

Disclaimer

TMW electronic ensures the proper work of T-Box hardware device in combination with the MSI programmer software. We're selling this set and we ensure the full support and warranty. You can contact us in case of any problems.

As for the other software (PSA calculator, Airbag Tool, Navigation software, unregistration software and other...) - there are too many specific problems eg. Airbag sensor firmware versions with different algos for crash entry, different ECU coding algos The scale of the support service would be huge! We can not support it for such a low price! The above mentioned software is for free and should be considered strictly as a bonus. Note that You're using it on your own discretion. As this software is free of charge – TMW electronic does not take any responsibility for the proper work of this software and gives no support.

To avoid software - firmware compatibility problems follow the instruction below.

Check T-Box firmware - Run T-Box MSI software and press T-Box check button. Software caption (T-Box MSI 18.04.08 – 0.1) means that the software requires firmware 0.1. If your T-Box firmware ≥ 0.1 it means there will be no compatibility problems. If the firmware version of your T-Box is lower then required - run T-Box Updater software and upgrade your T-Box firmware.

Warnings

- Do not open the T-Box device.
- Be careful while trying to connect T-Box device with any other hardware.
- TMW electronic takes no responsibility for the damage the device may cause!
- If it's possible - always use external power supply!
- 400mA is the maximal rating output current value the device can deliver!
- Always use a power supply with current limitation.
- Read carefully the T-Box USB installation guide document

The T-Box set contents

- T-Box device
- USB connection cable
- DIP8-SOIC8 adapters (3 pcs)
- Power supply cable

1. Introduction.

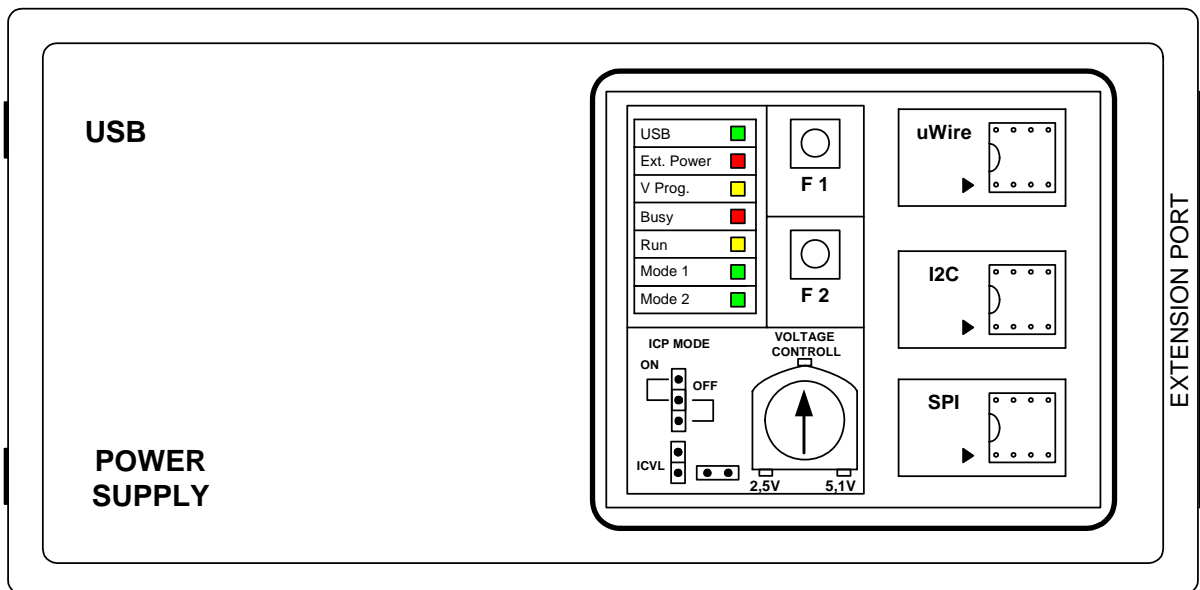
T-Box can be considered as a future oriented hardware platform designed to work with almost all TMW electronic software. The main but not only function of this device is a software hardlock function which in fact means the software protection just like in case of Hasp or Sentinel dongles.

As mentioned, T-Box is something more than only a software protection dongle. T-Box can program several serial memories (SPI, I2C, μ Wire) some MCUs and other devices eg. navigational processors (FIS). T-Box platform is future oriented and can be freely reprogrammed via the integrated USB port. The built in extension port enlarges the present and future application area making this device to a good future investment. Note, you only have to pay for the device, all future software and firmware updates will be free of charge.

As for the software you can run with this device – there is only one rule. The software name must start with the letter “T – “. For more details refer to the download section of our www.

2. Hardware description.

T-Box hardware basis is an 8-Bit RISC MCU with 32kB of internal flash memory running at 16 MHz. The communication between host PC and the MCU runs via USB interface. The device is stealing power from USB port to supply the MCU. All programmed devices can be also fed from USB port (ICP MODE switch in OFF position) but this option is not recommended. Generally if you want to use the T-Box as a programmer - you always need an external power supply. Running T-Box as an software protection dongle doesn't require additional power source.



T-Box top view.

NR	ELEMENT	FUNCTION DESCRIPTION
1.	USB	USB host PC connection port.
2.	Power Supply	External power supply socket 8-12V AC/DC. External power supply is always recommended and necessary if you want to read in circuit. If you read a memory placed in T-Box socket, without

		voltage control – you don't have to connect it. The device takes voltage from USB port. In this state the ICP MODE switch must be placed in OFF position. For more details refer to the T-Box schematic.
3.	Extension port	System voltage, General purpose Input / Output pins. Use this port if you work in ICP mode! For more details refer to the T-Box schematic.
4.	USB LED	LED on means +5V USB voltage is present.
5.	Ext. Power LED	LED on means external voltage is present. This signal is necessary if you want to work in ICP mode.
6.	V Prog. LED	LED on indicates the presence of the programming voltage.
7.	Busy LED	LED – the function of this led is software dependant. In normal state, after pressing the F1 function button, led on indicates that the programming bus is busy. This means you can't work in ICP mode.
8.	Run LED	LED on indicates the T-Box activity. This means memory reading or memory programming or data scrambling / decoding.
9.	Mode 1 LED	The function of this led is software depending. For more details refer to the software specific manual book.
10.	Mode 2 LED	The function of this led is software depending. For more details refer to the software specific manual book.
11.	ICP MODE SWITCH	In Circuit Programming switch. Select the ON position if you want to work in circuit – with voltage control. Select the OFF position if you work without external power supply – stealing power from USB port. For more details refer to the T-Box schematic.
12.	ICVL SWITCH	In Circuit Voltage Level. The normal position of this switch is on. Remove the jumper if you work with the ICP voltage level below the value of 3V.
13.	F1 Button	Function key. In normal state pressing this key will call a bus traffic check routine. Busy LED on means bus occupation - programming is not possible.
14.	F2 Button	System restart key. This key is used in firmware update operation. For more details refer to the firmware updater software.
15.	Voltage Control	Use this pot. to set the ICP power supply voltage.
16.	μWire dip 8 socket	Use this socket to work with standard pinout μWire serial eeproms.
17.	I2C dip 8 socket	Use this socket to work with standard pinout I2C serial eeproms.
18.	SPI dip 8 socket	Use this socket to work with standard pinout SPI serial eeproms.

3. In Circuit Programming.

T-Box hardware and software were designed to read and write data working in circuit – without desoldering. Special software and hardware features enabling this mode are:

- Programming voltage regulation (2,5 – 5,1 V)
- Programmable bus frequency (100 kHz – 1 MHz)
- Selectable memory write time (2 ms – 10 ms)
- Special data addressing mode (no page write)
- Bus traffic detection
- Dynamic pull-up and system voltage control functions

Reading and writing data in circuit is always a tricky job. During in circuit programming - the programming lines must stay in HZ otherwise – there will be problems! The best results are achieved in I2C systems as I2C is a pure bus architecture with open collector transmission lines. SPI and μ Wire systems are really hard to work with. In most cases the master MCU forces the states on transmission lines making data transmission impossible. The only way to achieve reasonable results is to lower the power supply voltage to a value a memory still work with but the MCU no - what in practice means you have to lower the voltage to the value of about 2,8V – 3,5V. Positive results can be also achieved after introducing distortion to the main MCU simply by shorting the XTAL lines.

Master MCU is not the only problem source in ICP operation. Serial eeprom hardware connection can also make programming in circuit impossible.

<i>I2C memory type:</i>

- Physical address lines forced to high state. Standard programmers can't address such a memory. In case of T-Box use T – I2C ICP software and rescan the bus. The device will find the proper physical address and read the memory properly.
- Write protect line forced to high state. Programming in circuit is not possible.

I2C CLIPS ADAPTER SCHEMATIC	
DB25M PIN NUMBER	DIP / SOIC PIN NUMBER
25 – via 1 k Ω resistor	1 (A0)
25 – via 1 k Ω resistor	2 (A1)
25 – via 1 k Ω resistor	3 (A2)
25	4 (GND)
18	5 (SDA)
17	6 (SCL)
25 – via 1 k Ω resistor	7 (WP)
24	8 (Vcc)

- Start reading with 2,5V, increase the voltage till there will be no verification errors.
- Remove the ICVL jumper if the voltage is lower than 3V.
- Press F1 to check bus state.
- Memory write time: 10 msec.

SPI memory type:

- Hold line forced to low state. Data transmission is interrupted so programming in circuit is not possible.
- Write protect line forced to low state. Programming in circuit is not possible.

SPI CLIPS ADAPTER SCHEMATIC	
DB25M PIN NUMBER	DIP / SOIC PIN NUMBER
13	1 (/S)
15	2 (Q)
24 – via 1 kΩ resistor	3 (/W)
25	4 (GND)
14	5 (D)
16	6 (C)
24 – via 1 kΩ resistor	7 (/HOLD)
24	8 (Vcc)

- Start reading with 2,5V, increase the voltage till there will be no verification errors.
- Remove the ICVL jumper if the voltage is lower than 3V.
- If possible – short master MCU XTAL lines
- Press F1 to check bus state.
- Memory write time: 10 msec.

SPI M35080 CLIPS ADAPTER SCHEMATIC	
DB25M PIN NUMBER	DIP / SOIC PIN NUMBER
25	1 (GND)
13	2 (/S)
24 – via 1 kΩ resistor	3 (/W)
15	4 (Q)
	5 (NC)
16	6 (C)
14	7 (D)
24	8 (Vcc)

- Start reading with 2,5V, increase the voltage till there will be no verification errors.
- Remove the ICVL jumper if the voltage is lower than 3V.
- If possible – short master MCU XTAL lines
- Press F1 to check bus state.
- Memory write time: 10 msec.
- The actual firmware doesn't support incremental registers erasing.

μWire memory type:

- Org line forces 8 bit or 16 bit organization. While reading or writing select the proper organization type from the select device menu.

μWIRE CLIPS ADAPTER SCHEMATIC – ORG16	
DB25M PIN NUMBER	DIP / SOIC PIN NUMBER
8	1 (CS)
7	2 (SK)
6	3 (DI)
5	4 (DO)
25	5 (GND)
24 – via 1 kΩ resistor (x16)	6 (ORG)
Don't connect	7 (DC)
24	8 (Vcc)

- Start reading with 2,5V, increase the voltage till there will be no verification errors.
- Remove the ICVL jumper if the voltage is lower than 3V.
- If possible – short master MCU XTAL lines
- Press F1 to check bus state.
- Memory write time: 10 msec.

Generally there are no rules. In some systems working in circuit is very easy but in other almost impossible! Due to all this, TMW electronic gives you no warranty the T-Box device will work as an In Circuit Programmer.

Working with extension port requires high responsibility. Connecting a general input / output port to a 12V potential will damage the device. While connecting the programmer with external devices eg. (FIS, Airbag sensor with CR16 MCU, serial eeprom) be sure you're using the proper line and signal. Always use T-Box external power supply and check everything twice before powering the system on.

In Circuit Programming example 1

PCB type: W211 dashboard,

EEProm type: 24C16 (I2C)

Programming voltage: 2,5V

Other: ICVL jumper removed (OFF)

Clips and DB adapters not included in T-Box set.



In Circuit Programming example 2

PCB type: SDRAM module,

EEprom type: 24WC02 (I2C)

Programming voltage: 2,5V

Other: ICVL jumper removed (OFF)

Clips and DB adapters not included in T-Box set.



In Circuit Programming example 3

PCB type: PSA dashboard

EEProm type: 95020 (SPI)

Programming voltage: 4,0V

Other: ICVL jumper inserted (ON)

Clips and DB adapters not included in T-Box set.



In Circuit Programming example 4

PCB type: FTDI USB <-> Serial converter,

EEProm type: 93C56A (μ Wire)

Programming voltage: 2,5V

Other: ICVL jumper removed (OFF)

Clips and DB adapters not included in T-Box set.

