A-188-1 BBD replacement and adjustment procedure

The following steps have to be carried out with the unpowered A-188-1 module (i.e. the module is not connected to the A-100 bus board or the module is connected to the A-100 bus board while the mains power is off).

Inserting the BBD circuit

Two types of BBD circuits are available: a small 8 pin version and a large 16 pin version. Even the large version uses 8 pins only with one pin pair located at each edge of the case. The A-188-1 pc board has two IC sockets for the two different types of BBD circuits available. The sockets are labelled IC6B and IC6A. They are realized with precision single row female connectors (no standard IC sockets). Please refer to the picture on the next page.

- A small BBD circuit has to be inserted into the IC connector IC6B (**blue circuit**) and the notch or the dot that marks pin #1 has to show to the left.

- A large BBD circuit has to be inserted into the IC connector IC6A (**yellow circuit**) and the notch or the dot that marks pin #1 has to show to the right.

Attention! Wrong orientation will destroy the inserted BBD circuit !

Pay attention that each of the 8 pins fits exactly into the corresponding counterpart of the socket and that no pin is bended or outside the corresponding female connector !

Jumper settings

The jumper pair *JP4* near the bus cable connector has to be set for the right type of BBD:

- horizontal orientation of the jumpers for BBD circuits MN/BL30xx : 
- vertical orientation of the jumpers for BBD circuits MN/BL32xx : 

The small signs (labelled 32xx and 30xx) below JP4 on the pc board show the right orientation. The picture on the next page below shows the jumper settings for MN/BL32xx.

Attention! Wrong jumper settings will destroy the inserted BBD circuit !

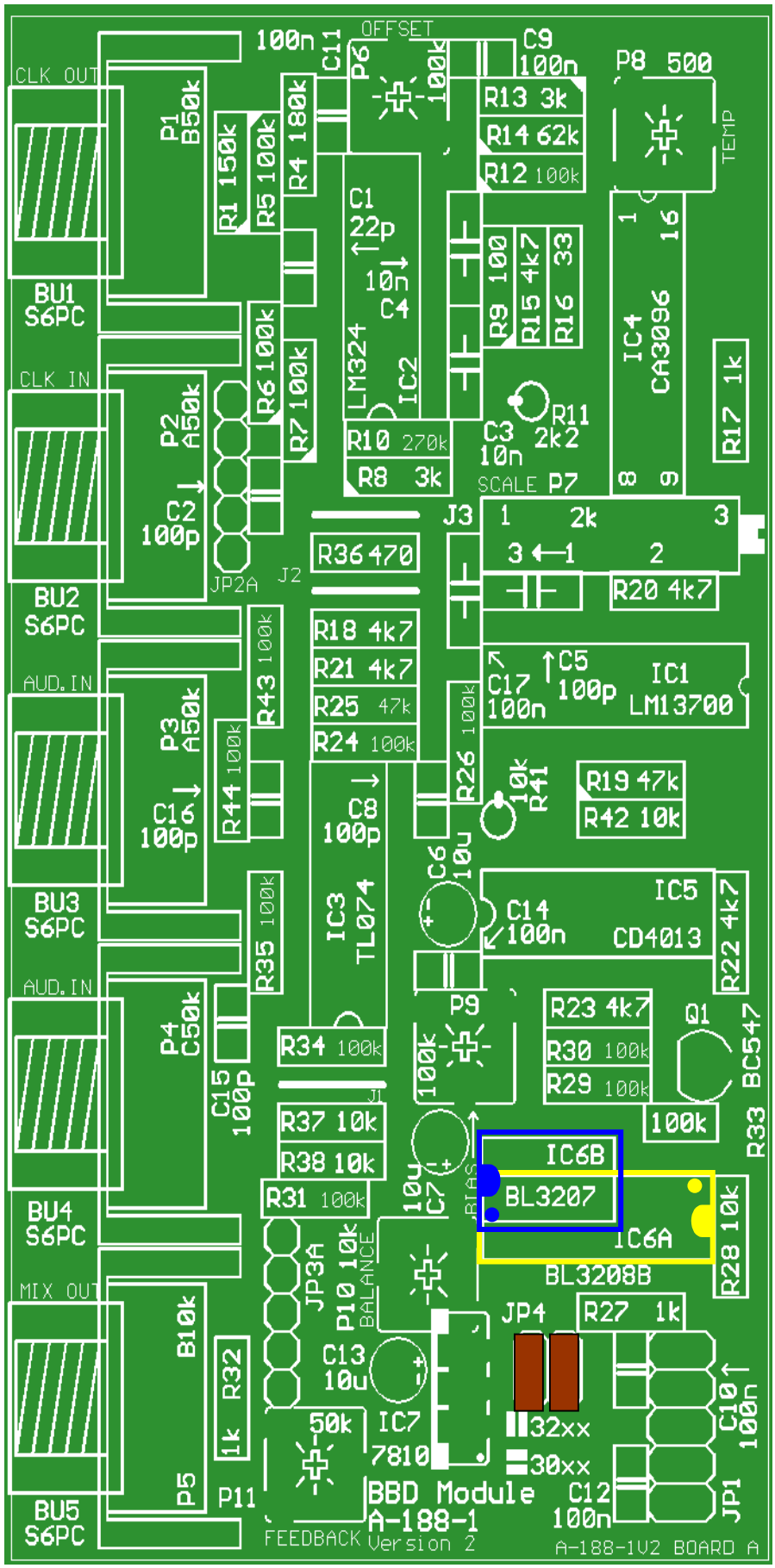
The following steps have to be carried out with the powered A-188-1 module (i.e. the module has to be connected to the A-100 bus board and the mains power has to be on). Pay attention that no short circuits are made during the adjustments. We recommend to put the module on a non-conducting support during the adjustment procedure. Warranty is void if the module is destroyed because of a short circuit during adjustment.

A digital multimeter and an oscilloscope are required for the adjustments. A frequency meter is recommended but not essential. All voltages are measured with GND reference. GND is available e.g. at the potentiometer cases or at the 6 center pins of the bus connector.

Temperature adjustment of the exponential converter

Remark: This adjustment is not necessary if only the BBD circuit is replaced or a BBD circuit is inserted into a module without BBD. This adjustment is already carried out in the factory for all modules.

Use trimming potentiometer P8 (TEMP) to adjust the voltage at pin 6 of IC2 (inverting input of operational amplifier IC2B) to 0.62...0.63V.



Orientation of small BBD circuits (IC6B)

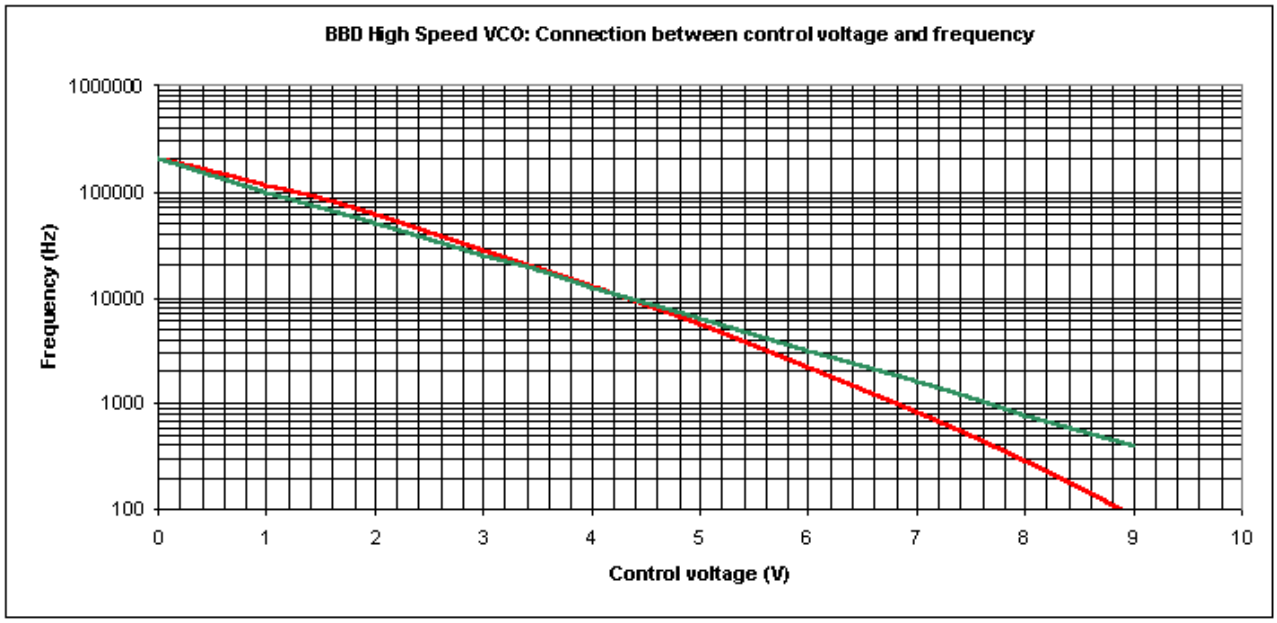
Orientation of large BBD circuits (IC6A)

Jumpers are shown for MN/BL32xx BBD circuits

VCO scale adjustment

Remark: This adjustment is not necessary if only the BBD circuit is replaced or a BBD circuit is inserted into a module without BBD. This adjustment is already carried out in the factory for all modules.

- Connect clock out jack socket (*BU1)* to a frequency meter or oscilloscope.
- *Polarity* toggle switch for CV1 center position
- Apply +1.00V to socket CV1
- Switching the toggle switch to right (+) position has to double the frequency approximately (e.g. 40kHz → 80kHz)
- Switching the toggle switch to left right (-) position has to divide the frequency by 2 approximately (e.g. 40kHz → 20kHz)
- If the behaviour is not correct use the scale trimming potentiometer P7 for adjustment
- The absolute frequencies for this measurement should be in the 10kHz…200kHz range. Use the *Delay Clock* control at the front panel to adjust the absoulte frequency.



Frequency response of the high speed VCO
(green = perfect behaviour / red = real behaviour

VCO offset adjustment

Remark: This adjustment is necessary if the BBD circuit is replaced and the maximum clock frequency of the new BBD circuit differs from the maximum clock frequency of the old BBD circuit (please refer to the BBD table for details). It is also necessary if a BBD circuit is inserted into a module without BBD.

- Connect clock out jack socket (*BU1)* to a frequency meter or oscilloscope.
- *Delay Clock* control at the front panel fully clockwise (maximum)
- *Polarity* toggle switch for CV1 center position
- Do not apply control voltages to CV1 or CV2 (or move the switches to center positions)
- Adjust the frequency with the offset trimming potentiometer P6 to at least twice the maximum clock frequency of the BBD in question (please refer to the BBD table for details).
- Example 1: max. clock frequency of the BBD is 100kHz. In this case the frequency should read at least 200kHz (e.g. 210 kHz)
- Example 2: max. clock frequency of the BBD is 200kHz. In this case the frequency should read at least 400kHz (e.g. 430 kHz)

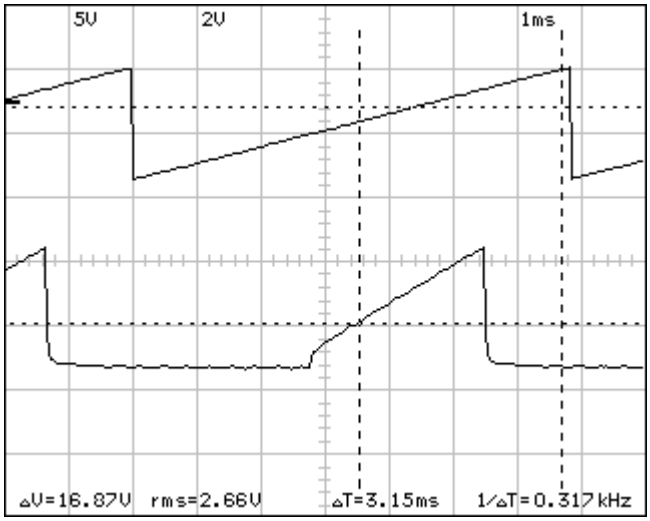
- Overclocking is not a problem (e.g. 300kHz instead of 200kHz) as the BBD circuit cannot be destroyed. But the BBD is used out of it's specification and some parameters (e.g. output level, distortion, noise, feedback behaviour) may be different from those within the specs. Beyond a certain frequency the BBD may even stop working. In this case the maximum frequency has to be reduced and the power supply turned off/on.

Remark: Because of the internal 2-phase converter the frequency at the clock socket is twice the BBD clock frequency.

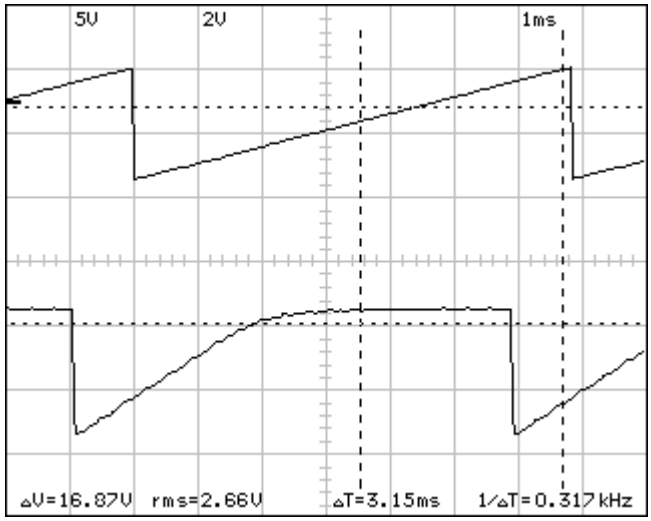
The following adjustments have to be carried out if the BBD circuit has been changed or if a BBD circuit is inserted into a A-188-1 module without BBD.

<u>BIAS adjustment</u>

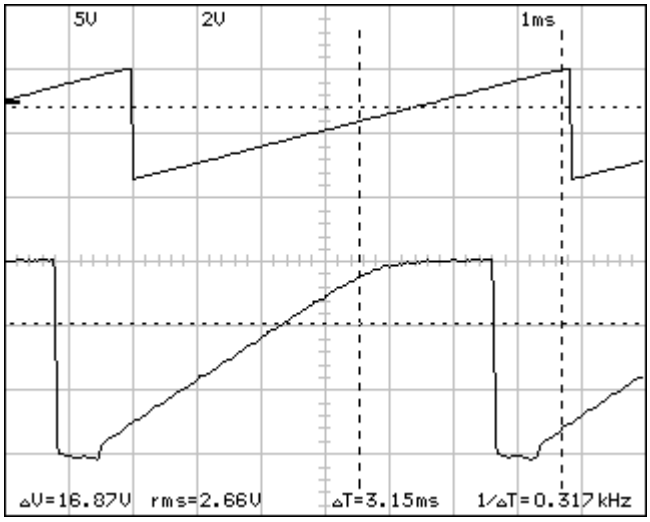
- Connect the BBD output socket to an oscilloscope (not the Mix socket !).
- Feedback polarity switch to left position (-)
- Connect the audio input socket with the sawtooth output of a VCO (e.g. A-110)
- Increase the output level with the Audio Level control until clipping occurs
- Adjust the trimming potentiometer P9 (BIAS) so that the clipping becomes symmetrically.
- The following oscilloscope screen shots show the input signal (sawtooth from a VCO) on top and the BBD output signal on bottom:



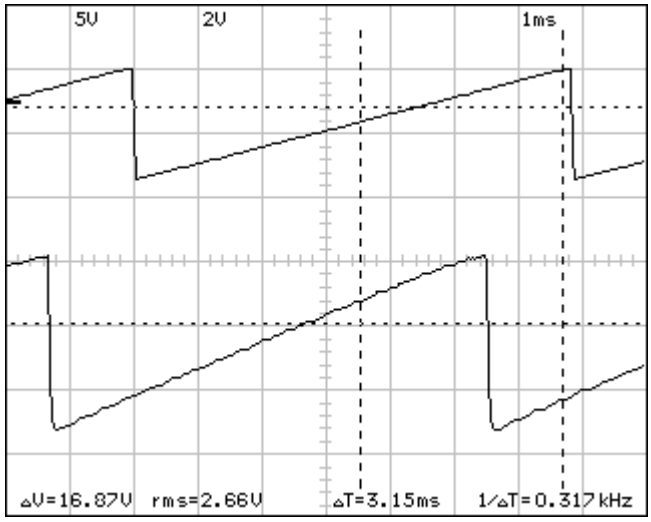
wrong clippingadjustment
(bottom clipping)



wrong clipping adjustment
(top clipping)



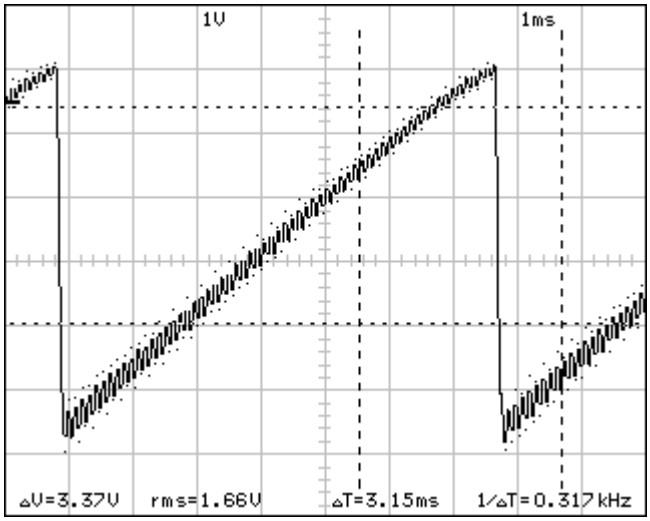
correct clipping adjustment
(nearly symmetrical clipping)



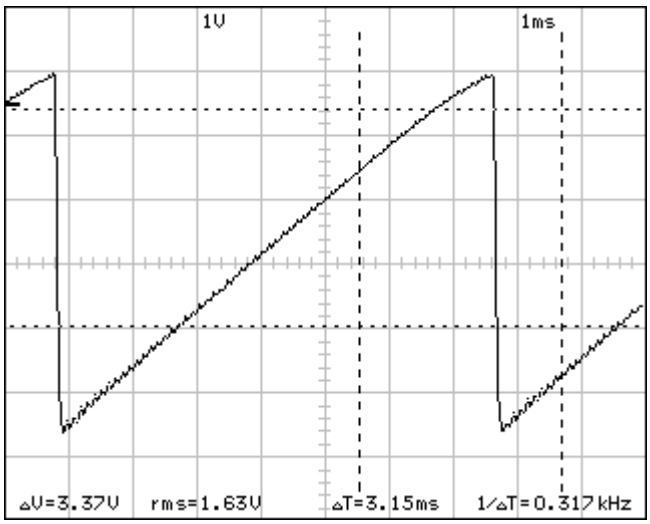
output signal with slightly reduced level

BALANCE adjustment

- Feedback polarity switch right position (+)
- Now the BBD output shows the raw BBD signal without any pre-filtering (i.e. a lot of clock noise on the BBD output signal).
- Adjust the trimming potentiometer P10 (BALANCE) to minimize the clock noise.
- *Remark: it is impossible to adjust P10 so that no noise appears. The noise can only be minimized.*



output signal before balance adjustment with P10



output signal with correctly adjusted balance with P10

FEEDBACK adjustment

- Delay Clock and Feedback control at the front panel fully clockwise.
- Feedback polarity switch to left or right position
- Adjust the Feedback trimming potentiometer P11 to the desired maximum feedback value.
- Even self oscillation is possible. The self oscillation signal depends upon the "history" of the signal as there are several stable self oscillation states possible.