PolySix Anti-log Notes, adjustment procedure.   R. Grieb   3/6/2014

      I suggest first trying to tune the voices using only
   VR10 and VR11 for each voice, in case the anti-log circuit is OK.

      If that does not work out, try the steps below to adjust the anti-log
circuit. First, here is a little information on the circuit and available adjustments.
This assumes you have the "new production" KLM366B board.   Keys are numbered
C1 to C6 and notes C1 to C8.   Pressing C6 key with octave set to 4' should get you
a C8 note.

      The key assigner MCU is constantly scanning through eight "time slots". Time slots 0-5
are used to feed the pitch voltage to each of the voices. Trimmer VR2 and the opto-isolator
feedback loop are active during time slot 6. At this time the DAC puts out the value for note C8.
VR2 allows you to adjust the output of the anti-log circuit for this note.   Typical range would
be 3.00 to 3.16 volts, but this varies. (If your anti-log output for C8 is not affected by VR2
then the opto-coupler may be bad, or something else in that circuit.) The photo-coupler controls
the amount of input signal applied to the base of left Q12 transistor. This is a sort of "scale
factor" control.

      Trimmer VR3 adjusts the offset voltage of output op amp IC17-5,6,7. This adds or subtracts
a constant value from the output voltage over its entire range.   So this applies an offset after
the conversion, and only a small one. This trimmer is used to tune the low octaves.

      Trimmer VR15 sets a low point on the output curve by applying a variable offset to the input
voltage. It is used to set the correct value for note C4.   (Octave 4', key C2)   Another servo loop,
active during time slot C7, holds the value that you set using VR15.

      The two servo loops help to stabilize the anti-log circuit over temperature. One holds the C4
note value constant by applying a variable offset to the input voltage, and the other holds the C8 value
constant by changing the anti-log scale with the photo-coupler.

      Trimmer VR1 also applies a variable offset to the input voltage, but a very small one.   I have
not really used it. Note that the Korg calibration instructions say to make sure this pot is in the ctr.

      The output of the anti-log for 8 C notes should be a set of values, each of which is exactly
twice or half the next one.   So here is one possible set of C voltage values:

Note:	C8	C7	C6	C5	C4	C3	C2	C1
Volt:	3.00	1.50	0.750	0.375	0.1875	0.0938	0.0469	0.0234

The exact C8 voltage range will vary. My P6 C8 voltage range (adjusting VR2) is higher than 3.0 volts.
So we can't say "set this exact voltage".   The goal is a set of voltages that are spaced out properly.
Many people won't have a meter that can measure tenths of a millivolt.   Just try to set the trimmers as
accurately as you can. For the C6 note, ~4 mV of voltage change gets you 10 cents of pitch change.
Small errors are easy to hear.

Here are some steps I have used to tune several instruments:

1) Power down the Poly6

2) Make sure the Normal/Stretch switch is in the Normal position.   (Closer to
the rear of the instrument)

3) Set VR1, VR2, VR3, VR15 to center position.

4) Connect pos DMM lead to R147 on voice 1, front end. It's a little tricky to
get to this, but may be possible without removing the keybed, which you will
need for this procedure. I use a small hooked clip lead for my meter
to connect to this resistor. If you can't be sure that your DMM lead is
not shorting to something else as well, then you will need to remove the
keybed screws and slide it forward a little. Connect neg DMM lead to TP4 (-10V)
Set DMM to lowest DC voltage scale that can measure 3.2 volts.

(While your meter is connected to R147, voice 1 will sound a little odd.   This is
OK. You are adding noise to its circuitry)

5) Power up the Poly6 and let it warm up for 15 mins or so.
Whenever you are tuning, select manual mode, no modulation, pitch
wheel centered, chorus off. You will need to re-select manual mode
after you cycle power.

6) Set front panel tuning knob to the center position

7) With octave switch in 4' position, press C6 key a number of
times, stopping when the meter has updated and note the measured voltage.
A typical value would be 3.0 to 3.2 volts. This value should not change when
you adjust VR15 or VR3.   (It may change for a short time, then the servo loop
should bring it back to the previous value.) VR2 should adjust this voltage
roughly 0.08 volts in each direction. Set VR2 in the middle and note the exact
voltage value.

8) With a calculator, divide this exact voltage by 2, then by 4, then by 8, etc
to obtain the eight target voltages for each of the C notes.   The lowest value
will be around 20-25 mV DC.

9) With the octave switch in the 16' pos, repeatedly press C1 key to update voice 1,
while adjusting VR3 to obtain the lowest value you calculated. If your meter has
a mV DC scale, use it.

10) With the octave switch in the 4' pos, keep pressing C2 key to update voice 1,
while adjusting VR15 to obtain the calculated value that is 1/16 of the highest value.
(This should be ~0.19V)

11) Repeat steps 9-10 until no more adjustment is necessary.

12) Power down the P6, remove the meter leads, and tune the voices using VR10 and 11
for each voice.   With the octave switch in 4' pos, press C2 until voice 1 LED comes
on, then adjust VR10 for the correct pitch, then release C2 and press again, then adjust
voice 2, etc.   Once all six voices have VR10 set, repeat this procedure using C6 key
and VR11 for each voice in turn. Now go back and re-do VR10, then VR11, etc until no more
changes are necessary.   Do not adjust any of the anti-log trims at this time.

13) Once you have the voices more or less in tune, you need to check the D#6-E6 adjustment.
This can throw off the tuning if it is not set properly.

14) With the octave switch set to 4', play D#4 key (D#6 note) and note its pitch relative
to correct value. Now play E4 key and note its pitch.   Using the trimmer, set the interval
between these two notes to exactly one semi-tone. It's OK if they are both sharp or both flat.
The important thing is the gap between them. If this gap is wrong, it will affect other notes
as well.

15) Once you have checked the D#6-E6 gap, if any change was made, go back and re-tune all
six voices, using only VR10 and VR11.

16) Set octave switch to 16' and check C1 and C2 key tunings.   Adjust trimmer VR3 to get
the best overall tuning in the lowest two octaves. Do not expect the results here to be as
good as the upper 5 octaves. The Korg factory spec for the low two octaves is much looser
than the upper ones.

17) After you have adjusted VR3, you will need to re-tune the voices slightly.

18) In case VR10 on a voice cannot hit correct pitch, you will need to use VR2 to raise or lower all of the voltages.   Assuming VR10 cannot adjust the pitch high enough, then you would want to raise the VR2 C8 voltage, instead of setting VR2 in the middle.   This will raise all of the desired C voltages, hopefully enough to be within VR10's adjustment range.   Re-calculate all of the desired C voltages, then start over at step 9.