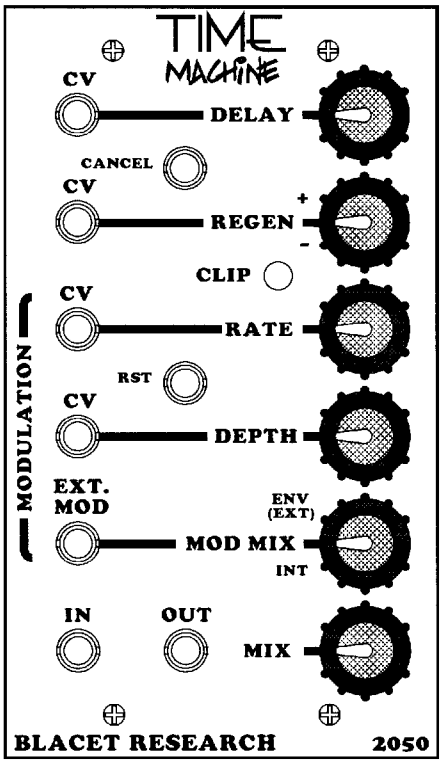
TIME MACHINE

BLACET RESEARCH MODEL TM2050
Voltage Controlled Analog Delay

Users Manual



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Introduction

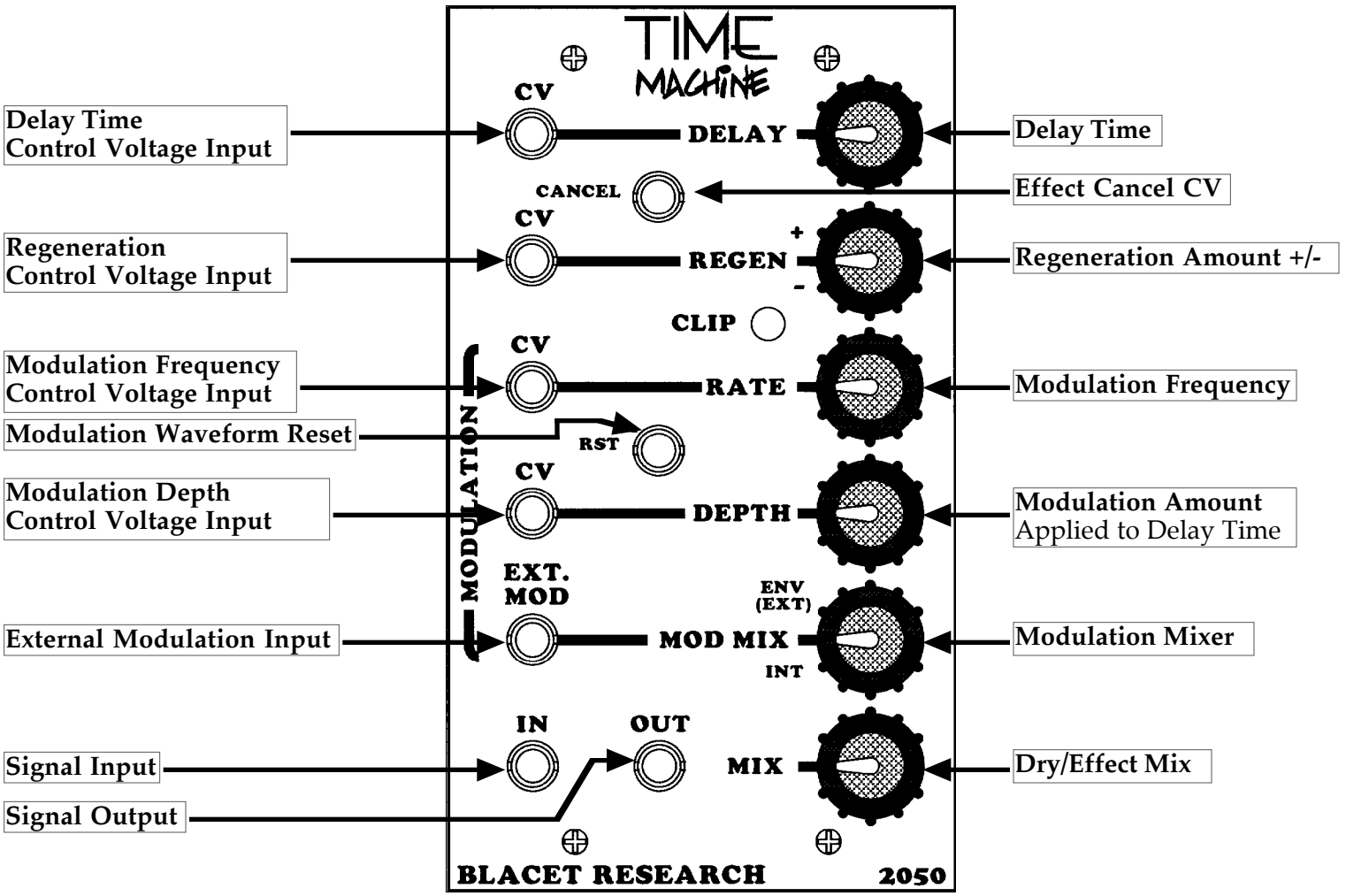
The Time Machine is a high quality voltage controlled analog delay using a 80's technology BBD (Bucket Brigade Delay) IC. Sophisticated tracking filters allow variable bandwidth delays from 10 mS to 2 S. A compander system minimizes noise and expands the dynamic range of the unit.

Voltage control of the delay time is nominally exponential, meaning the delay time will double or halve for each change of one volt in control voltage. This allows convenient setting of the delay time and gives balanced modulation results.

The TM2050 includes a built in voltage controlled resettable triangle wave modulation generator (LFO) with voltage controlled modulation depth. External modulation may also be mixed with the internal LFO . With no external modulation input, the signal envelope may be mixed in.

Voltage controlled regeneration with either + or - phase is also included. The Cancel input allows voltage controlled attenuation of the delay effect.

Standard effects possible with this unit include flanging, doubling, chorus, slap back echo and long delays. The extensive implementation of voltage controlled functions allows exploration of whole new areas of sound warping.

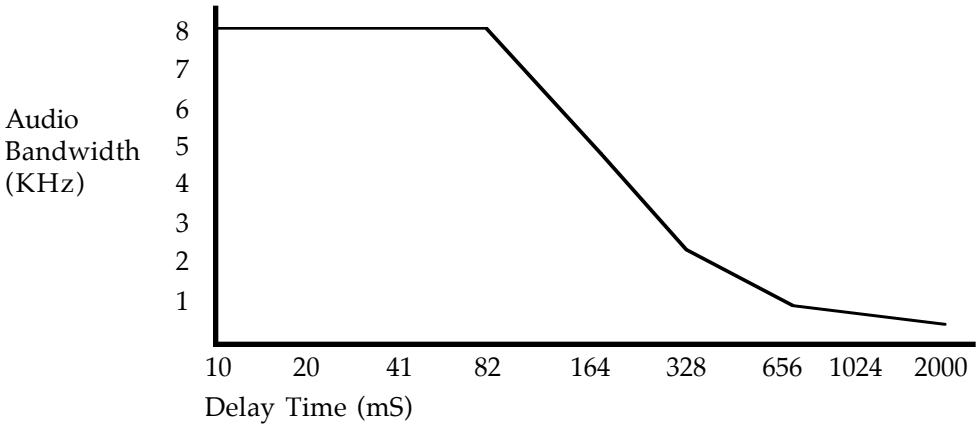


Controls and Operation

Audio Input, Audio Output, Clip LED: The Time Machine is optimized for 10V signal levels common to modular systems. The effect of the companding system is to allow a wide range of signal levels to give acceptable results, although signals in the 1V range may benefit from some prior amplification to 10 V levels for optimal noise performance. The Clip LED will tend to flash with large amounts of regeneration. If clipping is a persistent problem, on board trimpot RT4 or a small CV at the Cancel jack can be used to attenuate the input signal.

Delay Control Voltage Input Jack, Delay Pot: The delay time is set with the CV input and/or the pot. Increasing CV or pot rotation in the CW direction increases delay time. The range of the CV is about 7.5 V.

Increasing delay time results in decreasing audio bandwidth. This is due to the finite number of stages available in the BBD IC. (See "Circuit Description" for more information on this.) For delays from 10 mS to 80 mS, the BW is about 8 KHz. Increasing delay times to 2 S results in a gradual reduction of BW to 400 Hz.



Regen Control Voltage Input, Regen Pot: "Regen" is Regeneration or feedback of the delayed audio signal back into the delay line. This allows the generation of multiple repeats or echoes. The regeneration may be "+" or "-" (in or out of phase with the original signal). This feature is especially useful at shorter delays, where the quality of the sound changes dramatically depending on the phase.

The center detent of the pot is "Off" or no repeats. There is 60 dB of control in either the "+" or "-" direction and runaway feedback is possible at most delay settings except for very long ones. The response as you approach "runaway" is a bit touchy, so take care; things can get loud!

For the external CV, with the pot at mid position, 0V will equal "Off" with -5V and +5 V resulting in full feedback of either phase. A small change in CV can result in a large change in feedback, so be careful with this input.

Modulation Rate Control Voltage Input, Rate Pot, RST Input, Modulation Depth Control Voltage Input, Depth Pot: The modulation generator (LFO) supplies triangle wave frequency modulation of the delay time, with the Depth CV Input or Depth pot regulating the level. A positive supply voltage (+5V or above) at the RST (Reset) Input forces termination of the LFO cycle. Upon removal of the RST, the LFO cycle will initiate in a positive direction. The state of the reset modulation depth **is half of the active depth; not ground or "off" as you might expect.** This allows for a more normal modulation "feel". Note that the Depth function only effects the internal LFO, allowing any external modulation to have it's own envelope.

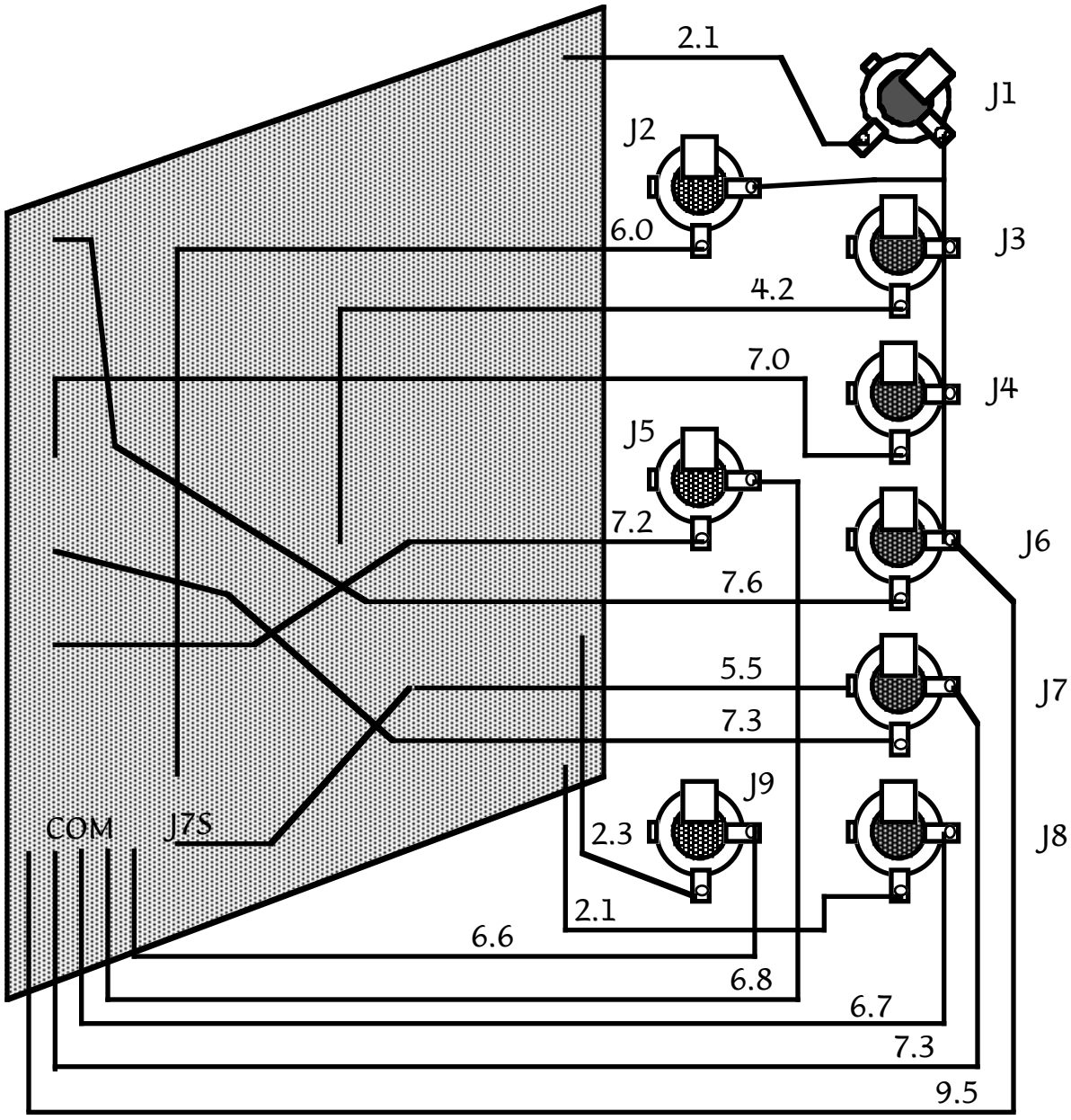
Ext Mod Input, Mod Mix Pot: The Mod Mix pot mixes the internal LFO with a built in envelope follower (ENV), which follows the Audio Input signal. When an external modulation source is input, the ENV is disconnected and the external source can be mixed with the internal LFO.

Mix Pot: Mixes the dry signal with the delay effected signal. Full CCW equals dry signal only.

Power Input Jack J10: A source of <u>regulated</u> +/-15Vdc power must be supplied to this PCB jack to run the Time Machine. Note the current requirements in the "Specifications" section.

Connections to this jack should be made only when the power supply is OFF and the connector must be positioned correctly on the pins.

As using the wrong supply can cause damage to the unit, please contact us if you have any questions!



Wire Lengths in Inches

Calibration

There are six trimmers on the PCB:

- RT1 sets the initial frequency of the high frequency VCO.
- RT2 sets the scale factor of the high frequency VCO.
- RT3 sets the clock null or balance on the delay IC output.
- RT4 attenuates the audio level into the Time Machine.
- RT5 sets the bias voltage for the delay IC. **This is a critical adjustment and you will not hear any effect sound if this is not adjusted correctly.**
- RT6 sets the 10.0 V reference voltage. (This trimmer was set when you powered up the board without the ICs).

RT5: Connect a audio source such as a VCO or keyboard to the "IN" jack. Select a triangle waveform or a flute type sound. Connect the "OUT" jack to your mixer or audio amplifier. Rotate **RT4** full CW. Rotate the Mix pot. At full

CCW, you should hear your unprocessed signal. You may or may not hear anything as you go full CW.

Set the Delay pot to about 30% CW, the Regen pot to mid position, the Rate pot full CCW, the Depth pot full CCW, the Mod Mix pot full CCW, the Mix pot full CW.

Rotate RT5 until you hear the processed signal; go slowly as the signal is delayed to some extent and so are the adjustments you are making! Check the full range of the Delay pot and adjust for the least distortion.

RT3 can typically be left at mid position, but you can check it by turning the Delay pot full CW. Remove the audio input and monitor the audio at TP1. You will hear a bit of clock noise. Adjust RT3 for minimum clock noise.

Set the Delay pot to full CCW and connect a frequency counter to the right side of R16. Adjust **RT1** for a reading of 400 KHz. Rotate the Delay pot full CW and adjust **RT2** for a reading of 2 KHz. These two trimmers interact, so recheck the min and max frequencies until they are close to the nominal values.

Troubleshooting, Repair, Warranty

If you encounter problems that you can't solve, contact us, preferably via e-mail with a description of the problem. We can then help you get your module working.

The parts contained in this unit have been carefully selected and tested. They are guaranteed for 90 days from the date of purchase.

Specifications

Front Panel Size: 5.25 x 3" W
Module Depth: 6.5"
Input/Output Jacks: 3.5 mm (1/8")
Input Level: 0 to 10V P-P
CV Range: 0-10V (0-7.5V for delay) (+5 to -5V for Regen.)
LFO Range: 40S to 40Hz
Output Level: 13 V max
Delay Range: 200:1, 10 mS to 2 Seconds
Audio Bandwidth: 8 KHz to 400 Hz (varies with delay time)
Power: +/-15 Vdc @+95/-75 mA

Modifications

Please check the Tech page on our website for two mods that will improve the useability of older TMs, prior to rev B.