Power Distribution Unit (PDU)

Hardware v1.0
Software v1.4

Overview
Operation
Calibration
Datastreams
Specifications

LifeRacing

1 Overview

The Life Racing Power Distribution Unit (PDU) is a multi channel solid state power switch with microprocessor control, designed to provide intelligent switch and fuse functions for 12V common ground systems. 32 power outputs are independently controlled based on 32 logic inputs. Current flow on all active outputs is measured and fusing applied based on configurable current limits, inrush and trip times. A dual purpose fault light output / manual reset input is provided. All input and output states and currents are provided on RS232 and CAN datastreams for connection to logging or telemetry systems.

2 Operation

The basic control sequence is:

1. The raw state of all logic inputs is sampled. Latching, flashing, and debounce functions are applied as required.
2. The final state of each input may then be enabled or disabled by the state of other inputs. A latching input may also be cleared by other inputs becoming active.
3. The desired state of each output is determined - outputs may be enabled by one or more final input states. Outputs may also be turned on permanently.
4. When turned on, outputs are initially unfused for a configurable inrush time.
5. When an output trips, the fault light is turned on. The output remains off until the unit is power cycled or the fault light output is grounded for 500ms (manual reset).

3 Calibration

The PDU is configured using the generic Life Racing calibration software LifeCal, as used with all other Life Racing electronic controllers. The calibration menu is divided into three sections:

3.1 Inputs

3.1.1 Input Bias – f(Input)

Specifies whether an input is pulled up to 5V or pulled down to logic input ground.

3.1.2 Input Sense – f(Input)

Specifies each input as active high or active low.

3.1.3 Input Latch – f(Input)

Allows each input to be configured for software latching. Each pin voltage transition from inactive to active toggles the input state.

3.1.4 Input Debounce Time – f(Input)

Sets the debounce time for each input - pin voltage changes will be ignored for this period following a state change.

3.2 Control

3.2.1 Input Flash Time – f(Input)

Allows the flash rate of an input to be set. If zero, the input does not flash.

3.2.2 Input Cancel Time – f(Input)

Allows a latching input to auto-cancel after a configurable time. If zero, the input does not cancel.

3.2.3 Input Logic – f(Input,Input)

Allows the final state of each input to be enabled or disabled (or its latch to be cleared) by other inputs.

3.2.4 Output Map – f(Input,Output)

Specifies which input final states can activate each output.

3.2.5 Output Always On – f(Output)

Specifies which outputs are permanently turned on.

3.3 Limits

3.3.1 Output Inrush Time – f(Output)

Sets the unlimited current (inrush) time for each output. When the output is turned on fusing is disabled for this period. Hardware protection prevents damage to the unit if the maximum rating is exceeded during this time.

3.3.2 Output Trip Time – f(Output)

Specifies the trip time for each output. An output is tripped if its current limit is continually exceeded for this time.

3.3.3 Output Current Limit – f(Output)

Specifies the trip current for each output.

3.3.4 Output Current Calibration – f(Output)

Allows the current measurements for each output to be fine tuned if required.

4 Datastreams

The PDU continually transmits all input and output states and currents on both RS232 serial and CAN. The channel definitions and data byte layouts are the same for both; frames are sent at approximately 100Hz in the sequence 0 1 2 3 4 5 6 7 8.

Channel	Type	Quantity
PRE	U32	Input States Pre Logic (MSB is input 32, LSB is input 1)
POST	U32	Input States Post Logic (MSB is input 32, LSB is input 1)
ST1..32	U8	Output State (0=ON 1=OFF 100=FAULT)
CUR1..32	U8	Output Current (divide by 2 to get amps)

Frame	Data bytes							
0	PRE (high byte first)				POST (high byte first)			
1	ST1	ST2	ST3	ST4	ST5	ST6	ST7	ST8
2	ST9	ST10	ST11	ST12	ST13	ST14	ST15	ST16
3	ST17	ST18	ST19	ST20	ST21	ST22	ST23	ST24
4	ST25	ST26	ST27	ST28	ST29	ST30	ST31	ST32
5	CUR1	CUR2	CUR3	CUR4	CUR5	CUR6	CUR7	CUR8
6	CUR9	CUR10	CUR11	CUR12	CUR13	CUR14	CUR15	CUR16
7	CUR17	CUR18	CUR19	CUR20	CUR21	CUR22	CUR23	CUR24
8	CUR25	CUR26	CUR27	CUR28	CUR29	CUR30	CUR31	CUR32

4.1 RS232 Serial

Asynchronous serial at 38400/N/8/1

Each frame is

Sync byte (0xFF)

Frame id byte (0..8)

8 Data bytes

Checksum byte (mod 256 sum of sync byte through last data byte)

4.2 CAN

CAN2.0B (11 bit identifiers) at 1MHz

Each frame contains 8 Data bytes

Frame Identifiers are 0x700+frame id byte (0..8)

5 Specifications

Maximum Current Per Output : 30A continuous, 45A for short periods

PC Interface : 100MHz full duplex ethernet

Supply Voltage : 6 to 26V

Dimensions : 208 x 120 x 30 mm plus connectors

Weight : 885g