LEDLabs can be assembled anyway which suits, however the lower profile components such as resistors, diodes etc would make it a little easier to assemble if soldered first. The PTC fuse or an axial quick blow fuse should be installed as no power is available without.
The PTC is used for temporary short circuits or excessive short term current loads, most usb power supplies also have current limiting protection. This point can be bridged with a link wire, however with no fuse in place, it would then make use of the overload protection of the usb power source.
The stepper motor should be a general low power type like 5V 4-PHASE 28BYJ-48.

The potentiometers, the thumb turn potentiometers suit ledlabs, 3386F 3386/P 1-turn Finger Adjust Potentiometer Variable Resistor, bournes or suntan types. some types used may reverse the rotation swing direction, this is electrically okay, however, the actions could be in reverse, eg, turning up a voltage from 0v-5v may operate the opposite way.

The large led voltmeter has three connections on the under side of the pcb marked 0v +v and v-in, and are coloured silver, solder should be melted on these three points and the corresponding wires cut to about the correct length ensuring the red wire is soldered to v+ and black to 0v and the third colour usually white soldered to v-in.

Dot matrix displays and seven segment displays can be pushed into pin header connectors if required, this will allow for quick changing of the devices, for example changing the colour of the displays, no unsoldering is required if installed this way.

The 5 segment bar graph order from left to right is +v then 0v,.....Leds can also be used here.

Care should be taken when soldering components to the board to ensure a good connection and not to leave the soldering iron on the board for too long, as a risk of burning the pads could occur.
Component identification and orientation should be observed as well, before soldering.
The board shows component values like resistors and + and – symbols where necessary.
The IC's have dil sockets to solder in place first, then the legs of the new IC's should be squeezed in to fit the socket.

The large 1 watt leds should have a small length of wire soldered to the led connections where the + and – markings are, with the wire provided.
One module at a time can be built and then powered up to check it, this would be easier to locate a soldering error or component inserted incorrectly, than if the whole board was built then tested.

The ptc fuse provided is 1100ma hold current 2 amp trip, this should be installed to allow power to the board, and should be suitable for most applications. A Higher value can be used to suit the application type.
Several wire links are required and are marked accordingly. Make sure the wire links are all installed as modules will not work without them. (9 off)

Eight stand offs should be fitted where marked with an arrow and form the legs to the board.

Care should be taken when switching on any of the larger Leds as they are very bright when the variable brightness is set high and should avoid looking directly into them, always make sure the brightness is set low first. The 20R resistor can be changed to say a 100R to reduce further if required. The 20R resistor sets a current of around 110ma, and not their maximum range of 350ma which is too bright for this purpose. UV should not be looked directly into, as the peak wavelength can not be seen, just the visible side as in the purple colour.

The power supply requirements are generally a 5 volt usb rated @ 1 amp, usb battery power banks can drive LEDLabs. A good quality usb power supply should be purchased if using one. A good quality usb 3 cable should be used, a thick cable, cheaper cables can send the sensitive comparators of the Lm3914 into dot mode even when the bar mode jumper switch is on. Use a Usb 3 or good quality cable to avoid problems, no longer than 1 metre.

LEDLabs can be connected straight from a laptop usb port, if it's usb 3 which can source 900mA, usb 2 is about half this value, or the current drawn from a particular circuit is known, LedLabs in it's Quiescent state, or generic applications on the board would allow connection to a computer usb port. The two boards in the videos on the main LEDLabs page are connected to one computers usb ports, however due to the rapid turning on and off of the devices, this load current is quite small.

The large Leds on full brightness consume up to 110ma each, so when on constant, this would use 550ma for all 5 and around 100ma for other quiescent devices.
This is why a 1 amp is recommended, however other devices consume considerably less.
If no particular program is running on the dot matrix displays, it will just have random data loaded and may flash or light all segments when not in use, if the data into the max7219 is taken to 0v, this should blank the display and save power. Also the 27k resistors near the dot matrix can be changed to a 10k, this will increase brightness slightly but will be more demanding on the power supply.

Note:- if sourcing own components, and clear leds are chosen rather than the standard diffused types as (Led labs supplies) the resistor values may need to be increased as these are usually very bright. With leds ever getting brighter even the diffused types, choose a low mcd type led, otherwise the new high brightness type will be too bright with the resistors marked on ledlabs pcb, or breadboard first before choosing resistor value. The aim is to have an equal brightness across the Lab.

The 4026 counter section has 330r resistors printed on silk screen, which gives a modest display brightness on both red and green 7 segments, and keeps within ohms law, however lower values can be used. (ie 10r or 100r) as the 4026 regulates the current anyway, and does not need resistors at 5v. this will achieve max brightness.

Dot Matrix Displays are orientated with the code lettering towards the bottom of the board.
Displays are common cathode types.
As the ldr and thermistor have thin wires, make sure they are not touching, to avoid possible problems. Ldrs and thermistors can be mounted straight to the board or connectors like the ones used in other areas with leads soldered onto the devices, this can move them away from the board by an amount, useful for thermistor applications.

Leds in the shift register section can be switched off with the slide switch.

The zif socket suits several types, either the small 28 pin zif allowing standard size logic IC's etc, the holes are drilled on the pcb for this narrower fitting, or the universal type, which allows for the smaller logic IC's and wider types. The zif socket for wider IC's only, is not generally recommended.
The tactile switches are better with caps, so using 6x6x6mm will allow for a switch cap as in photos of Lab, these photos may also aid in assembly.

The atmega section has a 28 pin socket to allow for a atmega328pu or equivalent to be inserted here, development boards such as the arduino uno R3 has the atmega328pu in a socket and can be removed and installed directly in Ledlabs socket and programmed in situ.
Using the normal software coding platform with the arduino connected to a computer with the atmega328pu removed and installed in Ledlabs then connecting the rx,tx, and reset and a common ground wire (0v) from the development board to the Ledlabs atmega section inputs it can be programmed in this way and would allow for faster software changes and tests as it is programmed in situ.
It can also be programmed normally then removed from the arduino development board and placed in Ledlabs. Otherways are possible using a FTD1232 converter directly from a computer
Please note the atmega328pu micro itself (just the chip) if ordered without the development board normally would require an r3 bootloader loading first, options for this can be purchased with or without a boot loader, depending on the user's knowledge in this area and programming techniques.

For ledlabs pcb with the fast led section, various methods can be used to program the displays, Included is a remote control and a music controller for a quick get up and running.
A cable connector is provided to connect the controller to ledlabs, this is 3 wires and should be connected here, and the other end to the controller output itself.
The controller requires 5v power which could be plugged into a usb splitter cable, one for ledlabs power and the other to power the light controller. Or modifying the controller power input and connecting it to a ledlabs 5v source, this controller is then powered and so is 5v, 0v and din, of the fast led inputs through this 3 pin connector through the controller.
If programming the lights via arduino or other micro, the 5v and 0v of the fast led inputs should be connected (linked) to the section just below this 3 wire connection point, also marked 5v, 0v, connector blocks could be used here a 3-way and a 2-way if required, this gives the led lights power as it is then connected to the ledlabs power source, just the data is then input from the micro etc.marked as Din.

When running the ws2811 fast leds, power could be of consideration, generally it would not be too much of a problem depending on application and how ledlabs is powered, example computer usb port is not recommended when running the fast led lights, due to current limits of the usb ports.

An optional power source has been integrated into ledlabs other than the usb power.port
By way of example if the display leds were all white and constant it could consume up to 2.5A
This is a maximum condition, as this colour uses RGB to emit white, (60ma) each led. (20ma/colour rgb) Generally the leds would just be less bright rather than try to pull current from a source that just can not provide it, however requires considering.
A 5v 3A dc adaptor could be used to power the whole ledlabs board and the usb port could provide power to the usb of the music controller, however, for moving and pattern displays of the fast leds which would use a lot less, just the usb power input alone should be okay without using a 5v 3A dc adaptor. A usb splitter cable could also be used one to power the lab the other for a light controller with a usb power input connector for power.

If using the controller provided it may require colour setting using the app instructions, setting for ws2811 rather than the default setting of ws2812, this can be noticed when red is selected on the remote and the leds show as blue and vice versa.
The flat side of the led should follow the silkscreen legend, this normally denotes a cathode of a normal led, here it is the output to the next led.

Soldering the WS28XX LEDS, it is thought best to solder the outside pins first with the soldering iron away from the centre 2 pins, then, moving the iron to the centre gap for the inner pins.
Also pre cutting the pins down on the LEDs so little appears through the pcb.
Having this part of the pcb warm also aids in solder flow,
A 0.5mm solder diameter is useful for this type of soldering as it is very thin
If a solder bridge appears due to the close proximity of contact points, clean the tip of the iron and pull through the solder bridge until it clears, maybe add flux gel or liquid flux or use a solder braid to aid this. This area is quite robust. Maybe soldering around 4-5 WS28XX LEDS at a time then checking functionality by connecting either the controller provided or other method to make sure they power up, starting at LED1 located at the top left side of pcb.

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The usb port connector, that powers the lab, the tabs that offer support should be scratched to provide a good solder key, and bent to suit and solder applied.

The op-amp buffers are also good for driving the same output of an Ic to inputs of different logic Ics, the breakout port below the Vco section can extend an output driven by a buffer etc.
An example here is Pwm out from the bass filter connected through a buffer whose output is then connected to the break out port, this then offers multiple connection points to connect to other circuits, Carry out functions can also drive other circuits etc.

Mic bass section, has a place for a 1k potentiometer suitable for most applications, if however real precision is required a 1k cermet type multi-turn trimmer up to 17 turns can also be placed here instead of a standard potentiometer, this is why there are 3 holes in a line on the pcb.
Any problems with the response of the microphone as indicated by the bass led response, the usual problem here is the mic which can differ to the standard or generic mic the circuit was designed for. A different mic should be used electret type with pcb pins.
The + mic looks like an isolated pin, the other pin (ground) has wire tracks running to the ground of the case.
An unfiltered section of the microphone circuit is available, this has no pwm, just a very small analog gain of 11 from the mic, and is in the order of microvolts, this can be amplified by normal op-amp circuits or other methods.
The Lm386 output of the audio amplifier may require a dc blocking capacitor from the output if not connecting to the onboard speaker.
(applies only to the ledlabs version without WS28XX leds), the green solder mask version.

The counter section seven segment displays, where there is one connector point to make connections, a double connector can be cut and one of the pins removed, this gives a bit more stability.

The DC adaptor is optional, as works okay through usb 3 cable.

The LM3914 can be changed for LM2915/16 as the pinouts are the same.

NOTE:

Any problem with dot mode (LM3914), this is to say, led 9 not switching off when led 10 turns on
The 2.2k resistor can have a parallel 1k soldered to the back to stop this niggle.
Or even replace it with a 690R or close to it, if required, or LM3916 VU Ic

ANY PROBLEMS WITH THE DISPLAYS, THIS IS CHARACTERISED BY NO DISPLAY AT ALL, NO FLASHING OR ANY DISPLAY, TRY ANOTHER MAX7219CNG IC WITH DIFFERENT CODE, SAY FROM MAX7219CNG 2219+ TO A CODE OF MAX7219CNG HLF 23A8
THE DOT MATRIX DISPLAYS USED HERE IS COMMON CATHODE.