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The Powered Up connector

This connector first appeared in WeDo 2.0 set (45300) in 2016. It allows to connect sensors and motors to the controller. This 6-wire system progressively replaces the Power Functions 4-wire system. This system was initially named "Power Functions 2.0" but it was then used in 2017 Boost Creative Toolbox (17101), 2019 Powered Up trains, and 2019 Control + Technic sets, so naming this system remains... tricky! But as of publishing, it looks like LEGO gathered these avatars under the common "Powered Up" banner.

Mechanical details

The plug is - afaik - LEGO proprietary. Fortunately connector contact pitch is standard, at 1.27mm.
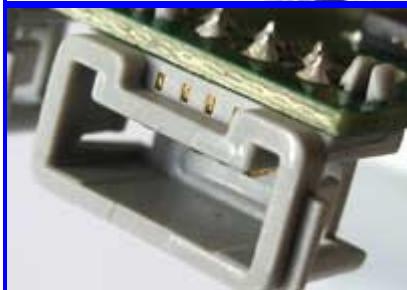
Dimensions:

- Width = 13.9mm
- Height = 7.5mm
- Overall length = 13.7mm
- Plugged depth = 5.85mm
- Pitch = 1.27mm
- Cable width = 7.5mm
- Cable thickness = 1.2mm

As you can see on the first photo, the third contact (used for ground connection) is a tad longer, allowing the ground connection to be established before other ones. This can avoid
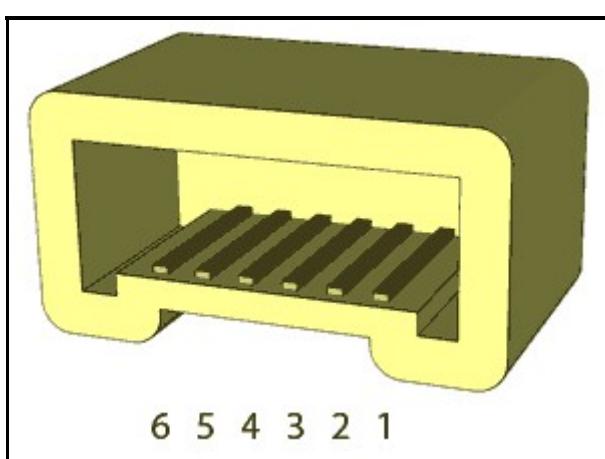
some electrical problems during "hot plug".

The socket. The third photo shows the retainer latch that goes in the side notches of the plug to provide some "clutch power" between plug and socket.

Pinout

Pin	Label	Function
1	M1	Motor power lead 1 (PWM controlled)

2	M2	Motor power lead 2 (PWM controlled)
3	GND	Ground (0V)
4	VCC	Power for device electronics (3.3V)
5	ID1	Analog identification line 1 / Serial data (hub -> device)
6	ID2	Analog identification line 2 / Serial data (device -> hub)

Note that even if power supply for device electronics is 3.3V, motor PWM is at battery voltage for Powered Up, 5V for WeDo 2.

ID1/ID2 function

ID1/ID2 pins have different function depending on the type of devices. For "dumb" ones (those that don't contain a controller), they are hard-wired to GND/VCC, either directly or through resistance, to provide an analog style identification. For devices containing a controller (sensors, motors with position encoder), ID1/ID2 are used as a serial link between the hub and the device. ID1 transmits data from hub to device, ID2 from device to hub. More details in Powered Up serial protocol.

Here is the table showing wiring of analog identification style devices:

Device	Label	Wiring
Powered Up simple motor / Wedo 2 motor	ID1 ID2	GND through 2.2 kOhm resistor GND
Powered Up train motor	ID1 ID2	VCC GND
LED	ID1 ID2	GND through 2.2 kOhm resistor Not connected