U220FC Filter Capacitor Board in SB-220

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The U220FC universal application filter board is sized to perfectly fit the SB220 filter capacitor housing. Some board parts are not populated in the SB220 and other applications.

The U220FC, besides precisely fitting the factory filter capacitor bank housing of the Heathkit SB-220, also has four #6 machine-screw size mounting holes. In the SB220, the U220FC is held by three rubber edge moldings and one thin flat insulating sheet on the bottom. The U-shaped factory housing nuts under the SB220 chassis pull down and in on the U220FC board, compressing the rubber strips. This compression securely locks the board in place.

The SB220 originally held filter capacitors inside molded plastic forms. The closed plastic forms block cooling airflow. The U220 board reduces capacitor operating temperatures by up to fifty degrees Fahrenheit during normal use.

This board improves system performance by:

1.) Using lower ESR 105c-rated capacitors

2.) A thick circuit board acting as a heat dam between resistors and the capacitors

3.) Suspending capacitors in open air, permitting convection cooling

4.) Adding a 10kV-rated surge limiting resistor in series with the HV lead to the tube compartment. This reduces arc fault currents. (This resistor is moved to and located on our matching rectifier board when our rectifier is used)

5.) Adding an optional negative rail clamp to protect meters, if your amplifier does not already have one on its rectifier board. (Our rectifier board has better rail clamping and meter protection than any other aftermarket board.)

Installation SB-220 U220FC

In the SB220, the U220FC has two basic configurations:

1.) If your rectifier/meter board has good rail clamp protection or if our rectifier/metering

board is used, the U220FC will not need the rail clamp components. This eliminates D1, FB1, C9-C11

2.) If our rectifier/meter board is added the large green 10kV surge resistor R9 resides on our rectifier/meter board

3.) High voltage meter resistors R10-R14 are normally not used in any SB220 series. They are for amplifiers using on-board metering

Summary: The U220FC board normally uses only filter capacitors C1-C8 and bleeders R1-R8. Typically, all other parts are omitted in the U220FC SB220 application.

This replacement board wires like the original Heathkit board when our rectifier/metering board is used. A small thin blue (or black) negative connected to the rec- pad near R1A and R2A. A thick blue high-voltage insulated wire connects from Heathkit terminal H to our board rect+.



When using the OEM or other rectifier board system, R9 must be populated. A new HV wire

Figure 1 pictorial connections

must be run from this board at HV+ to the SB220 high-voltage feedthrough insulator. This wiring change causes tube arcs to pass through surge resistor R9, reducing the chances of amplifier arc damage. We can supply a Teflon-sleeved blue silicon wire for the positive lead to the HV feedthrough insulator.

The original Heathkit blue high voltage wire is used from the Heathkit doubler output (board

terminal H) to our board **rec+**. Our wire is safe beyond 12kV unless the insulation is cut or damaged.

NOTE: We can include the fault-limiting diode D1, R9, and three capacitors and prewire if you order this board alone. This may take a few days of extra prep time.



Prewired U200FCp board:

Figure 2 U220FCp

Blue arrows show rec+, HV lead to feedthrough (tubes), and our safety ground black wire Red arrow shows the power transformer wire connection point Yellow shows acceptable rectifier board B- connection points. All are equally good in the prewired board.





Figure 3 Wire connections

- 1.) Remove the cabinet, chassis cage top, and side panel to gain full access to filter caps.
- 2.) Loosen four #6 nuts under the chassis that hold the filter capacitor housing
- 3.) Disconnect the wires and slide the old filter bank out
- 4.) Remove and save the old parts, including plastic capacitor holders
- 5.) Position the new filter band in place as shown and tighten the housing nuts. The housing pushes against the rubber edging to lock the board in place.

6.) The board has a great deal of in-and-out room. Position or hold the board outward near the outside edge of the Heathkit U-enclosure. This makes wiring easier. The position shown in Figure 3 is ideal, with resistors just level or beyond the enclosure.



Figure 4 Board in place surge resistor but no clamp diode (as for Harbach rectifier)

7.) Attach the existing wires as shown below. This unit pictured does NOT have the negative rail clamp diode. The negative rail clamp adds one jumper and additional small parts. With rail protection added, the upper left mounting pad has to be chassis grounded. The Heathkit original rectifier wire from Heath board terminal B connects either to pad B- by FB1 or to rec-.



Figure 5 fully wired board (without optional rail clamp diode)

Using a stock rectifier board, adding a protection diode with the jumper and capacitors is best. This is not required with a Harbach rectifier board since it has a protection system on board, although the green 10-ohm 10kV surge resistor is a good idea. When using a filter-bank mounted protection system, the ground point in the upper left corner must be grounded to the chassis (far upper left corner pad)!

U200FC with CTR Engineering SB220RECT Metering Rectifier Board

The SB220RECT has all protection installed on the rectifier board. The SB220RECT board has rail clamps and a 10-ohm fault surge resistor. The SB220RECT was designed this way so people using existing filter boards have fully improved protection even while using other filter boards.

The filter board ground, along with D1, FB1, C9-C11, R9, and resistors R10-R14 are not used with our SB220RECT rectifier and metering board.

The U220FC board only needs filter capacitors C1-C8 and bleeders R1-R8. Typically, all other parts are omitted in the U220FC/SB220RECT application.



Figure 6 No ground or protection needed with 220MRB

Since the ground requirement is removed, the U220FC can be flipped to either vertical position. The HV lead pad and wire can be positioned at the amplifier's top or chassis bottom. Use whatever orientation is easier or neater looking. It makes no difference to the board.

I think ground down and HV up worked a little better for wires in my amplifier, but this might not be the case for you. Whichever way the U220FC is mounted, be sure the thin insulating sheet is on the low-voltage rec- end of the board. See Figure 7 below. Keep in mind while this board has the diodes and capacitors for fault clamping in the lower right-hand corner, they are not used. There is no ground wire. If I installed a ground wire to the chassis, they would become active, even though redundant and of no meaningful benefit. The protection parts are there because I used an existing board that had them installed for my amplifier.



Figure 7 Inverted mounting is also okay

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