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Power supplies-Types, and Synthiam Use

In this tutorial, we'll learn about the different types of power supplies, and their use with the ez-b and other hardware, to help you find the right method to power your robot.

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Requirements, and Power Statistics

To select a power supply, you need to know 2 things:
What voltage do you need?
And
What amperage do you need?
All power supplies provide different levels of each, so it can be tricky to find the "prefect "one.
All Ez-robot heavy duty servos run at a max of 7.4V(Minimum 4.8V). This voltage is provided by the battery found in the store. The EZ-b V4 does not regulate power to the DIGITAL pins, so whatever goes in comes out. Other servos often have a max of 6V. This will require you to regulate the power to the servo, or run a 6V power supply.
The EZ-b has an operating range of 4.5V-16V.
The Ez-b V4 uses around 80mAh. The camera, around 100mAh.
Quote about Ez-b Capabilities:

Quote:
I know it has floated around the forum that the digital power pins can handle 5 amp per digital pin, but that's not the case. It's max of 2 amps per pin and a combined constant amperage of 5A for all the digital power pins. While you can have a spiked (pulsed) current up to 20A, the ez-bv4 is only rated for 5A of constant current.
If you find you are drawing much more than this we would recommend externally powering your motors directly from the battery power supply to the motor drive electronics (it's good idea to add a fuse in between them).
Servo power is best to come from a 7.4V LiPo battery (with protection) but you'll need servos that are rated for 7.4V, if you don't have servos that can handle this high of a voltage you'll need a
voltage regulator.
The thing to watch out for with regulators is how much current draw they can handle, like most motors, servo motors can draw huge spikes of current when first initialized so you'll likely want to double or triple the current rating of your voltage regulator compared to the operating current of the servo so you don't experience a brown out. Brown outs result in the voltage dropping below a certain level and will either effect the operation of the servo or the electronics controlling them.
EZ-B Data sheet
Servos, for example, the heavy duty servos in the store, and used on all Ez-robots, pull a suggested max of 2A-3A. This can cause a problem for robots with many servos, and will often cause "brown outs", or a sudden shut down of the EZ-b to protect it.
For example, here's a JD robot:

He has:
Ez-b---------- 80mah
camera----------100mah
12 servos-------22A- 8HD, 4 mini
RGB led array-~50mah
Which totals---22.2A Max draw.
And due to the 20Asurge and 5A continuous limit, this would require most servos and modules to be powered directly from the battery, if servos are moved often and together
That's a lot for a little robot.
So now you need to power that little guy...

Power Supply Types

Power supplies come in many forms. Many are listed below. Skip past if you need portable(battery) power. Power supplies often take wall power and convert it to lower usable forms of power.
PC(computer) power supplies can make 12V, 5V, and 3.3V. These all have their own amperage rating, so look at the label.

RED:AC input: make sure it matches what you can input.
PINK/PURPLE:DC output: Make sure it is DC.
BLUE: 3.3V/5V 22A/25A: When 2 catagories share the same Watt count, it means they are tied together, so you can only do 5V at 25A or 3.3V at 22A. This is not 47A total!
LIGHT BLUE: 12V 1/12V 2: power supplies may have multiple voltage rails. This is for reliability/safety. Same rules as BLUE.
GREEN: Ignore negatives/ specially marked. Its for the better.
The higher the Wattage power supply, the more Amps its capable of, but also the more power it draws.
You can always regulate 12V down to the needed Voltage.

1. 12v car PC power supply: <(FOR USE WITH BATTERY)
www.powerstream.com/DC-PC-12V.htm
This gives you 12V, 5v, and 3v at high amperages, which will power sensors, servos, and lots of lights.

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1. Standard PC Power Supply:
www.bestbuy.ca/en-CA/category/power-supplies/20380.aspx
Can be found everywhere! And if you want cheap, go to eWaste and pick out one for free-$20! Just get a high Wattage supply.

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1. Courtesy @Steve_G from @fxrtst's Power supply thread:
"I had a bit of a search for you, and came up with the following fixed voltage supplies which was all from one website called TCR Electronics and are all under 100 bucks. Searching other sites pretty much came up with the same makes and models. The ones I've linked to are the best of the bunch that I think meet some of your requirements. I threw a couple of 20 amp supplies in as well in case anyone else is looking...
7.5v
40 amp
345 watts
215x115x50
$44.80 for 1 to 9 units (cheaper after that).
www.trcelectronics.com/View/Mean-Well/SE-350-7.5.shtml
7.5v
40 amp
300 watts
199x105x41
$76.50
www.trcelectronics.com/View/Mean-Well/HRP-300-7.5.shtml
7.5v
20 amp
150 watts
199x99x50

$43.90
www.trcelectronics.com/View/Mean-Well/SP-150-7.5.shtml
7.5v
20 amp
150 watts
199x99x30
$36.90
www.trcelectronics.com/View/Mean-Well/RSP-150-7.5.shtml
7.5v
32 amp
240 watts
190x93x50
$50.90
www.trcelectronics.com/View/Mean-Well/SP-240-7.5.shtml
And the smallest I found at a reasonable price, but at 20 amps...
7.5v
20 amp
150 watts
159x97x38
$47.70
www.trcelectronics.com/View/Mean-Well/HRP-150-7.5.shtml
Anything smaller in the way of form factor, and you're looking to pay out at three digit figures. The one other plus about this website is that they do bulk buy discounts too."

1.

Courtesy @Steve_G from @Askwpccoach's "How Can I Provide Continuous Power To Jd From An Ac Outlet Or Battery That Will" Thread
"So a 7.4 volt, 20 amp power supply is what you will need to have JD working at his best along with a female mini deans socket. This switching power supply is a good example of what you would need, although if you look around, you can find cheaper power supplies. "
m.ebay.com/itm/TEKPOWER-USA-TP3020E-SWITCHING-DC-POWER-SUPPLY-VARIABLE-0-30-VOLTS-0-20-AMPS-/201413831219?nav=SEARCH

1.

Courtesy @Mathprof from his "Usb or Ac-Dc Conversion as a Lipo battery replacement" Thread
"Ok, so a 20 amp supply is a good target. Just looking around a little, I found this:
P/N: RSP-150-7.5
7.5vdc Power Supply
Approx Power: 150 Watts
Max Current: 20 Amps
Enclosed 1U low profile 30mm, built-in active PFC function, built in constant current limiting, LED indicator for power on, adjustable output voltage, and universal AC input range: 85~264vac.
Dimensions: 199x99x30mm
More Info, Quotes, Purchase $36.90 ea."
www.trcelectronics.com/7.5-volt-power-supplies-chassis-1.shtml

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Battery Types

Batteries are also a method of powering your robot, and is a common choice. These come in many kinds, and each has its benefits, and disadvantages. They have a special measurement known as the "C rating". This is the rate the battery can be discharged, as a multiple of the capacity. A 1A battery with a 20C rating can output 20 Amps, but not for long before it runs out.
NiMH: High capacity battery, limited power output, more stable than other kinds. Best for mild robots that don't move a lot of servos, and need to travel distances, or need reliability.
NiCd: Similar to NiMH, but different compound. Less stable, and can be damaged easily. Discharges 10% right after charge and sitting. Longer life cycle than NiMH.
Lead Acid: Heavy, high capacity, long charge time, Very reliable. Often used in large robots.
Lithium Ion- Polymer: High output amperage, upwards of 20x the capacity(C rating). Can explode if damaged or over charged. Best for robots with many servos, as high discharge can allow servo power surge without damage. Used in Ez-robots.
Those are the main kinds of batteries. Other kinds are available, but are less commonly used.

Regulating Power

Regulating power is pretty simple, but has a few things to look out for.
Types:
Linear regulators: Use 3 pin regulator to step voltage down to usable level. Most basic, but less efficient. Requires a minimum of around 2V higher input in order to get required voltage output. Produce lots of heat if a large voltage range is used. Efficiency: ~50%
Switching Regulators: More efficient than Linear, work better than linear in large voltage range applications. Creates "noise" on the line. Efficiency: ~85%
With both regulators, you must have a higher input than output. You also must be careful of the Amperage provided. Remember that 1 servo can use 2-3A? Well, most regulators only provide 2-3 Amps, which means you need one for each servo, or a higher amperage regulator. Try to find a regulator that can provide a high amperage, and be careful not to exceed its limits.
Regulators can be connected to components via the ez-b(IE. The inline regulator in the store), but many builders choose to connect regulators to the battery direct, to take load off the ez-b.
The ez-b has an Amperage limit, which prevents burning the circuit.
Any regulator is connected to the servo directly, and then to the power source. If connecting to the EZ-b, this can be done by cutting servo cable extensions, and a little bit of wire soldering work, or through jumper cables. If to the battery direct, a connection to the battery is needed.
When using a regulator with a servo, make sure to connect the servo's signal wire into the ez-b, not through the regulator.

Credits and Round out

Battery info:
batteryuniversity.com/learn/article/whats_the_best_battery
Regulator info:
components.about.com/od/Components/a/Types-Of-Voltage-Regulators.htm
I hope this tutorial was helpful, and that you are more educated on the different types of power supplies, batteries, and regulators. When in doubt, ask on the Ez-robot forum. Anyone is a source of help.