

There are many trimmers in the Crumar Bit99. 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.

CPU board:

Trimmer 4 is the DAC full scale (range) adjustment. This would be the voltage at TP14. 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)

Trimmer 8 sets the TP15 reference voltage for the op amps in the HF osc section. It should probably be set to either 2.50V or half of whatever the 5V supply measures. Probably either setting will work. After you have set it, adjust the Pitch control so that the TP17 voltage is the same as TP15.

Trimmer 11 sets the high pulse width for DC01 clock F1. With no LFO oscillator modulation, detune set to 0, pitch centered as mentioned, and MIDI pitch bend at 0, 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 note pitch. Once you have set it, measure the positive and negative pulse widths of the F1 clock as they cross the 2V level.

Transistor Q35 is off when the detune parameter is set to 0. This allows the signal from F1 to feed into the F2 timing circuit. I think this helps to keep the two oscillators at the same exact frequency when no detune is applied (assuming they are calibrated properly). When adjusting F2, we don't want this synchronization. To disable it, jumper from Q35 collector to Q35 emitter (ground).

Using trimmers 6 and 7, set the negative and positive pulse widths of F2 to match the values measured on F1. Double check the frequency of F2 with the tuner by turning on DC02 and turning off DC01. Make any small adjustments on trimmer 6 or 7 to get the correct tuning. Remove the short across Q35 after you have adjusted the F2 trimmers.

Trimmer 5 looks to be used to match the pitch bend of F2 to F1. It should be possible to adjust this by ear by applying full pitch bend and adjusting for equal change in DC01 and DC02. It may not be possible to get a perfect match across the entire range.

Transistor Q34 is on for negative bend values and off for positive ones. When Q34 is on, the voltage at the collector should be very close to the voltage at TP15, so in this case trimmer 10 should have no effect. So it seems that trimmer 9 would be used to adjust the negative bend amount, and trimmers 9 and 10 would affect the positive bend amount, so only trimmer 10 would be adjusted to make the positive bend equal to the negative bend amount. Probably the easiest way to measure this would be with a DMM. Connect the negative lead to TP15, and the positive lead to TP16. Now send MIDI pitch messages to get the maximum bend in each direction and check the adjustments. Set the MIDI pitch bend value to 0 after making this adjustment.

Trimmer 1 is adjusted to obtain the best triangle waveform shape. This can be done by monitoring the voice 1 signal at TP25 and enabling only the triangle wave of DC01, with no modulation. It's easy to see what this trimmer does. This trimmer affects all six voices.

Trimmers 2 and 3 are part of the Mod and Bend wheels ADC measurement circuit. Each wheel's voltage is sampled and then converted while the other one is being sampled. Conversion is accomplished by resetting counter IC4, then allowing it to count up until its value causes IC5 to change state. The counter digital value is converted to a current by binary-weighted resistors 10-16. When the comparator flips, the counter value is clocked into IC9, and is read later by the CPU. The Bit One and Bit 01 do not have this circuit. In the Bit One, the wheels are not read by the CPU, and are implemented completely in the analog circuitry. I did not make any measurements concerning Bit99 trimmers 2 and 3.

Voice board:

Filter Frequency Trimmers:

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

These trimmers adjust the filter cutoff frequency range.

To adjust these trimmers, disable the filter envelope and any LFO cutoff modulation. Disable all three waveforms for both DC01 and DC02. 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 13, monitor TP1 to set  
Voice 2 Voice Board Trimmer 14, monitor TP2 to set  
Voice 3 Voice Board Trimmer 15, monitor TP3 to set  
Voice 4 Voice Board Trimmer 16, monitor TP4 to set  
Voice 5 Voice Board Trimmer 17, monitor TP5 to set  
Voice 6 Voice Board Trimmer 18, monitor TP6 to set

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 DC01 and DC02. 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 3, monitor IC30-7 to set  
Voice 2 Voice Board Trimmer 4, monitor IC30-7 to set  
Voice 3 Voice Board Trimmer 7, monitor IC30-7 to set  
Voice 4 Voice Board Trimmer 8, monitor IC30-1 to set  
Voice 5 Voice Board Trimmer 11, monitor IC30-1 to set  
Voice 6 Voice Board Trimmer 12, monitor IC30-1 to set

To set these, shut off all three waveforms of DC01 and DC02, set VCA sustain to 63, LF01 to square wave, enable LF01 to VCA modulation, and set LF01 depth to 63. Press one key to activate voice 1. Adjust trimmer 3 to either extreme and observe a square wave at the test point. Amplitude will be a few hundred mV. Adjust trimmer 3 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.

Noise Level Trimmer:

Trimmer 19 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 DC01 saw, open up the filter, and set the noise level parameter to 63. Set VCA sustain to 63. Press a key and see if the noise level seems correct relative to the level of DC01. Set the noise level as desired.

Pulse Width trim:

Trimmer 20 allows the DCO pulse width to be set to 50% when the PW parameter is set to 15. To check it, set the DC01 to pulse, turn off triangle and saw. Turn off DC02. Set the VCF cutoff to 63 and the resonance to 0. Turn off any frequency modulation on DC01. Set the VCA sustain to 63. Monitor TP1 on the voice board for voice 1. Press a key and confirm that the square wave duty cycle is 50%. The pulse width can only be changed in steps, not smoothly, so there is no fine adjustment possible. You just want to insure that the duty cycle is 50% at this setting.