

RELAYUNIT FOR PRE-HEAT AND/OR PULSE-DRIVER

PreHeater

This electronic device is intended for use in cars or engines that use ethanol (E85) as a fuel and for that reason are difficult to start in cold weather. It is specifically designed to work semi-automatically, while this circuit reacts on the voltage from the cables belonging to the parking light and the dipped beam - which also supply the units.

I've noticed that modern cars are very capable of handling fuel quantities at engine start even if the fuel is different from the car's standard fuel. If the car is hard to start when you use E85 and the temperature is above zero is it probably not on the fuels inability to ignite at low temperatures. It is more likely that it is the amount that is incorrect. So to make the car more easier to start, in that case, you can try to adjust the fuel amount, instead of experimenting with inflammable gas ('Startgas' in Swedish). However, is the temperatures below zero, then it may be up to date with inflammable gas. In extreme circumstances it may be necessary to preheat the pipes, the intake manifold, carburetor and/or the area around it.

So this is the concept here. One circuit for preheating and one for extra fuel or inflammable gas. Both of these depend on the surface mount NTC-1 resistance value. The driver IC which has been selected to manage this is the usual NE555. The two 555 are connected as a mono stable flip-flops (one shots) but with different pulse widths - or in other words; their active time delay. Depending on how your fuel ignition and pre-heat equipment looks like, is the time delay adjusted by changing the value of the following components:

Unit1; R4 or R3. And Unit2; R5 (+ NTC2) or C4.

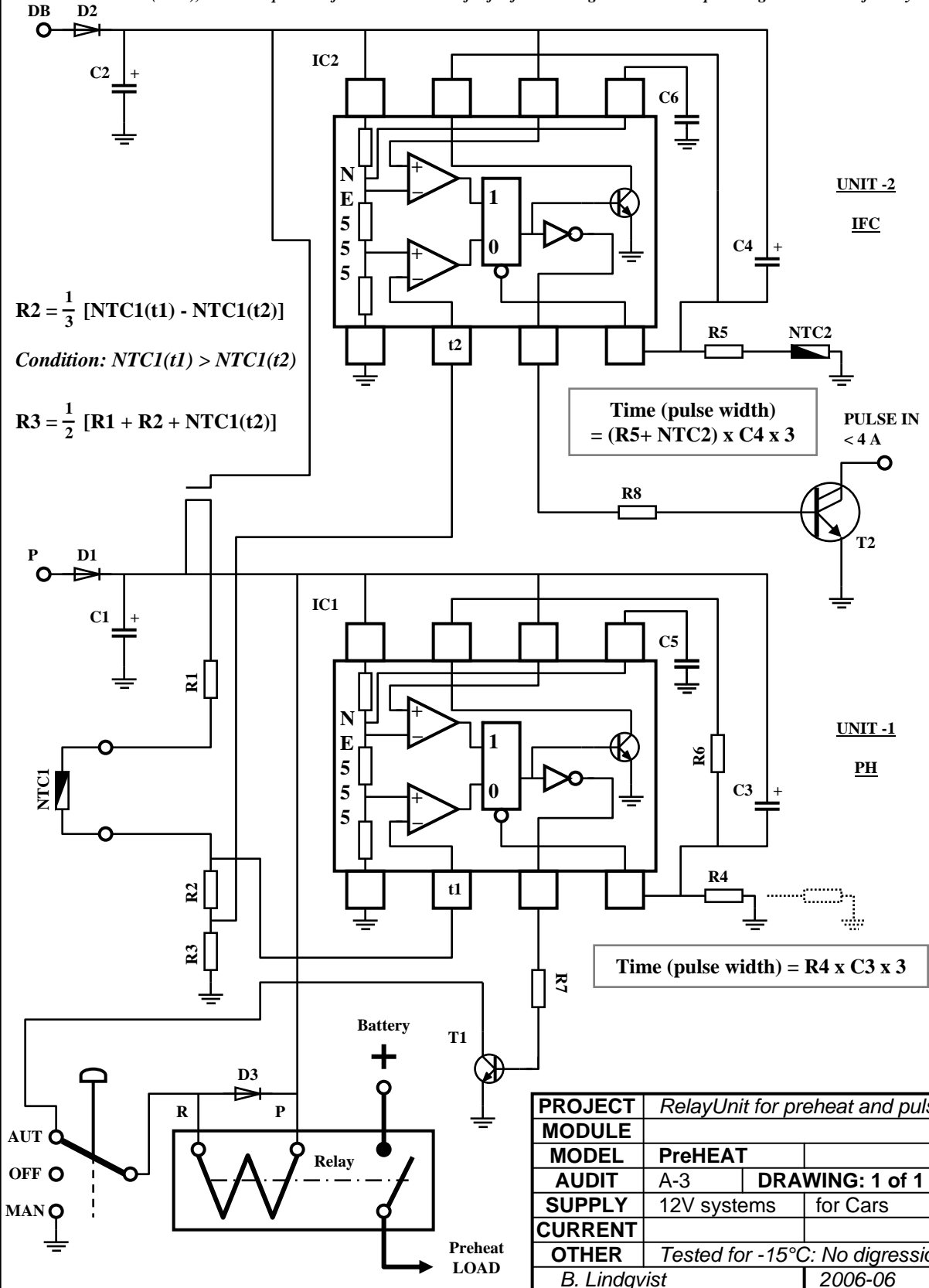
We will need a plastic-protected 12V car relay since the PH-function requires a lot of power. You can buy this in auto parts stores. The power to the PH-equipment and which also passes the relay must be taken from the car battery's positive terminal. The PH-unit (1) is activated of the switch for the parking light (P).

The IFC (Inflammable Fuel Control) that you may have built is fed through a power Darlington transistor T2 (BC677). If the pulse duration is short you not need a heat sink, but this can also be shield metal that is built around the circuit board. Remember to protect T2 if the load is an inductance. Use a power diode for this. The IFC-unit (2) is activated by the appropriate power switch for the dipped beam. Please note that the units can operate reversibly. IFC might as well work with the relay (and DB), rather than to T2.

NTC-1 should be mounted high on the engine block. "Threshold" which determines the area where 555 will work in is below 0 degrees for the IFC-unit and below -10 degrees for the PH-units. Regardless of the unit become they completely inactive when the temperature goes above -10, or 0 degrees but it is also the resistors in the NTC-resistance as well. After the engine had run a while, the heat will turn off this electronic device and it will not become active until the engine is cold again.

CIRCUIT DIAGRAM

The size of C2 determines whether the Unit-2 can be activated after the engine has started (twice). If C2 is big (470u), it won't repeat itself. That's not a benefit if inflammable gas is used to help the engine run at the first try.

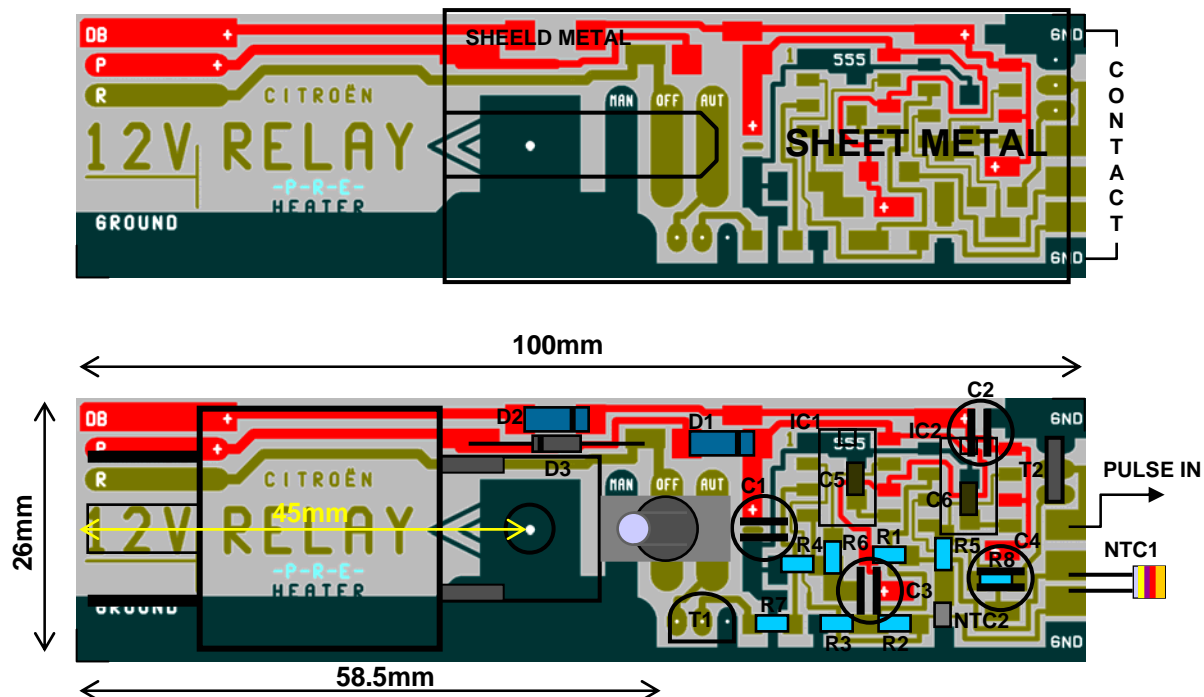


$$R2 = \frac{1}{3} [NTC1(t1) - NTC1(t2)]$$

Condition: $NTC1(t1) > NTC1(t2)$

$$R3 = \frac{1}{2} [R1 + R2 + NTC1(t2)]$$

PLACING OF COMPONENTS



SMR1206:

R1 = 1k
R2 = 3k9
R3 = 10k
R4 = 220k
R5 = 1k
R6 = 1k
R7 = 10k
R8 = 4k7

SMC1206:

C5 = 10n
C6 = 10n

Other Capacitors:

C1 = 22 μ , E-lytic, hole mount
C2 = 22 μ , E-lytic, hole mount
C3 = 220 μ , E-lytic, hole mount
C4 = 22 μ , E-lytic, hole mount

Semiconductors:

D1&D2 = LL5817, surface mount
D3 = 1N4004, hole mount
T1 = BC337-25, hole mount
T2 = BD677A, hole mount

IC (hole mount):

IC1 = NE555P, timer (better choice SA555)
IC2 = NE555P, timer (better choice SA555)

NTC (Negative Temperature Coefficient):

NTC1 = 4k7 (25°C), hole mount
NTC2 = 4k7 (25°C), surface mount

Electro mechanics:

12V Relay for cars
3-way toggle switch (on-off-on), optional

Time (pulse width) = $R \times C \times 3$ [Seconds]

R4 = 220k, C3 = 220u \Rightarrow About 2 minutes

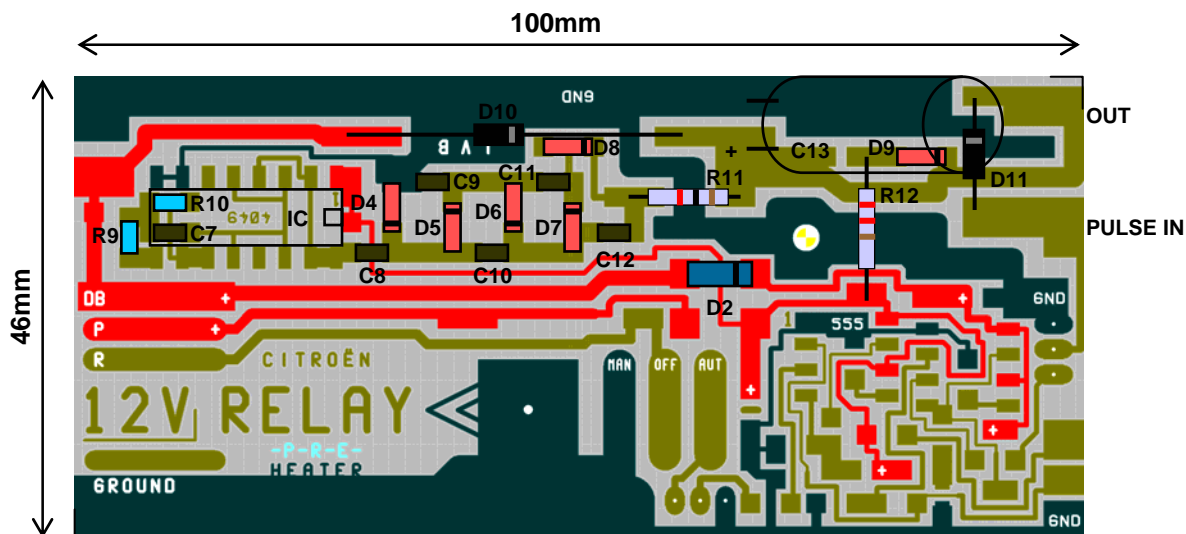
R5 = 1k + NTC2, C4 = 22u \Rightarrow About 2 second's for -10°C

$NTC1(t) = 4700 \times e^{\frac{3977}{(t+273)} - \frac{3977}{298}}$ [$\Omega(^{\circ}C)$]

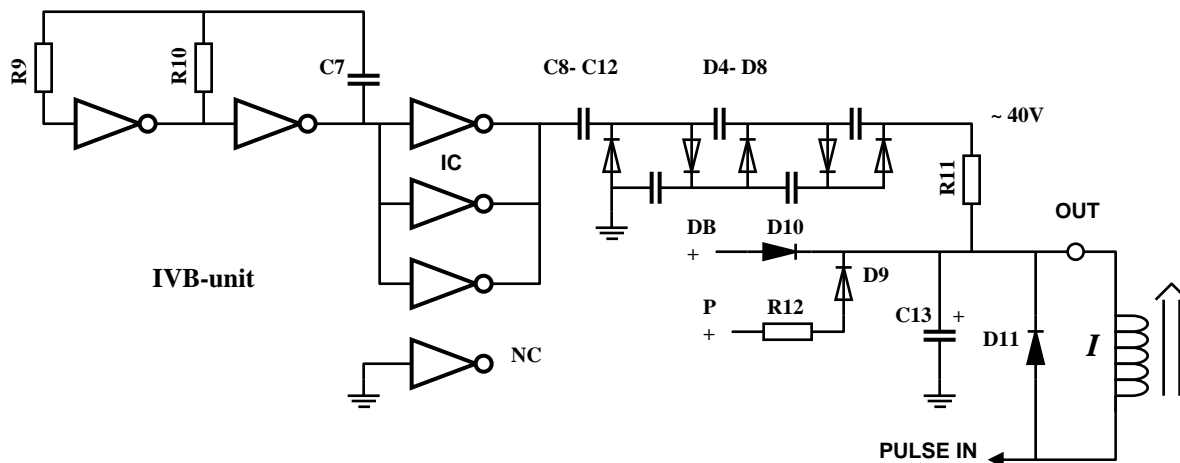
Single side board. Drill only one hole for the relay (M4). All components shall be handled as SMD, thus made, all soldering take place on the same side (component side). The units should be shielded with sheet metal, from the relay to the board end. The sheet metal must bring contact between both GND-markings, or the unit-2 will not work!

PROJECT	RelayUnit for preheat and pulse		
MODULE			
MODEL	PreHEAT		
AUDIT	A-3	DRAWING: 1 of 1	
OTHER	Tested for -15°C: No digressions.		
B. Lindavist		2006-06	

PLACING OF COMPONENTS AND CIRCUIT



Only components that belong to the IVB-variant, is described here.



SMR1206:
R9-10 = 10k

SMC1206:
C7 = 10n
C8-C12 = 100n

Other Components:

R11 = 1000Ω , hole mount
R12 = 220Ω , hole mount
C13 = 470μ , 50V , E-lytic , hole mount

Semiconductors:

IC = 4049 , CMOS-logic , hole mount
D4-9 = BAS32 , surface mount
D10 = SR806 , hole mount
D11 = 1N4004 , hole mount

The inductor-function (for the IFC) facilitated by a voltage shock. So the IVB-unit will slowly increase the voltage on the out-connection when the parking light-switch turn on. The voltage will raised to ~20V after about 15 seconds and ~35V after 30 sec.

IVB current consumption ≈ 3mA

Single side board. All components shall be handled as SMD, thus made, all soldering take place on the same side (component side). The units should be shielded with sheet metal - from the relay to the board end. The sheet metal must bring contact between both ground areas, or the unit-2/IVB will not work!

PROJECT	RelayUnit for preheat and pulse	
MODULE	IVB (Induction Voltage Booster)	
MODEL	PreHEAT	
AUDIT	A-3	DRAWING: 1 of 1
OTHER		
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