

411BAM Battery Auctioneering Module



Introduction

The 411BAM is designed to act as a central component of a small E-Plex system. It can measure the voltage and current of two separate battery banks, up to 100A. It provides three outputs, auctioneered from the highest voltage supply and also provides two inputs.

Additionally, when the E-Plex clock is switched off and the 411BAM manual mode features are active they make the module ideal for a number of different power management scenarios. For example, low battery voltage detection and automatic disconnect of selected loads, control of power supply to the clock and managing power supplies to touch screens to avoid data loss.



Key Features

- Two solid state outputs capable of up to 5 amps each.
- One solid state output capable of up to 12 amps total.
- Thermal and short circuit protection.
- Monitors voltage and current for two battery supplies.
- Two switch inputs for status monitoring or system control.

The following manual mode behaviour is programmable:

- Automatically force outputs on/off when clock switches off.
- The two inputs can control outputs two and three with momentary or toggle action.
- Low battery voltage disconnect and reconnect of outputs when clock is switched off.
- Manual overrides for outputs 1 to 3 using push buttons on module.

Electrical Specifications

Description	Minimum	Nominal	Maximum	Absolute Max (Surge)
Voltage	7 VDC	12 / 24 VDC	32 VDC	45VDC ¹
Current, battery 1 and 2 outputs	0A	-	100A	200A ¹
Current, channels 1 to 3 total	0.03A	-	12A ²	160A ¹
Sleep / Storage ³	5mA	-	30mA	-
Current, per channel 1 & 2 continuous	0A	-	5A	25A
Current, channel 3 continuous	0A	-	12A	80A
Supply cable inductance	0μH	-	100μH ⁴	-
Load inductance, channels 1 & 2 ⁵	0μH	-	15mH	-
Load inductance, channel 3 ⁵	0μH	-	20mH	-
Input impedance	-	100kΩ	-	-
Input off threshold	-	<2VDC	-	-
Input on threshold	-	>6VDC	-	-
E-Plex LEN	-	2	-	-
Transient voltage suppression	EN6100-6-1			
PCB characteristics	UL94V-0			
Ignition protection	UL 1500 compliant			

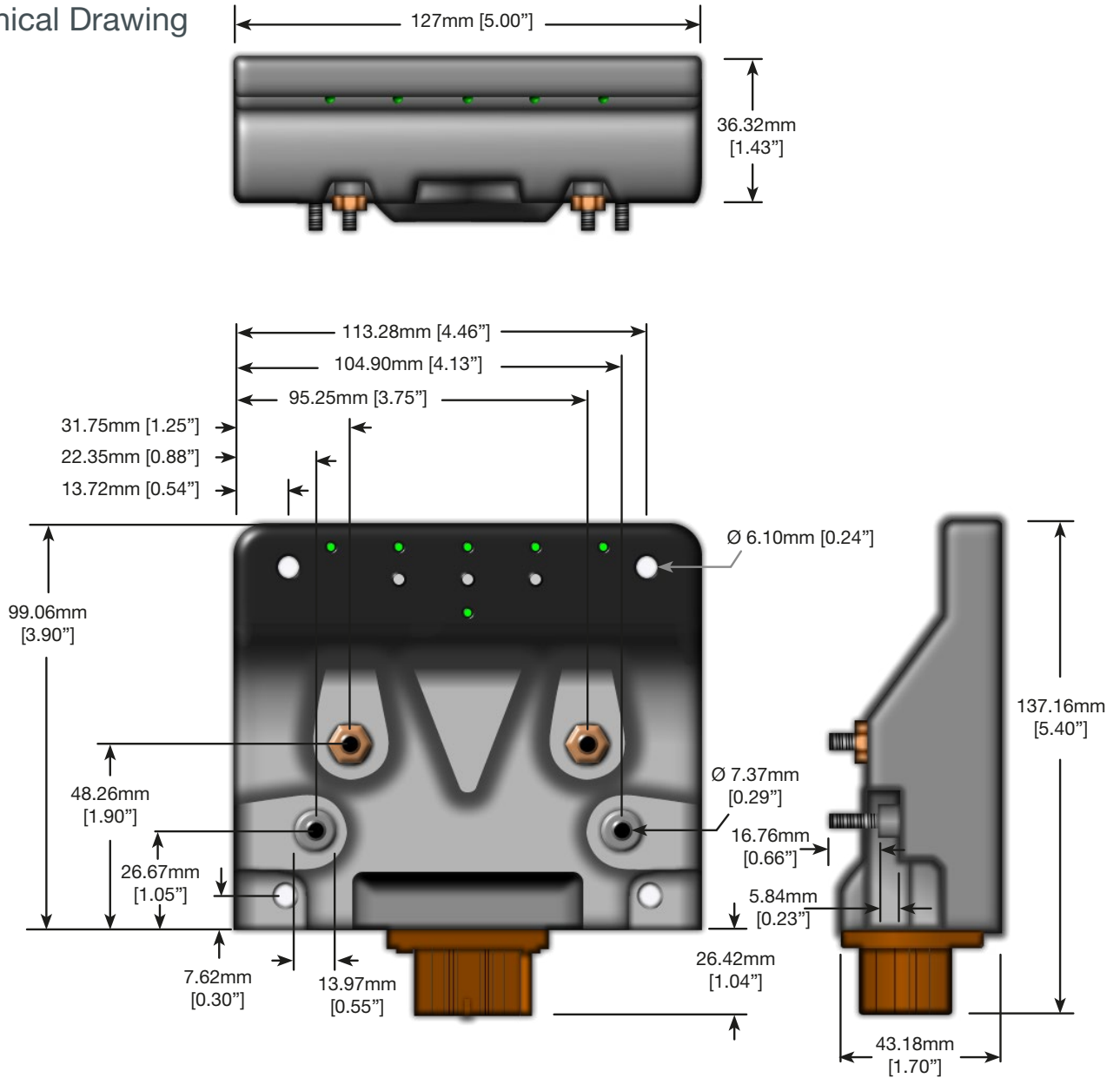
Notes:

1. Measured at 8.3ms single half sine wave. (JEDEC Method), 10,000 pulses.
2. De-rate max current by 0.2A per °C above ambient, 25 °C.
3. Sleep/storage defined as clock and all outputs off.
4. Specified as 50 feet of 2 AWG (43 mm²) wires with a 6 inch diameter spool for both power and ground.
5. For load resistance greater than 2 ohms load inductance is infinite.

Mechanical Specifications

- Shock : Mil Std 202 Method 213 test condition 1.
- Vibration : Tested to Lloyds Register Approval Vibration Test 2.
- Moisture resistance : IP66.
- Salt spray: Tested to Lloyds Register Approval Salt Spray Test.
- Operating Temperature: -40°C to 60°C.
- Storage Temperature: -40°C to 85°C.
- Operating Humidity: 0% to 100% (condensing).
- Weight: 1.65 lb (750g)

Mechanical Drawing



Mounting Instructions

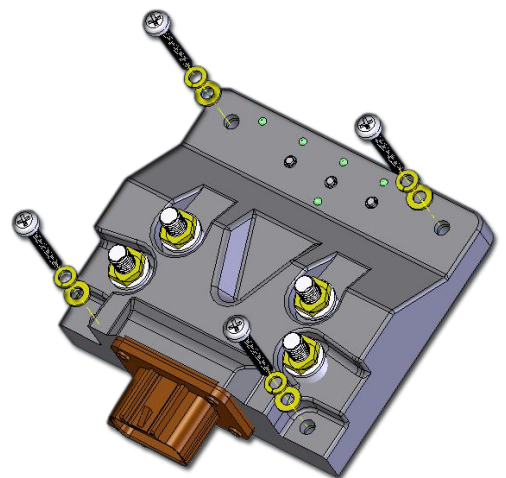
Screw assembly to a flat mounting surface in four places, as shown in the illustration.

Metric fasteners

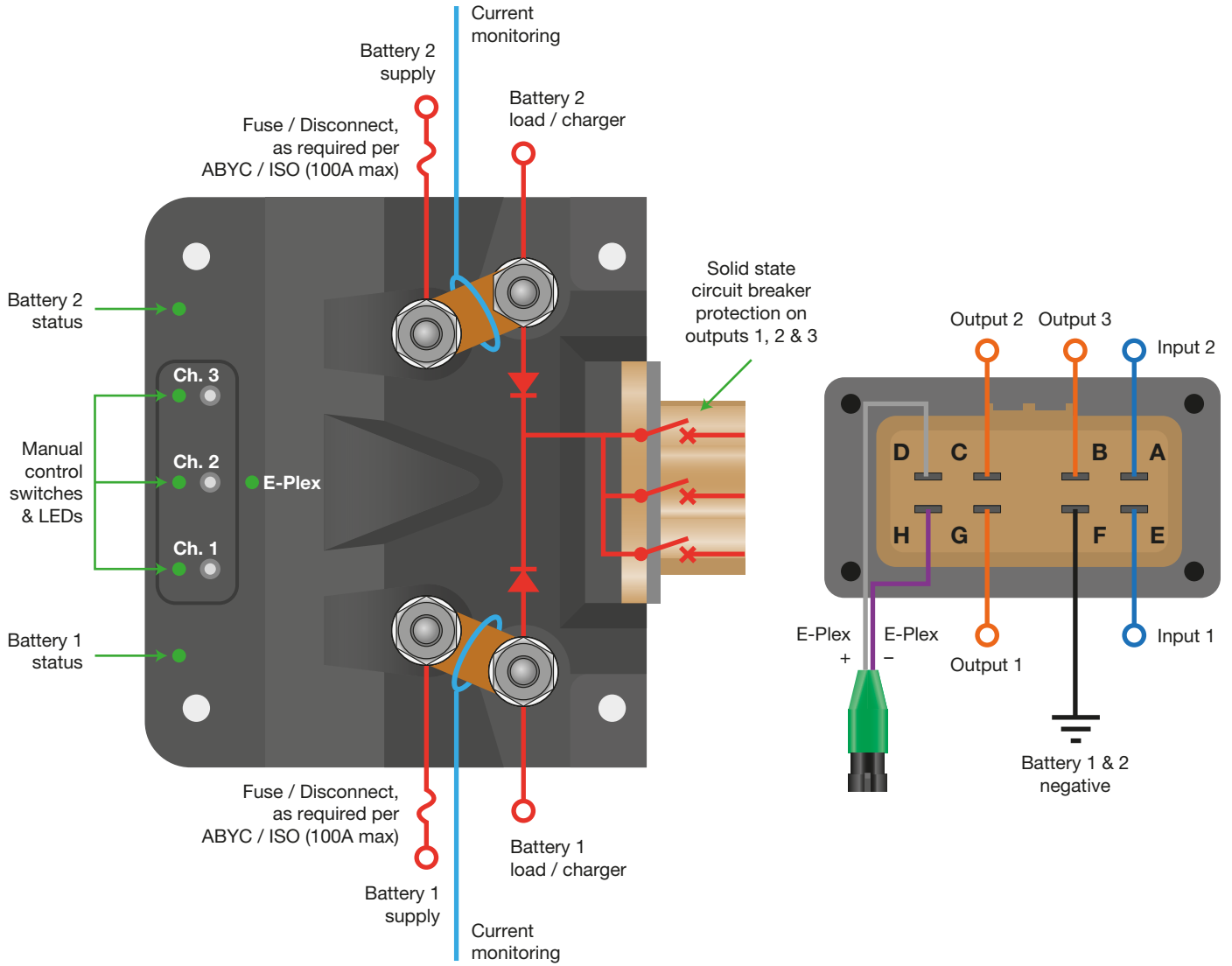
Use M5 size screw, M5 split lock washer and M5 washer. Torque to 250~280 N-cm. Do not exceed this torque as it could cause damage to the electronics.

Imperial (English) fasteners

Use #10 size screw, #10 split lock washer, #10 washer. Torque to 20~22 in-lb. Do not exceed this torque as it could cause damage to the electronics.

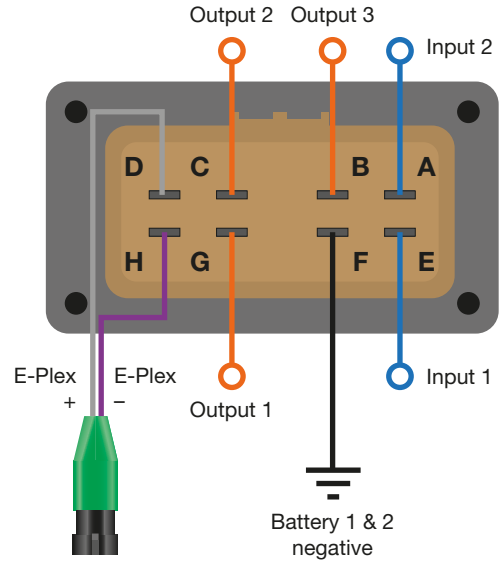


Typical Wiring Diagram



Wiring Details - Brown Delphi Connector

Connector Pin	Description
A	Digital Input 2
B	Solid State Fused Output 3
C	Solid State Fused Output 2
D	E-Plex Data Bus +
E	Digital Input 1
F	Battery -
G	Solid State Fused Output 1
H	E-Plex Data Bus -



Mating Connector

- Brown plug: Delphi P/N: 15317308

Female pins

Cable range AWG (mm ²)	Female terminal	Terminal insulation range	Seal insulation range	Seal P/N
18-16 (0.75 - 1.00 mm ²)	15304716	1.70 - 2.25 mm	1.20-1.85 mm	15366063
			1.85-2.25 mm	15356064
16-12 (1.50 - 2.50 mm ²)	15304717	2.20 - 3.00 mm	2.09-2.66 mm	15366061
			2.70-3.2 mm	15336674

Cavity Plug

- Delphi P/N: 12059168

Wiring Details - Power Terminals

Terminal	Description
M8-T1	Battery 1 Feed
M8-T2	Battery 2 Feed
M8-T3	Battery 1 Distribution Output Feed
M8-T4	Battery 2 Distribution Output Feed

- Power terminal type: M8 thread nickel plated brass.
- Power/Battery Connections must be fused.
- Wire size should be calculated based on upstream fuse.
- **WARNING:** When connecting the power source to the power studs on the module, torque the hex nuts to 60 in-lb (6.78 N-m). Failure to properly torque hex nuts may result in intermittent operation due to terminals loosening over time.
- Do not wire the power connections of this module through any cranking circuits.
- The power inputs should be connected directly to the battery terminals through a circuit breaker.
- Note: External surge suppression is required when the module battery supply cable is longer than 50'
- Reversed battery conditions: If both batteries are reversed the outputs will remain off with no damage incurred by the device (under nominal operating load conditions).

Status LEDs

Manual control LEDs

The 3 LEDs adjacent to the manual control switches display the status of the respective solid state output. The status of the LED is defined as:

- On: Channel active
- Off: Channel inactive
- Blinking: Channel tripped due to over current.

E-Plex Active

- LED flashes when clock is streaming and module is correctly programmed, or the module test program is open and the module is communicating.

Battery status

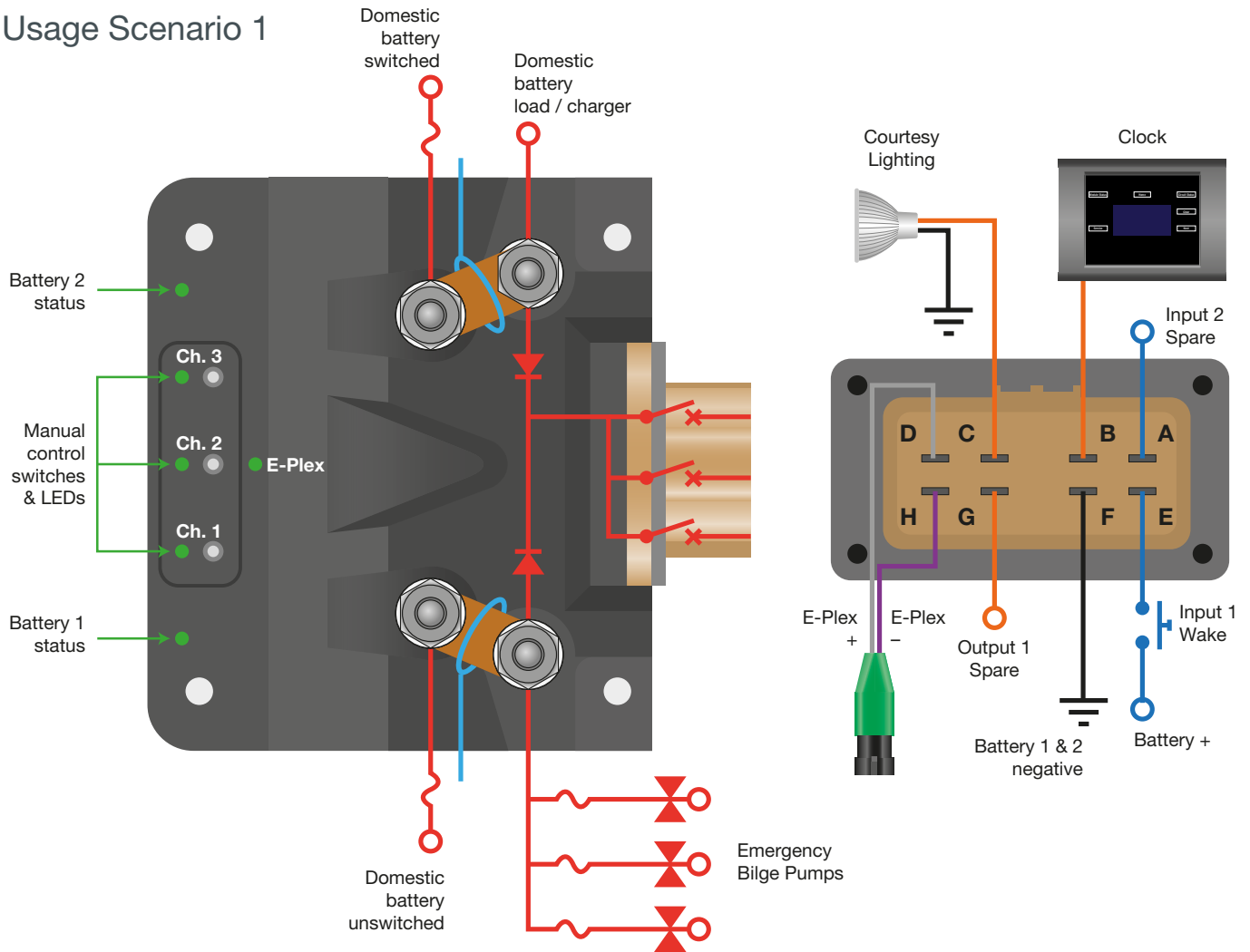
There are two battery status LEDs one for each battery.

- When in streaming mode the LEDs will illuminate to signify the respective battery supply is connected and switched on.
- When in manual mode, i.e. the clock is switched off or disconnected from the E-Plex bus the LEDs will display the following status information:
 - Off: Battery supply switched off.
 - On: Battery voltage OK.
 - Blinking at 3Hz (fast flash): Battery voltage has dropped below low voltage disconnect threshold, loads will disconnect after 15 minutes.
 - Blinking at 1Hz (slow flash): Selected loads have been disconnected due to low battery voltage.

Ordering Information

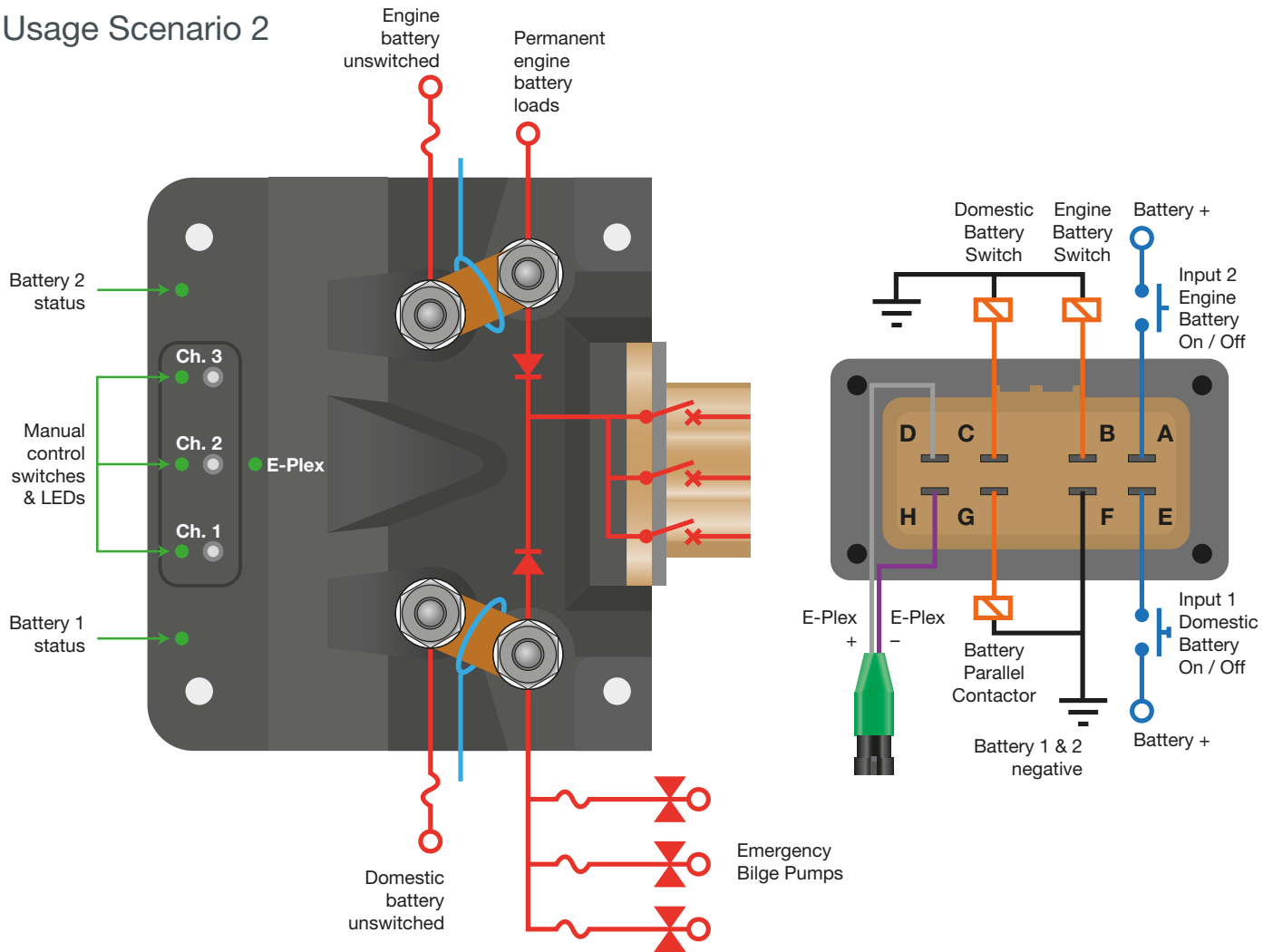
Order Code	Description
EP-SW-ESSENT-411BAM-12V	411BAM for 12V system operation
EP-SW-ESSENT-411BAM-24V	411BAM for 24V system operation

Usage Scenario 1



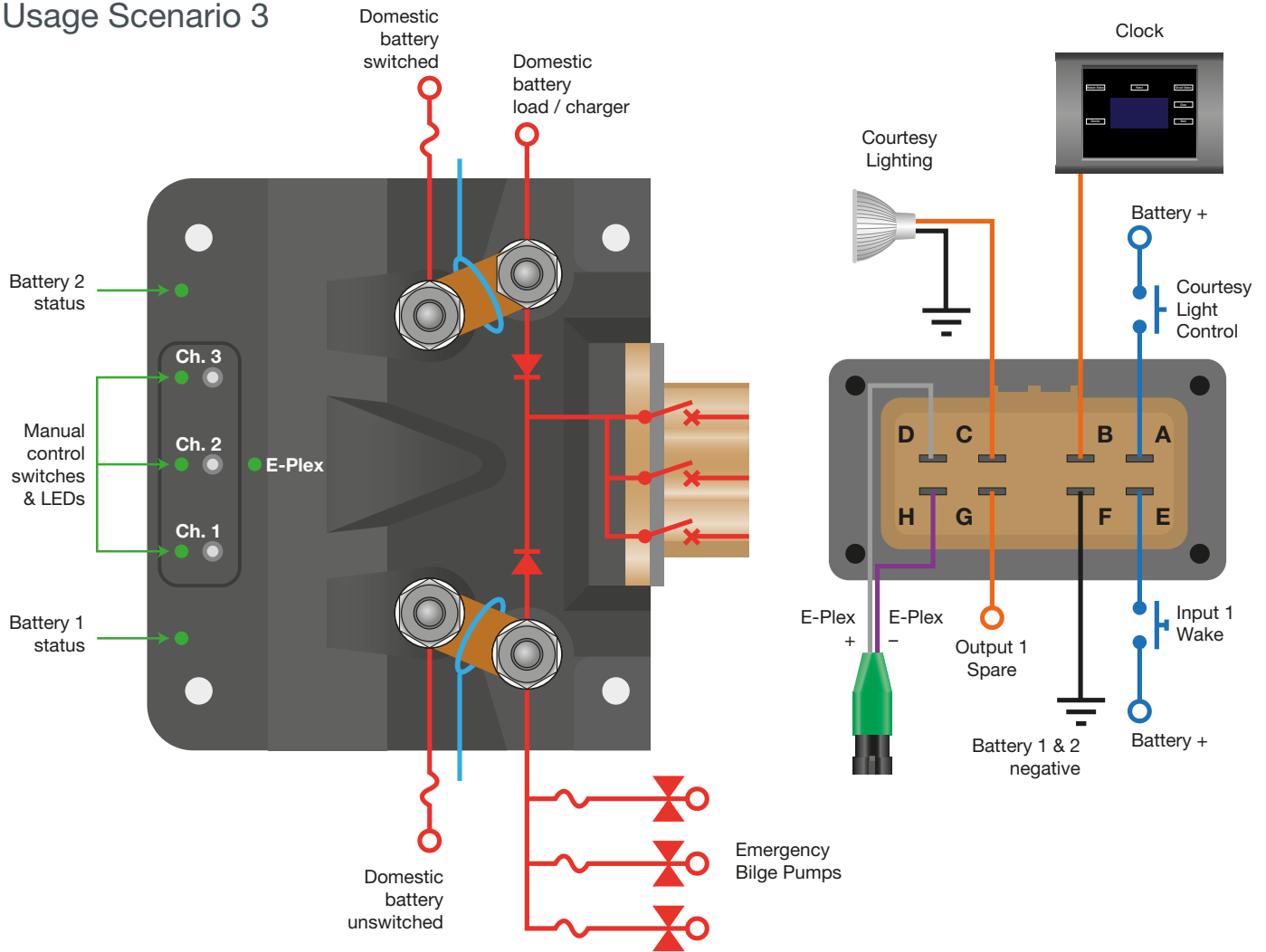
Pin	Terminal	Connected To	Notes
	Battery 1 In	Domestic battery unswitched	Fuse at <100A
	Battery 1 Out	Bilge pumps via individual fuses	Used to measure bilge pump run time based on current measurement, only when clock is switched on
	Battery 2 In	Domestic battery switched	Fuse at <100A
	Battery 2 Out	Domestic battery loads	
E	Input 1	Wake momentary push button	411BAM will power output 3 for 5 minutes but then turn off if battery switched remains off
A	Input 2	Spare input for normal use	
G	Output 1 (5 Amp)	Spare for normal use	
C	Output 2 (5 Amp)	Courtesy light supply	Powered on wake button, under clock module control when system powered
B	Output 3 (12 Amp)	Clock module and any required modules to control battery switch	Powered on when domestic battery switched supply >18V (24V system) or > 9V (12V system) , or Wake button pressed
F	Ground	Battery negative	

Usage Scenario 2



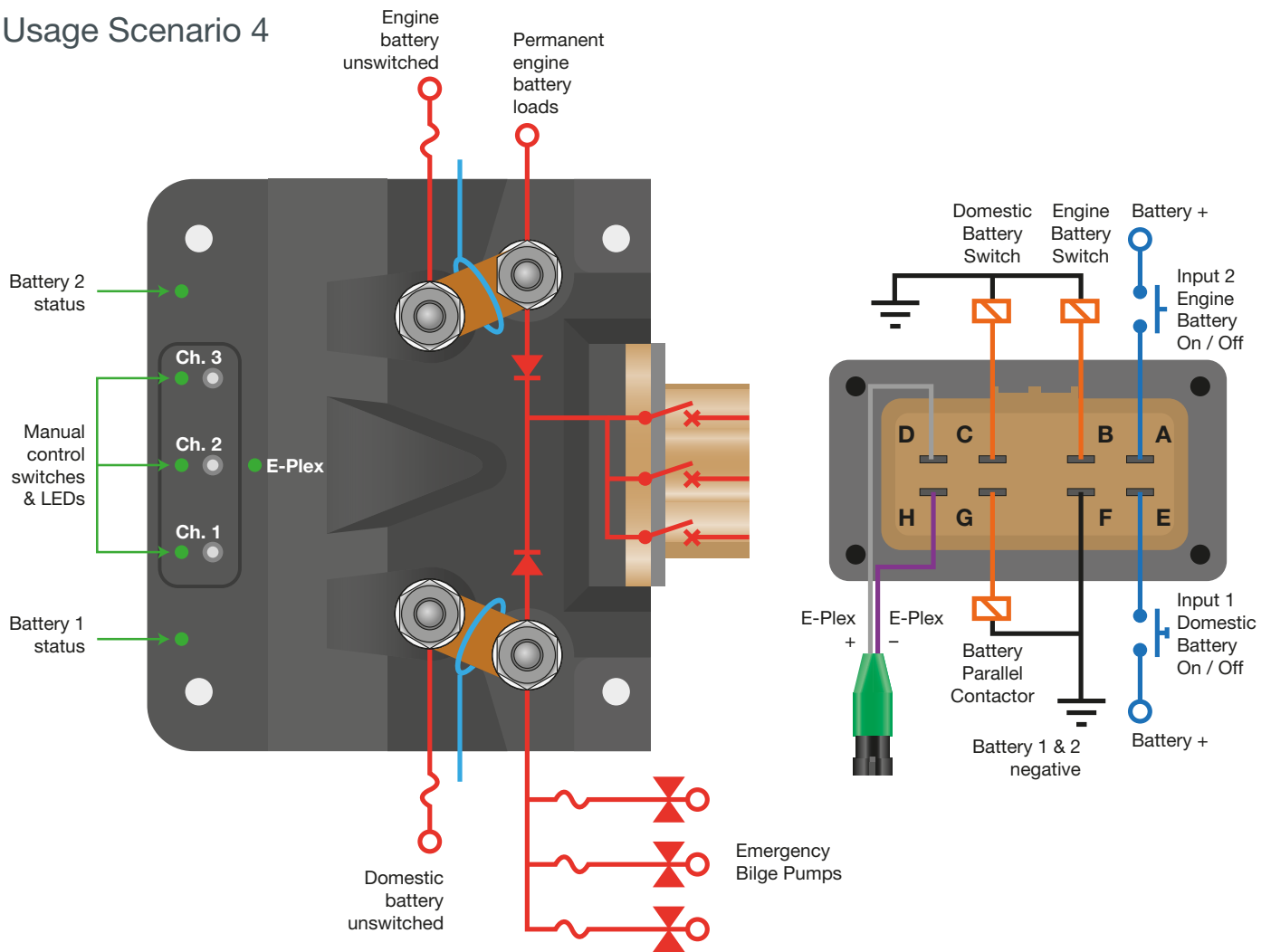
Pin	Terminal	Connected to...	Functionality
	Battery 1 In	Domestic battery unswitched	Fuse at <100A
	Battery 1 Out	Bilge pumps via individual fuses	Used to measure bilge pump run time based on current measurement, only when clock is switched on
	Battery 2 In	Engine battery unswitched	Fuse at <100A
	Battery 2 Out	Unused	
E	Input 1	Momentary push button	Domestic battery switch control
A	Input 2	Momentary push button	Engine battery switch Control
G	Output 1 (5 Amp)	Battery parallel contactor	Provides battery cross-charge functionality, manual parallel control via E-Plex
C	Output 2 (5 Amp)	Domestic battery switch	Pulses when Input 1 asserted or controlled via E-Plex
B	Output 3 (12 Amp)	Engine battery switch	Pulses when Input 1 asserted or controlled via E-Plex
F	Ground	Battery negative	

Usage Scenario 3



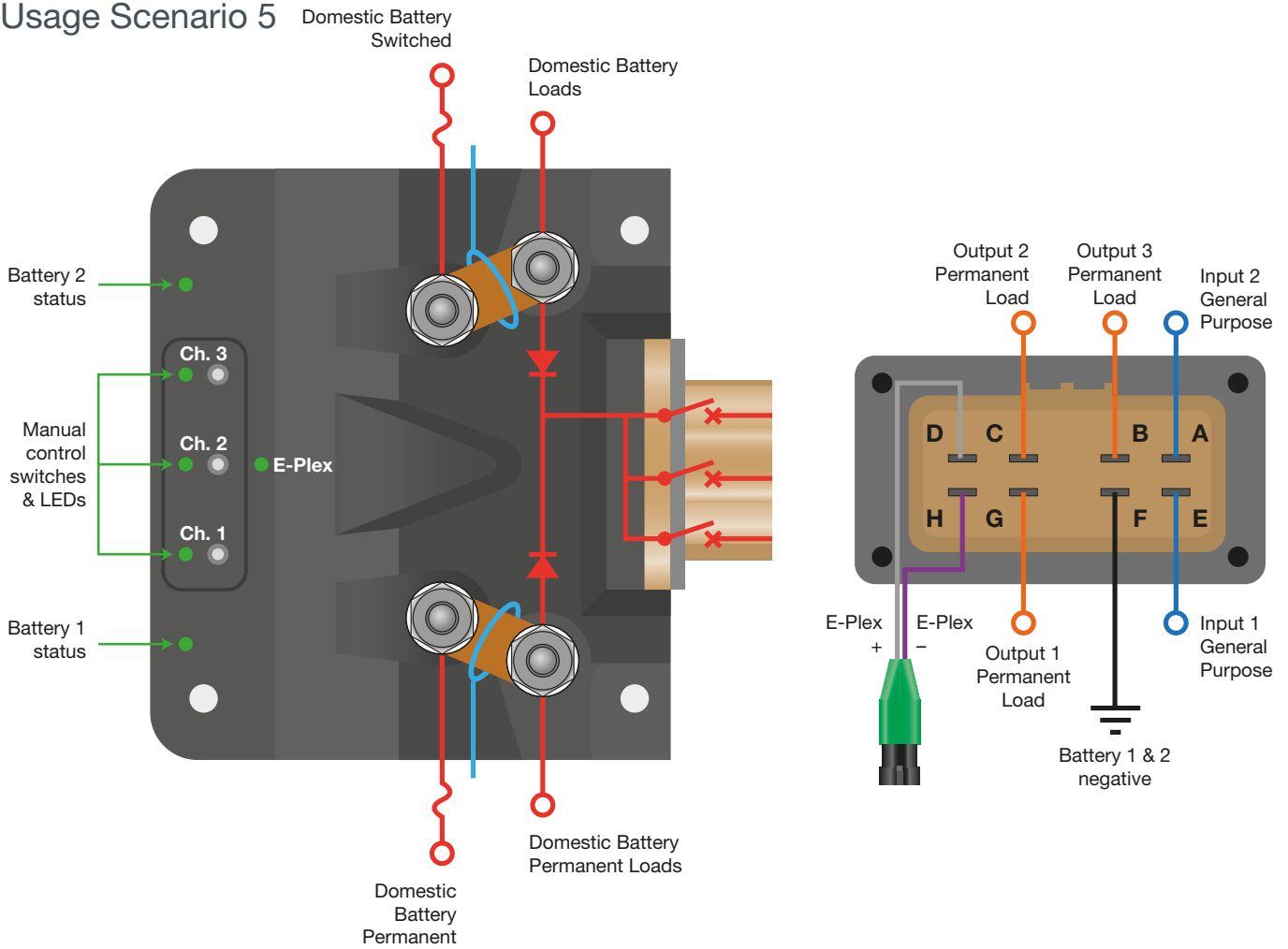
Pin	Terminal	Connected to...	Functionality
	Battery 1 In	Domestic battery unswitched	Fuse at <100A
	Battery 1 Out	Bilge pumps via individual fuses	Used to measure bilge pump run time based on current measurement, only when clock is switched on
	Battery 2 In	Domestic battery switched	Fuse at <100A
	Battery 2 Out	Domestic battery loads	
E	Input 1	Wake momentary push button	411BAM will power output two for five minutes but then turn off if battery switched remains off
A	Input 2	Momentary push button	Courtesy Light control
G	Output 1 (5 Amp)	Spare for normal use	
C	Output 2 (5 Amp)	Courtesy light output	On for 5 minutes after switch supply is turned off
B	Output 3 (12 Amp)	PC display and clock	Powered on when domestic switched >18V Output 1 remains powered for 2 minutes after domestic battery switch turns off to allow PC to shut down from clock
F	Ground	Battery negative	

Usage Scenario 4



Pin	Terminal	Connected to...	Functionality
	Battery 1 In	Domestic battery unswitched	Fuse at <100A
	Battery 1 Out	Bilge pumps via individual fuses	Used to measure bilge pump run time based on current measurement, only when clock is switched on
	Battery 2 In	Engine battery unswitched	Fuse at <100A
	Battery 2 Out	Unused	
E	Input 1	Domestic Battery Switch control	Pulses output 2 when clock not streaming to power up system
A	Input 2	Domestic battery switch aux contact	Monitors status of domestic battery switch
G	Output 1 (5 Amp)	Battery parallel contactor	Provides battery cross charge functionality, manual parallel via E-Plex
C	Output 2 (5 Amp)	Domestic battery switch on-coil	Pulse switches magnetically latching domestic battery switch on
B	Output 3 (12 Amp)	Domestic battery switch off-coil	Pulse switches magnetically latching domestic battery switch off
F	Ground	Battery negative	

Usage Scenario 5



This scenario provides power to permanent loads and disconnects them if battery voltage drops to low. It will then reconnect loads when chargers are switched on and battery voltage rises again.

Pin	Terminal	Connected to...	Functionality
	Battery 1 In	Domestic battery unswitched	Fuse at <100A
	Battery 1 Out	Not used	
	Battery 2 In	Domestic battery switched	Fuse at <100A
	Battery 2 Out	Domestic battery loads	Current consumption may be monitored
E	Input 1	Not used	General purpose input into E-Plex
A	Input 2	Not used	General purpose input into E-Plex
G	Output 1 (5 Amp)	Permanent load with low voltage disconnect	Maintains state when E-Plex switched off
C	Output 2 (5 Amp)	Permanent load with low voltage disconnect	Maintains state when E-Plex switched off
B	Output 3 (12 Amp)	Permanent load with low voltage disconnect	Maintains state when E-Plex switched off
F	Ground	Battery negative	



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