PRICE: $30.00

DZ COMPANY · LOVELAND, COLORADO

DZKIT

ASSEMBLY MANUAL

SIENNA

HF RECEIVER/TRANSCEIVER

DZ COMPANY CONTACT INFO

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YOUR DZKIT 90-DAY FULL WARRANTY

During your first ninety (90) days of ownership, DZ Company will replace or repair free of charge—as soon as practical—any parts which are defective, either in materials or workmanship. You can obtain parts directly from DZ Company by writing us, emailing us or telephoning us. And we'll pay shipping charges to get those parts to you—anywhere in the world.

We warrant that during the first ninety (90) days of ownership, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

You will receive free consultation (except for the cost of your long distance phone call) on any problem you may encounter in the assembly or use of your DZKit product. Just drop us a line, email us, give us a call, or visit our website and click on "Support". That will give you access to free on-line support and a discussion group. Sorry, we cannot accept collect calls.

Our warranty, both expressed and implied, does not cover damage caused by the use of corrosive solder, defective tools, incorrect assembly, misuse, fire, customer-made modifications, floods or acts of God, nor does it include reimbursement for customer assembly or setup time. The warranty covers only DZKit products and is not extended to non-DZ allied equipment or components used in conjunction with our products or uses of our products for purposes other than as advertised.

If you are ever dissatisfied with our service—warranty or otherwise– or our products, please write or email the president, Brian Wood, W0DZ, and he will make certain your problems receive prompt, personal attention.

THE DZ COMPANY, LLC
LOVELAND, CO 80537

Assembly

Of the

Sienna HF Receiver/Transceiver

DZ COMPANY
LOVELAND, COLORADO

TABLE OF CONTENTS

INTRODUCTION

The Sienna family of receivers/ transceivers represents a revolution in amateur radio. Now you can start with a relatively inexpensive remote-control-only receiver, using either your own or an internal "embedded" PC to control it using your favorite software, and then add a front panel, transmitter, tuner and amplifier, as well as numerous IF filters as your desires or budget allow. Or you can start with any combination of modules to create just the right radio for your needs.

The time-tested triple-conversion receiver design assures general coverage receive with no dead spots and excellent image rejection. It also has very good dynamic range by virtue of an optional 4.5KHz roofing filter at the 70.455MHz first IF, and compatibility with a wide variety of high performance crystal filters and Collins mechanical filters at the 2nd and third IF's to provide excellent selectivity. We've also added innovations in AGC control, bandpass filtering with GaAsFET switches instead of PIN diodes, and the ability to run full-duplex and cross-band at HF frequencies.

Sienna transceivers are also a study in duality: dual preamps, dual keying (manual and paddle inputs available at the same time), dual audio (headphones and speakers available at the same time), dual receive (front panel access to the audio from an external secondary receiver), and dual backlit analog meters, which give the rig a nice glow that harkens back to the early days of radio when all radios glowed. Dual microprocessors are in total control of the radio.

And now, for the first time, with an *optional* internal PC, it is

possible to connect a keyboard, mouse and display to your transceiver and add digital modes, logging, rig control, file transfer via LAN or USB and much more, at a reasonable price, and without adding any external rig interface equipment. It accomplishes this by means of a tiny but powerful personal computer that runs a common operating system—Microsoft® Windows® XP Embedded or Linux. This "embedded PC" is a fully functional personal computer with O/S stored on Compact Flash. It also has on-board sound card, Ethernet networking, COM ports, VGA display, PS/2 keyboard/mouse, USB and more. And it's expandable, with plug-in MIO boards that offer even more features, such as dual display and 6 Watt stereo speaker outputs.

But unlike some "Software-defined radios" that are totally controlled by PCs, the Sienna does not *need* the PC unless you choose to operate it without its optional front panel. Sienna is a full-featured HF radio. The twin microprocessors in Sienna's controller run the radio. There's no waiting for the PC to boot when you turn the radio on unless you want to use the features *added* by the PC.

The Sienna can be built in several stages and in several combinations. This manual is thus a complete assembly manual for the fully loaded Sienna. As you upgrade your Sienna, you can still use this one manual as a complete assembly reference.

Thanks for trusting in DZKit to provide not only unique electronic products, but to give you hours of building fun too.

General Assembly Notes

1. Most screws in this kit are Phillips Panhead Machine Screws. For simplicity, we refer to them simply as “screws” unless a different style is used. These may be stainless steel or zinc-plated steel.
2. Almost all sheet metal parts are attached to each other using 6-32 x 1/4” screws that are inserted into captive fasteners that have been pressed into the sheet metal by the factory. You will not need to use many nuts and lockwashers.
3. Most PC boards attach to the sheet metal using 6-32 x 1/4" screws but there are some exceptions, which are explained in the steps.
4. As you tighten a screw, it is very important that you do not strip the threads. All screws should fasten smoothly without resistance. If a screw appears to be hard to fasten, something else is probably wrong—a cable could be in the way, you are trying to use the wrong size screw or something else is wrong. DO NOT FORCE SCREWS! Instead, inspect the assembly carefully and try to see why you are having difficulty.
5. A PC within arms reach of your workbench is useful in helping you locate the parts on the boards. Shipped with your kit is a USB flash drive containing the PCB layout files for all boards (without traces). To find the location of a part, simply install and run the “ExpressPCB” program (free download from www.expresspcb.com) and open the board you wish to work on. Press “Ctrl-F” to find a part, and then enter it in the box that pops up (e.g., “R1”, without the quotes). The program will show you exactly where that part is located. If you do not have a PC nearby but have ordered the internal PC for the Sienna, you can run this program on it once you have installed the PC (which is done in an early step). Take a few minutes to familiarize yourself with this program before beginning construction. You can also find parts manually by just looking for the part on the silkscreen, but on the denser boards, this can take a long time. We highly recommend using ExpressPCB to locate parts.
6. There are three large sheet metal brackets. Two are identical and are placed opposite each other lengthwise from front to back. These brackets are referred to as "large bracket LR" (for Left/Right). The other large bracket runs from side to side in the

front, attaching to the other brackets. It is called the "front bracket".

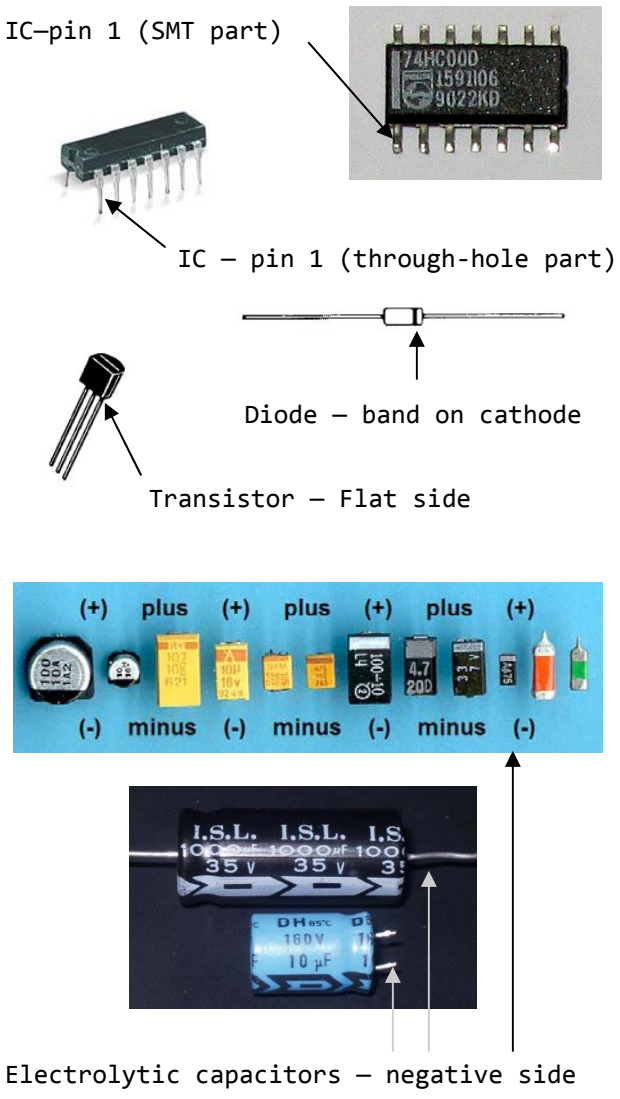
7. All references to left and right, front and back are with the chassis in an orientation such that the front of the radio faces you. The large openings on the bottom of the chassis are to the right, with the folded sides pointed up.
8. Each circuit part has its own component number (R1, L4, Q3, etc.). R1 on one assembly will not be the same as R1 on a different assembly, so be sure you are looking at the right set of parts when comparing part numbers with the printed parts list. Check off each part at the beginning of each section to make sure all the parts are there. If you find any missing, give us a call or email us and we will rush a replacement to you.
9. Most electronic kits that are returned for service have poor soldering jobs. ***Please*** take a moment to familiarize yourself with proper soldering technique. And do not, under ***ANY*** circumstances, use corrosive ("acid-core") solder! That will void your warranty and render your kit inoperative. Also be sure to avoid the use of products that may be called solder but are really glue (e.g., LePage's Liquid Solder (nothing more than metallic-grey colored airplane glue).
10. Soldering should only be done in an area with good ventilation and with a properly heated soldering iron.
11. Resistors are identified by their values in Ohms, Kilohms (K) or Megohms (M) and by color codes. Your kit uses resistors of several types. Axial leaded resistors have color coded bands on them. For 5% resistors, the first two bands represent the numeric value and the third band represents a multiplier, which is a power of 10. Thus, a 56 Ohm resistor is Green-Blue-Black. A 10KOhm resistor is Brown-Black-Orange, and so on. The fourth band is the tolerance – no band represents 20%, a silver band 10%, and a gold band 5%. Your Sienna uses mostly one percent or better resistors, which have 4 bands for the value. A 4.75K resistor is Yellow-Violet-Green-Brown. We have placed resistors of given types in individual bags for you, but should they get mixed and you have trouble reading the color code, we recommend an inexpensive volt-ohmmeter be used to

Most kit builders find it helpful to separate the parts into categories for quick identification. Muffin tins and egg cartons serve this purpose admirably.

check the values. A fluorescent light is also useful to "bring out" the colors, and a magnifying glass is also handy.

12. Capacitors are identified by their type – disk, polystyrene, polypropylene, electrolytic, trimmer, etc.) and capacitance values are in microfarads (uF) or picoFarads (pF). Polarized types have the positive pin marked on the silkscreen and also have a square pad.
13. Inductors are represented either by their inductance in nanoHenries (nH), microHenries (uH), milliHenries (mH) or by the number of turns in the coil if you are doing the winding.
14. Diodes are marked with a band on the cathode end. The PC boards have a bar silkscreened across one side of the component outline and a square pad which identifies the cathode.
15. Transistors have either a tab or a flat side that you can match to the silkscreened component outline. Most transistors will need to have their leads "sprung" a little to fit in the holes. Do so carefully to avoid breaking the leads off.
16. ICs have a notch, beveled side and/or a dot representing the side containing pin 1. When you hold an IC with the notch pointing up or the beveled side to your left, pin 1 is in the upper left corner. The silkscreened outlines on the board all have notches and pin 1 also has a square pad.

It is CRITICAL that you mount polarized parts correctly! Double check your work to be sure that all such parts match the photos. See Detail 1.



Detail 1. Identifying polarity of diodes, transistors, ICs and polarized capacitors.

Abbreviations and definitions of terms used in this manual:

PC = Personal Computer
PCB = Printed Circuit Board
PH = Panhead
FH = Flathead
M/S = Machine Screw
PCB-mt = Printed Circuit Board mounting
AMP MTA = Tyco Electronics connector with .1" or .156" pin spacing
IDC = Insulation Displacement Connector (MTA connectors are IDC type)
Ribbon cable = Flat, gray cable with connectors on each end
Header = PCB-mounted connector
CA = Cable Assembly

A word about what lies ahead…

This manual is designed to allow you to build confidence in your kit-building ability as you go along. You start by building the DC power distribution circuitry, which is the simplest of all the circuitry. You then install this board on the chassis. You will then be able to turn on the power and measure some voltages. If you purchased the PC, you will then install it, build and attach its DC power supply, power it up and see it boot. This will give you confidence that the kit-building is progressing normally. You will also be able to use the PC to help you locate parts on the rest of the boards using the PCB lay-out files that we have included. The project continues with building of the front panel circuit board (if you purchased a front panel) and integration with the pre-assembled controller board. At that point, you will be able to experiment with the front panel controls and/or the remote control functions. Once all that works, you will build and install the receiver's IF and bandpass filter boards. Next you will finish building the partially pre-assembled receiver. At this point, you will be able to test and align the receiver and use the built-in keyer. If you purchased the base Sienna model, which is a receiver, you're done! Otherwise, you might want to take a break and spend a few hours using the receiver before continuing! Next, you will finish the partially assembled transmitter. The transmitter and receiver boards are the most complex, which is why they have been saved for last. But once you get to them, you will have great confidence that you have built the radio correctly to that point. So let's get started!

NOTE: If you would prefer to build all the boards first, you may go directly to the Appendices and do so.

KIT-BUILDING PROCEDURES

The steps involved in building a kit are listed below. Be sure to follow them and you will have a lot of fun building, aligning, testing and using your kit.

1. **Do a parts inventory**. At each major section and in the Appendices, there's a list of parts used in that section (or that will be used shortly). Check off each part to be sure you are not missing anything. Our method of bagging parts is different from all other kit vendors and will make the task much faster and less error prone. But despite our valiant efforts, mistakes can happen. If you are missing any parts, call or email us and we'll rush replacements to you immediately.
2. Do not remove parts from the bags until called for, to avoid mixing parts up (especially resistors).
3. **Pay attention to soldering techniques**. Keep your soldering iron clean by using a wet sponge, use appropriate heat and maintain heat long enough to make good solder joints. Solder problems are the number one cause of problems when building electronic products (not just kits!), so try extra hard to do it right.
4. **Take your time**! We know you want to get it done and start using it, but doing it wrong will only delay that moment. Before you start, set up a ventilated, static-free work area with enough room to build the kit. Prepare parts bins and get the tools you will need (needle-nose pliers, wire-cutter, wire stripper, Phillips head screw drivers, wrenches, soldering iron, solder, insulated tool, awl or other sharp-ended tool, scissors, magnifying glass, etc.) Open bags only when they are called for so parts don't get intermixed. If you're tired, take a break. Enjoy building your kit!
5. **Make sure that you are loading the part that's called for in the right holes.** Once loaded, it can be hard to find a misloaded part. Be especially careful to load polarized parts (ICs, diodes, electrolytic capacitors) the right direction. If you are not sure about any step, call or email us!
6. Once you've done a step, **put a checkmark inside the parentheses.**
7. **After you have assembled a circuit board, take a moment (just one) to marvel at your handiwork, then spend a few more minutes critiquing it!** Check for solder bridges, unsoldered or insufficiently soldered connections, solder blobs (especially on insulated magnet wire used on toroids), loose screws and electronic parts, reversed polarized components, etc. Sometimes it helps to have a friend check your work.

Safety First!

Your safety is of utmost importance to us. Please read this information before you get started, and remember these rules as you continue building and testing your Sienna.

1. Always have a healthy respect for electricity. While the voltages present inside the Sienna are not lethal, high currents are available (up to 30 Amps when the 100 Watt amplifier is used). Use a power supply with overcurrent foldback or crowbar protection so that in case of high currents the supply will shut down. Set the output current only as high as necessary for a given step.
2. When measuring voltages inside electronic equipment, it is generally a good idea to use only one hand, wear rubber-soled shoes and avoid areas with standing water. However, remember that slightly humid environments can prevent static electricity that could damage the electronic parts! Use a humidifier in dry climates.
3. Do not work on powered electronics by yourself if at all possible. Have a parent, spouse or friend nearby. If you must work alone, keep a telephone handy in the event you run into problems.
4. Soldering irons are hot. They can burn your skin and cause damage to workbenches and carpets. We recommend you use one with an automatic shutoff in case you forget to turn it off when you are done.
5. Do not work on electronic projects when you are tired. We know you want to finish it, but accidents are more likely when you are tired. Take breaks! Be careful!
6. Use proper ventilation in your work area. Solder contains tin and lead (or tin and silver), and solder fumes should not be allowed to “hover” near your work. Open a door or window, use a fan, and be cognizant of the potential dangers.
7. When clipping leads, use eye protection and/or be sure to direct the flying leads down into a nearby trash can. As you gain experience clipping component leads, you will learn how to clip them so that they fall harmlessly away from the board.
8. Be careful not to cut yourself when handling sharp objects such as connectors and sheet metal. Keep some tissues, bandages and antibiotic ointment nearby in the event of an injury.
9. This may sound obvious, but do not insert any parts in any portion of your body.
10. Use common sense in dealing with unfamiliar things. If you don’t understand something, call us or ask a friend for help.

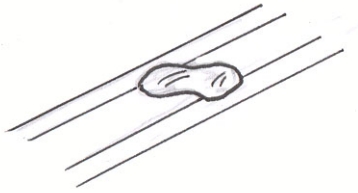
SOLDERING INSTRUCTIONS

Poor soldering accounts for almost 90% of all kit building problems. The photographs below show examples of the most common types of bad solder connections and a good one. If you locate any of these bad solder connections in your kit, correct them as described. Study this section carefully before you start building your kit.

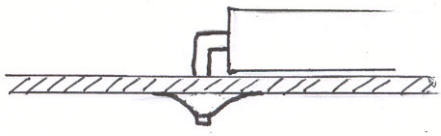
Solder blob. In this example, solder flowed onto a lead, but the heat was not maintained long enough for it to flow onto the circuit board pad. Solution: reheat the connection, touching the iron to both the component lead and the pad at the same time.

Use a good quality, variable temperature soldering iron with a conical, narrow tip, and set the temperature to 750 degrees F. Use thin, non-corrosive, rosin core solder to assemble your kit. Keep the sponge damp and wipe the tip on the sponge after each solder step.

Solder bridge. Solder that stretches from one trace or pad to another creates a short circuit. Solution: Hold the board upside down and reheat the area. The excess solder will flow down the soldering iron. Another solution is to use a "solder sucker" or solder wick to remove excess solder. Solder suckers work well one or two times on a given connection. If used too much, they can pull pads and traces off of PC boards.



Good solder connections. A good solder connection looks like this. Solder flows evenly onto both the part and the PC board or chassis component. It is shiny and even, not lumpy and dull. Component leads that are properly soldered can not be moved in the hole. The component lies flat on the board.



STATIC PRECAUTIONS

Many of the components in your kit can be damaged by exposure to static electricity. Please read this page to familiarize yourself with the causes of and solutions to this problem.

When the climate is dry, you can generate thousands of volts simply by walking across a carpet. When you then touch a metal object you can feel the effects of this as you draw a spark! That same spark, often too small to see or feel, can destroy sensitive electronic components. You ***MUST*** take precautions when working with electronics to prevent damage.

The best solution is to outfit your workbench with anti-static devices – floormats, grounded soldering irons, and workmats with grounded wriststraps. If these are not practical for you, the very least you should do is to discharge yourself to ground after you sit down and before you touch any electronic items, by touching a grounded object such as the corner of a wall.

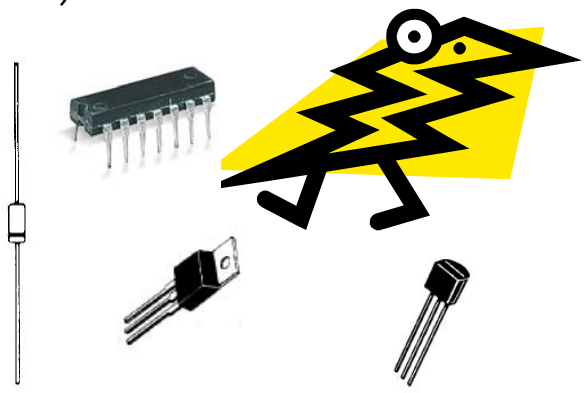
In a dry environment, simply standing up after sitting in a non-grounded chair can also charge you with electricity. If you stand up to stretch, for example, be sure to re-ground yourself before getting back to work. Don't wear insulated sole shoes and avoid nylon, wool or other static-producing material in your clothing.

If your work area floor is carpeted, spray fabric softener on it using a hand spray bottle. Fabric softener is conductive and will bleed away carpet static for a few hours.

Don't use a plastic table unless you have a grounded workmat on it. Use a metal table if possible.

Cats are notorious for inducing static into your work area. Don't allow them anywhere near your workbench!

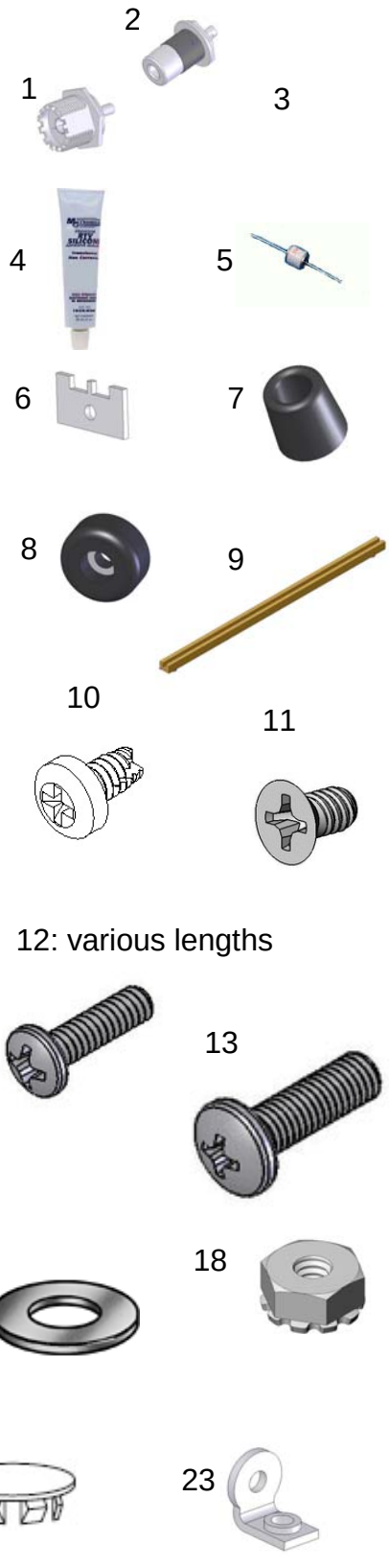
All electronic components are susceptible to static, but semiconductors and assembled boards containing semiconductors are the most prone to damage. These include diodes (including light-emitting diodes [LEDs]), transistors and integrated circuits (ICs).



You are a walking lightning bolt! Be careful!

Chassis Parts

Item	Description	Qty	Bag Nr
1	SO-239 RF chassis-mt connector	2	1
2	Phono connector, chassis mount, red	1	1
3	BNC connector, chassis mount	1	1
4	RTV - 4 gram tube	1	1
5	Gas discharge tube	3	1
6	Anderson Powerpole mounting clamp	1	1
7	Foot - front SCREW-ON BLK 1.00 X .75"	2	1
8	Foot - rear SCREW-ON BLK .28 X .625"	2	1
9	Plastic Board Guide - 6"	1	1
10	Screw - 6-32 x 1/4" PH Phillips thread-cutting self-tapping	4	1
11	Screw - 6-32 x 1/4" FH Phillips Black M/S	11	1
12	Screw - 6-32 x 1/4" PH Phillips M/S	60	1
12	Screw - 6-32 x 1/2" PH Phillips M/S	1	1
12	Screw - 6-32 x 1" PH Phillips M/S	6	1
12	Screw - 6-32 x 1 1/4" PH Phillips M/S	2	1
13	Screw - 10-32 x 5/8" PH Phillips M/S	1	1
14	Jackscrew - 4-40 x 3/16" x 3/16" x Male thread = 5/16"	2	1
15	Hex M/F spacer - 6-32 x 1/2"	2	1
15	Hex M/F spacer - 6-32 x 5/8"	12	1
16	Hex F/F spacer - 6-32 x 2"	1	1
17	Washer, flat - #10	2	1
18	Nut - 6-32 KEPS	10	1
18	Nut - 10-32 KEPS	1	1
19	Nut - 10-32 Wingnut	1	1
20	#10 solder lug	1	1
21	Washer - #6 x .050" flat Plastic	1	1
22	Hole plug - .5" nylon	1	1
23	Angle bracket 6-32 threads	5	1



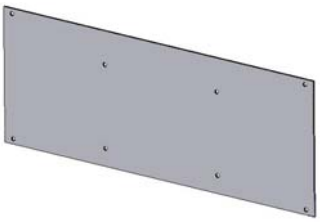
Item	Description	Qty	Bag Nr
	Bare wire 18AWG (inches)	6	1
	Hookup wire - white 24# (inches)	12	1
	Heat shrink tubing, 3/32" x 6"	1	1
	Heat shrink tubing, 1/8” x 4”	1	1
24	Sienna serial number sticker	1	2
25	Fan - 12V 60x60x25 Orion	1	
25	Fan - 12V 40x40x20mm Orion	2	
26	Bottom cover plate	1	
27	Chassis bottom	1	
28	Speaker	2	

24

25

Two sizes

26



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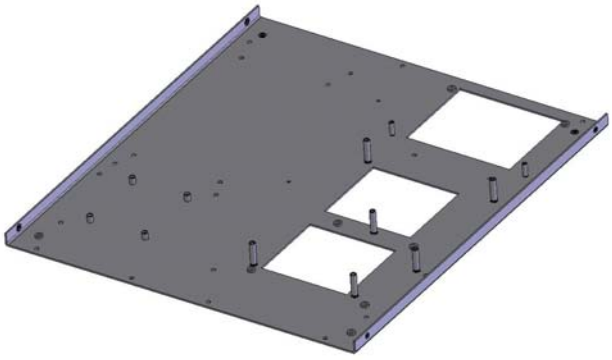

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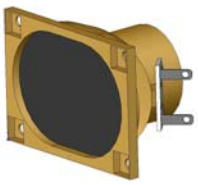
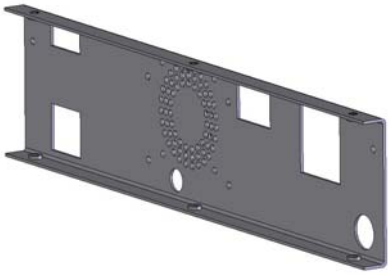


Item	Description	Qty
29	Large Bracket Front	1
30	Large Bracket LR	2
31	Small Bracket	1
32	Fan Mounting Bracket	1
33	Rear Panel	1
34	Rear Panel Tray	1
35	PC cover plate	1
36	Top cover	1

29



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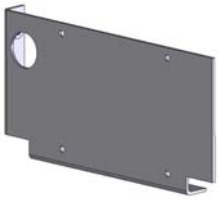

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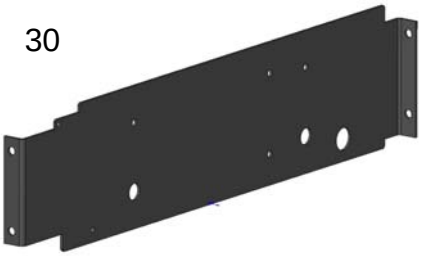

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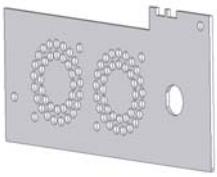

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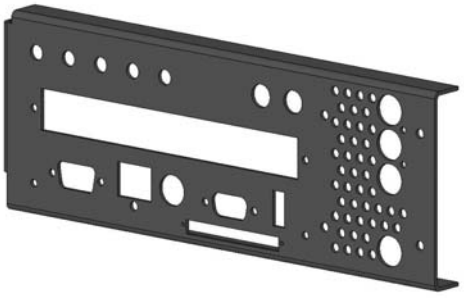

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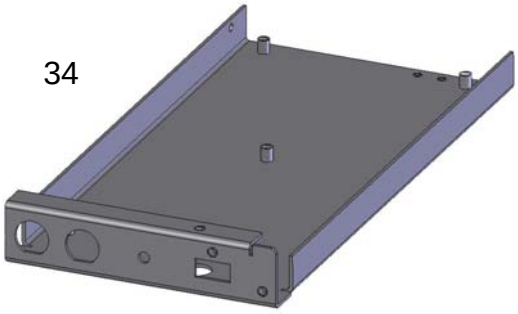

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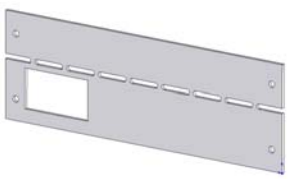

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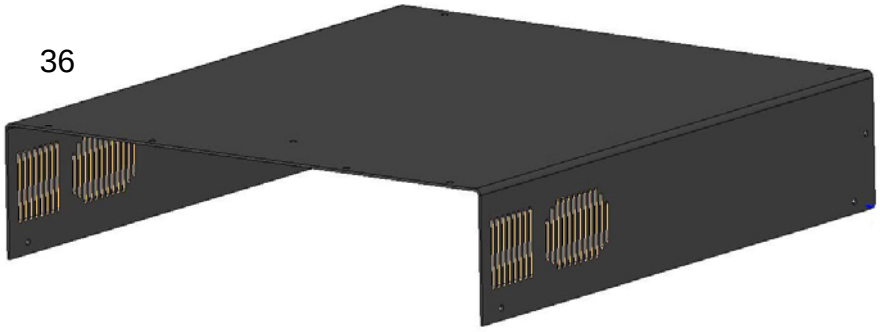


Board kits:
Controller (assembled)
DCD/Tuner
IF Filter
RXBPF (partially assembled)
BPF (11 bands) (partially assembled)
Receiver (partially assembled)
Test Board (assembled)

Options:
Front Panel
Transmitter & SWR Meter (partially assembled)
TXBPF (partially assembled)
Tx BPF boards (10 bands) (partially assembled)
100W amplifier
Antenna Tuner
PC (assembled)

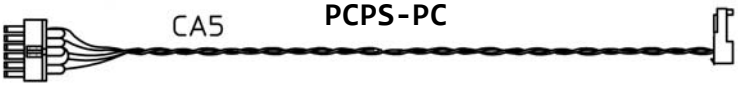
Cables

DCDIST-ONOFF

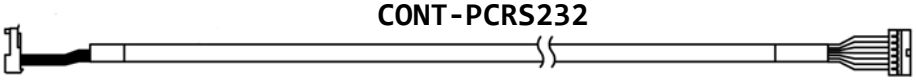
CA1

DC power input

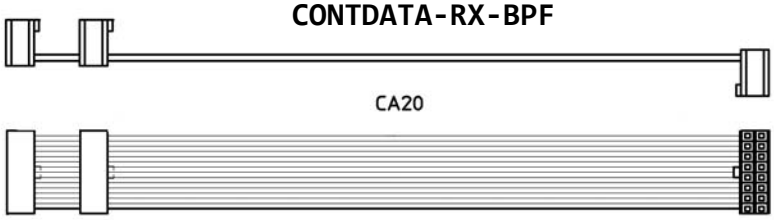
CA5 **PCPS-PC**



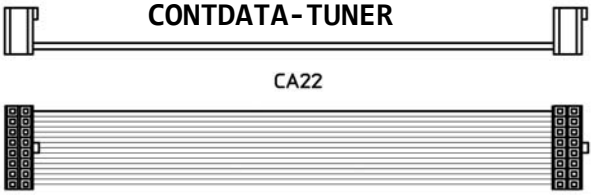
CA12 **CONT-PCRS232**



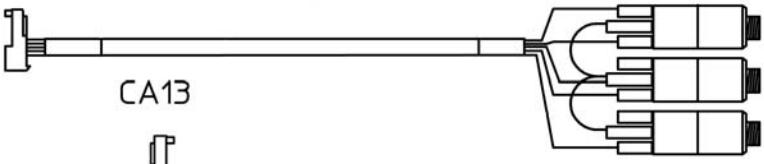
CONTDATA-RX-BPF



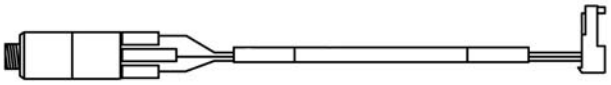
CONTDATA-TUNER



CONT-RPKEY

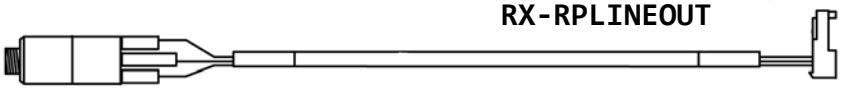


RX-RPLINEIN



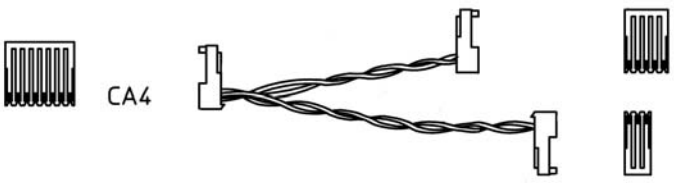
CA30

RX-RPLINEOUT

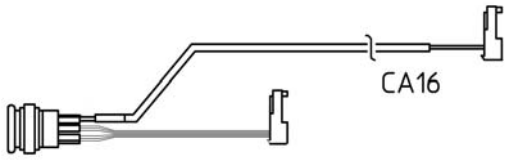


CA31

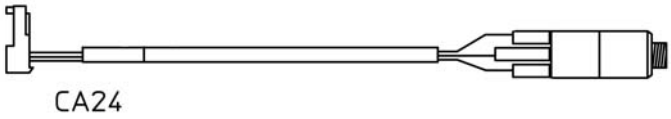
CA4 DCDIST-TX



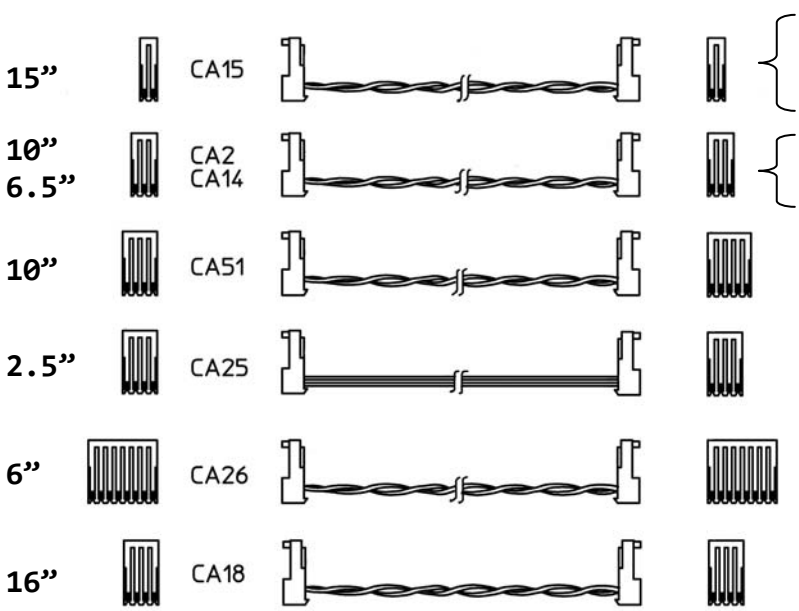
CONT-MIC



RX-HP

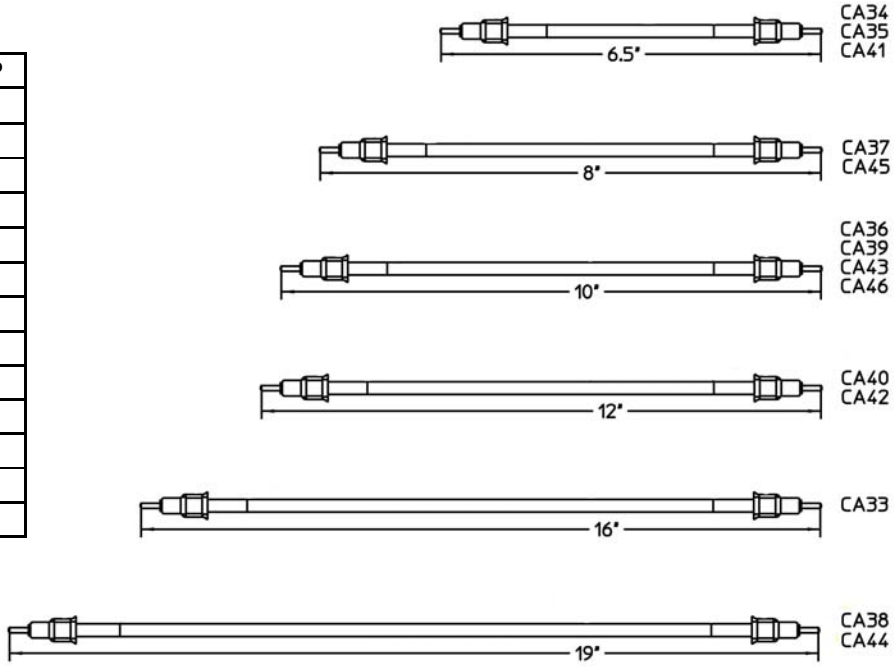


AMP MTA–MTA Cables **Use:**



RF CABLES

CA33	RXBPFMAIN-TX/AMP
CA34	RXANT
CA35	RF1 (RXBPF to RX)
CA36	RXLO1
CA37	RXLO4
CA38	TXBFO
CA39	RXLO2
CA40	RXLO3
CA41	IF1
CA42	IFOUT
CA43	IF4
CA44	TXVFO
CA45	IF2
CA46	IF3



STEP-BY-STEP ASSEMBLY: Chassis, DC Power, PC

Refer to Pictorial 1 for the following steps.

( ) Place the chassis bottom on a hard surface. Push the 6" plastic board guide into the holes in the center transmitter compartment until the guide is firmly seated.

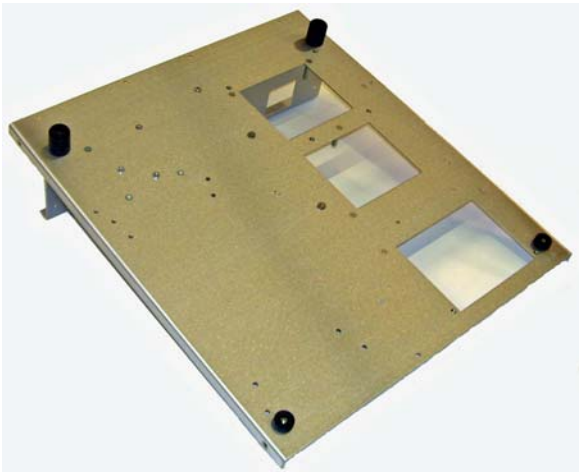
( ) Locate a CA15 2-pin MTA cable. Cut one end to a length of 6”. Strip the leads to 1/4” and tin them. Cut the red and blue fan wires on the large fan 3” from the body of the fan. Strip the leads to 1/4” and tin them. Place 1/2” of heatshrink tubing over the ends. Solder the red wire from CA15 to the red wire of the fan. Solder the black wire of CA15 to the blue wire on the fan. Place the heatshrink tubing over the solder joints and apply heat until the tubing shrinks.

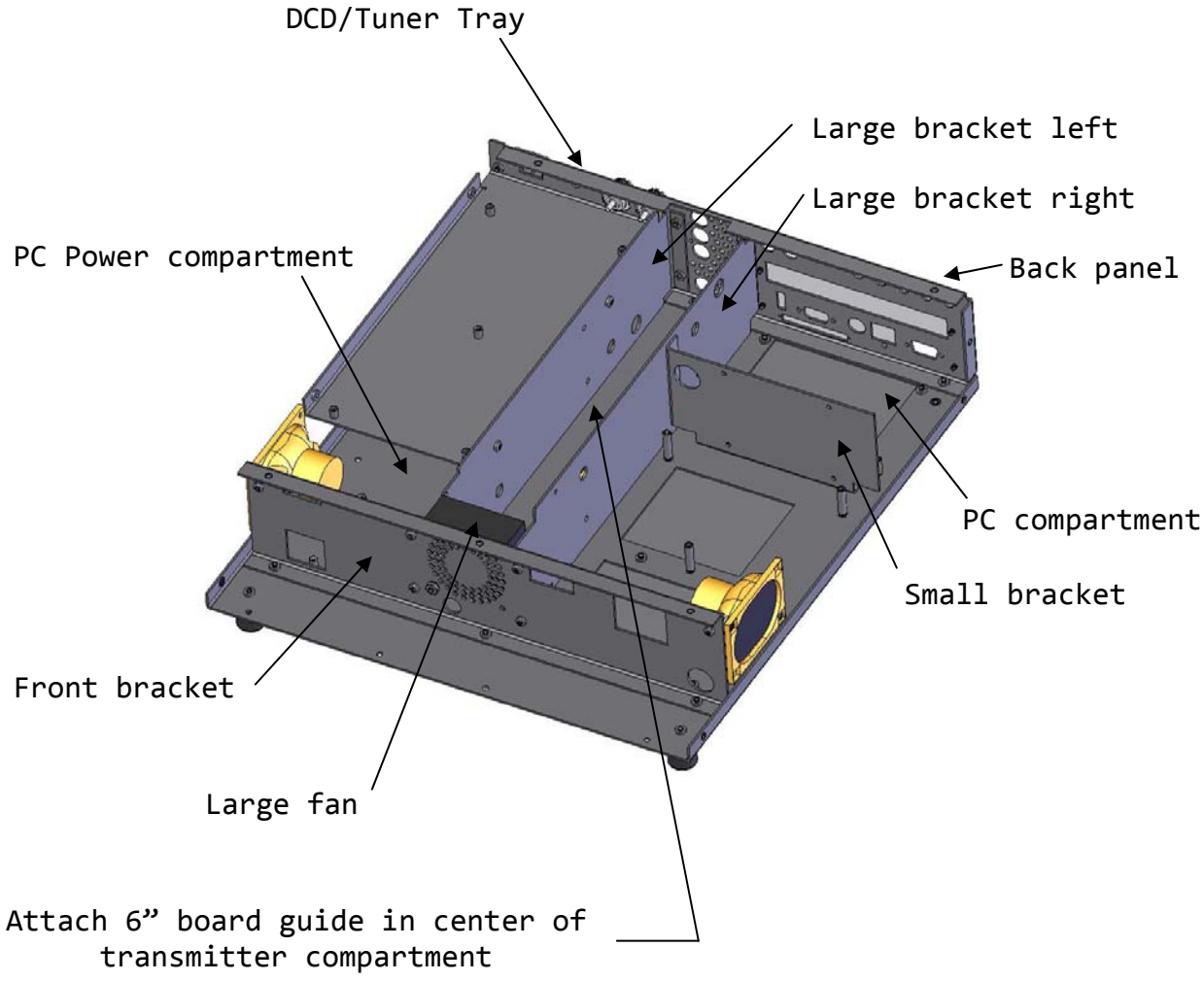
( ) Position the front bracket with the top and bottom folded sides facing you and the fan holes toward your left. Attach the large fan to the back side of this bracket with two 6-32 x 1 1/4" screws and two 6-32 KEPS nuts. (Hint: use a 5/16” socket wrench on 6-32 KEPS nuts.) Use two holes diagonally opposite each other. Make sure the airflow arrow on the fan points toward the back, with the power cable on the bottom. Holding the front bracket as described, the KEPS nuts should be visible to you and the screw heads should touch the fan. Leave the fan cable in the center (transmitter) compartment.

( ) Attach the front bracket to the chassis bottom using one 6-32 x 1/4" screw in the middle hole.

( ) Attach the two large rubber feet to the bottom of the chassis and into the outer two holes on the front bracket using two 6-32 x 1" screws.

( ) Attach the two small rubber feet to the two holes on the back, directly opposite the front feet, using two 6-32 x 1/4" screws. See photo.




DCD/Tuner Tray
Large bracket left
Large bracket right
PC Power compartment
Back panel
PC compartment
Small bracket
Front bracket
Large fan
Attach 6” board guide in center of transmitter compartment

Pictorial 1

( ) Locate CA6, the PC power cable. Even if you have not purchased the internal PC, this cable must be installed because it is difficult to add later should the unit ever be upgraded. Set the end with the 2 quick disconnect connectors, white MTA connector and loose red and black wires into the power compartment. Dress the cable so that the other end hangs out into the receiver compartment. See Chassis Photo 1.

( ) Position the two large brackets on each side of the fan such that the long side is perpendicular to the front of the radio and the back folds face each other. Attach these brackets to the front bracket using four 6-32 x 1/4” screws.

( ) Attach the small bracket to the right large bracket using two 6-32 x 1/4" screws. The folded sides on the small bracket face toward the back. Do not attach screws to the bottom at this time.

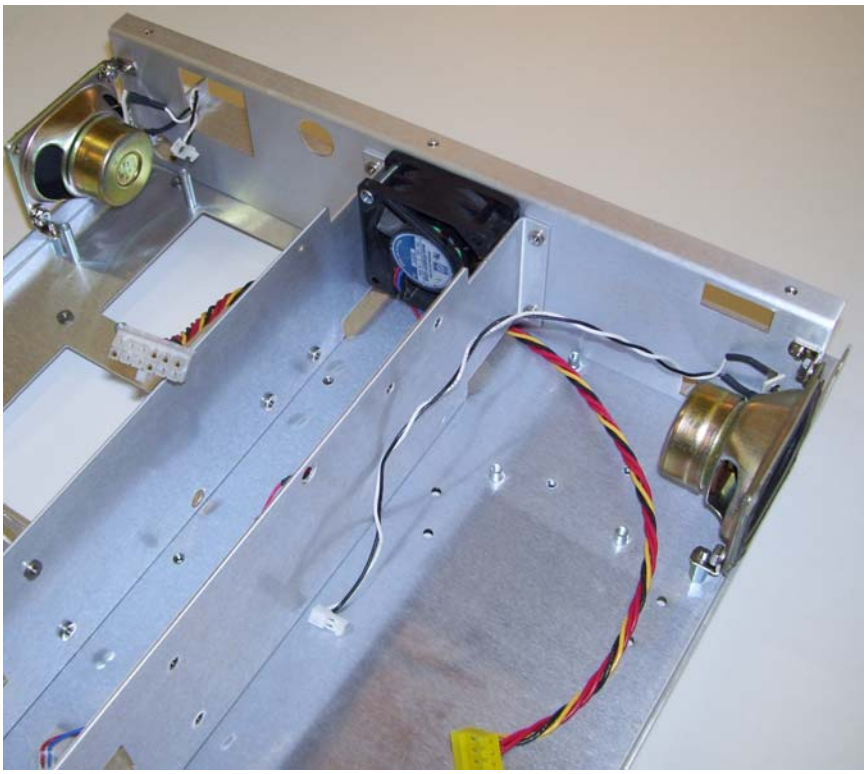
( ) Locate a 2-pin MTA cable (CA15). Cut it so that one length is 10”. Cut the other piece so that it is 4” long. Strip all exposed ends of both cables to a length of 1/4”. Tin all 4 ends. Twist the wires about 2 turns per inch if they are not already twisted. Place a 1/2" length of 1/8” heatshrink tubing over each wire. Using the 10” length of cable, solder the red wire to + and the black wire to - on one loudspeaker. Position the heatshrink over the terminals and heat them with a heatgun or soldering iron.

( ) Using the 4” length of 2-wire cable you just prepared, solder the red wire to + and the black wire to - on the other loudspeaker. Position the heatshrink over the terminals and heat them with a heatgun or soldering iron.

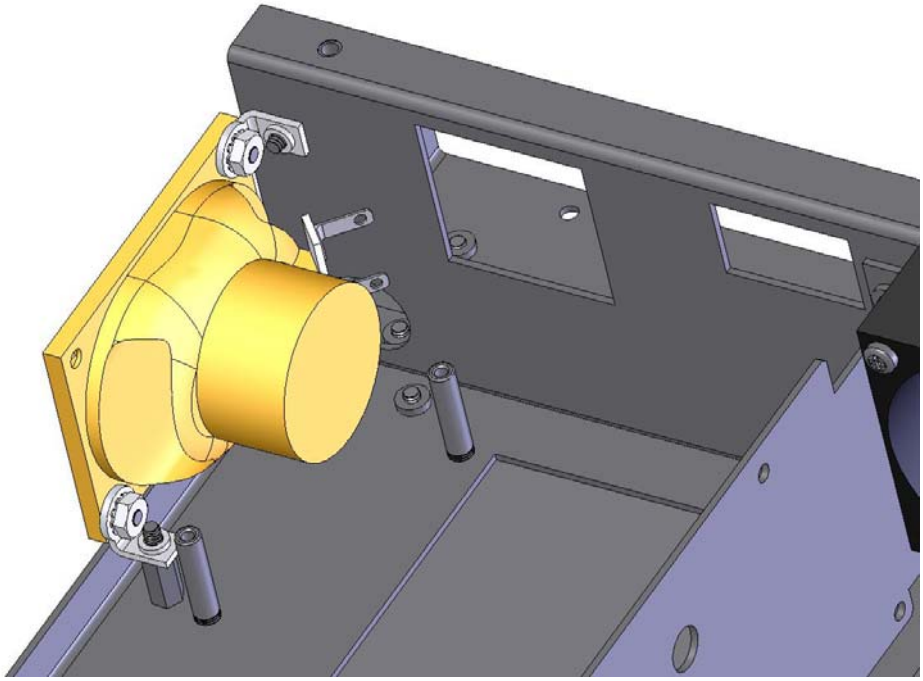
( ) Refer to Detail 1. Attach the speaker with the 10” cable to the left side (as viewed from the front of the unit) of the chassis bottom using one angle bracket, one 6-32 x 1/2” hex male/female spacer, one 6-32 KEPS nut and two 6-32 x 1/4” screws. Position the terminals such that they point towards the front of the unit.

( ) Attach the diagonally opposite mounting hole on the left speaker to the front bracket using one angle bracket, one 6-32 KEPS nut and two 6-32 x 1/4” screws.

( ) Repeat the previous two steps for the right speaker, mounting it to the right side of the chassis.



Chassis Photo 1, showing PC power cable dress



Detail 1. Right side speaker mounting

If you have purchased the internal PC (Option 105):

( ) Unpack the PC. Be sure to observe handling precautions to avoid static discharge which could damage this board. Remove the 2 jackscrews on each of the DB connectors (VGA and RS-232C) and discard them.

( ) Remove the Compact Flash card (CF) from the bottom of the PC (leaving the RAM memory card alone) and put it in a safe place. Using a fine-tipped awl, remove the metal CF ejection mechanism (with plastic lever) by carefully prying it off. It is easiest to do this on the two latches on the side closest to the edge of the board. Discard this cover. See below.

( ) Attach CA32 to the PC as shown in Pictorial 2.

( ) **If you did *not* install the PC,** build the RS232 Board (see Appendix B). Remove the two jackscrews from the 9-pin connector and insert the connector into the hole on the back panel labeled "RS-232C". Secure it using two 4-40 x 3/16" x 5/16" jackscrews (included with Chassis HW).

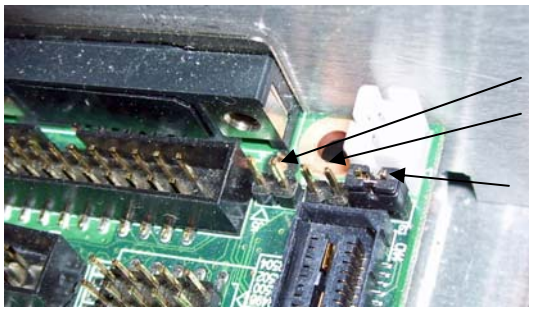
( ) Locate the 24" 6-pin IDC to rectangular connector cable labeled CONT-PCRS232 (CA12). Pass the IDC end from the receiver compartment through the round hole at the bottom right of the front bracket and leave the 6-pin IDC connector in the front controller compartment.

( ) Pass the other end of CA12 under the notch in the right side of the small bracket and connect the 2mm rectangular connector to CN8 on the PC (if installed) or to J1 on the small RS232 Board that you earlier attached to the back panel. The tab on one side of the connector faces toward the back of the radio.

NOTE: There may be small tabs on the right and left sides of the 2mm connector which cause a slight bowing of the CN8 connector. This is OK. Make sure that the connector is centered in the CN8 housing.

Remove this CF ejection mechanism from the PC by prying here

( ) Make sure that jumpers J3/J4/J5 on the PC are set so that J3's jumper is on, and J4 and J5's jumpers are off.



If you have purchased the MIO-6254 board with the PC:

( ) Remove jumper J7 in the corner of the PC as shown in Pictorial 2. Leave the jumper in place on J1.

( ) Unpack the MIO-6254 box. Remove the 4-40 x 3/4" brass spacers and 4-40 nuts from the bag and attach them to four locations on the PC as shown in Pictorial 3. Tighten the nuts securely on the bottom of the PC except where noted.

( ) Carefully push the MIO board onto the PC, making sure to align the row of connectors and mounting holes to that of the PC. Affix it to the PC with the 5 screws that are provided in the bag that is included with the MIO board.

If you purchased the PC:

( ) Attach the 12-pin power cable to the PC power connector.

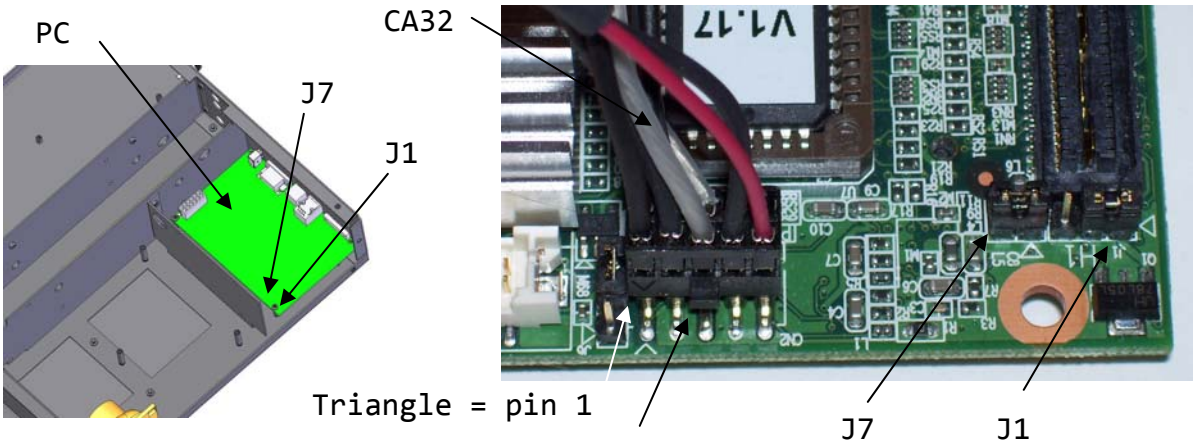
( ) Align the board(s) so that the row of I/O connectors is toward the back.

( ) Place the PC assembly over the two standoffs that are located in front of the large opening in the bottom chassis. If you do not have the MIO board, secure the PC in the standoffs with two 4-40 x 1/4" screws. If you do have the MIO board attached, loosen the right front corner screw, tighten the spacer in-between the two boards into the chassis-mounted standoff and then re-tighten the screw on the top. The PC assembly is held in place weakly until it is mounted to the back panel in a later step, so do not apply excessive force to it.

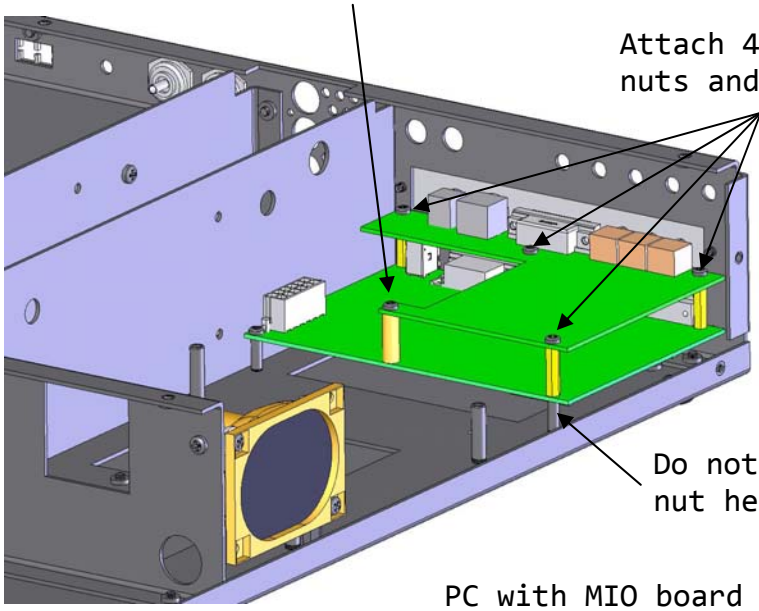
( ) Align the PC's connectors to the holes in the back panel as you attach the back panel to the chassis.

( ) Affix two brass jackscrews to each of the two DB connectors to fasten the PC securely to the back panel.

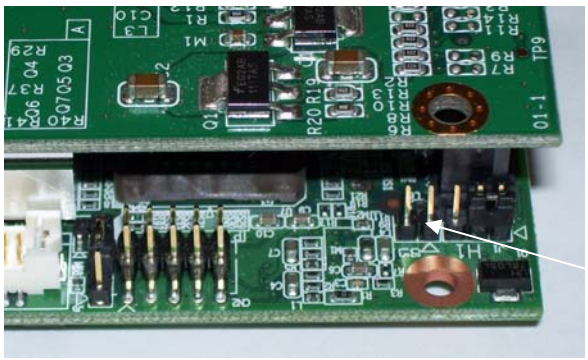
( ) Insert the CF card into the CF tray with the serial number sticker facing up, and insert the tray into the PC from the back panel. Affix



PC without MIO board attached



PC with MIO board attached
(small bracket removed for clarity)



Pictorial 2

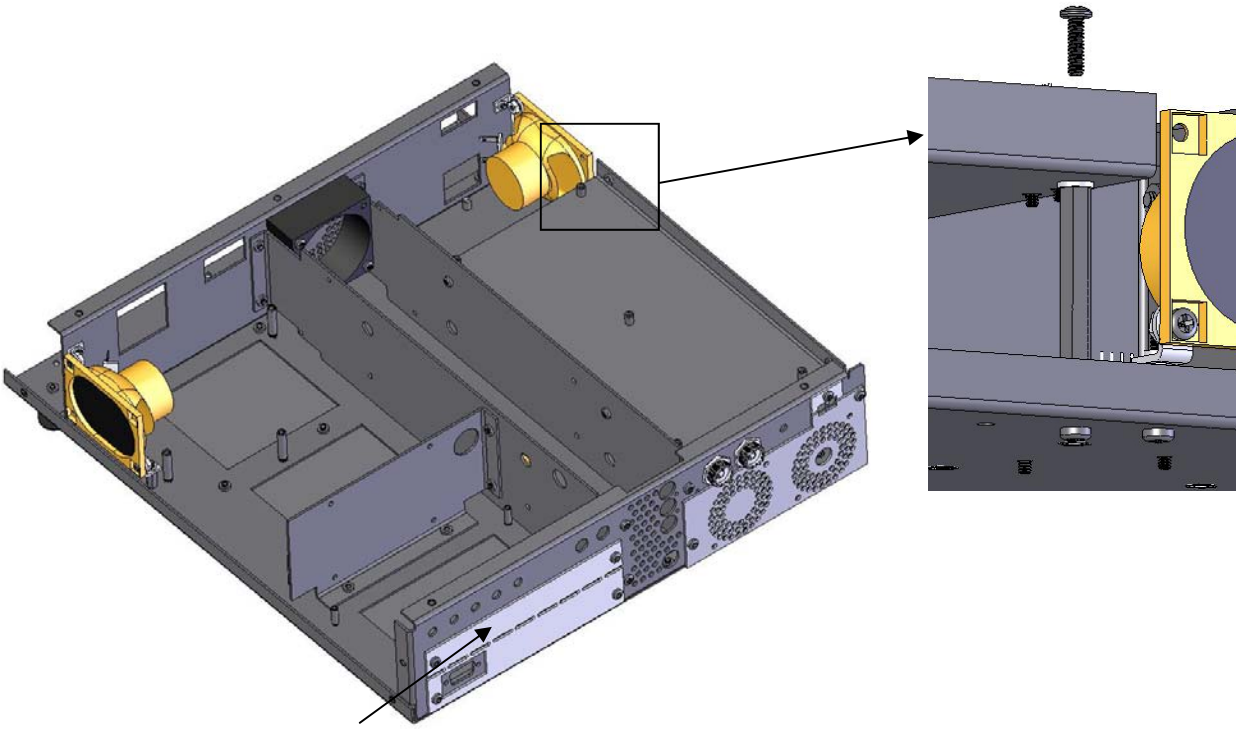
the CF tray to the back panel using two #1 x 1/4” self-tapping screws.

( ) If you did NOT install the MIO card, break the PC/MIO cover apart at the breakaway tabs and fasten the smaller piece to the back panel using two #6 x 1/4” self-tapping screws.

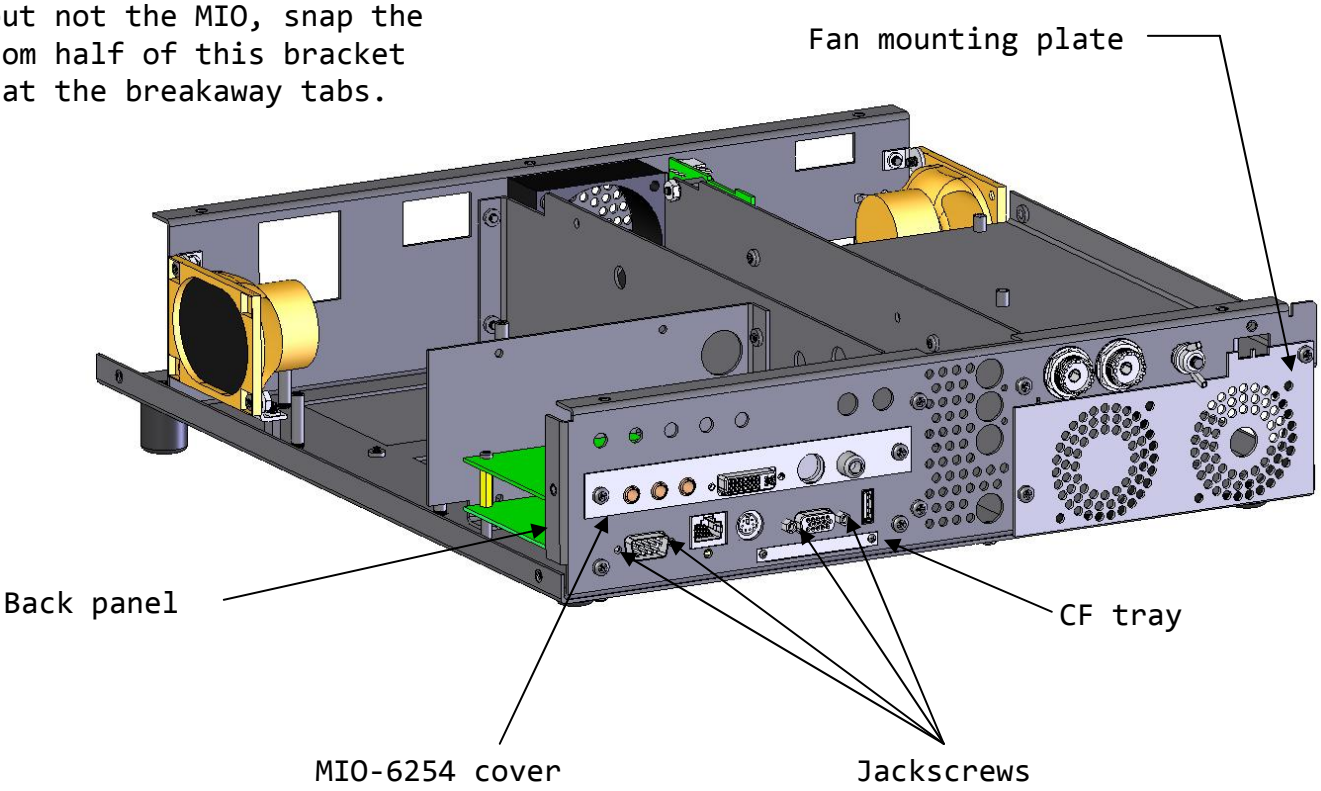
( ) If you *did* install the MIO board, fasten the MIO-6254 cover (with holes and silk-screening) to the back panel using two #6 x 1/4” self-tapping screws.

( ) Fasten the PC/MIO cover bracket to the back panel using four #6 x 1/4” self-tapping screws.

( ) Install the PC power supply and optional UPS board (Appendix A).



PC/MIO cover. If you have the PC but not the MIO, snap the bottom half of this bracket off at the breakaway tabs.



Pictorial 3

Refer to Pictorial 3 for the following steps.

( ) Attach the back panel to the back of the chassis bottom using two 6-32 x 1/4" screws on the bottom, two more on the right bracket, and one on the top of the two left bracket holes.

( ) Insert two SO-239 connectors from the inside of the DCD/Tuner tray into the large "D"-shaped holes. The lockwasher and nut go on the *outside* of the panel (the side with lettering). Tighten the nuts, being careful not to mar the sheet metal.

( ) Attach the ground lug to the hole next to the SO-239 connectors: Place a #10 solder lug on the 10-32 screw and then insert it into the tray from inside. Position the solder lug so that it faces the SO-239 connectors. Secure it tightly with a 10-32 KEPS nut on the outside. (Hint: Use a 3/8" socket wrench.) Place two #10 washers over the screw and then fasten the #10 wingnut finger-tight.

( ) Build the DC distribution section of the DCD/Tuner Board. See Appendix C1.

( ) If you have purchased the transmitter, build the SWR meter section of the DCD/Tuner board. Parts are provided in the transmitter kit. See Appendix C2.

( ) If you have purchased the Tuner option, build the Tuner section of the DCD/Tuner Board. Parts are provided in the tuner kit. See Appendix C3.

( ) Affix two TO-220 Thermalsil insulators to the DCD/Tuner tray on the two holes near the front edge. Be sure to uncover the hole in the insulators and line the holes on the chassis up with the openings in the insulators. See Detail 2.

( ) Attach the DCD/Tuner board to the tray using four 6-32 x 1/4" screws in three corners and the center. Do not put a screw in the front left corner (near J8).

( ) Apply heat to the pin you soldered earlier on U8 and push it down flush with the chassis. Move it back and forth until the hole in the tab lines up precisely with the hole in the chassis. Be careful not to let the soldering iron touch the connectors that are nearby.

( ) Insert a #4 shoulder washer in the tab hole, then insert a 4-40 x 1/4" screw through the washer and tab.

( ) Repeat the previous two steps for transistor Q1.

( ) Using an ohmmeter, verify that the resistance from each tab (U8, Q1) to ground is greater than 750 ohms. If you read a short to ground, remove the screws, reposition the parts and try again.

( ) Solder all 3 pins of Q1 and U8. Clip the leads, making sure that clippings do not fly into the chassis. Be careful not to let the soldering iron touch the plastic connectors that are nearby.

( ) Solder one pin of a gas discharge tube and a 1.5” length of bare wire to each SO-239 antenna connector’s center terminal. Connect the other end of each tube to the #10 solder lug as shown below. Dress the parts neatly along the chassis and be careful they do not short to each other or to the chassis. Solder the other end of the bare wires into the pads labeled ANTA and ANTB. Refer to the lettering on the back of the tray for reference.

Gas discharge tube mounting

( ) Attach the front left corner of the DCD/Tuner tray to the chassis bottom as shown in the inset drawing in Pictorial 3, using a 6-32 x 2” hex female/female spacer, a #6 x .05” Nylon spacer, a 6-32 x 1/2” screw on top and a 6-32 x 1/4” screw on the bottom.

( ) Attach the DCD/Tuner Tray to the left large bracket using two 6-32 x 1/4" screws.

( ) Attach the Anderson Powerpole clamp to the back panel using one 6-32 x 1/4” screw. Insert the small tab on the clamp into the opening between the red and black connectors.

Note: The DCD/Tuner tray is designed to be rotated up to a vertical position for troubleshooting of the 100W amplifier. A small right angle bracket is included to hold it in place when vertical. Attach this angle bracket to the one remaining threaded captive nut on the large left bracket using a 6-32 x 1/4” screw for such use later.

( ) At-

Spare angle bracket mounting

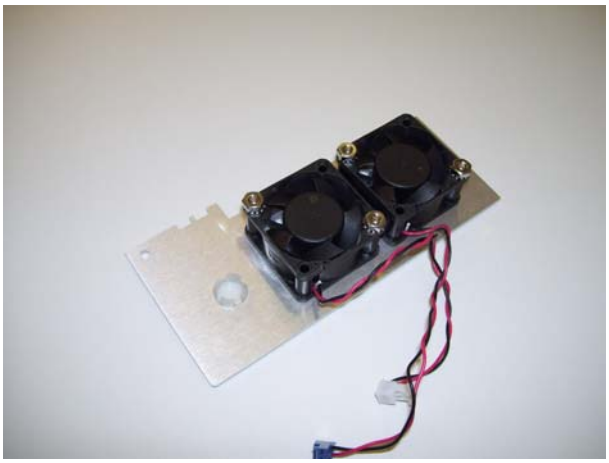
tach two 40x20mm DC fans to the inside of the Fan mounting plate using four 6-32 x 1” screws on the outside and four 6-32 KEPS nuts on the inside. Be sure the arrow that is embossed on one side of each fan points toward the back (**exhausting out the back of the radio**). Position the wires so that they exit out the bottom of the fan.

( ) If the fans have a white wire, clip the white wire on both fans close to the body of the fan. Be careful not to nick the other wires.

( ) Cut the red and black fan wires 3” from the body of the fan. Strip the leads to 1/4” and tin them.

( ) Locate a 2-pin MTA cable (CA15). Cut it 3” from the connector on each end, making two 3” long cables. Strip the wires to 1/4” and tin them. Place 1/2” of heatshrink tubing on each wire, then solder the red wire to a red fan wire and the black wire to the black fan wire of the same fan. The overall length of the cable from the fan to the connector should be 6”. Slide the heatshrink tubing over the solder joints and heat them with a heat gun or soldering iron until the tubing has shrunk around the contacts. No bare wires should be exposed. See photo.

( ) Repeat the previous procedure for the second fan. See photo.



Fan bracket assembly

If you purchased the 100W PA:

( ) Attach a fuseholder (provided with the amplifier kit) to the Fan mounting plate using the provided plastic nut. The rubber washer goes on the outside of the back panel. Tighten it securely.

( ) Insert a 25A 3AG fuse into the fuseholder and attach the cap.

Note: If you did not purchase the 100W PA, you can place a battery inside and bring its power cable out the fuse hole. A 1/2” hole plug is provided to cover this hole if you do not plan to use a battery. You can also choose to install the fuseholder for future use so that it won’t get lost.

( ) Insert the fan cables through the hole in the back panel tray and up into the top compartment. Plug them into the two 2-pin connectors labeled “Fans” on the DCD/Tuner board. It does not matter which connector goes to which fan.

( ) Attach the Fan mounting plate to the back panel using two 6-32 x 1/4” screws. You will need to insert the small tab between the red and black power connectors.

STEP-BY-STEP ASSEMBLY - Initial Tests

( ) Locate CA1, the on/off switch with attached cable. Attach the 5-pin connector to J4 on the DCD/Tuner board. Let the other end hang loose, but be careful not to short it to the chassis. (If this cable is not available, short pins 4 and 5 together on J4. These are the two pins closest to the orange Resettable fuse.

( ) Locate the pre-assembled Anderson Powerpole cable in the Cable bag. Attach it to the connectors on the back panel and connect the other end to a DC power supply that is capable of delivering 4A at 11-15VDC (12-15VDC if the PC is installed).

( ) Apply 12VDC power to the rig. Push the on/off switch. The green LED inside the on/off switch should light and the small fans should run at a low speed with air moving from front to back. Remove power immediately if you smell smoke or see anything wrong.

( ) Using a voltmeter, verify that you can measure the applied voltage between the pad marked “To P.A. V+” near the back of the DCD/Tuner board and chassis ground.

( ) Using a voltmeter, measure the voltages on J10 (Rx) of the DCD/Tuner board. They should agree with the voltages in Table 1. If any voltages are incorrect, refer to the troubleshooting guide in the Service Manual.

( ) Slowly lower the input voltage. As it reaches about 11.5V, the on/off switch should turn red. Below about 9.7V it should go off. Now slowly raise the voltage. Power should come back on once the voltage reaches about 10.8V and the light should turn green once it reaches 11.9V. If this does not happen, refer to the troubleshooting guide in the Service Manual.

( ) Push the on/off switch to the off position and verify that the power LED goes off.

Connector.pin	Voltage
J10.1	5.0V +/-.15V
J10.2	-9.5V +/-.5V
J10.3, J10.5	0.0V +/-.05V (ground)
J10.4	Applied voltage (11-15V)

Table 1. DC Voltages on DCD/Tuner board

( ) If you have installed the PC option, connect a monitor, keyboard and mouse to the back of the unit. Apply power and push the on/off switch. You should hear the PC beep and begin its boot procedure. If you want to experiment with the PC for a while, feel free! You've earned some relaxation time. If all is well, push the power switch to off and remove the DC input. Otherwise refer to the troubleshooting guide in the Service Manual.

STEP-BY-STEP ASSEMBLY: Front Panel Integration
Models without controls

If you have purchased a Sienna *with* front panel controls, (SF-100 models), go to page 38.

If you are upgrading an existing Sienna by adding a full front panel:

( ) Remove power from the connectors at the back of the unit.

( ) Remove the top cover.

( ) Remove the 4 screws along the bottom of the front panel that hold the front panel to the chassis.

( ) Remove all cables from the controller board.

( ) Disconnect the on/off switch from the DCD/Tuner board and push the connector through the hole in the front bracket.

( ) Remove the front panel assembly from the unit.

( ) Carefully remove the controller board from the existing front panel. Observe static control precautions while handling this board. **The controller is attached with six 6-32 x 1/4" screws.**

( ) Discard the old front panel.

Go to page 38.

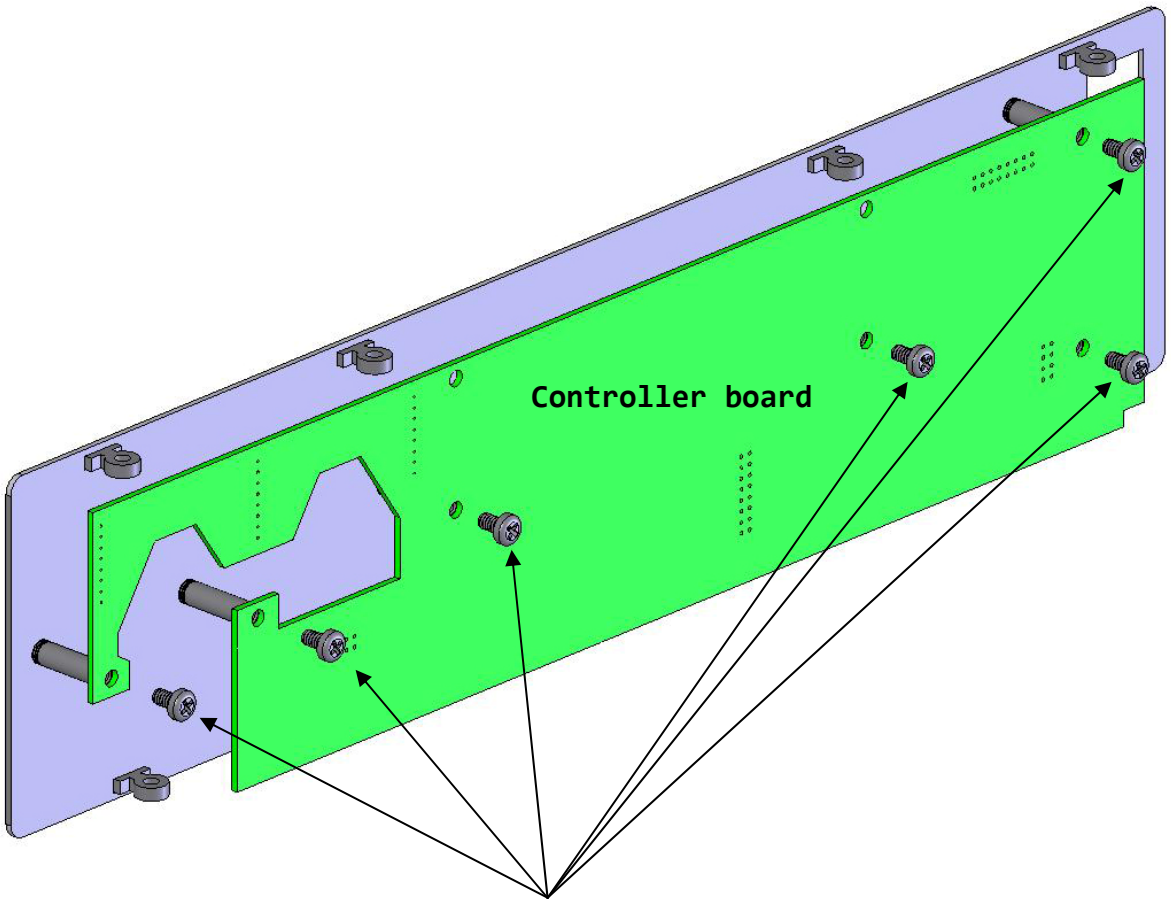
Refer to Pictorial 4 for the following steps. (See Parts List in Appendix D1).

( ) Remove the controller board carefully from its anti-static bag and observe static control precautions while handling this board. Attach the controller board to the front panel using six 6-32 x 1/4" screws.

( ) Clean any oil residue off the front panel sheet metal with a tissue or clean, dry towel.

( ) Remove the backing from the front panel Lexan® overlay and attach it to the front panel sheet metal, aligning it carefully before pressing hard to stick it to the sheet metal.

Go to page 43.



6-32 x 1/4” screw

Pictorial 4

STEP-BY-STEP ASSEMBLY - Front Panel Integration
Models with controls

( ) Build the Front Panel board (See Appendix D).

Refer to Pictorial 5 for the following steps.

( ) Attach two **6-32 x 1/2"** hex male/female spacers to the top two VFD mounting holes and secure with 6-32 KEPS nuts.

( ) Place the front panel sheet metal upside down on a towel or other smooth surface. Now place the Vacuum Fluorescent Display (VFD) over the large rectangular opening with the glass facing down and connectors to the right. Line up the two bottom mounting holes with the two short captive standoffs on the sheet metal. Insert two **6-32 x 1/2"** hex male/female spacers in the bottom two holes, with the threads going into the standoffs on the sheet metal.

( ) Push the front panel board onto the back of the steel front panel. Attach it with four 6-32 x 7/16" hex male/female spacers, and six 6-32 x 1/4" screws.

( ) Locate the two analog meters. Push the meters into the back of the steel front panel (meter faces visible from the front). Put the S-meter closest to the side of the sheet metal (left side as viewed from the back) and the transmit meter toward the inside (right side as viewed from the back). Handle the front panel sheet metal by the edges to avoid getting oil from your fingers on it.

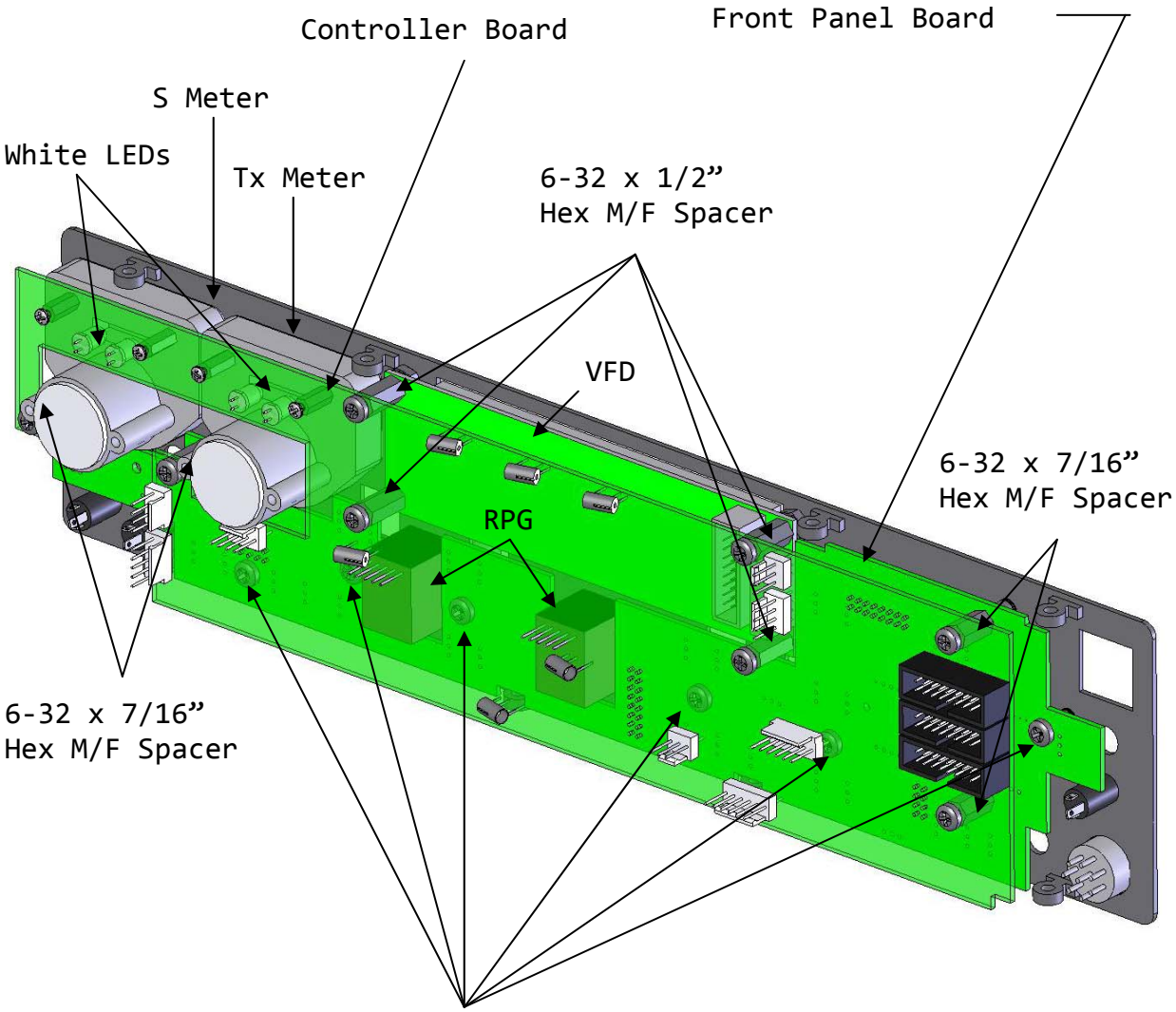
( ) Locate the two Rotary Pulse Generators (RPG). Remove the nuts and lockwashers from their shafts and save them for use in a later step.

( ) Insert both RPGs into their holes in the center of the sheet metal so that the plastic tabs insert fully into the small rectangular holes. Tighten the RPGs using the hex nuts that you just removed from these parts.

For the following steps, be sure that you are properly grounded and working on a static-free work surface. Static can damage the sensitive control board.

( ) Remove the controller board from its anti-static bag.

( ) Solder the four white LEDs *to the back side of the controller board* with the flat side facing up. Clip the excess leads.


Controller Board
Front Panel Board
S Meter
White LEDs
Tx Meter
6-32 x 1/2”
Hex M/F Spacer
VFD
6-32 x 7/16”
Hex M/F Spacer
RPG
6-32 x 7/16”
Hex M/F Spacer
Six 6-32 x 1/4” screws secure
front panel board to sheet metal
Eight 6-32 x 1/4”
screws secure control-
ler to VFD and front
panel board

Pictorial 5

( ) Attach the controller board to the front panel assembly. A fair amount of pressure is required to align the five connectors (four to the front panel and one to the display) while aligning the 5 pins on each RPG with their holes in the controller board. Push and wiggle the board gently but firmly until all connectors are lined up. The board may flex a little during this process. Once snug, tighten the controller to the front panel and display using six 6-32 x 1/4" screws.

( ) Fasten the meters to the controller board using four 2-56 nuts.

( ) Solder all 5 pins of each RPG to the controller board. Remove the nuts after soldering the parts and save them for later use.

( ) Using a small flat blade screwdriver, adjust the black meter zeroing screws on the front panel so that the meters read 0.

( ) Clean any oil residue off the front panel sheet metal with a tissue or clean, dry towel.

( ) Remove the backing from the front panel Lexan® overlay and attach it to the front panel sheet metal, aligning it carefully before pressing hard to stick it to the sheet metal. Smooth it carefully to avoid having air bubbles form in it.

( ) Attach the RPG nuts and lockwashers to the two RPGs and tighten. Do not over-tighten to avoid dimpling or cracking the overlay.

( ) Locate a 2-wire MTA cable assembly (CA15). Cut the cable in half. Strip 3/8” of insulation off the ends and tin them. Solder the black wire to negative (-) and the red wire to positive (+) on the S-meter.

( ) Repeat the previous step using the other half of the CA15 cable and solder the ends to the transmit meter.

( ) Temporarily attach the front panel assembly to the chassis bottom using two 6-32 x 1/4" screws. (Four are used when assembly is complete - these just hold it down while you work on other things.)

STEP-BY-STEP ASSEMBLY - Connect Controller Cables

Make sure that no DC power is applied to the DC input connectors on the back panel while you connect internal cables. Do not simply rely on the on/off switch being off, because you could accidentally bump it to the ON position while working on the cables.

If you have purchased the full front panel:

( ) Run the free ends of the meter cables through the large rectangular hole on the right of the front bracket and into the Receiver compartment.

( ) Remove the knurled nuts from the minijacks on the CONTFPKEY (CA11) cable. Insert the minijacks into the front panel with the minijack having all three pins attached to wires into the hole marked **Paddles** and the other one into the hole marked **Manual**. Fasten the knurled nuts tightly against the front panel. Do not overtighten to avoid dimpling the polycarbonate overlay. Connect the free end of CA11 to J32 on the controller board.

If you have purchased the transmitter:

( ) Insert one end of a 20.5" gray ribbon cable (CONTDATATX – CA21) into the top of three 16-pin connectors, J2 (Tx), on the Controller board. Dress the other end through the top rectangular hole in the front bracket. Fold the cable at a right angle close to the DCD/Tuner board. Fold it over 90 degrees downward into the transmitter compartment. Fold it again at right angles such that it runs along the middle of the left bracket toward the back.

( ) Locate the 10" stereo minijack to 3-pin IDC connector (RX-HP – CA24). Remove the knurled nut and save it. Pass the minijack through the front panel hole on the far left side with a headphone symbol next to it. Reattach the nut and tighten securely. Pass the IDC end through the round hole on the upper right side of the front bracket.

( ) Locate the 8-pin microphone connector to 6-pin IDC and 2-pin stereo cable (CONT-MIC – CA16). Remove the nut and lockwasher. Insert the 6-pin IDC connector and stereo cable through the mic hole in the bottom left of the front panel. Pass the long cable through the lockwasher and then the nut and then do the same for the 6-pin IDC connector. Tighten the nut on the back side of the panel. Attach the 6-pin connector to J20 on the controller board. Pass the shielded cable through the bottom of the two rectangular holes on the left side of the front bracket, then under the large left bracket and into the transmitter compartment. Note that this cable is provided whether you have the transmitter or not. This allows you to use a hand-held mic to increment or decrement the operating frequency using buttons commonly available on most hand mics.

( ) Locate the 16" 4-pin IDC cable (CONT-TXVM – CA18). Connect one end to J7 on the controller board. Pass the other end through the round hole under the fan in the front bracket and into the Transmitter compartment.

( ) Unplug the 5-pin on/off switch cable from the DCD/Tuner board. Insert this cable assembly through the square opening in the upper left of the front panel assembly, IDC connector first. Finally, push the on/off switch into the hole until it snaps into place. Insert the IDC connector through the rectangular opening in the front bracket and push it onto connector J4 (on/off) on the DCD/Tuner board.

( ) Locate the 15" triple stereo minijack to 5-pin IDC cable (CONT-RPKEY – CA13). Pass the 5-pin IDC through the round hole at the bottom right side of the front bracket and connect it to J3 on the controller board. Run the cable along the bottom of the chassis and under the bottom right side of the small bracket. Remove the three knurled nuts and save them. Insert the one with only two wires going to it in the far right hole labeled **Keypad** on the back panel. Reattach the nut and tighten it. Attach the other two minijacks in similar fashion. The minijack that has one wire going to two pins goes to the hole labeled **Manual** in the "Key" group. The other one goes to the hole labeled **Paddles**.

Pictorial 6. Completed unit showing cable dress from controller

( ) Locate a 6 1/2" 4-pin IDC cable (CONT-RXVOXST – CA14). Connect one end to J11 (ST/VOX) on the Controller board. Dress the cable through the round opening on the upper right side of the front bracket.

In the next steps you will connect some RF cables. These connectors can be a little tricky to insert into the mating connectors on the PC boards, and they can work loose if inserted and removed more than about 10 times. They have a friction fit and must be aligned perfectly to go in. Once aligned, a gentle but firm push will seat them. Using your fingernails on the "ears" of each cable's connector will help you push them in. Be sure that any strands at the end of the center conductor of the cables are either clipped or lined up with the centerline to avoid difficulty getting the center pin into the mating hole. Once you see how to get the first one in properly, the rest will be easier.

( ) Insert RF cable RXLO1 into J24 (RXLO1) on the Controller board. Dress the cable through the large rectangular hole on the right side of the front bracket.

( ) Insert RF cable RXLO2 into J25 (RXLO2) on the Controller board. Dress the cable through the large rectangular hole on the right side of the front bracket.

( ) Insert RF cable RXLO3 into J26 (RXLO3) on the Controller board. Dress the cable through the large rectangular hole on the right side of the front bracket.

( ) Insert RF cable RXLO4 into J23 (RXLO4) on the Controller board. Dress the cable through the round hole on the upper right side of the front bracket.

( ) Insert RF cable TXVFO into J22 (TxVFO) on the controller board. Insert the other end through the round hole in the front bracket and into the transmitter compartment. Put a small piece of heatshrink tubing over the end and heat it, so that the connector does not touch the chassis.

( ) Insert RF cable TXBFO into J27 (TXBFO) on the controller board. Insert the TXBFO cable through the round hole in the front bracket and into the transmitter compartment. Put a small piece of heatshrink tubing over the end and heat it, so that the connector does not touch the chassis.

If you have purchased the transmitter:

( ) Locate a 3-pin IDC cable (CONT-TUNER – CA17) and connect one end to J21 (Tuner) on the controller board and the other to J3 (SWR) on the DCD/Tuner board.

( ) Connect the 6-pin IDC connector on CA12 (RS-232 cable) to J4 (RS232C) on the Controller board.

( ) Insert one end of an 8" gray ribbon cable (CONTDATA-TUNER – CA22) into the ***bottom*** of three 16-pin connectors, J18, on the controller board. Dress the other end through the rectangular hole in the front bracket. Make two right-angle folds in the cable close to the DCD/Tuner board so that the cable enters the DCD/Tuner board lined up with connectors J1 and J2. Insert the end of this cable into J1 on the DCD/Tuner board.

( ) Locate a 14.5" gray ribbon cable having one connector on one end and two on the other end (CONTDATA-RX-BPF – CA20). Push the end with one connector into the ***middle*** of three 16-pin connectors, J15, on the Controller board. Fold the cable at a right angle and dress the cable along the underside of the top fold in the front bracket. Fold the other end at a right angle and position it in front of the large rectangular opening on the right side of the front bracket.

( ) Locate a 10" 3-pin IDC cable (DCDIST-CONT – CA2). Connect one end to J9 (Control) on the DCD/Tuner board. Run the other end through the rectangular hole on the left side of the front bracket and into the front panel compartment.

STEP-BY-STEP ASSEMBLY-Front Panel/Controller Tests
Units with full front panels

( ) Measure the resistance between pin 1 and ground on the connector that is at the end of CA2. It should be >200 ohms. Also measure resistance between pin 3 and ground. It should be open (or very large, >1M). If you measure a short at either point, see the troubleshooting guide in the Service Manual.

( ) Connect CA2 to J1 on the controller board.

( ) Make sure that jumpers JP1 and JP2 are NOT installed on the controller board. These jumpers are located near the meters. If the jumpers are in place, remove them and reinsert them with only one pin making contact. This is a handy way to keep them with the radio so they won't get lost.

( ) Turn on the radio by applying DC power to the APP connectors on the back panel and pushing the on/off switch.

( ) You should again hear the PC boot if it is installed. (If you do not wish to cycle power on the PC while testing other boards, simply remove the 4-pin cable going to the PCPS board.) The front panel pushbuttons should light up briefly and then go out. The VFD should come up with a default frequency of 14.00000 MHz.

( ) Push all buttons one at a time and note the response. The green LEDs inside the buttons should light when you push the button. Turn the controls to observe their responses. At this point, since you have not yet installed the receiver or transmitter, many of the front panel controls will not seem to do anything. That's OK. As long as it lights up and some buttons respond, you can be sure that the controller and front panel boards are working.

( ) Turn off the power and remove the DC inputs.

STEP-BY-STEP ASSEMBLY-Front Panel/Controller Tests Units without full front panels

( ) Measure the resistance between pin 1 and ground on the connector that is at the end of CA2. It should be >200 ohms. Also measure resistance between pin 3 and ground. It should be open (or very large, >1M). If you measure a short at either point, see the troubleshooting guide in the Service Manual.

( ) Connect CA2 to J1 on the controller board.

( ) If using an external PC to control the rig, connect its RS-232 port to the DB9 connector on the back panel.

( ) Make sure that jumpers JP1 and JP2 ARE installed on the controller board. These jumpers are located near the meters. If the jumpers are set so that only one pin is connected, remove them and reinsert them so that both pins are attached.

( ) Turn on the radio by applying DC power to the APP connectors on the back panel and pushing the on/off switch.

( ) You should again hear the PC boot if it is installed.

( ) From either the internal or external PC, start the "Hyperterm" program and set it for 9600 baud, 8 bits, no parity, 1 stop bit, no handshake.

( ) Enter the following commands:

ID; { Response: ID710; }
FA; { Response: FA00014000000; }

If you want to experiment with other commands to observe the responses, consult the Sienna Operator's Guide.

( ) Turn off the power and remove the DC inputs.

STEP-BY-STEP ASSEMBLY-Receiver Integration

Refer to Pictorial 7 for the following steps.

( ) Build the IF Filter board (See Appendix E).

( ) Locate the 4" 8-pin IDC cable (RX-IFFILT – CA26). Connect one end to the IF Filter board. Leave the other end disconnected for now.

( ) Install the IF Filter board on the 6 tall standoffs in the receiver compartment with the filters facing down. Use six 6-32 x 5/8" hex male/female spacers to secure the board. Tighten the spacers securely, but do not overtighten to avoid damage to the PC board.

( ) Install any standard and optional filters. See Appendix K for information on how to install them and tell the control firmware they are there.

( ) Connect the Test Board and perform the IF Filter test procedure as described in Appendix L.

( ) Remove the test board and disconnect all cables from it. Save the test board for further use.

( ) Remove IF1 from J18 on the IF Filter Board and insert it into J2.

( ) Remove IF2 from J19 on the IF Filter Board and insert it into J3.

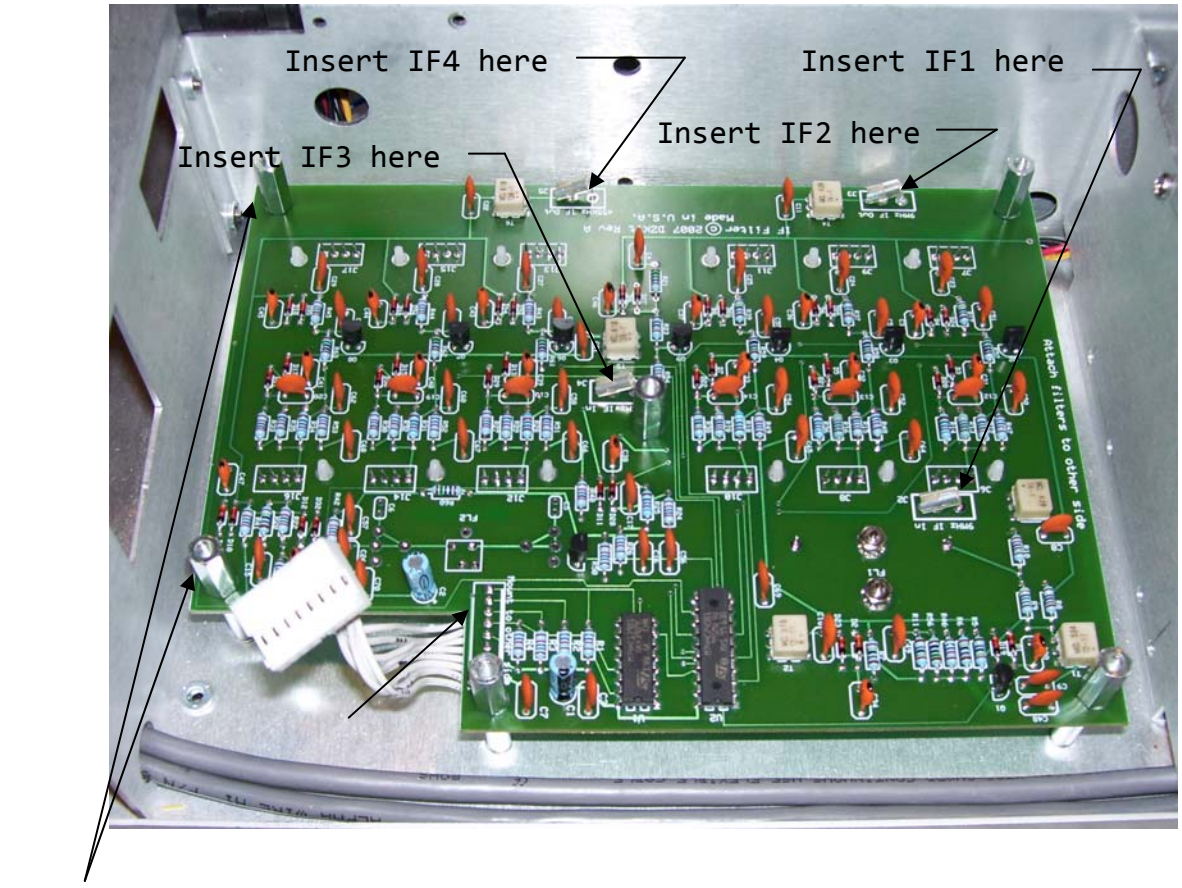
( ) Build the RXBPF board (See Appendix F).

( ) Locate the 2.5" 4-pin IDC cable (RX-BPFDC – CA25). Connect one side to J1 on the RXBPF board with the cable extending upward. Do not twist the leads.

( ) Lay the RXBPF board on top of the 5/8" hex male/female spacers. Secure it with six 6-32 x 5/8" hex male/female spacers. Tighten the spacers securely, but do not overtighten to avoid damage to the PC board.

( ) Remove the mounting nut and solder lug from a BNC connector and insert the connector from the outside of the back panel at the location marked “RX ANT”. Reattach the solder lug and nut and tighten it. Bend its solder lug at a 45 degree angle.

( ) Solder a gas discharge tube between the BNC center conductor and the solder lug. Be careful not to short the metal ends to the chassis.



Pictorial 7. IF Filter Board Mounting

( ) Solder the center conductor of the RXANT cable to the center terminal of the BNC connector. Solder the braid to the solder lug.

( ) Pass the other end of the RXANT cable through the large round hole in the small bracket and insert it into the RF connector labeled J3 (Rx Antenna) on the RXBPF board.

( ) Connect the Receiver power cable from J10 (“Rx”) on the DCD Board to J17 (“From DCD (test)”) on the RXBPF Board.

( ) Connect the bottom of the two connectors at the end of the gray ribbon cable to J5 on the RXBPF board.

( ) Connect the Test Board and perform the RXBPF test procedure described in Appendix M.

( ) Insert RF cable RXBPFMAIN-TX into the RF connector labeled J2 (Main Antenna) on the RXBPF board. Dress the other end of this cable through the large round hole in the small bracket and into the PC compartment, then into the holes in large bracket right, large bracket left and into the DCD/Tuner compartment. Connect the end to J11 on the DCD/Tuner board.

( ) Locate the 8-pin to 5-pin/3-pin cable (DCDIST-TX – CA4). Connect the 8-pin connector to J7 (Tx) on the DCD/Tuner board. Dress this cable along the top of the large left bracket and into the transmitter compartment.

( ) Remove the IF test board and disconnect all cables going to it. If you do not plan to add the transmitter, install this board in the transmitter compartment and connect cables as follows:

( ) Fan to J7
( ) CONT-TXVM – CA18 to J6
( ) CA4 (5-pin) to J5
( ) CA4 (3-pin) to J4
( ) TXBFO to J8
( ) TXVFO to J11 or J14
( ) Set jumper JP1 to “IF”
( ) Set jumper JP3 to “TX”

( ) Attach the Test Board to the chassis using two 6-32 x 1/4” screws.

( ) Insert RF cable RF1 in the connector labeled J4 (To Rcvr) on the RXBPF board.

( ) Build the Receiver board (See Appendix G).

( ) Carefully place the receiver board on top of the six hex standoffs. Secure it with six 6-32 x 1/4" screws. Make sure no cables are stuck or pinched beneath the board.

Refer to Pictorial 8 for the following steps.

If you have installed the full front panel:

( ) Connect the 2-pin connector coming from the S-meter to J19 (Meter) on the Receiver board.

( ) Connect the 2-pin connector coming the Tx Meter to J25 (Tx Mtr) on the Receiver board. This meter is present even if you did not purchase the transmitter.

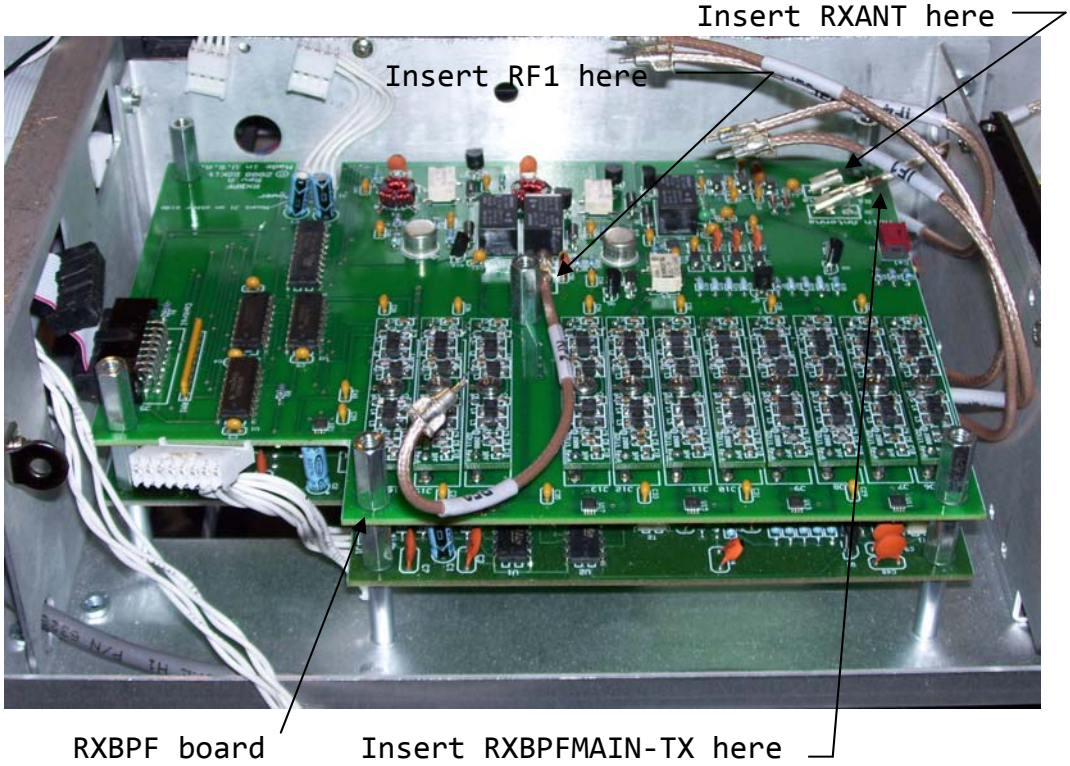
( ) Connect the cable that is wired to the headphones (RX-HP – CA24) to J6 (Phones) on the receiver board.

( ) Locate the IDC cable that is connected to J11 (CONT-RXVOXST – CA14) on the Controller board. Connect the other end to J24 (Sidetone/VOX) on the Receiver board.

( ) Locate the 2.5" 4-pin IDC cable coming from the RXBPF board (RX-BPFDC – CA25). Connect it to J13 on the Receiver board.

( ) Locate the 3" 8-pin IDC cable coming from the IF filter board (RX-IFFILT – CA26). Connect it to J10 on the Receiver board.

( ) Locate the 10" 3-pin IDC cable labeled RX-TXLINE (CA29).



Attach one end to J23 (Line/VOX) on the receiver board. Run the other end through the large round hole in the small bracket and then through the round hole in the right bracket and into the Transmitter compartment.

( ) Locate the 10" stereo mini-jack to 3-pin IDC cable (RX-RPLINEIN – CA30). Remove the knurled nut from the minijack and save it. Connect the IDC end to J21 (Ext In) on the Receiver board. Pass the other end through the large round hole in the small bracket and through the hole in the back panel labeled "Line In". Reattach the nut and tighten securely.

( ) Locate the 15" stereo mini-jack to 3-pin IDC cable (RX-RPLINEOUT – CA31). Remove the knurled nut from the minijack and save it. Connect the IDC end to J16 (Ext Out) on the receiver board. Pass the other end around the right side of the receiver stack, under the right side of the small bracket and through the hole in the back panel labeled "Line Out". Reattach the nut and tighten securely.

( ) Insert RF cable RF1 into J14 (RF In) on the Receiver board. This cable makes a tight turn as it comes up from the RXBPF board.

( ) Insert RF cable IF1 into J17 (IF1-To9M) on the Receiver board.

( ) Insert RF cable IF2 into J11 (IF2-From9M) on the Receiver board.

( ) Insert RF cable IF3 into J8 (IF2-To455) on the Receiver board.

( ) Insert RF cable IF4 into J7 (IF2-From455) on the Receiver board.

( ) Insert RF cable RXLO1 into J2 (marked LO1) on the Receiver board.

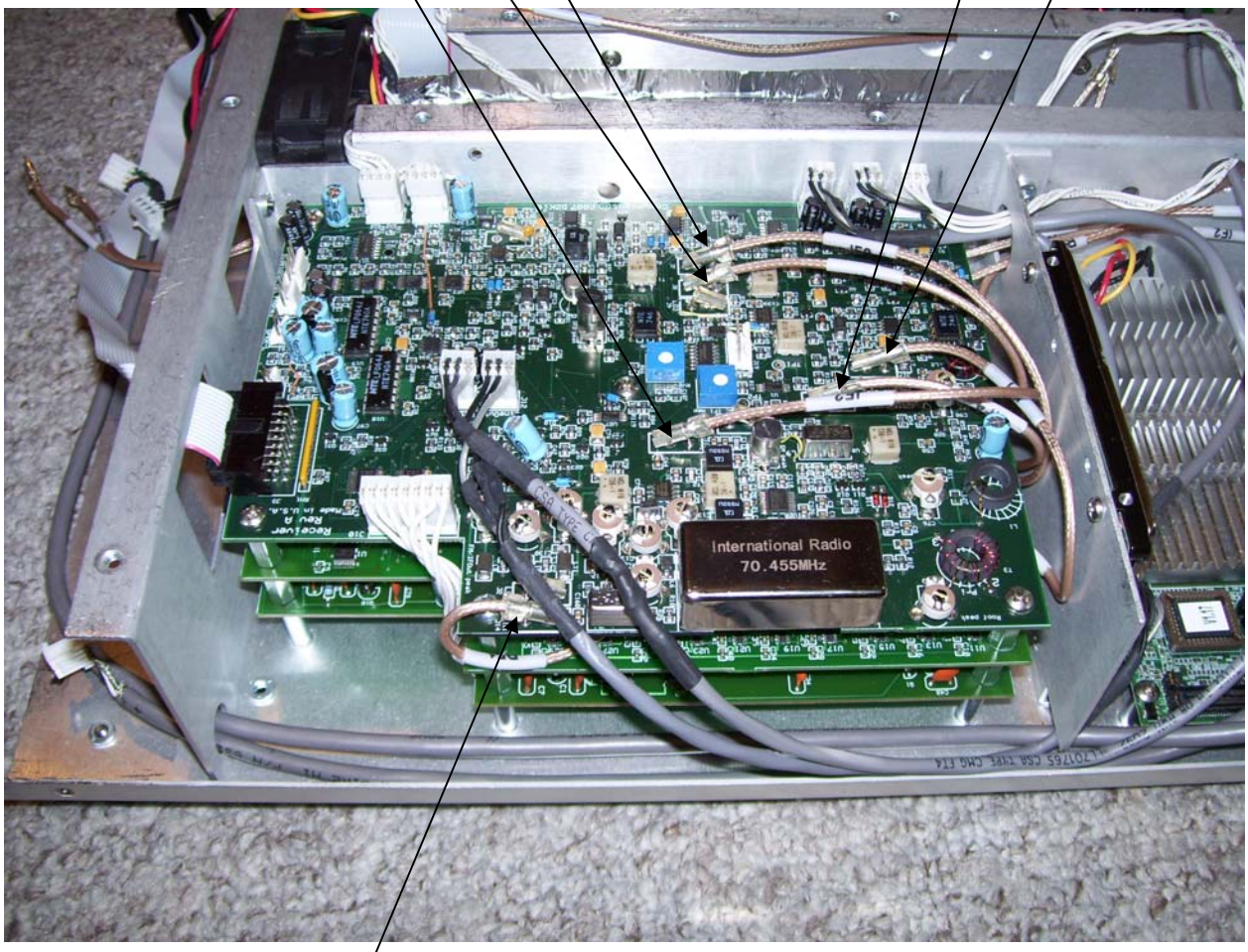
( ) Insert RF cable RXLO2 into J15 (marked LO2) on the Receiver board.

( ) Insert RF cable RXLO3 into J9 (marked LO3) on the receiver board.

( ) Insert RF cable RXLO4 into J1 (marked LO4) on the receiver board.

( ) Connect the top connector on the CONTDATA-RX-BPF ribbon cable (CA20) into J3 on the receiver board.

( ) Locate a 10" 4-pin-5-pin IDC cable (DCDIST-RX – CA51). Connect the 5-pin end to J10


Insert IF1 here
Insert IF4 here
Insert IF3 here
Insert IF2 here
Insert IFOUT here
Insert RF1 here
International Radio
70.455MHz

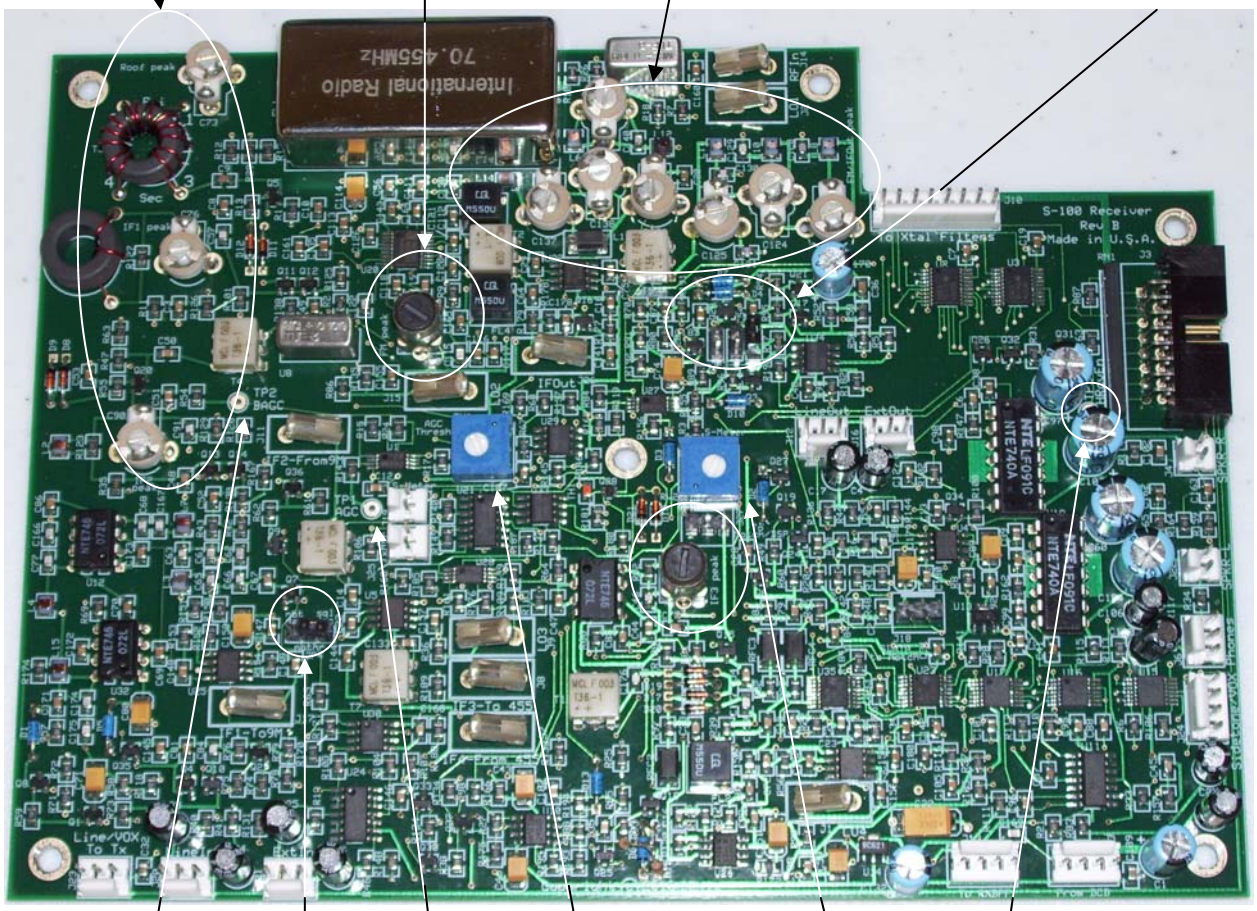
Pictorial 8

(Rx) on the DCD/Tuner board. Dress this cable along the top of the unit, around the fan and into the receiver compartment. It is important that this cable not protrude above the fan so that it does not get pinched when the top cover is installed, so position it in the gaps around the back and sides of the fan. Connect the 4-pin end to J5 (Power) on the Receiver board.

( ) Dress the left speaker cable along the top of the chassis, next to the fan, and plug the connector into J22 (SPKR-L) on the Receiver board.

( ) Dress the right speaker cable along the top of the Receiver board and plug the connector into J4 on the board.

( ) If you have installed the PC option and NOT the MIO board, locate the cable assembly that you attached to the PC earlier that has three cables attached to a 2mm rectangular connector (PC-RX/TX – CA32). Pass the cable with the 2-pin MTA connector on the other end through the hole in the right bracket and into the transmitter compartment. Pass the shorter of the two cables with 3-pin IDC connectors through the large round hole in the small bracket and connect it to J20 (Line In) on the receiver board. Connect the longer of the cables to J12 (Line Out) on the receiver board. Dress it along the bottom of the chassis and under the small bracket.


3 trimmers
L9:FM Peak
7 trimmers
Jumpers JP1-2-3
S-meter zero pot
TP3—HRcvEn
Jumper JP4
AGC Threshold pot
TP1—AGC
TP2—BAGC (buffered AGC)
L5 (IF3 peak)

Pictorial 9

STEP-BY-STEP ASSEMBLY - Receiver Alignment/Tests Using full front panel

When so instructed, connect a voltmeter to the test points described below (red to the noted test point, black to any point on the chassis).

If you are using an S-100 model (no front panel controls), go to page 64.

( ) Temporarily disconnect the 5-pin power cable from the DCD/Tuner board (J10) that goes to the 4-pin connector J5 on the Receiver board (DCDIST-RX – CA51).

( ) On the 5-pin connector at the end of CA51, measure the resistance between pin 1 and ground. (Use the exposed metal pins on the side of the connector.) It should be >1K ohms. Now measure the resistance between pin 2 and ground. It should also read > 1K ohms. Finally, measure the resistance between pin 4 and ground. It should read > 150 ohms. Pin 3 is grounded and should read less than 1 ohm. Pin 5 is not connected and should read open. If you measure incorrect values at any of these points, refer to the troubleshooting section of the Service Manual.

( ) Reconnect the Receiver power cable to the DCD/Tuner board (J10).

( ) Disconnect any antennas from the antenna jacks on the Back Panel.

( ) Disconnect the TXBFO cable from the Test Board and reconnect it temporarily to J14 (“To P.A.”) on the DCD/Tuner board. This connects the 10.7MHz transmitter local oscillator to the antenna input, which is also connected to the RXBPF board’s antenna input.

( ) Flip switch S1 on the RXBPF board to the “Rcv” position.

( ) Temporarily remove the IF4 cable from J7 on the Receiver board. Be careful not to let the bare end come into contact with the Receiver board.

( ) Temporarily remove RXLO3 from the Controller and Receiver boards. Insert one end into J26 (IFOut) on the Receiver board. Connect the other end to IF4 on the Receiver board.

Note: The following steps adjust the 71MHz low pass filter, the 9MHz bandpass filter and the FM receiver peaking. Since this signal path is also used to create

the 455kHz IF Output, you can also peak the signal using an external panadapter connected to the IF Output jack instead of using the internal IFOut-to-IF4 connection. An RFSpace SDR-IQ receiver is recommended for this, but any spectrum analyzer capable of displaying frequencies around 455kHz can be used. If you choose to do this, do not do the previous two steps. Ignore the S-meter readings and peak the signal on the panadapter.

( ) Set both trimpots on the Receiver Board in their middle position.

( ) Turn on the radio by applying DC power to the APP connectors on the back panel and pushing the on/off switch.

( ) Press MENU to enter the menu mode, then rotate the large knob until the mode is selected, then rotate the small knob to select FM.

( ) Rotate the NB Thr/FM Sql knob on the front panel until you can hear audio coming out of the speakers.

( ) Press PAGE/MODE and then rotate the small tuning knob until you see a selection called “FM/IF Test”. Select it with the large tuning knob . (If it is the first item in the menu, rotate the large knob off of the selection and back again). Turn the function on by rotating the small knob to the “On” position. Press MENU again to exit menu mode.

( ) Connect a Yaesu-style microphone to the 8-pin connector on the front panel.

( ) Press the PTT button on a connected microphone. This causes an FM signal to appear on the antenna. Using a small, insulated screwdriver, adjust the 7 trimmer capacitors (in a group to the right of the large roofing filter) so that you see a maximum reading on the S-meter.

( ) Using a small screwdriver, adjust variable inductor L9 (“FM Peak”) for a maximum reading on the S-meter.

( ) Release the PTT button on a connected mic.

( ) Turn off the FM Cal function by rotating the small knob so that the selection reads “Off”.

( ) Press MENU again to exit menu mode.

( ) Wait 10 seconds for current menu settings to be saved, then turn off the radio and remove DC power.

( ) Remove the RXLO3 cable from the Receiver board and reconnect it between J26 (RXLO3) on the Controller board and J9 (LO3) on the Receiver board, passing it through the top round hole in the right side of the front bracket.

( ) Reconnect the IF4 cable to J7 (IF4) on the Receiver board.

( ) Turn the radio on.

( ) Enable the internal attenuator by pushing only the "Pre2/Atten" button. Do **not** push the "Preamp1" button.

( ) Set the RF Gain control to the maximum clockwise position.

( ) Press MENU, then rotate the large tuning knob (the PAGE/MODE LED will go off) until the AGC selection (bottom left side of display) is highlighted. Rotate the small tuning knob until the AGC setting is "AGC-Fast".

( ) Press PAGE/MODE to re-enable menu paging, then rotate the small tuning knob until the menu page appears that has "RFG Cal (F)" as one of the selections. Rotate the large tuning knob to select that item. Touch the red voltmeter lead to TP1 and then turn the small knob to get a voltage reading of 3.81V. A typical value is 22.

( ) Use the tuning knobs to select "AGC Slow".

( ) Select RFG Cal (S). Touch the red voltmeter lead to TP1 and then turn the small knob to get a voltage reading of 3.81V. A typical value is 12.

( ) Touch the red voltmeter probe to TP2 and adjust the AGC Threshold pot on the receiver board to get a voltage reading of 4.0V.

( ) Rotate the RF Gain control to the counterclockwise position. The S-meter should rise to a maximum. Return the control to the clockwise position.

( ) Touch the red voltmeter probe to TP4 (S Cal) [use the junction of R181 and R187 on Rev B boards]. Adjust menu item "S-meter cal" for a reading of 2.1V.

( ) Flip switch S1 on the RXBPF board to the "Cal" position.

( ) Rotate the large tuning knob to the mode entry (top row above the displayed frequency) and then turn the small tuning knob until "CW (USB)" mode is selected.

( ) Press “Menu” to exit menu mode. Tune the frequency to 10700.00 kHz. Then press “Menu” again to re-enter menu mode.

( ) Rotate the small tuning knob until you see a selection called “S/Pwr cal”. Select it with the large tuning knob and then turn it on by rotating the small knob to the “On” position.

( ) Rotate the large knob until AGC is selected. Rotate the small knob to select AGC-Slow. Press MENU again to exit menu mode.

( ) Press the Preamp1 button, which disconnects the internal attenuator when Pre2/Atten is also on. Both preamp LEDs should now be on.

( ) Adjust the main tuning until a signal can be heard in the speakers.

( ) Peak the S-meter reading by adjusting the main tuning knob.

( ) Using a small, insulated screwdriver, adjust the three trimmer caps toward the back of the board, labeled “Roof peak”, “IF1 peak” and “IF2 peak” to achieve a maximum reading on the S-meter.

( ) Adjust variable inductor L5 (IF Peak) for a maximum reading on the S-meter. Typically, the slug will extend out the top of the can about 1/8”. It is not a sharp peak but you should notice when it peaks and then starts dipping again.

( ) Press MENU. Select the menu that includes the settings for AGC SSB/CW control. Adjust the menu selection until the meter reads S9. Typical value is 150-210.

The above steps calibrate the receiver’s RF gain so that a signal at the antenna of 50uV (-73dBm) causes the S-meter to read S9 when using two preamps. It will not be as accurate when using zero or one preamp or the attenuator. Typically, you will want both preamps for frequencies above 14MHz.

( ) Remove the TXBFO cable from the DCD/Tuner board and plug it into J8 on the IF Test board in the transmitter compartment.

( ) Exit menu mode. Press the “Page/Mode” button and select AM by rotating the small knob. Press “Page/Mode” again to exit this mode. Connect an antenna to the back panel An-

tenna A input. Tune in an AM station in the AM broadcast band. Re-enter menu mode and select the AGC AM setting. Adjust the value until the station is at a comfortable listening level. You may need to turn off the preamps and turn on the attenuator.

( ) Set the Rcv/Cal switch to Rcv on the RXBPF board.

Note: The menu setting “AGC Hang” is not used unless you select jumpers JP2 and JP3 and remove JP1. The Hang AGC circuit is not used at this time but is present on the board for experimental purposes.

This completes receiver alignment.

STEP-BY-STEP ASSEMBLY - Receiver Alignment/Tests Using remote control

( ) Temporarily disconnect the 5-pin power cable from the DCD/Tuner board (J10) that goes to the 4-pin connector J5 on the Receiver board (DCDIST-RX – CA51).

( ) On the 5-pin connector at the end of CA51, measure the resistance between pin 1 and ground. (Use the exposed metal pins on the side of the connector.) It should be >1K ohms. Now measure the resistance between pin 2 and ground. It should also read > 1K ohms. Finally, measure the resistance between pin 4 and ground. It should read > 150 ohms. Pin 3 is grounded and should read less than 1 ohm. Pin 5 is not connected and should read open. If you measure incorrect values at any of these points, refer to the troubleshooting section of the Service Manual.

( ) Reconnect the Receiver power cable to the DCD/Tuner board (J10) and turn on the radio by applying DC power to the APP connectors on the back panel and pushing the on/off switch.

( ) Disconnect any antennas from the antenna jacks on the Back Panel.

( ) Disconnect the TXBFO cable from the Test Board and reconnect it temporarily to J14 (“To P.A.”) on the DCD/Tuner board. This connects the 10.7MHz transmitter local oscillator to the antenna input, which is also connected to the RXBPF board’s antenna input.

( ) Flip switch S1 on the RXBPF board to the “Rcv” position.

( ) Temporarily remove the IF4 cable from J7 on the Receiver board. Be careful not to let the bare end come into contact with the Receiver board.

( ) Temporarily remove RXLO3 from the Controller and Receiver boards. Insert one end into J26 (IFOut) on the Receiver board. Connect the other end to IF4 on the Receiver board.

Note: The following steps adjust the 71MHz low pass filter, the 9MHz bandpass filter and the FM receiver peaking. Since this signal path is also used to create the 455kHz IF Output, you can also peak the signal using an external panadapter connected to the IF Output jack instead of using the internal IFOut-to-IF4 connection. An RFSpace SDR-IQ receiver is recommended for this,

but any spectrum analyzer capable of displaying frequencies around 455kHz can be used. If you choose to do this, do not do the previous two steps. Ignore the voltmeter readings and peak the signal on the panadapter.

( ) If using an external PC, connect an RS-232 cable to the DB-9 connector on the back panel.

( ) From either the internal or external PC, start a terminal emulation program such as “Hyperterm” and set it for 9600 baud, 8 bits, no parity, 1 stop bit, no handshake.

( ) Send the commands:

```
ID;     { Sienna responds
          with “ID710;” }
MD4;              { FM mode }
CF1;              { FM Cal on }
```

( ) Connect a Yaesu-style microphone to the 8-pin connector on the front panel. If none are handy, put a clip lead or other removable wire on TP3 (LPTT).

( ) Press the PTT button on a connected microphone or touch TP3 (LPTT) to ground on the Receiver board. Send the command “SQnnn;”, where nnn goes from 000 to 255. This is the FM squelch control. A value less than about 050 should allow you to hear sound from the speakers. Select a value that allows you to hear sound without it cutting in and out.

( ) Using a small, insulated screwdriver, adjust the 7 trimmer capacitors in a group to the front of the roofing filter so that you see a maximum reading on the voltmeter.

( ) Using a small screwdriver, adjust variable inductor L9 (“FM Peak”) for a maximum reading on the voltmeter.

( ) Adjust trimpot RV2 for voltmeter reading of about 1.0V. The value is not critical in FM. This is just a relative signal strength indicator.

( ) Release the PTT button on a connected mic or disconnect TP3 (LPTT) from ground on the Receiver board.

( ) Send the command “CF0;” to turn off FM cal mode.

( ) Wait 10 seconds for current settings to be saved, then turn off the radio and remove DC power.

( ) Remove the TXBFO cable from the DCD/Tuner board and plug it into J8 on the Test board in the transmitter compartment.

( ) Insert the TXVFO cable into either J11 (LO3) or J14 (LO4)

on the Test Board in the transmitter compartment.

( ) Remove the RXLO3 cable from the Receiver board and reconnect it between J26 (RXLO3) on the Controller board and J9 (LO3) on the Receiver board, passing it through the leftmost of the two rectangular holes in the right side of the front bracket.

( ) Reconnect the IF4 cable to J7 (IF4) on the Receiver board.

( ) Set both trimpots on the Receiver Board to their middle position.

( ) Send the following commands:

```
GT006;      { AGC Off }
RA01;       { Attenuator on }
RG255;      { RF Gain max }
```

( ) Touch the red voltmeter lead to TP1 and then send the command “CRnnn;”, where “nnn is a number from 000 to 255. Send the command repeatedly, increasing the number from 000 until you get a voltage reading of 3.75V. A typical value is 020.

( ) Touch the red voltmeter probe to TP2 and adjust the AGC Threshold pot on the receiver board to get a voltage reading of 4.0V.

The above steps set the Receiver’s Automatic Gain Control (AGC) threshold voltage.

( ) Disconnect the TXBFO cable from the Test Board and reconnect it temporarily to J14 (“To P.A.”) on the DCD/Tuner board. This connects the 10.7MHz transmitter local oscillator to the antenna input.

( ) Flip switch S1 on the RXBPF board to the “Cal” position.

( ) Send the following commands:

```
MD3;          { CW(USB) mode }
CS1;          { S/Pwr Cal on }
FA000010700000;
              { Freq=10.7MHz }
RT1;          { RIT on }
RC;           { RIT Clear }
GT004;        { AGC Slow }
```

( ) Place a voltmeter on pin 1 of J19 on the Receiver board. Select a range close to 5V. This is the S-meter output. If you have a 100uA meter handy, you can connect it to this connector instead.

( ) Using a small, insulated screwdriver, adjust the 7 trimmer capacitors (in a group to the right of the roofing filter) so that you see a maximum voltage reading on the voltmeter. Some trimmers may appear to do nothing

at this point. Do not worry about this.

( ) Send the command “PA2;” to turn off the attenuator and turn on both preamps.

( ) Adjust the frequency for a maximum voltmeter reading by sending the command “RU;” (RIT up 10 Hz) repeatedly until the voltmeter peaks. If you need to move the frequency down 10Hz, use the command “RD;”.

( ) Using a small, insulated screwdriver, adjust the three trimmer caps toward the back of the board, labeled “Roof peak”, “IF1 peak” and “IF2 peak” to achieve a maximum reading on the voltmeter.

( ) Adjust variable inductor L5 for a maximum reading on the voltmeter.

( ) Send the command “CDnnn;”, where nnn goes from 000 to 255, until the voltmeter reads 1.0V. This is an S9 reading.

The above step calibrates the receiver’s RF gain so that a signal at the antenna of 50uV (-73dBm) causes the S-meter to read S9 when using two preamps, which you will typically need for all frequencies above 14MHz. The S-meter will not be as accurate with zero or one preamp engaged. Many applications, including Ham Radio Deluxe, read this value to display an approximate S-meter reading graphically.

( ) Flip switch S1 on the RXBPF board to the “Rcv” position.

This completes receiver alignment.

STEP-BY-STEP ASSEMBLY-Transmitter Integration

( ) Remove the Test board from the transmitter compartment and disconnect all cables from it.

( ) Build the Transmitter board and attach it to its heatsink (See Appendix H).

( ) Build the TXBPF board (see Appendix I).

( ) Attach the TXBPF board to the back of the transmitter board using two 4-40 x 3/16” screws. Be sure to carefully align all four connectors. The notches at the tops of the two boards should align with each other.

( ) Attach the threaded #4 x 1 1/4” hex female/female spacer to the transmitter using a 4-40 x 3/16” screw.

( ) Attach the transmitter extender plate to the large right bracket using a 4-40 x 1/4” screw and a 4-40 KEPS nut. Position the plate so that it stands up vertically above the radio.

( ) Rest the back end of the transmitter on the back panel and attach the top of the extender plate to the 4-40 x 1 1/4” spacer using a 4-40 x 1/4” screw. Make sure both 4-40 screws are tight to keep the transmitter from falling.

( ) Locate the fan cable. Connect it to J15 (Fan) on the Transmitter board.

( ) Attach the 5-pin connector on the end of the DCDIST-TX (CA4) cable to J5 on the Transmitter board. Attach the 3-pin connector to J18 on the Transmitter board.

( ) Locate the 4-pin IDC cable coming from the front panel compartment. Connect it to J14 on the Transmitter board.

( ) Insert RF cable TXBFO into J9 (TXBFO) on the Transmitter board.

( ) Insert RF cable TXVFO into J10 (TXVFO) on the Transmitter board.

( ) Push the connector on the gray ribbon cable (CONTDATA-TX – CA21) into J1 on the Transmitter board.

( ) Insert RF cable TX-TUNER/AMP (CA47) into J11 (RF Out).

( ) Insert RF cable RXBPFMAIN-TX into J8 (RxBPF).

( ) Connect the 2-pin IDC Microphone cable coming from the

front panel to J4 (Mic) on the Transmitter board.

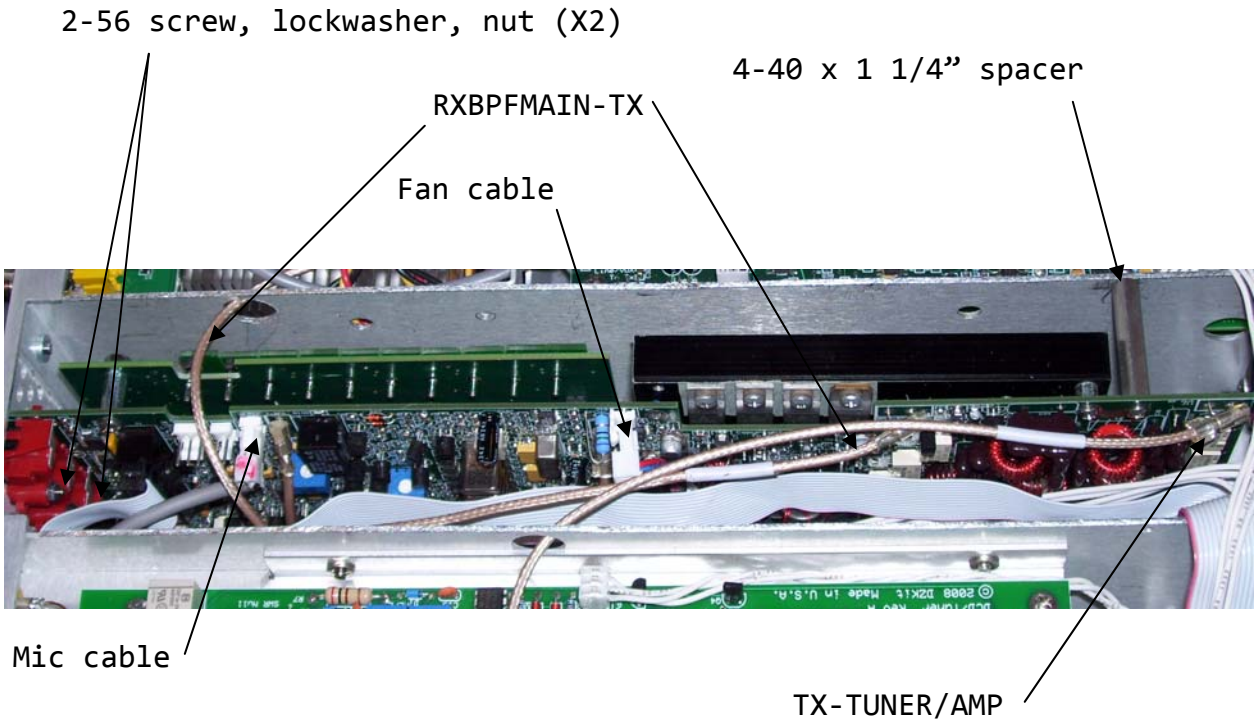
( ) If you have purchased the PC, Connect the 2-pin IDC Microphone cable coming from the PC to the connector labeled PCMic on the Transmitter board.

( ) Connect the 3-pin IDC cable coming from the receiver to J6 (VOX/Lin) on the Transmitter board.

( ) Dress RF cable RXBPFMAIN-TX through the notch on the back of the board, into the PC compartment and then into the Receiver compartment. Insert it into the Main Antenna input on the RXBPF board.

( ) With all cables installed, make sure they are dressed neatly without kinks.

This completes transmitter integration.



Detail 7. Transmitter integration

STEP-BY-STEP ASSEMBLY
Transmitter, SWR Alignment/Tests—Models with front panels

( ) Connect a dummy load to the antenna A jack via an RF power meter. Connect a key to the front panel (if present) or back panel MANUAL key jack.

( ) Apply power to the radio. If you observe anything out of the ordinary, turn off power at once. With the transmitter installed but not transmitting, you should see no change in anything – the receiver should work, the front panel should light up, and you should not see smoke!

( ) Select CW(USB) mode and set the frequency to 14.300MHz. Select Forward Power on the TxMeter entry in the menu. Set the Mic Gain control on the front panel to the 12:00 position (mid-scale). Set the RF Power control counter-clockwise ("P- 0.0"). If you are performing this procedure after having already installed the 100W amplifier, select the "Amp" option in Menu2 for "Int 10W", which tells the radio that the amp is not installed. This will cause it to be bypassed for the following tests.

( ) Enable Power calibration by selecting "S/Pwr Cal" in the menu and then selecting "On". Exit the menu mode.

( ) Press the key. As you do so, gradually increase the RF Proc and RF Power controls, alternating between them a little at a time until the output power reaches 5.0W on an external power meter. (In this cal mode, RF Proc controls "Drive" at the first IF frequency, and RF Power controls "Final" amplifier gain at the output frequency.) Now look at the forward power indication on the built-in analog meter. Adjust RV1 on the DCD/Tuner board (FWD) until the meter reads as close to 5.0W as possible. (Note that the scale is 12W, not the marked 120W, when the amplifier is disabled. Therefore, 5W is a little less than mid-scale.)

( ) Select Refl Pwr on the meter from the TxMeter menu. Adjust RV2 (REFL) on the DCD/Tuner board until the meter reading dips. Adjust trimmer C17 on that board for as close a reading to 0 as possible.

( ) Repeat the previous two steps until the forward power reads 5.0W and the reflected power reads 0.

( ) Release the key. Select USB mode. Turn off S/Pwr cal.

( ) Turn on Full Duplex from the

menu *or* listen to your signal on a nearby monitor receiver. Connect a Yaesu style microphone to the front panel mic jack. Press the PTT button. Adjust RV1 on the Transmitter board so that the carrier is at a minimum.

( ) Select LSB. Re-adjust RV1 for minimum carrier. Alternate between USB and LSB until both modes have equally low carrier. Although you may be able to hear it when monitoring your own signal, the carrier suppression is sufficient that it will not be audible on the air.

( ) Press the “Proc” button on the front panel. Set the Proc Level control to mid-scale. From the menu, select “Comp” (compression) as the TxMeter function. Adjust Mic gain and RF Proc controls so that the RF Compression reads no higher than 12dB and the signal sounds clean and readable with little distortion.

( ) Select AM mode on both the transmitter and the monitor receiver. Press the PTT button and speak into the microphone. Verify that your AM signal is readable as an AM signal. Keep the power level less than 3W (30W with 100W amp) on AM.

( ) Select FM mode on the transmitter and monitor receiver. Press the PTT button and speak into the microphone. Verify that your FM signal is readable as an FM signal. The default bandwidth of the narrow-band signal is 2.5kHz. If you plan to use 4 or 5kHz, change it to this in the appropriate menu. Keep the power level less than 3W (30W with 100W amp) on AM.

( ) Turn off power.

( ) Remove the extender plate from the transmitter. Keep it in a safe place should you ever want to work on the transmitter.

( ) Holding the cables out of the way, lower the transmitter into its compartment and align it with the board guide on the bottom. Slide it up against the back panel, feeding the three phono connectors through their holes. Secure it with two 2-56 x 5/8" panhead machine screws mounted on the back panel, two #2 lockwashers and two 2-56 nuts.

TIP: The lockwashers and nuts are small and easy to drop. Use double stick tape on your finger to hold them as you position them.

( ) Attach the 1 1/4” spacer to large bracket right using a 4-40 x 3/16” screw.

This completes alignment and test of the Transmitter board and SWR meter.

STEP-BY-STEP ASSEMBLY
Transmitter, SWR Alignment/Tests—Models without front panels

( ) Connect a dummy load to the antenna A jack via an RF power or SWR meter. Connect a key to the front panel (if present) or back panel MANUAL key jack.

( ) From either the internal or external PC, start the "Hyperterm" program and set it for 9600 baud, 8 bits, no parity, 1 stop bit, no handshake.

( ) Apply power to the radio. If you observe anything out of the ordinary, turn off power at once. With the transmitter installed but not transmitting, you should see no change in anything – the receiver should work, the front panel should light up, and you should not see smoke!

( ) Send the following commands:

```
MD7;   { CW(USB) mode }
FA0000014300000 { 14.3MHz }
PW1;   { 10W Tx present }
PL000; { 0 RF Proc level }
PC000; { 0W RF Power level }
MG128; { Mic Gain=midscale }
RM7;   { RF Power Meter }
```

( ) Connect a voltmeter between pin 1 of J25 ("TxMtr") and ground on the Receiver board. This is the meter output for the selected transmitter measurement function (in this case, Forward Power). Voltages on this pin are never greater than 2V so choose a range on your voltmeter as close as possible to this value.

( ) Press the key. As you do so, gradually increase the RF Proc and RF Power functions, alternating between them a little at a time until the output power reaches 5.0W on an external power meter. (In this cal mode, RF Proc controls "Drive" at the first IF frequency, and RF Power controls "Final" amplifier gain at the output frequency.) Use the following commands:

```
PCnnn; { RF Power }
PLnnn; { RF Proc }
```

where nnn goes from 000 (low) to 255 (high).

( ) Now look at the voltmeter reading. Adjust RV1 on the DCD/Tuner board (FWD) until the meter reads as close to 0.833V as possible.

( ) Send the command "RM8;", which selects Reflected Power. Adjust RV2 (REFL) on the DCD/Tuner board until the meter reading dips. Adjust trimmer C17 on that board for

as close a reading to 0 as possible.

( ) Repeat the previous two steps until the forward power reading is 0.833V (5.0W on the power meter) and the reflected power reads 0V (0W).

( ) Release the key.

( ) Send the following command:

```
MD2;   { USB mode }
```

( ) Set up a nearby monitor receiver to listen to your transmitted signal. If one is not available, send the command “FD;” to put your Sienna into Full Duplex mode, allowing you to hear your transmitted signal. Keep the audio volume low by sending the command “AG010;”

( ) Connect a Yaesu style microphone to the front panel mic jack. Press the PTT button. Adjust RV1 on the Transmitter board so that the carrier (audible tone) is at a minimum.

( ) Send the command “MD1;” (LSB). Re-adjust RV1 for minimum carrier. Alternate between USB and LSB until both have equally low carrier. Although you may be able to hear it when monitoring your own signal, the carrier suppression is sufficient that it will not be audible on the air.

( ) Send the following commands:

```
PR1;   { RF Processor on }
PL128; { Level = midscale }
RM2;   { Meter = Comp }
```

( ) While monitoring your signal, Adjust Mic gain and RF Proc controls by sending the commands “MGnnn;” (Mic Gain) and “PLnnn;” (Proc Level) (gradually changing nnn from 128 up or down as necessary so that the voltmeter reads no higher than 1.6V (12dB) and the signal sounds clean and readable with little distortion.

( ) Send the command “MD5;” (AM) on the transmitter and select AM mode on the monitor receiver. Press the PTT button and speak into the microphone. Verify that your AM signal is readable as an AM signal. Keep the power level at less than 3W when using AM.

( ) Send the command “MD4;” (FM) on the transmitter and select FM on the monitor receiver. Press the PTT button and speak into the microphone. Verify that your FM signal is readable as an FM signal. The default bandwidth of the narrow-band signal is 2.5kHz. If you plan to use 4 or 5kHz,

change it to this in the appropriate menu. Keep the power level below 3W when using FM (30W with the 100W amp enabled).

( ) Turn off power.

( ) Remove the alignment plate from the transmitter. Keep it in a safe place should you ever want to work on the transmitter.

( ) Holding the cables out of the way, lower the transmitter into its compartment and align it with the board guide on the bottom. Slide it up against the back panel, feeding the three phono connectors through their holes. Secure it with two 2-56 x 5/8" panhead machine screws inserted from the outside of the back panel, two #2 lockwashers and two 2-56 nuts.

TIP: The lockwashers and nuts are small and easy to drop. Use double stick tape on your finger to hold them as you position them.

( ) Attach the 1 1/4” spacer to large bracket right using a 4-40 x 3/16” screw.

This completes alignment and test of the Transmitter board and SWR meter.

STEP-BY-STEP ASSEMBLY-100W PA Integration

Refer to Pictorial 10 for the following steps.

( ) Build the 100W PA Board and attach it to its heatsink (See Appendix J).

( ) Remove power from the Sienna.

( ) Disconnect the fan connectors from the DCD/Tuner board and push the connectors down through the opening in the tray. Remove the two screws holding on the Fan mounting plate and pull the fan assembly off.

( ) Remove the two screws that hold the DCD/Tuner tray to the large left bracket.

( ) Remove the screws, spacer and 6-32 x 2” hex F/F spacer that holds the tray to the chassis bottom.

( ) Rotate the tray up 90 degrees and re-insert a 6-32 x 1/4” screw into the front mounting hole and into the left bracket. Tighten it enough to keep it from moving as you install the amplifier.

( ) Attach four 6-32 x 1 1/2” hex F/F spacers to the bottom chassis using four 6-32 x 1/4” screws.

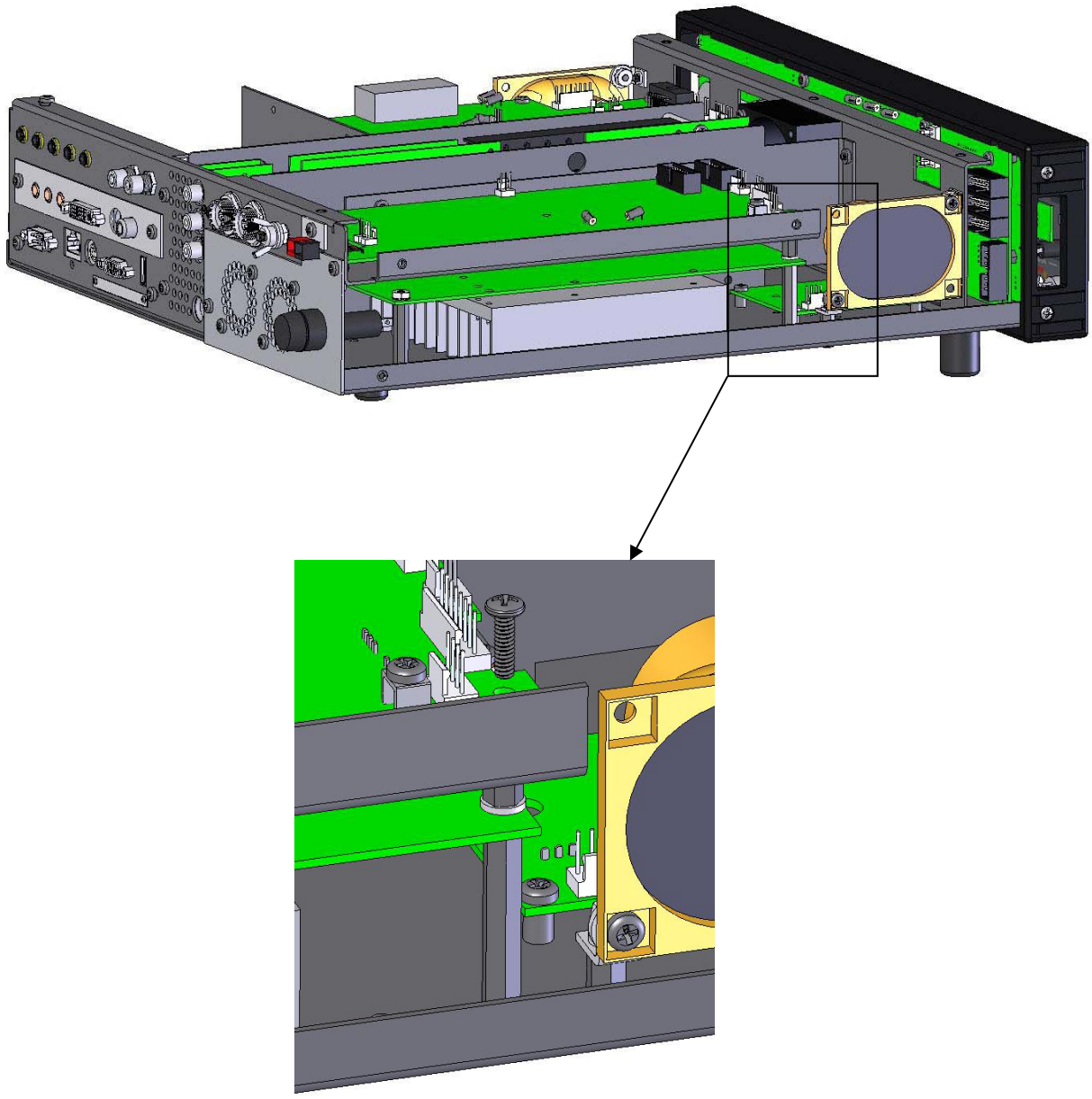
( ) Place the assembled 100W PA in the chassis with the toroids facing towards the front. Line its mounting holes up with the four 1 1/2” spacers. Attach the PA to three of the four spacers using three 6-32 x 1/4” screws. Do not put a screw in the left front corner.

( ) Connect the fan wires to J7 and J8 (marked “Fans”) on the 100W PA assembly.

( ) Locate one 12” 14# red wire with a male insulated terminal (tab) on one end and a female terminal (receptacle) on the other. Cut it into three pieces, each 4” long. You will end up with two wires with a lug on one end and one wire with no lugs. Strip the free end of each wire to 1/2” and tin the ends.

( ) Solder the tinned end of the wire having the female lug into the pad labeled “V+” on the DCD board. Position the cable over the side of the chassis, through the notch in the side of the tray. Be careful not to let the wire touch the chassis after insertion into the V+ pad.

( ) Solder the tinned end of the wire having the male lug into the side lug on the fuseholder. You may need to spring the side lug out



Pictorial 10. 100W PA Mounting

slightly first.

( ) Insert one end of the remaining 4” wire into the bottom side of the 100W PA Board into the pad marked W1 (“From Fuse”). Solder the other end to the end lug on the fuse-holder.

( ) Locate the other 12” 14# wire with a male lug on one end and a female on the other. Plug the male end into the 4” cable coming from the DCD/Tuner board. Plug the female end into the cable that is attached to the fuse-holder. ***Note: Once the tray is lowered into its normal position (after test), this extender cable will be removed and the other cables connected together. This minimizes wire length for this high current wire.***

( ) Locate a CA15 2-pin MTA cable. Connect one end to J19 (“Amp”) on the Controller board. Route the other end of the cable through the rectangular opening on the left side of the front bracket and connect the end to J1 (“PA Curr”) on the PA board. Dress this cable between the board and the heatsink so that it won’t get pinched by the top cover when it is attached later.

( ) Remove the end of the RXBPFMAIN-TX/AMP RF cable (CA33) from J8 (“RxBPF”) on the Transmitter board. Pass it through the center hole in the large left bracket and connect it to J6 (“To RxBPF”) on the 100W amp board.

( ) Remove the end of the TX-TUNER/AMP RF cable (CA47) that is connected to J11 on the DCD/Tuner board. Feed this cable through the lower hole in the large left bracket and connect it to J5 (“Tx In”) on the 100W PA Board.

( ) Insert a short gray ribbon cable between J6 (To PA) on the DCD/Tuner board and J3 on the 100W PA board. This cable goes underneath the other one that is connected to J2.

( ) Connect RF cable AMP-TUNER (CA49) between J2 (“Antenna”) on the 100W PA board and J4 (“From PA”) on the DCD/Tuner board.

100W PA Alignment/Tests

Note: If your results are different from the expected ones, refer to the troubleshooting guide in the Service Manual.

( ) Using an ohmmeter, measure the resistance between V+ (W1 – ”From Fuse”) and ground. It should be > 1500 ohms.

( ) Turn trimpot RV1 (“PA Bias”) all the way ***clockwise*** (right).

( ) Connect power to the Sienna DC input terminals and turn on the unit. If you smell smoke or observe power cycling on and off, switch the power off.

( ) Using a voltmeter, measure the voltage on TP3. It should read 5.0V +/- 0.15V.

( ) Verify that the fans are running at low speed. If you have a heat gun (a hairdryer will work), blow some heat on thermistor TH1, aiming at the bottom of the board. When the temperature rises enough, the fans should switch to high speed. You can hear the difference as they run faster. As the temperature cools back down, they should switch back to normal, low speed.

If you have the full front panel (SF-100xx models):

( ) Press the BAND button and then use the large knob to cycle through the bands. As you do so, you should hear the low-pass filter relays K4-K13 switch on and off.

( ) Turn off BAND mode and press the MENU button. Select the menu item marked “Amp:” and then change the selection from “Int 10W” to “Int 100W”. As you do so, you should hear relays K1, K2 and K3 switch. Alternate between “Int 10W” and “Int 100W” and you should hear the relays click on and off. Leave the selection at “Int 100W”.

If you have a remote-control-only version (S-100xx) of the Sienna:

( ) Connect to Sienna using Hyperterm or other RS-232 control program.

( ) Enter the following commands. After each one, you should hear the low-pass filter relays K4-K13 switch on and off:
FA00001800000;
FA00003500000;
FA00007000000;
FA00014000000;
FA00021000000;

( ) Enter the following command to enable the 100W amp:

PW2;

You should hear relays K1, K2 and K3 switch. Alternate between the commands “PW1;” (10W output) and “PW2;” (100W output) and you should hear the relays click on and off. Leave the selection at “PW2”.

( ) Short TP2 to ground using a clip lead or insulated wire. Measure the voltage at TP1 (“100V Back Bias”). It should read 100V +/-5V.

( ) Place a voltmeter on test point TP4. Slowly adjust pot RV1 (“Bias”) until the voltage reads 0.1V +/-0.02V. This sets the Class AB bias level such that each RF power transistor draws about 320mA of collector current. If you have a front panel, you can see the “PA Curr” value in the voltage/current monitor menu page.

( ) Turn off the radio and remove the power.

( ) Place a #6 x 1/16” Nylon spacer on top of the board in the front left corner and insert a 6-32 x 7/16” hex M/F spacer into it, tightening it into the 1 1/2” spacer.

( ) Remove the screw holding the tray upright, lower the tray back down and reattach it to the left bracket using two 6-32 x 1/4” screws.

( ) Insert a 6-32 x 1/2” screw into the left front corner of the DCD/Tuner board, into the spacers. Tighten it.

This completes installation of the 100W PA Option.

STEP-BY-STEP ASSEMBLY-Final Assembly

( ) Apply a small amount of RTV adhesive (in the 3 oz. tube) to all toroids on the receiver and transmitter boards (and tuner and 100W amplifier boards if present). Just a small dab in one spot is sufficient. Do not coat the entire toroid with the adhesive.

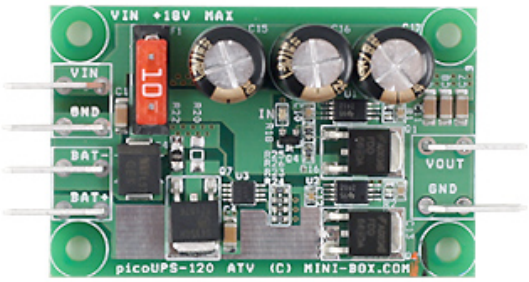
( ) Secure the front panel to the bottom chassis using four 6-32 x 1/4” screws (one or two should already be in place on the bottom).

( ) Place the top cover on the radio and secure it to the chassis using eleven 6-32 x 1/4” flathead black anodized screws.

( ) Affix the serial number sticker to the back panel between the LINE OUT and IF OUT connectors.

This completes assembly and test of the Sienna transceiver.

Appendix A: PC Power Wiring



The optional UPS (Uninterruptible Power Supply) board switches automatically between normal unswitched power from the DCD and a backup battery (not provided; place one in the compartment below the DCD board). If present, it then connects to the mini-ATX power supply which in turn provides power for the PC. This option is not recommended when you have the 100W amp installed, as there is no place to put a backup battery.

The UPS board mounts directly on the Sienna chassis in the compartment in front of the DCD board (rev C chassis) or on a small daughter board that mounts to the chassis (rev B chassis).

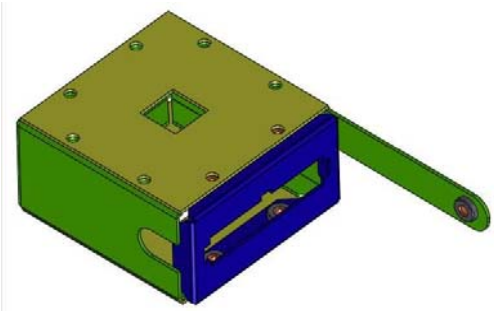
If you have purchased the UPS board:

( ) For rev B chassis: Attach the UPS to the daughter board first, using four 4-40 x 1/2” hex male/female spacers and four 4-40 KEPS nuts.

( ) Mount either the daughter/UPS assembly to the chassis using four 6-32 x 1/4” screws (rev B) or mount the UPS to the chassis directly using four 4-40 x 1/4” screws (rev C).

( ) Attach a battery to the BAT+ (Red) and BAT- (Black) terminals on the UPS using the provided wires with quick disconnect terminal lugs on the ends.

Standard parts provided with PC



Steel RFI shield
(2 pieces)

Power adapter
(Supplied with
PC)

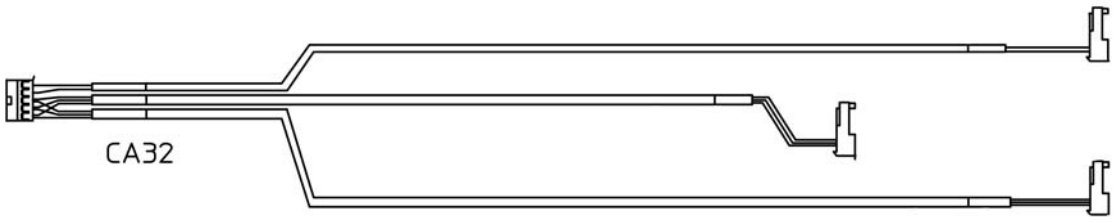
PC

2 jack screws

2 4-40 x 1/4” screws
6 6-32 x 1/4” screws

CF Mounting tray

2 #1 screws



#6 solder lug

CA6

Mini-ATX Power Supply

PC Power Supply Integration

( ) Insert the 20-pin white connector on the power adapter into the small sheet metal bracket (Shown in blue or darker color on previous page).

( ) Attach the mini-ATX supply to the 20-pin connector.

( ) Attach the outer steel shield cover to the housing using four 6-32 x 1/4” screws. Be sure to dress the cables through the openings at the bottom and side of the cover as shown in Photo A1.

( ) Secure the assembly to the small bracket using two 6-32 x 1/4” screws.

( ) Connect the quick disconnect terminals to the three cables that you placed in the PC compartment on an earlier step. Match red to red, black to black and white to white.

( ) Plug the two-pin connector into the PC motherboard as shown in Photo A1, with the black lead toward the back of the radio.

( ) Plug the white 12-pin connector into the PC motherboard.

( ) Dress the cables neatly inside the PC compartment.

( ) On CA6, in the DCD compartment, solder one end of the stripped and tinned 18” red wire to the pin connected to the red Anderson Powerpole connector at J12 on the DCD board.

( ) On CA6, locate the black wire with the quick disconnect terminal on one end and nothing on the other end. Solder the unterminated end to a #6 solder lug. Remove the screw in the front left corner of the DCD board and insert the solder lug, then re-tighten the screw.

( ) Connect the 4-pin MTA connector on CA6 (in the DCD compartment) to J8 on the DCD board.

( ) If you have installed the UPS, connect the quick disconnect on the red wire at the DCD end of CA6 to the terminal marked VOUT. Connect the quick disconnect on the black wire to the terminal marked GND. Connect the VIN and GND terminals to the red and black wires connected to the DCD board.

( ) If you have not installed the UPS, connect the quick disconnects on the red and black wires to the quick disconnects on the wires of the same color attached to the DCD board.

This completes installation of the PC power supply.

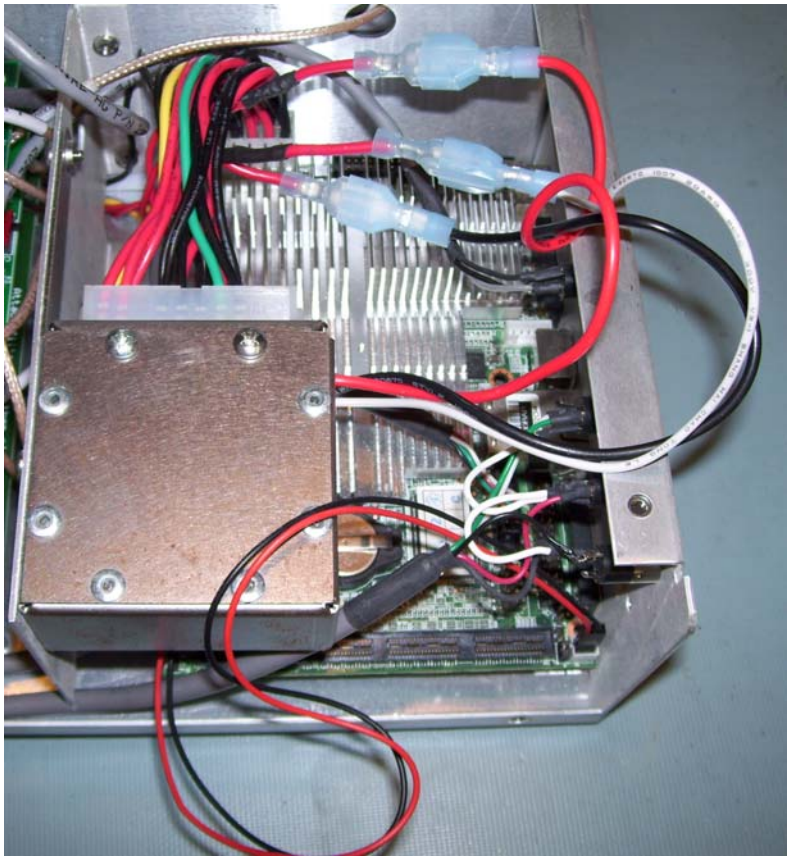
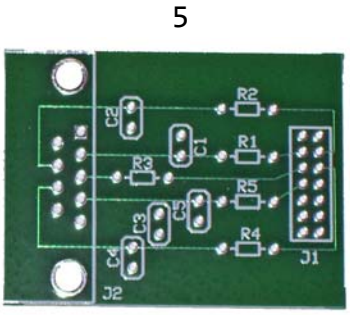


Photo A1. ATX Shield mounting

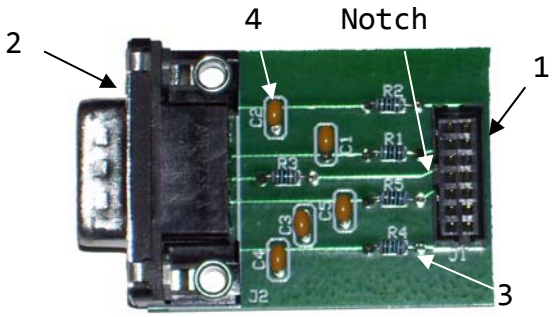
Appendix B: RS232 Board

PARTS LIST

Item	Part	Description	Qty
1	J1	14-pin 2mm connector	1
2	J2	DB-9 PC-mt right-angle connector (male and female provided, see assembly notes	1
3	R1,R2,R3,R4,R5	100 ohm 1/8W resistor	5
4	C1,C2,C3,C4,C5	150pF monolithic capacitor	5
5		RS232 Board blank	1



RS232 Board, blank



RS232 Board, assembled

STEP-BY-STEP ASSEMBLY-RS232 Board

( ) Load and solder all resistors. Clip the leads.

( ) Load and solder all capacitors. Clip the leads.

( ) Load and solder the 14-pin rectangular connector. The side with a notch faces inward (See note on photo.)

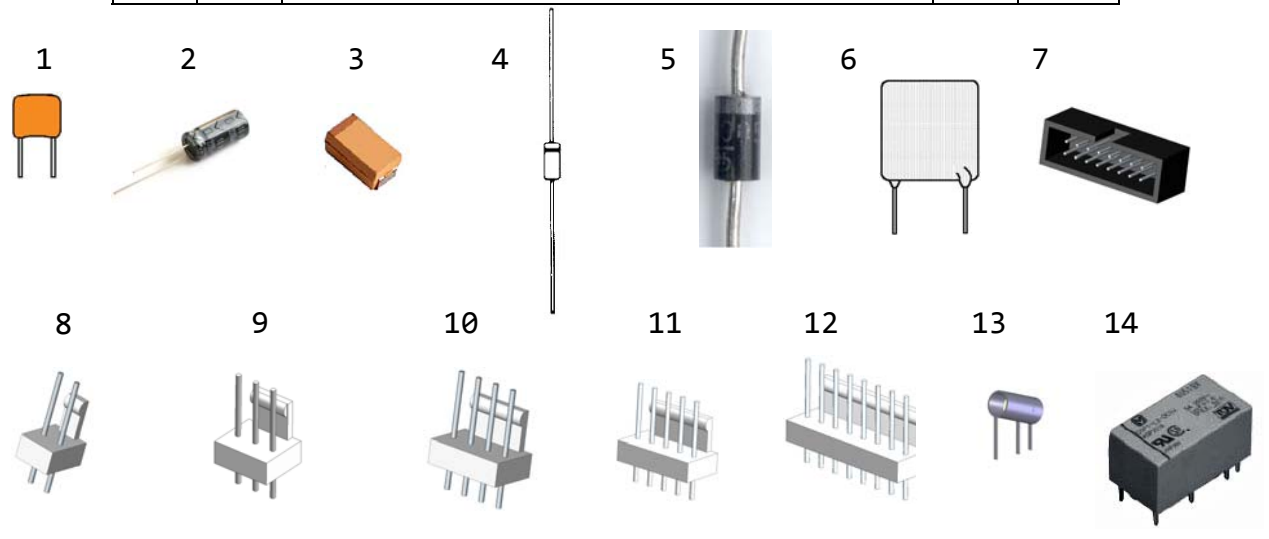
( ) Load and solder the 9-pin D-subminiature connector. If you want a male connector facing out the back panel, load the ***male*** DB9 connector to the top (component side) of the RS-232 board and install the board with components facing up. If you do this, you will most likely need a "gender changer" on the connector, because most RS-232 cables have male connectors on them. If you want to avoid the use of the adapter, load the ***female*** DB9 connector to the **BOTTOM** (circuit side) of the board and install the board upside down. Note that the connector that the controller interface cable attaches to will now be upside down. A male and female DB9 connector have bee provided in the kit.

This completes assembly of the RS-232 Board. This board is only used when no PC is installed in the Sienna.

Appendix C1: DCD/Tuner Board [DCD Section]

PARTS LIST

Item	Part	Description	Qty	Bag Nr
1	C3 C4 C16 C18 C19 C21 C25 C26 C28	.1uF 50V monolithic X7R 5%	9	1
2	C1 C2 C20 C22 C23 C29	100uF/25V 20% aluminum electrolytic	6	1
3	C24 C27	22uF/25V tant "D" 1 ohm ESR	2	1
31	R28	165K ohm 1/8W 1%	1	1
4	D8 D11 D12	1N4007B 1000V rectifier diode	3	2
4	D5 D9	1N5223B-2.7V Zener diode	2	2
4	D7	1N5711 Schottky diode	1	2
4	D10	1N5818 Schottky diode	1	2
5	D6	1N5404 power rectifier	1	2
6	F1	9A PTC Resettable fuse	1	2



Item	Part	Description	Qty	Bag Nr
31	R12 R19 R23 R27	1M ohm 1/8W 1%	4	2
7	J2 J1	16-pin 2-row .1" centers shrouded male header	2	3
8	J5 J6	2-pin .1" centers male keyed header	2	3
9	J9	3-pin .1" centers male keyed header	1	3
10	J8	4-pin .1" centers male keyed header	1	3
11	J10 J4	5-pin .1" centers male keyed header	2	3
12	J7	8-pin .1" centers male keyed header	1	3
13	J11 J14	Taiko-Denki RF jack PCB	2	3
22		Anderson Powerpole contact, right angle PCB mount	2	3
23	J12	Anderson Powerpole connector - red	1	3
23	J13	Anderson Powerpole connector - black	1	3
14	K17 K18	DSP1A-DC12	2	4
15	K19	ET1 25A SPDT Relay	1	4
16	L8 L9	47uH shielded/ferrite	2	4
17	RFC1	Type 77 Toroid	1	4
18	RN1	Resistor network, .1" centers, 10-pin 10K	1	4
19		Screw - 4-40 x 1/4" PH Phillips M/S	2	4

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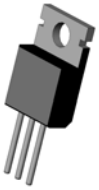


Item	Part	Description	Qty	Bag Nr
20		4-40 shoulder washer	2	4
21		TO-220 insulator	2	4
		Magnet wire, red 24AWG (inches)	8	4
24	Q1	TIP41C power transistor TO-220	1	5
25	Q2 Q4 Q5	2N7000 MOSFET	3	5
29	U10	MAX765 8-pin DIP	1	5
26	U2	74HC273 octal D flip-flop 20-pin DIP	1	6
27	U4	ULN2803 relay driver 18-pin DIP	1	6
28	U6	LM339 quad comparator 14-pin DIP	1	6
29	U7	LM393 dual comparator 8-pin DIP	1	6
30	U8	AP1084-5 5V regulator TO-220 (“84-50”)	1	6
30	U9	LM2940CS-9 9V regulator TO-263	1	6
31	R29 R30	51 ohm 1W small metal oxide 5%	2	7
31	R20	100 ohm 1/8W 1%	1	7
32	R26	470 ohm 2W small metal oxide 5%	1	7
31	R8 R18 R21 R22	1K ohm 1/8W 1%	4	8
31	R10 R17	3.3K ohm 1/8W 1%	2	9
31	R25	4.7K ohm 1/8W 1%	1	10
31	R1 R2 R9 R14	10K ohm 1/8W 1%	4	11
31	R3 R11 R13 R24	22K ohm 1/8W 1%	4	12
33		Blank DCD Board	1	13

25 

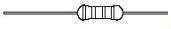
26 

27 

28 

29 

30 

31 

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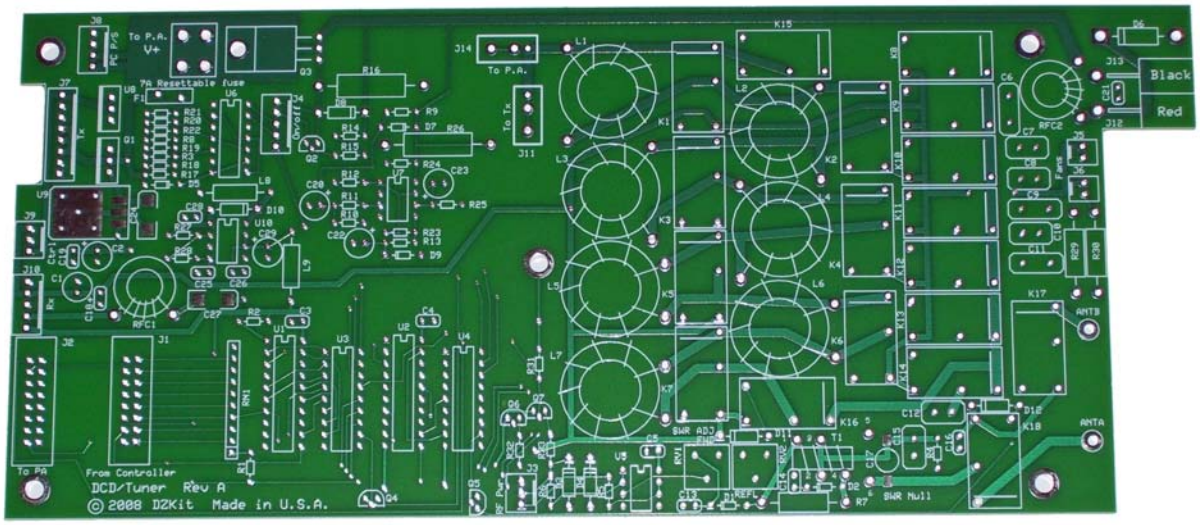

To P.A.
V+
PA Resettable fuse
To P.A.
To Tx
Black
Red
ANTB
ANTA
SWR ADJ
SWR Null
From Controller
DCD/Tuner Rev A
© 2008 DZKit Made in U.S.A.

STEP-BY-STEP ASSEMBLY-DCD Board

Highlight or check off each part on the parts list that came inside the bag as you install it on the board. Unless otherwise instructed, load all parts of the same type from each bag and clip the leads after soldering.

( ) Load and solder all capacitors, one bag at a time, including electrolytic capacitors, being careful to observe polarity (see page 8).

Note: The tantalum electrolytics C24 and C27 mount with the stripe aligned with the angled side of the silkscreen:

( ) Load and solder all resistors, one bag at a time. Clip the leads. Note that some resistors are in bags that also contain other parts.

( ) Load and solder all diodes, one bag at a time, being careful to observe polarity (page 8). The side with a band (the cathode) goes in the square pad. Note that some diodes are in bags that also contain other parts.

Note that D6, the large 1N5404, mounts vertically; place it with the band down and bend the lead over and into the round pad:

( ) Load and solder inductors L8 and L9.

( ) Load and solder F1, the 9A Resettable fuse. Bend this part over at a 45 degree angle so that it does not hit the top cover when it is installed.

( ) Load and solder the resistor network. Be sure that the side with the dot goes into the square pad.

( ) Load and solder Q2, Q4 and Q5. Line up the flat side of the transistor with the flat side of the silkscreened outline. Spread the transistor leads apart as you insert the part into the board. The parts should be inserted until the bottom of the plastic transistor body is about .1” off the board.

( ) Insert the right angle Anderson Powerpole (APP) contacts

into the red and black bodies:

( ) Attach the APP connectors together with the red and black bodies in the orientation labeled on the board. Position the connectors so that their bodies match the outline on the board, then bend the leads down. Load and solder the connectors to the board. Clip the excess leads off on the bottom of the board.

( ) Wrap five turns of #22 magnet wire around Toroid RFC1. Insert the toroid into the board with the cylinder facing vertically. Solder the leads. Maintain heat for about 1 minute, long enough to melt the coating and cause solder to flow onto the lead and the pad. Be sure your soldering iron is set to at least 750 degrees. Clip any excess leads. Using an ohmmeter, verify that there is continuity from one pad to the other. If not, reheat the connections.

( ) If you plan to install the tuner parts during initial assembly of this board, skip the next step.

( ) Cut a 4” length of magnet wire. Insert one end into the bottom pad of L7 with about 1/2” extending out the bottom of the board. Insert the other end into the top pad of L1 and pull the wire taut. Solder both ends using magnet wire soldering procedures described earlier.

( ) If you plan to install the transmitter, skip the next step.

( ) Place a 1” length of bare wire in the holes marked “5” and “6”, next to transformer T1. Solder the wires as described earlier and clip extra lead length.

( ) Load and solder relays K17, K18 and K19. They will only go in one way.

( ) Place U9, an SMT regulator, on the board where marked. Hold it in place while soldering one pin, then solder the other two pins. Finally, heat the tab and apply solder until it flows evenly along the bottom and sides of the tab. Apply solder to the five pads beneath the part on the bottom of the board too.

( ) Load and solder all remaining Integrated Circuits ***except U8***, one bag at a time. Make absolutely sure that the ICs are inserted with pin 1 oriented correctly. When holding an IC horizontally so that

you can read the printing from left to right, pin 1 is in the lower left corner. It is often marked with a dot, and there is also often a notch on that side of the IC. Pin 1 goes in the square pad on the board. Be especially careful when loading U5 and U7, since they look alike.

( ) Load and solder connectors J1 and J2. Pin one of these connectors is marked with an embossed triangle on one side. Line this up with the square pad. The side with a single notch faces the resistor network. Be sure the connectors are flush with the board.

( ) Load and solder the two RF connectors, J11 and J14. These connectors are mounted at a 45 degree angle. First bend the end pin down, compress the two larger pins slightly, and push the connectors into the holes. It is OK for the body of the part to touch the board—it will not short out the center conductor.

( ) Load and solder all other connectors **except J3**, which is included with the SWR kit. Be sure to align the tab on the white AMP MTA connectors with the thick silkscreened bar. Be sure the connectors are flush with the board.

( ) Clip the pins of 8-pin connector J7 as close as possible to the board.

Note: In the next two steps, be sure that these regulators are mounted to the **BOTTOM** side of the board.

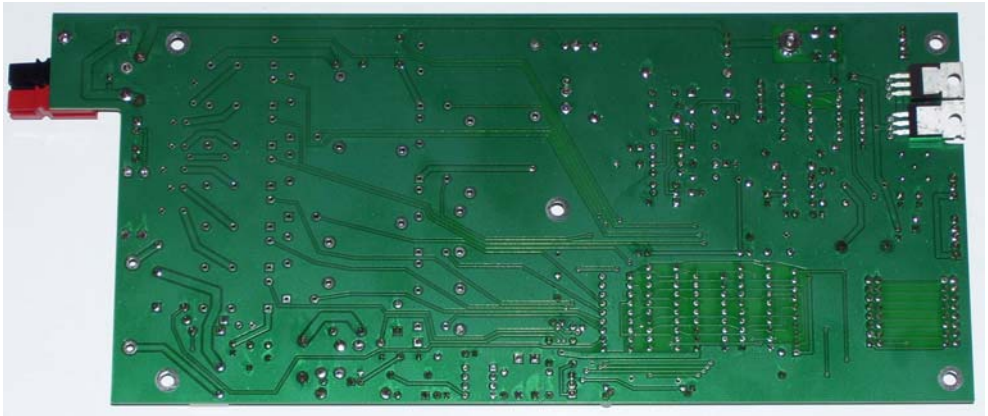
( ) Bend the leads of U8 *up* 0.8” from the end of the tab. Insert U8 from the ***bottom*** of the board, such that the bottom of the tab is 1/4” from the bottom of the PC board. Solder only one pin, just enough to keep the part from falling out. It will be secured to the chassis when the board is installed.

( ) Repeat the previous step with Q1 (again, mounting it on the ***bottom*** of the board). Since Q1 and U8 look alike, be sure the right part is placed in the right location.

( ) Check your work. Pay particular attention to connectors and ICs, making sure that every pin is soldered. Hold the board at an angle and make sure all leads have been clipped.

This completes construction of the DCD (DC Distribution) portion of the DCD/Tuner board.

DCD Board, front, tuner section not installed, SWR meter installed



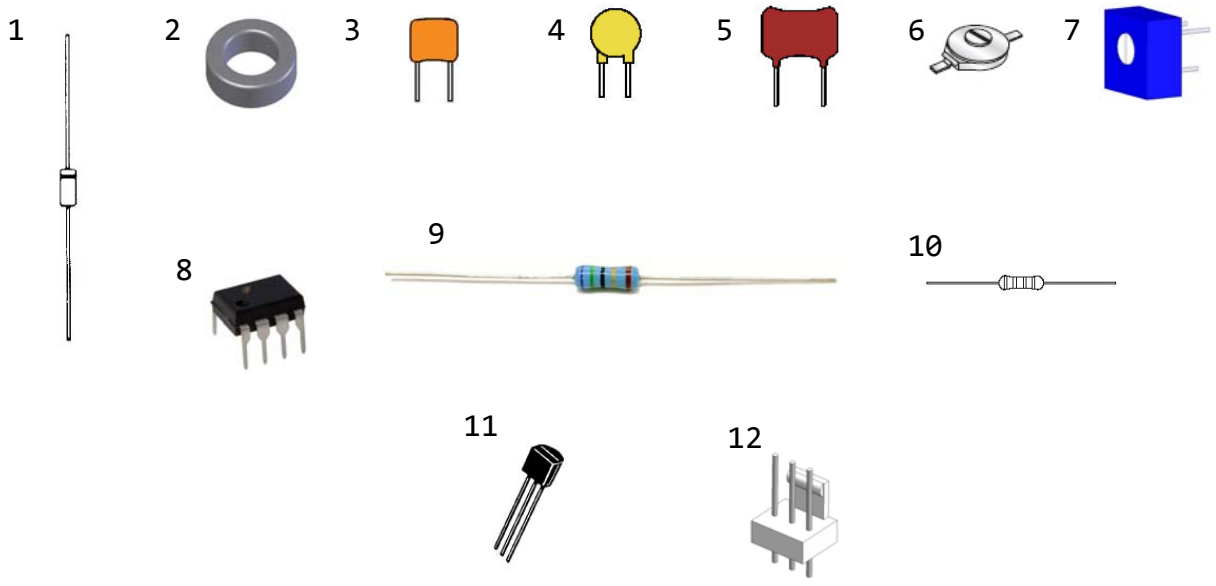
DCD Board, back, tuner section not installed, SWR meter installed

Appendix C2: DCD/Tuner Board [SWR Section]

PARTS LIST

Note: These parts are included with the transmitter board

Item	Part	Description	Qty	Bag
1	D1, D2	1N5711 Schottky diode (blue)	2	1
1	D3, D4	1N4733A 5.1V 1W Zener diode (red)	2	1
2	T1	FT50-43 toroid	1	1
3	C5	.1uF monolithic capacitor	1	1
4	C13, C14	1000pF ceramic disk capacitor	2	1
5	C15	100pF silver mica capacitor	1	1
6	C17	30pF trimmer capacitor	1	1
7	RV1, RV2	100K top adjust trimpot	2	1
8	U5	LM358 dual op-amp	1	1
9	R7	200 ohm 1W	1	1
10	R4	3.3K ohm	1	2
10	R32, R33	4.7K ohm	2	3
10	R5, R6, R31	10K ohm	3	1
11	Q6, Q7	2N7000 MOSFET	2	1
12	J3	3-pin AMP MTA male keyed header	1	1
		Bare wire 18# (inches)	2	2
		Magnet wire - 24# red (inches)	12	2
		Magnet wire - 24# green (inches)	12	2



( ) Load and solder all capacitors, including C17, the 30pF trimmer capacitor. The trimmer can be installed either direction.

( ) Load and solder all resistors, one bag at a time. Clip the leads. Note that some resistors are in bags that also contain other parts.

( ) Load and solder all diodes, one bag at a time. Note that some diodes are in bags that also contain other parts.

( ) Load and solder the trimpots, RV1 and RV2.

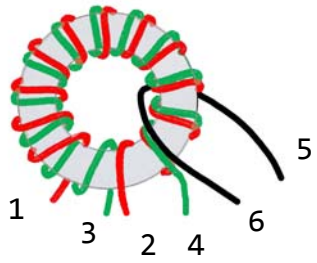
( ) Load and solder U5, the LM358 8-pin DIP. Be sure pin 1 goes into the square pad.

( ) Load and solder Q6 and Q7. Spring the leads slightly when inserting these transistors, and make sure the flat side of the transistor lines up with the flat side on the silkscreen.

( ) Load and solder J3, the 3-pin MTA connector. Be sure the side with the vertical tab is aligned with the thick white bar on the silkscreen.

( ) Cut two lengths of #24 magnet wire 10” in length. Fold 1/4” of both ends of one wire back onto itself. Twist the two wires together, about 2 turns per inch. Wrap twelve turns of the finished wires around toroid T1. Insert the toroid into the board with the unfolded leads going into pins 1 and 2 and the folded leads into pins 3 and 4 (after unfolding them so they fit in the holes). Follow soldering instructions given in the previous step. See detail C2-1.

( ) Cut 1 1/2” of 22# magnet wire. Insert the wire through toroid T1 and solder the ends to pins 5 and 6. (If you earlier installed a wire between pins 5 and 6, remove it before installing T1.)



Detail C2-1. T1 construction (2nd winding shown in green for clarity)

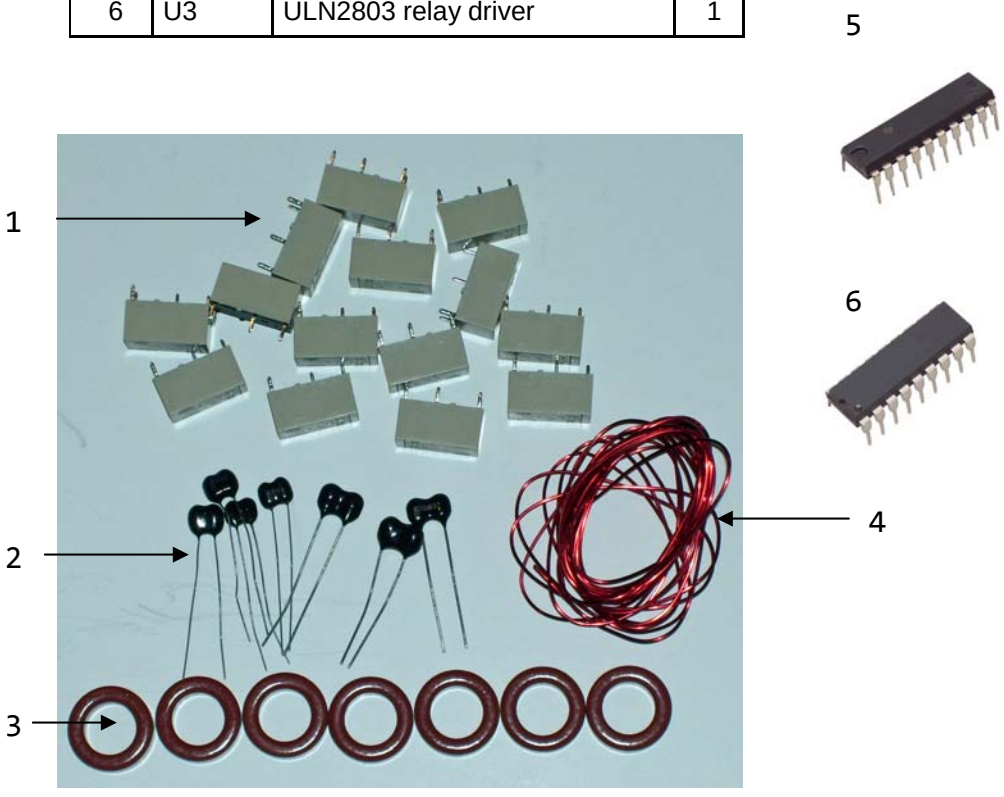
( ) Check your work. Pay particular attention to connectors and ICs, making sure that every pin is soldered. Hold the board at an angle and make sure all leads have been clipped.

This completes assembly of the SWR section of the DCD/Tuner board.

Appendix C3: DCD/Tuner Board [Tuner Section] (Option 102)

PARTS LIST

Item	Part	Description	Qty
1	K1-K16	SPST 12V relay, 8A	16
2	C12	10pF silver mica (sm)	1
2	C11	20pF sm	1
2	C10	39pF sm	1
2	C9	82pF sm	1
2	C8	150pF sm	1
2	C7	330pF sm	1
2	C6	560pF sm	1
3	L1-L7	T80-2 Toroid	7
4		20# magnet wire	10’
5	U1	74HC273 octal D flip-flop	1
6	U3	ULN2803 relay driver	1



Note: Capacitors are marked with actual value, e.g. “330”, in pF.

STEP-BY-STEP ASSEMBLY-Tuner Board

Note: Be very careful not to let your soldering iron touch plastic parts on the DCD board as you install these parts.

( ) If you are installing this option after you finished wiring your Sienna, first disconnect power, remove all cables and screws from this board, remove the Fan mounting bracket, remove the nuts holding in the two SO-239 connectors and the ground lug, and pull the DCD/Tuner board out of the unit. Also unsolder the wire that runs diagonally across the board.

( ) Wind 31 turns of 20 gauge magnet wire around toroid L1. See detail photo on next page. Each time the wire enters the toroid counts as one turn. Leave about 1/2” lead exposed. Do not space the leads evenly around the core – wind them tightly together. See photo of assembled unit.

( ) Load and solder the toroid where noted on the board. Be sure it lies flat on the board and tighten the leads as much as possible. Once the board has been tested, you will apply a small amount of glue to keep the toroids from moving, but it is not necessary to do so at this time. Apply heat to each lead for at least one minute to be sure that the coating melts off and the lead is securely soldered to the board. Then clip excess leads.

( ) Wind 22 turns of magnet wire around toroid L2. Solder the toroid in place.

( ) Wind 15 turns of magnet wire around toroid L3. Solder the toroid in place.

( ) Wind 10 turns of magnet wire around toroid L4. Solder the toroid in place.

( ) Wind 5 turns of magnet wire around toroid L5. Solder the toroid in place.

( ) Wind 3 turns of magnet wire around toroid L6. Solder the toroid in place.

( ) Wind 2 turns of magnet wire around toroid L7. Solder the toroid in place.

( ) Load and solder all silver mica capacitors. Clip the leads.

( ) Load and solder all 16 relays.

( ) Load and solder both ICs, making sure pin 1 goes into the hole with the square pad.

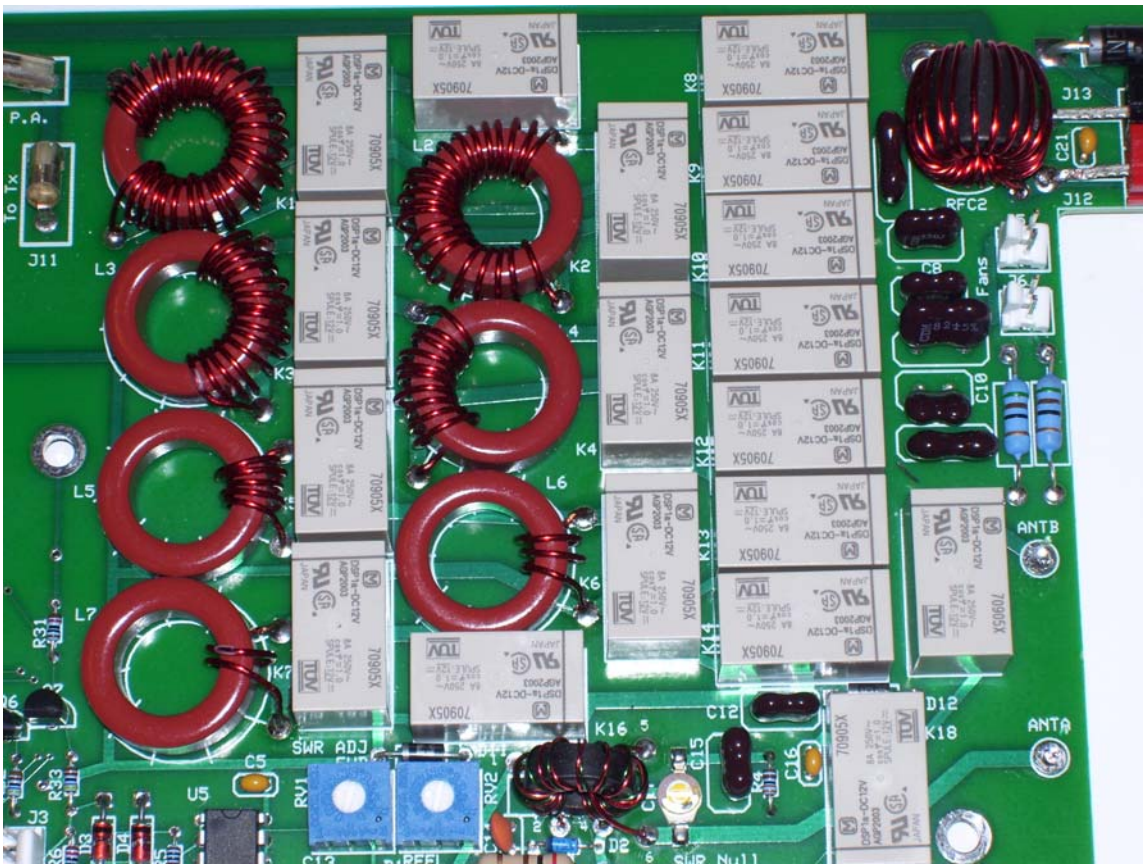
( ) Using an ohmmeter, verify continuity (< 1 ohm) between the two pads that each toroid’s wires are soldered to.

If any do not read correctly, re-heat the connections making sure that all enamel is removed.

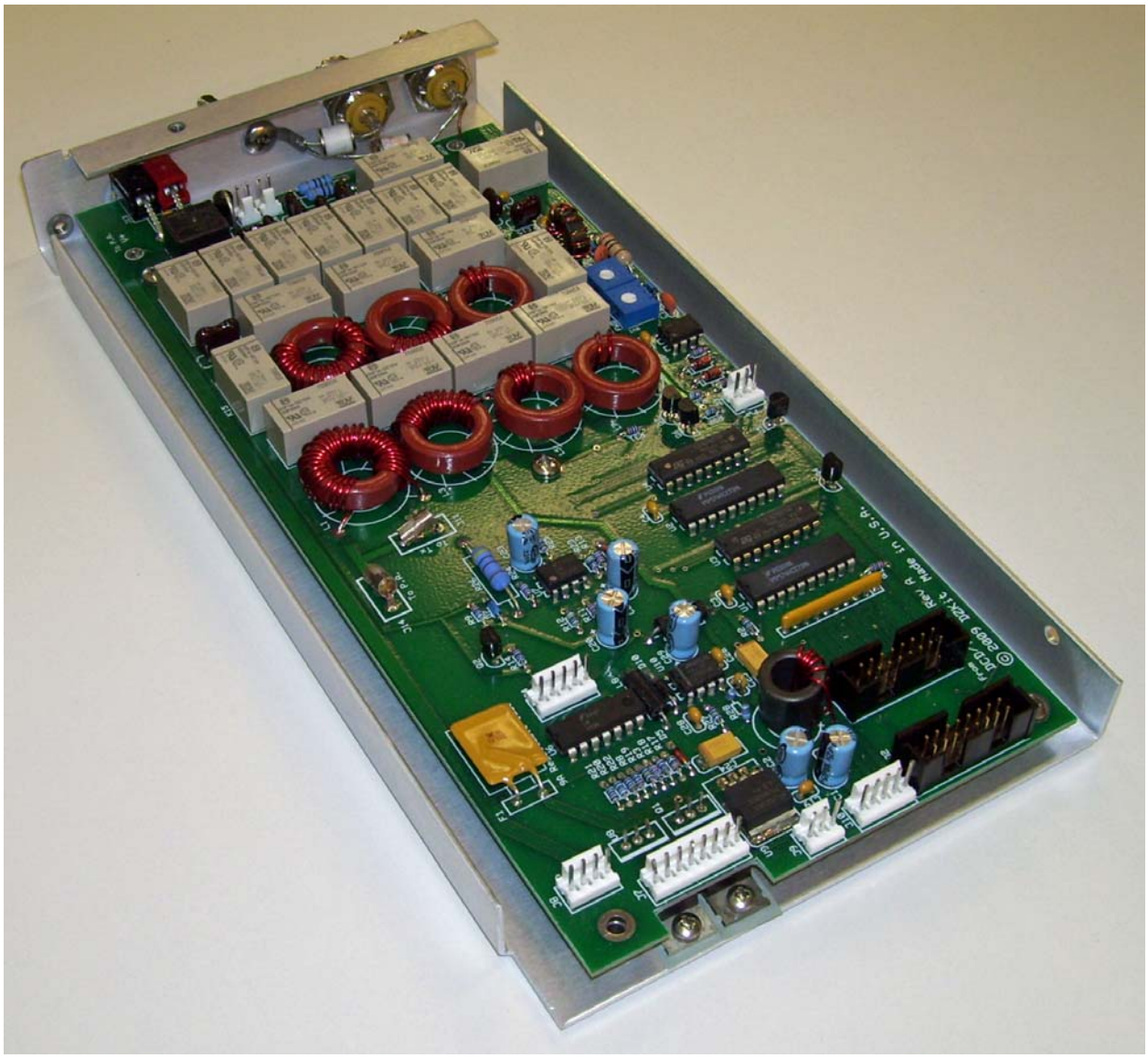
( ) Check your work.

( ) If this is an upgrade, reinstall the board and reconnect cables.

This completes assembly of the Tuner section of the DCD/Tuner board.



Detail photo showing correct winding of tuner toroids



DCD Board, tuner and SWR meter installed, on tray

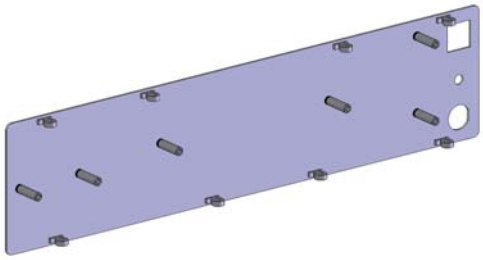
Appendix D1-Front Panel without controls

PARTS LIST

Item	Description	Qty
1	Screw - 6-32 x 1/4" PH Phillips M/S	6
2	Front Panel—no controls sheet metal	1
3	Front panel– no controls polycarbonate overlay	1
4	Controller Board	1

1

2



3

4

There are no assembly steps here. See the integration pages (pp 36-37) for front panel assembly for information regarding assembly of this module.

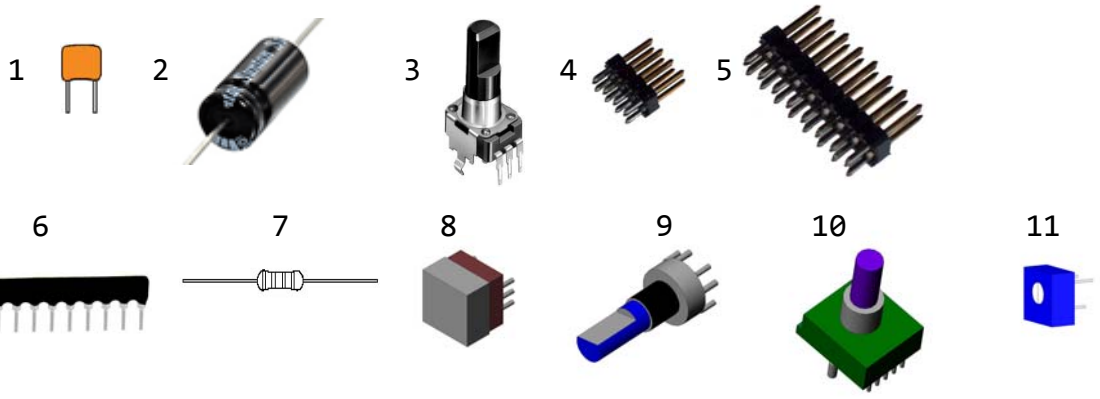
Appendix D2-Front Panel with controls

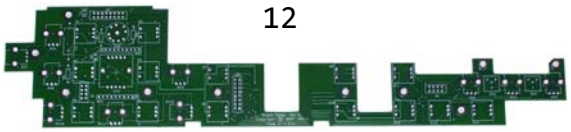
35

PARTS LIST—PC Board

Note: These parts comprise bag #1 for the front panel option

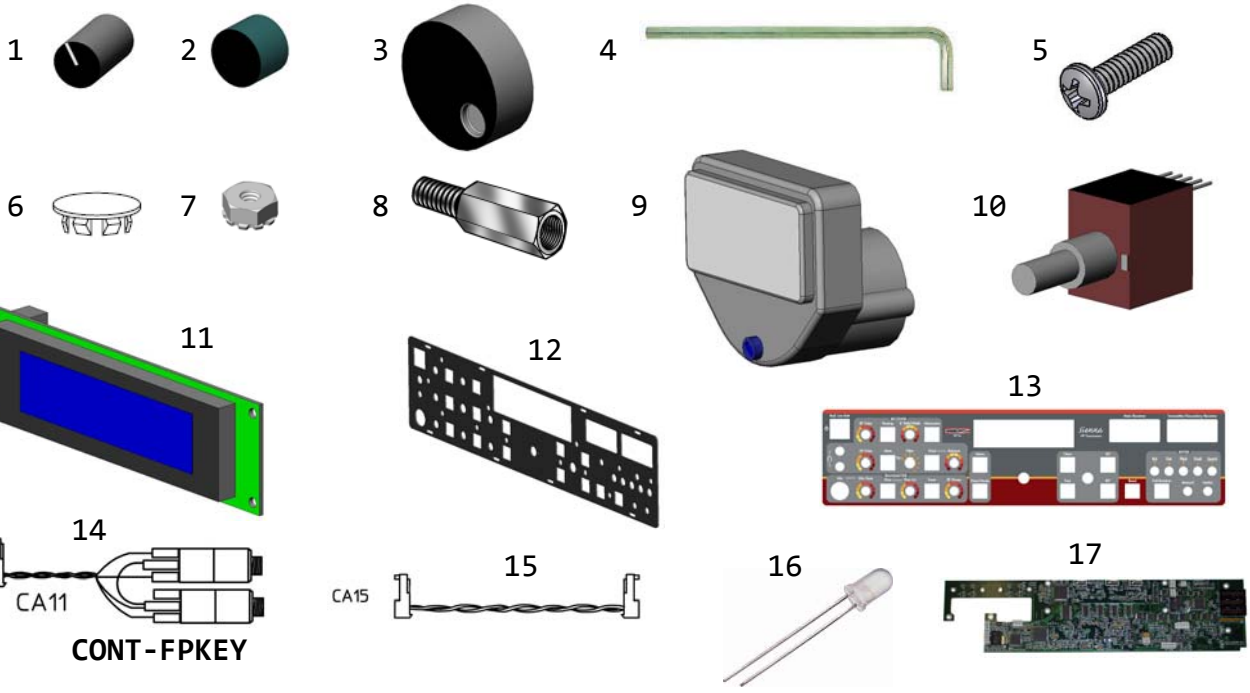
Item	Part	Description	Qty	Bag
1	C1, C2	.1uF monolithic capacitor	2	1
2	C3	100uF/25V axial leaded electrolytic capacitor	1	1
3	RV1,RV3, RV5-RV12	10K 9mm snap-in pot	10	1
4	J2,J4	8-pin 2-row male header	2	2
5	J3, J5	16-pin 2-row male header	2	2
6	RN1,RN2	1K - 5 isolated resistor network	2	1
7	R4	100 ohm 1/4W resistor	1	1
7	R1,R2	1K ohm 1/4W resistor	2	2
8	S1-S14	NKK Lighted Pushbutton	14	2
9	S16	Rotary Encoder/switch	1	1
10	S15	SP8T Rotary switch	1	1
11	RV2,RV4	Trimpot 10K top adjust	2	1
12		Blank board	1	-





PARTS LIST—Hardware

Item	Part	Description	Qty	Bag
1		Knob-small	12	2
2		RIT Knob	1	2
3		Tuning knob	1	2
4		.05” Hex key	1	4
4		1/16” Hex key	1	4
4		5/64” Hex Key	1	4
5		Screw - 6-32 x 1/4" PH Phillips M/S	14	4
6		Hole plug—.25” Nylon	2	4
7		Nut - 2-56	4	4
8		Hex M/F spacer - 6-32 x 7/16"	4	4
8		Hex M/F spacer - 6-32 x 1/2"	4	4
9		S-meter	1	4
9		Transmit meter	1	4
10		Rotary Pulse Generator (RPG)	2	3
11		Vacuum Fluorescent Display (VFD)	1	4
12		Front panel sheet metal	1	4
13		Front panel polycarbonate overlay	1	4
14	CA11	CA11—CONT-FPKEY cable	1	4
15	CA15	CA15—2-pin MTA to 2-pin MTA cable	1	4
16		White LED	4	3
17		Controller Board (assembled)	1	-



STEP-BY-STEP ASSEMBLY-Front Panel Board

( ) Load and solder the two monolithic capacitors (Bag 1) at C1 and C2.

( ) Load and solder the 100uF electrolytic capacitor C3 (Bag 1). The positive side has an indentation in the body and goes in the hole with the square pad.

( ) Load and solder the two resistor networks (Bag 1). Although these are symmetric, so orientation does not matter, it is good practice to put the dotted side in pin 1, the square pad.

( ) Load and solder the 100 ohm resistor (Bag 1).

( ) Load and solder the two 1K ohm resistors (Bag 2) at R1 and R2.

( ) Clip all leads done so far.

( ) Load and solder all rotary pots (Bag 1). Make sure they lie flush on the board.

( ) Load and solder the rotary encoder (Bag 1).

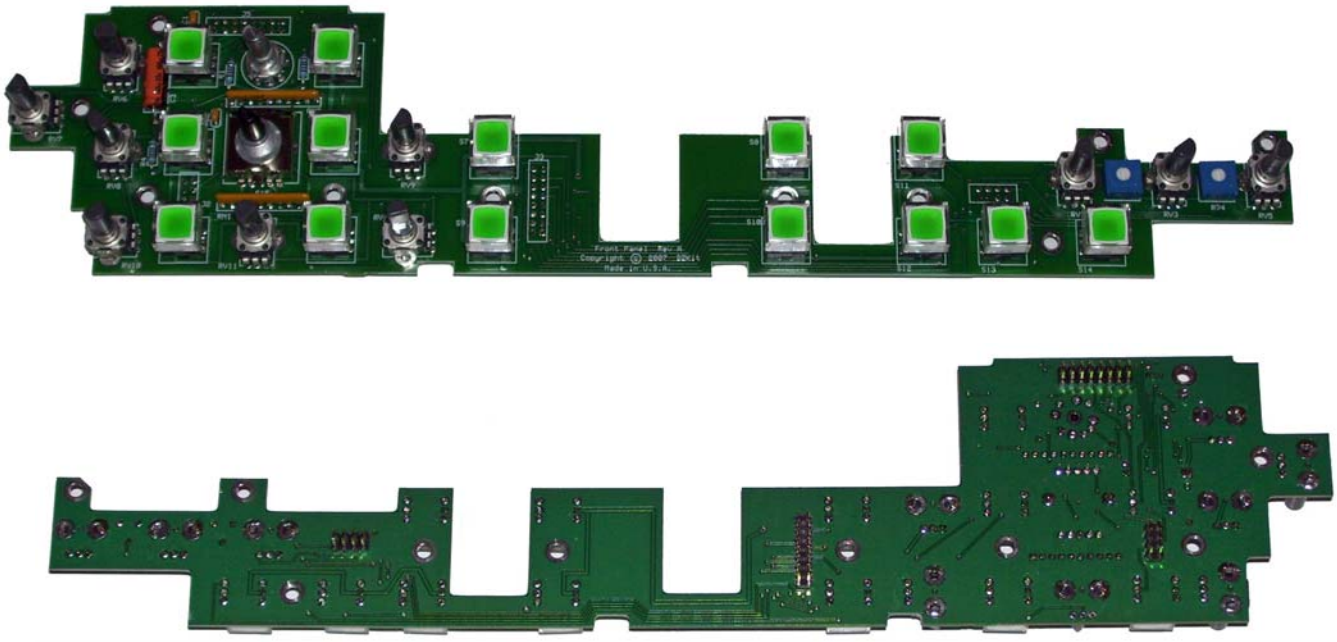
( ) Load and solder the two trimpots, RV2 and RV4 (Bag 1).

( ) Bend the small tab on the 8-position rotary switch (Bag 1) 90 degrees. Remove and save the lockwasher and nut. Load and solder the switch.

( ) Mount all connectors (Bag 2) to the back of the board - the non-silkscreened side; i.e., solder them on the top side. Make sure they are flat against the bottom side of the board.

( ) Insert the NKK pushbutton switches into the front panel board one at a time. (See note on next page.) Solder each one as it is installed before doing the next one. Be sure that the text on the back of the switch faces UP. There is a "+" symbol next to the middle pin on one side and a "-" symbol on the middle pin on the other side of the switch. The "+" side goes to the square pad. It is very important to get these right as the lights will not work if you get them reversed, and removing the switches is not trivial. ***Tip: solder one pin while holding the board vertically, then lay it on a flat surface and heat that pin back up while you seat the switch on the board.*** The plastic body must be absolutely flat and even. Be very careful not to touch the plastic switch covers with the soldering iron - they will melt.

This completes assembly of the Front Panel board. Keep the hardware bags for use in front panel integration.

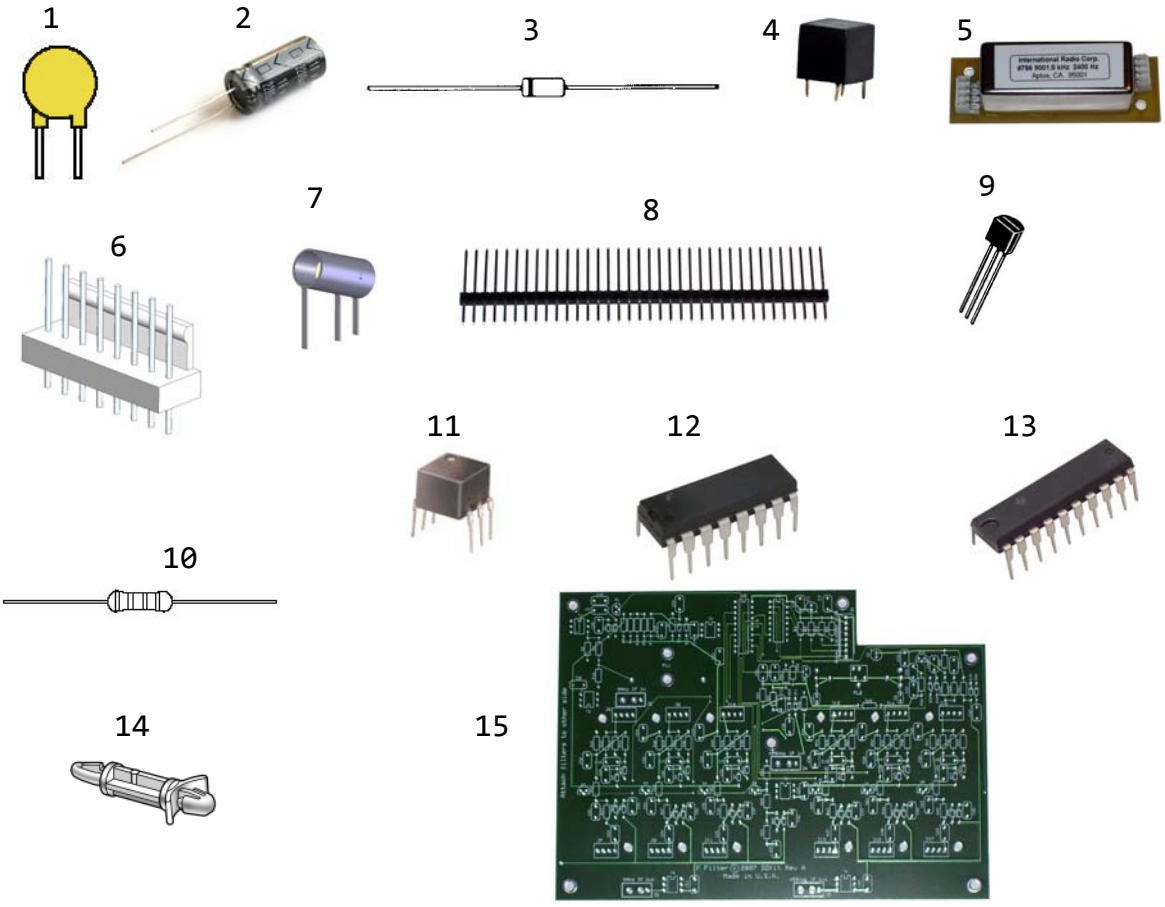


Note: If you bought your front panel with specific LED colors and/or keycaps, be sure to look at the front panel polycarbonate panel and determine which ones you want where before soldering them in. Keycaps are fairly easy to interchange, but LEDs are not, since they are integral to the switch. If you bought a combination of colored LEDs, they will have been packed in separate bags. Be careful not to intermix them prior to assembly, because they are hard to tell apart.

Appendix E: IF Filter Board

PARTS LIST

Item	Ref Desig	Description	Qty	Stock Bin	Bag Nr
1	C30-47	10pF 50V ceramic disk NP0 5%	18	233	1
10	R18	68 ohm 1/4W 1%	1	433	1
1	C5 C6	27pF 50V ceramic disk NP0 5%	2	119	2
1	C3, C4 C7-29 C48-70	.1uF 50V ceramic disk Y5U 5%	48	8	2
2	C1, C2	10uF/25V aluminum electrolytic 20%	2	211	2
10	R21 R56-63	150 ohm 1/4W 1%	9	28	2



Item	Ref Desig	Description	Qty	Stock Bin	Bag Nr
3	D1-D36	1N914 signal diode	36	50	3
9	Q1-Q10	2N7000 MOSFET	10	227	3
10	R9, R12, R15	300 ohm 1/4W 1%	3	246	3
12	U1	74HC139 dual 2-4 decoder 16-pin DIP	1	312	3
13	U2	74HC240 octal buffer 20-pin DIP	1	401	3
4	FL2	LTM455DU ceramic filter	1	402	4
6	J1	8-pin .1" centers male keyed header	1	79	4
7	J2 J3 J4 J5 J18 J19	Taiko-Denki RF jack PCB-mt	6	407	4
8		36-pin 1-row male tall pins	2	397	4
10	R13, R16	470 ohm 1/4W 1%	2	44	4
14		Board lock 3/16" Nylon (Richco LCBSM-3-01)	12	107	4
10	R14,R25 R28, R31 R34, R36	620 ohm 1/4W 1%	6	42	5
10	R8, R10, R19	1.2K ohm 1/4W 1%	3	436	6
10	R5, R6, R7 R11, R17 R20, R23 R37, R38 R39	2.4K ohm 1/4W 1%	10	437	7
11	T5, T6	T36-1 36:1 transformer 6-pin DIP	2	364	7
10	R1-R4 R26, R29 R32, R35 R46-R55	10K ohm 1/4W 1%	18	17	8
10	R22, R24 R27, R30 R33 R40-R45	20K ohm 1/4W 1%	11	248	9
11	T1, T2	T2-1T tapped 2:1 transformer 6-pin DIP	2	362	9
11	T3, T4	T4-1 4:1 transformer 6-pin DIP	2	118	10
5	FL3	9.0015MHz 2.4KHz Inrad Crystal Filter	1	354	
15		Blank IF Filter Board	1	boards	

STEP-BY-STEP ASSEMBLY-IF Filter Board

IMPORTANT! ALL parts are mounted on the top (silkscreened) side of the board EXCEPT J1, all filters and the connectors that are formed out of the 36-pin, single row connector.

Highlight or check off each part on the bag label as you install it on the board. Unless otherwise instructed, load all parts of the same type from each bag and clip the leads after soldering.

( ) Load and solder all 1N914 diodes. Make sure that the side with a band on it goes into the hole with a square pad. Clip the leads as close to the board as possible (called "close-clipping").

( ) Load and solder all capacitors. Make sure the electrolytic capacitors are loaded with the long (+) lead in the holes with square pads and marked on the silkscreen with a '+'. Close-clip the leads. Use silkscreened text and/or ExpressPCB to help you locate the parts.

( ) Load all resistors. Use silkscreened text and/or ExpressPCB to help you locate the parts.

Note: In the next three steps, you will load transformers. They look exactly the same but there are three different values. Be sure to load the one that is called out and double check before soldering!

( ) Load and solder transformers T1 and T2. These are marked T2-1T. Pin 6 (yes, pin 6) is marked with a dot. It must be loaded into the hole with the square pad.

( ) Load and solder transformers T3 and T4. These are marked T4-1.

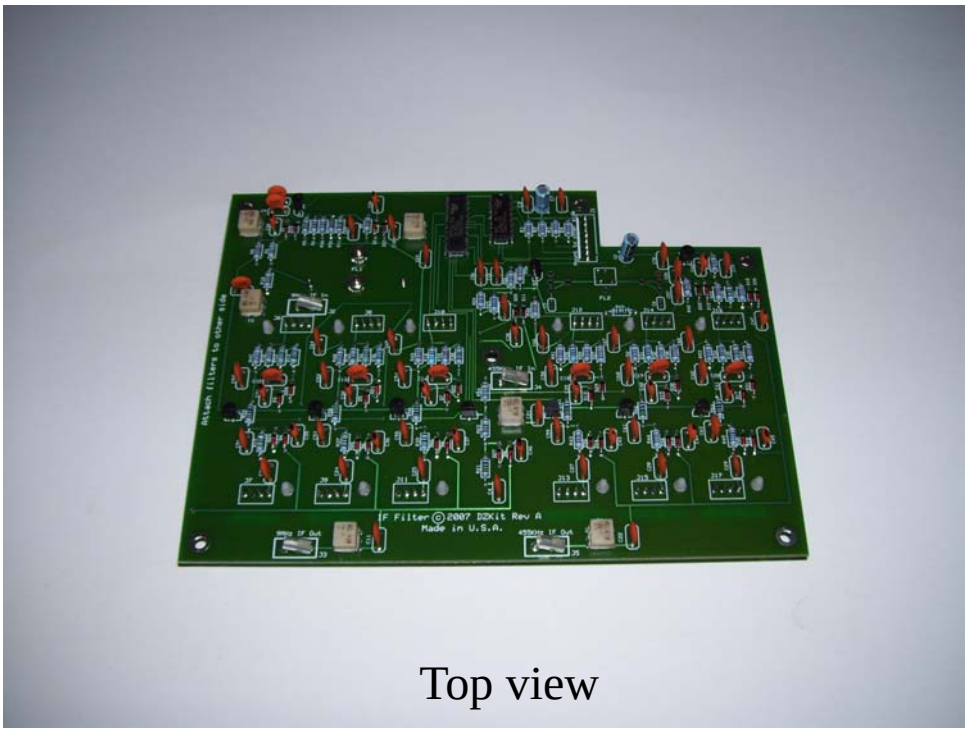
( ) Load and solder transformers T5 and T6. These are marked T36-1.

( ) Load and solder IC's U1 and U2. Make sure that pin 1 goes in the hole with the square pad.

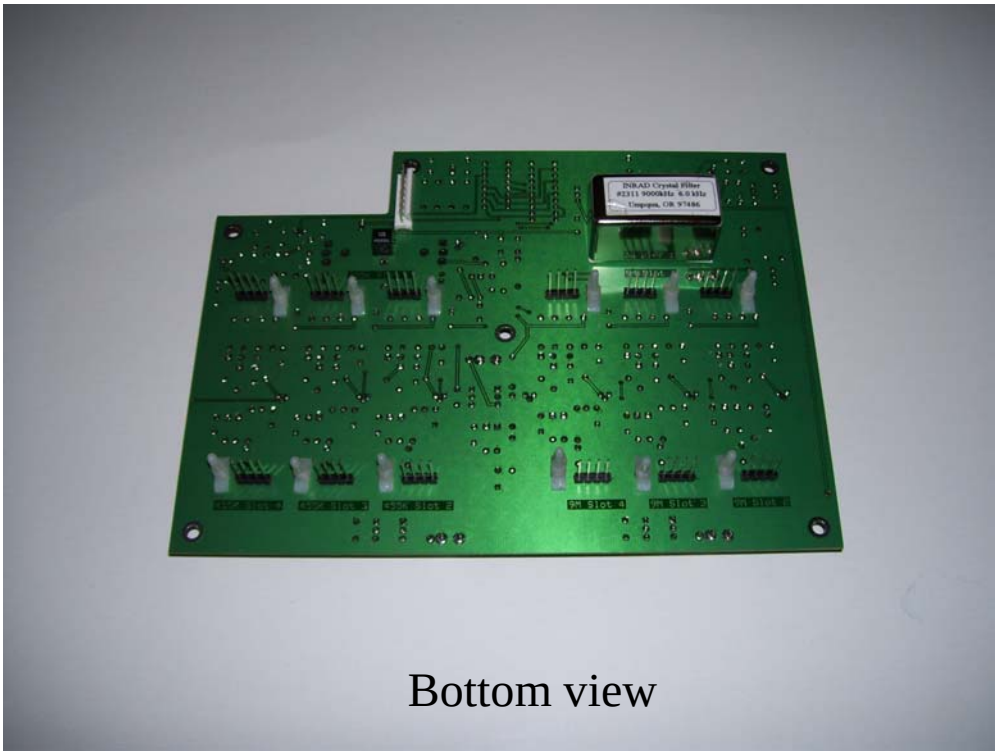
( ) Load and solder transistors Q1-Q10. Make sure the flat side of the transistor is lined up with the flat side of the silkscreened outline.

( ) Load and solder 6 Taiko-Denki RF connectors.

( ) Load connector J1 ***on the bottom side of the board.*** Make sure that the tab on the connector is on the side with the heavy bar on the silkscreen.



Top view



Bottom view

IF Filter Photographs

( ) If you have purchased a 5.8KHz Collins mechanical filter for 455KHz, install it on the bottom side of the board in the location marked FL2.

( ) If you have NOT purchased the Collins filter, load and solder the LTM455DU 20KHz ceramic filter in FL2 on the bottom side of the board.

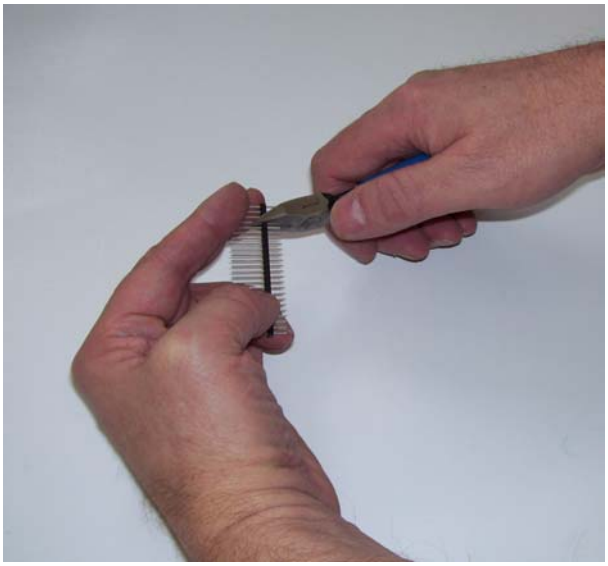
( ) Cut the 36-pin connectors into 12 4-pin connectors. (There will be extra pins left over.) Use wire cutters on the indented sections of the plastic. These connectors are very sharp. Be careful! Solder all 12 ***to the bottom side of the board.*** Disregard the square pad. See detail E1.

( ) If you have purchased the 9.0MHz 6KHz AM filter, remove it from its box and locate the plastic sheet. Cut the sheet 1/8” larger than the size of the filter. Carefully punch holes in the plastic sheet at the location of the threaded tabs and the two pins. Push the sheet onto the filter, shiny side toward the filter, and place the filter on the board at FL1 ***on the bottom side of the board.*** Attach the nuts and lockwashers to the top side of the board. Solder both pins. Clip the leads.

( ) Push a Nylon fastener into each of the 12 holes located near the 12 4-pin connectors as shown in the bottom photo on page 89. Push the tabbed end into the board so that the tab compresses and lies flat against the board. You will hear a click as the tab locks into place.

( ) After installation, you will add plug-in filters, including the 4-pole SSB filter that is included in this kit. Do not load it at this time, but set it aside in a secure place.

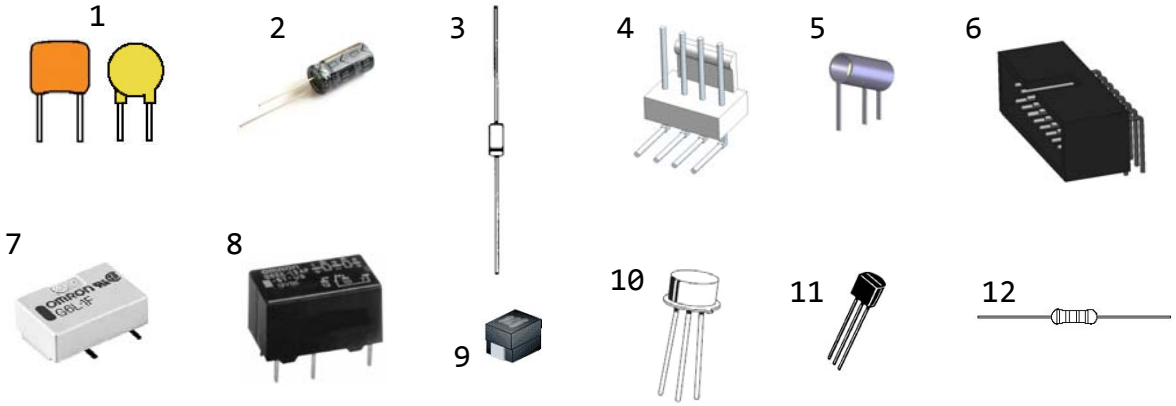
This completes assembly of the IF filter board.



Detail E1. Cutting 36-pin connector into 12 4-pin connectors

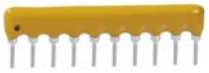
Appendix F: RXBPF Board

Item	Ref Desig	Description	Qty	Stock Bin	Bag Nr
1	C45, C48, C50	10pF 50V monolithic C0G 5%	3	576A	1
3	D1, D2	1N5223B-2.7V Zener diode	2	224	1
12	R12, R19, R30	4.75 ohm 1/8W 1%	3	356	1
1	C21	15pF 50V monolithic C0G 5%	1	576B	2
3	D3-D8	1N4007B 1000V rectifier	6	53	2
11	Q7, Q8	MPSH10 NPN RF transistor	2	54	2
12	R23-R29	27 ohm 1/8W 1%	7	356	2
1	C25	47pF 50V monolithic C0G 5%	1	576C	3
9	L7, L8	150nH 1210 10%	2	355A	3
12	R3, R5 R14, R21	51 ohm 1/8W 1%	4	356	3
1	C23	68pF 50V monolithic C0G 5%	1	576D	4
9	L5, L6	470nH 1210 10%	2	355A	4
12	R13, R20	100 ohm 1/8W 1%	2	356	4
1	C26	150pF 50V monolithic C0G 5%	1	576E	5
9	L2, L3, L4	1.5uH 1210 5%	3	355A	5
12	R11, R18	470 ohm 1/8W 1%	2	356	5
1	C20	180pF 50V monolithic C0G 5%	1	576F	6
9	L1	2.2uH 1210 5%	1	355A	6
12	R10, R17	680 ohm 1/8W 1%	2	356	6
1	C22, C24	220pF 50V monolithic X7R 10%	2	575B	7
12	R15, R22	1K ohm 1/8W 1%	2	356	7
1	C9, C10, C11	.0015uF 50V ceramic disk Y5P 10%	3	236	8
12	R9, R16	2.7K ohm 1/8W 1%	2	356	8



Item	Ref Desig	Description	Qty	Stock Bin	Bag Nr
1	C16, C32-C40 C43, C44, C47	.01uF 50V monolithic X7R 10%	13	575D	9
12	R7, R8	4.7K ohm 1/8W 1%	2	356	9
1	C30, C31	.047uF monolithic X7R 10%	2	576H	10
12	R1, R2	10K ohm 1/8W 1%	2	356	10
1	C3-C8 C12-C15 C17, C19 C28, C29 C41, C42 C46, C49	.1uF 50V monolithic X7R 10%	18	232	11
2	C1, C2	10uF/25V aluminum electrolytic 20%	2	211	11
12	R4, R6	78.7K ohm 1/8W 1%	2	356	11
4	J1	4-pin .1" centers male keyed header, right angle	1	373	12
25	J17	4-pin .1” centers male keyed header	1	88	12
5	J2, J3, J4	Taiko-Denki RF jack PCB-mt	3	407	12
6	J5	16-pin 2-row .1" centers r/a shrouded male header	1	379	12
21		Filter pin socket	22	520	12
7	K1, K2, K3	SPST 12V relay	3	150	12
8	K4, K5, K6	SPDT 12V relay	3	L1	12
13	RFC1	1mH inductor	1	19	12
14	RN1	Resistor network, .1" SIP 10-pin 10K	1	78	12
15	S1	DPDT Switch	1	517	12
16	T1 T2	10T:10T FT37-43 toroid	2	59	12
		Magnet wire, green 24AWG (inches)	18	wire	12
		Magnet wire, red 24AWG (inches)	18	wire	12
10	Q3, Q4	2N5109 NPN RF transistor	2	45	13
11	Q1, Q2, Q5 Q6, Q9, Q10	2N7000 MOSFET	6	227	13

13 

14 

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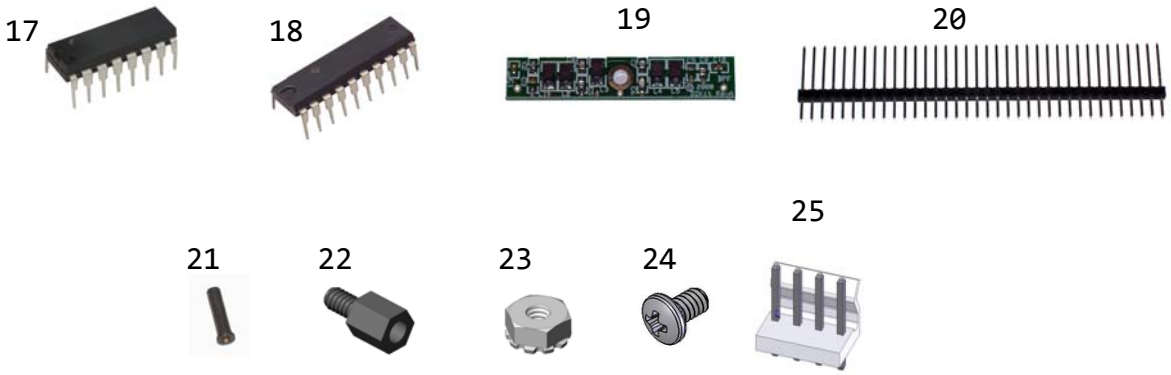
16 

Item	Ref Desig	Description	Qty	Stock Bin	Bag Nr
17	U1	74HC138 3-to-8 decoder 16-pin DIP	1	494	13
17	U2, U3	74HC174 hex flip-flop 16-pin DIP	2	218	13
18	U4	74HC374 octal flip-flop 20-pin DIP	1	495	13
22		Hex M/F spacer - 4-40 x 3/16"	11	452	14
23		Nut - 4-40 KEPS nut	11	457	14
24		Screw - 4-40 x 3/16" PH Phillips M/S	11	478	14
20		36-pin 1-row male tall pins (cut into 22 1-pin)	1	397	14
19		BPF RF1-RF11 Board	1	preload boards	14
26		Preloaded RxBPF board	1	preload boards	



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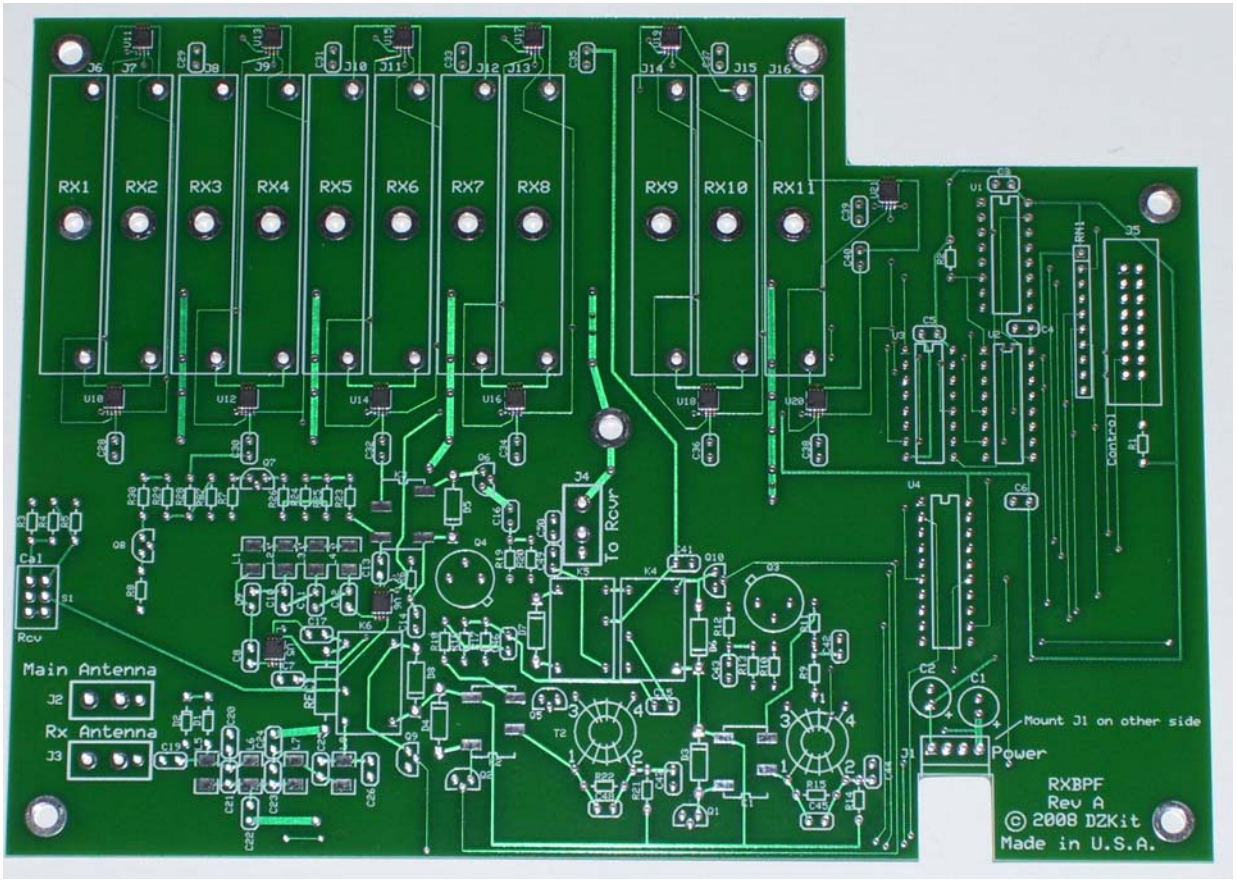


RXBPF board before loading

STEP-BY-STEP ASSEMBLY-RXBPF Board

Highlight or check off each part on the bag label as you install it on the board. Unless otherwise instructed, load all parts of the same type from each bag. Solder the pins after you have installed a couple of bags of parts and then clip their leads. You do not want to do too many parts at once because you may miss some, and with too many leads, they can interfere with each other. When clipping leads, note whether parts move, indicating that they have not been soldered, and apply solder.

( ) Remove the RXBPF board carefully from its antistatic bag. Observe static control precautions while loading this partially-loaded board. The GaAsFET switches that have been loaded are very sensitive devices and will have a direct effect on receiver performance if they are damaged. Be careful!

( ) Load and solder all capacitors. Make sure the two electrolytic capacitors are loaded with the long (+) leads in the holes with square pads and marked on the silkscreen with a '+'. Use silkscreened text and/or ExpressPCB to help you locate the parts. Note that all capacitor bags also contain resistors. Do not load the resistors until the next step.

( ) Load all resistors. Use silkscreened text and/or ExpressPCB to help you locate the parts. Note that some resistors are in the bag with diodes, and the rest are in the capacitor bags.

( ) Load and solder all diodes. Make sure that the side with a band on it goes into the hole with a square pad.

( ) Load all inductors. These are surface mount parts. To load a part, apply a small amount of solder to one of the pads on the board, then place the part on the pads and hold it in place with an awl, screwdriver or other small tool while applying heat to the same pad. When one side is soldered, solder the other side. Note that there are also transistors and/or ICs in the same bags. Save them for the next steps.

( ) Load the two metal transistors, Q3 and Q4. These transistors will only go in one way, and the tab on the side should be lined up with the silkscreened tab on the board. Insert the parts all the way down on the board.

( ) Load Q7 and Q8. Be sure to line up the flat side with

the silkscreened outline on the board. Wiggle one pin into the hole, then twist the part gently until the other two pins can be inserted. Push the transistors down such that the bottom of the plastic body is about .1” off the board.

( ) Load the remaining six plastic transistors in the same manner as the previous step.

( ) Load the resistor network, RN1. Be sure that pin 1, marked by a dot, goes into the hole with the square pad.

( ) Load RFC1.

( ) Load switch S1. Make sure that the switch lever extends out the side of the board.

( ) Load relays K1-K3. These are surface mount relays. To load a part, apply a small amount of solder to one of the pads, then place the part on the pads (being careful to note the orientation) and hold it in place with a finger while applying heat to the same pad. When that pin is soldered and the relay is positioned inside the silkscreened outline, solder the other pins.

( ) Load relays K4-K6. These will only go in one way.

( ) Cut the magnet wire into four equal pieces, 6” each. Wind 10 turns around each side of each of the two toroids. See the photo of the finished board for reference. Remember that each pass of the wire through the toroid counts as one turn. Insert one toroid into the location marked T1 and the other into T2. Pull the leads tight and apply solder to each lead for at least one minute, rubbing the side of the wire with the iron frequently. Keep the heat on until shortly after you see the flux start to boil. Using an ohmmeter, Verify that there is continuity from pin 1 to pin 2, and pin 3 to pin 4, on each part after soldering. If not, apply more heat and re-measure.

Read the next two steps before proceeding:

( ) Load all ICs. Before inserting each one into the board, verify that the name of the part that’s printed on the IC matches the name on the bag label (e.g., 74HC138 - ignore other prefixes and suffixes). Do not solder them yet! Be sure that pin 1 of each IC is loaded in the square pad. Note that U1 is a 16-pin part as are U2 and U3. Be sure not to load U1 in the holes for U2 or U3, and vice versa. To

keep the ICs in place before soldering, bend the corner pins over on the bottom side of the board.

( ) Look at the ICs that you have loaded. Double check that no pins are bent under the parts, the right ICs are loaded in the right places and that pin 1 is on the square pad. When you are absolutely certain that the ICs are correctly loaded, solder all pins.

( ) Load all connectors. ***J1, the 4-pin right-angle connector, mounts on the BOTTOM side of the board. All others mount on the top.***

( ) Check your work. Run your finger over the parts on the top of the board gently to see if any parts are loose. Check IC orientation and electrolytic capacitor and diode polarity. Make sure all parts have enough solder but not too much. Make sure all parts are flush with the board. Check the bottom of the board for leads that may be touching other leads, and clip them closer to the board if necessary.

( ) Attach 11 4-40 x 3/16” hex male/female standoffs in the center holes of the 11 filters (marked RX1-RX11). Use 4-40 KEPS nuts on the bottom of the board to secure them.

( ) Cut the 36-pin male header into 22 1-pin pieces and discard the remaining 14-pin piece. Extra pins were included in case you have trouble with any of them.

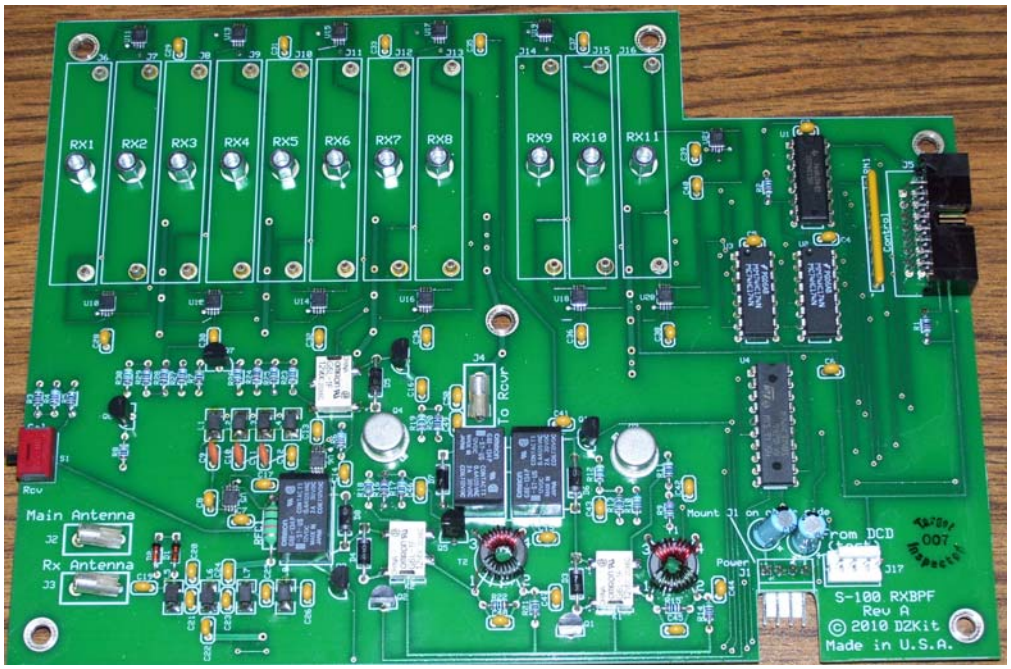
( ) Locate the up to 11 receiver bandpass filters (RF1-RF11). Attach two 1-pin connectors to each of the filters you have purchased and cut each one to 1/4” as shown in Detail F1.

( ) Push a filter pin socket onto each side of the filters (up to 22 total).

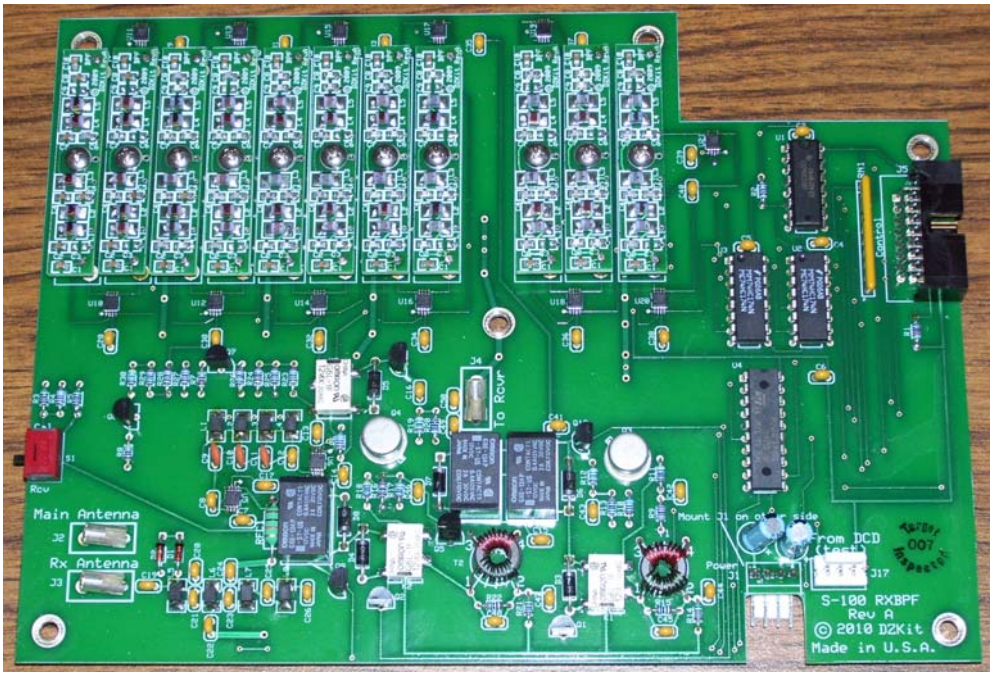
( ) Place each filter in the corresponding filter location on the board (RX1-RX11) and tighten each one with a 4-40 x 3/16” screw.

( ) Turn the board over and solder all filter pins.

This completes assembly of the RXBPF board.



RXBPF board after loading, prior to insertion of BPF's



RXBPF board after loading and insertion of BPF's

Cut to 1/4"

Detail F1. BPF Assy

Appendix G: Receiver Board

PARTS LIST

Item	Ref Desig	Description	Qty	Bag Nr
1	C73 C76 C90 C123 C124 C125 C136 C137 C138 C158	6-70pF trimmer	10	1
2	C4 C17 C24 C25 C26 C27 C93 C94 C106 C110	22uF/16V bi-polar aluminum electrolytic 20%	10	1
3	C1 C132 C170	100uF/25V 20% aluminum electrolytic	3	1
3	C60 C97	330uF/16V 20% aluminum electrolytic	2	1
3	C103 C104	470uF/10V 20% aluminum electrolytic	2	1

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Item	Ref Desig	Description	Qty	Bag Nr
4	D1 D2 D3 D4 D5 D6 D7 D10 D13 D15	1N5711 Schottky diode	10	2
4	D8 D9 D11 D12 D16 D17 D18 D19 D20 D21	1N914 signal diode	10	2
5	FL2 FL3 FL4	LTM455DU ceramic filter	3	3
6	J3	16-pin 2-row .1" centers r/a shrouded male header	1	3
7	J4 J19 J22 J25	2-pin .1" centers male keyed header	4	3
8	J6 J12 J16 J20 J21 J23	3-pin .1" centers male keyed header	6	3
9	J5 J13 J24	4-pin .1" centers male keyed header	3	3
10	J10	8-pin .1" centers male keyed header	1	3

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Item	Ref Desig	Description	Qty	Bag Nr
11	J18 J27 JP4	3-pin .1" centers header	3	3
12	JP1 JP2 JP3	2-pin .1" centers header	3	3
13	JPx	2-pin female shorting bar	3	3
14	J1 J2 J7 J8 J9 J11 J14 J15 J17 J26	Taiko-Denki RF jack	10	3
15	L1 T3	FT50-61 toroid	2	3
		Magnet wire, red 24AWG (inches)	20	3
		Magnet wire, green 24AWG (inches)	10	3
16	L5 L9	100uH variable inductor	2	3
17	RN1	Resistor network, .1" SIP, 10-pin 10K	1	3
18	T2	T4-1 4:1 transformer 6-pin DIP	1	3
19	RV1	10K trimpot	1	3
19	RV2	500 ohm trimpot	1	4
18	T1 T4 T5 T6 T7	T36-1 36:1 transformer 6-pin DIP	5	4
20	U18 U19	LM380 audio amplifier 14-pin DIP	2	5
21	U9 U12 U32	MC1350 IF amplifier 8-pin DIP	3	5
22	U6 U8	TUF-3 Mixer	2	5
23	U31	LM2940CS-9 9V regulator TO-263	1	5
24		Preloaded Rx Board	1	6
25	FL1	Inrad 70.455MHz filter (Option 206)	1	

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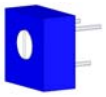
19 

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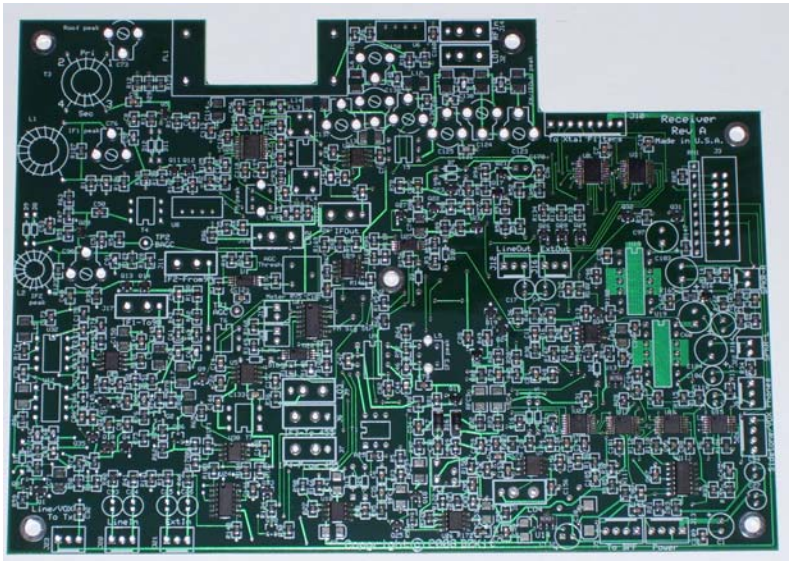

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STEP-BY-STEP ASSEMBLY-Receiver Board

There are a lot of parts on this board. It can take quite a while for you to locate the parts visually. We highly recommend that you use the free ExpressPCB software to help you find the parts. Load the file receiver_revx_no_traces.pcb (the x represents a revision letter).

Highlight or check off each part on the parts list that is inside the bag as you install it on the board. If parts have long leads, solder the leads after you have installed about 5-10 of them and then clip their leads. You do not want to do too many parts at once because you may miss some, and with too many leads, they can interfere with each other. When clipping leads, note whether parts move, indicating that they have not been soldered well, and re-solder them.

***Hint:** Some parts fit loosely in the pads. To solder them, hold the board upright and use one finger to hold the part in place while you solder one lead on the bottom. It doesn't matter if the part is not flush. Once you've "tacked" it in, push it flat while reheating the pin, then lay the board upside down and solder the remaining leads. Note – this works well on multi-pin connectors, but you can burn your finger if you are touching the lead you are tacking down. Be sure to touch other pins or the connector body instead of the lead you are soldering!*

( ) Remove the Receiver board from its antistatic bag. Handle this board with care and observe anti-static precautions to avoid damaging the pre-loaded parts.

( ) Load and solder all 70pF trimmer capacitors (Bag 1).

( ) Load and solder all 22uF/16V aluminum electrolytic capacitors (Bag 1) flush with the board. These parts are bipolar – they can be installed in either direction even though one lead is longer.

( ) Load and solder the two 470uF/10V electrolytic capacitors and three 100uF/25V aluminum electrolytic capacitors (Bag 1) flush with the board. Be sure to put the longer ('+') lead in the square pad, also marked with a '+' symbol. (The caps are very close together, and the '+' symbol can be interpreted as belonging to the wrong part, so be sure to look at the square pad!)

( ) Load and solder the two 330uF/16V electrolytic capacitors (Bag 1).

( ) Load U31 (Bag 5), a 9V regulator, on the bottom of the board. This is an SMT device. To load, place the part on the pads and solder one pin while holding the device in place. Then solder the other two pins. Apply solder to the tab along the top edge and keep the heat on until the solder flows freely around the tab. On the top side, apply solder to the two holes that are located in the center of the tab area.

( ) Load and solder all 1N914 diodes (Bag 2). Be sure that the side with a band goes into the hole with a square pad. These parts are colored red.

( ) Load and solder all 1N5711 diodes (Bag 2). Be sure that the side with a band goes into the hole with a square pad. These parts are colored blue.

( ) Load and solder FL2, FL3 and FL4 (Bag 3), 20KHz ceramic filters.

( ) Load and solder L5 and L9 (Bag 3), the two variable inductors.

( ) Load and solder resistor network RN1 (Bag 3). Be sure that the dot marking pin 1 goes into the hole with the square pad.

( ) Load and solder trimpot RV1 (Bag 3). The value of this pot is marked on the side with a “103” (10K ohms).

( ) Load and solder trimpot RV2 (Bag 4). The value of this pot is marked on the side with a “501” (500 ohms).

( ) Load and solder T2, a Minicircuits T4-1 transformer (Bag 3). Pin 6 is marked by a dot. This pin goes in the hole with the square pad. ***The other 6-pin transformers look exactly like this one. Make sure you load the T4-1 transformer into T2.***

( ) Load and solder five T36-1 Minicircuits transformers (Bag 4). Pin 6 is marked by a dot. This pin goes in the hole with the square pad.

( ) Load and solder U6 & U8, TUF-3 RF mixers (Bag 5). Make sure the body is oriented so that it does not extend beyond the silkscreened outline. Leave a small gap (less than 1/32”/0.8mm) between the bottom of the part and the board to avoid shorts between the pads and the case.

( ) Load and solder the two LM380 (NTE740) audio amplifier ICs, U18 and U19 (Bag 5). Be sure

that pin 1 goes into the hole with the square pad.

( ) Load and solder U9, U12, and U32 (Bag 5), the MC1350 (NTE746) IF amplifier ICs. Be sure that pin 1 goes into the hole with the square pad.

( ) Locate the two toroids and magnet wire (Bag 3). Cut a 3” length of red magnet wire and wind one toroid with 2 turns. Leave about 1/2” of lead extending out from the toroid. Load it into L1. Each time the wire passes through the center is considered 1 turn. Leave about 1/2” of lead extending out from the toroid. Solder the leads, keeping the soldering iron (set to 750 degrees F) on the leads until the coating melts away and the solder flows onto both the pad and the wire smoothly. This can take about one minute per lead. You may prefer to note the location where the wires touch the pads, then remove the toroids, tin the wires, then reinsert them and solder them in place.

( ) Cut a 10” length of red magnet wire. Wind 13 turns completely around the remaining toroid. Then cut a 3” length of green magnet wire and wind 3 turns on top of the side of the toroid that does not have leads extending out from it. Solder the four leads at T3. The side with 3 turns goes into the holes marked Primary (pins 1 and 2).

( ) Clip excess leads from the toroid wires. Apply a small dab of RTV to each toroid to hold it in place.

( ) Using an ohmmeter, verify that there is continuity (<1 ohm) from pins 1 to 2 and from 3 to 4 on T3, and from one lead to the other on inductor L1. If not, apply more heat to the leads and remeasure.

( ) Load and solder J18, J27 and JP4 (Bag 3), 3-pin headers. Orientation does not matter. Place a shorting bar between the center pin and the pin labeled “sql dac”.

( ) Load and solder JP1, JP2 and JP3 (Bag 3), 2-pin headers. Place a shorting bar on JP1. Place the remaining shorting bar ***on only one pin*** of JP2 or JP3.

( ) Load and solder all white AMP MTA connectors. Be sure the tab lines up with the heavy line on the silkscreened outline. Load these connectors one at a time. See the soldering hint at the beginning of this section.

( ) Load and solder J3, a right-

angle 16-pin ribbon cable connector. Pin 1 on this connector is marked with an embossed triangle. Be sure this pin goes into the hole with the square pad.

( ) Load and solder the 10 RF connectors. Bend the small lead down, then squeeze the thicker leads together slightly so the connector will not fall out while you solder it. Solder one lead, then push the connector down so that the end with the small pin is flush with the board. These connectors point up at a 45 degree angle.

( ) If you did ***not*** purchase the optional Inrad roofing filter:

( ) Locate Bag 7. Insert a 3-pin insulating wafer on the 3-pin crystal filter and solder the filter to the Filter board.

( ) Load and solder the two T36-1 transformers. The lead with a dot next to it goes into the square pad. Note: The two transformers mount in opposite directions! Be careful!

( ) Locate the long pins that you earlier clipped apart when building the RxBPF board. Cut one into four one-pin connectors. Insert the short end into the four holes at FL1 and solder them so the pins point straight up. These pins are very sharp. Be careful!

( ) Insert the IF Filter board onto the 4 pins such that the text reads upside down compared to text on the Receiver board. Solder the pins and clip excess lengths.

( ) If you purchased the optional Inrad roofing filter:

( ) Cut two 1/4” squares of plastic sheet and puncture the center with an awl, or small knife or screwdriver. Place the squares over the two ungrounded pins of the 70.455MHz roofing filter. The ungrounded pins are the two that are not directly connected to the metal body. Load and solder the filter as shown, with the printing on top upside down compared to the other text on the board.

Completed receiver board. Note the orientation of the optional roofing filter.

Appendix H: Transmitter Board

PARTS LIST

Item	Part	Description	Qty	Bag
1	C108	18pF silver mica (sm)	1	1
1	C86	20pF sm	1	1
1	C103	27pF sm	1	1
1	C112	33pF sm	1	1
1	C110	47pF sm	1	1
1	C105	56pF sm	1	1
1	C95, C107	68pF sm	2	1
1	C85	82pF sm	1	1
1	C40, C89	100pF sm	2	1
1	C106	120pF sm	1	1
1	C101, C109, C111	150pF sm	3	1
1	C36	220pF sm	1	1
1	C49, C55. C104	270pF sm	3	1
1	C13, C39, C56, C87, C90, C91	330pF sm	6	1
1	C38, C88	390pF sm	2	1
1	C59, C99	560pF sm	2	1
1	C11	1000pF sm	1	1
1	C34, C41	1200pF sm	1	1
1	C37	2200pF sm	1	1
2	C84, C121, C122	22uF/16V bi-polar aluminum electrolytic	3	1
3	C2, C30, C82, C96, C139	10uF/25V aluminum electrolytic	5	1
4	C1, C116	100uF/25V aluminum electrolytic	2	2
5	D14, D27	1N914 signal diode	2	2
6	F1	250mA axial picofuse	1	2
7	Y1-Y14	10.73MHz Crystal	14	9
7		Mylar crystal insulator—HC-49/U	14	9
8	FL1	10.7MHz 4-pole, 12kHz filter	1	9
9		Mylar crystal insulator—HC-49/U-3pin	1	9

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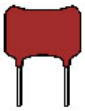

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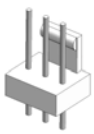
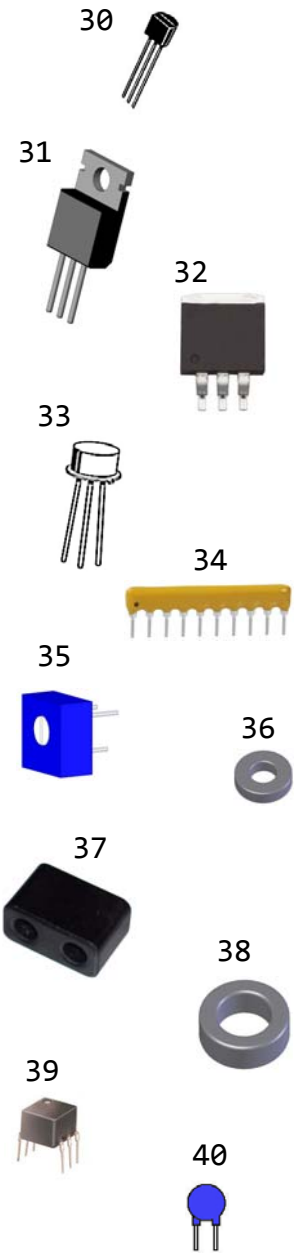
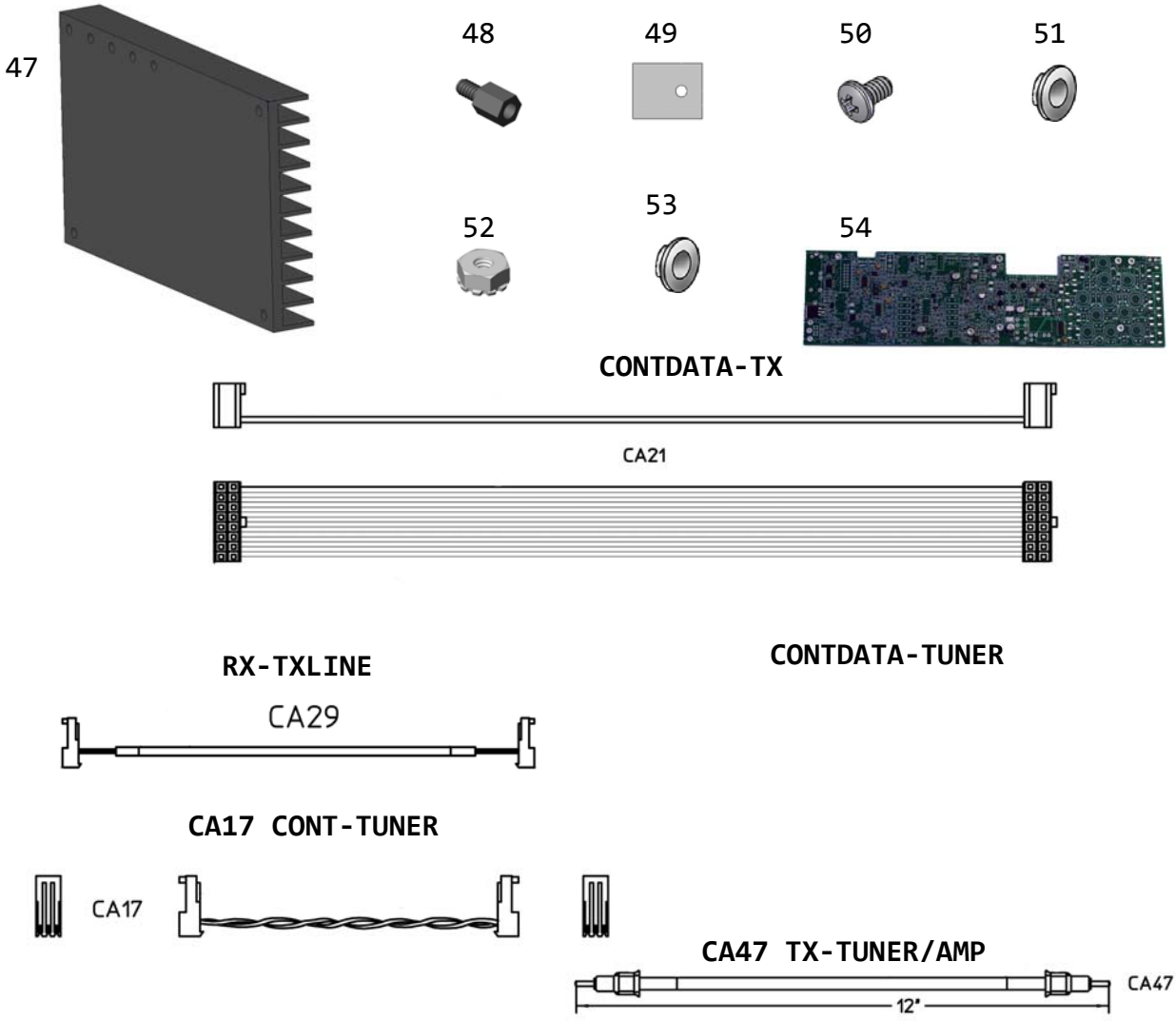
Item	Part	Description	Qty	Bag
10	R73	.05 ohm 2W sense resistor (SMT)	1	5
11	R56	1.5 ohm 1W power resistor (SMT)	1	6
11	R85	50 ohm 1W power resistor (SMT)	1	7
12	R27	75 ohm 1W power resistor	1	5
13	R39	180 ohm 1W axial power resistor	1	6
14	J1	16-pin 2-row .1" centers shrouded male header	1	3
15	J3, J4, J15	2-pin AMP MTA male keyed header	3	3
16	J6, J18	3-pin AMP MTA male keyed header	2	3
17	J14	4-pin AMP MTA male keyed header	1	3
18	J5	5-pin AMP MTA male keyed header	1	3
19	J13, J17	4-pin 2-row female bd mt socket	2	3
20	J12, J16	8-pin 2-row female bd mt socket	2	3
21	J2	8-pin DIN PC-mt	1	3
22	J8, J9, J10, J11	RF Jack	4	3
23	J7	Kobiconn triple phono connector	1	3
24	K1-K10	SPST 12V SMT relay	10	3
25	K11	DPDT 12V relay	1	3
26	K12, K13, K14	SPDT 12V relay	3	3
27	L1, L2, L3, L4	T50-2 toroid (red)	4	4
28	L5-L12	T50-10 toroid (black)	8	4
29	L13, L14	Ferrite Bead	4	4



Item	Part	Description	Qty	Bag
30	Q6, Q9, Q12, Q15, Q26	2N3904 NPN transistor	5	5
30	Q19, Q34	2N3906 PNP transistor	2	6
30	Q21	J310 JFET	1	8
30	Q24	MPSH10 low capacitance NPN transistor	1	9
30	Q1, Q2, Q7, Q8, Q10, Q16, Q20, Q22, Q23, Q28, Q29, Q32, Q33, Q35	2N7000 N-channel MOSFET	14	7
31	Q4, Q5	2SC1945/69 NPN RF power transistor	2	5
31	Q3	2SC2166C NPN RF power transistor	1	6
31	Q13	TIP31A NPN power transistor	1	7
32	Q11	FQB9N15TM N-channel MOSFET (SMT)	1	5
33	Q14	2N5109 NPN low-noise RF transistor	1	5
34	RN1	Resistor network, 10-pin 10K ohm	1	8
35	RV1	1M trimpot - horizontal	1	8
36	T1, T3	FT37-43 toroid	2	8
37	T5	Binocular core	1	8
38	T4	FT50-43	1	8
39	T2, T6	T36-1 6-pin transformer	2	8
40	TH1	Thermistor - 10K ohm	1	8
41	U10	TUF-3 RF mixer	1	8
42		Hex F/F spacer, 4-40 x 1 1/4"	1	HW
43		Screw - 2-56 x 5/8” PH Phillips M/S	2	HW
44		Nut - 2-56	2	HW
45		Lockwasher - #2	2	HW
46		Transmitter extender bracket	1	HW



Item	Description	Qty	Bag
47	Heatsink - 2.5” x 4.5”, black anodized	1	-
48	Hex M/F spacer - 4-40 x 3/16"	4	3
49	Thermalsil sticky-back insulator	4	3
50	Screw - 4-40 x 3/16" PH Phillips M/S	2	3
51	Screw - 4-40 x 3/8" PH Phillips M/S	1	HW
52	Nut—4/40 KEPS nut	1	HW
53	Fiber shoulder washer	4	3
54	Partially loaded Transmitter Board	1	-
	RG-178/U coaxial cable (inches)	8	4
	#18 bare wire (inches)	3	4
	#18 bare wire (inches)	12	9
	#24 red magnet wire (inches)	180”	4
	#24 green magnet wire (inches)	36”	4
	CA17, CA21, CA29, CA47	1 ea	HW



STEP-BY-STEP ASSEMBLY-Transmitter Board

Remove the transmitter board from its antistatic bag. Handle this partially assembled board carefully and observe antistatic precautions to avoid damaging the board.

Check off each of the parts on the parts list that is inside the bags as you install them on the board.

( ) Load and solder all 10 surface mount relays, K1-K10 (Bag 3). To solder relays, follow this procedure: Add a small amount of solder to any pad. Place the relay into position with all pins centered on the pads. Re-heat the pad you just added solder to while holding the relay in place. Once it is soldered securely, solder the other pins. Be sure to do this step first, as it is hard to reach some of the relay pins once the toroids are in place.

( ) Load and solder all (5) power resistors, both surface mount and through-hole parts (items 10, 11, 12 and 13 from Bags 5, 6 and 7).

( ) Load and solder surface mount transistor Q11 (Bag 5). Place this SMT part on the pads and solder one pad while holding the part to keep it from moving. Then solder the other pin(s). Some of these parts have 3 pins, some have 2. Finally, solder around the edges of the metal tab, applying enough heat to cause the solder to “wick” under the part.

( ) Load and solder small aluminum electrolytic capacitors C2, C30, C82, C96 and C139 (Bag 1) and large aluminum electrolytic capacitors C1, C116 (Bag 2). Make sure the long lead goes in the hole with the square pad, also marked on the silkscreen with a “+”. Clip the leads.

( ) Load and solder non-polarized 22uF electrolytic capacitors C84, C121, and C122 (Bag 1). Even though one lead is longer than the other, these parts can be inserted either way. Clip the leads.

( ) Load and solder diodes D14 and D27 (Bag 2). Be sure that the side with the band goes into the hole with a square pad. Clip the leads.

( ) Load and solder all (5) 2N3904 NPN transistors (Bag 5). Be sure the flat side lines up with the flat side of the silkscreened outline. Clip the leads.

( ) Load and solder all (2)

2N3906 PNP transistors (Bag 6). Be sure the flat side lines up with the flat side of the silkscreened outline. Clip the leads.

( ) Load and solder Q14, a 2N5109 RF transistor (Bag 5), flush with the board. Clip the leads.

( ) Load and solder all (14) of the 2N7000 N-channel MOSFETs (Bag 7). Be sure the flat side lines up with the flat side of the silkscreened outline. Clip the leads.

( ) Load and solder Q21, a J310 JFET (Bag 8). Be sure the flat side lines up with the flat side of the silkscreened outline. Clip the leads.

( ) Load and solder Q24, a low capacitance MPSH10 NPN RF transistor (Bag 9). Be sure the flat side lines up with the flat side of the silkscreened outline. Clip the leads.

( ) Load and solder resistor network RN1 (Bag 8). Be sure that pin 1, marked with a dot, goes into the hole with the square pad. ***Be very careful not to blob solder onto the small adjacent pads.***

( ) Load and solder trimpot RV1 (Bag 8). Clip the leads.

( ) Load and solder U10, a TUF-3 RF mixer (Bag 8). Make sure the body is oriented so that it does not extend beyond the silkscreened outline. Clip the leads.

( ) Place a 2-pin Mylar insulator on each of the crystals (Y1-Y14, Bag 9). Insert the crystal on the board and solder one pin while pushing on each crystal to be sure it lies flat against the board. Once secure, solder the other pin. Clip the leads.

( ) Solder a bare wire to the top of all the crystals in each of the two groups, then solder another bare wire to the pad labeled GND that is near each group of crystals. Do not apply any more heat than necessary to the tops of the crystals.

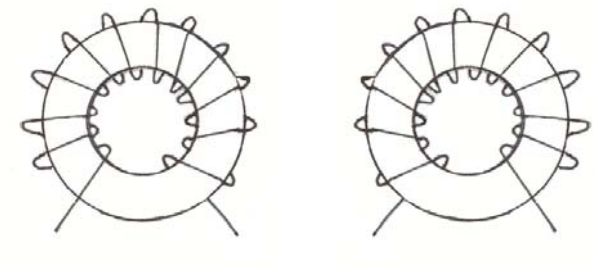
( ) Place a 3-pin Mylar insulator on filter FL3 (Bag 9) and solder the crystal flat against the board. Clip the leads.

( ) Load and solder fuse F1 (Bag 2). Clip the leads.

( ) Read this entire step before soldering connectors! Load and solder each connector, one at a time, including RF connectors (Bag 3). Be sure to line up the tabs on the white AMP MTA connectors with the silkscreened bar. Make sure the embossed triangle on the 16-pin connector goes into the square pad. Bend the

center conductor pin on the RF connectors so that the connector sits at a 45 degree angle when inserted into the board. ***J12, J13, J16 and J17 mount on the back side of the board. Be sure these lie flat against the board.***

NOTE: Unless specified otherwise, all toroids should be built by inserting a wire in from the front as the opening faces you and wrapped clockwise through the core. Silkscreening on the board is only a rough indication of a generic toroid, not actual winding information.



Clockwise **Counterclockwise**

( ) Locate the four red toroids (Bag 4). Cut the **red** magnet wire into 12 lengths as shown in the table below. Wind the specified number of turns of magnet wire around each toroid. Each time the wire passes through the center is considered 1 turn. Leave about 1/2” of lead extending out from the toroid. Load these toroids into L1-L4. Note that these toroids stand up while L5-L12 lay flat on the board. **L2 must be wound counterclockwise**, the others clockwise. Solder the leads, keeping the soldering iron (set to 750 degrees F) on the leads until the coating melts away and the solder flows onto both the pad and the wire smoothly. This can take about one minute per lead. Clip the leads.

( ) Repeat the previous step with the eight black toroids (Bag 4). Load and solder these toroids into L5-L12. Clip the leads.

L1: 27 turns (18”) RED
L2: 25 turns (17”) RED-ccw
L3: 14 turns (10”) RED
L4: 13 turns (10”) RED
L5: 13 turns (10”) BLACK
L6: 12 turns (9”) BLACK
L7: 12 turns (9”) BLACK
L8: 11 turns (8”) BLACK
L9: 10 turns (7”) BLACK
L10: 9 turns (7”) BLACK
L11: 8 turns (6”) BLACK
L12: 8 turns (6”) BLACK

( ) Measure resistance between the pins on each toroid. They should read less than 1 ohm. If they don’t, reheat the connections.

( ) Load and solder all silver mica capacitors (Bag 1). Clip the leads. Save two of the large diameter leads.

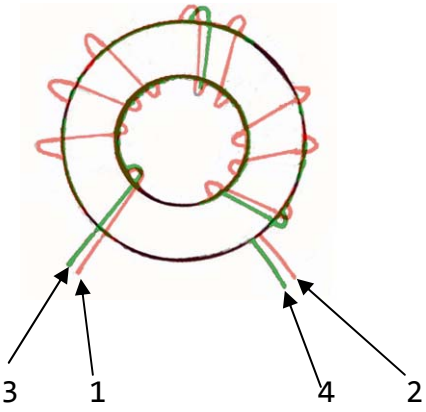
( ) Place two ferrite beads (Bag 4) over a clipped lead from the previous step. Bend the ends of the wire down so that the resulting inductor fits

in the holes for L13. Load and solder this part and clip the leads.

( ) Repeat the previous step for inductor L14.

( ) Load and solder a T36-1 transformer (Bag 8) at T2 and T6. Pin 6 is marked with a dot and goes in the hole with the square pad.

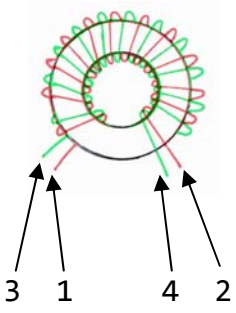
( ) Cut 10” of red 24# magnet wire and wrap 9 turns completely around an FT37-43 toroid (the smaller ones in Bag 8). Cut 4” of green 24# magnet wire and wrap 3 turns around the red wire, overlapping it evenly. Leave 1/2” of all leads extending from the toroid. Stand the toroid up and solder its leads at T1. The red wires go in holes 1 and 2. Clip the leads. Note that it is easiest to insert this toroid at a 45 degree angle to the silkscreening on the board. See drawing below.



Detail H1. T1 construction/mtg

( ) Cut 13” of red 24# magnet wire and wrap 12 turns completely around an FT37-43 toroid (the smaller ones in Bag 8). Cut 8” of green 24# magnet wire and wrap 6 turns around the red wire. Leave 1/2” of leads extending from the toroid. Stand the toroid up and solder its leads at T3. The red wires go in the holes marked 1 and 2. Clip the leads.

( ) Cut 6” lengths of red and green magnet wire. Twist the wires together about 2 turns per inch. Wind 5 turns completely **counterclockwise** around an FT50-43 toroid (the larger one in Bag 8). Stand the toroid up and solder its leads at T4. The red and green leads on the same side of the toroid go in the holes marked 1 and 3, respectively (1=red, 3=green). The other red wire goes in 2. The other green wire goes in 4. Clip the leads. See detail H2.



Detail H2. T4 construction/mtg.

( ) Locate the gray binocular core (Bag 8). Wind 2 turns of red magnet wire in the center

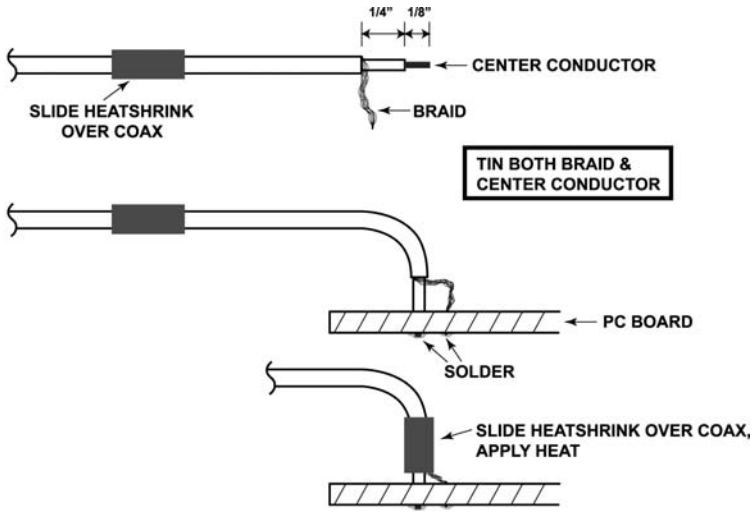


Figure H1. Transverter coax cable wiring

holes and leave 1” extending out from the body of the core. Wind 3 turns of green magnet wire from the other side and leave about 1” extending out from the body facing the other direction. Load the core at T5, with the 3 turn winding facing toward the bottom of the board. Solder and clip the leads.

( ) Cut two 2” lengths of red magnet wire and feed them through the outer holes in the core and into the pads at the edges of the core, one on each side. Solder and clip the leads.

( ) Load and solder relay K11 (Bag 3). Be sure that the side with a white bar printed on top lines up with the white bar on the silkscreened outline.

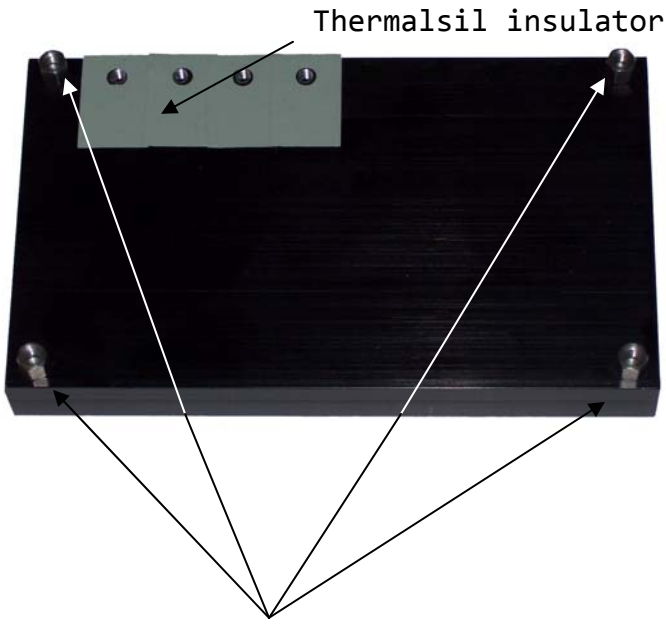
( ) Load and solder relays K12, K13 and K14 (Bag 3).

( ) Strip and tin the 8” RG-178/U coaxial cable (Bag 4) as shown in Figure H1 above. On the back side of the board, solder the coaxial cable between the two pads labeled XVT. Connect the shield on each end to the adjacent pad labeled GND.

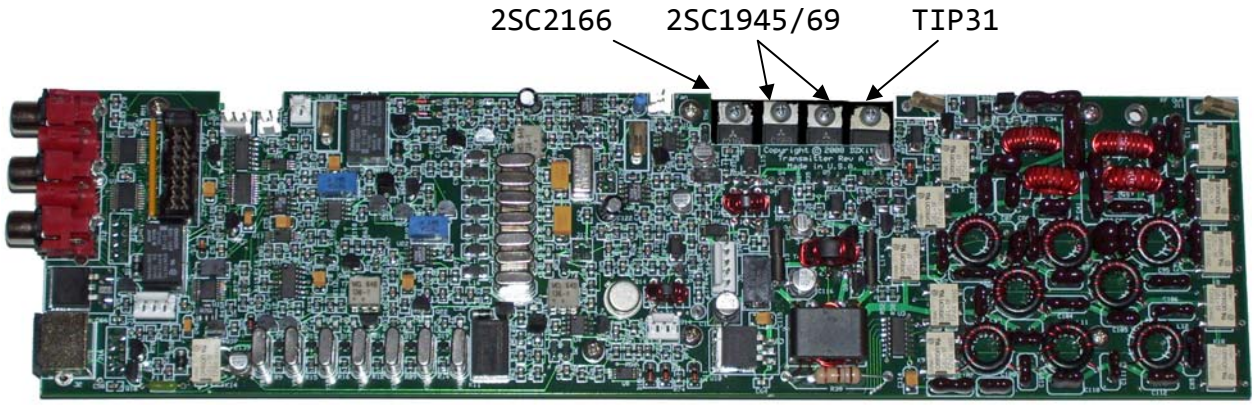
( ) Insert thermistor TH1 (Bag 8) from the back side of the board. It must physically touch the heatsink that will be attached next, so position it slightly off the board so that you can bend it into place against the heatsink. Clip the leads on the top side of the board.

( ) Insert and tighten four 4-40 x 1/4” hex male/female standoffs in the four threaded mounting holes in the heatsink. Refer to Pictorial H1.

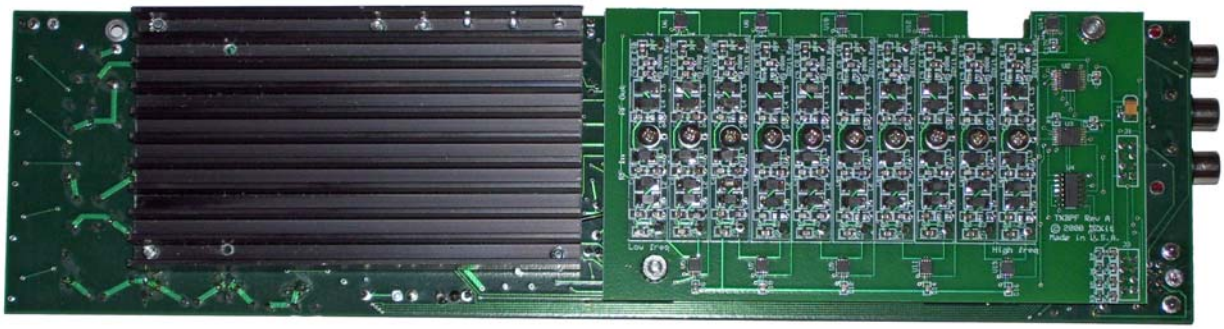
( ) Look at transistors Q4 and Q5. These are the RF power



Pictorial H1. Transmitter heatsink



Transmitter board, after construction, top



Transmitter board, after construction, bottom

transistors that make up the 10W final amplifier. Two different versions are being shipped. 2SC1945 transistors have a pin orientation of "Base Emitter Collector" (BEC). 2SC1969 transistors have a pin orientation of "Base Collector Emitter" (BCE). Now look at the area of the board just beneath the large notch. If you have 2SC1945 transistors, insert bare wire between pads labeled a and 2a and between pads b and 3. If you have 2SC1969 transistors, use pads a and 3 and pads b and 3b. Do this step twice, once for Q4 and once for Q5. Solder all four jumpers and clip any excess.

( ) Affix four Thermalsil sticky-back insulators on the heatsink as shown in pictorial H1 so that the large hole in the insulator lines up with the transistor mounting holes.

( ) Place the four power transistors on the heatsink as shown in the pictorial in the order shown using a fiber shoulder washer and a 4-40 x 3/8" screw through each mounting hole and into the threaded holes in the heatsink. ***Do not tighten the screws. Make sure the screws are seated against the fiber washers and the washers are in turn seated against the metal transistor tabs. Do not force the screws in, as this could warp the washers. The screws and washers should go in smoothly.***

( ) Place the heatsink into position and note where the transistor leads must be bent up so that they will fit into the holes in the PC board. Remove the heatsink and bend the leads up.

( ) Line up the heatsink mounting holes with the mounting holes on the board as you insert the four transistors into their PC board holes. Secure the heatsink with four 4-40 x 3/16" screws.

( ) Solder the power transistor leads. Clip off any excess lead length.

( ) Build the TXBPF board (Appendix I).

( ) Push the TXBPF board onto connectors J12, J13, J16 and J17 with the notch in the board lined up with the notch in the top of the transmitter board. Secure the board with two 4-40 x 3/16" screws.

( ) If you are adding the transmitter later to an already built Sienna, remove the DCD board and add the SWR meter components to it. See Appendix C2.

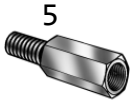
( ) Check your work carefully.

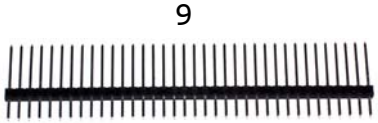
This completes assembly of the Transmitter.

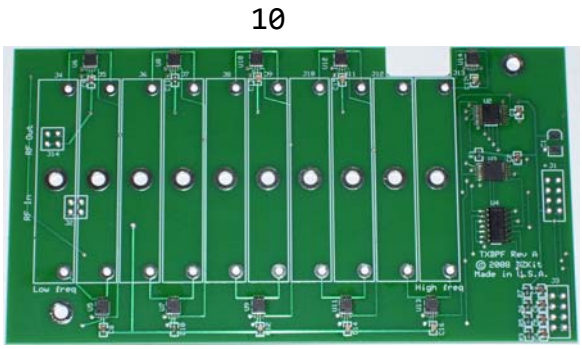
Appendix I: TXBPF Board

PARTS LIST

Item	Part	Description	Qty
1	J1, J3	8-pin 2-row male header	2
2	J2, J14	4-pin 2-row male header	2
3		BPF TF1	1
3		BPF TF2	1
3		BPF TF3	1
3		BPF TF4	1
3		BPF TF5	1
3		BPF TF6	1
3		BPF TF7	1
3		BPF TF8	1
3		BPF TF9	1
3		BPF TF10	1
4		Filter pin socket	20
5		4-40 x 7/16” hex M/F spacer	2
6		4-40 x 3/16” hex M/F spacer	10
7		4-40 KEPS nut	12
8		4-40 x 3/16” PH M/S	10
9		36-pin 1-row male tall pins (cut into 20 1-pin)	1
10		Partially loaded board	1







STEP-BY-STEP ASSEMBLY-TXBPF Board

( ) Remove the TXBPF board carefully from its antistatic bag. Observe static control precautions while loading this partially-loaded board. The GaAsFET switches that have been loaded are very sensitive devices and will have a direct effect on transmitter performance if they are damaged. Be careful!

( ) ***Load all connectors (J1,2,3,14) on the BOTTOM side of the board. Be sure they are mounted flat against the board.***

( ) Attach ten (10) 4-40 x 3/16” hex male/female spacers in the center holes of the 10 filters (marked TX1-TX11). Use 4-40 KEPS nuts on the bottom of the board to secure them.

( ) Cut the 36-pin male header into 20 1-pin pieces and discard the remaining 16-pin piece. Extra pins were included in case you have trouble with any of them.

( ) Locate the 10 transmitter bandpass filters (TX1-TX11). Attach two 1-pin connectors to each of the filters and cut each one to 1/4” as shown in Detail I1. Make sure they are mounted as straight as possible.

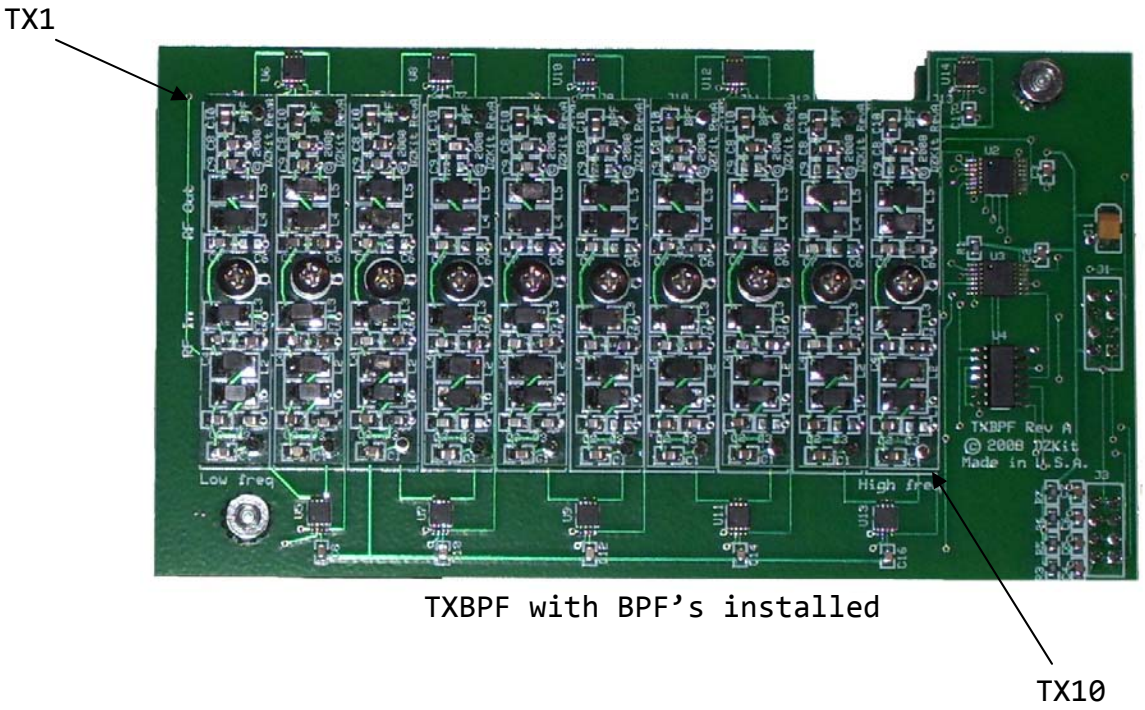
( ) Push one filter pin socket onto the end of each of the 20 filter pins.

( ) Place each filter in the corresponding filter locations on the board and tighten each one with a 4-40 x 3/16” screw. If the filter pin sockets do not lie flush with the board, push them down until they do. If you cannot get the screw to seat the board without warping it, remove the board and the filter pin sockets and clip another 1/16” off the end of the filter pins, then try again.

( ) Once all filters are in place and the sockets are flush with the board, solder the filter pin sockets to the back side of the board.

( ) Insert the male threads of two 4-40 x 7/16” hex male/female spacers from the back side of the board into the corner mounting holes and secure them on the front of the board with two 4-40 KEPS nuts.

This completes assembly of the TXBPF board.



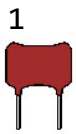
TXBPF with BPF's installed

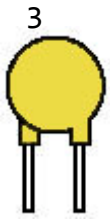
Detail I1. BPF Assy

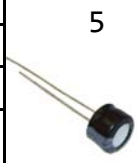
Appendix J: Option 104: 100W PA

PARTS LIST

Item	Part	Description	Qty	Bag
1	C58	18pF silver mica capacitor (sm)	1	1
1	C44	20pF sm	1	1
1	C53	27pF sm	1	1
1	C62	33pF sm	1	1
1	C60	47pF sm	1	1
1	C55	56pF sm	1	1
1	C50, C57	68pF sm	2	1
1	C63	82pF sm	1	1
1	C38, C47	100pF sm	2	1
1	C56	120pF sm	1	1
1	C52, C59, C61	150pF sm	3	1
1	C32	220pF sm	1	1
1	C40, C41, C54	270pF sm	3	1
1	C36, C37, C42, C45, C48, C49	330pF sm	6	1
1	C34, C46	390pF sm	2	1
1	C43, C51	560pF	2	1
1	C26, C35	1000pF sm	2	1
1	C31, C39	1200pF sm	2	1
1	C33	2200pF sm	1	1
2	C9	180pF monolithic capacitor	1	2
2	C70	1800pF 200V monolithic capacitor	1	3
2	C8, C12, C13	4700pF 50V monolithic	3	4
2	C23, C24	4700pF 200V monolithic	2	5
2	C22, C27, C28	.01uF monolithic 50V	3	5
2	C3, C4, C5, C10, C14, C15, C16, C25, C29, C30, C64-C68	.1uF monolithic 50V	15	6
2	C18, C19, C20	.1uF 200V monolithic	3	7
2	C17,C71	1.0uF monolithic	1	8
3	C21	.01uF 500V disk ceramic capacitor	1	5
4	C11, C69	10uF/25V alum. electrolytic cap	2	8
5	C6, C7	100uF/25V alum. electrolytic cap	2	7
6	D6	1N5818 diode (solid, black)	1	9
6	D7, D8, D9, D10	1N914 diode (glass)	4	9







Item	Part	Description	Qty	Bag
7	D3	1N5404 diode (large)	1	9
8	J3	16-pin 2-row shrouded connector, right angle	1	10
9	J1, J7, J8	2-pin AMP MTA connector, right angle	3	10
10	J2, J5, J6	RF connector	3	10
11	K1-K13	SPDT 12V relay	13	10
12	L1, L2, L3, L4, L14, L15	T50-2 toroid (red)	6	10
13	L5-L12	T50-10 toroid (black)	8	10
14	RFC3-7	100uH inductor (SMT)	5	14
15	Q5, Q10, Q11	2N3904 NPN transistor	3	11
15	Q1, Q4, Q12	2N7000	3	12
16	Q8, Q9	2SC2879A RF power transistor	2	11
17	Q2	FQB9N15TM power N-channel MOSFET	1	11
17	U6	LM2940CS-5 regulator TO-263 (SMT)	1	12
18	Q6, Q7	MJE182 NPN power transistor	2	11
19	Q3	TIP31A NPN power transistor	1	11
20	R10	10 ohm 1/4W metal film resistor	1	13
21	R7, R27	51 ohm 1/8W metal film	2	13
21	R20	100 ohm 1/8W metal film	1	9
21	R6, R8, R22, R28, R38, R39	1K ohm 1/8W metal film	6	5
21	R21, R34	3.16K ohm 1/8W metal film	2	6
21	R3, R9, R31	4.7K ohm 1/8W metal film	3	7
21	R1, R2, R9, R29, R33	10K ohm 1/8W metal film	5	8
21	R4	130K ohm 1/8W metal film	1	2
21	R30	1M ohm 1/8W metal film	1	3
21	R5	10M ohm 1/8W metal film	1	4
22	R19	.005 3W resistor SMT	1	12
23	R13, R14	2.0 2W resistor (SMT)	2	13
23	R11, R12	20 ohm 2W (SMT)	2	13

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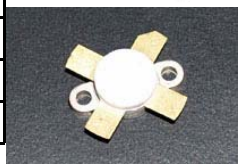

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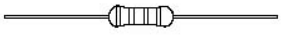

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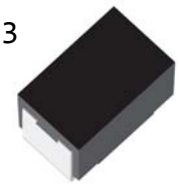
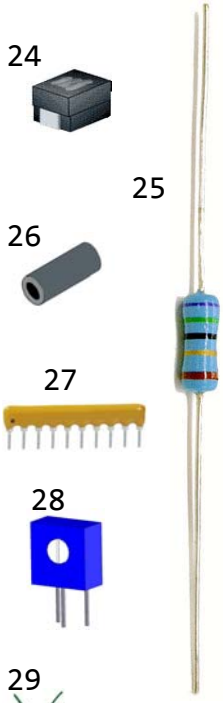
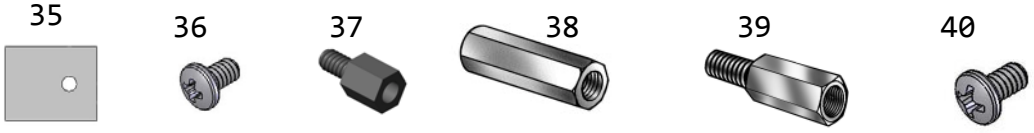


Item	Part	Description	Qty	Bag
24	R23, R24	100 ohm 1W resistor (SMT)	2	9
25	R15, R16, R17	10 ohm 2W metal oxide resistor	3	13
25	R26, R32, R35, R36, R37	47 ohm 1W metal oxide resistor	5	13
25	R18	300 ohm 2W metal oxide resistor	1	9
25	R25	120 ohm 2W metal oxide resistor	1	4
26	RFC1, RFC2	Ferrite Bead	2	14
27	RN1	Resistor network, .1" centers, 10-pin 10K	1	14
28	RV1	1K trimpot - side adjust	1	14
29	T1	Small binocular core, .5"x.75", wound 9:1CT	1	15
30	T2	Large binocular core, 1"x1.2", wound 1CT:16	1	15
31	TH1	Thermistor - 10K	1	14
32	U1	74HC273 octal D flip-flop	1	12
33	U2	ULN2803 relay driver	1	12
34		Partially loaded board	1	
		RTV - 4 gram tube	2	10
		22# magnet wire	160”	10
		Parts used for mounting board to chassis:		
35		Thermasil sticky-back insulator	3	
36		Screw - 4-40 x 3/16" PH Phillips M/S	11	
37		Hex M/F spacer - 4-40 x 3/16"	4	
38		Hex F/F spacer - 6-32 x 1.5”	4	
39		Hex M/F spacer - 6-32 x 7/16”	1	
40		Screw - 6-32 x 1/4” PH M/S	3	
41		Fiber shoulder washer	1	
42		Heatsink compound (Wakefield 4g pack)	1	
43	CA15	2-pin IDC cable	1	
44	CA23	Ribbon cable — TUNERDATA-AMP	1	
45	CA49	RF cable — AMP-TUNER	1	
46	CA50	12” 16AWG red wire with insulated terminals	2	
47		Fuseholder	1	
48		Fuse - 25A 3AG	1	
49		Heatsink	1	





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CA15

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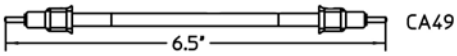

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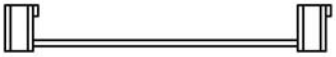

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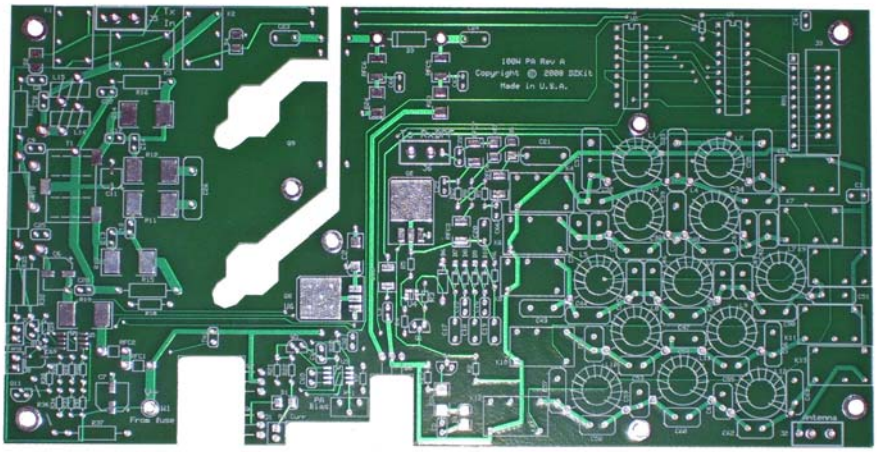


STEP-BY-STEP ASSEMBLY-100W PA Board

When loading the following parts, locate the appropriate bag and remove only the specified parts. Check off the parts on each bag as you remove them, and then check off each step once you have completed it.

( ) Load and solder SMT power resistor R19 (Bag 12).

( ) Load and solder SMT power resistors R11 and R12 (Bag 13).

( ) Load and solder SMT power resistors R13 and R14 (Bag 13).

( ) Load and solder SMT power resistors R23 and R24 (Bag 9).

( ) Load and solder SMT RFCs RFC3, RFC4, RFC5, RFC6 and RFC7 (Bag 14).

( ) Load and solder power N-channel MOSFET Q2 (Bag 11). Be sure you install this at Q2 and not U6. The pads look the same. First, apply a small amount of solder to the center, large pad. Place this SMT part on the pads and solder one pad while holding the part to keep it from moving. Then solder the other pin(s). Some of these parts have 3 pins, some have 2. Finally, solder around the edges of the metal tab. It will be necessary to hold the soldering iron on the tab for about 30 seconds so that the solder flows evenly around and under the tab.

( ) Load and solder U6 (Bag 12), a 5V regulator, in the same manner as the previous step.

( ) Load and solder aluminum electrolytic capacitors C6, C7 (Bag 7), and C11 and C69 (Bag 8). Note that these are not all the same value capacitors. The long lead is positive and must be mounted in the hole with the square pad. Clip the leads.

( ) Load and solder resistor network RN1. Be sure that pin 1, marked with a dot, goes into the hole with the square pad.

( ) Load and solder all monolithic and ceramic disk capacitors (Bags 2-8). Note that these are not all the same value. Clip the leads.

( ) Load and solder all 1/8W, 1/4W, 1W and 2W resistors (Bags 2-9 and 13). Clip the leads. Save seven of the leads from the 2W resistors.

( ) Place a ferrite bead over a clipped lead from the previous step. Bend the ends of the wire down so that the resulting inductor fits in the holes for RFC1. Load and solder this part and clip the

leads.

( ) Repeat the previous step for RFC2.

( ) Bend the remaining clipped resistor leads so that they fit in the five jumpers that span the vertical cut in the top center of the board. Align them carefully so they do not touch each other. Solder them in place. Clip any excess lead lengths.

( ) Load and solder all diodes and the power rectifier (Bag 9). Make sure the banded side goes on the pads marked on the silkscreen with a square pad. Clip the leads.

( ) Load and solder trimpot RV1 (Bag 14). Clip the leads.

( ) Load and solder 2N3904 NPN transistors Q5, Q10 and Q11 (Bag 11). Bend the leads slightly as you insert the parts and line up the flat side with the silkscreening.

( ) Load and solder 2N7000 MOSFET transistors Q1 and Q4 (Bag 12).

( ) Load and solder ICs U1 and U2 (Bag 12). Be sure pin 1, marked by a notch in the IC, goes in the square pad.

( ) Load and solder all relays, K1-K13 (Bag 10).

( ) Load and solder connector J3 (Bag 10). Pin 1 on J3 is marked by an indented triangle. Line this up with the square pad.

( ) Load and solder all right angle AMP MTA connectors, J1, J7 and J8 (Bag 10). These 2-pin connectors are mounted with the pins extending out past the edge of the board.

( ) Load and solder the RF connectors J2, J5 and J6 (Bag 10). Clip the leads.

( ) Cut the leads on small transformer T1 (Bag 15) to 1/2”. Strip 1/8” off the ends.

( ) Lay T1 on top of the board inside the silkscreened outline, with the leads facing toward the edge of the board. Note that the PC board that forms each side of the transformer has two pads on one side that line up with the pads on the 100W PA Board. On the other side, one center pad lines up with a pad on the 100W PA Board. While holding the part in place, solder one pad of the transformer to the corresponding pad on the 100W PA Board, followed by the other two. Insert the leads into the closest pads and solder them. Clip the leads. It is very difficult to remove this part once installed, so take your time and be sure that it is installed correctly.

( ) Repeat the above procedure for large transformer T2 (Bag 15), mounting it on the back side of the board. Position this part as close as possible to the edge of the board while still making contact with its pads. The heatsink will be mounted very close to this part, so it is helpful to have as much clearance as possible.

( ) Locate the six red toroids (Bag 10). Cut the magnet wire into 14 lengths as shown in the table below. Wind the specified number of turns of magnet wire around each toroid. Each time the wire passes through the center is considered 1 turn. Leave about 1/2” of lead extending out from the toroid. Load these toroids into L1-L4 and L14, L15. ***Mount L14 and L15 upright on the back side of the board.*** Solder the leads, keeping the soldering iron (set to 750 degrees F) on the leads until the coating melts away and the solder flows onto both the pad and the wire smoothly. This can take about one minute per lead. Clip the leads.

( ) Repeat the previous step with the eight black toroids (Bag 10). Load and solder these toroids into L5-L12. Clip the leads.

L1: 27 turns (18”) RED
L2: 25 turns (17”) RED
L3: 14 turns (10”) RED
L4: 13 turns (10”) RED
L5: 13 turns (10”) BLACK
L6: 12 turns (9”) BLACK
L7: 12 turns (9”) BLACK
L8: 11 turns (8”) BLACK
L9: 10 turns (7”) BLACK
L10: 9 turns (7”) BLACK
L11: 8 turns (6”) BLACK
L12: 8 turns (6”) BLACK
L14:31 turns (21”) RED
L15:31 turns (21”) RED

( ) Load and solder all silver mica capacitors (Bag 1). Clip the leads. The component value in picoFarads is printed on the body of the cap. For example, a 330pF capacitor is marked 330. Ignore any suffix, such as “J”.

( ) Insert and tighten four 4-40 x 3/16” hex male/female spacers into the four mounting holes on the heatsink as shown in Detail J2, below.

( ) Affix three Thermasil insulators to the heatsink as shown.

( ) Place Q8 and Q9 (Bag 11) on the heatsink in the orientation shown in Pictorial K1 (Q8’s collector facing up, Q9’s collector facing down such that they point towards each other). The collectors have an angled cut in the fin. Insert a 4-40 x 3/16” screw into the mounting holes on each transistor and into the threaded holes on the heatsink. Secure the screws

but do not tighten them.

( ) Place the board over the heatsink, lining up the four mounting holes. Insert two 4-40 x 3/16" screws in diagonally opposite holes to keep it in place. See Detail J3.

( ) Solder the fin on Q8 and Q9 that is accessible (barely covered by the heatsink). It is only necessary to tack these fins in at this point, just to keep the parts from moving. See Detail J4.

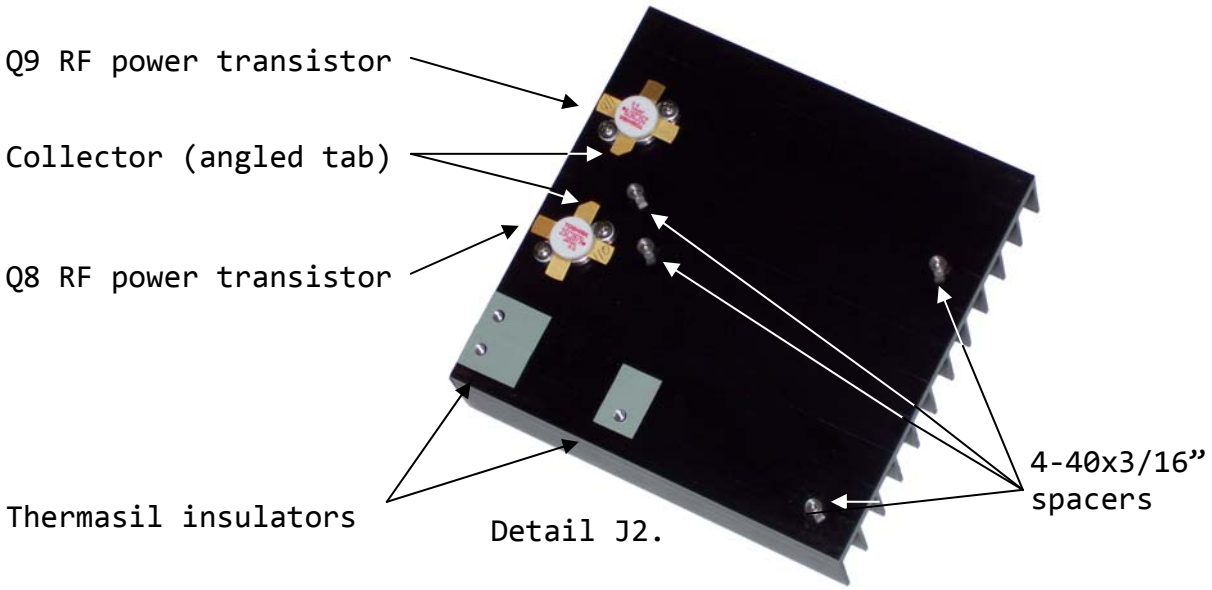
( ) Remove the mounting screws from the heatsink and from Q8 and Q9 and remove the board.

( ) Solder the other three fins on Q8 and Q9. Apply plenty of solder to be sure the fins are fully attached to the pads. Re-heat the pad you tacked earlier, applying more solder if necessary. See Detail J5.

( ) Line up the other three transistors (Q3, Q6 and Q7—Bag 11) in the correct locations on the heatsink. Note where the leads of the transistors need to be bent up to fit in the PC board holes. Bend the leads up and insert them into the PC board holes from the bottom side of the board ***but do not solder them.***

( ) Insert thermistor TH1 (Bag 14) ***from the bottom of the board.*** Push it over slightly toward the center of the board, but not all the way, so that when the heatsink is attached it will compress the thermistor against the heatsink. ***Do not solder it.***

( ) ***In the next few steps you will attach the heatsink, after which the bottom of the PC board will no longer be accessible, so take a few minutes to check every solder connection! There is a virtually 100% chance that you***



Detail J2.

will find a few pins unsoldered. Better to fix them now than to take the heatsink off and fix them later.

( ) Apply a liberal amount of heatsink compound to the bottom metal body of Q8 and Q9.

( ) Lay the board onto the heatsink, being careful to line up the mounting holes.

( ) Re-insert the four screws into the mounting holes for Q8 and Q9 and the four PC board mounting screws.

( ) Insert a shoulder washer in Q3's mounting hole.

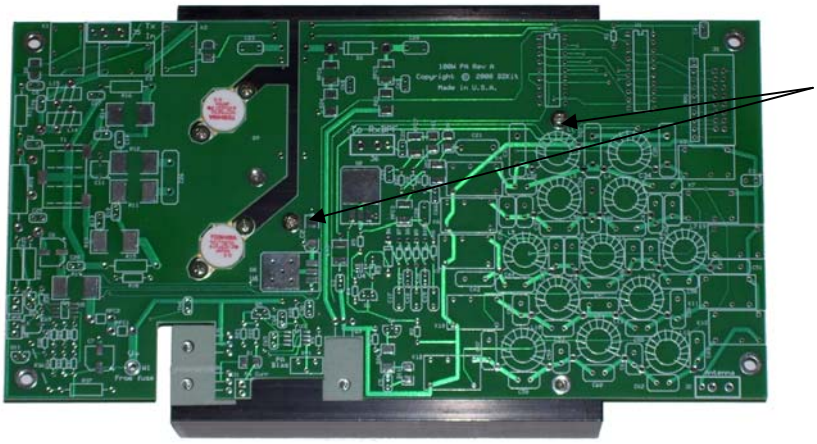
( ) Gently wiggle Q3, Q6 and Q7 so that their mounting holes line up perfectly with the corresponding threaded hole in the heatsink. Insert a 4-40 x 3/16" screw into the three transistor mounting holes. Make sure as you do this that the screws go in smoothly without any difficulty and that Q3's shoulder washer remains fully inserted in the transistor mounting hole. If you encounter resistance, back off on the screw, re-seat the washer, check to make sure the hole is centered and try again. Tighten the screws, but do not overtighten to avoid damaging the parts.

( ) Solder the pins on Q3, Q6 and Q7 and clip their leads.

( ) Insert four 6-32 x 1 1/2" hex male-female spacers from the bottom side of the board (with the male threads pointing up) in the four corner holes of the board and attach 6-32 KEPS nuts to the top of three of the four spacers. On the spacer that is next to the RF connector marked "Antenna", use a 7/16" hex double-female threaded spacer instead of a KEPS nut.

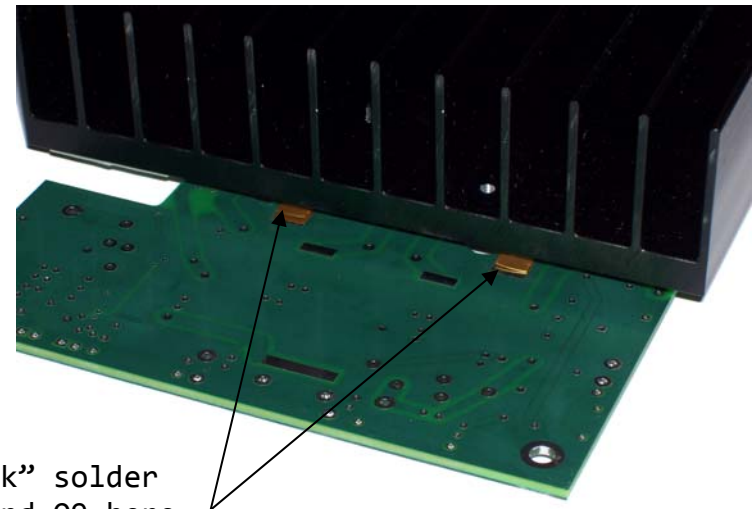
( ) Push C21 (the large ceramic disk) and the large silver mica capacitors over as far as they will go. Nothing may protrude higher than .4".

This completes assembly of the 100W power amplifier.



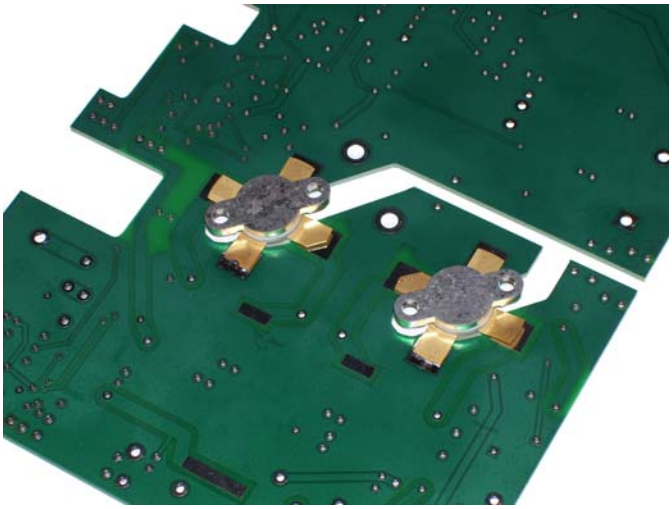
Temporary mounting screws

Detail J3.



"Tack" solder Q8 and Q9 here

Detail J4.



Remove heatsink and solder remaining pins of Q8 and Q9.

Detail J5.

Appendix K: Installing IF Filters

Refer to Pictorial K1 for the following steps.

There are three Intermediate Frequencies (IF's) used in the Sienna:

1st IF: The first IF is at 70MHz (70.455MHz with the optional Inrad 4kHz roofing filter). The Inrad crystal filter can be soldered directly to the Receiver board in the fours holes located at "FL1" - the area with a notch. The standard ceramic filter is mounted on a small PC board and also solders to the Receiver board. When soldering either of these filters, pay particular attention to the orientation of the pins: the text on the Inrad filter and on the PC board reads upside down compared to the other text on the Receiver board when installed correctly!

2nd IF: The second IF is at 9MHz and uses only Inrad crystal filters. A 4-pole SSB filter is shipped with all Sienna radios standard, and mounted on a Yaesu-style snap-in "C" board. This filter should be inserted into 9MHz Slot 2 from the bottom of the board. Other optional filters are of two types: the AM filter, which solders and screws directly to the IF Filter board because of its unusually tall form factor. All other filters snap in from the bottom of the radio into filter slots labeled 9MHz Slot 2, 3 and 4. Although the order is not important, most prefer to arrange them in decreasing bandwidth from Slot 2 through Slot 4. If you purchased a higher quality (more poles) SSB filter, you can install it *instead* of the standard 4-pole unit in Slot 2.

3rd IF: The final IF is 455kHz, and the filters for this IF are of three types:

1. Standard 20kHz ceramic filter. This small black cube is soldered directly to the bottom of the board in Slot 1.

2. Collins mechanical filters. The 5800 Hz mechanical filter, if present, must be soldered into the bottom of the board at Slot 1 instead of the ceramic filter noted above. Other mechanical filters are provided on Yaesu "C"-style snap-in boards.

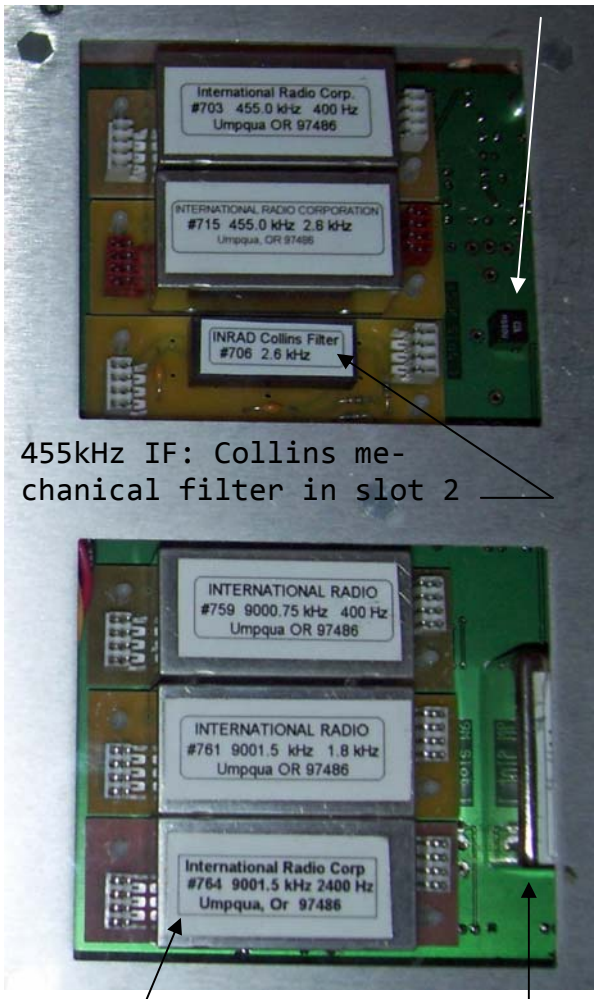
3. Inrad crystal filters, all of which are mounted on Yaesu

"C"-style snap-in boards.

Once filters are installed, the control firmware in the Sienna main microprocessor must be told which filter is located in which slot. If you have a front panel, press the menu button and rotate the small tuning knob until the IF filter choices show up. This screen shows the values installed in the 455kHz slots 1-4:

Once the page you want to change is selected, press the "Page/ Mode" button and/or rotate the large tuning knob to the desired slot. Rotate the small tuning knob until the desired bandwidth is shown for the selected slot. Once all filter values have been set, press Menu again to exit menu mode. Allow 10 seconds for the internal read-only-memory to be updated before turning off power. Photo K1 shows a typical installation of crystal, mechanical and ceramic filters.

Note: Sienna's processor "knows" what the actual center frequency of the available filters is (e.g., 9000.75, 9001.5 MHz). Non-standard choices may not work.



If you have a front panel-less model of the Sienna, you must enter the filter information by sending commands in the following form:

(Use Hyperterm or other RS-232 communications program at 9600 baud, 1 stop, no parity, no handshake)

“IR0;” (if you have the standard 70MHz filter)

“IR1;” (if you have the optional Inrad 70.455MHz filter)

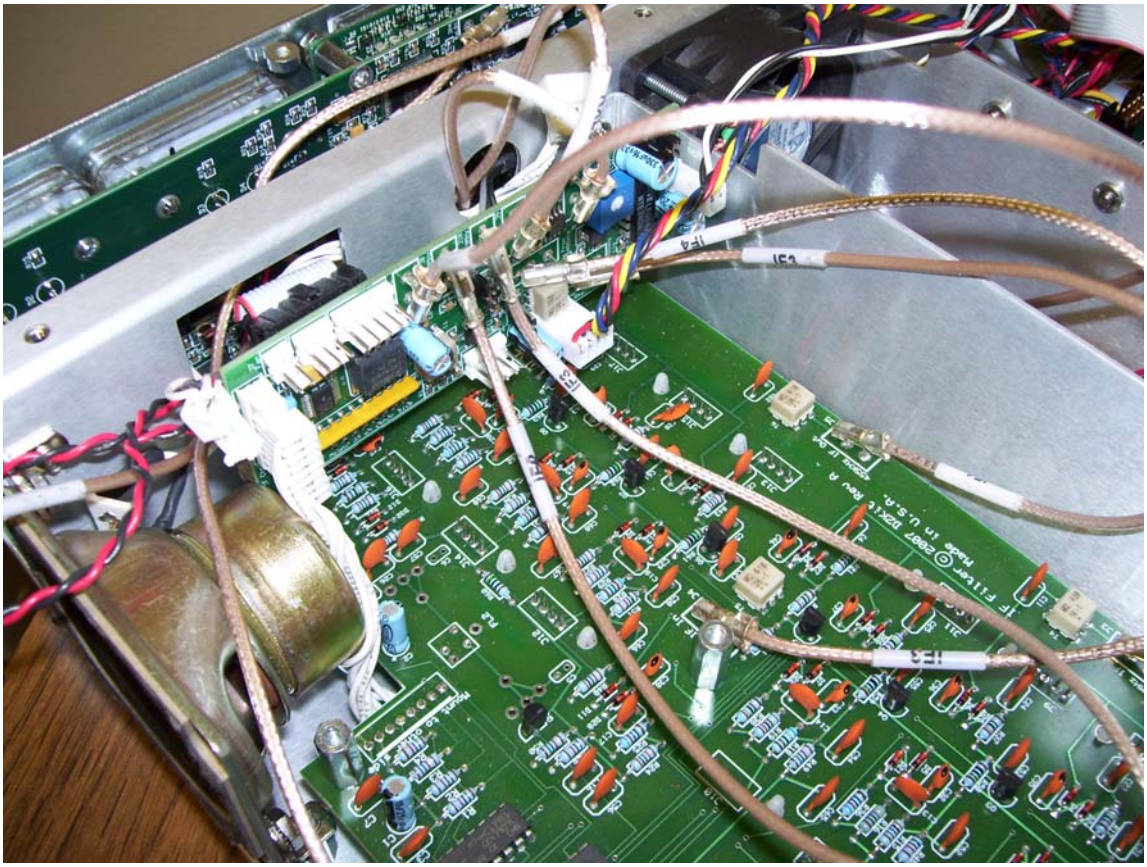
455kHz filters:
“IXnnnn;” n =
0,1,2,3,4,5,6,7,8,9,a,b,c,d
where:
0=20K, 1=5800, 2=2800,
3=2600, 4=2100, 5=2000,
6=1800, 7=1000, 8=500,
9=400, a=300, b=250, c=125,
d=none

9MHz filters:
“IYn;” n = 0,1,2,3,4,5,6,7,8
where:
0 = 6000, 1=2800, 2=2400,
3=2100, 4=1800, 5=1000,
6=400, 7=250,8 = none

Entries are in slot 1-4 order.

Example:
IX0269; installs the 20KHz filter in slot 1, 2800Hz in slot 2, 1800Hz in slot 3 and 400Hz in slot 4 for the 455kHz filters.

If you want to verify that the commands “took”, send just the characters “IR;” or “IX;” or “IY;”. The returned data will tell you which filters it thinks are in those slots.



Test Board connections to IF Filter Board

Appendix L: IF Filter Test Procedure

Refer to Pictorial L1 for the following steps.

( ) Remove the preassembled Test Board from its anti-static bag. Use static control procedures while handling this board.

( ) Pull the jumpers out of JP1, JP2 and JP3 if necessary and re-insert them as follows:
JP1: IF (top 2 pins)
JP2: IF (bottom 2 pins)
JP3: Rx (top 2 pins)

( ) Push the bottom of the two connectors at the end of the long 16-pin gray ribbon cable coming from J15 (“Rx”) on the Controller Board into the black connector (J3) on the back of the Test Board.

( ) Connect the cable labeled IF1 between J18 (“9MHz In (Test)”) on the IF Filter board and J9 (“To 9MHz”) on the Test Board.

( ) Connect the cabled labeled IF2 between J19 (“9MHz Out (Test)”) on the IF Filter board and J10 (“From 9MHz”) on the Test Board.

( ) Connect the cable labeled IF3 between J4 (“455kHz In”) on the IF Filter Board and J12 (“To 455kHz”) on the Test Board.

( ) Connect the cable labeled IF4 between J5 (“455kHz Out”) on the IF Filter Board and J13 (“From 455kHz”) on the Test Board.

( ) Connect the cable labeled LO3 between J26 (“RXLO3”) on the Controller Board and J11 (“RXLO3”) on the Test Board.

( ) Connect the cable labeled LO4 between J23 (“RXLO4”) on the Controller Board and J14 (“RXLO4”) on the Test Board.

( ) Connect the cable labeled TXVFO between J22 (“TXVFO”) on the controller and J8 (“TXVFO/RFOut”) on the Test Board. This cable should be lying in the transmitter compartment.

( ) Connect the 8-pin MTA cable from J1 (on the IF Filter Board to J2 (“IF Ctrl”) on the Test Board.

( ) Connect the 2-pin connector coming from the left speaker to J15 (Spkr) on the Test Board.

( ) Connect the Receiver power cable between J10 (“Rx” – 5

pins) on the DCD Board and J1 (“From DCD or RXBPF” - 4-pins) on the Test Board.

( ) Attach the Test Board to the two spacers closest to the front edge of the IF Filter board using two 6-32 x 1/4” screws.

Note: Connectors J4, J5, J6 and J7 are not used for the following tests.

( ) Make certain that all cables that are not in use are not shorting to the chassis or to other components on any boards.

( ) Apply power to the radio and press the on/off switch. Set the mode to USB and the frequency to 9000.00 kHz. If you have a front panel, use the FAST button and the small tuning knob to quickly change frequency. In menu mode, select FM/IF Test mode ON. If you are using a remote control model, connect the RS-232 port and issue the following commands using Hyperterm or any RS-232 remote control program (9600 baud, 1 stop bit, no parity, no handshake):

```
MD2;          { USB mode }
CF1;          { FM/IF Test On }
FA00009000000;
              { Freq=9.000MHz }
```

( ) Tune around the frequency until you hear a tone in the speaker. Adjust the RV1 pot on the Test Board for a comfortable listening level.

( ) Change the 9MHz and 455kHz filter settings and verify that you can still hear the tone. The amplitude may vary slightly from one filter to the next, and you may have to tune across several kHz to find it, since the local oscillator frequencies normally change slightly to compensate for the different center frequencies of the various filters. If you have a front panel, filters are selected by pushing the ADJUST button (notice the “*” symbol moving back and forth from the “9” to the “4” near the trapezoidal filter bandwidth displays) and then turning the ADJUST knob either direction. If more than one filter is installed, the width of the trapezoids will change and the selected bandwidths will be displayed. If you do not have a front panel, use the following RS-232 commands:

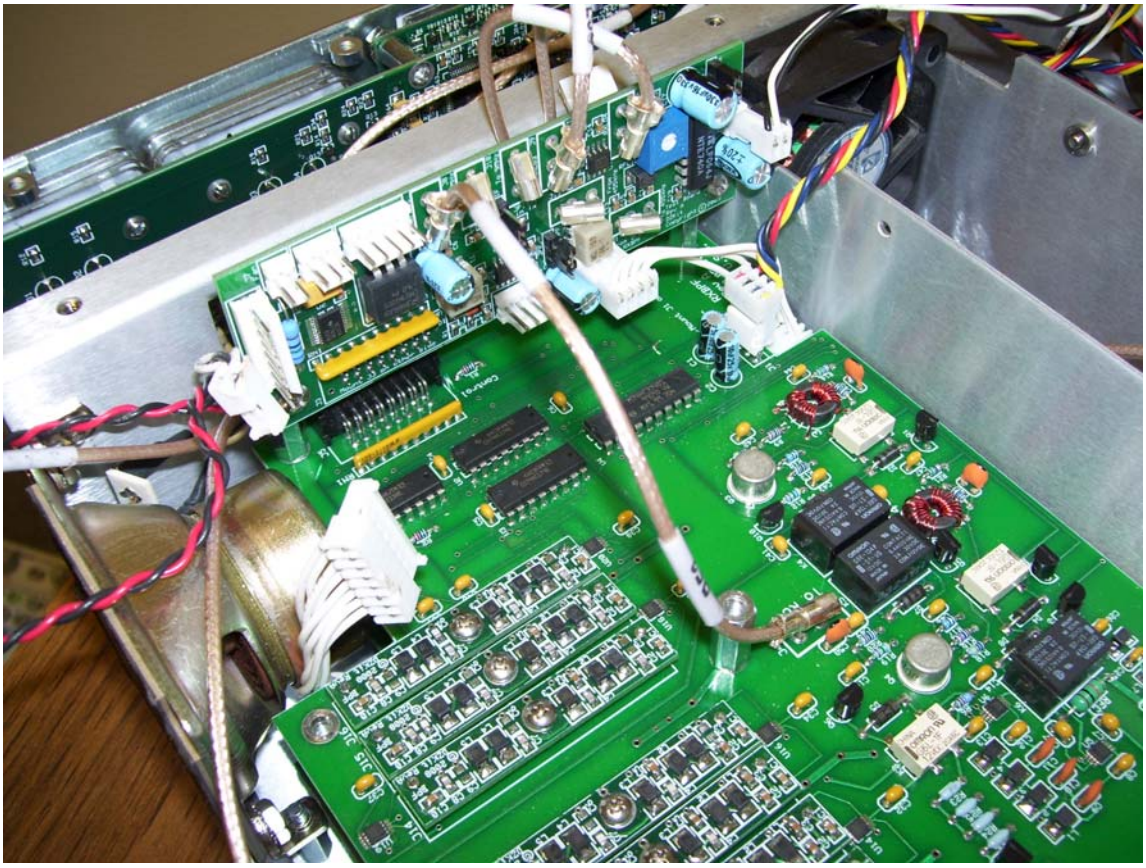
FXs; where s is the desired slot of the 455kHz filter (1-4)

FYs; {selects 9MHz filters}

( ) Turn off the radio and remove the Test Board. Disconnect all cables from it.

( ) Remove the cable labeled IF1 from J18 (“9MHz In (Test)”) on the IF Filter board and reconnect it J2 (“9MHz In”).

( ) Remove the cable labeled IF2 from J19 (“9MHz Out (Test)”) on the IF Filter board and reconnect it to J3 (“9MHz Out”).



Test Board connections to RXBPF Board

Appendix M: RXBPF Test Procedure

Refer to Pictorial M1 for the following steps.

( ) If you have not already done so, remove the preassembled Test Board from its anti-static bag. Use static control procedures while handling this board.

( ) Pull the jumpers out of JP1, JP2 and JP3 if necessary and re-insert them as follows:
JP1: BPF (bottom 2 pins)
JP2: BPF (top 2 pins)
JP3: Rx (top 2 pins)

( ) Push the top of the two connectors at the end of the long 16-pin gray ribbon cable coming from J15 (“Rx”) on the Controller Board into the black connector (J3) on the back of the Test Board.

( ) Connect the cable labeled LO3 between J26 (“RXLO3”) on the Controller Board and J11 (“RXLO3”) on the Test Board.

( ) Connect the cable labeled LO4 between J23 (“RXLO4”) on the Controller Board and J14 (“RXLO4”) on the Test Board.

( ) Connect the cable labeled TXVFO between J22 (“TXVFO”) on the Controller Board and J2 (“Main Antenna”) on the RXBPF board.

( ) Connect the short cable labeled RF1 between J4 (“To Rcvr”) on the RXBPF Board and J8 (“TXVFO/RFOut”) on the Test Board.

( ) Connect the 2-pin connector coming from the left speaker to J15 (Spkr) on the Test Board.

( ) Connect the Receiver power cable between J10 (“Rx” - 5-pins) on the DCD Board and J17 (“From DCD (test)”- 4-pins) on the RXBPF Board.

( ) Connect the short 4-pin cable between J1 (“Power”) on the RXBPF Board and J1 (“From DCD or RXBPF”) on the Test Board.

( ) Attach the Test Board to the two spacers closest to the front edge of the RXBPF Board using two 6-32 x 1/4” screws.

( ) Connect the top connector on the gray ribbon cable to J3 on the Test Board.

Note: Connectors J2, J4, J5, J6, J7, J9, J10, J12 and J13 on the Test Board are not used for the following tests.

( ) Make certain that all cables that are not in use are not shorting to the chassis or to other components on any boards.

( ) Set the switch on the edge of the RXBPF Board to the “Cal” position.

( ) Apply power to the radio and press the on/off switch. Set the mode to USB and the frequency to 9000.00 kHz. If you have a front panel, use the FAST button and the small tuning knob to quickly change frequency. If you are using a remote control model, connect the RS-232 port and issue the following commands using Hyperterm or any RS-232 remote control program (9600 baud, 1 stop bit, no parity, no handshake):

```
MD2;          { USB mode }
CF1;          { FM/IF test on }
FA00009000000;
              { Freq=9.000MHz }
```

( ) Tune around the frequency until you hear a tone in the speaker. Adjust the RV1 pot on the Test Board for a comfortable listening level.

( ) Once you have located the tone, engage the preamps and attenuator to verify that they perform as expected. From the front panel, simply push the “Preamp1” button and then the “Pre2/Atten” button. In each case you should be able to hear relays click on the RXBPF board and the signal should get louder. Press the “Preamp1” button again to turn off the preamps and turn on the Attenuator. You should then hear the signal get much weaker. If you do not have a front panel model, use the following commands instead:

```
RA00; { Attenuator off }
PA0;  { Preamp 1 and 2 off }
PA1;  { Preamp1 on, 2 off }
PA2;  { Preamp1 and 2 on }
RA01; { Atten on, preamps off }
```

( ) Return the switch to the Rcv position, turn off the radio and remove the Test Board.

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