

The Tellun Corporation

DB-320 Daughterboard for MOTM-320

User Guide, Rev. 1.1

Circuit design by Larry Hendry

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## ***Introduction***

The DB-320 is a daughterboard for the MOTM-320 Voltage Controlled LFO. The DB-320 is intended to be used with the Stoope Enterprises 320R panel. The DB-320 adds inverted outputs for the four LFO waveforms. A header is also provided for connecting the RANGE switch on the MOTM-320R panel.

## ***Circuit Description***

The four output waveforms from the MOTM-320 are brought into the DB-320 via JP2. Three identical inverters are built around quad op-amp U1 for the triangle, sine, and sawtooth waveforms. Each of these inverters provides unity gain; the signal driving them is 10 Vpp. The signal driving the inverter for the pulse waveform goes from approximately  $-13\text{ V}$  to  $+13\text{ V}$ . This fourth inverter also provides unity gain but R16 and R17 cut the amplitude of the inverted pulse waveform to 10 Vpp.

JP3 provides a source of both  $+15\text{ volts}$  and  $0\text{ volts}$  for the RANGE switch on the 320R panel. With the RANGE switch in the NORMAL position, R18 is connected to ground and the MOTM-320 operates in its normal frequency range. With the RANGE switch in the HIGH position, R18 is connected to  $+15\text{ volts}$  and the MOTM-320 frequency is increased about 20 times (from a maximum of 30 Hz to a maximum of approximately 640 Hz).

## ***Construction Tips***

The DB-320 should be installed on top of the MOTM-320 using  $3/4''$  standoffs. A standard MTA-156 power connector is supplied on the DB-320. An MTA-100 connector is provided for connecting the four waveforms from the MOTM-320 to the DB-320.

Use coax cable to feed the four waveforms from the MOTM-320 to the DB-320. The best place to tap the four waveforms off the MOTM-320 is directly underneath the motherboard near the bottom end of the module where the coax wires are connected. For all four waveforms, connect the coax shield (outside conductor) to the nearest ground connection on the underside of the MOTM-320 motherboard. The following instructions indicate where to connect the coax core (inside conductor) for the four waveforms.

- Sine            U3b side of R44
- Saw            U5a side of R64
- Triangle      U7a side of R75
- Pulse          U6b side of R71

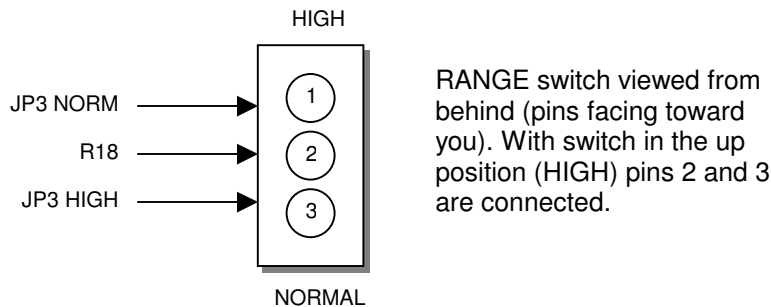
The other ends of these four coax wires connect to the DB-320 via an MTA-100 connector. Clip the coax shield from these ends and cover them with a piece of heat

shrink tubing to prevent any stray strands from coming into contact with anything. At this clipped end, connect the coax core (inside conductor) to the MTA-100 connector. You should be able to get all four coax wires to fit comfortably into the MTA-100 connector and still get the dust cover on. Use a cable tie to bundle the four coax wires together near the MTA-100 connector.



The RANGE switch on the 320R panel needs to be connected to both the MOTM-320 motherboard (via R18) and the DB-320 daughterboard. R18 must be connected to pin 9 of U1 on the MOTM-320 motherboard. The best place to make this connection is on the underside of the motherboard where resistor R7 (on the motherboard) connects to pin 9 of U1. Solder R18 onto R7, not directly onto U1. Connect a 5" piece of wire from the other end of R18 and connect this wire to pin 2 (the middle lug) of the RANGE switch as shown below. Cover R18 with a piece of heat shrink tubing before connecting this wire to the RANGE switch. Resist the temptation to connect R18 directly to the RANGE switch and run a long wire to pin 9 of U1; pin 9 of U1 is a summing node and the wire that connects this node to R18 should be as short as possible to avoid picking up noise.

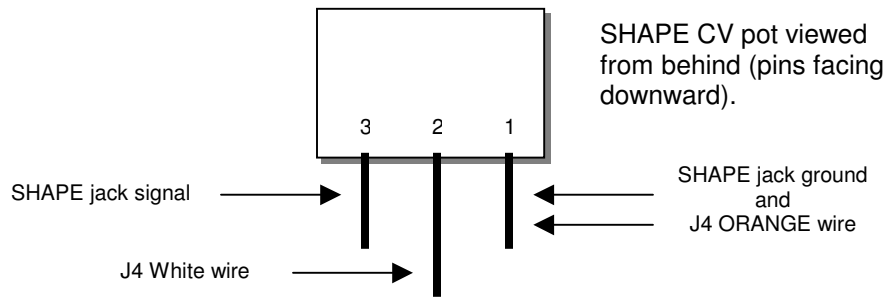
Use a 5" twisted pair of wires to connect pins 1 and 3 of the RANGE switch to JP3 on the DB-320. Pin 3 (the bottom lug) should connect to the HIGH pin on JP3.



On a "stock" MOTM-320, the SHAPE jack is connected to J4 on the MOTM-320 motherboard via a twisted pair of wires (white and orange). The SHAPE CV pot needs to be inserted between the SHAPE jack and J4 on the MOTM-320 motherboard.

The pin out for most pots is (left to right): 3, 2, 1 when viewing the back of the pot with the leads facing down. Unsolder the twisted pair of wires at the SHAPE jack (the orange

and white wires). Reconnect these wires to the SHAPE CV pot as follows: the white wire goes to pin 2 (the middle pin), and the orange wire goes to pin 1 (the right pin). Use a 6" twisted pair of wires to connect the SHAPE jack to the SHAPE CV pot as follows: the jack signal (left terminal on jack) goes to pin 3 (the left pin on the SHAPE CV pot), and the jack ground (beveled terminal) goes to pin 1 (the right pin on the SHAPE CV pot). Use heat shrink tubing to cover the connections to the SHAPE CV pot.



The cable tie for J8 on the MOTM-320 motherboard must be removed in order to get the SHAPE CV pot in place. Orient the pot so that the leads are facing downwards (towards the SAW and PULSE jacks). Remember to install a hex nut on the pot shaft before attaching the pot to the panel. When the SHAPE CV pot is in place it should have two hex nuts installed: one on either side of the panel (just like the RATE, FM, and SHAPE pots).

Use coax cable to hook up the four outputs from the DB-320 to the SINE-, TRI-, SAW-, and PULSE- output jacks. Holes are provided on the DB-320 for using cable ties with these four coax connections (just like on the MOTM-320).

A simple way to provide power to the DB-320 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, 0.4" 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.

## Wiring Guide

<i>From</i>	<i>To</i>	<i>Wire Length (inches)</i>	<i>Wire Type</i>
U3b side of R44 on MOTM-320 (sine)	JP2 pin 3 on DB-320 (sine)	4	coax
U5a side of R64 on MOTM-320 (saw)	JP2 pin 2 on DB-320 (saw)	6	coax
U7a side of R75 on MOTM-320 (triangle)	JP2 pin 1 on DB-320 (triangle)	5	coax
U6b side of R71 on MOTM-320 (pulse)	JP2 pin 4 on DB-320 (pulse)	6	coax
JP3 on DB-320	RANGE switch pins 1 and 3	5	twisted
R18	RANGE switch pin 2	5	single plain wire
SHAPE jack	SHAPE CV pot pins 1 and 3	6	twisted
J4 on MOTM-320	SHAPE CV pot pins 2 and 3	use existing J4 wire	twisted
SINE– on DB-320	SINE– jack	4	coax
SAW– on DB-320	SAW– jack	4	coax
TRI– on DB-320	TRI– jack	4	coax
PULSE– on DB-320	PULSE– jack	4	coax

## Modifications

R18 adds a frequency “boost” to the MOTM-320 when the RANGE switch is set to the HIGH position. As designed, the HIGH setting increases the frequency about 20 times (from a maximum of 30 Hz to a maximum of approximately 640 Hz). This frequency boost can be made subtler by increasing R18. Lowering R18 will result in a greater boost when the RANGE switch is set to the HIGH position. If you want to get really ambitious, you can try tweaking R18 so that it adds an integer number of octaves when the RANGE switch is in the HIGH position.

## DB-320 Parts List

### Resistors (18)

Quantity	Description	Part No.	Notes
3	1 K	R4, R8, R12	5% or better, Mouser #291-1K
1	1.3 K	R17	5% or better, Mouser #291-1.3K
1	2.7 K	R16	5% or better, Mouser #291-2.7K
4	4.7 K	R3, R7, R11, R15	5% or better, Mouser #291-4.7K
8	10 K	R1, R2, R5, R6, R9, R10, R13, R14	1%, Mouser #271-10K
1	330 K	R18	1%, Mouser #271-330K

### Capacitors (4)

Quantity	Description	Part No.	Notes
2	0.1 uF ceramic	C3 – C4	Mouser #147-72-104 Mouser #581-SA105E104M
2	22 uF 35V electrolytic	C1, C2	Mouser #140-XRL35V22

### Semiconductors (1)

Quantity	Description	Part No.	Notes
1	TL074 quad op amp	U1	Mouser #595-TL074CN

### Miscellaneous

Quantity	Description	Part No.	Notes
4	phone jack	J1 – J4	Switchcraft 112A, Allied #932-9391
1	14 pin DIP socket		for U1 (optional)
2	axial ferrite beads	L1, L2	Active #MURJP2141, or Mouser #623-2743002112
1	MTA-156 4 pin	JP1	Mouser #571-6404454 (header)
1	MTA-100 2 pin	JP3	Mouser #571-6404562 (header) Mouser #571-6404402 (connector) Mouser #571-6405502 (dust cover)
1	MTA-100 4 pin	JP2	Mouser #571-6404564 (header) Mouser #571-6404404 (connector) Mouser #571-6405504 (dust cover)
1	MTA-156 4 pin pass-thru		Mouser #571-6405994 (connector) Mouser #571-6406434 (dust cover) (optional, for supplying power to DB-320 using existing MOTM-320 power cable)
1	SPDT switch, NKK M2012ES1W01	SW1	Allied #870-8646
1	100 K linear pot	for SHAPE CV attenuator	Spectrol 149 series, Allied #970-1791

### Hardware

Quantity	Description	Notes
1	knob	ALCO PKES90B1/4
1	DB-320 PCB	printed circuit board

2	3/4" standoff (6-32 thread)	Mouser #534-2211 (for mounting board DB-320 above MOTM-320)
1	power cable	with MTA-156 connectors (if not using MTA-156 pass-thru)
1	320R panel	Stooge panel
1	4 pot short Stooge bracket	Stooge bracket
2	#6-32 screw	for mounting DB-320 to standoff
1	pot nut	Mouser #534-1456 for mounting SHAPE CV pot to front panel
	coax cable (RG174/U)	Mouser #566-8216-100 (100 foot spool)
	heat shrink cable	
	hookup wire	
	solder	both organic and no clean

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