



## Full and Halfwave Rectifiers Utilising TRAC

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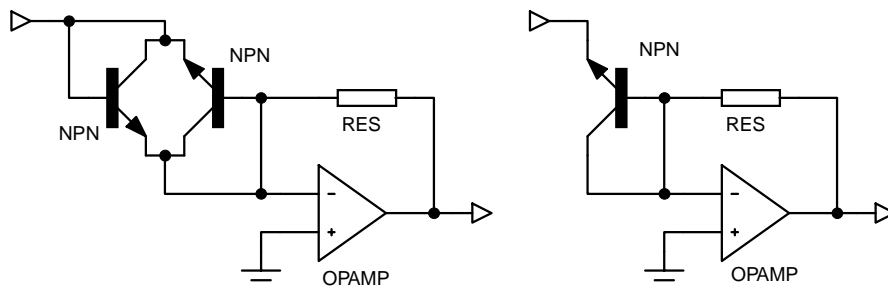
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brings a truly Integrated Route to signal processing problem solving, providing designers with benefits formerly associated only with programmable digital devices, and offering a path to Custom Silicon for higher volume users.

### Introduction

Full wave rectification of a waveform will be found many times in the implementation of the TRAC chip preceding some other processing. This short note demonstrates how easily the full wave rectification function can be emulated using approximately one half of a TRAC chip and this is followed by a very simple design for a half wave rectifier.



**Figure 1**  
**LOG and REC functions**

### Theory of Application

The design uses the LOG and REC functions to capture the positive and negative halves of the input waveform. First the signal is transformed to the LOG domain then the following REC function selects only the positive half of the waveform.

The RECTify function is identical to the ANTilog function except that only one of the diodes in the input pair is used. (See Figure 1). The result is a half wave rectified version of the input signal.

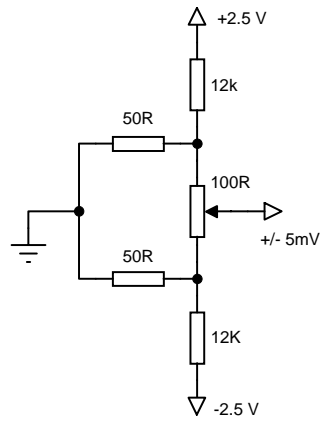
### Software

The negative half cycle is selected by inverting the waveform; in this instance using an ADDer and then again RECTifying the waveform to give a half wave rectified version of the negative half of the input signal.

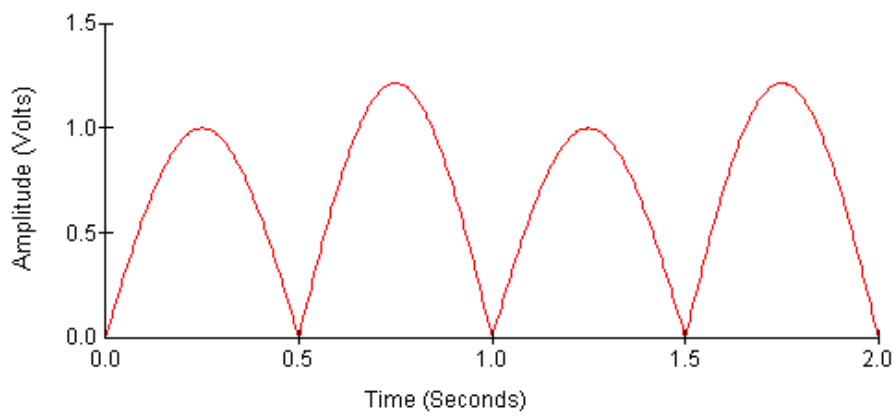
The two halves are then ADDED to give a full wave rectified waveform and finally it is necessary to INVERT the result to produce the required positive output.

The ADD function (which was used to invert the input waveform) is also used to add a trim voltage to correct offsets in the two halves of the output waveform. This would normally be adjusted by applying a sine wave at the input and observing the output waveform.

The two half cycles will normally be found to be slightly unequal therefore a small trimming voltage around  $\pm 5$  mV can be applied (see Figure 2) and adjusted such that the two half cycles are equal. (see Figure 3).



**Figure 2**  
Trimming Circuit



**Figure 3**  
Output Waveform before adjustment

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Figure 5 shows the very simple implementation of the half wave rectifier which in the interests of simplicity has no trimming input. If precision is required then a trim voltage could be introduced in the same manner as the full wave rectifier.

### Notes

In practice all TRAC functions, with the exception of the NIP (Non Inverting

Pass) and the OFF function, invert the waveform applied with respect to the input.

The first ADDer in the full wave rectifier application would not be needed for simulation purposes and the input is set to zero volts. It is possible to see the effect of this input by applying a small voltage ( $\pm 5\text{mV}$ ) and rerunning the simulator.

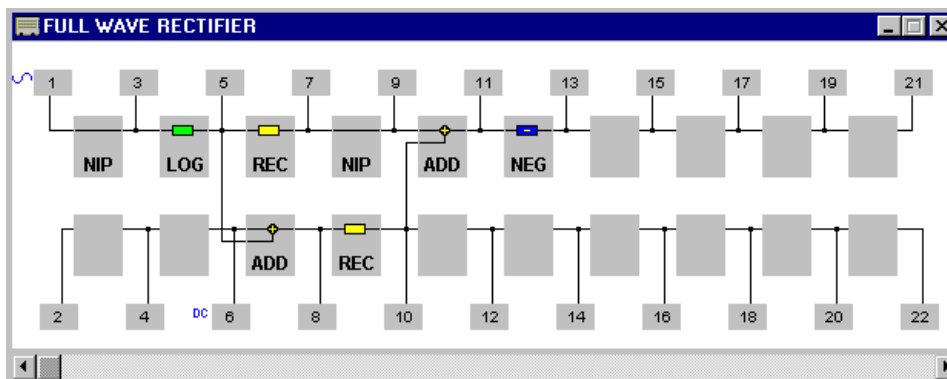


Figure 4  
TRAC Full Wave Rectifier Design

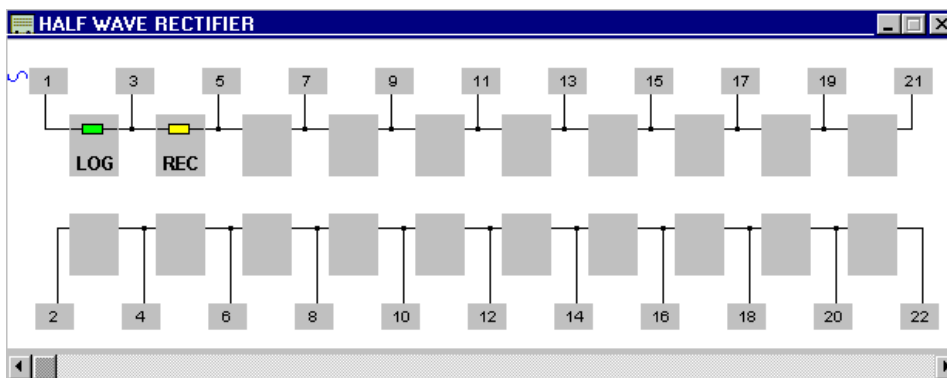


Figure 5  
TRAC Half Wave Rectifier Design

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