

## Important Information

Congratulations and thank you for your purchase of the LDB-1se "Little Drummer Boy" Analog Drum Machine Kit!

Once you have built the kit, download the [User Manual](#) to learn how to use all of the features.

Before you start, please read the [Electronic Kit Soldering Tutorial](#). It contains important and useful information even for experienced kit builders. If this is your first electronic kit, you sure picked a big one. It is not difficult to assemble, but there are a lot of parts. Take your time and be careful to put the right part in the right place. It is difficult to de-solder parts if you make a mistake.

The PCB (printed circuit board) is not marked with part values, but rather with reference designators (refdes). For example, R1 refers to resistor number one and C1 refers to capacitor number one.

The parts for the kit are in multiple bags. One or more bags contain discreet components like resistors and capacitors, and the other bag contains electromechanical parts like jacks and switches. The discreet components are soldered first. Before you start, separate the parts by type. When you are ready to solder parts of a particular type, separate them by value. In general, the order that the parts are soldered onto the PCB is shortest to tallest.

The complete bill of materials is on the last two pages of this document.

Refer to the pictures of an assembled kit on pages 9 and 10 of this document.

## Bottom Side Parts

The first group of parts are mounted on the bottom side of the PCB, and soldered on the top side. By top side, we mean the side with the controls (buttons, LEDs, and potentiometer).

### Diodes

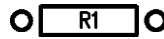


There are 27 diodes. All of the diodes other than D10 are the same value (1N4148). The diodes are red and black glass. When inserted into the PCB, the black side of the diode must line up with the stripe on the part outline on the PCB. The diode leads need to be bent close to the body of the diode. Hold the diode body and press down on each lead right at the body to make a U shape.

**D10 is different!** D10 is a BAT85 Schottky Diode. D10 goes in the upper right corner of the PCB.

D10 stands out from the rest of the diodes in the kit. Either D10 has little bits of paper on its leads, and the other 26 do not; or D10 does not, and the other 26 do.

**Resistors**



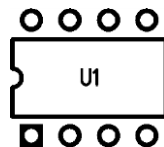
The value of a resistor is indicated by colored stripes on its body. In all cases the fifth stripe is brown (indicating 1% tolerance), so that stripe has been omitted from the chart below.

The resistor leads need to be bent close to the body of the resistor. Hold the resistor body and press down on each lead right at the body to make a U shape. It does not matter which lead goes in which PCB hole.

We recommend that you start with the 1K and 10K resistors because they are the most common values. Once they have been soldered onto the PCB, it will be much easier to find the other refdes values.

<u>Value</u>	<u>Marking (colored stripes)</u>	<u>Quantity</u>	<u>Refdes</u>
22R	Red, Red, Black, Gold	2	R70, R76
220R	Red, Red, Black, Black	4	R38, R46, R48, R67
390R	Orange, White, Black, Black	1	R6
470R	Yellow, Violet, Black, Black	2	R33, R68
560R	Green, Blue, Black, Black	1	R9
820R	Gray, Red, Black, Black	1	R35
1K	Brown, Black, Black, Brown	12	R40, R44, R50, R61, R62, R63, R64, R65, R66, R69, R73, R75
1K5	Brown, Green, Black, Brown	1	R54
2K2	Red, Red, Black, Brown	1	R56
4K7	Yellow, Violet, Black, Brown	3	R25, R60, R74
6K8	Blue, Gray, Black, Brown	1	R57
7K5	Violet, Green, Black, Brown	1	R22
10K	Brown, Black, Black, Red	10	R18, R28, R36, R41, R45, R51, R58, R59, R71, R72
15K	Brown, Green, Black, Red	2	R26, R52
22K	Red, Red, Black, Red	2	R7, R14
33K	Orange, Orange, Black, Red	5	R13, R17, R20, R21, R31
47K	Yellow, Violet, Black, Red	1	R27
68K	Blue, Gray, Black, Red	2	R24, R29
82K	Gray, Red, Black, Red	1	R8
100K	Brown, Black, Black, Orange	9	R1, R2, R3, R4, R19, R32, R37, R42, R53
220K	Red, Red, Black, Orange	3	R11, R15, R47
390K	Orange, White, Black, Orange	3	R5, R12, R16
1M	Brown, Black, Black, Yellow	3	R30, R34, R55
2M2	Red, Red, Black, Yellow	3	R10, R23, R39
4M7	Yellow, Violet, Black, Yellow	2	R43, R49

**Chip Sockets**



There are five 8-pin sockets and three 14-pin sockets. Sockets are marked with a small notch that must line up with the outline on the PCB. Once the socket is soldered in place, the PCB outline will not be visible, so it is important that the sockets are oriented correctly in order to ensure that the chips are inserted correctly.

Note that two of the 14-pin sockets go right next to each other to accommodate the 28-pin U6.



**Ceramic Capacitors**

Ceramic capacitors are small tan or blue blobs. Their value is marked on them with a three-digit code. The marking is rather tiny, so you may have to use a magnifying glass to read them. It does not matter which lead goes in which PCB hole.

We recommend that you start with the 0.1 uF capacitors because that is the most common value. Once they have been soldered onto the PCB, it will be much easier to find the other refdes values.

<u>Value</u>	<u>Marking</u>	<u>Quantity</u>	<u>Refdes</u>
220 pF	221	1	C24
470 pF	471	3	C14, C15, C16
0.001 uF	102	4	C8, C18, C19, C23
0.0022 uF	222	1	C20
0.0033 uF	332	2	C9, C10
0.0068 uF	682	2	C28, C29
0.022 uF	223	2	C32, C33
0.033 uF	333	6	C26, C27, C30, C31, C35, C36
0.047 uF	473	1	C11
0.1 uF	104	10	C1, C2, C3, C4, C5, C6, C7, C22, C25, C38
0.22 uF	224	1	C34
0.47 uF	474	2	C13, C21
1 uF	105	3	C12, C17, C37



**Electrolytic Capacitors**

There are three electrolytic capacitors. Each one is a different value, which is clearly printed on the capacitor.

Electrolytic capacitors are polarized, so which lead goes in which hole is important. The negative lead on the capacitor is the shorter one and it is marked with a gray stripe on its body. The positive lead is longer. The positive hole on the PCB has a square pad and is marked with a plus sign.

<u>Value</u>	<u>Quantity</u>	<u>Refdes</u>
10 uF	1	C39, C41, C42, C43
100 uF	1	C40

**Voltage Regulators**



There are two voltage regulators (refdes REG1 and REG2). They are marked KY5050 or LM7805. They have the same basic as a transistor. It is easy to tell the difference, either by the part marking, or the fact that the two regulators are taped together, and the nine transistors are taped together.

Make sure that the flat side of the regulators line up with the flat side of the outline on the PCB. Push the leads through the holes, and bend the two outer leads apart to keep it in place while soldering. They will not sit flush against the PCB, and that is fine. Do not force them.

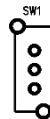
Voltage regulators are more heat sensitive than most of the parts in this kit, so take care not to let the soldering iron linger too long. If you are unsure, then solder one lead at a time and let the part fully cool off before soldering the next lead.

**Transistors**



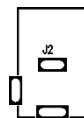
There are nine (9) 2N3904 transistors. They are marked on the PCB with regdes Q1 through Q9. For soldering tips, refer to the paragraphs above relating to voltage regulators.

**Power Switch**



The power switch can only be inserted one way. The switch actuator faces away from the PCB. Make sure it is seated flush against the PCB before soldering it. The switch will not stay in place by itself, so you may want to tape it in place while you solder it. Another tip is to solder only one of the pins, then check to make sure it is flush. If it is not flush, it is simple to reheat the one solder joint while pressing the switch into place. Once one pin is secure, the switch will stay in place while you solder the other pins.

**Power Jack**



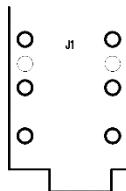
The type M power jack can only be inserted one way. The opening of the jack faces away from the PCB. Solder one pin, then make sure it is seated flush against the PCB, then solder the other two pins.

**3.5mm Jacks**



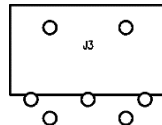
The three 3.5mm jacks can only be inserted one way. The openings of the jacks face away from the PCB. Make sure they are seated flush against the PCB before soldering it. They snap into place and will stay put once inserted.

**¼" Jack**



The one ¼" jack can only be inserted one way. The opening of the jack faces away from the PCB. Make sure it is seated flush against the PCB before soldering it. It snaps into place and will stay put once inserted.

**MIDI / DINsync Jack**



The MIDI jack can only be inserted one way. The opening of the jack faces away from the PCB. Make sure it is seated flush against the PCB before soldering it. This jack will not stay in place by itself, so you may want to tape it in place while you solder it. Another tip is to solder only one of the pins, then check to make sure it is flush. If it is not flush, it is simple to reheat the one solder joint while pressing the jack into place. Once one pin is secure, the jack will stay in place while you solder the other pins.

### Top Side Components

The pushbuttons, LEDs, and potentiometer are mounted on the top side of the PCB, the opposite side that all the other parts are on. Refer to the photo of the completed kit for reference.

#### LEDs

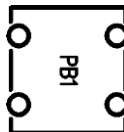


There are 19 LEDs. They are polarized, so the direction that they are inserted into the PCB is important. The PCB pattern has a square pad for the positive lead (anode), and is marked with a line on the negative side (cathode). The LED has a flat side and a shorter lead to indicate the negative.

Insert each LED into the plastic LED spacer, which could be black, white, or translucent. The spacers are self-retaining. With the spacers on, the LEDs will stay in place when you insert the leads into the circuit board, but it is still easy enough to bump them during handling. Place and solder them one row at a time starting with the top row (furthest from the buttons).

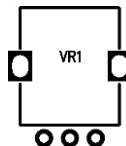
Make sure the LEDs are seated flush against the PCB before soldering them. If they are tilted, or are at different heights, then the control panel will not go into place correctly. Do not bend the LED leads. That will almost ensure that will not be flush. Solder one lead of each LED in the row. Then, double check the seating. If an LED is not quite flush, then you need to reheat the lead while pushing down on the LED. That is far easier than heating two leads at the same time. When the whole row is good, solder the second lead, clip the lead ends, and move on to the next row.

#### Pushbuttons



There are 13 pushbuttons. They snap into place and stay put while being soldered. Make sure they are seated flush against the PCB before soldering them. Note that they are rectangular, not square, so if the pins are not lining up, rotate the pushbutton 90 degrees.

#### Potentiometer



The potentiometer can only be inserted one way. It snaps in place and will stay there while you solder it. Be careful to press down evenly so you do not bend the pins. Make sure it is all the way in and seated flush against the PCB before soldering it.

**Battery Snap**



The battery holder wires are first threaded up through the hole next to the battery pads, arched over, then soldered in place on top of the board. This keeps the battery wires from getting accidentally pulled out of the PCB. The red (positive) wire goes in the hole with the square pad, and the black (negative) wire goes in the hole with the round pad.



**Chips**

There are six chips. Carefully insert each chip into its appropriate socket, making sure not to bend any of the pins. Note the direction of the chips before inserting them. The notch on the chip must line up with the notch on the socket. Refer to the photo of the completed kit for reference.

The chip pins come from the factory a little bit splayed out, not pointing straight down. You may need to bend them inward a little before you insert them. Hold the body of the chip and rest all of the pins on one side against the table top and gently press down just a little bit. Then do the other side. If the pins do not line up well with the socket, repeat the straightening procedure.



<u>Value</u>	<u>Pins</u>	<u>Quantity</u>	<u>Refdes</u>
TL072	8	2	U1, U3
TL074	14	1	U2
NoiseChip	8	1	U4
TC1044	8	1	U5
PIC18F26K40	28	1	U6
6N138N	8	1	U7

will be marked PIC12F1822 or PIC12F1571

## Inspection

At this stage, pause to inspect your work. Compare your PCB to the photo. Make sure that:

- You didn't forget a part.
- The chips are oriented correctly.
- All of your solder joints are good.
- There are no solder bridges (blobs of solder covering two leads/pins).
- The leads are clipped off short – right above the solder.
- The bottom side parts are seated flush against the PCB.

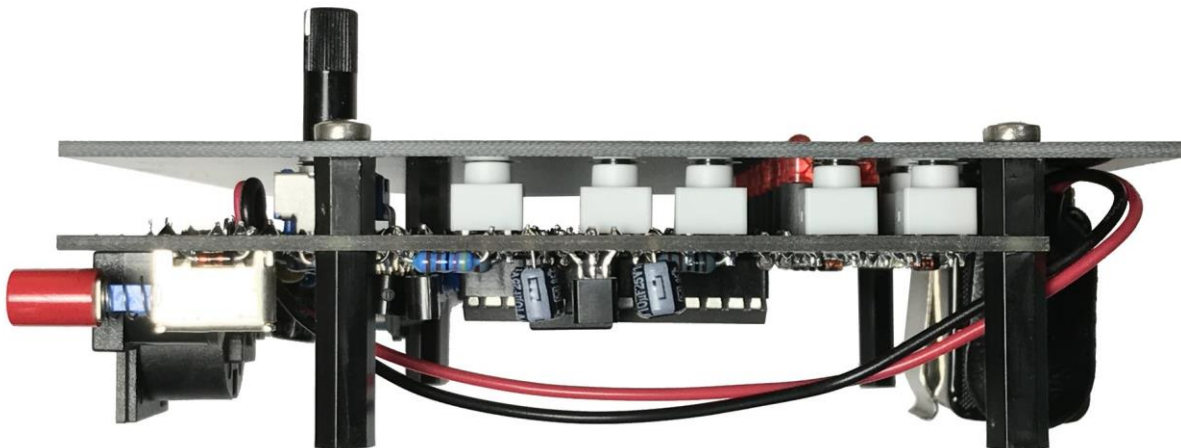
## Test

1. Insert a new 9V battery in the battery clip and turn on the LDB-1se. The first time you turn it on, you will see the two Row Indicator LEDs blinking alternately for about two seconds. Subsequent power on cycles will show an animation of all of the LEDs on the unit. If you do not see the LEDs blinking, then something is wrong. Turn off the LDB-1se, remove the battery and reinspect your work. Otherwise, go to the next step.
2. Insert a mono ¼" plug into the audio output jack and plug the other end of the cable into your amplifier or mixer.
3. The LDB-1se starts in the "Pad Play" mode. Press the buttons along the bottom of the LDB-1se to play individual drum sounds. If you do not hear some or all of the sounds, or if an instrument sounds odd, then something is wrong. Turn off and unplug the LDB-1se and reinspect your work.
4. If you have gotten this far, then you should be good to go. Of course, you will want to test all of the other functions at some point to be certain that everything is soldered correctly.
5. You have successfully built an LDB-1se Analog Drum Machine. Congratulations!

## Control Panel, Battery Holder, and Feet

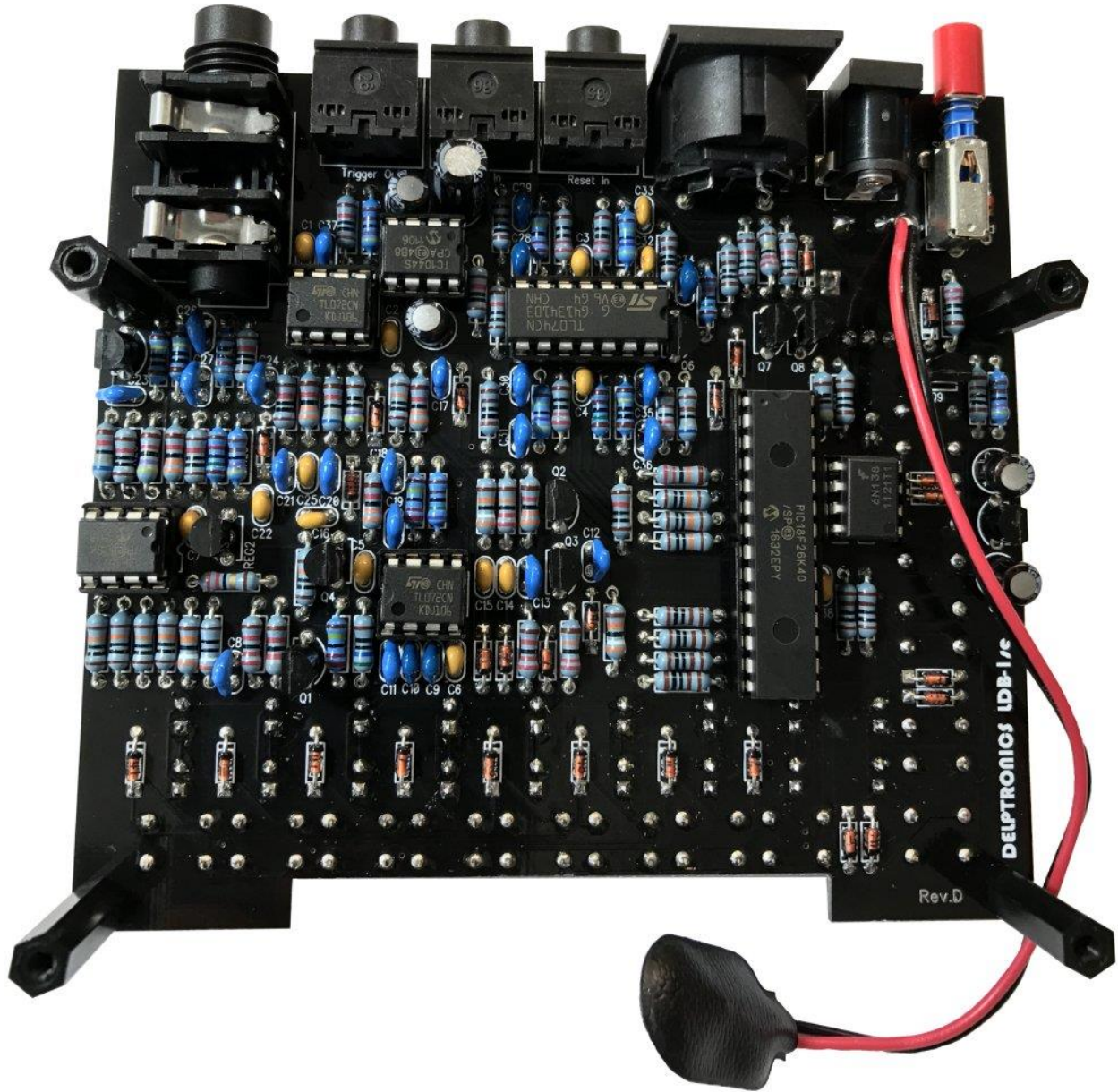
The panel covers most of your soldering, so it is best to test the LDB-1se before putting the panel on. First, attach the battery holder to the bottom of the panel with the two small screws and nuts, as shown in the picture to the right.

Next, attach the plastic feet and spacers to the PCB. Then put the control panel on, and screw it to the spacers, as shown below.

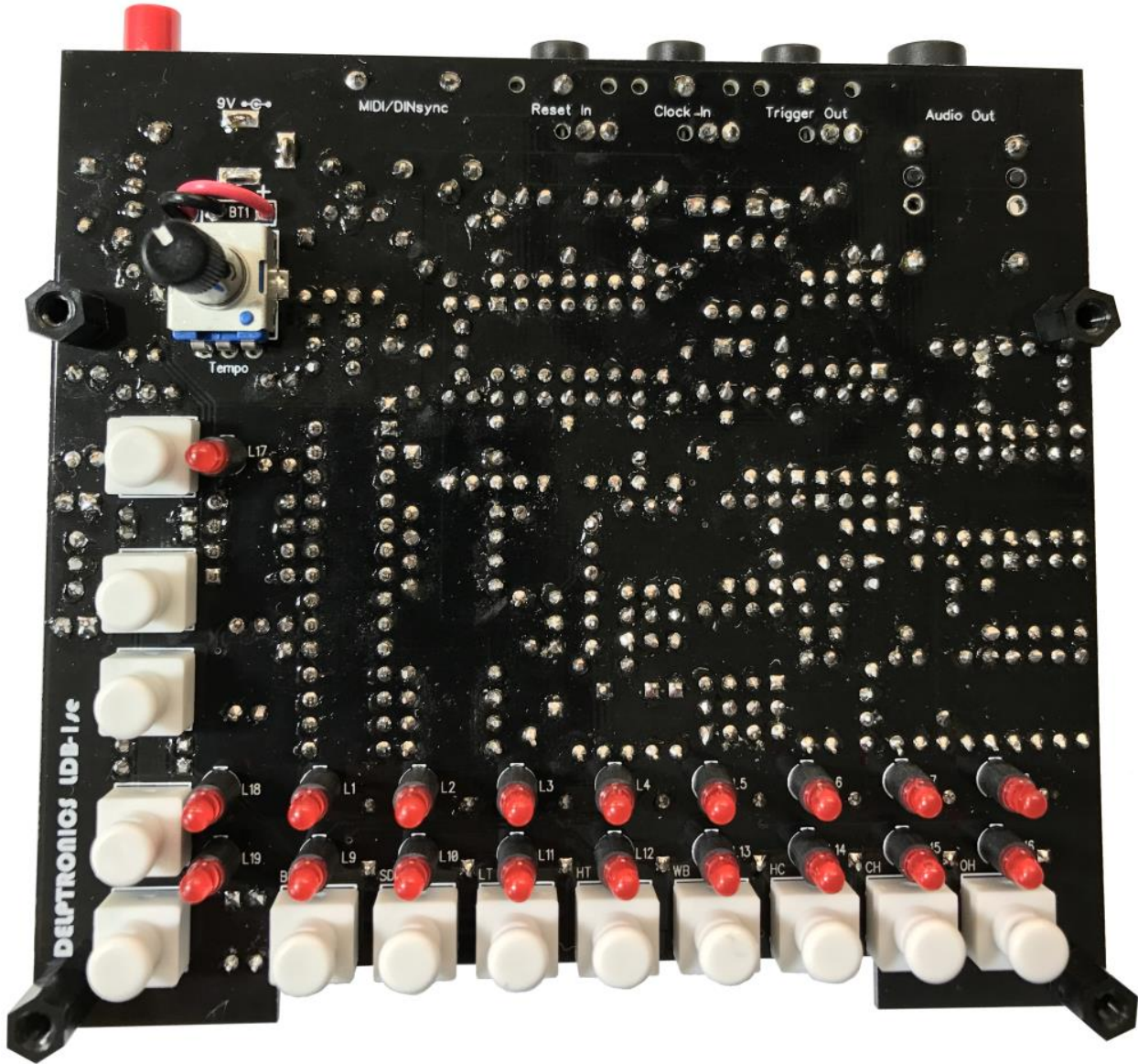




**Bottom / Component Side of Circuit Board**



Top / Controls Side of Circuit Board



## Bill of Materials

<u>Name</u>	<u>Value</u>	<u>Quantity</u>	<u>RefDes</u>
Diode	1N4148	26	D1 - D9, D11 - D27
Schottky Diode	BAT85	1	D10
Resistor	22R	2	R70, R76
Resistor	220R	4	R38, R46, R48, R67
Resistor	390R	1	R6
Resistor	470R	2	R33, R68
Resistor	560R	1	R9
Resistor	820R	1	R35
Resistor	1K	12	R40, R44, R50, R61, R62, R63, R64, R65, R66, R69, R73, R75
Resistor	1K5	1	R54
Resistor	2K2	1	R56
Resistor	4K7	3	R25, R60, R74
Resistor	6K8	1	R57
Resistor	7K5	1	R22
Resistor	10K	10	R18, R28, R36, R41, R45, R51, R58, R59, R71, R72
Resistor	15K	2	R26, R52
Resistor	22K	2	R7, R14
Resistor	33K	5	R13, R17, R20, R21, R31
Resistor	47K	1	R27
Resistor	68K	2	R24, R29
Resistor	82K	1	R8
Resistor	100K	9	R1, R2, R3, R4, R19, R32, R37, R42, R53
Resistor	220K	3	R11, R15, R47
Resistor	390K	3	R5, R12, R16
Resistor	1M	3	R30, R34, R55
Resistor	2M2	3	R10, R23, R39
Resistor	4M7	2	R43, R49
Capacitor Ceramic	220 pF	1	C24
Capacitor Ceramic	470 pF	3	C14, C15, C16
Capacitor Ceramic	0.0010 uF	4	C8, C18, C19, C23
Capacitor Ceramic	0.0022 uF	1	C20
Capacitor Ceramic	0.0033 uF	2	C9, C10
Capacitor Ceramic	0.0068 uF	2	C28, C29
Capacitor Ceramic	0.022 uF	2	C32, C33
Capacitor Ceramic	0.033 uF	6	C26, C27, C30, C31, C35, C36
Capacitor Ceramic	0.047 uF	1	C11
Capacitor Ceramic	0.10 uF	10	C1, C2, C3, C4, C5, C6, C7, C22, C25, C38
Capacitor Ceramic	0.22 uF	1	C34
Capacitor Ceramic	0.47 uF	2	C13, C21
Capacitor Ceramic	1 uF	3	C12, C17, C37

## Bill of Materials (continued)

<u>Name</u>	<u>Value</u>	<u>Quantity</u>	<u>RefDes</u>
Capacitor Electrolytic	10 uF	4	C39, C41, C42, C43
Capacitor Electrolytic	100 uF	1	C40
NPN Transistor	2N3904	9	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9
5V Regulator	LM7805	2	REG1, REG2
Optoisolator	6N138	1	U7
NoiseChip	PIC12F1571	1	U4
MCU	PIC18F26K40	1	U6
Charge Pump	TC1044	1	U5
OpAmp	TL072	2	U1, U3
OpAmp	TL074	1	U2
LED		19	L1 - L19
Tempo	10K	1	VR1
1/4 Mono Jack	Audio Out	1	J1
3.5mm Mono Switched Jack	Clock In	3	J4, J5, J6
DIN5	MIDI/DINsync	1	J3
TypeMJack	Power	1	J2
Tactile Switches		13	PB1-13
Switch	SPST	1	SW1
Switch Cap		1	
9V Battery Snap		1	
Battery Holder Vertical		1	
LED Standoffs		19	
PCB Standoffs (set)		1	
pcb		1	
panel		1	