

# Modification Kit

for the



## HW-2036 SYNTHESIZED 2-METER FM TRANSCEIVER

MODEL 830-29

The purpose of this Modification Kit is to update your HW-2036 Transceiver to reflect all of the latest Heathkit engineering improvements.

### PARTS LIST

Check each part against the following list. Return any part that is packed in an individual envelope, with the part number on it, back in the envelope after you identify it until that part is called for in a step.

To order a replacement part, always include the PART NUMBER. Use a Parts Order Form or, if one is

not available, refer to "Replacement Parts" inside the rear cover of your Transceiver Manual. For prices, refer to the separate "Heath Parts Price List."

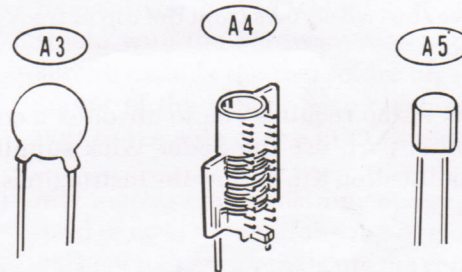
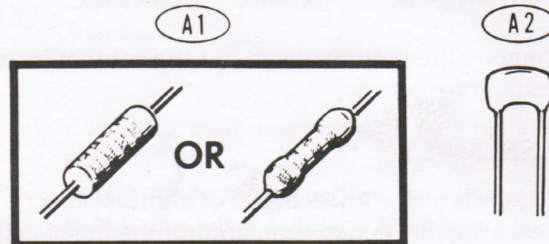
NOTE: The circuit component numbers refer to the component numbers in your Transceiver Manual and Schematic.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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#### ELECTRONIC COMPONENTS

NOTE: The following resistors are 1/4-watt and have a tolerance of 5% (gold fourth color band).

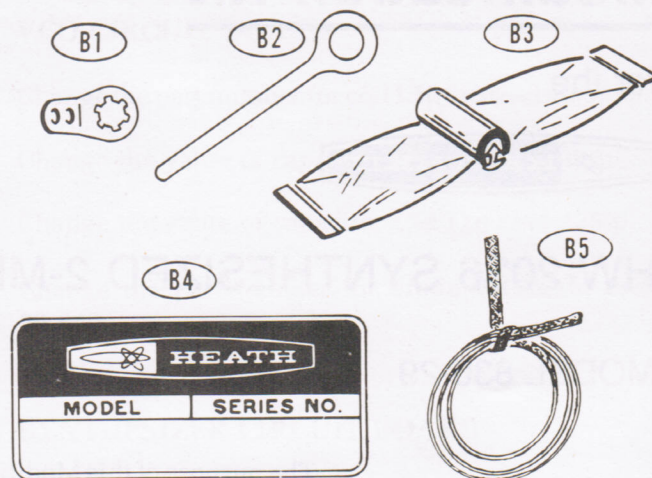
A1	6-101-12	1	100 $\Omega$ (brown-black-brown) resistor	R103
A1	6-562-12	1	5600 $\Omega$ (green-blue-red) resistor	R427
A1	6-103-12	1	10 k $\Omega$ (brown-black-orange) resistor	R428
A1	6-153-12	1	15 k $\Omega$ (brown-green-orange) resistor	R233
A2	20-130	1	12 pF mica capacitor	C325
A2	20-99	1	22 pF mica capacitor	C509
A2	20-177	1	125 pF mica capacitor	C513
A3	21-78	1	5 pF ceramic capacitor	C201
A3	21-75	1	100 pF ceramic	C403
A4	40-1855	1	.25 $\mu$ H coil (blue)	L501
A5	56-640	1	MV2110 diode	VD502



KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
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### MISCELLANEOUS

	344-90	3'	Black wire	
	344-92	3'	Red wire	
	346-1	2'	Sleeving	
B1	259-1	1	#6 solder lug	
B2	259-24	1	#8 solder lug	
B3	351-9	1	Package of epoxy	
B4	391-34	1	Blue and white label	
B5	490-185	1	Package of Soder Wick*	
	597-260	1	Parts Order Form	
	597-308	1	Kit Builders Guide	
		1	Modification Kit Manual (See Page 1 for part number.)	
			Solder	



\*Registered Trademark, Solder Removal Company

## MODIFICATION PROCEDURE

### PREPARATION

NOTE: When assembly or disassembly is required in a step, refer to your Transceiver Manual for the proper procedure.

- (X) Be sure your Transceiver is off and is disconnected from its power source.
- (X) Remove the bottom cover and the cabinet from your Transceiver.

### VCO ASSEMBLY

- (X) Carefully use a knife blade or similar object to peel away the epoxy from around the top of coil L501 in the top VCO shield.
- (X) Remove the two screws from the top of the VCO assembly.

NOTE: When a step requires you to unsolder a component or other part, use the Soder Wick supplied with this Modification Kit. Follow the instructions on the package.

- (X) Carefully unsolder the two solder lugs from the side of the top VCO shield. Then remove the shield.

- (X) Remove the hardware from the VCO circuit board. Then remove the circuit board, as far as possible, from the bottom VCO shield.

Refer to Pictorial 1 for the following steps.

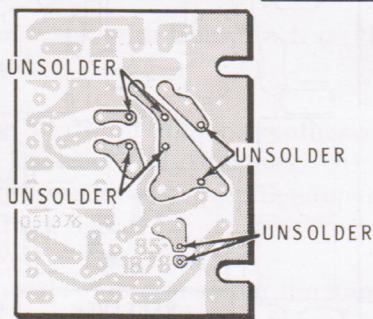
- (X) Refer to Part A of the Pictorial and unsolder the eight indicated solder connections on the foil side of the circuit board.
- (X) Refer to Part B of the Pictorial and carefully break coil L501 and capacitors C509 and C513 loose from the circuit board. Use a knife blade or similar object to remove any excess epoxy from the circuit board.
- (X) Refer again to Part B of the Pictorial and carefully remove diode VD502 from the circuit board.

NOTE: When you install a new part in a circuit board, as in the next step, solder the leads to the foil and cut off any excess lead lengths.

- (X) VD502: Install an MV2110 diode (#56-640) at VD502 in the circuit board. Be sure to position the flat on the diode as shown on the circuit board.

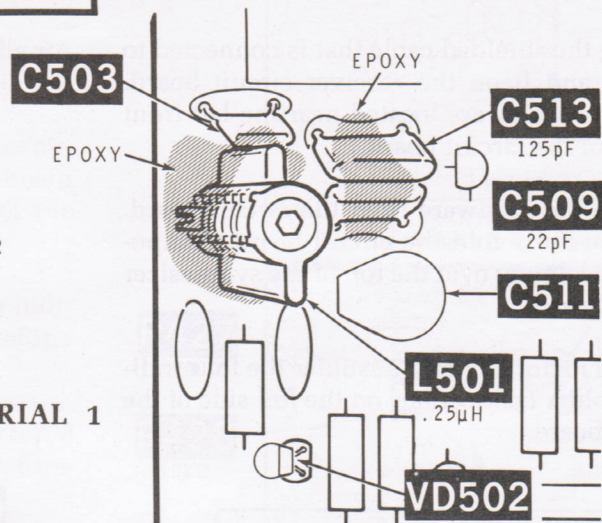


## PART A

VCO  
CIRCUIT BOARD

PICTORIAL 1

## PART B



NOTE: Be careful in the next two steps that you do not get any epoxy on trimmer capacitor C511.

- (X) C513: Install a 125 pF mica capacitor at C513 in the circuit board.
- (X) C509: Install a 22 pF mica capacitor at C509 in the circuit board.
- (X) L501: Install a .25  $\mu$ H coil (#40-1855) at L501 in the circuit board. Install this coil so the tab is positioned as shown on the circuit board. Hold the coil down **tightly** against the circuit board while you solder the leads to the foil.
- (X) Push the tops of capacitors C513 and C509 together. Also push the top of capacitor C503 against coil L501.

NOTE: Perform the next three steps carefully but quickly. The epoxy sets in five minutes.

- (X) Open the package of epoxy. Then use the following procedure to prepare some of the epoxy for use in the next five steps:

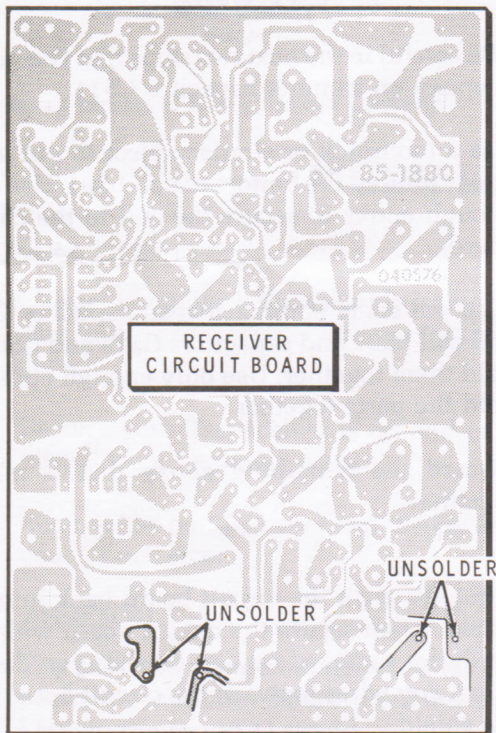
1. Remove the clamp from between the epoxy sections.
2. Cut the sections apart at the point where the clamp was. NOTE: Be careful that you do not squeeze out any of the epoxy yet.
3. Squeeze out **half** of the contents from each section onto a piece of paper. Save the remaining epoxy for use in a later step.
4. Use a toothpick or similar object to thoroughly mix the epoxy, on the piece of paper, together.

- (X) Use a toothpick or similar object to put some epoxy around the bottom of coil L501. Use only enough epoxy to secure the coil to the circuit board.
- (X) Also put some epoxy between capacitor C503 and coil L501 and capacitors C513 and C509 to hold them together. Use only enough epoxy to hold the parts together.
- (X) Discard the remaining epoxy that is mixed together.
- (X) Carefully push the circuit board back into the shield. Then secure the circuit board with the hardware removed earlier. Be sure you do not pinch any wires between the circuit board and the shield.
- (X) Reinstall the top VCO shield on the bottom VCO shield with the hardware removed earlier. Be sure to include the two solder lugs at the front corner of the shield. Also resolder the solder lugs to the side of the VCO shield.
- (X) Mix together the remaining epoxy. Then put a bead of epoxy around the top of coil L501. Use only enough epoxy to secure the coil form to the top VCO shield.

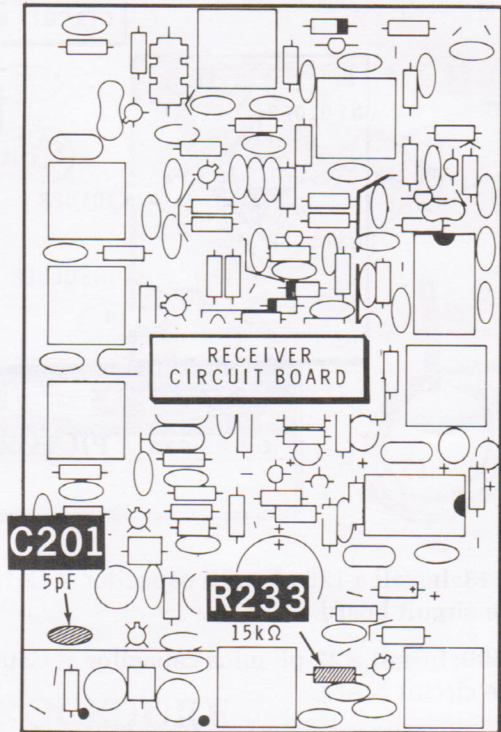
This completes the VCO modification. Refer to "Receiver Circuit Board."

## RECEIVER CIRCUIT BOARD

- (X) Unplug the shielded cable that is connected to pins A and B on the receiver circuit board. (These two pins are located near the left front corner of the circuit board.)
- (X) Remove the hardware from the circuit board. Then carefully fold the circuit board (component side down) over the top of the synthesizer circuit board.
- (X) Refer to Pictorial 2 and unsolder the four indicated solder connections on the foil side of the circuit board.



PICTORIAL 2



PICTORIAL 3

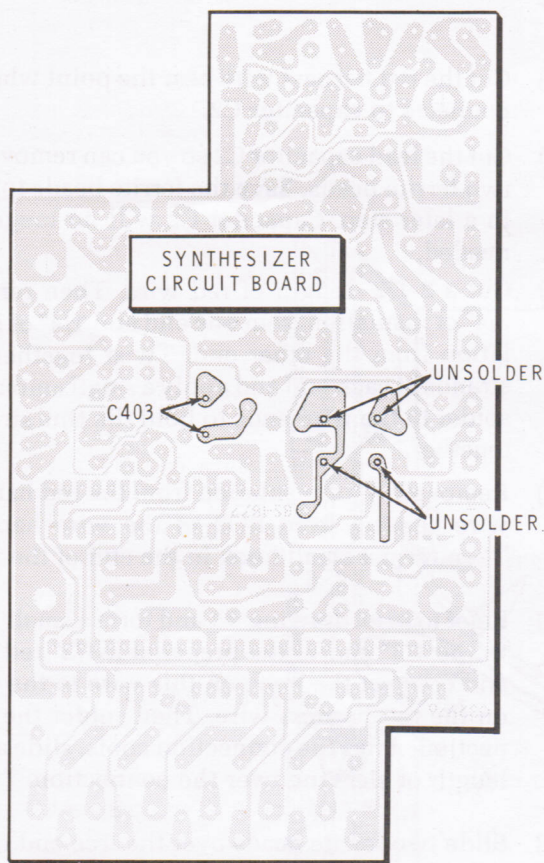
- (X) Refer to Pictorial 3 and carefully remove resistor R233 and capacitor C201 from the circuit board.
- (X) R233: Install a 15 k $\Omega$  (brown-green-orange) resistor at R233 in the circuit board.
- (X) C201: Install a 5 pF ceramic capacitor at C201 in the circuit board.
- (X) Remount the receiver circuit board to the chassis with the hardware removed earlier.
- (X) Reconnect the shielded cable inner wire to pin A and the shield wire to pin B on the circuit board.

This completes the receiver circuit board modification. Proceed to "Synthesizer Circuit Board."

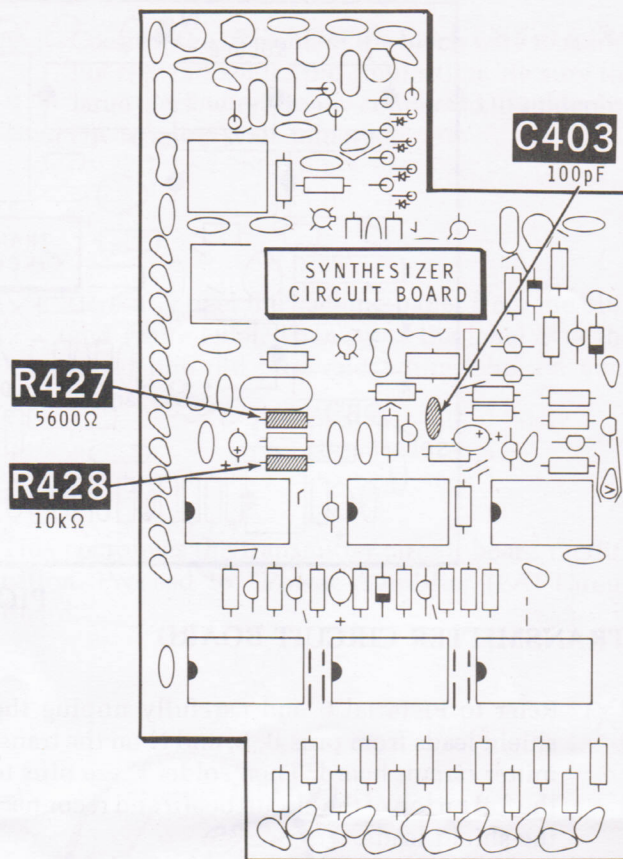


## SYNTHESIZER CIRCUIT BOARD

- (X) Unplug the black wire from pin L on the PA circuit board.
- (X) Remove the hardware from the synthesizer circuit board. Then carefully fold the circuit board (component side down) over the top of the receiver circuit board.
- (X) Refer to Pictorial 4 and unsolder the four indicated solder connections on the foil side of the circuit board.
- (X) Check the value of capacitor C403 (see Pictorial 5). If this capacitor is not already 100 pF, carefully unsolder and remove it.



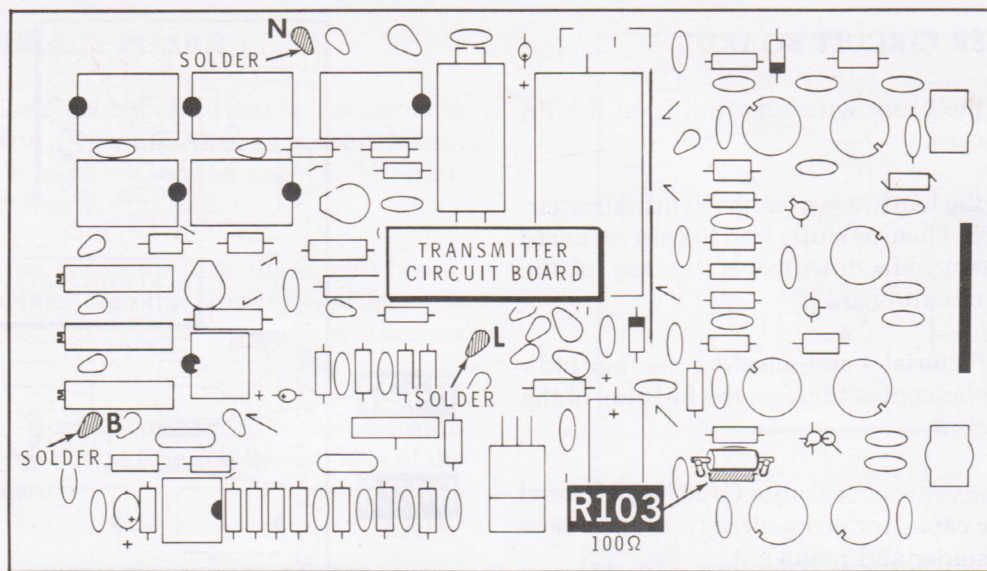
PICTORIAL 4



PICTORIAL 5

- (X) Refer to Pictorial 5 and carefully remove resistors R427 and R428 from the circuit board.
- (X) R428: Install a 10 kΩ (brown-black-orange) resistor at R428 on the circuit board. NOTE: This used to be a 5600 Ω resistor.
- (X) R427: Install a 5600 Ω (green-blue-red) resistor at R427 on the circuit board. NOTE: This used to be a 10 kΩ resistor.
- (X) C403: If you removed this capacitor, install a 100 pF ceramic capacitor at C403 on the circuit board.
- (X) Remount the synthesizer circuit board to the chassis with the hardware removed earlier.
- (X) Reconnect the black wire to pin L on the PA circuit board.

This completes the synthesizer circuit board modification. Proceed to "Transmitter Circuit Board."



PICTORIAL 6

## TRANSMITTER CIRCUIT BOARD

- (X) Refer to Pictorial 6 and carefully unplug the shield leads from pins B, L, and N on the transmitter circuit board. Then solder these pins to the foil on top of the circuit board and reconnect the shield leads.

NOTE: Because the transmitter is somewhat difficult to remove from the chassis, the following steps will direct you to change a resistor from the top side of the circuit board. If you prefer, you may remove the circuit board from the chassis and then refer to your Transceiver Manual to reinstall the circuit board.

- (X) Refer to Pictorial 6 and cut the leads of resistor R103 close to the resistor body. Then straighten the leads so they extend straight up from the circuit board.
- (X) R103: Cut both leads of a 100  $\Omega$  (brown-black-brown) resistor to 1/8".
- (X) Carefully tack solder the leads of the prepared resistor to the two leads extending from the transmitter circuit board. Be sure you do not allow the solder on the connection nearest coil L102 to short to the foil on the top of the circuit board.

Refer to Pictorial 7 for the following steps.

- (X) Carefully unplug the red harness wire and capacitor C2 from pin S on the transmitter circuit board. Then unsolder the other capacitor lead from solder lug DA.

- (X) Cut the red harness wire near the point where it connects to capacitor C2.
- (X) Cut the lead capacitor C2 so you can remove the two ferrite beads. Save the ferrite beads for use in a later step. Capacitor C2 will no longer be needed.
- (X) Cut a 2-1/2" length of red wire. Then remove 3/4" of insulation from one end and 1/4" of insulation from the other end. Twist together the strands at each end and apply a small amount of solder to the wire ends to hold the fine strands together.
- (X) Remove 1/4" of insulation from the red harness wire coming from BO2 of the wire harness. Then form a small hook in the end of the wire.
- (X) Refer to inset drawing #1 and form a small hook in the 1/4" end of the prepared 2-1/2" red wire and connect the hook on this wire to the hook on the red harness wire. Then solder the connection. After the connection cools, slide a 1/2" length of sleeving over the connection.
- (X) Slide two ferrite beads over the free end of the red wire. Then connect the end of the wire to pin OUT on the transmitter circuit board. Wrap the wire around the top of the pin and solder the connection.
- (X) Cut a 1-1/4" black wire. Then remove 1/4" of insulation from each end and apply a small amount of solder to the ends as you did before.



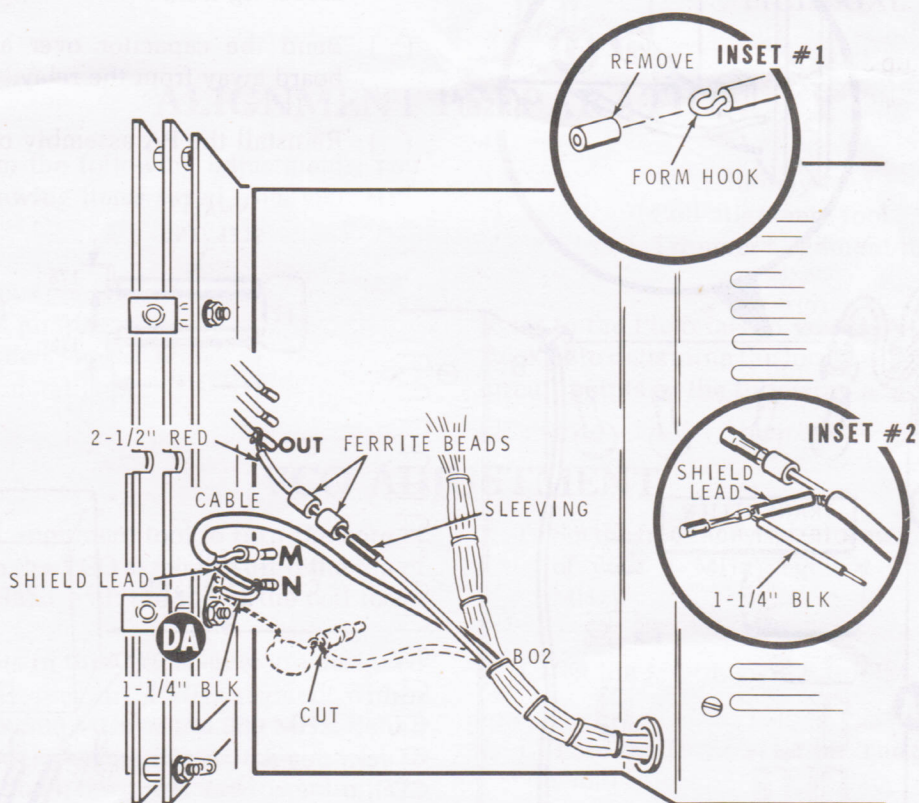
(X) Refer to inset drawing #2 and use the following procedure to connect one end of the prepared black wire to the connector at pin N on the circuit board:

1. Unplug the shielded cable from pins M and N on the circuit board.
2. Remove 1/8" of sleeving from the top of the connector on the shield wire.
3. Wrap one end of the black wire around the top of the connector and solder the connection.
4. Reconnect the connector on the inner lead of the shielded cable to pin M and the connector on the shield lead to pin N on the circuit board.

(X) Connect the free end of the black wire to solder lug DA and solder the connection. Be sure the large black wire already connected to solder lug DA remains well soldered.

(X) Carefully peel the backing paper from the blue and white label. Then press the label over the top of the old blue and white label on your Transceiver.

This completes the transmitter circuit board modification. Proceed to "Power Amplifier (PA) Circuit Board."



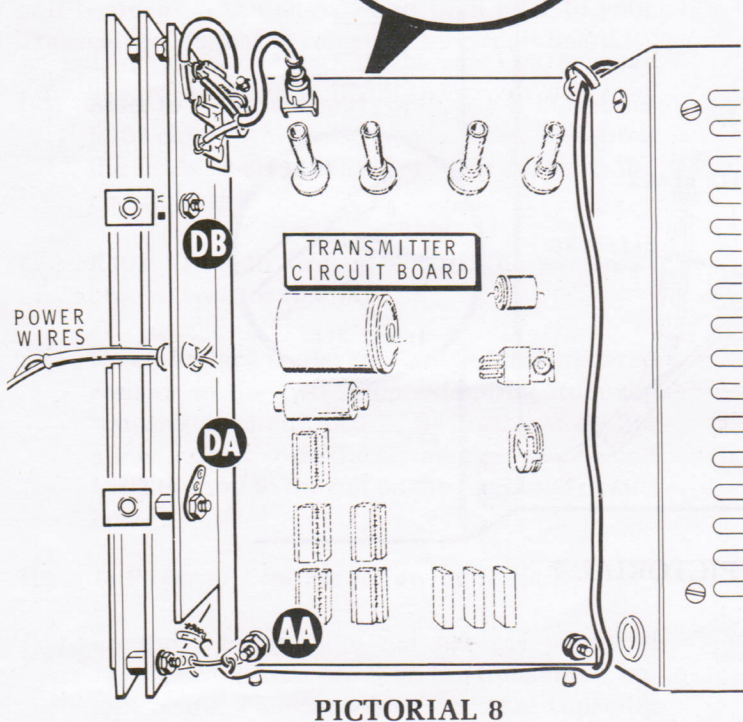
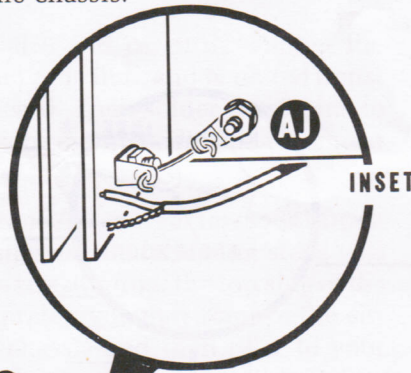
PICTORIAL 7

## POWER AMPLIFIER (PA) CIRCUIT BOARD

NOTE: Disregard the following steps if capacitor C325 is already installed on your PA circuit board. Proceed directly to "Alignment Preparation."

Refer to Pictorial 8 for the following steps.

- ( ) Unplug the 9-pin socket from the PA circuit board.
- ( ) Remove the nut from stud AA on the **transmitter** circuit board. Then raise the solder lug so it clears the stud.
- ( ) Refer to the inset drawing and remove the nut from screw AJ on the **receiver** circuit board. Then raise the solder lug so it clears the stud.
- ( ) Remove the hardware from DA and DB on the rear edge of the chassis.

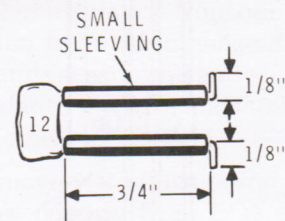


- ( ) Lift the power wires from the slot in the PA assembly. Then carefully lower the PA assembly so it is positioned foil-side-up behind the chassis.

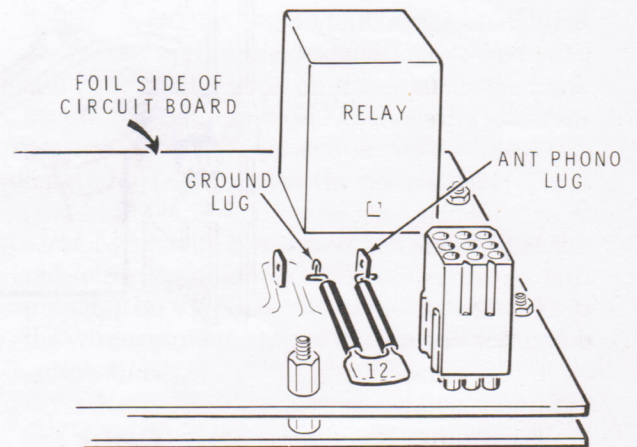
NOTE: In the next two steps the length of the capacitor leads are extremely important. Be sure to cut and bend these leads properly.

Refer to Pictorial 9 for the next three steps.

- (✓) Locate a 12 pF mica capacitor and cut the leads to 7/8".
- (✗) Place 3/4" of small sleeving over each capacitor lead.
- (✗) Bend 1/8" of the end of each lead as shown.
- ( ) C325: Refer to Pictorial 10 and solder the capacitor leads between the ANT phono socket lug and the ground lug as shown. Place the capacitor leads against the already-soldered connections and heat the connection with your soldering iron.
- ( ) Bend the capacitor over against the circuit board away from the relay.
- ( ) Reinstall the PA assembly on the chassis.

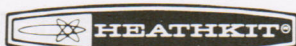


**PICTORIAL 9**



**PICTORIAL 10**

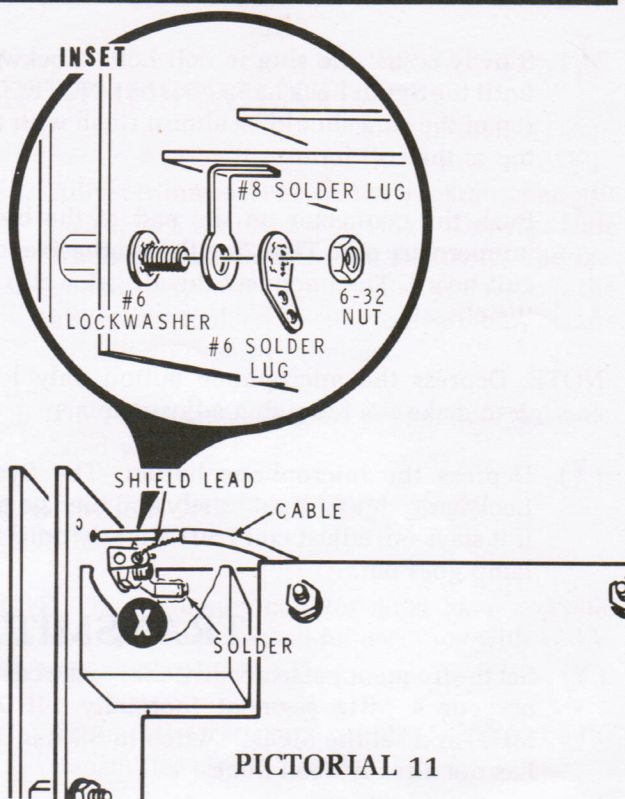




Refer to Pictorial 11 for the following steps.

- ( ) Remove the nut from the stud at X on the PA circuit board. Do not remove the lockwashers.
- ( ) Mount a #8 solder lug and a #6 solder lug onto the stud at X. Use the 6-32 nut removed earlier. Form the #8 solder lug so it touches the chassis as shown.
- ( ) Solder the #8 solder lug to the chassis in the area shown.
- ( ) Carefully unsolder the shield lead from hole B in the PA circuit board. Then connect the shield lead to the #6 solder lug at X and solder the connection.

This completes the power amplifier modification. Proceed to "Alignment Preparation."



## ALIGNMENT PREPARATION

NOTE: To perform the following adjustments, you will need the following items saved from your HW-2036 kit:

Red jumper wire  
Black jumper wire  
Shielded jumper wire  
Alignment load

50  $\Omega$  dummy load  
Coil alignment tool  
Trimmer alignment tool

Refer to the Pictorials in your HW-2036 Illustration Booklet to determine the location of components and circuit points in the following adjustment sections.

## VCO ADJUSTMENT

- ( ) Use the coil alignment tool to turn the core of coil L501 on the VCO assembly until the top of the core is flush with the top of the coil form.
- ( ) Set the frequency selector switches to the center of your 4 MHz segment (normally 146.000 MHz).
- ( ) Set the MODE switch to SIM.
- ( ) Turn the Transceiver on. The Synth Lock lamp should light.

NOTE: The circuits in this Transceiver are designed to operate properly over any 4 MHz segment within the range from 143.500 MHz to 148.500 MHz. Before you proceed, select the segment in which you wish to operate and write down the upper and lower limits of that segment in the margin of this page. Be sure to include the transmitter offset frequencies when you figure your 4 MHz range. Only the last four digits of the operating frequency are displayed on the switches. A setting of 6.940 is actually 146.940 MHz, etc.

NOTE: If the Synth Lock lamp will not go out in the following step, refer to the "Synthesizer Problems" troubleshooting chart in your HW-2036 Manual (Illustration Booklet, Page 15).

- (X) Slowly adjust the slug in coil L501 clockwise until the Synth Lock lamp goes out. NOTE: The top of the slug should be almost flush with the top of the coil form.
- (X) Push the connector on the end of the black jumper wire onto TP402 on the synthesizer circuit board. Then connect the alligator clip on the chassis.

NOTE: Depress the microphone button only long enough to make the following adjustments.

- (X) Depress the microphone button. The Synth Lock lamp should light briefly and then go out. If it stays on, adjust coil L501 slightly until the lamp goes out.

- (X) Depress the microphone button and use a VTVM to measure the voltage at TP401 on the synthesizer circuit board, and adjust coil L501 for an indication of 2.2 volts.

- (X) Remove the jumper wire you connected between TP402 and the chassis.

NOTE: DO NOT press the microphone button when you perform the next step.

- (X) With the VTVM still connected to TP401, adjust trimmer capacitor C511 on the VCO circuit board for 2.2 volts.

- (X) Turn the Transceiver off.

## TRANSMITTER ALIGNMENT

- (X) Set the frequency selector switches to the center of your 4 MHz segment (normally 146.000 MHz) and set the MODE switch to SIM, if this has not already been done.
- (X) Unplug the cable from J102 on the transmitter circuit board.
- (X) Plug the alignment load (51 ohm resistor and phono plug) into J102.
- (Y) Turn the Transceiver on.
- (X) Connect the probe of your VTVM to TP101 on the transmitter circuit board.

- (X) 1. Depress the microphone button and adjust coils L101 and L102 for maximum meter indication. Repeat this adjustment two or three times.

- (X) 2. Move the VTVM probe from TP101 to TP102.

- (X) 3. Depress the microphone button and adjust coils L103 and L104 for maximum meter indication. Repeat this adjustment two or three times.

- (X) 4. Move the VTVM probe from TP102 to TP103.

- (X) 5. Depress the microphone button and adjust coil L105 for a maximum meter indication.

- (X) 6. Move the VTVM probe from TP103 to TP104.

- (X) 7. Depress the microphone button and adjust coils L105, L106, and L107 for maximum meter indication. Repeat this adjustment two or three times. NOTE: If coil L105 has two peaks, use the peak with the slug highest in the coil.

- (X) 8. Move the VTVM probe from TP104 to TP101 and repeat steps 1 through 7.

- (X) 9. Set the frequency selector switches 1.5 MHz below the center of your 4 MHz segment (normally 144.500 MHz). Move the VTVM probe from TP104 to TP101. Then depress the microphone button and adjust coil L101 for maximum meter indication.

- (X) 10. Set the frequency selector switches 1.5 MHz above the center of your 4 MHz segment (normally 147.5 MHz). With the VTVM probe still on TP101, depress the microphone button and adjust coil L102 for maximum meter indication.

- (X) 11. Repeat steps 9 and 10.

- (X) 12. Adjust coil L103 exactly 1/4 turn clockwise.

- (X) Turn the Transceiver off.

- (X) Disconnect your VTVM from the Transceiver.

- (X) Unplug the alignment load from J102 on the transmitter circuit board and reconnect the cable coming from the power amplifier circuit board to J102.



## 10 MHz OSCILLATOR ADJUSTMENT

NOTE: The 10 MHz oscillator is divided down to provide the 833.333 Hz signal which determines the spacing between adjacent channel frequencies (when it is multiplied by 6). It is very important that this oscillator be set as accurately as possible, since any error will accumulate across the band. Two methods of adjustment are given, in the order of preference.

### ALIGNMENT WITH WWV

- ( ) Tune a short-wave receiver to WWV on 10, 15, 20, or 25 MHz. Use the highest frequency that you can receive in your area.
- ( ) Turn the Transceiver upside down, if this has not already been done.
- ( ) Remove 1/4" of insulation from one end of a suitable length of insulated wire. Then wrap this end of the wire around TP108 on your transmitter circuit board.
- ( ) Position the free end of the wire coming from TP108 near the antenna input on your receiver.
- ( ) Turn the Transceiver on.

- ( ) Adjust trimmer C144, on the transmitter circuit board, for a zero beat with WWV (During a time when no tone is being transmitted). The frequency may shift slightly when you remove the alignment tool, so be sure the zero beat occurs AFTER you remove the tool.
- ( ) Turn the Transceiver off and remove the insulated wire.

### ALIGNMENT WITH A FREQUENCY COUNTER

NOTE: The frequency counter must have a crystal time base, recently checked for accuracy with WWV, and must read out to  $\pm 1$  Hz.

- ( ) Connect the frequency counter to TP108 on the transmitter circuit board.
- ( ) Turn the Transceiver on.
- ( ) Adjust trimmer capacitor C144, on the transmitter circuit board, for a reading of 10.000,000 MHz. Check this reading after you remove the adjustment tool from the trimmer.
- ( ) Turn the Transceiver off and disconnect the frequency counter.

## POWER AMPLIFIER ADJUSTMENT

NOTE: Make sure all of the screws are in the rear panel before you attempt to align the power amplifier.

- ( ) Unplug the black wire from connector pin C on the PA circuit board. Use the 8" black jumper wire to connect a VTVM pin to C. Then connect the common VTVM lead to the chassis. If you have an in-line wattmeter (capable of accurate readings at the operating frequency), connect the wattmeter between the 50 ohm dummy load and the ANT socket on the rear panel. Use the VTVM for an indication of relative power output when you perform the following adjustment.
- ( ) Locate the free end of the short shielded cable coming from the PA circuit board. Then plug it into J102 on the transmitter circuit board, if this has not already been done.
- ( ) If this has not already been done, connect the 50-ohm dummy load to the ANT socket on the rear panel (either direct or through an in-line wattmeter).
- ( ) Be sure the MODE switch is at SIM.
- ( ) Set the frequency selector switches to the center of your 4 MHz segment, if this has not already been done. Then reduce this setting by 1 MHz (normally 145.000 MHz).

NOTE: Unless you are directed otherwise, do not depress the microphone button for more than 30 seconds continuous. Release the microphone button after you make each adjustment. **DO NOT** adjust any of coils L101 through L107 on the transmitter circuit board for maximum output. You should only adjust these coils by following the procedure under "Transmitter Alignment."

- ( ) Turn the Transceiver on.
- ( ) Depress the microphone button. The meter should indicate half of one scale division or more. If there is no meter indication, adjust trimmer capacitor A or B (or both) until there is some indication on the meter.
- ( ) Depress the microphone button and adjust the trimmer capacitors, through the rear panel holes, for a maximum meter indication. Use the

following adjustment sequence: A, B, C, D, E, D, C, A, B. Remember to observe the 30-second limit when you depress the microphone button.

- ( ) Try different settings of trimmer capacitors C and D to obtain a maximum meter indication.
- ( ) Again adjust trimmer capacitors A and B for a maximum meter indication. NOTE: Do not adjust trimmer capacitor A any further counterclockwise than necessary to obtain maximum power output.
- ( ) Disconnect the VTVM and 8" black jumper wire. Then reconnect the black wire, coming from pin E on the receiver circuit board, to pin C on the PA circuit board.
- ( ) Turn the Transceiver off.

## RECEIVER ALIGNMENT

( ) Push the PCB connector on the red jumper wire onto pin C of the RF probe, if this is not already done.

( ) Temporarily disconnect the green wire from pin P on the receiver circuit board. Then push this wire onto the PCB pin on the free end of the red jumper wire (coming from the RF probe).

( ) Push the PCB connector on the end of the black jumper wire onto pin B of the RF probe, if this is not already done. Connect the alligator clip on the other end of the wire to the chassis.

( ) Temporarily disconnect the inner lead of the shielded cable from pin C on the receiver circuit board and push the connector on this wire onto pin A of the RF probe.

( ) Set the frequency selector switches to 145.000 MHz.

( ) Make sure the RF probe assembly is not touching any wires or components which could cause a short circuit.

( ) Turn the Transceiver on.

( ) Adjust coils L402 and L403 on the synthesizer circuit board for a maximum indication on the S meter.

( ) Turn the Transceiver off.

( ) Disconnect the inner shielded cable lead from pin A of the RF probe and reconnect it to pin C on the receiver circuit board.

( ) Hold the RF probe by the ground lug and touch the bare wire, extending from lug 1, to gate 2 (G2) of transistor Q202 on the receiver circuit board.

( ) Turn the Transceiver on.

( ) Adjust coils L212 and L213 (in that order) on the receiver circuit board for maximum indication on the S meter. NOTE: These two coils interact. When they are properly adjusted, the slugs in these coils will be at approximately the same position.

( ) Turn the Transceiver off.

( ) Disconnect the RF probe from the Transceiver and plug the green harness wire back onto pin P of the receiver circuit board.



- (X) Temporarily unplug the shielded cable from pins A and B on the receiver circuit board.
- (X) Connect the inner lead at one end of the shielded **jumper** wire to TP106 and connect the shield lead to TP107 on the transmitter circuit board.
- (X) Connect the inner lead at the free end of the shielded jumper wire to pin A and connect the shield lead to pin B on the receiver circuit board.
- (X) Turn the Transceiver on. The S meter should indicate up-scale and/or the receiver should show quieting (a reduction of noise from the speaker). NOTE: You can check this by changing the setting of the center frequency selector switch to 1 and back to 0. The receiver should be quieter when you have the switch in the 0 position. If not, adjust trimmer capacitor C435 on the synthesizer circuit board until it is.

NOTE: If the meter goes beyond midscale in the next step, adjust C147 on the transmitter circuit board as necessary to reduce the meter indication. If the meter still goes past midscale, detune coil L207 clockwise, as necessary, to keep the meter below midscale.

- (X) Adjust coils L201 through L209 on the receiver circuit board for a maximum indication on the S

meter. NOTE: It may be necessary to begin the alignment by adjusting these coils for maximum quieting (least noise) until there is enough signal to cause a meter indication.

- (X) Repeat the above step several times until there is no further improvement. NOTE: Coil L204 may have two peaks. If yours does, use the peak that occurs with the slug nearest the circuit board.
- (X) Adjust coil L207 for maximum indication on the S meter.
- (X) Turn the Transceiver off.
- (X) Remove the shielded jumper wire between TP106 and TP107 on the transmitter circuit board and pins A and B on the receiver circuit board.
- (X) Reconnect the inner wire of the shielded cable coming from the PA circuit board to pin A and the shield wire to pin B on the receiver circuit board.
- (X) Turn the Transceiver on.
- ( ) Adjust coil L210 on the receiver circuit board for maximum noise.
- ( ) Turn the Transceiver off.

## OFFSET OSCILLATOR ADJUSTMENT

### Receiver Offset Oscillator

NOTE: You will now adjust the 21.55 MHz receiver offset oscillator and quadrature coil. Two methods are given. The first method is best, but the second method is acceptable.

#### ALIGNMENT WITH A FREQUENCY COUNTER

NOTE: The frequency counter you use for this adjustment must be capable of counting up to at least 25 MHz.

- ( ) Attach the frequency counter probe to pin C on the synthesizer circuit board.

- ( ) Turn the Transceiver on.
- ( ) Set the frequency selector switches to 146.000 MHz. Then adjust C435 on the synthesizer circuit board until the counter indicates 22.550,000 MHz.
- ( ) Disconnect the frequency counter from pin C.
- ( ) Connect the Transceiver to a suitable antenna. Then readjust coil L210 on the receiver circuit board for the best audio quality of a received signal.
- ( ) Turn the Transceiver off.

## ALIGNMENT WITH AN ACCURATE ON-THE-AIR SIGNAL

NOTE: Most repeaters are kept to tight frequency tolerances. It is desirable to use a repeater station in the next step, if possible.

- ( ) Connect the Transceiver to a suitable antenna and set the frequency selector switches to the frequency of a station of known accuracy.
- ( ) Turn the Transceiver on.
- ( ) Adjust trimmer capacitor C435 on the synthesizer circuit board and coil L210 on the receiver circuit board for the best audio quality.
- ( ) Turn the Transceiver off.

## Transmitter Offset Oscillators

NOTE: You will now adjust the transmitter offset oscillators. Four methods are outlined below in the order of preference. Use the method that you can perform with your available equipment.

### METHOD #1

NOTE: If your frequency counter will not operate as high as the 2-meter band, proceed to "Alternate Method."

- ( ) Connect the 50-ohm dummy load to the ANT socket on the rear panel.
- ( ) Set the frequency selector switches to 146.000 MHz.
- ( ) Be sure the MODE switch is at SIM.
- ( ) Connect an accurate frequency counter across the dummy load. CAUTION: Since as much as 30 volts may be present at the ANT socket, and many counters have a 2-volt maximum input, use a suitable attenuator, or you may damage the counter. Consult the instruction book for your counter.
- ( ) Turn the Transceiver on.

NOTE: When you perform the adjustments in the next seven steps, adjust the trimmers as close as possible to the proper frequency.

- ( ) Depress the microphone button and adjust trimmer capacitor C425 on the synthesizer circuit board until the counter indicates 146.000,000 MHz.
- ( ) Place the MODE switch to the -600 position.
- ( ) Depress the microphone button and adjust trimmer capacitor C422 until the counter indicates 145.000,000 MHz.
- ( ) Place the MODE switch in the +600 position.
- ( ) Depress the microphone button and adjust trimmer capacitor C428 until the counter indicates 146.600,000 MHz.

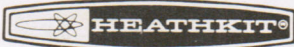
NOTE: Perform the next two steps only if you have an auxiliary crystal installed at Y40<sub>4</sub>.

- ( ) Place the MODE switch in the AUX position.
- ( ) Depress the microphone button and adjust trimmer capacitor C432 until the counter indicates the proper transmitter frequency.
- ( ) Turn the Transceiver off and disconnect the frequency counter from the dummy load.

### Alternate Method

NOTE: The frequency counter you use for this adjustment must be capable of counting up to at least 25 MHz.

- ( ) Disconnect the white-brown wire from pin H on the transmitter circuit board.
- ( ) Connect the frequency counter probe to pin C on the synthesizer circuit board.
- ( ) Turn the Transceiver on.
- ( ) Place the MODE switch in the SIM position.
- ( ) Set the frequency selector switches to 146.000 MHz.



- ( ) Depress the microphone button and adjust trimmer capacitor C425 until the counter indicates 24.333,333 MHz.
  - ( ) Release the microphone button.
  - ( ) Place the MODE switch in the -600 position.
  - ( ) Depress the microphone button and adjust trimmer capacitor C422 until the counter indicates 24.233,333 MHz.
  - ( ) Release the microphone button.
  - ( ) Place the MODE switch in the +600 position.
  - ( ) Depress the microphone button and adjust trimmer capacitor C428 until the counter indicates 24.433,333 MHz.
  - ( ) Release the microphone button.
- NOTE: Perform the next two steps only if you have an auxiliary crystal installed at Y404
- ( ) Place the MODE switch in the AUX position.
  - ( ) Depress the microphone button and adjust trimmer capacitor C432 until the counter indicates  $1.000,000 \text{ MHz} + f_{XTAL}$  (MHz).
  - ( ) Release the microphone button.
  - ( ) Turn the Transceiver off.
  - ( ) Reconnect the white-brown wire to pin H on the transmitter circuit board.

#### METHOD #2

Use the facilities of a commercial two-way radio shop.

#### METHOD #3

Use a receiver of known frequency accuracy which has a metered discriminator. Tune the receiver to each transmit frequency and adjust each trimmer capacitor for an on-frequency indication.

#### METHOD #4

Adjust each trimmer capacitor for an acceptable modulation quality as judged by several other amateur radio operators.

## DEVIATION ADJUSTMENT

If a deviation monitor is available, adjust control R119 on the transmitter circuit board for 4.5 to 5 kHz of FM deviation. A good way to accomplish this is to whistle a steady tone into the microphone.

If a deviation monitor meter is not available, preset control R119 halfway between 11 and 12 o'clock, as viewed from the knob side of the control. Use on-the-air checks with other amateur operators. Check with three or four stations to get a consensus of opinion on recaptured audio in their receivers. NOTE: If the op-

erator with which you are checking has old, surplus, commercial equipment, it may have been designed to receive 15 kHz FM deviation signals. In this case, you may get a report of low-level recaptured audio. Attempting to increase the deviation for this type of receiver will cause phase distortion or may even close the squelch on narrow bandwidth receivers designed for 5 kHz FM deviation signals.

This completes the alignment of your Transceiver. Reinstall the cabinet and bottom cover on the chassis.

## MANUAL CHANGES

NOTE: The time required for the synthesizer to lock will vary across the band due to changing loop parameters. This time may be slightly longer on the high end of the band than it was before you made the modifications.

Make the following changes in your HW-2036 Manual:

**Page 143** — Under "Receiver." Change the specification for the seventh item to read:

Below 1  $\mu$ V equivalent (except at 144, 146, and 148 MHz).

**Page 144** — Under Transmitter." Change the specification for the second item to read -60 dB. Delete any other words from the specification.

— Under "General." Change the specification for the first item to read:

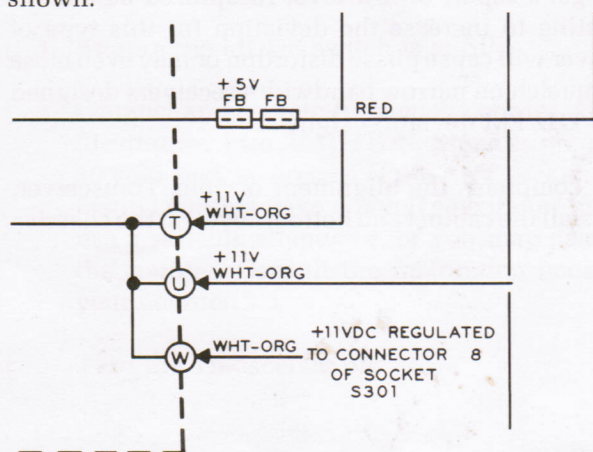
Any 4 MHz segment from 143.5 to 148.5 MHz. (Transmitter lockout can be defeated for out-of-band operation.) **Offset must not exceed  $\pm 1$  MHz.**

Make the following changes on your HW-2036 Schematic:

### TRANSMITTER CIRCUIT BOARD

Change the value of resistor R103 to read 100  $\Omega$ .

Refer to the partial schematic for this circuit board. Delete capacitor aC2 and pin S on your schematic as shown.



### VCO CIRCUIT BOARD

Change the part number for coil L501 to read 40-1855.

Change the value of capacitor C509 to read 22 pF.

Change the value of capacitor C513 to read 125 pF.

Change the part number for diode VD502 to read 56-640.

### SYNTHESIZER CIRCUIT BOARD

Change the value of resistor R427 to read 5600  $\Omega$ .

Change the value of resistor R428 to read 10 k $\Omega$ .

### RECEIVER CIRCUIT BOARD

Change the value of capacitor C201 to read 5 pF.

Change the value of resistor R233 to read 15 k $\Omega$ .

### POWER AMPLIFIER CIRCUIT BOARD

Refer to the partial schematic from this circuit board and draw capacitor C325 on your schematic as shown, if not already done.

