robbe Futaba

English

PSS 2018 - Power Supply System

No. F1660

Operating Manual

1. Preface

Dear customer,

we are glad you decided for the high power dual current supply **PSS2018** from the robbe product line. With that you own a powerful current supply for your valuable model.

Despite simple handling of this dual power supply, operation and usage demand some knowledge from the user. This manual will introduce you quickly to this device.

In order to reach this goal safely carefully read this manual and especially the safety instructions (chapter 2) before operating your new current supply.

We wish you success and fun with this high grade product!

Exclusion of liability:
This dual current supply is exclusively designed and approved to be mounted into radio controlled RC models. robbe Modellsport assumes no liability if used otherwise.

Both, adherence to the operating instructions as well as conditions and methods of operation can not be monitored by robbe Modellsport.

Therefore, we assume no liability whatsoever for loss, damage or cost which result from erroneous usage and operation or which can be linked to such events.

As far as allowable by law, commitment for indemnification, independent of any legal foundation, is limited by the invoice value of the directly engaged robbe products causing the damaging event.

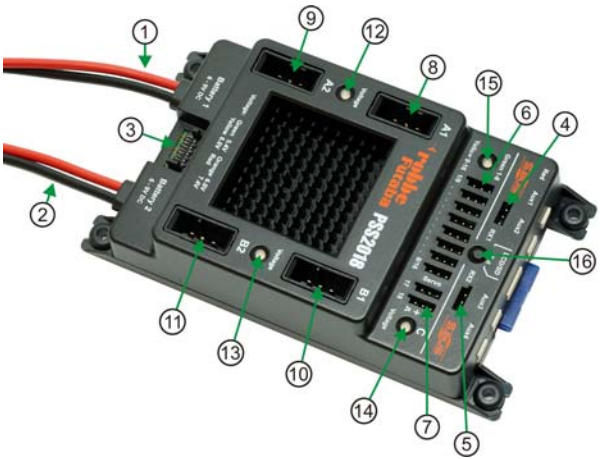
This does not hold true if for mandatory statutory provisions unlimited accountability is demanded due to deliberate intention or grossly negligence.

Contents

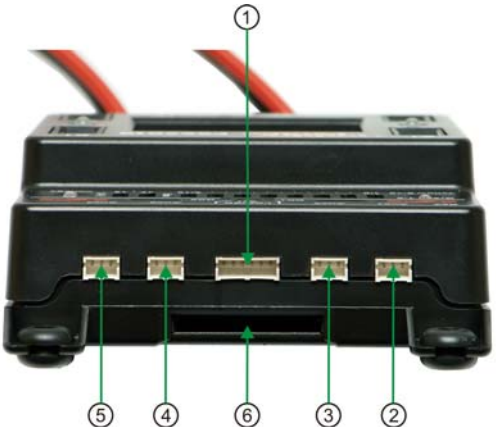
2. Safety Instructions

- In general, all connecting lines should be run so that they do not come into contact with moving or hot parts of the model (such as servos, gears or sound absorbers).
- The **PSS2018** must be protected from humidity and moisture.
- The **PSS2018** must be located at a sufficient distance from neighboring surfaces to enable good heat dissipation of the cooling element.
- Improper handling of the **PSS2018** can result in serious damage/injury to property or persons!
- Carry out a general inspection of all connections in your model before each use! All plugs must be correctly polarized and have clean contacts (i.e. fit tightly). Loose cables present a potential hazard!
- Under no circumstances may power sources that do not meet the specified voltages be used.
- The current-conducting contacts of the connector plugs may not be short-circuited. If you fail to observe this warning, the short-circuited cables may overheat and even melt.
- The **PSS2018** may not be taken apart or technically altered under any circumstances.
- Never use the **PSS2018** for purposes other than for RC model making as a hobby. Above all, their use in passenger-carrying equipment is strictly prohibited.
- Operate the **PSS2018** only with the remote control components provided for model making.
- Always ensure that you have fully charged batteries when operating your model. Empty batteries inevitably lead to failure of the RC components, which cause the model to crash.
- Do not expose the **PSS2018** to any extremely hot or extremely cold temperatures, moisture or humidity. This would lead to danger of malfunction, damage or decreased efficiency.
- Only use our released accessories in connection with the **PSS2018** (e.g. switch actuator, fan, cables, external voltage indicators etc.).
- Operate only with robbe/Futaba S-Bus receivers or Spektrum-Satellites.
- Observe implicitly operating instructions for the utilized transmitter and receiver.

3. PSS2018 Overview



1	Connection Battery 1
2	Connection Battery 2
3	Connection Switch Actuator (e.g. Magnetically Switch Actuator)
4	Connection S-BUS Receiver 1
5	Connection S-BUS Receiver 2
6	Output "C" for 8 Servos (channel 1-8 or channel 9-16)
7	Output "C" for 2 Servos (channel 17 and 18 – switching channels)
8	Connection S-BUS “A1” (bus system)
9	Connection S-BUS “A2” (bus system)
10	Connection S-BUS “B1” (bus system)
11	Connection S-BUS “B2” (bus system)
12	Indicator LED Output Voltage for S-BUS “A1” and “A2”
13	Indicator LED Output Voltage for S-BUS “B1” and “B2”
14	Indicator LED Output Voltage for Servo Outputs "C"
15	Indicator LED for Operating Mode (S-BUS / Spektrum)
16	Programming Push Button

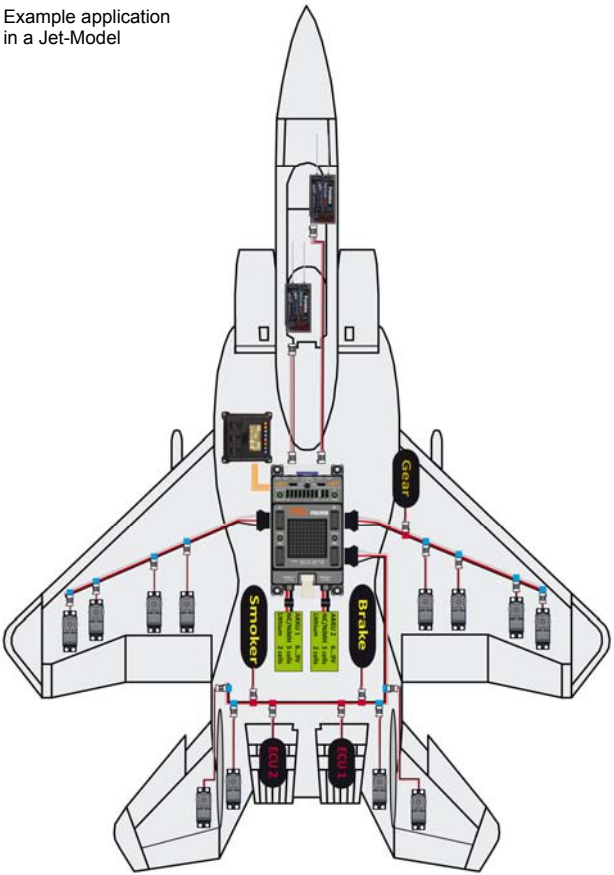


1	Connection for LCD control box (optional)
2	Connection Spektrum-Satellite 1
3	Connection Spektrum-Satellite 2
4	Connection Spektrum-Satellite 3
5	Connection Spektrum-Satellite 4
6	SD memory card slot (2GB SanDisk – FAT32)

Hint:
The nominal input voltage of the **PSS2018** ranges from 6V up to 8.4V. Battery connections are protected against reverse polarity. Batteries that can be used: 5 to 7 cell NiMH batteries, 2 cell LiIon, LiPo or LiFePO4 batteries.

Hint:
At delivery, all output voltages are set to 6.0V. The **PSS2018** operates in "FASST S-BUS "channel 1-8" mode. Two 2S LiPo batteries, 2000 milli-amps each, are set as battery types.

Example application
in a Jet-Model



4. Features of the PSS2018

The dual current supply PSS2018 (=> Power Supply System) is predominantly designed for receivers and servos with the S-Bus system. Using PWM adapters, standard servos and other electronically equipment can be connected, too. The special advantage of the S-Bus system is the 3-wire cable from the receiver into the dual current supply but still transmitting 18 channels.

Therefore, the receiver can be easily positioned at a place where receiving is best (e.g. in the cockpit) while the dual current supply is placed further down in the fuselage.

Dual safety by two receivers
Two (or up to four) receivers can be connected to the input. The battery switch contains automatic switching between receivers, dependant on signal strength. This is important for huge model aircrafts over 25 kilograms / 55 pounds where two receivers are mandatory. The **PSS2018** is also appropriate for four Spektrum-Satellite receivers.

Bus-Concept
A slightly thicker 3-wire S-BUS cable (1mm² / AWG 17) leads from the dual current supply to the servos, for example one cable leads into the fuselage, one to the rear and additionally one or two into the wings. The servos connect to the S-BUS at desired positions using special S-BUS connectors. Hereby, complexity for cabling is reduced enormously. Because the many conventional cables are heavy, this system is saving weight. Furthermore, two or more servos can be placed at an arbitrary position if the power of one servo is not sufficient. Using the S-BUS connector, a servo is quickly connected. Just assign a corresponding channel number to the servo and you are done connecting a servo.

Three voltage regulators
In summary, four S-BUS outputs are available which are paired (output 1: A1+A2, output 2: B1+B2). Each of both outputs has its own voltage supply which is selectable between 5.4V, 6.0V, 6.6V or 7.4V. Maximum power load is 10 amps continuously (> 15min / 7.4V) and 50 amps temporarily (per double output) when connecting 2S LiPo batteries.

Using an optional temperature regulated fan, which is simply screwed onto the base device, the power of the battery switch can be increased to 16 amps continuously if needed.

Besides the serial outputs also parallel outputs 1..8 (or 9..16) are available for connecting standard servos or auxiliary electronics with PWM control. These outputs (C) also contain their common voltage supply, which is selectable between 5.4V, 6.0V, 6.6V or 7.4V. Current load is here approx. 8 amps continuously and can be increased to 12 amps when using the fan.

Current supply for the receiver(s) is also accomplished via the output (C), herewith the voltage is identical. This also allows for connecting servos directly to the receiver.

High current capability
Battery connection takes place intentionally via slightly thicker cables. Of course, both batteries are discharged completely symmetrically during operation. This divides the current per battery by two which helps for a longer battery life. With two LiPo chargers 2S 750 milli-amps (Part Nr. F1692) both LiPo batteries can be charged from the 115/230 volts system without disconnecting cabling. The integrated equalizer serves for balanced cell voltages.

Acoustically alarm
Maximized safety is guaranteed by the integrated buzzer. It outputs error information by buzzer codes. If the capacity of the battery decreases to an impending low voltage situation, this will be signaled unambiguously.

Up to 36 Servos
The transmitter controls a maximum of 16 proportional and 2 switching channels (depending on transmitter). On the side of the battery switch, an unlimited number of servos can be operated in parallel if assigned an identical channel number. For these servos travel, direction, reaction times etc. are adjustable individually.

Furthermore, parallel and serial channels can be used at the same time. The number of maximum usable servos is only limited by current load and can practically reach up to 36 servos depending on the servo type used.

Due to the low number of connectors as well as highly effective fan technology for cooling, the battery switch is relatively small with 122 x 80 x 33mm^3 / 4.8" x 3.15" x 1.3" light-weight with its 200 grams / 0.440925 pounds (220 grams / 0.485017 pounds with fan).

Simple Mounting
The **PSS2018** is mounted in the model with four screw connections via vibration dampened rubber buffers. All electrical connections are plugged in order to easily move the battery switch from one model to another.

SD Memory Card
Furthermore, the **PSS2018** has a slot for a SD memory card. Herewith, the software can be updated via a boot loader function. The SD memory card is also used for recording data. The most important flight data (voltages, currents, capacities, errors and so on) can be easily transferred to and read, displayed and evaluated at a PC. Due to the huge memory capacity of the SD card a real model log book can be saved. The data can also be read and displayed in real time on the field using an optional LCD control box.

5. Contents of Delivery

Scope of delivery of **PSS2018**:

- Dual Current Supply **PSS2018**
- Magnetically Switch Actuator (internal)
- Switching element for Magnetically Switch Actuator
- SD memory card with 1GB or 2GB capacity (FAT32)
- Operating manual (German)

Manuals in other language than German are stored at the SD memory card (Acrobat ® PDF format).

Each **PSS2018**-System carries its own serial number and is tested several times before delivery!

6. Mounting Instructions

6.1. Mounting the PSS2018

The **PSS2018** has four screw mounts for M4 screws. The inserted rubber grommets serve for vibration protected mounting. In general, electronically parts should always be placed at positions with fewer vibrations.

Because both S-BUS receivers are connected via patch cables, they can be placed at best receiving positions. The **PSS2018** itself can be mounted at more remote locations – depending on available space.

Hint:
The upper and lower side of the **PSS2018,** where the heat shields are located, must not be covered or pasted up with anything and should have a distance of at least 30 mm / 1.2" to any close surface (fuselage bottom or similar)!

In general, always observe vibration free mounting and sufficient air circulation.

A much approved mounting method is screwing the **PSS2018** onto a mounting board using M4 screws and four short gasoline hoses. These serve as excellent additional dampers against vibrations and allow for neat mounting.

Of course, mounting with short spacers is possible. This is appropriate for gliders and jet models (models with little or no vibrations).

Hole Distances for Mounting

6.2. Connecting the Switch Actuator

Mechanically switches carry the risk of failing. Vibrations on a huge model's fuselage sidewall can be quit strong. In order to avoid any mechanical influence, powerful electronically switches are utilized in the **PSS2018**. The electronically switches are just controlled by a pulse from the corresponding switch actuator. The switch actuator delivers only the On/Off signal and does not switch any power.

In delivery included, the especially light-weight and space saving magnetically switch actuator controls the switching event totally free of contacts with an external magnet (see photo). Holding the magnet over the on-position (see print "ON" on PCB) turns the **PSS2018** on. Holding the magnet over the off-position ("OFF") turns the system off. Duration for turning off is at least 2 seconds. The range labeled "undefined" indicates uncertainty whether a power on or off can occur. The distance of the magnet can be up to 8mm / 0.3" – therefore, thick fuselage sidewalls are of no problem.

The magnetically switch actuator can be positioned arbitrarily (e.g. inside a fuselage's sidewall). A little hole of 3mm / 0.12" in the sidewall suffices in order to see the red control LED from the outside. Simply glue the magnetically switch actuator inside the fuselage's sidewall using silicone for example.

Plug the connection cable with its white plug into the corresponding multipoint connector of the **PSS2018** until it locks. In order to remove the plug for a possible change carefully remove the plug toward top (not to the front) from the multipoint connector (hold the cable directly at plug).

There are other switch actuators available which can be used with the **PSS2018**.

Pin Switch Actuator Part Nr. F1665 (optional)
The pin switch actuator generates a switching pulse by using a gold plated contacting pin which is to be put into the corresponding socket of the actuator. The pin turns the **PSS2018** on if put into the "on" socket (red). Putting it into the "off" socket (black) turns the **PSS2018** off. Even if the pin is lost, the system resides turned on.

A **PSS2018** can only be turned off if the pin is put into the off socket.

Hint:
In case the pin is lost a 2mm / 0.08" wire or a 2mm screw can help when simply put into the corresponding socket.

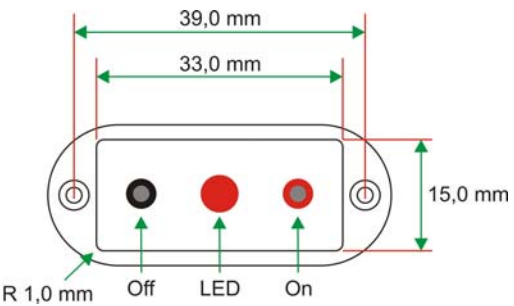
Magnetically Switch Actuator (Housing) Part Nr. F1671 (optional):
There is an optionally magnetically switch actuator available. For turning on hold the magnet over the on-position (green marking on plastic housing).

In order to turn off, hold the magnet over the opposite marking of the actuator (red) for approx. 2 seconds.

Two commercially available battery controllers with Uni-Plugs can be connected directly to the back side of the actuator. "B1" and "B2" mean battery 1 and battery2 respectively. With that, additional voltage control of the batteries is possible. Observe correct cell number and battery type settings when using such battery controllers.

Hint:
If the **PSS2018** is turned off, external connected battery controllers are also turned off.

Switch Dimensions:



Magnetically Gas Cap Switch Part Nr. F1674 (optional):
Alternatively, a gas cap switch actuator is available. The design mimics a gas cap. Here too, switching occurs with a magnet. Pulling the magnet off, turns the system on, if pushed in, the system is turned off.

The central ultra bright LED in the switch actuator is lit, when the **PSS2018** is turned on. In case of an error (e.g. low voltage) or during programming, the LED indicates the states by different blink codes.

6.3. Connecting Receivers

The **PSS2018** is designed for operation with robbe/Futaba S-BUS receivers. Alternatively, up to four Spektrum-Satellite receivers can be connected. Because the **PSS2018** is usually built into big and therefore expensive models, having more than one receiver is reasonable because of gained redundancy.

S-BUS receivers are connected to the **PSS2018** by patch cables (Part Nr. 4090, 4093 or 4096 – depending on length). See print RX1 and RX2 on housing. Patch cables can be up to 50 cm / 20". This allows for long distances in-between them and therefore for optimal positioning of the antennas.

Hint:
S-BUS Receivers are supplied with the regulated output voltage "C". This is voltage which supplies directly connected PWM servos.

Hint:
You must not connect two S-BUS receivers necessarily! If only one receiver is connected, the **PSS2018** works just fine – of course there's no receiving redundancy any more.

Hint:
If your equipment does not work please check first whether all cabling is correct and that the modulation mode of transmitter and receiver correlate and they are bound.

Spektrum-Satellites:
The **PSS2018** accommodates up to 4 Spektrum-Satellite receivers instead of robbe/Futaba S-BUS receivers, alternatively. Which receiver type (S-BUS or Spektrum) delivers the valid signal is selected by programming later on.

Spektrum-Satellites are connected to the **PSS2018** with their own connection cables. Depending on security demands, one, two, three or four satellites can be connected. The **PSS2018** recognizes the number of receivers automatically on power up and does not indicate an error if not all inputs are used.

6.4. Connecting Batteries

All commercially available types of batteries come into consideration (NiCd and NiMH) but also Lithium-Ion (LiIon), Lithium-Polymer (LiPo) or Lithium-Ferrite-Phosphate (LiFePO4). These batteries are unconditionally usable, independent of the selected output voltage.

Besides the commonly used 6V NiMH batteries 6-cell (7.2V) and 7-cell (8.4V) NiMH batteries are connectable. This only makes sense if the output voltage for servos on the **PSS2018** is set to high values (7.4V) and servos with corresponding higher voltages are to be used. In general, 5-cell NiMH or 2-cell LiPo batteries are utilized. Usage of 4-cell battery packs (NiCd / NiMH) is not permissible for a **PSS2018**!

Especially applicable are PSS *Lithium Polymer* batteries which are available with different capacities. These batteries are especially adjusted to the **PSS2018**.

Battery Capacities

In general, observe the current load and capacities of your batteries. Two batteries of 500 milli-amps for a model with 10 servos are way too small. Here, at least two "2000's" are in order. The batteries must be able to deliver high currents. Especially when using digital servos you must be prepared for higher current consumption especially during startup due to higher starting torques.

Furthermore, make sure connection cables are thick enough when selecting batteries. We recommend using *PSS Lithium Polymer* batteries. These are delivered totally cabled and are ready for connection to the **PSS2018**. An additional charging plug allows for charging the batteries without disconnecting from the **PSS2018**.

Selecting the Output Voltage

Meanwhile, almost all servos and receivers are applicable for a 6.0V supply. Therefore, the **PSS2018** is preprogrammed to 6.0V at delivery.

Output voltages of the **PSS2018** are programmable to 5.4V, 6.0V, 6.6V or 7.4V and therefore can be adapted to many individual demands. The smaller the selected output voltage and the higher the input voltage of the battery the warmer the heat sink of the **PSS2018** gets.

Hint:
The higher the difference between the input and output voltage, the higher is the power dissipation which converts to heat. When using many servos it is advisable to select a higher output voltage on the **PSS2018**. Alternatively, an optional fan (Part Nr. F1660200) can be mounted.

The three voltage regulators distribute over the S-BUS outputs "A1" and "A2", "B1" and "B2" as well as the receivers and directly connected PWM servos "C". Therefore, a mixed mode operation with different voltages is possible without problems. Directly connected servos can be supplied e.g. 6.0V, but servos on S-BUS outputs with e.g. 6.6V and 7.4V.

The higher the servo voltage, the faster and stronger the servo works. Of course, observing manufacturer requirements is mandatory!

6.4.1. Charging Batteries

The **PSS2018** switches battery plus, i.e. both batteries are commonly connected with their minus-wires (ground). *Simultaneously* charging of both batteries is not always possible because most chargers which contain several charging outputs are commonly connected with their plus-wires. **Separate charging of the batteries if still connected to the PSS2018 is possible at any time!**

In connection with two *LiPo-Chargers 2S 750mA - EQ* (Part Nr. F1692) both batteries can be charged simultaneously from the 115/230V system without disconnecting from **PSS2018**. There's no simpler way!

If in doubt (and if there are no LiPo-Charger 2S 750mA – EQ used) it is reasonable and safer to disconnect the batteries from the **PSS2018**.

Hint:
It is possible to charge the battery (e.g. via an additionally soldered charging cable) when connected to the **PSS2018**. Now only charge one battery, not both simultaneously!

6.5. Connecting Servos

PSS2018 allows for different ways to connect servos.

Servos directly connected to a connected S-BUS receiver
Observe that the receiver is only supplied power using a thin patch cable when connected to the **PSS2018**. Because the cable is thin, maximum current is limited. That's why, if ever, only electronically devices which need little current should be connected (such as a turbine ECU). Please be aware that directly connected servos or other electronics do not work if that particular receiver fails. Because the **PSS2018** switches to another receiver in case of an error this method looses safety.

Servos directly on PSS2018

The **PSS2018** extracts serial data from the S-BUS out of the connected receivers and converts this data into PWM signals for regular servos. Ten servos can connect to the servo outputs of the **PSS2018** directly.

Servos of channels 17 and 18 are "fixed wired". These are switching channels which are controlled by the S-BUS protocol. Depending on switch position, servo position is -100% or +100% servo travel.

The first eight servo slots are special: here, receiver channels 1 through 8 or 9 through 16 are output. Selection is done by simple programming of the **PSS2018**.

The ten servos which are connected directly to the **PSS2018** are supplied by supply voltage "C". This is a separate voltage regulator which can be programmed to 5.4V, 6.0V, 6.6V or 7.4V output voltage.

Hint:
Servos which are directly connected to the **PSS2018** are supplied output voltage "C". This voltage is settable to 5.4V, 6.0V, 6.6V or 7.4V. Connected S-BUS receivers are also supplied with voltage "C". Spektrum-Satellite receivers are supplied with separate 3.3V from the **PSS2018**.

Servos on S-BUS outputs
The robbe/Futaba S-BUS system transmits information for a total of 18 servos in a digital format as serial protocol over one data line. For this data line supply voltage is needed. This results in 3 wires.

Now, several servos can be connected in parallel onto these lines (bus concept). Prior connection, each servo is assigned a receiver channel. The servo extracts its own information out of the bus line and executes its orders.

The **PSS2018** has four S-BUS outputs where up to eight servos can be connected by one S-BUS cable.

For these S-BUS outputs of the **PSS2018** high grade pluggable systems are used which are easily connected and disconnected. Thanks to a secure lock link the connection can not disconnect by vibration. Furthermore, the connectors are reverse polarity safe and designed for high currents. The transmission of the data via a bus line as well as the new connector system allow for previously unknown flexibility for model cabling.

7. Servos at S-BUS Outputs

The biggest advantage of the **PSS2018** is its bus concept. This means, a single line is available (four times all together) where several servos can be connected simultaneously.

A 3-wire cable which allows for sufficient current consumption for several servos is installed into a wing. A *PSS S-BUS* connector (Part Nr. F1690) is mounted onto the cable at each position where a servo is required.

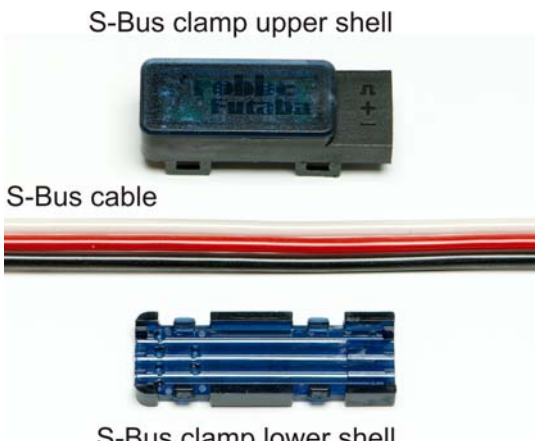
The cable contact is established by IDC (Insulation Displacement Connector). It takes the appropriate signals and allows for connection of a regular S-BUS servo. The gold plated insulation displacement connectors are a safe method for connections. Each hard disk connector in a PC is equipped with these insulation displacement connectors and the system is approved a million times.

7.1. Using S-BUS Connectors

There are two S-BUS connectors available:

- Part Nr. F1690 PSS S-BUS connector
- Part Nr. F1691 PSS S-BUS connector with PWM Adapter

The S-BUS connector with *PWM-Adapter* allows for connection of regular servos onto the S-BUS. Regular servos are controlled by a pulse width modulated signal (PWM). The connector generates this signal out of the S-BUS protocol. Therefore, already available servos can use the S-BUS concept.



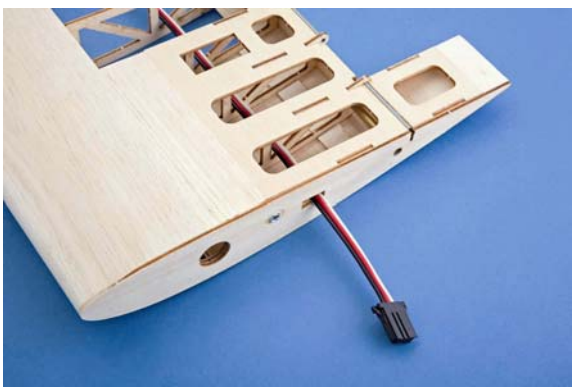
The S-BUS connectors are to be pressed onto the 3-wire S-BUS cable. The connectors cut the insulator of the cable and press the inner copper strands into the gold plated contacts. Mounting onto the cable must be executed with great care. It is best to use a small bench vice. It is important to lock both housing halves simultaneously and in parallel.

Hint:
Observe polarity before pressing the housing halves together! Black wire = Minus (-), red wire = Plus (+), white wire = pulse. Both halves are labeled.

Hint:
When locking both housing halves, all of the four locks must click hearable. Both housing halves can even be separated again. Using a small screwdriver allows for carefully pry open the locks and remove the upper half step wise.

The S-BUS cable is available in different length - applicable for each model. Of course a too long cable can be shortened.

Part Nr. F1681 S-BUS cable with plug 150cm / approx. 59", 1mm² / AWG 17
Part Nr. F1682 S-BUS cable with plug 200cm / approx. 78", 1mm² / AWG 17
Part Nr. F1683 S-BUS cable with plug 300cm / approx. 118", 1mm² / AWG 17

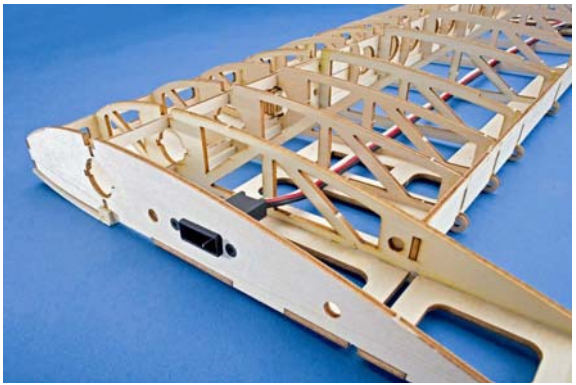


The plugging system is revolutionary because the plug not only is reverse polarity secure but also contains a bomb-proof lock which can be released at any time.

In order not to produce short circuits at the (cut off) end of the cable, cut the 3 wires at different length.

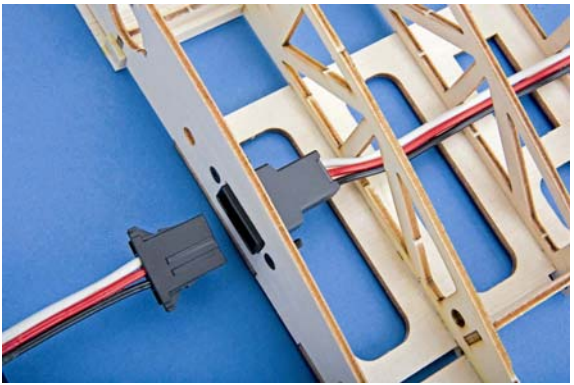
An additional cable type allows for mounting the complete cable harness into a wing. Termination is done by a plug which is screwed into the root fin.

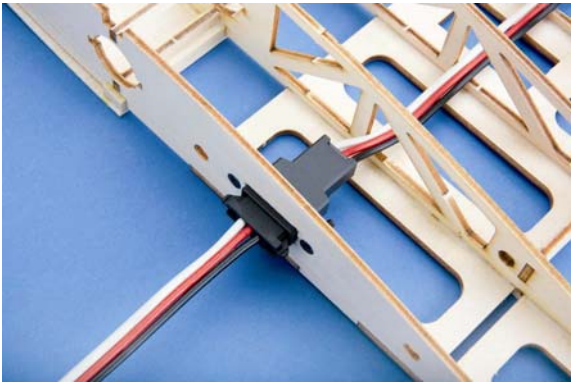
Part Nr. F1686 S-BUS wing cable with plug 150cm / ca. 59", 1mm² / AWG 17
Part Nr. F1687 S-BUS wing cable with plug 200cm / ca. 78", 1mm² / AWG 17
Part Nr. F1688 S-BUS wing cable with plug 300cm / ca. 118", 1mm² / AWG 17



When using the S-BUS wing cable, an adapter cable is necessary which connects the **PSS2018** and the S-BUS wing cable.

Part Nr. F1684 Adapter cable for S-BUS wing cable 30cm / 12", 1mm² AWG 17
Part Nr. F1685 Adapter cable for S-BUS wing cable 50cm / 20", 1mm² AWG 17





The connector cable is easily removed by pressing both sidewise available locks. Now the plug is easily removable.

As soon as the *PSS S-BUS* connector (Part Nr. F1690) is mounted onto the S-BUS cable, a S-BUS servo can be connected directly to the connector.

Hint:
There is a blue LED in the S-BUS connector which is lit as soon as voltage is supplied. The S-BUS connector with PWM adapter contains a red LED. This color allows for distinction of the connectors.

Hint:
Of course, a mixed operation of the S-BUS connectors is possible, i.e. you can operate S_BUS connectors with and without PWM adapter on one single S-BUS cable.

First assign the correct channel number for a S-BUS servo. Also its parameters can be programmed (see instructions for particular servo).

A regular servo can be connected to a *PSS S-BUS connector with PWM adapter* (Part Nr. F1691). Assign the corresponding channel number to the connector. This is done using the associated *S-BUS channel programmer SBC-1* (Part Nr. F1696). On the other hand, it is possible to program all parameters of the servo (direction, center position, end points and speed) using the *USB-Adapter CIU-2* (Part Nr. F1405).

An interface cable is necessary in connection with the programming devices which convert the PSS S-BUS plug to a Futaba servo plug which in turn is plugged into the *SBC-1* or *CIU-2*.

The CIU-2 allows for configuring the whole harness by PC software (with all S-BUS connectors).

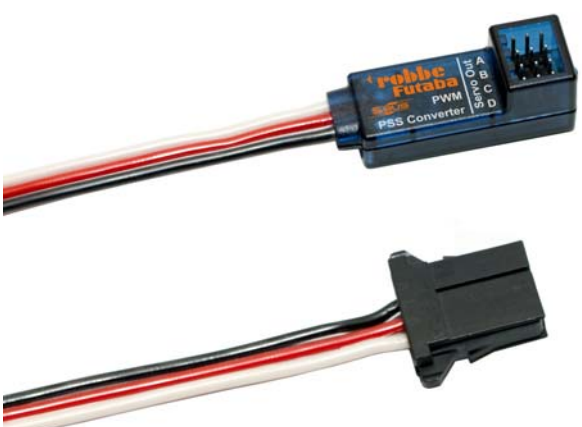
After starting the PC software *PC-Link,* assign the address of the S-BUS servo or S-BUS connector with PWM adapter via PC. The address is labeled on the servo as well as the connector. The addresses allow for communicating with the connectors individually. With the aid of the software the desired receiver channel is to transmit to the S-BUS connector. Furthermore, direction, center position, end positions and servo speed can be set for the connected servo (servo matching). Settings are visible right away.

Hint:
Programming of the *S-BUS connector with PWM-Adapter* is analog to programming a regular S-BUS servo.

In total, there are four slots for connecting S-BUS cables available on the **PSS2018**. These are labeled "A1" and "A2" and "B1" and "B2".

Hint:
S-BUS outputs "A" (labeled "A1" and "A2") and S-BUS outputs "B" (labeled "B1" and "B2") have their own voltage regulators. The output voltage is arbitrarily adjustable in 4 steps (5.4V, 6.0V, 6.6V and 7.4V).

Eventually, it is possible to connect the optionally available *S-BUS cable with plug and 4-fold PWM Adapter* (Part Nr. F1680) to the **PSS2018**. The 4-fold PWM adapter allows for connecting four regular PWM servos onto the S-BUS.



Here too, all parameters of the servos are programmable individually. Programming is done like programming the S-BUS connector with PWM adapter. Assign the address (identifier) of the 4-fold PWM adapter by the PC software *PC-LINK*. Because the PC software communicates only with one servo channel at any given time, the individual servo outputs are assigned single addresses (identifiers). Servo output A gets the address which is printed on the label, Output B gets an address increased by one, output C an address increased by two, and so on.

The combination of all products allows for unimagined flexibility in outfitting a RC model and simplifies cabling enormously.

Hint:
The total current consumption varies dependent on number and power of the utilized servos. The higher the total current consumption, the more energy is converted to heat. The heat sinks of the **PSS2018** can get hot. This is not a malfunction but rather normal functioning. Therefore, observe sufficient heat dissipation (distance to neighboring walls like fuselage sidewall and similar – possibly provide cooling air). Optionally it is possible to mount a fan (Part Nr. F1660200).

8. SD Memory Card

A SD-memory card which is included in delivery records diverse data during power up of the **PSS2018**. The SD card has a capacity of 1GB or 2GB and is formatted in the FAT32 file system format.

Hint:
The SD card is formatted in the FAT32 file system format. Only SD cards from manufacturer Sandisk with 1GB or 2GB capacity can be used. Other cards can cause writing errors.

Hint:
Hot-Plug is not supported by the **PSS2018**. This means, the SD card is to be inserted before turning the system on. The same holds true for removing the SD card. Here, first turn the **PSS2018** off before removing the SD card. In case of mishandling data can be lost!

After turning the **PSS2018** on (or after a reset), recording of data occurs after 10 seconds. When turning off, writing stops. The data can be read using a card reader and a normal PC. Data format is a CSV (Comma Separated Value) table.

The **PSS2018** saves manifold information onto the SD memory card. Besides the total operating time (in seconds) and number of power-on cycles, the configuration is memorized. With this, it is immediately visible how the **PSS2018** was configured (i.e. receiver type, battery type, battery capacity, output voltages, etc.).

After this more general information, all measured results are saved in 0.5 seconds intervals. The following information is available:

Time Stamp	Seconds Interval [s]
Voltage Battery 1	In milli-volt [mV]
Current from Battery 1	In milli-amps [mA]
Remaining Energy of Battery 1	In milli-amps [mA]
Voltage Battery 2	In milli-volt [mV]
Current from Battery 2	In milli-amps [mA]
Remaining Energy of Battery 2	In milli-amps [mA]
Combined Voltages of Batteries	In milli-volt [mV]
Internal 5V Supply Voltage	In milli-volt [mV]
Output Voltage „A“	In milli-volt [mV]
Output Voltage „B“	In milli-volt [mV]
Output Voltage „C“	In milli-volt [mV]
Additional Information PSS2018	Diverse Error Flags (Bit Value)
Receiving Source	Active Receiver
Receiver Status RX1	Okay, Failsafe or Error
Receiving Quality RX1	In Percent [%]
Receiver Status RX2	Okay, Failsafe or Error
Receiving Quality RX2	In Percent [%]
Receiver Status RX3	Okay or Error
Receiving Quality RX3	In Percent [%]
Receiver Status RX4	Okay or Error
Receiving Quality RX4	In Percent [%]
Temperature	Temperature of heat sink [°C]
Fan RPM	If fan is installed [1/min]

Using a table calculation program (e.g. Excel) values can be graphically displayed or calculations executed.

The print on the housing of the **PSS2018** indicates how to insert the SD card (chamfered corner). The contacts of the SD card point up always. Insert the SD card fully into the slot which automatically locks the card.

In order to remove the card, easily push the card into the slot. This releases the lock and the card can be removed. Don't touch the gold plated contacts if possible.

9. Connecting Optional Products

The **PSS2018** allows for diverse additional add-on products. Depending on the application, there reasonable add functionality.

9.1. Connecting a Fan

The optional fan allows for better heat dissipation of the heat sinks. Especially when using many powerful servos, usage of the fan is reasonable. This is especially important when supplying servos with low voltages of e.g. 5.4 volts.

The fan is controlled by temperature and only runs if the temperature exceeds 65° C (149°F). The fan automatically stops if the temperature drops below 50° C (122°F).

Hint:
Only robbe fans can be used. Other products are possibly not recognized and therefore not controlled.

Mounting the fan (from upper left to lower right)

9.2. Connecting the LCD control box

The LCD control box serves as optional extension for the **PSS2018**. It displays important information which is evaluated during operation in plain text on a 3-line display. This is information for

- Signal quality of the receiver
- Supply voltage of the batteries
- Output voltage of the servos
- Extracted capacities from batteries
- Current-flow in receiver equipment

and many more.

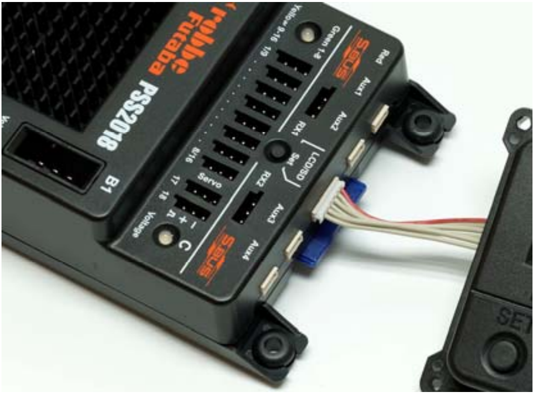
The integrated LEDs allow for recognizing system states at one glance without actually reading the text from the display. Critical states are indicated by fast flashing LEDs. Causing problems can then read from the display.

Three push buttons serve for selecting display or for setting options. It was never easier to display different data or to setup diverse adjustments. The optimized operating concept was evaluated in practical studies and is almost self explaining.

The LCD control box also serves as On/Off switch which eliminates the switch actuator. It is installed just like a cockpit instrument into the model. This makes up a functional operating- and display-unit which grades up the total impression of the model by its small dimensions and its shapely designed housing.

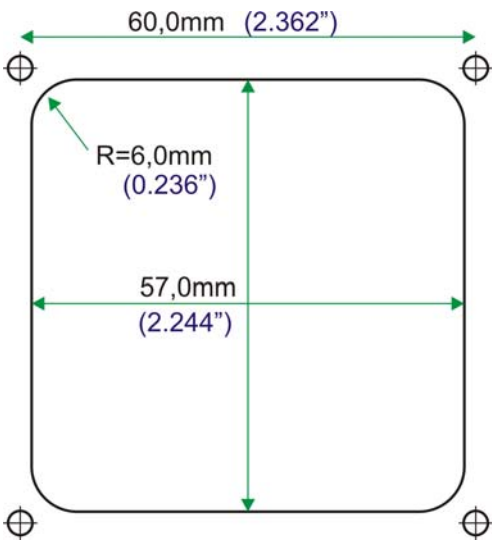
The LCD control box also works in parallel with a magnetically switch actuator. Turning on and off is then possible with both systems.

A 6-pole multi pin connector for the connection cable resides on the middle of the back of the housing. Simply plug the connection cable onto the multi pin connector. Reverse polarity is impossible. The other side of the cable is plugged into the assigned slot of the **PSS2018** (labeled "LCD/SD").


robbe
Futaba
PSS2018
B1
Red
Green 1-8
Yellow 9-16
Aux1
Aux2
RX1
Set
LCD/ISD
RX2
Servo
Aux3
Aux4
Voltage
SET

The LCD control box can serve as a cockpit instrument. Cut a square hole with 57mm / 2.24" length of edge with 6mm / 0.24" inside radius in the cockpit (or similar mounting board). The LCD control box is then fed from back (!) through the hole and screwed with normal M3 threaded screws from the front. The screws are self cutting and find sufficient material in the plastic of the mounting flange. Screw distance is 60mm (2.36").

Drilling template scale 1:1:



10. Operation

In order to turn on the **PSS2018** and after connecting every thing correctly (batteries, receiver(s), servos), hold the magnet over the "ON" position of the magnetically switch actuator. The red, ultra bright LED in the switch actuator and the LEDs in the **PSS2018** turn on. This signals operation. The buzzer signals the battery type immediately after power on. Afterwards, the algorism for error recognition (and voltage monitoring) starts and the system works in normal operation.

In order to turn the **PSS2018** on using the LCD control box, temporarily push the "SET" button.

Hint:
Power on occurs without any microprocessor and therefore is totally independent of any software. In the power on state the **PSS2018** remains turned on – even when the switch actuator does not function any more by removing it or cutting the connection cable.

The **PSS2018** always starts a self test after power on. Here, important system checks are executed and evaluated. Results are partially saved on the SD card. In case an important system check leads to a negative result, all LEDs of the **PSS2018** will blink for ever. The device is then to be sent to a service address.

After self test, additional checks are executed in repeating intervals. Possible errors are indicated by blink codes of the LEDs or by buzzer sequences. In case of a connected LCD control box, errors are displayed in plain text.

Hint:
If the **PSS2018** outputs error codes for low voltage after a short time of operation although all batteries are fully charged, a wrong battery type is possibly programmed. It is also possible, that a battery is used, which has a too high internal resistance and breaks down when loaded (e.g. NiMH batteries in Mignon size "AA"). Always use batteries with a high current load capability!

In order to turn the **PSS2018** off, hold the magnet over the "OFF" position of the magnetically switch actuator for at least two seconds. If using the LCD control box, both buttons "UP" and "DOWN" are to be pressed simultaneously for approx. 2 seconds.

11. Functional Indicators

To inform the user about the corresponding state of the **PSS2018** or the connected batteries, several LEDs are built into the housing of the **PSS2018**. Additionally, there is a buzzer integrated which signals error codes acoustically. The external LCD control box displays errors in plain text. The LED in the external switch actuator serves for possible error indications or warnings as well.

11.1. Indicator-LEDs

The **PSS2018** has four built in LEDs which indicate diverse states and errors. The LEDs can change color (red, orange, yellow and green). The colors of orange and yellow result from mixing red and green LEDs.

An additional red LED is built into the external switch actuator.

There are some critical system states or errors where the **PSS2018** is to be sent in for repair.

Indicator-LEDs of PSS2018 (internal LEDs & LED in Switch Actuator)	**Cause of error**
Alternating 1second on and 1second off	Microprocessor defect or memory error (e.g. during firmware-update). This causes an ever lasting reset.
Steady blinking 5 times per second	Supply voltage (battery voltages) smaller than 5.5V. No safe operation possible any more. Voltage regulator defective (nominal voltage not reachable). Internal error in **PSS2018** (e.g. internal communication).

Display of internal LEDs:

12 Indicator LED Output Voltages for S-BUS “A1” and “A2”
13 Indicator LED Output Voltages for S-BUS “B1” und “B2”
14 Indicator LED Output Voltages for Servo Outputs "C"
15 Indicator LED for Operating Mode (S-BUS / Spektrum)

Immediately after power on, all LEDs are turned on temporarily to test functionality. Then, the actual configuration is displayed. The LEDs (12), (13) and (14) indicate the output voltage of the corresponding voltage regulator. The assignment is printed onto the housing to provide quick overview (especially on the airfield).

Meaning of LEDs (12-14):

LED (12 – 14)	Meaning
Green	Output voltage 5.4 Volt
Orange	Output voltage 6.0 Volt
Yellow	Output voltage 6.6 Volt
Red	Output voltage 7.4 Volt
Flashing 5 times per second	The programmed voltage is not settable => error. Possibly battery voltage too low or a too high current consumption.

Meaning of LED (15):

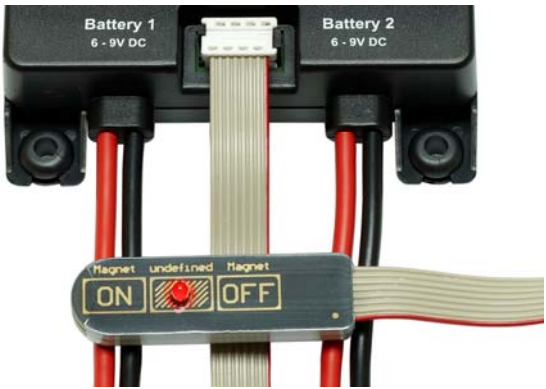
This LED indicates the receiver mode the **PSS2018** is in.

LED (15)	Meaning
Green	FASST S-BUS with channels 1 to 8 at servo outputs
Yellow	FASST S-BUS with channels 9 to 16 at servo outputs
Red	Spektrum-Satellites => Spektrum operation

The LEDs show a different behavior during programming (see chapter programming).

Hint:
In Spektrum operating mode Spektrum channels 1 through 8 are output at PSS servo outputs. PSS2018 outputs 17 and 18 are assigned Spektrum channels 9 and 10.

Indications of central LED in switch actuator:



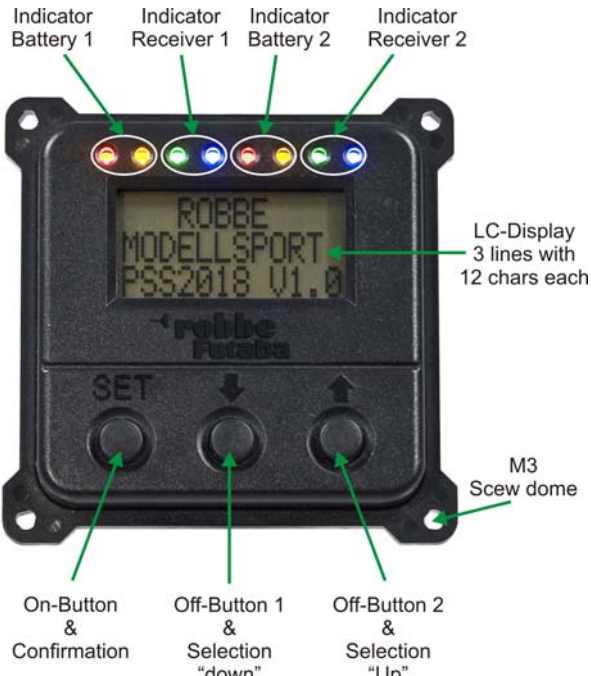
The LED in the corresponding switch actuator is steadily lit if the **PSS2018** is turned on and no error exists. In case of impending low voltage or other errors different blink codes are output, depending on the encountered error. Directly after power on, the programmed battery type is indicated by blink code.

11.2. Buzzer

The built in buzzer communicates occurring errors by a loud signal. Buzzer codes are different depending on the error. Directly after turning the **PSS2018** on, the buzzer indicates the utilized battery type by a defined code once.

Hint:
The indications of the LED in the external switch actuator always work in parallel to the buzzer. If the buzzer sounds, the LED is off, if the buzzer is quiet, the LED is on. Exception: if the buzzer is deactivated it is not controlled any more – the LED still indicates errors by blink codes.

11.3. Display of the LCD control box



The optional LCD control box displays different menu items in serial after power on which are not displayed in normal operation later on. The most important menu items pertain to batteries and their state. The user on one hand can input the capacity of the utilized battery, on the other he must tell the system whether the batteries are newly charged or not.

The LCD control box indicates information and errors with eight bright LEDs and displays text with a 3-line display. Different information is selected by pressing the "UP" 🡅 and "DOWN" 🡇 buttons. If an actual error occurs, the currently output frame of the display is interrupted and the error is output alternating with the regular display.

The corresponding frames are self explanatory to large extent. When powered on the buttons of the LCD control box work as confirmation for an entry "SET" or for selecting displayable information as "UP" 🡅 and "DOWN 🡇. By pressing "UP" or "DOWN" the menu pages (this is a display frame with text information) increment.

There is a specialty of the button assignment:

1.) If the "**SET**" button is pressed for about 5 seconds when turning the **PSS2018** on, the system changes to the programming mode (Setup). Here, different settings of the system can be conducted.

2.) The bright LEDs can dazzle reading of the display under some circumstances. Therefore, the LEDS can be turned off by temporarily pressing the "**SET**" button. Pressing the "**SET**" button again turns the LEDs on again.

Hint:
If the "SET" button is pressed during operation, the LEDs turn off. Pressing the button again, turns the LEDs back on again.

Function	Buttons
Turn **PSS2018** on	Press **SET** temporarily
Turn **PSS2018** off	Press 🡇 + 🡅 for 2 seconds simultaneously
Turn LEDs off	Press **SET** temporarily during operation
Turn LEDs on	Press **SET** temporarily during operation
Start setup	Press **SET** for 5 seconds during power up

11.3.1. LED Indicators

After powering the **PSS2018** on, all eight LEDs are turned on temporarily from left to right in order to test their functioning.

The LEDs have different meanings and are grouped.

Assignment of LEDs (top view on display)							
Battery 1		**Receiver 1***		**Battery 2**		**Receiver 2***	
Red	**Yellow**	**Green**	**Blue**	**Red**	**Yellow**	**Green**	**Blue**

* Receiver 1 => RX1 or AUX1 / AUX2
* Receiver 2 => RX2 or AUX3 / AUX4

- The red and yellow LEDs are assigned to batteries
- The green and blue LEDs are assigned to receivers

Red means: Error (Danger)
Yellow means: Warning
Green means: All is OK
Blue means: Additional information (which receiver is active)

Indicating battery errors

Red LED

- Steadily on (both red LEDs!) if charging state of battery is that much low that internal low voltage applies (=> charging battery mandatory). The **PSS2018** can fail any time.
- Fast flashing if battery voltage drops below 3.5 volts or the battery is missing at all. Fast flashing therefore indicates loose connection or a totally empty battery. Error indication is active until power off.

Yellow LED

- The yellow LED blinks if remaining capacity drops below 20%. The LED is steadily turned on if the battery's voltage is low. The error indication is active until power off.

Indicating receiver errors

Green LED

- The LED is steadily on as long as the corresponding receiver "transmits" valid signals. Therefore, green means: "receiver ok".
- The green LED blinks if the receiver indicates a failsafe state (Futaba S-BUS only).
- The LED turns off if the receiver does not send a signal at all.
- The green LED flickers if the receiving quality is bad and the receiver indicates several malfunctions. Therefore, the LED functions as indicator for decreasing receiving quality (=> range test).
- Both green LEDs blink if both receivers indicate failsafe. Signals are sent to servos but not the pilot's commands but rather failsafe values of the active receiver (see blue LED).

Hint:
Receiver errors are indicated by LED only if at least one valid signal is received in the first place. The display indicates "ERR" if there is no receiving signal immediately.

Blue LED

- The blue LED always indicates the active receiver, in other words which receiver supplies the connected servos (left LED = RX1 / AUX1 or AUX2 active, right LED = RX2 / AUX3 or AUX4 active). Therefore, either the left or right blue LED is on.

Summary:

LED State	Display
Red LED on	Internal low voltage (both batteries empty) or a temporarily too high current or during turning the **PSS2018** off.
Red LED blinks	Battery error (malfunction) or battery voltage < 3.5V
Yellow LED blinks	Capacity of battery low => charge battery
Yellow LED off	Battery voltage ok
Green LED on	Receiving signal ok
Green LED blinks	Failsafe-Signal of receiver
Both green LEDs blink	Both receiver broke down together or both deliver a failsafe signal
Green LED off	No receiving signal, i.e. receiver defective
Blue LED on	This receiver supplies connected servos

Hint:
Fast flashing of a LED indicates a critical situation which can lead to a break down of complete equipment.

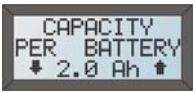
Hint:
In order not to be dazzled by LEDs when reading the display, pressing the "**SET**" button temporally turns the LEDS on or off.

11.3.2. Display

Display after power on:

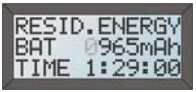
After power on (or connecting the device) the display shows the start frame first for about two seconds. Here, besides other things, the software version is displayed.

The next frame allows the user to reset the capacity counter (e.g. after charging the batteries). This frame is active for 5 seconds. If no button is pressed, the frames advance forward.



If the button ⬇ (YES) is pressed for frame "BAT CHARGED", the nominal capacity of the battery is displayed. This value can be set by the user if he wishes to do so. Using buttons ⬇ and ⬆ allow for changing the values. For two connected batteries with 2.0 Ah each, 2.0 Ah is to be set. This value remains until changed. If nothing is changed, the frame is left after five seconds.

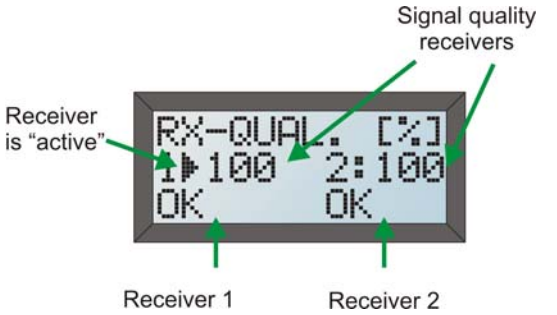
Now, the battery type is displayed. In this example, two 2-cell LiPo batteries with 2.0 Ah capacity each. This frame is active for three seconds.



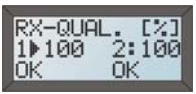
The remaining energy of both batteries in milli-Ah and the expected remaining time is displayed now. Remaining time depends on current consumption of the total system – similar to the remaining mileage counter in an automobile. The pilot can immediately evaluate how long he still can fly without danger before recharging the batteries is in order. This frame is active five seconds.

After these start information frames (first four frames) the system changes to normal display mode. Different frames can be selected by using the buttons ⬇ (forward) and ⬆ (return).

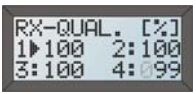
The first frame in normal operating mode indicates receiver characteristics.



Display of receiving quality displayed in percent. The currently active receiver is marked by an arrow (►). If no error is encountered the lowest line indicates "**OK**". If a receiver is erroneous either "**HOLD**" (hold mode), "**FS**" (failsafe) or "**ERR**" (total malfunction) is displayed. If a switch from RX1 to RX2 occurred quality can not reach 100% any more.



First display in normal operation (after self test). All additional information can be selected by buttons ⬇ (forward) und ⬆ (return).



If four receivers are connected (Spektrum-Satellites) the quality of all four is displayed. The active receiver is marked with an arrow (►).

In this example, receiver 1 (RX1) sends a failsafe signal. Therefore, "**FS**" is displayed. Receiver 2 is automatically selected (visible by arrow (►). Receiving quality of RX1 automatically gets worse and counts backwards. Display "**FS**" or "**HOLD**" is only applicable when using robbe/Futaba S-BUS receivers.

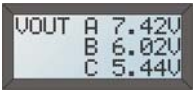
Hint:
The signal quality refers to the ratio in percent of the correctly, compared to the erroneous, evaluated servo pulses. This is, all "good" and all "bad" (e.g. failsafe) servo pulses are recorded and the ratio evaluated in a certain time frame.

Hint:
If the receiving quality drops below 90% this is considered critical already; find a remedy by relocating the antenna(s) or other countermeasures.

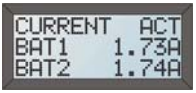
Besides data from the receivers, the **PSS2018** delivers additional information about the system. This is data about the batteries and energy consumption, temperature and operating time (power on time). All this data is recorded on the SD memory card.

Display of actual battery voltage from battery 1 and battery 2.

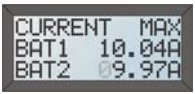
Display of lowest battery voltage. This value is not saved and only refers to the actual power on cycle. If the difference of the actual and minimum voltage is high (>0.5V) these batteries are not applicable for this application and more powerful types should be used.



Display of actual output voltage "A", "B" and "C". The nominal voltages (5.4V / 6.0V / 6.6V und 7.4V) can not be guaranteed 100%. Therefore, variations of up to 0.2 volts are possible and permissible.

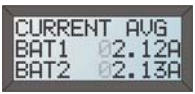


Display of the actual current for each battery (is not saved and only applies to the current power on cycle). If the current is less than 0.1 amps "<0.1A" is displayed. Current measurement is only precise starting from 0.1A.



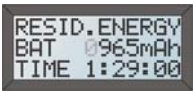
Display of maximum current for each battery (is not saved and only applies to the current power on cycle). If the current is less than 0.1 amps "<0.1A" is displayed.

Display of the actual and maximum currents all together (summed value). This value is not saved and only applies to the actual power on cycle. This value could be "0.00A" if no consumer is connected to the **PSS2018**.

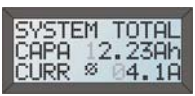


Display of average current (=mean current) of both batteries. This value is additionally internally stored and never reset and serves for calculation of the remaining energy. The displayed value is only valid for that actual power on cycle.

Display of withdrawn capacity per battery (is saved). The values are deleted if the batteries are recharged and it is confirmed after power on (=> reset).



Display of remaining energy, i.e. capacity and flight time. This value is saved and only deleted when the batteries are recharged and if this is confirmed after power on (=> reset). The energy is subtracted from the nominal capacity of the battery by counting backwards to 0. At 20% remaining energy a warning is output (charge battery!) This is because LiPo batteries only provide 80% of their indicated capacity. At 20% remaining energy the batteries are practically empty.



Summed value of withdrawn capacity and of the average current (is saved). The value is deleted if the batteries are recharged and this is confirmed at the beginning (=> reset).

Actual and maximum heat sink temperature. If a fan is mounted, fan RPM is also displayed if it runs. If the system has no fan, ---- is displayed for RPM. Values are not saved.

Operating time since last power on. Time in actual power-on cycle => "A" and since first time operation of the **PSS2018** => "Σ". The summed value can not be deleted and ranges up to 9999:59:59 hhhh:mm:ss.

From here on, display starts from the beginning with indicating receiving quality.

11.4. Error Indications

The **PSS2018** has several microprocessors which continuously monitor the system. An intelligent algorism makes sure, that e.g. a temporarily low voltage is not only detected when caused by movement of all servos. The algorism is designed especially for operation in model airplanes, i.e. cyclic loads of the batteries. With that, a secure detection of low voltages is assured.

Different error types are indicated by the internal buzzer (and the LED in the external switch actuator). The errors are differently prioritized and can vanish, dependent on meaning and severity.

1. Exceeded temperature:

Error signal: continuous beep

If the temperature of the heat sink exceeds 80°C / 176°F a continuous sound is output. In this case probably an external short circuit is encountered which can lead to damage of the **PSS2018**. This error type has highest priority. If the temperature drops below 80°C / 176°F for a few seconds, the buzzer stops sounding.

2. Receiver error RX:

Error signal: 1x (or 2x, 3x, 4x) long beep(s)

If the connected receiver (Futaba S-BUS) does not receive any more (FS or HOLD), the quality display of the receiver's receiving quality is reduced stepwise. If no signal at all is sent by the receiver (e.g. by **ERR**) or there is an error in a connected Spektrum-Satellite, quality display is divided by 2 immediately and counting down.

A receiver quality below 70% is indicated by a loud acoustic signal. If receiver RX2 is erroneous two long signals are output, for AUX3 three and for AUX4 four signal tones. Error remains active until receiver quality exceeds 75%.

3. Internal voltage too low: _____ _____ _____

Error signal: slow beeps every 2 seconds

If the internal supply voltage of the **PSS2018** gets too low (batteries almost empty) this error is output. ATTENTION: In this case the **PSS2018** might execute a reset. A safe operation is not guaranteed. This error indication is active until power off. Furthermore, no data is recorded on the SD memory card.

4. Battery interruption: _ _ _ _ _ _ _ _ _

Error signal: fast beeps 5 times per second

If a battery, no matter which one, has a break (e.g. even intermittently) this code is output. This error indication remains until turning the **PSS2018** off. The user therefore recognizes this after flight in any case if a break in the supply occurred.

5a. Low voltage battery 1: _ _ _ _____

Error signal: 3 times short beeps, then 1time a long beep

If the voltage of battery 1 drops below a certain value this buzzer code is output. Usually, this capacity suffices for one more flight before recharging is in order. However, the battery should be recharged anyhow, when this error code is sounding. It is clear that the correct battery type must be programmed. This error code is also indicated if the battery capacity of the **PSS2018** reaches 20% remaining energy. **This only is true for a connected optional LCD control box**.

5b. Low voltage battery 2: _ _ _ _____ _____

Error signal: 3 times short beeps, then 2 times a long beep

The same holds true as for error type 5a - just referring to battery 2.

Hint:
The algorism's limits for recognition of low voltages are especially designed for operation in RC airplane models. If using the **PSS2018** in other applications wrong error information could be output. If this is the case, the acoustically error signaling can be deactivated if disturbing (see chapter programming).

6. Current overload:

Error signal: 100ms, 200ms, 400ms, 800ms beep, 3 times in sequence

This signal sounds if the power consumption out of the **PSS1018** gets too high; this can lead to damage of the device. This is the case if battery 1 or battery 2 is loaded with more than 10 amps for more than 10 seconds or if the current exceeds 18 amps for one second. Probably an external short circuit occurred or some servos block. As soon as the current consumption drops, the error output stops also.

7. Voltage regulator:

No buzzer output, but corresponding LED blinks

If the desired output voltage of the corresponding voltage regulator (e.g. 6.6V or 7.4V) is not selectable by the **PSS2018**, the assigned LED blinks quickly (5 times per second). This means: either the battery voltage is too low (in this case e.g. 6V) or the withdrawn current is too high breaking down the battery voltage. The error disappears as soon as the output voltage is correct again.

Hint:
All acoustically buzzer signals are output in parallel by the LED of the external switch actuator by blinking. Output by LED even occurs if the buzzer is deactivated.

Hint:
In case of several errors, the error with the highest priority is reported first. Now, a switch occurs every 9 seconds between error code outputs.

Summary of error codes:

Priority	Test / Error	Buzzer Output
(1)	Temperature too high	Continuous sound
(2)	Receiver error	RX1 / AUX1: 1x long RX2 / AUX2: 2x long AUX3: 3x long AUX4: 4x long
(3)	Internal voltage too low	1 x per second
(4)	Break of a battery	5x second
(5)	Battery low voltage or capacity exhausted	Battery 1: 3x short, 1x long Battery 2: 3x short, 2x long
(6)	Current overload	3x in a row 100ms, 200ms, 400ms, 800ms on
(7)	Voltage difference at outputs of voltage regulators	No Buzzer output LED: 5x per sec. blinking at output "A" and/or "B" and/or "C"

11.5. Error Indications of the LCD control box

The functioning of the **PSS2018** is always identical, no matter there is a LCD control box connected or not. However, the display offers more convenience and possibilities. In case of errors, these errors are displayed in plain text by the display of the LCD control box. Here, the actual frame (e.g. voltage display of batteries) is interrupted. The error information is displayed with the regular frame alternatively. Display duration is always 2 seconds.

Additionally to the display in plain text, the LEDs of the LCD control box are set accordingly as well (see chapter 11.3.1.).

Battery 1 is missing or input voltage at **PSS2018** (battery voltage) is smaller than 3.5V. The same is true for battery 2.

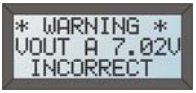
Remaining capacity of battery exhausted. Only 20% are left of the calculated nominal capacity of the battery. On the other hand, the battery voltage could be too low. The low voltage error must first qualify (threshold 1 = 30 sec. and threshold 2 = 6 sec.). This error remains until power off.

This information is displayed if both batteries are getting empty. Because the **PSS2018** discharges both batteries symmetrically, after a short time, the second battery will also indicate this warning.

Error report, if one (or both in this case) receiver(s) fail(s). The error results from the quality display in percent, i.e. if the quality drops below 70%. When signals are missing, the quality is divided by two, for failsafe values it counts down. The error is reversible, i.e. if the receiving quality exceeds 75%, the error is deleted and the display vanishes.

In this case, the current consumption in the **PSS2018** is too high (current overload). This is the case if battery 1 or battery 2 are loaded with more than 10 amps for more than 10 seconds or if the total current exceeds 18 amps for more than one second. Possibly an external short circuit is encountered which could damage the **PSS2018**.

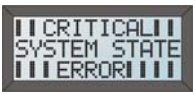
This frame is displayed if the heat sink exceeds a temperature of 80°C / 176°F (for more than 6 seconds) due to power dissipation. As soon as the temperature drops below 80°C / 176°F the error is deleted after a short time and not displayed any more. A possibly installed fan turns on at a temperature of 65°C / 149°F and turns off again at a temperature of 50°C / 122°F.



If the **PSS2018** does not reach the desired (programmed) output voltage at output "A", "B" or "C", this error is displayed. This can happen, if the battery empties slowly and its voltage reaches the point or even drops below the desired voltage.

If the internal operating voltage is too low (batteries almost empty) this error is displayed. The **PSS2018** possibly does not function correctly any more. Writing to the SD memory card stops.

This error is displayed if the inserted SD memory card is not recognized or erroneous. The SD memory card must be 1GB or 2GB in size and formatted in FAT32. Furthermore, it must be of SanDisk brand.



In this case a severe system error is encountered. The **PSS2018** must be sent to a service point.

12. Programming

The **PSS2018** can be programmed in two manners:

1) Using the internal push button
2) Using the optional LCD control box

Programming (configuring) of the **PSS2018** is only possible within a short timeframe after power on. This inhibits undesired programming during operation.

12.1. Programming with Push button

Using the push button all important settings can be accomplished:

1) Programming the output voltages "A", "B" and "C" (5.4V / 6.0V / 6.6V / 7.4V).
2) Selection of the receivers and the PWM servo outputs (Futaba S-BUS channels 1-8 or channels 9-16) or Spektrum-Satellites.
3) Binding for Spektrum-Satellites
4) Battery type (NiMH, LiPo etc.)

There are two variations for starting programming (depending on setting)

* The button is pressed prior to turning the **PSS2018** on
* The button is pressed after turning the **PSS2018** on

Hint:
When using the button for programming it must be pressed longer than 3 seconds for activating programming in both cases!

After power on, the programming window is open for 10 seconds, afterwards, the button does not function, and i.e. it is not monitored any more. After 3 seconds, release the button in order to enter programming mode.

12.1.1. Battery Type

Button is pressed PRIOR to power on (battery type programming)

In order to allow for a correct low voltage threshold the **PSS2018** must know the utilized battery type (NiMH, LiIon, LiPo or LeFePO4). Different battery types are indicated by buzzer codes.

As soon as the battery programming starts (press button prior to power on and releasing after 3 seconds) the internal buzzer is turned on for three seconds, and turned off for another 3 seconds. This indicates operating mode "programming".

Now, you hear **one single** beep, which indicates "battery type 1". If the button is pressed within three seconds "battery type 1" is selected and programmed.

If the button is not pressed, **two** beeps sound for "battery type 2". Here too, the user has 3 seconds to press the button if he/she wants to select (program) this battery type.

This principal repeats until the buzzer beeps seven times (deactivate low voltage recognition). If the button is not pressed within 3 seconds, no programming takes place and the system changes to normal operation mode.

Battery types are defined as follows:

Type Nr.	Buzzer Code	Battery Type / Programming
1	1x beep	5-cell NiCd / NiMH (6.0V)
2	2x beep	6-cell NiCd / NiMH (7.2V)
3	3x beep	2-cell Lithium-Ion (7.2V)
4	4x beep	2-cell Lithium-Polymer (7.4V)
5	5x beep	2-cell LiFePO4 (6.6V)
6	6x beep	7-cell NiCd / NiMH (8.4V)
7	7x beep	Deactivate battery monitoring

At delivery, "Battery type 4" (2-cell LiPo battery) is programmed by default. When selecting "7 times beep" (deactivate battery monitoring) low voltage errors are not reported by the buzzer any more.

ATTENTION:
If the buzzer was deactivated using the LCD control box when programming, no buzzer output occurs any more! In this case, the buzzer is not used any more even when programming! The LED in the external switch actuator still indicates the sequences by blink code. Programming now is only possible visually (by LED indication).

Hint:
Always use two identical batteries, i.e. same battery type (NiMH, LiIon, LiPo or LiFePO4) and same cell number. Battery capacity might be different – even if this does not make any sense.

Hint:
After powering the **PSS2018** on, the battery type is output by buzzer codes (if the buzzer was not deactivated). Therefore, multiple beeps after power on indicate no error!

Hint:
If "Battery type 7" was programmed (deactivate battery monitoring), the LCD control box only displays 10 dots on the display after power on. Because no check is activated, no battery is defined.

12.1.2. Selecting Output Voltages

When the button is pressed for at least 3 seconds within 10 seconds after power on, first of all, all 4 LEDs of the **PSS2018** turn off. This indicates activation of the programming mode for the voltage regulators and the receiver type.

Actual programming of the parameters occurs always in this sequence:

a.) Setting of output voltage "A"
b.) Setting of output voltage "B“
c.) Setting of output voltage "C“
d.) Selection of receivers / binding (for Spektrum)

After all LEDs turned off, first the LED for output voltage "A" blinks (2 times per second). The user can now select voltage "A" by pressing the button temporarily. With each press, the voltage advances forward to the next value. Each button press is confirmed by a short beep of the buzzer (if it was not deactivated).

Output voltages are assigned different colors of the LEDs:

Color of LED	Output Voltage
Green	5.4 Volt
Yellow	6.0 Volt
Orange	6.6 Volt
Red	7.4 Volt

Wait approx. two seconds for each button press until the voltage is set to the selected value. Then, a new button press selects the next voltage value. If the desired voltage is reached, nothing has to be done. The selected value is stored safely after another five seconds and the LED is on steadily; these points to a newly programmed voltage.

At the same time, the LED for output voltage "B" blinks. Here, the procedure is identical, i.e. if a change is desired press the button temporarily, if not wait five seconds until the display changes to the next LED (output voltage "C"). Programming output voltage "C" is identical again.

Hint:
For programming output voltages "A", "B" and "C" a little safety feature is built in if the desired voltage is not settable. If e.g. 7.4V is selected but the battery is only of a 6V type (5-cell NiMH), 7.4V can never be reached. In this case, the corresponding LED keeps its old color (=voltage), despite pressing the button.

After programming "C" the fourth and last LED blinks. This LED is assigned for programming receivers.

12.1.3. Programming the Receiver

Hint:
Only if the programming cycle for all three output voltages is executed (see 12.1.2), receiver programming settings are possible!

If the last of the four LEDs of the **PSS2018** blinks, the receiver settings can be conducted.

Color of LED	Receiver
Green	S-BUS channel 1-8
Yellow	S-BUS channel 9-16
Orange	Reserved
Red	Spektrum-Satellite

Programming is done like programming the output voltages. Here too, a button press advances the LED-color. After five seconds, the menu finishes also.

Special consideration is in order for Spektrum-Satellites. These must be correctly bound to the transmitter-HF module (binding). Binding the Spektrum-Satellites is the last programming option (receiver). When selecting "Spektrum-Satellite", the LED blinks 2 times per second in red. At the same time, a 5 second timer starts.

If the timer times out, the red LED flashes fast (5 times per second) and indicates to the user the binding can be prepared now.

Pressing the button during that fast flashing means start of binding. The red LED changes its blinking frequency to 10 times per second. Now, the system hangs and expects the user to turn off the system. Because binding takes place after restart of the **PSS2018**, a restart is mandatory.

If the button is not pressed during the time of blinking (5 times per second) the current configuration is taken and the system changes to normal operation (no binding of the receiver(s) take place).

Hint:
After turning the **PSS2018** off, a wait of 10 seconds is necessary before turning the **PSS2018** back on again. This time is needed to discharge all remaining capacities.

After turning off and then on again cause the Spektrum-Satellites to bind. If no satellites were connected yet, you can do so now.

If binding is not successful, all must be repeated (i.e. from the very beginning by programming output voltages).

Binding of Spektrum-Satellites in an overview (after entering the programming option for receivers):

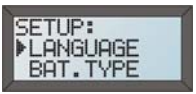
Color of LED	Meaning	Action
Blinking red 2 times per second	Selection of receiver mode "Spektrum-Satellite“	Wait 5 seconds
Blinking red 5 times per second	Binding desired?	Yes: press button
Blinking red 10 times per second	Preparation for binding	Turn **PSS2018** off- and then on again

Hint:
Observe binding instructions of manufacturer carefully (e.g. power on for transmitter).

12.2. Programming with LCD control box

When using the external LCD control box programming is even simpler because all instructions / programming options are displayed in plain text.

In order to start the programming mode press the "**SET**" button for more than 5 seconds when turning the **PSS2018** on. Because this button serves as power on button just keep it pressed.



The way the programming menu is designed allows for just pressing the buttons 🡻 and 🡹 to select the desired programming options. The arrow (▶) shows the currently selected line. Pressing the button "**SET**" starts this option.

By pressing several times an arrow button brings you back to start, i.e. to the first frame.

12.2.1. Programming Options

German or English can be selected as language. This setting is active immediately, i.e. the text appears in the desired language instantly.

The battery type defines the thresholds for correct low voltage recognition. Here, NiMH, LiIon, LiPo or LiFePO4 can be selected.

Output voltage "A" is assigned S-BUS output "A1" and "A2" and can be set to 5.4V / 6.0V / 6.6V or 7.4V.

Output voltage "B" is assigned S-BUS output "B1" and "B2" and can be set to 5.4V / 6.0V / 6.6V or 7.4V.

Output voltage "C" is assigned the directly connectable PWM servos (and connected S-BUS receiver(s)) and can be set to 5.4V / 6.0V / 6.6V or 7.4V.

Here, the receiver mode is selected (Futaba S-BUS channel 1-8, Futaba S-BUS channel 9-16 or Spektrum-Satellites).

When this menu item is selected, the **PSS2018** is informed to bind the Spektrum-Satellites when turning on again the next time.

In this menu item, the buzzer can be deactivated. Possibly occurring errors are now only indicated by display or the LED in the switch actuator.

Here you can select the unit of the temperature (°C or °F).

If a new software version is stored on the SD memory card, it can be installed by selecting "UPDATE".

Factory setting restores the system back to original values. If you are not certain whether you have made a mistake during programming, this is helpful.

The programming mode is left with END/RETURN. The **PSS2018** resets and starts with the newly programmed parameters.

From now on, the display repeats, i.e. the selection options rotate.

Hint:
Configuration menu items "AUX BINDING" and "UPDATE" require a restart after executing the selected corresponding procedure. This is indicated on the display. In this case, no button press is recognized any more.

12.2.2. Programming Examples

By selecting and confirming **BATTERY TYPE** with the **SET** button you enter the sub menu for setting batteries. The activated option at the beginning of a sub menu is always **RETURN**. This is indicated by cursor ► at the start of the line. If the SET button is pressed again, the menu is left. Alternatively, pressing 🡻 or 🡹 selects the corresponding line.

An asterisk * at the end of the line indicates that this option is active. When e.g. **2S Lipo** * is displayed, a 2-cell LiPo battery is programmed. In order to change the value, simply move the cursor ► with 🡻 or 🡹 into the line, which is to be selected and confirm with **SET**. The Asterisk is now positioned to the end of the new selection and indicates a newly activated option.

If the setting is validated, position the cursor to line **RETURN** and confirm with **SET**. The sub menu is left again.

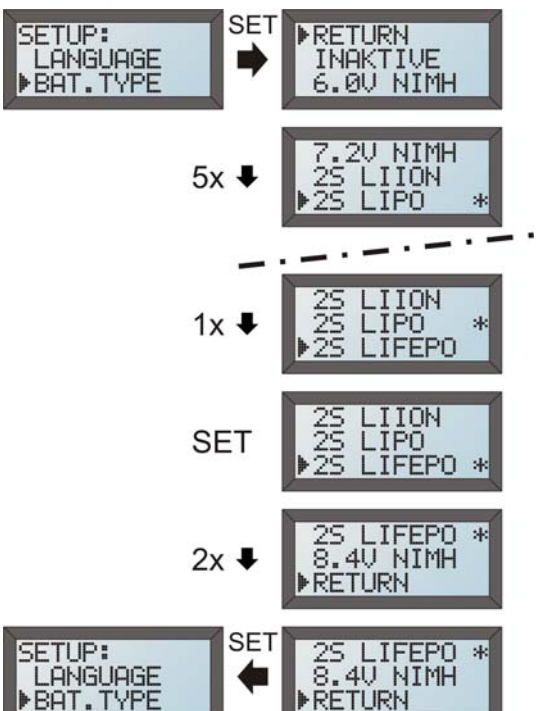
With this, all settings are simply accomplished. Explanations are always self explanatory and non-ambiguous.

Hint:
When programming output voltages of the voltage regulators "A", "B" or "C", the corresponding LED of the **PSS2018** blinks several times after each new selection. This means, the selected voltage is being programmed.

Hint:
When receiver settings are in work, here too, the color of the corresponding LED in the housing of the **PSS2018**changes immediately.

Hint:
Each button press is confirmed by a short sound of the buzzer. If you deactivate the buzzer, it is only deactivated at next power-on cycle or after leaving programming.

The following example shows how to select a 2S LiFePO4 battery with a previously programmed (actual) 2S LiPo battery.



Special hints for binding Spektrum-Satellites

You must inform the **PS2018** about connected Spektrum-Satellites. This happens in programming option **RECEIVER**. Here, select option **SPEKTRUM** and confirm.

If this is done (LED in **PSS2018** = red) binding can start (**AUX BINDING**).

Immediately after selecting **AUX BINDING**, the user is asked to turn the **PSS2018** off and back on again (analog to programming with the button). The LED flashes fast (10 times per second). When the **PSS2018** restarts, all Spektrum-Satellites are bound automatically.

Hint:
When the option **AUX BINDING** is activated, although the receiver setting is not set to Spektrum, the LED of the **PSS2018** blinks red too, and you are asked to turn the system off and back on again. A binding is executed anyhow (if Spektrum-Satellites are connected). Of course, the previously active receiver option (Futaba S-BUS) remains active.

12.2.3. Factory Settings

If you are uncertain whether you made a mistake or "displaced" something this option allows for setting the **PSS2018** into the delivery state.

In delivery state (factory setting) the following options are preprogrammed:

- All output voltages of the voltage regulators are 6.0V
- For receiver, Futaba S-BUS channel 1-8 is selected
- Menu language is German
- Temperature unit is °C
- Battery type is 2S LiPo battery with 2.0Ah capacity
- Capacity counter is reset, as well as the value for average current

12.2.4. End / Return

Selecting this option leaves the programming mode and the system resets (restart). Newly selected settings become active.

Hint:
As time goes by, settings / programming options might change. Because operation of the **PSS2018** and programming of its options is largely self explanatory, this should be of no problems after studying these operating instructions.

13. Firmware-Update

The concept of the **PSS2018** allows for installing new software if necessary (firmware update). As like with other high grade products, updates allow for implementing new functions or improving existing ones.

Firmware update is only possible with the optional LCD control box. Furthermore, a SD memory card must be inserted into the **PSS2018** which contains the newest software version. You find new versions on the robbe homepage or the homepages of the selected specialty retailer. Simply copy the file "**update.pss**" onto the SD memory card's root directory by using a PC (card reader).

Hint:
Only use a SanDisk SD card with 1GB or 2GB of capacity which must be formatted FAT32.

If "UPDATE" is selected as programming option, the new software version (e.g. "UPDATE V1.6") appears in the display underneath the option "RETURN". If no SD memory card is inserted or no firmware is stored on the card, only "RETURN" can be selected.

As soon as the menu item "UPDATE Vx.x" is activated, the **PSS2018** starts updating automatically. Just follow the instructions on the display. The **PSS2018** must be turned off and then back on again after a few seconds. Nothing must be changed on the device!

After power-on, the update is displayed with a progress bar.

WARNUNG:
During firmware update (indicated by display) the supply voltage must not be removed from the PSS2018 under no circumstances!

After approx. 10 seconds, the update is finished and the **PSS2018** automatically restarts. Previous settings (output voltages, receiver selection and so on) usually remain untouched after an update.

14. Technical Data of the PSS2018

Current Sources	5, 6, 7-cell NiCd / NiMH cells 2-cell Lixx batteries (LiIon, LiPo, LiFePO4)
Operating Voltage Range	5.5V 13.2V
Nominal Input Voltage	6.0V 8.4V
Quiescent Current (power off)	Approx. 1µA per battery
Quiescent Current (power on)	Approx. 220mA (without receiver)
Voltage Regulator "A" @ 7.4V Output Voltage	Output 5.4V / 6.0V / 6.6V / 7.4V programmable 10A continuous current, 16A with fan, 50A peak current
Voltage Regulator "B" @ 7.4V Output Voltage	Output 5.4V / 6.0V / 6.6V / 7.4V programmable 10A continuous current, 16A with fan, 50A peak current
Voltage Regulator "C" @ 7.4V Output Voltage	Output 5.4V / 6.0V / 6.6V / 7.4V programmable 8A continuous current, 12A with fan, 30A peak current
Supply S-BUS Receiver	From voltage regulator “C”
Supply Spektrum-Satellites	Regulated 3.3V out of PSS2018
Drop-Out-Loss @ 4A	Approx. 0.4V
Maximum Power Dissipation (Continuously)	12W (with fan 20W)
Receiver Types	2 times FASST S-BUS; 4 times Spektrum-Satellite
Number of Servos in System	Up to 36 Servos
CE-Check	According to 2004/108/EC
Permissible Temperature Range	-10°C .... +70°C / 14°F .... 158°F
LCL-Filtering (EMI)	For each individual servo output
Dimensions	122mm x 80mm x 33mm / 4.8" x 3.15" x 1.3"
Hole Distances for Mounting	134,0mm x 66,0mm / 5.3" x 2.6" (4x M4)
Weight	Approx. 200g / 0.4409 pounds Approx. 220g / 0.4850 pounds with fan
Warranty	24 month

Technical modifications and errors expected!

15. Recommended Accessories

PSS2018 Battery-Switch	Part Nr. F1660
Additional fan 16A	Part Nr. F1660200
Switch black	Part Nr. F1665
Magnetically switch actuator black	Part Nr. F1668
Magnetically switch actuator internal (included in delivery)	Part Nr. F1671
Magnetically Gas-Cap Switch	Part Nr. F1674
LCD control box	Part Nr. F1676
LiPo battery 2S-2000mAh	Part Nr. F1661
LiPo battery 2S-3300mAh	Part Nr. F1662
LiPo battery 2S-4000mAh	Part Nr. F1663
LiPo battery 2S-5300mAh	Part Nr. F1664
2S LiPo charger with integrated Equalizer 750mA	Part Nr. F1692
S-Bus receiver R 6108S	Part Nr. F1008
Connection cable receiver *6,5cm / 2.56"* *21,5cm / 8.46"* *50cm / 19.69"*	 Part Nr. 4090 Part Nr. 4093 Part Nr. 4096
S-Bus wing cable with panel jack *150cm / 5'* *200cm / 6.6'* *250cm / 8.33'*	 Part Nr. F1686 Part Nr. F1687 Part Nr. F1688
S-Bus wing cable with plug *150cm / 5'* *200cm / 6.6'* *250cm / 8.33'*	 Part Nr. F1681 Part Nr. F1682 Part Nr. F1683
S-Bus adapter cable *30cm / 1'* *50cm / 1.66'*	 Part Nr. F1684 Part Nr. F1685
S-Bus connector	Part Nr. F1690
S-Bus connector with PWM adapter	Part Nr. F1691
S-Bus cable with wing plug and 4-fold PWM adapter	Part Nr. F1680
S-Bus channel programmer	Part Nr. F1696
CIU2 adapter	Part Nr. F1405

16. Service Addresses

Andorra	Sorteney Santa Anna, 13 AND-00130 Les Escaldes-Princip D'Andorre sorteny@sorteny.com	Phone 00376 (862) 865
Austria	robbe-Service Puchgasse 1 A-1220 Wien office@robbe.at	Phone 0043 (1258) 11-79
Denmark	Nordic Hobby A/S Bogensevej 13 DK-8940 Randers SV hobby@nordichobby.com	Phone 0045 (86) 43 61 00
France	S.A.V. Messe 6, Rue Usson du Poitou, BP 12 F-57730 Folschviller sav-robbe@wanadoo.fr	Phone 0033 (3) 87 94 62 58
Germany & Spain	robbe-Service Metzloser Str. 38 D-36355 Grebenhain hotline@robbe.com	Phone 0049 (6644) 87-779
Greece	TAG Models Hellas 18,Vriullon Str. GR-14341 New Philadelfia / Athen info@tagmodels.gr	Phone 0030 (2) 102584380
Italy	MC-Electronic Via del Progresso, 25 I-36010 Cavazzale di Monticello C.Otto (Vi) mcelec@libero.it	Phone 0039 (0444) 945992
Netherlands & Belgium	Jan van Mouwerik Slot de Houvelaan 30 NL-3155 Maasland van_mouwerik@versatel.nl	Phone 0031 (10) 59 13 594
Norway	Norwegian Modellers Box 2140 N-3103 Toensberg per@modellers.com	Phone 047 (333) 78 000

Slowakia & Czech Republic	Ivo Marhoun Horova 9 CZ-35201 AS ivm2000@seznam.cz	Phone 00420 (351) 120 162
Sweden	Minicars Hobby A.B. Bergsbrunnagatan 18 S-75323 Uppsala info@minicars.se	Phone 0046 (1) 86 06 571
Switzerland	robbe Futaba Service Baselstrasse 67 A CH-4203 Grellingen info@robbefutaba-service.ch	Phone 0041 (61) 741 23 34
UK	robbe-Schluter UK Unit 53, Southfield Road GB-LE10 1UB Leicestershire keith@robbeuk.co.uk	Phone 0044-1455-637151

17. Guarantee

Naturally we guarantee this unit for the statutory period of 24 months. If you believe you have a valid claim under guarantee, please contact your dealer in the first instance, as he is responsible for processing guarantee claims.

During the guarantee period we will correct any operating deficiencies, production defects and material faults which arise, at no charge to you. We will not entertain any claims beyond these terms, e.g. consequent damage.

The unit must be returned to us carriagepaid; it will also be returned to you carriagepaid. We will not accept goods sent to us without pre-paid carriage. We accept no liability for transit damage and the loss of your shipment; we therefore recommend that you take out suitable insurance to cover these risks. Send the unit to the Service Centre responsible for the country in which you live.

The following conditions must be fulfilled if we are to process your guarantee claim:

- Send proof of purchase (till receipt) with your shipment.
- The unit must have been operated in accordance with the operating instructions.
- The unit must have been operated with the recommended power sources and genuine robbe accessories.
- The unit must not exhibit damage due to damp, unauthorised intervention, reverse polarity, overload conditions or mechanical damage.
- Please include a concise description of the fault or defect, as this will help us identify the problem.

18. Conformity Declaration

robbe Modellsport GmbH & Co. KG hereby declares that this product satisfies the fundamental requirements and other relevant regulations contained in the appropriate EU directives. The original Conformity Declaration can be viewed on the Internet under www.robbe.com: click on the logo button marked “Conform” which is included in each device description.

19. Disposal of Devices

It is illegal to dispose of electronic equipment in the ordinary household waste: that is the meaning of the symbol printed alongside. It simply means that you must dispose of electrical and electronic equipment separately from the general household waste when it reaches the end of its useful life. Take your **PSS2018** to your local specialist waste collection point or recycling centre. This applies to all countries of the European Union, and to other European countries with a separate waste collection system.

robbe Modellsport GmbH & Co. KG
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