

INJECTION-PERIOD EXPANDER - Slim

IPE-S

This is a variation of the same theme as IPE-GS/GP but differs mainly in terms of complexity, number of components and the way to connect it. IPE-S is a simple design based on the earlier IPE-DS, which basically already was top-optimized for the task.

The different against the G-series is that IPE-S requires a break-up of the injector cable (or cables for a sequential injection system). The cable must be cut somewhere; maybe you can make the connection near or inside the fuel control unit (ECU) - if it's a multi-point fuel injection then? In the case of a sequential system, so must each injector be fitted with one IPE-S device. IPE-S will not equalize existing induction transients which are derived from the fuel spreaders magnetic coils, because C1 do not affect them! On the contrary is it D2 that determines the peak voltage, i.e. the supply voltage. IPE-S does not generate any spike-pulse after the injector is closed, such as the G-series does.

Both the G-series and IPE-S support themselves through fuel injectors own power supply. The method IPE-S uses are somewhat clumsy but works satisfactorily and in addition is the power consumption basically negligible. IPE-S can not expand injection opening time less than 1.5 mS. In most cases is the opening time at idle around 2 ms which means that there is a margin against the lowest possible opening time, despites that limitation. For the G-series can one experiment with different proportionality constants, i.e. how linear the device will opens up for different loads - by shifting C4 (a capacitor). IPE-S can only function with one single capacitor size (25uF).

Nowadays is even this circuit endowed with a choke (into a new RCW module), and also two different AFE modules! This pulse extender circuit seemed to be popular and it is easy to understand, for it is a simple and reliable construction.

IPE-S has no additional modules that provide information about if the engine is running too lean or fat. The adjustment is done via a potentiometer that can be placed close to the device or by a cable that is drawn in into the driver's compartment. The right adjustment must be ascertained experimentally.

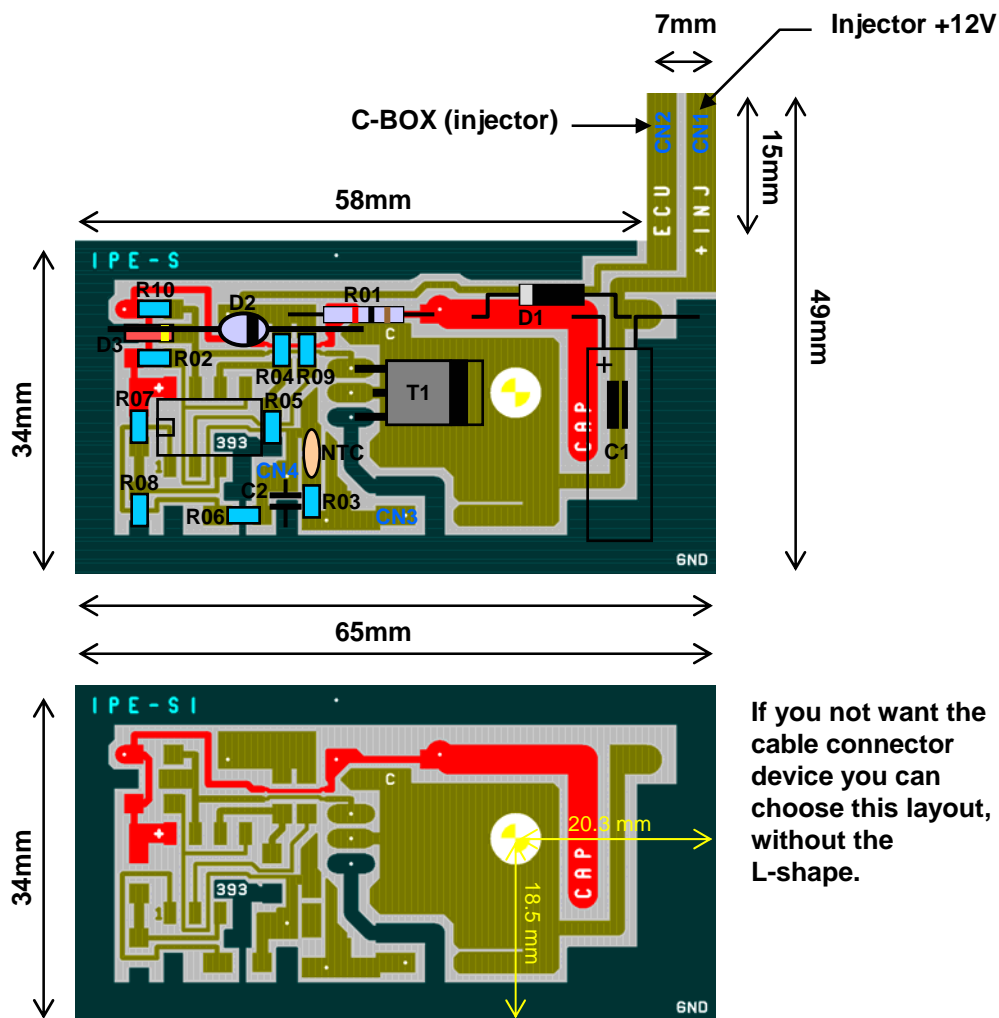
This method manipulates the injector timing device by extending the pulse width of the existing opening injector pulse or the opening time (or increasing the duty cycle). IPE-S measure the time of every injector pulse before itself create a pulse that is proportional in width to the pulse width it just had measure. That means; consideration takes by variation of the pulse width. The condition for the concept is that your fuel injections computer or ECU (Electronic Control Unit) is unaffected if the ECU are disconnected from the injectors?

Usually this is not a problem since the ECU has a resistance R01 who is connected to the main voltage for simulate one injector. The value for R01 can be hard to determine for all cars but if something is wrong or if the computer not are able to detect your injectors, you probably need to lower the value for R01.

[illegible]

PROJECT	<i>Injection-period expander - S</i>	
MODULE		
MODEL	IPE-S	Slim
AUDIT	B-1	DRAWING: 1 of 1
SUPPLY	12V systems	for cars 5-18V
CURRENT	~ 2mA	
OTHER	<i>Tested!</i>	
<i>B. Lindqvist</i>		<i>2011-08</i>

PLACING OF COMPONENTS



SMR1206:

- R02 = 10k
- R03 = 100Ω
- R04 = 22k
- R05 = 330Ω

SMR1206:

- R06 = 47Ω
- R07 = 100k
- R08 = 22k
- R09 = 1k
- R10 = 4k7

Other Components:

- R01 = 1000Ω , coal based , hole mount
- NTC = 150Ω (25°C) , place it under the IC preferably
- C1 = 1000μ , 25V , E-lytic , hole mount
- C2 = 25μ (22μ + 2μ2), 25V , E-lytic , hole mount
- D1 = 1N4004 , hole mount
- D2 = BZT03C , zener 15V or 18V , hole mount
- D3 = Zener , 12V , SMD (if D2>16V)
- IC = LM393N 400nS , dual voltage comparators
- T1 = IRLR3410 , 17A , 100V , logic DPAK or better
- P1 = 470-1000Ω , PT-15NV15/17 , trimpot. (RCW)

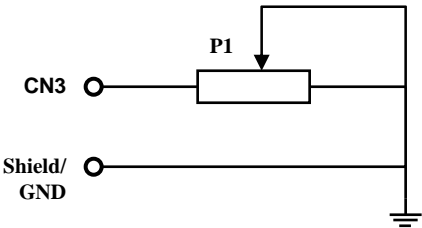
A single side board is enough. T1 don't need a heat sink if you have high impedance injectors? To fix the T1, us solder. All components shall be handled as SMD, thus made, all soldering take place on the same side, the component side. The unit can be shielded with sheet metal.

PROJECT	Injection-period expander - S	
MODULE		
MODEL	IPE-S	Slim
AUDIT	B-1	DRAWING: 1 of 1
OTHER	Tested!	
B. Lindqvist		2011-08

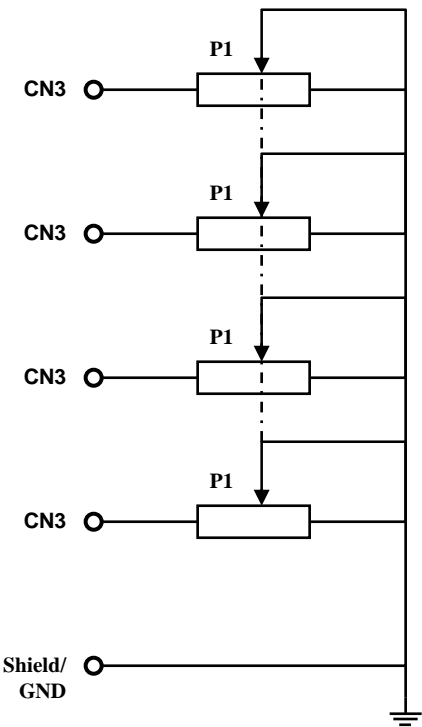
MODULE

Remote Control by Wire (RCW) is the unit who determine the quantity of fuel the car/engine need to run properly. It is a simple rheostat and nothing more. One rheostat are require for every IPE-S - unit. Just turn the rheostat to the right position. The right position is the location where the engine work similar as it do when the tank is filled by pure petrol.

One rheostat:



*Four rheostats,
for four ‘individual’ engine cylinders:*

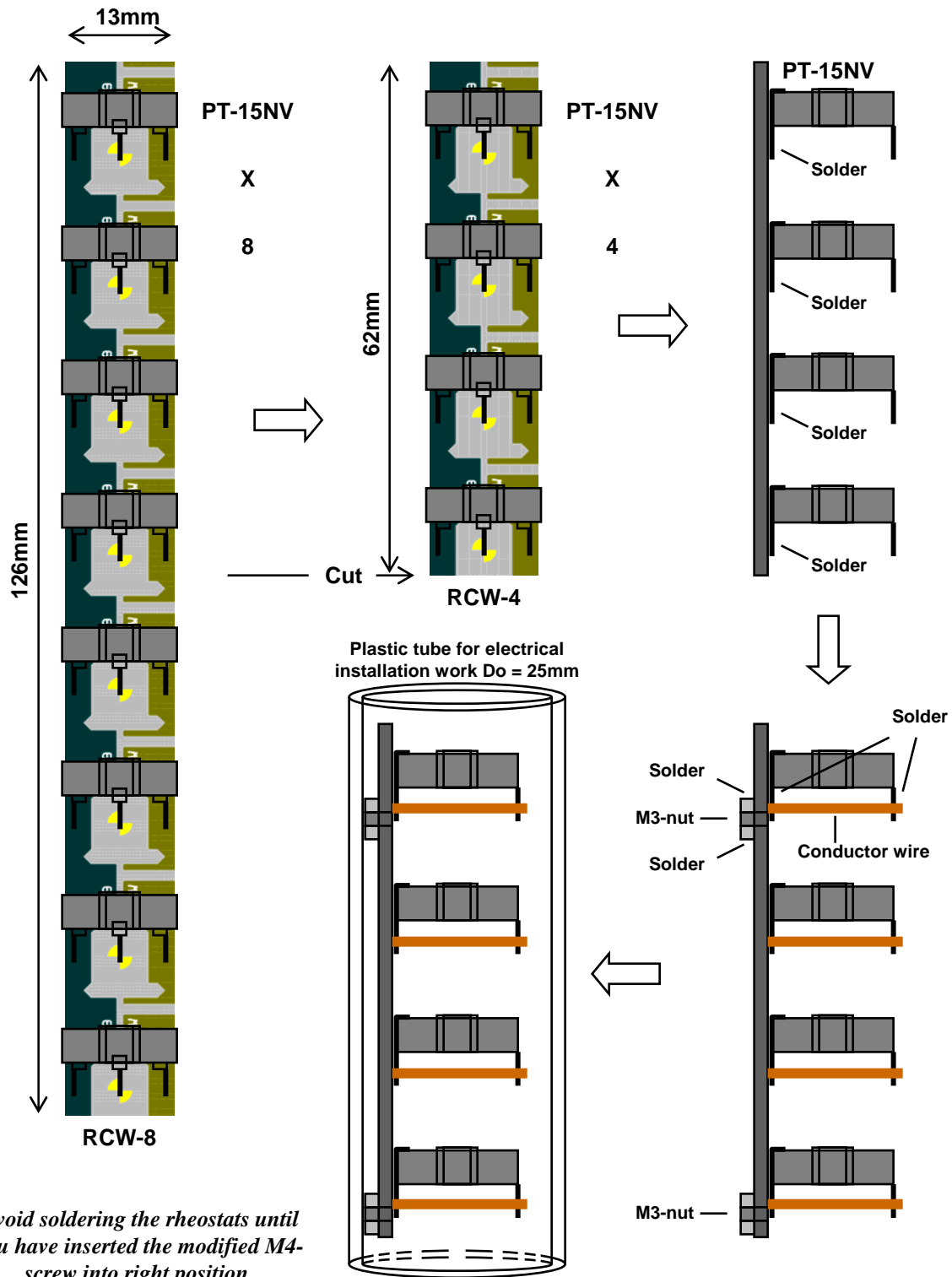


Rheostat:

P1 = 470Ω , PT-15NV15 (trimpotentiometer)
Also PT-15NV17 can been utilized.

PROJECT	Injection-period expander - S	
MODULE	Remote control by wire - S	
MODEL	RCW	
AUDIT	B-1	DRAWING: 1 of 1
OTHER		
B. Lindqvist		2011-04

MODULE PLACING OF COMPONENTS

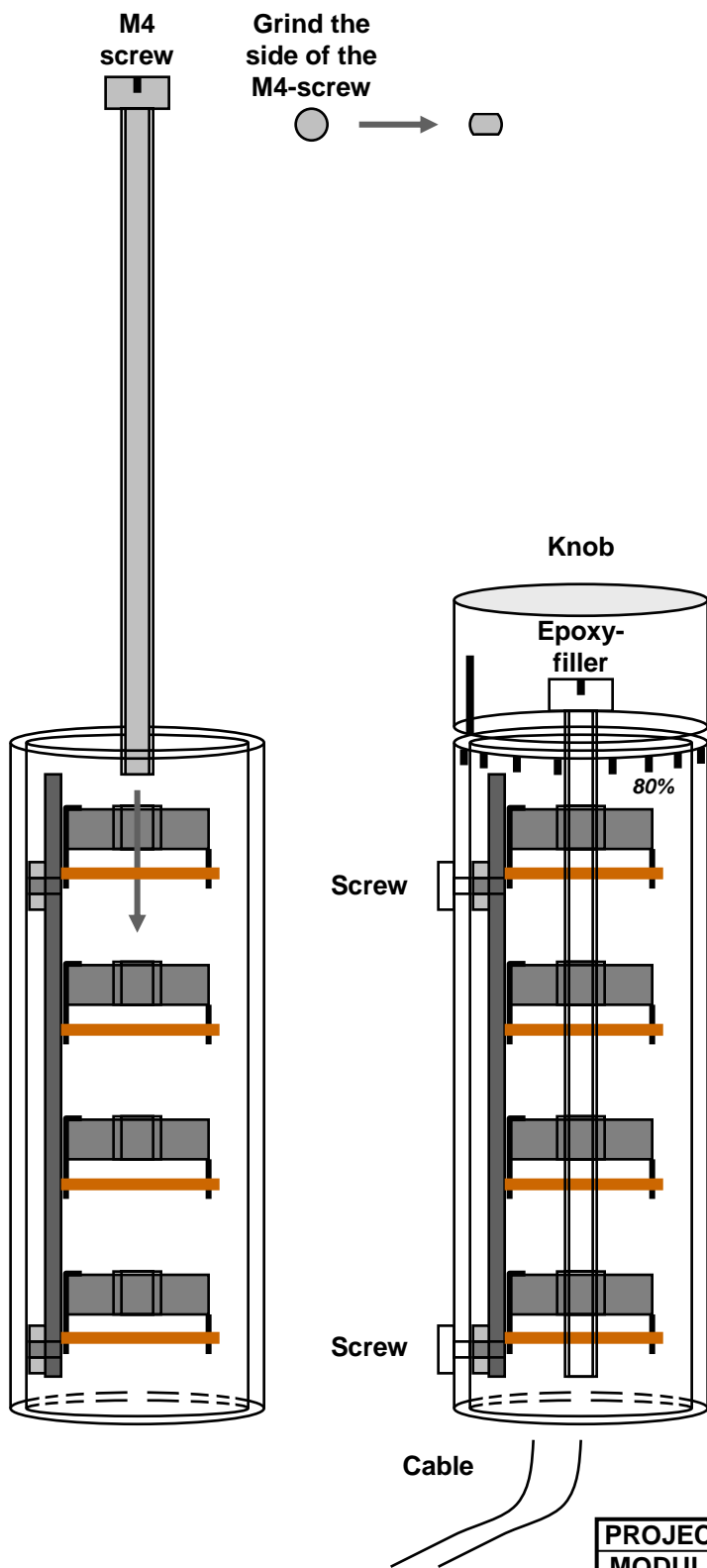


Avoid soldering the rheostats until you have inserted the modified M4-screw into right position.

A double side board is necessary because nuts must be soldered on the other side of the board.

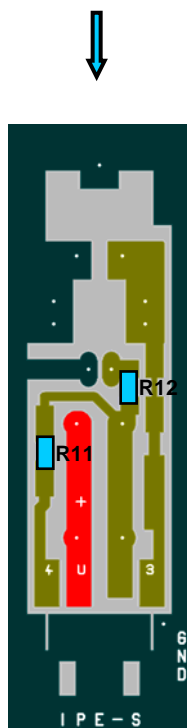
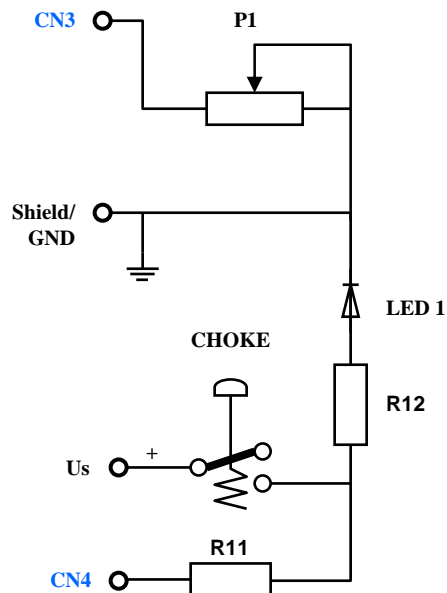
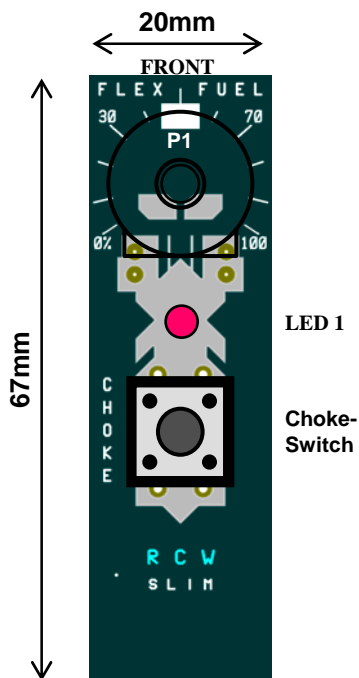
PROJECT	Injection-period expander - S		
MODULE	Remote control by wire - S		
MODEL	RCW		
AUDIT	B-1	DRAWING: 1 of 2	
OTHER			
B. Lindqvist		2011-04	

MODULE PLACING OF COMPONENTS



PROJECT	Injection-period expander - S	
MODULE	Remote control by wire - S	
MODEL	RCW	
AUDIT	B-1	DRAWING: 2 of 2
OTHER		
B. Lindqvist		2011-04

MODULE PLACING OF COMPONENTS AND CIRCUIT DIAGRAM



As the number of cars with multi-point type of system is higher than other variants, exist a need of a multi functionally RCW module - but that not is suitable in sequential systems.

Even a choke will fit and totally requires four lines from the IPE unit to this type of RCW module. Many types of signal cables from the telecommunications and the computer world can certainly be used here.

SMR 1206:

R11 = 27k

R12 = 1k

Other components:

P1 = 470-1000Ω , PT-15NV(17) , hole mount

Also PT-10 / PTC-10

LED1 = Red , EL1224URC (or similar)

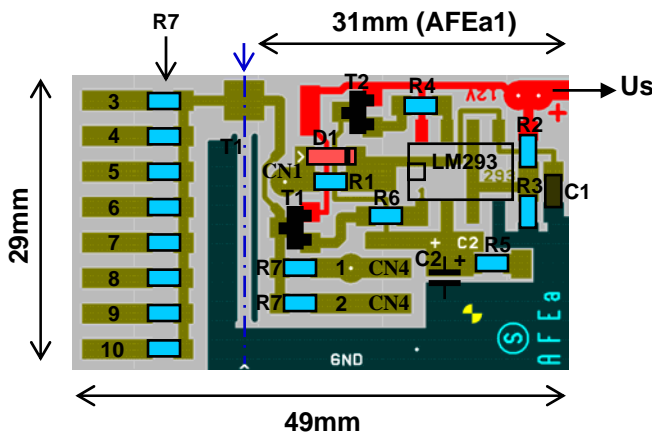
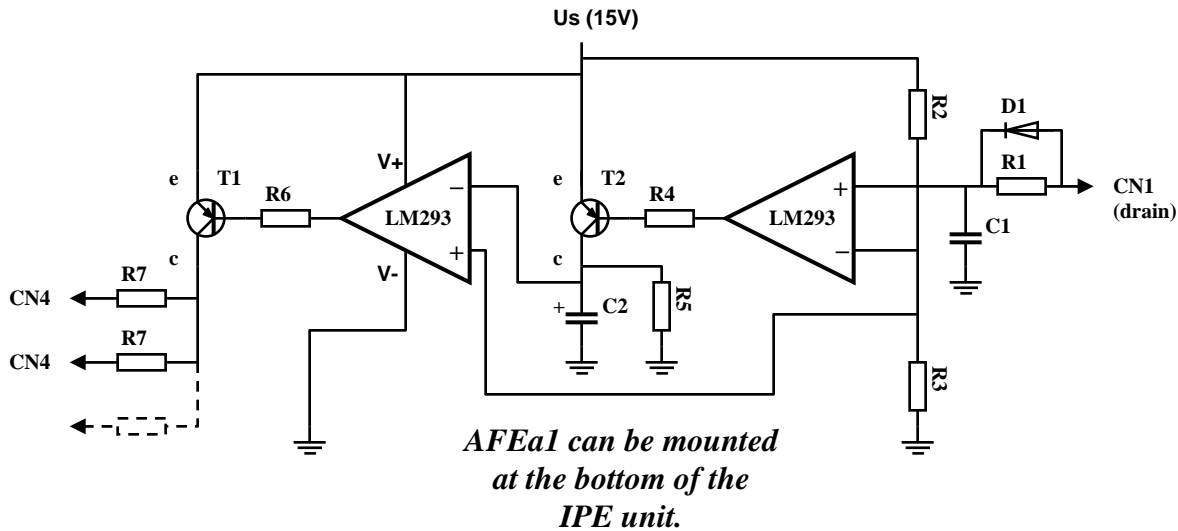
Choke-switch = TACT-Switch, snap-in type

This module require a double side board and a number of holes must be drilled, since it contain both surface- and hole mount components.

PROJECT	Injection-period expander - S	
MODULE	Remote control by wire - S	
MODEL	RCW	
AUDIT	B-1	DRAWING: 1 of 1
OTHER		
B. Lindqvist		2011-08

MODULE PLACING OF COMPONENTS AND CIRCUIT DIAGRAM

Automatic fuel enrichment, during the time the engine still not has reached the required operational temperature, is actually a requirement the fuel E85 have onto a converted petrol car, and this to avoid that it does not running lean before the engine become hot. A timer circuit which is triggered by the large pulse width the choke gives rise to, make sure that the extra enrichment activities will be activated during a given period. Thus bypassing the need for having to measure the engine temperature (use a NTC resistor).



SMR1206:
R1 = 100k
R2 = 22k
R3 = 2k2
R4 = 22k
R5 = 1M*
R6 = 100k
R7 = 330k *Enrichment ~10%*

SMC1206:
C1 = 47n

* R5 can be an NTC-100k in serial with 680k

If the choke is activated at a cold start will the circuit be active for about 7 min. The choke must be pressed for at least one second to ensure that C2 become completely filled. If this happens will R7 be connected in parallel with R02 and the amount of fuel to the engine is then slightly higher.

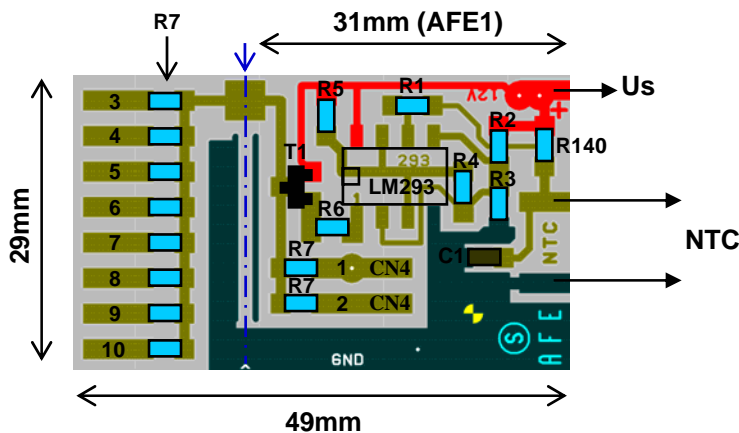
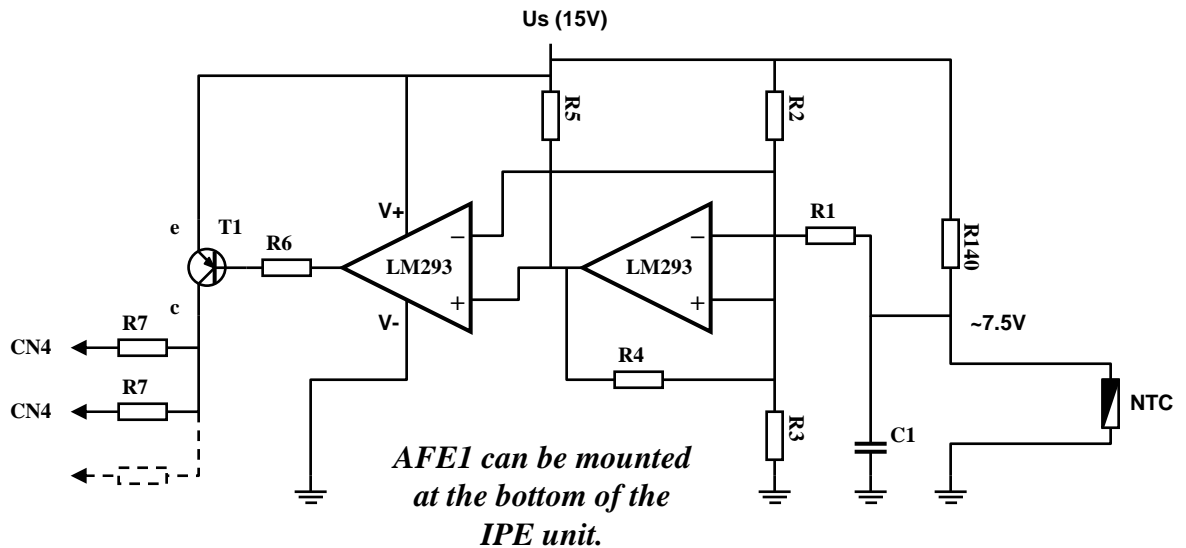
Other components:
C2 = 470µ , 25V , E-lytic , hole mount
D1 = BAS32 , SMD
T1 & T2 = BC857B
LM293/2903 = Low power dual voltage comparators

The module requires only a single side board.
No hole need to be drilled for any component.

PROJECT	Injection-period expander - S	
MODULE	Automatic Fuel Enrichment a	
MODEL	AF Ea S	
AUDIT	B-1	DRAWING: 1 of 1
OTHER		
B. Lindqvist		2011-08

MODULE PLACING OF COMPONENTS AND CIRCUIT DIAGRAM

Automatic fuel enrichment, during the time the engine still not has reached the required operational temperature, is actually a requirement the fuel E85 have onto a converted petrol car, and this to avoid that it does not running lean before the engine become hot. A NTC resistor mounted on the engine block is controlling when the extra fuel contribution shall occur and for a maximum of ten IPE-S units (for sequential fuel systems).



SMR1206:

R1 = 4k7
R2 = 100k
R3 = 100k
R4 = 1M
R5 = 100k
R6 = 100k
R7 = 330k *Enrichment ~10%*

SMC1206:

C1 = 100n

When the engine reached 140 degrees Fahrenheit is it time to switch over to normal opening time and it is the value of R140 which determines when the shift will happens. The easiest is to use an ohm-meter and measure the NTC resistor and then choose the same shift value on R140.

Other components:

T1 = BC857B
R140 ~ 15k (NTC47k) or 18k (NTC100k) , SMR1206
NTC = 47k-100k at 25°C (fixed on the engine block)
LM293/2903 = Low power dual voltage comparators

The module requires only a single side board.
No hole need to be drilled for any component.

PROJECT	Injection-period expander - S		
MODULE	Automatic Fuel Enrichment		
MODEL	AFE S		
AUDIT	B-1	DRAWING: 1 of 1	
OTHER			
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PHOTOS

