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PLEASE NOTE. PDF WIRING DIAGRAMS ARE AVAILABLE HERE.

## SPEKTRUM - DX5e

R/C ELECTRONIC SPEED CONTROLLERS  
FOR LOW COST 2.4 Ghz 5 CHANNEL RADIO CONTROL

## INSTRUCTIONS.

Thank you for purchasing this Microprocessor ( $\mu$ P) based R/C Electronic Speed Control (ESC) system.

**THIS SYSTEM REQUIRES THE SPEKTRUM DX5e 2.4 GHZ R/C FOR ALL INSTALLATIONS.**

**THE FOLLOWING MAXIMUM BATTERY VOLTAGES MENTIONED ARE THE NOMINAL VOLTAGE.**

USE 7.2v - 18v BATTERIES for the **EVOLUTION** B-3 ESC's.

USE 14.4v - 18v BATTERIES for the **EVOLUTION** E-3 ESC's.

USE 14.4v - 24v BATTERIES for the **EVOLUTION** B-5, B-10, E-PnP-AC, E-PnP-BK, E-6 & E-9 ESC's

**DO NOT CONNECT TO MAINS POWER (110 - 240V AC).**

The **EVOLUTION** "B SERIES" ESC's HAVE BEEN DESIGNED TO BE AN ENTRY LEVEL ESC AT THE LOWEST POSSIBLE COST, COMBINED WITH SMOOTH PERFORMANCE & BULLET PROOF RELIABILITY.

**THEY DO NOT HAVE DIRECTIONAL CONSTANT BRIGHTNESS LIGHTING OR SOUND TRIGGERS.**

**The **EVOLUTION** "E SERIES" ESC's DO HAVE LIGHTS AND SOUND TRIGGERS.**

We tested this system three times during manufacture and it was working normally when it left our factory. If damage in transit has occurred please return to place of purchase for attention.

**THIS ESC IS GUARANTEED FOR ONE YEAR.**

INCLUDED ARE ONE OR THE OTHER OF THE FOLLOWING COMPONENTS:

**B-3, B-5, B-10, PnP-AC, PnP-BK, E-3, E-6 or E-9 ESC.**

They come complete with plug in servo leads.

You will supply the 2.4 Ghz 5 channel Digital Proportional **SPEKTRUM DX5e** R/C.

You will supply a locomotive or trail car, the 7.2 - 24 volt traction batteries (depending on ESC), a fuse, an ON-OFF switch and wires to connect the **ESC** to the battery and motor(s).

Where soldering is necessary, we recommend a low wattage soldering iron and resin core solder.

**THESE ESC's CAN BE USED WITH THE DX6i & DX7.**

## CAUTION

DO NOT ATTEMPT TO ALTER THE TUNING OF THE RADIO EQUIPMENT  
DO NOT USE RADIO CONTROL EQUIPMENT IN THUNDERSTORMS

CHILDREN UNDER 12: ADULT SUPERVISION RECOMMENDED DURING USE.

## INSTALLING **EVO** “E” SERIES **ESC**'s. FOR USE WITH LOW COST 2.4 GHz 4/6 CHANNEL R/C.

All **EVO R/C ESC**'s work with any standard 2.4 GHz digital proportional 4/6 channel R/C with servo outputs. They will be easiest to operate if the channels you choose have spring loaded centre off control sticks. A backwards and forwards motion stick such as the elevator is used for speed and direction control. A Left to Right sideways motion stick such as the Rudder or Aileron operates the accessory functions. Although they can be used with the centering springs removed we do not recommend you use them this way, as the system requires a positive neutral and not having a spring makes this hard to judge.

Separation of R/C systems is done by “Binding” any RX to a particular TX.

### “BINDING” THE RX TO THE TX.

Before using the R/C system you must ensure the RX and TX recognise each other. You do this by following the “BINDING” procedure as outlined in the R/C system instructions.

No need to supply RX batteries for “BINDING”. Once wired up simply switch the system on before “BINDING”.

### SHORT CIRCUIT & OVERLOAD PROTECTION.

All **EVO-B** series **ESC**'s are self protecting.

Although there is output overload and short circuit protection built into them it is essential you fuse the battery supply for overall system protection. Wiring diagrams are available separately on the EVO website.

**EVO ESC**'s provide a 5 volt BEC supply for the Radio receiver via the supplied servo leads which are compatible with Futaba & HiTec R/C. Other brands of R/C may differ. Check compatibility before installing.

You do not need batteries. Extra servos can be powered from the receiver.

### INSTALLING THE ESC.

You can mount the PCB with double stick tape or non conductive silicone. Do not allow metal objects to touch the rear of the PCB. Damage to the PCB may result.

Keep the RX well away (2" - 3") from the throttle, motor(s), batteries and any speakers. The magnetic fields will affect radio signal stability.

### SPECIAL NOTE REGARDING **EVO PnP ESC**'s.

The # **PnP-AC** is designed specifically for AristoCraft locos with the PnP socket. It will work backwards if used with the Bachmann PnP sockets. You can compensate by reversing the servo output on the Elevator channel.

The # **PnP-BK** is designed specifically for the Bachmann K-27 PnP socket and has a built in sound trigger inverter. It is not recommended for use in AristoCraft locos.

### MOUNTING THE RX & ANTENNA.

To get the best range it is usually possible mount the RX & antenna up high & in a straight line in bigger locos. We have 300' + “reach” with the system in plastic locos.

**N.B.** With metal locos the antenna **MUST** be vented externally otherwise range will likely be reduced.

There is **NO** “glitching” or “Rusty Bolt Effect”. We can turn the TX OFF to save the batteries and the loco will “Cruise” along until the TX is turned ON again and control resumed.

### INSERTING SERVO LEADS.

For the speed control we inserted the pre-wired JR/Hi-Tec 3 x way plug into the RX Elevator Ch.

For the accessory functions insert the Hi-Tec 3 x way plug with a single wire into the RX Rudder or Aileron channel. Polarity is important. The Orange/ Yellow signal wire usually goes towards the middle of the RX.

### WIRING BATTERY & MOTORS.

Connect the traction battery, which **MUST BE FUSED**.

Connect the ESC motor terminals **M & M** to the motor(s). If the loco runs backwards reverse leads at **M & M**.

### MOTOR “NOISE” SUPPRESSION IS NOT NEEDED.

If you decide to use our constant and directional lighting outputs the bulbs **MUST** be rated for whatever the traction voltage is. ie 7.2 - 24 volts. If you are using LED's you must place a 470-1000 ohm resistor in series with each diode to drop the traction voltage to an acceptable level. See wiring diagrams.

Alternately we have a small **RELAY** pcb that can handle 1 amp. These make wiring much simpler.

The RCS # **RELAY** pcb can control incandescent bulbs up to 1 amp. This is ideal for use with locos that have on board electronic features such as big diesels made by AristoCraft or USAT. It saves a lot of rewiring. Auto neutral detection at switch on differs in that the rear light will flicker ON, then it should change to the front light ON. One light will always be ON when stationary.

**IT IS MOST IMPORTANT THAT THE LIGHT BULBS BE COMPLETELY ISOLATED FROM ANY OTHER WIRING.**

## INSTALLING EVO "E" SERIES ESC's.

The trim tabs on the channels used **MUST** be in the middle. We glued ours into position. Changing the trim tab settings during use may cause the loco to speed up or slow down on its own.

**N.B. it is most important the TX is at least 3ft (1 x metre) away. Otherwise a false neutral may be set.**

Switch the **ESC** ON first. Then switch on the TX. Both lights (+ LED) will come ON. See page # 4. The rear light will go out. The front one stays on indicating the ESC has noted & stored "neutral".

**See page # 4 for notes on switching ON with 2.4 GHz DSS R/C such as SPEKTRUM DX5E.**

For an inexperienced operator the maximum speed can be set for 100%, 75% or 50%. See page # 4.

### MEMORY MOMENTUM OPERATION.

**EVO ESC's** operate totally differently from regular Digital Proportional R/C. The stick position does not determine the actual speed. Rather, it is used to control the rate of acceleration up to a "cruise" setting. Once the speed has been set you let the stick go and the set speed is maintained.

There are three selectable RUN modes each with two rates of acceleration/braking.

1. 2½ - 5 seconds from stop to full speed and the same back down again.
2. 5 - 10 seconds from stop to full speed and the same back down again.
3. 10 - 20 seconds from stop to full speed and the same back down again.

The slowest rate is available on the 2<sup>nd</sup> 1/3<sup>rd</sup> of stick movement.

The faster rate is available with the final 1/3<sup>rd</sup> of stick movement.

In other words the further you push the stick forwards the faster the loco will accelerate forwards.

**FORWARDS MOVEMENT.** Gently push the elevator channel stick about 1/3<sup>rd</sup> of the way forwards.

The loco will accelerate to top speed as long as you hold the stick in position.

Let the stick go once the desired speed has been reached. The **EVO** ESC will remember the speed setting until told to change it by once again moving the elevator channel stick.

You can turn the TX off to save TX batteries if you wish. The loco will remember the setting and stay there until the TX is switched back on and the stick moved.

**SLOWING DOWN.** Pull the stick back to the desired braking rate. Let the stick go once desired speed has been reached. To stop loco simply hold stick back until loco stops. In fast rate braking the loco will stop dead once you have reached 30% of the ESC setting. This is ideal for Kadee<sup>®</sup> switching as it will prevent accidental re-coupling due to hesitation. For smooth stops use the slow rate.

When you slow down from forwards say & then stop, the lights will automatically change to reverse.

This may worry you because you intended to proceed in the same forwards direction. If so, as soon as you move the stick to forward the same as before, the lights will be ON for forwards motion.

If you want them to set for forwards and remain stationary, briefly press the stick forwards. This will make them change but will not be enough for the motor start.

**REVERSE MOVEMENT.** You must first completely stop the loco. The lights will change to reverse. Then let the stick go and wait for 1 second for the programme logic to allow you to move off in reverse.

Now gently pull the stick back to the desired acceleration rate.

The controls work exactly the same way in reverse although the mirror opposite to forwards.

Slow down when travelling in reverse by pushing the stick forwards.

### SOUND SYSTEM TRIGGERS.

The **EVO "E" ESC's** have been designed with sound systems in mind.

They can be used with Phoenix P5 + P5T, PB9, Sierra, Dalle & MyLocosound sound systems as supplied.

Additionally, the Sierra requires the installation of the # **SSI-12v5** opto interface.

### OPERATION.

Press the L – R Aileron or Rudder stick half way or more either side of neutral to activate each function.

There are two outputs. # 1 & # 2.

Each L – R function can be programmed for either Momentary (1) or latch ON-OFF (2) or OFF (3).

There is an Aux function, # 3, which can be auto ON ramping up and OFF ramping down.

Use for automatic operation of "Working" or "Rev Up". **Or:**

ON when fast ramping down. Select slow brake or accelerate to turn OFF.

Use with a "Dynamic Brake" or "Drifting" chuff of a steam engine.

A third option is OFF.

**N.B. At present the auto function cannot be used with Phoenix PB9.**

## PREPARATION FOR PROGRAMMING CHANGES.

Make **EVO** "E" series programming changes at the ESC pcb using the 3 way DIP switch. The bracketed number eg **(1)** indicates how many times the light(s) will flash in a pre-arranged sequence after a programming change has been made. The LED on ESC pcb is connected to the front light.

**Refer to DIP switch chart on page # 7 to get correct button settings for each function.**

Batteries must be charged before use.

1. To make any programming changes the loco must always be switched **OFF** before you start.
2. Set the DIP switches in the combination for the function you want to programme.
3. Turn ESC ON. Lights and LED will flash and go out. Turn ESC OFF.
4. Repeat steps 2 & 3 for as many functions as you wish.
5. When the ESC is OFF set the DIP switches to OFF. Then turn ON and you are ready to go.

### CHANGING THE **ESC** ACCELERATION RATE.

From the fast **(1)** 2½ + 5 second setting to the slower **(2)** 5 +10 second rate or slowest **(3)** 10 + 20 secs:  
Set DIP switch to BC # **1** ON, turn Loco ON. If lights flash once (5 sec) toggle loco ON-OFF until lights flash twice in the ON position. (3 flashes indicates the slowest 10 + 20 second rate). Turn loco OFF.  
Set DIP switches to BC # **0** and turn loco ON. The LED on pcb will come on and you are ready to go.

### CHANGING THE **ESC** MAXIMUM SPEED.

To change from the 100% top speed **(1)** setting to either 75% top speed **(2)** or 50% top speed **(3)**:  
Set DIP switch to BC # **5** ON, turn Loco ON. If lights flash once (100% speed) toggle loco ON-OFF until lights flash twice for 75% speed or three times for 50% speed in the ON position. Then turn loco OFF.  
Set DIP switch to BC # **0** and turn loco ON. The LED on pcb will come on and you are ready to go.

### CHANGING THE **ESC** ACCESSORY FUNCTIONS.

See page # 5 for how to use with the Phoenix P5.

Sierra® sound systems self latch the Bell ON & OFF with brief pulses.

Dallee® sound systems require the Bell to be latched ON –OFF.

**WHISTLE:** From Momentary to Latch ON-OFF or function permanently OFF:

Set DIP switch to BC # **2** ON. Toggle loco power ON-OFF until lights flash twice **(2)** in the ON position (Latch ON/OFF) or **(3)** times (function OFF). Then turn loco OFF.

**BELL:** From Momentary to Latch ON-OFF or function permanently OFF:

Set DIP switch to BC # **3** ON. Toggle loco power ON-OFF until lights flash twice **(2)** in the ON position (Latch ON/OFF) or **(3)** times (function OFF). Then turn loco OFF.

**AUX:** From **(1)** ON going UP & OFF going down to ON going down & OFF at 30% **(2)**, or AUX OFF:

Set DIP switch to BC # **4** ON. Toggle loco power ON-OFF until lights flash twice **(2)** in the ON position (ON down) or three times **(3)** for AUX OFF. Then turn loco OFF.



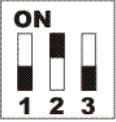

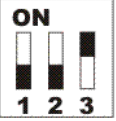
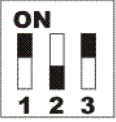
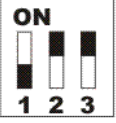
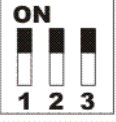
Set DIP switches to BC # **0** and turn loco ON. The LED on pcb will come on and you are ready to go.

### **How to switch ON a 2.4 GHz DSS R/C system such as SPEKTRUM DX5E.**

It has been our experience that the most accurate way for automatic neutral to be selected, is to switch ON the **ESC** first. The DSS RX will not send a servo position signal until it has bonded to the TX.

The DSS TX must be at least 4 feet away from the loco before you switch the DSS TX ON. The TX to RX bonding then takes place. This can take between 2 – 6 seconds. An LED on the RX will go to solid ON when bonding has taken place. Then the RX will send the set positions of the various sticks on the TX to the **ESC**.

The **ESC** will wait until the RX sends the required information to the **EVO-E3 ESC**. Then automatic neutral selection will take place and the rear light will go out.

DIP SWITCH SETTING. "BC"	ADJUST	R/C (1)		AUTO (2)
 <b>0</b>		<b>RUN</b>		<b>RUN</b>
 <b>1</b>	<b>Accelerate Brake</b>	(1) 2½ + 5 Secs (2) 5 + 10 Secs (3) 10 + 20 Secs		(1) 5 Seconds (2) 10 Seconds (3) 20 Seconds
 <b>2</b>	<b>Whistle Tx #1</b>	(1) Momentary (2) Latch On/Off (3) Off		(1) Automatic (2) Off
 <b>3</b>	<b>Bell Tx #2</b>	(1) Momentary (2) Latch On/Off (3) Off		(1) Auto (A) (2) Auto (B) (3) Off
 <b>4</b>	<b>Auxiliary Tx #3</b>	(1) On - up (2) On - down (3) Off		(1) On - up (2) On - down (3) Off
 <b>5</b>	<b>Max speed</b>	(1) Full speed (2) 75% speed (3) 50% speed		(1) Full speed (2) 75% speed (3) 50% speed
 <b>6</b>	<b>Dwell time.</b>	Unused		(1) 10 s (2) 30 s (3) 1 m (4) 2 m (5) 4 m
 <b>7</b>	<b>Select Programme</b>	Lights flash once		Lights flash twice

**Please note:** The **GREY** background indicates the default settings as supplied.  
 The (1) symbol always indicates the default setting in each programme.  
 (1), (2) & (3) also indicate how many flashes the lights make when programming.

**Please note:** The "BC" refers to the binary code (0-7) positions of the DIP switches.

e.g. BC3 is codes # 1 and # 2 both on & # 3 OFF. It is NOT DIP switch # 3 ON.  
 As RCS has always done, the part of switch you move is shown in black.

**Please note:** When a programme setting is changed it is effective across both programs.

e.g. Say you wish to have the automatic BELL in Automatic mode. If you change the mode to R/C(1) the BELL function is automatically set to MOMENTARY and will need to be reprogrammed to latching ON-OFF operation if that is how you want it.

**Please note:** Pay special attention when placing magnets for automatic operation.

eg. The reversing magnet which is set AFTER the stopping magnet, MUST be placed about halfway between start of slow down and the actual stopping point of the loco.  
 Where magnets should be placed depends on the top speed and acceleration/braking rates.