

# ASSEMBLY INSTRUCTIONS

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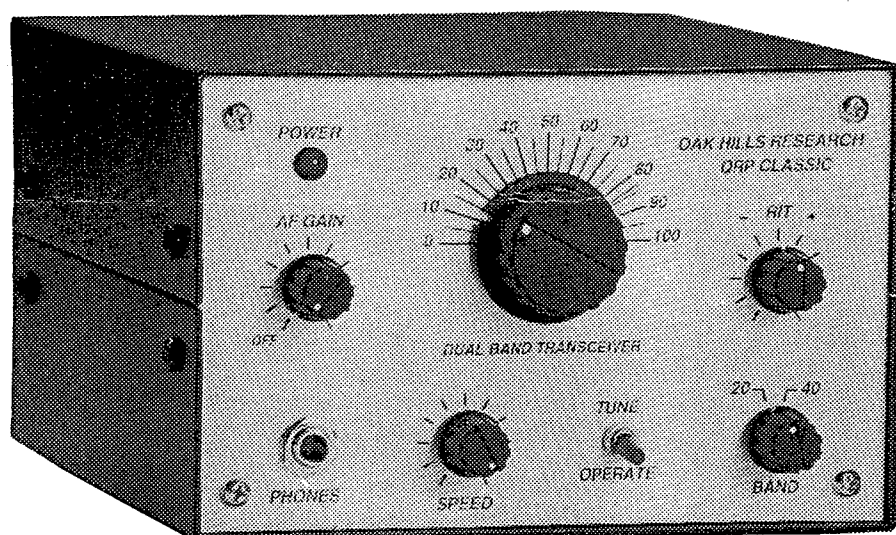
## QRP CLASSIC CL2040

(previous)

18MHz  Y101

(50) 12pF  C138

(4.7) 2.2μH  L110



Oak Hills Research  
20879 Madison Street  
Big Rapids, MI 49307



## Introduction

Thank you for purchasing the QRP Classic dual band transceiver kit. The Classic is a dual band transceiver operating on the 20 & 40M band. It features a single conversion superhet receiver with high side LO injection on both bands. The receiver features an RF pre-amp, diode ring mixer, AGC circuit, 4 pole crystal ladder filter, 4 pole audio filter, very stable VFO covering 100 Khz on each band, RIT providing  $\pm 1$  Khz of range. The transmitter features 4-5 watts of output and is adjustable from 0 to full output with a rear panel control, very smooth QSK circuit, sidetone generator with level adjust. All panels are pre-punched for the optional lambic keyer kit. The keyer kit can easily be added at any time. Both lambic and manual key jacks are provided in the basic transceiver kit. An alignment tool is also provided for use in aligning the radio.

You will need the following tools and test equipment to assemble and align your kit. Normal hand tools which include long-nose & regular pliers; diagonal cutters; 1/4" nutdriver; a GOOD pair of wire strippers; phillips head screwdriver; .050" allen wrench; small hammer; 22 to 25 watt pencil soldering iron; ruler; magnifying glass. You will also need a frequency counter and oscilloscope capable of reading 25 Mhz signals. You will need a voltmeter to set the AGC idle voltage. A desoldering bulb and desoldering braid are also helpful to have.

Soldering is one of the most important operations you will perform while assembling your kit. About 95% of all kits returned to us for repair have problems caused by poor soldering. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board pad. A bad solder connection will prevent an otherwise well constructed kit from operating properly. It is easy to make good solder connections if you will follow a few simple rules. Use the correct type of soldering iron. A 22 to 25 watt pencil soldering iron with a 1/8" or 3/16" chisel tip works best. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth, then apply solder to the tip to give the entire tip a wet look. This process is called tinning, and it will protect the tip and enable you to make good connections. When solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned. ALWAYS use ROSIN CORE, radio type solder (60:40 tin-lead content) for all the soldering in this kit. The warranty will void and we will not service any kit in which acid core solder or paste has been used.

## ASSEMBLY NOTES

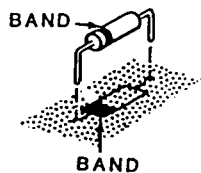
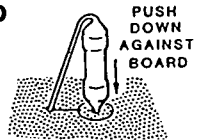
There are three circuit boards (four if you have the optional keyer) in the kit. The three boards are the receiver (40-110); oscillator (40-108); T/R (40-109). Each board is supplied with it's own parts list and parts pack. There are also separate parts packs for the chassis parts and hardware. Each parts list contains a KEY # and REF DES #. Use the KEY # and the parts pictorial sheet to help identify parts. The REF DES # is used on the schematic diagram and PC board to identify individual parts. DO NOT unpack all the parts packs at one time. Only unpack the parts for the board you are about to work on. We have included a schematic diagram and large, blown-up parts overlay for each board. Some parts may be supplied on a tape. Use your cutters to cut the component leads from the tape. Never pull the components from the tape. All components are mounted on the component screen side of the board (except where noted). All components are positioned down against the board unless noted otherwise.

The PC boards supplied in this kit are double-sided with plated-thru holes. The top side (component screen side) of the board is ground. The optional keyer board is single-sided and does not have plated-thru holes. When you assemble the PC boards, BE ABSOLUTELY SURE YOU HAVE THE CORRECT COMPONENT IN THE CORRECT LOCATION BEFORE SOLDERING IT IN PLACE! DOUBLE CHECK YOUR WORK BEFORE SOLDERING! With plated-thru holes, once you have soldered a component in place, and then want to remove it, it is more difficult. If you do make a mistake and want to remove a component, follow this simple procedure. Use your desoldering bulb and your desoldering braid to remove ALL solder from the hole. Make sure the component leads are loose and free in the holes before removing the component. Use care when handling the chassis parts. Some may have sharp edges. You should wear eye protection to prevent a cutoff lead clipping from flying up into your eye. As you cut component leads, hold on to the lead as you cut it.

The QRP Classic is not difficult to build. Just take your time and use common sense. Don't work too long at one time. Take frequent breaks. Take the time now to read through all the steps in this booklet before beginning construction of your kit. This will help you become familiar with the kit and may help prevent mistakes.

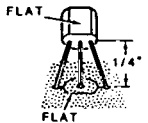
## OSCILLATOR BOARD ASSEMBLY

- ( ) Locate the oscillator board parts pack. Unpack it and take inventory. Also locate the oscillator PC board (40-108).
- ( ) Refer to the oscillator board parts list and component screen diagram for the following steps. It may be helpful to refer to the parts pictorial to help identify parts.
- ( ) Some resistors and chokes mount vertically on the board. Refer to the drawing at the right for the correct procedure.
- ( ) The REF numbers for the components start at 100 for the oscillator board. The lowest numbers start at the upper left corner.
- ( ) Start by installing the resistors. Install four or five components at a time. Then turn the board over and solder each connection. Trim the leads. Install all resistors following this procedure.
- ( ) Install all chokes. Solder and trim leads.
- ( ) Install all the .1uF and .01uF mono caps. NOTE: The .1uF mono caps are positioned 1/4" above the board. Solder and trim leads.
- ( ) Install all the NP0 ceramic disc caps. These caps are tan in color with a black mark on top. Solder and trim leads. NOTE: When installing C141, mount so the bottom of the cap is 1/4" above the board.
- ( ) Install all the NP0 Mono caps. These caps are yellow in color and very small in size and have very small printing on them. Get out the magnifying glass! Solder and trim leads.
- ( ) When you install a diode, be sure to match up the banded end on the diode with the banded end on the board. See drawing at right. Install all 1N4148 diodes. Solder and trim leads.
- ( ) Install the bifilar coil at T101. Insert the two RED leads into the two holes labeled "R" and the two GREEN leads into the holes labeled "G". Solder and trim leads.



## **OSCILLATOR BOARD ASSEMBLY (CONT)**

- ( ) Install the white 10K (103) trim pot at R112. Solder and trim leads.
- ( ) Install the 8 pin IC socket at U101. Be sure to match up the notched end on the socket with the half-moon mark on the board. Solder all pins.
- ( ) Install a black trim cap at C117 and C137. Solder and trim all leads.
- ( ) Install a orange trim cap at C118 and C138. Solder and trim all leads.
- ( ) Install the brown trim cap at C145. Solder both leads.
- ( ) Install the 9 Mhz crystal at Y100. Solder and trim leads.
- ( ) Install the 18 Mhz crystal at Y101. Solder and trim leads.
- ( ) Install the 11 Mhz crystal at Y102. Solder and trim leads.
- ( ) In this step you will install the 78L09 9V regulator at U100. The component screen foot print on the board is incorrect. Simply position the 78L09 180° from what is shown on the board. The rounded part of the 78L09 now faces toward C113. Solder and trim leads. See parts overlay diagram.
- ( ) Install MPF102 transistors at Q100, Q104, Q106 and Q107. Position the flat side of the transistor with the flat side on the board. Position the bottom of the transistor about 1/4" above the board. Solder and trim all leads.
- ( ) Using the same procedure as above, install 2N3904 transistors at Q101, Q102 and Q105. Solder and trim all leads.
- ( ) Install the 2N3906 at Q103. Solder and trim leads.
- ( ) Install the IF transformer (42IF123) at T100. Solder all leads including the ground tabs.
- ( ) Install the VFO coil (STYLE 3) at L109. Solder all leads including ground tabs.



## OSCILLATOR BOARD ASSEMBLY (CONT)

- ( ) Install the four bandpass filter adjustable inductors (SLOTTEN-3) at L100, L101, L107 and L108. Solder all pins including ground tabs.
- ( ) Locate the length of 25 conductor grey cable, the length of black miniature coax cable and the short length of large RED wire.
- ( ) Cut the large RED wire to 1 1/2". Remove 1/4" of insulation from both ends. Insert one end into the hole labeled "TO C155". This hole is located just to the left of the brown trim cap, C145. Solder and trim lead. The other end will be connected later.
- ( ) At one end of the grey 25 conductor cable, cut the outer jacket back about 1" or enough to expose the wires. Start pulling the wires out of the jacket one or two at a time until all are removed. Discard the grey jacket. These wires will be used for all point to point connections.
- ( ) Cut the following wires to the indicated length:

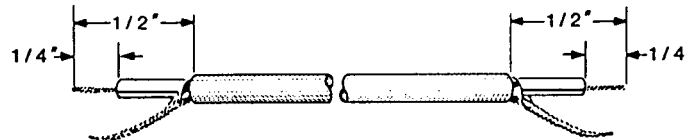
|            |             |
|------------|-------------|
| BLK 4"     | RED/BLK 4"  |
| RED 3"     | ORG/BLK 11" |
| RED 1 1/4" | ORG/RED 4"  |
| ORG 4"     | BLU/BLK 2"  |
| ORG 1 1/2" | BLU/RED 9"  |
| GRN 4"     |             |
| GRN 3"     |             |

- ( ) Remove 3/8" insulation from one end of each wire. DO NOT use a knife or razor blade to remove the insulation. If you cut into the wire strands, you will be constantly repairing broken wires. Use a GOOD pair of wire strippers. With your soldering iron, lightly tin the exposed wires. Remove 1/4" insulation from the other end of each wire. DO NOT tin the wires at this end.
- ( ) Install the above prepared wires at the indicated PC board locations. Use the end with 1/4" insulation removed. Solder and trim leads.

|        |     |                    |     |         |                   |
|--------|-----|--------------------|-----|---------|-------------------|
| 4"     | BLK | #1 (near R116)     | 4"  | RED/BLK | #2 (near R114)    |
| 3"     | RED | +12V (near C131)   | 11" | ORG/BLK | +12VR (near R103) |
| 1 1/4" | RED | +12V (near C108)   | 4"  | ORG/RED | #3 (near R113)    |
| 4"     | ORG | Band 2 (near R136) | 2"  | BLU/BLK | +12VT (near R104) |
| 1 1/2" | ORG | Band 2 (near R102) | 9"  | BLU/RED | KEY (near D104)   |
| 4"     | GRN | Band 1 (near C135) |     |         |                   |
| 3"     | GRN | Band 1 (near R109) |     |         |                   |

## OSCILLATOR BOARD ASSEMBLY (cont)

- ( ) Locate the length of black miniature coax cable. Cut the following lengths of cable: 3", 6" and 10 1/2". Prepare the 3" cable as follows. Carefully remove 1/2" of the black outer jacket from each end. Be very careful not to cut into or nick the braid. Push the braid back to loosen it up. Now comb out the braid and twist the strands of wire together so as to form a wire lead. Remove 1/4" of the inner jacket insulation. Twist the wire strands together. Use your soldering iron to lightly tin the braid lead and the inner conductor lead. Prepare the other two cables in the same manner. See drawing below.



- ( ) Install the prepared cables as follows. Insert the leads at one end of the 6" cable into the holes labeled "T/R MIX". These holes are located near T100. The braid goes in the larger hole. Solder and trim leads. With a small piece of tape, label the free end of the cable "TX OSC".
- ( ) Install the leads at one end of the 3" cable in the holes labeled "PD". The free end will be connected later.
- ( ) Install the leads at one end of the 10 1/2" cable in the holes labeled "TX/RX MIX". These holes are located near the test loop. Label the free end "VFO".
- ( ) Use a cut off lead clipping for this step. Cut the lead to 1/2". Form a loop and install at "TEST LOOP". Position the loop 1/4" above the board. Solder and trim leads.
- ( ) All components, wires and cables should now be mounted and soldered on the oscillator board. The IC will be installed later. Check the board over to make sure you have not left any connections unsoldered. If everything looks ok, set the oscillator board aside for now.

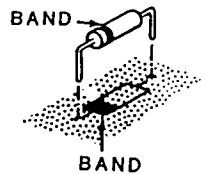
## **RECEIVER BOARD ASSEMBLY**

- ( ) **Locate the receiver board parts pack. Unpack it and take inventory. Do not remove the four crystals from the parts bag until instructed to do so. They are a matched set. Also locate the receiver PC board (40-110).**
- ( ) **Refer to the receiver board parts list and component screen diagram for the following steps. It may be helpful to refer to the parts pictorial to help identify parts.**
- ( ) **Some resistors mount vertically on the board. Refer to the drawing at the right for the correct procedure.**
- ( ) **The REF numbers for the components start at 200 for the receiver board. The lowest numbers start at the upper left corner.**
- ( ) **Start by installing the resistors. Install four or five components at a time. Then turn the board over and solder each connection. Trim the leads. Install all resistors following this procedure.**
- ( ) **Install all the .1uF mono caps. Remember to position the cap 1/4" above the board. Solder and trim leads.**
- ( ) **Install a .01uF mono cap at C209. Solder but do not cut off the component leads yet. Cut the LEFT lead off at 3/8" from the board. Slip a 1/4" piece of discarded insulation from a piece of stranded wire onto this lead of C209. Bend this short lead down and solder to the LEFT lead of R222 (this lead is closest to U202). Trim the other lead of C209. Refer to the parts overlay for this connection.**
- ( ) **Install the remaining .01uF mono caps. Solder and trim leads.**
- ( ) **Install the 1uF mono cap at C231. This cap is yellow in color and is labeled 105. Mount about 1/4" above board.**
- ( ) **Install the .001uF mono cap at C214. Solder and trim leads.**
- ( ) **Install the green .033uF poly cap at C229. Solder and trim leads.**
- ( ) **Install the green .022uF poly cap at C220. Solder and trim leads.**



## **RECEIVER BOARD ASSEMBLY (CONT)**

- ( ) Install green .01uF poly caps at C224, C225 and C238. Solder and trim leads.
- ( ) Install green .0022uF poly caps at C235, C236 and C237. Solder and trim leads.
- ( ) Get out the magnifying glass again! Install an 18pF NP0 mono cap at C213. Solder and trim leads.
- ( ) Install 330pF NP0 mono caps at C202 and C205. Solder and trim leads.
- ( ) Install 470pF NP0 mono caps at C203 and C206. Solder and trim leads.
- ( ) Install a 560pF NP0 mono cap at C204. Solder and trim leads.
- ( ) Install all the electrolytic caps. Be sure to observe the correct polarity. The longer of the two leads is ALWAYS positive. Solder and trim leads.
- ( ) Install 1N4148 diodes at D200, D201, D202 and D203. Be sure to match up the banded end on the diode with the band on the board. See drawing at right. Solder and trim all leads.
- ( ) Install white trim pots (103) at R219 and R224. Solder and trim leads.
- ( ) Install the IF transformer (42IF123) at L200. Solder all pins including the ground tabs.
- ( ) Install the four matched 9 Mhz crystals at Y200, Y201, Y202 and Y203. These crystals mount down against the board. Solder and trim leads.
- ( ) Install the 2N5179 transistor at Q201. Position 1/4" above board. Solder and trim leads.



## **RECEIVER BOARD ASSEMBLY (CONT)**

- ( ) Slip a white spacer onto the leads of a 2N3866 transistor. The leads go through the inside opening of the spacer and each lead fits into one of the cutouts. This spacer prevents the bottom of the transistor from shorting to the top of the board which is ground. Install the transistor and spacer at Q200. Position down against the board. Solder and trim leads. Install a small red heatsink on Q200.
- ( ) Install a bifilar transformer at T200. Identify the two RED leads and the two GREEN leads. The two RED leads go into the holes labeled "R" and the two GREEN leads go into the holes labeled "G". Position the transformer so it is not touching the heatsink on Q200. Solder and trim leads.
- ( ) Install MPF102 transistors at Q203 and Q204. Position the flat side on the transistor as indicated on the board. Mount the transistor 1/4" above the board. Solder and trim leads.
- ( ) Install a 2N3906 transistor at Q202. Use same procedure as above. Solder and trim leads.
- ( ) Install 8 pin IC sockets at all IC locations. Be sure to position the notch as shown on the board. Solder all pins.
- ( ) Cut the following wires to the length indicated.

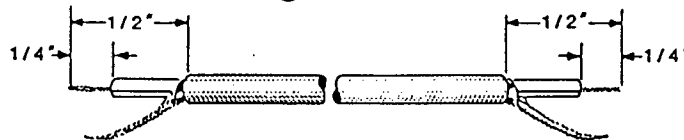
|         |     |
|---------|-----|
| BLU/WHT | 7"  |
| ORG/GRN | 7"  |
| GRN/WHT | 10" |
| BLU/BLK | 4"  |
| WHT/RED | 5"  |
- ( ) Prepare these wires as follows. With your wire strippers, remove 3/8" insulation from one end of each wire. Lightly tin the exposed wires. Remove 1/4" insulation from the other end of each wire. Do not tin this end of the wires.

## RECEIVER BOARD ASSEMBLY (CONT)

- ( ) Install the above prepared wires at the indicated locations on the board. Install the end with 1/4" insulation removed. The free ends will be connected later.

|     |         |                  |
|-----|---------|------------------|
| 7"  | BLU/WHT | #3 (near C226)   |
| 7"  | ORG/GRN | #2 (near R229)   |
| 10" | GRN/WHT | KEY (near R229)  |
| 4"  | BLU/BLK | 12VT (near C207) |
| 5"  | WHT/RED | 12V (near C217)  |

- ( ) Cut a 14 1/2" and a 15" piece of black miniature coax cable. Prepare both ends of both cables using the same procedure used on the oscillator board. See drawing below.



- ( ) Install one end of the 14 1/2" cable at the holes labeled "REC IN". The braid goes in the larger of the two holes. With a small piece of tape, label the free end "RX IF".
- ( ) Install one end of the 15" cable at the holes labeled "J200". Braid goes in larger hole. Label the free end "TO PHONE JACK".
- ( ) All components, wires and cables should now be mounted and soldered on the receiver board. The ICs will be installed later. Check the board over to make sure you have not left any connections unsoldered. If everything looks ok, set the receiver board aside for now.

## **T/R BOARD ASSEMBLY**

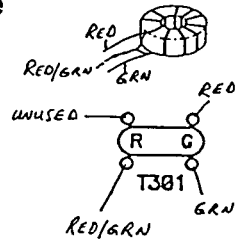
- ( ) Locate the T/R board parts pack. Unpack it and take inventory. Do not open the packages containing L305/L310 and L306/L311 and T301 until instructed to do so. Also locate the T/R board (40-109).**
- ( ) Refer to the T/R board parts list and component screen diagram for the following steps. Also refer to the parts pictorial for help in identifying parts.**
- ( ) Some resistors and chokes mount vertically, the same as on the other two boards.**
- ( ) The REF numbers start at 300 for the T/R board. The lowest numbers start at the upper left corner.**
- ( ) Start by installing the resistors. Install four or five at a time. Turn the board over and solder each connection. Trim the leads. Install all resistors following this procedure.**
- ( ) Install all chokes. Solder and trim leads.**
- ( ) Install all the .1uF and .01uF mono caps. Remember that the .1uF caps are mounted 1/4" above the board. Solder and trim leads.**
- ( ) Install .001uF mono caps at C300, C308 and C315. Solder and trim leads.**
- ( ) Install 15pF NP0 mono caps at C312 and C332. Solder and trim leads.**
- ( ) Install 12pF NP0 mono caps at C305 and C331. Solder and trim leads.**
- ( ) Install 33pF NP0 mono caps at C307 and C340. Solder and trim leads.**
- ( ) Install 68pF NP0 mono caps at C313 and C333. Solder and trim leads.**
- ( ) Install a 1pF NP0 mono cap at C321. Solder and trim leads.**
- ( ) Install a 3.3pF NP0 mono cap at C323. Solder and trim leads.**
- ( ) Install a 10pF NP0 mono cap at C317. Solder and trim leads.**
- ( ) Install a 56pF NP0 mono cap at C328. Solder and trim leads.**

## **T/R BOARD ASSEMBLY (CONT)**

- ( ) Install 470pF silver mica caps at C316 and C329. Solder and trim leads.**
- ( ) Install 180pF silver mica caps at C311 and C330. Solder and trim leads.**
- ( ) Install a 820pF silver mica cap at C318. Solder and trim leads.**
- ( ) Install a 360pF silver mica cap at C319. Solder and trim leads.**
- ( ) Install 1uF electrolytic caps at C349 and C350. Remember the longer lead is always positive. Solder and trim leads.**
- ( ) Install a 10uF electrolytic cap at C337. Solder and trim leads. C351 (10uF) will be connected later.**
- ( ) Install a .47uF electrolytic cap at C348. Solder and trim leads.**
- ( ) Install a 22uF electrolytic cap at C347. Solder and trim leads.**
- ( ) Install a 100uF electrolytic cap at C303. Solder and trim leads.**
- ( ) Install a TUF-1 mixer at U300. Solder all pins.**
- ( ) Install the two blue miniature relays (OUA-SS-112D) at K300 and K301. Solder and trim leads.**
- ( ) Open the parts package labeled "20M". Install the coils at L306 and L311. Mount these coils down against the board in a vertical position. Solder and trim leads.**
- ( ) Open the parts package labeled "40M". Install the coils at L305 and L310. Mount these coils down against the board in a vertical position. Solder and trim leads.**
- ( ) Install the four bandpass filter variable inductors (T1005) at L303, L304, L307 and L308. Solder all pins including ground tabs.**
- ( ) When you install the diodes, be sure to position the banded end as shown on the board. Install 1N4007 diodes at D305 and D306. Solder and trim leads.**

## T/R BOARD ASSEMBLY (CONT)

- ( ) Install 1N4148 diodes at the following locations; D300, D301, D302, D303, D304, D307, D308, D309, D310, D311, D312, D313 and D314. Solder and trim all leads.
- ( ) Refer to the drawing below to install transformer T301. Remove the transformer from its package. You will notice the two wire leads lightly twisted together. These two leads BOTH go into the indicated hole. The other two leads go into the other holes as shown. The fourth hole in the board is not used. Solder and trim leads.



- ( ) Install the remaining three bifilar coils at T300, T302 and T303. RED leads go in holes labeled "R" and GREEN in holes labeled "G". Solder and trim leads.
- ( ) Install a 2N2222A transistor at Q300. Mount 1/4" above board. Solder and trim leads.
- ( ) Install a 2N5179 transistor at Q304. Mount 1/4" above board. Solder and trim leads.
- ( ) Install a 2N2907A transistor at Q306. Mount 1/4" above board. Solder and trim leads.
- ( ) Slip a white transistor spacer onto the leads of a 2N3866 transistor. Install at Q301. Push the transistor and spacer down against the board and solder. Trim leads. Slide a red heatsink onto the case of Q301. Be sure that nearby components are not touching the heatsink.
- ( ) Install a 2N3904 transistor at Q303. Mount 1/4" above board. Solder and trim leads.
- ( ) Install a 2N3906 transistor at Q305. Mount 1/4" above board. Solder and trim leads.
- ( ) Install MJE172 transistors at Q307 and Q308. Position both transistors so the bare metal side is facing toward Q306. Solder and trim leads.

## **T/R BOARD ASSEMBLY (CONT)**

- ( ) Install the large black TO-220 heatsink at Q302. Hold the heatsink down against the board and solder the two pins. Insert the 2SC2075 transistor with flat side against the heatsink into the three holes on the board. Line up the TOP hole in the heatsink with the hole in the transistor. From the back side of the heatsink, insert a 4-40 x 1/4" phillips head screw. On the transistor side secure with a #4 lockwasher and #4 hex nut. Now tighten hardware without twisting transistor. Solder and trim leads on transistor.
- ( ) In this step you will install electrolytic cap C351. This cap is mounted on the SOLDER SIDE of the board. Refer to the parts overlay diagram. Cut both leads of the 10uF electrolytic cap to 1/2". Locate R333. It is located near Q306. Turn the board over and identify the two leads of R333 on the SOLDER SIDE of the board. You will notice that one of the two pads that the lead of R333 is soldered to is isolated, no other traces connect to it. Solder the NEG lead of C351 to this pad. Solder the POSITIVE lead of C351 to the other lead of R333. Position C351 as close to the board as possible.
- ( ) Install the 100 ohm vertical mount pot with white shaft at R305. Position the pot so the white shaft is extending out over the edge of the board. Solder all three pins.
- ( ) Cut the following wires to the length indicated.

|             |         |
|-------------|---------|
| BLK/RED     | 11"     |
| BLK/WHT     | 9"      |
| BLU         | 10 1/2" |
| WHT         | 11"     |
| WHT/RED     | 8"      |
| WHT/BLK/RED | 10"     |
- ( ) Prepare each wire as follows. With your wire strippers, remove 3/8" insulation from one end of each wire. Lightly tin the exposed wires. Remove 1/4" insulation from the other end of each wire. Do not tin this end of the wires.

## **T/R BOARD ASSEMBLY (CONT)**

- ( ) Install the wires prepared in the last step at the indicated locations on the board. Install the end with 1/4" insulation removed. The free ends will be connected later.

|         |             |                    |
|---------|-------------|--------------------|
| 11"     | BLK/RED     | BAND 1 (near C330) |
| 9"      | BLK/WHT     | KEY (near C349)    |
| 10 1/2" | BLU         | 12V T (near C350)  |
| 11"     | WHT         | BAND 2 (near D303) |
| 8"      | WHT/RED     | 12VDC (near C350)  |
| 10"     | WHT/BLK/RED | 12VDC (near C303)  |

- ( ) Cut a 3 1/2" piece of black miniature coax cable. Prepare both ends of this cable using the same procedure used on the other two boards.
- ( ) Install one end of the 3 1/2" cable at the holes labeled "ANT". These holes are located near relay K301. The braid goes in the larger hole. The free end will be connected later.
- ( ) All components, wires and cables should now be mounted and soldered on the T/R board. Check the board over to make sure you have not left any connections unsoldered. If everything looks ok, set the T/R board aside for now. If you have purchased the optional lambic keyer kit, proceed to the next section. If you are not installing the lambic keyer kit at this time, skip to the section entitled "CHASSIS ASSEMBLY".

## **LAMBIC KEYER BOARD ASSEMBLY**

- ( ) Locate the lambic keyer board parts pack. Unpack it and take inventory. DO NOT remove the 20 pin keyer IC from its package until instructed to do so. Also locate the keyer PC board (40-0103).
- ( ) Refer to the keyer board parts list and component screen diagram for the following steps. It may be helpful to refer to the parts pictorial to help identify parts.
- ( ) The REF numbers for the components start at 1 on the keyer board.
- ( ) Start by installing the resistors. Install four or five components at a time. Turn the board over and solder each connection. Trim the leads. Install all resistors using this procedure.

## **IAMBIC KEYER BOARD ASSEMBLY (cont)**

- ( ) In the following steps, when you are instructed to install a component, it means install the component, turn the board over and solder and trim leads.
- ( ) Install .22 $\mu$ F (224) poly caps at C1 and C5.
- ( ) Install a .15 $\mu$ F (154) poly cap at C7.
- ( ) Install a .1 $\mu$ F (104) mono cap at C3.
- ( ) Install .01 $\mu$ F (103) mono caps at C4, C6 and C8.
- ( ) Install a 22 $\mu$ F electrolytic cap at C2. Remember the long lead is always positive on electrolytic caps.
- ( ) Install the blue 500K (504) PC trim pot at R2.
- ( ) Install the 5V regulator (78L05) at U1. Be sure the flat side on device is positioned as shown on the board. Mount this regulator and all transistors 1/4" above the board.
- ( ) Install a BS170 transistor at Q1.
- ( ) Install a 2N4401 transistor at Q2.
- ( ) When installing diodes, be sure to position the banded end as shown on the board.
- ( ) Install 1N4007 diodes at D3 and D4.
- ( ) Install 1N4148 diodes at D1 and D2.
- ( ) Install the 20 pin IC socket at U2. Be sure to match up the notched end on the socket with the half-moon end on the board. DO NOT install the IC at this time.
- ( ) Form a cut-off component lead into a hairpin jumper. Install in the holes labeled "B". These holes are located near C4.

## **IAMBIC KEYS BOARD ASSEMBLY (cont)**

- ( ) Cut the following wires to the indicated length.

|             |        |
|-------------|--------|
| RED/BLK     | 8 1/2" |
| ORG/GRN     | 7"     |
| BLU/RED     | 3"     |
| BLU/WHT     | 3 1/2" |
| WHT/BLK     | 3"     |
| BLK/GRY/RED | 11"    |
| GRN/WHT/BLK | 11"    |

- ( ) Prepare each wire as follows. Use your wire strippers and remove 3/8" insulation from one end of each wire. Lightly tin the exposed wires. At the other end of each wire remove 1/4" insulation. Do not tin this end.

- ( ) Install the ends with 1/4" insulation removed at the indicated locations on the board . Solder each wire as you install it. The free ends will be connected later.

|        |             |                     |
|--------|-------------|---------------------|
| 8 1/2" | RED/BLK     | 12V (near R3)       |
| 7"     | ORG/GRN     | XMTR (near C8)      |
| 3"     | BLU/RED     | TUNE/OPER (near R1) |
| 3 1/2" | BLU/WHT     | R12 (near R11)      |
| 3"     | WHT/BLK     | R12 (near R10)      |
| 11"    | BLK/GRY/RED | DASH (near R10)     |
| 11"    | GRN/WHT/BLK | DOT (near D3)       |

- ( ) You will install the 8044ABM IC in this step. Be sure you are well grounded at your work table. Refer to Fig 9 for this step. Remove the 8044ABM IC from its package. On a piece of wood, lay the IC on its side with one row of pins flat on the wood surface. Roll the body of the IC on the surface so as to make the pins 90 deg to the body of the IC. Do the same with the other row of pins. Install the IC at U2 on the keyer board. Be sure you have pin 1 in the proper place. Set the keyer board aside for now.

## **CHASSIS ASSEMBLY**

- ( ) Refer to the parts pictorial diagram. Locate the chassis, 2 side panels, front panel and rear panel. Locate the hardware parts pack. Unpack it and take inventory. Some of the chassis parts may have sharp edges. You may want to use a file or piece of sandpaper to remove these sharp edges.
- ( ) Position one side panel so the small end flanges are facing down. Place the panel on a small block of wood. From the top side, insert a square plastic nut in one of the 1/4" square holes. Use your small hammer to seat the square nut in the hole. Use the block of wood to support the panel. Use this same procedure to install the remaining three square nuts. Repeat on the other side panel.
- ( ) Refer to the assembly pictorial, Fig 1 for this step. Position one of the side panels as shown. Install a three lug terminal strip at the indicated hole. Use a 4-40 x 1/4" screw, two #4 lockwashers and a #4 hex nut. Position the terminal strip as shown. Tighten hardware. Label this terminal strip TB3. Also, label the three lugs 1 - 3 as shown.
- ( ) Refer to the "Top View Chassis" diagram and the assembly pictorial, Fig 2 for the following steps. Position the chassis as shown with the side flanges facing down. With a felt tip pen or a piece of tape, label this side as "TOP" and the other side as "BOTTOM". You may also label each hole with the proper letter if you want to.
- ( ) Install the 1/2" grommet in hole "D".
- ( ) Install 3/8" x 4-40 round aluminium spacers at the indicated holes using the following procedure. Place a #4 lockwasher on a 4-40 x 1/4" screw. From the bottom of the chassis, place the screw through hole "A". On top of the chassis, place another #4 lockwasher on the screw and then turn on a 3/8" spacer finger tighten. Repeat this procedure at holes N, P, C, E, G, Q and S.

## **CHASSIS ASSEMBLY (cont)**

- ( ) Place the oscillator board over the spacers at holes E, G, Q and S with the 1 1/2" RED wire facing toward holes K and M. Place a #4 lockwasher on a 4-40 x 1/4" screw. Place the screw through one of the four mounting holes in the board and start it into the spacer. Repeat at the other three holes. Now tighten the screws holding the board. Turn the chassis over and tighten the screws holding the spacers. Turn the chassis over again and remove the screws holding the board. Set the oscillator board aside for now.
- ( ) Use this same procedure for the receiver board at holes A, C, N and P. Position the receiver board so R255 is facing toward hole H. Set the receiver board aside when done.
- ( ) Place a #4 lockwasher on a 4-40 x 5/16" screw. From the bottom of the chassis, insert the screw into hole "H". On top of the chassis, place a five lug terminal strip, another #4 lockwasher and a #4 hex nut. Tighten hardware. Be sure terminal strip is positioned as shown. Label this terminal strip TB1. Also, label the five lugs 1 - 5 as shown in Fig 2.
- ( ) Refer to the assembly pictorial, Fig 3 for the following steps. Place a #4 lockwasher on a 4-40 x 5/8" screw. From the TOP side of the chassis, insert the screw through hole "B". Place another #4 lockwasher on the screw then turn on a 1/4" hex aluminium spacer finger tight. Repeat at holes F, I, L, O, R. Use a 1/4" nutdriver and tighten the hex spacers at holes I and L.
- ( ) Place a #4 lockwasher on a 4-40 x 5/16" screw. From the TOP of the chassis, insert the screw through hole "J". Place a 5 lug terminal strip, a #4 lockwasher and a #4 hex nut. Position terminal strip as shown in Fig 3. Tighten hardware. Label this terminal strip TB2. Also, label the five lugs 1 - 5 as shown in Fig 3.
- ( ) Position the chassis so the bottom side is facing up with the 1/2" grommet on the left. Position the T/R board over the four hex spacers with diode D309 near the 1/2" grommet. The white shaft of pot R305 will extend over the rear edge of the chassis. Insert the four screws into the board mounting holes. Tighten the four 5/8" screws a small amount from the TOP side of the chassis. Remove the T/R board and tighten the four hex spacers with a 1/4" nutdriver.

## **CHASSIS ASSEMBLY (cont)**

- ( ) The air variable cap, C155 will be mounted in this step. Position the chassis with the TOP up and the grommet on the right. Place a #4 lockwasher on a 4-40 x 1/4" screw. From the BOTTOM side of the chassis insert the screw through hole "K". Place the air variable cap on top of the chassis with its shaft extending over the edge of the chassis. Line up the two machined holes in the bottom of the cap with holes K & M in the chassis. Start the screw into the threads of the cap. Place another #4 lockwasher on a 4-40 x 1/4" screw and place it through hole "M". Start the screw into the machined hole. Be sure cap is parallel with front edge of chassis. Tighten both screws.
  
- ( ) The chassis should still be positioned with the TOP up and the grommet on the right. Locate the side panel with the 3 lug terminal strip mounted on it. Position this side panel with the end flanges facing the chassis. The terminal strip will be near the front edge of the chassis. Line up the two small holes in the side panel with the two small holes in the chassis side flange. Insert a 4-40 x 5/16" screw through one of the holes in the side panel and through the hole in the chassis flange. Place a #4 lockwasher and a #4 hex nut on the screw. Repeat at the other hole in the side panel. Tighten both screws. Use the same procedure to install the other side panel. This panel will have one unused small hole at the upper rear corner.

## **FINAL ASSEMBLY & WIRING**

- ( ) In the following steps, (NS) means not to solder the connection because you will add other wires later. "S-" with a number, such as (S-2), means to solder the connection. The number following the "S-" tells you how many wires should be at the connection. This helps you check your work for errors as you go.
  
- ( ) Refer to assembly pictorial, Fig 9 for this step. Place an NE602AN IC on its side with one row of pins flat on a wood surface. Roll the IC on the surface so as to make the pins 90 deg to the body of the IC. Do the same with the other row of pins. Install this IC on the oscillator board at U101. Be sure pin 1 is in the proper place. Repeat this procedure with all the ICs on the receiver board. Install these ICs on the receiver board as follows: U200 - MC1350P; U201 - LM380N-8; U202 - LM358N; U203 - NE602AN; U204 & U205 - TL082CP; U206 & U207 - NE5534N.

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Position the oscillator board over the spacers mounted in holes E, G, Q and S. The large RED wire will be facing the front edge of the chassis. Mount the board using a 4-40 x 1/4" screw with a #4 lockwasher at the four mounting holes. Tighten all four screws.**
- ( ) Connect the RED wire coming from "TO C155" to the right rear terminal lug of the air variable cap. Push the end of the wire through the hole in the lug just far enough to be able to make a good solder connection. Be sure the wire is not shorting out on the chassis. Solder the connection.**
- ( ) Connect the following wires coming from the oscillator board. Connect both GRN wires to TB1 lug 1 (NS).**
- ( ) Connect both ORG wires to TB1 lug 2 (NS).**
- ( ) Connect the BLU/BLK wire to TB1 lug 4 (NS).**
- ( ) Connect both RED wires to TB1 lug 5 (NS).**
- ( ) Route the following wires & cables through the 1/2" grommet: BLU/RED; ORG/BLK; cable from "TX/RX MX"; cable from "T/R MIX".**
- ( ) Position the receiver board near the oscillator board. Connect the short coax cable coming from "PD" on the oscillator board to "OSC" on the receiver board. Braid goes in larger hole. Solder both connections.**
- ( ) Position the receiver board over the four spacers with the red heatsink at the rear left corner. Install a 4-40 x 1/4" screw and a #4 lockwasher at each of the four mounting holes. Tighten all four screws.**
- ( ) Connect the BLU/BLK wire to TB1 lug 4 (NS). Connect the WHT/RED wire to TB1 lug 5 (NS). Route both coax cables and the GRN/WHT wire through the 1/2" grommet. The ORG/GRN and BLU/WHT wires will be connected later.**

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Cut the following wires to the indicated length:

|         |        |             |         |
|---------|--------|-------------|---------|
| BLK     | 2 1/2" | RED/WHT     | 4"      |
| BLK     | 2"     | WHT/BLK     | 9 1/2"  |
| RED     | 6 3/4" | ORG/RED     | 10"     |
| ORG     | 1 1/2" | GRN/BLK     | 10 1/2" |
| BLK/RED | 1 1/2" | GRN         | 3"      |
| RED/GRN | 7"     | RED/BLK/WHT | 9 1/4"  |
| RED/WHT | 1"     |             |         |

- ( ) Prepare each wire by removing 3/8" insulation from each end. Tin both ends of each wire.
- ( ) Connect one end of the 9 1/2" WHT/BLK wire to TB1 lug 5 (NS). Use the bottom hole in lug 5. The free end of the WHT/BLK wire will be connected later.
- ( ) Connect one end of the 6 3/4" RED wire to TB1 lug 5 (S-5). Use the bottom hole in lug 5. There should be a total of (5) wires soldered to TB1 lug 5. Route the free end of the RED wire through the grommet.
- ( ) Connect one end of the 10 1/2" GRN/BLK wire to TB1 lug 1 (S-3).
- ( ) Connect one end of the RED/BLK/WHT wire to TB1 lug 2 (S-3). Route the free end through the grommet.
- ( ) Turn the chassis over so the bottom is facing up. Install the coax cables coming through the grommet at the indicated locations on the T/R board. The free ends of the cables should be labeled with the location where each cable will be installed. The braid goes in the larger hole. Solder and trim each connection.
- ( ) Connect the ORG/BLK wire coming from the grommet to the hole labeled "+12V R". This hole is located near Q306. Solder and trim connection.
- ( ) Install the T/R board onto the four mounting screws. At each location place a #4 lockwasher and a #4 hex nut. Tighten all four mounting nuts.

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Route the free end of the BLU wire through the grommet to the top side of the chassis. Turn the chassis over. Connect the free end of the BLU wire to TB1 lug 4 (S-3).
- ( ) Turn the chassis over again so the bottom is facing up.
- ( ) Connect one end of the 4" RED/WHT wire to TB2 lug 5 (NS).
- ( ) Connect the wires coming through the grommet to TB2 as follows:  
GRN/BLK - lug 1 (NS); RED/BLK/WHT - lug 2 (NS); BLU/RED & GRN/WHT - lug 4 (NS); RED - lug 5 (NS).
- ( ) Connect the wires coming from the T/R board to TB2 as follows:  
BLK/RED - lug 1 (NS); WHT - lug 2 (NS); BLK/WHT - lug 4 (NS);  
WHT/RED & WHT/RED/BLK - lug 5 (NS).
- ( ) Install one end of the previously prepared 10" ORG/RED wire to TB2 lug 4 (NS). Route the free end through the grommet.
- ( ) If you are installing the optional Iambic keyer complete the following steps. If you are not installing the keyer skip the next two steps.
- ( ) Place a #4 lockwasher on the two remaining mounting screws. Place the keyer board onto the screws. Use the board holes near R11 & C8. Secure with a #4 hex nut at each location. Tighten nuts.
- ( ) Connect the wires coming from the keyer board to TB2 as follows:  
ORG/GRN - lug 4 (S-5); RED/BLK - lug 5 (S-5). Route the free ends of the BLK/GRY/RED & GRN/WHT/BLK wires through the grommet.
- ( ) If you are not installing the optional keyer at this time, connect one end of the 3" GRN wire to TB2 lug 4 (S-5).
- ( ) Connect one end of the prepared 1 1/2" ORG wire to TB2 lug 2 (S-3).
- ( ) Connect one end of the prepared 1 1/2" BLK/RED wire to TB2 lug 1 (S-3).
- ( ) Connect one end of the 2 1/2" BLK wire to TB2 lug 3 (S-1). This is the center ground lug of TB2.

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Refer to assembly pictorial, Fig 5 and Fig 6 for this step. Locate the 2 position rotary switch, S300. Position the switch as shown in Fig 6. The shaft is facing away from you and the small bent tab is on the left. Identify pins 1, 2 and 3. DO NOT cutoff these pins. Use your diagonal cutters to cutoff all other terminal pins on back of the switch.**
- ( ) Locate the front and rear panels. Examine the unpainted side of each for any paint overspray near or around any of the holes. Use a piece of sandpaper to remove any overspray around any of the holes. A good ground is necessary at these points.**
- ( ) Refer to assembly pictorial, Fig 4 & 5 for the following steps. Locate the front panel, R257 (10K panel pot w/switch), RED LED and LED holder. Remove the control nut and flat washer from R257. Notice there is an alignment tab on the body of the pot. Break off this tab with your pliers. From the unpainted side of the front panel, insert R257 through the hole labeled "AF GAIN". Secure with the supplied flat washer and nut.**
- ( ) Remove the nut and flat washer from R139 (center detent 10K panel pot). Break off the alignment tab. From the unpainted side of the front panel, install R139 in the hole labeled "RIT". Position pot as shown in Fig 4. Secure with flat washer and nut.**
- ( ) From the painted side of the front panel, install the LED holder in the hole labeled "POWER". From the other side of the panel, install the RED LED into the holder. Push the LED in until it snaps in place. Position the longer lead toward R257. See Fig 4.**
- ( ) Refer to Fig 5 for this step. Locate the 500K panel pot (R12 if you are installing the keyer kit). This pot is installed whether you are installing the keyer kit or not. Break off the alignment tab on the pot. Remove the nut and washer. Install the pot at the hole labeled "SPEED". Secure with the supplied hardware. Position the pot as shown in Fig 5.**

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Remove all hardware from S300, the rotary switch. Screw one of the control nuts onto the threaded bushing of the switch. Leave about 4 threads showing between the nut and the body of the switch. Install S300 in the hole labeled "BAND". Position the switch as shown in Fig 5 with the three terminals up and the small alignment tab on the left. Secure with the flat washer and nut.**
- ( ) Remove all hardware except hex nut from the toggle switch. Screw the hex nut onto the switch bushing until there are about 3 threads showing between the nut and the body of the switch. Install the switch in the hole labeled "TUNE/OPERATE". Secure with the flat washer and knurl nut. Be careful not to damage the paint on the front panel. Position the switch as shown in Fig 5.**
- ( ) Remove the nut and flat washer from a 1/4" phone jack. Install the jack in the hole labeled "PHONES". Position jack as shown in Fig 5. Secure with the flat washer and nut.**
- ( ) Refer to Fig 7 for the following steps. Locate the rear panel. From the UNPAINTED side of the rear panel, install the SO-239 connector in the holes labeled "ANTENNA". Insert a 4-40 x 5/16" screw through the upper right hole from the painted side of the panel. Install a #4 solder lug and #4 hex nut. Position solder lug as shown in Fig 7. Install a 4-40 x 5/16" screw in the remaining three holes. Secure with a #4 lockwasher and #4 hex nut.**
- ( ) Place a #6 lockwasher on a 6-32 x 5/8 screw. From the UNPAINTED side of the rear panel, insert the screw through the hole labeled "GND". Secure with a #6 lockwasher and #6 hex nut.**
- ( ) Refer to Fig 8 for the following steps. Remove the nut and lockwasher from the coaxial power jack. From the painted side of the rear panel, insert the jack through the hole labeled "12VDC". Secure with the lockwasher and nut.**
- ( ) Remove the flatwashers and nuts from the 1/4" standard and stereo phone jacks. From the unpainted side of the rear panel, install the STEREO jack in the hole labeled "KEYER". Position the jack as shown in Fig 8. Secure with the flat washer and nut. In the same way install the standard phone jack in the hole labeled "MANUAL". Position jack as shown in Fig 8. Secure with the flat washer and nut.**

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Bend the leads of a 2.2K ohm resistor (RED-RED-RED) straight down from the body. Cut each lead to 3/8". Connect the resistor between lugs 2 & 3 of TB3 (NS). TB3 is the terminal strip mounted on the side panel.**
- ( ) Connect one end of the previously prepared 7" RED/GRN wire to terminal #5 of switch S301 (S-1). (S301 is the black switch on the rear of the AF GAIN pot). Connect one end of the previously prepared 1" RED/WHT wire to terminal #4 of S301 (S-1).**
- ( ) Position the front panel near the front edge of the chassis. Engage the two RED LED leads into TB3, lugs 1 & 2. The short LED lead goes to lug 1 and the long lead goes to lug 2. From the painted side of the front panel, insert a 6-32 x 3/8" screw through one of the four corner mounting holes and through the hole in the side panel flange. Secure with a #6 lockwasher and a #6 hex nut. Repeat at the other three mounting holes.**
- ( ) Loosen the control nut on R257 (AF GAIN). Turn the radio so the front panel is facing away from you. Rotate R257 to the left about 45 deg. so terminals 1, 2 and 3 are facing the top center of the front panel. The two switch terminals 4 & 5 will be almost parallel with the chassis. Retighten the control nut. It is easier to connect wires to the terminals when the pot is positioned this way.**
- ( ) Connect one end of the previously prepared 2" BLK wire to terminal #1 of R257(S-1) . See Fig 4. Connect the other end to TB3, lug 1 (S-2). Solder TB3, lug 2 (S-2).**
- ( ) Connect the free end of the WHT/BLK wire coming from TB1, lug 5 to TB3, lug 3 (NS). Connect the free end of the 1" RED/WHT wire coming from S301, terminal 4 to TB3, lug 3 (S-3).**
- ( ) Connect the free end of the ORG/GRN wire coming from the receiver board to R257, terminal #2 (S-1). Connect the free end of the BLU/WHT wire to R257, terminal #3 (S-1).**
- ( ) Connect the free end of the BLK wire coming from the oscillator board to the RIT pot R139, terminal #1 (S-1). Connect the free end of the RED/BLK wire to terminal #2 (S-1). Connect the free end of the ORG/RED wire to terminal #3 (S-1).**

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Position the rear panel near the rear of the radio. Insert the white shaft through the hole labeled "POWER ADJ". Line up the four corner mounting holes in the rear panel with the four holes in the side panels. Use 6-32 x 3/8" hardware and secure the rear panel the same as you did on the front panel.
- ( ) Position the radio so the front panel is upright and facing you. Locate the power cable assembly and plug the connector into the coaxial power jack. Cut the leads of the large 1N5401 diode to 3/8". On the banded end, form a small loop near the end of the lead. Solder the UNBANDED end to the center pin of the coaxial power jack. Solder the free end of the RED/GRN wire to the loop at the banded end of the 1N5401 diode.
- ( ) See Fig 8 for the next two steps. Connect the free end of the ORG/RED wire coming from the grommet to MANUAL key jack J301, terminal #3 (S-1).
- ( ) If you are installing the keyer kit at this time, complete this step. Connect the free end of the BLK/GRY/RED wire coming from the grommet to KEYSER jack J1, terminal #3 (S-1). Connect the GRN/WHT/BLK wire to terminal #1 (S-1).
- ( ) Turn the radio over so the front panel is facing you. Connect the short coax cable coming from the holes labeled "ANT" on the T/R board to the SO-239 connector on the rear panel. Solder the center conductor to the center pin of the connector. Solder the braid to the solder lug.
- ( ) Refer to Fig 5 for the following steps. Turn the radio around so the rear panel is facing you. Connect the free end of the RED/WHT wire coming from TB2, lug 5 to the rotary switch S300, terminal #2 (S-1). Connect the free end of the ORG wire to S300, terminal #1 (S-1). Connect the free end of the BLK/RED wire to S300, terminal #3 (S-1).
- ( ) Connect the remaining coax cable to the PHONES jack, J200. Connect the braid to terminal #1 (S-1) and the inner conductor to terminal #3 (S-1).
- ( ) Connect the free end of the BLK wire coming from TB2, lug 3 to the TUNE/OPERATE switch S302, terminal #2 (S-1).

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) If you are installing the keyer kit at this time, perform this step. Remove an additional 1/4" insulation from the free end of the BLU/WHT wire coming from the keyer board. Connect to the SPEED pot R12, terminal #2 then bend the end down and connect to terminal #3. Solder both connections. Connect the free end of the WHT/BLK wire to R12, terminal #1 (S-1). Connect the free end of the BLU/RED wire to the TUNE/OPERATE switch S302, terminal #1 (S-1).
- ( ) If you are not installing the keyer kit at this time, perform this step. Connect one end of the previously prepared 3" GRN wire to the TUNE/OPERATE switch S302, terminal #1 (S-1). Connect the other end to TB2, lug 4 (S-4). Solder TB2, lug 5 (S-4).
- ( ) Place the brass dial mounting hub on your work table with the flange up. Place the dial pointer on the hub and line up the two holes. Start a 2-56 x 1/8" screw into one of the holes. Do the same at the other hole. Tighten both screws just enough to hold the dial pointer in place. Place the mounting hub on the shaft of the air variable cap with the side with the hex set screw facing toward the cap. Turn the shaft of the air variable cap all the way to the left. Position the dial pointer on the "0" mark and just far enough away from the front panel so as not to rub on it. Tighten hub set screw. Turn the shaft of the cap from 0 to 100. The side of the hub should not bind on the front panel hole. If the hub does bind, loosen the four front panel mounting screws and move the panel around until the binding stops. Retighten the mounting screws. Place the large knob on the shaft and position it 1/8" from the front panel. Tighten the set screw.
- ( ) Turn the shaft of the AF GAIN control left until it clicks. Place a small knob on the shaft and line up the notch with the "OFF" mark. Tighten the set screw.
- ( ) Place the shaft of the "RIT" pot in its center detent position. Place a small knob on the shaft and line up the notch with the center mark. Tighten the set screw.
- ( ) Turn the shaft of the "BAND" switch to the left position (20M). Place a small knob on the shaft and line up the notch with the left index mark. Tighten the set screw.

## **FINAL ASSEMBLY & WIRING (cont)**

- ( ) Turn the shaft of the "SPEED" control all the way to the RIGHT. Place a small knob on the shaft and line up the notch with the index mark on the right. Tighten set screw.
- ( ) With the radio upright, place a plastic tie wrap around the wires and cables coming up through the grommet. Place the tie about 2" from the grommet. Dress the wires above TB1 and the receiver board. Use two or three more plastic ties to bundle and tie the wires and cables as neat as possible.
- ( ) Turn the radio over. Route and dress the wires and cables going to the T/R board, keyer board and the cable to the phone jack above and along the front edge of the T/R board. Use three or four plastic ties to bundle the wires and cables as neat as possible.
- ( ) This completes the assembly of the transceiver. The alignment will be performed next. NOTE: If you have not installed the keyer, you should keep the remaining pieces of wire. If you decide to install the keyer in the future, you will have the correct wire colors. Also, when ordering the optional keyer kit (KEY1), please indicate on the order form that it is for the QRP Classic.

## **ALIGNMENT**

- ( ) You will need the following equipment to align the radio: 25 MHz oscilloscope; 25 MHz frequency counter; voltmeter; QRP wattmeter; QRP dummy load; well regulated 1.5A - 13.6V power supply. DO NOT USE A PLUG IN THE WALL TYPE POWER SUPPLY! These units are generally not well filtered or regulated.
- ( ) Locate the molded power cable assembly. Examine the end with the tinned leads. Notice that one of the leads has ribs or notches on it and the other has printing on it. The ribbed or notched lead is POSITIVE and the printed lead is NEGATIVE. You may trim the wire leads to a shorter length if desired. Attach the power cable to your power supply. Make sure power supply is turned off. Attach molded end of cable to your radio.
- ( ) Preset the controls on the radio as follows: AF GAIN - off; TUNE/OPERATE - operate; SPEED - full clockwise; BAND - 20M; RIT - center detent; MAIN TUNE - 50. With the rear panel facing you, adjust the white power adj control full counterclockwise.

## **ALIGNMENT (cont)**

- ( ) Attach your frequency counter probe to the forward lead of cap C141 (near R137) on the oscillator board. Attach the probe ground lead to the side panel. Attach a QRP 5W dummy load to the antenna connector.**
- ( ) Turn the power supply and the radio on. The red led on the front panel should be on.**
- ( ) Adjust C138 for a frequency of exactly 18.000 MHz. Place the band switch in the 40M position. Adjust C137 for a frequency of 11.000 MHz. There may be a little interaction between the two band switch positions. Be sure the two frequencies end up as indicated above. Switch the band switch back and forth several times to be sure.**
- ( ) Remove the probe from C141 and attach it to the test loop. Place band switch in 20M position and the main tuning dial to "0".**
- ( ) Use the plastic alignment tool and adjust L109 for a frequency of 23.000 MHz. Turn main tuning dial to "100" and adjust C145 for a frequency of 23.100 MHz. Turn the main tuning dial to "0" and again adjust L109 for a frequency of 23.000 MHz. Turn main tuning dial to "100" and again adjust C145 for a frequency of 23.100 MHz. Continue this adjustment procedure until you have exactly 100 KHz of coverage on the dial. Place the band switch in the 40M position. You should have exactly 100 KHz (16.000 - 16.100 MHz) of coverage on this band also.**
- ( ) Place the main tuning dial at about "50". Record the frequency. Place the tune/operate switch in the tune position and observe the frequency. Carefully adjust R112 so the frequency in the tune position is exactly the same as the frequency in the operate position. Keep toggling back and forth until both frequencies are exactly the same.**
- ( ) Remove the counter probe from the test loop and attach your scope probe to the test loop. Place your scope probe in the X10 position. Place the band switch in the 20M position. Adjust coils L107 and L108 for maximum signal on your scope. There should be about 1 V P-P at the test loop. The sinewave at this point may look rather jagged. This is normal. Turn the main tuning dial from "0" to "100". The P-P amplitude of the signal should be constant through the tuning range. Place the band switch in the 40M position. Place the main tuning dial at "50".**

## **ALIGNMENT (cont)**

- ( ) Adjust coils L100 and L101 for maximum signal. The signal amplitude on 40M may be higher or lower than the signal on 20M. This is normal. Remove the scope probe from the test loop.
- ( ) With the front panel of the radio facing you, locate the 10K ohm (brn-blk-org) resistor R223 on the receiver board. Refer to the parts overlay diagram. Attach the ground lead of your voltmeter to the side panel. Attach the other lead of your voltmeter to the RIGHT lead of resistor R223. Adjust pot R224 (just below R223) for a voltage of 4.8VDC. Remove both voltmeter leads.
- ( ) Turn the radio over so the T/R board is facing up. Remove the dummy load. Attach a QRP wattmeter to the antenna jack. Terminate the wattmeter with the dummy load. Turn the power adj control on the rear panel fully clockwise. Turn the main tuning dial to "50" and the band switch to 20M.
- ( ) As you perform the following step, do not leave the tune/operate switch in the tune position for more than 30 seconds at a time. Allow one minute for cool off.
- ( ) Place the tune/operate switch in the tune position. Adjust coils L303 and L307 for maximum power output on the wattmeter. Turn the main tuning dial from "0" to "100" while observing the wattmeter. The power output should be relatively even across the entire dial. If it is not, continue adjusting L303 and L307 until it is. These two coil adjustments will interact, but you should be able to find a setting that will provide relatively even output power. You should have 4 - 5 watts of output.
- ( ) Place the band switch in the 40M position. Repeat the above procedure, but this time adjust coils L304 and L308. The power output on 40M will be greater than on 20M. Adjust the power adj control to keep the power output in the 4 - 5 watt range.
- ( ) Turn the radio over so the receiver and oscillator boards are facing up. Attach a 50 ohm antenna to the antenna jack. Attach 8 ohm headphones to the phones jack. Set the band switch to the band of your choice. Tune in a CW signal near the center of the dial. Adjust C117 on the oscillator board for a 700 or 800 Hz CW note. You may have to make minor adjustments to the main tuning dial while adjusting C117. As you adjust C117, the CW signal will get louder as you center the signal in the audio filter.

## **ALIGNMENT (cont)**

- ( ) You will find a setting where the CW note is loudest and at the correct frequency. Verify that C117 is adjusted on the lower side of the crystal filter skirt. This is easy to check. Tune in a CW signal. As you slowly turn the main tuning dial toward "0", the CW signal should get lower and lower in frequency until you reach zero beat. If the signal goes higher and higher in frequency, this means you have adjusted C117 on the wrong side of the crystal filter skirt. Simply readjust C117 to the correct side. Once you have C117 adjusted correctly, tune in a CW signal and adjust L200 on the receiver board for maximum signal. You will have to remove or turn the manual key jack to make this adjustment. Also, adjust T100 on the oscillator board for maximum signal. If you do not hear much of a change in the signal when T100 is adjusted, simply adjust it so the green core is near the top of its adjustment range.
- ( ) In this step you will adjust the transmitter carrier oscillator. Attach a 50 ohm dummy load to the antenna jack. Set the main tuning dial to mid-range. If you have another transceiver or access to one, it will be very helpful for this adjustment. This really is the only accurate way to set the carrier oscillator. Terminate your other transceiver in its own 50 ohm dummy load. Transmit with the other transceiver into its dummy load and find the signal on the Classic. Tune the Classic for the loudest signal. Unkey the other transceiver. Now, without touching the main tuning dial on either radio, place the tune/operate switch in the tune position. While listening for the QRP signal in the other transceiver, adjust C118 on the oscillator board until you hear a nice mellow tone in the other transceiver. Do not leave the tune switch on for more than 30 seconds at a time.
- ( ) Key the radio with the tune switch and adjust R219 on the receiver board for a comfortable sidetone level. Unkey the radio.
- ( ) If you have installed the keyer kit, plug in your Iambic key. Key the radio using the keyer and adjust the weight pot, R2 to mid-range or to a setting of your choice.
- ( ) Attach the top and bottom cabinet covers using the #8 x 1/2" black self-tapping screws. Install the four rubber feet on the bottom cover. Position the feet 1/2" in from each corner.

## **ALIGNMENT (cont)**

- ( ) If you do not wish to do the alignment yourself, Oak Hills Research will do the alignment and return the unit to you for a fee of \$50.00. This fee is for alignment only on a properly assembled unit. It does not include the correction of assembly errors or other repairs.  
**PAYMENT MUST ACCOMPANY UNIT.**

## **OPERATION**

The operation of the QRP Classic is easy and straightforward. Simply attach a power supply, 50 ohm antenna, your favorite key and a pair of 8 ohm headphones. With a good antenna, stations worldwide can be routinely worked.

The RIT control will vary the receive frequency  $\pm 1\text{KHz}$ . The RIT is defeated on transmit. Leave it in the center detent position when not in use.

The TUNE/OPERATE switch is used to manually turn the transmitter on to make transmatch adjustments.

The keyer speed control adjust the CW code speed on transmit. The speed is minimum with the knob clockwise. The speed pot is an audio taper type and is wired this way to make the speed adjustment more linear.

The power adjust control on the rear panel is used to adjust power output from 0 to full output. The most efficient operation occurs when the output power is 4.5 watts and the unit is drawing 1A from the power supply.

We hope you have enjoyed building the QRP Classic, and that it provides you with many years of trouble free service. As always, we appreciate any comments or suggestions you may have.

**OAK HILLS RESEARCH**



## 1 YEAR LIMITED WARRANTY

**PARTS** - Replacements for defective parts will be supplied free of charge for a period of one year from the date of purchase. Replacement parts are warranted for the remaining portion of the original warranty period. If you do have a defective part, you may obtain a replacement by writing or calling us at (616) 796-0920. We will pay the shipping charges on these parts.

**SERVICE LABOR** - For a period of one year from the date of purchase, any malfunction caused by defective parts will be corrected at no charge to you. You must deliver the unit at your expense to Oak Hills Research. This warranty does not cover the corrections of assembly errors or any damage incurred during assembly of the unit.

**TECHNICAL CONSULTATION** - You will receive free consultation on any problem you may encounter in the assembly or use of our product. Just give us a call at (616) 796-0920, we will be glad to assist you.

**NOT COVERED** - The correction of assembly errors, adjustments, calibration, damage due to misuse, abuse or negligence are not covered by this warranty. Use of corrosive solder will void this warranty in its entirety. This warranty does not include reimbursement for inconvenience, loss of use or customer assembly.

This warranty covers only Oak Hills Research products and is not extended to other equipment or components that a customer uses in conjunction with our products.

**EFFECTIVE WARRANTY DATE** - Warranty begins on the date of first consumers purchase. Please supply a copy of your invoice when you request warranty service or parts.

**SHIPPING UNITS** - When shipping a unit back to us for repair, use adequate packing material. Damage due to inadequate packing cannot be repaired under this warranty.

**OAK HILLS RESEARCH**  
20879 Madison Street  
Big Rapids, MI 49307  
(616) 796-0920



## OSCILLATOR BOARD PARTS LIST

RESISTORS & PC POTS  
ALL RESISTORS ARE 1/4W 5%

| QTY | PART#    | DESCRIPTION                        | REF DES#                 |
|-----|----------|------------------------------------|--------------------------|
| 1   | 6-150-14 | 15 ohm (brn-grn-blk                | R100                     |
| 2   | 6-470-14 | 47 ohm (yel-vio-blk)               | R108,R113                |
| 4   | 6-101-14 | 100 ohm (brn-blk-brn)              | R106,R117,R118,R124      |
| 1   | 6-271-14 | 270 ohm (red-vio-brn)              | R101                     |
| 2   | 6-471-14 | 470 ohm (yel-vio-brn)              | R111,R134                |
| 2   | 6-561-14 | 560 ohm (grn-blu-brn)              | R137,R138                |
| 3   | 6-102-14 | 1K ohm (brn-blk-red)               | R128,R130,R136           |
| 1   | 6-152-14 | 1.5K ohm (brn-grn-red)             | R110                     |
| 4   | 6-222-14 | 2.2K ohm (red-red-red)             | R120,R121,R122,R131      |
| 4   | 6-332-14 | 3.3K ohm (org-org-red)             | R102,R107,R109,R123      |
| 2   | 6-472-14 | 4.7K ohm (yel-vio-red)             | R103,R104                |
| 1   | 6-822-14 | 8.2K ohm (gry-red-red)             | R133                     |
| 2   | 6-103-14 | 10K ohm (brn-blk-org)              | R116,R126                |
| 2   | 6-123-14 | 12K ohm (brn-red-org)              | R119,R132                |
| 1   | 6-153-14 | 15K ohm (brn-grn-org)              | R129                     |
| 5   | 6-104-14 | 100K ohm (brn-blk-yel)             | R105,R115,R125,R127,R135 |
| 1   | 6-105-14 | 1M ohm (brn-blk-grn)               | R114                     |
| 1   | POT 7    | 10K ohm pot (103)<br>(see key# A1) | R112                     |

## OSCILLATOR BOARD PARTS LIST

| QTY                  | PART# | DESCRIPTION | KEY# | REF DES#                |
|----------------------|-------|-------------|------|-------------------------|
| <u>NP0 MONO CAPS</u> |       |             |      |                         |
| 1                    | MC04  | 3.3pF (339) | A2   | C136                    |
| 1                    | MC13  | 18pF (180)  | A2   | C108                    |
| 4                    | MC18  | 47pF (470)  | A2   | C150,C151,C152,<br>C154 |
| 2                    | K048  | 62pF (620)  | A2   | C114,C116               |
| 1                    | MC21  | 82pF (820)  | A2   | C139                    |
| 1                    | MC26  | 220pF (221) | A2   | C148                    |
| 2                    | MC32  | 680pF (681) | A2   | C147,C149               |

### MONO CAPS

|    |       |             |    |                                                                                       |
|----|-------|-------------|----|---------------------------------------------------------------------------------------|
| 14 | MC102 | .1uF (104)  | A2 | C100,C101,C102,<br>C104,C113,C121,<br>C123,C124,C132,<br>C133,C135,C140,<br>C144,C153 |
| 13 | MC101 | .01uF (103) | A2 | C103,C109,C110,<br>C111,C112,C120,<br>C125,C128,C129,<br>C130,C131,C142,<br>C143      |

### NP0 CERAMIC DISC CAPS

|   |      |             |    |                |
|---|------|-------------|----|----------------|
| 1 | NP02 | 5pF (5)     | A3 | C115           |
| 2 | NP03 | 10pF (10k)  | A3 | C107,C146      |
| 3 | NP06 | 20pF (20)   | A3 | C126,C127,C141 |
| 2 | NP11 | 51pF (51)   | A3 | C106,C119      |
| 3 | NP12 | 100pF (101) | A3 | C105,C122,C134 |

### CERAMIC TRIM CAPS

|   |      |             |    |           |
|---|------|-------------|----|-----------|
| 2 | TC13 | 120pF (blk) | A4 | C117,C137 |
| 1 | TC10 | 60pF (brn)  | A4 | C145      |
| 2 | TC11 | 50pF (org)  | A4 | C118,C138 |

## OSCILLATOR BOARD PARTS LIST

| <u>QTY</u>    | <u>PART#</u> | <u>DESCRIPTION</u>        | <u>KEY#</u> | <u>REF DES#</u>              |
|---------------|--------------|---------------------------|-------------|------------------------------|
| <u>CHOKES</u> |              |                           |             |                              |
| 1             | CH11         | 4.7 $\mu$ H (yel-vio-gld) | A5          | L110                         |
| 1             | CH13         | 6.8 $\mu$ H (blu-gry-gld) | A5          | L113                         |
| 2             | CH16         | 15 $\mu$ H (brn-grn-blk)  | A5          | L103,L106                    |
| 5             | CH26         | 100 $\mu$ H (brn-blk-brn) | A5          | L102,L104,L105,<br>L111,L112 |

### COILS & TRANSFORMERS

|   |      |                         |    |                         |
|---|------|-------------------------|----|-------------------------|
| 1 | IF01 | 4.7 $\mu$ H (42IF123)   | A6 | T100                    |
| 1 | K163 | 8.0 $\mu$ H (STYLE 3)   | A6 | L109                    |
| 4 | K242 | 1.2 $\mu$ H (SLOTTEN-3) | A6 | L100,L101,L107,<br>L108 |
| 1 | K235 | Bifilar coil            | A7 | T101                    |

### CRYSTALS

|   |      |                |    |      |
|---|------|----------------|----|------|
| 1 | K032 | 9 Mhz Crystal  | A8 | Y100 |
| 1 | K018 | 11 Mhz Crystal | A8 | Y102 |
| 1 | K248 | 18 Mhz Crystal | A8 | Y101 |

### TRANSISTORS & VOLTAGE REGULATORS

|   |        |                |    |                         |
|---|--------|----------------|----|-------------------------|
| 4 | MPF102 | JFET (TO-92)   | A9 | Q100,Q104,Q106,<br>Q107 |
| 3 | 2N3904 | NPN (TO-92)    | A9 | Q101,Q102,Q105          |
| 1 | 2N3906 | PNP (TO-92)    | A9 | Q103                    |
| 1 | 78L09  | 9V Reg (TO-92) | A9 | U100                    |

## OSCILLATOR BOARD PARTS LIST

| <u>QTY</u>    | <u>PART#</u> | <u>DESCRIPTION</u> | <u>KEY#</u> | <u>REF DES#</u>                                                         |
|---------------|--------------|--------------------|-------------|-------------------------------------------------------------------------|
| <u>DIODES</u> |              |                    |             |                                                                         |
| 12            | 1N4148       | Silicon Diode      | A10         | D100,D101,D102,<br>D103,D104,D105,<br>D107,D108,D109,<br>D110,D111,D112 |
| 1             | MV2109       | Varactor Diode     | A11         | D106                                                                    |

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### ICs & SOCKETS

|   |         |                 |     |      |
|---|---------|-----------------|-----|------|
| 1 | NE602AN | 8 Pin IC        | A12 | U101 |
| 1 | ICS01   | 8 Pin IC Socket | A13 |      |

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### MISCELLANEOUS

|   |      |                   |  |  |
|---|------|-------------------|--|--|
| 1 | K134 | 2" large red wire |  |  |
|---|------|-------------------|--|--|

# RECEIVER BOARD PARTS LIST

RESISTORS & PC POTS  
ALL RESISTORS ARE 1/4W 5%

| QTY | PART#    | DESCRIPTION                        | REF DES#                                    |
|-----|----------|------------------------------------|---------------------------------------------|
| 1   | 6-279-14 | 2.7 ohm (red-vio-gld)              | R230                                        |
| 1   | 6-569-14 | 5.6 ohm (grn-blu-gld)              | R200                                        |
| 1   | 6-100-14 | 10 ohm (brn-blk-blk)               | R210                                        |
| 2   | 6-330-14 | 33 ohm (org-org-blk)               | R201,R204                                   |
| 2   | 6-470-14 | 47 ohm (yel-vio-blk)               | R212,R215                                   |
| 1   | 6-560-14 | 56 ohm (grn-blu-blk)               | R202                                        |
| 1   | 6-680-14 | 68 ohm (blu-gry-blk)               | R206                                        |
| 2   | 6-101-14 | 100 ohm (brn-blk-brn)              | R239,R247                                   |
| 1   | 6-221-14 | 220 ohm (red-red-brn)              | R245                                        |
| 2   | 6-271-14 | 270 ohm (red-vio-brn)              | R208,R209                                   |
| 2   | 6-471-14 | 470 ohm (yel-vio-brn)              | R213,R216                                   |
| 1   | 6-561-14 | 560 ohm (grn-blu-brn)              | R203                                        |
| 8   | 6-102-14 | 1K ohm (brn-blk-red)               | R205,R214,R217,R233,<br>R236,R246,R249,R254 |
| 2   | 6-222-14 | 2.2K ohm (red-red-red)             | R211,R241                                   |
| 1   | 6-272-14 | 2.7K ohm (red-vio-red)             | R256                                        |
| 1   | 6-332-14 | 3.3K ohm (org-org-red)             | R225                                        |
| 1   | 6-472-14 | 4.7K ohm (yel-vio-red)             | R231                                        |
| 1   | 6-682-14 | 6.8K ohm (blu-gry-red)             | R207                                        |
| 5   | 6-103-14 | 10K ohm (brn-blk-org)              | R221,R222,R223,R229<br>R235                 |
| 1   | 6-153-14 | 15K ohm (brn-grn-org)              | R251                                        |
| 3   | 6-223-14 | 22K ohm (red-red-org)              | R237,R240,R250                              |
| 1   | 6-273-14 | 27K ohm (red-vio-org)              | R232                                        |
| 8   | 6-333-14 | 33K ohm (org-org-org)              | R226,R227,R228,R242,<br>R243,R244,R252,R253 |
| 2   | 6-513-14 | 51K ohm (grn-brn-org)              | R234,R248                                   |
| 1   | 6-104-14 | 100K ohm (brn-blk-yel)             | R238                                        |
| 1   | 6-394-14 | 390K ohm (org-wht-yel)             | R220                                        |
| 1   | 6-105-14 | 1M ohm (brn-blk-grn)               | R255                                        |
| 1   | 6-155-14 | 1.5M ohm (brn-grn-grn)             | R218                                        |
| 2   | POT 7    | 10K ohm pot (103)<br>(see key# A1) | R219,R224                                   |

# RECEIVER BOARD PARTS LIST

| QTY | PART# | DESCRIPTION | KEY# | REF DES# |
|-----|-------|-------------|------|----------|
|-----|-------|-------------|------|----------|

## NP0 MONO CAPS

SEE  
NOTE IN  
PARTS PACK.

|     |      |             |    |           |
|-----|------|-------------|----|-----------|
| 1   | MC13 | 18pF (180)  | A2 | C213      |
| *-2 | MC28 | 330pF (331) | A2 | C202,C205 |
| 2   | MC30 | 470pF (471) | A2 | C203,C206 |
| 1   | MC31 | 560pF (561) | A2 | C204      |

## MONO CAPS

|    |       |              |    |                                                               |
|----|-------|--------------|----|---------------------------------------------------------------|
| 1  | MC100 | .001μF (102) | A2 | C214                                                          |
| 10 | MC101 | .01μF (103)  | A2 | C200,C201,C207,<br>C208,C209,C210,<br>C211,C215,C233,<br>C239 |
| 10 | MC102 | .1μF (104)   | A2 | C212,C221,C222,<br>C223,C228,C240,<br>C241,C242,C247,<br>C249 |
| 1  | MC106 | 1μF (105)    | A2 | C231                                                          |

## POLYESTER CAPS

|   |      |                     |    |                |
|---|------|---------------------|----|----------------|
| 3 | K112 | .01μF (103) green   | B1 | C224,C225,C238 |
| 1 | K108 | .022μF (223) green  | B1 | C220           |
| 3 | K016 | .0022μF (222) green | B1 | C236,C237,C235 |
| 1 | K109 | .033μF (333) green  | B1 | C229           |

## ELECTROLYTIC CAPS

|   |      |           |    |                              |
|---|------|-----------|----|------------------------------|
| 2 | CE01 | .47μF cap | B2 | C218,C246                    |
| 1 | CE02 | 1μF cap   | B2 | C232                         |
| 2 | CE06 | 10μF cap  | B2 | C226,C230                    |
| 3 | CE07 | 22μF cap  | B2 | C234,C243,C245               |
| 5 | CE10 | 100μF cap | B2 | C216,C217,C227,<br>C244,C248 |
| 1 | CE11 | 220μF cap | B2 | C219                         |

## RECEIVER BOARD PARTS LIST

| <u>QTY</u>      | <u>PART#</u> | <u>DESCRIPTION</u>             | <u>KEY#</u> | <u>REF DES#</u>         |
|-----------------|--------------|--------------------------------|-------------|-------------------------|
| <u>CRYSTALS</u> |              |                                |             |                         |
| 4               | K032         | 9 Mhz crystal<br>(matched set) | A8          | Y200,Y201,Y202,<br>Y203 |

### COILS & TRANSFORMERS

|   |      |                       |    |      |
|---|------|-----------------------|----|------|
| 1 | IF01 | 4.7 $\mu$ H (42IF123) | A6 | L200 |
| 1 | K235 | Bifilar coil          | A7 | T200 |

### TRANSISTORS

|   |        |              |    |           |
|---|--------|--------------|----|-----------|
| 2 | MPF102 | JFET (TO-92) | A9 | Q203,Q204 |
| 1 | 2N3906 | PNP (TO-92)  | A9 | Q202      |
| 1 | 2N3866 | NPN (TO-39)  | B3 | Q200      |
| 1 | 2N5179 | NPN (TO-72)  | B4 | Q201      |

### DIODES

|   |        |               |     |                         |
|---|--------|---------------|-----|-------------------------|
| 4 | 1N4148 | Silicon diode | A10 | D200,D201,D202,<br>D203 |
|---|--------|---------------|-----|-------------------------|

### ICs & SOCKETS

|   |          |                     |     |           |
|---|----------|---------------------|-----|-----------|
| 1 | LM358N   | 8 Pin IC            | A12 | U202      |
| 1 | LM380N-8 | 8 Pin IC            | A12 | U201      |
| 1 | MC1350P  | 8 Pin IC            | A12 | U200      |
| 2 | NE5534N  | 8 Pin IC            | A12 | U206,U207 |
| 1 | NE602AN  | 8 Pin IC            | A12 | U203      |
| 2 | TL082CP  | 8 Pin IC            | A12 | U204,U205 |
| 8 | ICS01    | 8 Pin dip IC socket | A13 |           |

### MISCELLANEOUS

|   |      |                         |    |  |
|---|------|-------------------------|----|--|
| 1 | K027 | TO-39 transistor spacer | B5 |  |
| 1 | HS03 | TO-39 ribbed heatsink   | B6 |  |



## T/R BOARD PARTS LIST

RESISTORS & POTS  
ALL RESISTORS ARE 1/4W 5%

| QTY | PART#    | DESCRIPTION                             | REF DES#                                                                      |
|-----|----------|-----------------------------------------|-------------------------------------------------------------------------------|
| 1   | 6-129-14 | 1.2 ohm (brn-red-gld)                   | R304                                                                          |
| 1   | 6-339-14 | 3.3 ohm (org-org-gld)                   | R313                                                                          |
| 2   | 6-100-14 | 10 ohm (brn-blk-blk)                    | R301,R324                                                                     |
| 1   | 6-270-14 | 27 ohm (red-vio-blk)                    | R311                                                                          |
| 2   | 6-470-14 | 47 ohm (yel-vio-blk)                    | R308,R339                                                                     |
| 1   | 6-820-14 | 82 ohm (gry-red-blk)                    | R303                                                                          |
| 3   | 6-101-14 | 100 ohm (brn-blk-brn)                   | R318,R320,R325                                                                |
| 1   | 6-561-14 | 560 ohm (grn-blu-brn)                   | R331                                                                          |
| 1   | 6-680-14 | 680 ohm (blu-gry-brn)                   | R319                                                                          |
| 14  | 6-102-14 | 1K ohm (brn-blk-red)                    | R300,R302,R306,R309,R310,<br>R312,R315,R316,R317,R323,<br>R332,R334,R336,R340 |
| 2   | 6-222-14 | 2.2K ohm (red-red-red)                  | R338,R342                                                                     |
| 1   | 6-332-14 | 3.3K ohm (org-org-red)                  | R330                                                                          |
| 4   | 6-472-14 | 4.7K ohm (yel-vio-red)                  | R333,R335,R337,R341                                                           |
| 2   | 6-562-14 | 5.6K ohm (grn-blu-red)                  | R307,R322                                                                     |
| 5   | 6-103-14 | 10K ohm (brn-blk-org)                   | R314,R326,R327,R328,R329                                                      |
| 1   | 6-473-14 | 47K ohm (yel-vio-org)                   | R321                                                                          |
| 1   | K228     | 100 ohm PC pot w/shaft<br>(see key# C1) | R305                                                                          |

| QTY | PART# | DESCRIPTION | KEY# | REF DES# |
|-----|-------|-------------|------|----------|
|-----|-------|-------------|------|----------|

### NP0 MONO CAPS

|   |      |             |    |           |
|---|------|-------------|----|-----------|
| 1 | MC01 | 1pF (109)   | A2 | C321      |
| 1 | MC04 | 3.3pF (339) | A2 | C323      |
| 1 | MC10 | 10pF (100)  | A2 | C317      |
| 2 | MC11 | 12pF (120)  | A2 | C305,C331 |
| 2 | MC12 | 15pF (150)  | A2 | C312,C332 |
| 2 | MC16 | 33pF (330)  | A2 | C307,C340 |
| 1 | MC19 | 56pF (560)  | A2 | C328      |
| 2 | MC20 | 68pF (680)  | A2 | C313,C333 |

## T/R BOARD PARTS LIST

| QTY              | PART# | DESCRIPTION        | KEY# | REF DES#                                                                                    |
|------------------|-------|--------------------|------|---------------------------------------------------------------------------------------------|
| <u>MONO CAPS</u> |       |                    |      |                                                                                             |
| 3                | MC100 | .001 $\mu$ F (102) | A2   | C300,C308,C315                                                                              |
| 16               | MC101 | .01 $\mu$ F (103)  | A2   | C302,C306,C320,C322,<br>C327,C334,C335,C336,<br>C338,C339,C341,C342,<br>C343,C344,C345,C346 |
| 8                | MC102 | .1 $\mu$ F (104)   | A2   | C301,C304,C309,C310,<br>C314,C324,C325,C326                                                 |

### SILVER MICA CAPS

|   |      |             |    |           |
|---|------|-------------|----|-----------|
| 2 | K231 | 180pF (181) | C2 | C311,C330 |
| 1 | K244 | 360pF (361) | C2 | C319      |
| 2 | K230 | 470pF (471) | C2 | C316,C329 |
| 1 | K245 | 820pF (821) | C2 | C318      |

### ELECTROLYTIC CAPS

|   |      |             |    |           |
|---|------|-------------|----|-----------|
| 1 | CE01 | .47 $\mu$ F | B2 | C348      |
| 2 | CE02 | 1 $\mu$ F   | B2 | C349,C350 |
| 2 | CE06 | 10 $\mu$ F  | B2 | C337,C351 |
| 1 | CE07 | 22 $\mu$ F  | B2 | C347      |
| 1 | CE10 | 100 $\mu$ F | B2 | C303      |

### COILS & TRANSFORMERS

|   |      |                     |    |                     |
|---|------|---------------------|----|---------------------|
| 4 | K068 | 4.7 $\mu$ H (T1005) | A6 | L303,L304,L307,L308 |
| 4 | K235 | Bifilar coil        | A7 | T300,T301,T302,T303 |
| 2 | K039 | Pre-wound coil      | C3 | L306,L311           |
| 2 | K044 | Pre-wound coil      | C3 | L305,L310           |

## T/R BOARD PARTS LIST

| QTY           | PART# | DESCRIPTION               | KEY# | REF DES#                                             |
|---------------|-------|---------------------------|------|------------------------------------------------------|
| <u>CHOKES</u> |       |                           |      |                                                      |
| 9             | CH26  | 100 $\mu$ H (brn-blk-brn) | A5   | L300,L301,L302,<br>L309,L312,L313,<br>L314,L315,L316 |

### TRANSISTORS

|   |         |              |    |           |
|---|---------|--------------|----|-----------|
| 1 | 2N2222A | NPN (TO-18)  | C4 | Q300      |
| 1 | 2N2907A | PNP (TO-18)  | C4 | Q306      |
| 1 | 2N3866  | NPN (TO-39)  | B3 | Q301      |
| 1 | 2N3904  | NPN (TO-92)  | A9 | Q303      |
| 1 | 2N3906  | PNP (TO-92)  | A9 | Q305      |
| 1 | 2N5179  | NPN (TO-18)  | B4 | Q304      |
| 1 | 2SC2075 | NPN (TO-220) | C6 | Q302      |
| 2 | MJE172  | PNP (SOT-32) | C7 | Q307,Q308 |

### DIODES

|    |        |               |     |                                                                                  |
|----|--------|---------------|-----|----------------------------------------------------------------------------------|
| 2  | 1N4007 | Silicon diode | C8  | D305,D306                                                                        |
| 13 | 1N4148 | Silicon diode | A10 | D300,D301,D302,<br>D303,D304,D307,<br>D308,D309,D310,<br>D311,D312,D313,<br>D314 |
| 1  | 1N5401 | Silicon diode | C9  | D316                                                                             |

### MISCELLANEOUS

|   |       |                         |     |           |
|---|-------|-------------------------|-----|-----------|
| 2 | K247  | SPDT PC Relay           | C10 | K300,K301 |
| 1 | TUF-1 | Mixer                   | C11 | U300      |
| 1 | K027  | TO-39 transistor spacer | B5  |           |
| 1 | HS03  | TO-39 ribbed heatsink   | B6  |           |
| 1 | HS04  | TO-220 heatsink         | C12 |           |

C

C

C

## IAMBIC KEYSER PARTS LIST

RESISTORS & POTS  
ALL RESISTORS ARE 1/4W 5%

| QTY | PART#    | DESCRIPTION                         | REF DES# |
|-----|----------|-------------------------------------|----------|
| 1   | 6-221-14 | 220 ohm (red-red-brn)               | R3       |
| 2   | 6-471-14 | 470 ohm (yel-vio-brn)               | R6, R10  |
| 1   | 6-472-14 | 4.7K ohm (yel-vio-red)              | R9       |
| 1   | 6-473-14 | 47K ohm (yel-vio-org)               | R8       |
| 1   | 6-563-14 | 56K ohm (grn-blk-org)               | R1       |
| 1   | 6-913-14 | 91K ohm (wht-brn-org)               | R11      |
| 2   | 6-105-14 | 1M ohm (brn-blk-grn)                | R4, R7   |
| 1   | 6-106-14 | 10M ohm (brn-blk-blu)               | R5       |
| 1   | K136     | 500K ohm pot (504)<br>(see key# E8) | R2       |

| QTY              | PART# | DESCRIPTION       | KEY# | REF DES#   |
|------------------|-------|-------------------|------|------------|
| <u>MONO CAPS</u> |       |                   |      |            |
| 3                | MC101 | .01 $\mu$ F (103) | A2   | C4, C6, C8 |
| 1                | MC102 | .1 $\mu$ F (104)  | A2   | C3         |

### POLYESTER & ELECTROLYTIC CAPS

|   |      |                         |    |        |
|---|------|-------------------------|----|--------|
| 1 | K019 | .15 $\mu$ F (154) POLY  | B1 | C7     |
| 2 | K015 | .22 $\mu$ F (224) POLY  | B1 | C1, C5 |
| 1 | CE07 | 22 $\mu$ F electrolytic | B2 | C2     |

### TRANSISTORS & VOLTAGE REGULATORS

|   |        |                      |    |    |
|---|--------|----------------------|----|----|
| 1 | 2N4401 | NPN (TO92)           | A9 | Q2 |
| 1 | BS170  | Power Fet (TO-92)    | A9 | Q1 |
| 1 | 78L05  | 5V Regulator (TO-92) | A9 | U1 |

## IAMBIC KEYER PARTS LIST

| <u>QTY</u> | <u>PART#</u> | <u>DESCRIPTION</u> | <u>KEY#</u> | <u>REF DES#</u> |
|------------|--------------|--------------------|-------------|-----------------|
|------------|--------------|--------------------|-------------|-----------------|

### DIODES

|   |        |               |     |        |
|---|--------|---------------|-----|--------|
| 2 | 1N4148 | Silicon diode | A10 | D1, D2 |
| 2 | 1N4007 | Silicon diode | C8  | D3, D4 |

### ICs & SOCKETS

|   |         |                  |     |    |
|---|---------|------------------|-----|----|
| 1 | 8044ABM | Keyer IC         | G1  | U2 |
| 1 | ICS05   | 20 pin IC socket | A13 |    |

### MISCELLANEOUS

|   |         |                  |     |    |
|---|---------|------------------|-----|----|
| 1 | 40-0103 | PC board         |     |    |
| 1 | K098    | 1/4" stereo jack | E13 | J1 |

## CHASSIS PARTS LIST

| <u>QTY</u> | <u>PART#</u> | <u>DESCRIPTION</u> | <u>KEY#</u> |
|------------|--------------|--------------------|-------------|
|------------|--------------|--------------------|-------------|

### HARDWARE

|    |      |                            |     |
|----|------|----------------------------|-----|
| 11 | K014 | #6 hex nut                 | D1  |
| 18 | K059 | #4 hex nut                 | D15 |
| 8  | K151 | square nylon nut           | D2  |
| 8  | K147 | round alum spacer (3/8")   | D11 |
| 6  | K239 | hex alum spacer (1/4")     | D12 |
| 9  | K116 | #6 lockwasher              | D5  |
| 52 | K058 | #4 lockwasher              | D14 |
| 1  | K004 | #4 solder lug              | D13 |
| 8  | K038 | 6-32 x 3/8" machine screw  | D3  |
| 1  | K117 | 6-32 x 5/8" machine screw  | D4  |
| 20 | K162 | 4-40 x 1/4" machine screw  | D6  |
| 10 | K056 | 4-40 x 5/16" machine screw | D8  |
| 6  | K238 | 4-40 x 5/8" machine screw  | D7  |
| 2  | K066 | 2-56 x 1/8" machine screw  | D18 |
| 8  | K152 | #8 x 1/2" blk sheet screw  | D23 |
| 2  | K237 | 5 lug terminal strip       | D9  |
| 1  | K146 | 3 lug terminal strip       | D10 |
| 1  | K017 | 1/2" rubber grommet        | D16 |
| 4  | K132 | rubber feet                | D20 |
| 11 | K145 | 4" plastic tie             | D21 |
| 1  | K006 | brass dial mounting hub    | D17 |
| 1  | K165 | dial pointer               | D19 |
| 1  | K241 | plastic alignment tool     | D22 |
| 1  | K012 | large control nut          | D23 |

## CHASSIS PARTS LIST

| QTY | PART# | DESCRIPTION | KEY# | REF DES# |
|-----|-------|-------------|------|----------|
|-----|-------|-------------|------|----------|

### CHASSIS & PANEL MOUNTED PARTS

|   |      |                             |     |           |
|---|------|-----------------------------|-----|-----------|
| 1 | K222 | 10K ohm pot w/switch        | E3  | R257/S301 |
| 1 | K013 | 10K ohm pot (center detent) | E5  | R139      |
| 1 | K158 | 500K ohm pot*               | E8  | see note  |
| 1 | K095 | SPDT toggle switch          | E7  | S302      |
| 1 | K167 | 2 pos rotary switch         | E6  | S300      |
| 2 | K090 | 1/4" standard phone jack    | E4  | J200,J301 |
| 1 | K098 | 1/4" stereo phone jack*     | E13 | see note  |
| 1 | K092 | SO-239 connector            | E9  | J300      |
| 1 | K062 | coaxial power jack          | E12 | J302      |
| 4 | K005 | small knob                  | E10 |           |
| 1 | K164 | large knob                  | E11 |           |
| 1 | K100 | red LED                     | E2  | D315      |
| 1 | K172 | LED holder                  | E1  |           |

### MISCELLANEOUS

|     |          |                      |    |      |
|-----|----------|----------------------|----|------|
| 1   | 40-108   | Oscillator PC board  |    |      |
| 1   | 40-109   | T/R PC board         |    |      |
| 1   | 40-110   | Receiver PC board    |    |      |
| 1   | AV03     | 18pF variable cap    | F1 | C155 |
| 1   | 10-104-D | Chassis panel        | F2 |      |
| 2   | 10-104-E | Side panel           | F3 |      |
| 1   | 10-104-B | Front panel          |    |      |
| 1   | 10-104-C | Rear panel           |    |      |
| 2   | 10-101-A | Cabinet cover        | F4 |      |
| 1   | K234     | Power cable assembly | F5 |      |
| 14" | K047     | 25 conductor cable   |    |      |
| 60" | RG174/U  | Miniature coax cable |    |      |
| 1   | K250     | Instruction set      |    |      |

\* NOTE: If you have ordered the transceiver without the optional keyer kit, these two parts will be mounted and left blank. See instructions.

# PARTS PICTORIAL

A1



A2



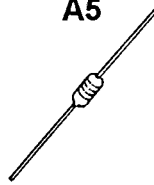
A3



A4



A5



A6



A7



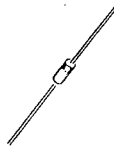
A8



A9



A10



A11



A12



A13



Always count the number of pins on the socket.

B1



B2



B3



B4



B5



B6



C1



C2



C3



C4



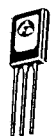
C5

NO PART

C6



C7



C8



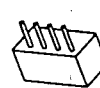
C9



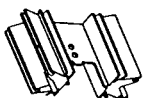
C10



C11



C12



D1



D2



D3



D4



D5



# PARTS PICTORIAL

D6



D7



D8



D9



D10



D11



D12



D13



D14



D15



D16



D17



D18



D19



D20



D21



D22



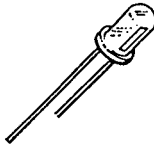
D23



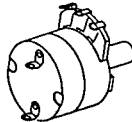
E1



E2



E3



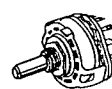
E4



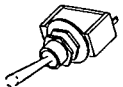
E5



E6



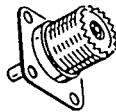
E7



E8



E9



E10



E11



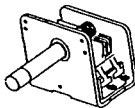
E12



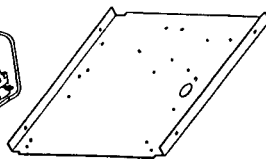
E13



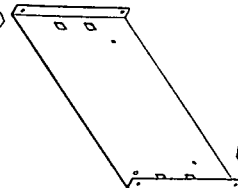
F1



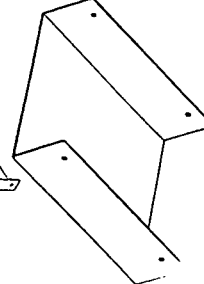
F2



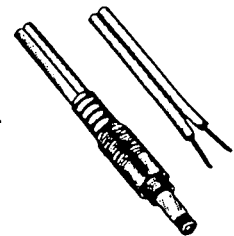
F3



F4



F5



G1



# ASSEMBLY PICTORIAL

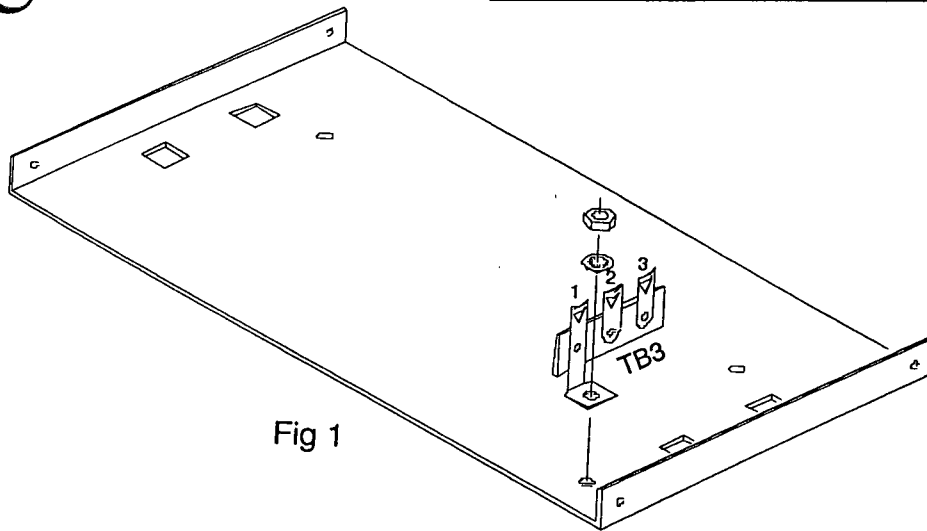


Fig 1

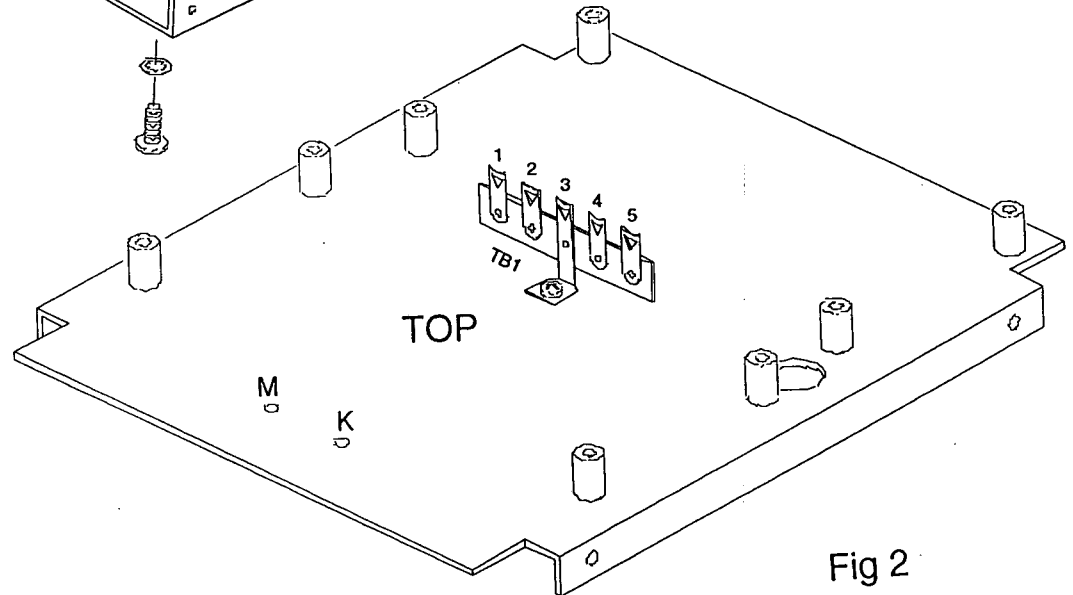


Fig 2

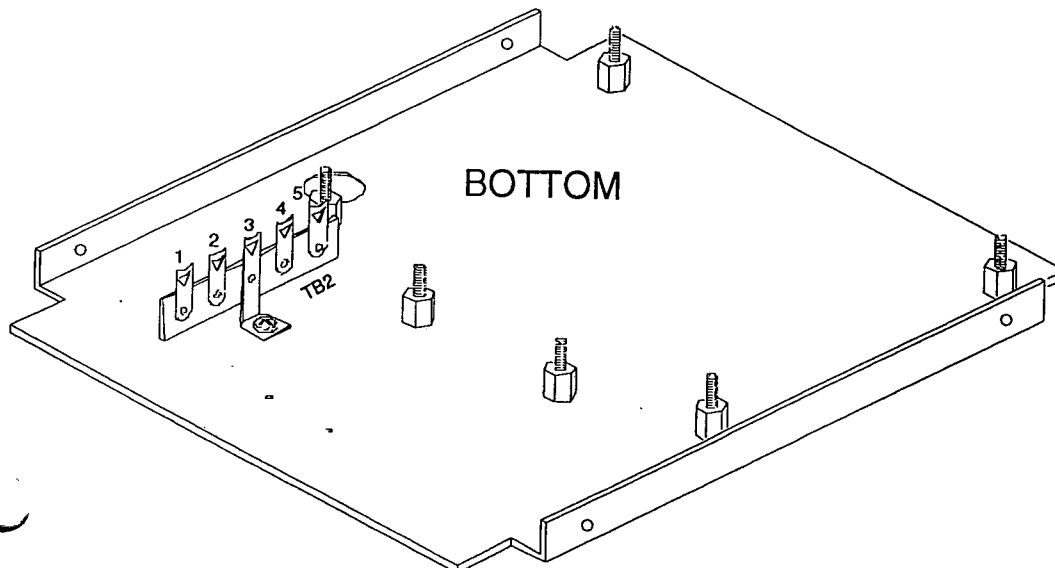


Fig 3

# ASSEMBLY PICTORIAL

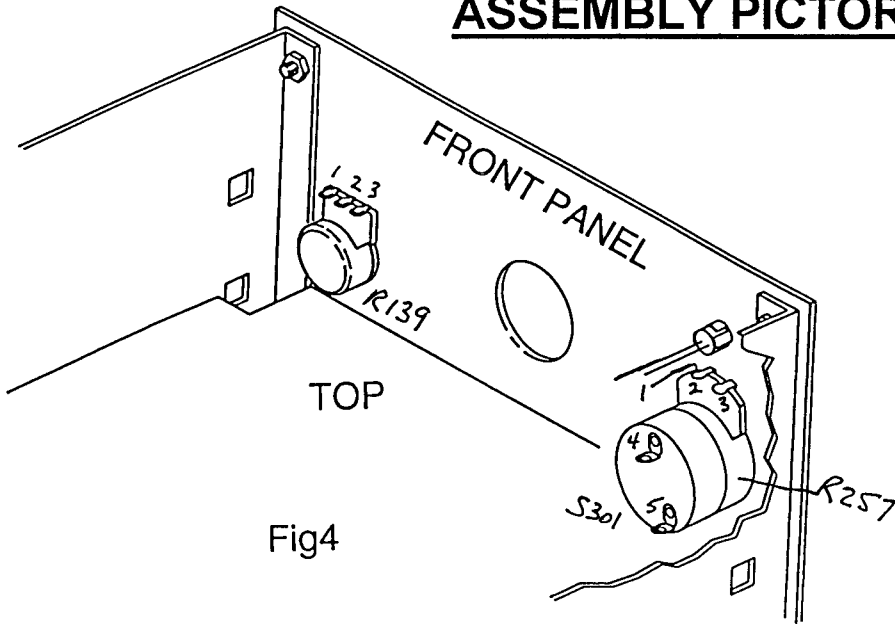
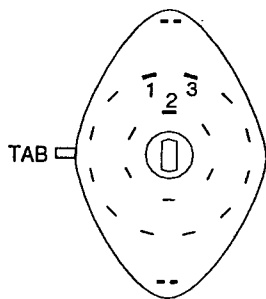


Fig 4



REAR VIEW  
S300

Fig 6

CUTOFF ALL UNMARKED  
PINS FLUSH WITH BACK  
OF SWITCH. **DO NOT** CUT  
OFF PINS 1, 2 AND 3.

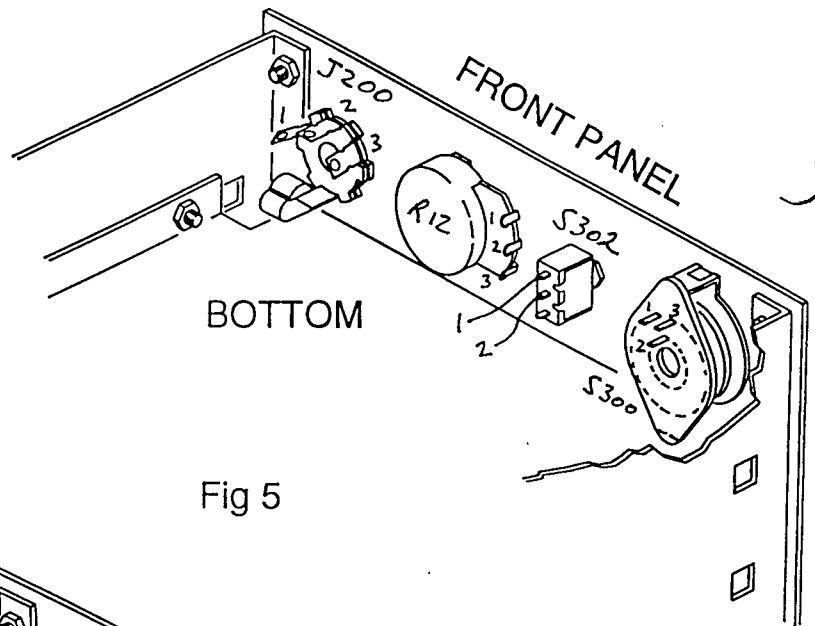


Fig 5

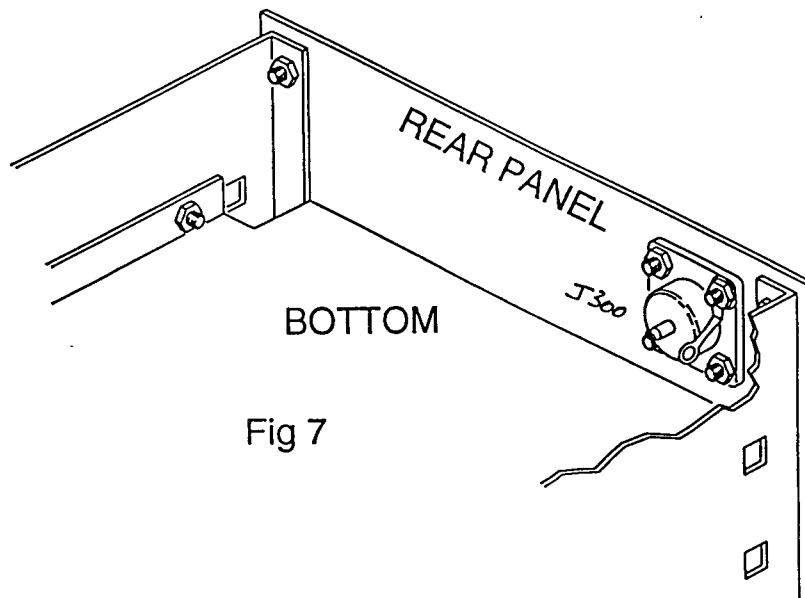
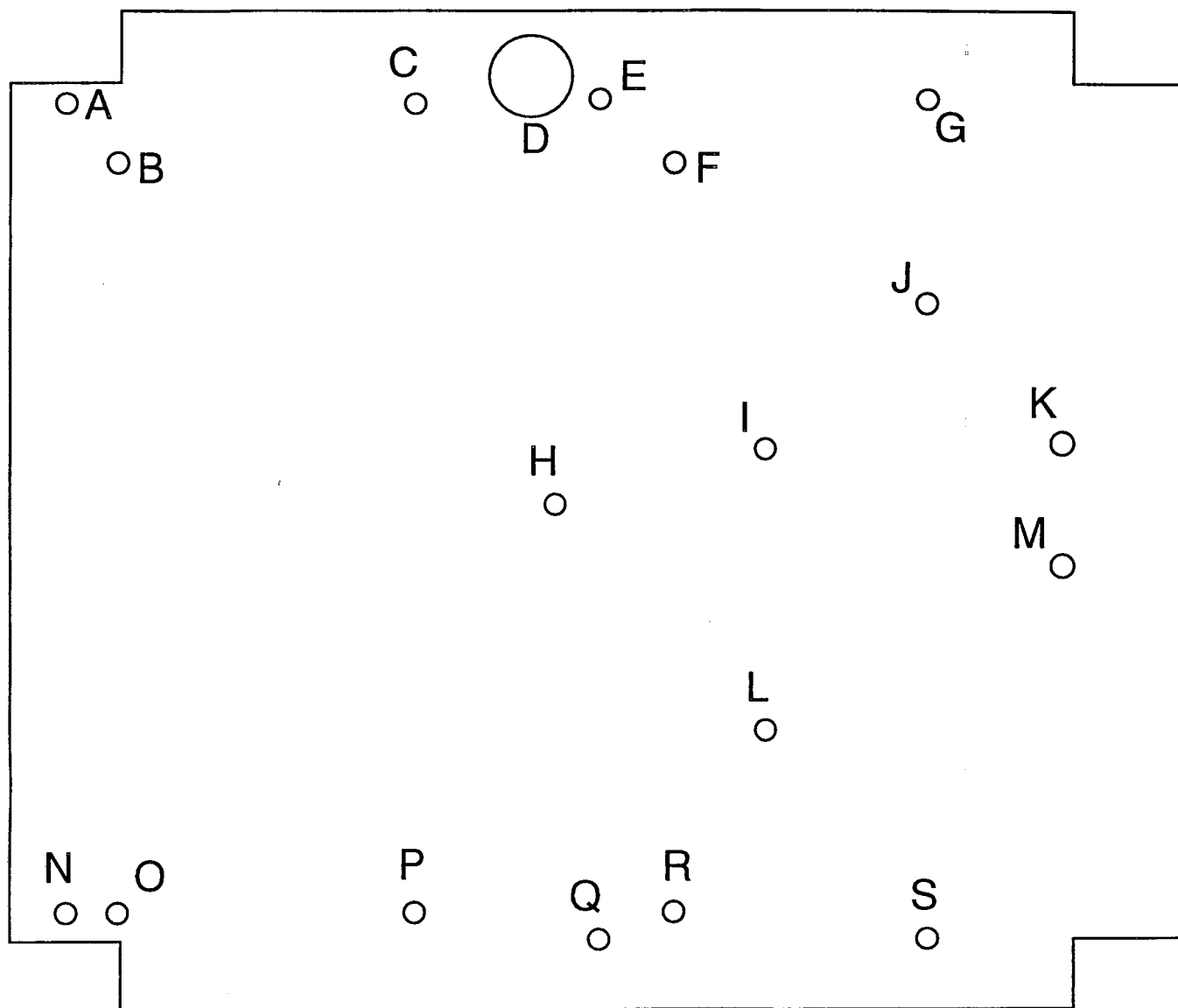
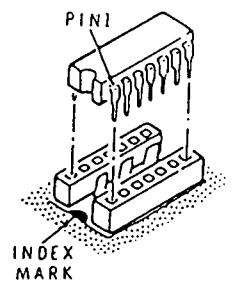
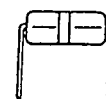
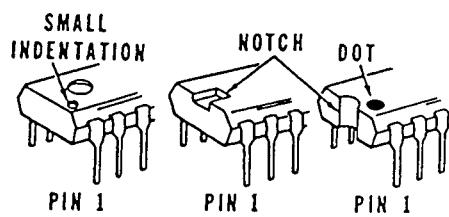
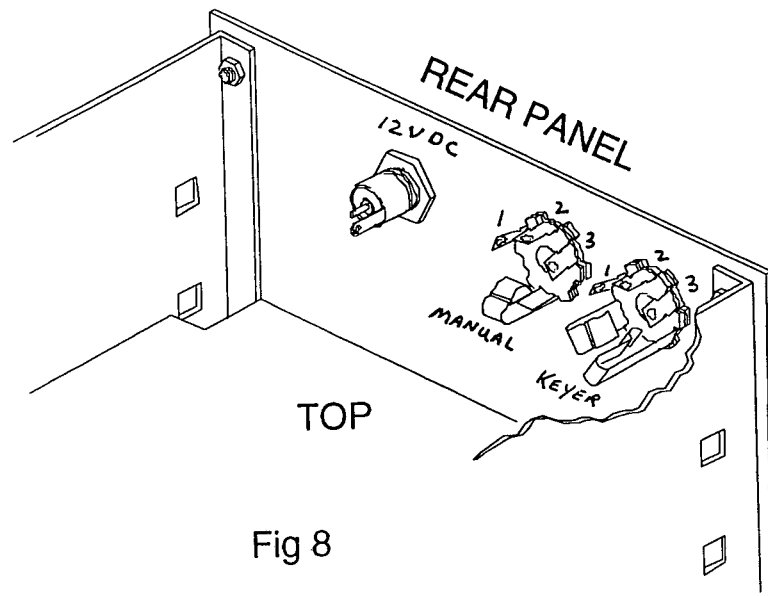


Fig 7

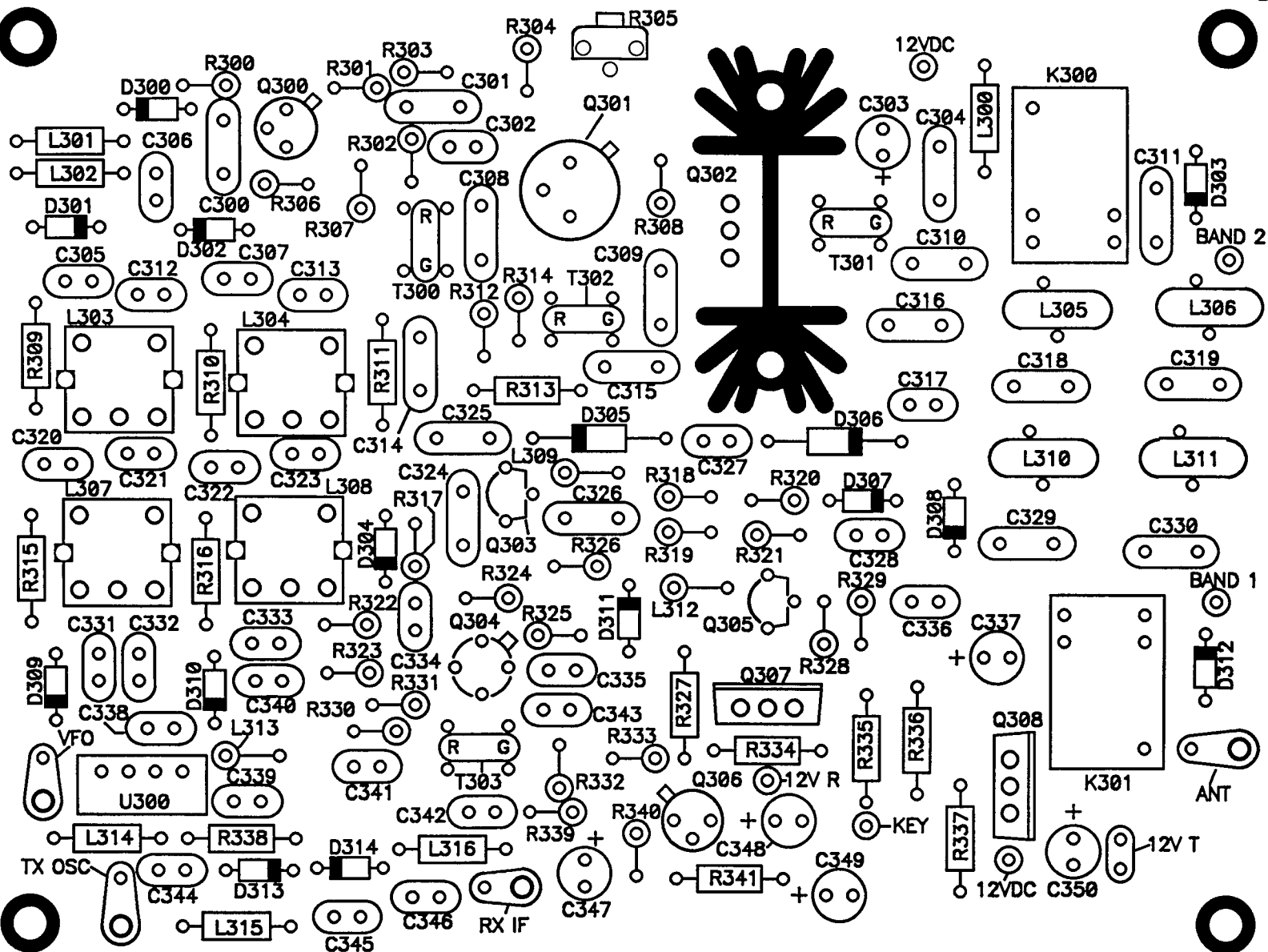


TOP VIEW  
CHASSIS

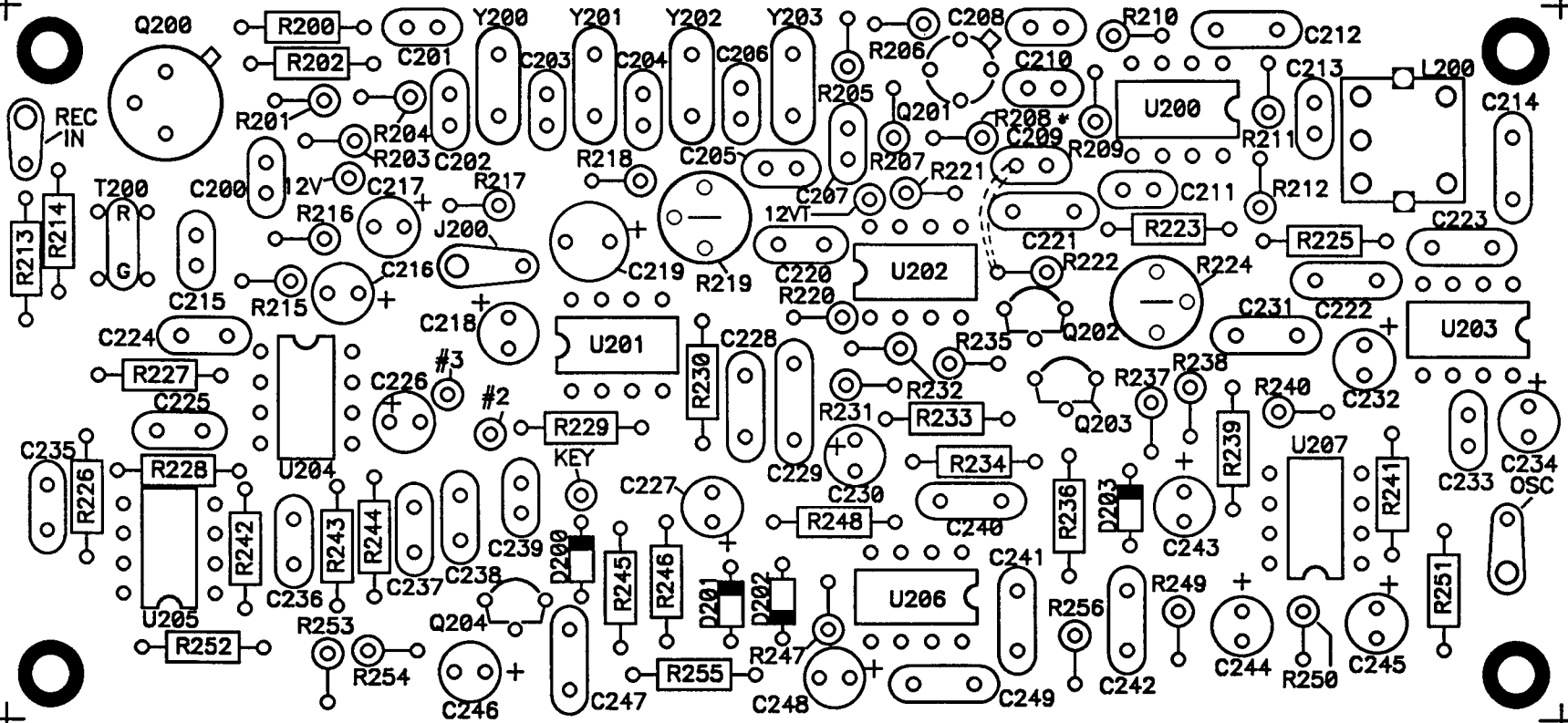
# ASSEMBLY PICTORIAL



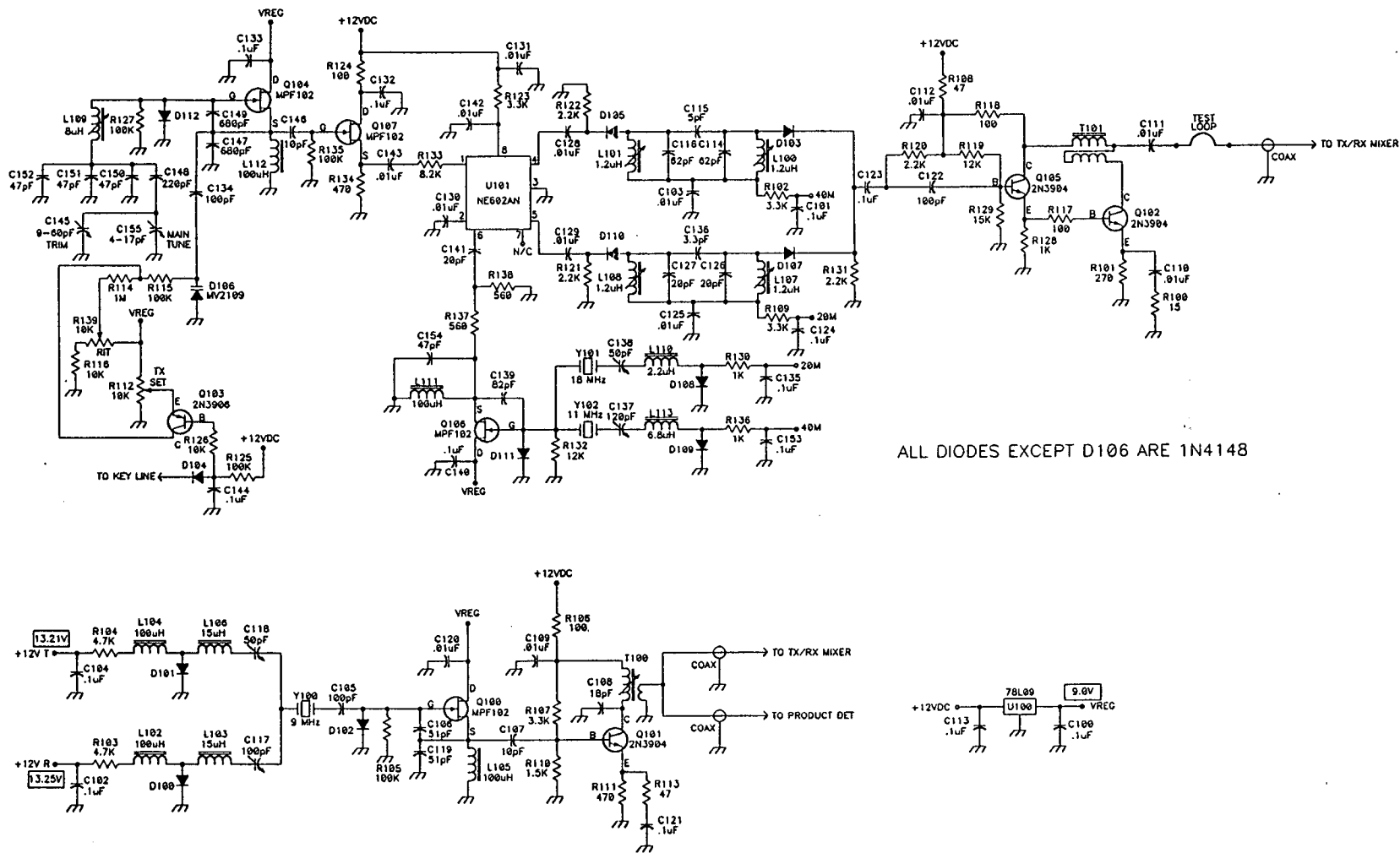




\* NOTE: FOLLOW SPECIAL INSTRUCTIONS WHEN INSTALLING C209



40-110  
RECEIVER BOARD



|          |              |                  |                               |
|----------|--------------|------------------|-------------------------------|
| Title    |              |                  | OAK HILLS RESEARCH            |
|          |              |                  | CLASSIC DUAL BAND TRANSCEIVER |
| Size     | Number       | 40-0108          | Rev                           |
| C        |              | OSCILLATOR BOARD | B                             |
| Date     | 1/94         | Drawn by         | DW                            |
| Filename | CLAS1OSC.S01 | Sheet            | 1 of 3                        |



