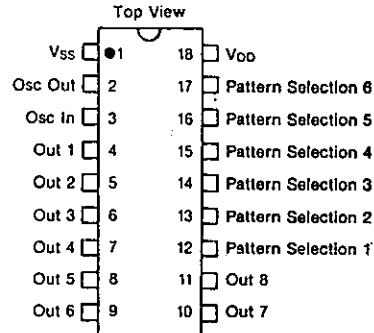# Rhythm Generator

FEATURES

- Drives 8 instruments
- 32 beat long pattern
- 6 rhythm selections
- Internal oscillator
- Mask programmable rhythm pattern and pattern length
- Automatic reset for easy chord coupling

DESCRIPTION

The AY-5-1315 is a P-Channel MOS IC specifically designed for the Rhythm and Percussion section of an Electronic Organ and for Automatic Rhythmers. It contains all the logic circuits necessary to generate six sets of rhythm patterns driving eight instruments. The automatic reset feature allows it, when coupled with the chord section of the organ, to start on the downbeat every time a new chord is played. Selecting multiple patterns will result in a combination of the patterns selected. Tempo is externally adjustable from slower than largo to faster than presto. For added stability of the internal tempo oscillator a ÷32 circuit is provided. If an external tempo oscillator is used this circuit could be mask programmed out of the counter decoder chain. For added flexibility the output buffers could be mask programmed for either 100% or 50% duty cycle. The AY-5-1315 may be operated alone or in conjunction with the AY-5-1317A chord generator.

PIN CONFIGURATION
18 LEAD DUAL IN LINE

Top View

|		
Vss	1	18 Voo
Osc Out	2	17 Pattern Selection 6
Osc In	3	16 Pattern Selection 5
Out 1	4	15 Pattern Selection 4
Out 2	5	14 Pattern Selection 3
Out 3	6	13 Pattern Selection 2
Out 4	7	12 Pattern Selection 1
Out 5	8	11 Out 8
Out 6	9	10 Out 7

A separate publication, "AY-5-1315 Custom Coding Information", available from GI Sales Offices, describes the punched card and truth table format for custom programming of the AY-5-1315 memory.

BLOCK DIAGRAM
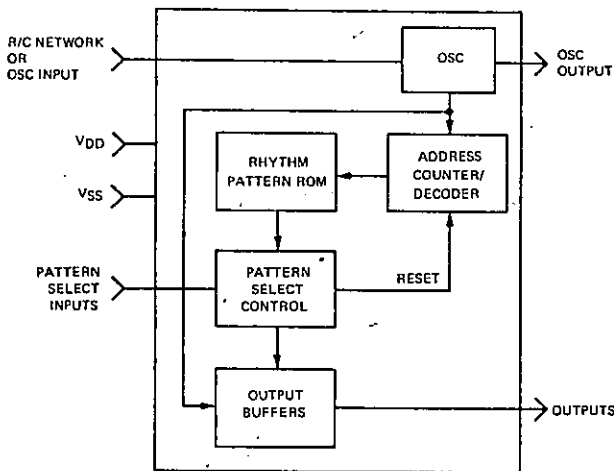
TYPICAL APPLICATION
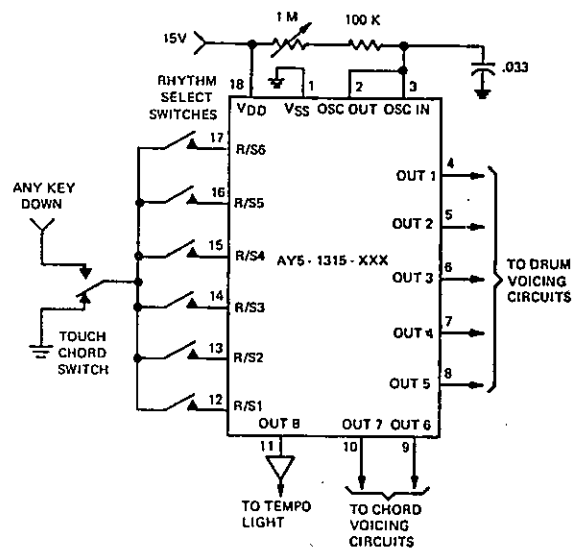
ELECTRICAL CHARACTERISTICS

Maximum Ratings*

Voltage on any pin with respect to V_{SS} ....−20V to +0.3V
Storage Temperature ....−65°C to +150°C
Operating Temperature (T_A) ....−25°C to +70°C

*Exceeding these ratings could cause permanent damage.
Functional operation of this device at these conditions is
not implied—operating ranges are specified below.

Standard Conditions (unless otherwise noted)
V_{SS} = 0 Volts, V_{DD} = −12 to −18 V

Characteristic	Min	Typ**	Max	Units	Conditions
Clock input					
Freq.	DC	100/1000	100k	Hz	with ÷32 circuit in
	DC	3/300	100k	Hz	with no ÷32 circuit
Logic '0'	V_{DD}−4.0	—	V_{DD}	V	
Logic '1'	+0.3	—	−1.0	V	
Internal osc. freq.	—	100/1000	—	Hz	Set by external resistor & capacitor
Rhythm select Inputs					
Logic '0'	V_{DD}−4	—	V_{DD}	V	
Rhythm select Inputs					
Logic '1'	+0.3	—	−1.0	V	
Rhythm select Input					
Impedance	10	—	—	kΩ	Pulled to V_{DD}
Instrument & osc. output					
Logic '0' (Note 1)	V_{DD}−6.0	—	V_{DD}−4.0	V	with internal pull ups to V_{DD} (instrument outputs only) supplying 0.1 mA
Instrument & osc. output					
Logic '1'	—	—	−1.0	V	Sinking 1.0 mA
Power	—	—	300	mW	V_{DD} = 15 volts

**Typical values are at +25°C and nominal voltages.

NOTE: 1. Open ended devices have a minimum impedance of 500K to GND when in the off condition.

OPERATION

The AY-5-1315 Rhythm Generator contains an internal oscillator, a clock generator circuit, a 5-bit synchronous resetable counter/decoder, and a ROM that drives 8 instruments and the reset circuit. By selecting one of the 6 available rhythm patterns, the appropriate section of the ROM is enabled.

If no pattern is selected the reset circuit is activated which stops the internal oscillator, inhibits the output drivers and resets the counter to count 1. When a selection is made, the outputs are enabled which brings out the program as stored in count 1- the down beat program.

The oscillator frequency determines the tempo of the rhythm pattern generated. The clock generator generates a 2 phase clock ϕ1 and ϕ2. If the internal divide by 32 option is selected ϕ1 is on for the first 16 count and ϕ2 is on between count 17 and 32, thus producing two non overlapping clocks. If the divide by 32 circuit

is programmed out, the circuit ϕ1 and ϕ2 will be directly related to the ON (logic 1) and OFF (logic 0) time at the clock generator input as provided by an external oscillator. The ϕ2 clock drives the 5 bit counter/decoder which sequentially turns on one of the 32 lines of the ROM.

On the ϕ1 clock, the program out of the ROM is transferred to the output thus eliminating decoding spikes at the output. If the output of the ROM is a '1' the proper instrument will be turned on. The output drivers are programmed either for 100% duty cycle or 50% duty cycle. When programmed for 100% duty cycle the output turned on will remain on for an entire ϕ1/ϕ2 cycle. If the next bit in the program is a '1' again, the output will remain on for the next cycle without going to zero between cycles. When programmed for 50% duty cycle the output will be on during ϕ1 only and return to zero during ϕ2.

PATTERN GENERATOR & VOICING BOARD 75.043
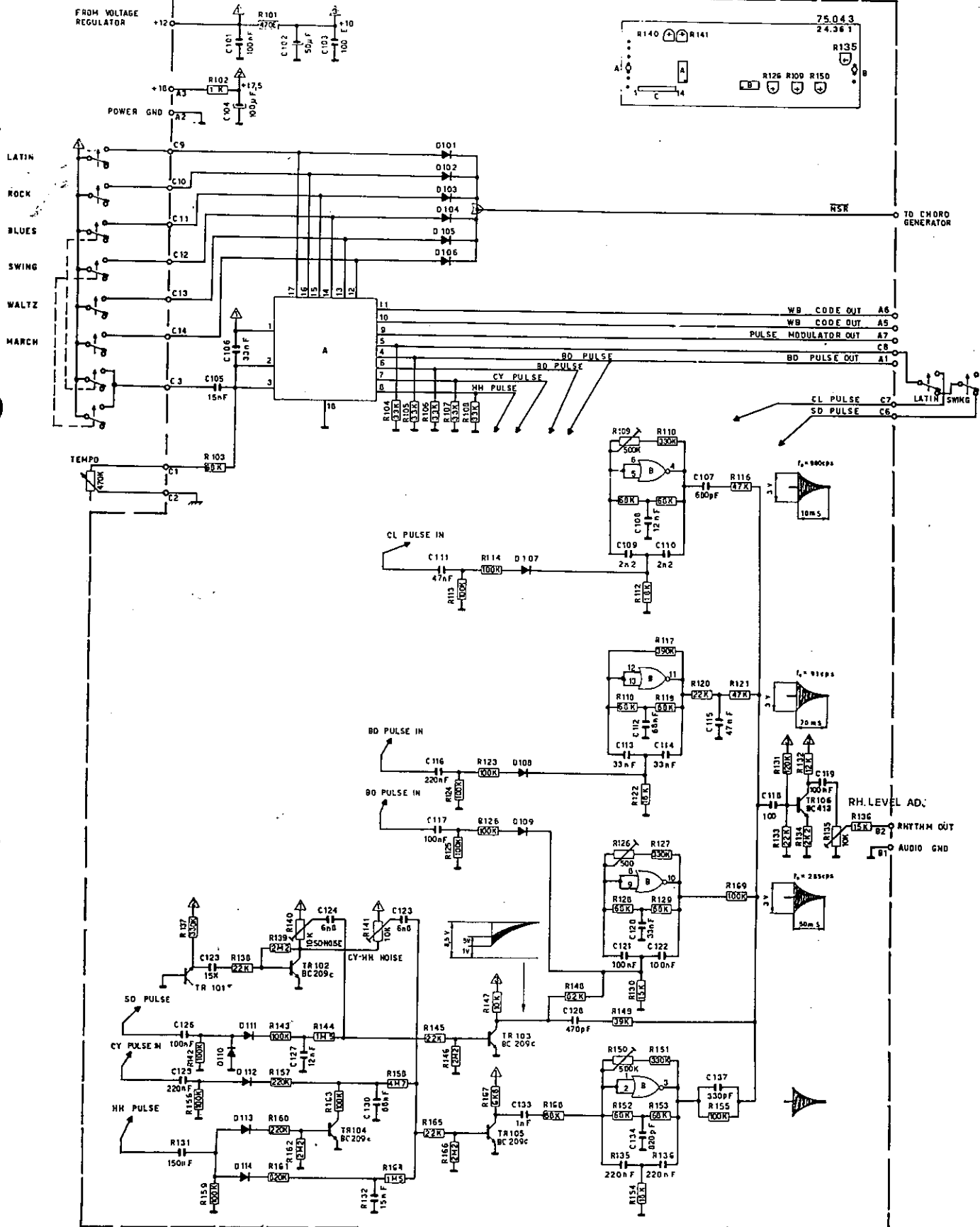
NOTES
1) IC A = IC 101 = AY-5-1315 - +12 pin 1 - GND pin18
2) IC B = IC 102 = 4001   - +10 pin 4 - GND pin 7
3) TR 101 - BLUE DOT - FACTORY SELECTED CN 09.401
4) ALL RESISTORS 1/4 WATT UNLESS OTHERWISE SPECIFIED.
5) ALL DIODES FDH 999 (OR EQUIVALENT) UNLESS OTHERWISE SPECIFIED.
6) ALL VOLTAGES MEASURED WITH RESPECT GND.