

FB-220 FILTER CAPACITOR BLOCK INSTALLATION INSTRUCTIONS

PARTS SUPPLIED WITH THIS KIT:

(1) FB-220 Filter Capacitor Block Assembly

To start the installation, read these instructions very carefully. Now unplug the amplifier and remove any input, output and control cables that may be connected to the back of the amplifier. Place the amplifier on a book, front panel up, and remove the bottom screws holding the feet and case in place. Lift the case up and remove it from the amplifier. Place the amplifier on the bench with the front panel facing you. You are now ready to proceed with the installation.

- () Remove the 15 sheet metal screws that hold the perforated cover in place and remove this along with the top rear plate cover.
- () Remove the top rear 6-32 screw, nut and washer holding the right side panel in place along with the 4 sheet metal screws that attach the right side panel to the chassis.
- () Remove the top front Phillips-head screw on the right side of the front panel. This will release the right side panel for removal.
- () Tip the amplifier onto its left side.
- () Unsolder the 3 wires attached to the old capacitor bank. There is a **BLACK** wire from the rectifier board, a **BLUE** wire also from the rectifier board and a **RED & YELLOW** wire from the HV transformer.
- () Remove the (4) 6-32 nuts and washers securing the capacitor bank bracket. Now lift the bracket up about 1/2".
- () Remove the 8 capacitors and the nylon spacers. This task can be made easier by cutting some of the wires between the capacitors (they are no longer needed).
- () Slip the replacement capacitor bank into the cavity vacated by the old capacitor bank with the solder lugs toward the front panel. **Make sure that you fully slide the block to the rear of the cavity. Now, slide the assembly approximately 1/16" out of the cavity.**
- () Press down on the capacitor bank bracket and reinstall the (4) 6-32 nuts and washers. Depending on the tolerances of the bracket, you may have to leave off the washers. Tighten the nuts securely.
- () Solder the 3 wires you removed earlier; The **BLUE** to the bottom solder lug, the **RED & YELLOW** to the middle lug and the **BLACK** to the top lug.
- () Place the right side panel in position and secure with the 4 sheet metal screws removed earlier.
- () Reinstall the top front Phillips-head screw on the right side of the front panel and tighten.
- () Reinstall the 6-32 screw, nut and washer in the top rear of the back panel.

- () Replace the perforated cover and top rear plate cover. Reinstall the 15 sheet metal screws holding these pieces in place. **DO NOT** over tighten these screws, as it is fairly easy to strip the screw threads in the aluminum underneath.
- () Use the book to hold the amplifier while you reinstall the case and feet.

This completes the installation of the FB-220 filter capacitor block. It will provide you with a better power supply that provides the necessary B+ filtering and regulation. Your amplifier should not experience any filtering problems in the future.

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FM-220 FAN & MOTOR REPLACEMENT INSTRUCTIONS

PARTS SUPPLIED WITH THIS KIT:

- (1) Fan Motor with Leads
 - (1) 6" 6-Bladed Fan
 - (2) #6 Fender Washers
 - (2) 6-32 Nuts
 - (2) Blue Wire Nuts
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To start the installation, read these instructions very carefully. Now unplug the amplifier and remove any input, output and control cables that may be connected to the back of the amplifier. Place the amplifier on a book, front panel up, and remove the bottom screws holding the feet and case in place. Lift the case up and remove it from the amplifier. Place the amplifier on the bench with the front panel facing you. You are now ready to proceed with the installation.

- () Remove the 15 sheet metal screws that hold the perforated cover in place and remove this along with the top rear plate cover. Carefully remove the tubes and set them aside.
- () If you have not unpacked the motor and fan blade, do so now.
- () Using one of the larger foam pieces as a cushion, place the motor (shaft up) on the foam pad and press the mounting studs into the foam.
- () Take the fan blade (metal ring up) and press the blade down onto the shaft. Do not press too far. Have about ¼" of the shaft protruding through the fan blade hub.
- () Remove the outer nut and washer from each of the mounting studs of the new motor.
- () Turn the amplifier upside down. Locate the 2 wires coming from the old fan motor and cut them where they go through the chassis.
- () Turn the amplifier back right side up. Remove the screws (or nuts, whichever you have) holding the old fan motor to the rear panel.
- () Lift the old motor and fan out of the chassis through the area vacated by the tubes.
- () Lower the new motor and fan into the area vacated by the old fan and motor.
- () Push the mounting studs through the existing mounting holes and secure with the provided washer and nut on each stud. Tighten both nuts.
- () Turn the amplifier upside down.
- () Pull the motor leads out of the bottom of the fan cutout. Cut both wires so that about 2" extend outside the fan cutout with the leads dressed against the rear panel and pulled toward the circuit breakers.
- () Strip approximately ½" of insulation from the motor leads. In a like manner, strip ½" of insulation from the fan motor power leads that were previously cut.

- () Twist the fan motor leads to the fan power leads and secure with the provided blue wire nuts. Make sure that these connections are tight and are fully insulated.
- () Dress the connected wires along the rear of the chassis under the rear panel lip.
- () Turn the amplifier back right side up and replace the tubes.
- () Replace the perforated cover and top rear plate cover. Reinstall the 15 sheet metal screws holding these pieces in place. **DO NOT** over tighten these screws, as it is fairly easy to strip the screw threads in the aluminum underneath.
- () Reinstall the case and feet using a book to support the amplifier.

This completes the replacement of the fan motor on your SB-220. You will notice a big difference in fan noise. The new fan and motor assembly is much quieter than your old motor and moves more air for better cooling.

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MM-220 OR PM-220 METER REPLACEMENT INSTRUCTIONS

PARTS SUPPLIED WITH THIS KIT:

- (1) MM-220 or PM-220 Replacement Meter (Multi-Meter or Plate Meter)
 - (2) Panel Drilling Templates
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To start the installation, read these instructions very carefully. Now unplug the amplifier and remove any input, output and control cables that may be connected to the back of the amplifier. Place the amplifier on a book, front panel up, and remove the bottom screws holding the feet and case in place. Lift the case up and remove it from the amplifier. Place the amplifier on the bench with the front panel facing you. You are now ready to proceed with the installation.

- () Remove the 15 sheet metal screws that hold the perforated cover in place and remove this along with the top rear plate cover.
- () Remove the 3 large and 2 small knobs from the front panel.
- () Remove the nut and washer holding the band switch to the front panel.
- () Remove the nuts and washers holding the meter switch and sensitivity pot to the front panel.
- () Remove the 2 Phillips-head screws on the right side of the front panel.
- () Remove the 2 Phillips-head screws on the left side of the front panel and loosen the front panel. It may require a slight prying action with a screwdriver to separate the front panel from the chassis due to paint stickage.
- () Pull out the pilot lamp assemblies from each meter.
- () On the back of each meter remove the nuts that secure the solder lugs to the meter.
- () Remove the terminal strip attached to the front panel. The lower left nut on the plate current meter fastens it. The front panel should now be free.
- () Remove and save the mounting nuts for both meters and remove the meters from the panel. The panel should now be free of all parts except for the Heathkit logo.
- () Take a moment to clean the face of the front panel with hot water and dishwashing detergent.
- () Cut the supplied template sheet in half to separate the two templates. One of these is a spare.
- () Place one of the templates on the rear of the front panel and **very carefully** align the hole patterns of the meter being replaced. The adjacent meter should be very close to also being aligned (holding the panel up to a light source will aid in alignment).
- () Hold the template in place with tape so that it will not move during the following operations. Now check the alignment again.

- () Carefully center punch the new upper right and lower left mounting holes.
- () Drill these holes with a 1/16" drill, keeping the drill perpendicular to the panel (a drill press helps, but is not necessary).
- () Drill out the upper right hole with a 1/8" drill.
- () If you have a 3/32" drill bit, use it to enlarge the lower left 1/16" hole, otherwise carefully enlarge this hole with the 1/8" drill. The drill will tend to drift into the larger (old) hole. The final size hole is to be 1/8". A small rat-tail file would be useful in cleaning up this hole.
- () Punch through the template near the upper left notch to be cut in the front panel. With a small rat-tail file make the indicated notch in the meter cutout hole. A triangular file or the edge of a rectangular file may also be used to make the notch (the notch does not have to be round).
- () Remove the template from the panel and trial fit the new meter. This will indicate whether more filing is needed to obtain a good fit and have the top of the meter parallel with the top of the front panel.
- () When a good fit is obtained, fasten the meter to the front panel with the supplied washers and nuts. If the plate meter is being replaced, leave off the washer and nut from the lower left stud (viewed from the rear of the front panel).
- () Unsolder the meter leads and bypass capacitor from the solder lugs that went to the **old meter**.
- () Cut the black and white leads going to the lamp assembly removed from the **old meter**. Cut these leads close to the lamp assembly and strip about 1/8" of insulation from each end. We will now reassemble the front panel.
- () Bring the front panel up to the front of the amplifier chassis and put the meter switch and sensitivity potentiometer shafts through their respective mounting holes. Loosely install the mounting washers and nuts.
- () Reinstall the meter leads on the meter not being replaced and tighten the meter terminal nuts.
- () If the **plate meter** is being replaced, place the supplied flat washer over the remaining mounting stud, then the meter light terminal strip and finally the mounting nut. Tighten the mounting nut firmly.
- () Looking down at the back of the front panel, loop the **RED** meter wire through the "+" terminal of the new meter (the terminal nearest the right edge of the front panel). **DO NOT** solder yet.
- () Loop the **BLACK** meter wire through the "-" terminal of the meter. **DO NOT** solder yet.
- () Loop the leads of the bypass capacitor through the two meter terminals and solder two leads on each meter terminal lug.
- () Connect and solder the meter lamp leads to the top solder lugs on the meter. These are the internal lamp connections.

- () Reinstall the lamp assembly into the meter not being replaced.
- () Bring the front panel up to the chassis. Put the tuning capacitor, loading capacitor and bandswitch shafts through their respective holes. Hold the front panel in place with the bandswitch mounting washer and nut (loosely installed).
- () Replace the (4) 6-32 Phillips-head screws at each corner of the front panel. Secure with a lock washer and nut and tighten firmly.
- () Tighten the nuts holding the bandswitch, meter switch and sensitivity potentiometer.
- () Place the loading capacitor and tuning capacitor in their fully meshed position. Turn the other 3 shafts to their full counterclockwise position. Now reinstall the 3 large and 2 small knobs. The tuning and loading capacitors each point directly to the left (9 o'clock). The bandswitch knob points at 80. The sensitivity potentiometer points at 7 o'clock and the meter switch knob points to "GRID".
- () Replace the perforated cover and top rear plate cover. Reinstall the 15 sheet metal screws holding these pieces in place. **DO NOT** over tighten these screws, as it is fairly easy to strip the screw threads in the aluminum underneath.
- () Reinstall the case and feet using a book to support the amplifier.

This completes the replacement of a panel meter on your SB-220. You will notice small differences in the action of these meters as the ballistics are different from the original Heathkit meters. They are as accurate, however.

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RM-220 RECTIFIER & METERING BOARD INSTALLATION INSTRUCTIONS

PARTS SUPPLIED WITH THIS KIT:

- (1) RM-220 Rectifier & Metering Circuit Board Assembly
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To start the installation, read these instructions very carefully. Now unplug the amplifier and remove any input, output and control cables that may be connected to the back of the amplifier. Place the amplifier on a book, front panel up, and remove the bottom screws holding the feet and case in place. Lift the case up and remove it from the amplifier. Place the amplifier on the bench with the front panel facing you. You are now ready to proceed with the installation.

- () Remove the 15 sheet metal screws that hold the perforated cover in place and remove this along with the top rear plate cover.
- () Remove the 3 large knobs from the front panel.
- () Remove the nut and washer holding the band switch to the front panel.
- () Remove the top rear screw holding the right side panel in place along with the 4 sheet metal screws holding the right side panel.
- () Remove the 2 Phillips-head screws on the right side of the front panel. This will release the right side panel for removal.
- () Remove the 2 Phillips-head screws on the left side of the front panel and loosen the front panel. It may require a slight prying action with a screwdriver to separate the front panel from the chassis due to paint stickage.
- () Swing the front panel around to the right and support it against the right side of the chassis to prevent undue stress on the wires leading to the panel. Now the old circuit board assembly is fully accessible.
- () Remove the (4) 6-32 x ¼” screws holding the old rectifier circuit board to the tapped spacers on the capacitor bank bracket.
- () Swing the circuit board out to gain access to the rear of the board. Unsolder and remove all wires from the board.
- () Cut or unsolder the leads going to the zener bias diode. This is mounted behind and to the left of the old rectifier board. The old zener diode is no longer used.

NOTE: All holes noted in the following steps are marked on the solder side of the new circuit board, and are in a similar location as those on the original rectifier board.

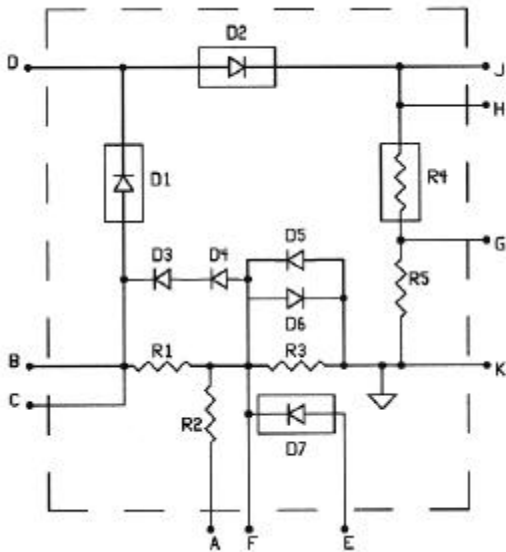
- () Connect the **RED** wire coming from the high voltage transformer to hole “D” on the new circuit board and solder.
- () Connect the **HEAVY BLUE** wire coming from the high voltage feed-through insulator on the left to hole “J” and solder.

- () Connect the **BLUE** wire coming from the bottom of the capacitor bank (the + wire) to hole “**H**” and solder.
- () Connect the **BLACK** wire coming through the grommited hole in the chassis (from the relay contact) to hole “**E**” and solder.
- () Connect the **ORANGE** wire coming from the meter switch to hole “**G**” and solder.
- () Connect the **YELLOW** wire coming from the meter switch to hole “**F**” and solder.
- () Connect the **BLACK** wire coming from the plate meter to hole “**C**” and solder.
- () Connect the **RED** wire coming from the plate meter to hole “**A**” and solder.
- () Connect the **BLACK** wire coming from the top of the capacitor bank (B- wire) to hole “**B**” and solder.
- () Connect the bare wire of the 0.001 μ F 6KV capacitor to hole “**K**” and solder.
- () Carefully inspect all solder joints to be sure that both the joint is good and that there are no solder bridges which could short components together. There are very high voltages on this board.
- () Attach the RM-220 circuit board to the tapped spacers using the previously saved (4) 6-32 x 1/4” screws.
- () Place the front panel back in place and loosely put in the 2 Phillips-head screws on the left side of the front panel.
- () Loosely reinstall the nut and washer holding the band switch to the front panel.
- () Place the right side panel in position and hold it in place with the 4 previously removed sheet metal screws.
- () Reinstall the 2 right side Phillips-head screws in the front panel. Tighten all screws in the front panel and the nut securing the band switch.
- () Reinstall the 6-32 screw, nut and washer on the right rear top of the back panel.
- () Replace the perforated cover and top rear plate cover. Reinstall the 15 sheet metal screws holding these pieces in place. **DO NOT** over tighten these screws, as it is fairly easy to strip the screw threads in the aluminum underneath.
- () Reinstall the 3 large knobs on the front panel. Be sure that your pointer orientation is correct on these knobs.
- () Use the book to hold the amplifier while you reinstall the case and feet.

This completes the installation of the RM-220 rectifier and metering board. It will provide you with protection from diode failure, as well as providing much more accurate meter readings. When you operate your linear amplifier, you will probably find that the plate voltage reading is much higher than before. This is not really the case. The voltage is the same as before, but you are now reading the true voltage. You may notice a slight reduction in the idling plate current of your SB-220. This is because the new board produces 6.8V of bias for the 3-500Z tubes, rather

than the 5.1V provided by the original Heathkit design. This will lower the heat produced by the amplifier during voice lulls, but will not materially affect the linearity at high power levels.

RM-220 RECTIFIER & METERING BOARD



PARTS LIST

D1 & D2	5-1N5408 (3A 1000 PIV)
D3 - D6	1N5408 (3A 1000 PIV)
D7	8-1N4005 (1A 600 PIV)
R1	1 Ω 3W 1%
R2	3600 Ω 1/4W 1%
R3	0.82 Ω 3W 5%
R4	14-1M Ω 1/4W 1% IN SERIES
R5	5600 Ω 1/4W 1%

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NOTE: A Method That May Be Easier

It may be easier, in some instances, to see a slightly different approach to replacing the circuit board. This method does not require the removal of the front panel.

- () Remove the perforated cover over the tube compartment.
- () Remove the perforated cover on the right side of the amplifier.
- () From the underside of the chassis, remove the 4 nuts and lock washers that hold down the cover over the filter capacitor block. If you are also replacing the filter capacitors, you will have been instructed to do this.
- () With the chassis right side up, lift the capacitor hold down cover. This will give you access to the lower screws holding the old circuit board.
- () Now, follow all steps in the previous instructions starting at **STEP 8**.
- () After the new RM-220 is wired, with the exception of the wire to hole "K", remount the circuit board on the capacitor hold down cover.
- () Reinstall the cover using the saved nuts and lock washers.
- () Connect the bare wire of the 0.001 μ F 6KV capacitor to hole "K" and solder.
- () Reinstall the perforated right side panel.
- () Replace the perforated cover and top rear plate cover. Reinstall the 15 sheet metal screws holding these pieces in place. **DO NOT** over tighten these screws, as it is fairly easy to strip the screw threads in the aluminum underneath.