

## Tips for using the AVC

- If you set a Custom Cutoff voltage, then you don't have to repeat the procedure before each flight. The AVC is ready to go (using the stored cutoff voltage) when you turn it on.
- If you fast-charge your battery pack, wait at least 5 minutes before using it. This assures the AVC can properly determine the number of cells in the pack when it is operating with Auto Cutoff.
- After you connect your charged battery pack to the ESC and turn power on, wait about 3 seconds before advancing the throttle. This gives the AVC time to accurately determine the number of cells in the battery pack.
- If the motor cuts off in flight:
  1. Move throttle stick to off.
  2. Move throttle stick back up.
 The AVC should provide 3 restarts, as long as the pack recovers enough voltage to go above the AVC's cutoff.

## AVC cell detect and auto low voltage cutoff specifications

For initial voltage	Pack type/size* is assumed to be	And cutoff voltage (when enabled) is
5.30 to 7.15 V	NiCd/NiMH, 5 cells	5.3 ±0.1 V
7.16 to 8.55 V	NiCd/NiMH, 6 cells; or LiPo, 2 cells	5.3 ±0.1 V
8.56 to 9.95 V	NiCd/NiMH, 7 cells	5.4 ±0.1 V
9.96 to 11.20 V	NiCd/NiMH, 8 cells	7.5 ±0.1 V
11.21 to 12.45 V	NiCd/NiMH, 9 cells; or LiPo, 3 cells	8.4 ±0.1 V
12.46 to 14.50 V	NiCd/NiMH, 10 cells	10.0 ±0.1 V
14.51 to 16.05 V	NiCd/NiMH, 11 cells	10.3 ±0.1 V
16.06 up	NiCd/NiMH, 12 cells; or LiPo, 4 cells	11.0 ±0.1 V

\*number of cells connected in series

## AVC1AIR specifications

Model	AVC1AIR	Input operating voltage	5.2 to 18 VDC
Functions	Automatic and custom low voltage cutoff for electric-powered radio controlled airplanes. Adds low voltage cutoff if not provided by ESC, and automatic cutoff for LiPo packs if ESC is not LiPo-compatible.	Motor support	1 DC motor
Input	2 to 4 Lithium Polymer cells in series, or 5 to 12 NiCd/NiMH cells in series	ESC support	Works with ESCs for both brushed and brushless motors
		Dimensions	1.21" x 0.40" x 0.25" (30.7mm x 10.2mm x 6.4mm)

## FMA limited warranty for low voltage cutoffs

FMA, Inc. warrants this product to be free of manufacturing defects for the term of 90 days from the date of purchase. Should any defects covered by this warranty occur, the product shall be repaired or replaced with a unit of equal performance by FMA or an authorized FMA service station.

### Limits and exclusions

This warranty may be enforced only by the original purchaser, who uses this product in its original condition as purchased, in strict accordance with the product's instructions. Units returned for warranty service to an FMA service center will be accepted for service when shipped postpaid, with a copy of the original sales receipt or warranty registration form, to the service station designated by FMA.

### This warranty does not apply to:

- Consequential or incidental losses resulting from the use of this product.
- Damage resulting from accident, misuse, abuse, neglect, electrical surges, reversed polarity on connectors, lightning or other acts of God.
- Damage from failure to follow instructions supplied with the product.
- Damage occurring during shipment of the product either to the customer or from the customer for service (claims must be presented to the carrier).
- Damage resulting from repair, adjustment, or any alteration of the product by anyone other than an authorized FMA technician.
- Installation or removal charges, or damage caused by improper installation or removal.

Call (301) 668-7614 for more information about service and warranty repairs.



## Auto Cell Detect Low Voltage Cutoff

Model AVC1AIR for electric-powered aircraft using Lithium Polymer, NiCd or NiMH battery packs

For Version 1.22 Firmware

## Features

The Auto Cell Detect Low Voltage Cutoff (AVC) enables proper Low Voltage Cutoff (LVC) for Lithium Polymer, NiCd and NiMH packs when used with an Electronic Speed Control (ESC) that doesn't provide proper cutoff voltage for these battery types.

- Works with any ESC that terminates motor voltage on loss of signal (LOS).
- Adds LiPo-specific Low Voltage Cutoff (LVC) to any Electronic Speed Control (ESC) that doesn't have settings for LiPo packs.
- Enables use of LiPo batteries with both brushed and brushless ESCs.
- Two user switchable Low Voltage Cutoff options. Auto Cutoff, when enabled, automatically cuts off motor at minimum voltage calculated from initial battery pack voltage. Custom Cutoff, when enabled, automatically cuts off motor at a voltage you set.

Kokam/FMA Direct Lithium Polymer cells are the next-generation replacement for NiCd, NiMH and Lithium Ion cells. This unique power technology offers high energy density, low weight, long life, safe operation and environmentally-friendly chemistry. FMA Direct offers a full line of LiPo cells, packs and compatible electronics at [www.fmadirect.com](http://www.fmadirect.com). LiPo technical and application information is available in the Support section of the Web site.

**Note:** When using LiPo batteries in fuel-powered models, use an FMA voltage regulator/LED indicator, such as the Sport VRLI.

## Precautions

- Follow all instructions in this manual to assure safe operation.
- Observe frequency control. If someone else is operating a radio controlled model on the same channel as your transmitter, **do not turn on your transmitter—even for a short time**. Your transmitter has a channel number marked somewhere on its case. When a model receives signals from two transmitters on the same channel at the same time, it cannot be controlled and will crash—possibly causing personal injury or property damage. **For safety, most RC flying fields have formal frequency control rules. Follow them carefully.**
- Do not operate your radio control transmitter within 3 miles of a flying field. Even at a distance, your transmitter can cause interference.
- Make sure your LiPo packs are not fully discharged when you first connect them to the AVC and apply power. The AVC sets its Auto Cutoff by measuring initial pack voltage. If the LiPo pack voltage is too low, the Auto Cutoff may be set too low, and cells could be over-discharged. Charge state is less critical for NiCd/NiMH packs, but it's always a good idea to start with a freshly charged pack.
- Always use some form of low voltage cutoff with LiPo cells and packs—either the FMA AVC, an FMA Super Series ESC, or an ESC with LiPo-specific cutoff settings. LiPo packs can be permanently damaged by discharging them below 2.5 volts per cell.

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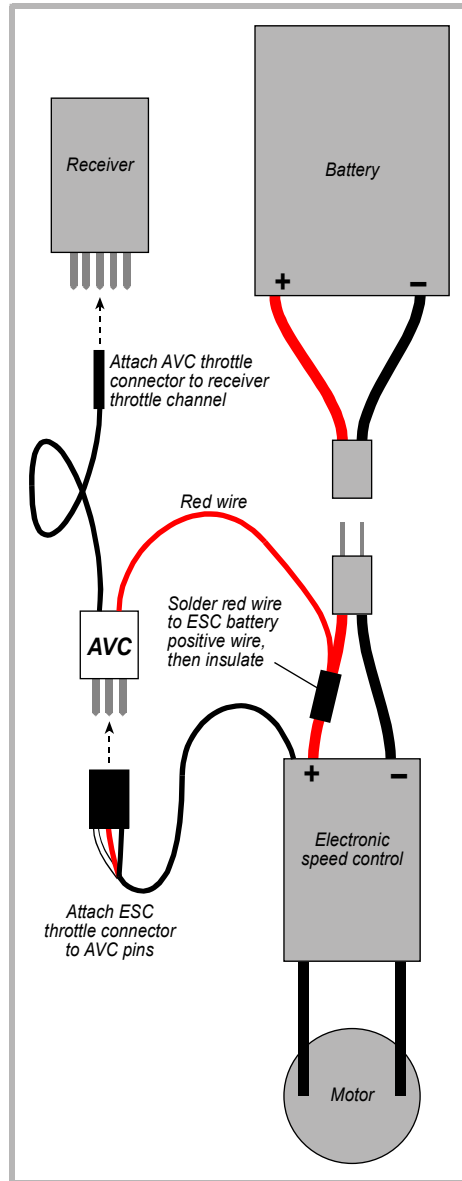
**FMA**  
Direct

## Installing the AVC

1. Install and test the electric power system **without** the AVC, following instructions provided with your motor, electronic speed control (ESC) and receiver.
2. Disconnect the battery from the ESC.
3. Remove the ESC's throttle connector from the receiver.
4. Cut a small opening in the AVC's plastic cover so you can set the switches, or poke through the shrink cover and use the head of a T-pin to change switch settings.
5. Solder the AVC's red wire to the ESC's positive (+) battery wire. Insulate the solder connection (for example, with electrical tape or heat shrink tubing) so it won't short.
6. Attach the ESC's throttle connector to the pins on the AVC (observe polarity!).
7. Attach the AVC's throttle connector to the throttle channel on the receiver (observe polarity!).

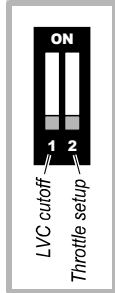
**Note:** Double-check connector polarities. Damage caused by reversing battery polarity is not covered by the warranty!

8. If the ESC has Low Voltage Cutoff, and it can be disabled, then disable it. (The AVC provides Low Voltage Cutoff.)



## Setting up the AVC

1. Teach the AVC where the throttle's off position is:
  - a. Turn off the ESC and turn off your transmitter.
  - b. Set AVC Switch 2 on (see switch diagram).
  - c. Move your transmitter's throttle stick all the way **down**.
  - d. Turn on your transmitter, then turn on the ESC. The motor will not rotate until step e is complete.
  - e. Set AVC Switch 2 off.
2. The AVC turns off the motor when battery voltage gets low. This enables the battery to maintain radio system functions for a short time—enough time to glide the aircraft to landing. Low voltage cutoff also prevents cell damage from deep discharge. Two cutoff options are provided. With **Auto Cutoff**, the AVC automatically determines the cutoff voltage based on initial pack voltage. With **Custom Cutoff**, you set the voltage at which cutoff occurs.



*To enable Auto Cutoff:* With the ESC off, set AVC Switch 1 on.

*To enable and set Custom Cutoff:*

**Tip:** For safety, have another person help you with this procedure.

- a. With the ESC off, set Switch 1 off.
  - b. Connect a partially discharged battery pack. (Pack can be fully charged, but it will take longer to reach the target cutoff voltage).
  - c. Connect a voltmeter between battery + and -.
  - d. Move your transmitter's throttle stick all the way **down**.
  - e. Turn on your transmitter, then turn on the ESC. Hold the aircraft securely and clear of the propeller, then move the throttle stick **full up**.
  - f. Watch the voltmeter. When the voltage drops to the desired cutoff point, set AVC Switch 1 on. This sets the cutoff voltage and turns the motor off.
- The ESC will use this cutoff voltage until you repeat the above procedure, or you disable Custom Cutoff.

*To disable Custom Cutoff and enable Auto Cutoff:*

**Tip:** For safety, have another person help you with this procedure.

- a. With the ESC off, set AVC Switch 1 off
- b. Move your transmitter's throttle stick all the way **down**.
- c. Hold the aircraft securely and clear of the propeller. Turn on your transmitter, then turn on the ESC. **Don't move the throttle stick.**
- d. Set AVC Switch 1 on.
- e. Turn off the ESC, then turn off your transmitter.