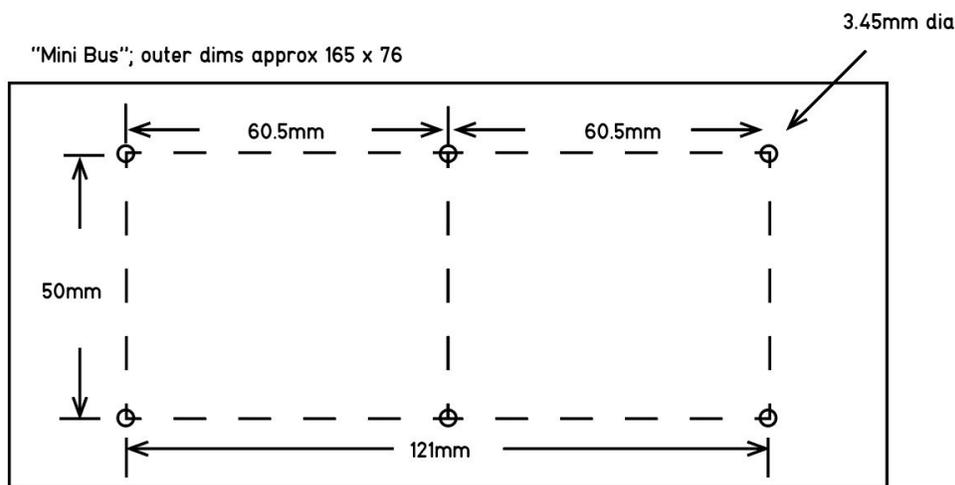


Buchla Mini-Bus build guide 08/10/20

Specs

- +/-15V @ 1A; +5V @ upto 1A*; +12V @ 500mA.
*depends on part selection. See BOM.
- AC/DC converter required: 12V @ 4A+, Positive Tip.
- 15V Ripple and Noise: <5mVp-p measured at 100nF output capacitors under 75% load. (May vary somewhat based on part selection).

Mechanical

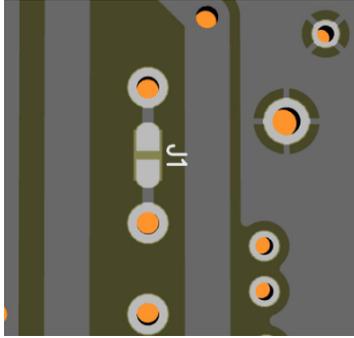


Part Selection

The BOM provides several options for the dual-output 15V DC converter (DCC), the 5V converter, and the large inductor.

The 15V DCC footprint is standard, and you will find many makes and models that can be used here, most with very comparable specs. One thing to note if you do your own shopping, is that the "remote" pin on these converters can be either "negative-logic" or "positive-logic" (look at the part's data sheet).

Positive-logic converter variants are enabled with the remote pin OPEN or HIGH. (By default, the PCB leaves this pin OPEN.) Negative-logic converters are enabled when the remote pin is tied LOW. **All of the part variants given in the BOM are positive-logic.. with the exception of the TDK.** Solder jumper J1 on the PCB rear shown below with a blob of solder to tie the remote pin LOW if you happen to pick a converter that is enabled low.



solder this jumper if you are using a negative-logic converter.

For the 5V DCC, there are again many options available. The footprint is the same as a good old 780_ linear regulator, and many manufacturers have designed drop-in switching (efficient) replacements, several of which are given in the BOM. Though there are 500mA, 1A and 1.5A options given, note that the Mini-Bus PCB is designed for a **max spec of 1A on the 5V rail**. The TI part listed in the BOM will require a pin-change- that is, the pins are straight, and you'd need to install right-angle pins here to lay the regulator down on the PCB, otherwise it'd be too tall.

The large inductor chosen is simply what Buchla's own power supply used to decouple the "Noisy" and "Quiet" grounds, a 68uH 3.3A inductor. You may get away with a slightly smaller inductor here, but over-spec'ing is advisable, thus 3A would be nominal. If you do your own shopping, remember to look at DC resistance, you'll want to keep that reasonably low.

For the 12VDC connector, the footprint will accommodate either a 4-pin Molex mini-fit connector, or 2x "Faston" .250 blade connectors. Note silk screen for proper polarity when wiring to DC barrel connector.

...A word about ground

The ground-scheme adapted here is straight from Buchla's own power supply boards (at least in 2008 which is when my case was manufactured) and verified elsewhere.. That is- "Noisy" ground is the AC/DC adapter's own ground (generally, this is earth-grounded at the mains side) It serves as ground to the input side of the (isolated) 15V DCC, the 5V DCC and is distributed across the board to the card-edge connectors to modules that use it. "Quiet" ground is the 15V DCC output-side common and is coupled to "noisy" ground through the large inductor. It is also used as chassis-ground and on the Mini-Bus is distributed across the board through several planes. There are also two handy solderable ground pads- denoted by the ground symbol that you can use to ground the board to your chassis if, for instance, you are using adhesive backed standoffs, or would like to add a ground- banana jack to the chassis for connection to other powered chassis.

Note that some DC barrel connectors, such as the one in my store, have a conductive body that is mated to the sleeve (ground) terminal, in keeping with Buchla's ground scheme, this must be insulated if installed in a bare aluminum/ steel chassis. Heat shrink tubing and a plastic washer can be used for some models, we will ship with a custom printed plug and washer insulator with ours.

Assembly

Assembly is straight-forward, note polarity on electrolytic caps, diode, and 5V DCC. Be advised that the thick traces and ground planes do take a bit of extra heat here and there to solder. A decent iron set to 750 F will do just fine.

Installation should be considered beforehand w. regard to the 12VDC input connector.

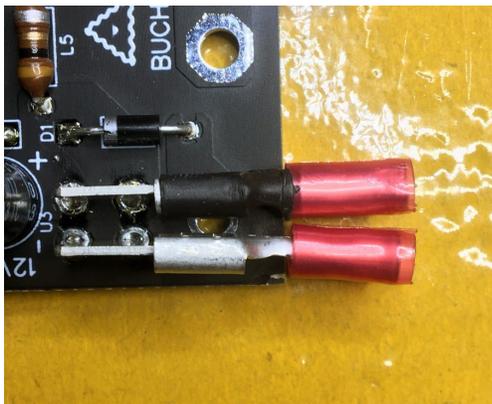
The Molex mini-fit connector is very nice, and affordable pre-made cable assemblies are available (Bonus: a single 4-pin cable assembly can make 2, as you only need 2 conductors per..) However, it is relatively tall, as compared to the Faston .250 blade connectors. The Molex connector with cable assembly is around 15mm high, where the Fastons with insulated crimp connector are about 8mm high. (see BOM for part numbers) .. Of course you can simply hard-wire to the pads as well.

It is recommended, in any case, that at least 18AWG stranded wire be used.

A Note about using Faston blades

Space is pretty tight when both connectors are seated- therefore it is advisable to test-fit the faston blades with the crimp-on connects partially fitted to be sure you solder them with enough of a gap (there is a bit of play in the holes provided as they are designed to fit the Molex connector) so as to not stress the solder joints when they are fully seated.

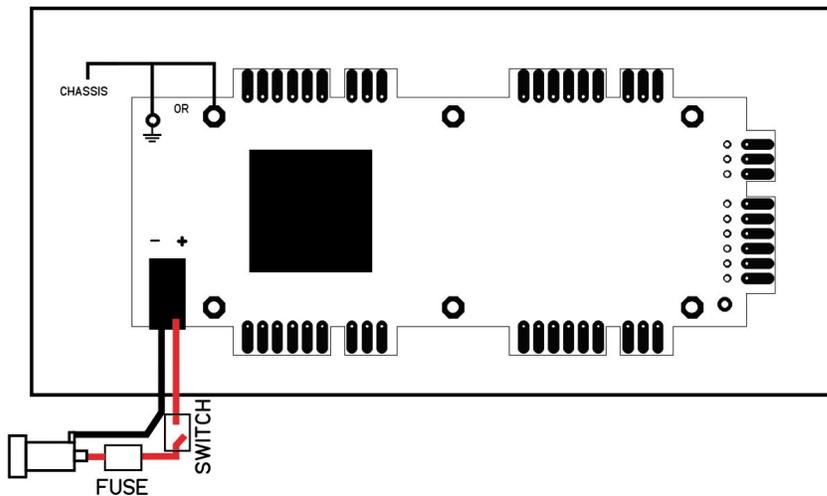
Rev 1 PCB: The + side blade connect should be fully insulated with heat shrink, etc. This is because there is a plated hole directly below that is close enough for concern of a short. Future board revisions will have fixed this issue. Alternatively, you could add a small piece of tape to cover the plated hole.. *



Fusing (optional, but recommended)

The BOM provides a link to an in-line fuse holder, and the type of fuse to use. Reverse-polarity protection is provided on the PCB by diode D1. It's purpose is to essentially short-circuit the 12V DC power source in the event of an accidental reverse connection, and protect the downstream circuitry. All recommended 12V AC/DC converter bricks have built-in overcurrent protection- this means that in the event of a short, they are designed to shut themselves off until the short is removed. Adding a 4A "slow-blow" fuse to the (+) positive side of the 12V DC input is an additional failsafe that will open in the event of catastrophic failure and will mitigate damage downstream.

It is designed so that it doesn't blow under normal use-cases. The fuse holder linked in the BOM comes with a length of 16AWG on either side that you can use to wire to the Mini-bus and/or power switch/ DC connector. Proper wiring is shown below:

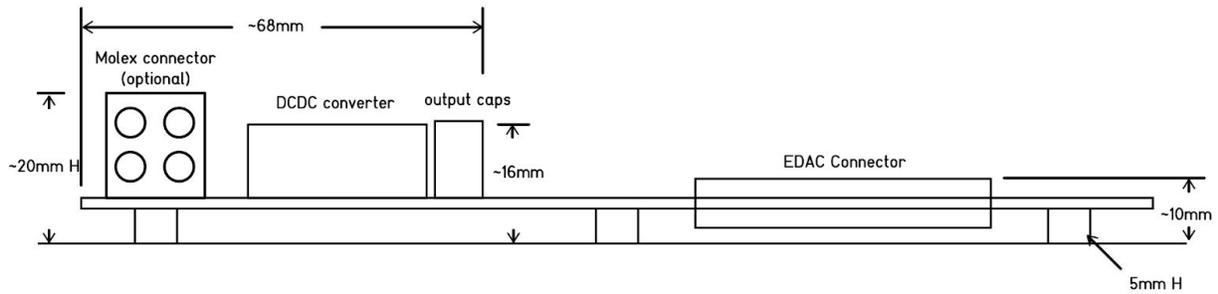


Installation

The Mini-Bus can be mounted either with the components face up or face down.

Mounting the board face-down is recommended if enclosure dimensions allow. The tallest components on the board are around 11mm high. Mounting standoffs of .5" /12.5mm can be used. This places the DC/DC converter (DCC) very close to the enclosure bottom, and you may want to thermally couple the DCC to the enclosure (boat) if it is thermally conductive (ie Aluminum / steel) to help wick away heat. For this you can use a thermally-conductive adhesive pad, see BOM.

Face up allows for a bit more vertical clearance in a shallow boat over half the board- the tallest components on the board are around 11mm high (except for the Molex connector if you go that route, which stands ~15mm off the board with the cable connected.) as short as 5mm mounting standoffs may be used in this case, which makes the lowest half of the board around 10mm high with EDAC connectors installed. (see drawing)



BTW, This board is just short enough to be mounted under 1 module space, if need be, this would free up the rest of the boat to have full vertical clearance.

Remember that in any case, there are conductive surfaces exposed, and any modules mounted overhead should have adequate vertical clearance to avoid shorts. The DCC can get fairly warm as well under normal use, so plan accordingly.

Remember that if non-conductive standoffs are used , it is recommended to ground the chassis to the Mini-Bus by way of the provided ground-pads.

The last step is to wire install a DC-barrel connector , and wire to the board. Remember to double-check polarity, center (tip) should be (+) Positive and sleeve (-) Negative. If a power switch is desired, install in series with the + side.

Once it's completed and wired up, connect your AC/DC adapter, and if it has a power LED, check to make sure it's on. With a multimeter, check the 15V lines and the 5V line that they are close to what they should be. Note that unloaded, the 5V line may read a bit off, but will come up with an attached load and should be within manufacturer tolerance. If all seems good, disconnect the 12V supply and begin installation of modules. Hopefully the EDAC connectors on the modules have the polarity clip installed, double check that you have them oriented correctly before powering on!

Thanks for buying my board! I hope it serves you well in your adventures. Don't hesitate to email with any questions or feedback. info@toppobrillo.com