Precharge / Discharge Controller Datasheet

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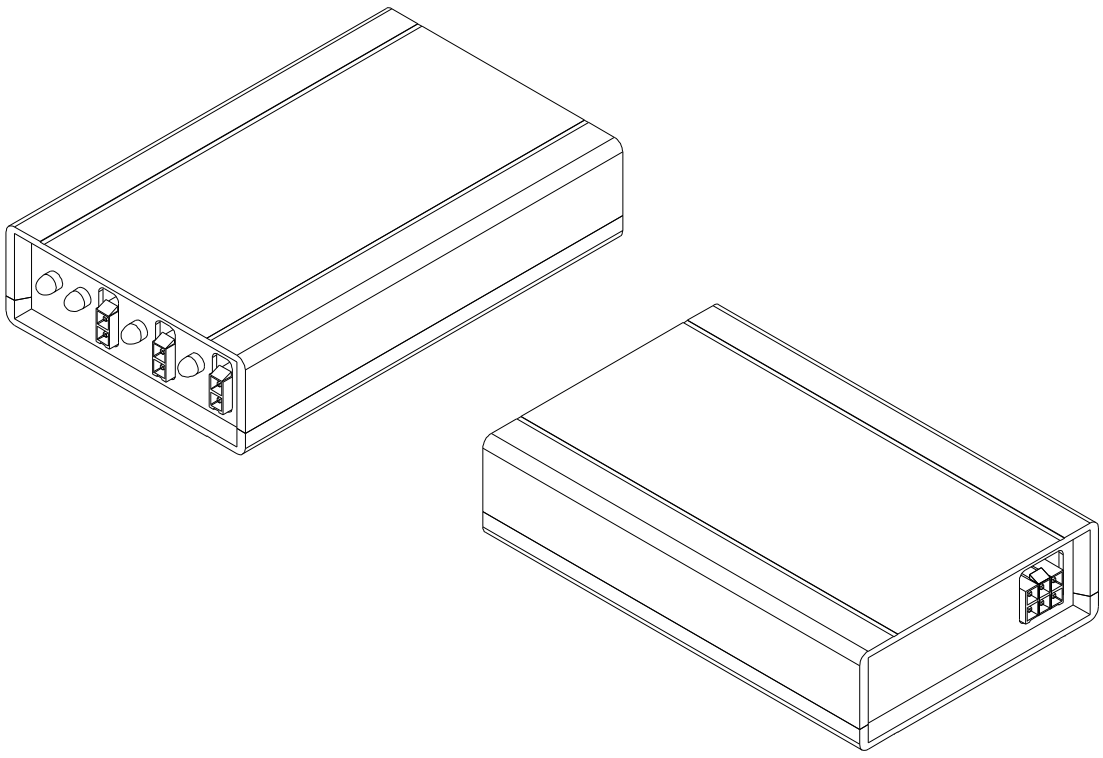
1 INTRODUCTION

This document describes the electrical specifications, performance and properties of the Tritium Precharge / Discharge Controller.

The Precharge / Discharge controller provides a safe way to connect and disconnect a WaveSculptor motor controller (or any other capacitive load of a similar size) to a low-impedance power source such as a battery pack, without the risk of dangerous currents, contact welding, or sparks.

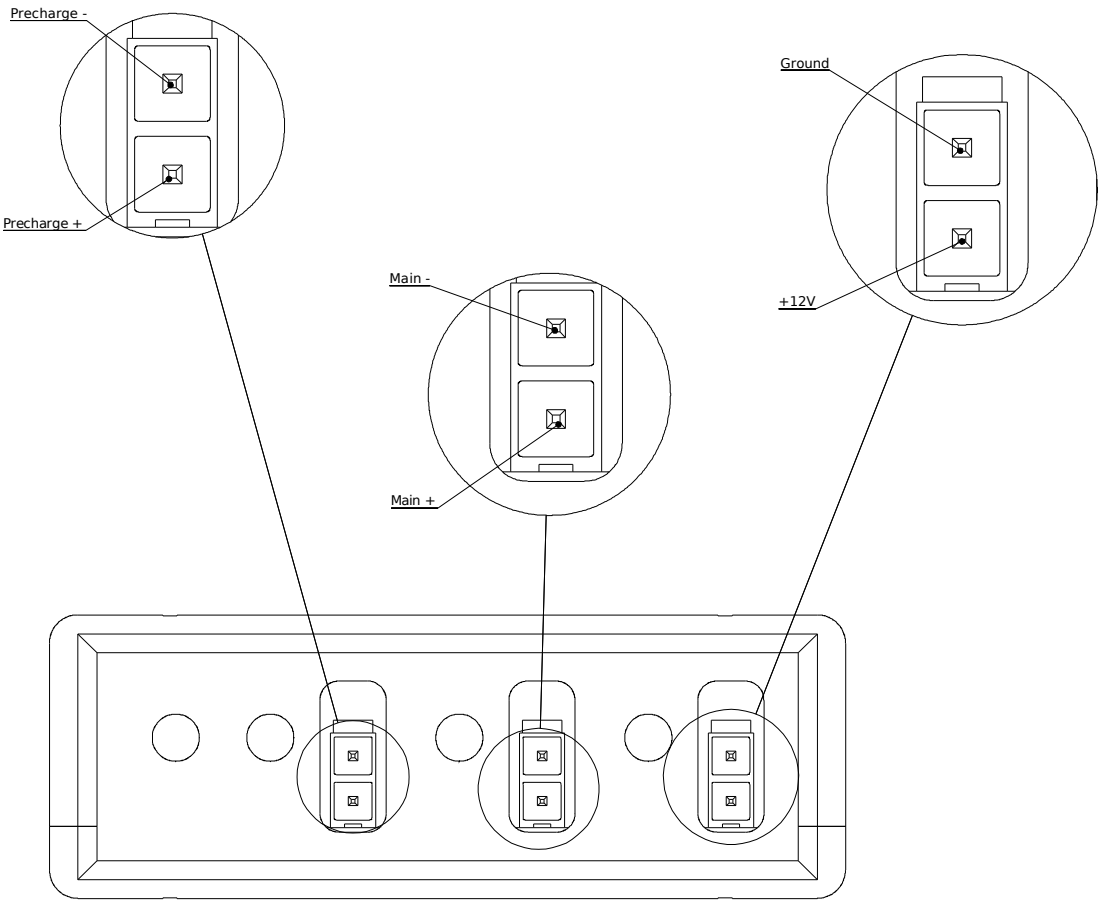
For usage information, please refer to the Precharge / Discharge controller User's Manual (TRI72.001), available on the Tritium website.



2 FRONT PANEL CONNECTOR PINOUTS

The pin definitions for the front panel connectors are shown in the diagram below.

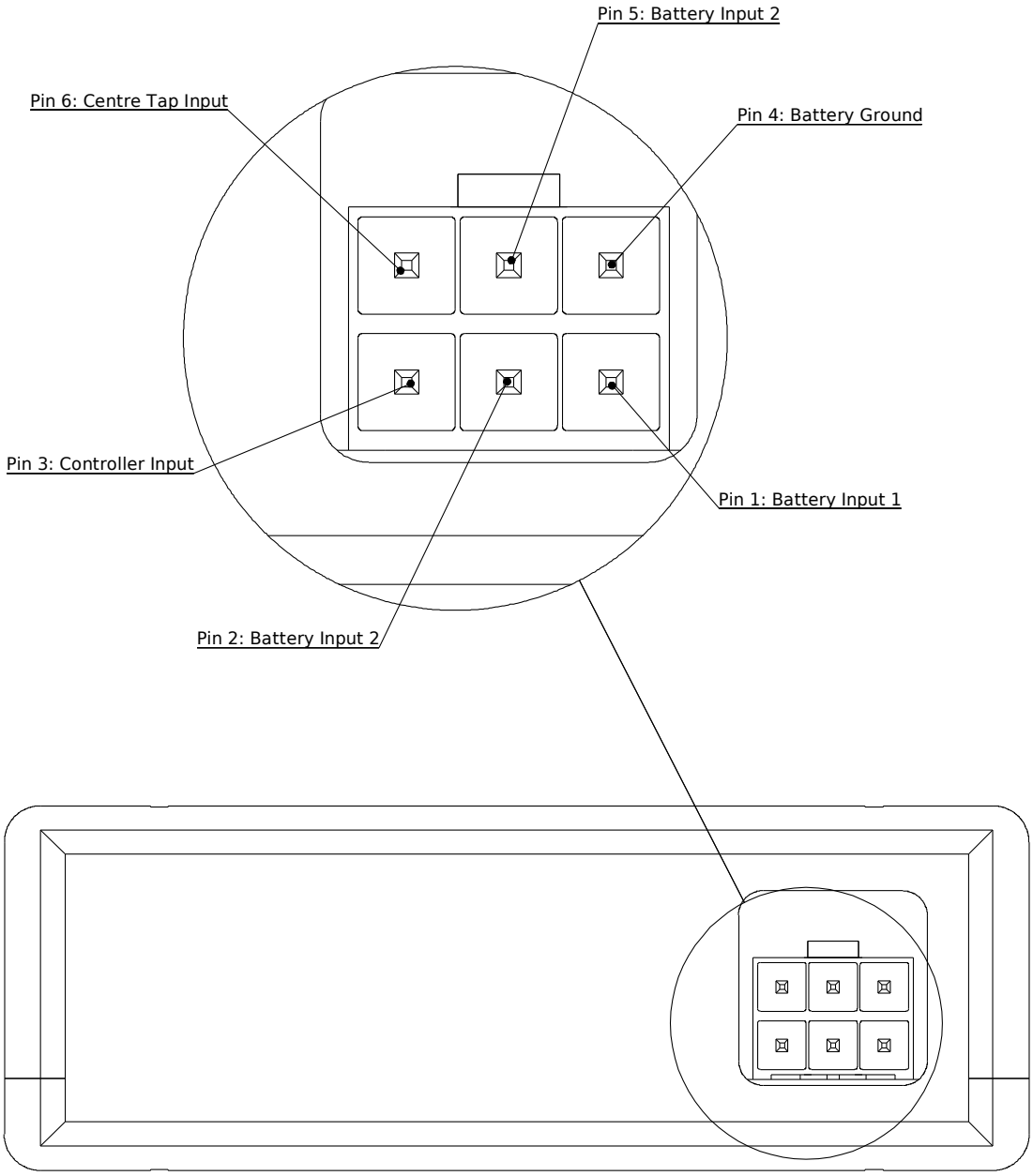
Please refer to the Precharge controller User's Manual (TRI72.001) for mating crimp, connector and tooling part numbers.



3 REAR PANEL CONNECTOR PINOUTS

The pin definitions for the rear panel connector are shown in the diagram below.

Please refer to the Precharge controller User's Manual (TRI72.001) for mating crimp, connector and tooling part numbers.



4 INPUT POWER

The input power connection provides operating power to the precharge controller. It's presence or absence is also used as the control signal to begin precharge or discharge operations.

It is expected to be connected to a low voltage battery or power supply via the vehicle ignition switch and an emergency shutdown switch.

The input power connection is isolated from the high-voltage sense pins connected to the battery and other high power circuits.

Supply voltage nominal:	13.8	V	(Note 1)
Supply voltage minimum:	9	V	(Note 1)
Supply voltage maximum:	15	V	(Note 1)
Circuit supply current:	75	mA	(Note 2)
Isolation voltage:	400	V	(Note 3)

Notes:

1. The input voltage operates the internal circuitry, but is also switched through the control circuits in the precharge controller and is output on the contactor control outputs. Please choose an operating voltage that will allow correct operation of your chosen contactors.
2. The supply current drawn by the precharge controller only. Allow extra current capability on this input for whatever power is drawn by the external contactors. Please note that several models of contactor have large inrush (turn-on) surges, and the impedance of the input supply connection should be kept low. Use short wiring and add external capacitors if needed.
3. Please refer to the Isolation section of the Wiring Engineering Reference document (available on the Tritium website) for more information regarding recommended earthing and connection practices.

5 MAIN CONTACTOR OUTPUT

The main contactor output provides operating power to energise an external high-voltage DC contactor. It operates subject to a valid temperature on the internal precharge and discharge resistors, and if the temperature is in the acceptable range, will be energised whenever input power is applied to the precharge controller.

The output voltage present when this output is active will be whatever voltage is applied to the input power connector.

Switching current maximum:	15	A	(Note 4)
Switching current continuous:	3	A	(Note 4)
Disconnection temperature (approx):	80	°C	(Note 5)
Maximum ambient temperature:	40	°C	(Note 6)

Notes:

4. Output is switched using a 30V logic-level N-Channel MOSFET with a 45mOhm on-resistance. Continuous operation at higher currents than specified may activate the over-temperature shutdown feature of the precharge controller.
5. Above this temperature, the precharge controller will de-energise the main contactor to remove power from the high-voltage circuitry. Once the temperature falls below this figure, normal operation will resume. A hysteresis of a few degrees is used to avoid oscillations in the output.
6. During normal operation the temperature rise of the internal heatsinking can be expected to be around 10°C per precharge or discharge event. If several events occur in rapid succession (car is turned on and off repeatedly) then the precharge controller may reach the disconnection temperature earlier than desired, and require a several minute cool-down period before the vehicle can be restarted. See the “Precharge resistor” section for more details.

6 PRECHARGE CONTACTOR OUTPUT

The precharge contactor output provides operating power to energise an external high-voltage DC contactor. It operates subject to a match in Battery (system input) and WaveSculptor (system output) voltages, and also to a valid temperature on the internal precharge and discharge resistors. The output will be energised if the voltages are matched AND temperature is valid.

The output voltage present when this output is active will be whatever voltage is applied to the input power connector.

Switching current maximum:	15	A	(Note 4)
Switching current continuous:	3	A	(Note 4)
Disconnection temperature (approx):	80	°C	(Note 5)
Maximum ambient temperature:	40	°C	(Note 6)
Voltage match tolerance:	10	%	
Maximum sense input voltage:	200	V	
Sense input impedance:	1M	Ohms	

7 PRECHARGE RESISTOR

An internal precharge resistor is used when the precharge controller is configured as a Type 1 circuit (see User's Manual for definition). This resistor is capable of withstanding high pulse energy events, and is mounted on a small heat spreader.

Precharge resistor value:	47	Ohms	
Precharge resistor tolerance:	5	%	
Temperature increase per event:	10	°C	(Note 7)
Maximum precharge voltage:	200	V	

Notes:

7. Each precharge event dissipates a fixed amount of power into the precharge resistor. This power is determined by the amount of capacitance and the voltage to which it is being precharged. For a single WaveSculptor being precharged to 160V, the energy is around 128 Joules. With the heat spreader used, this gives a heat rise of slightly under this figure per event.

8 DISCHARGE RESISTOR

An internal resistor is used for discharge, and also for precharge when the precharge controller is configured as a Type 2 circuit. This resistor is capable of withstanding high pulse energy events, and is mounted on a small heat spreader.

Discharge resistor value minimum:	680	Ohms	
Discharge resistor value maximum:	1k	Ohms	
Temperature increase per event:	10	°C	(Note 7)
Maximum initial discharge voltage:	200	V	
Discharge resistor fuse opening current:	500	mA	(Note 8)
Discharge resistor fuse operating voltage:	250	V	(Note 8)

Notes:

8. To avoid a potentially uninterruptable current path between Battery and WaveSculptor in the event of a single component failure when using a Type 2 circuit configuration, the precharge path through this resistor is fused with a soldered-down fuse on the precharge controller circuit board. This fuse should only be replaced using a temperature controlled soldering iron and a solderable 20 x 5 mm fuse.

9 MECHANICAL

The precharge controller is packaged in an ABS plastic enclosure. Adhesive rubber feet are supplied, or the box may be mounted using a user-supplied velcro strip on the base.

Enclosure length:	133	mm	(Note 9)
Enclosure width:	85	mm	
Enclosure height:	30	mm	
Enclosure mass:	180	grams	

Notes:

9. Enclosure length only. Please allow extra room for connector bodies and wiring harnesses at both ends of the enclosure. Recommended minimum allowance is 50mm per end.

10 REVISION RECORD

WHO	***DATE***	***CHANGE***
JMK	22 January 2007	Version 1 - Initial Document