

Assembly Instructions for the FRB FET FM 70 Watt Amp

- 1.) Orient the circuit board with the diagram
- 2.) Use a narrow chisel tip 25-30 watt soldering iron for assembly
- 3.) All the small parts are taped onto one sheet of paper
- 4.) Begin assembly with the surface mount capacitors (SMT) (non-leaded components)
- 5.) Remove one component at a time from the paper, begin at the input side
- 6.) Create a small puddle of solder on the pad where the component is being placed
- 7.) Use a pair of tweezers to hold the capacitor in position
- 8.) Place the capacitor in the correct position as indicated by the diagram. Heat the pad and draw the solder puddle toward the SMT component so the solder flows onto metal lead area on the component
- 9.) **Do not overheat**, this will lead to failure of the component
- 10.) Go to the other side of the component which in many cases will be the ground plane of the circuit board.
- 11.) Heat the area next to the capacitor, apply solder & draw the puddle to the end of the capacitor
- 12.) Soldering surface mount components takes a bit of dexterity and skill. The resulting joint should look like this:

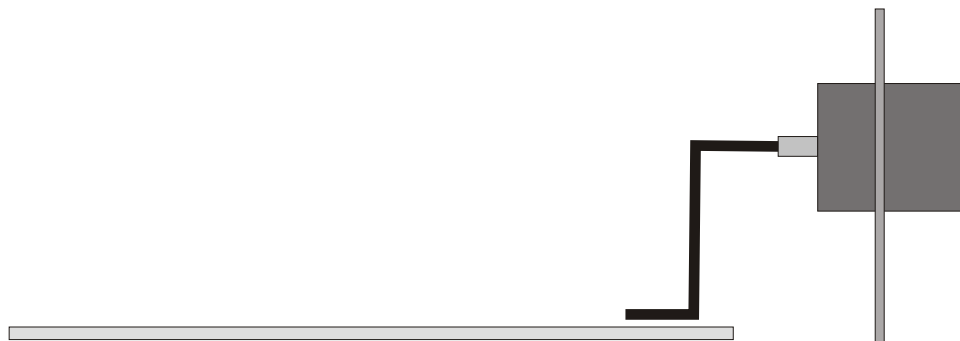


- 13.) Continue to solder the surface mount capacitors to the circuit
- 14.) After this, solder the leaded components to the board, start with the capacitors, **do not solder the transistors in, however.**
- 15.) Keep the leads short, so the component is 1/8 to 1/4 inches above the PC board. Form them like this:



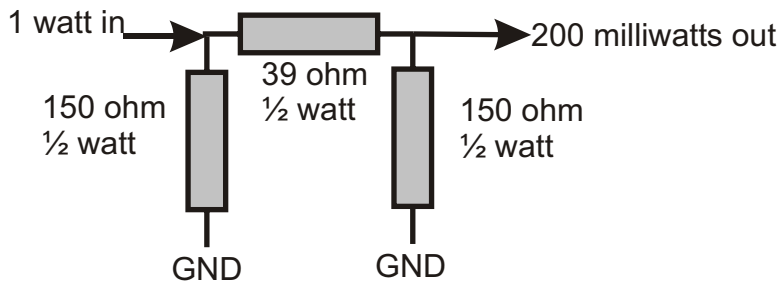
- 16.) When you get to the coils and chokes, form the leads like above and scrape the enamel from the ends of the red wires that will be soldered to the pads.
- 17.) Be sure to orient the 78L08/9 regulators properly, see diagram
- 18.) Observe correct orientation on the electrolytic capacitor, negative lead to ground area
- 19.) The amplifier board is mounted to the heat sink with 6 #6 self tapping screws. If it is mounted directly with spacing to a heat sink, 1 or 2 washers will be needed with under each screw.
- 20.) Place the board flat on the heat sink (brick enclosures if ordered along with the amp kit come pre-drilled) and mark the hole locations with sharp tip marker (fine tip sharpie).
- 21.) Center punch the hole marks with a center punch (or a nail and hammer), this prevents the drill bit from walking.
- 22.) Drill out the mounting holes with a 7/64" drill bit.
- 23.) Place the amplifier board on the heat sink to check alignment of the mounting holes
- 24.) Lift the board up and place #8 washers, if needed, on top of each hole.
- 25.) Place the board down carefully and align the mounting holes with the washers and the holes in the heat sink.
- 26.) Take the #6 self tapping screws and insert them into the holes. Lightly tighten the screws
- 27.) Grasping the RD06HFV1 transistor by the mounting flange, place it into the cutout in the board
- 28.) Be sure that the transistor is oriented properly
- 29.) Position the transistor so that the leads are perfectly centered on the circuit board traces/pads

- 31.) Mark the center of the mounting hole of the transistor on the heat sink
- 32.) Repeat the previous steps for the RD70HFV1
- 33.) Hold the transistor in position, correctly aligned, and mark the center of the flange mounting holes on the heatsink.
- 34.) Remove the transistor from the board.
- 35.) Remove the board from the heat sink.
- 36.) Center punch the mounting holes for the transistors
- 37.) Drill out the three holes with a 1/8" bit.
- 38.) Deburr the two holes
- 39.) Mount the board on the heat sink, do not tighten the screws all the way down just yet.
- 40.) Spread a thin film of heat sink compound on the bottom of the flange of the transistors
- 41.) Position the transistors.
- 42.) Take two 4-40 by 1/2" bolts and insert them through copper tabs and the flange mounting holes.
- 43.) From the other side of the heat sink place 4-40 nuts on the bolts and finger tighten
- 44.) For the RD06HFV1, only one bolt is required with a copper tab
- 45.) You may have to wiggle the board or transistors slightly to achieve alignment.
- 46.) Check for proper alignment, be sure the copper tabs are in place, tighten down the #6 screws
- 47.) Lightly tighten down the transistors, do not over tighten, go back and forth from one bolt to the other.
- 48.) When you see the heat sink compound begin to squeeze out from the flange, it is tight enough.
- 49.) Now, solder the leads of the transistor to the areas they are contacting on the board
- 50.) Do not use too much solder.
- 51.) Puddle the solder first on the pad and then draw it toward the transistor lead.
- 52.) Apply the solder and let it flow between the pad and transistor lead. Then solder the copper tabs.
- 53.) Remove the solder flux from the pad areas with alcohol and a small stiff brush, an old toothbrush
- 54.) The next step is to connect the voltage and ground wires to the board
- 55.) Use #18 red wire for these connections
- 56.) Measure the length needed to connect from the voltage pad of the circuit board to where the red banana socket is mounted on the panel
- 57.) Cut the wire to length and strip about 1/4" of the insulation from the ends
- 58.) Route the wire so it runs parallel to the edge of the board, not across it
- 59.) Solder one end to the voltage pad and the other end to the tab on the banana socket
- 60.) If you are using our brick enclosure, the black banana jack will be above the circuit board.
- 61.) Using a short piece of tinned bus wire, solder one end to the banana jack and the other end to the circuit board ground area.
- 62.) The RF output pad is connected to the SO239 socket
- 63.) If you are using the brick enclosure, the socket will be directly above the output pad
- 64.) Connect like this



- 65.) Solder one end to the center pin of the SO239 connector and the other end to the pad
- 66.) If you are using another type of enclosure use a short piece of RG8X to connect from the output pad to the SO239 connector.

- 67.) The last remaining connection is to the input pad of the amplifier.
- 66.) Usually the input will be coming from a 1 watt PLL exciter. You will need to attenuate the input so that it does not exceed 200 milliwatts. Use a Pi pad made from 3 resistors to reduce the input power level. The newest revision of the FRB 1 watt PLL has an adjustable power level from 0 to 1.5 watts.



- 68.) If you are using our brick enclosure, the PLL exciter will be mounted on a slide plate directly above the 70 watt amplifier with its voltage leads connected to the red & black banana sockets.
- 69.) Use a short piece of RG174 coax to connect from the output of the 1 watt PLL to the input pad of the 70 watt amplifier, center conductor to the pads, shield to ground side of the boards.
- 70.) If you are using an external exciter to drive the 70 watt amplifier, you will connect the input pad to the power input SO239 connector with a short piece of RG174 coax.
- 71.) Double check all the connections, use a continuity test to make sure there are no shorts on the input and output traces of the amplifier.
- 72.) Connect a dummy load of sufficient capacity (100 watts continuous) to the output connector of an RF power meter. Use a short coax jumper to make the connection.
- 73.) Connect the output of the amplifier to the input of the RF power meter.
- 74.) If you are using an external amplifier to drive the 70 watt amplifier, connect it to the input of the 70 watt amplifier.
- 75.) If you are using an internal PLL exciter, be sure it is working correctly and the output does not exceed 200 milliwatt watts. Turn the 10K bias trimmers on the 70 watt so that the wipers are at ground
- 76.) Once everything is connected properly it is time to test the amplifier.
- 77.) Connect your power supply, 12-14 volts DC - observe correct polarity.
- 78.) Turn on the power supply, be certain the unit is connected to the power meter & dummy load.
- 79.) With 13.8 volts DC and the bias turned down, the amplifier should have very little output
- 80.) If there is no output or the transistor is getting excessively hot, turn everything off and check all the connections - bad solder joints are the usual culprits.
- 81.) If everything is ok, then proceed to turn everything off.
- 82.) Turn the unit back on, and increase the RD06 bias voltage by turning the trimpot R1 CW until a maximum power level is shown on the power meter. Then increase the RD07 bias voltage by turning the trimpot R3 CW until a power level of 70 is achieved
- 83.) When the amplifier is put into operation proper cooling is necessary. Be certain that the heat sink fins are point up and are not obstructed. Place a fan directly on top of the heat sink blowing directly down on the area where the transistor is mounted. A fan from a surplus PC power supply works very well. If you use a 12 volt DC fan, use a separate power supply such as a wall wart to power it. Some fans will induce noise into the DC power supply, you will hear a background whine on the frequency the transmitter is set for.

70 Watts Out

GND

13.8
Volts DC

C12 - 180pf 1210

C13 - 100pf mica

C12 - 47pf 1210

C11 - 43pf 1210

C14 - 47uf

L10 - 3T .25 dia. #18

C15 - .001uf

C9 - 100pf 1210

C16 - .1uf

C10 - 56pf mica

L9 - .375" Hairpin #14

C8 - 100pf mica

L11 - 6T .25 #18
on T50 ferrite toroid

C17 - .001uf

L8 - .5" Hairpin #14

L7 - 6T .25 #18

C7 - 68pf 1210

C6 - 150pf 1210

C5 - 56pf mica

C18 - .1uf

7808/9 Regulator
Mount vertically

RD70

Copper foil
tabs soldered
to ground plane

to R2

R3-10K
Trimmer

C19 - .1uf

L6

C4 - 470pf 1206

C3 - 120pf 1206

to 7805/7809

R1 & R3
Bottom View

R4 - 120 ohm

L11 - Ferrite
Bead

L5 - 1T .25 dia. #18

70 & 6 Watt Bias Adjustment
Center (wiper) conductor of 10K
trimmer goes to resistor pad.
One of the other two leads
goes to ground and the
remaining lead goes to the
voltage regulator

C21 - 47uf

C20 - .001uf

L4 - Wide Band
Choke

C2 - 180pf

C26 - 100pf mica

L3 - 6T .25 dia. #18

C22 - .1uf

C23 - .001uf

R1-10K
Trimmer

RD06

Copper foil
tab soldered
to ground plane

L1 - Wide Band
Choke

7808/9 Regulator
Mount vertically

C24 - .001uf

R2 - 150 ohm
& ferrite
bead

L2 - 4T .25 dia. #18

C25 - .1uf

C1 - 470pf mica

RF Input - 200 milliwatts

FRB 70 Watt Dual Stage FM Broadcast Amplifier

Parts List

COMPONENT		TYPE	QUANTITY
C1		470pf mica	1
C2		82pf 1206 SMT	1
C3		120pf 1206 SMT	1
C4		470pf 1206 SMT	1
C5, C10		56pf mica	2
C6		150pf 1210 SMT	1
C7		68pf 1210 SMT	1
C8, C13, C26		100pf mica	2
C9		100pf 1210 SMT	1
C11		43pf 1210 SMT	1
C12		180pf 1210 SMT	1
C14, C21		47uf electrolytic	2
C15, C17, C20, C23, C24		.001uf 1206 SMT	5
C16, C18, C19, C22, C25		.1uf 1206 SMT	5
C27		100pf 1206 SMT	1
IC1, IC2		7808/9 voltage reg.	2
L1, L4		Wideband RF Choke	2
L2		4 turns #18 .25" dia.	1
L3		6 turns #18 .25" dia.	1
L5		1 turns #18 .25" dia.	1
L6		#18 hairpin .5"	1
L7		6 turns #18 .25 dia., enamel	1
L8		#14 hairpin .5"	1
L9		#14 hairpin .375"	1
L10		3 turns #18 .25" dia.	1
L11		6 turns #18 enamel on T50 toroid	1
L12		Ferrite bead on wire	1
Q1		RD06HFV1	1
Q2		RD70HFV1	1
R1, R3		10K Trimmer	2
R2		150 ohm ¼ watt resistor	1
R4		120 ohm ¼ watt resistor	1
1	SO239	8	4-40 nuts
2	banana jacks (1 black, 1 red)	2	banana plugs (1 black, 1 red)
1	#16 Red & Black zip cord -8"	1	RG174- coaxial cable - 8"
1	#4 bolt 3/8"	4	#4 bolts ¼"
4	#6 washers	3	#4 bolts – ½"
4	#6 sheet metal screws	1	ground lug
1	70 watt circuit board	3	copper tabs
1	heat sink compound packet	1	RG8X – coaxial cable – 8"
1	ferrite bead for R2		