**AMSynths**

**AM1027**

**Sequential Controller**

**Project Notes**

**V1.0**

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**ARP Module Description**

The 1027 Clocked Sequential Controller is an early analog sequencer which has 10x step rows and 3x control voltage vertical columns. The ARP module is double width and has an analog clock which drives the 3 rows of control voltages on the right. The left hand side of the panel has the clock controls; stop, start, rest, step and frequency. There is also a useful pulse width control.

**The AM1027 Circuit**

The AMSynths circuit is based around the original ARP schematics with significant changes to implement a 4017 CMOS decade divider chip to replace the very hard to locate Burroughs BIP2611-1 decade “nixie” driver chip that was used in the original.

Using the 4017 inverts the logic state with HIGH being ON and therefore requires downstream changes, and the removal of the power conditioning for the Burroughs chip.

The AM design uses three PCB’s:

* Main divider and output PCB (OUTPUT)
* Analog Clock and Control PCB (SEQ CONTROL)
* CV Potentiometer PCB x3 (POTS)

Overall the 1027 is an easy to build circuit, with no resistor selection required.

**SEQ CONTROL PCB**

The AMSynths design retains the LM301 Op Amps and uses an encapsulated AM4001 exponential generator sub module with Linear Systems matched transistors.

The original circuit uses 2N3638 transistors to drive the incandescent bulbs in the ON switch, OFF switch and RATE light. These is because each bulb requires 40mA. I have retained the bulbs in the switches but used a LED for the RATE lamp, as it switches on and off faster. The 2N3638 transistors have been successfully replaced with 2N3906 and the TZ581 (Q5) has also been replaced by a 2N3906.

The STEP switch pull up resistor at R31 was changed from 1K to 330R to successfully work.

The trimmers in the design are largely unmarked, this is what they do:

R9 50K - Clock Lower Frequency Trimmer – set to 20 ppm

R12 10K - Clock Upper Frequency Trimmer – set to 440Hz

R19 10K - Pulse Width Trimmer – set to 10%

R22 50K - Clock Waveform Offset –set to 0V

With these changes the analog clock works perfectly.

**OUTPUT PCB**

Using the 4017 requires a number of changes:

The Transistor Drivers (TD-1 to TD-8) need reconfiguring to use positive logic from the 4017. Q11-Q20 and Q21-Q30 now become 2N3904 transistors, and I have used LED’s as the position lamps which reduces the current being drawn. The 470R resistors at R81- R90 become 330R (giving a gate ON voltage of +9.8V), as the output voltage from the 4017 is higher than the BIP. The pull up resistors at R71 – R80 are removed and this provides +13.4V to the CV potentiometers when HIGH, we will adjust this down to +10V on the POT PCB.

The power conditioning around the BIP2611-1 chip is not needed when using the 4017, so Q33, Q34, CR8, CR9, CR10 and C12 are not required and the 100K pull up resistors at R112 and R114 are removed, and pull down resistors used on the 4017. I have used 10K resistors before the CLOCK and RESET pins, ENABLE is tied to GND.

**POTS PCB**

This was not in the original design but I have used three of them to make the wiring less complex. Each POT PCB holds the 10 control voltage potentiometers as well as the output summing Op Amps.

R1, R9 and R17 have been increased from 68K to 82K and a 10K trimmer and 91K resistor replace R5, R13 and R21, so we can accurately set the HIGH +10.00V output voltage.