripple content in the LV-B+, HV-B+ and bias voltages from the power supply.

24. Check to be sure that the shafts do not touch each other in the insulated coupling, and that the set screws do not touch the PA shield.

25. Check to be sure that the PA tune shaft turns the variable capacitor & is not slipping in the insulated coupling.

DECEMBER 18, 1974

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-8

OSCILLATIONS OR LOW DRIVE

Loose boards cause sporatic self oscillations & unstable RF conditions, particularly at the high [15 & 10 meter] bands. The comb brackets which have been used are aluminum & could not be soldered. Steel brackets are now available [PN 204-2096] & should be used whenever encountered in the field. Both the switch shields & the driver boards should be soldered to these brackets.

This change helps to increase grid drive as well as increase stability.

MAY 2, 1975

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-9

SELF OSCILLATIONS OCCURRING AFTER INSTALLATION OF

STEEL COMB BRACKETS

It has been found that in a number of units, self oscillations are still occurring after installation of both steel comb brackets [PN 204-2096]. To correct the condition, the screws around the RF driver board must be tightened securely. Also, the lockwashers between the circuit board & chassis must be installed, otherwise a good ground is not assured. Retightening screws which are already snug will also cause these oscillations to disappear in units where it is a problem.

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MARCH 26, 1976

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-10

S-METER DRIFT

To bring the meter drift to an acceptable level, install the following:

CHANGE: R107 from 100K Ohm 1/2 Watt to 100K 1 Watt

[PN 1-28-1]

This makes the voltage divider string more stable with temperature changes caused by internal heating.

This change will be made in future production runs.

---------- NOVEMBER 15, 1976

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-11

LOW RECEIVER SENSITIVITY

NOTE: Sensitivity of the unit is worse on the higher frequencies [15] & [10] meters.

CURE: Diode D907 may be in backwards or banded backwards.

JANUARY 14, 1977

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-12

IMPROPERLY MANUFACTURED 6HS6 TUBES

Some 6HS6 tubes supplied with the HW-101 were improperly manufactured with the suppressor grid and cathode pin outs interchanged. These tubes will glow brightlywhen power is applied.

All of these tubes, with this trouble, have been removed from stock. Any new 6HS6 tubes ordered from parts replacement will be okay.

Some HW-101 kits will tgemporarily have 6AU6 tubes substituted for the 6HS6 until production quantities of the good tubes are available.

APRIL 13, 1977

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-13

GERAMIUM DIODE CHANGE

The seven germanium diodes [PN 56-26-1] used in this kit are selected [PN 56-26] diodes. They are selected for low reverse-current characteristics.

Due to the low percentage of the tested diodes meeting the low reverse-currect spec, the germanium diodes in this kit are bing changed as follows:

CR1, CR2, CR3 and CR4 in the Balanced Modulator circuit are being changed to

[PN 56-87] hot-carrier diodes.

CR901, CR941 and CR201 are being changed to non-selected [PN 56-26] diodes.

Install these changes only when needed.

APRIL 28, 1977

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-14

IMPROVE ALC ADJUSTMENT

Remove: R202 (10 k ohm) and replace with a jumper wire.

JUNE 2, 1977

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-15

DRIVER AND MIXER SWITCH SHIELDS WILL NOT TAKE SOLDER

The two switch shields which have a zinc coating, will not take solder. To correct this, the coating on these shields has been changed to a "lustre lite" coating. The part number of the shield remains the same, [PN 206-519]. The new shields can be identified by the "gold" color.

Any switch shield that will not take solder should be changed to the newer-type shield.

AUGUST 23, 1977

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-16

SIDE TONE TOO LOUD

Complaints are being received that the side tone is too loud when using headphones with this unit. To reduce the side tone level,

CHANGE: R326 from 1 Megohm to 3.3 Megohm [PN 1-38].

SEPTEMBER 28, 1977

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-17

TRANSCEIVER OSCILLATES IN TRANSMIT WITH THE MIC KEYED

If it is not possible to null the carier and get more than ~25 watts with the microphone keyed and the mic level turned down, V12 [PN 411-124] may be causing the transmit mixer to oscillate. The mic level control will operate nearly normal in tune, but will exhibit normal control over the first 75% of the rotation and will decrease the output over the last 25%.

If V12 is an Elmenco tube, replace V12 [PN 411-124] with a GE tube. (NOTE: If a GE tube is not available, it may be necessary to try several Elmenco tubes for a satisfactory result.)

JANUARY 20, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-18

RF CHOKE IN FINAL PLATE CIRCUIT OVERHEATS OR

DIFFICULT TO NEUTRALIZE ON 10 AND 15 METER BANDS

6146B tubes in the final amplifier may be causing this problem. To correct, replace with 6146A tubes.

A label will be installed on the back panel of the HW-101 recommending the use of 6146A tubes only. The 6146B tubes should not be used as a replacement.

FEBRUARY 2, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-19

VFO SHIFT

The trimmers on the VFO tuning capacitor tend to align at their minimum capacitance. Therefore, the head of the screw may not be under sufficient pressure against the spring plates of the trimmers, and intermittant frequency shift can result. Changing C947 from 56 to 47pf NPO [PN 21-147] will allow the trimmers to tune to a point with tighter compression.

FEBRUARY 3, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-20

LOW POWER OUTPUT, S-METER DRIFT, ETC

The #44 pilot lamps presently used in the unit unbalance the series-parallel filament line because of their 250ma current requirements.

In each unit srvice, change the pilot lamps to type #47 [PN 412-11].

This change will be incorporated in future runs.

MARCH 31, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-21

DISTORTED AUDIO, NO CARRIER NULL OR ERRATIC

POWER OUTPUT IN VOICE MODE

This problem may be caused by V1 oscillating at approximately 65KHZ, especially if a "GE" brand tube is used at this location.

To correct,

INSTALL: .005 uf capacitor [PN 21-57] in parallel with the .2 uf capacitor at C3.

Install only as needed.

APRIL 14, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-22

RELATIVE POWER METER PEGS ON 15 AND 10 METER

Diode CR-901 [PN 56-26] shuld be mounted on terminal strip BR with 1/2" leads. This introduces a slight amount of inductance into the circuit, which cures the problem.

The next manual level will include this instruction.

JUNE 5, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-23

RELAYS REMAIN ENERGIZED AFTER TRANSMIT CONDITION

After keying the transceiver with PTT for thirty to forty seconds, a positive voltage in excess of 10 volts appears at the control grid, pin 9 of V12, thus keeping the relays energized.

To correct the problem, replace V12 [PN411-124]. IEC Brand tubes have been found defective in several cases, but other brands may also cause this problem.

JUNE 5, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-24

POOR AGC ACTION

Leakage in the 6HS6 tubes [PN 411-247] at V10 and/or V11 has been found to cause:

- poor AGC action

- Fast S-meter decay

- poor sensitivity when RF gain control is fully clockwise.

This usually occurs after warmup of at least an hour. A positive voltage, usually over 1 volt, will appear at the grid, pin 1, of either one or both tubes.

Replacement of the tube with the positive voltage corrects the problem.

JUNE 5, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-25

100 KHZ CALIBRATOR SPURS

Strong signals may occur at other than 100khz points.

Look at the calibrator output [ahead of output diode] with an oscilloscope. Use high input gain and a slow sweep speed. If the upper portion of the sine-wave signal appears choppy or uneven, the Y201 crystal may be at fault.

After installation of a new crystal [PN 404-43], recheck with oscilloscope.

AUGUST 3, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-26

RECEIVER RECOVERY SLOW

THIS BULLETIN OBSOLETE. REFER TO BULLETIN NO: HW-101-36 DTD OCTOBER 10, 1978.

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service

JULY 24, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-27

ERRATIC VFO TUNING

Erratic tuning can be caused by an intermittant electrical contact in the vernier drive of the tuning capacitor. This causes a change in the ground path from the capacitor frame. This affects the capacitance and subsequently, the tuning.

To prevent this, solder a heavy gauge wire or braid from the stop stud to a solder lug under the closest mounting screw. This provides a suitable short ground path from the capacitor frame to ground.

JULY 24,1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-28

CARRIER NULLS WITH IC14 TRIMMER PLATES COMPLETELY

MESHED

If C14 nulls the carrier with its plates fully meshed toward V2 [to the right], relocate C18, 12pf capacitor, to the other section of the null trimmer [C14].

JULY 24, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-29

POOR PRESELECTOR TRACKING

This problem is more noticeable on the 10-meter band. It may be caused by the drive belt slipping or by one of the variable capacitors not turning due to excessive friction in its bearings.

Check the belt for being loose or worn and replace as needed. Lubricate the bearing of the variable capacitors.

If lubricating the capacitor bearings does not allow the rotor to turn freely, replace the capacitor [PN 26-122].

AUGUST 1, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-30

LOADING CAPACITOR TURNS AS PLATE CAPACITOR

IS ROTATED

This problem can be caused by:

- Insufficent friction in the loading capacitor or;

- Excessive friction between the plate and load tuning shafts.

If the problem persists after freeing and lubricating the shafts, install a rubber grommet [PN 73-3] on the loading capacitor shaft between the pulley and the RF cage. Apply slight pressure to the grommet as the pulley set-screw is tighted. This will add enough friction to keep the loading capacitor still while tuning the plate control. Use only as needed.

AUGUST 3, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-31

RELAYS CHATTER IN VOX MODE

This may occur when the VOX gain is in the near-full CW position with the MIC level advanced past the 12 o'clock position. Also, the unit will not return to receive when the operator stops talking.

Check the tube at V1. A "GE" tube will tend to oscillate, thus causing the above problem. Other 6EA8 tube brands should operate properly at V1.

AUGUST 3, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-32

"CHIRPING" AND SLOW RECEIVER RECOVERY

If "chirping" of the audio in the receive mode and slow recovery of the receiver after long periods of transmitting are encountered, remove the cover of RL2 and check for carbon buildup at the base, just below the contact. Clean dirt or carbon tracks, or replace if necessary.

A dirt or carbon buildup will cause the +300 volts to be applied to adjacent contacts such as the bias or AGC lines, adversely affecting receiver cutoff by upsetting the operation of 1] V12, receiver mixer; 2] V10, RF amplifier; and 3]V11, first receiver mixer.

---------- AUGUST 21, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-33

ALC METER READS BELOW ZERO

If the ALC meter reads below zero on SSB transmit and low on voice peaks, perform the following:

- Install a 2K ohm resistor [PN 1-90] between lug 1 of relay 1 and the center lug of the S meter zero adjust control.

For fussy customers, a 10K ohm trim control [PN 10-312] may be used for exact zeroing on both transmit and receive.

AUGUST 22, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-34

S METER DRIFT

If the S meter drops below zero and pins after 1/2 hour of operation, there may be leakage in one or more of the following tubes: V3, V4, V10 or V11. New RCA tubes may exhibit the same problem. The following procedure will aid in finding the leaky tube:

1. Disconnect R415 to isolate V3 and V4 from the AGC line. Monitor the control grid at P1 of V3 for several minutes. If the voltage drifts in the positive [+] direction, V3 or V4 is leaky. Proceed to step 2. If the voltage remains stable, go to step 5.

2. Remove the white/blue wire from pin 2 of T102 and repeat the test. This will isolate V4 from V3. If the voltage still drifts, V3 is at fault.

3. To verify, reconnect the white/blue wire and then disconnect R101. Monitor the voltage at pin 1 of V4. The voltage should remain stable.

4. Reconnect R415 and R101.

5. Disconnect R408 and check the voltage at pin 1 of V10. If voltage drifts, replace V10. If the voltage is stable, replace V11.

6. Reconnect R415 and R408.

Straight substitution with new tubes may not work if more than one tube is causing the problem, since even a small leakage can cause the drift. When you replace a tube, check for stable voltage at its control grid. Replace with the tube which gives most stable voltage.

SEPTEMBER 26, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-35

POOR IF SENSITIVITY

Check C101. It may have inadvertently been wired to point 2. It should be wired to point 15. It is an "easy-to-overlook" wiring error that would cause the transceiver to have low IF sensitivity which would result in poor receiver sensitivity and low power output.

OCTOBER 10, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-36

RECEIVER RECOVERY SLOW

This is an improved method of grounding the PA tube screens in receive mode. The screens will now be grounded through the unused contacts of RL1, independent of the action of RL2.

Complete the following wiring changes:

1. Disconnect the WHT-ORG-ORG lead from RL2, lug 7 and reconnect it to RL1, lug 10.

2. Connect RL1, lug 2 to ground.

3. Connect a wire to RL1, lug 6 to RL2, lug 7.

This Bulletin will supersede TEB-100-12 dated August 3, 1978.

At Rl1, the PA screen connection [Lug 10] will always break from the +300 volt supply condition [Lug 6] before the screens are grounded by lug 2 in receive condition [de-energized relay]. This eliminates the possibility of the +300 volt supply momentarily being shorted to ground during transition from transmit to receive.

This modification is NOT/NOT for the SB-100, SB-101 or SB-102 transceivers.

OCTOBER 11, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-37

R940 SHORTING TO SHIELD

To prevent the leads of R940 shorting to ground, install a length of sleeving [PN 346-1] on each lead of R940.

This will be incorporated in future production.

OCTOBER 13, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-38

POOR CARRIER SUPPRESSION

The HW-101 carrier suppression specification is -45db or below. If the carrier cannot be nulled on both USB and LSB to this level, try changing R9 on the modulator board from a 1K Ohm to a 390 Ohm [PN 1-48].

This change will reduce the injection level to the balanced modulator and hence reduce the carrier suppression level.

NOVEMBER 20, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-39

IDENTIFICTION OF THE 6146A TUBES

The 6146A tubes [PN 411-75] used at V8 and V9 of this unit are marked '6146A' in white ink on the side of the tube. These tubes may also have '6146B' etched in the galss. These tubes have been reworked by G.E. and are acceptable for use in the HW-101. Most tube cartons will contain the following insert to explain the situation to the customer:

IMPORTANT INFORMATION;

THE TUBE SUPPLIED WITH THIS NOTICE IS TYPE 6146A, AS PRINTED ON ONE SIDE OF THE TUBE, EVEN THOUGH THERE MAY BE A 6146B ETCHED ELSEWHERE ON THE TUBE ENVELOPE.

ALWAYS REPLACE V8 AND V9 WITH 6146A TYPE TUBES

Replace the backing from this label and place the label at any convenient location inside the cabinet top.

NOVEMBER 28, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-40

NOISE OR STATIC FROM SPEAKER WHEN CHASSIS TAPPED

LIGHTLY

If noise or static is heard from the speaker when the chassis is lightly tapped, check for intermittent tubes, cold solder connections, or intermittently shorting filaments in the pilot lamps by tapping each lamp lightly. This produces noise in the filament supply but usually will not produce any difference in the lamp brilliance.

DECEMBER 11, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-41

RELAY CHATTER IN ANY SETTING OF THE VOX SENSITIVITY

CONTROL

If the relays chatter in the VOX mode, try performing the procedures in BULLETIN'S HW-101-13, -31 and -38. If these changes do not correct the problem, perform the following:

1. With a scope, check for excessive noise at the junction [point 8] of R213 and R214. Any noise on the white-red-red wires coming from the mode and function switches will override the reverse bias to D201, thus activating V12B.

2. Replace the two white-red-red wires with shielded cable [PN 343-15].

3. Ground the shields to a ground foil near the junction of R213 and R214.

DECEMBER 27, 1978

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-42

UNIT "WARBLES" WHEN CHASSIS IS TAPPED

This "warble" has been traced to the VFO assembly. This occurs especially when the leads of the C946 and C953 capacitor combination is too long, enabling the capacitors to vibrate.

To solve this problem, glue the top of C946 [4700pf] to the chassis wall of the VFO assembly. The glue [PN 350-12] may be used.

January 24, 1979

HW-101 BULLETIN NO:

SSB TRANCEIVER HW-101-43

POOR SENSITIVITY OR GRID OR PLATE DRIVER COILS WILL NOT TUNE

Check the lugs that are nearest the chassis and verify that they are not folded under the capacitors; thus shorting them out.

January 25, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-44

NO GROUND PIN ON TUBE SOCKETS AT V10 AND V11

The 7-pin tube sockets [PN 434-112] now used at V10 and V11 on the RF driver circuit board do not have a ground pin in the center. Only the 7-pin socket [PN 434-129] at V6 on this board uses a ground clip.

February 16, 1979

HW-101 Bulletin No:

SSB TRANSCEIVER HW-101-45

VFO WILL NOT ADJUST PROPERLY

If the unit will not track at 0 and 500, or if it will track at 0 and 500, but the error at 100, 200, 300, 400 is greater than specifications, then make sure the slug in the VFO coil is adjusted to the lower of the two peaks. To check, insert the shorter end of PN 490-1 tuning tool into the coil. The body of the tool should just touch the top of the coil form. If it sticks out a half inch, the coil is at the wrong peak. Turn slug into coil and readjust tracking.

April 25, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-46

LOW POWER OUTPUT; POOR VOX SENSITIVITY

It has been determinded that Sylvania, RCA and Westinghouse brand tubes do not function properly at locations V3 and V4.

The brands found to work at these locations are: EL-MENCO, IEC, General Electric and Realistic.

Westinghouse tubes at other locations throught the unit may cause low power output and VOX problems. It is suggested not to use Westinghouse tubes at all.

May 15, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-47

DRIVER PRESELECTOR WON’T PEAK FOR FULL OUTPUT AT 7.0 MHZ

Driver Preselector Won't Peak For Full Output At 7.0 MHZ

When aligned the 40-Meter driver grid/plate coils at 7.2 MHZ with the driver preselector control at the 12 o'clock position, there may not be enough grid drive for full output when tuned to 7.0 MHZ. The preselector will be full CCW without peaking.

To correct, realign the 40-Meter driver grid/plate coils with the VFO set at 7.2 MHZ and the driver preselector control set to the one o'clock position.

At 7.3 MHZ, the driver preselector will still peak before reaching full CW.

May 15, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-48

PEC [PN 84-22] NO LONGER USED

The next production run of HW-101's will use discrete components instead of the PEC at V15A since the manufacturer will no longer supply this part. However, the parts replacement department has a three year supply of these on hand, so continue to order the PECs if an older unit requires one.

May 15, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-49

CHANGEOVER TO 6146B FINALS

The 6146A final amplifier tubes are no longer available from the manufacturer. Future productions runs will use the 6146Bs. These are GE brand tubes and have been tested in the HW-101. No difficulty was encountered in neutralizing the finals; nor did the RF choke in the final plate circuit overheat. The tube replacement label [PN 390-146] should be removed from all units brought in for service.

July 30, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-50

R940 OVERHEATS

In new units, R904 100 ohm [PN 6-101] is a film-type resistor. During installation, the body of the resistor may rub against the driver shield, resulting in the resistor shorting to the shield. When installing a new resistor or preworking the unit, position this resistor away from the shield.

July 30, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-51

OPERATION OF MODE SWITCH TRIPS VOX

Dress wht-org-org lead from foil side of modulator board away from V1 foils.

If dressing of this lead fails to correct the problem, install filter in line with wht-org-org lead. Use the unused foil at point "A".

(((Shows .024uf connected from wht-org-org to ground --- 2.2K ohm resistor in line going to R1)))

August 15, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-52

VFO STOPS WORKING AT HIGH END OF ALL BANDS

This problem occures in all modes except LSB. In LSB, the VFO operates okay.

To Correct:

Change: R947 from 1000 ohm to 470 ohm [PN 6-471]

Add: [PN 56-56] diode from gate of Q941 to ground; anode of diode to gate.

September 20, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-53

LOW TRANSMITTER OUTPUT; LOW RECEIVER SENSITIVITY

When cleaning the unit during prework [tube sockets, potentiometers, etc.], don't overlook the SSB/CW filter slide switch located with the RF gain control. This switch handles both transmit and receive signals and dirt and grease build-up can affect the performance of both functions.

September 27, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-54

RECEIVER AUDIO TROUBLESHOOTING INFORMATION

Equipment needed:

Audio Signal Generator

Oscilloscope

01uf capacitor 500 volts or greater [PN 21-16]

Procedure:

- connect a 4 ohm load to the speaker jack.

- set the AF gain control full clockwise.

- set the generator to 1 KHZ at .01 volt RMS

- connect the generator to V13, pin 7 through the .01uf capacitor.

The signal voltages for the points listed should compare with the values given below:

Pin 1 of V14 = 50mv p-p

Pin 9 of V14 = 1.5v p-p

Pin 8 of V14 = 1.5v p-p

Pin 6 of V14 = 35v p-p

Speaker Jack = .6v p-p

Add these voltages to your shop schematic.

November 19, 1979

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-55

AVC DECAY TOO FAST; S METER DROPS TOO QUICKLY

Check for open R117 [PN 6-332]

When replacing this resistor, be sure to dress it away from the AVC wire ends protruding from the IF board to insure that the wire ends will not pierce the resistor's film coating.

JANUARY 21, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-56

LOW GRID DRIVE ON CERTAIN PORTIONS OF ONE OR MORE BANDS

The cause may be an improperly aligned or intermittent 8.395 - 8.895 Mhz bandpass filter, T202

[PN 52-65].

An alignment problem can be corrected by sweep aligning T202.

Equipment Required:

Post/Marker Sweep Generator (IG-5257 or equivalent) with Demodulator

Probe (IG -5257) and Attenuator.

Oscilloscope (IO-4550 or equivalent).

RF Generator (MS-27 or equivalent).

Procedure:

- Unsolder T202's two mounting lugs on the bottom of the Bandpass circuit board.

- Turn the unit over and remove the screw from the top of T202. Remove the shield from T202.

- Connect your equipment as shown below:

[[Shows the RF Generator (set at 5.5mhz) connected to the Marker/Sweep Generator (set at 4.5 Mhz marker on and Lo Sweep), which is in turn connected to the O-scope. The Attenuator is connected to the Sweep Generator.]]

- Connect the demodulator probe's red lead to C402 (lead closest to front of transceiver); black

lead to ground.

- Unplug the coax cable from the VFO (LMO) and connect to the attenuator (set to 0 dB).

- Set the controls and switches as follows:

RF Generator

Frequency Dial.....5.5 Mhz

Marker Sweep Generator

4.5 Marker.....ON

Trace.....FCW

Sweep Range.....LO

Unit Under Test

Mic Level.....FCW

Preselector.....FCCW

- Key the transmitter and adjust T202 for a wave form similar to the one shown.

[[Base ref line graduated, starting at 4.5mhz - 4.75 - 5.0 - 5.25 - 5.5; Vertical plane is defined .1V - .2V - .3V. The waveform rises to .2V (TOP TRIMMER)/4.75 Mhz, remains steady till approximately 5.25 MHz/.3V which indicates (BOTTOM TRIMMER). Trace then drops back down to .2V where at approximately 5.5 Mhz, (MIDDLE TRIMMER). [this is just prior to the trace dropping back to the base line]]]

JANUARY 21, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-57

RELAY CHATTER IN VOX MODE

This can be caused by the 0 to -50 Volt pulse at pin 9 of V1B when switching from transmit to receive. This is fed back to the VOX circuit through the MIC control.

Perform the suggestions in TEBs HW-101-31 and HW-101-41. If this doesn't correct the problem, then install two 0.1 uF capacitors [PN 27-28] across R308. This will reduce pulse rise time and improve VOX operation. Note: In some older transceivers, it may be necessary to add a higher value capacitor; perhaps as high as 0.47 uF.

Perform this modification on an "as-needed" basis.

JANUARY 21, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-58

RECEIVER OSCILLATIONS

The following symptoms may be present:

- The S meter deflects upscale when the CW filter is switched in.

- Oscillations occur with the RF Gain control at maximum and the Bandswitch is changed.

- Oscillations may die out after three to four minutes.

To correct, retune T103 [PN 52-79] to it's top peak. (This may also give you more audio output.)

MARCH 7, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-59

FINALS WILL NOT NEUTRALIZE; C913 AT MAXIMUM CAPACITY

Check for missing bare wire between Driver Plate board and RF-Driver board at location shown in drawing below.

[[Looking down at the RF-Driver Circuit Board - the Driver Plate Circuit Board is 'bonded' to it, by the short bare wire at a location on the PCB's approximately half-way between the right side of the chassis and the switch shaft that passes through the Driver Plate CB]]

If the bare wire is missing, install a 11/16 inch large braid [PN 345-1] between these two boards. If a bare wire is already installed, replace with the braid to improve reliability.

In either case, be sure the braid doesn't short to adjacent foils.

APRIL 10, 1980

service

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-60

RF MOD IN CQ MAGAZINE

The March, 1980 issue of CQ Magazine ran an article on interfacing the HW-101 to a Drake 2B receiver. Among other things, the article implied that Heath Company is supplying an RF gasket and metal inserts to replace the rear panel nylon inserts to correct an RF leakage problem from the back of the HW-101 during transmit.

This has been generating numerous phone calls to Technical Consultation from customers wanting the modification parts; whether they have RF leakage problems or not.

Currently, Heath does not offer such a modification for the HW-101 since Tech Consultation or Engineering has no evidence of any severe RF leakage problems.

If you discover that an HW-101 has rear panerl RF leakage while you are servicing it, you can correct it by connecting a three inch length of brain [PN 345-1] between two solder lugs [PN 259-1] and mounting it on the rear cabinet top and rear panel on the transceiver. Be sure to sand the area around the solder lug on the cabinet top. Refer to the pictorial below.

[[Pictorial shows the 3" braid as stated above - connected in the center of the rear flange of the top cover to the middle of the rear back plane of the chassis]]

Perform this modification on an "as-needed" basis and only if standard servicing procedures do not correct; re:, lockwashers between the RF driver board and chassis, tube shields at V6 and V7, all hardware tightened.

JUNE 20, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-61

PARASITIC OSCILLATIONS

Parasitic oscillations occurring in the HW-101 may be caused by excessive component lead length. The leads of the components installed on V8 and V9 tube shockets whould be kept to a minimum and dressed as shown in the pictorials below.

[[Pictorials indicate a direct-path method of interconnectivity, keeping component lengths at their minimum]].

JUNE 20, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-62

PHASE SHIFT CIRCUIT BOARD PARTS LIST

The following components are being used to replace the PEC [PN 84-22] at V15A in the current production run of the HW-101. This list is intended as a quick reference when servicing the newer transceivers. Continue ordering [PN 84-22] if the PEC must be replaced on older units (re: Bulletin No. HW-101-48).

Circuit Comp. No.	Description	Heath Part No.
C331	0.01 uF ceramic disk capacitor	21-16
C332 thru C336	470 pF mica capacitor	20-128
R341 thru R346	470 kilo Ohm, 1/2 watt resistor	1-33
Phase shift circuit board		85-2138-1
"F" connector (3 qty.)		432-734

AUGUST 12, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-63

VOX DELAY TOO SHORT

Change: C213 from a .2 uF capacitor to a .47 uF capacitor [PN 27-61].

AUGUST 13, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-64

LOAD CONTROL SQUEAKS WITH TEB HW-101-30 MOD INSTALLED

Install a 1/4" flat fiber washer [PN 253-62] between the grommet and the RF cage. Make this change only to units with the modification described in Bulletin No. HW-101-30.

---

service

AUGUST 21, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-65

CW SIDETONE INOPERATIVE

This problem will occur only in units that use the phase shift circuit board in place of the PEC (see Bulletin HW-101-62, dated June 20, 1980).

NOVEMBER 4, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-66

ROTARY SWITCH DETENT CHANGE

The [PN 266-85] rotary switch detents are being replaced with [PN 266-1116] detents. The new detents [PN 266-1116] are directly interchangeable with the old ones.

Continue to use the old detents as replacements until Parts Department's stock is depleated.

DECEMBER 11, 1980

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-67

CANNOT ZERO S METER WITH THE METER ZERO CONTROL

Change: R104 from 47 ohm resistor to 75 ohm resistor [PN 6-750]

R105 from 47 ohm resistor to 22 ohm resistor [PN 6-220]

Make this change on an as-needed basis.

MARCH 12, 1981

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-68

WIRING FOR USE WITH THE HD-15 PHONE PATCH

Refer to the pictorial and perform these steps:

[[Pictorial shows the part of the PCB area where the C12 and V1 (6EA8) are installed]]

- Install a 22 kilohm [PN 6-223] resistor across points A and B.

- Install one end of a 2 feet coax cable [PN 343-15], center conductor to foil pad A, shielded conductor to ground.

- Route the coax cable back to the SPARE JACK and make connections.

MAY 8, 1981

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-69

NO POWER OUTPUTIN USB OR LSB; TUNE OKAY

This may be caused by an open 3.3 megohm resistor [PN 6-335] at R915. Failure of this resistor causes the ALC circuit to function incorrectly.

JUNE 30, 1981

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-70

SIDETONE IS TOO LOUD

To correct, install a volume control circuit.

Parts needed: one 500 kilohm control [PN 10-149]

one 0.005 uF capacitor [PN 21-27]

one fiber washer [PN 253-34]

Installation:

- Remove and discard R326.

- Install a 0.005 uF capacitor [PN 21-27] between the underside foil of pin 1 of V15 and the end lug of the volume control (inside lug that is nearest R302 & 303).

- Install a 500 kilohm CW volume control [PN 10-149] with a fiber washer [PN 253-34] as shown.

[[This is installed at the lower right hand corner of the PCB, where the middle lug is positioned where it can connect to the foil where C311 connects]].

SEPTEMBER 25, 1981

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-71

THE #266-1116 SWITCH DETENT BREAKS DURING INSTALLATION

This occasionally happens when installing the switch detent to the front panel. To correct, install two 3-48 x 3/8" screws [PN 250-172] with two lockwashers [PN 254-7], and two [PN 252-1] nuts.

[[The 3-48 x 3/8" screws and nuts are inserted through the switch detent on the inside of the panel, along with one of the lockwashers. The other lockwasher and control nut are then connected on the outside of the front panel]].

OCTOBER 21, 1981

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-72

VOX CYCLING

This may be caused by a spike introduced at the input of the VOX amplifier. To correct, install a [PN 57-27] diode in series with the white-red-red wire at the junction of resistors R213 and R214.

[[The diode is placed in series between the aforementioned junction of R213/214 and lug 2 & 3 of the PTT switch. The cathode connected to the wire going to the junction, and the anode connected to the path going to the PTT switch]].

NOVEMBER 13, 1981

service

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-73

TONE IN AUDIO WHEN SWITCH TO CW; RELAY CHATTERS WHEN KEY

IS CLOSED

Check for an open 40 uF capacitor [PN 25-36] at C5 in the PS-23A power supply.

JANUARY 21, 1982

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-74

KEYS CONTINUOUSLY WHEN USED WITH THE SA-5010 MEMORY KEYER

This may be caused by a defective 6EA8 tube [PN 411-124] at V15. To check for a defective tube, increase the volume to maximum on the HW-101, switch to CW mode, and listen for a 1-kilohertz tone. If a tone is heard, replace V15.

MARCH 11, 1982

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-75

R940 OVERHEATS

If the 100-ohm resistor [PN 6-101] at R940 overheats, change:

C701 and C801 from 680 pF 300 volt to 680 pF 500 volt [PN 20-735].

Install the higher voltage rated capacitor on all units received for service.

FEBRUARY 25, 1982

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-76

CARRIER NULL CONTROL ISTALLATION CHANGE

The case of the 200-ohm carrier null control [PN 10-147] has been changed to an aluminum case. Therefore, you cannot solder a wire to the case as was done on the older type control. If you attempt to solder a wire to the case, the heat will damage the plastic parts inside the control. So, when replacing a carrier null control with the new type, use the following procedure:

- Melt a small amount of solder onto the two mounting tabs of the 200 ohm control [PN 10-147].

- Now place a fiber washer on the shaft of the control and install it from the foil side of the board. Solder

the five tabs to the foil.

APRIL 23, 1982

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-77

VFO STOPS OSCILLATING AT HIGH END OF DIAL

Two peaks will be noticed when adjusting the VFO coil, one near the top of the coil and the other near the bottom of the coil. Adjust the VFO coil to the top peak to correct this problem. However, to do this it may be necessary to adjust the slugs in T941 to reduce the output level. Reduce the output level from

3-volt RF to about 2-volt RF.

APRIL 29, 1983

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-78

TUNE CONTROL SLIPS

To Prevent the loading shaft from slipping when the tune control is adjusted, install two nylon washers and a spring washer behind the loading shaft pulley onto the loading shaft. Use the following installation procedure and illustration to install the washers.

Parts needed:

QTY DESCRIPTION PART NO.

------ ------------------- -------------

2 flat nylon washer 253-49

1 spring washer 253-36

Procedure:

1. Remove V6, V7, V10 and V11.

2. Remove the loading shaft pulley.

3. Install the spring washer [PN 253-36] between the two nylon washers [PN 253-49] on the loading shaft.

4. Reinstall the pulley by firmly pushing it onto the shaft and compressing the spring washer between the nylon washers.

5. Reinstall V6, V7, V10 and V11.

SEPTEMBER 14, 1983

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-79

DRIVER STAGE OSCILLATES ON 15 METERS

Bend the driver neutralizer wire exiting from hole "W" on the RF driver circuit board flat against the circuit board as shown in the pictorial below. This will eliminate the oscillation. Perform this on an "as needed" basis.

[[Pictorial shows neutralizer wire bent flat against PCB - down along side of C412.]]

SEPTEMBER 14, 1983

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-80

LOW TRANSMITTER OUTPUT DUE TO LOW VCO OUTPUT

To check, measure the voltage at the emitter of Q942. The voltage should be about 8.6 VDC. If the voltage is significantly less (i.e. 7.5 VDC), replace Q942 with a hand-selected [PN 417-118] transistor with the generic marking 2N3393 on it. This replacement should increase the output by 0.1 VRF. Next, change R945 from a 4700 ohm resistor to a 47 kilohm resistor [PN 6-473]. This will raise the VFO output by another 0.1 VRF. These power increase may make the difference between a unit that will meet transmitter power specs and one that will not.

JANUARY 27, 1984

HW-101 Bulletin No:

SSB Transceiver HW-101-81

PRESELECTOR CAPACITORS WON'T TAKE SOLDER

The variable capacitors [PN 26-122] have been found to have corrosion on the pins used to solder the frame to the driver board. The last production run and all parts in replacement stock had this condition. To correct, remove the capacitor from the circuit board. With fine sandpaper or a small ignition file, remove the corrosion. Tin the pins before reinstalling. Be careful not to damage the plates of the capacitors.

Replacement parts stock has been reworked.

SEPTEMBER 21, 1984

HW-101 Bulletin No:

SSB Transceiver HW-101-82

S METER DRIFTS; IF OSCILLATES

Check the brand of 6AU6 tubes at V3 and V4. If a brand other than GE is used at these locations, replace them with GE brand tubes. Parts replacement will stock only GE brand of 6AU6 tubes [PN 411-11].

FEBRUARY 8, 1985

HW-101 Bulletin No:

SSB Transceiver HW-101-83

OSCILLATION ON 15 METERS

On the RF driver board in the newer units, the tube sockets at V10 and V11 were changed to types without the center ground post. Consequently, the switch shields aren't grounded at those points. To correct, refer to the drawing below and use large metal braid [PN 345-1] to ground the switch shield to the RF driver board ground foils at V10 and V11 and at the ends of the shield where the bare wires are located. Resolder the ground post connections at V6 and V7.

DECEMBER 22, 1988

HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-84

R1, R6 AND R7 OUT OF TOLERANCE OR OPEN

The wattage rating of the resistors used R1, R2, and R7 are too low. This cause them to go out of tolerance and eventually open. To prevent this failure, change:

R1 from a 100 kilohm, .5 watt resistor

to a 100 kilohm, 1 watt resistor [PN 6-104-1].

R6 AND R7 from a 33 kilohm, .5 watt resistor

to a 33 kilohm 1 watt resistor [PN 6-333-1].

Also check the 100 kilohm resistor at R215 and the 22 kilohm resistor at R316 for signs of overheating. If necessary, replace them with 1 watt resistors: 100 kilohms [PN 6-104-1] and 22 kilohms [PN 6-223-1].

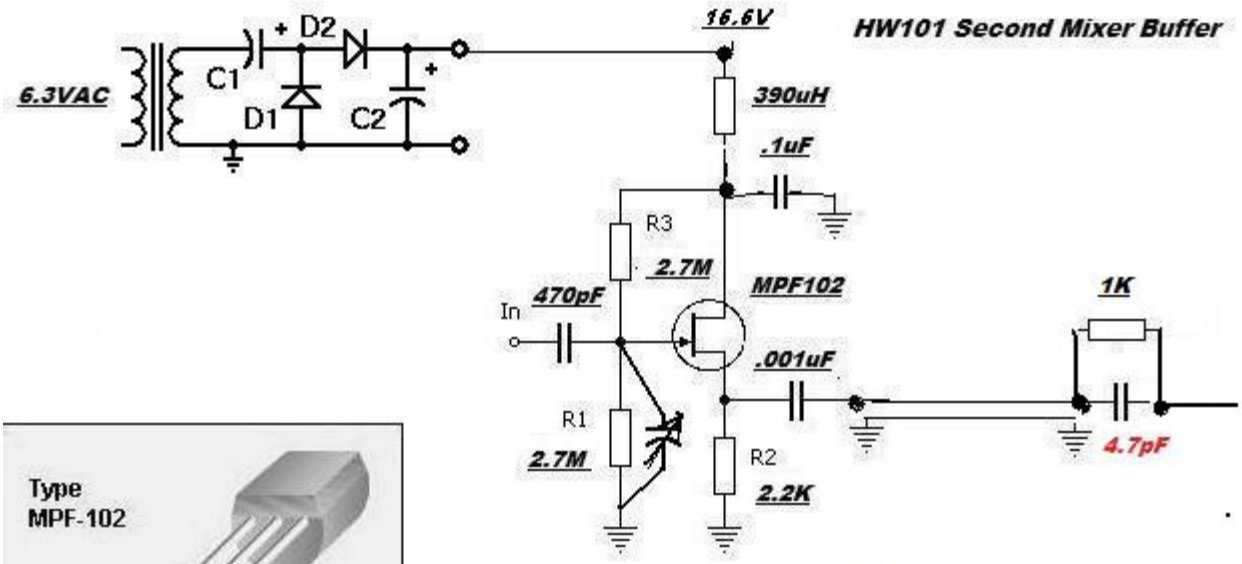
APRIL 28, 1989

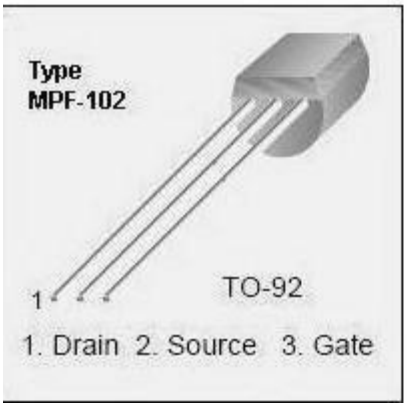
HW-101 BULLETIN NO:

SSB TRANSCEIVER HW-101-85

VOX ACTIVATES WHEN MIKE NOT CONNECTED

If the optional cable to "patch jack" is installed, using the spare phono jack, and the VOX activates without a mike connected, suspect a poor ground at the spare phono jack. This phono jack is used as a ground connection for the power supply, including the 60 Hz filament supply. A poor ground at this point causes hum in the speech amp, tripping the VOX. To correct this problem, tighten the screws securing the spare phono jack.





This circuit matches the crystal filter impedance of 2K to the high impedance output of the Second mixer.

Adjust 15-120pF C across R1 to allow tuning of mixer output LC. (Replaces coax capacitance)

Improve Your HW101or SB100 Rig

(Without Changing Its Selling Price)

By Steve Ray K4JPN ex K1VKW

In 1976 I put together my HW101. It's been a great rig for the money, but over the past 23 years I've found some improvements that I've passed on to a number of HW101 users. I've tested all of these in my HW101 and in several other HW101's and I'm presently using them in my HW101.

S meter won't zero. Heath has had problems with the 6AU6 tubes made by El Menko in that they draw too much plate current. The reason is the ElMenko 6AU6's were manufactured with 5 Volt filaments rather then 6.3 Volt filaments. If the S meter won't zero, replace the 6AU6 at V3 with another brand 6AU6. Simply swapping 6AU6's in the rig will not correct this problem as all the 6AU6's made by El Menko draw too much plate current..

Chirps on CW. This problem usually shows up after several months of operating. It is caused by the same problem that causes the S meter not to zero-a bad 6AU6 at V20 made by El Menko. The fix is to replace the 6AU6 at V20 with another brand.

Loss of sensitivity and/or no output from speaker or phones when going from transmit to receive. Take a piece of typing paper and clean the contacts of RL2, in particular contacts 10 and 2. The plastic cover can be removed on RL1 and RL2 by pulling straight up.

Low transmitter output power, VOX control hard to set, OA2 V18 flashes out when keying rig on CW. Check to make sure the HP23 power supply switch is set for 3OOVDC not 25OVDC. In fact, one should check this first whenever one has problems with the HW101.

Final tune control in wrong position on some bands and/or arcing on some bands in final. The five wires that come from L904 to the band switch can short together if the rig is operated without an antenna by accident. The failure mode is for the wires to short together side by side as they come through the chassis. The fix is to simply replace the shorted wires. Since this is rather difficult to do without disassembling the chassis cage that protects the final, an easy fix is to slide a good grade of plastic sleeving over the shorted wires.

RF in the sidetone oscillator when using headphones (usually occurs with low Z headphones). This can be corrected by a .01 UFD capacitor across pins 3 and 2 on the phone jack. Complaints of RF in Audio, eventually no modulation, but noisy carrier in USB or LSB mode. CW mode OK. Replace the 6EA8 at V1 with a 6CQ8, the tubes are directly interchangeable and you will get a lot more audio drive.

CW sidetone oscillator problems, first check V15, then PEC #84-22. This problem can also show up as sidetone when the rig is in CW mode but not in transmit; when this occurs, suspect V15 has short. Bleed through of the CW sidetone when in CW receive can be cured by simply putting a tube shield on V15.

One of the most important things when problems are encountered with the HW-101/SB-100 series rigs is check the tube voltages per the chart in your manual. I have found several SB-100 series rigs with low output, or weak receive audio that had the wrong voltage on either the VFO driver or the audio output tubes. It is interesting to note that the plate voltages of these tubes were supplied through a 10K resistor and on everyone the resistor had gone up in value. The fix was easy simply change out the bad 10K resistor. I have only seen this on SB-100 series rigs.

Addition of a SO-239 connector at the antenna output. There are several ways to do this. (1) I used a standard SO-239 in place of the phone jack. Use a sheet metal ream to enlarge the hole, then decide if you want to mount the flange inside or outside of the chassis. If outside, simply drill mounting holes and remount the ground going from relay RL1 to one of the mounting screws. If you desire to have the flange on the SO-239 inside the chassis, simply file down one side of the flange till it clears the bracket of the final switch shield. Then drill your screw holes and reconnect the ground from RL1. (2) Another method is to use an 83-875 1002 coaxial connector. This is a single hole SO-239. Don t forget to ground relay RL1 on a convenient ground. This can be the screws in the hole at the shield at the back of the chassis.

S Meter drifting. First try changing V3, next replace R106 with a 33K 2 watt resistor.

Difficulty in neutralizing the rig. This may show up in neutralizing the final, but the problem is in the driver. The final is neutralized on page 123 of the manual; then on page 12-4 one is told to "adjust the driver preselector to produce smooth peaking in RF output". I have found that if the white wire is too far into hole W on the RF driver board one can have trouble neutralizing the final. In my HW101, a 1/4 of an inch into the hole is too far and best results were obtained with the wire only a 1/8 of an inch. So if difficulty is encountered in neutralizing the final, reduce the an amount of wire sticking through hole W. This adjustment is important for if the driver is not neutralized properly you will not be able to neutralize the final.

The best way to neutralize the rig is to load the rig up on 10 meters into a 50 ohm dummy load. Then cut the power make sure the power supply capacitors are discharged, then disconnect the plate and screen voltage to the finals. Hook up a 50 Ohm dummy load and a RF probe to the output of the rig and adjust the neutralizing capacitor for minimum output. Do not adjust the plate tuning or loading capacitors or any other adjustments except the neutralizing capacitor. I have found that one gets a lot better neutralization of the finals, then the way described in the Heath manual.

There has been a lot of articles on what type of finals to run in the HW-101/SB-100 series rigs. I have run 6146's 6146A and 6146B's. I have found the best to be the 6146B's provided you neutralize them with the plate and screen voltage disconnected. I have had a set of 6146B's in my HW-101 for over 3 years now of heavy use and not had a bit of problems with them.

The following mods and trouble shooting techniques are from Heathkit. Again I've checked them all on my HW101.

To improve drive on all bands, remove R-202, the lOK resistor between V3 and V5A and replace with a wire. R-202 is the resistor that connects the Band pass board with the IF board.

To improve filament voltage balance (the HW101 has the filaments in a series/parallel circuit in which the pilot lamps are part of the load) replace the #44 (bluebead) with #47 (brownbead) pilot lamps. Under no condition operate the HW101 without both pilot lamps installed. It should be noted the Heathkit Manual calls out #47 pilot lamps, but every HW101 I've seen has #44 pilot lamps.

Alignment tip. Filter T1 will peak at two points. Use the peak with the slug at the top.
S meter instability (this is a rare problem so first check V3). Replace R-107 with a 100K 1 watt resistor.

S Meter instability first check V3 if that does not cure it, try replacing R-107 with a 100K 1 watt resistor.

The following mods, are from the 1978 addition of the ARRL publication Hints and Kinks. I have tried them all. (1) On page 37, the "Improved Recovery for Heath Transceivers and Modification for the SB-200 Linear Amplifier". This mod is easy to do and works great. (2) On page 47, eliminating AC Buzz in the Heathkit SB-102 transceiver is also applicable to the HW101. I found that grounding the shield on the circuit board was not adequate. I found it necessary to add a ground lug to the chassis and ground the shield at the chassis and circuit board at the circuit board end of the shielded cable.

There are several mods I've heard about and tried. One is using 6AU6's for the 6HS6's at V10 and V11 to reduce the susceptibility of the receiver to cross modulation. I tried this and prefer the 6HS6's. Another mod is to substitute 6AK5's for V10 and V11. It will be necessary to cut off pin 2 on the 6AK5's before they are used. This mod seems to reduce the front end noise, but the 6AK5's appear to get gassy after they have been run for a. while. If you have a couple of old 6AK5's try it and see if you like it. It is important that you replace both V10 and V11 with 6AK5's if you try using only one 6AK5 you will unbalance the filament voltage.

I've heard several fellows talk about removing the 6.8 MHz trap in the grid circuit of V5A to improve drive. This trap is used to eliminate the second harmonic of the oscillator getting into the drive and then out of final. This mod should be tried only if one has access to a spectrum analyzer to see if there are any spurious signals coming out of the HW101 after the filter is removed.

If your HW101 has El Menko tubes for the 6AU6, 6HS6, 6EA8, 12AT7, l2AU7, 6CL6, etc. I'd recommend you have spares of another brand. I've not been pleased with the El Menkos, they don't seem to last plus the bad 6AU6's made by El Menko with the wrong filament voltage. I replaced all the ElMenko tubes in my HW-101 many years ago and I believe me it has saved a lot of problems.

I recommend any Heath Kit fan visit http://members.accessus.net/~dwentz/kb9jja/heathkit/
Well, try these mods. They are all easy and are worth the time and effort. I'm interested in any mods for the HW101. There are several mods for RIT, and improving VOX response on CW.

When I've tried them I'll write them up. I'll respond to any questions on the mods provided a self addressed, stamped envelope is sent with the question.
Good luck.

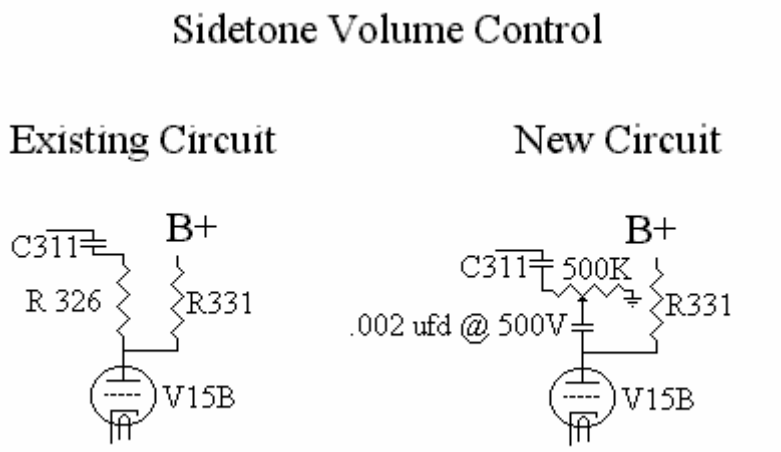
Steve Ray K4JPN ex K1VKW HW-101, HW-8,
SWL 30-40, Pixie II, NC 38S, OHR 100A 30 M and Heath Kit fan

Email sbralr@worldnet.att.net

Adjustable CW Sidetone Volume Control for the HW-101

1. Remove R-326 from the audio circuit board.
2. Install a .002 ufd 500 VDC capacitor from the pad where R-326 was removed to the pad between where R-329 is mounted and with C-311 is mounted. There is nothing mounted on this pad.
3. Install a printed circuit pot 500K ohms through the hole on the Audio Circuit board, near R-326.

4. Solder the pot terminals to the circuit board.



5. I recommend one examine the two excerpts from the schematic and the figure on page 189. A volume control for the side tone level on the SB-101 was provided. However, Heath didn't do this on the HW101. The SB-101 and HW101 use the same circuit boards so this is a real easy mod as the hole and terminals are already provided for mounting the pot.

SCHEMATIC OF THE HEATHKIT® SSB TRANSCEIVER MODEL HW-101

DIODES

COMPONENT DESIGNATION	TYPE	HEATH PART NO.
D 1, 2, 101, 201, 301, 902, 903, 904, 905, 906	1N2071 (1 A, 600 PRV)	57-27
D901	1N4149	56-56
CR 1, 2, 3, 4, 201, 401, 441	1N191	56-26-1
D 202	15 V Zener	56-25

TRANSISTORS

COMPONENT DESIGNATION	HEATH PART NO.	MANUFACTURER'S NUMBER	(BOTTOM VIEW) BASING
Q941	417-169	MPF 105 FET	
Q942	417-118	2N3393	

Hints and Kinks For the Experimenter

RIT FOR THE HW-101

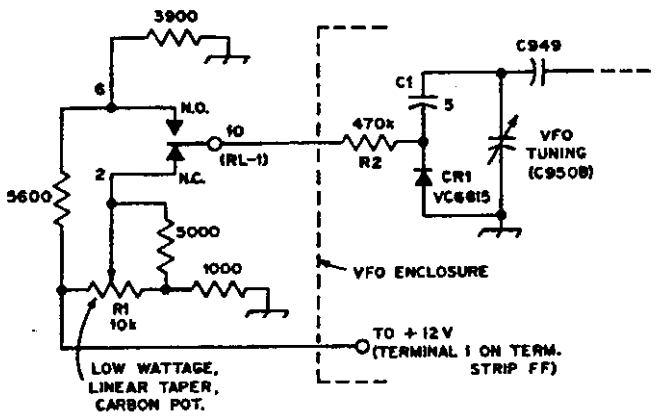
This simple circuit provides an incremental tuning range of 4 kHz for the receiver and makes use of a voltage-variable-capacitance diode. With slight modification to the T-R relay in the HW-101 and front panel, a beautiful addition can be made. The circuit to be described may be applied to any transceiver that can provide:

1) A source of dc voltage in the range of 12 to 20 volts (+ or –).

2) A spare pole on the T-R relay with one normally closed and one normally open contact.

The diode is mounted inside the VFO enclosure. The dc voltage for CR1 is taken from the regulated 12-V line at terminal 1 of the strip FF. In our case, the voltage-divider circuit was built into an external Minibox and connected to the VFO and relay through shielded cables. Feedthrough capacitors were used where the leads entered the VFO enclosure. There is more than enough room in the HW-101 VFO enclosure to house the voltage-divider components. In the permanent modification R1 could be mounted just to the left of the meter on the front panel of the HW-101.

CR1 is made by Eastron Corp., 25 Locust Street, Haverhill, MA 01830. This diode offers a capacitance range of 7.5 to 35 pF over a bias range of 0 to 20 volts. The diode is installed in parallel with the transceiver VFO tuning capacitor. If your transceiver offers only a negative dc voltage within the VFO, simply reverse the diode polarity in the circuit. The diode remains in the circuit at all times. A fixed value of bias is applied to the diode on transmit to provide a reference capacitance around which the receive-mode capacitance is varied. The bias is varied by R1 on receive, thus changing the VFO frequency. R2 serves as a decoupling resistor to prevent the oscillator from being loaded down by the dc source. C1 isolates the dc from the oscillator tank circuit. With the resistances shown, a total change of about 4 kHz is realized over the range of R1. If you substitute different values for any of the resistors, make sure the transmit frequency is not varied accidentally when R1 is adjusted.

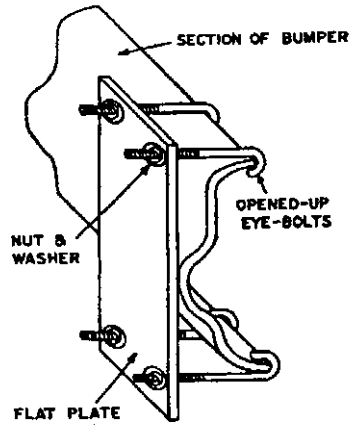


RIT for the HW-101.

To set the reference of the RIT, measure the voltage at the diode when the transceiver is in the transmit mode. Now switch to receive and adjust R1 for the same voltage. This setting of R1 is the point where the transmit and receive frequencies coincide. Next, the dial is calibrated while using the 100-kHz calibrator. This completes the alignment. – *Floyd Sense, K4EQA*

INEXPENSIVE MOBILE ANTENNA MOUNT

Mobile or would-be mobile operators looking for a low-cost bumper mount for their antennas might be interested in this system. Basically, it consists of a flat, stiff aluminum plate placed against whichever part of the bumper projects out the farthest. It is held solidly by means of four hooks behind the aluminum. The plate should be 1/4- to 1/2-inch thick, or it can be a piece of 1-inch board if you aren't too concerned with appearance. Quarter-inch steel plate will work also, but can rust in short order.



The four hooks are made from eye-bolts such as the ones sold in hardware stores. The hooks should be plated to resist rust, be at least 1/4 inch in diameter, and one inch longer than the depth of the bumper. They should be threaded over most of the shank (for adjustment). The best way to open the "eyes" is to drive a cold chisel down into the crack where the end is curled around to touch the shank. Laying the eye over the partly opened jaws of a vise will enable one to further open the eye with the cold chisel.

Most mobile antennas require a ground connection to the automobile frame, and this mount does not make a particularly good one – especially if you use a piece of board for the mounting plate. So it would be wise to use a separate ground lead

RIT INSTALLATION INSTRUCTIONS

1. Assemble the RIT KIT's 3 terminal, terminal board,as shown in PICTORIAL #1.

2. Assemble the special RIT KIT potentiometer as shown in PICTORIAL #2.

3. Refer to the DMK-101 Installation Instructions and complete Steps 1. thru 8.

4. Remove the HW-101 ZERO SET button.

5. Unsolder the B+ wire, Bias wire and Filiment wire from the rear terminals of the VFO.

6. Remove the four VFO-mounting nuts and remove the VFO.

7. Remove the Zero-Set Post located on the VFO case. The Zero Set Post screw hole will be used to route the orange wire from the three terminal, terminal board to pin #10 of relay RL1.

8. Install the three terminal, terminal board as shown in Detail 1-A. Re-install the VFO. Replace the B+, Bias and Filiment wires.
9. Carefully cut the letters "ZERO SET" off of the HW-101 Escutcheon.

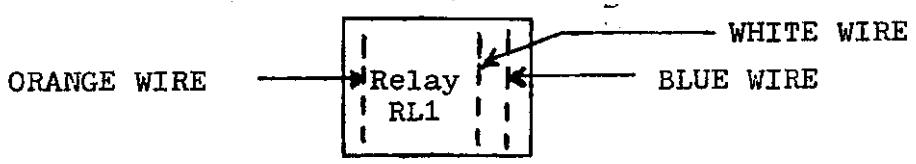
10. Apply the RIT decals as showm in Detail 1-B. It is recommended that you mask off a small area around the Rit decal and spray the RIT decal lightly with a clear plastic spray.

11. After the spray drys. Install the assembled RIT potentiometer in the ZERO SET BUTTON HOLE. Install the RIT control knob.

12. Route the red wire from the 39K resistor located on the RIT potentiometer to the +150VDC terminal (B+) located on the rear of the VFO. Cut off excess wire and solder to the B+ terminal of the VFO.

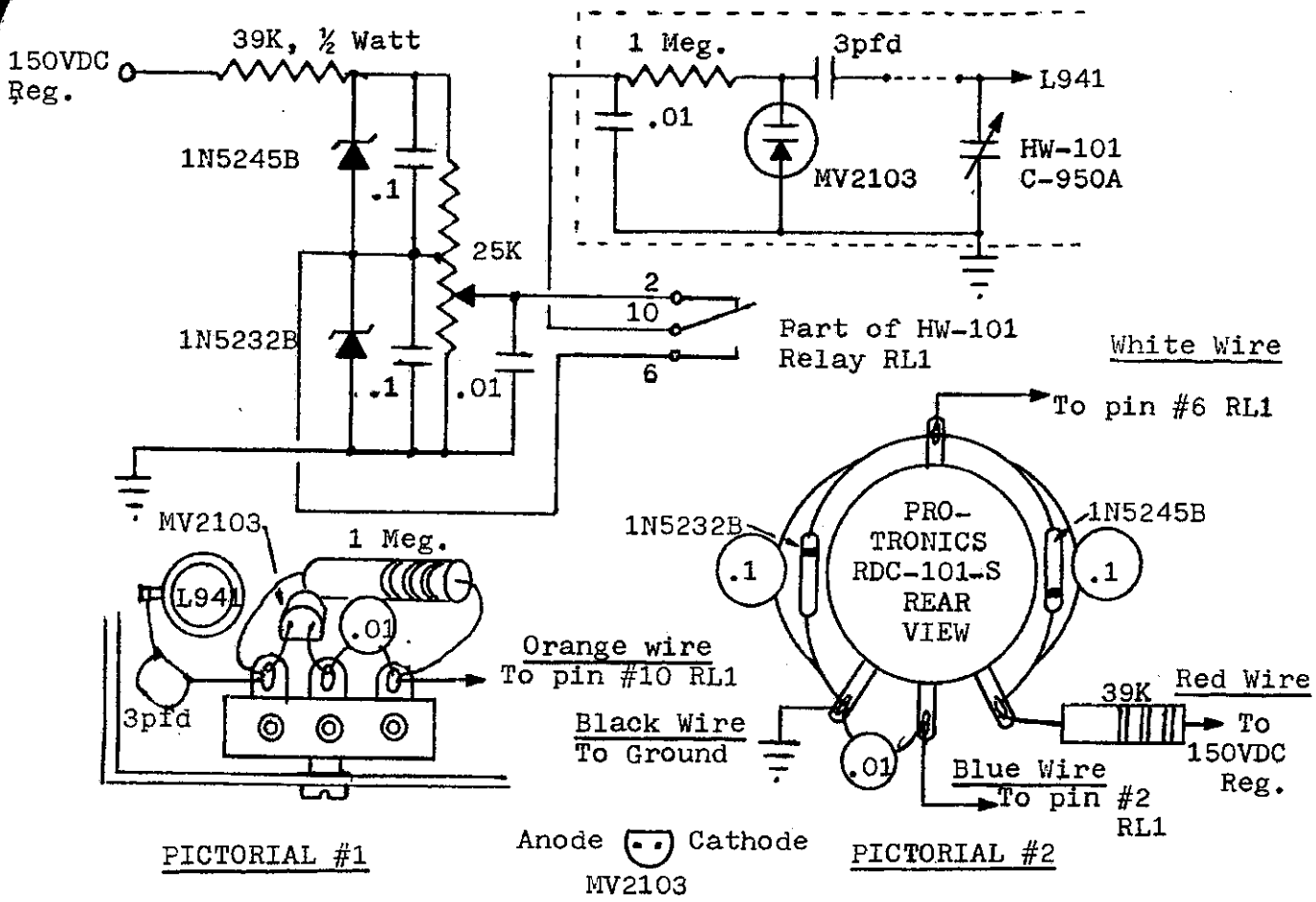
13. Route the Black wire of the RIT potentiometer to the grounded terminal of the HW-101 FUNCTION SWITCH. Cut off excess wire and solder to the grounded terminal.

14. Route the white, Blue and Orange wires to relay RL1 of the HW-101. Cut off excess wire and terminate as shown below.



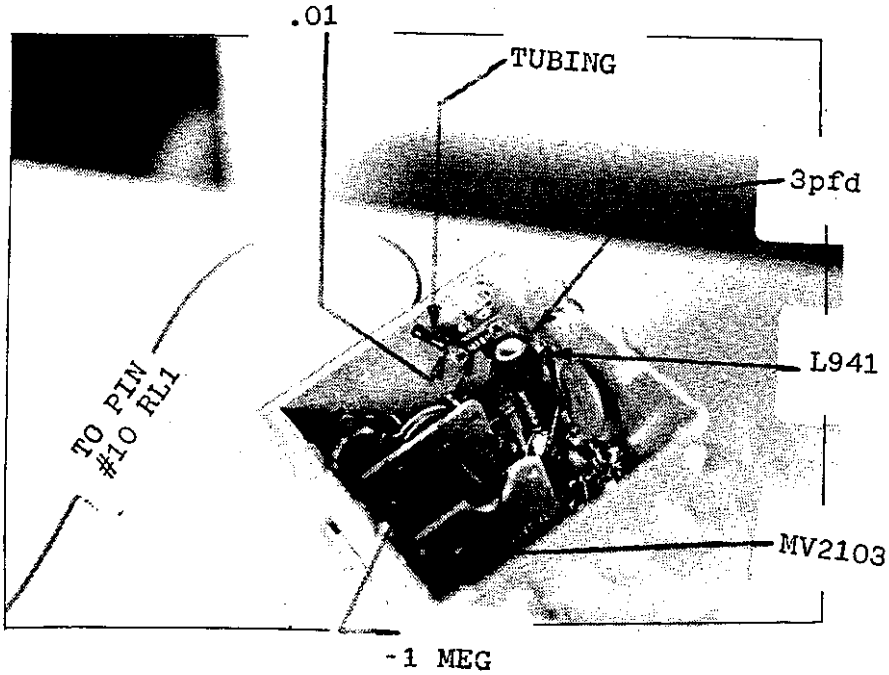
15. This completes the RIT installation. Continue with STEP 9. of the DMK-101 installation instructions.

RIT KIT for the HW-101

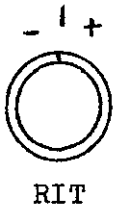


PICTORIAL #1

PICTORIAL #2



DETAIL 1-A



RIT LABELING

DETAIL 1-B