Towards Realizing the TPU

V1.4

Poynt99 – 2009/Jan/10

INTRODUCTION – Unraveling the Mystery

This document is about gaining an understanding of a given body of information and aims to develop from it a working conceptual design of the TPU in line with how Steven Mark originally conceived of and built his units.

Although the material indirectly supplied by SM is voluminous, very little of it is useable as a means to solving the TPU mystery. What can be used of it and other incidental sources will be, but the primary inspiration for this development is the material posted by Spherics at the overunity forum:
http://www.overunity.com/index.php/topic,4297.0.html

The Spherics material can not be validated as authentic and true, but to date in my view it represents the most lucid description of how SM's TPU's might work, and provides actual hardware descriptions which can be tested. Far from perfect and most likely incomplete, but it is the best starting point ever presented on the web. Sadly, Spherics focuses mainly on an improved model and exotic physics explanations without making much reference to how the original SM designs (in terms of hardware) fit into this picture.

This thread will mainly focus on reverse engineering the nuts and bolts of Spherics' material in an attempt to unravel the SM designs, but will inevitably cover aspects of the Spherics design as well. There will be occasion to scrutinize the theory Spherics put forth, with simplified or modified alternatives proposed.

Consider this a work in progress. New material and/or edits will be incorporated as time and insights permit. It's also not considered highly polished, nor error-free.

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CHAPTER 1 – A Look at the Source

Some important passages from Spherics' posts follow, in chronological order. Analytical commentary is provided to *extract the pertinent information* and develop further insights. Those that may see this chapter as a mere summary have surely missed the finer details:

1) Within the space of the sphere electromagnetic waves constructively interfere to generate the necessary 3D vortex in the ether. Constructive wave interference causes massive build up of ether wave amplitudes within the center of the sphere. Tune these waves to the pulsation of the ether and the ether will feed by resonance its energy into the 3d ether vortex.

   This passage (now removed) speaks for itself and sets up the existence of the ether and it's potential.

2) In these designs the coils are pointing horizontal and not angled upwards, and the top vertical coil (coil A) is created by wrapping around all of the three coils. As the vertical coil is not identical to the other 3 this creates problems, which is why they feed DC into this coil; and the other coils need to be fed with high energy pulses. It is not optimum and neither are their results.

   Here Spherics is referring to the works of Bob Boyce and Stefan Marinov et al. To date most have used coil configurations not incorporating angles in the Z plane. Of interest here is the top "A" coil in spherics' design—he is saying that the equivalent in their designs is the overall control winding or static (DC) magnetic bias. SM mentions an overall control winding in his letters. This opens the possibility of SM's "A" coil winding being either pulsed, held at a steady DC bias, or both. This is important for later consideration.

3) You need only supply correctly phased DC offset square waves of approximately 300V (levels of 0V and 300V not -150V to 150V) to succeed in creating a rotating magnetic field which in reality is vortexing ether. Surely I don't need to tell you how to intercept a high speed rotating magnetic field to create current of high potential!

   So 15V or even 30V is not going to do the job. However, pulsing a coil at +300VDC implies that either the coil is of quite high resistance, or the pulse is of ultra-short duration, or maybe both. The control coil seen in the FTPU is certainly not of high resistance, so either a resistor is in series with it, or again, the pulse duration is ultra-short. Of note here is that SM pulsed his coils with tubes in the early days. If you know about tubes, you know they are a high impedance device, so again ultra-short pulse durations, and/or high resistance to the coils would have been utilized. This is probably how the requirement for relatively high voltage was discovered, as this is right in the area many tubes operate. Pulsing directly from a 9V battery isn't going to cut it.

Because of the opposing angled and vertical coils, a rotating magnetic field (RMF) will be produced. A RMF = vortexing ether, something to keep in mind. "Correctly-phased", also something to examine later.

So we can intercept this RMF with a properly-oriented coil, and in Spherics' design it is a toroidal coil. This might be conventional induction, but later we'll see that this is either part of the power generation process, or there's something entirely different happening according to Spherics.

4) Now I'm telling you the practical theory on how to use the ether. Steven Mark never did understand exactly why things worked. His coils are not optimum but never-the-less indirectly generate what my four coils will achieve.

SM's designs may not be optimum, but they DO work, and this is encouraging. Spherics is telling us that SM achieved the same end result by some means not identical to his own. The point of this passage is to reinforce the idea that SM's designs DO work.

5) Coils XYZ are pulsed at frequency F1 with a phase of 120 degrees between each coil. Coil A is fed a frequency of 3 x F1 and has a phase of 0 with respect to the other coils.

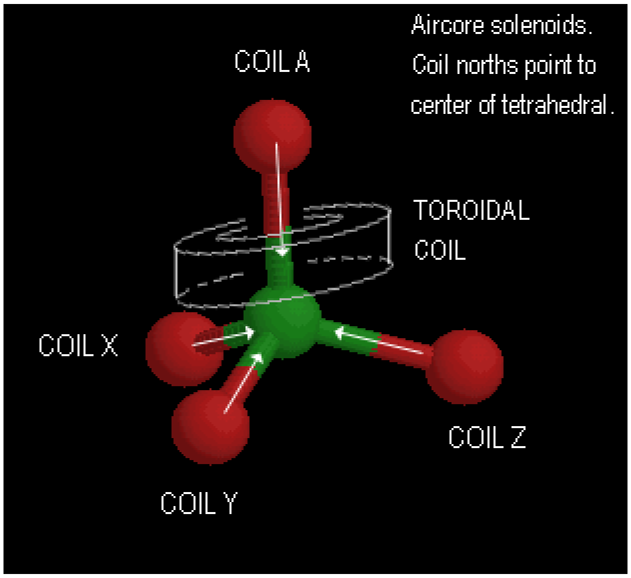
Here Spherics is telling us that only 2 frequencies are required for his design—F1 and F3. This makes sense in light of his design, but does not line up well with the statement made by SM regarding the use of a second and third harmonic. In the LTPU demonstration, SM switches ON only a "first" then a "second" frequency to start the device—an example of the many inconsistencies in SM's material.

6) If you pulse iron wire at iron's NMR you'll get a minor resonance effect even if the coil is not tuned to that frequency. Steven Mark was utilizing this effect along with the timing delay action of iron wire to generate a rotating magnetic field of the correct frequency. The requirement for coil A to pulse in time with the other coils was not understood by SM who unwittingly incorporated its effect via interaction of several coils.

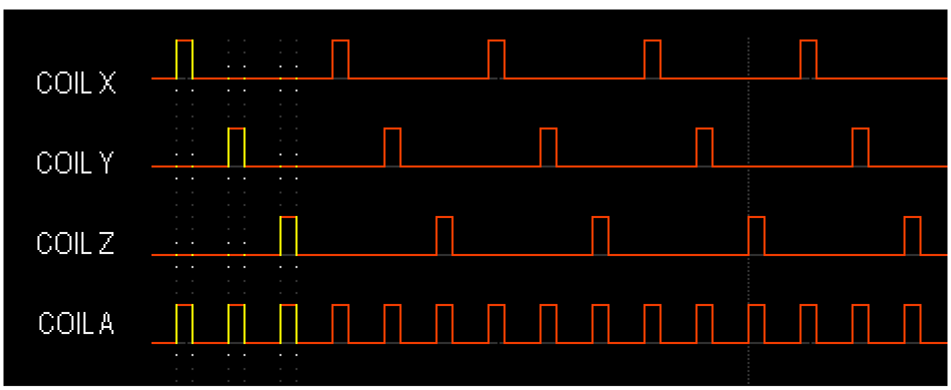
An important point to glean from this passage is that SM was indeed using an "A" coil. Apparently the interaction of several coils caused the "A" coil to pulse in time with the other control coils (kick coils in spherics' terminology), and was a byproduct rather than an engineered result. So Spherics is stating that the "A" coil is pulsed. Keep that in mind as it relates back to passage 2).

7) ...you could stick two solid 1 cm diameter 3/4 circle copper bars into the field and measure substantial voltage and current.

This is encouraging and indicates that it should not be difficult to extract power from the process, as long as the coil/wire orientation is correct. Note however that the orientation of a ¾ circle copper bar in the horizontal plane (assuming this is what he means) would *not produce output power due to conventional induction. It would have to be the result of some other form of "induction". See 3). Keep this in mind for later.*

8) 

This diagram illustrates the 4 coils' orientation and where the toroid collector coil sits. The monopole RMF is engineered to culminate substantially in the region of the toroid.

9) 

A straight forward diagram illustrating the two frequencies used. Note that there appears to be OFF space between the points where the kick coils are fired. Spherics does not go into detail regarding the pulse widths nor the "OFF" time requirement, but I will venture to say that there is an optimum amount of time delay for this and it may be proportional to the strength of the pulsed field.

10) The SM designs all work on the same set of principles. A pulse into a coil generates an expanding magnetic field. … If you then cause a second magnetic field to expand through the same space as the already expanding magnetic field, a specific

cascading action, a pattern is setup in the ether which is the EQUIVALENT of a magnetic field and has many of the characteristics of a magnetic field.

This would be the COMP field Spherics speaks of. Send this field through a properly oriented air-core coil, and it should produce output power via "induction". Straight forward, but see 11) and 12) for more details.

11) Steven Mark created his own delay elements using iron wire after several years of intermittent experimentation. The technique was to carefully wrap a bifilar air-coil using copper wire. The longer the length of copper the better but using identical lengths. The two coils were connected to the SAME pulse waveforms in parallel so that the magnetic field is additive NOT canceling. The delay element was added in series to only one of the coils that made up the bifilar coil. The delay coil was made from insulated iron wire wound into an air coil. An oscilloscope was connected to both COPPER coils. The setup would be pulsed with a DC offset square wave (i.e. 0 to 20V not -10 to 10V) at the resonant frequency of the bifilar coils. The tuning consisted of cutting the iron wire down in length until an unexpected pulse/signal appeared. This pulse is the kick. I will refer to these tuned bifilar coils as kick coils.

*The FTPU doesn't appear to follow what Spherics is saying here in terms of length of wire. There is apparently no more than 3 or 4 feet of wire used to wind the control coils there. SM said the FTPU was his first device and that it only delivered about 25W of power. This device did not have a separate "A" coil per se (or did it?**) and it certainly used very little wire for both the collector and control coils, which may explain its relatively feeble output in comparison to the subsequent devices he built and demonstrated. It DID work however, so relatively short kick coil wiring remains a possibility. One question that arises out of this: is the short shiny control coil wiring seen in the FTPU a bifilar winding?* **See Chapter 3.*

So the trick is to pulse the first coil of the bifilar pair, then pulse the second—after a certain amount of delay time. An electronic adjustable delay would be best. Pulse at the coils' resonant frequency (easy to determine) and adjust the delay until you see the kicks. I wonder if 20V pulses really will work for this test.

12) The magnetic field is now larger than expected. All that needs to be done is to rotate this field in a circle and intercept the field with an output coil. The captured energy is greater than the input energy because of the energy apparently created by the COMP field. If you arrange all N poles of the kicker coils so that they point towards the center and pulse each coil in turn you will get a rotating magnetic field. There are many ways to create a rotating magnetic field. A secondary effect of a rotating field is the entrainment of the COMP field so that the pattern in the ether is partially additive. A big problem was the iron in the delay coils. It was found that a large solenoid fed with a DC current to produce a static magnetic field around all of the kicker coils allowed the kicker coils to be tuned with the iron delay coils in close proximity.

The "secondary effect" statement above is not entirely clear but seems to allude to the Aspden Effect which is mentioned later.

Here Spherics is giving the second clue about the "A" coil. The "large solenoid…..around all the kick coils" IS the "A" coil, and it is fed with a static DC. It's now clear that the "A" coil in SM's designs has both a static DC and pulsed DC voltage applied to it.

13) Feedback of the output into the input was achieved using toroidal saturable inductor switches. … Early designs used a small magnet to bias the saturable inductors.

This and the next one 14) are BIG clues that go a long way toward realizing SM's TPU designs. Here Spherics indicates that the toroidal CM chokes present in the SM designs are dual-purpose—1. as a pulse shaper to drive the kick coils, and 2. as a means of feeding back the output to the input in order to perpetuate the process.

In cases where the pulse voltage from the control circuit is not quite high enough to saturate the CM chokes (the early designs), a weak ferrite magnet is placed near the choke in order to bring it closer to its saturation point.

14) All SM devices had small batteries to power the LC oscillators. The LC oscillators were used as control pulse currents to the saturable inductors. To start the process high voltage capacitors were step charged; this is why the coils took time to start-up! The first few pulses came from these pre-charged capacitors being switched via saturable inductors. Part of the DC output was fed back to keep the capacitors fully charged.

Through the use of a simple LC oscillator, such as a blocking oscillator, a high voltage capacitor is step charged initially to provide the high voltage source for the first few kick pulses. This sustains the energy generation process until enough DC output can be tapped off to keep the discharge capacitor fully charged. Wonderful and simple!

15) My design shown at the very start of this message thread eliminated the need for an iron delay coil because the pattern is set up in the ether outside of the influence of copper metal of the control coils. It directly allows the COMP field to be generated IN FREE SPACE. By placing the output toroidal coil within this free space the COMP field is intercepted.

Only information I can glean from this passage is that there is a difference in the kick coil type depending on the device configuration. If the output coil and control coils do not occupy the same space (in SM's designs they do except for the OTPU), a bifilar kick coil is <u>not</u> necessary to produce the COMP field. A standard solenoid coil will apparently do the job.

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16) You need to wrap your head around some of concepts espoused by Harold Aspden before commenting on whether the toroid is correctly placed or of the correct structure. The ether keeps spinning for a considerable amount of time after the pulses are stopped. If you would care to consider the angle in 3D where the magnetic fields would oppose you would observe that it forms at an angle. Transposed into a rotation this forms a funnel of compression. With a little bit more thought you may even consider the placement of the magnetic void and again see that this void would transpose on rotation to form a toroid void. The persistence of the ether waves long after the magnetic field allows discrete time separated pulses to merge in their affect on the ether. This void combined with the rotating pulses cause the ether to spiral. The spiraling ether interacts with the metal of the copper toroid along with the vertical direction pulse from the top coil. This causes the ether to not only spiral around in a circle as viewed from above, but also to corkscrew along the path of the toroid windings. The corkscrewing path of the ether around the toroid is now in-line with the windings. This creates a longitudinal wave along the copper creating a large current effect in the toroid windings. Which is what is needed. Given that the toroid is now generating a magnetic field, outside of the toroid (even though you don't have a magnetic field) you still have ether waves.

"The ether keeps spinning for a considerable amount of time after the pulses are stopped." This is worth repeating and is something I have thought was involved in the TPU operation from the first time I read SM's words about the "turbine effect". The "Aspden Effect" is required reading for those not familiar with this anomaly.

If an inertia effect is exhibited when the control pulses cease, then it is logical to conclude that there exists an inertia effect upon startup of the device as well. This is where the OFF time between control pulses may have an optimum setting depending on the strength of the field being created by them. This OFF time is necessary to allow the ether time to converge on the region of the kick coil. The ether will continue to move from kick coil to kick coil as they're fired, and with each subsequent kick, will pick up momentum as the process continues. This is what Spherics means when he says that the discrete time-separated pulses merge in their effect to create a smooth rotating ether flow. An analogy might be a large heavy flywheel that we are trying to get into rotary motion by kicking it with discrete bursts of acceleration. It starts off slow but gradually picks up momentum and speed. Once spinning at a high rate, it will continue to spin smoothly and wind down slowly if we remove the accelerating kicks.

If an ether vortex is one goal, then the cone-shaped field created by the resultant "A" coil/kick coil field summation may be a key factor in forming this vortex. "Vortex" means spiral, so we want the ether to spiral downward into the device. Spherics is also saying that the A-coil pulses and the ether-interaction with the toroid windings causes the ether to "corkscrew <u>along the path of</u> and <u>in line with</u> the toroid windings". The A-coil must play a key role here. He goes on to say: "This creates a longitudinal wave along the copper creating a large current effect in the toroid windings." Conventional induction does not operate in this mode, so would this not be a new form of "induction"? I will refer to this as "etheric induction" from this point onward.

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Before continuing, it's necessary to examine the following points once again: 3), 7), 10), and 16). There is an obvious disconnect here.

In 3) Spherics speaks of pure conventional induction and there is no issue in that regard.

In 7) it's noted that two simple copper bars (assuming horizontal placement) will yield some output power. I accept this, but it can not be the result of conventional induction; due to the "incorrect" relative orientation of the revolving field and the copper rings. Something "else" must be occurring here.

In 10) Spherics speaks of the COMP field (pattern in the ether) being the "equivalent of" and "having many characteristics of" a magnetic field. In other words the COMP field is affected by ferromagnetics and can produce current via conventional induction modes as supported by 3).

In 16) we learn that there is some alternate type of induction possible and it's produced by longitudinal ether waves traveling along the path of the toroidal windings. It would appear this is also the cause for output power in the copper bars described in 7).

Spherics was too brief in his dissertation indeed!

Notwithstanding, I'll venture to propose a theory that will adroitly explain this apparent disconnect.

From the above summarized points, it's evident that Spherics speaks of two types or modes of induction: the conventional mode in which we are all quite familiar, and the "etheric induction" mode. Conventional moving magnetic fields induce currents in conductors which are perpendicular to the direction of travel. Ether waves seem to induce currents in conductors that are either *perpendicular to* OR *in line with* the direction of travel. But how can ether waves "induce" currents this way? We need a model for ether waves to see how.

My proposed model for the ether waves as described by Spherics includes at least these two components: a magnetic field B, and an etheric field C. The characteristic which enables the ether waves to induce "currents" in conductors of either orientation is that the two fields are orthogonal to one another, just as electric and magnetic fields are in EM waves. In the case of the ether waves, the etheric C field forms in the direction of travel and has the ability to induce *etheric current* in the conductors it "follows", while the magnetic B field forms orthogonal to the direction of travel and has the ability to induce *conventional current* in conductors which are perpendicular to the direction of travel of the ether wave.

By the nature of this ether wave, it should be possible to tailor the amount of conventional vs. etheric induced current in the output coil by virtue of the coil's orientation relative to the ether wave direction of travel.

As a final note, it could be speculated that a third component, the electric E field, is part of the ether wave model as well and would be orthogonal to both the B and C fields.

CHAPTER 2 – Nuts and Bolts of Spherics' Design

A summary from CHAPTER 1 of what was learned and developed is listed here as it applies to the Spherics' Tetrahedral (**TTPU**) design:

2a) The control/kick coils should present a high impedance to the driver and be pulsed between 0V to about +300VDC. Pulsing indirectly through a Saturable Inductive Switch is a possible option in obtaining these two requirements.

2b) The A-coil is pulsed in time with the XYZ coils.

2c) The XYZ coil pulse timing and angular spacing is 120º apart.

2d) Pulses should be of ultra-short duration, but preferably with adjustable pulse width.

2e) The kick coils are standard air-core solenoids, but should be reasonably well-matched.

2f) A toroidal coil appears to be the optimum output coil due to its ability to generate both etheric and conventional currents simultaneously from the ether waves impinging on it.

2g) All 4 coils are arranged in a tetrahedral configuration as outlined by the diagram in figure 8) and in the Spherics texts.

2h) No ferromagnetic material is to be used within or near the device.

Diagrams incorporating these design requirements are discussed next.

Overall Block Diagram

In **Figure 2a** the top-level interconnection between the coils and 2 main sub-blocks is illustrated.

Power Supply Unit (PSU)

Figures 2b-d present three variations of the 300V DC power supply needed for the PCU.

Figure 2b illustrates a line-sourced supply adequate for the initial testing stages. It's advised that this supply be kept several feet away from the DUT. Also note that additional output filtering may be necessary depending on the demand required by the kick coils. Lower frequencies and/or wider pulse widths will require more current.

Figure 2c illustrates a capacitor step-charging method commonly employed in cameras with a xenon flash. There are IC's available that facilitate the U1 requirement, but research has determined that they're not suitable for this application. A more suitable straight-forward method involves the use of a simple oscillator, MOSFET driver, MOSFET, transformer, and shut-down mechanism by way of feedback from the output. See the patent in **Appendix A** for a few good design improvements.

Figure 2d is for those that may not want to search for a suitable transformer and would prefer to obtain or wind their own simple inductor coil. Along with this comes a slightly more complex shut-down circuit however, because the polarity of the output voltage is reversed. An example shut-down circuit with starting values is given. A simple 555 astable oscillator designed to run between 5 ~ 100kHz together with a MOSFET driver will work fine for U1.

The need for a reliable charge shut-down mechanism in circuits 2c and 2d should be obvious, because without one the capacitor could charge to a voltage far beyond its rating and eventually explode.

Although the design calls for a 300VDC source, it may be desirable to increase this to as high as 1500VDC or so, depending on coil impedance and pulse duration. Adjustments to the 3 circuits can be made accordingly.

As far as which circuit to begin with, the recommendation is to utilize the PSU from Figure 2b until success is achieved, then worry about the minor details in making either circuit 2c or 2d work.

Pulse Control Unit (PCU)

Figure 2e depicts the PCU—a circuit proposed to control the pulse frequency, pulse width, and pulse sequencing of the four kick coils in the TTPU.

Although only three MOSFETs are utilized, all four coils are pulsed correctly as shown in the Spherics timing diagram. To accomplish this, coil A is placed in series with all three coils X, Y, and Z. Doing this has two benefits; it simplifies the design, and it doubles the impedance seen by the MOSFETs.

The clock consists of a simple Schmitt trigger oscillator which then feeds a divide-by-two flip flop to obtain a 50% duty cycle square wave. For those ambitious and capable with micro-controllers, the clock could be replaced with a basic DDS chip feeding a precision zero-crossing detector. The benefit obtained with this approach should be obvious, but the circuit provided here has certain advantages as well, and certainly does the job.

The clock splits off to feed two circuits; the pulse generator, and the 1 of 3 selector. The latter circuit concept was borrowed from a post Earl made at overunity.com, which he called his “rat race” circuit. The pulse generator section involves a precision pulse delay circuit (**Figure 2f**, **PDC**) and a fast NOR gate which “extracts” the variable pulse from the incoming clock signal. Together, the two circuits combine through three AND gates which pulse the appropriate MOSFET driver. The 1 of 3 circuit can be thought of as an “enable” for the pulse output, which feeds all three simultaneously.

For the best possible performance, stick with the part numbers noted. The parts are surface mount and discrete, and are readily available from Fairchild Semiconductor.

In addition to crediting Earl for the excellent “rat race” idea, I’d also like to give credits to z_p_e for the substantial contribution made from his TP900 design, once available at overunity.com. The clock and pulse delay circuits were taken directly from his “TP900” document.

TTPU Notes

The astute reader should now be armed with all the necessary information to build the TTPU as given by Spherics. Some electronics know-how is required, as this document was not intended to be a substitute for proper electronics training.

Care should be taken to place the coils as close as possible to the specified 120º spacing.

The kick coils should be wound with as much wire as possible, according to what Spherics mentioned regarding the bifilar experiment.

An approach to initial testing is to use as short a duration pulse setting as possible such that the coils will just begin to energize from incoming current. Then start with a frequency at the low end of the clock, and gradually increase upwards until a significant power increase occurs. In theory, there should always be *some* DC output current present in the toroid coil as a result of the revolving mono-polar magnetic field, but this may only be conventional induction.

As previously mentioned, because the original design calls for a +300VDC source, and the A coil is placed in series with the X, Y, and Z coils, it may be advantageous to use +600VDC or higher with this approach.

High voltage short duration pulses have been used in “peculiar ways” since Tesla, so one could speculate that there is something to the *pulse voltage/pulse duration* ratio.

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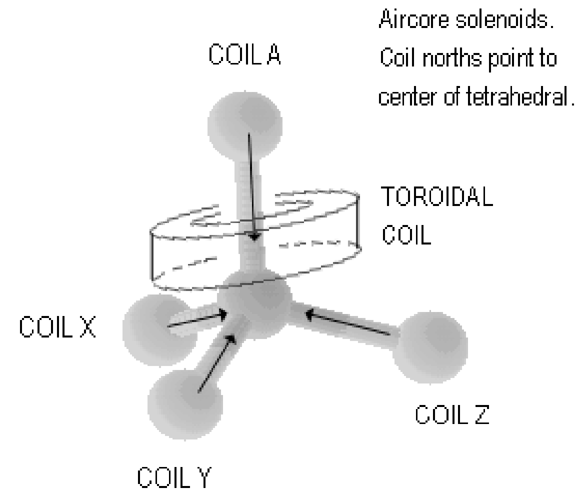
Given that one goal with this and Steven Mark's devices is not to pump in loads of juice just to make things happen, it's reasonable to assume that the energy used per pulse must be of a nominal amount so as to not overly discharge the high voltage storage capacitor. Otherwise, it might be difficult for the device to even start up. The amount of energy lost per pulse should be kept to a minimum (not to exceed 5% for eg.) and results in a given amount of input energy *E*. *E* will be proportional to a given pulse voltage amplitude and pulse duration in seconds; *E ~ Vp x Tp*. If either *Vp* or *Tp* increases, the amount of input energy increases. We want *E* however to remain constant or decrease as parameters are adjusted. If *Vp* increases, *Tp* must decrease proportionately.

Optimum pulse width and pulse voltage settings for your particular set of coils can be found by adjusting the pulse width setting as minimal as possible such that the full source voltage swing (starting at +300VDC for eg.) just starts to appear on the scope when probing the MOSFET Drain lead. Too short a pulse width will be evident in that this scope point pulse wave form will not appear to switch. What you are doing at this point to obtain full swing to 0V is adjusting for the combined rise/fall times of all the devices in the path of the pulse signal chain. This will be a finite amount determined by the devices used, and to a certain extent the layout of the devices and interconnecting traces or wires. Once a minimum pulse width has been adjusted for, higher source voltages can be attempted. Slight tweaking of the pulse width (i.e. longer) will likely be necessary as the source voltage increases. Increase the source voltage until the tolerable energy loss per pulse (5% loss for eg.) is reached, and you now have an optimized setting for your set of coils. All the aforementioned adjustments should be performed at a relatively low frequency of 1kHz or so. Tweaking of the pulse width may again be necessary with frequencies in the MHz range.

It should be mentioned that the following circuits are presented as good starting points for those that may want to venture into this design. Although I believe the circuits to be of sound design, use them at your own risk, and use your head above all.

NOTES:

a) **PSU** = Power Supply Unit.
b) **PCU** = Pulse Control Unit.
c) **PDC** = Pulse Delay Circuit.
d) LA=LX=LY=LZ; identical solenoid coils.
e) LT = Toroidal Output Coil.
f) All coils are air-core.
g) Coil orientation and configuration is as shown top right.
h) The "feedback" shown may supplement PSU and/or PSU power requirements.
i) TTPU = Tetrahedral TPU



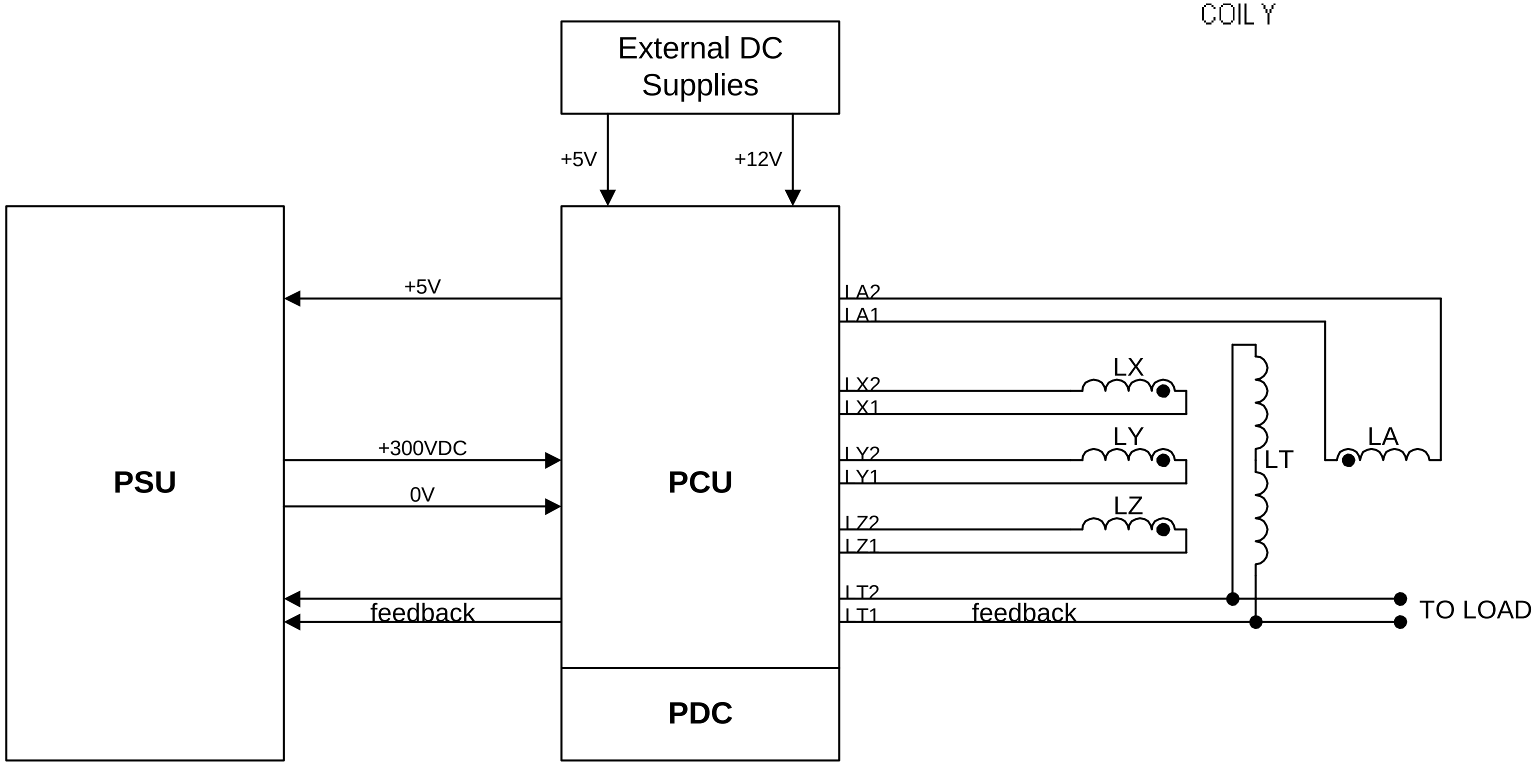
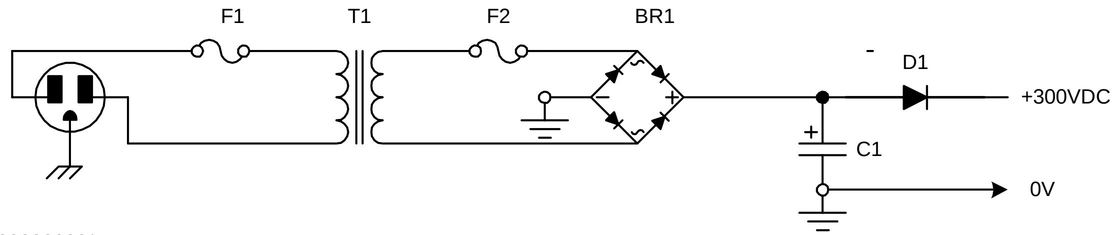


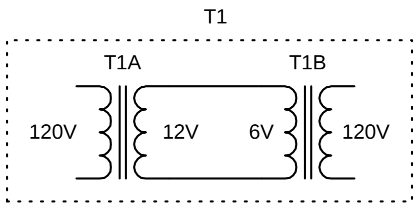
Figure 2a - TTPU Block Diagram

NOTES:

a) F1/F2 = 1A (or smallest tolerable) slow blow.
b) T1 = Hammond 260 or equivalent.
c) BR1 = 500V min., 5A min.
d) C1 = 350VDC minimum, highest value obtainable.
e) D1 = Fast diode such as MUR820, or MUR1520.
f) DO NOT mess with this ciruitry if you don't know what you're doing!; Lethal voltages and currents are present!



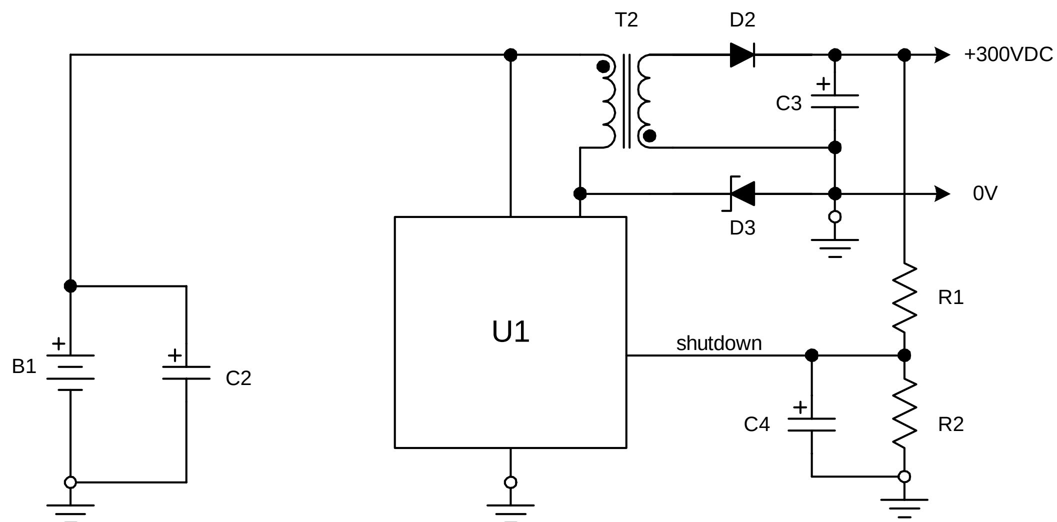
T1 Alternative



(2b)

NOTES:

a) B1 = 3V~9V.
b) C2 = 4u7, X5R or X7R 10V.
c) U1 = Flyback charging circuit. See Appendix A.
d) T2 = 1:10 Step-up such as KIJIMA MUSEN PART# SBL-5.6-1.
e) D2 = MUR820 or VISHAY GSD2004S dual diode (in series).
f) D3 = ZETEX ZHCS400 or equivalent.
g) C3 = Photo Flash Capacitor, or other suitable HV type.
h) C4, R1, R2 = Feedback network for charge shut-down.
i) DO NOT mess with this circuitry if you don't know what you're doing!; Lethal voltages and currents are present!



(2c)

Figure 2b/2c - TTPU PSU

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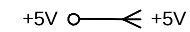
NOTES:

a) B2 = 6V~12V.
b) C5 = 1000u,35V.
c) U1 = 5 ~ 10kHz oscillator (555) and MOSFET driver such as MAX4420.
d) L1 = Suitable ferrite or iron-core inductor, min. 500V insulation.
e) D4,D5 = MUR820 or MUR1520.
f) R1 = Metal film 5 to 50 Ohm, 1/2W.
g) M1 = IRF640N, IRF3710, IRFP3710, or other suitable MOSFET.
h) C6 = Photo Flash Capacitor, or other suitable HV type.
i) C7, R4, R5, R6, R7, R8, 4N25 = Feedback network for charge shut-down.
j) ***** Note that the GROUND of this circuit CAN NOT be commoned with the PCU circuitry ground; it must be isolated.
k) DO NOT mess with this circuitry if you don't know what you're doing!; Lethal voltages and currents are present!



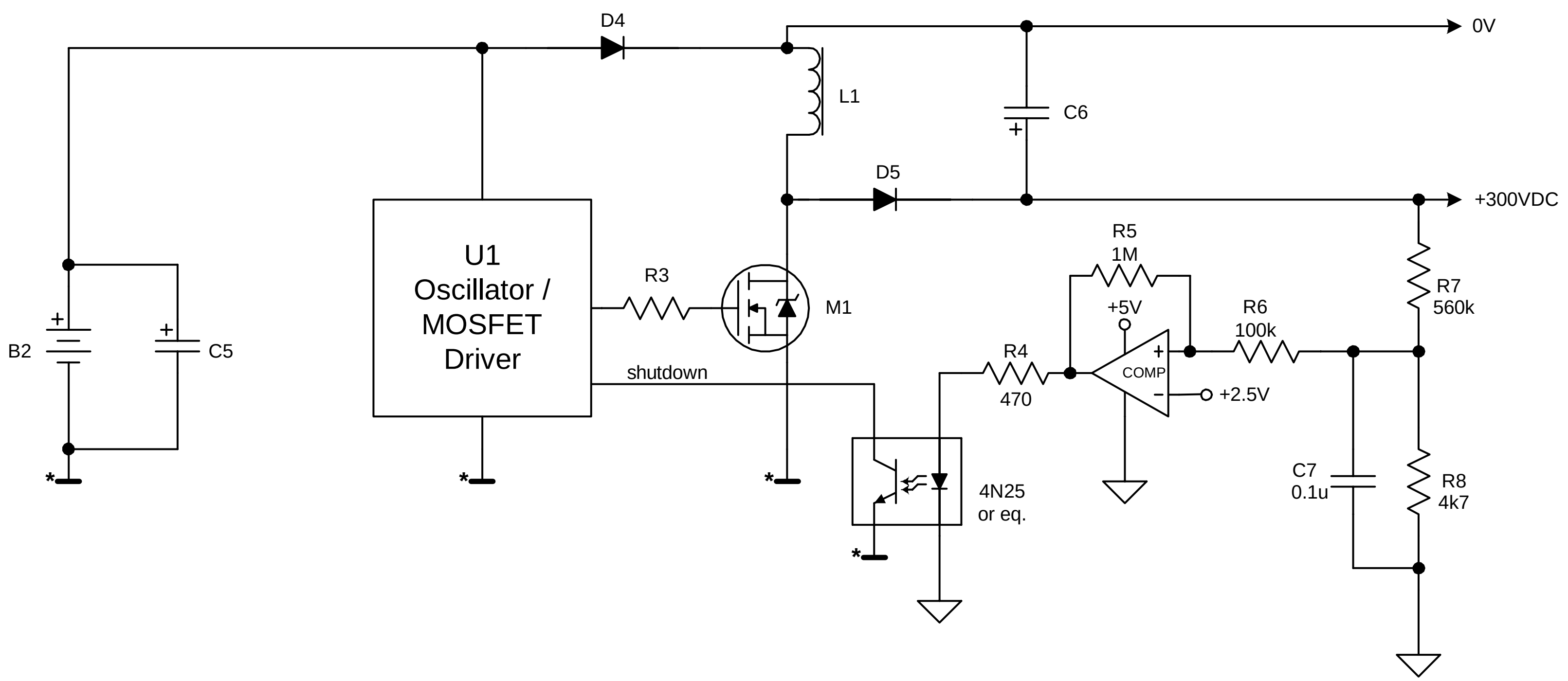
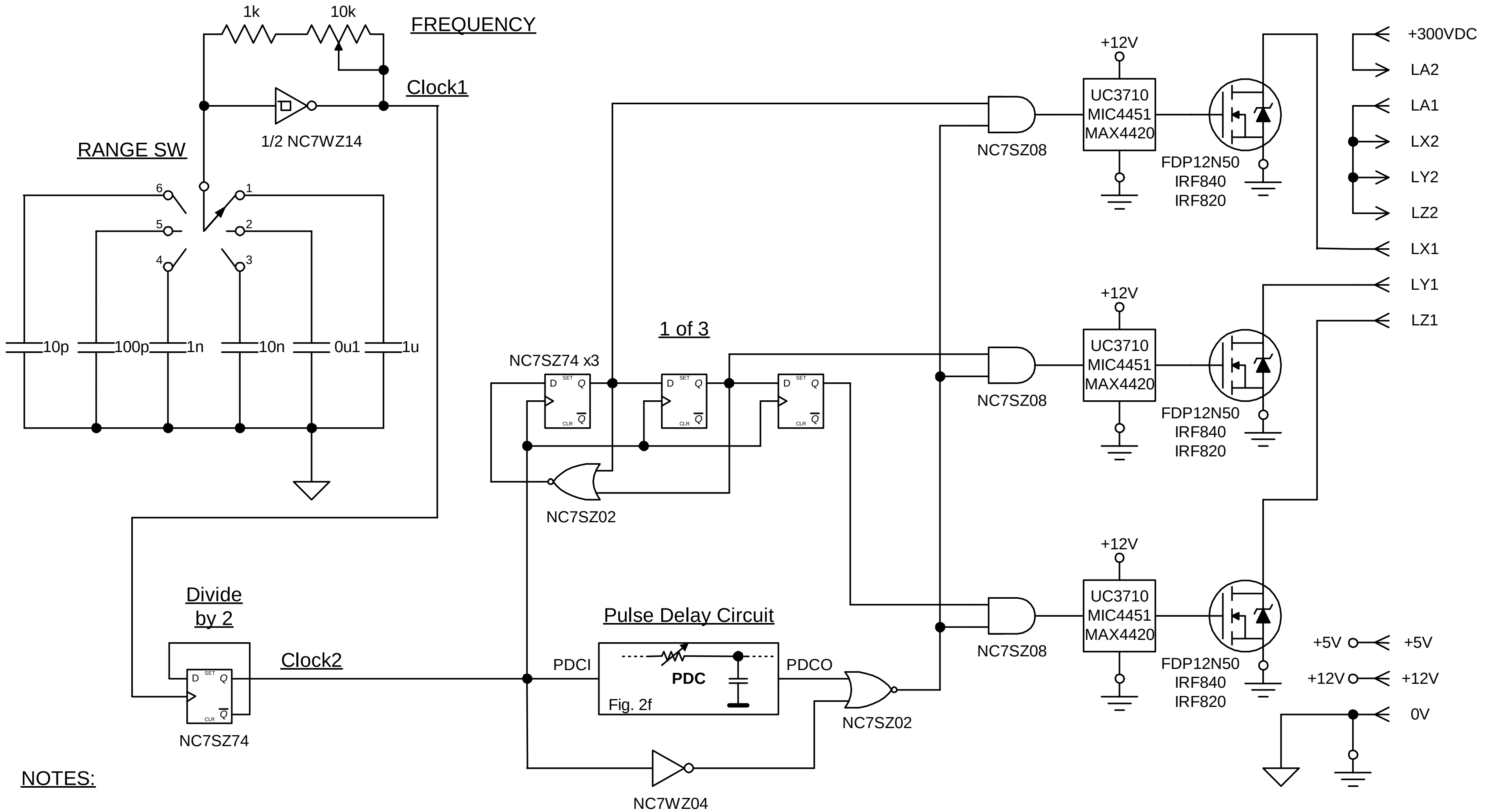


Figure 2d - TTPU PSU

Towards Realizing the TPU - 17



NOTES:

a) Frequency span is from about 40Hz - 20MHz in 6 ranges.
b) Pulse Width is adjustable from about 20ns - 5ms in 6 ranges.
c) All Logic IC's powered from +5V, UC3710 from +12V. Keep logic and "power" grounds separate. Bypass supplies appropriately.
d) Use MOSFET snubber circuitry as required.
e) See Figure 2f for Pulse Delay Circuit (**PDC**).
f) LA is in series with LX, LY, and LZ, therefore does not require it's own switch.
g) DO NOT mess with this ciruitry if you don't know what you're doing!; Lethal voltages and currents are present!

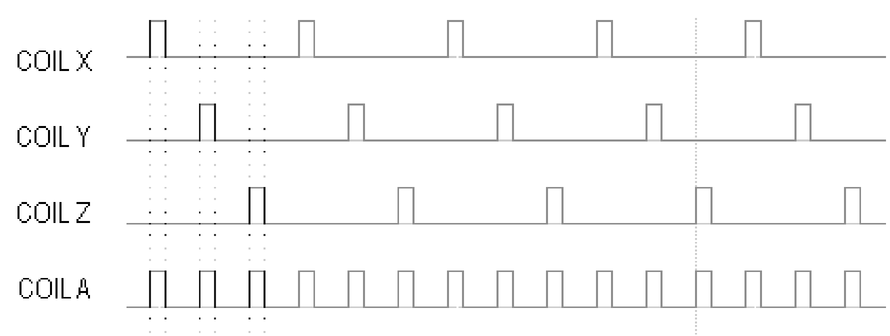


Figure 2e - TTPU PCU

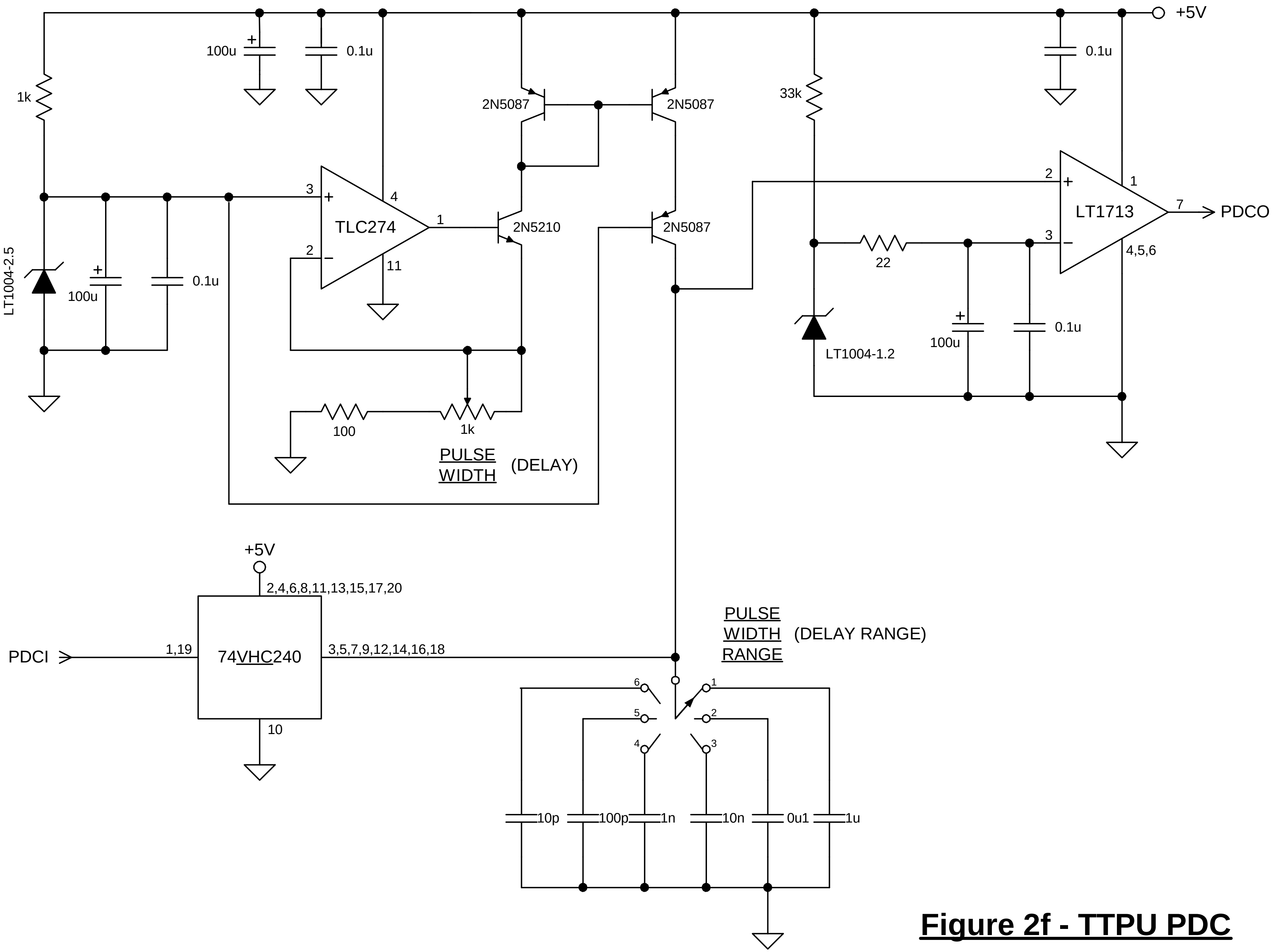


Figure 2f - TTPU PDC

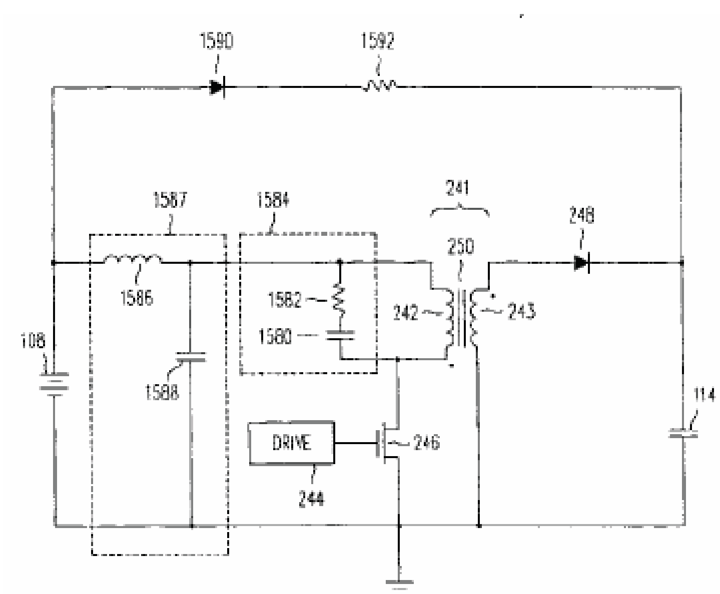
APPENDIX A – Capacitor Step-Charging

As noted in CHAPTER 2 Figure 2c, one option to implement a self-contained high voltage source (+300VDC or higher) is to use a method similar to xenon flash bulb chargers used in cameras etc. The problem with the commercially available chips that serve this function is that they require a toggling input to their "CHARGE" pin. The assumption is that they will be under the direction of a micro-controller. With a 555 timer chip and some basic circuitry, one can easily design their own step-charging circuit.

In any case, the following excellent patent was discovered while doing some research into the subject, and although geared toward camera flash applications, the novelty of the patent pertains more to increasing efficiency and the supporting components around the main chip, which in our case is a custom discrete design (denoted as the DRIVE component 244 in the patent).

The patent should prove to be a useful reference if/when the need becomes a reality.

EFFICIENT PHOTOGRAPHIC FLASH
Carver A. Mead
Glenn J. Keller
Assigned to Foveon, Inc.
6,674,247 B1
Jan. 6, 2004



APPENDIX B – Bifilar Kick Coil Test Setup

This subject should have probably been placed front and center in this document rather than in an appendix at the back, however much of what Spherics said in his posts has to be taken "as is" because most will not have the time nor ability to prove it right or wrong.

In this particular case, it is quite important and represents a proof-of-concept test that should in truth determine whether one goes on with the Spherics design or chalks it up to yet another "nice" theory. It's all fairly simple so there is no excuse to not perform this test.

Some may have noticed that most of the work to do this test has already been done for you in CHAPTER 2. With a few minor changes, the circuit in **Figure 2e** can be re-arranged to facilitate an excellent *bifilar kick coil* proof-of-concept test-bed. It should be apparent that the iron coil as described by Spherics was simply a convenient method Steven Mark used for introducing very short phase delays before the advent of readily available very high speed binary logic IC's. The following circuit generates these precise but variable phase delays electronically, and allows the test to be performed at a wide range of frequencies. It should be noted that the coils will be pulsed with 50% duty cycle square waves and no pulse width adjustment is provided. This is as per the Spherics posts.

Taylor the source voltage based on the inductance of your bifilar kick coils. If using low turns, decrease the source voltage accordingly, down to 20V if necessary.

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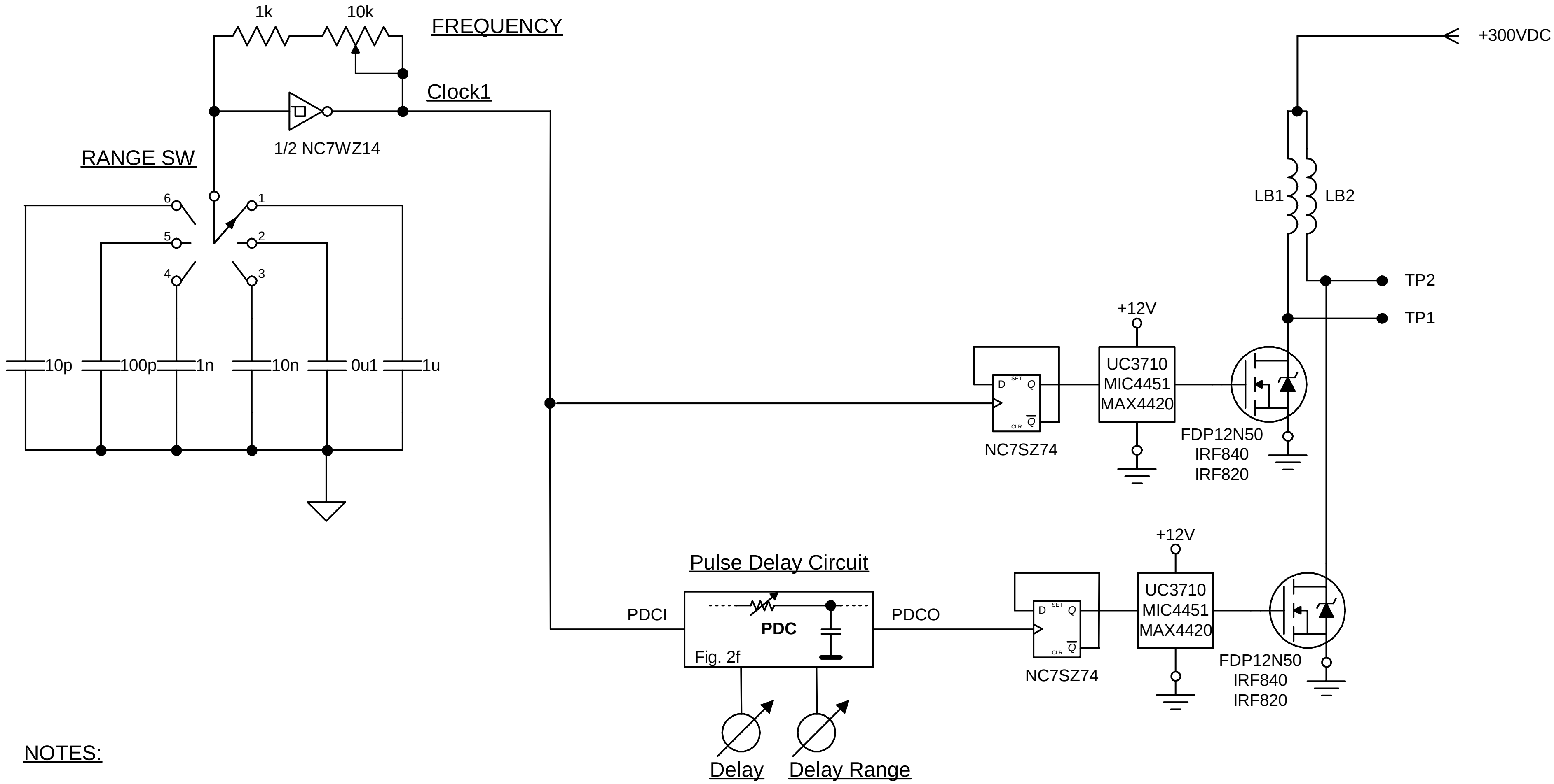

NOTES:

a) Frequency span is from about 40Hz - 20MHz in 6 ranges.
b) Pulse Delay is adjustable from about 20ns - 5ms in 6 ranges.
c) All Logic IC's powered from +5V, UC3710 from +12V. Keep logic and "power" grounds separate. Bypass supplies appropriately.
d) Use MOSFET snubber circuitry as required.
e) See Figure 2f for Pulse Delay Circuit (**PDC**).
f) LB1,LB2 = Bifilar-wound kick coil, as per Spherics' posts.
g) +300VDC is shown but +24VDC would be a good starting point.
h) DO NOT mess with this ciruitry if you don't know what you're doing!; Lethal voltages and currents may be present!

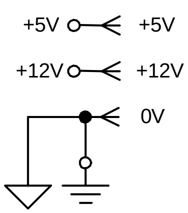

Figure B – BIFILAR KICK COIL TEST SETUP