GENUSMODU

LIBB

Low Impedance Bus Board

Instruction Manual

version 1.01

***LIBB**: Low Impedance Bus Board,*
low noise power distribution for Eurorack
format modular synthesizers.

Items included with LIBB:

- LIBB PC board
- This instruction manual
- LIBB Mounting and Drilling Template
- 9 x 1/2 inch long 4-40 threaded aluminum standoffs
- 9 x flat #4 washers (use on cabinet side)
- 18 x 4-40 screws

Tools and supplies needed:

- Philips head #2 screwdriver
- Wire cutter
- Wire stripper
- Drill (for cabinet)
- 1/8 inch or 3.0 mm drill bit
- Center hole punch for marking drill holes
- #12, #14 or #16 AWG stranded insulated wire, see instructions for metric and UK equivalents

Instructions

1) Plan your system mounting so there is sufficient clearance on all sides for connecting 16 pin sockets to the board mounted headers. Minimmum clearance of 0.75 inches (19.1 mm) is recommended around the board's headers, and is included on the supplied template, also available for download from our web site.

2) The board mounts "Component" labeled side down against the cabinet, and "Solder" labeled side up. The 16 pin shrouded headers and the barrier strip will be mounted near your cabinet bottom or back, with only the surface mount LEDs, surface mount capacitors and soldered pins visible from the top.

3) LIBB has four jumpers labeled J18-J21. Preferred operation for maximum performance is to have all 4 jumpers installed. They connect the large 220 uF capacitors on the outer part of the board. Some power supplies may have difficulty starting up their power rails with the high capacitance in addition to that from all of the modules. In that case the user has the option to remove 2 or 4 of the jumpers to reduce capacitance. Through testing the estimated power supply headroom impact with all capacitors enabled is 100-200 milliamps for linear power supplies. A limited sampling of switching power supplies has not shown any issues but that can vary with your model.

4) The supplied hardware is #4 imperial sized and can be used for most cabinets with up to 1/8 inch thick metal. Metric M3 hardware may also be used. Mount the standoffs to the board using the #4 screws. Save the washers for the cabinet.

5) A drill hole template is provided with the product. Mark the holes first with the center hole punch. Use drill size of 1/8 inch or 3.0 mm for the cabinet holes.

6) If mounting to a solid wood cabinet, then wood screws with non-threaded standoffs (not provided) may be used as long as the wood is ½ inch or thicker. Drill hole sizes must be sized to match the softness/hardness of your cabinet's wood. For thinner wood use longer machine screws with washers and the supplied threaded standoffs, and insure the standoffs do not dig into the wood.

7) Mount your LIBB to your cabinet using screws and washers into the cabinet holes. Do not fully tighten down until power has been tested and the jumpers have been finalized.

8) Cut #12, #14 or #16 AWG wire to the lengths needed for routing from your power source to the bus board barrier terminal strip.

While lighter gauge wire can be used, it is not recommended due to the higher resistance of those gauges. Flexible #12, #14 and #16 AWG wire can be found at most auto supply stores. Heavier gauges such as #10 cannot be used with the barrier strips. Avoid stiff "house wiring" type wire, and look for silicon or flexible wire. If using #16 AWG it is recommended to run two wires from each barrier strip location.

9) The solder turrets of the common linear power supplies from SL Power (Condor), Bel Power (Power One) or International Power will accept 14 AWG or 16 AWG wires. Wire at 12 AWG is too large to fit inside the solder turret, however, you can split the strands of a 12AWG wire across the inside and outside of the solder turret to get the larger wire to fit.

10) This wire resistance chart below shows why you should use the heaviest gauge possible. With an effective LIBB PCB ground impedance of less than 400 micro ohms, you will not achieve the full noise reduction benefit with higher gauge/smaller diameter cables. The LIBB distribution resistance is lower than most cables.

Wire Gauge	Resistance per inch	Resistance per cm	Length for resistance of 2 mΩ	Length for resistance of 2 mΩ
US/Imperial 12 AWG	0.133 mΩ	0.052 mΩ	15.0 inch	38.2 cm
US/Imperial 14 AWG	0.22 mΩ	0.087 mΩ	9.1 inch	23.1 cm
US/Imperial 16 AWG	0.34 mΩ	0.134 mΩ	5.9 inch	14.9 cm
US/Imperial 18 AWG	0.54 mΩ	0.213 mΩ	3.7 inch	9.4 cm

Metric and UK Standard Wire Gauge (SWG) wire conversion:

US/imperial	metric diameter	metric cross section	UK
12 AWG	2.05 mm	3.3 mm2	#14 SWG
14 AWG	1.63 mm	2.086 mm2	#16 SWG
16 AWG	1.29 mm	1.306 mm2	#18 SWG

11) Strip the wire 3/8 inch (9-10 mm) on ends connecting to the bus board. Insert the wires straight into the terminal under the plate. There is no need to make "J Loop" shaped connections or to completely remove the barrier strip screw. Use both ground lugs on the barrier strip because power and ground (return) should be balanced. Terminate the cables as needed for the power source.

12) It is recommended to route wire underneath the bus boards between euro connectors, instead of over the bus board, to keep them out of the way and prevent being snagged during module installation.

13) If a single power source is feeding a single bus board, then two wires may be used per barrier strip connection, one on each side of the screw. This is especially recommended if you are using 16 AWG wire. If multiple bus boards are wired from a single power source, then bus boards may be daisy chained by using the second wire connection to go to the next board. For best performance, limit daisy chaining to one additional bus board.

14) Never, ever, connect two power sources to the same bus board, or through daisy chaining, connect two power sources together. There should be only one power supply per power rail.

15) The onboard capacitors are polarized and will be damaged by a cross connection (power to ground and ground to power, or +12V to -12V and -12V to +12V). Double check the wiring before powering on.

16) Once connected to power, and before modules are connected, turn on the power and verify that the three LEDs light on the bus board. Some power supplies and systems may use only +12V and -12V, in which case the +5V amber LED will not light.

17) If green +12V or red -12V LEDs do not light, turn off the power source immediately. You may have a bad power supply, a missing connection, or a crossed connection. In rare instances your power supply may not start without a load, normally limited to switching type PSUs. Check your wiring and power supply. If you have a digital multimeter, verify you are receiving the proper voltages on the barrier strip, and adjust the power supply as needed.

18) Once power is tested, modules may be connected to the bus board. Be careful to note polarities by the red line on the power cable, and match the "Red Stripe" line on the LIBB. Most power cables are notched to prevent incorrect installation, but a few are not. In some instances reversed cables have been shipped, so always check.

19) If your system does not power on with all modules installed, you may need to remove one or both pairs of jumpers to reduce total capacitance.

20) Finish tightening down all screws on the cabinet and bus board.

21) Note that one common Eurorack power problem is a module that requires +5V, but does not receive +5V from the bus board. This can prevent the other power rails from coming up as well. Check for this if you have power problems after installing a new module.

22) Enjoy the quietest Eurorack bus board you can buy.