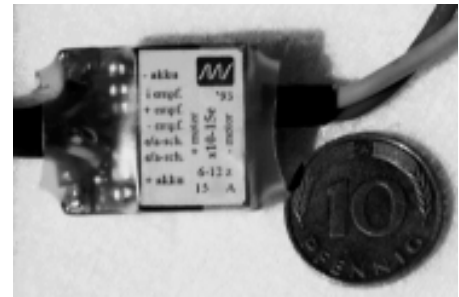




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1 CE-Certification:

The products described in this manual are manufactured in accordance with all specific and mandatory European CE guidelines:

EMI 89/336/EEC, 91/263/EEC and 92/31/EEC.

The products have been tested according to these norms:

EMI-emissions: EN 50 081-1:1992

**EMI-resistance: EN 50 082-1:1992 or
EN 50 082-2:1995**

Design and construction of our products comply with the requirements for safe operation.

EMI emissions were tested under realistic conditions, i.e. using suitable motors close to the maximum allowed currents. Using resistors instead of motors will not create maximum emission levels.

Further testing is done to ensure adequate EMI-resistance against emissions from other devices. The HF signals used for these tests are similar to those produced by mobile telephones or RC transmitters.

Again, our products are tested under realistic conditions for the most dangerous situation: Exposed to the field of a powerful Tx, the motor must not start while working on the model.

Problems using our products are most likely caused by unsuitable combinations of radio components or improper installations.

2 Safety Precautions:

Make sure that...

... your motor is suppressed by at least two, better: three, ceramic capacitors of 10 ... 100nF / 63 ... 100V. Extra suppression can also be achieved using filters with coils.

... your receiver and its antenna are at least 3cm away from the motor, the speed controller and the high current cables.

... all high current cables are as short as possible. Maximum length between flight pack and speed controller: 20cm, between speed controller and motor: 12cm.

... all high current cables longer than 5cm must be twisted, especially the motor cables.

... half of the receiver antenna is routed along the fuselage (in a boat above the waterline!) with the other half outside in a vertical position. On an aircraft model half part of the antenna may hang down freely, but be careful not to step on it!

3 General Warnings:

Electric motors with propellers are dangerous objects which require due care for safe operation. Keep away from the danger zones when the battery-pack is connected.

The CE-Certificate on the speed controller is not a permit for careless handling!

Technical defects of electrical or mechanical nature may result in unintended motor runs and/or loose parts may cause serious personal injuries and/or property damage.

Every time you use your propulsion system - before turning on the Rx -, make sure that:

- no one else is using the same frequency (identical channel number)
- your transmitter is turned on and the throttle stick is in STOP position.



Also to be considered:

- c) Electronic equipment is sensitive to humidity. Speed controllers and switches which have got wet may not function properly even after thorough drying.
- d) Protect the speed controller against mechanical loads.
- e) Speed controllers and switches are not protected against reverse polarity (+ pole changed with - pole) and connection of your **battery pack** to the **motor leads** of the controller/switch will almost certainly cause irreparable damage.
- f) Use only compatible connectors. A 2mm pin in a 2.5mm socket will not provide reliable contact. The same applies for 2mm gold pins in 2mm tin sockets.
- g) Regularly check the wiring of your RC-components for loose wires, oxidation, or damaged insulation, especially when using BEC.
- h) Speed controllers and switches are exclusively designed for RC-models. Their use in man carrying aircraft is prohibited.
- i) Never disconnect your flight pack while the motor is still running. The speed controller/switch may suffer/damage.
- j) Never leave your flight pack connected while the model is not in use. Even on/off switch does not disconnect the speed controller completely from the battery pack. Never charge battery pack while connected to the speed controller/switch.
- k) Make sure your motor is equipped with brush arc suppression. Usually, three capacitors, mounted directly at the motor, will suffice (refer to our Application Notes). Note that some motors have these capacitors built-in, on most types you have to solder them on yourself.
- l) Prior to flight, perform a range check. Let a helper hold the airplane, set the throttle stick at half throttle (full throttle when using switches). The transmitter antenna should be retracted. Move the standard distance as recommended by the manufacturer of the radio. Make sure that you still have full control at this distance. Note that specifically with BEC controllers -which do not have opto-coupler isolation- your range may be [somewhat] reduced.

m) CAUTION!

Speed controllers and switches will only function as such when they are in good working condition. They mostly have monitoring circuits too. Should one of the power FETs fail, full power may be applied when battery pack is connected. Neither the Stop signal from the Tx nor the current limiting circuit nor the temperature monitoring circuit can stop the motor.

It is always a good idea to first test your setup with the propeller removed. In this case, the use of the lowest allowed number of battery cells is a must!

n) General Recommendations

Most **schulze** controllers have built-in current limiting devices. It is important to know what they do. For instance, a short in the motor cables, operation with a cold controller (i.e. at start up) and operation at higher than specified nominal current (a permanent current close to the peak value) can not be detected in speed controllers without decreasing current limitation. Also, with blocked propeller, very high motor current will occur. However, if you are e.g. operating a 20 A motor with a 80A controller, the controller may not sense over current and will not shut down. In those devices with no electrical current limitation (like s10) the use of a fuse of correct value in the motor line is recommended. Do not use fuses in battery line when using a speed controller or switch with BEC!

o) Disclaimer

We attempt to guide you as much as possible with the application of these controllers. However, since neither the manufacturer (**schulze**) nor the importer in USA (**R/C-Direct**) can control the exact use of these products, we will not be liable for any direct or consequential damage, loss and/or injuries to the user, bystander(s) and/or the environment as a result of the use of this product. As far as legally admissible, our liability to compensate for damages - regardless of the legal basis - shall be limited to the invoice amount of the portion of the merchandise directly involved in the event which caused the damages. This does not apply insofar as our unrestricted liability due to wrongful intent or gross negligence is concerned and imperatively prescribed by the law.



4 Application

The s10 soft start controller has been especially designed for the SPEED-400 motors. It should not be used with a different motor.

In order to make the s10 as small as we could, it does not have a brake.

The s10 is equipped with a 5V receiver Battery Eliminator Circuit (BEC) so that you do not have to use a separate receiver battery. Output of the BEC is 5V (regulated) at 1 Amp (max).

5 Description

s10-15e:

Soft start motor on/off control with BEC. Printed circuit board only. No brake. Designed especially for SPEED-400 motors. Can be mounted directly behind the motor. No cables at all.

s10-15ek:

Same as above, except with cables installed. The BEC has a „universal“ connector compatible with Futaba, JR and HiTec.

6 Characteristics

Power-On Reset:

Prevents motor start when the battery is being connected. *Works only when the transmitter is ON and the throttle stick is in the minimum position.*

Soft Start:

Allows operation of the s10 from your throttle channel, or from any on/off channel.

ON/OFF Switching:

Due to the built-in hysteresis, the motor-ON and motor-OFF positions are not the same on the stick. This design cleverly prevents ON/OFF cycling of the motor during brief receiver glitches.

Switching Frequency:

[none] the s10 is a linear ON/OFF switch.

Brake:

not installed on the s10.

LED:

The s10 circuit board is equipped with a miniature LED which shows you if s10 is ready to go.

BEC:

The s10 will only operate when the airplane is NOT equipped with a separate receiver battery. Please observe that the BEC output current is limited to 1 Amp which would be reached with two mini-servos when at stall conditions.

System Switch:

If you decide to install a separate on-off switch to activate the s10 (see drawing) then it should be realized that this switch will only turn off the receiver and the drive circuitry on the s10. This switch will not disconnect the flight pack voltage from the power FET transistors.

s10-15ek only:

This unit is supplied with flexible cables with thin-wall, light-weight silicon wires to keep the weight down (16-20 grams with vs. 7 grams without).

7 Protective Circuitry

Current Limiting:

Not implemented (use a fuse!).

Reverse Polarity Protection, Overtemperature Protection:

Not implemented.

UnderVoltage Protection:

As soon as your flight battery is discharged to 5 Volt, the motor is automatically switched off to preserve the BEC output and radio control of the model. Sometimes, the battery pack will recover sufficiently -after a few seconds- to allow short motor runs. To restart motor, slide your stick for about one second to the motor stop position and then to full throttle.

It is your responsibility to determine how long after initial motor shutoff you will maintain radio control. This will depend on the capacity and number of cells of your flight battery pack.

8 Hookup and Installation

We suggest you use standard colors to prevent confusion.

Battery Cables:

red: battery positive (+) terminal

black: battery negative (-) terminal

We suggest you use your favorite battery cable connector. We recommend the ASTRO or Sermos connectors since they are basically fool proof.

Motor Cables:

red: motor positive (+) terminal;
this one is indicated with a red dot

yellow: motor negative (-) terminal

You can solder the s10 directly to the motor.

Should -for one reason or another- the motor turn the wrong direction, simply reverse the red-and-yellow motor wires. **Do not reverse the battery leads!!!**



9 Mounting

The s10 should not be completely wrapped in foam. Mount it with double-sticky tape so that there is a little bit of air flow around the s10 for cooling.

10 Adjustment

The s10 should not require any adjustment when used with Futaba, JR, and HiTec equipment. Should, however, the small trimpot become mis-adjusted, then here follow the simple instructions to re-adjust it properly: Please use a small screwdriver, one that accurately fits the (very) small pot on the board (widths 2mm / 0.0785"). First, adjust this pot mid-way in its 270 degree turning range.

You can get to this little pot by temporarily folding the edges of the covering material up, next to the slit in the covering.

CAUTION!

The motor could start as soon as you apply power. This adjustment should always be made with the propeller removed!

- 1) Hook up the s10 to the motor. Turn transmitter ON. Set motor stick position to 3/4 of „full gas“. Center the motor stick trim.
If you use the system on/off switch, switch it off.
Hook up the battery. Turn system switch on.

If the motor does not run:

- 2) s-l-o-w-l-y turn the trimpot screw clockwise (=to the right), until the motor runs.
- 3) slowly bring the throttle stick back to brake position (neutral). The motor should stop at about the 1/4 throttle position. Continue with step 4 below.

If the motor does run:

- 2) slowly bring the throttle stick back to 1/4 throttle
- 3) s-l-o-w-l-y turn the screw on the trimpot counter-clockwise (=to the left), until the motor stops.
- 4) Check by moving the throttle stick that the motor does, indeed, start and stop at the newly programmed throttle stick positions.

Should the motor not switch on and off with this setup, or should the motor not turn on or off at all, then:

- a) check if servo runs on this channel. Put BEC cable onto another channel of your receiver.
- b) check to make sure that the range (ATV) of the throttle is programmed for 100% in your transmitter
- c) reverse the throttle control at the transmitter.

Tip: Please note that the motor starts about 1 second after the stick is moved to its „run“ position. This is a part of the soft start requirement.

After proper adjustment of the s10, you could plug it into a switched channel of your transmitter, e.g.

landing gear. This switch would then simply perform the remote MOTOR ON/OFF function.

11 Warranty

All **schulze** products are 100% dynamically tested with a battery and a motor. No simulated tests here. Should your s10 develop a problem, please send it to **schulze** or to the importer. Add a description of the problem. Be precise and exact, listing battery voltage and capacity, motor type, conditions of failure etc. A note saying „Don't Work“ is insufficient and may lead to wasted time in trouble shooting. Before returning the s10 for repair, please test it „one more time“ carefully. We will charge repair cost for a returned controller which is found to be operating correctly whether it is in warranty or not.

One more hint:

Do not try to troubleshoot a defective unit yourself; very few hobby shops are equipped to analyze and repair SMT (surface mount) printed circuit boards. We reserve the right to refuse repair to units which have been altered or „improved“ by unauthorized so-called experts.

Again, if you ever have a problem with one of our products, please send it directly to **schulze** or to its authorized representative (see manual). Do not return it to the dealer. This way, you can be sure that the proper replacement parts will be used and that you, again, will have maximum pleasure from using these products, and carry a renewed warranty following the repair.

12 Technical Data

Type	s10-15e	s10-15ek
Dimensions (l,w,h)	~27x23x10 both	
Weight (without on/off switch)	~7g.	~16grams
Battery cable length	-	~12cm
Battery cable diameter	-	~1.0mm ²
BEC cable length	-	~25cm
# Cells NiCad	(6*)7-12	both
Voltage range	(7.2*)	8.4-14.4V
s10 Current Consumption	~35mA	both
Motor Current Nominal	~12A	both
Motor Current Maximum	~15A	both
Full ON Resistance	~10 milliOhm	both
Undervoltage Protection Limit	~5.15V	both

[*] as a result of the undervoltage protection of the BEC circuitry, the flight battery pack may not fully discharge.

You will find wiring instructions with a picture on the following two pages when using s10-15e





A Wiring Instructions for the s10-15e

You have purchased the s10e without the cables, so you have to connect them yourself. Please follow these directions carefully and accurately. The solder connectors are small, and they are close together. Watch for short circuits (inter-connected solder joints).

We have tested all s10-15e modules dynamically and they are factory adjusted for a neutral pulse setting, prior to shipment. This adjustment is valid for Futaba, JR and HiTec radios without having to re-align the s10.

Incorrect cabling will, in all likelihood, damage the s10 when you plug it in. We can not warranty units which have been mis-wired or otherwise damaged as a result of incorrect installation.

You need:

- 1 servo connecting cable (for the BEC).
- 1 lead for the battery POSitive connection (red), length about 4", dia. 1 mm.
- 1 lead for the battery NEGative connection (black), length about 4", dia. 1 mm.
- 2 pieces of heat shrink tubing, 1/2" long, 1/4" dia. (enclosed).
- 1 piece of heat shrink tubing 1" diameter (enclosed).

As required:

- 1 system on/off switch with 4" leads (for 1A current)
- 1 motor connecting lead POS (red), about 3" long, dia 1 mm.
- 1 motor connecting lead NEG (yellow or blue), about 2" long, dia. 1 mm.

B Preparations

For the following solder activities, make sure you use a fine-tipped soldering iron and thin, rosin core 60/40 solder. Do NOT use soldering paste or other acid-based soldering aids.

Remove about 3/16" of insulation from the ends of the battery and motor leads; neatly twist the wires together and tin them thoroughly without disturbing their shape. Cut the tinned ends so that you have 1/8 inch of wire exposed.

Tin the three leads of the servo connector and cut them so that you have 3/32" of wire exposed.

C Assembly

Servo Cable

- 1) slide one piece of the 1/2" heat shrink tubing over the servo cable. Do not shrink this in place at this time. Pay attention to the fact that the sequence of wire leads in this cable may not necessarily be the same as the sequence of the solder pads on the s10 pc board.
- 2) solder the signal lead (white or yellow or orange) onto solder **pad 1** on the s10 pc board
- 3) solder the positive lead (red) onto solder **pad 2**
- 4) solder the negative lead (black or brown) onto solder **pad 3**

If you are going to install a system on/off switch, then continue with step **5a**.

If you are *not* going to use a system on/off switch, then your plane will be „hot“ as soon as you plug the flight battery pack in. In this case, continue with step **5b**.

With system switch

- 5a) slide the two leads which come from the switch, through the heat shrink on the servo cable.
- 6a) solder the first lead onto solder **pad 4** on the s10 pc board.
- 7a) solder the other lead onto **pad 5**.

continue with step **8**), below.

Without system switch

- 5b) solder a little jumper wire between **pads 4 and 5** on the s10 pc board.
- continue with step **8**), below.

Battery Leads

- 8) solder the black (-) battery lead to **pad 6**. Fold this lead back over the pc board so that it points to the right. See the drawing.
- 9) solder the red (+) battery lead to **pad 7**. Fold this lead back over the pc board so that it points to the left.



- 10) Slide the battery leads through the heat shrink tubing which already contains the servo (BEC) cable and the two switch leads. This is tight. Use a drop of W40 if you have to.
- 11) Slide the heat shrink tubing as close as it will go, towards the s10 pc board; organize the cables and leads inside so that the servo cable and switch leads are under, and the two battery leads are above, neatly next to each other.

Motor Leads (if required)

- 12) solder the red (+) motor lead to **pad 8**, component side of the pc board. Bend this lead also „up and away“ from the board.
- 13) solder the yellow or blue (-) motor lead to **pad 9** on the component side of the s10 pc board. Bend this lead away from the pc board.
- 14) slide the motor wires into the second piece of 1/2 inch heat shrink tubing.
- 15) slide the heat shrink tubing towards the pc board, as far as it will go.

D Functional Test

Temporarily hook up the motor (no propeller!). Observe positive (red lead, red dot on motor back plate) and negative (yellow or blue lead) polarity. Temporarily mount the motor in a test stand or vise (use padding) to prevent run-away. Temporarily connect (plug in) battery cable and the radio. Test operation as described above. Adjust the trim pot if necessary. Disconnect battery and motor.

E Final Assembly

- 16) pull the cables tight and slide the heat shrink tubing as close as possible towards the pc board.
- 17) slide the large piece of heat shrink tubing over the entire pc board and shrink it in place, using a heat gun with care.
- 18) if you want to mount the s10 directly onto the SPEED-400 motor, remove the motor leads and remove the large heat shrink material at pads 8 and 9. Goto step 19.
- 19) carefully slide the motor terminals into the slotted holes in the pc board (component side towards motor) - watch polarity! - and solder the pc board directly to the motor terminals, soldering them from the motor side.

CAUTION! Make sure that you do not damage the cables near the positive + terminal !

F You are ready - we wish you many flights!

G Color Code for Servo Cables

	Futaba	JR	HiTec
Signal	white	orange	yellow
+ 4.8V	red	red	red
- (Ground)	black	brown	black

Note that the sequence (order) of leads in servo cables is different for the different manufacturers!

