Original in Swedish: http://www.flexitune.se/document/FLEXITUNE-II-Anvandarmanual.pdf

Initial English translation by Hervé Layec alias CEYAL

Disclaimer: In case of any discrepancies between the original and the translation, the original remains

## 1. Introduction

Congratulations! Now, you can begin to drive environmentally friendly on a simple way with your common petrol car.
Flexitune is designed to cope with Swedish climate so it will take car of both low and high temperatures, otherwise the electronic part will not work properly. Moreover, the components meet increased environmental requirements and lead-free soldering.
Installation is very easy and does not require specific competences.

Please spend some time to read this manual entirely before beginning installation!

Important! This version of Flexitune can only be installed on cars with a fuel injector system.

Below, a picture of Flexitune II :


### 1.1 Installation

This chapter deals with installation of FlexituneII but there is also information in the chapters Connections and Connection guide.

### 1.2 Important

It is important to check if the fuel injector is a low resistance type (approximately 1-6 ohms). In this case, most often one resistor is linked in serial manner with the fuel injector. In certain cars the additional resistor is external while sometimes it sits built-in in the ECU.
If there is an external resistor, then you can connect Flexitune directly but if there is not such external resistor, then you must complement with such a 4-8 ohms and 20W power resistor (e.g. ELFA part number 60-048-65, www.elfa.se).
If the fuel injector is a high resistance one (10-15 ohms), then you can directly connect Flexitune II (without additional resistor).

### 1.3 Good to have before installation :

1. Small flat screwdriver (approximately 2-3 mm point) for adjustment of Flexitune
2. Cable bands in order to affix cables and Flexitune
3. Cable shoe pliers *(Cable shoes (insulated mal/female and screw cable shoe for gnd)to connect Flexitune)*
4. Cutting pliers in order to cut of cable
5. Knives in order to cut any length of cable
6. Installation cable (approximately 2-4 metres 1.5 mm2)
7. Multi metre to facilitate installation

### 1.4 Additional functions in Flexitune requires (up to you to install):

1. A three ways switch (to select petrol only or ethanol only)
2. One LED for 12V/15mA
3. One pushbutton

### 1.5 Where to install Flexitune

A possible location is on the wall between the engine bay and the passenger's compartment. Assembly at about 1 meter high is an excellent location in order to avoid dirt and because it is simpler to adjust the screws. Flexitune can also be assembled in the passenger's compartment if desired.

## 2. Connections

### 2.1 Terminal labeled 12V

There are several ways to connect Flexitune. A first solution is to link directly to the car's battery and the other is to link it to the car's ignition.

#### 2.1.1 Direct to the battery

To the battery (install it approximately 20 centimeters from the battery's PLUS pole via a 6-10A fuse)

#### 2.1.2 Via the Ignition

No fuse is needed. Flexitune can be disconnected from 12V when the car's ignition is off.

Note: Please pay attention that it must remain some voltage when the engine is powered off.

**Advice!** Coil gets power via the ignition key, it is then possible to connect Flexitune to coil as coil will be set on and off with the ignition key. Measure with a multimeter when the engine is running which of the 2 cables connected on coil will provide the highest voltage (both can to have voltage but the one with highest voltage will be used). Connect then Flexitune terminal labeled 12V to this coil connector.

**N.B.** on certain cars it is not possible to connect on coil!

### 2.2 Terminal labeled GND

To be connected to ground

### 2.3 Terminal labeled ECU

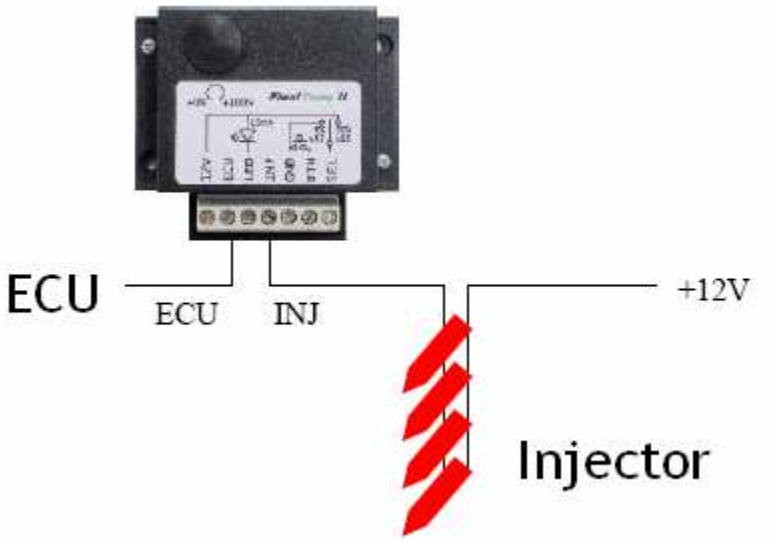
To be connected to the car's ECU. (Before Flexitune is installed, this cable goes normally from the car's ECU to the fuel injector. The cable is cut into two parts and the part that comes from the ECU is connected to the connection point labeled ECU on Flexitune)

### 2.4 Terminal labeled INJ

To be connected to the fuel injector. (Before Flexitune is installed, this cable goes normally from the car's ECU to the fuel injector. The cable is cut into two parts and the part that goes to the fuel injector is connected to the connection point labeled ECU on Flexitune)
(Please refer to any possible specific instruction/information in relation with the considered car)
Below, a principle scheme how Flexitune is connected to the fuel injector and the car's ECU. See also the chapter Link's diagram.

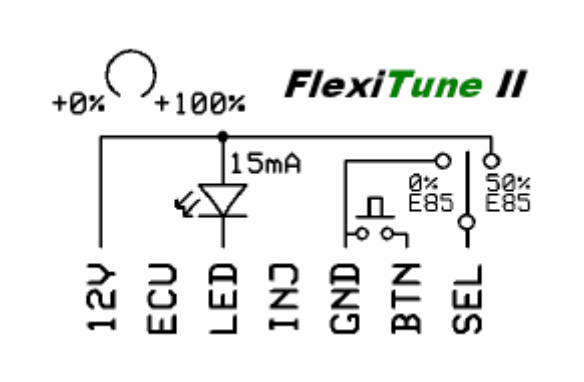
Before Installing Flexitune


After Installing Flexitune




| | |
|---|---|
| 12V | +12 Volt |
| GND | Ground |
| INJ | Fuel Injector |
| ECU | ECU |
| SEL | Selection of fuel type |
| BTN | PushButton |

LED LED




**2.5 Connection guide – step by step**

1. Link 12V on Flexitune to +12 V, for example to that very connector which coil gets power from: check with a multimeter which cable on coil gives the highest voltage (both can have power but the one with the highest voltage has to be used), where Flexitune terminal labeled 12V is to be connected.
    i. **Note 1!** To perform the test with the multimeter, the engine must be running, it is not enough the ignition to be on.
    ii. **Note 2!** On certain cars it is not possible to connect on coil!
2. Link GND on Flexitune to ground
3. Have fuel injector connectors lifted off from any contacts and lets them off during entire installation (it is important that all contacts be lifted off, otherwise the voltage measurement in next point may be wrong)
4. Power on the ignition (on certain cars it is necessary to have the engine running) and measure with a multimeter which one of the two wires of the fuel injector connector does not carry +12V (measure between ground and each wire of the fuel injector connector). It can remain a small voltage on this wire but it will not reach 12 V or more
5. Note the colour of the wire that did not have +12V
6. Power off the ignition
7. Follow the cable that did not have +12V until you find an appropriate place for Flexitune
8. Extend the length of the original cable with a new one with the correct colour (as noted earlier)
9. Cut the original cable and assemble cable connectors at both ends (a male and a female, so that it will be possible at any latter occasion to reconnect the original cable again; use isolated cable connectors).
10. Engage INJ from Flexitune to the cable that comes from fuel injector (measure with the multimeter the overall resistance in order to see that you have a sound cable)
11. Engage ECU to the other cable that goes to the car's ECU
12. Set back every fuel injector connector
13. Check all contacts and connections an additional time

**3. Initial adjustment**

Start may happen simply after the assembly if the car tank already contains E85. The choke may be used for cold start.
If the car tank contains petrol you can adjust down the potentiometer to the left situation to drive on petrol. Alternatively connect SEL to ground in order to drive on full petrol.
After a full tank with E85, disconnect SEL from ground (this can be done advantageously via a switch to be installed on appropriate place) and adjust to approximately 25-30% increase (left/right: 0/100% increase).
Flexitune is delivered with an initial position set to approximately 25-30% increase of the fuel amount. This position has shown itself to fit most cars for a 100% E85 operation.
The adjustment is simple, find a situation that is approximately 30% of the scale from the left situation. It corresponds to approximately 30% increase of the fuel amount. Possible adjustement is from 0% increase leftmost (=petrol operation) and 100% increase rightmost (double fuel amount).

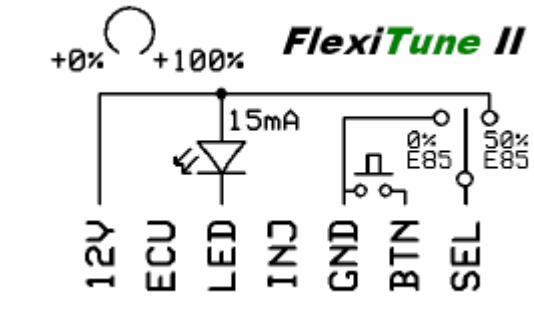

Remove potentiometer Cap for adjustement  Adjustement screw

## 4. Additional functions (up to you to install)

### 4.1 Overview of additional functions

· Petrol situation (SEL) - is linked to ground in order to drive on petrol
· Mixed situation (SEL) - is linked to +12V in order to drive on 50/50, E85/Petrol
· Button choke (BTN) - is linked to a pushbutton to be linked to ground in order to choke manually
· Choke via delayed ignition - this requires that Flexitune is connected in such a way to be powered when the ignition is set on

Decalcomania on Flexitune describes how the functions will work



**Advice!** Use a 3 way switch for SEL for smooth selection between Petrol, E85, mixed petrol/E85.

### 4.2 LED Description

LED is a connector to drive a LED. Connect pole + of the LED to +12V and pole – of the LED to Flexitune. The diode indicates the number of times the pushbutton is depressed (corresponding to choke before the ignition). It blinks also too when Flexitune is started up (when 12V is powered on). It shows also current dutycycle for fuel injector. Any type of brand LED may be used (provided it draws up to 15mA); no restriction for power limitation.

### 4.3 SEL Description

To be connected via a switch to ground: in this case, it indicates Flexitune about the fuel amount in order to run with full petrol operation.

To be connected via a switch to +12 volts: in this case, it indicates Flexitune about the fuel amount in order to run with a mixture of 50% petrol and 50% E85.
Such a situation may happen if you are forced to add petrol, e.g. if you drive in cold weather and find deep problems with cold start.

### 4.4 Choke description (BTN)

To be engaged via a pushbutton to ground. Each action on the pushbutton increases the choke level. Maximum choke level is five prints. If one wants to restore the choke to" 0" (no choke) hold the button at least 2 seconds (until LED off).

Flexitune has to be connected to the 12V via the ignition; when you want to use the choke button, you must first set the ignition on (the built-in choke that is activated via delayed ignition is shut down at the first print on the button choke. Only the choke button decides how much choke is to be used at start).

The choke is restored automatically after a certain time that depends on how much choke has been activated. The choke does not need to be deactivated manually.

### 4.5 Description of choke via delayed ignition

Flexitune has a "delayed ignition" choke before initial start. You can delay the ignition between approximately 1-5 seconds in order to achieve a lot of choke effect before initial cranking of the engine. The choke level is increased over time up to when you feel there is enough choke for the current car and temperature.
To abort the choke via delayed ignition, hit the ignition key or hold the choke button for at least two seconds.

- **Note 1!** If the key is left with the ignition for more than 15 seconds the choke is entirely aborted .This is done in order not to choke unnecessarily while having the ignition on for instance in order to listen on radio or such.
- **Note 2!** If you activate the choke button, choke via delayed ignition is aborted and the choke button drives the choke in instead.

- **Note 3!** In order to have Flexitune with delayed ignition choke, Flexitune must be linked in such a way it gets power first when the ignition is hit on.

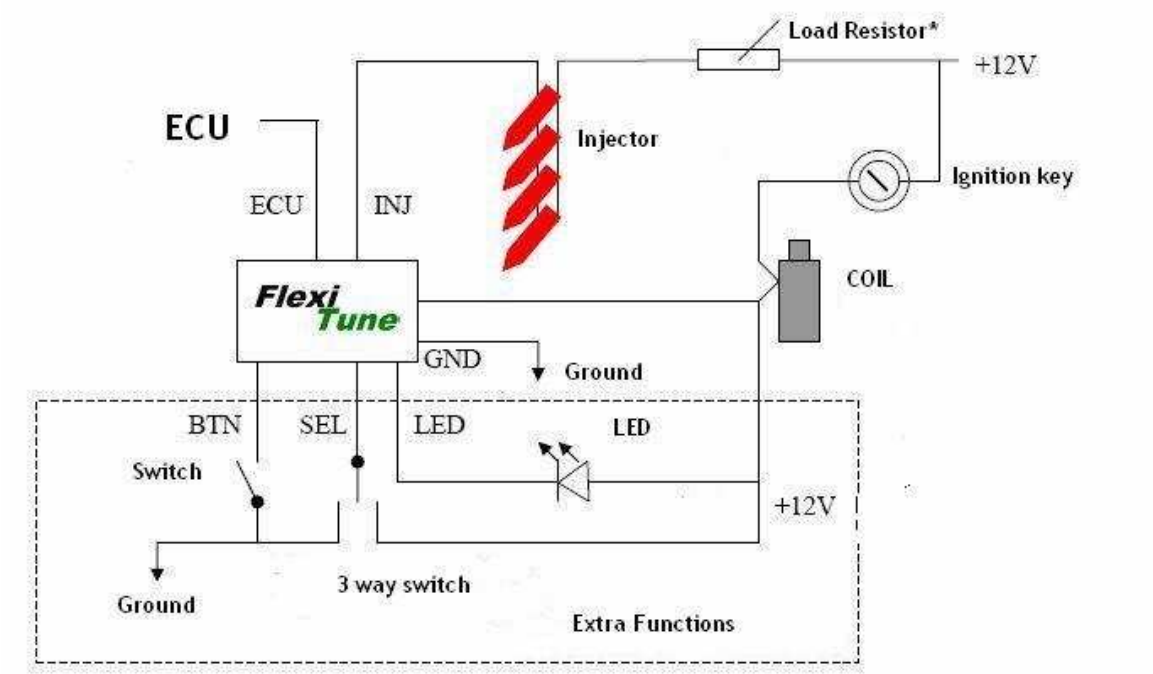
Example of command panel

Picture of Flexitune command panel in a Volvo with LED, 3-way swich and pushbutton

## 5. Coupling diagram

### 5.1 Example on connection via the ignition

In this example Flexitune gets power when the ignition is hit. With such a connection, it is possible to use "choke via delayed ignition". In this case you do not need to depress the choke button if you do not want to. The power to Flexitune is taken from the car's coil, where is namely 12 volts then the ignition be hit to.

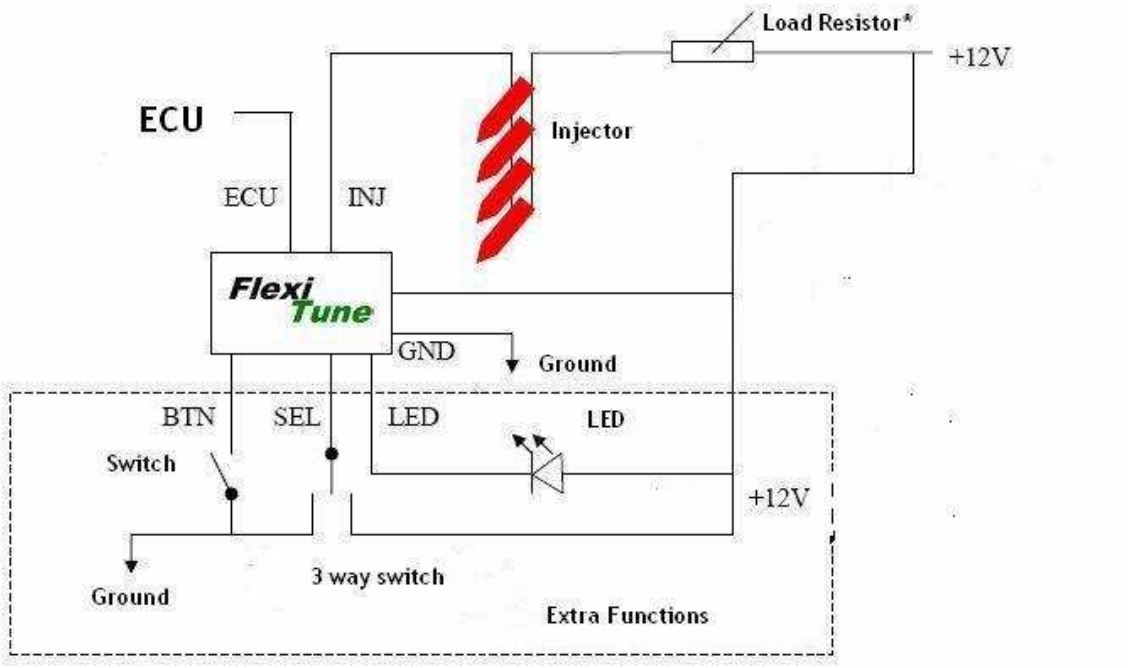



---- **Note!** Measure the coil with a multimeter to find where there is 12-13V when the engine is cranked; Flexitune has to be connected there. ---

LED is a connection to drive a LED. An appropriate LED is on Biltema catalog, article n°: 43 - 870
* a Load resistor is most often required with low impedance fuel injector, e.g. in FA catalog n° 60-048-65.
See also above mentioned section 2

### 5.2 Direct connection to battery

In this case, Flexitune is directly connected to the battery +12 Volts. It functions excellently but choke via delayed ignition does not function. It is then recommended that the choke button be used in this case. One should also use a fuse (approximately 6-10 amperes) in the vicinity of the battery (not shown on the picture).




LED is a connection to drive a LED. An appropriate LED is on Biltema catalog, articles n°: 43 – 870 (www.bitlema.se)
* Load resistor is most often required with low impedance fuel injector, e.g. in ELFA catalog n° 60-048-65. (www.elfa.se)
See also above mentioned section 2

## 6. Additional functions Guide

### 6.1 Choke

1. Choke via delayed ignition is governed up to 5 seconds before initial cranking. In order to abort the choke, hit off the ignition (if the ignition is on for more than 15 seconds choke is automatically aborted)
2. Choke via choke button may be set up to 5 levels: 1, 2, 3, 4 or 5 prints before initial cranking. In order to abort the choke, depress the push button for at least 2 seconds

3. Choke is gradually activated and happens automatically for some time. The time depends on how much choke has been activated, more choke giving longer time.
At cold start in winter you may need to try several initial values; try to start with full choke, if the car does not start, wait for some seconds and do it again with choke. If the car still does not start, try then to start without choke the third time.

### 6.2 Petrol - and mixed Petrol/E85

1. Set the switch into the petrol situation if you have full petrol or up to 15% E85 in the tank
2. Set the switch into the mixed situation if you have approximately 35-65% E85 in the tank
3. Set the switch away from both positions when running on E85 (85-100% E85 in the tank)

The above mentioned percentages may vary depending on car models and the above given values should be seen as simple recommendations.

### 6.3 LED

LED has the following functions:
1. Indicates when the ignition is hit (when Flexitune is connected to 12V via the ignition)
2. Indicates button pressures
3. Indicates choke levels with up to 5 blinks (the corresponding number of button pressures)
4. Indicates when the choke is aborted e.g. when hitting on the ignition and choke time-out (approximately 15-30 seconds).
5. Indicates when choke is aborted when hitting the pushbutton
6. Indicates dutycycles for fuel injectors (not active as standard):
    - 80%: diode blinks slow
    - 90%: diode blinks more quickly
    - 100%: diode blinks quickly

### 6.4 Dutycycle monitoring of fuel injector

Activation and deactivation
As standard duty cycle monitoring is deactivated and must be activated when desired.
· Activation: Hold on the choke button meanwhile the ignition is hit to, then release the button.
· De-activation: Hold the choke button meanwhile the ignition is hit to, then release the button.
· Duty cycle monitoring inactivity is indicated via the diode blinking once exactly when the ignition is hit
· Duty cycle monitoring activity is indicated with two short blinks when the ignition is hit.
**N.B.** it is required that Flexitune is linked via the ignition in order to the above will function.

### 6.5 Over power protection on fuel injector

The circuit that drives the fuel injectors is very powerful. If by mistake you shorts this circuit there is a big risk that something can get damaged. Flexitune has therefore a over

power protection which becomes active when the power through the fuel inhjector wire becomes too high. This typically happens in case of a low impedance injector and a line obstruction. Such obstructions are normal in cars with low impedance fuel injector and then it is of no problem. When an over power is detected, Flexitune opens the circuit and the LED is lit during 3 seconds, whereupon Flexitune tries again.