Some info about calibrating the Crumar Bit One   R Grieb May 17,2020

There are many trimmers in the Crumar Bit One.   With any luck,
most of these will not need adjusting, but in case the need does arise, below
is some information that may help.   Some specific settings are based on
measurements on a particular Bit01 which seemed to be working well.   All
of the voices measured the same. None of this information is guaranteed to be
accurate.   Use it at your own risk.   The section on calibrating the filters
only applies to units with the CEM filter chips installed.

CPU board:

Trimmer 1 is not installed on the pcb and is not needed.

Trimmer 8 is the DAC full scale (range) adjustment. This would be the voltage at
test pt DAC. It's hard to adjust this in normal operation of the synth, as the DAC
voltage is constantly changing. In my new firmware I added a test mode that
applies all 1's to the DAC inputs. 5-6 Bit99, BitOne and Bit01's have been
tested and the DAC full scale voltage was typically 4.7-4.85 volts. (No DAC
adjustments were made to these units)

Measure the DC voltage at the wipers of the rear panel tuning pot and the detune
slider and set them to 0.0 volts. Center the Bend/pitch wheel.

Turn off any modulation, set the cutoff to max, resonance to
minimum, turn on only DCO1 saw and/or DCO2 saw as appropriate.   Monitor the synth
output with a pitch tuner and an amplifier.

Trimmer 2 sets the low pulse width for DCO1 clock F1. (Schematic is wrong)
Set it to 165 +/- 5 nSec, using the 2V crossing as the division between high and low parts.

Trimmer 5 sets the high pulse width for DCO1 clock F1.   With no LFO oscillator modulation,
bend, detune, and pitch centered as mentioned, the frequency of F1 should be roughly 2.0 MHz.
You can set it using a tuner on the output of the synth, and adjusting for the correct DCO1
note pitch.

Trimmer 4 sets the low pulse width for DCO2 clock F2. (Schematic is wrong)
Set it to 165 +/- 5 nSec, using the 2V crossing as the division between high and low parts.

Trimmer 3 sets the high pulse width for DCO2 clock F2.   With no LFO oscillator modulation,
bend, detune, and pitch centered as mentioned, the frequency of F2 should be roughly 2.0 MHz.
You can set it using a tuner on the output of the synth, and adjusting for the correct DCO2
note pitch.

Trimmers 7 and 9 adjust the bend amount for DCO1 and DCO2.   The bend amount should be the same
to prevent detuning when bending. It should be possible to match them by ear by applying full
pitch bend and adjusting either trimmer for equal change in DCO1 and DCO2. It may not be
possible to get a perfect match across the entire range.

Trimmer 6 is adjusted to obtain the best triangle waveform shape.   This can be done by
monitoring the voice 1 signal at TP10 and enabling only the triangle wave of DCO1, with no
modulation. It's easy to see what this trimmer does. This trimmer affects all six voices.

Voice board:

(You will need to use a DMM measuring resistance to
match these against the schematic and label them before adjusting)

Filter Frequency Trimmers:

Voice 1 Trimmer 2, monitor TP1 to set
Voice 2 Trimmer 3, monitor TP2 to set
Voice 3 Trimmer 4, monitor TP3 to set
Voice 4 Trimmer 5, monitor TP4 to set
Voice 5 Trimmer 6, monitor TP5 to set
Voice 6 Trimmer 7, monitor TP6 to set

These trimmers adjust the filter cutoff frequency range.
To adjust them, disable the filter envelope and any LFO cutoff modulation.
Disable all three waveforms for both DCO1 and DCO2. On the voice board, monitor the
output of each filter chip, such as TP1 for voice 1, etc, with an oscilloscope.
Set the cutoff parameter to 31 and the resonance to 63. Turn filter key tracking to 0.
Play notes on an attached controller to update the cutoff CV for the voice being adjusted.
You will need to press multiple keys at once to update the higher voices. If you just
press one key at a time, only voice 1 will be used.   Measure the resonant frequency of
the voice you are adjusting, and set it to 670 Hz.   Make sure the VCF CV for that voice
has been updated before you make the adjustment.   At a VCF setting of 15, the frequency
should be about 130 Hz.

Filter Resonance Amount Trimmers:

Voice 1 Voice Board Trimmer 8, monitor TP1 to set
Voice 2 Voice Board Trimmer 9, monitor TP2 to set
Voice 3 Voice Board Trimmer 10, monitor TP3 to set
Voice 4 Voice Board Trimmer 11, monitor TP4 to set
Voice 5 Voice Board Trimmer 12, monitor TP5 to set
Voice 6 Voice Board Trimmer 13, monitor TP6 to set

(These trimmers are located just to the left of the 3328 chips)

These trimmers adjust the amt of resonance for each voice. To adjust them, disable the
filter envelope and any LFO cutoff modulation. Disable all three waveforms for both
DCO1 and DCO2. On the voice board, monitor the output of each filter chip, such as TP1
for voice 1, etc, with an oscilloscope.   Set the cutoff parameter to 31.   Check for a
large change in the pk-pk filter oscillation output when you change the resonance
parameter from 49 to 50. At resonance=49, the oscillation should be maybe 300-400mV pk-pk.
At resonance=50, the pk-pk voltage should increase dramatically, to something like 1.4V
Below 49, the oscillation should be small or die out.   Above 50, it should increase a
little, but the maximum level will only be about 1.8-1.9V pk-pk at 63. Really what you
are looking for is a large change in the level of oscillation between the settings of 49 and 50.
Turn the trimmer so that the filter resonant amplitude changes as mentioned above between
resonance=49 and resonance=50.

VCA Offset/CV rejection trimmers:

Voice 1 Voice Board Trimmer 14, monitor IC27-1 to set
Voice 2 Voice Board Trimmer 15, monitor IC27-1 to set

Voice 3 Voice Board Trimmer 16, monitor IC27-1 to set
Voice 4 Voice Board Trimmer 17, monitor IC27-7 to set
Voice 5 Voice Board Trimmer 18, monitor IC27-7 to set
Voice 6 Voice Board Trimmer 19, monitor IC27-7 to set

To set these, shut off all three waveforms of DCO1 and DCO2, set VCA sustain to 63,
LFO1 to square wave, enable LFO1 to VCA modulation, and set LFO1 depth to 63.   Press
one key to activate voice 1.   Adjust trimmer 14 to either extreme and observe a square wave
at the test point.   Amplitude will be a few hundred mV. Adjust trimmer 14 to zero out the
square wave. To set voice 2, press two keys, then lift the first one pressed, so that
only voice 2 is still active and adjust its trimmer.   Use this same procedure to adjust
each trimmer.   I guess one way to select the voice you want to adjust would be to turn
the trimmer to one extreme, and then press keys until you see the square wave, then
release all but the last key pressed. Now adjust the trimmer to null the square wave
amplitude.   If changing the trimmer has no effect on the waveform, then that voice is not
currently active and you need to press keys until it is.

Front Panel Board:

Noise Level Trimmer:

Trimmer 1 sets the level of noise fed to all of the voices.   It's hard to adjust with
a scope because the waveform is so random it's tough to measure any sort of amplitude.
One way to set this would be to enable DCO1 saw, open up the filter, and set the noise
level to maximum. Set VCA sustain to 63. Press a key and see if the noise level
seems correct relative to the level of DCO1. Set the noise level as desired.