The Tellun Corporation

DB-800 Daughterboard for MOTM-800

User Guide, Rev. 1.0

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Introduction

The DB-800 is a daughterboard for the MOTM-800 EG. The DB-800 adds a comparator to the GATE input and a clipper to prevent the EG output from rising above +5 volts. The MOTM-800 requires a relatively fast rising signal at the GATE input to generate an envelope. Slow rising signals, like the SINE output from an LFO, will not normally trigger the MOTM-800. The comparator squares up any signal at the GATE input so that any voltage rising above +1.4 volts will trigger the EG. Two optional LED drivers are also provided, one for the GATE input and another for the EG output.

Circuit Description

A comparator with hysteresis is built around U1. R1 and R2 set the upper trip point at approximately +1.4 volts. When the signal at the GATE input rises above the upper trip point, the output from U1 rises very quickly from 0 to +15 volts. The output from U1 stays at +15 volts until the signal at the GATE input goes below the lower trip point (approximately +1.2) volts. U1 then drops very quickly from +15 volts to 0 volts and stays there until the signal at the GATE input rises above the upper trip point again. This comparator circuit is placed between the GATE jack on the MOTM-800 panel and the GATE input pads on the MOTM-800 motherboard to generate a fast rising GATE from any input signal. U2b is a simple LED driver that turns on the GATE LED whenever the output from U1 goes high.

The clipper circuitry is built around U3[1]. This circuit comes from Jung's Op-Amp cookbook and can also be found in Electronotes #88. R8 and R9 set the clip point at +10 volts. If the input signal (at pin 5 of U3) is below +10 volts, the clipper output (measured at pins 6 or 2 of U3) follows the input signal. If the input signal rises above +10 volts, the clipper output stays at the voltage set by R8 and R9. The MOTM-800 divides this signal by two so the EG output is effectively clamped at +5 volts. This clipper circuit is inserted between the raw EG signal on C9 and buffer U3b on the MOTM-800 motherboard. U2a is a simple LED driver that follows the EG output.

Construction Tips

The DB-800 should be installed on top of the MOTM-800 using 3/8" standoffs. A standard MTA-156 power connector is supplied on the DB-800. Two MTA-100 connectors are provided for connecting the comparator and clipper circuits to the MOTM-800.

The comparator must be connected between the GATE input jack and J1 pin 3 on the MOTM-800 motherboard. Disconnect the white wire at the signal lug of the GATE input

[1] Thanks to Richard Brewster for introducing me to this clipper circuit.

jack and connect it to the GOUT pin at JP2 on the DB-800. Connect a 2" wire between the signal lug of the GATE input jack and the GIN pin at JP2 on the DB-800.

Hooking up the clipper requires performing a bit of surgery on the MOTM-800 motherboard. The clipper must be connected between the raw EG output at C9 and pin 3 of U3 (both on the MOTM-800 motherboard). It would be most convenient to simply disconnect pin 3 of U3 from the rest of the MOTM-800 circuitry and insert the clipper there. Unfortunately, pin 3 of U3 is in the middle of a long trace that connects C9 to other circuitry. There are two ways to isolate pin 3 of U3.

The first method involves cutting two traces on the bottom of the MOTM-800 motherboard. The two traces are on both sides of U3 pin 3. Cutting these two traces isolates U3 pin 3. A jumper must be inserted to reconnect the two cut traces so that C9 will still be connected to the rest of the circuitry on the MOTM-800 motherboard.

The second method involves lifting pin 3 of U3 off the motherboard[2]. This is easy to do if the MOTM-800 has not been built yet. Simply bend pin 3 upwards so it doesn't go into the motherboard. If pin 3 is already soldered in, it can be clipped on the top side of the motherboard and bent upwards.

Once pin 3 of U3 has been isolated, connect a 4" wire to the spot where pin 3 used to be connected (this spot should still be connected to C9 and other circuitry on the MOTM-800 motherboard). Connect the other end of this wire to the CIN pin at JP3 on the DB-800. Connect another 4" wire to pin 3 of U3. Connect the other end of this wire to the COUT pin at JP3 on the DB-800. Consider using a piece of heat shrink tubing on the connection to pin 3 of U3 if that pin has been lifted off the motherboard.

Installing both LEDs on the MOTM-800 panel requires some creative thinking. There is sufficient space to install an LED between the DECAY and SUSTAIN pots. But the screws on the panel for attaching the mounting bracket interfere with putting an LED between the ATTACK/DECAY pots and the SUSTAIN/RELEASE pots. You may have to sacrifice one of the bracket mounting screws.

A simple way to provide power to the DB-800 is to use a pass-thru MTA-156 connector. This connector can be installed on an existing MOTM power cable to provide two outlets from one cable.

The PCB uses 0.4" spacing for the resistor pads, 0.3" for the diode pads, and 0.2" spacing for most of the capacitor pads. The electrolytic capacitors have a 0.1" pad spacing.

For the LEDs, the square pad on the PCB indicates the cathode. The cathode is normally the shorter lead on an LED.

[2] This method suggested by Richard Brewster.

Modifications

The comparator and clipper circuits are independent of each other. You don't need to build the clipper if you don't want it. The same goes for the comparator.

Any LEDs that are not used should be replaced with a short circuit (use a scrap resistor lead).

The hysteresis on the comparator can be changed by modifying R4. Lower values will provide a wider window.

The upper trip point of the comparator can be changed by modifying R1 and/or R2. As designed, the upper trip point is about +1.4 volts and the lower trip point is about +1.2 volts.

The comparator can be temporarily disabled by removing the header to JP2 and inserting a scrap resistor lead (bent into a U shape) into the two holes of the connector. The GATE LED will not function correctly with the header removed.

The clipper can also be temporarily disabled by removing the header into JP3 and inserting a scrap resistor lead (bent into a U shape) into the two holes of the connector. The OUT LED will not function correctly with the header removed.

DB-800 Parts List

Resistors (12)

Quantity	*Description*	*Part No.*	*Notes*
1	1 K	R5	5% or better, Mouser #291-1K
3	10 K	R2, R3, R7	5% or better, Mouser #291-10K
2	100 K	R1, R6	5% or better, Mouser #291-100K
1	1 M	R4	5% or better, Mouser #291-1M
2	2.2 K	R11, R12	5% or better, Mouser #291-2.2K
1	4.7 K	R10	5% or better, Mouser #291-4.7K
1	49.9 K	R8	1%, Mouser #271-49.9K
1	100 K	R9	1%, Mouser #271-100K

Capacitors (11)

Quantity	*Description*	*Part No.*	*Notes*
1	100 pF ceramic	C9	Mouser #140-50N5-101J Mouser #147-75-101
8	0.1 uF ceramic	C3 – C8, C10, C11	Mouser #147-72-104 Mouser #581-SA105E104M
2	22 uF 35V electrolytic	C1, C2	Mouser #140-XRL35V22

Semiconductors (7)

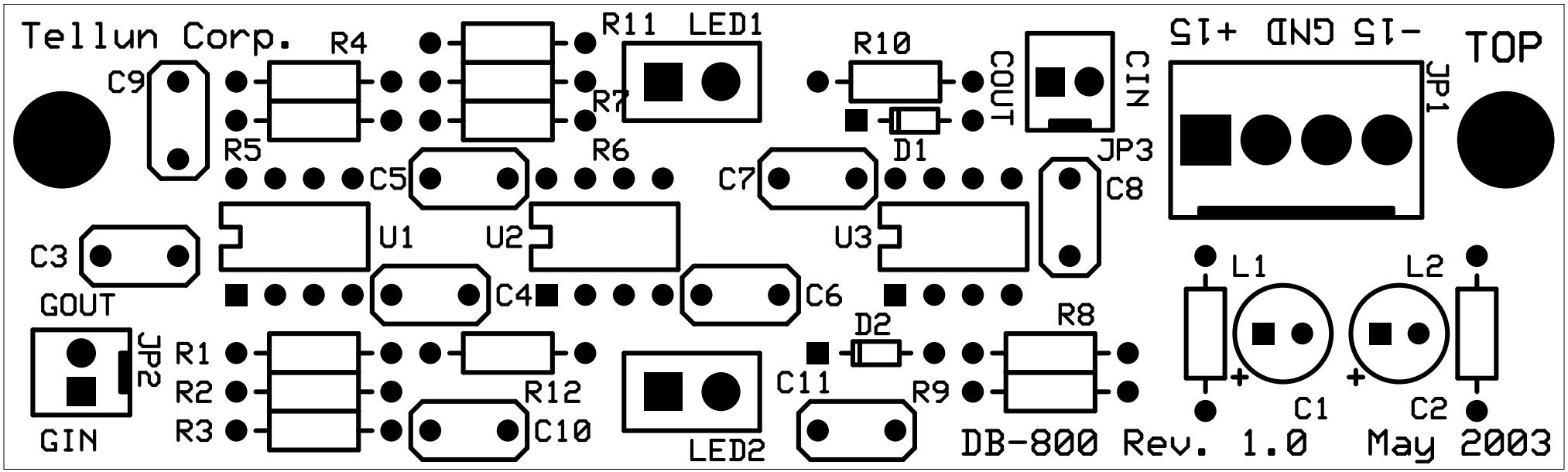
Quantity	*Description*	*Part No.*	*Notes*
1	LM311N comparator	U1	Mouser #511-LM311N
2	TL072CP dual op amp	U2, U3	Mouser #595-TL072CP
2	1N4148 diode	D1 – D2	Mouser #78-1N4148 (can substitute 1N914)
2	LED	LED1, LED2	Digikey #67-1155-ND (Lumex red) Digikey #67-1156-ND (Lumex green) Digikey #67-1157-ND (Lumex yellow)

Miscellaneous

Quantity	*Description*	*Part No.*	*Notes*
3	8 pin DIP socket		for U1, U2, U3 (optional)
2	axial ferrite beads	L1, L2	Active #MURJP2141, or Mouser #623-2743002112
1	MTA-156 4 pin	JP1	Mouser #571-6404454 (header)
2	MTA-100 2 pin	JP2, JP3	Mouser #571-6404562 (header) Mouser #571-6404402 (connector) Mouser #571-6405502 (dust cover)
1	MTA-156 4 pin pass-thru		Mouser #571-6405994 (connector) Mouser #571-6406434 (dust cover) (optional, for supplying power to DB-800 using existing MOTM-800 power cable)

Hardware

Quantity	*Description*	*Notes*
1	DB-800 PCB	printed circuit board
2	3/8” standoff (threaded male/female)	Mouser #534-8413
1	power cable	with MTA-156 connectors (if not using MTA-156 pass-thru)
	heat shrink cable	
	hookup wire	
	solder	both organic and no clean


Tellun Corp.
R4
R11
LED1
R10
COUT
CIN
-15 GND +15
TOP
C9
R7
JP1
R5
R6
D1
JP3
C5
C7
C8
U1
U2
U3
C3
L1
L2
GOUT
C4
C6
D2
R8
JP2
R1
R2
R3
R12
C11
R9
C10
C1
C2
GIN
LED2
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