

The Tellun Corporation

Multi-Use Universal Buffer (MUUB)

User Guide, Rev. 2.0

Circuit design by Richard Brewster, Larry Hendry, and Scott Juskiw

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Introduction

The Multi-Use Universal Buffer (MUUB) is a general purpose daughterboard for adding additional circuitry to MOTM, Oakley, Blacet, or almost any synthesizer module. The MUUB printed circuit board (PCB) has provisions for a four-pin MTA-156 power connector, ferrite beads, and bypass capacitors for powering your circuit. The remainder of the board contains space for op-amps, resistors, capacitors, trimmers, diodes, and wire pads. The MUUB PCB is available in three configurations: MUUB-2 has space for one dual op-amp, MUUB-4 has space for two dual op-amps, MUUB-3 has space for one dual op-amp and a general purpose area with six uncommitted power busses and plenty of plated through holes for additional circuitry. There are a variety of op-amps that have the same pin-out (TL072, LT1013, OP275); any of these will work fine.

Circuit Description

Power is applied through JP1, ferrite beads L1/L2 and electrolytic capacitors C1/C2. Capacitors C3-C4 (and C5-C6 on MUUB-4) are ceramic bypass capacitors for the op-amps.

There are two op-amp circuits (A,B) on the MUUB-2 and MUUB-3 and four op-amp circuits (A,B,C,D) on the MUUB-4. Each op-amp circuit is identical; any discussion of circuit A applies equally to circuits B, C, and D.

RA1-RA4 and CA1 are the summing network for the inverting input of the op-amp. Negative feedback is provided via RA9, CA3, and RA14 in series with RA10. RA11 and TA1 provide a bias source to the inverting input of the op-amp. RA5-RA8 and CA2 are the summing network for the non-inverting input of the op-amp. Positive feedback is provided via RA12. RA13 and TA2 provide a bias source to the non-inverting input of the op-amp. RA14-RA15 can be used to create a voltage divider on the output. CA4 can be used for additional output compensation.

Construction Tips

Always install all of the power supply components: JP1, L1/L2, C1/C2, C3/C4, and C5/C6 (on MUUB-4). Everything else is optional and depends on what circuit you are trying to build.

All MUUBs have mounting holes for attaching them to your module or mounting bracket using threaded standoffs. The MUUB-3 and MUUB-4 have the same form factor as the DB-120 and DB-320 PCBs and can be installed on top of the lower half of many MOTM modules using 3/4" standoffs (see website pictures for the DB-120 and DB-320).

Use coax cable whenever you are dealing with audio signals. The square pads on the PCB for connections JA1-JA9 are connected to ground. Use twisted wire for non-audio signals.

All components on the schematic with an A, B, C, or D in the middle should be considered “suggestions” and not “requirements”. There is no reason to put a resistor in RA10 if your circuit requires a capacitor there (or a diode, or a trimmer). The PCB will accommodate a number of different components if you are creative. In particular, holes have been provided on the PCB to place trimmers into CA1-CA4 if a variable resistor is needed.

TA1 and TA2 are trimmers that would typically be used for adding a bias. When a fixed bias is needed, the trimmer can be replaced with a jumper. The center trimmer hole can be jumper to the positive supply (labeled “+” on PCB), the negative power supply (labeled “-“ on PCB), or ground (the hole immediately to the left of the center trimmer hole, WA1 and WA2 on the schematic). If the bias needs to be user adjustable, simply attach a panel mounted potentiometer in place of the trimmers.

There are six holes for tapping into the positive and negative power supply just to the right of L1 (marked V+ and V-). The square pads of JA1-JA9 are a good place to tap into the ground plane. You can use MTA pass-thru connectors to supply power to the MUUB using your existing power cables. See website pictures for DB-120 and DB-320 to see how this is done.

A small array of 25 pads is available in the lower left corner of the MUUB-2 and MUUB-4 for adding more circuitry if you need it. The MUUB-3 has a larger area for additional circuitry on the right hand side. There are six uncommitted power busses (marked with a horizontal rectangle on the top-side of the PCB). Between the horizontal power busses, each vertical column of holes are connected together. To the right of TB1 and TB2 are seven locations for attaching two-connector wires (marked with a rectangle on the top-side of the PCB). Each location has two holes: the square hole is connected to ground, the round hole is connected to the hole to its immediate right.

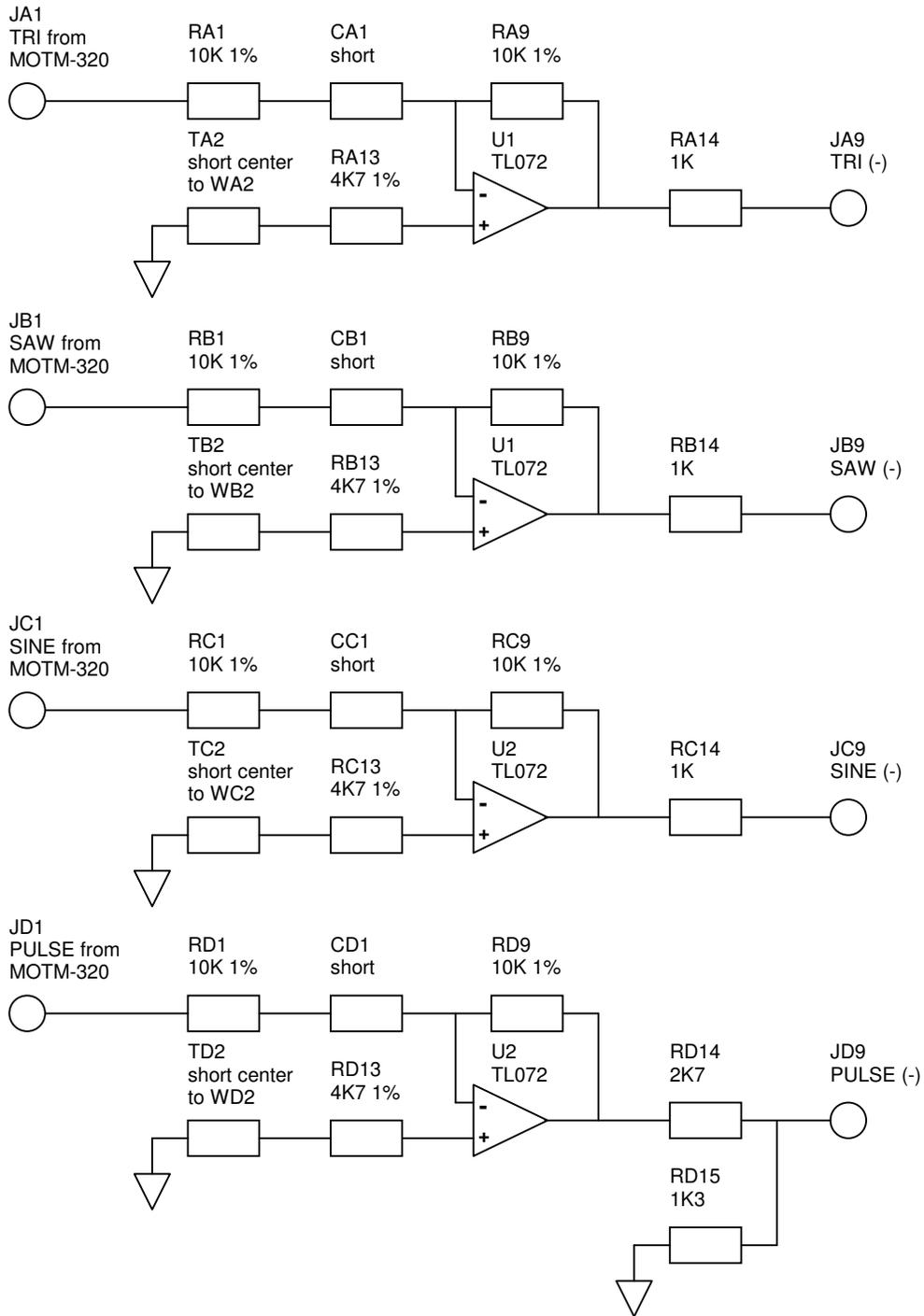
The PCB uses 0.4” spacing for the resistor pads, 0.4” spacing for the ferrite bead pads, and 0.2” spacing for most of the capacitor pads. The electrolytic capacitors have a 0.1” pad spacing.

Sample Circuits

This section provides some examples to demonstrate what you can build with the MUUB.

DB-320 Replacement

The following shows how the MUUB-4 can be used to recreate the functionality of the discontinued DB-320 daughterboard that adds inverted outputs to the MOTM-320 LFO. In this circuit, CA1, CB1, CC1, and CD1 must all be short circuited by installing a scrap resistor lead. Also, the center hole of TA2, TB2, TC2, and TD2 must be jumpered to ground (WA2, WB2, WC2, and WD2 respectively). You will need two TL072 op-amps, as opposed to a single TL074 quad op-amp as listed in the DB-320 parts list. You will also not be using the MTA-100 headers. The RANGE switch (on the DB-320 schematic) needs to have one side connected to ground, the other side connected to +15V, and the center pin connected to R18 (on the DB-320 schematic). You still need to install R18 directly on the MOTM-320 motherboard and not on the MUUB-4. Both +15V and ground connections are available on the MUUB-4. See the documentation for the DB-320 for details on how this circuit works.



MUUB Parts List

Resistors

Mouser part numbers for 5% resistors: #291-value.

Mouser part numbers for 1% resistors: #271-value

For example:

100 ohm = #291-100

1 Kohm = #291-1K

3.3 Kohm = #291-3.3K

82 Kohm = #291-82K

1 Mohm = #291-1M

Trimmers

Mouser part numbers for multi-turn trimmers: #72-T93YA-value.

For example:

100 ohm = #72-T93YA-100

5 Kohm = #72-T93YA-5K

1 Mohm = #72-T93YA-1M

Capacitors

Quantity	Description	Part No.	Notes
2	22 uF 35V electrolytic	C1, C2	Mouser #140-XRL35V22
2-4	0.1 uF ceramic	C3 – C6	Mouser #147-72-104 Mouser #581-SA105E104M

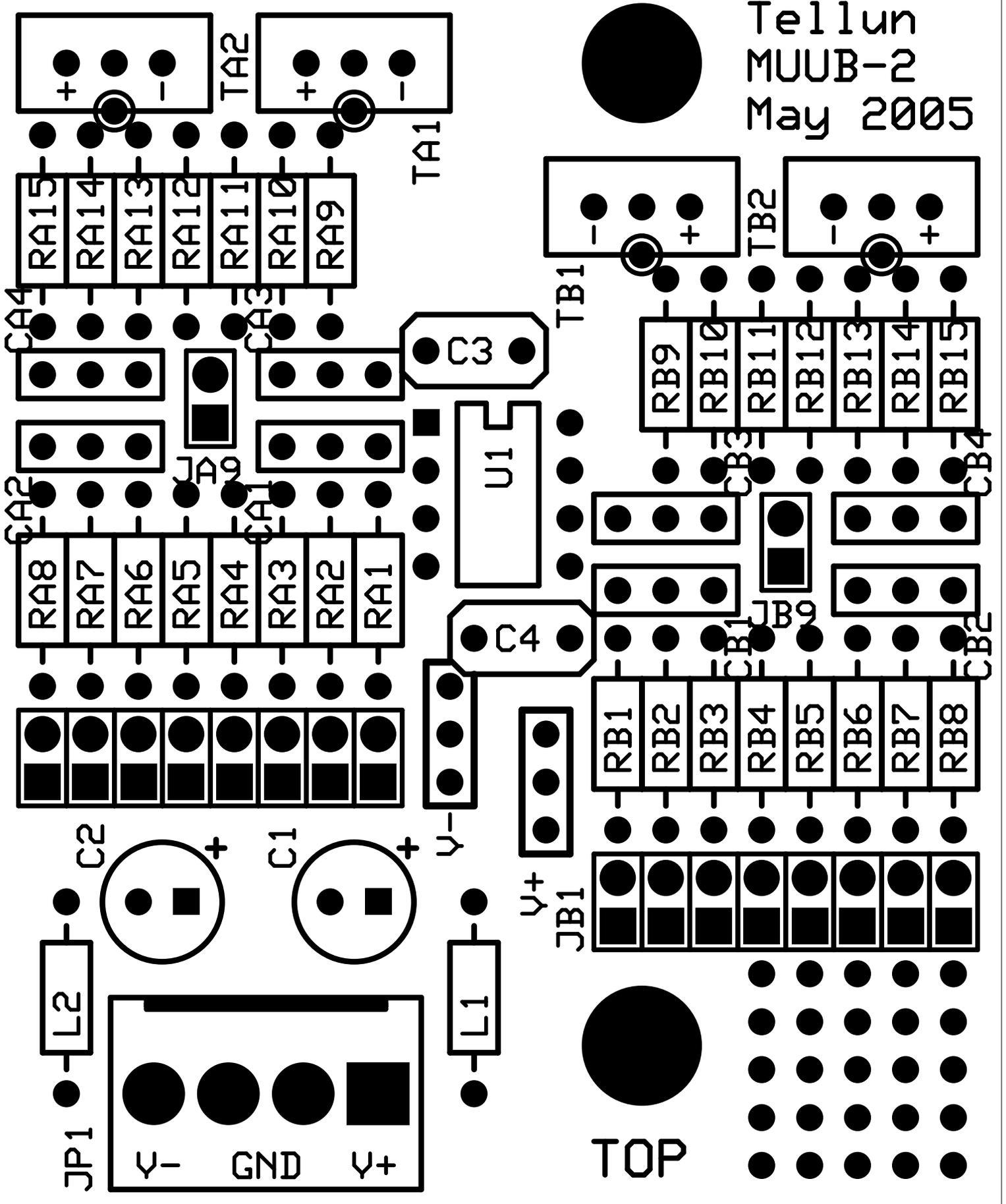
Semiconductors

Quantity	Description	Part No.	Notes
	TL072 dual op amp	U1-U2	Allied #735-2727 Mouser #595-TL072CP
	MXL1013 (or LT1013) dual op amp	U1-U2	Allied #735-2727 Mouser # 595-LT1013CP
	OP275GP dual op amp	U1-U2	Allied #630-9295
	1N4148 diode		Mouser #78-1N4148
	LED		Digikey #67-1155-ND (Lumex red) Digikey #67-1156-ND (Lumex green) Digikey #67-1157-ND (Lumex yellow) Digikey #67-1158-ND (Lumex super red)

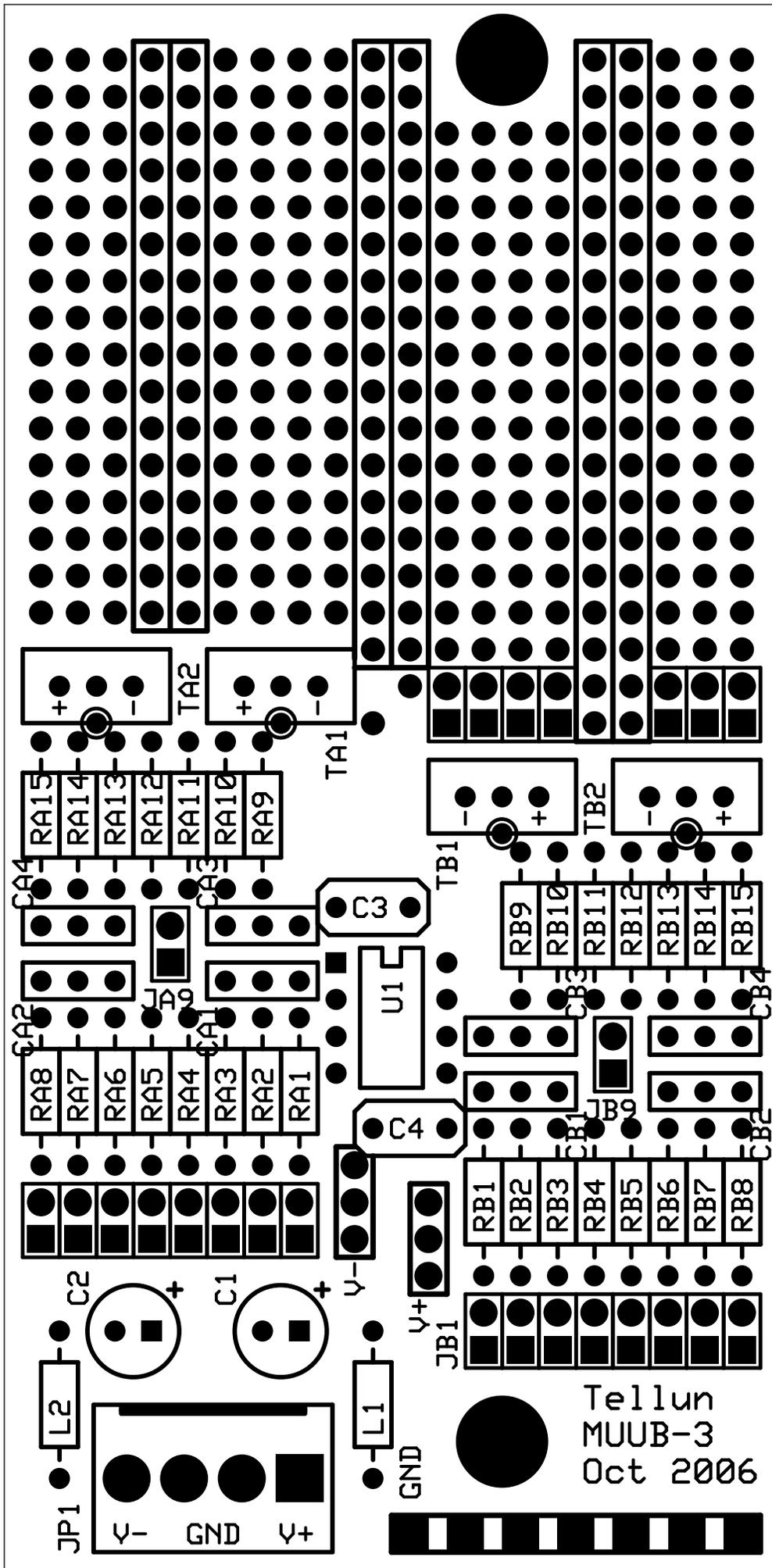
Miscellaneous

<i>Quantity</i>	<i>Description</i>	<i>Part No.</i>	<i>Notes</i>
2	axial ferrite beads	L1, L2	Active #MURJP2141, or Mouser #623-2743002112
1	MTA-156 4 pin	JP1	Mouser #571-6404454 (header)
1	MTA-156 4 pin pass-thru		Mouser #571-6405994 (connector) Mouser #571-6406434 (dust cover) (optional, for supplying power to MUUB using existing power cable)
1-2	3/4" standoff (6-32 thread)		Mouser #534-2211

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MUUB-2
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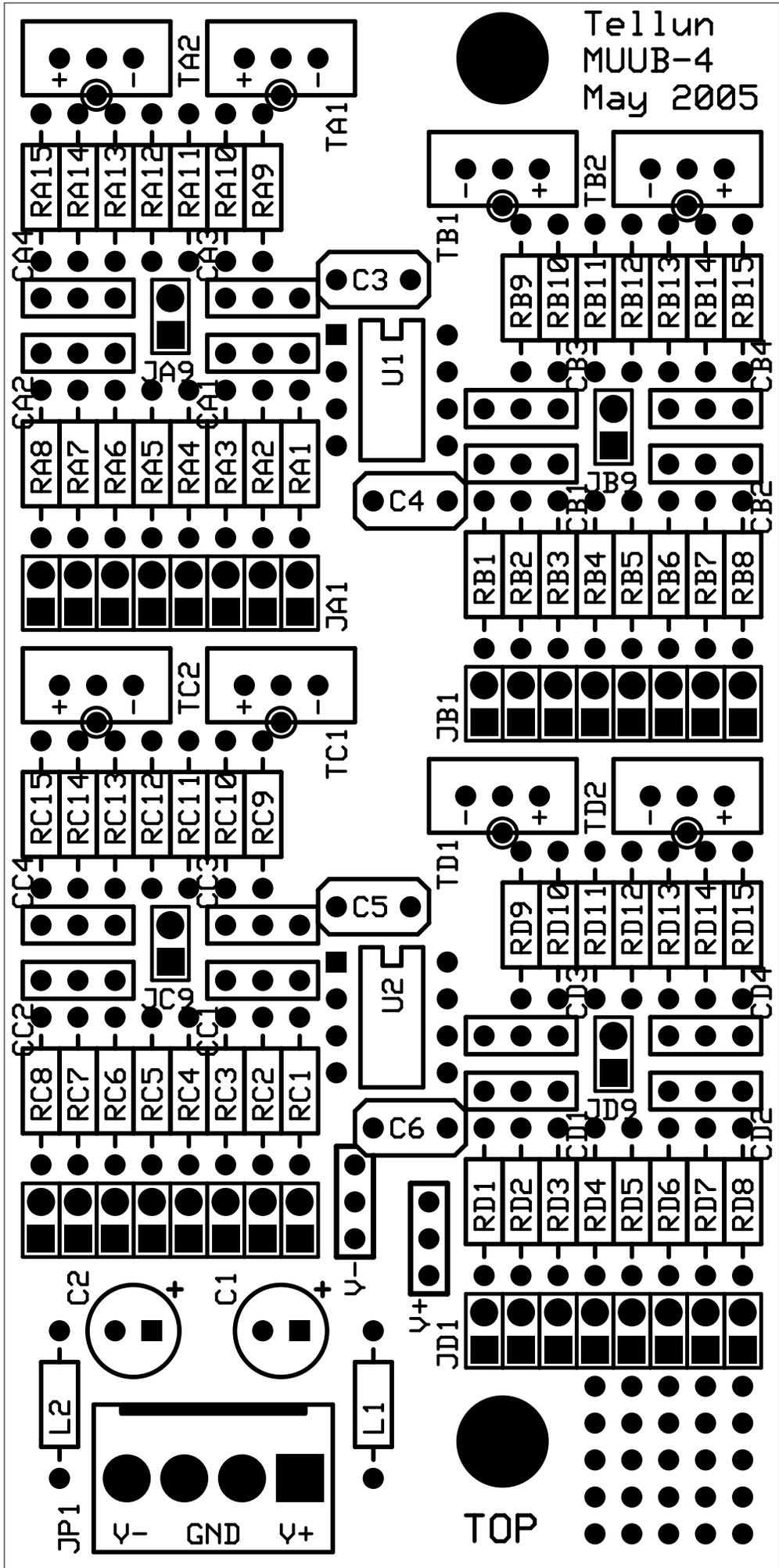


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