

PC BOARDS

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I originally made a single-sided printed circuit board from scratch for the power meter. I made the artwork using the computer program TurboCad (Version 7). The resulting TurboCad file is named "PC Board, Version 3.tcw" and is included. This artwork was made from the perspective of looking from the top. I normally print the artwork onto a transparency blank (clear plastic sheet, normally used for transparencies, available at office products stores) and use this to mask the raw PC board. I am also enclosing a pdf file of the artwork in case you want to use it. It is named "PC Board, Rev 3, Artwork.pdf". If you do this, be sure the magnification of the printer is properly set. On mine, I had to set Scaling to "None" in the printer dialog of the program used to display the file. Finally, I am including another drawing of the artwork, this time expanded to fill the page, and showing the parts locations in pencil. This file is named "PC Board Layout, Version 3, showing parts.pdf". Note that the dotted lines shown on this view are wires that have to be installed.

Several years after I made this board, I discovered ExpressPCB, an online maker of circuit boards. Doing boards with them is much easier, and you get a nicer product. You can download schematic capture and PC board software from their website (no cost). This software is easier to use than TurboCad, and I now make all my circuit boards using it. When you have completed the design, you simply transmit the resulting file to ExpressPCB and they make boards that get delivered within a few days. The price is modest, and for me worth it. The file named "PC Board, Version 3.pcb" is the ExpressPCB file for the main PC board and the file "RF Board, Version 3.pcb" is the PC Board file for the RF section (U1 and U2). To use these files, you will have to download the appropriate software from the ExpressPCB website. Were I doing this project now, I would get the boards made from ExpressPCB rather than make them myself. Please note that I just designed these two boards and have not tested the design. I tried to be careful, but it is possible that they could contain an error or two.

The ExpressPCB board designs make certain assumptions. The resistors R3, R5, R6, and R7 are assumed to have a lead spacing of 0.25 inches, usually meaning the resistor is rated at 1/10 – 1/8 watt. The 5 k Ω trimmer resistor is assumed to have three leads in a row with spacing between adjacent leads of 0.1 inches. All of the 0.1 μ F tantalum capacitors are assumed to have a lead spacing of 0.1 inches. These capacitors are polarized, so you have to be sure to install them with

the + lead to the higher voltage. For the –12 volt bus bypass capacitors, the positive side goes to ground. C15 and C16 are assumed to have a lead spacing of 0.2 inches. C17 is assumed to have a 0.1-inch lead spacing.

The surface mount parts used in the RF section of the unit have the following sizes: R1 and R2 0603; C1-C4 0603, C5 and C6 3216. U1 and U2 are the surface mount versions of these parts. You could use different size resistors and capacitors, but you would need to change the PC board design appropriately.

The main board includes seven headers (connectors). The pin spacing on all headers is 0.1 inches. J1 is two parallel 7-pin headers and is used to connect to the LCD display. J2 is a 2-pin header. Pin 1 is connected to the +5 volt supply and pin 2 is connected to ground of the power supply. J3 and J4 are both 2-pin headers. J2 is the connection to the forward-power channel on the RF board. Pin 1 carries the signal and pin 2 the ground. J3 serves a similar purpose for the reflected-power channel on the RF board.

J4 is a three pin header. Pins 1 and 2 are connected to the +12 volt and –12 volt supplies, while pin 3 serves as the ground. J6 is a 5-pin header. Pins 1 and 2 connect to the 1-mA analog meter on the front panel; pin 1 is the + lead. Pins 3 and 4 connect to the front panel switch #2 (SW2). This switch is used to select between forward or load power. Pins 4 and 5 connect to the front panel switch #1 (SW1), which selects between the shorter and longer averaging times.

Finally, J7 is a 3-pin header. Leads to this header connect to the front panel potentiometer R4, which is used to set the contrast of the LCD display. Pin 1 connects to the top of R4, pin 2 to its slider, and pin 3 to the bottom (ground) side of R4.