Universal Trip Computer (UTCOMP)

User & assembly manual

Last update: ***2012-10-13,***

UTCOMP version: ***2.0.X***

The latest software and manuals can be downloaded from technical support manufacturer's website.	
www.reveltronics.com	*technical support:* *support@reveltronics.com*

Contents

1. General information

1.1. Description

Universal Trip Computer (UTCOMP) is an on-board computer designed for motor vehicles. It has useful functions such as: thermometer (temperatures measurement inside and outside vehicle), fuel consumption measurement (average and real-time), velocity, distance and accelerations measurement, voltmeter and much more. It has also more advanced functions for more advanced users, eg. AFR, vacuum and boost gauges, analog signal inputs (e.g from O2 lambda sensor) and more. UTCOMP takes information from main sensors then process data and sends to LCD or OLED screen with user friendly interface. Onboard computer is equipped with USB interface so it can be configured in many ways via dedicated PC software. UTCOMP is also known as UKP on Polish market.

1.2. Unit functions

The user is supported with useful and practical functionality like:

- velocity (units: km/h and mph),
- real-time fuel consumption (units: l/h and l/100km ,gph and mpg, l/h and km/l),
- average fuel consumption (units: l/100km, mpg, km/l),
- distance (from refuel or reset),
- fuel level in fuel tank(s),
- estimate distance to refuel,
- independent daily/travel counter (travel time, average speed, max speed, distance, average fuel consumption, travel costs),
- full support for cars with LPG system (independent consumption and distance measuring),
- date and time,
- temperature measurement (inside and outside),
- user temperature - analog temperature sensor can be adopted (typical coolant temperature sensor can be screwed into engine cylinder block, engine head or oil sump),

- automatic acceleration measurement with user defined range (eg. 0-60 mph, 60-120 km/h, 0-400m, 1/4 mile etc.),
- ability to connect up to two analog sensors (max 0-5V) with oscilloscope function (draw signal on display), eg. lambda sensor, wideband O2 sensor, pressure sensor (vacuum / boost), TPS etc.
- support for wideband controller of oxygen sensor (0-5V, ability of calibration U(AFR) linear function) - AFR gauge,
- support for vacuum/boost sensor (0-5V, ability of calibration U(bar) linear function) - BAR or PSI units,
- voltmeter - battery voltage measurement,
- cooling fan status (on/off),
- headlight reminder,
- car mileage,
- black ice warning,
- temperature alert (sound buzzer warning) - if temperature from analog sensor (eg. coolant temperature, oil temperature etc.) is to high (user own level setting is possible),
- additional user screen - fully customizable,
- possibility to enable/disable each screen,
- possibility to change units (metric/imperial),
- possibility to change font style,
- multi-language menu: english, german, polish,
- user splash screen (text or graphic - import from bitmap files),
- lcd brightness adjustment (from menu),
- communication with PC via USB interface (PC application is working on Windows XP, Vista, 7 and 8) - possibility to change all settings using PC,
- and much more...

All UTCOMP functions are described in details in this manual.

1.3. Functioning and requirements

To achieve the main functions only two signals from engine equipment are required (vehicle speed signal and fuel consumption signal).

To show the vehicle speed it is required to get the Vehicle Speed Signal (VSS) – from Vehicle Speed Sensor (VSS) or from ABS control module. VSS is located usually in gearbox and it sends real-time speed signal to main ECU (Engine Control Unit) and/or to instrument panel (tachometer). Almost every car with injection system has such sensor (so most of cars since '92 are supported with). The most popular is Hall sensor which generates pulses proportional to speed (usually from 3 to 8 pulses for one turn of the wheel). UTCOMP counts up these pulses in real-time. Knowing constant VSS [m/imp] UTCOMP will show real speed and distance on the screen (UTCOMP software can easily calculate VSS constant). It is possible to calibrate velocity with GPS accuracy. More info about finding and connecting speed signal can be found in assembly instructions (Chapter 2).

To show fuel consumption (real-time and average) there is fuel consumption signal required. In petrol and petrol + gas engines you can get signal directly from injector (injection timing changes according to engine load, rpm etc.). In diesel engines (with electronic injection pump or common-rail) you need dedicated signal for fuel consumption. Generally such signal is called as "fuel consumption signal" or "trip computer" and can be found in ECU outputs (main Electronic Control Unit). In some common-rail diesel engines (which do not have dedicated fuel consumption signal) you can achieve fuel consumption measurement in alternative way - you can get also injection timing (from one of injectors) and fuel pressure signal (from C-R fuel pressure sensor). When you have appropriate signal(s) connected than it is possible to exactly calculate fuel consumption. In this purpose the injection constant [l/s] must be setup. UTCOMP software is able to calculate and setup this constant in easy way. After calibration UTCOMP can show average consumption with better than 1% accuracy. More info about how to calculate injection constant can be found in calibration section (Chapter 3.3).

To activate following features of the UTCOMP further signals have to be connected. What kind of signal for each sensor is required shows the table below.

UTC Functions	**Signal required**	**Number of wires required**
speed, distance, acceleration measurement, average fuel consumption etc.	speed signal from VSS (Vehicle Speed Sensor) /OR ABS control module /OR instrument panel	1
fuel consumption (real-time, average)	fuel consumption signal *for petrol or petrol+gas engines*: injector timing, *for diesel engines*: dedicated fuel consumption signal OR injector timing + fuel pressure.	1 (2)

LPG (for cars with gas system)	low level 0V (petrol supply), high level +5V or +12V (LPG/gas supply) – signal from LED (in LPG switch) or electrovalve solenoid	1
cooling fan info signal OR headlight reminder	low level 0V (fan cooler OFF / headlights OFF), high level +12V (fan cooler ON / headlights ON)	1

Power supply from battery and from ignition switch must be connected too. More details can be found in assembly notes.

PC software can be used to configuration and personalization of the device. Configuration can be done also directly from LCD menu - PC computer is not required. Software is working on Windows XP, Vista, 7 and 8. You can download software from our page free of charge (technical support tab).

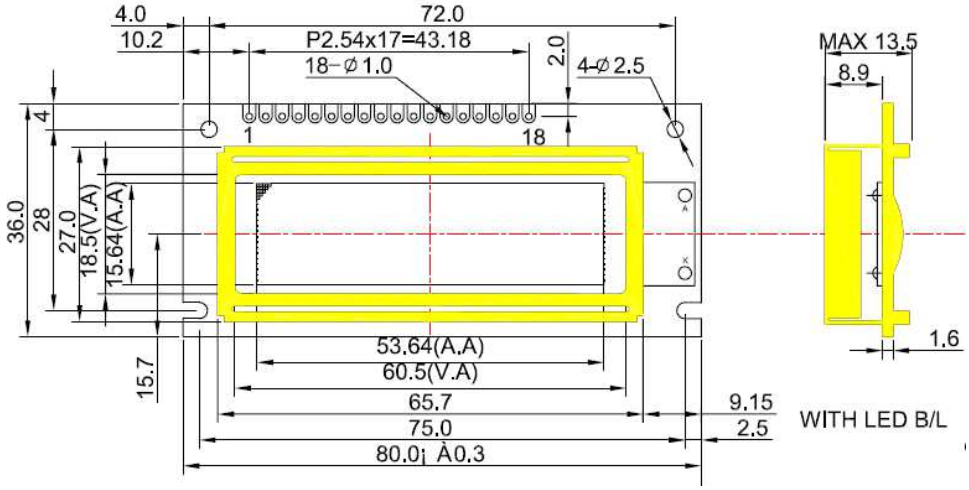
1.4. Technical parameters

- power supply: +12V DC (safe range +9...+16V DC),
- current consumption: max 160mA for LCD version, max 80mA for OLED version,
- current consumption in standby mode (ignition off): max 30mA (typ. 25mA),
- operating temperature: -40C...+85C,
- LCD operating temperature: -20C...+70C (recommended +10C...+40C),
- OLED operating temperature: -40C...+85C,
- temperature sensors measurement range: -40C...+120C,
- temperature measurement accuracy: 0,5C (0,1C resolution),
- vehicle speed accuracy: +/- 1km/h or mph (calibration is possible)
- acceleration measurement accuracy: +/- 0,1s,
- fuel consumption accuracy: 1% for petrol engines, 2% for petrol + gas engines, 1-3% for diesel engines (calibration is possible),
- sampling time of real-time fuel consumption: average from 1s, 2s or 3s,
- sampling frequency from analog sensors: 25Hz,
- analog sensors measurement accuracy: +/- 0,1 [V] or 1/32 range [V] (in oscilloscope representation),
- voltmeter accuracy: +/- 2% range (possibility of calibration),
- communication with PC via USB 2.0 (HID)

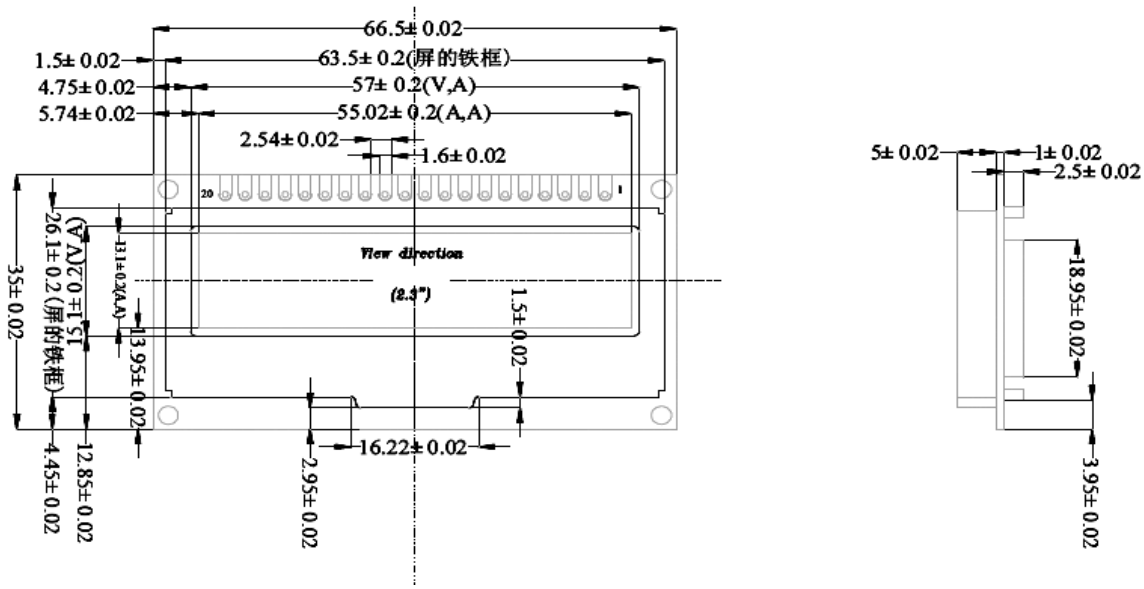
UTCOMP module dimensions:

- width: 6,5 [cm]
- length: 9,0 [cm]
- height: 2,0 [cm]

LCD 2,5” dimensions [mm]:



OLED 2,3” dimensions [mm]:



2. Assembling manual

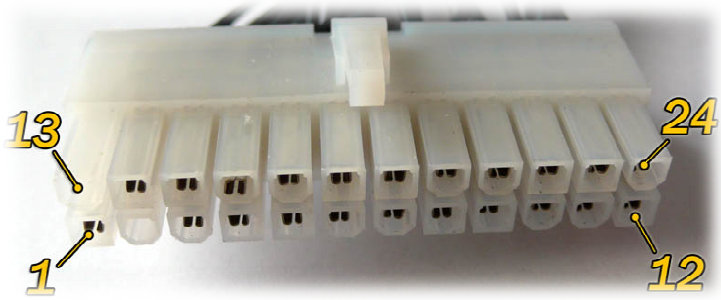
IMPORTANT: Read the following instruction before installing UTCOMP. The warranty does not include damage caused by improper installation.

2.1. General remarks

The device has a 24-pin MOLEX connector. The kit comes with a plug with cables to solder. **Pay special attention to the numbered pins** (not colors). All cables used to be install must be the dedicated automotive, recommended 0.3 – 0.5 mm^2 (AWG20 or AWG22 recommended) cross-section with insulation resistant to mechanical damage (abrasions, cracks etc.). All connections must be effectively soldered and hotair shrink insulation. First you need to solder all the needed wires to the pins, and only then connect the plug to the socket device. **Before the first connecting plug to the device, make sure that the appropriate signals have been soldered to the corresponding pins of the plug.** Connect the LCD display before connecting the 24-pin connector.

2.2. Pinout

The following photos show the plug and connector in the UTCOMP with numbering and marking pins:



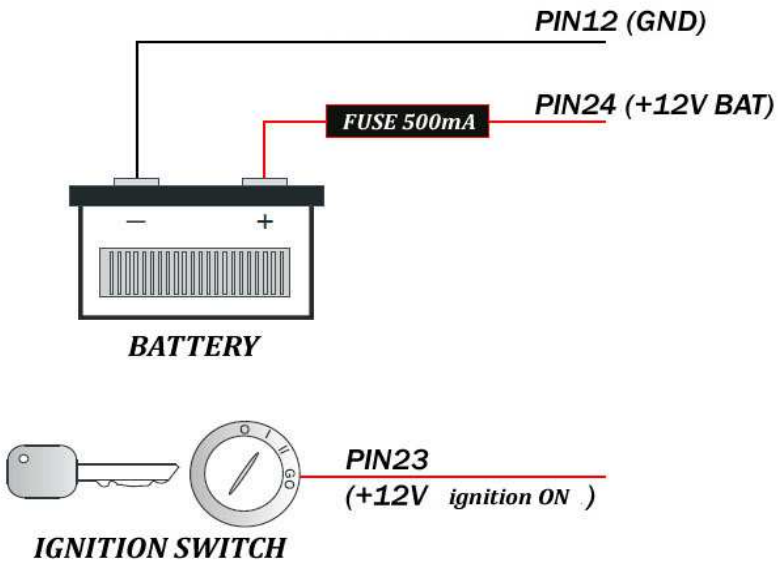
PIN	DESIGNATION	PIN	DESIGNATION
1	SW_GND	**13**	-
2	-	**14**	SW_3 (tact switch 3)
3	SW_2 (tact switch 2)	**15**	SW_1 (tact switch 1)
4	DS18B20-A_GND	**16**	DS18B20-B_GND
5	DS18B20-A_DQ (signal)	**17**	DS18B20-B_DQ (signal)
6	DS18B20-A_VCC (+5V OUT)	**18**	DS18B20-B_VCC (+5V OUT)
7	BUZZER_GND	**19**	BUZZER_VCC (+5V OUT)
8	ADC1 input (analog signal 1)	**20**	ATS (+5V OUT)
9	ADC2 input (analog signal 2)	**21**	HEADLIGHTS or COOLER (+12V IN)
10	INJECTOR (0-5V IN or 0-12V IN)	**22**	VSS (0-5V IN or 0-12V IN)
11	LPG (+5..12V IN)	**23**	**+12V ignition switch**
12	**GND (POTENCIAL GROUND 0V)**	**24**	**+12V power supply (with fuse 0.5 A)**

GROUP	DESCRIPTION
SW_1, SW_2, SW_3, SW_GND	output for the three-button keypad
DS18B20-A_X (inside) and DS18B20-B_X (outside)	output for digital temperature sensors (3 wires for each sensor) – keep out for power supply! – reverse connection VCC/GND can damage sensor and the power circuit of UTCOMP.
BUZZER_VCC, BUZZER_GND	pinout for buzzer (VCC = +5V)
ADC1, ADC2	input voltage signal for any analog sensor (max 0-5V) e.g. lambda sensor, wideband oxygen sensor controller, pressure sensor, vacuum/boost sensor, TPS, etc.
INJECTOR (0-5V IN or 0-12V IN)	input injection pulses (0V… +12V, or 0V….+5V) or fuel consumption signal
LPG (+5V or +12V IN)	Input signal from the LPG system (e.g. status LED indicator or electrovalve: 0V (OFF) – petrol +5…12V (ON) – gas)
ATS (+5V OUT)	output +5V for the user Analog Temperate Sensor (ATS) – screwed into the engine block, engine head or oil sump (gnd of sensor on the thread)
HEADLIGHTS or COOLER (+12V IN)	input signal from headlights or fan cooler: +12V (ON), 0V (OFF)
VSS (0-5V IN or 0-12V IN)	input signal from vehicle speed sensor - VSS (0V – low state, 5V and more – high state)

2.3. Wiring diagrams

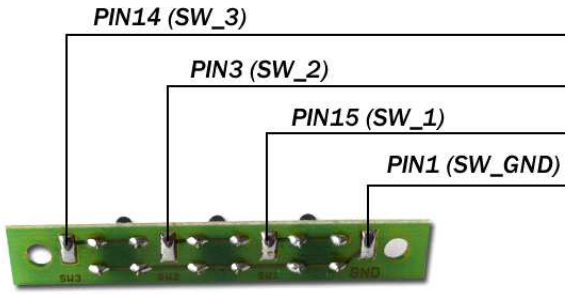
2.3.1. POWER SUPPLY

Power should be connected according to the following picture. **PIN24** must be connected to +12V (BAT), and **PIN23** to +12V ignition power (voltage occurs when the ignition key is turned on). **PIN12** must be connected to the ground of the car (GND). **The line PIN24 should be secured with 500mA fuse.**

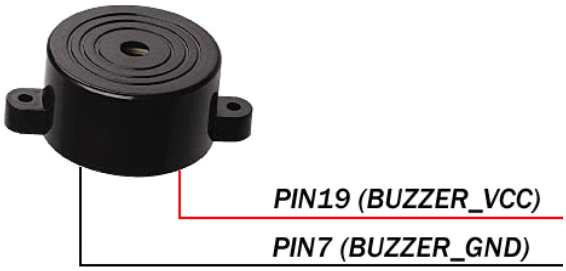


2.3.2. KEYBOARD

The kit includes three-button keyboard. The keyboard should be connected four wires according to the following drawing (3 pushbuttons and GND).

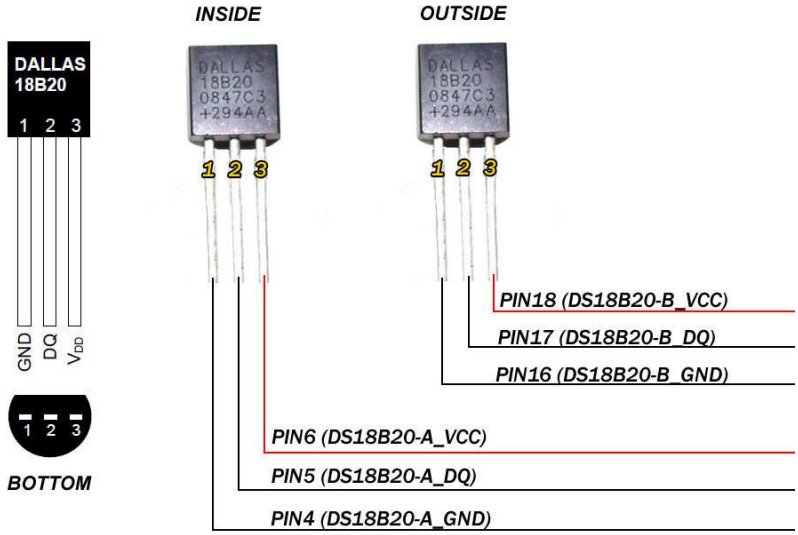


2.3.3. BUZZER



2.3.4. TEMPERATURE SENSORS DS18B20

The set includes two digital temperature sensors DS18B20. Each sensor has 3 terminals: GND (GROUND), DQ (SIGNAL) AND VCC (POWER SUPPLY).



Pay special attention to the outputs – it is easy for mistake changing side wires and burning the sensor (if mistake is done then nothing will be displayed on the screen). Isolation wire leads must be done with hotair shrink insulation.

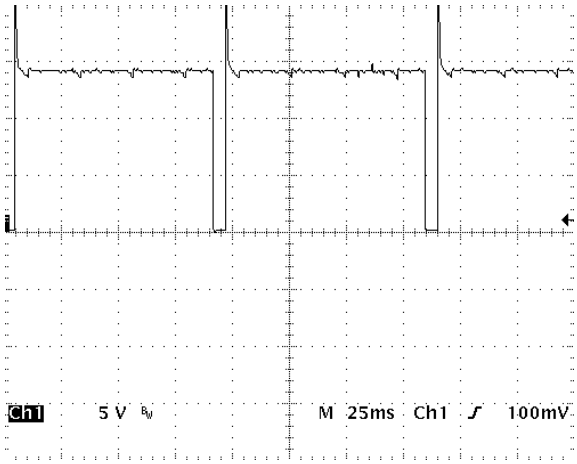
One of sensors (PIN 4,5,6) should be located inside the car in the place of free heating air, sun rays etc. The second sensor (PIN 16,17,18) should be located outside the car, ahead cooler in a low place. The correct placement of sensors is a key influence on subsequent accuracy of the actual temperature.

2.3.5. FUEL CONSUMPTION SIGNAL

The signal pulses from the injector or dedicated fuel consumption signal connect to **PIN10**. Where the pulse signal can be found:

Petrol engines:

- option 1 : directly on the injector connector – two pins should be in there (or more in case of mono injection). When the engine is ON, one pin is +12V constant signal, the other one is pulse signal 12V…0V (injectors GND controlled). Pulse signal should be connected to PIN10 of UTCOMP (sample waveform is shown below),
- option 2: to the appropriate pin in the ECU socket (injector control) - pinout for ecu connector can be found in electrical documentation (wiring diagrams) of vehicle



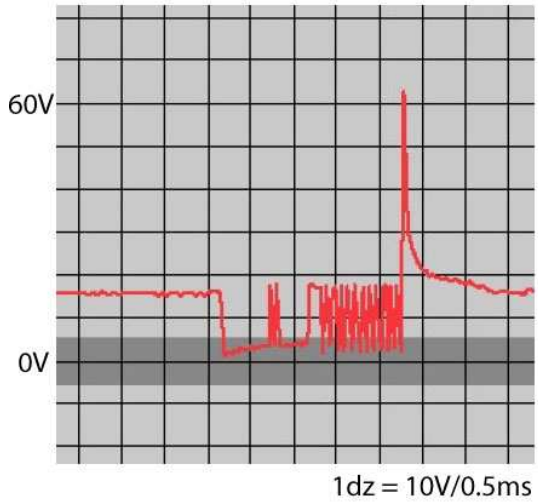
Petrol engines with gas system:

- option 1: to the appropriate pin in the ECU socket (petrol injector control) - pinout for ecu connector can be found in electrical documentation (wiring diagrams) of vehicle. You should not connect directly to injector connector because there is no signal when engine is running on gas/lpg.

Diesel engines:

In case of diesel engines you should looking for dedicated fuel consumption signal. Usually it is called as "Trip Computer – TC", "fuel consumption signal" or less specific: "instrument panel signal", "multifunction display" , "mfa" etc. Remember – some diesel engines do not have such signal. Feel free to contact us if you have problems with locating such signal – we will try to help.

- option 1: to the appropriate pin in the ECU connector,
- option 2: the signal may also often be located on the injection pump connector,
- option 3: in most cases appropriate signal can be found in instrument panel connector (e.g. in TDI, HDI, DTI, TDDI etc.) - note: CAN signal is not supported!
- option 4: in cars with PD injectors (e.g. 1.9TDI PD) signal can be taken directly from appropriate pin in the ECU connector (PD injector control) – sample waveform is shown below:



note: most cars with PD injectors have also dedicated fuel consumption signal which gives better results in accuracy.

In every case search for pulsed voltage / PWM signal (controlled by the GND or +12V). Sample waveforms are shown in the figures above. Pulse width should be proportional to the current consumption (injection timing).

In newer diesel cars with CAN system (generally since '05) there is not available dedicated fuel consumption signal. Most diesel engines from 1994 to 2004 (with electronic injection pump or common rail) have such signal.

There is also alternative method for some common-rail engines without fuel consumption signal. Requirements:

- possibility to measure fuel injection timing (from injector) – max 150V amplitude,
- possibility to measure common-rail fuel pressure (from pressure sensor 0-5V).

Good example is 2.0 HDI engine installed in latest Berlingo (Citroen) and Partner (Peugeot) cars. There is Siemens SID801 ECU (earlier versions had Bosch EDC15 where already was consumption signal). Also some CDTi engines (with Siemens SIDxxx ECU) are supported. Check Chapter 3.7.4.2 for more details.

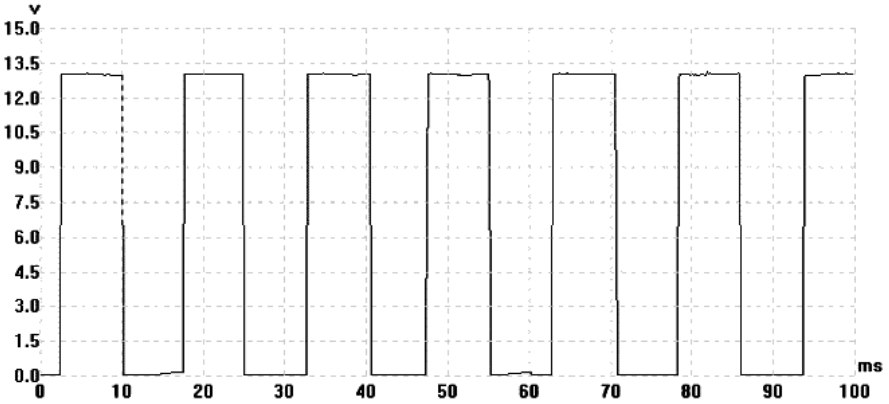
2.3.6. VSS (Vehicle Speed Sensor)

The pulse speed signal (VSS) connect to **PIN22** of the device. Where the VSS signal can be found:

- option 1: some vehicles have a VSS signal in the ISO socket of the radio (function volume up with increasing velocity) – generally pin 1 in socket A (called as SPD, GAL, VSS etc.)
- option 2: vehicles with electronically controlled speed have a speed sensor signal in instrument panel connector (marked usually as speed1, speed2, vehicle speed etc.) – take a look in the vehicle's electrical system documentation for the signal connector from tachometer (pinout).
- option 3: if the car is with electronic injection system and have tachometer 'on cable' the VSS signal can be found at the ECU connector – check ECU pinout (electrical system documentation) which pins to select,
- option 4: connect straight to VSS sensor, which you can find in gearbox body. The sensor can be two-pins (power and VSS signal) or three-pins (additionally the GND wire is connected). Connect to the pin on which there is a pulsed signal (0..+12V) when the car is moving (usually 8 pulses for one turn of the wheel),

- option 5: if your car is equipped with ABS than required signal can be found in one of the ouputs of ABS control unit,
- option 6: if your car definitely does not have VSS signal than you can install universal speed sensor (hall sensor + magnets) – described in other manual (can be downloaded from our webpage)

Below is an example of a pulse signal from the VSS sensor (vehicle pushed)



In most newer cars, instead of speed sensor, there is signal coming from ABS control module or from instrument panel – signal will be the same as this one at the picture above.

There is a small percentage of vehicles that have electronic fuel injection, and do not have the speed sensor. In this case, the sensor can be installed yourself (in the gearbox - if the manufacturer foresaw such a possibility), or obtain the usual hall sensor (cost about 3$) and install inside tachometer (the sensor can be mounted in a workshop dealing with the assembly taximeters) or on wheel hub (with additional magnets).

2.3.7. FAN COOLER or HEADLIGHTS

In order to activate the signaling function of the radiator fan OR headlight reminder, appropriate signal (+12 V when the fan/headlights is turned on, 0V when turned off) should be connected to **PIN21** of UTCOMP. After assembling, appropriate option should be chosen in UTCOMP PC application (cooler state info or headlight reminder).

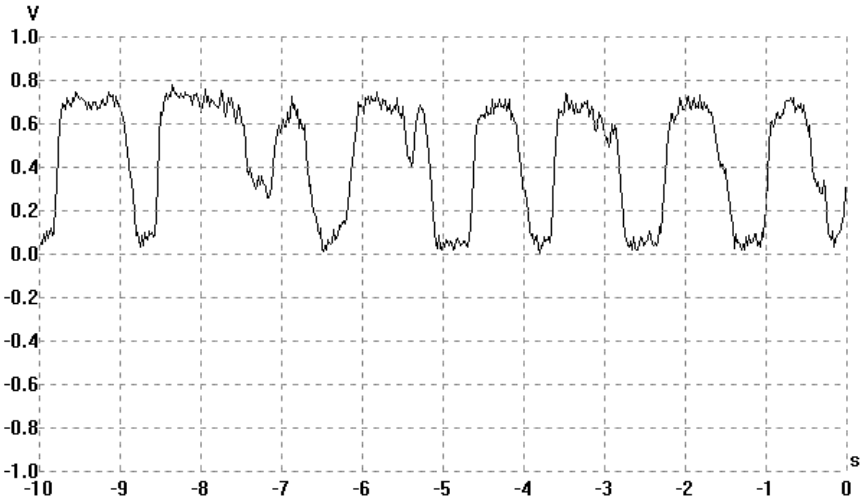
2.3.8. ADC1 and ADC2 ANALOG INPUNTS

UTCOMP has ability to support up to two analog sensors which produce out voltage signal (max 0-5V). It may be, for example, the signal from the lambda sensor (0-1V or 0-5V), the

signal from the wideband controller of oxygen sensor (AFR gauge), the signal from the vacuum/boost sensor (pressure measurement in units of BAR or PSI) etc. One sensor should be connected to ADC1 input (**PIN8**), second to ADC2 input (**PIN9**).

The following example is about connecting lambda (oxygen) sensor. In order to activate the function of drawing the sine wave of the lambda sensor on the display, connect one wire from the oxygen sensor to PIN8 or PIN9 of UTCOMP (the one where the signal voltage is from 0V to about 1V or to about 5V - depending on what type of probe we have). After assembling, appropriate option in UTCOMP application should be chosen.

Oxygen sensor helps determine, in real time, if the air fuel ratio (afr) of a combustion engine is rich (1V or 5V) or lean (0V). Sample workflow lambda probe is shown on the chart below:



2.3.9. AUTOGAS – LPG system

In the case of cars fitted with gas installations connect signal to **PIN11** indicating UTCOMP the current mode power supply (0V - petrol, 5 ... 12V - gas). In this way, the device will recognize at which kind of fuel your car currently working. UTCOMP will count distance, fuel consumption etc. apart for two different modes.

This signal is best to connect from the LED's indicator the status of the gas installation (usually when the LED lights up continuously car runs on LPG). **Signal on the LED should have minimum +4V in high state.** If car does not have such a signal, the signal can be lead directly from the control solenoid / electrovalve (0V, +12 V).

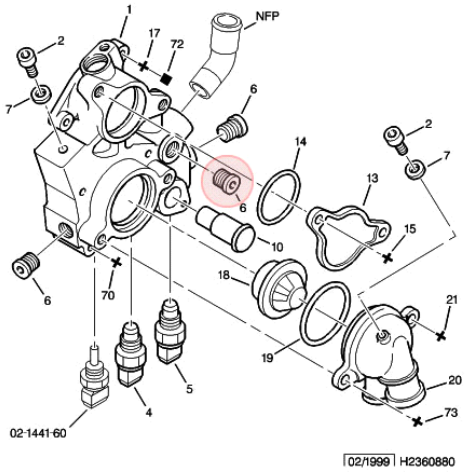
2.3.10. *** ANALOG TEMPERATURE SENSOR (ATS)

Advanced users may connect additional ATS to **PIN20** of UTCOMP. Such a sensor can be used to measure engine cooling temperature or oil temperature in the oil sump.

NTC type sensor may be bought (it is recommended to use the same NTC type like there is already used for coolling measurement in your car) and installed in the body of engine head, engine cylinder block or in the oil sump (most manufactures provide the mounting place in engine head). **Do not connect to original equipped factory sensor in the car!** (+5V is supplied on the sensor pin).

The following illustration shows an example of the sensor FACET matching multiple car models. Such sensors are typically one-pin (ground on the thread).

The next illustration shows one of a sample place for an additional sensor mounted in the car (in place of the factory plugs 6).



Unfortunately, analog sensors are non-linear (non-linear change of resistance as a function of temperature) and should be approximated by an appropriate function. The UTCOMP is supported with the possibility of accurate approximation (at a certain temperature range - for example, 40-110C) giving the coefficients of the exponential function. In order to calculate it, the knowledge of the characteristics of the sensor is required (manufacturer usually gives the resistance for several different temperatures). For more details see APENDIX A.

Fitting the sensor provides the user with useful function buzzer warning of excessive temperature (engine, oil etc.) - the user can freely set the threshold temperature.

2.4. Graphic display: LCD or OLED

The system includes a graphical LCD or OLED display with a resolution of 122x32 pixels. The display must be connected to the UTCOMP using a dedicated ribbon tape (included in the kit). The tape has a special key so that it cannot be wrong side connected. To properly run the UTC, the display should be connected before power is connected to the device.

Due to the huge variety of mounting preferences of users, the display is supplied without a housing. Take special care during installation. Do not use any glues or substances that can conduct electricity. If you use two-component epoxy adhesives (eg. Poxilina) before connecting the display, wait until the glue completely dries (evaporate moisture). The display can be freely located in the car - it all depends on the user imagination and dexterity. The most frequently used sites are built around the center console and the dashboard (also behind the glass of dashboard) or in the instrument panel.

Here is a link where you can download some photo examples:

http://www.reveltronics.com/downloads/adds/ukp_przyklady.rar

Guidelines for the selection of LCD assembly:

- display should be mounted in a visible place as close as possible the driver's eye level,
- avoid the selection of places that require looking at the display at a high angle (the maximum optimal viewing angles for lcd display: horizontally 60deg and 45deg in the vertical),
- the lcd display has the best parameters (contrast and refresh) at 10-40C, therefore, avoid locations directly exposed to higher temperatures.

OLED display has angles view about 180deg and perfect contrast in wide range of temperatures.

2.5. Additional instructions for assembly

The most important notes are given in chapter 2.1. Notes of the LCD assembly are given in chapter 2.4. The additional points of installation instructions are listed below:

- before connecting the signal to the device, make sure you connect the appropriate cable (check the signal with a multimeter or oscilloscope)– warranty does not cover damage caused by unprofessional and improper installation,
- do not pay attention to colors in 24pin socket - pay attention only to pin numbers.
- while connecting / disconnecting the plug wires do not pull the cables - only for housing,
- before installing plan ahead component locations (central unit, keyboard, LCD display, temperature sensors) having regard to the length of wires,
- it is recommended to mount the unit with a USB cable connected to the UTC and lead the USB cable outside (possibility to change the device parameters from a PC at any moment),
- before installing, you can connect UTC to PC (using the USB cable) and pre-configure it (details described in next chapters).

3. User manual

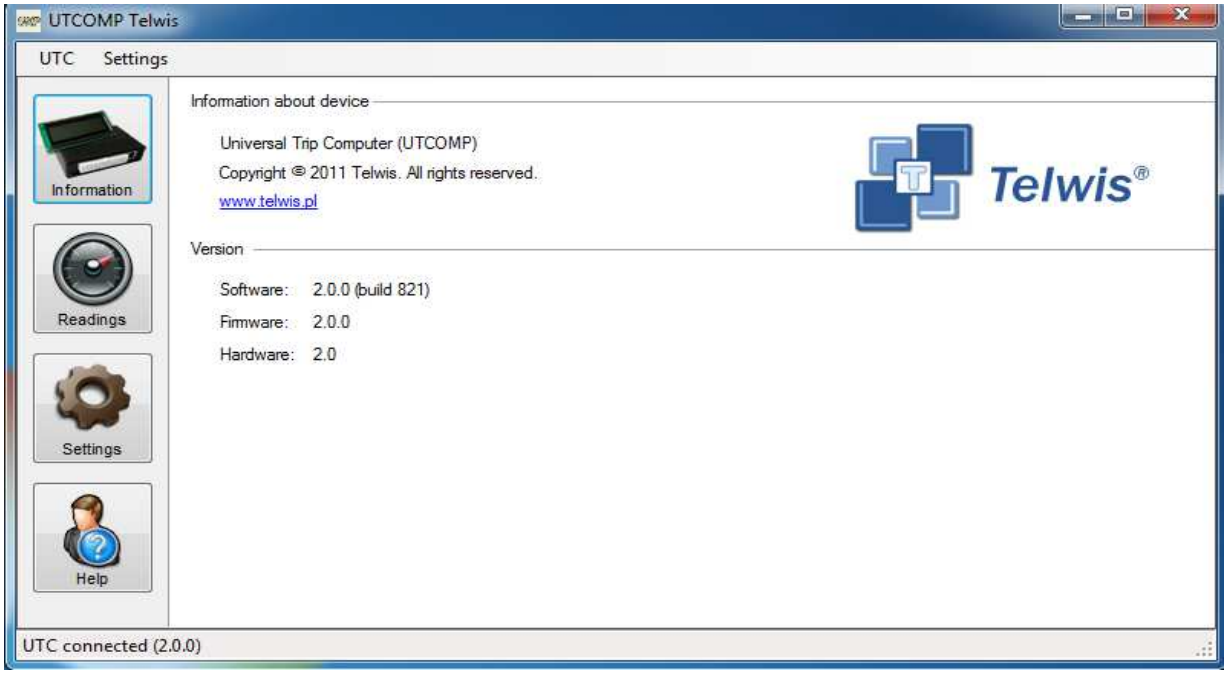
3.1. First start - before assembling

Initial start-up can be performed before the assembly - in order to check the device and its initial configuration.

Connect the device using the USB 2.0 cable to the PC. Windows should detect new hardware and automatically install the drivers. Then run the UTCOMP[1] application (single file UTCOMP.exe). If the device is working properly the status window will display "Connected".

In the program there are four options:

- information about device (version of software, hardware and firmware),
- current readings from sensors,
- device settings,
- help (calibration assistant – helps calculate injector constant and VSS constant)

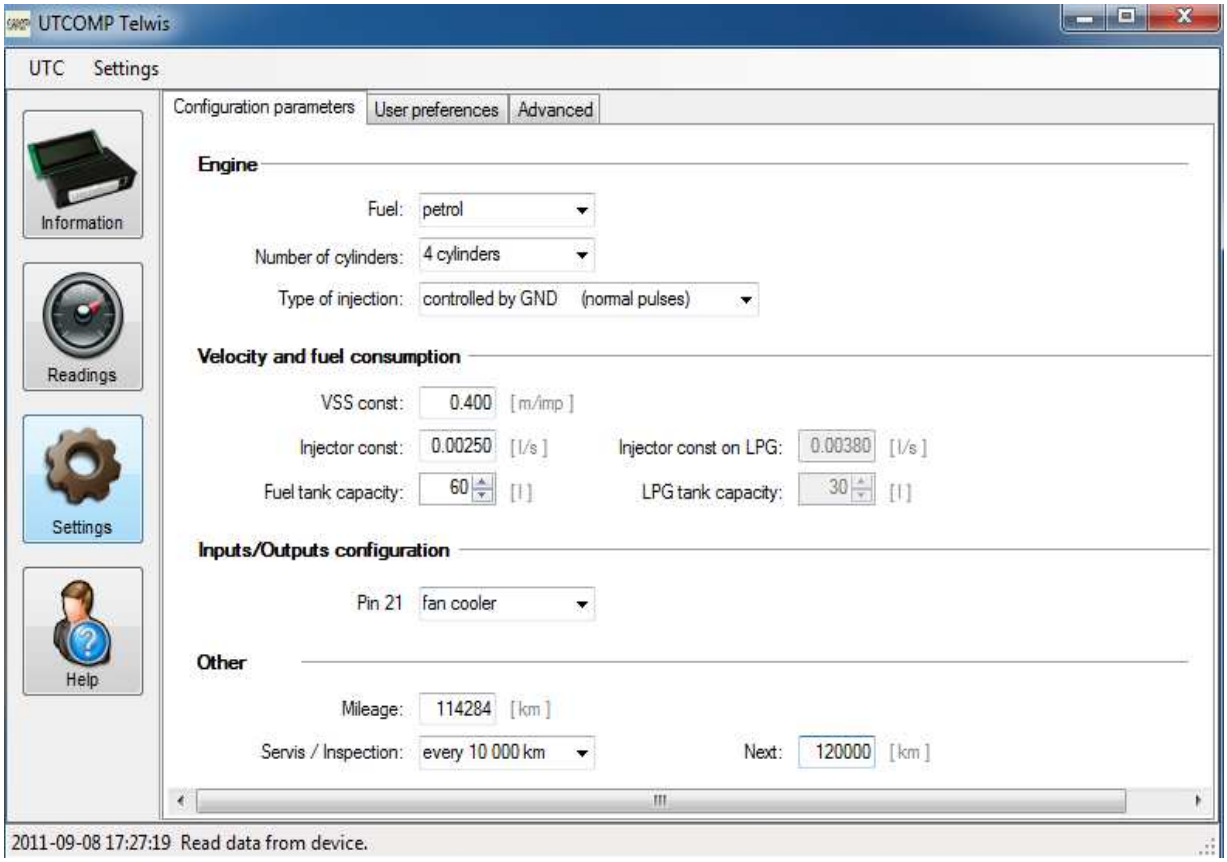


As the device is not yet mounted in the car, the options readings and an assistant will not

[1] UTCOMP software can be downloaded from manufacturer page (technical support tab)

be used yet. We will use the "Settings" in order to preset the device.

When you click "Settings" button, a appropriate dialog should popup (similar to that shown in the screenshot below). The program should read the settings from the device.



Before assembly, you can enter main car settings (configuration parameters). Changing constants (VSS and injection) is not recommended until the calibration device in the car. Save settings selecting from menu "Settings -> Save settings to UTC" (CTRL+S shortcut). Success information should appear in the status bar. All important settings are stored permanently - the device remembers the settings even after a power failure.

If the device has communicated with a PC and can be read and save the new settings - means that the device is working properly and you can proceed to its assembly.

Prior to installation, thoroughly read the assembly instructions (Chapter 2).

3.2. First start in the car

If the installation was performed correctly it can be connected to the main 24-pin connector to the device. Previously, connect the LCD/OLED connector.

When you turn the ignition key, the display should illuminate and show the splash screen. The welcome screen is displayed for 2 seconds, then displays the default user screen (varies depending on the preferences selected in the settings). If you connect UTCOMP with no signs of life, please read the section "Troubleshooting" - APPENDIX B

Then we can go to check the readings from individual sensors (checking connections). The first button (SW1) on the keyboard is used to move between successive screens. A long press SW1 (1s) will take you to the user mode settings. A long press SW2 (1s) will take you to the configuration settings mode. Next long press SW1 will return to the main screen.

Run the engine. Indications speed and fuel consumption will not show the correct values yet – the device should be calibrated first. To do this, go to the configuration settings mode (long press SW2) and then to the screen "Diagnostic1" (short press of SW1 will jump to the next screen).

The screen shows the main readings associated with the signal from the injectors and the speed sensor. When the engine is running, injection times should be displayed [ms], while the pulses from the speed sensor should still read zero. When we move the vehicle, the display should show counted pulses [i]. If the injection time [ms] and the VSS pulses [i] are displayed, then we can proceed to calibrate the display of speed and fuel consumption, as described in the next chapter.

3.3. Calibration (VSS and injection constants)

In order to calibrate the device (velocity and fuel consumption), two constants have to be set:

- VSS constant, expressed in meters per pulse [m/imp],
- Injection constant, expressed in liters per second [l/s].

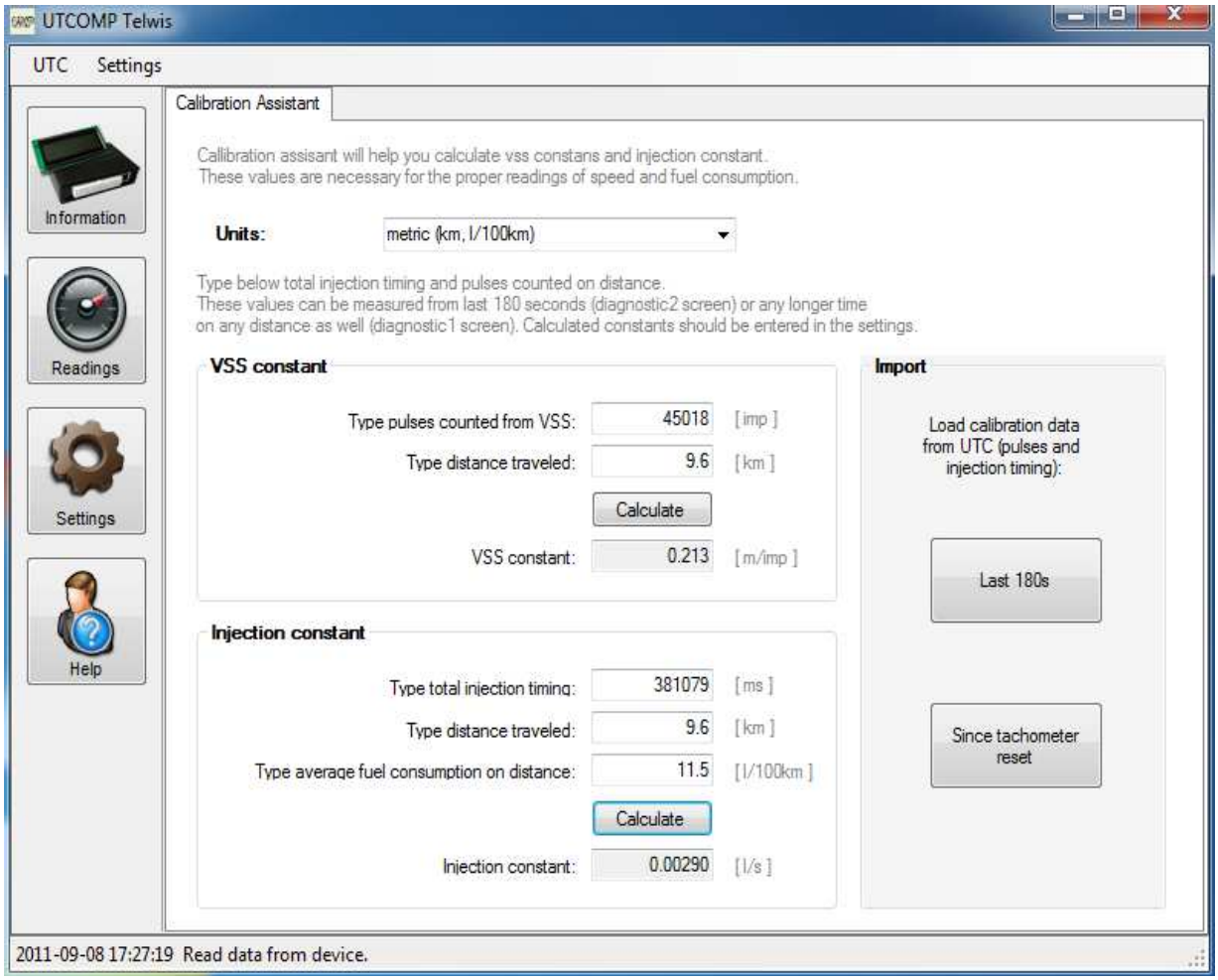
3.3.1. Initial calibration

To calculate these constants, go to the configuration screens (long press SW2) and to the "Diagnostic 2". This screen displays the injection times of the last 3 minutes (180 seconds). A long press the third button (SW3) clears the displayed values.

Value should be reset and go for a test drive (you can reset the values during the test drive if you want to perform measurement again). After 3 minutes the display shows combined injection times in the past 180 seconds and the number of pulses counted in the past 180 seconds - you should save these values. In order to calculate the constants, run UTCOMP application on PC (the device can be connected via USB, but not required). Click on "Help" and "Calibration Assistant", should pop up window shown in the screenshot below.

Import or type the new value of combined pulses and the distance displayed by the UTCOMP – the more precisely we introduce the distance traveled the more accurate will be indication of the speed later. Click the "Calculate" button - the program should display the calculated constant VSS [m/imp]. Most vehicles have a sensor that generates 8 pulses per wheel rotation. Depending on the size of the wheels we have in the car, the VSS will be different (in most cases will be within the range from 0.050 to 0.250 m/imp).

The next step is to calculate the injection constant. Type in form total injection time from last 180seconds (value is displayed on the screen diagnostic2). Re-enter the distance traveled and estimated average fuel consumption of our car. If you made a measurement on the road then type in an average fuel consumption of our car in the extra-urban cycle, if you made a measurement in city - type an average fuel consumption of our car in the urban cycle. Click "Calculate". The program will calculate a fixed injection, which in most cases should be in the range 0.00100 - 0.00600 [l / s].



Save the calculated values and enter them in the UTCOMP settings (in PC application or in configuration mode screen on the device). Save new settings to the device (CTRL + S).

TIP: calibration can be set from any distance and time – instead of using parameters from last 180s, use parameters from last reset (reset can be performed in tacho screen).

To summarize the above steps:

- leave for a test drive and reset the settings screen "diagnostic2" so reset the indications which we begin to measure the distance traveled (with the meter in the car or GPS),
- drive 3 minutes in terms of measuring and then save the combined injection times and count pulses of the road (shown on the screen diagnostic2), run "Calibration Assistant" in the program on the PC and calculate two constants.

- enumerated constants enter in the UTCOMP settings.

In this way, we roughly measured speed indication and fuel consumption. Accuracy should be no worse than 5-15% - depending on how accurately estimated the fuel consumption of the car.

Remember to enter the quantity of fuel tank (or tanks if you have installed the gas system). We introduce a real value - which indeed we are able to refuel the car.

3.3.2. Tips for initial calibration

During the initial calibration a short test drive must take place before. It is recommended:

- best carry out a test drive in non-urban conditions - a constant speed on flat road,
- it's recommended to bring GPS navigation for a test drive, which will read the exact distance traveled (from the last 180 seconds),
- when typing average fuel consumption into the program, the consumption should be as accurately estimated as possible in the conditions under which the testing took place (in l/100km).

3.3.3. Accurate calibration - achieving accuracy better than 1%.

Before an accurate calibration the initial calibration must be done.

Speed indications we can calibrate with the GPS indication. When UTCOMP lowers speed by X% of the speed of the GPS, then increase a constant in the VSS settings by the X% - thereby we calibrate the speed display of the GPS accuracy, ie much higher than factory-dashboard indication in the car (which usually overstates the rate of about 10%).

In the case of indications of average fuel consumption it's recommended to do longer distance (more fuel have to be consumed). Refuel to full (please make sure to set the volume of the tanks in the UTC settings) and reset the display during an active screen counter (distance and fuel consumption) – just hold the SW3 button longer and follow the instructions on the screen (reset indication). After resetting the values we pass a significant distance (at least 100km – of course we do not have to do this at a time) and refill again fuel in the tank. We compare the displayed UTCOMP fuel consumption with the one displayed

by the actual value of the average measured distance. Then proceed as in the previous case, ie if the average fuel consumption indications are overstated by X%, then reduce the constant injection of UTCOMP in the settings of these X%. If the indication of the average fuel consumption is too low in relation to the actual fuel consumption, increase the constant of injection. After the first refueling, accuracy should already reach better than 5%, after a few tanking up accuracy should be better than 1%.

TIPS:

- when you change constants, automatically are updated readings: average fuel consumption and distance,
- you can calibrate vehicle speed with: tachometer (generally it has 10% mistake), distance meter (trip) and GPS,
- it is possible to set VSS constant more accurate via UTCOMP application (PC software) - 0.1234 instead of 0.123,
- it is very important to set appropriate controlling of injection (in UTCOMP application). In most petrol engines injectors are GND controlled. In most diesel engine (with dedicated fuel consumption signal) signal is +12V controlled.

3.4. Menu navigation

Control of the device passes through the 3-button keypad. Depending on the currently selected screen, the functions of the buttons may vary. The following is a function which is to be expected after the data buttons:

Button 1 (SW1)	short press - *go to the next screen*
	long press (1s) - *change display modes screens (reading screens / user settings mode)*
Button 2 (SW2)	short press - *action depends on the currently displayed screen*
	long press (1s) – *configuration settings mode*
Button 3 (SW3)	short press - *action depends on the currently displayed screen*
	long press - *reset settings (specific to the currently displayed screen)*

3.5. Overview screens and functions

3.5.1. Screen 1 - Temperature

The screen displays the three temperatures:

- outside the vehicle,
- inside the vehicle,
- engine / oil (if ATS is connected and calibrated) - the value is shown above 40 C.

Temperature screen also displays the date and current time. If you connect the signaling state of the radiator fan, his work is indicated in the form of changing the third icon (thermometer / fan). You can also switch to battery (accu) voltage measure (SW2) in third window.

3.5.2. Screen 2 - Tachometer

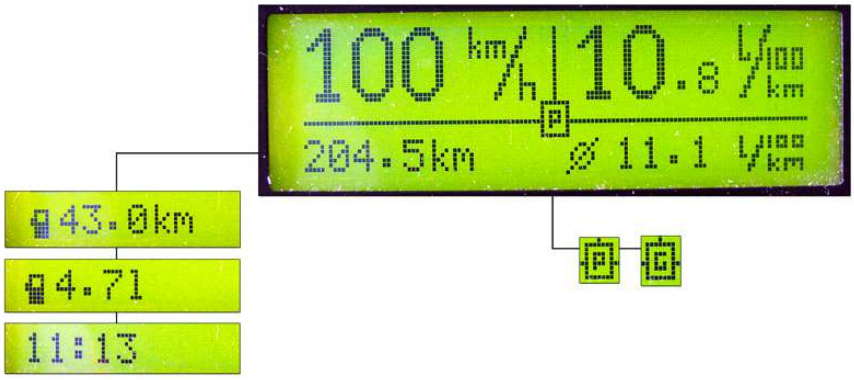
The screen displays:

- velocity (km/h or mph),
- real-time fuel consumption (l/100km and l/h OR km/l and l/h - when the vehicle speed less than 10kmh; mpg and gph - when the vehicle speed less than 10mph),
- average fuel consumption (l/100km, km/l or mpg),
- *** distance traveled (km or mil),
- *** distance to refuel (estimate based on current average fuel consumption and the amount of fuel in the tank),
- *** the remaining amount of fuel in the tank (for proper indications must refuel at least once to fully and properly enter the capacity of the tanks in the UTC settings)

*** only one option is displayed at the time (SW2 switches between these options).

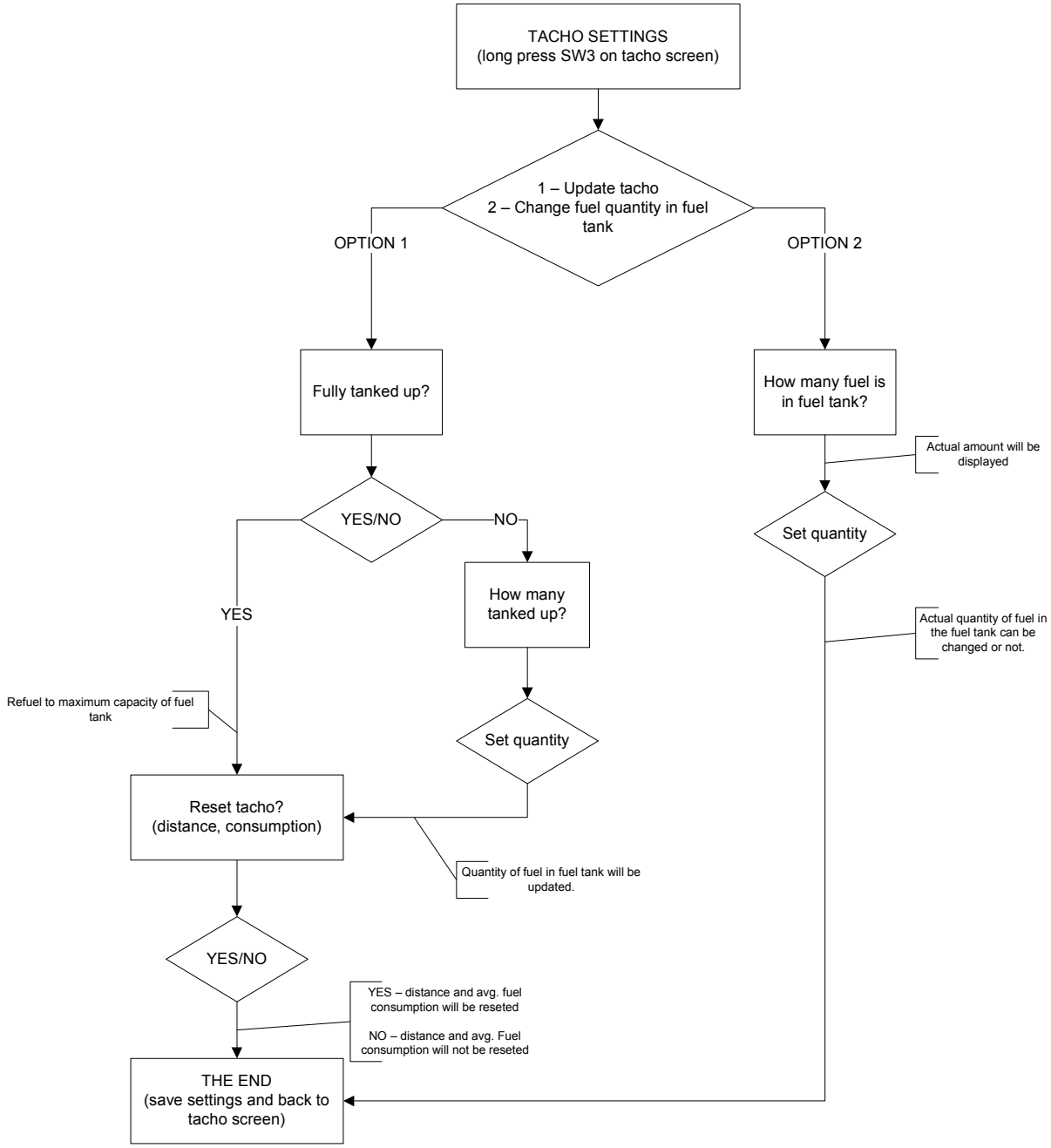
In the case of car with gas installation ("petrol+gas" option selected in UTCOMP application settings) the current type of fuel supply in the middle of the screen is indicated:

- P – Petrol,
- G – GAS/LPG.



All these options are counted and stored separately for two types of fuel, ie. instantaneous and average fuel consumption will be different for petrol and gas (the same with distance or amount of fuel in the tank). In the UTCOMP settings you can enter another injection constant for PB and another for LPG (usually a constant injection for LPG will be about 10-20% greater than the constant injection for the PB).

Long press SW3 switches to update mode (reset the average fuel consumption and distance traveled, fuel supplement after refueling). You can also direct change of the fuel quantity in the tank. The sequence of screens displayed after long pressing SW3 is shown in the diagram below:



3.5.3. Screen 3 - TRIP (day counter / travel)

UTCOMP is equipped with a useful function daily counter, which can be reset at any time independently of the other measurements. From version 2.0.5 TRIP has two sub-screens (SW2 change currently displayed)

TRIP screens display:

- travel time,

- average speed,
- max speed,
- distance,
- average fuel consumption on this distance,
- travel costs[2]
- amount of fuel used at the distance.

To reset the daily counter, hold button SW3.

3.5.4. Screen 4 – Fuel Tank(s)

The fuel levels in tanks are visualized on the screen. If the car does not have the LPG system only one tank is visualized.

3.5.5. Screen 5 - Measurement of acceleration

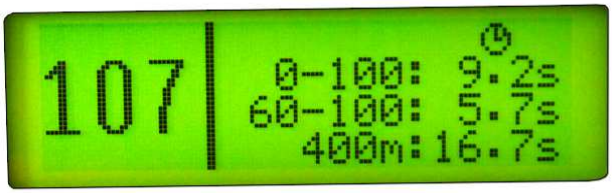
Acceleration measurements are made automatically. For example, if you want to measure vehicle acceleration 0-100kmh, you should:

- stop the car,
- press SW3 button (reset measures),
- go (measurement will start automatically)

UTCOMP upon detection of the first pulse (vehicle moved) will start counting the time. Take a look that you do not have to move immediately after resetting the measurements. When the vehicle reaches the desired speed level then counter stops.

[2] travel cost is calculated by traveled distance and average fuel consumption at distance (in trip screen). Fuel price (per liter or gallon) can be set in option menu (hold SW3).

Measurement accuracy is + / - 0.1s.

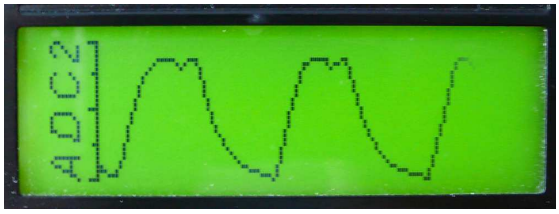


The screen displays the currently set intervals, and current speed measurements. Refreshing parameters on the screen are slower and less accurate than measurement procedure.

The user can set the ranges of accelerations in which the measurement will be made (via UTCOMP application)

3.5.6. Screen 6 – ADC measurements

If appropriate option in UTCOMP advanced settings is set (in UTCOMP PC application) the signals from analog sensors are displayed.



SW2 button switches between signals from ADC1 and ADC2 inputs. The signal is sampled at a frequency of 25 Hz. The signal can be rescaled in the program settings by selecting appropriate range.

UTCOMP also supports dedicated sensors such as: lambda probe signal, pressure sensors (eg. vacuum/boost), wideband controllers of oxygen sensors etc. If appropriate option is chosen in UTC application, then additional screen is displayed with measurements from these sensors (AFR, pressure in BAR or PSI).

User should know voltage characteristics (from datasheet) of connected sensors. The corresponding coefficients (of linear function) should be entered in the settings.

3.5.7. Settings screens

There are two groups of settings:

- user preferences settings (language, clock etc.) – to access this group of settings you should press and hold SW1 button,
- calibration settings (vss constant, injection constant, fuel tanks etc.) – to access this group of settings you should press and hold SW2 button.

To back to main screens you should press and hold SW1 button again. Short press of SW1 switches to next screen.

In the setting mode, you can change only the most important options (all options can be configured from a PC application), such as:

- language,
- brightness,
- inspection/service reset,
- date and time,
  - VSS constant,
  - injection constant
  - ***injection constant on lpg
  - fuel tank capacity
  - ***lpg fuel tank capacity

*** screens are displayed only if appropriate option in UTCOMP application is chosen (fuel: petrol + gas).

Moreover, the last two screens in calibration settings mode are typically diagnostic (diagnostics1 and diagnostics2).

On the screen "diagnostics1" you can view the current consumption, average fuel consumption, the total injection time in last second [ms], the total injection time since tacho reset screen [ms], current vehicle speed in [kmh/mph] and in [imp], pulses counted since tacho reset [imp].

The display „diagnostics2” as mentioned earlier in the chapter about calibration is used to measure the opening times of the injections in the past 180seconds and the pulses counted during the last 180seconds. This information is needed to calibrate and calculate the constant VSS and injection.

3.6. Review of other functions

3.6.1. Headlight reminder

At the stage of assembly, decide what connect to the pin21 of UTCOMP – a signal from headlights or fan cooler. If you choose headlight reminder function, you should connect appropriate signal from headlights (+12V headlights on, 0V headlights off).

If vehicle speed is greater than 10 [km/h or mph] and headlights will not be turned on, the screen will show a message “Turn headlights on” and you will be additionally informed with sound signal (from buzzer).

The screen will disappear only when you turn on headlights or you press any button (this way reminder is deactivated until next ignition switch)

3.6.2. Inspection/Service

There is a possibility to set inspection/service reminder – how many kilometers (or miles) left to service (eg. oil change). Mileage and inspection function should be set in UTCOMP application. If it is less than 1500 km (or miles) than reminder screen appears (for 5 seconds) with information how many km/mil left to inspection.

You can reset inspection in user settings mode (long press SW1) or directly from UTCOMP application.

3.6.3. Black ice alert

You should have outside temperature sensor connected. In the case of temperature below two degrees, the outside temperature icon will change (snow instead of clouds).

3.6.4. Travel costs

It is possible to calculate travel costs in TRIP screen. To calculate they are used values: average fuel consumption in trip screen, distance and fuel price (per liter or per gallon).

3.6.5. Watch

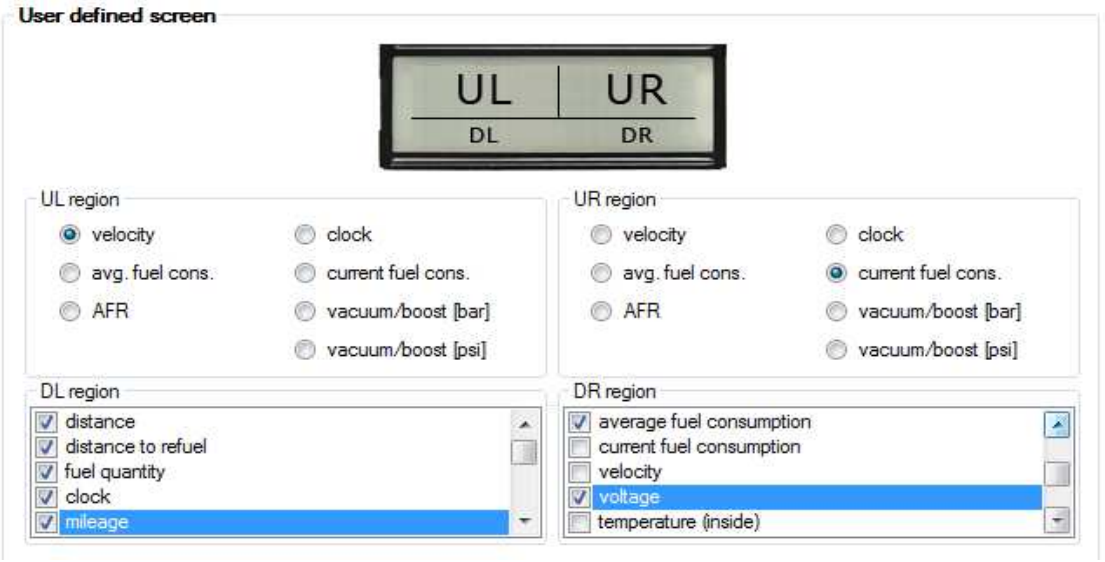
You can activate additional screen with big clock and temperatures (inside and outside vehicle). The screen can be displayed (or not) even after removing key from the ignition (in standby mode) – the screen in sleep mode is displayed without backlight. It all depends what option in user preferences settings (UTCOMP application) is chosen.

3.6.6. Font selection

You can change the large font. Changes can be made in UTCOMP application (user preferences settings) or in watch screen (button SW3 changes the font). There are three types of fonts: fine, normal and bold.

3.6.7. User defined screen

In UTCOMP application, you can define your own screen (with template from tacho screen). You can decide what to display in each place.



UL and UR regions are single choice. DL and DR regions are multiple choice. SW2 button on the user screen switches between options in DL. SW3 button toggles between options in DR.

3.6.8. Units

You can change the units of distance, speed, fuel consumption and temperature. Distance can be displayed in kilometers or miles. Vehicle speed can be displayed in km/h or mph. Fuel consumption can be displayed in l/100km and l/h (liters per hour) OR km/l and l/h OR mpg (miles per gallon) and gph (gallons per hours). Temperature can be displayed in Celsius or in Farentheit degrees. Units can be changed in UTCOMP application – in user preferences settings.

3.6.9. Battery voltage measurement

Battery voltage is displayed on the temperature screen in the third window – an alternative to user temperature. To switch between user temperature and battery voltage, press SW2 button. Accuracy of battery voltage measurement is +/- 0.1V.

3.6.10. Adjusting the brightness of the backlight display

You can change the brightness of the LCD/OLED display. To do this, go to user preferences settings (long press SW1) and then to adjust brightness screen (short press SW1). Adjusting the backlight intensity can be done with a threshold at about 6%. By default, the display brightness is set at 80%.

3.6.11. Adjusting the contrast of LCD display (by hardware)

Each unit is tested and calibrated for kit display. When you change LCD for another one you should calibrate contrast. There's a small hole in the top of UTCOMP case and there you can find potentiometer. You should have small screwdriver. The best conditions for setting contrast is in temperature of 20C degrees.

OLED display does not require contrast adjustment.

3.7. Setting device parameters

As mentioned in the previous chapter important device parameters can be entered from the screens. To change all parameters of the device in a convenient way connect the USB cable to the device (best left usb cable led out in car in an accessible place) and run the UTCOMP application on your PC. How to run and manage the program is explained in Section 3.1.

From the application we can change all device settings. There are three groups of settings:

- configuration parameters,
- user preferences,
- advanced settings.

All important settings are stored in external memory (EEPROM), so after a power failure (disconnected from battery) UTCOMP does not lose these settings. A copy of configuration is done for each turning off ignition.

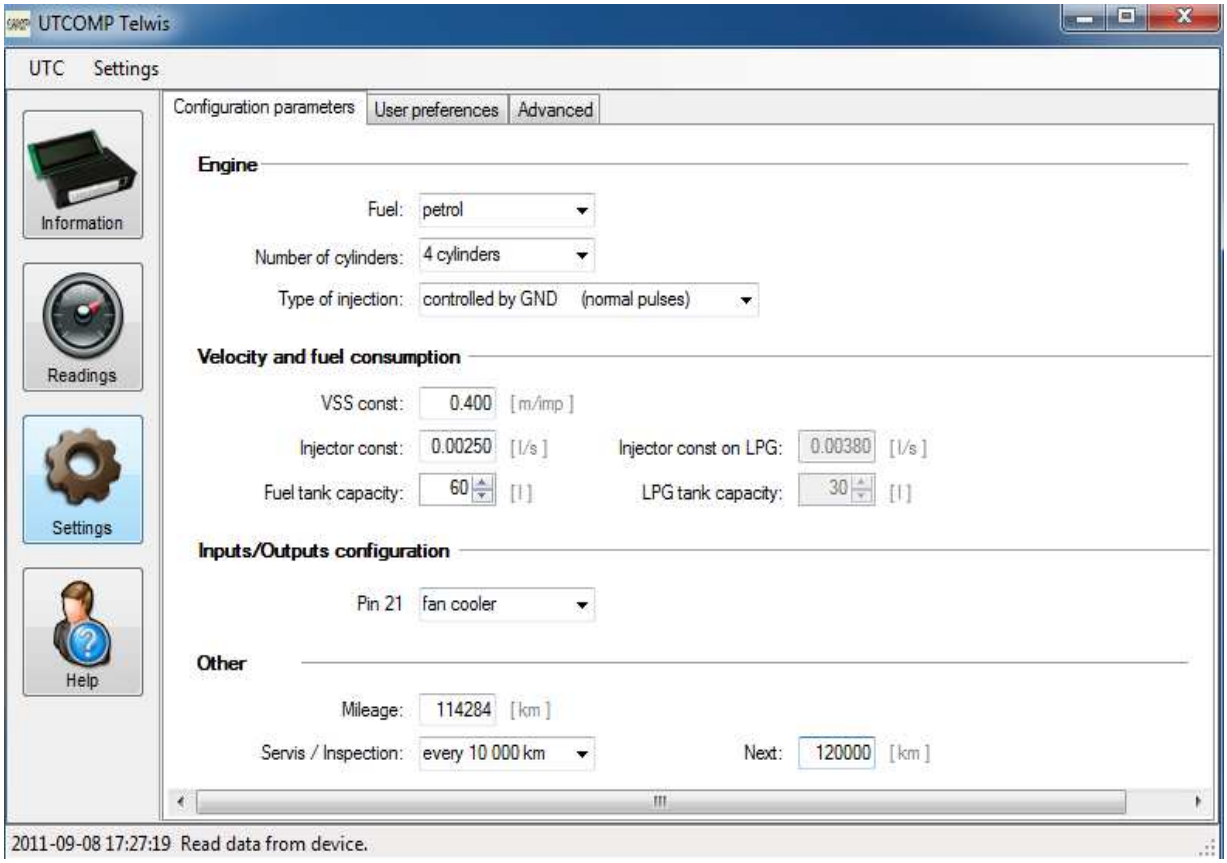
3.7.1. Configuration parameters

The most important group of settings related to the configuration of the car. Without proper configuration, performance of certain function may be incorrect.

In this group you can change the following settings:

- number of cylinders,
- type of injection control (ground-controlled or plus-controlled),
- fuel type (petrol, petrol + gas, diesel),
- vss constant,

- injection constant – if car is equipped with gas system then injection constant is different for PB and for LPG (usually the injection constant of LPG is 10-20% higher than the injection constant of PB),
- tank capacity (enter the actual volume, which you are able to refuel),
- pin configuration (pin21 – headlights or fan cooler),
- mileage,
- inspection/service.



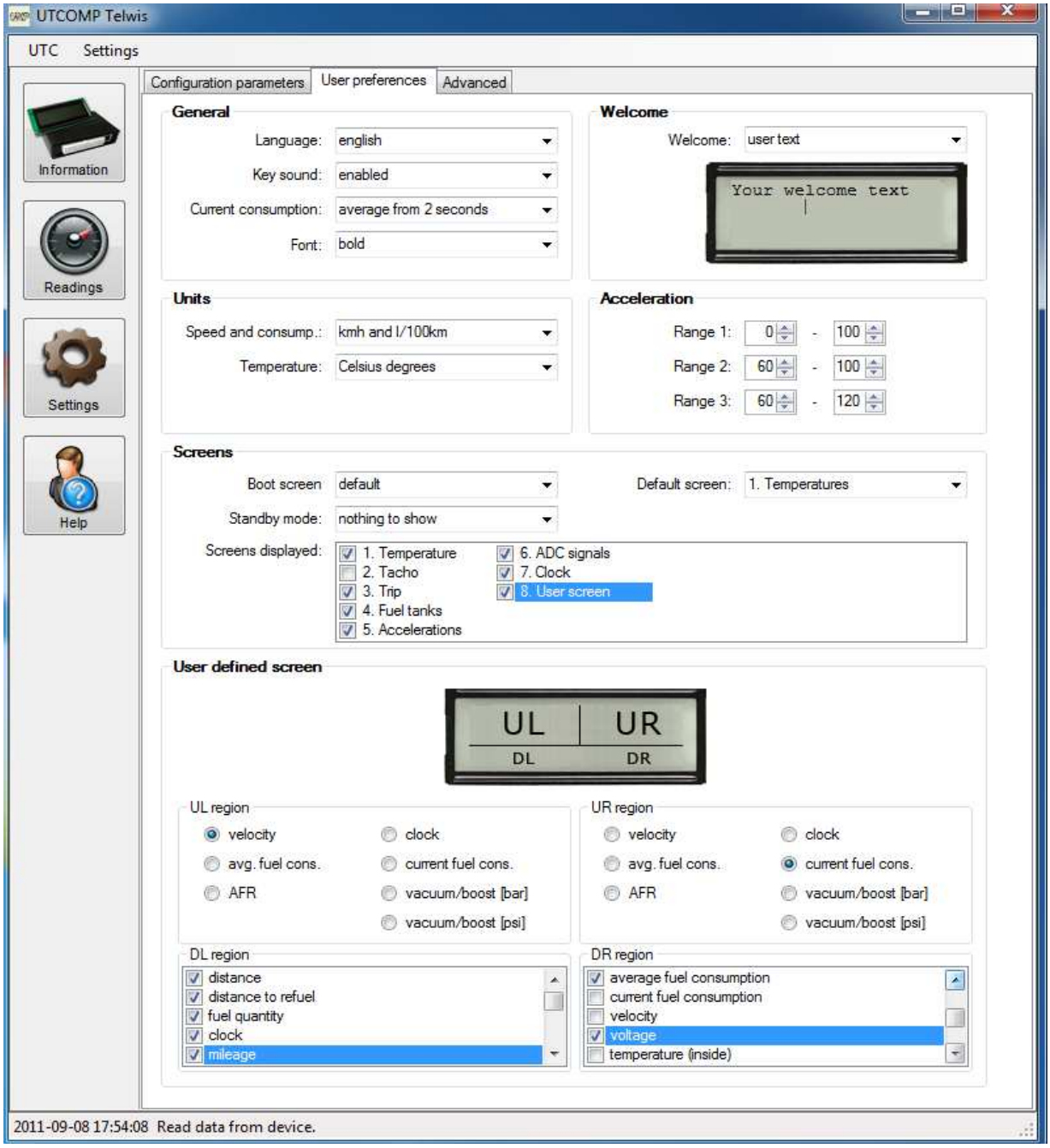
3.7.2. User preferences

In this group are settings associated with the user preferences, including:

- menu language (english, german, polish),
- key sound (on/off),
- current consumption (how many seconds averaged measurement – 1s/2s/3s),
- font style selection,
- units selection,
- splash screen settings,

- range of accelerations,
- screens configuration,
- user screen configuration.

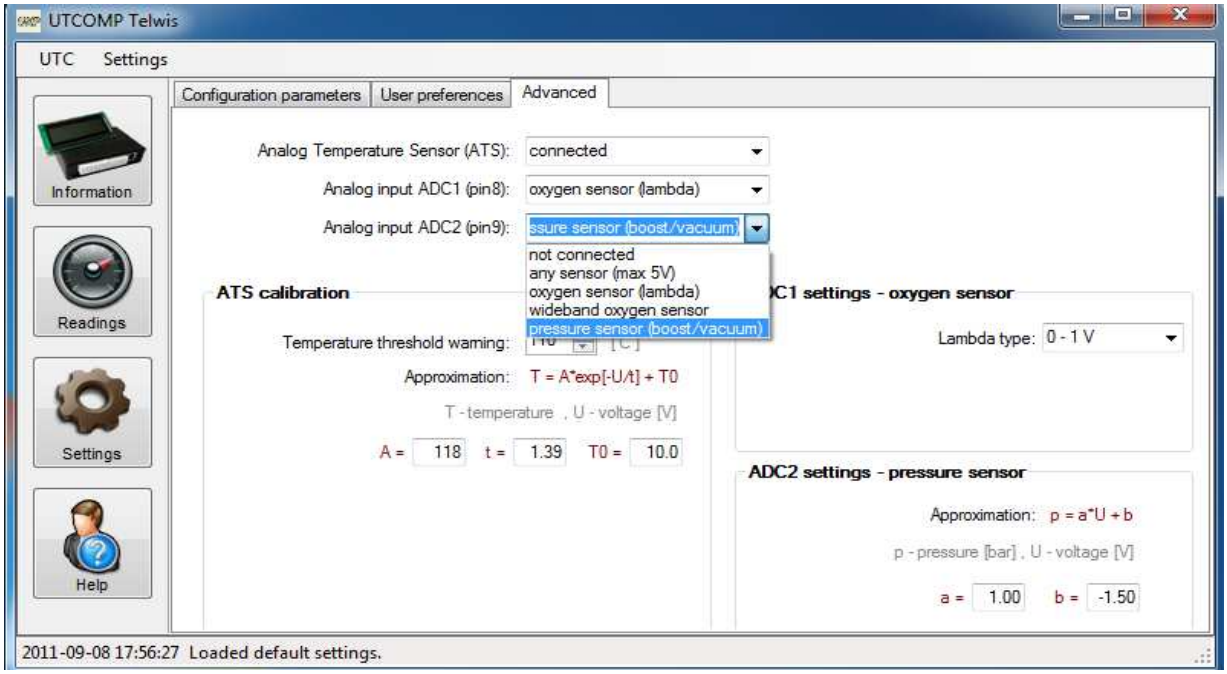
The following screenshot shows the configuration parameters associated with the user's preferences.



3.7.3. Advanced settings

In this group of settings, collected all settings associated with the operation of analog sensors. After selecting the type of sensor connected to appropriate pin (ATS, ADC1 or ADC2) there is possibility to set individual configuration. With the ability of individual configuration (scale, approximation function etc.) it is possible to use almost all types of sensors from different manufacturers.

The following screenshot shows a sample configuration of analog sensors.



Please remember two very important issues:

- never connect factory engine/oil temperature sensor to ATS output of UTCOMP (output supplies +5V), always mount the additional sensor,
- all analog sensors connected to ADC1 or ADC2 inputs should be maximum in range of 0-5V.

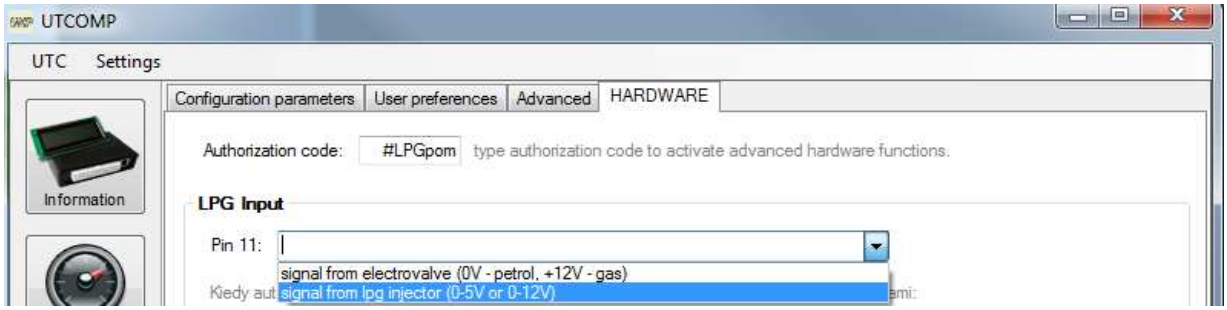
3.7.4. HARDWARE settings (for advanced users)

„HARDWARE" tab is available since 2.0.4 version and by default is hidden. To make visible this tab press **CTRL + ALT + H.**

You need to type authorization code to make specific options visible. These options are for advanced user and generally you should not change them.

3.7.4.1. Alternative metod for LPG fuel consumption (authorization code #LPGpom)

There is possibility to change method of measuring LPG fuel consumption. By default, you need to connect only signal from petrol injector + binary signal from LPG system. When you change this option you can connect also LPG injector (instead of binary signal at pin 11). You should choose second option in combo box menu.



Notes:

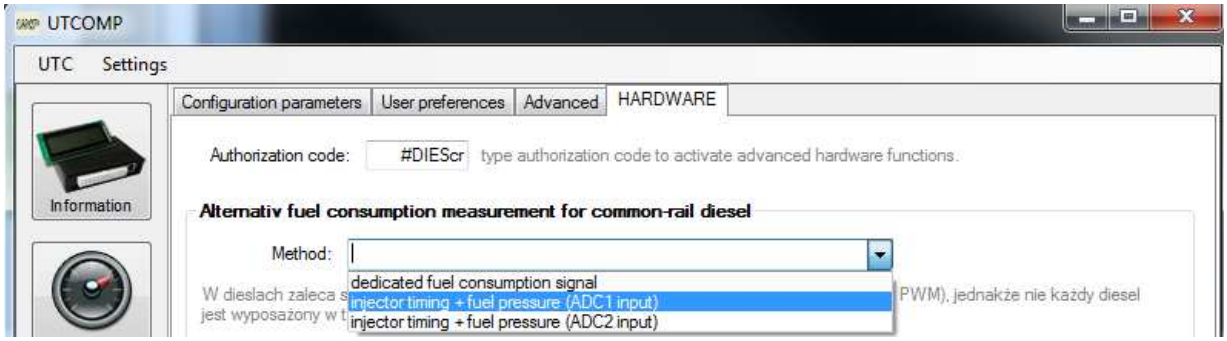
- both injectors (PB and LPG) should be controlled in the same way (both GND controlled or both +12V controlled)
- while engine is LPG running, there should be constant signal at PB injector input (pin 10)

3.7.4.2. Fuel consumption with fuel pressure signal (authorization code #DIEScr)

This option is designed for diesel engines, which do not have dedicated fuel consumption signal (see Chapter 2.3.5). Measuring injection times and fuel pressure (which changes linear to rpm) there is possibility to calculate fuel consumption. To make it possible, there should be two conditions passed:

- there is possibility to measure injection timing (pulse width = injection time),
- there is possibility to measure fuel pressure (eg. in common-rail engines there is fuel pressure sensor 0-5V).

To activate this feature you should choose option "injector timing + fuel pressure" in combo-box (see picture below). Analog signal from pressure sensor (0-5V) should be connected to ADC1 or ADC2 input.



4. Attachments

4.1. APPENDIX A - Analog Temperature Sensor (ATS)

It is assumed that the user is familiar with Chapter 2.3.10.

In order to properly display the temperature indication from the ATS, approximate of the characteristics by an exponential function of the form:

$$T = A * e^{-\frac{U}{t}} + T0$$

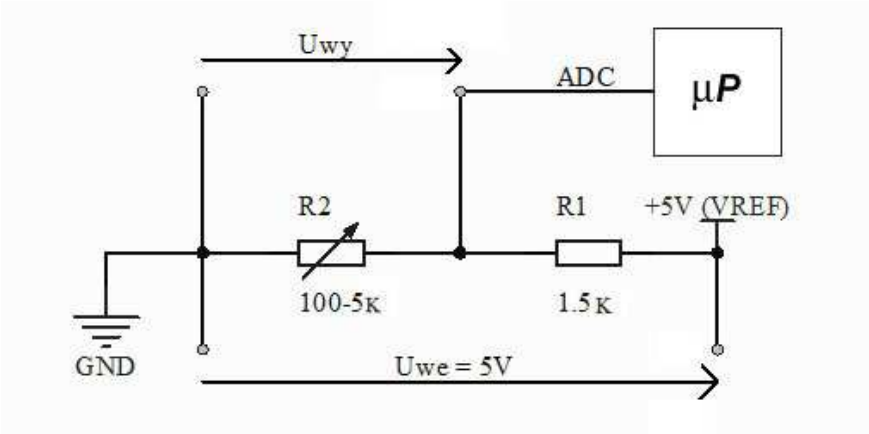
, where:

T – calculated and displayed by the device temperature,

A, t, T0 – constant approximations introduced in the UTC application,

U – read the voltage level from the sensor ***

*** The sensor should be of the NTC, which is the one whose resistance decreases with increasing temperature. The sensor is connected to the microcontroller ADC output (control unit of UTC) following this scheme:

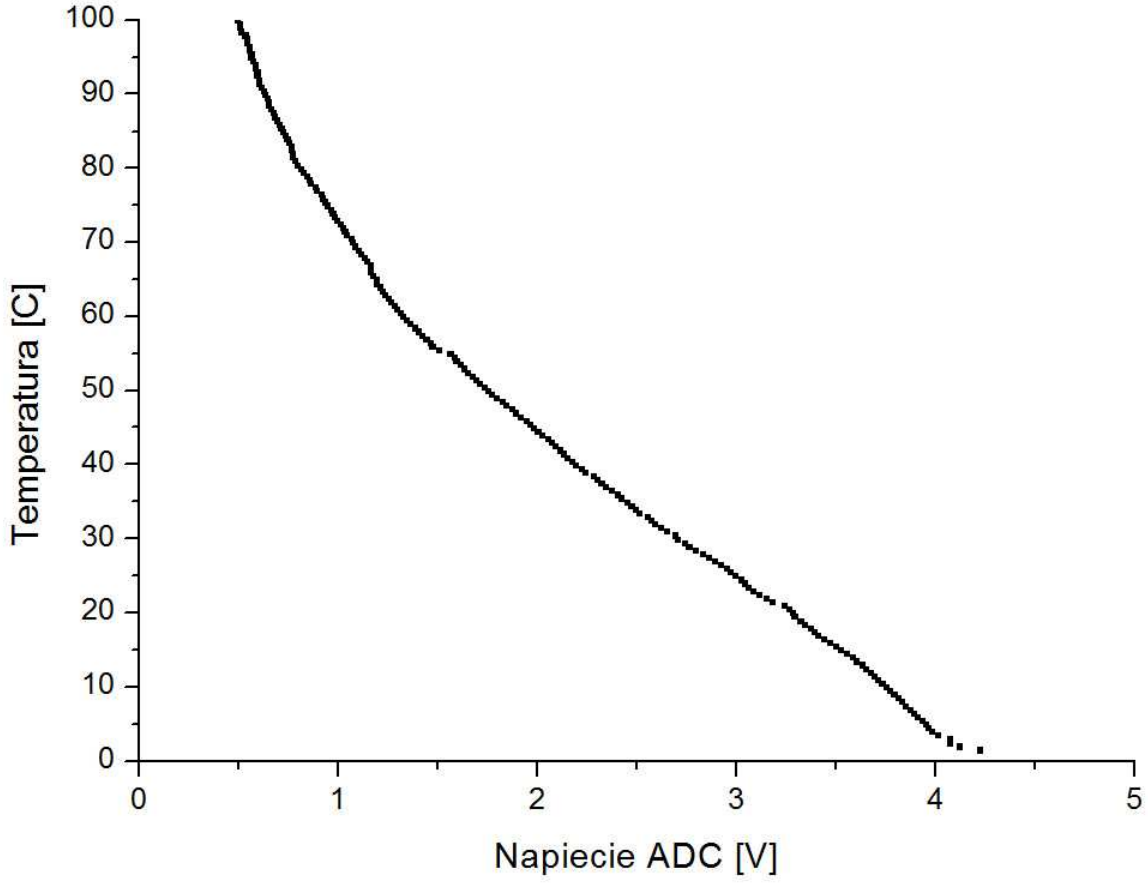


As you can see, our sensor (R2) is connected by a voltage divider so that the change in resistance can be directly translated to change the voltage (Ohm's law).

To be able to choose the coefficients of approximation, one must know the characteristics of the sensor (a few points of the sheet) - that is a given resistance at a given temperature.

Knowing the characteristics of the resistive (as a function of temperature) it must be converted into voltage characteristics (conversion at a given voltage divider - the UTC resistor R1 has a value 1.5kOhm).

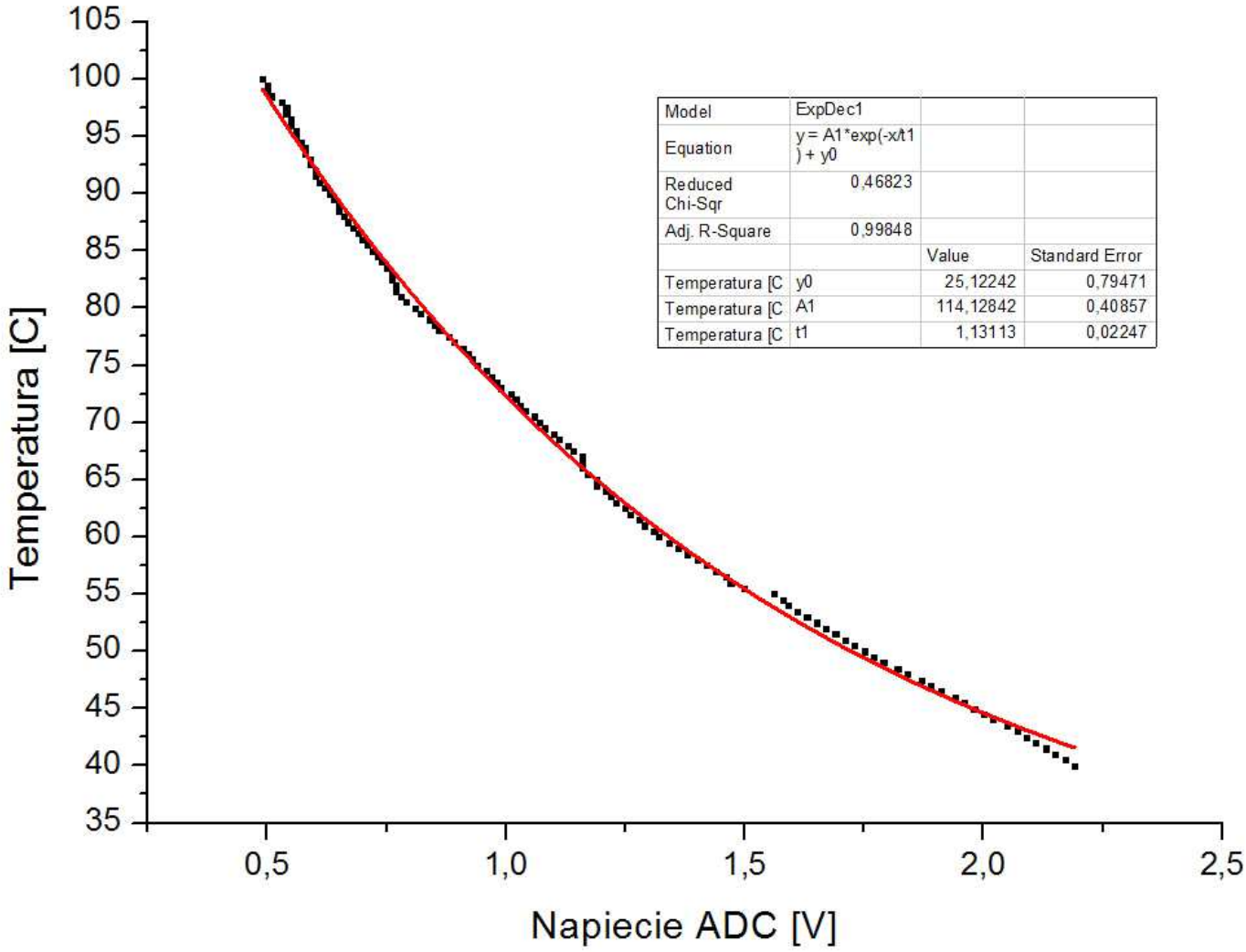
The chart below shows the characteristics of the sensor FACET 7.3113 designation (eg INTERCARS available - No 1 830 113):



Sensor characteristics was collected using an accurate digital sensor DS18B20.

The above characteristics mentioned earlier should be approximated by a function in the range of 40C or more (if we feel strong in math, scratch on a piece of paper, if not then I recommend a program such as trial version of Origin).

The result of approximation in the range of 40C .. 100C is shown in the screenshot below:



The calculated coefficients to be made to UTC settings are:

A = 114.1,

t = 1.13,

T0 = 25.1

From now UTC will display the correct temperature indication from the ATS (above the 40C). If the read temperature of the ATS is less than 40C, the UTC will display "-" instead of temperature. The approximation error will be indicated above the graph.

4.2. APPENDIX B - Troubleshooting

Each unit is tested and calibrated with display by the manufacturer.

The following table lists examples of issues and possible solutions:

problem	possible solution
After mounting and connecting the UKP in the car display shows nothing.	• No power supply, • No power at ignition, • Defective tape from the LCD • Defective display. You should also check whether the UTCOMP is communicating with a PC (via USB).
UTCOMP does not count the time of injection.	• No signal from the injector pulse Please check the connection - if the signal from an injector appears at the input of UTC
UTCOMP does not count pulses of the road (does not show the speed).	• No pulses from VSS sensor, • Defective VSS sensor in the car. Please check the connection – whether a signal from the speed sensor comes to the input of UTCOMP when the vehicle moves.
The car does not move but the display shows some speed value	• Incorrect signal from speed sensor pulses, • Connected signal is invalid, • Pulse signal is strongly disturbed. Check the connection (if connected to a valid signal). If connections are okay, check the signal on an oscilloscope and contact technical support.
Speed indications are incorrect	• VSS constant was incorrectly entered in the device settings Coarse / accurate calibration must be performed.
Fuel consumption indications are incorrect	• Incorrect injection was introduced in the device settings Coarse / accurate calibration must be performed.

During acceleration the fuel consumption is decreasing instead of increasing	• Reverse type of injection If in UTCOMP application, type of injection has been set to "controlled by GND" then select inverse pulses ("controlled by +12V").
One of the sensors shows a still -0.1C	• the temperature sensor is not connected • the temperature sensor is connected incorrectly • defective temperature sensor Check the connections according to the documentation installation. If correct, replace the sensor to the new one.
One of the sensors still shows 85C	• damaged / burnt temperature sensor Replace the new sensor.
ATC sensor readings are incorrect	incorrect characteristics approximation of the ATS (incorrect settings permanently in UTCOMP) Approximations must be performed again and introduce new fixed settings in UTCOMP.
When inside the car is very hot / cold the contrast in the display significantly increases / decreases.	• Display contrast is set optimally for the temperature range from +10 C to +40 C The contrast can be adjusted by turning yourself right knob (potentiometer) in UTCOMP.
UKP application is not working.	• NET Framework out of date You need to install .NET Framework 4.0 (free download from Microsoft).

4.3. APPENDIX C - Frequently Asked Questions (FAQ)

In the previous chapter the table shows examples of issues and possible solutions - maybe there you find a solution of your problem. In this chapter there is a supplement in the form of frequently asked questions.

Q: What is the minimum required number of connections to work UTC in the car.

A: Absolute minimum is three power signals (+12V permanent battery, ignition +12V and GND - ground). Once they are connected UKP should work and display information on the display. To switch between screens, connect a keyboard. Connecting the next signal will activate more features.

Q: Can I use my own buttons or keyboard?

A: Yes. The buttons can be used by any user preferences. You can use any keys that contain the data when switching pin (SW ...) to ground (should be a momentary buttons - ie, that if released they return to their original state).

Q: Can I use my own display, eg a different color lights? Is the display can be larger?

A: UTCOMP works with all graphic displays with a resolution 122x32pix based on the controller NJU6450, SED1520 and related. UTCOMP works also with OLED displays with SSD1305 driver (since 2.0.4 firmware version). The displays with higher resolutions are not currently supported.

Q: Is it possible to upgrade the firmware on the device?

A: Yes - if a newer firmware version will be released to the hardware version of UTCOMP. The only possibility to update is to send the unit to us.

Q: How do I know that the newer firmware version will fit into my hardware version of the UTCOMP?

A: Signs firmware are three-membered: X.Y.Z. UTCOMP signs are double-articulated X.Y. The first and the second term should be the same e.g. for UTC version 2.0. will fit all of the firmware designation 2.0.X.

Q: Where can I read my firmware, and versions of the UTCOMP?

A: Version of the device and firmware version is displayed in the first screen of UTCOMP settings. In addition, the firmware version is displayed in the UTCOMP application when the device is connected via USB cable.

Q: Where to find the signal from the VSS speed sensor?

A: If you have an electronically controlled counter (ie, no "cable") the easiest and fastest way is to check whether such a signal is connected to the the radio socket (some radios have the option volume up with increasing speed) – the ISO pin no.1, designated generally as VSS, Vehicle Speed, GALA, GAL, etc. Another place where this signal is for sure (in case of an electronically controlled counter) is a tachometer (instrument cluster) – output is usually marked on the diagram as VSS, Vehicle Speed, Speed1, Speed2 etc. If you have a mechanical counter, "with the cable" the signal is to be found in the ECU socket (marked as Vehicle Speed Sensor - VSS) or take a signal directly from the speed sensor which is mounted in the gearbox of the vehicle (sensor has three terminals: power, ground, and the pulse signal).

Q: My car has no speed sensor what can be done?

A: Even some cars with a mechanical counter "on the cable" have the speed sensor located in the gearbox (its signal is fed to the ECU). However, if the car actually have not a VSS sensor, you can always mount the HALL sensor at the counter - the signal from this sensor is supported by UTCOMP.

Q: I have car with diesel engine , does fuel consumption function will work?

A: If there is a signal in the car that represents the injection time (voltage, pulse, where pulse width is the time of injection), assuming a constant fuel supply pressure, so it will work. Injection times (or pulse width) should decrease with increasing engine speed (idling). Such a signal is found in most diesel engines with unit injectors or common rail. You should look at the ECU or the fuel injection pump controller for such a signal. Diesels with mechanical injection pump "on the cable," certainly do not have such a signal.

Q: I have a car with gas installation (LPG) - where the charge pulses from the injectors are?

A: the best place to find the signal pulses from the injectors is directly in the ECU socket - just connect to one of the injectors (it does not matter which one). ECU controls the

operation of injectors and the computer from the gas installation uses this signal to control the gas injectors. Just be remember then to set a separate constant injection for petrol and for gas (because the fuel consumption will be diffrent for gasoline, and diffrent for gas).

P: How accurate is the measurement of gas consumption?

O: The accuracy of measurement of gas consumption is slightly worse than the accuracy of gasoline. Tests on a few cars have shown that after a careful calibration of the measurement error of gas consumption was less than 2%.