



## USER MANUAL

The T70 is a high performance digital dual battery backer with advanced telemetry features. It contains a charging circuit and touch switch functionality. The device is ideal for mid-size models where high-voltage servos are used without voltage stabilization.

T70 is suitable for models equipped either with dual receiver batteries, or with ESC battery eliminator circuit (BEC) used as a primary power source, combined with a small backup battery. The device prefers its primary battery input, while in case of voltage drop it automatically switches to the secondary input. The charging circuit may be optionally enabled to charge the secondary battery from the primary input/BEC.

T70 is designed to turn on/off the electronics in your model, it can replace a mechanical switch as well. The device remembers its last operating state, and if the battery is accidentally disconnected, the T70 will automatically boot up again as soon as the battery is connected again.

### Features

- Intelligent dual battery backer/multiplexer with configurable voltage switchover threshold.
- Touch switch function. Optionally, the possibility of connecting a magnetic, mechanical or electronic switch or button.
- Duplex EX, Futaba S.Bus2, Multiplex MSB, Graupner Hott, PowerBox P<sup>2</sup>Bus telemetry support (current, voltage, capacity of both battery inputs).
- Optional charging of the secondary battery.
- Remembers the last operating state.
- Two expansion ports that allow connecting additional Duplex EX/EX Bus sensors. Alternatively, the ports offer digital inputs/outputs functionality.
- Configuration through the transmitter or MAV Manager PC software.
- Firmware updates.

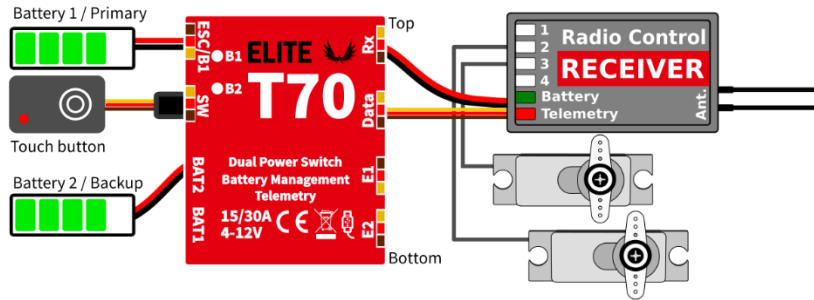
	T70-C	T70 JR
<b>Dimensions</b>	40x21x6mm	40x21x6mm
<b>Weight incl. cables</b>	23g	21g
<b>Cables</b>	1mm <sup>2</sup> (17AWG)	0.5mm <sup>2</sup> (20AWG)
<b>Connectors</b>	-	Standard JR
<b>Continuous current</b>	15A	
<b>Peak current (2s)</b>	30A	
<b>Standby current</b>	100 µA	
<b>Operating current</b>	40mA	
<b>Charging current for Batt.2</b>	up to 200mA	
<b>Operating temperature</b>	-20 – 85°C	
<b>Supply Voltage</b>	4 – 12.6V	
<b>Recommended Supply Voltage</b>	5-8.4V	
<b>Telemetry</b>	Duplex EX, Multiplex MSB, Graupner Hott, Futaba S.Bus2, PowerBox P <sup>2</sup> Bus	
<b>Telemetry expander</b>	2 Extension ports: Duplex EX/EX Bus	
<b>Touch switch support</b>	Yes	
<b>BEC</b>	No	
<b>Selectable touch / mechanical switch/ RC switch</b>	Yes	
<b>Status LED</b>	Yes	

# INSTALLATION

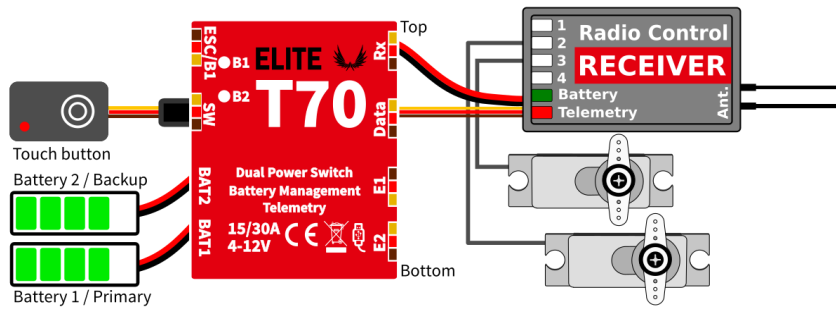
Plug the device between receiver and a primary battery/BEC. Connect the secondary battery to the B2 input.

## Dual battery installation (without BEC):

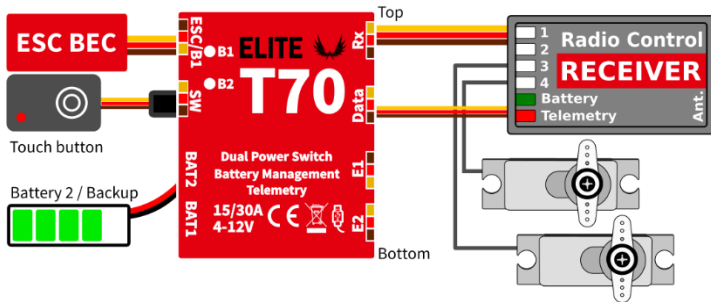
**T70-JR**



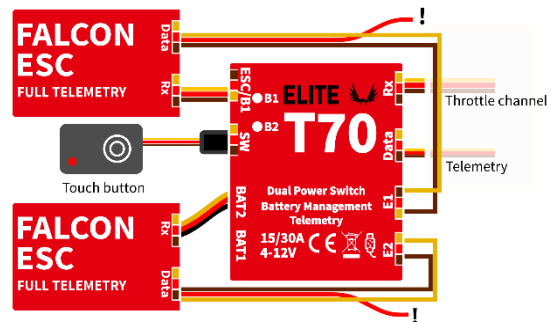
**T70-C**



## Installation with ESC BEC and a backup battery - T70-JR:

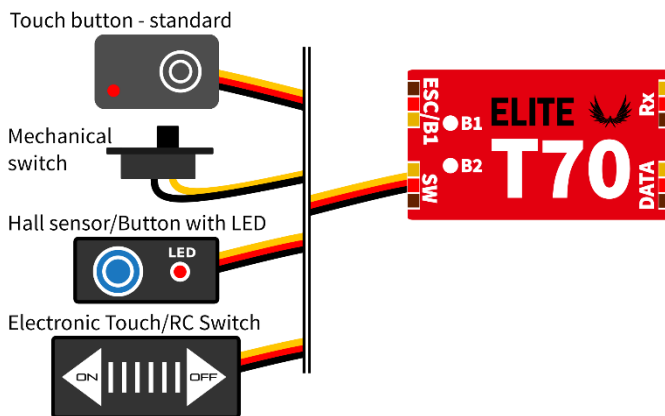


## Dual ESC with Duplex telemetry - T70-JR:



## Optional mechanical/electronic switch connection:

**T70-JR  
T70-C**



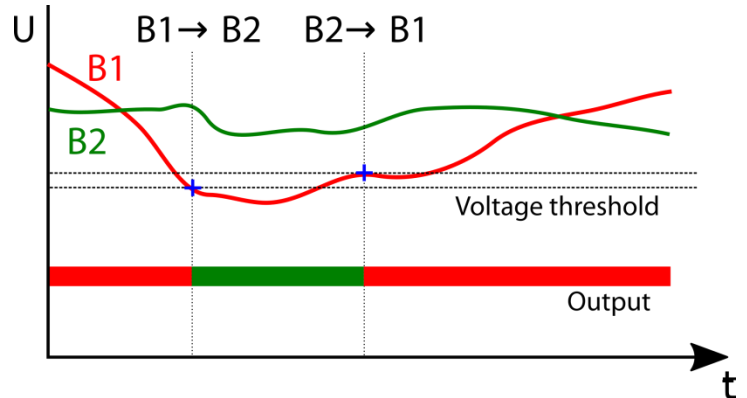
If using in combination with **R3/RSW Wireless Switch** you have to change the T70 setting from "Touch" to "Electronic" switch option. For long term storage, backup battery has to be disconnected due to constant load of the R3/RSW Wireless Switch.

The **Hall/Magnetic Switch** is available as a standard accessory of the FALCON ESC / T70.

## BATTERY BACKUP FUNCTION

The T70 generally uses its primary battery input B1 as a main power source. If the B1 voltage drops below the configured *Voltage threshold* value, it can switch to the B2 input. In such case the source with higher voltage will be used. As soon as the B1 voltage returns back above the threshold value (+ additional hysteresis), the T70 switches automatically back to B1, no matter the voltage of B2 input. There are several applications where the user can benefit from the T70:

- **ESC-Battery combination:** Set the *Voltage threshold* value below the voltage of the battery eliminator circuit (BEC). In this case, the BEC output will be used exclusively while the secondary input (B2) will act just as a backup battery. Please note that both the ESC BEC and the backup battery must handle the full load of the attached servos.
- **Equal dual battery discharging:** Set the *Voltage threshold* value above the maximum battery voltage. Both batteries will be discharged equally keeping equal voltage. The batteries have to be of the same chemistry, number of cells and similar capacity. Set the *Voltage hysteresis* value to correspond the battery properties (LiPol/LiIon – high or medium, LiFe – medium or low).



The T70 always drains power from a single battery input. This solution is robust against a spontaneous battery shortcut. The active battery input is marked with a red LED.

## BATTERY CHARGING CIRCUIT

The T70 contains a simple battery charging circuit designed for 2S Li-XXX without balancing. The charging may be optionally enabled to keep the backup battery (B2) always ready without the need to remove it from the model (however, we recommend to charge the battery with a balancer at least once in a month). Several safety conditions are used during the charging:

- The B1 voltage must be higher than the B2 voltage and the B1 must be selected/indicated by the LED.
- The B2 voltage must be within the specified limits (5.5V - 8.3V for LiPol/LiIon; 5.0V - 7.1V for LiFe).
- The T70 never charges to a full capacity.
- The voltage difference must be lower than 5V.
- The temperature must be below 70°C.

## EXTENSION PORTS

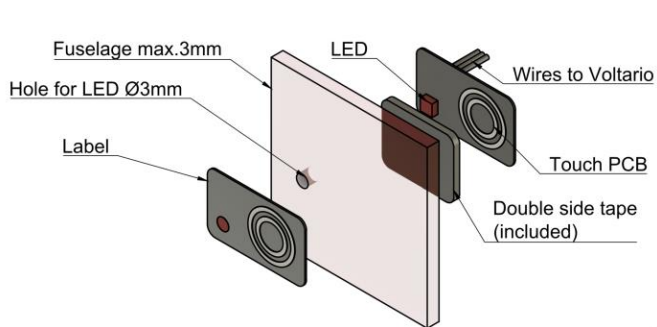
The T70 offers two additional configurable JR-type extension ports. These ports allow you to extend the device functionality in combination with some RC systems.

- Expander EX – useful if you need to connect additional Duplex EX/EX Bus sensors to the T70.
- Digital Input – the state of the signal pin is transferred back to the transmitter over the telemetry channel.
- Digital Output – the state of the signal pin depends on the value of the appropriate bus channel (log.1 above 1.5ms).

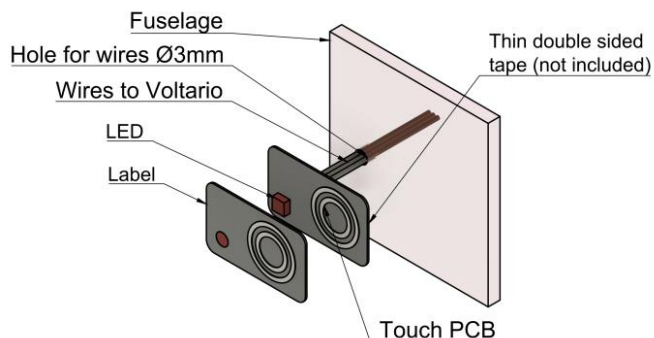
### Extension ports compatibility table

Extension port	Expander EX	Digital Input	Digital Output
E1	Duplex EX/EX Bus	Duplex EX/EX Bus, P <sup>2</sup> Bus telemetry	EX Bus, S.Bus2, P <sup>2</sup> Bus
E2	Duplex EX/EX Bus	Duplex EX/EX Bus, P <sup>2</sup> Bus telemetry	EX Bus, S.Bus2, P <sup>2</sup> Bus

## TOUCH SWITCH



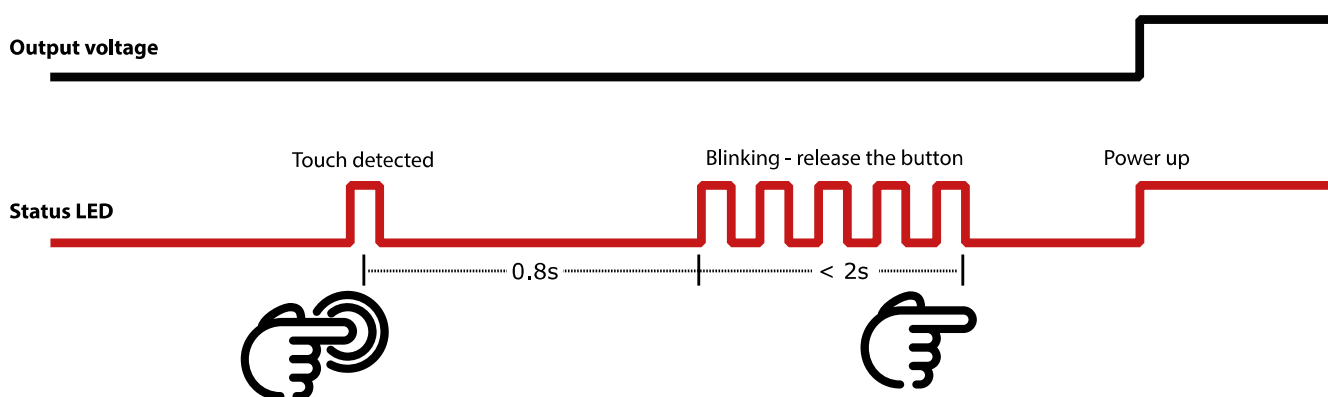
Installation inside the fuselage.



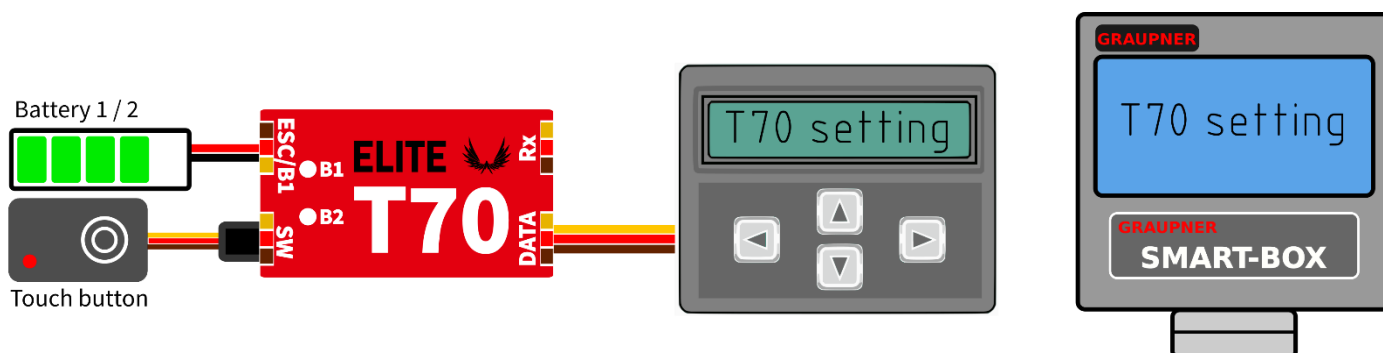
Installation on top of the fuselage.

### Touch switch behavior

- Place the touch button anywhere on your model on the surface made of nonconductive material. You can place the touch button also inside the fuselage with maximum thickness up to 3mm.
- Make the status LED visible from outside the fuselage and put the “touch” sticker on top of the touch surface.
- Connect the receiver battery to the T70 and briefly touch the button. Status LED should blink once. If not, please increase the touch sensitivity parameter in the configuration.
- Touch and hold the button for about 2 seconds. After the initial blink, the LED will start blinking again. At this moment, release the button. The main output will be activated:



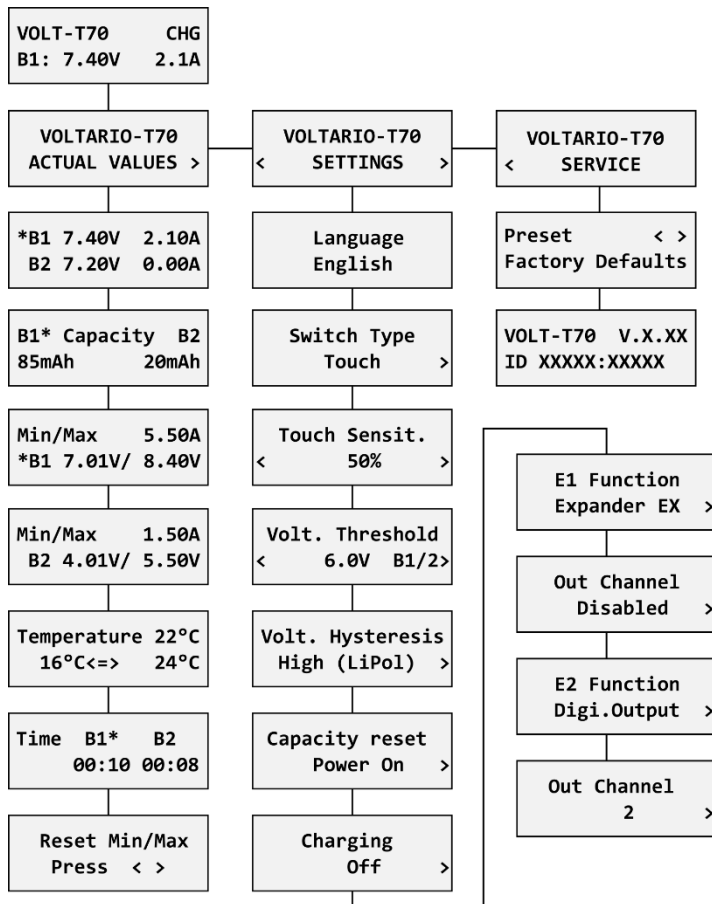
## TELEMETRY AND SETTINGS



The device is compatible with JETIBOX/SMART-BOX and you can use it for programming. The JETIBOX menu is divided into three sections:

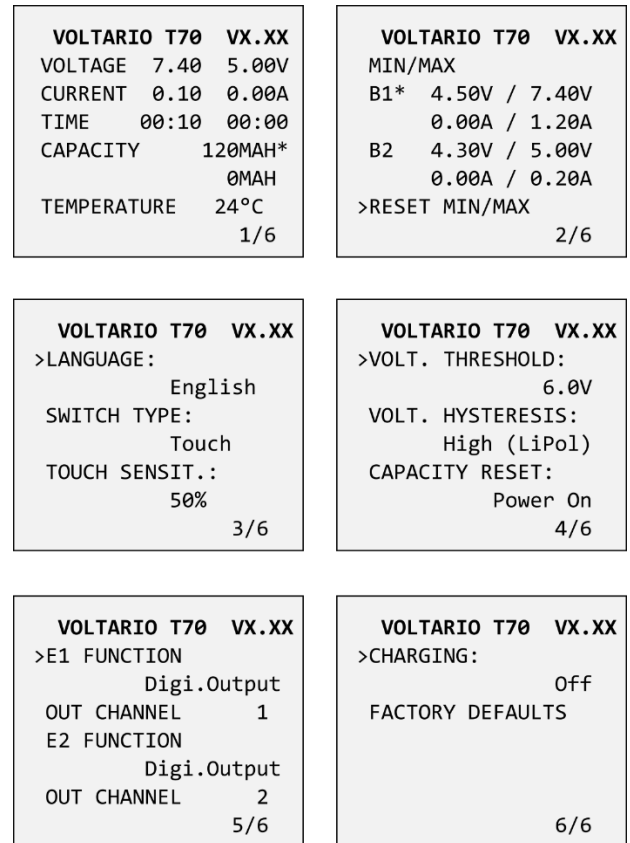
- **Actual values** – displays the latest telemetry values (current, voltage, capacity, temperature) together with minimums and maximums.
  - The main screen shows device temperature together with voltage and current of the active battery. If the charging is enabled and active, the „CHG“ status is displayed.
  - In the Capacity screen, you can press left+right buttons together to reset the measured capacity. The asterisk marks the active battery input.
  - The “Time” screen shows a cumulative time of the primary and secondary battery input, meaning how long each source has been used to power the device.
  - Reset Min/Max - press left+right buttons together to reset all minimums and maximums.
- **Settings** – basic settings of the sensor
  - **Language** – you can choose the language of the JETIBOX screen.
  - **Switch type** (Touch/Electronic/Mechanical/Hall/Button). You can specify which type of switch will be used to turn the device on and off. If you choose the Electronic option, you can connect any electronic switch with voltage output (e.g. magnetic switch or radio controlled switch).
  - **Touch sensitivity** – if the integrated touch switch is used, you can increase its sensitivity by editing this value. Please note that increasing the sensitivity will allow you to install the T70 directly inside thicker fuselages. On the other hand, this will also make the touch sensor more vulnerable to erroneous inputs.
  - **Voltage threshold** – specifies the switchover voltage for B1 and B2 inputs, see the *Battery Backup Function* chapter.
  - **Voltage hysteresis** – this parameter is taken into account in case of switching supply from one battery to the other and back. It is important to keep the hysteresis low to enable equal discharging of batteries. On the other hand, it must be high enough to prevent fast battery switching under load. There are three possible options:
    - High hysteresis (LiPol) – approx. 1.2V. This is a default and recommended option for LiPol(LiIon)/LiPol(LiIon) or ESC-LiPol(LiIon) combination. This option can be used together with batteries of high internal resistance.
    - Medium – approx 0.5V. This option can be used for equal discharging of low-resistance LiPol(LiIon) batteries.
    - Low (LiFe) – approx. 0.3V. Use this option together with low-resistance LiFe batteries.
  - **Capacity reset** – Setting up this parameter will specify at which moment the capacity is reset to zero. Available options:
    - Power-On (default) – capacity is reset every time after connecting the battery.
    - Voltage-Change – capacity is reset after connecting the battery with different voltage (by 15% or more). This way the sensor may distinguish between charged and discharged battery.
    - Manual – capacity is never reset automatically.
  - **Charging** – you can enable the charging function for 2SLi-Ion/Li-Pol or 2S LiFe secondary battery (B2).
  - **E1/E2 Function** – choose the preferred function of the two extension ports (possible options: EX/EX Bus telemetry input, digital input, digital output).
  - **E1/E2 Out Channel** – if the digital output function is selected, it is necessary to choose the appropriate channel.
- **Service** – In this menu you can view the device version and reset it to the default factory configuration.

## JETIBOX menu structure



## Graupner Hott Menu Structure

The T70 offers telemetry as an “Electric Air Module”.



## Futaba and Multiplex connection

Futaba and Multiplex systems do not offer wireless device configuration. The telemetry transmission is possible with the following fixed sensor slots:

	Futaba S.Bus2	Multiplex MSB
<b>Current 1</b>	2	3
<b>Voltage 1</b>	3	2
<b>Capacity 1</b>	4	4
<b>Current 2</b>	5	6
<b>Voltage 2</b>	6	5
<b>Capacity 2</b>	7	7
<b>Note</b>	Manual detection in the menu Linkage – Sensor. Choose S1678 current sensor on slot <b>2 and 5</b> .	Automatically detected by the transmitter.

## SAFETY INFORMATION

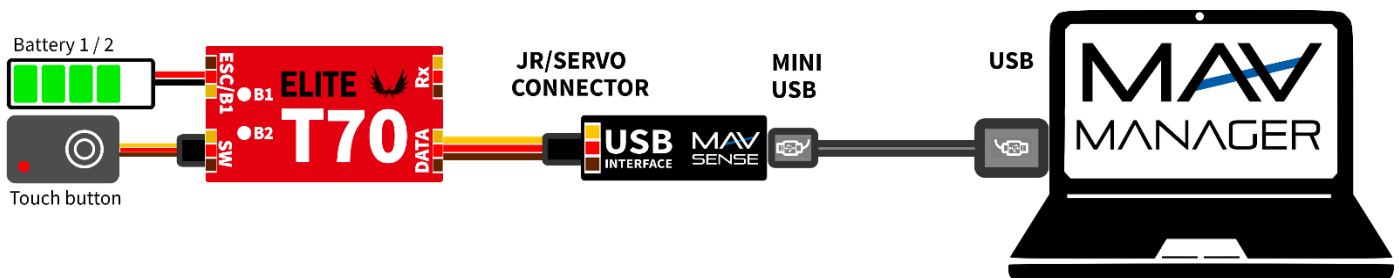
- Operate the T70 always in dry environment and within the device limits stated in this guide. Never expose the device to excessive heat or cold.
- Do not remove the heat shrink tube from the device and do not try to implement any changes or modifications. This can lead to a total destruction and to the denial of any warranty claims.
- Always check the polarity of the cables. Never inverse the polarity – this could lead to total destruction.
- Always use a sufficient power source according to the consumption of the attached servos. Never exceed the maximum allowed operating voltage of the attached servos.

## FIRMWARE UPDATE

Firmware updates for the T70 are transferred from a PC via the USB interface. The required programs and files are available at [www.esprittech.com](http://www.esprittech.com)

Install the MAV Manager software and the USB drivers on your computer. Check the system requirements.

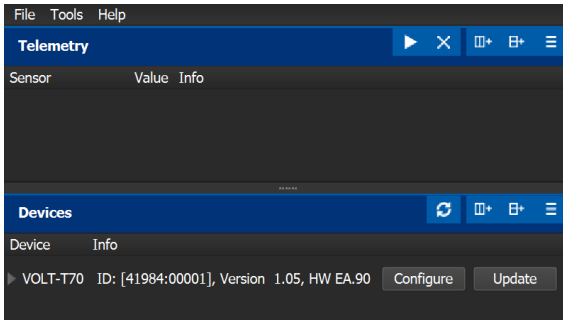
- 1) Disconnect all devices attached to the T70.
- 2) Connect the USB interface to your PC, run MAV Manager and select the correct COM Port.
- 3) Connect the T70 according to the picture below.
- 4) Apply external power to the T70 via B1 or B2 battery inputs.
- 5) Select the appropriate \*.BIN file and press the Update button.



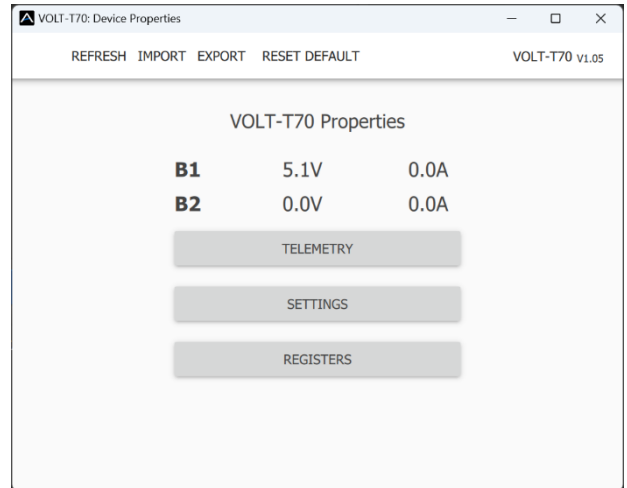
## PC CONFIGURATION

It is possible to use the MAV Manager software (1.7.0 and later) to conveniently configure all device settings, display real-time telemetry and make a backup copy of your settings. The configuration menu contains four buttons in the top toolbar:

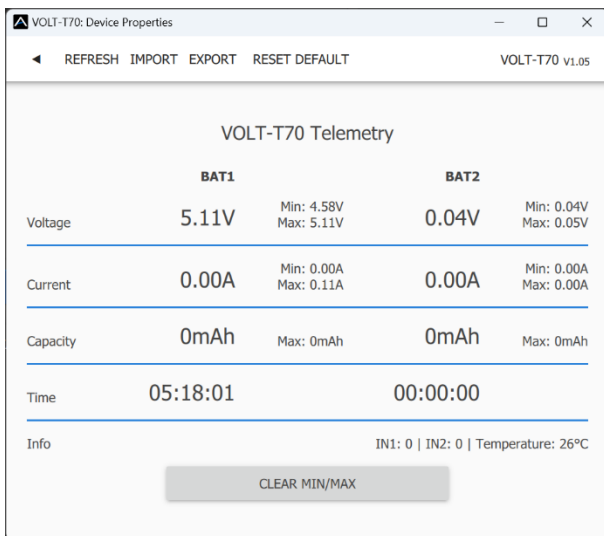
- **Refresh** – forces the configuration to be reloaded from the device.
- **Import** – imports the settings from a file. If you have several devices and want identical settings for all of them, simply import the same settings to each device.
- **Export** – exports the settings from the device to a file. You can easily create a backup configuration stored in your PC. After creating a backup, you may easily experiment with the settings and later revert back to the original configuration by pressing the “Import” button and choosing the original exported file.
- **Reset default** – resets the device to factory defaults and reloads all the settings.



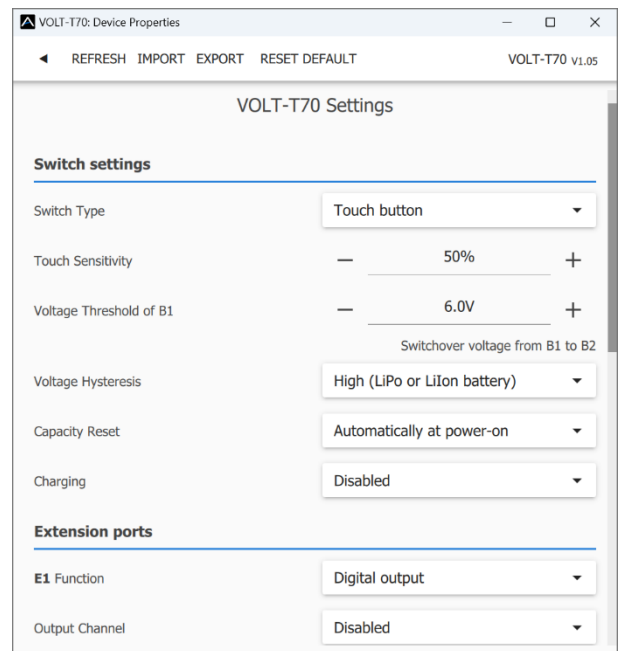
Connect the T70 to your PC using the USB interface. The ESC will be automatically detected by the MAV Manager.



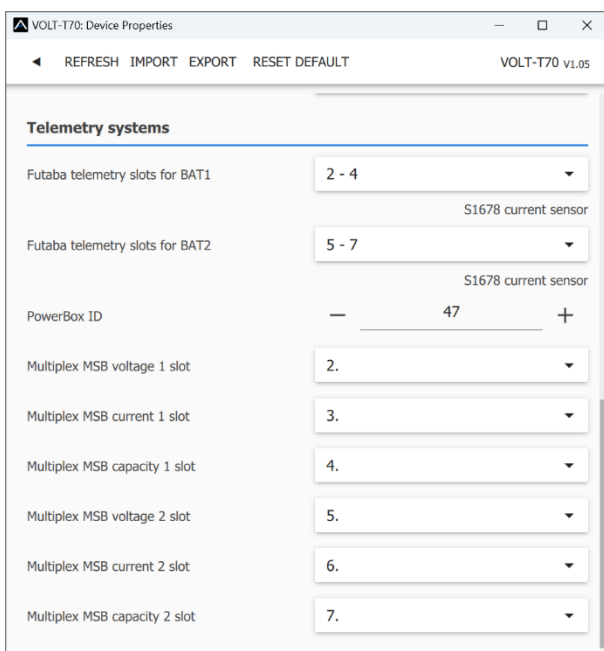
The device properties are available after pressing the “Configure” button.



Real-time telemetry with min/max values. The MAV Manager is also able to create a log file from the real-time telemetry data, which can be viewed, analyzed, imported and exported.



T70 settings. Every time you make any change in the configuration, the new value is immediately transferred to the device and saved to memory. There is no need for additional confirmation.





## WARRANTY

We grant a warranty of 24 months from the day of purchase under the assumption that they have been operated in conformity with these instructions at recommended voltages and that they were not damaged mechanically. Warranty and post warranty service is provided by the manufacturer.

