J1939 POWERCELL
Setup and Configuration Guide
Universal Switch Interface

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Overview

The Infinitybox J1939 POWERCELL brings flexible multiplexed power distribution to any vehicle builder. Using standard J1939 PGN structures and commands, you can control the outputs on the POWERCELL with practically any J1939 input device.

This document shows how to set up the J1939 POWERCELL, wire it and details the PGN structure required to turn outputs on and off.

The J1939 POWERCELL comes with a standard configuration that allows the end-user broad flexibility in creating their own layouts to suit their unique applications. Using simple software tools from their J1939 input manufacturer, they can quickly configure the system in the field. In cases where custom configurations are required for a specific vehicle, the system can be modified easily. Contact technical support for more details.

Warnings

THE INFINITYBOX J1939 POWERCELL IS A FUSED POWER DISTRIBUTION MODULE FOR VEHICLES. PROPER CARE MUST BE TAKEN TO FUSE THE INPUT FEEDS TO THE CELL AND THE OUTPUT FEEDS FROM THE CELL. IMPROPER FUSE SELECTION CAN CAUSE DAMAGE TO THE VEHICLE ELECTRICAL SYSTEM RESULTING IN FIRE.

PROPER CARE MUST BE TAKEN TO ENSURE THAT POWER IS CORRECTLY APPLIED TO THE POWERCELL. REVERSING POLARITY TO THE POWER AND GROUND FEEDS WILL CAUSE IRREPARABLE DAMAGE TO THE CELL AND WILL VOID THE WARRANTY.

J1939 POWERCELL Technical Details

System Operating Voltage: 7.0 to 15.8 VDC

Number of Outputs: 10

Output Type: High-Side Switched via MOSFETs

Maximum Current Rating per Output: 25-amps

Maximum Current Rating per POWERCELL: 125-amps

Internal Fusing: Standard Mini™ Fuse

Maximum Operating Temperature: 125 °C

Minimum Operating Temperature: -40 °C

POWERCELL Installation Steps

Mounting the POWERCELL

Mount the POWERCELL on a suitable flat surface in the vehicle. Use the 4 mounting points in the corners of the cell and 1/4 –inch hardware. The recommended method to mount the POWERCELL is to use ¼-inch X 5/8-inch shoulder screws. If not using shoulder screws, take care as to not crush the mounting points by over tightening the screws.

In applications where the steady-state current draw out of the POWERCELL exceeds 90-amps, mount the POWERCELL in an area with adequate ventilation and with the fins of the heat sink running vertically.

Supplying 12-volt Power

The POWERCELL gets its 12-volt power from the 3 circular Maxi-style connectors on the edge of the cell. Each of these connectors can accept up to 60-amps. The following table summarizes all the components for these connectors. The POWERCELL input connectors use readily available connector components from Delphi. See the instructions from Delphi for proper assembly and termination of these connector components.

Based on the total current output of the POWERCELL required, install 1 or 2 power feeds into the round Maxi-style connectors. Seal the third remaining connector with an POWERCELL sealing plug.

Table 1: POWERCELL Input Connector Components.

		Delphi Part Number
POWERCELL Input Connector	Connector	12129380
	Seal	12129382
	TPA	12129384
	Wire Seal	12129381
	Terminal	12129414

Each of the power feed wires to the POWERCELL should be protected with a fuse located as closely to the battery source as possible. Size the fuse based on the gauge of wire feeding the POWERCELL. The Table 2 summarizes the proper fuse sizes for different wires.

Table 2: Maximum Fuse Ratings for Different Wire Gauges.

AWG Size	Maximum Fuse Rating (Amps)
12	40
10	50
8	60

Wiring the Output Harnesses

The POWERCELL output connectors use readily available connector components from Delphi. See the instructions from Delphi for proper assembly and termination of these connector components. Table 3 summarizes all the connector and terminal components required to build custom wiring harnesses for your J1939 POWERCELL.

Table 3: POWERCELL Output Connector Components.

		Delphi Part Number
POWERCELL Output Connector	Connector/Seal	12110295
	TPA	12059195
	Wire Seal	12015323
	Terminal	12129493

Each output harness has one ground wire and 5 output wires. The ground wires should be 14-AWG and should be connected to the vehicle ground. It is important that the POWERCELL is grounded to the chassis through a metal-to-metal connection. Make sure to remove all paint, powder coating, dirt and grease from the contact area.

The individual output wires should be properly sized to carry the output load. The maximum output current for a single POWERCELL output is 25-amps. The total POWERCELL can carry up to 125-amps. Exceeding these values will damage the cell and void the warranty.

Table 4 summarizes the details of the output harnesses by connector and cavity identification.

Table 4: POWERCELL Output Harness Connector Details.

Cavity ID	Connector A	Connector B
A	GROUND	GROUND
B	Output 10	Output 1
C	Output 9	Output 2
D	Output 8	Output 3
E	Output 7	Output 4
F	Output 6	Output 5

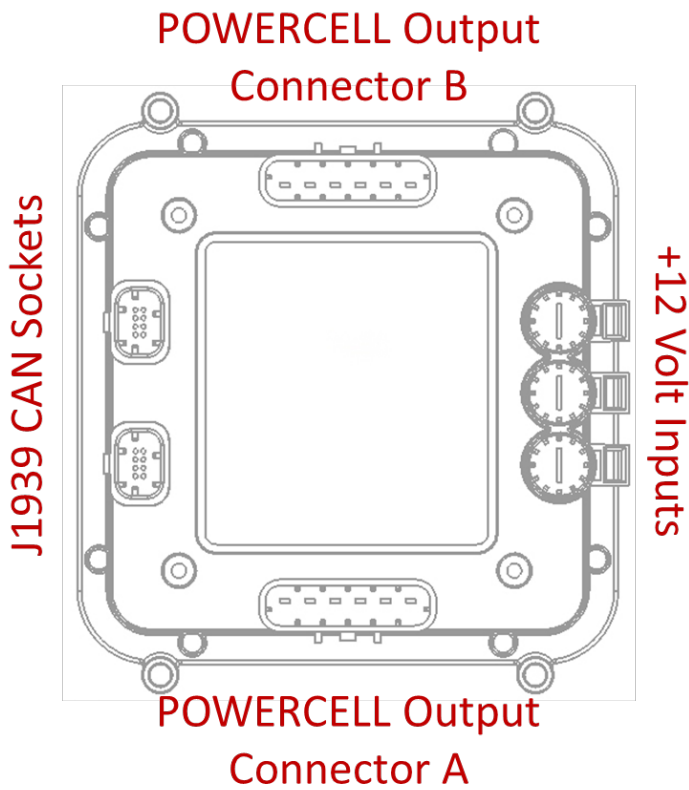Figure 1 identifies all the connectors on the J1939 POWERCELL.

POWERCELL Output Connector B

J1939 CAN Sockets

+12 Volt Inputs

POWERCELL Output Connector A

Figure 1: Socket Identification for J1939 POWERCELL.

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Installing Fuses

The POWERCELL has internal fuse holders to protect the output wires from short circuits and low-overloads. The holders are designed for a standard Mini™ automotive fuse. Select the rating of fuse to protect the smallest gauge of wire in the harness for each output. Never use a fuse rated at higher than 25-amps to protect a POWERCELL output. Table 5 gives recommendations on fuse ratings for different wire gauges.

Table 5: Maximum Fuse Ratings for Different Wire Gauges.

AWG Size	Maximum Fuse Rating (Amps)
20	10
18	15
16	20
14	25

Use only OEM approved Mini™ fuses to protect the POWERCELL outputs. There are numerous grey-market manufacturers of fuses that are unsafe and unreliable. Recommended manufacturers for these fuses are Littelfuse, Inc, Bussmann and Pacific Engineering.

Connecting J1939 CAN Network

The CAN sockets on the J1939 POWERCELLs connect the J1939 input device to the cells. These sockets provide 12-volt power for the J1939 input device and the CAN HI & LOW connection for the J1939 network.

There are two CAN sockets on the POWERCELL so that multiple J1939 POWERCELLs and J1939 inMOTION Cells can be connected on the same network. A CAN terminator plug with a 120-ohm resistor should be inserted into the last open CAN socket on the J1939 network. The two CAN sockets on a POWERCELL are electrically identical so you can plug the CAN connector into either socket.

Table 6 shows the function, cavity identification and wire colors for the CAN connector. Connect the corresponding wires from the J1939 input device to these cavities in the connector.

Table 6: CAN Connector Wiring Details.

Cavity ID	Function	Standard Wire Color
5	Ground	Black
6	CAN LOW	Green
7	CAN HIGH	Yellow
8	+12 Volt Power	Red

When building the J1939 network between the cells, the +12 Volt Power wires and the Ground wires should only go between the first POWERCELL and the J1939 input device, if required. There should not be power and ground wires between the different J1939 cells in the network.

The J1939 POWERCELL can supply a total of 0.6-amps out on the +12 Volt Power wire in the connector socket. If the total current draw for the J1939 input devices exceeds this limit, they must be connected to +12 volts from a different source.

Setting the J1939 POWERCELL Address

Each J1939 POWERCELL or J1939 inMOTION Cell must have its own unique address for the network to work correctly. The address is set by arranging jumpers in a binary pattern under the cover of the POWERCELL. Figure 2 shows the location of the address headers on the POWERCELL.

LOCATING THE ADDRESS
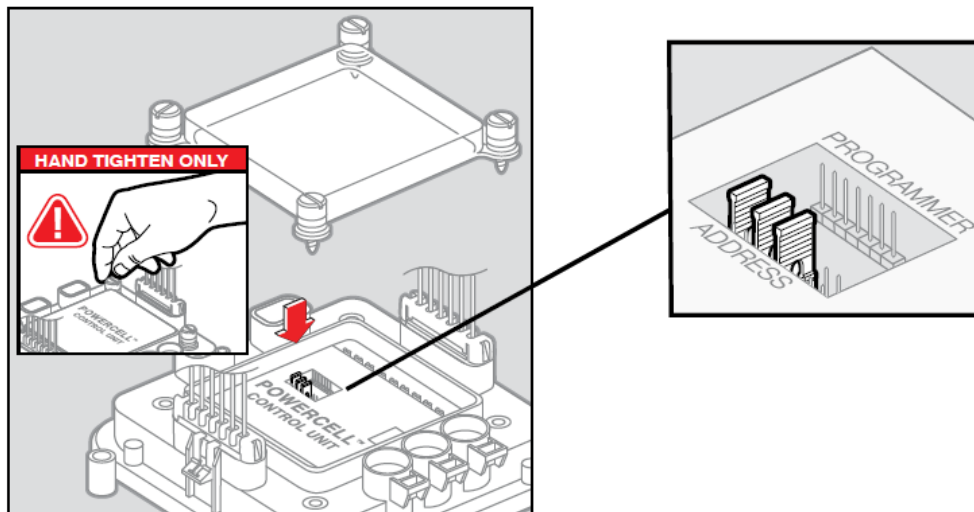
Figure 2: Location of the Address Headers on the J1939 POWERCELL.

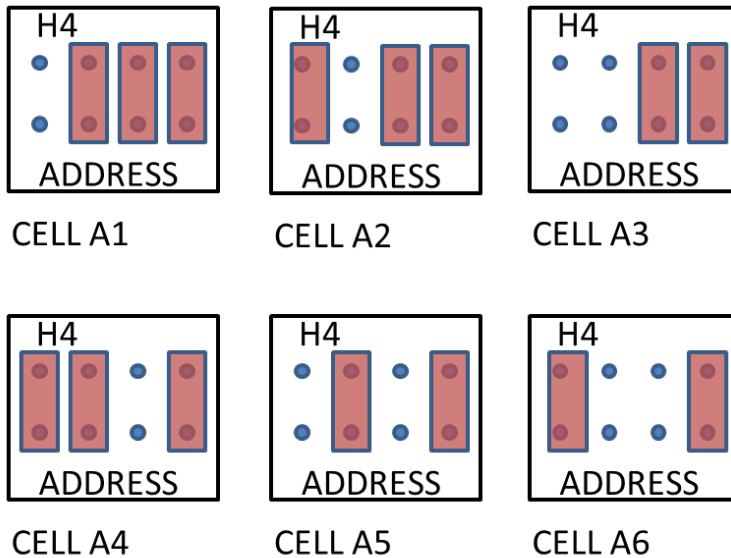Figure 3 shows how to properly orient the jumpers on the headers to set the cell address.

Figure 3: Correct Orientation of the Address Headers.

CAN Parameter Setup

For PGN's in the range of FF01 through FF08, the bits in the available 8 bytes correspond to outputs on the cells attached to the J1939 network. A (1) in any of these bits will cause its corresponding cell output to react based on its configuration table.

The POWERCELL will accept CAN frames broadcast out on PGN numbers that correspond to the address set on the cell in the step above. The following table summarizes the broadcast PGN and the corresponding POWERCELL address.

Parameter Group Number (HEX)	POWERCELL Address
FF01	A1
FF02	A2
FF03	A3
FF04	A4
FF05	A5
FF06	A6
FF07	A7
FF08	A8

The following table shows the relationship between the bits broadcast in the CAN frame and the POWERCELL output behavior. The proceeding glossary describes the POWERCELL output personalities in more detail.

	Byte 1								Byte 2								Byte 3								Byte 4							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Cell Output	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	1	1	1	1	1	2	2	2	2	2	2
Connector	B	B	B	B	B	A	A	A	A	A	B	B	B	B	B	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B
Cavity ID	B	C	D	E	F	F	E	D	C	B	B	C	D	E	F	F	E	D	C	B	B	B	B	B	B	B	C	C	C	C	C	C
Personality	Track	Track	Track	Track	Track	Track	Track	Track	Track	Track	Soft-Start (2-sec)	Soft-Start (2-sec)	Soft-Start (2-sec)	Soft-Start (2-sec)	Soft-Start (2-sec)	Soft-Start (2-sec)	Soft-Start (2-Sec)	Soft-Start (2-Sec)	Soft-Start (2-Sec)	Soft-Start (2-Sec)	Track: PWM 5%	Track: PWM 10%	Track: PWM 15%	Track: PWM 25%	Track: PWM 50%	Track: PWM 75%	Track: PWM 5%	Track: PWM 10%	Track: PWM 15%	Track: PWM 25%	Track: PWM 50%	Track: PWM 75%

	Byte 5								Byte 6								Byte 7								Byte 8							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Cell Output	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7	7	X	X
Connector	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	A	A	A	A	A	A	A	A	A	A	A	A	X	X
Cavity ID	D	D	D	D	D	D	E	E	E	E	E	E	F	F	F	F	F	F	F	F	F	F	F	F	E	E	E	E	E	E	X	X
Personality	Track: PWM 5%	Track: PWM 10%	Track: PWM 15%	Track: PWM 25%	Track: PWM 50%	Track: PWM 75%	Track: PWM 5%	Track: PWM 10%	Track: PWM 15%	Track: PWM 25%	Track: PWM 50%	Track: PWM 75%	Track: PWM 5%	Track: PWM 10%	Track: PWM 15%	Track: PWM 25%	Track: PWM 50%	Track: PWM 75%	Track: PWM 5%	Track: PWM 10%	Track: PWM 15%	Track: PWM 25%	Track: PWM 50%	Track: PWM 75%	Track: PWM 5%	Track: PWM 10%	Track: PWM 15%	Track: PWM 25%	Track: PWM 50%	Track: PWM 75%	X	X

POWERCELL Personality Glossary

The J1939 POWERCELL has a pre-configured library of personalities that define how the output reacts when it receives a J1939 command. The following list describes these different personalities and their behaviors.

Track

Track is the most basic personality. The output tracks the state of the input. When the J1939 switch is pressed or latched into an ON position, it is broadcasting an ON command to the POWERCELL output. That output will remain ON as long as the J1939 input device is broadcasting the ON command. When the J1939 input device broadcasts an OFF command, the POWERCELL output turns OFF.

Toggle

The toggle personality latches the state of the POWERCELL output in either an ON or OFF state based on receiving a command from the J1939 input device. The J1939 input device broadcasts a command indicating that the state of the switch has changed from OFF to ON and back to OFF again. This action causes the POWERCELL to change the state of the output from OFF to ON or ON to OFF. This is to be used with J1939 inputs devices that have a momentary mechanical action and broadcast a change in switch state in the pressed position of the switch.

Pulse Width Modulation (PWM)

The Power outputs are controlled by solid-state MOSFETs. This allows the POWERCELL to vary the amount of power coming out of an output by pulsing the output rapidly. This allows for easy control of light dimming, heater control and motor speed. The base frequency of the PWM pulse is 200 Hz. Custom duty cycles and base frequencies are available. Contact technical support for more information.

NOTE: Pulse Width Modulation of inductive loads will require a quenching diode to suppress any back-EMF. Consult the manufacturer of your load for more information. Failure to install quenching diodes will result in damage to the POWERCELL output and void the warranty of the cell.

Post-Time

A Post Time output is a Track output with delay built into it. The output turns ON with the J1939 input. When the J1939 input turns OFF, the POWERCELL output remains ON for a preset period of time. Custom timing is available. Contact technical support for more information.

Toggle Time

Toggle Time sets a timer on the POWERCELL output based on a momentary input from the J1939 input device. A momentary press of the input switch will cause the POWERCELL output to turn ON for a preset period of time. The POWERCELL output will turn OFF after this preset period of time regardless for how long the J1939 input switch is pressed. The standard timer value is 30 seconds from the press of the J1939 input switch. Custom timing is available. Contact technical support for more information.

Track: Pattern

Track Pattern is a tracking personality that generates a pattern approximating a vehicle turn-signal. The POWERCELL output will turn ON and OFF at a rate of approximately one cycle per 2 seconds. The duty-cycle of the pattern is approximately 50%. Custom patterns are available. Contact technical support for more information.

Powering the System

Once the J1939 input devices are properly set up and configured, connect the network to +12 volts through the input harnesses to the cells. After 3 seconds, the system will be communicating with the J1939 input devices.

There is a blue LED located towards the center of the inMOTION Cell under the clear cover. This light indicates the status of the communication on the network. When the system receives a packet of data on the J1939 network, the light should blink.

Warranty Information

Infinitybox, LLC ("Infinitybox") warrants against any defects in materials and workmanship to the Product's modules, wiring harnesses and accessory modules for a period of one (1) year from the first date of purchase. Subject to the terms of this warranty described below, Infinitybox will replace any such defective Product that is returned to Infinitybox within the one (1) year period from initial purchase. Replacement of any defective part or Product will not extend the applicable warranty period.

The warranty does not apply to: (i) any Product that is not installed in compliance with the applicable Product documentation; (ii) any defect in, or failure of, the Product resulting from an accident, shock, negligence, water immersion or misuse; (iii) any Product that has been modified, adjusted, repaired, or disassembled by any party other than Infinitybox; or (iv) any defect other than in materials and workmanship.

This warranty covers only the original purchaser of Product purchased from an Infinitybox authorized dealer in the United States. In order to receive warranty service, purchaser must provide Infinitybox with a copy of the receipt stating the dealer name, product purchased and date of purchase. Products found to be defective during the warranty period will be replaced (with a product deemed to be equivalent or better) at the discretion of Infinitybox.

Infinitybox's sole liability for any defective Product is limited solely to the replacement of Product pursuant to this warranty. Infinitybox reserves the right to replace any repairable parts with new or refurbished parts.

INFINITYBOX DISCLAIMS ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, SUCH AS WARRANTIES OF MERCHANTABILITY AND FITNE SS FOR PURPOSE. IN NO EVENT SHALL INFINITYBOX BE LIABLE FOR ANY PUNITIVE, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LIABILITY FOR LOSS OF USE, LOSS OF PROFITS, LOSS OF PRODUCT OR BUSINESS INTERRUPTION HOWEVER THE SAME MAY BE CAUSED, INCLUDING NEGLIGENCE.