

# POWER CONTROL UNIT



FLEXIBLE DESIGN • SCALABLE • RELIABLE



# OVERVIEW

Magellan's power control unit (PCU) serves as the interface between the spacecraft solar array, battery and power bus. The PCU manages power transfers from the solar arrays to the batteries and provides fault-protected switches between the batteries and other spacecraft subsystems and payloads. It also provides extensive telemetry for determining the health of the power bus, including battery A-hr integrators, as well as solar array and individual switch current monitors. Magellan's PCU is designed to be scalable, capable of meeting power needs from 100 W to 6 kW, and can be configured to be either single or dual string. Magellan Aerospace has also developed a low-cost commercial grade variant of Power Control Unit, also known as Power Control and Distribution Unit (PCDU), to meet low cost requirements for the missions not warranting higher grade reliability. Magellan's low cost PCDUs are supporting commercial LEO missions. Magellan has NATO Secret facility clearance, is registered under the Joint Certification Program (JCP) of the U.S. Defence Logistics Agency, and is eligible for the Canadian exemption under ITAR Part 126.5.

## EXAMPLES OF REPRESENTATIVE PCU CONFIGURATIONS

	Flagship-Class Mission <sup>1</sup>	Generic SmallSat Mission <sup>2</sup>	
Card Complement:	<ul style="list-style-type: none"><li>• 2 controller cards (dual string)</li><li>• 4 switch cards with 24 switches each</li><li>• 2 propulsion/pyrotechnics cards</li><li>• 1 solar array card</li><li>• 1 battery card</li></ul>	<ul style="list-style-type: none"><li>• 1 controller card (single string)</li><li>• 1 switch card with 24 switches</li></ul>	<sup>1</sup> Actual values for a flagship-class mission with an undisclosed customer.
Power:	<ul style="list-style-type: none"><li>• Peak dissipation under peak load: &lt;50 W<ul style="list-style-type: none"><li>- Assuming 1,500 W peak spacecraft power, with 600 W from solar array and 900 W from battery</li></ul></li><li>• Peak power dissipation &lt;100W under 5kW load</li><li>• Dissipation under orbit-average load: &lt;35W<ul style="list-style-type: none"><li>- Assuming orbit-average spacecraft power demand of 500 W</li></ul></li></ul>	<ul style="list-style-type: none"><li>• 1 solar array card</li><li>• 1 battery card</li><li>• Peak dissipation under peak load: &lt;35 W<ul style="list-style-type: none"><li>- Assuming 500 W peak spacecraft power, with 250 W from solar array and 250 W from battery</li></ul></li></ul>	<sup>2</sup> Representative values for a hypothetical small satellite mission.
Input Voltage:	<ul style="list-style-type: none"><li>• 28±6 VDC unregulated</li></ul>	<ul style="list-style-type: none"><li>• Dissipation under orbit-average load: &lt;30 W<ul style="list-style-type: none"><li>- Assuming orbit-average spacecraft power demand of 150 W</li></ul></li></ul>	
Mass:	<ul style="list-style-type: none"><li>• 25 kg</li></ul>	<ul style="list-style-type: none"><li>• 28±6 VDC unregulated</li></ul>	
Dimensions (LxWxH):	<ul style="list-style-type: none"><li>• 32×37×23 cm</li></ul>	<ul style="list-style-type: none"><li>• 12 kg</li><li>• 18×37×23 cm</li></ul>	
Quiescent Power:	<ul style="list-style-type: none"><li>• 20 W</li></ul>	<ul style="list-style-type: none"><li>• 18×37×23 cm</li><li>• 20 W</li></ul>	
Generic Thermal Properties:	<ul style="list-style-type: none"><li>• Operating temperature range of -30°C to +45°C</li><li>• Acceptance temperature range of -35°C to +50°C</li><li>• Qualification temperature range of -40°C to +55°C</li><li>• Survival temperature range of -50°C to +60°C</li><li>• Minimum turn-on temperature of -40°C</li></ul>		

## RADIATION TOLERANCE

Total Ionizing Dose: >50 krad (Si)  
Single Event Latchup Threshold: 59 MeV·cm<sup>2</sup>/mg

## SCALABLE HARDWARE CONFIGURATION

The innovative "by the slice" modular design of the Magellan PCU allows customers to choose only the mission-specific functionality and level of redundancy required, thereby optimizing mass, power and volume. For example, a generic smallsat mission requiring less than 750 W could be supported with four cards (controller, solar array, battery, switch).

- Controller card
- Switch card(s) (>99% switch efficiency)
- Solar array card (>98.5% efficiency @ 1.5 kW)
- Battery card
- Propulsion/pyrotechnics card

Enhanced functionality for more complex missions would require the inclusion of additional cards.

## FLIGHT HERITAGE

- RADARSAT Constellation Mission (2019)
- Deep Space Exploration Mission (2020)
- Commercial LEO Constellation - undisclosed customer (2022 - 2024)
- CHORUS-C (Launch in 2026)
- Redwing (Launch in 2026)
- Deep Space Exploration Mission (Launch in 2028)

## ABOUT MAGELLAN AEROSPACE

Magellan Aerospace (TSX: MAL) provides products and solutions to the space, defence, and aviation markets, with facilities in Canada, the United States, Europe, and India. The company's Space and Rocket division has sixty years of flight heritage on NASA and CSA missions including Black Brant sounding rockets, sub-orbital payloads, Shuttle and ISS experiments, and satellite missions. Magellan's space solutions include the microsatellite-class MAC-100 bus, MAC-150 bus, and the smallsat-class MAC-200 bus, as well as payloads and subsystems including C&DH, power, ADCS, structures, and flight software. Magellan Aerospace has NATO Secret facility clearance, is registered under the Joint Certification Program (JCP) of the U.S. Defence Logistics Agency, and is eligible for the Canadian exemption under ITAR Part 126.5.

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