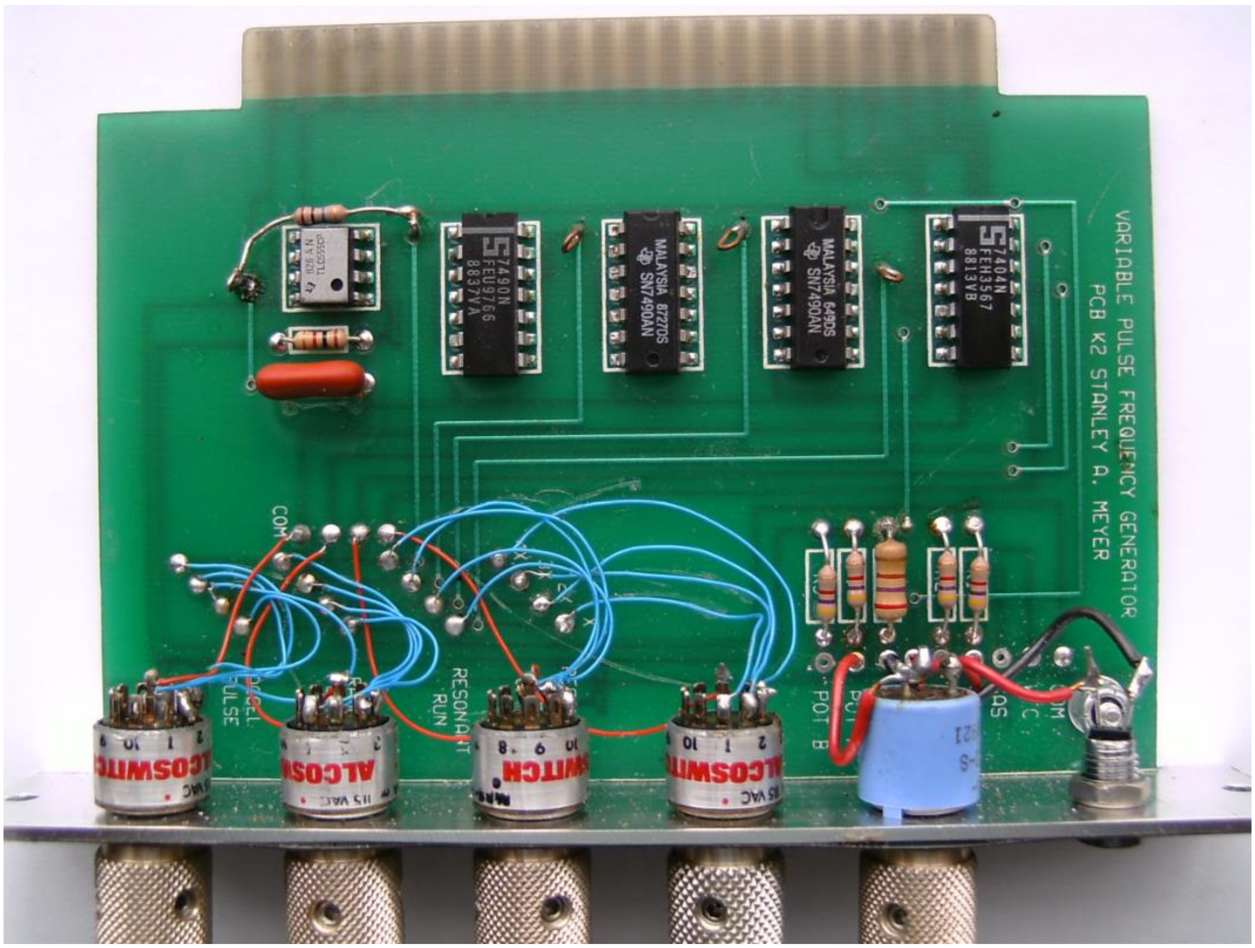
Description of the **Main Frequency Generator Board** used in Stanley Meyer's Water Fuel Cell

Simple explanation of the function of this card it provides 4 separate frequency to other components. A base frequency and 3 others that are direct divisions of the basic frequency which is generated on the card using a 555 Timer. As configured the center frequency output from the timer is 1.2k with a 90+ % duty cycle and a period of about 830ms. Selection of which frequency to use is done manually using switches on front panel of this card.

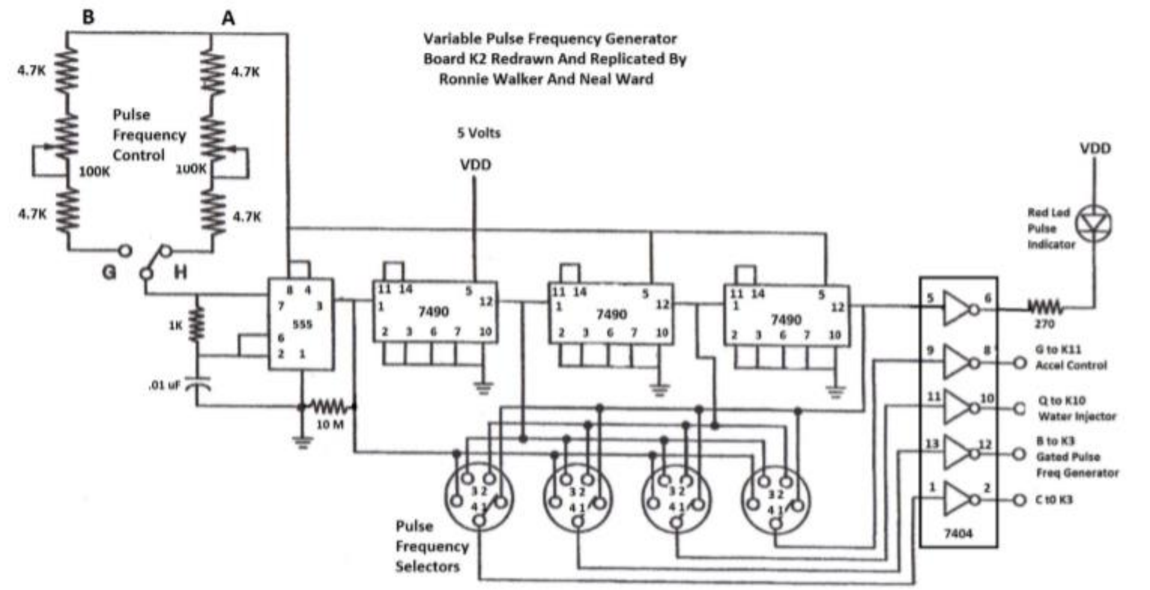
The output labels on circuit diagram below show up as inputs on other Stanley modules.

The card is (PCB K2) or and labeled Module K2 in Stanley Meyer's functional diagrams.



Note: the test points on card to allow a scope probe to used (wire loops)

The circuit for the card (Note: I used this drawing as it is cleaner than others one difference is the 10M ohm resister that was added on the version to clean up output signal from 555)



Card Inputs:

1. There is only one electrical input to the card: 5 VDC. (Note: This is shown on Stanley's drawings as VDD)
2. There are 5 manual inputs
    a. 100K Pot that controls the frequency output and duty cycle of the 555 Timer
    b. There are four switches that controls the frequency (1 of 4) to be sent to selected destination.
        i. Accel Control
        ii. Water Injector
        iii. Gated Pulse Freq Generator
        iv. K3

Card Outputs: There are 5 electrical outputs from the card. The fours frequency outputs can take on 4 states

1. Signal to turn on the LED on front panel (Red light Pulse Indicator)
2. Frequency selected by front panel switches (each switch setting is independent)
    a. G to K11 Accel Control
    b. Q to K10 Water Injector
    c. B to K3 Gated Pulse Freq Generator
    d. C to K3

Circuit Functional Description

Left to right.

The resisters and capacitor control the output of 555 timer. The 555 timer is used to generate the base frequency as it wired to operate in the "astable" mode (see data sheet for explanation). The frequency output is control by the resisters and capacitor (.01u standard value) to the left of the 555 (normal labeled R1 and R2). In this case R2 is 1K and R1 is a pot that controls the range and period of output. As Using 4.7K resisters plus a 100k pot with allow a frequency range 1.295KHz to 12.658KHz with center at 2.350KHz. The calculator at the following link can be used to determine 555 output values for the different settings of the 100k pot.

I left screen shots calculator here as it shows the Periods of the pulses as well.

NOTE: First version of this document had R1 and R2 switched. I check for error when I was rereading Stanley's WO 92/07861 which said out put should be over 10KHZ.

555 Timer Astable Circuit Calculator

In this **555 timer Astable calculator**, enter the values of timing capacitor C and timing resistors R1 & R2 to calculate the frequency, period and duty cycle. Here the time **period** is the total time it takes to complete one on/off cycle (T_1+T_2), while **Duty cycle** is the percentage of total time for which the output is HIGH.

Inputs

Capacitor (C)	.01	microFarad (uF)
Resistance 1 (R_1)	9.4	Kilo Ohm
Resistance 2 (R_2)	1	Kilo Ohm

Calculate Clear

Outputs

Frequency :	12.658	KiloHertz
Period (T):	79.002	MicroSeconds
Duty Cycle:	91.228	%
Time High (T_1):	72.072	MicroSeconds
Time Low (T_2):	6.930	MicroSeconds

555 Timer Astable Circuit Calculator

In this **555 timer Astable calculator**, enter the values of timing capacitor C and timing resistors R1 & R2 to calculate the frequency, period and duty cycle. Here the time **period** is the total time it takes to complete one on/off cycle (T_1+T_2), while **Duty cycle** is the percentage of total time for which the output is HIGH.

Inputs

Capacitor (C)	.01	microFarad (uF)
Resistance 1 (R_1)	59.4	Kilo Ohm
Resistance 2 (R_2)	1	Kilo Ohm

Calculate Clear

Outputs

Frequency :	2.350	KiloHertz
Period (T):	425.502	MicroSeconds
Duty Cycle:	98.371	%
Time High (T_1):	418.572	MicroSeconds
Time Low (T_2):	6.930	MicroSeconds

555 Timer Astable Circuit Calculator

In this **555 timer Astable calculator**, enter the values of timing capacitor C and timing resistors R1 & R2 to calculate the frequency, period and duty cycle. Here the time **period** is the total time it takes to complete one on/off cycle (T_1+T_2), while **Duty cycle** is the percentage of total time for which the output is HIGH.

Inputs

Capacitor (C)	.01	microFarad (uF)
Resistance 1 (R_1)	109.4	Kilo Ohm
Resistance 2 (R_2)	1	Kilo Ohm

Calculate Clear

Outputs

Frequency :	1.295	KiloHertz
Period (T):	772.002	MicroSeconds
Duty Cycle:	99.102	%
Time High (T_1):	765.072	MicroSeconds
Time Low (T_2):	6.930	MicroSeconds

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https://circuitdigest.com/calculators/555-timer-astable-circuit-calculator

The 10M resistor on the 555 output is used to clean up noise on the output signal (note this is not in the original circuit drawings).

The voltage of the 555 is negative pulse at the level of the VCC input.

The Three 7490 Decade Counters are used to divide its input by (10). This allows 4 separate frequencies to be available on the 4 selector switches.

1. 4X is output straight from the 555 Timer 10KHz
2. 3X divides 555 Timer output by 10 1KHz
3. 2X divides output of first 7490 by 10 50Hz
4. 1X divides output of second 7490 10 5Hz

Note: The 7490 divisor is hard wired to divide by 10

"It can be used as a divide by 10 counter by connecting Q_A with (clock) input2, grounding all the reset pins, and giving pulse at (clock) input1. This enables the cascade connection of the inbuilt counters." This came from the data sheet when I first looked at data sheets, I missed the comment about cascade counters and did not understand that the output of the timer is a clock pulse and not a 50 percent duty cycle pulse. Note: I have now built and tested the circuit and can verify this is the it works. I have added screen shots below to show output of each of the 4 stages before and after the final inverter step.

While the 555-timer output is a pulse the output of the 7490 is a 50% square wave.

This means the frequency input to each 7490 is divided by 10. Note: Now the labels on switches make sense as the output of the last 7490 is the lowest frequency and output of 555 is the highest.

The 7404 IC is used to invert the signal going to all 5 outputs so output pulse from card is positive pulse.

The 270-ohm resister reduces voltage going to LED. Note: Circuit is wrong, when I hooked it as shown the LED was always on. Thought about it then decided it should go to ground and not to VCC. This worked and makes sense as the output of the inverter is a positive +5 V pulse.

Led shows circuit is functioning.

For Reference

Pin Description:

Pin No	Function	Name
1	Clock input 2	Input2
2	Reset1	R1
3	Reset2	R2
4	Not connected	NC
5	Supply voltage; 5V (4.75V – 5.25V)	Vcc
6	Reset3	R3
7	Reset4	R4
8	Output 3, BCD Output bit 2	Q_C
9	Output 2, BCD Output bit 1	Q_B
10	Ground (0V)	Ground
11	Output 4, BCD Output bit 3	Q_D
12	Output 1, BCD Output bit 0	Q_A
13	Not connected	NC
14	Clock input 1	Input1

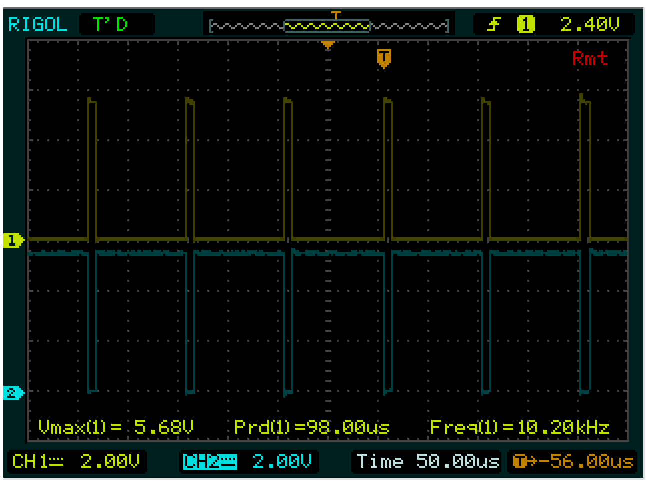
Screen shoots of the four stages.

For all screen shots I have set the base frequency of the 555 Timer to 10KH with the control pot. Note: the voltage is high as the 5-volt regulator has not arrive yet. I did some testing and verified voltage level for the timer and the invert follows VCC input level. Output of 7490 does not

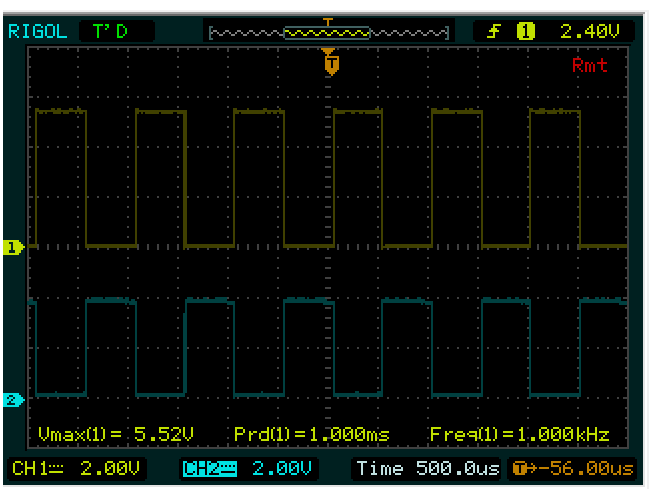
Hooked up both channels of my oscilloscope to card so I can show the out right of the stage and also the output after in comes out of the invert which is what is output from the card. In all cases Channel 2 blue on bottom is initial signal out from device and Channel 1 Yellow on top is the inverted board output.

Yellow pulse is always positive.
Blue pulse is always negative. Reason for inverter as last step.

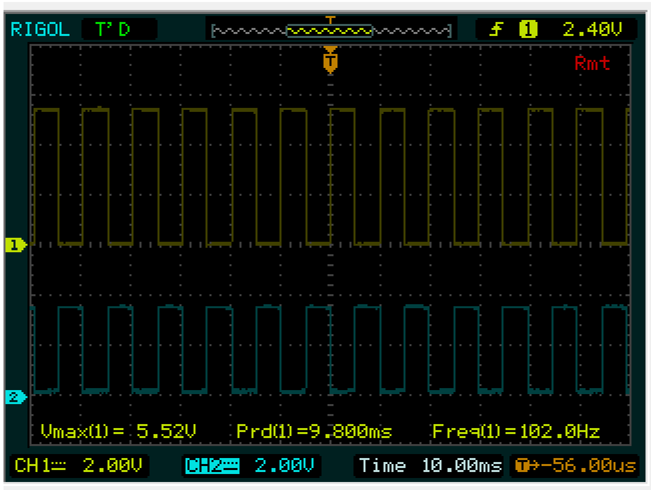
This is 555 Timer Output (Position 4x on switch) Note: Frequency is 10Khz



Output of First 7490 (Position 3X on switch) Note: Frequency is now 1KHz



Output of Second 7490 (Position 2X on switch) Note: Frequency is now 102Hz



Output of Third 7490 (Position 1X on switch) Note: Frequency is now 10.1Hz