High power strobe light

The real stuff.....

Introduction

The power of strobe lights is set by two parameters:

1) The flash energy in Joule, giving the "brightness" of the flash
2) The repetition rate or flash frequency.

The strobe light power (in Watts) can be calculated by multiplying both parameters: P = Joule x frequency.

The flash energy is determined by the flash elcap: this elcap is usually charged to 300-400V and then discharged through the Xenon flash tube.
The flash energy is the available energy in the flash elcap: Elcap = ½ x C x V ² [Joule]

Most commercial do-it-yourself kits (with the small U-shaped Xenon tubes) are not very powerful:
mostly, the flash energy is limited to about 1-2 Joule (22 - 33uF at 330V=)
at a flash frequency of 10 Hz the strobe light power is about 10 - 20 Watts
which is about the limit for small Xenon tubes.

The flash energy of this unit is about 25 Joules (220uF at 660V) giving you 250 Watts at 10 Hz flash frequency.
Forced cooling of the Xenon tube and the elcaps is required when the unit operates at 10 Hz for a prolonged period!

I divided the strobe light in two parts: the power unit containing the mains electronics and high voltage Xenon tube
ignition circuit, and the trigger circuit which takes care of the low power timing and trigger pulses for the SCR.

The power unit

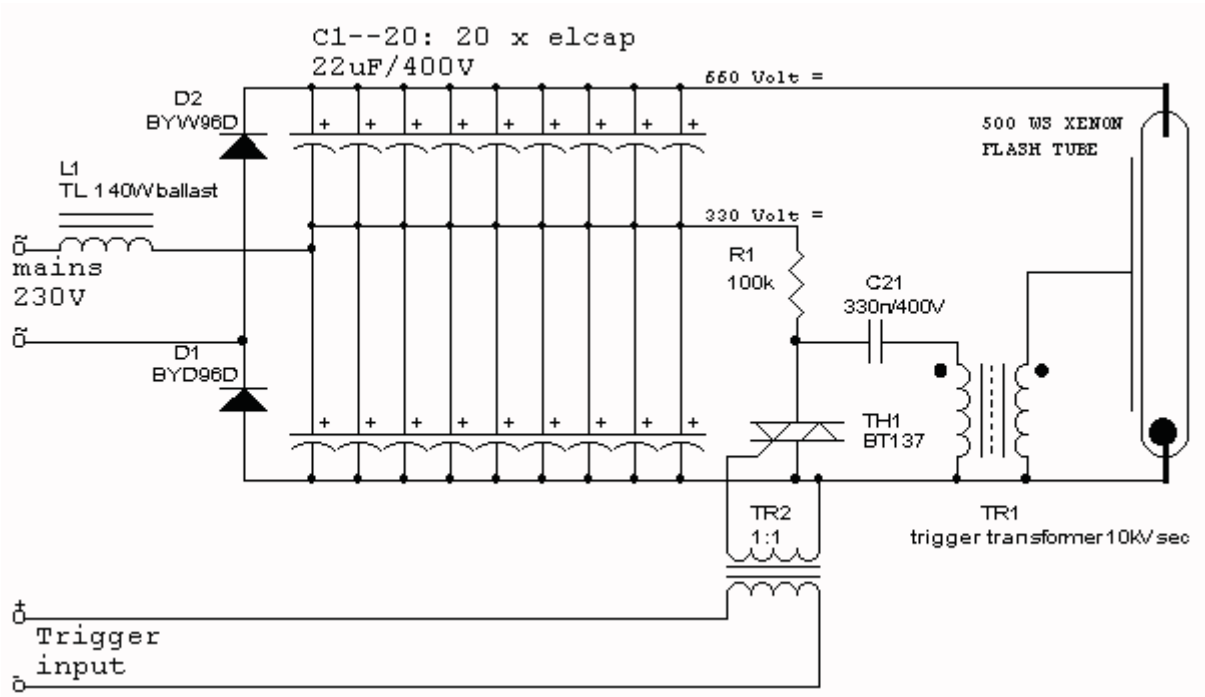
A detail that catches the eye in the power unit is the voltage doubler built with D1, D2 and C1--C20
The voltage doubler is necessary to generate the specified voltage of 660V= for the large Xenon flash tube.
I used a 140 W /230V TL ballast coil to limit the current. Less elegant, but also effective is a 500W light bulb as

a series resistor to limit the mains current.

Maximum mains current

The mains current must be high enough to charge the elcaps to 500-600 Volts at the maximum flash frequency (5-10Hz)
I experienced some problems: at high currents (2 x 140W ballast in parallel): the Xenon lamp will not extinguish anymore!
Apparently, the current is then high enough to keep the tungsten filament on emission temperature.
So if the lamp does not extinguish, lower the mains current.

Power unit schematic:



When you build the power unit, make sure you visit your local hardware store for some sturdy copper wire
to connect the elcaps and the xenon tube, the peak discharge current is about 150 Amps!
When you use short wires, 1.5 mm² should be sufficient.

The Xenon tube and the trigger transformer can be ordered at CONRAD electronics (Germany/Holland):

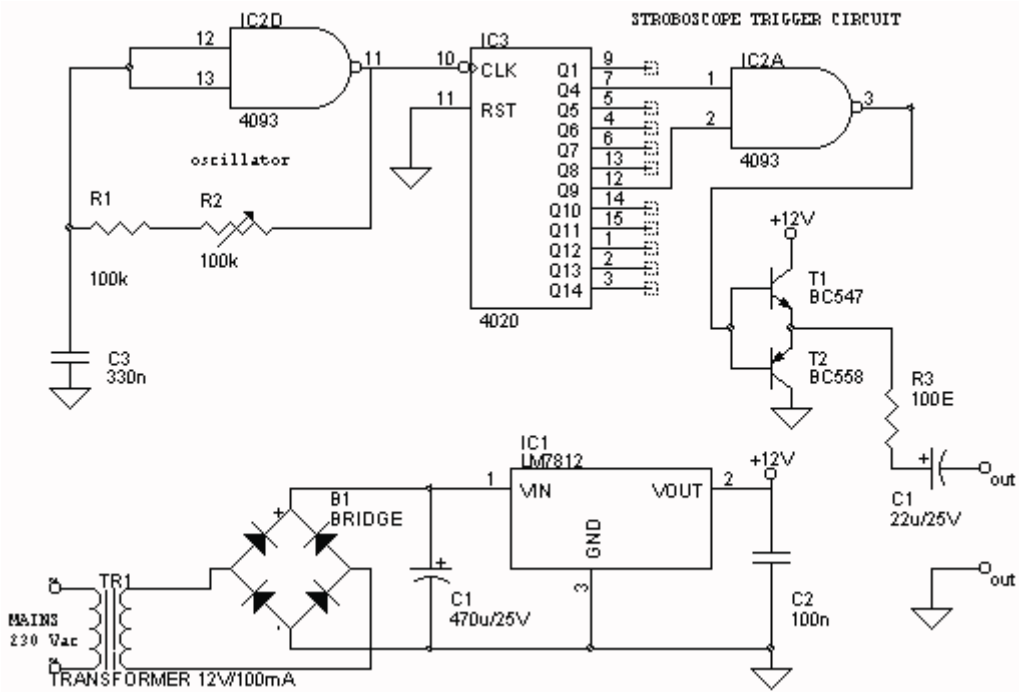
- Xenon tube 500Ws: nr: 58 15 77-01
- Trigger transformer 11kV nr: 58 15 18-01

The trigger circuit

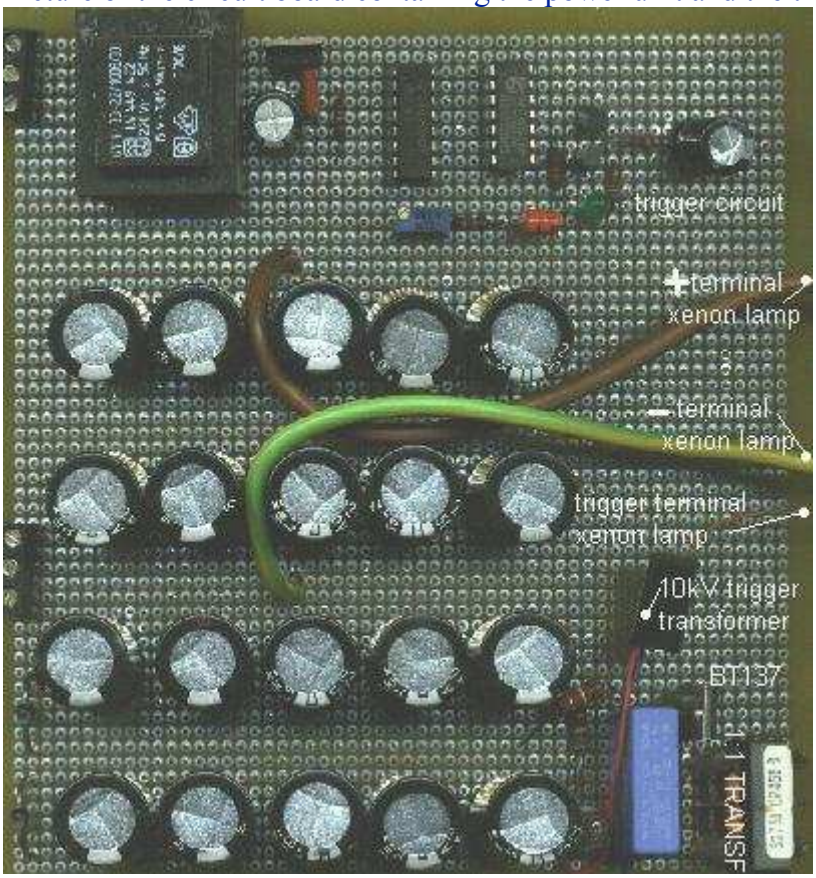
The trigger circuit is just a suggestion, you can trigger the power unit with any pulse generating circuit
but keep in mind that each flash is about 50 Joule, so 10 Hz will give you the specified maximum power of 500 Watts.

This trigger circuit is built up by a 50 -100 Hz oscillator (IC2D) which drives a binary counter (IC3).
From the counter a slow signal (Q9) is mixed with a fast signal (Q4) resulting in an alternating 5-10 Hz pulse train.
The signal is amplified by a complementary emitter follower (T1/T2). The output is connected to the 1:1 trigger transformer
of the power unit

Trigger circuit schematic:



Picture of the circuit board containing the power unit and the trigger circuit:



→ Download specifications of key components at the [Component specs page]