



Cellpro 4s Discharge Protection Module

for use with Cellpro LiPo Battery Packs

Model CP4S-DPM-BEC
for ESCs with Battery Elimination Circuits (BECs)

Model CP4S-DPM-OPTO
for ESCs with optical isolation in throttle circuit

About the Cellpro 4s Discharge Protection Module

The Cellpro 4s Discharge Protection Module (DPM) prevents FMA Cellpro Battery Packs from overdischarging in electric-powered radio controlled aircraft. Cellpro Packs have special connectors that enable Cellpro 4s Discharge Protection Modules (as well as Cellpro 4s Charge Protection Modules) to monitor the voltage of individual cells within the pack.

About the Cellpro system. Your airborne power supply will be made from two kinds of components:

- **Cellpro Pack(s).** Each pack has a special connector that enables Cellpro components to monitor the voltage of individual cells within the pack.
- **Cellpro 4s Discharge Protection Module (DPM)** for each Cellpro Pack. During discharge (flying), the Cellpro 4s DPM monitors individual cells within the connected pack and provides a warning when voltage gets low. A complex algorithm determines when the first cell reaches a preset voltage. At this time, the Cellpro 4s DPM works with your existing ESC to cut voltage to the motor.

For charging you'll need *one* of the following:

- **Cellpro 4s Charger.**
or
- **BalancePro HD Charger with BalancePro HD-to-Cellpro Adapter**, which automatically balances each cell and prevents overcharging. Besides providing fast charging, this combination enables Cellpro Packs to deliver longer life, as well as longer and consistent flight duration.
or
- **Other LiPo charger and Cellpro 4s Charge Protection Module.** This setup prevents overcharging, but cannot perform cell balancing. Over time, the pack may become unbalanced, reducing flight duration.

Cellpro 4s DPM features

- Works with any Electronic Speed Control (ESC).
- Enables use of LiPo batteries with both brushed and brushless ESCs.
- Soft cutoff gives you time to set up for landing before battery is depleted.
- Handles up to a 4s Cellpro Pack.
- Three Cellpro 4 DPMs can be daisy-chained to handle up to 12 cells in series.
- Connects to ESC through Deans Ultra connectors.
- **CP4S-DPM-OPTO only:** Optical isolation prevents interference from propagating back to receiver.
- Optional LED/Speaker Module provides status information.

Precautions

Read and follow all precautions provided with LiPo packs and chargers.

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FMA limited warranty

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.

Installing the CP4S-DPM-BEC

Note: Use the CP4S-DPM-BEC if your ESC is equipped with a Battery Eliminator Circuit (BEC) and you **do not need** optical isolation to prevent interference from propagating back into the receiver.

1. Disable the ESC's cutoff, or set the cutoff to a value well below 3V/cell.
2. Connect components (see drawing at right):
 - a. Attach the ESC's throttle connector to the Cellpro 4s DPM's Throttle Output connector.
 - b. Attach the DPM's Throttle Input connector to the receiver's throttle channel.
 - c. If you purchased the optional LED/Speaker Module, plug it into the DPM.
 - d. Connect the Cellpro Battery Pack to the ESC.

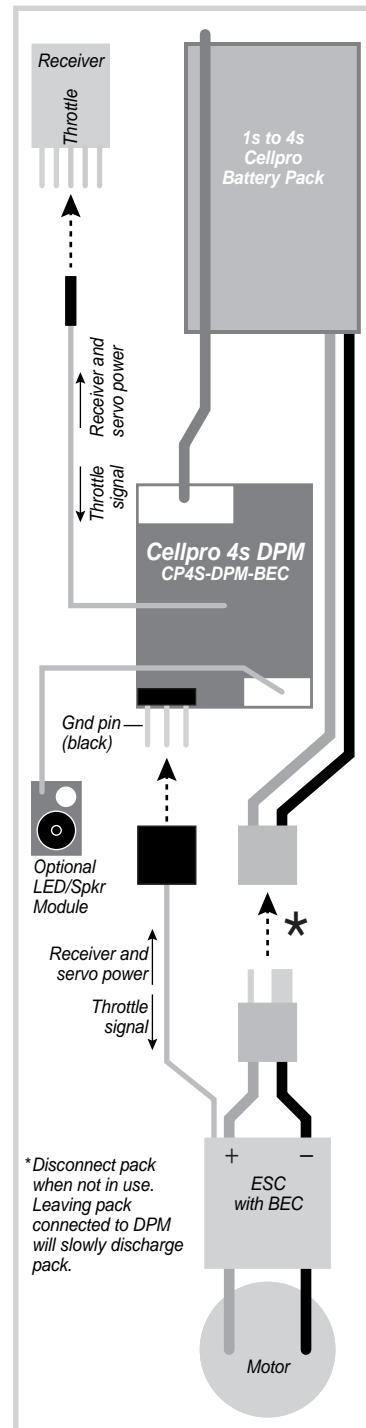
CAUTION: Do not install an on/off switch in the battery negative (black) wire. You can install an arming switch in the battery positive (red) wire. However, remove power by disconnecting the battery from the DPM.

Capacitors, connectors and arcing

FMA recommends connecting the Cellpro 4s DPM to the ESC using mating Deans Ultra connectors. Noise reduction capacitors at the motor draw extremely high currents when battery voltage is applied to the ESC. This current typically causes arcing at the pins of the connector completing the circuit. Here's the correct procedure for powering up the ESC:

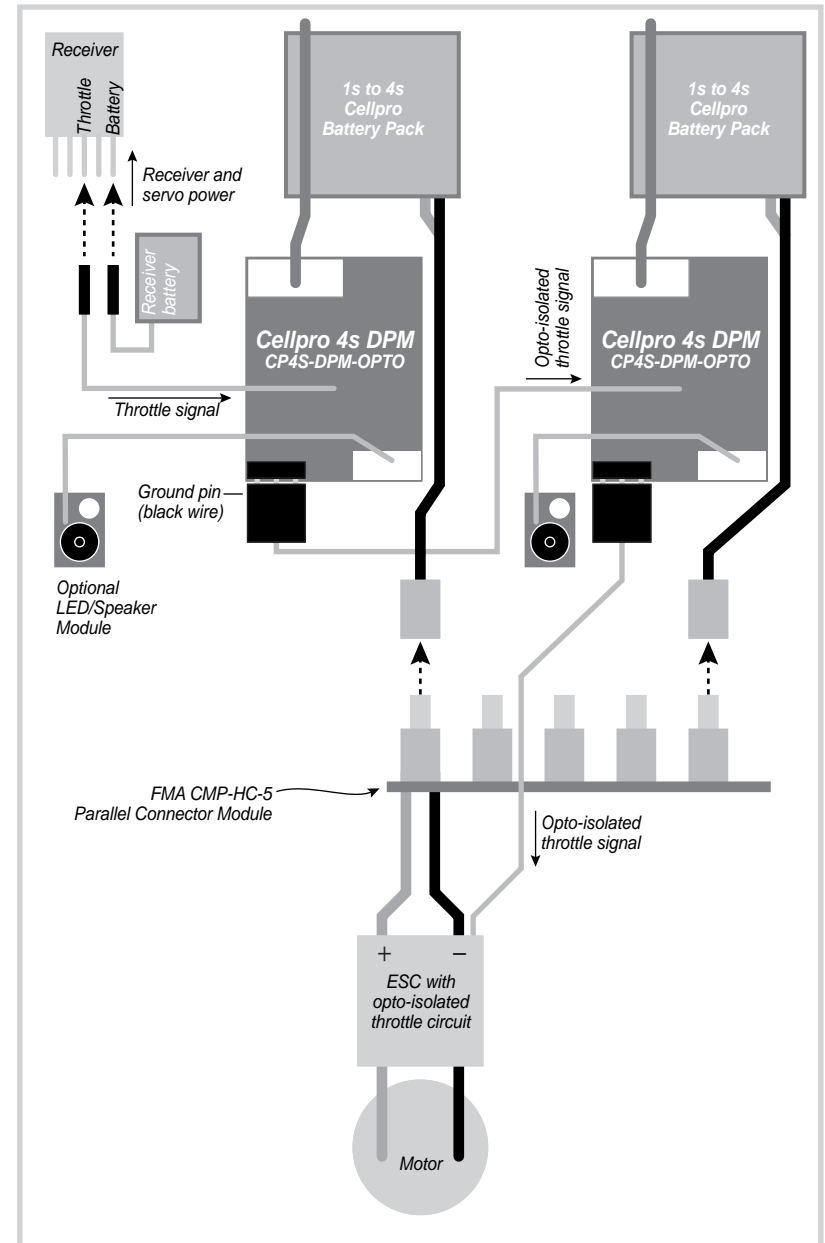
1. Disconnect the Deans Ultra connector between the Cellpro 4s DPM and the ESC.
2. Connect the Cellpro Pack to the Cellpro 4s DPM.
3. Connect the Deans Ultra connector to complete the circuit. Arcing may occur at this connector.

While this procedure doesn't eliminate arcing, it assures that it happens at the Deans Ultra connector. Eventually, repeated arcing will degrade the connector and you'll need to replace it. That's not a bad thing, as the Deans Ultra is both inexpensive and easy to replace.



Driving a motor with Cellpro Packs in parallel

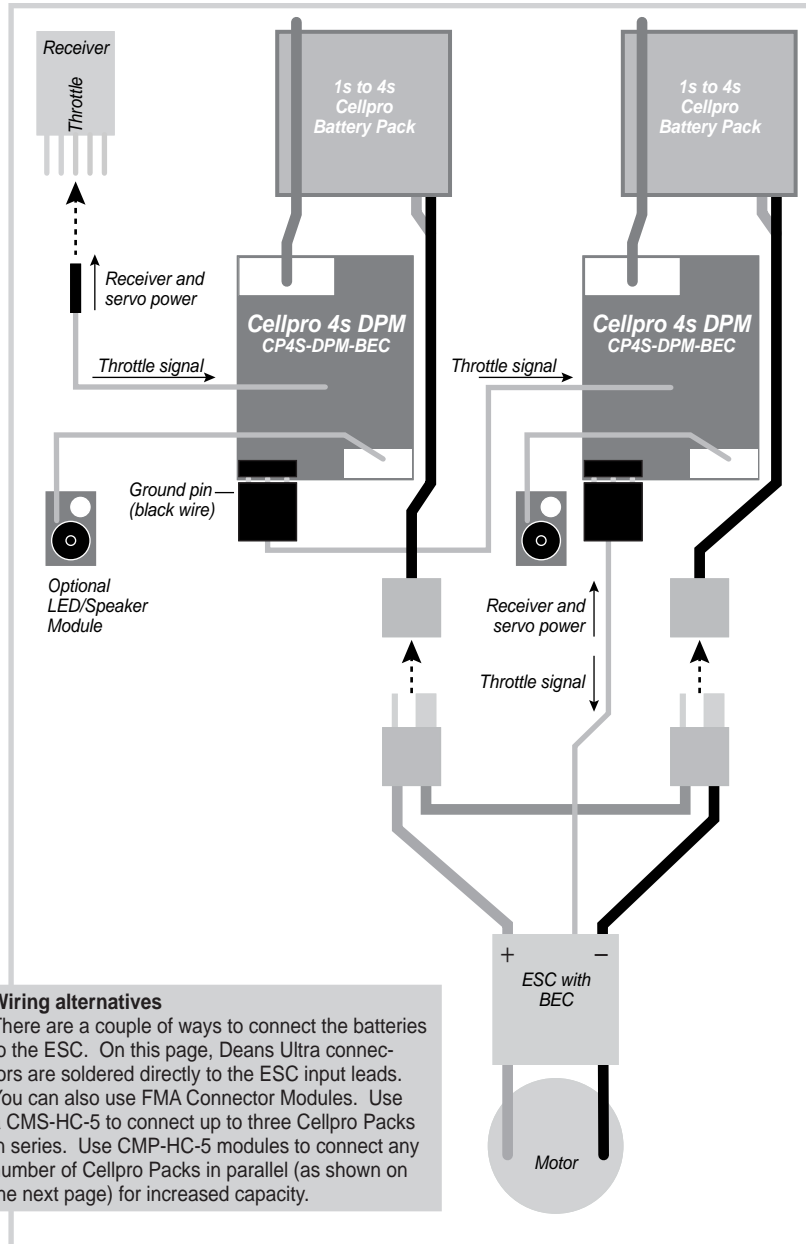
For higher capacity, connect any number of Cellpro Packs in parallel, as shown below. This example shows CP4S-DPM-OPTOs, which need a separate battery to power the receiver and servos.



Driving a motor with Cellpro Packs in series

You can connect up to three Cellpro 4s DPMs for higher voltage systems. Voltage to the ESC is the sum of the voltages of the Cellpro packs.

Note: If you connect an optional LED and Speaker Module to one Cellpro 4s DPM, you must also connect one to the other Cellpro 4s DPM to receive correct status.



Wiring alternatives

There are a couple of ways to connect the batteries to the ESC. On this page, Deans Ultra connectors are soldered directly to the ESC input leads. You can also use FMA Connector Modules. Use a CMS-HC-5 to connect up to three Cellpro Packs in series. Use CMP-HC-5 modules to connect any number of Cellpro Packs in parallel (as shown on the next page) for increased capacity.

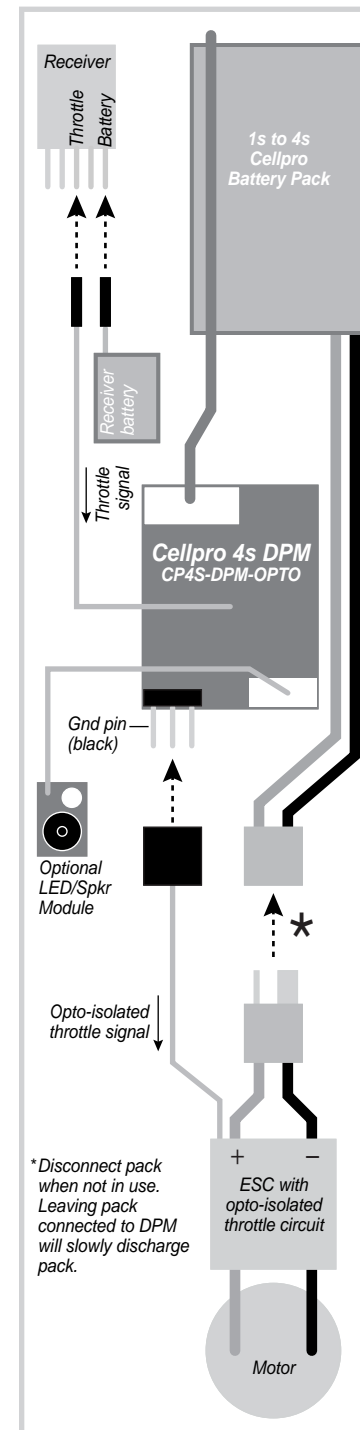
Installing the CP4S-DPM-OPTO

Note: Use the CP4S-DPM-OPTO if your ESC has optical isolation in the throttle circuit, or When your ESC is equipped with a Battery Eliminator Circuit (BEC) and you need to prevent interference from propagating back into the receiver.

1. Disable the ESC's cutoff, or set the cutoff to a value well below 3V/cell.
2. Connect components (see drawing at left):
 - a. Attach the ESC's throttle connector to the Cellpro 4s DPM's Throttle Output connector.
 - b. Attach the DPM's Throttle Input connector to the receiver's throttle channel.
 - c. Connect a battery to the receiver. This battery will power the receiver and servos.
 - d. If you purchased the optional LED/Speaker Module, plug it into the DPM.
 - e. Connect the Cellpro Battery Pack to the ESC.

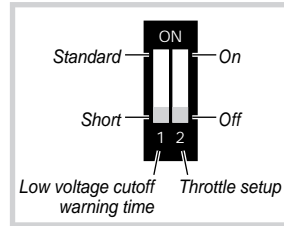
CAUTION: Charging Cellpro Packs

FMA recommends that you charge Cellpro Packs with a BalancePro 6s Charger with BalancePro HD-to-Cellpro Adapter, or with a Cellpro 4s Charge Protection Module and another LiPo-compatible charger.



Setting up the Cellpro 4s DPM

- Teach the Cellpro 4s DPM about the throttle's off position. The DPM will function without completing the following steps; however, it will operate with a hard cutoff rather than a soft cutoff. **Be careful when performing these steps. The motor will turn if you move the throttle stick.**
 - Turn off the ESC and turn off your transmitter.
 - Set Cellpro 4s DPM Switch 2 on (see switch diagram at right).
 - Move transmitter throttle stick all the way down.
 - Turn on transmitter, then turn on ESC. **Don't move the throttle stick!**
 - Set Cellpro 4s Switch 2 off.
- Set the low voltage cutoff warning time (Switch 1) to Standard or Short:
 - Standard** is for new batteries. Use this setting when you want highest level of protection for the pack and longest warning time (motor pulses longer before cutoff) when the pack reaches cutoff.
 - Short** is for older batteries when you are less concerned about ultimate battery protection and more concerned about getting the longest flight time. The LVC is slightly lower in this setting. Although run time will be extended, warning time will also be shortened.



Flying with the Cellpro 4s DPM

Note: Be sure to follow the connection order described in "Capacitors, connectors and arcing" on page 2 when assembling your power system. When not using the pack, disconnect it from the DPM so it won't slowly discharge.

The Cellpro 4s DPM provides a warning when cells in its connected pack approach the preset voltage. When the first cell reaches the preset voltage, the Cellpro 4s DPM pulses voltage to the ESC (soft cutoff) so you can prepare for landing. Soon after, the motor will stop (hard cutoff). After the hard cutoff, you may be able to reset the Cellpro 4s DPM by pulling the throttle low and advancing it again. Restarts are possible, but the number depends on how fast the cell with the lowest voltage recovers above the minimum operating voltage. When the pack is fully exhausted, there will be no power to the motor.

It's a good idea to ground-test the entire propulsion system before flying with it. Take it through a full simulated run and keep pushing it until the motor won't restart. You'll get a feel for flying time, and gain hands-on experience with end-of-run motor behavior.

Interpreting the Status Module LED and tones

This tone...	Means this...
Startup song	Power applied
Single low tone (same as first note of startup song)	Brown out; possible loose connection
"Cricket" sound (starts when Cellpro 6s DPM has not detected a throttle signal from the receiver for two hours)	Disconnect Cellpro pack from Cellpro 4s DPM

This LED pattern...	Means this...	And this happens...
Repeating single flash	Low battery warning	—
Repeating double flash	Low battery, near cutoff	Motor pulses
Solid on	Battery depleted	ESC shuts down*

This tone during a flight (or other discharge)...	Means this...	And this happens...
Repeating single tone	Low battery warning	—
Repeating double tones	Low battery, near cutoff	Motor pulses
Solid tone	Battery depleted	ESC shuts down*

*ESC may restart if battery voltage recovers above cutoff.

Troubleshooting

Symptom	Solution
Solid tone after connecting to battery	Check for dirty node connector or broken wire.

Cellpro 4s DPM specifications

Power consumption	10mA from Cellpro Pack
Dimensions	1.15" (not including Throttle Output connector) x 0.82" x 0.43"
Weight	0.26oz (7.3g)
Optional speaker weight	0.14oz (4g)