Intelligent Power Distribution System

Distribute battery power programmatically with current feedback

Features

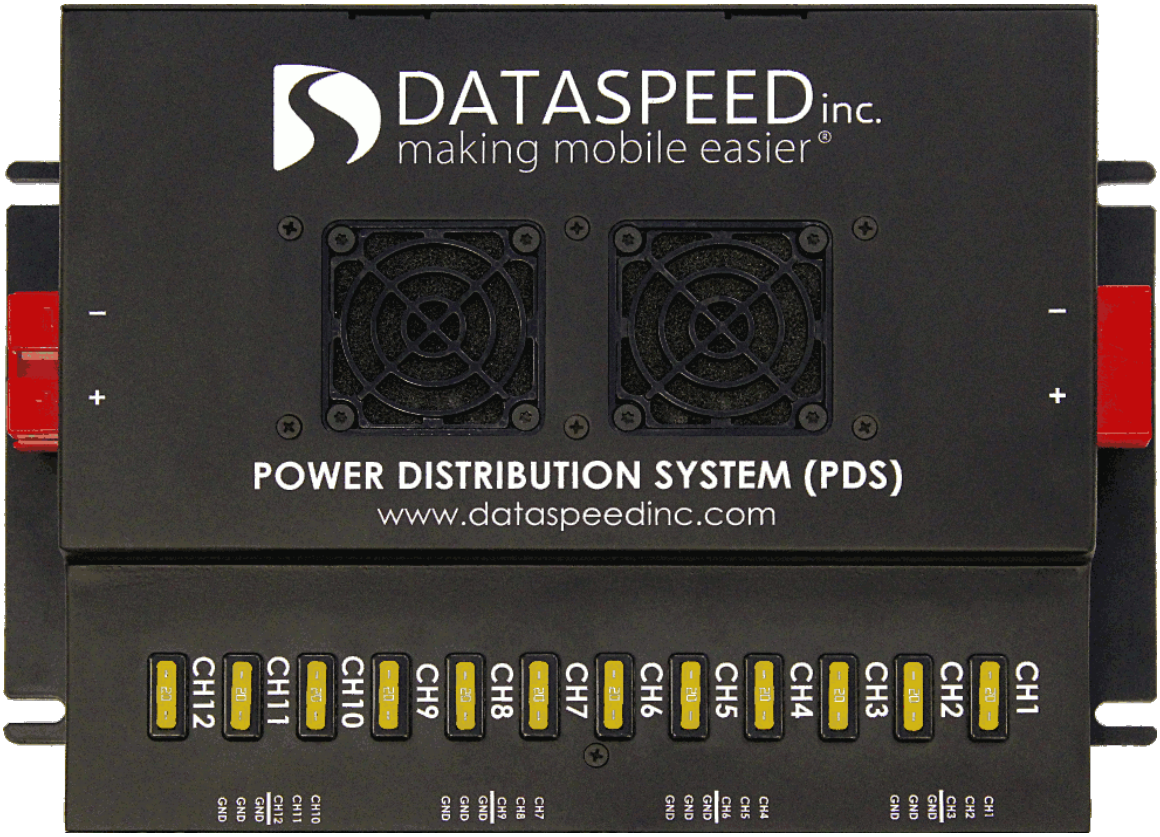
- 12 channels at up to 15A each (12V V_{BAT}) or up to 10A each (24V V_{BAT})
- Programmable startup and shutdown scripts
- Over-current feedback and diagnostics
- External temperature sensor and fan support
- Switch panel or touchscreen control and status
- CAN, Ethernet, and USB communication
- Chain up to four units together for a maximum of 48 channels
- Inverter remote to control AC power (See supported inverters)

Description

The Dataspeed Inc. Intelligent Power Distribution System (iPDS) enables computer control of fused power channels and programmable startup and shutdown sequences. Control of channels as well as the status is available over communication interfaces including industry standard CAN, Ethernet, and USB. An iPDS Switch Panel or iPDS Touch Screen is also included with the system to allow control and show status.

Applications

- Driverless car research
- Advanced driver-assistance systems (ADAS)



Contents

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1 System Components

The Intelligent Power Distribution System consists of two components. The iPDS Panel, pictured on the title page is the main component. To interface to the iPDS Panel either an iPDS Switch Panel or an iPDS Touch Screen is provided. They both feature buttons to toggle channel power, visual feedback, script triggering and mode change, and the touch screen also shows each channel's current.

1.1 Switch Panel

The iPDS Switch Panel controls up to two iPDS Panels, 24 channels, with physical buttons. LEDs in the buttons provide on/off/fault status of each channel. A startup and shutdown button are provided, as well as mode changing with a key. The Switch Panel is conveniently hidden in the center console of Ford MKZ, Ford Fusion, and Chrysler Pacifica vehicles.

1.1.1 Status LEDs

The power LED (green) indicates that power and ignition have been applied.
The status LED (red) blinks at a frequency of 1Hz to indicate normal operation.

1.1.2 Channel LEDs

The LEDs in the 4x6 grid indicate the status of the corresponding channels on the Power Distribution Panel.

Table 1: LED channel status enumeration

Solid off	OFF	Channel off
Solid on	ON	Channel on
1 blink	BAD RELAY	Relay failed to contact
2 blinks	BAD FUSE	Fuse is blown
3 blinks	OVER CURRENT	Channel disabled to protect fuse

1.1.3 Channel Buttons

Pressing the buttons in the 4x6 grid will send a CAN message command to the iPDS Panel to toggle the corresponding channel.

1.1.4 Script Buttons

The startup button LED will illuminate when the startup script is running and the shutdown button LED will illuminate when the shutdown script is running. Pressing the startup button will run or stop the startup script, and pressing the shutdown button will run or stop the shutdown script.

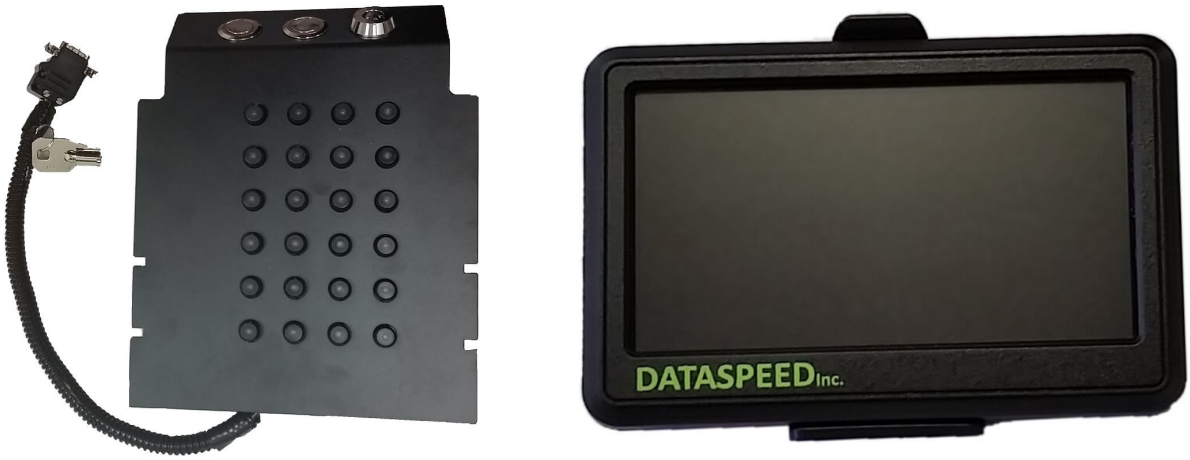
1.1.5 Mode Key

The mode can be selected by inserting and turning the key. When the key is turned, the 4x6 grid of buttons no longer corresponds to the channel statuses. The first three buttons select the mode. Normal operation returns after removing the key. See the Modes section for more information on the different modes.

1.2 Touch Screen

The iPDS Touch Screen controls up to four iPDS Panels, 48 channels, with touchscreen controls. The screen shows on/off/fault status of each channel as well as the current used by each channel. On-screen buttons are provided for running startup and shutdown scripts. Mode changes can be performed by entering a password.

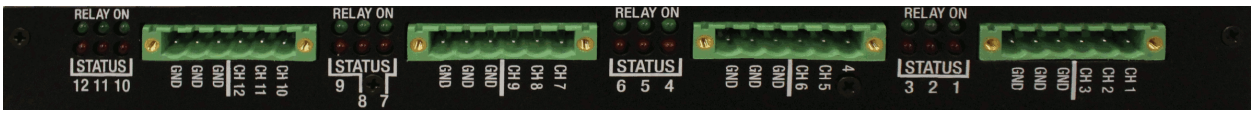
Figure 1: iPDS Interfacing Components



(a) iPDS Switch Panel

(b) iPDS Touch Screen

2 Connector Pin Descriptions



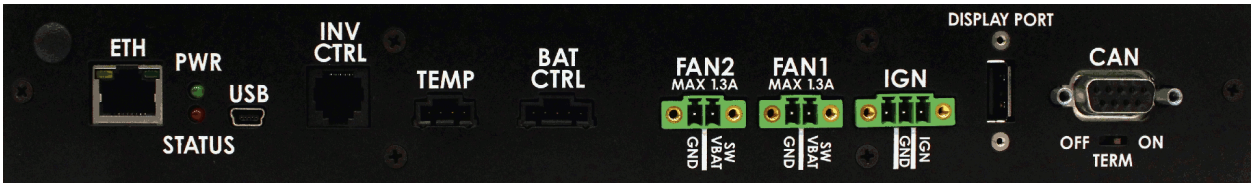


Table 2: Connector Description

Label	Manufacturer	Mating P/N	Description
POWER	Anderson	6810G3/1319G6	Power connector, V_{BAT} input
CH X/GND	Phoenix	1805343	Channel outputs[1]
CAN		DB9 Male	CAN and Ignition 1-2
Display Port		USB Type A	Input for display
IGN	Phoenix	1827716	Ignition 3
FAN1 & FAN2	Phoenix	1827703	Fans
INV CTRL		RJ12	AC power inverter control interface
TEMP	Molex	50579404	External temperature sensor[2]
BAT CTRL	Molex	50579405	To be supported in future firmware
USB		USB Mini B	USB mini
ETH		RJ45	Ethernet
TERM			CAN termination resistance ON/OFF (120Ω)

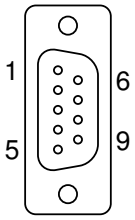
[1] If the connectors are not fully seated additional resistance will cause excessive heat and potential damage to the unit

[2] Older revision A-F hardware uses a Type-K thermocouple for external temperature

2.1 CAN/DB9 Connector

The CAN/DB9 connector is used for CAN communication and to provide power output. Applying voltage to either ignition input will power the device on. The TERM switch below the CAN Connector (added in revision G) enables or disables the CAN termination resistance. See the Electrical Characteristics section for more information.

Figure 2: CAN/DB9 Connector



Pin	Symbol	Description
1	NC	No Connect
2	CANL	CAN Low
3	GND	Ground
4	IGN1	Ignition 1
5	GND	Ground
6	GND	Ground
7	CANH	CAN High
8	IGN2	Ignition 2
9	POUT	Power Out (Switched V_{BAT})

2.2 Display Port Connector

The Display Port connector is used to provide power and CAN communication to the Touch Screen. Note: This USB connector does not provide standard USB signals. Connecting a USB device may result in damage to your device.

Table 3: Display Port connector pin description.

Pin	Symbol	Description
1	POUT	Power Out (Switched V_{BAT})
2	CANL	CAN Low
3	CANH	CAN High
4	GND	Ground

2.3 Ignition Connector

The Power Distribution Panel draws less than 0.2mA with ignition off. Applying voltage to any of the 3 ignition pins will power the device on. The startup and shutdown scripts will execute automatically in auto mode. Additionally, for hardware revisions B and newer IGN3 is passed through to IGN1 through a diode. This allows ignition pass-through and output on IGN1 to other devices.

Table 4: Ignition connector pin description.

Pin	Symbol	Description
1	IGN3	Ignition 3
2	GND	Ground
3	NC	No Connect

2.4 Fan Connectors

Table 5: Fan connector pin description.

Pin	Symbol	Description
1	SW VBAT	Switched V_{BAT}
2	GND	Ground

* Older revision A-F hardware uses a low side switch (V_{BAT} and switched ground)

2.5 Inverter Remote

The inverter remote is used to control a Samlex Pure Sine Wave Inverter from the list of supported models below.

Table 6: Supported Samlex part numbers

Model	Wattage	Voltage DC	Voltage AC	Connector
PST-600-12	600W	12V	120VAC	RJ12
PST-1000-12	1000W	12V	120VAC	RJ12
PST-1500-12	1500W	12V	120VAC	RJ50[1]
PST-2000-12	2000W	12V	120VAC	RJ50[1]
PST-60S-12E	600W	12V	230VAC	RJ12
PST-100S-12E	1000W	12V	230VAC	RJ12
PST-150S-12E	1500W	12V	230VAC	RJ50[1]
PST-200S-12E	2000W	12V	230VAC	RJ50[1]
PST-600-24	600W	24V	120VAC	RJ12
PST-1000-24	1000W	24V	120VAC	RJ12
PST-1500-24	1500W	24V	120VAC	RJ50[1]
PST-2000-24	2000W	24V	120VAC	RJ50[1]
PST-60S-24E	600W	24V	230VAC	RJ12
PST-100S-24E	1000W	24V	230VAC	RJ12
PST-150S-24E	1500W	24V	230VAC	RJ50[1]
PST-200S-24E	2000W	24V	230VAC	RJ50[1]

[1] Requires adapter, contact Dataspeed for specifications

2.6 Battery Control

This connector is not presently used.

2.7 USB Connector

The USB connector is used to connect to a host PC. A USB connection is required for the configuration GUI and firmware upgrades.

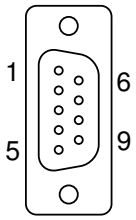
2.8 Ethernet Connector

The Ethernet connector supports 10/100 Mbit/s communication. The Ethernet protocol is Lightweight Communications and Marshalling (LCM).

2.9 Switch Panel Connectors

The CAN/DB9 connector is used for power input and CAN communication. Applying voltage to the ignition input will power the device on. See the Electrical Characteristics section for more information.

Figure 3: Switch Panel CAN/DB9 Connector



Pin	Symbol	Description
1	CAN2L	CAN 2 Low
2	CAN1L	CAN 1 Low
3	GND	Ground
4	IGN	Ignition
5	GND	Ground
6	GND	Ground
7	CAN1H	CAN 1 High
8	CAN2H	CAN 2 High
9	POWER	V_{BAT} input

The USB Mini connector can be used to perform firmware upgrades.

2.10 Touch Screen Connectors

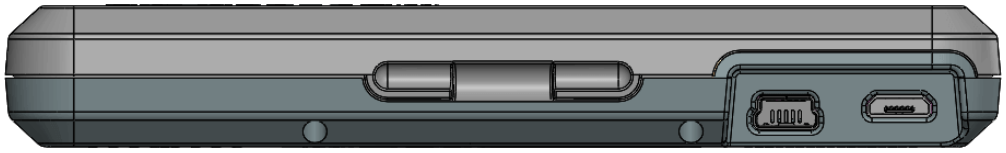


Figure 4: USB connectors, left: Mini, right: Micro

The USB Mini connector is used for power and CAN communication and should be connected to the iPDS Panel's Display Port. Note that the signals on this USB connector are not standard USB signals. Connecting a USB host such as a computer to the USB Mini connector is potentially dangerous.

Table 7: USB Mini Connector pin description.

Pin	Symbol	Description
1	POWER	V_{BAT} input
2	CANL	CAN Low
3	CANH	CAN High
4	GND	Ground

The USB Micro connector is used for firmware updates. Note that the device cannot be powered by this connector.

3 Electrical Characteristics

Table 8: Electrical Characteristics.

Characteristic	Min	Typ	Max	Units	Conditions
V_{IGN} ON[1]	9	12	28[2]	V	
V_{IGN} OFF[1]	-0.3	0	2	V	
V_{BAT}	9	12	28[2]	V	
$I_{CHANNEL}$			15	A	Continuous for each channel, V_{BAT}=12V
$I_{CHANNEL}$			10	A	Continuous for each channel, V_{BAT}=24V
I_{TOTAL}			180	A	Total current (device and all channels)
I_{POUT}			1.5	A	Shared by CAN and Display Port
I_{BAT_PANEL}		1500		mA	V_{BAT}=12V, V_{IGN}>9V, all channels on
I_{BAT_PANEL}		250		mA	V_{BAT}=12V, V_{IGN}>9V, all channels off
I_{BAT_PANEL}			0.2	mA	V_{BAT}=12V, V_{IGN}<2V
$I_{BAT\_TOUCH\_SCREEN}$		150		mA	V_{BAT}=12V
$I_{BAT\_SWITCH\_PANEL}$		200		mA	V_{BAT}=12V, V_{IGN}>9V, all channels on
$I_{BAT\_SWITCH\_PANEL}$		40		mA	V_{BAT}=12V, V_{IGN}>9V, all channels off
$I_{BAT\_SWITCH\_PANEL}$			0.2	mA	V_{BAT}=12V, V_{IGN}<2V
R_{CAN}		120		Ω	TERM=ON
Temperature	-40		+85	°C	

[1] For the iPDS Panel, V_{IGN} is the maximum of V_{IGN1}, V_{IGN2}, and V_{IGN3}
[2] Older iPDS Panel revision A-H hardware only supports a maximum of 16 V

4 Mechanical Drawings

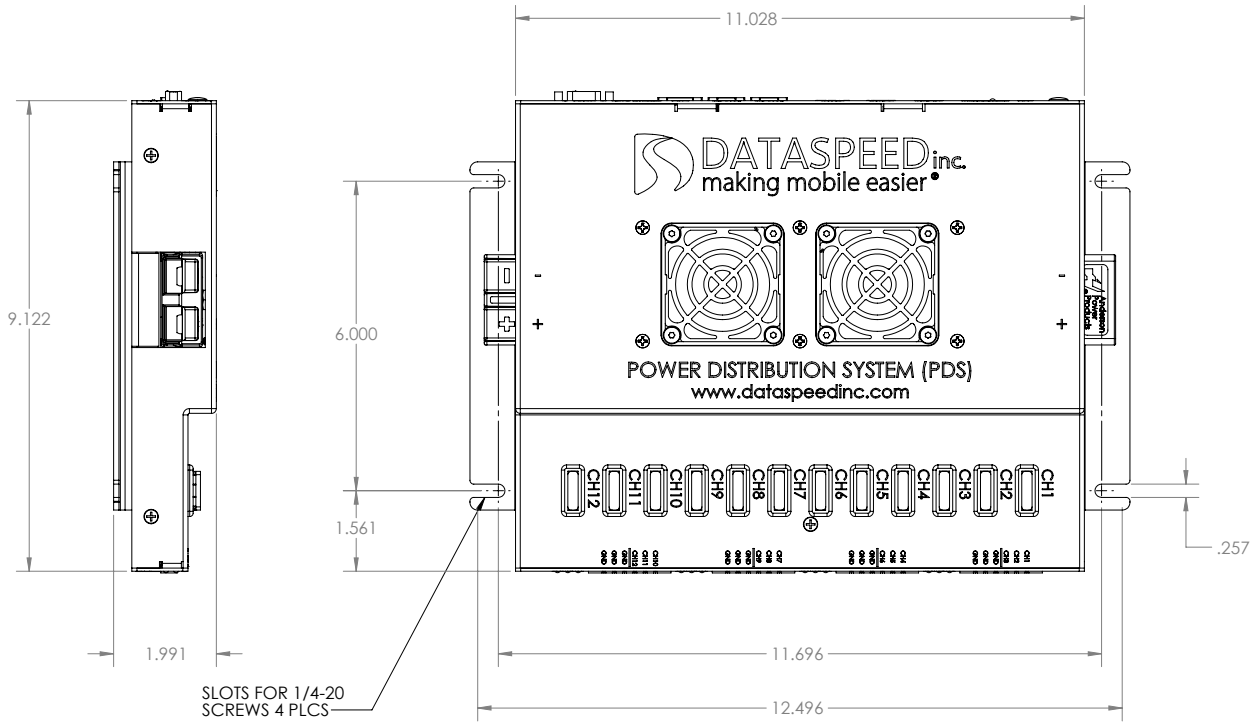


Figure 5: iPDS Panel Mechanical Drawing

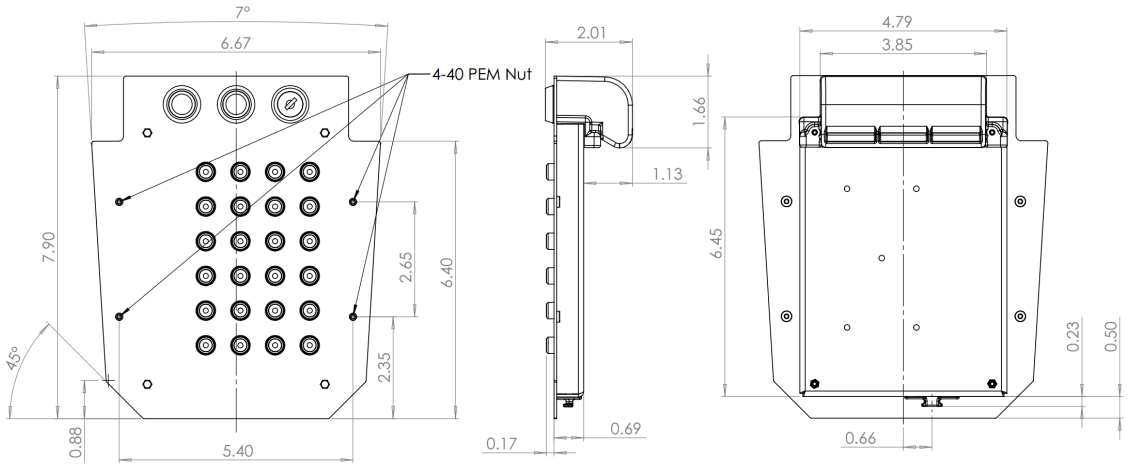


Figure 6: iPDS Switch Panel Mechanical Drawing for Lincoln MKZ

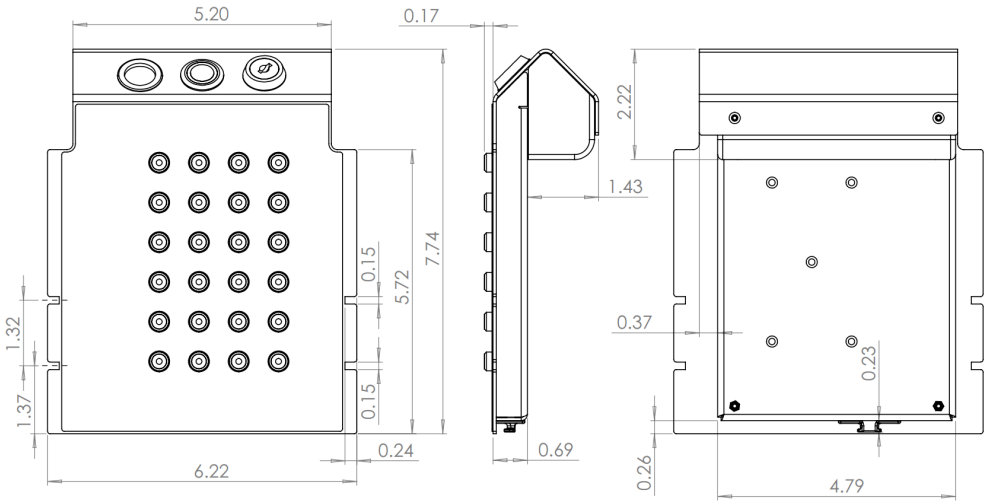


Figure 7: iPDS Switch Panel Mechanical Drawing for Ford Fusion

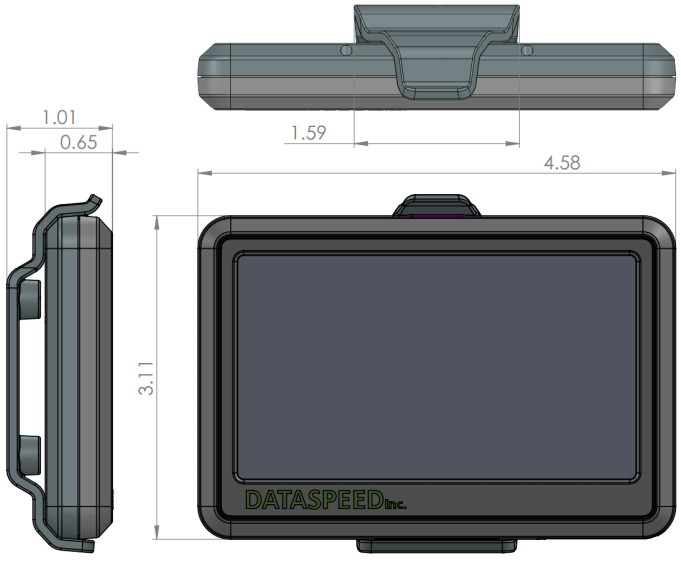


Figure 8: iPDS Switch Panel Mechanical Drawing for Ford Fusion

5 Active Cooling

Two fans provide active cooling for the Power Distribution Panel to help extend the operating temperature in hot environments. If the internal temperature reaches 45 °C they will turn on automatically. When the internal temperature drops below 40 °C the fans will turn off. For proper operation make sure to not block the fan openings. The fan filters should also be checked regularly and cleaned of any dust buildup.

6 LEDs

6.1 Main

The power LED (green) indicates that power and ignition have been applied.
The status LED (red) blinks at a frequency of 1Hz to indicate normal operation.

6.2 Channels

Each channel has a green and red LED.
The green LED is driven with the relay. If this LED is on, the relay is on.
The red LED indicates a fault status:

Table 9: Red LED status

Solid off	NORMAL	On and load is above 150mA
Solid on	NO LOAD	On and load is below 100mA
1 blink	BAD RELAY	Relay failed to contact
2 blinks	BAD FUSE	Fuse is blown
3 blinks	OVER CURRENT	Channel disabled to protect fuse

7 Modes

Mode AUTO uses all communication interfaces and automatically executes startup/shutdown scripts.
Mode MANUAL uses all communication interfaces and automatically executes the shutdown script.
Mode VALET only responds to USB. This is a lockout mode. Separate startup and shutdown scripts are executed.

Table 10: Mode Descriptions

Mode	USB	CAN	Ethernet	Bluetooth	Shutdown	Startup
AUTO	X	X	X	X	X	X
MANUAL	X	X	X	X	X	
VALET	X					

8 CAN Messages

Table 11: CAN bus configuration.

Parameter	Value	Units
BitRate	500	k
t_q	200	ns
SyncSeg	1	t_q
PropSeg	3	t_q
PhaseSeg1	3	t_q
PhaseSeg2	3	t_q
SyncJumpWidth	2	t_q

CAN bus termination of 120 Ω is only present on the iPDS Panel. In Panel revisions G and newer the TERM switch must be set to on for termination.

8.1 Request

Message ID: 0x410
Rate: On Event
Transmitted by: iPDS Switch Panel, iPDS Touch Screen

Table 12: Request CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	INDEX							
1	15:8	REQUEST							

bit 0-7 **INDEX:** Channel Index
0 = Channel 1
1 = Channel 2
2 = Channel 3
...
47 = Channel 48
—
48 = Inverter 1
49 = Inverter 2
50 = Inverter 3
51 = Inverter 4

bit 8-15 **REQUEST:** Relay Request
0 = Off
1 = On
2 = Toggle

Note: In Valet Mode the iPDS Panel will ignore Request CAN messages.

8.2 Mode

Message ID: 0x411
Rate: On Event
Transmitted by: iPDS Switch Panel, iPDS Touch Screen

Table 13: Mode CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	MODE							

bit 0-7 **MODE:** Mode Request
0 = Auto
1 = Manual
2 = Valet

8.3 Script

Message ID: 0x412
Rate: On Event
Transmitted by: iPDS Switch Panel, iPDS Touch Screen

Table 14: Script CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	SCRIPT							

bit 0-7 **SCRIPT:** Script Request
0 = None
1 = Startup
2 = Shutdown

Note: In Valet Mode the iPDS Panel will ignore Script CAN messages.

8.4 Reserved

Message ID: 0x413
Rate: On Event
Transmitted by: iPDS Touch Screen

8.5 Status

Message ID: 0x420, 0x421, 0x422, 0x423
Rate: 50ms
Transmitted by: iPDS Panel

Table 15: Status CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	INVERTER[1,2,3,4] BITS				RESERVED			
1	15:8	SCRIPT				MODE			
2	23:16	STATUS[2,14,26,38]				STATUS[1,13,25,37]			
3	31:24	STATUS[4,16,28,40]				STATUS[3,15,27,39]			
4	39:32	STATUS[6,18,30,42]				STATUS[5,17,29,41]			
5	47:40	STATUS[8,20,32,44]				STATUS[7,19,31,43]			
6	55:48	STATUS[10,22,34,46]				STATUS[9,21,33,45]			
7	63:56	STATUS[12,24,36,48]				STATUS[11,23,35,47]			

bit 0-3 **RESERVED:**
bit 4 **INV-REQUEST[1,2,3,4]:** Inverter 1,2,3,4 request: 0 = Off, 1 = On
bit 5 **INV-STATUS[1,2,3,4]:** Inverter 1,2,3,4 status: 0 = Off, 1 = On
bit 6 **INV-OVERLOAD[1,2,3,4]:** Inverter 1,2,3,4 over-load: 0 = No Fault, 1 = Fault
bit 7 **INV-OVERTEMP[1,2,3,4]:** Inverter 1,2,3,4 over-temperature: 0 = No Fault, 1 = Fault
bit 8-11 **MODE:** Current mode
0 = Auto
1 = Manual
2 = Valet
bit 15-12 **SCRIPT:** Running script
0 = None
1 = Startup
2 = Shutdown
bit 19-16 **STATUS[1,13,25,37]:** Channel 1,13,25,37 status
0 = Off
1 = On
2 = No Load
3 = Bad Relay
4 = Bad Fuse
5 = Over Current
bit 23-20 **STATUS[2,14,26,38]:** Channel 2,14,26,38 status (same as 1)
bit 27-24 **STATUS[3,15,27,39]:** Channel 3,15,27,39 status (same as 1)
bit 31-28 **STATUS[4,16,28,40]:** Channel 4,16,28,40 status (same as 1)
bit 35-32 **STATUS[5,17,29,41]:** Channel 5,17,29,41 status (same as 1)
bit 39-36 **STATUS[6,18,30,42]:** Channel 6,18,30,42 status (same as 1)
bit 43-40 **STATUS[7,19,31,43]:** Channel 7,19,31,43 status (same as 1)
bit 47-44 **STATUS[8,20,32,44]:** Channel 8,20,32,44 status (same as 1)
bit 51-48 **STATUS[9,21,33,45]:** Channel 9,21,33,45 status (same as 1)
bit 55-52 **STATUS[10,22,34,46]:** Channel 10,22,34,46 status (same as 1)
bit 59-56 **STATUS[11,23,35,47]:** Channel 11,23,35,47 status (same as 1)
bit 64-60 **STATUS[12,24,36,48]:** Channel 12,24,36,48 status (same as 1)

8.6 Current 1

Message ID: 0x424, 0x425, 0x426, 0x427
Rate: 50ms
Transmitted by: iPDS Panel

Table 16: Current 1 CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	CURRENT[1,13,25,37]<7:0>							
1	15:8	CURRENT[1,13,25,37]<15:8>							
2	23:16	CURRENT[2,14,26,38]<7:0>							
3	31:24	CURRENT[2,14,26,38]<15:8>							
4	39:32	CURRENT[3,15,27,39]<7:0>							
5	47:40	CURRENT[3,15,27,39]<15:8>							
6	55:48	CURRENT[4,16,28,40]<7:0>							
7	63:56	CURRENT[4,16,28,40]<15:8>							

bit 0-15 **CURRENT[1,13,25,37]:** Channel 1,13,25,37 current
0x8000 = -32.768A
0xFFFF = -0.001A
0x0000 = 0.000A
0x0001 = 0.001A
0x7FFF = 32.767A
bit 31-16 **CURRENT[2,14,26,38]:** Channel 2,14,26,38 current (same as 1)
bit 47-32 **CURRENT[3,15,27,39]:** Channel 3,15,27,39 current (same as 1)
bit 63-48 **CURRENT[4,16,28,40]:** Channel 4,16,28,40 current (same as 1)

8.7 Current 2

Message ID: 0x428, 0x429, 0x42A, 0x42B
Rate: 50ms
Transmitted By: iPDS Panel

Table 17: Current 2 CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	CURRENT[5,17,29,41]<7:0>							
1	15:8	CURRENT[5,17,29,41]<15:8>							
2	23:16	CURRENT[6,18,30,42]<7:0>							
3	31:24	CURRENT[6,18,30,42]<15:8>							
4	39:32	CURRENT[7,19,31,43]<7:0>							
5	47:40	CURRENT[7,19,31,43]<15:8>							
6	55:48	CURRENT[8,20,32,44]<7:0>							
7	63:56	CURRENT[8,20,32,44]<15:8>							

bit 0-15 **CURRENT[5,17,29,41]:** Channel 5,17,29,41 current
0x8000 = -32.768A
0xFFFF = -0.001A
0x0000 = 0.000A
0x0001 = 0.001A
0x7FFF = 32.767A
bit 31-16 **CURRENT[6,18,30,42]:** Channel 6,18,30,42 current (same as 5)
bit 47-32 **CURRENT[7,19,31,43]:** Channel 7,19,31,43 current (same as 5)
bit 63-48 **CURRENT[8,20,32,44]:** Channel 8,20,32,44 current (same as 5)

8.8 Current 3

Message ID: 0x42C, 0x42D, 0x42E, 0x42F
Rate: 50ms
Transmitted By: iPDS Panel

Table 18: Current 3 CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	CURRENT[9,21,33,45]<7:0>							
1	15:8	CURRENT[9,21,33,45]<15:8>							
2	23:16	CURRENT[10,22,34,46]<7:0>							
3	31:24	CURRENT[10,22,34,46]<15:8>							
4	39:32	CURRENT[11,23,35,47]<7:0>							
5	47:40	CURRENT[11,23,35,47]<15:8>							
6	55:48	CURRENT[12,24,36,48]<7:0>							
7	63:56	CURRENT[12,24,36,48]<15:8>							

bit 0-15 **CURRENT[9,21,33,45]:** Channel 9,21,33,45 current
0x8000 = -32.768A
0xFFFF = -0.001A
0x0000 = 0.000A
0x0001 = 0.001A
0x7FFF = 32.767A

bit 31-16 **CURRENT[10,22,34,46]:** Channel 10,22,34,46 current (same as 9)

bit 47-32 **CURRENT[11,23,35,47]:** Channel 11,23,35,47 current (same as 9)

bit 63-48 **CURRENT[12,24,36,48]:** Channel 12,24,36,48 current (same as 9)

8.9 Reserved

Message ID: 0x430
Rate: 200ms
Transmitted by: iPDS Panel

8.10 Reserved

Message ID: 0x431
Rate: On Event
Transmitted by: iPDS Panel

8.11 Reserved

Message ID: 0x432
Rate: 200ms
Transmitted by: iPDS Panel

8.12 Status2

Message ID: 0x43C, 0x43D, 0x43E, 0x43F
Rate: 50ms
Transmitted by: iPDS Panel

Table 19: Status2 CAN Message Description.

Byte	Bits	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	7:0	BOARDTEMP[0,1,2,3]							
1	15:8	THERMOCOUPLE[0,1,2,3]							
2	23:16	VOLTAGE[0,1,2,3]<7:0>							
3	31:24	—	—	—	—	VOLTAGE[0,1,2,3]<11:8>			

bit 0-7 **BOARDTEMP[0,1,2,3]:** Internal board temperature of unit 0,1,2,3
0x80 = -20.0°C
0xA8 = 0.0°C
0xA9 = 0.5°C
0x00 = 44.0°C
0x01 = 44.5°C
0x7F = 107.5°C

bit 8-15 **THERMOCOUPLE[0,1,2,3]:** External thermocouple reading of unit 0,1,2,3
0x80 = -20.0°C
0xA8 = 0.0°C
0xA9 = 0.5°C
0x00 = 44.0°C
0x01 = 44.5°C
0x7F = 107.5°C

bit 16-27 **VOLTAGE[0,1,2,3]:** Input voltage of unit 0,1,2,3
0x000 = 0.00V
0x001 = 0.01V
0x3FF = 40.95V

bit 28-31 **Unimplemented:** Set to '0'

Note: The master iPDS Panel is unit 0 and slaves 1-3 are units 1-3.

APPENDIX A: REVISION HISTORY

Revision A-00 (July 2015)
Modifications:

1. Initial release of this document.

Revision A-01 (September 2015)
Modifications:

1. Added CAN messages for multiple units to achieve 24 channels.
2. Added description for each mode.
3. Added section describing LED status codes.

Revision A-02 (October 2015)
Modifications:

1. Changed all CAN IDs to 0x4XX.

Revision A-03 (December 2015)
Modifications:

1. Added inverter to messages.

Revision A-04 (May 2016)
Modifications:

1. Added mechanical drawing.
2. Added connector pictures and part numbers.
3. Changed RESERVED pins on CAN/DB9 connector to ignition pins.

Revision A-05 (August 2016)
Modifications:

1. Updated LED table.
2. Added power usage to electrical specs.
3. Added Status2 CAN message

Revision A-06 (August 2017)
Modifications:

1. Fixed main LED color (power/status).
2. Fixed CAN bus termination value.
3. Added reserved CAN messages.
4. Added connector descriptions for inverter remote and battery control.
5. Added electrical characteristics for each channel

Revision A-07 (October 2017)
Modifications:

1. Split inverter status into 4 individual bits.

Revision A-08 (January 2018)
Modifications:

1. Updated mechanical drawing
2. Added note about multiple ignition voltages

Revision A-09 (May 2018)
Modifications:

1. Updated for changes in revision 'G' hardware
2. Changed IGN connector from 2-pin to 3-pin
3. Changed temperature sensor connector

Revision A-10 (April 2020)
Modifications:

1. Combined iPDS Panel, Switch Panel, and Touch Screen datasheets into this document
2. Updated for changes in iPDS Panel revision 'I' hardware
3. Updated product pictures
4. Updated connector description table
5. Updated electrical characteristics for 24V operation
6. Updated mechanical drawing
7. Added active cooling section
8. Added 4-Panel system support for up to 48 channels