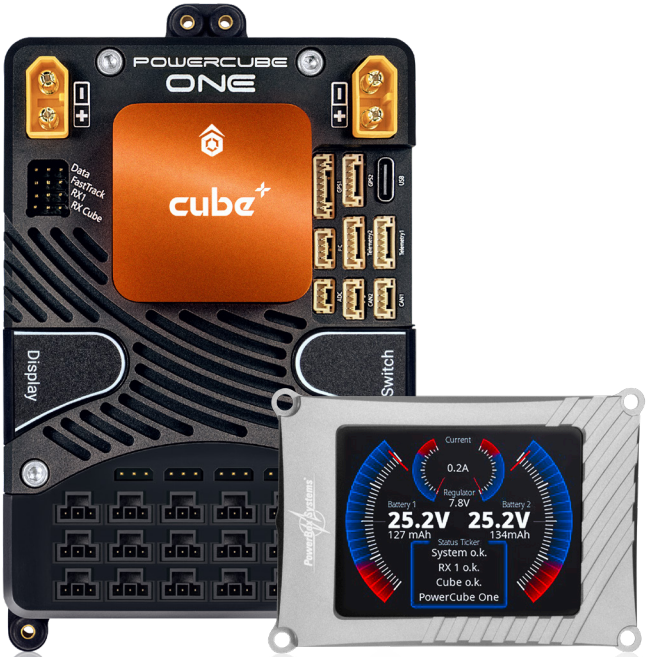
INSTRUCTION MANUAL

11/2024

PowerBox Systems®
Industrial



POWERCUBE ONE

High power, advanced features CUBE carrier board

Dear PowerBox customer,

with the **PowerCube ONE** PowerBox offers an all-in-one power supply system for the PIXHAWK CUBE flight controller, all the associated sensors, radio system and 24 high-power servos.

The two XT60 sockets are designed for the connection of rechargeable batteries or DC generator outputs. DC/DC converters of redundant construction provide 5V power to the CUBE and its peripherals, while an additional DC/DC circuit supplies a regulated 8V supply to the RC receiving system, the optional iGyro, GPS or True Airspeed Vario, and four servo sockets. The input voltage of 6V - 35V is available with minimal losses at all the other servo sockets. The entire power supply system is of redundant construction throughout.

However, the **PowerCube ONE** offers a great deal more: all the telemetry data which is gathered by the **PowerCube ONE**, such as battery information, GPS or True Airspeed data (if an optional GPS III or PBS-TAV is connected) are passed via the CAN bus to the CUBE, where the information can be used for flight control, or alternatively simply sent to the ground via the MAV-LINK interface and RC telemetry.

The RC receiver connected to the system (P²-BUS/EX-BUS/S.BUS2/SRXL2) can be used by the radio control system to activate a by-pass, which circumvents the Pixhawk control system. In by-pass mode it is possible with a fixed-wing aircraft to revert to proven iGyro technology, which is easy to set up. This enormously reduces the load on the pilot during manual take-off and landing during the set-up and parameter adjustment phases of the PIXHAWK flight controller.

All the servo outputs are freely assignable. If your aircraft features multiple servos actuating individual control surfaces, the **PowerCube ONE** offers a unique automatic servo-match function, which allows these servos to be synchronised in just a few seconds.

Two door sequencers, operating independently of each other, can be used to control a retractable undercarriage and wheel doors, or other control sequences, using only one channel. Each sequencer can control up to six servos with individual timing.

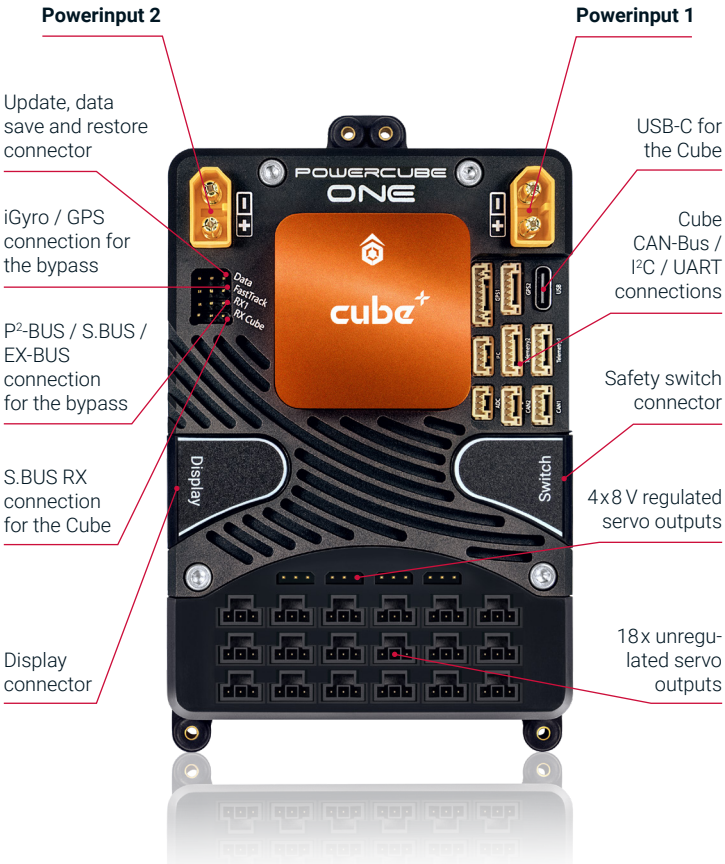
The unit features a full-colour 2.4" monitor which is legible in sunlight. Intuitively designed menus and assistants for initial installation, servo matching or the door sequencer make it a simple task to prepare the system for operation.

FEATURES

+ All-in-one power supply system for the Pixhawk Cube flight controller
+ High-performance dual power supply with high continuous current delivery
+ Low-loss 6-35V power supply for servos connected to the system
+ 40A brief maximum current load (10s)
+ 20A continuous load
+ 8A continuous load for the regulated 8V outputs
+ High-performance 5V/3A power supply for the Pixhawk and peripherals
+ Consistent dual construction of the high-power electronics
+ Redundant electronic switch
+ 26 channels (S.BUS: limited to 16)
+ 22 freely assignable servo outputs
+ CAN-BUS connection to the Pixhawk system
+ Availability of all telemetry data for the Pixhawk
+ Telemetry data for the RC system (P²-BUS/S.BUS2/SRXLS2/EX-BUS/HoTT/M-Link)
+ By-pass function for the controller
+ Servo-matching for all 22 outputs
+ Auto-matching function
+ 2 independent door sequencers with set-up assistant
+ Latest type of integral iGyro technology, with iGyroSat as gyro sensor
+ 12 independent gyro outputs for: 4x aileron, 4x elevator, 4x rudder
+ All 12 gyro outputs with individual gain control
+ Graphic menu representation for ultra-simple programming
+ Sophisticated assistant for fast initial set-up
+ Optional use with GPS III or PBS-TAV for speed-dependent gyro compensation (by-pass mode only)
+ Virtually every aspect can be operated from PowerBox and Jeti transmitters
+ User-selectable servo frame rate: 10ms, 12ms, 14ms, 16ms, 18ms
+ Suppression of servo feedback currents
+ 2.4” TFT screen, legible in sunlight
+ Bi-lingual menu system
+ Latest 32-bit micro-processor for precise high-speed signal processing
+ Optimised heat dissipation via high-performance machined metal heat-sink
+ Machined, anodised aluminium switch and screen case
+ Compact dimensions (136mm x 84mm x 31mm)
+ Weight only 170g (without Cube)

CONTENT

POWERCUBE ONE CONNECTIONS



The following instructions are limited to the **PowerCube ONE** features.
For Cube specific functions follow the Cube Pixhawk and Ardupilot instructions.

1. INITIAL INSTALLATION: GENERAL SEQUENCE OF OPERATIONS

When installing the unit, it is important to keep to the standard sequence described below, and adhere to the subsequent setup stages, as this ensures that your installation of the **PowerCube ONE** will be swift and problem-free.

The individual points are explained in full in the remainder of these instructions:

- Connect the Pixhawk Cube to the PowerCube ONE and fix it with 4 screws
- Install the PowerCube ONE in your aircraft including switch and screen
- Connecting the batteries and turn on the system
- Setup the Cube in the Mission Planer following the add-on instructions
- Connect a receiver to RX1 with P²-BUS, S.BUS, SRXL or EX-BUS
- Make the battery settings in the General settings menu
- Set up all the functions in the transmitter
- Carry out the Setup Assistant
- Carry out the Door Sequencer Assistant[1]
- Assign all remaining functions in Output Mapping
- Set up all control surface travels, flight modes, Dual-Rate, Expo etc. at the transmitter
- Use the Servo Matching feature to equalize servos operating in parallel
- Teach the stick end-points in the iGyro menu[2]
- Dial up the gyro gain in flight[2]
- Fine-tune the iGyro[2]

[1] not required if wheel doors are not present
[2] not required without using the iGyro

2. INSTALLATION, CONNECTIONS

a) Mounting

The **PowerCube ONE** should be mounted in the aircraft on a robust sub-structure using the four screws, rubber grommets and brass eyelets supplied in the set. The installed location is not important, but if an iGyroSat is to be used, the sensor must be installed perpendicular to the aircraft's centreline. Ideally the TFT screen should be in a clearly visible location. The very bright screen lighting makes it easy to read even in full sunshine, so no special provisions have to be made here. The screen is connected to the socket marked ***Display*** on the side of the PowerBox.

The switch should be mounted in the fuselage side. As with previous units, a wooden doubler should be glued to the inside of the switch aperture - especially if the fuselage is made of GRP - in order to avoid subjecting the switch to powerful vibration. The set includes a template for the switch aperture. An exposed switch is often undesirable in aircrafts, and for such applications we offer an alternative switch in the shape of the MagSensor. However, please note that the SensorSwitch is required for the programming procedure - unless you are using a Core or Jeti RC system - and for this reason it should always be available for use. The SensorSwitch is plugged into the socket marked ***Switch*** on the side of the PowerBox.

b) Receivers

Once you have installed the **PowerCube ONE**, the screen and the switch, it is time to connect the receivers.
It is permissible to extend the serial bus connection between receiver and backer to any length, as the signal is digital, and therefore extremely resistant to external influences.

The **PowerCube ONE** can be used with a wide range of radio control systems at **RX1**: PowerBox CORE P²BUS, Futaba S.BUS 2, Jeti EX-BUS, Spektrum SRXL2.
The **PowerCube ONE** automatically detects the system to which it is connected. However, when the radio is first switched on it may take a few seconds before the system is unambiguously recognised. Once detected, the unit stores the system type, and it will start immediately next time it is switched on.

RX1 goes directly to the main controller and is bypassing the Cube. RX1 is controlling with channel 16 if the signal from RX1 or the signal from the Cube goes to the outputs. If RX1 is not connected, the signal from the Cube is always present at the servo outputs.

RX Cube is the receiver input, if you want to use S.BUS to control the Pixhawk Flightcomputer. Other options like CAN bus or Mavlink are connected to the JST connectors on the other side.

c) Radio system and settings:

- **PowerBox CORE**
  Connect the receiver to RX1 with the **P²BUS** output.

- **Jeti EX-BUS**
  One output of the receiver you intend to use must be set to **EX-BUS**. The frame rate should be set to 10ms, and the Failsafe function must be OFF.

- **Futaba S.BUS2**
  Connect the receiver to RX1 with the **S.BUS2** output.
  In order to receive telemetry data you must carry out a ***Load New*** process in the Telemetry Sensor menu; this action completely erases the sensor list. Now select Slot 16 in the sensor list, and select **PowerBox**. The telemetry data now appears in Slot 16 or later.

  Note: Do not attempt to register the PowerBox as a sensor at the transmitter; this function is not implemented.

- **Spektrum SRXL 2**
  Connect a SPM4651T satellite to the **PowerCube ONE** using the optional adapter lead set (#9192).
  At the transmitter you will now see the battery data displayed under PowerBox Sensor.
  By default, the **PowerCube ONE** works in DX18 compatibility mode.

d) Connecting the batteries

When connecting the batteries, it is important to remember that high voltages of up to 35V are present. When the batteries are plugged in you will hear the characteristic sound which indicates that the integral capacitors are charging up; this is entirely normal.
LiPo or LiIon battery packs up to 8S can be used. The minimum battery is a 2S pack!
As a basic rule you should select a size of battery which ensures that one pack alone is capable of providing the power supply in the aircraft. In general terms it is permissible to select smaller battery capacities when working with a higher voltage.

If you assemble your own batteries, it is vital to maintain correct polarity. In order to avoid power losses, the unit does not include reverse polarity protection.

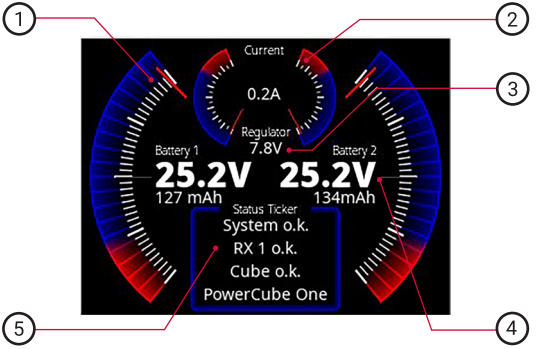
Note: Connecting reversed-polarity batteries, even briefly, will destroy the **PowerCube ONE**.

3. SWITCHING ON AND OFF

This is the procedure for switching the PowerBox on: hold the SET button pressed in until the LED glows red. Continue to hold it pressed in while you also press buttons I and II briefly to confirm the switching process. This method enables you to switch the batteries on individually; for example, in order to check that both packs are working properly, and deliver sufficient current when all the control surfaces are moved.

The same procedure is used to switch off.

The TFT screen now displays the following image:



1. Analogue battery voltage display, with recorded minimum value. The momentary value is indicated by the red line, while the grey line indicates the minimum voltage which occurred during the flight. The scale of the analogue display is automatically adjusted to suit the battery type you have selected. The supplementary digital display indicates the exact value.

2. The two analogue markers show the current being drawn from the right and left battery. The digital current figure shows the sum of the currents at both inputs.

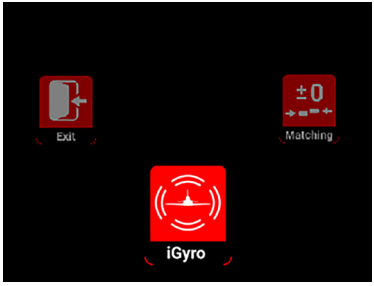
3. Shows the voltage present at the 8V output.

4. The consumed capacity is displayed separately for both batteries. It can also be reset from the transmitter if you assign a channel to this function.

5. All status messages are displayed at this point: receiver status and lost frames

4. MAIN MENU

To access the menu, you need to hold the SET button pressed in for about 2-3 seconds, after which you can select the desired menu using buttons I and II. Within the individual menus the selected menu point is always displayed in red.
Press the SET button once you have selected a menu point. You can now alter the values and settings using buttons I and II.



The “Rotary Menu” shown above contains the following sub-menus:

- **iGyro**
  Here you will find all the settings relating to the iGyro. These features are only available if an iGyroSat is connected to the ***FastTrack*** input of the unit.

- **Matching**
  If you have servos which are mechanically inter-connected, you can use this sub-menu to adjust them to match each other using a five-point curve. You will also find the Auto Matching function here.

- **Sequencer**
  At this point you can set up the two independent door sequencers, either manually or with the help of the Assistant.

- **Output**
  In this menu you can assign all 22 outputs directly to any transmitter channel, to a Gyro output or to one of the two sequencers.

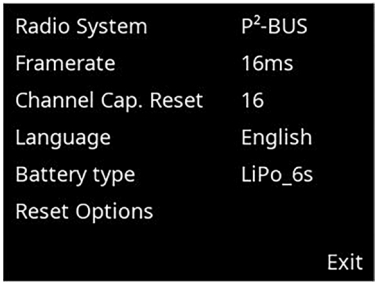
- **Input**
  The transmitter channels are assigned to the iGyro or sequencer here.

- **General**
  This menu is used to alter fundamental settings such as the language or frame rate.

- **Assistant**
  Always use the Setup Assistant when you are preparing a new aircraft for its first flight. This is where the transmitter input channels are determined, the aircraft type selected, and the servos assigned to the outputs. In just a few minutes the primary functions can be ready for use, and the Assistant procedure makes it much easier to set up the gyro functions at a later stage.

5. GENERAL SETTINGS

Before you start using the primary functions (with the help of the Setup Assistant) and connect the servos, you should enter the basic settings in the ***General Settings*** menu.



- **Radio control system**
  This menu point cannot be selected manually. As already mentioned, the unit automatically detects the radio control system. If you have already connected your receivers and bound them to the transmitter, you will see at this point the radio control system it has detected.

- **Frame rate**
  The default setting for this is 16ms, at which all current servo types operate reliably. Digital servos can deliver better performance if you set the frame rate to 12ms. Older analogue servos, on the other hand, may become hot if the frame rate is set too low, and will not be able to find their commanded position accurately.

- **Capacity reset channel**
  Enter a channel at this point which you wish to use to reset the consumed battery capacity. The capacity is reset when the selected channel is moved to +100%.

- **Language**
  Select German or English as menu language.

- **Battery type**
  At this point select the number of cells in your batteries.

- **Reset options**
  This menu point takes you to a sub-menu in which you can reset various settings individually or jointly.

6. SETUP ASSISTANT

The Setup Assistant is designed to help you complete basic channel and servo assignments quickly and easily. We recommend that you continue to use the Setup Assistant even if you are very familiar with the workings of PowerBox products. You should also use the Assistant even if you (temporarily) do not wish to use an iGyroSat.

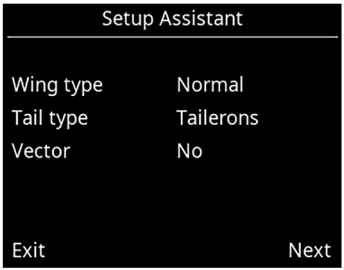
On the one hand the Assistant simplifies operations, because the menu initially refers to outputs in general terms, such as ***DIRECT-xy***, but once you have completed the Assistant it uses specific designations, for example, ***Right aileron*** … etc.
On the other hand, it is possible to retro-fit an iGyroSat without having to reprogram the battery backer. All assignments are already complete, and even the servo matching is maintained.

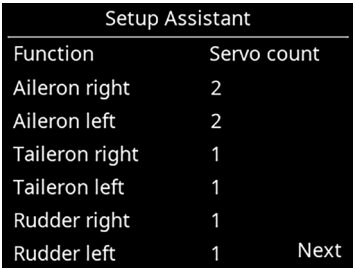
Note: When setting up the **PowerBox PowerCube ONE** for the first time, please keep to this sequence:
Setup Assistant (basic setup) → ***Sequencer Assistant*** → manual output assignment of all other functions.

The easiest way to go through the setup assistant is to use a RC-radio where all flight controls are programmed. Connect a matching receiver to **RX1**. If your flight computer channels are equivalent, it can take over control without further changes in the **PowerCube ONE**.

Before you select the Setup Assistant, establish all the primary functions at the transmitter, ideally with 50% travel. Mixers such as delta, tailerons and thrust vector must also be programmed at the transmitter before you start. Check the functions using your transmitter's servo monitor. At this stage servo centre positions and directions of rotation do not matter.
If you also intend to use an **iGyroSat**, you should now install the gyro sensor in a suitable position, perpendicular to the fuselage centreline, and connect it to the socket marked **FastTrack** on the **PowerCube ONE**. If you are also using a **GPS III** as telemetry sensor (and for gyro speed compensation), this should also be connected to the **FastTrack** input using a Y-lead.

Select the ***Assistant*** widget in the Main Menu, and you will see the following displays:

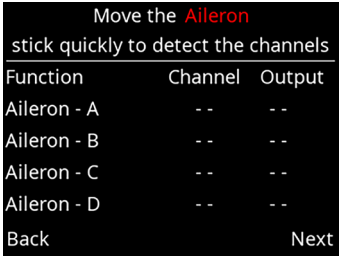


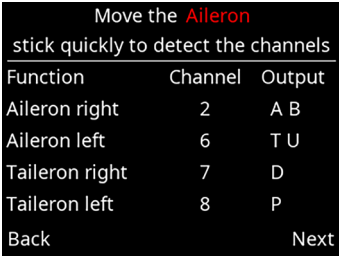


In the first display you select the wing type (Normal / Delta) and the tail type (Normal, Tailerons or V-tail). You can also determine whether the aircraft has a thrust vector system (Single or Dual).

On the next screen you enter the number of servos you wish to assign to individual control surfaces. The Assistant supports a maximum of three servos per control surface. This means: if your aircraft is fitted with six aileron servos, enter 3 for the right aileron and 3 for the left aileron.

You will now see further screen displays which vary according to the data you have already entered. The following illustrations show the aileron channel as an example, based on the above data:

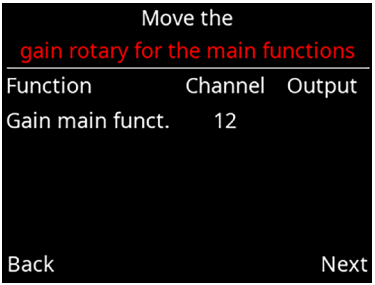




The left-hand picture shows the empty display. Now move the aileron stick at the transmitter: the PowerBox checks the input: in this example four channels should move.
The right-hand picture shows which channels have been detected, and the outputs to which you should connect the servos. Bearing in mind that your individual transmitter's channel sequence may not be as shown above, you may need to move the transmitter stick briefly and repeatedly until the detected channels appear after the appropriate functions.

Note: If multiple servos are mechanically coupled to a single control surface, disconnect the linkage to servos 2 and / or 3, as the servos are not yet matched to each other, and you could stall them!

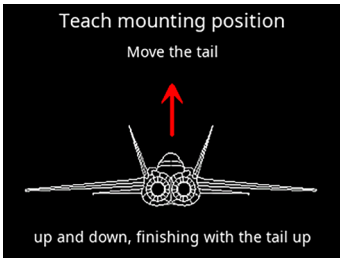
Repeat the procedure with the elevator and rudder functions. After this you will be asked to enter the Gain channel for the iGyro.

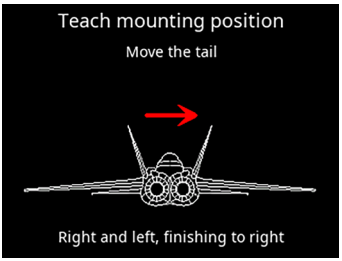


You need to assign a channel with +/-100% travel to a rotary control at the transmitter. Even if you have not connected an iGyroSat, this action is recommended as it will make it easier to retro-fit the gyro.
If you have selected a thrust vector function, you will see a second query regarding the sensitivity of the thrust vector control system. This is the method the Assistant uses to set up the basis for a simple but effective method of adjusting gyro gain in flight.

Once you have assigned the Gain control, press ***Continue*** to confirm your choice.
If no iGyroSat is connected, this concludes the Setup Assistant.

If an iGyroSat is connected, the next step is to establish the installed orientation of the iGyroSat:



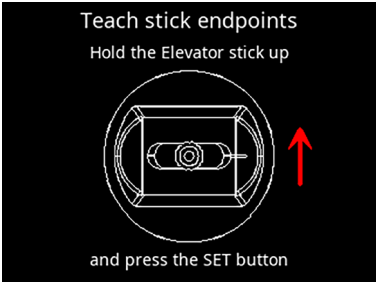


This is accomplished by moving the aircraft in the directions shown in the graphic display: first move the tail of the aircraft up and down two or three times. You will see that the elevators follow this movement every time - the direction of effect is not important at this stage.
At the end of the movement hold the aircraft's tail **up** and wait until the elevators return to neutral (centre).

Now repeat the procedure with the rudder (yaw) axis: move the tail to left and right two or three times – then hold the tail to the **right** until the rudder returns to neutral.

Note: This procedure can be awkward to carry out with larger aircrafts. However, there is a simple trick which makes learning the installed position easier: don't fix the iGyroSat in the aircraft until after the learning process is complete. During the learning procedure you simply move the **iGyroSat** in the appropriate direction, rather than the aircraft itself!

The Assistant now continues to the process of establishing the directions of effect ("sense") and learning the transmitter control end-points. Before you carry out this procedure, it is essential to set the direction of effect and the end-points of the primary functions at the transmitter.



Note: At any time, you can repeat the procedure in the Gyro menu for setting the direction of effect and the end-points. This is absolutely essential in any case if you adjust the travels or directions of effect of the primary functions while you are setting up the aircraft.

In this menu the system learns the aileron, elevator and rudder sticks as you hold each stick in the direction shown on the screen, and press the SET button.

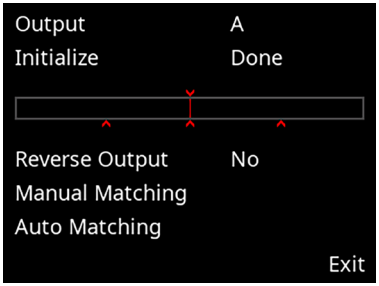
The Setup Assistant is now finished, but you can still assign additional outputs manually, carry out the Door Sequencer Assistant, or match multiple servos.

Note: It is possible to repeat the Setup Assistant at any time. The system retains previously entered settings, and only overwrites the entries you have changed.

7. SERVO MATCHING

The Servo Matching function can be used to adjust all 22 outputs in travel and direction using five points. Its purpose is to match the travels of multiple servos which are mechanically interconnected, or which control multiple functions using only a single channel. For example, the rudder may be coupled to a steerable nosewheel.

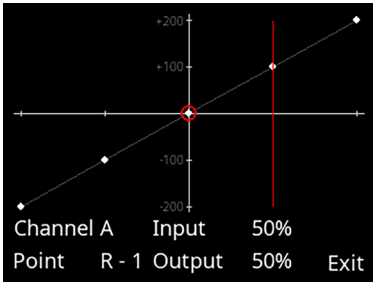
The servo matching procedure is divided up over two screen displays: in the first you set and initialise the channel which is to be adjusted.



- **Initialising**
  First centre your transmitter stick, then select ***Initialise***: now move the stick to both end-points. The screen displays the movement as a bar, and when the movement is complete, the small red markers remain in place at the end-points.

- **Reversing the output**
  If you simply wish to reverse the output without adjusting any individual point, just use the SET button to select ***Reverse output***.

- **Manual Matching**
  Select this menu point if you want to adjust the travel of the selected servo manually using five points. **The PowerCube ONE** switches to this display:



The procedure is very simple: use buttons I and II to select the point on the curve which you wish to change, then press the SET button. The servo automatically moves slowly to the corresponding point. Now you can alter the servo curve at this point using buttons I and II.
You don't need to use the transmitter to maintain the servo position; this makes accurate settings easier.
Once you have adjusted the curve point to the desired position, press the SET button again, and the servo slowly travels back to the position corresponding to the actual stick position.

If you now move the stick, you will see at ***Input*** the servo position corresponding to the transmitter stick position, and at ***Output*** the servo position now present at this servo.

Note: This action causes all the servos which are assigned to this input channel to move to the selected position. If this were not so, mechanically linked servos would immediately stall each other!

When you have completed all the adjustments, use button I or II to move to ***End***.

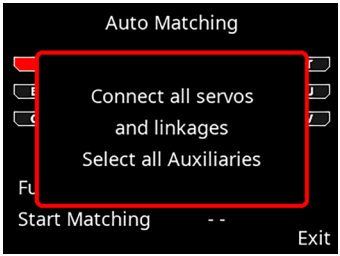
- **Auto Matching**
  The Auto Matching function is a completely new development. Its purpose is to match the travels of up to three mechanically interconnected servos accurately over five points, which it accomplishes in just a few seconds.

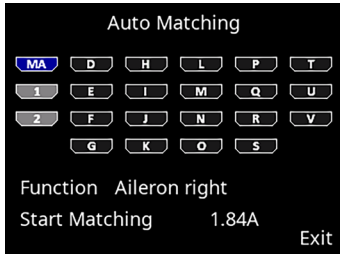
How does auto matching work?
The PowerCube ONE is fitted with the latest generation of micro-controller which is capable of measuring the current drawn from both batteries extremely quickly and precisely. The values for measured current are used to match two or three mechanically linked servos to each other.
This is accomplished by moving each servo to five points in turn and recording the lowest current values. The process is carried out in two steps: initially coarsely, then finely. A third stage then follows, in which fine-matching is carried out, taking into account any stiffness in the control surface hinges.
In the initial stage the servos are strained hard against each other for very brief periods (5 x 100ms). We have carried out hundreds of tests with this procedure, and have found that it presents no problems to servos - even low-cost examples. In fact, any linkage and servo must be capable of withstanding this procedure in any case, otherwise they would not be able to cope with flight loads.

Which servo types are suitable for auto matching?
All types of servo are suitable - with one exception: servos which do not become "soft" when the signal is switched off. There are a few digital servos which remain fixed at their position even when no signal is present. In steps 1 and 2 of auto matching this would cause the servos to draw a high current for an extended period, i.e. for as long as the matching process lasts, and this is not acceptable. Such servos can only be matched manually!

Start
In the first servo-matching display you select your **main servo** under ***Output***. In most cases this would be - in the case of ailerons - the servo closest to the fuselage. Connect the servo, and set the centre and travel at the transmitter. ***Initialise*** the servo with maximum travels.

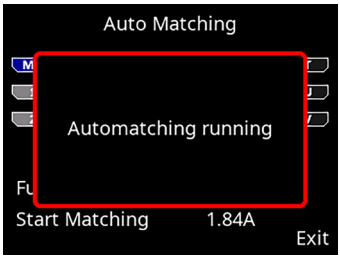
Now select ***Auto Matching***. At this moment all the **PowerCube ONE**'s other outputs are switched off, and you will see this message:

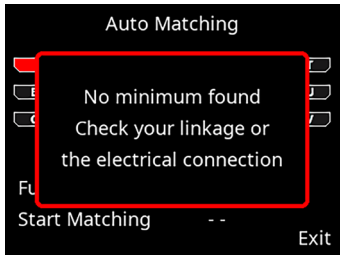




Now connect the second and - if present - the third servo to the appropriate outputs, and complete the mechanical linkages. Now use buttons I and II to move the cursor to the sockets to which the servos are connected, and press the SET button. These outputs now turn grey as ***participants***. When selected, these outputs are assigned to the same input channel as the **main servo**, and initialised. This means that you do not need to set the assignment of the ***participants*** beforehand in ***Output Mapping***, and also do not need to initialise them.
For example, if you accidentally select the wrong output, and wish to cancel your choice, the output will be reset to its previous function.

Once you have completed the selection of the participants, move the cursor to ***Start Matching***: the matching process commences. If you wish to interrupt the process, you can do this by pressing the SET button.
The procedure is automatically interrupted if the system fails to detect a minimum current value; for example, if a linkage is overloaded at its end-point, or you forgot to install it.



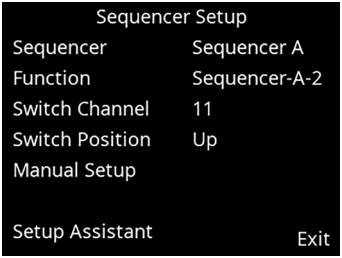


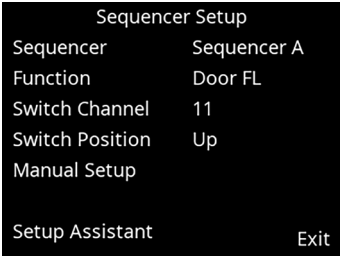
A matching process for three servos takes about 30-40 seconds. You can follow the current consumption directly on the screen. When the matching is finished, use the transmitter stick to run the servos to all five points. A quiet buzz from the servos in one or other position is normal. If the buzzing stops when you touch the control surface lightly with your finger, then this shows that the matching process has worked accurately.

Minor corrections can be carried out at any time under ***Manual Matching***. It is a good idea to check the servo matching occasionally before and during the flying season, as servos and mechanical systems are always prone to slight drift in use.

8. DOOR SEQUENCERS

The **PowerCube ONE** incorporates two independent, fully programmable door sequencers. For example, **Sequencer A** can be set up to control the undercarriage and wheel doors, while **Sequencer B** could be used to implement an opening canopy with latch. The **Sequencer Assistant** is designed expressly for Sequencer A, i.e. undercarriage and wheel doors.





The Sequencer menu is divided into three parts: sequencer selection and function, the actual set-up screen for manual set-up using the graphic display, and the Setup Assistant.

The two illustrations above show the method of starting the sequencer. The difference between them is this: in the left-hand picture the ***Function*** line shows the standard term for function 2 in sequencer A. The right-hand picture shows the specific term ***Door FL*** (front left) - this is the same function after the Setup Assistant has completed its work.

This means: the Assistant renames the doors in accordance with your own data, and this makes it simpler to make adjustments later. More on this below.

Regarding the individual menu points:

- **Sequencer**
  Select the sequencer you want to set up: ***Sequencer A*** or ***Sequencer B***.

- **Function**
  Here you select the function which is to be adjusted. Each of the two sequencers A and B provides facilities for six individually variable functions. For example, an undercarriage with four doors (individually controlled) needs five functions: four doors + retracts (valve or electronic unit).
  Up to seven travel points can be set up for each function. Each travel point is defined with a servo position and a time (delay) after the start point.

- **Switched channel**
  At this point you should define which transmitter channel is to be used to switch the selected sequencer. This setting is also present in ***Input Mapping***. At the transmitter the switched channel travel should be set to -100% to +100%.
  It is important to know that the door sequencer also includes a pause function: if you use a three-position switch and set it to 0%, the sequence stops at the current position. From this point you can continue or reverse the sequence according to the next switch position.

- **Switch position**
  Here the screen shows directly the current position of the assigned channel. If this position does not coincide with your preferred transmitter switch position, you can correct it at the transmitter using servo reverse.

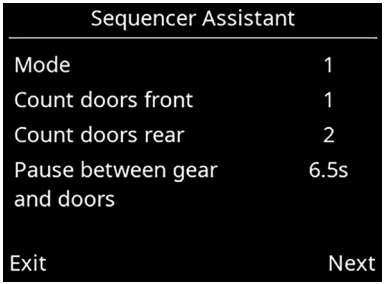
- **Manual Setup**
  This menu enables you to set up and adjust the individual functions, and also fine-tune the timing and position of functions which the Assistant has already set up for you.

- **Setup Assistant**
  As already described, the Setup Assistant prepares all the functions in the aircraft in accordance with your requirements. The system learns all the door positions and the retract control system.

After this, the Assistant assembles these positions in accordance with your selected mode (1-2-3 - see next page) in a timed sequence. We recommend that you always use the Setup Assistant – it will save you a great deal of adjustment work, and any non-standard movements can subsequently be added at any time using ***Manual Setup***.

a) Setup Assistant

The Setup Assistant is only available for Sequencer A, and is specifically designed to cater for retractable undercarriage sequences.



Once the Setup Assistant is selected, it has to learn a number of fundamental aspects:

- **Mode**

  Three modes are available, representing different sequences.

  Mode 1:
  Extension: all wheel doors open – undercarriage extends
  Retraction: undercarriage retracts – all wheel doors close

  Mode 2:
  Extension: all wheel doors open – undercarriage extends – rear wheel doors close
  Retraction: rear wheel doors open – undercarriage retracts – all wheel doors close

  Mode 3:
  Extension: all wheel doors open – undercarriage extends – all wheel doors close
  Retraction: all wheel doors open – undercarriage retracts – all wheel doors close

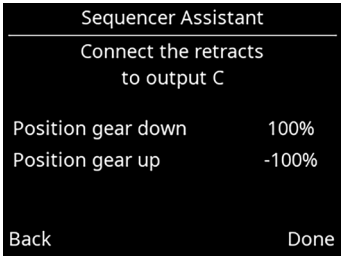
- **Number of wheel doors**
  Enter the number of doors. If all the wheel doors are to be operated by a single valve, enter a ***1*** at ***Number of front doors***, and leave the ***Number of rear doors*** vacant.

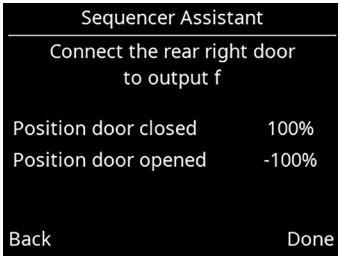
- **Pause between undercarriage and doors**
  Extend: The time the system waits after extending the undercarriage before the wheel doors close. Applies to modes 2 and 3 only.

  Retract: The time the system waits after retracting the undercarriage before the wheel doors close. Applies to all modes.

Note: All settings in the Assistant are stored – including all subsequent servo positions. For example, if you wish to change the retract mode or the pause period after completing the Assistant, simply run through the Assistant again without changing the positions. The Assistant then simply adjusts the timed sequence.

Once you have completed all these settings, select ***Continue***.





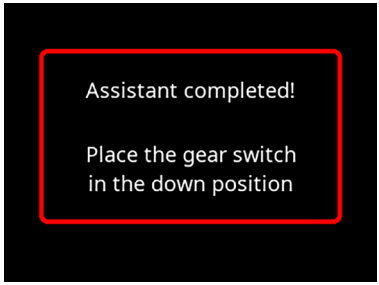
The positions of the undercarriage control system and all the wheel doors are now set up in accordance with the number of wheel doors you have entered. At this point you should connect the retract control unit and the wheel doors to the appropriate output of the **PowerCube ONE**. Starting with ***A*** the Assistant searches for outputs which have no special functions – i.e. ***Direct xy*** outputs, which are not assigned to a gyro or other sequencer function.

Note: It is important to keep to the standard sequence when installing the **PowerCube ONE** for the first time:

Setup Assistant (basic setup) → ***Sequencer Assistant*** → manual output assignment of all other functions.

If you ignore this, the Sequencer Assistant could overwrite ***Direct*** functions which are already assigned.

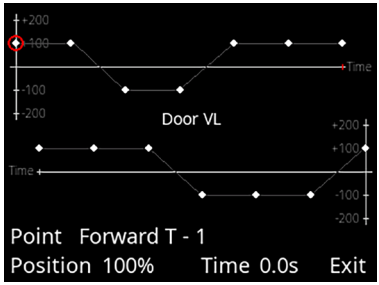
When the positions are being established you will see that the wheel doors and the undercarriage itself always follow the cursor position, and slowly approach the set position. If you wish to adjust these positions, press the SET button and make changes using buttons I and II. Select ***Finished*** to adjust the other wheel doors. Once all the doors are correctly adjusted, the following display appears, and you may be asked to move the retract switch to **Extended**:



The Assistant now opens all the wheel doors and moves the undercarriage to the **Extended** position. At this point you can check the operation of the sequencer by operating the retract switch on the transmitter. If you find a problem - perhaps the pause between the undercarriage and the wheel doors is too short - you just select the Assistant again, and change the appropriate setting. There is no need to re-adjust the wheel door positions.
Should you wish to set up additional wheel doors or travel points, you can do this at any time in ***Manual Setup***.

b) Manual Setup

You will find an overall view of the sequence for the selected function in the main Sequencer menu.
The upper line shows the sequence in the forward direction (extension), the lower line the reverse sequence (retraction).



In Manual Setup you can set seven travel points in time and position for each function; forward and reverse processes are individually variable.
The current position and time are shown in the bottom line of the screen.

Use buttons I and II to select the point you wish to change. The position of the servo follows the position of the cursor on the line. For example, if you select a point which stands at +80%, the corresponding servo moves slowly to the +80 % position.

Note: When adjusting the wheel doors, you should start by retracting and disabling the undercarriage itself, otherwise there is a risk of the doors fouling the wheel legs and causing mechanical damage.

To adjust a point, select the appropriate point using buttons I or II, and press the SET button; you can now adjust its position. Once the position is correct, you can set the time after pressing the SET button again.

All seven points are permanent. If you want a particular point to produce no servo movement, set its position to the same value as that of the previous point.

This is shown in the example above, where the three right-hand points on the upper line are at the same position. As a basic rule the time can only be entered between the two points at left and right. If you want to shorten the entire sequence, you must move all the points.

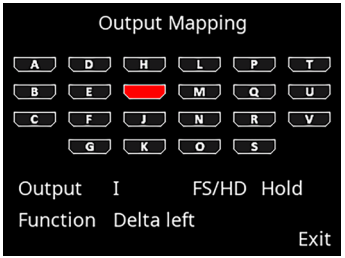
It is possible to test the sequence without leaving the menu: move the cursor to ***TEST*** at bottom right; this action transfers control to the retract switch on the transmitter. The ***TEST*** select point changes to ***Exit*** – press the SET button here to leave the menu completely.

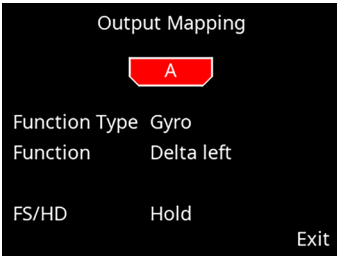
9. OUTPUT MAPPING

Output Mapping enables you to assign servo sockets to the transmitter channels and the gyro and sequencer functions.
All 22 outputs can be assigned, and there are no restrictions. For example, output A can be direct channel 5 from the transmitter, or a door sequencer function. It is also possible to assign one function to multiple outputs. For example, two elevator servos can be controlled from just one transmitter channel. Servo matching can then be used to match the control surfaces accurately to each other. This facility saves channels at the transmitter, where they can be in short supply.

Output Mapping is also used to set the Failsafe response of each individual channel.

In the ***Output Mapping*** display, you use buttons I and II to select the output you wish to assign:





Press the SET button to select the output. On the next screen you can now define the output:

- **Function type**
  Three different function types are available:

-Direct
Selecting a ***Direct*** channel assigns a transmitter or flight computer channel directly to the selected output without modification (except for servo matching). For example, if you assign Direct 5 to output V, then output V responds to channel 5 at your transmitter or your flight computer.

-Gyro outputs
Once the Setup Assistant is complete, you can assign the gyro channels to the outputs. At the Select stage you will find, for example, ***Aileron***, ***Elevator*** and ***Rudder*** functions. These functions can also be assigned to the outputs more than once. For instance, if you are setting up an aircraft with three aileron servos in each wing, then you will find three instances of ***Right aileron*** and ***Left aileron***.
Gyro channels not assigned through the Setup Assistant are designated Aileron-ABCD, Elevator-ABCD and Rudder-ABCD.

-Sequencer A and Sequencer B
This function type contains six outputs for each of the door sequencer functions. As in the case of the gyro, the sequencer outputs have general designations if the Assistant has not yet been completed - for example, Sequencer A-1. Once the Sequencer Assistant has been used, they are assigned specific names such as Door FL (front left) or Door RR (rear right).

- **Function**
  At the Function point you can use buttons I and II to choose the function you wish to assign to the output. Various options are available here, depending on the function type you have selected.

- **FS/HD**
  This is where you set the Failsafe response for the selected output. By default, all outputs are set to Hold mode. However, it is really essential to set Failsafe (FS) on throttle, so that the power system is throttled back or cut completely should the signal be lost. In many countries this is a legal requirement in any case.

If you set an output to Failsafe, all current positions are adopted from the transmitter when you leave the menu point. This means: you should move all channels to the desired position at the transmitter before you set an output to Failsafe.

The usual way to check the setting is to move the throttle channel to the half-way point, then switch the transmitter off: the throttle servo must now immediately move to the Idle position.

If you are using a **PowerBox** radio system, the Failsafe settings are adopted from the transmitter; this overwrites any Failsafe settings which you select at the **PowerBox PowerCube ONE**.

10. INPUT MAPPING

The Input Mapping menu is used to assign the channels coming from the transmitter to functions such as Gyro, Sequencer or capacity reset. The assignment process is carried out by the Setup Assistant and the Sequencer Assistant. If you add functions later, or change channels at the transmitter, it is possible to make appropriate adjustments subsequently at any time.
In particular, assigning different Gain channels for the iGyro makes it easier to enter the settings for more complex applications.

Input Mapping Gyro Aileron	
Aileron - A	2
Gain Aileron - A	9
Aileron - B	6
Gain Aileron - B	9
Aileron - C	7
Gain Aileron - C	10
Aileron - D	8
Gain Aileron - D	10

Input Mapping Gyro Aileron	
Aileron right	2
Gain Aileron - A	9
Aileron left	6
Gain Aileron - B	9
Taileron right	7
Gain Aileron - C	10
Taileron left	8
Gain Aileron - D	10

The screenshots above show once more that the Setup Assistant determines the function designations. On the left we see the general function names, whereas on the right - after carrying out the Assistant - the names are specific to your aircraft.

These pictures also clearly show the separate Gain channels for each gyro function. For example, aileron, elevator and rudder can be assigned three different Gain channels, which can then be adjusted individually in a single test-flight.

To assign a channel, use buttons I and II to select the function, then press the SET button. You now have two options for choosing the channel:

- Use buttons I and II
- Simply move the transmitter stick: the channel is automatically detected. If more than one channel is assigned to a particular transmitter control (for example, channels 2 and 6 for aileron control), repeatedly move the stick briefly from centre until the desired channel is selected.

Press the SET button to confirm your choice.

11. iGYRO

All iGyro features are explained in the manual of the iGyroSat, which can be found on our website.

Note: The iGyro feature relieves your pilot when the aircraft is test flying without the flight computer. It is not recommended to use the iGyro and the flight computer at the same time. This may create interference between both systems!
Special for manual controlled take-off and landing manoeuvres in windy conditions, it takes a lot of work load from the pilot.

It is important to carry out the Setup Assistant before you make any changes to the iGyro settings, as all the channel assignments will then be correct. A single test-flight with the base values then forms a good starting point for further fine-tuning.

12. GYRO SETTINGS – BEFORE THE FIRST FLIGHT

You must complete the following points before you start fine-tuning the iGyro in flight:

- Settings in the General Settings menu
- Setup Assistant completed – installed orientation learned
- Door sequencer set up if appropriate
- All other functions assigned, including throttle, flaps etc.
- All functions set up correctly: servo centre, end-points, servo matching, Dual Rates and Expo

The next step is to enter the iGyro menu with the cursor right at the bottom, so that the menu jumps to the second page. There you will find the ***Learn transmitter stick end-points*** menu point. Carry out this step as described above, in order to calibrate all the settings which have been entered in the course of the installation procedure.

Once you have completed these steps, turn the gyro gain control (or controls, if your aircraft has a vector control system) to maximum, and **check the direction of effect of the gyro**. The intelligent iGyro learning process effectively prevents the need for corrections here – unless you have made an error when learning the sticks or the installed orientation. If this should happen, simply repeat the appropriate point in the iGyro menu.

It is important to know that the gain control has two ranges, as explained above: range A and range B. In range B the Assistant assigns Attitude Assist to the aileron function. We recommend this setting on the ailerons, as it results in very precise gyro response. During the test-flight we suggest that you turn the gain control to the left (0% to -100%) in order to make use of this feature immediately. Later on, you can fine-tune ranges A and B individually at any time.

Your aircraft is now ready to fly. Set the gyro gain control to 0%, and take the aircraft off. On this first flight it should be trimmed out carefully without using the gyro function.

Should you need to adjust the trims, or correct the control surface travels, during or after that first flight, it is essential to re-learn the stick end-points in the Gyro menu.

The iGyro is now ready for the aircraft's initial set-up flight. Take the aircraft off with gyro gain set to 0%. Hold the aircraft straight and level while you (or a colleague) slowly turn the gain control to the left - or right, if you do not want to use Attitude Assist on the ailerons.

Slowly turn the gain control until the aircraft begins to oscillate. Once you have found this point, turn the gain control back slightly. Now fly a few circuits with this setting. The aircraft should exhibit no tendency to oscillate at any time.

As soon as you have found this optimum setting, bring the aircraft in for a landing. Switch to your transmitter's servo monitor, and read off the percentage value for gain. You can now swap the rotary control for a switch, and enter the associated servo travel as the percentage you have just established. A value of 0% disables the gyro.

Since the **PowerCube ONE** features integral gain controls for each individual gyro function, it is possible to implement different flight modes at the transmitter with no great effort.

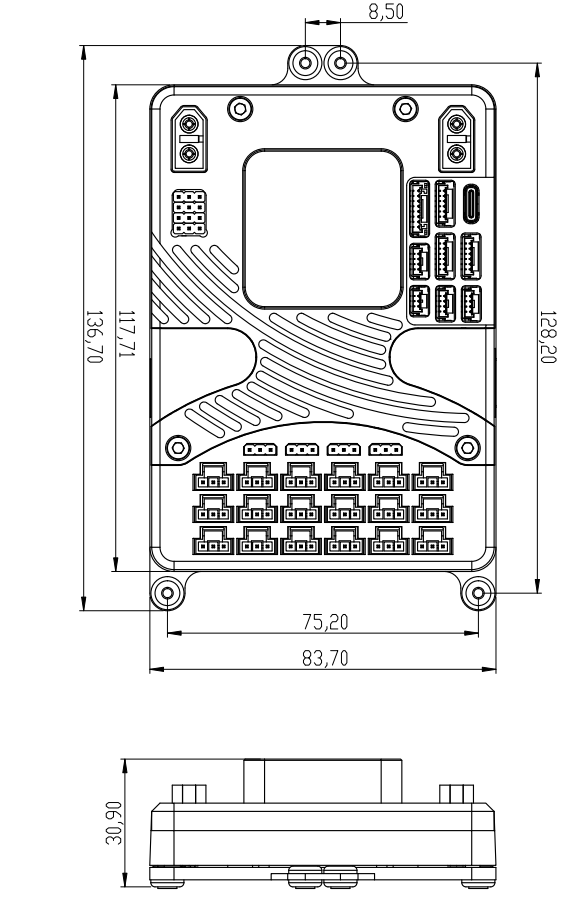
13. SPECIFICATION

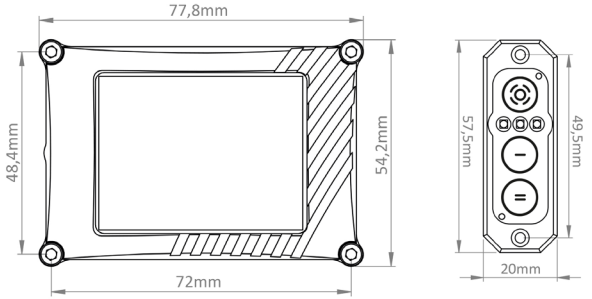
Operating voltage	6.0 V - 35.0 V
Power supply	3-8 s LiPo, Lilon or DC from a generator
Current drain, operating	75 mA at 20 V
Current drain, stand-by	40 µA
Maximum current continuous	2 x 20 A
Maximum current peak	2 x 40 A (< 10 s)
Drop-out voltage	0.35 V
Output voltage regulated	8.0 V
Signal input	Serial
RC systems supported	PowerBox, Futaba, Jeti, Spektrum, M-Link and Hott
Channels	26
Servo outputs, total	22
Servo signal resolution	0.25 µs
PWM framerate	10 ms, 12 ms, 14 ms, 16 ms, 18 ms
Gyro sensor type	External iGyro SAT
Number of sensor axes	12
Telemetry systems supported	P²BUS, S.BUS2, EX-Tele, SRXL2
Dimensions	137 x 84 x 19 mm
Weight	170 g (without Cube)
Weight, Sensor-Switch	15 g
Temperature range	-30 °C to +85 °C

14. SET CONTENTS

- **PowerBox PowerCube ONE**
- **TFT-Display**
- **SensorSwitch**
- 2 patch-leads
- 8 retaining screws
- 4 M2x20 screws
- 4 rubber grommets and brass sleeves
- Operating instructions

15. DIMENSIONS





16. SERVICE NOTE

For technical questions you can contact us here:
industrialsupport@powerbox-systems.com

SERVICE ADDRESS

PowerBox-Systems GmbH
Ludwig-Auer-Straße 5
86609 Donauwoerth
Germany

17. GUARANTEE CONDITIONS

At **PowerBox-Systems** we insist on the highest possible quality standards in the development and manufacture of our products.
They are guaranteed **“Made in Germany”**!

That is why we are able to grant a **24 month guarantee** on our **PowerBox PowerCube ONE** from the initial date of purchase. The guarantee covers proven material faults, which will be corrected by us at no charge to you. As a precautionary measure, we are obliged to point out that we reserve the right to replace the unit if we deem the repair to be economically unviable. Repairs which our Service department carries out for you do not extend the original guarantee period.

The guarantee does not cover damage caused by incorrect usage, e.g. reverse polarity, excessive vibration, excessive voltage, damp, fuel, and short-circuits. The same applies to defects due to severe wear.

We accept no liability for transit damage or loss of your shipment. If you wish to make a claim under guarantee, please send the device to the following address, together with proof of purchase and a description of the defect:

18. LIABILITY EXCLUSION

We are not in a position to ensure that you observe our instructions regarding installation of the **PowerBox PowerCube ONE**, fulfil the recommended conditions when using the unit, or maintain the entire radio control system competently.

For this reason we deny liability for loss, damage or costs which arise due to the use or operation of the **PowerBox PowerCube ONE**, or which are connected with such use in any way. Regardless of the legal arguments employed, our obligation to pay damages is limited to the invoice total of our products which were involved in the event, insofar as this is deemed legally permissible.

We wish you every success using your new **PowerBox PowerCube ONE**!

Donauwoerth, November 2024

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