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**TMS3615NS**

**OCTAVE MULTIPLE TONE SYNTHESIZER - OMTS**

**(2 FOOTAGES)**

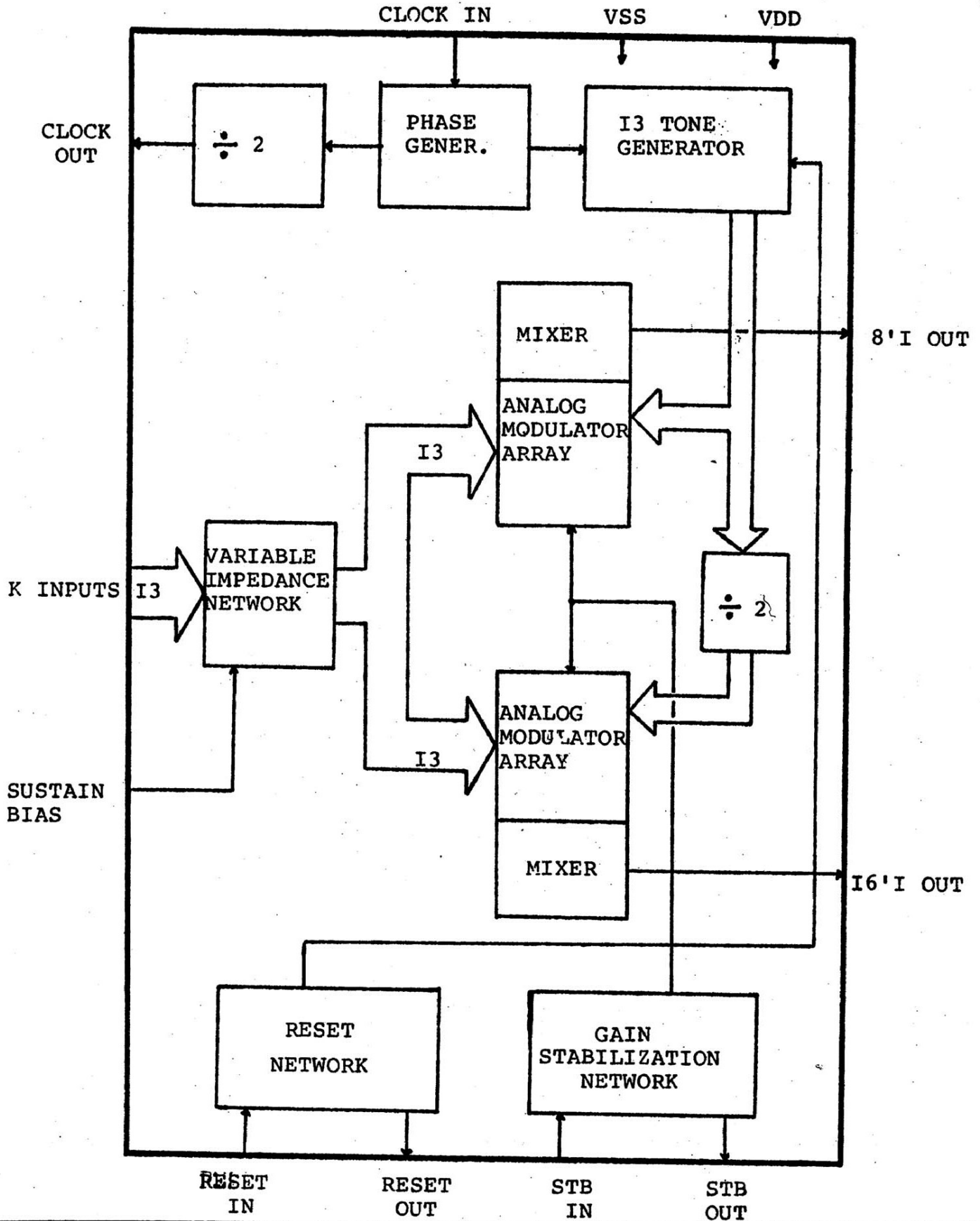
**NOVEMBER 1981**

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TMS36I5NS - RI107-RI103

- 2 footages (16', 8', or 8', 4' or 4', 2') current outputs
- Sustain of the output signals is possible by simply connecting a capacitor (1 /uF) to each key input
- Sustain decay time adjustable from a few ms to a very long time (key memorization) by connecting a variable voltage to the appropriate terminal
- Possibility of controlling the amplitude swing of the footage outputs, to minimize the spread among different devices, by connecting a simple external network to the appropriate terminals
- Asynchronous reset to synchronize devices of different octaves
- Single power supply (15V or 12V typical)
- Clock output for lower octave device

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

There is a tone generator, that produces 13 acoustic frequencies for the higher footage (8'), and 13 toggles that divide these frequencies by two for the lower footage (16').

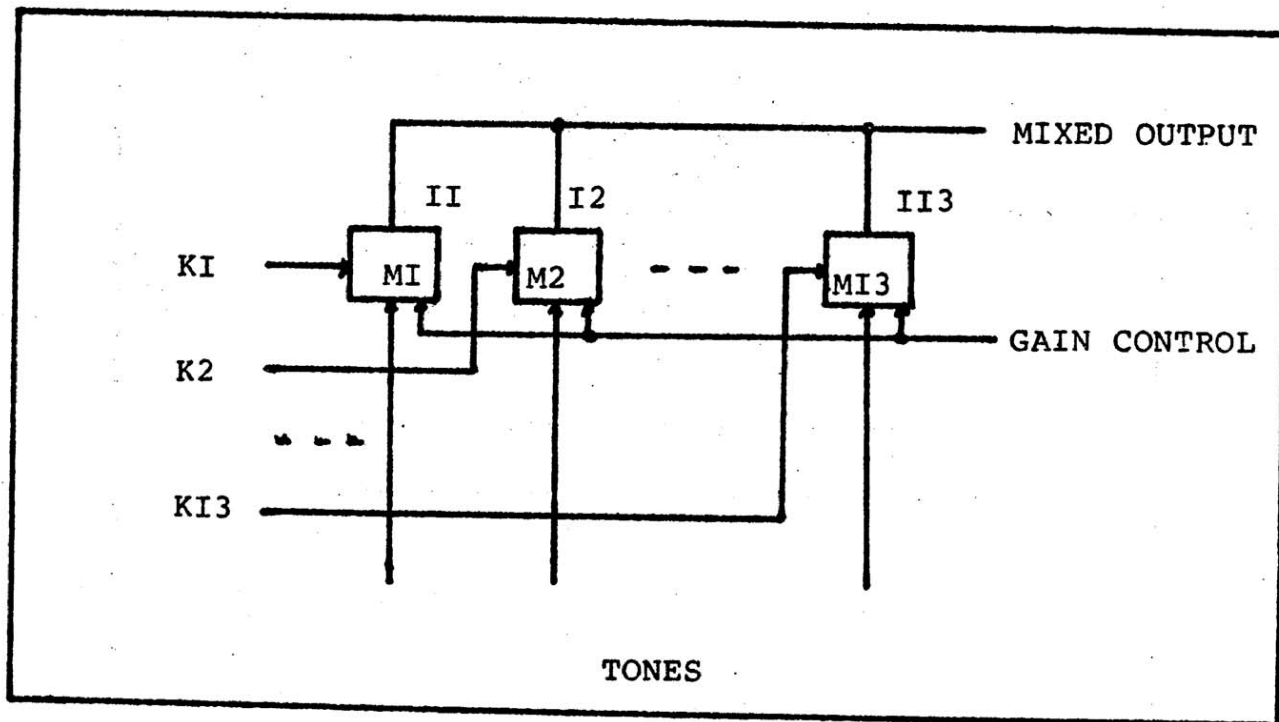
The actual frequency of the tones depends on the input clock.

A clock output (half of the frequency of the clock input) is provided to be used as clock input to the next lower octave device.

The pull-up impedance of the key inputs is programmable from a low value to an open circuit value by properly biasing the Sustain Bias input.

The k inputs go in parallel to the Analog Modulator Array blocks of the two footages.

Each of these blocks contains 13 identical current output analog modulators as shown in fig.



Each modulator produces an acoustic carrier (Tone), amplitude modulated from 0% to 100% by the corresponding k input voltage, around a constant d.c. level (offset current) equal to one half the maximum swing of each modulator output.

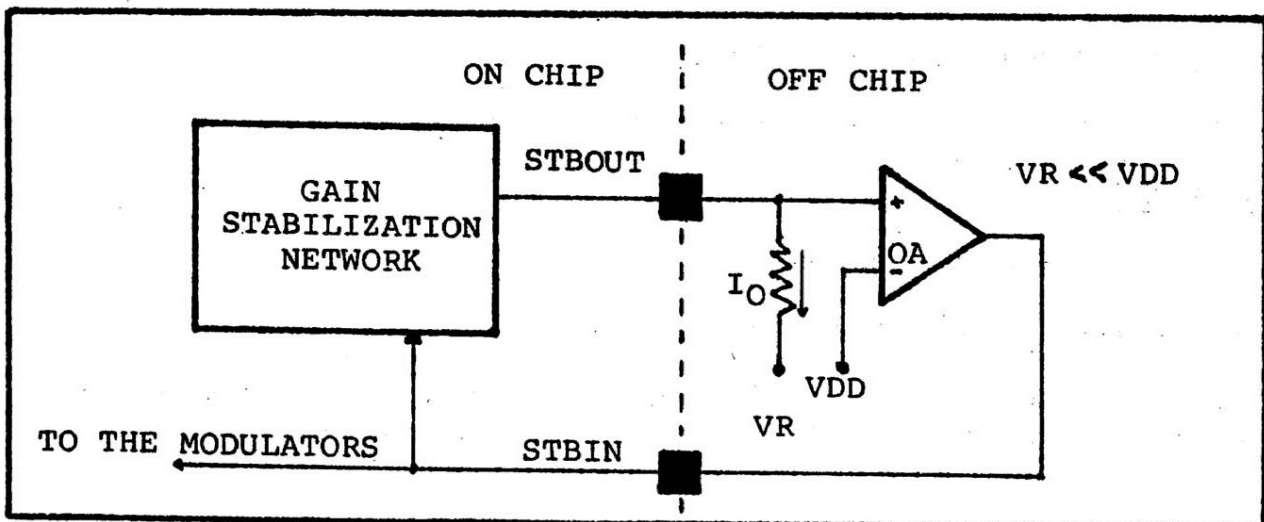
These outputs are then summed together, instant by instant, to provide a single composite output current given by:

$$I_{out} = \sum_{k=1}^{13} (I_0 + C V_k F_k)$$

Where:

- $I_0$  is the modulator output current (200 uA typical) with the k input at  $V_{SS}$ .
- C is a constant
- $V_k$  are the voltages on the k inputs, with respect of  $V_{SS}$ .
- $F_k$  are functions whose value are +1 or -1 according to the internal tone waveforms ("1", "0" logic).

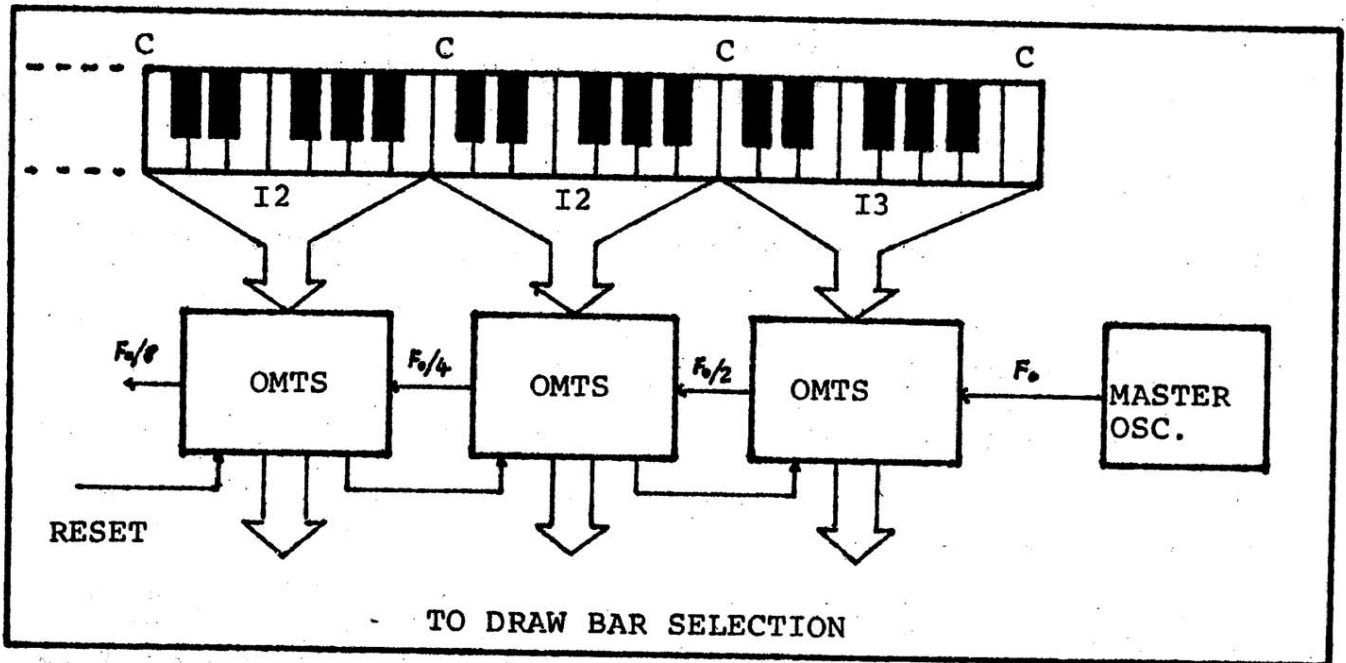
The mean value of each modulator's output is equal to  $I_0$  while the signal component  $C V_k F_k$  is equal to  $\pm I_0$  if  $V_k$  is equal to  $V_{DD}$ . In order to make this  $I_0$  value independent from temperature and constant, among different devices serving different octaves, each modulator has a gain control (STBIN) coming from the GAIN STABILIZATION NETWORK. This network provides automatic gain control (A.G.C.). When used in conjunction with an external amplifier that senses the current on the output STBOUT (this current is equal to  $I_0$ ) and automatically adjusts the STBIN voltage to maintain this current constant, as shown in Fig



## TMS36I5 NS - RI107-RI103

The TMS36I5NS is a device of the OCTAVE MULTIPLE TONE SYNTHESIZER family, producing 2 footage current outputs, for application in electronic musical instruments.

With this simple high integration component, used repetitively for each octave, the architecture of an electronic organ becomes:



The TMS36I5NS makes possible the introduction of substantial advantages in the electronic organ:

- achievement of modularity by matching the device count to the number of octaves in the keyboard
- major simplification of the architecture
- enhanced analog characteristics
- significant improvement of the reliability

### KEY FEATURES

- Low cost P MOS technology
- 13 key input (octave organization)
- Internal tone generation (50% duty-cycle for RI107; 25% DUTY-cycle on the higher footage 12 tones for RI103).

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TMS3615 NS - RI107-RI103

If the gain stabilization is not needed, the STBOUT may be left open and the STBIN must be connected at  $V_{SS}$ .

A reset network is provided to synchronize many devices together and to allow the frequency counters (tos) enter their proper counting sequence. On the reset input RESIN there is a schmitt trigger to allow slow changing edges of the reset signal. The output of this schmitttrigger is available on RESOUT.

WARNING

In order to avoid that a mishandling of the PC Board might cause reliability problems associated with the internal circuitry, we suggest to connect the PIN4 and PIN 24 with an external resistor of  $.5 M\Omega$  to  $V_{SS}$  on the same PC board.

DIVISIONAL FACTORS

The output frequencies are related to the input clock frequency through the following divisional factors:

<u>INPUT</u>	<u>OUT 8'</u>	<u>OUT 16'</u>
K 1	478	956
K 2	451*	902
K 3	426*	852
K 4	402*	804
K 5	379*	758
K 6	358*	716
K 7	338*	676
K 8	319*	638
K 9	301*	602
K10	284*	568
K11	268*	536
K12	253*	506
K13	239*	478

\* Duty cycles other than 50% (RI107) and 25% (RI103) available upon request.