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PduXSetup
User Manual

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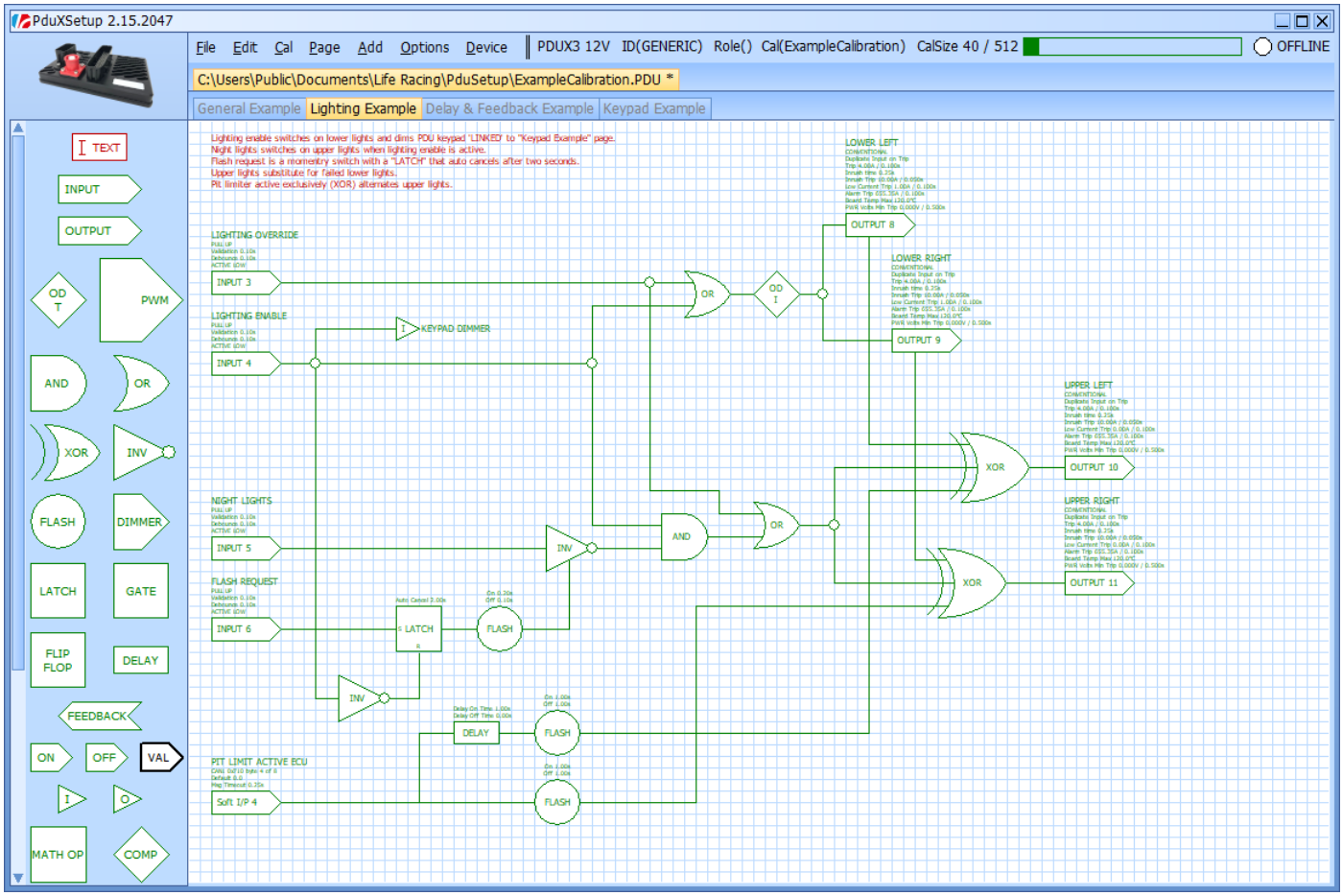
1 Contents

2 Introduction

PduXSetup is used to create PDUX calibrations to control how the PDUX device behaves. This is done with the use of graphically represented logic control.



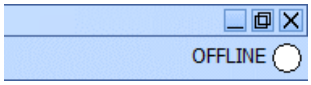
Due to continuous development, some features may change and the manual will update periodically. Please ensure you have the latest version dated on the cover page of this document.

3 User Interface

3.1 Menu bar

All menu buttons and sub items can be reached using keyboard shortcuts. Each option has an underlined letter, identifying its shortcut key or the shortcut displayed to the left of the drop-down menu.

Also displayed here is calibration information including the intended device, the calibration identity and the calibration size. On the far right of this bar is the connection status of a connected device. The name of the current PDUX calibration is displayed in a tab header. Multiple .pdux files can be opened within one PDUXSetup window.



No devices connected

Connected successfully

Connection lost

3.2 Components

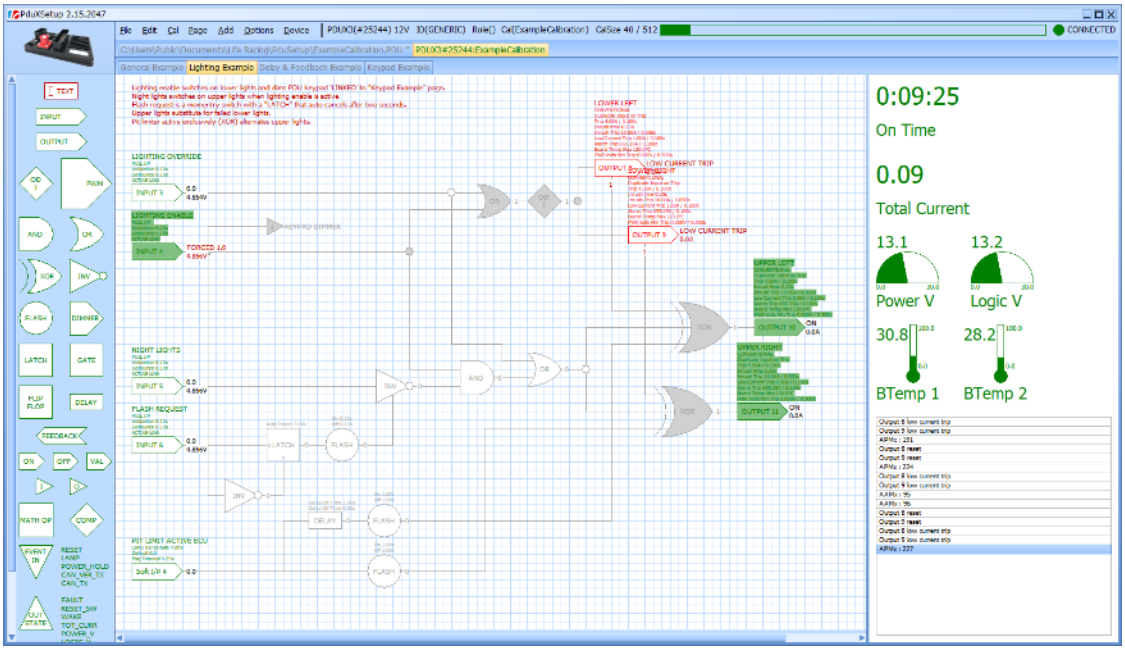
The component bar on the left shows all available schematic logic components. These can be grabbed and dragged on to the schematic space with the mouse or added through the *Add* menu.

3.3 Schematic

The calibration schematic can be split across several pages to improve visibility. Each page can be given a name which will appear in the tabs above the schematic space. These tabs can be used to switch between pages or numerical shortcuts are given under the *Page* menu.

3.4 Device Information

When connected, the right side of the screen will display device information including total current draw, device temperature, voltage, “on time” and any device messages. These messages can also be obtained through LifeMsg.



4 File

The calibration file is stored on the PC as a .pdux file. It can be accessed and edited without a PDUX device connected.

4.1 PC

To create a new PDUX Calibration, select *File, New* and select the correct device. The PDU type is required to build the list of inputs, outputs and features available.

Load a previously saved calibration by selecting *File, Load*.

Save the calibration to the working directory with *File, Save* or to a different location with *File, saveTo*.

Select *File, save as text (Q)* to export all IO information into a text file. This will be stored in the working directory.

Select *File, Close* to close the current calibration.

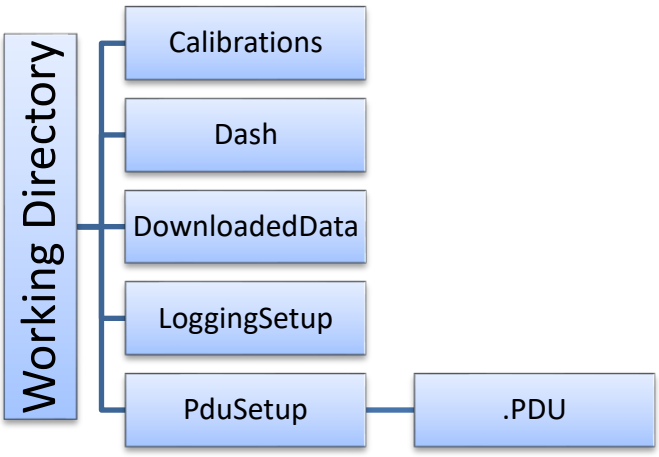
Select *File, Print* to print the current page in black and white as it is seen. This includes text and simulation status.

User Update is used to *Apply, Load, Create* an updated calibration for an ID locked PDUX device.

4.2 Working Directory

The working directory is maintained across all Life Racing applications and can be edited in LifeCal, LifeCfg, LifeData, LifeView, PduSetup and PduXSetup.

To change the current working directory select *Working directory* under *File*. Use *CREATE* to create a new folder in the current location. Use *SELECT* to select the current location as the new working directory. If the location has not been used before, a .CFG file will be created. Selecting *Working Dir Behaviour* allows editing of the .CFG file. All .PDUX files are saved in the PduSetup folder with no further directories.



4.3 Cal options

These options affect the calibration file and can be found under the *Cal* menu.

Legacy Communications
Legacy communications are only available in PduXSetup for reference when upgrading from a PduSetup to a PduXSetup calibration. Only for 2.17.XX and 2.18.XX main code versions.

Custom CAN
Create and configure customisable CAN communications to and from a PDUX device. There are limits on computation, transmission and reception. These are graphically displayed in the top right corner. For main code 2.19+. Please refer to section 5.

IO Summary
Review and monitor all configured Input and Output characteristics, in both online and offline mode. This section is read only and can be exported as a .csv file. It can also be used to pinpoint an Input/Output anywhere in the schematic using the “Goto” function – F12.

PassPhrase
Add a passphrase that must be entered before being able to view or edit the calibration.

Hard Fuse Current
Set the Hard Fuse current value for the PDUX device in use.

Start Simulation
Forces the calibration in to a simulation mode to test schematic layout and logic. When in simulation mode, the *Cal* menu is used.

Change Type
Change the type of PDUX associated with the calibration file. This changes the number of physical I/O available and must be correct before programming.

Change Operating Voltage
Switch between 12V and 24V power supply. A PDUX will require the correct operating voltage calibration to be programmed. Note that 24V calibrations will have lower fusing currents.

Change Identity
An identity is a security feature used to restrict access to devices and calibration options. The calibration ID must match the device ID to be programmed. Offline, a PC must have the necessary permissions to view a restricted calibration. Use this function the change the ID associated with the current calibration.

Validate
Validate the calibration and detect schematic logic and setup errors.

Revert
In case of a corrupted calibration, the software can revert to point where it considers the calibration serviceable.

Enable eXpert frequency mode
Prior to PDUX main code 2.19, every component in the schematic was evaluated at 100Hz. This can now be fine-tuned if *Expert Frequency Mode* is enabled in the calibration menu. Circuits of components can now be configured to run at anything between 1Hz and 1000Hz. There is an overall frequency budget but *Expert Frequency Mode* provides the choice on where to spend that budget.

4.4 Device

Retrieve a calibration from a connected PDUX device with *Device, Get.*

Program a calibration to a connected PDUX device by selecting *Device, Set*.

Programming and connecting, simultaneously, can be achieved with *Device, Set & Connect.*

When programming is complete, device information will be displayed as well as any messages describing calibration problems such as invalid current limits. Current limits can be found in the specific device datasheet.

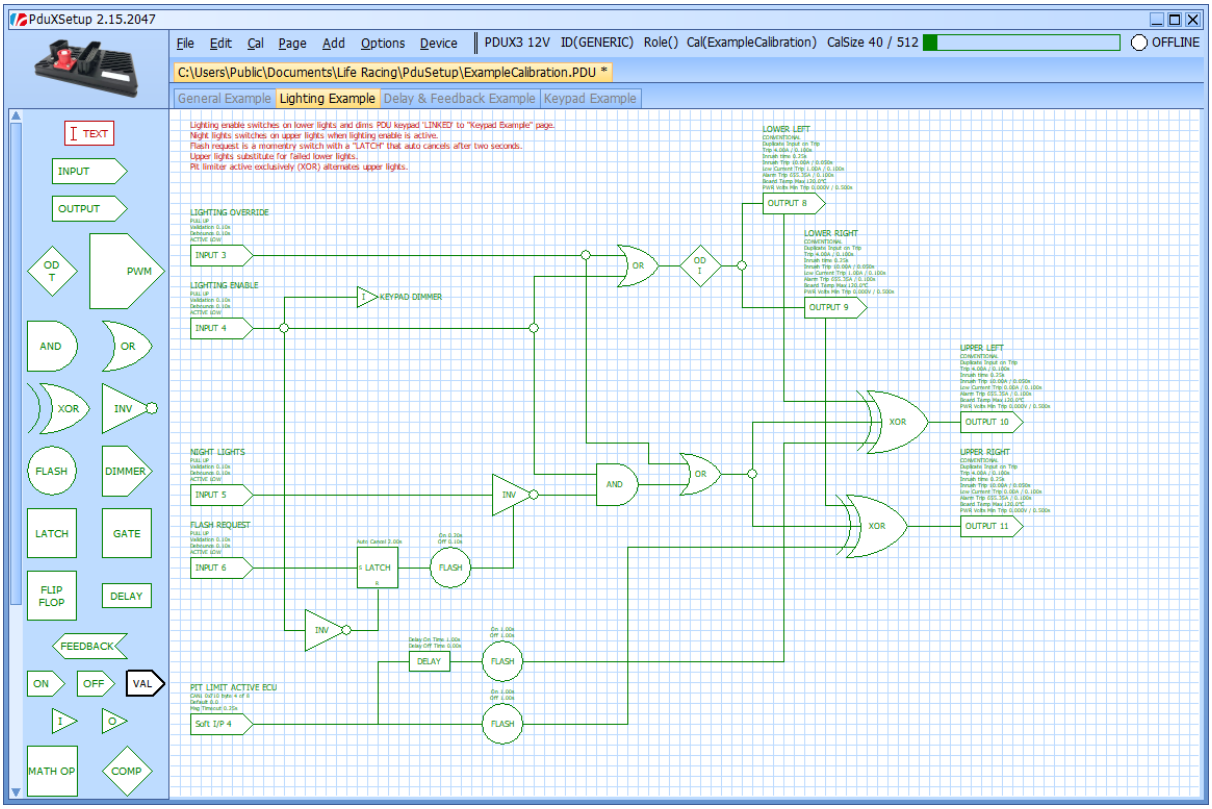
Retrieve, set and manipulate PDUX wake functionalities by going into *Device, Power Config* dialog box. The Power config is not saved in the calibration and must be retrieved from the device by selecting *Get Power-Config – F11,* and programmed to the device by selecting *Set Power-Config – F12*.

Note
Connecting to a device with *Device, Connect* is used for monitoring only. No changes to the calibration or Power Config can be made or programmed when in this state.

5 Calibrate

5.1 Main Display

The main display can consist of several tabs or 'pages' displaying a grid. The pages can be added, deleted renamed, resized and cleared under the *Page* menu. Numerical shortcuts can also be found here to switch between pages.



In the menu bar, the total calibration size and connection state is shown. The bar displayed represents the calibration size as a proportion of total available memory. A maximum of 512 logic components are allowed within a .pdux calibration. When this limit is surpassed, the bar will turn yellow and programming will not be allowed.

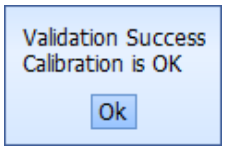
The tooltip comment cannot be deleted but can be edited. The text here is what is displayed in the file menu in the same way as a file comment.

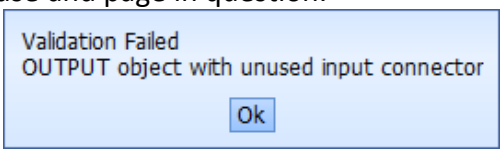
The keyboard can be used instead of the mouse with the following alternative controls:

Command	Mouse	Keyboard
Move pointer	Drag	Arrows
Select	Left click	Spacebar
Options	Right click	Enter
Zoom	Mouse wheel	+/-

Common windows shortcuts can be used to cut, copy, paste, undo and redo. They can also be accessed within the *Edit* menu.

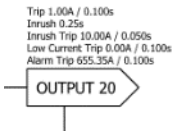
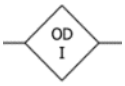
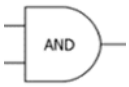
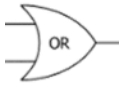
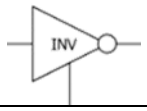
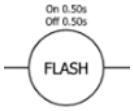
When calibration is complete, it can be validated by selecting *Cal, Validate*. This will then display an error if validation fails and hint at the cause and page in question.

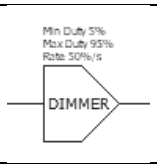
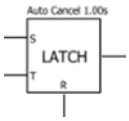
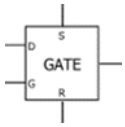
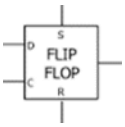
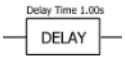
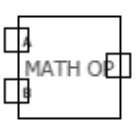


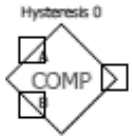


5.2 Components

Components can either be dragged onto the display with the mouse from the component panel displayed on the left of the screen or added from the *Add* menu. They can then be dragged around the grid into position. Hold <Ctrl> or draw a box to select multiple components. Select component nodes and drag to draw connectors between them. Add interconnects to create bends by selecting partway down the connection or at the end of a loose connection. Components and connections can be deleted or have further options edited by right clicking.

Shortcut	Symbol	Description	Menu Options
Text		Add text to the display.	Edit or lock text. When locked, text is displayed in yellow and cannot be moved or edited until unlocked.
Input		A physical or “soft” input.	Further properties.
Output		A physical or “soft” output. Physical outputs include a “Status output” which acts as a bypass if the output trips.	Lock output. When locked, all connected components will also be locked and displayed in yellow. These components cannot be edited or moved until the output is unlocked. Add or remove a status output. Further properties.
Output Distributor		Multiple output distributor. Teamed outputs will trip simultaneously.	Toggle individual or team distribution.
And		Logical AND. Triggers when all inputs are high.	Add or remove additional inputs.
Or		Logical OR. Triggers when any input or multiple inputs are high.	Add or remove additional inputs.
Xor		Logical XOR. Triggers when only a single input is high.	Add or remove additional inputs.
Invert		Logical NOT. Invert the input.	Add or remove a conditional input. Will cause the inverter to only work when conditional input is high.
Flash		Switch between high and low at set intervals.	Properties including on and off durations.

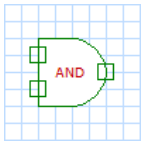
Dimmer		Variable PWM output control. Scrolls between min and max duties at defined rate	Set min/max duties and scroll rate
Latch		Output is toggled when T (toggle) is high. Output set to high when S (Set) is high and low when R (reset) is high.	Add or remove Set, Toggle and Reset inputs. Properties include auto-cancel time which will reset the latch after the specified time.
Gate		Output = D (data input) when G (Gate input) is high and latches when G is low.	Add or remove Set and Reset inputs. S latches output as high, R latches output as low.
Flip Flop		Output = D (data input) only when C (clock input) is on rising edge.	Add or remove Set and Reset inputs. S latches output as high, R latches output as low.
Delay		Delayed on by set delay time, instant off.	Properties including delay time.
Feedback		Should be used to feed corrective information back into directly linked logic.	None
ON (1)		Always high input.	None
OFF (0)		Always low input.	None
Link IN (2)		Terminate to continue at matching Link OUT (Can be on a different page)	Edit name of link for Link Out.
Link OUT (3)		Continue from matching Link IN (Can be on a different page)	Edit which link to use. “Goto LINK_IN” to find corresponding link quickly.
Val		Outputs a constant numerical value	Set numerical value
Out Event		Event triggered component such as specific function pins or internal triggers	Select event (FAULT, RESET_SW, WAKE, TOT_CURR, POWER_V, LOGIC_V, BOARD_TEMP, CAN_RX, QTY)
Event In		Unique events that can be triggered to activate specific commands	Select event (RESET, LAMP, POWERHOLD, CAN_VER_TX, CAN_TX)
Maths Op		Applies a selected mathematical operation to the incoming inputs	Set Type to select the desired mathematical operation.

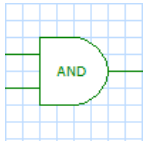
Comparator		Used to Compare numerical functions through a choice of four mathematical comparisons: A>B, A<B, A=B, A!=B	Set comparator type Set hysteresis

A soft input refers to an input received over CAN. A soft output refers to an output to be sent over CAN.

Examples of how each component can be used are found in the provided during software installation.

A components text will appear green when it is fully defined and red when it is not. A component is defined when all of its input and output nodes are used and properties correctly set. Before simulating or programming, all input nodes must be used. Output nodes can remain free to allow testing of subsystems and partial logic but will remain red.

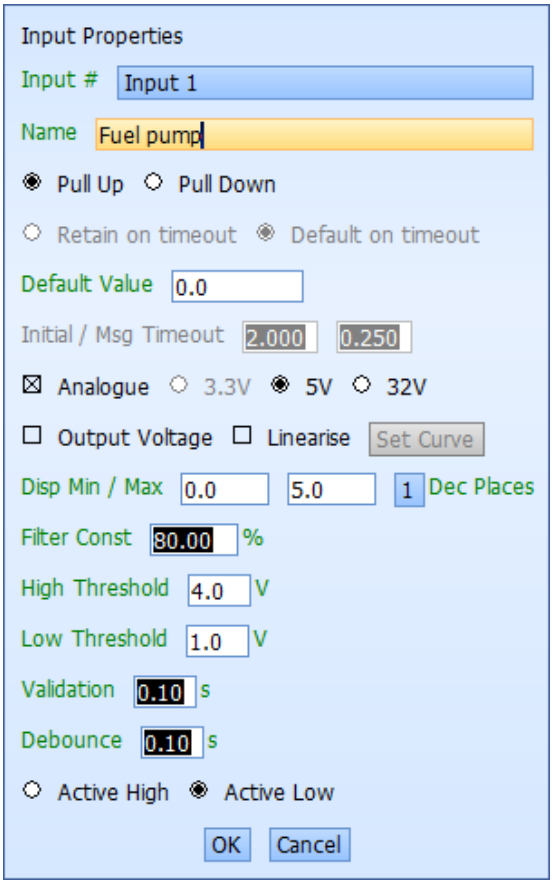




5.3 I/O Further Properties

All IO property information can be seen above the component in the schematic. This includes CAN address and byte number for soft IO.

5.3.1 Input Properties



Input #
Select input to assign either a physical (hard) input or a soft (CAN) input. CAN inputs are setup under *Cal, Custom CAN.*

Name
Type name to be visible on main display.

Pull Up/Down (physical inputs only)
Sets the state of the internal pull-up or pull-down resistors. Ultimately the state of the input when no signal is present.

Retain/Default on timeout (soft input only)
Choose between retaining the last recoded state or switching to default state when message timeout has expired.

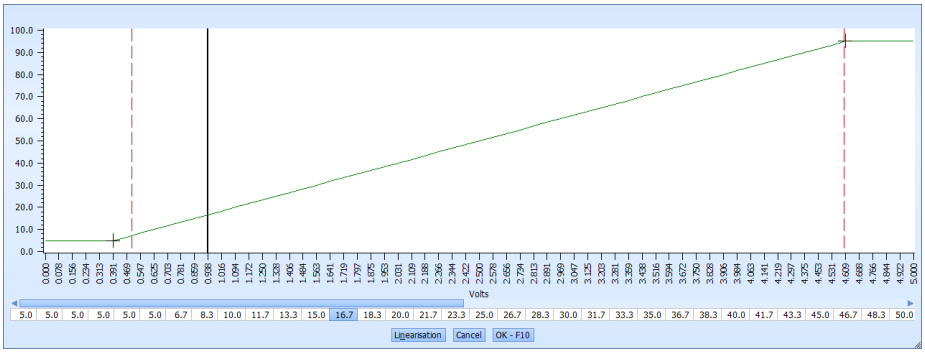
Default Value
If 'Default on timeout' is selected, choose what this default value should be.

Initial / Msg Timeout (soft input only)
Type the amount of time allowed for the initial message to be received before a timeout is triggered
Type the amount of time allowed between messages before a timeout is triggered.

Analogue (3.3v, 5v, 32v)
Used to define an analogue input.

Output Voltage
Inputs the raw voltage present at the pin into the schematic rather than a Boolean value set with voltage thresholds.

Linearise
Input Linearisation Dialog has a grid control added with customisable values. This is addition to the existing Add Hint Points and Linearisation strategies for a more efficient user interface.



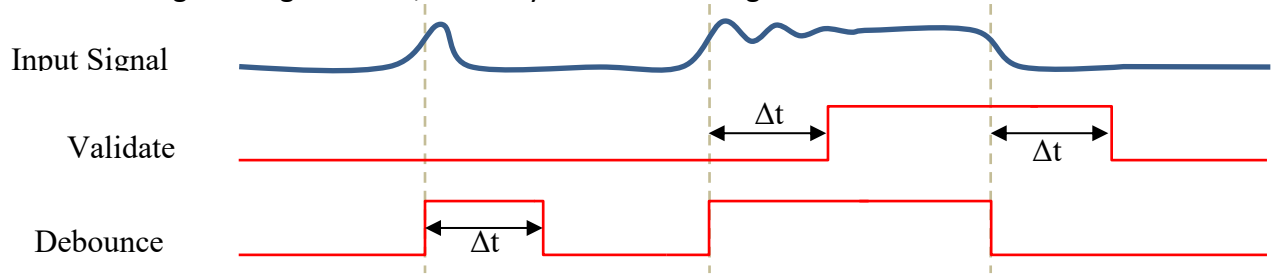
Disp Min/Max
Sets the range of values to be displayed while connected to a device. This does not affect the accuracy of the true reading.

High Threshold
If input is analogue, type the upper threshold voltage.

Low Threshold
If input is analogue, type the lower threshold voltage.

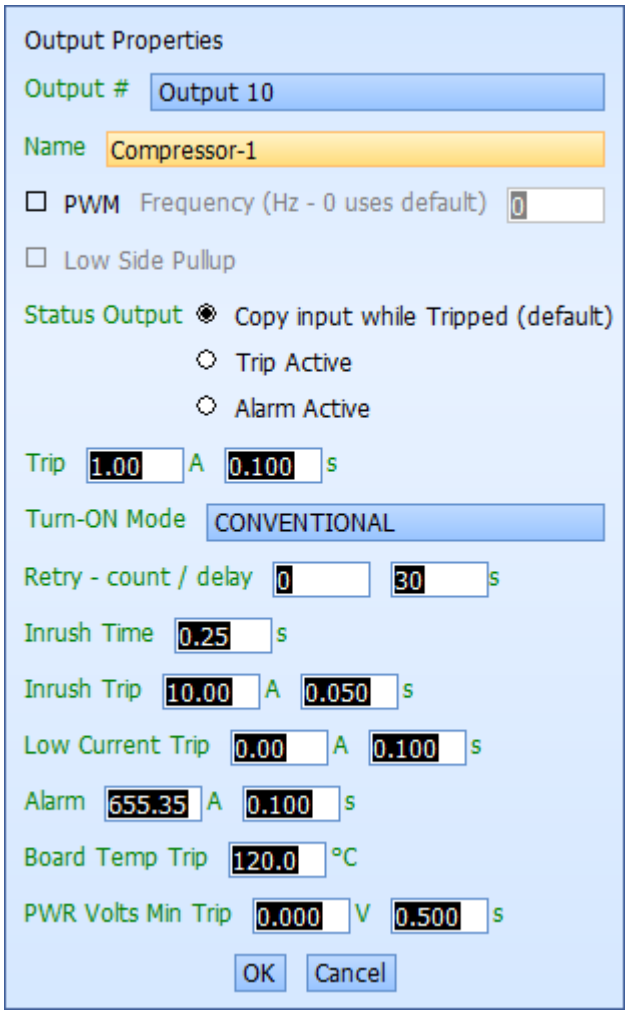
Validation
Requires an input signal to be consistent for the defined amount of time before acknowledging it as in input. Validation causes a small delay but avoids accidental switching.

Debounce
After detecting a change in state, instantly stabilises the signal for the defined amount of time.



Active High/Low (physical input only)
Set if input is active at high or low voltages. Logic uses input active state and not voltages.

5.3.1 Output Properties



Output #
Select output to assign. Either physical high side, physical low side, soft (CAN) or switch panel LED. CAN outputs are setup under *Cal, Custom CAN.*

Name
Type name to be visible on main display.

PWM
Sets the output to PWM mode. PWM frequency and range described in device datasheet

Low Side Pullup
Enable the low side pull up to 5V. Intended for PWM logic where an input needs a full signal.

Status Output
Choose the behaviour of the status output:
Copy input while tripped – If output has tripped, status output will be on when the output is on and off when it is off.
Trip Active – If output has tripped, status output will be on regardless of output state.
Alarm active – If current exceeds alarm value for alarm time, status output will be on regardless of trip state.

Trip
The output will trigger a fault when the trip current is exceeded for longer than the designated time period. This disables the faulted output.

Turn-ON mode
CONVENTIONAL – output state is switched normally.
CAPACITIVE start – To be used with capacitive loads e.g. steering wheel display or ECU.
INDUCTIVE start – To be used with inductive loads e.g. fans or compressors.

Different outputs are capable of different turn-ON modes, refer to specific device datasheet for further details.

Retry count/delay
Retry – count: number of auto re-initialisations of tripped output.
Retry – delay: Time gap between each retry attempt. (From trip incident to activation time)

Inrush Time (CONVENTIONAL & CAPACITIVE)
Specify the length of the inrush period. This affects how long the inrush trip is active.

Inrush Trip (CONVENTIONAL & CAPACITIVE)
Specify the inrush trip threshold applicable for the inrush time specified.

Soft Start time (INDUCTIVE)
Defines the maximum time the closed-loop soft start strategy is active before triggering an inrush trip. For the output to start successfully, the PWM sequence must achieve 100% duty within this timeframe.

Soft start current / Ramp time (INDUCTIVE)
Soft start current defines the maximum current allowable during the soft start sequence. As such, this should be set higher than the normal operating current of the device. Exceeding this value during starting will cause an immediate trip.

Ramp time defines the minimum time in which the soft start PWM duty can increase to 100%. This can be used to slow down the soft start sequence and should always be set to a value less than the Soft Start time.

Low Current Trip
The output will trigger a fault when the current is less than the specified trip current for longer than the designated time period.

Alarm Trip
A CAN message is sent as a warning when the output current exceeds the specified value for longer than the designated time period. Also turns on status output if “Alarm Active” selected.

Board Temp Trip
The output will trip if board temperature exceeds the defined temperature. This allows low priority outputs to be switched off in favour of others while avoiding overheating.

PWR Volts Min Trip
The output will trip if supply voltage drops below the defined voltage for the define duration. This allows low priority outputs to be switched off in favour of others in a low voltage situation.

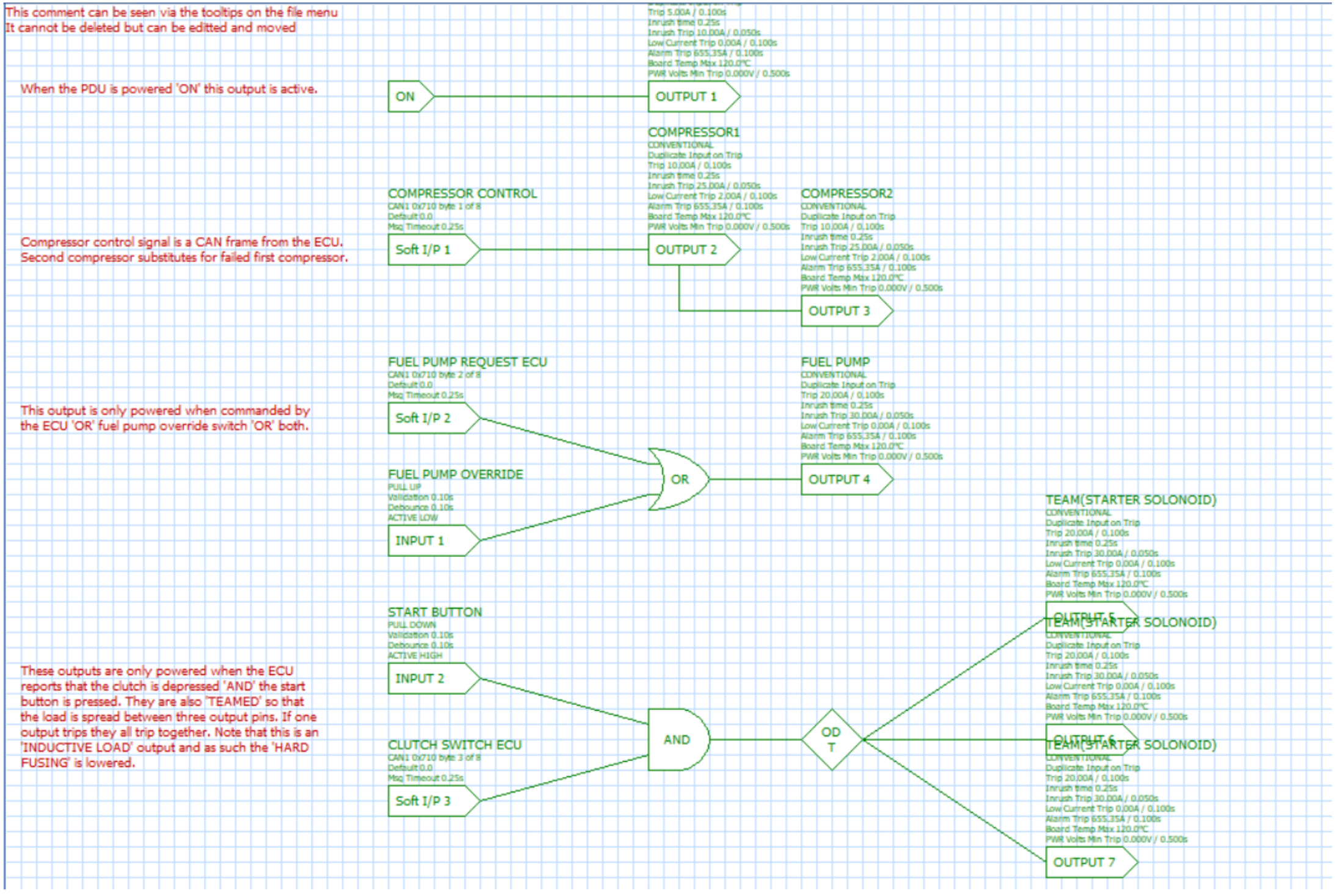
Note
Trips can be manually reset with a 'circuit reset' (activating the RESET component in the calibration or switching the physical reset pin) or with a power cycle. A hard reset can only occur once every two seconds.

5.4 Example Calibration

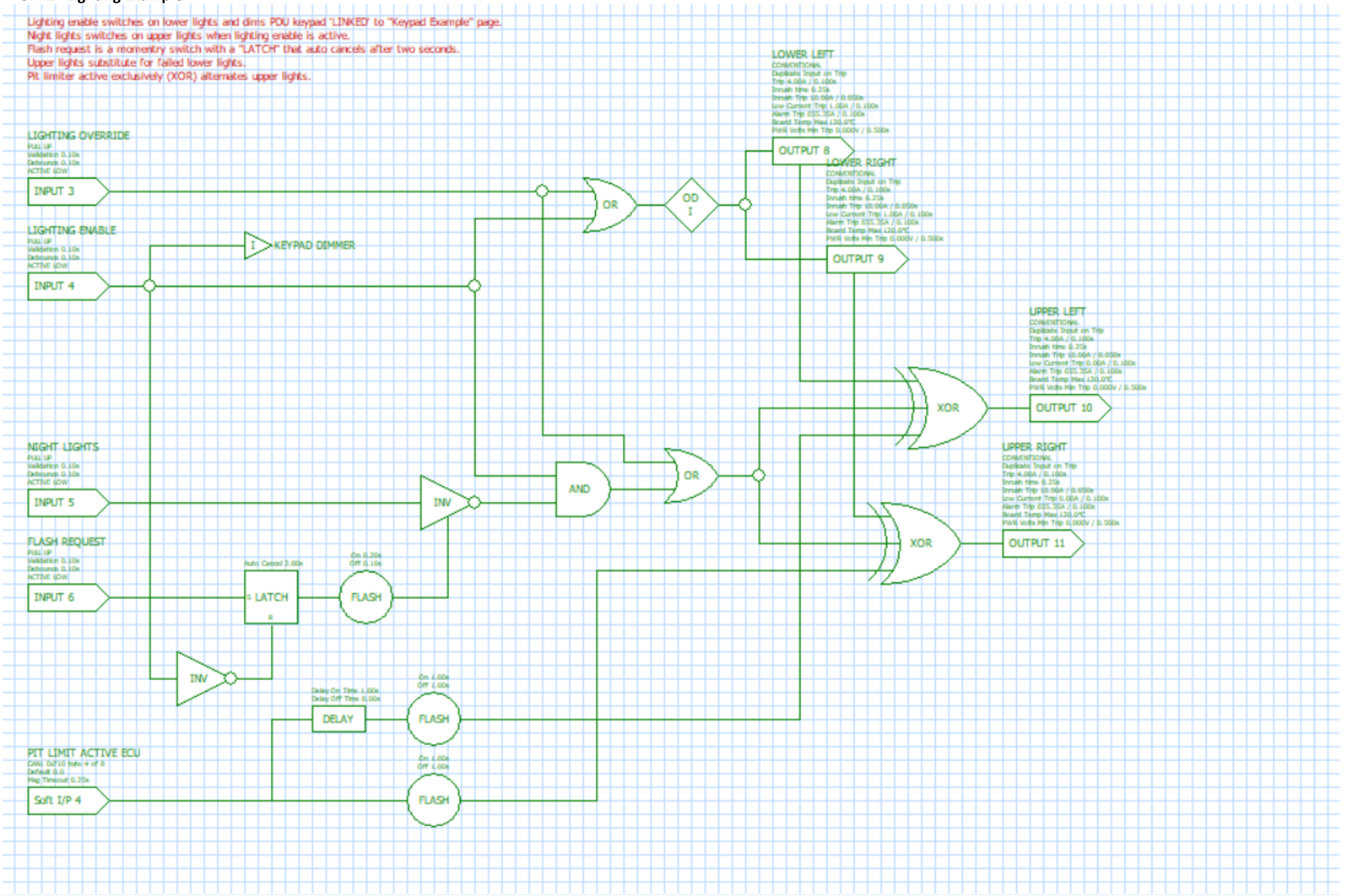
An example calibration is included with the PC installation and includes examples of most components and how they can be used. By default, this file is located in:
C:\Users\Public\Documents\Life Racing\PduxSetup\ExampleCalibration.PDUX

The following pages can be seen in this calibration and simulated to see how they work.

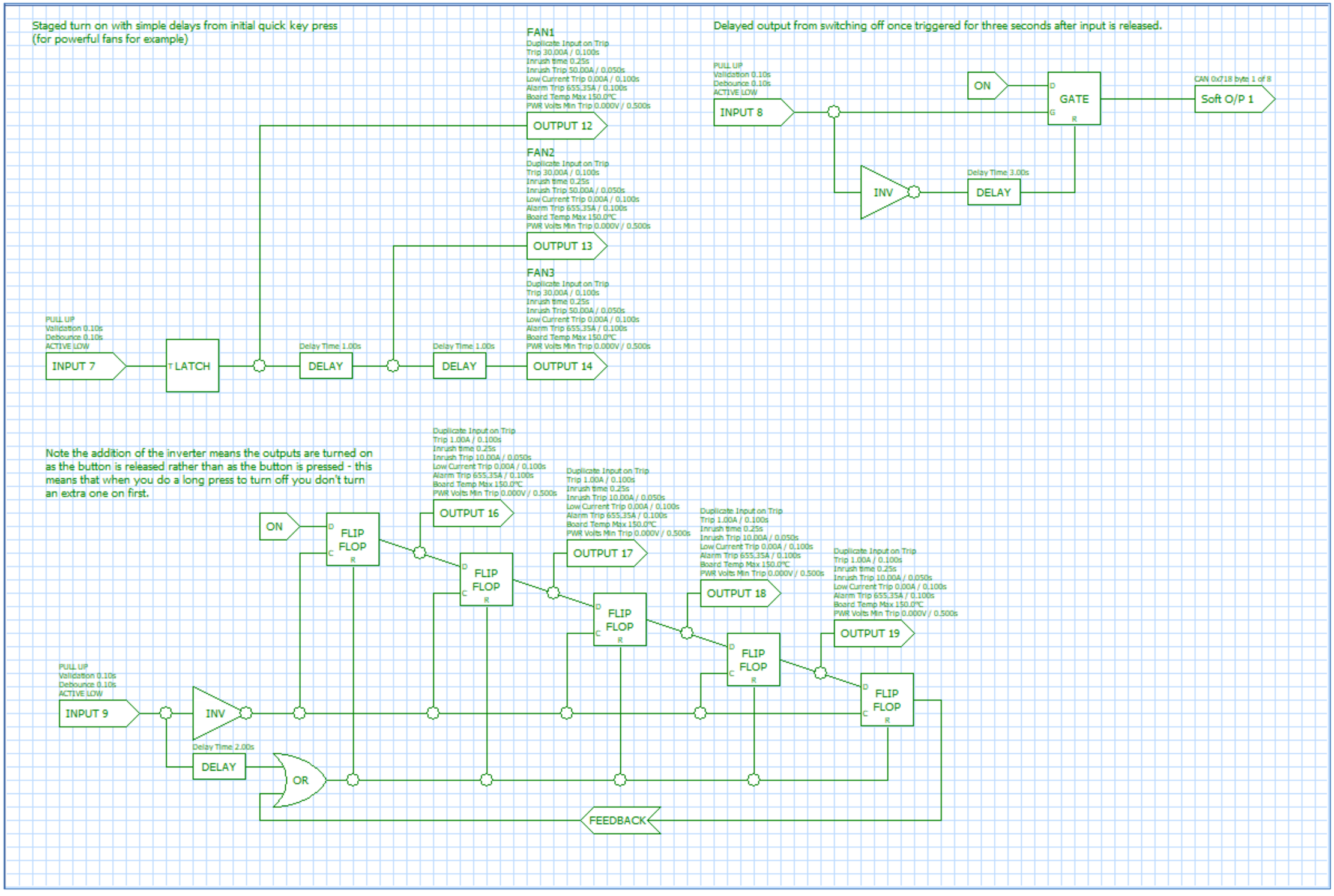
5.4.1 General Example



5.4.2 Lighting Example



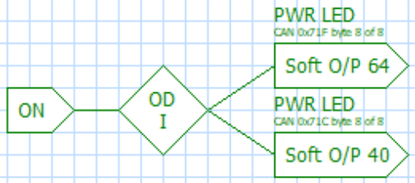
5.4.3 Delay and Feedback Example



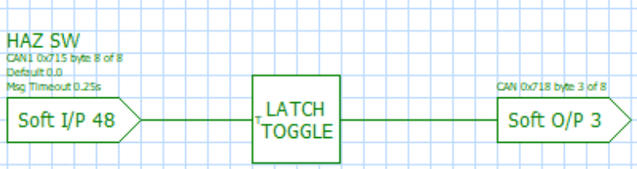
5.4.4 Keypad Example

SPECIAL DEMO CAL SETTING
Note that soft outputs 1..8 are sent out in frame 718h and received straight back in as soft inputs 9..16! This just to show how two DIFFERENT PDUs might talk and will not be allowed in later firmware releases.

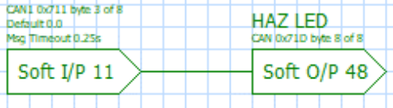
This is how to drive an LED on a keypad.
In this case the power LED at the top, which we want to be always on.



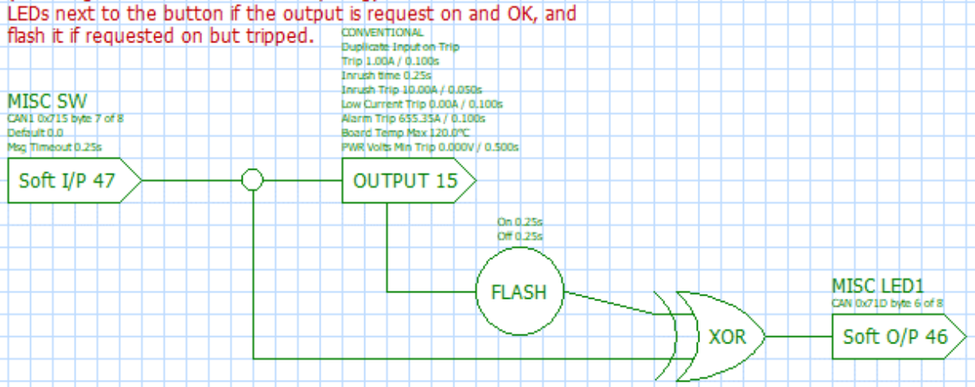
This is how to receive a keypad button from just one keypad.
Here we make it into a toggle switch then drive a soft output which could be a keypad LED or to share the result with another PDU



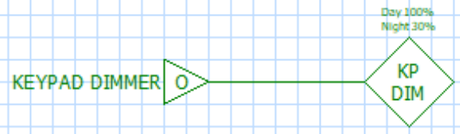
Here we receive that soft output back in (!!!) as a soft input as if it came from another PDU, then send it back out to drive a keypad LED. If you want both keypads to be able to turn the hazards on and also light both LEDs you can toggle and share the switches like this (one PDU managing each keypad) then put an OR in each PDU to drive the appropriate LED on the keypad it is managing.



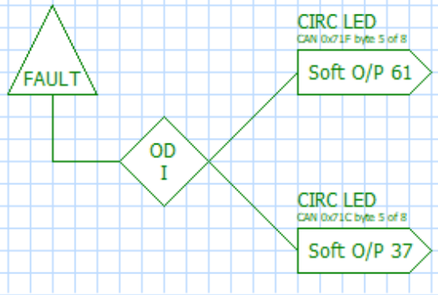
This is a silly circuit to use the misc switch on one of the keypads to turn on a hard output that will deliberately fail due to low current (assuming it is not connected to anything). We turn on one of the LEDs next to the button if the output is request on and OK, and flash it if requested on but tripped.



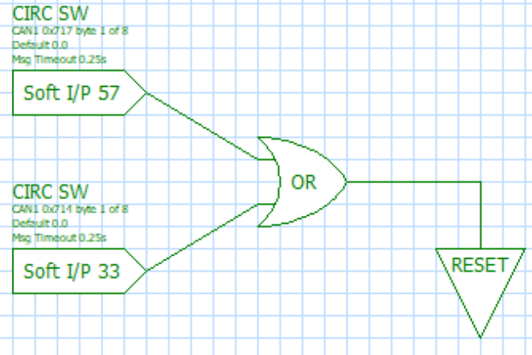
This is how you dim the keypad LEDs. The input here is from the "Lighting Example" page lighting enabled. If you manage one keypad from each PDU then you need one KP DIM in each PDU schematic, probably using soft inputs and outputs to share and agree the overall headlight state between PDUs.



This is how to use the fault component to turn on the circuit reset button LED on both keyads, when both keypads are managed by the same PDU. With two PDUs managing a keypad each you would send the fault states in each to a soft output to send to the other PDU and then use an OR to set the keypad LED when either we are faulted or the other PDU is saying it is.



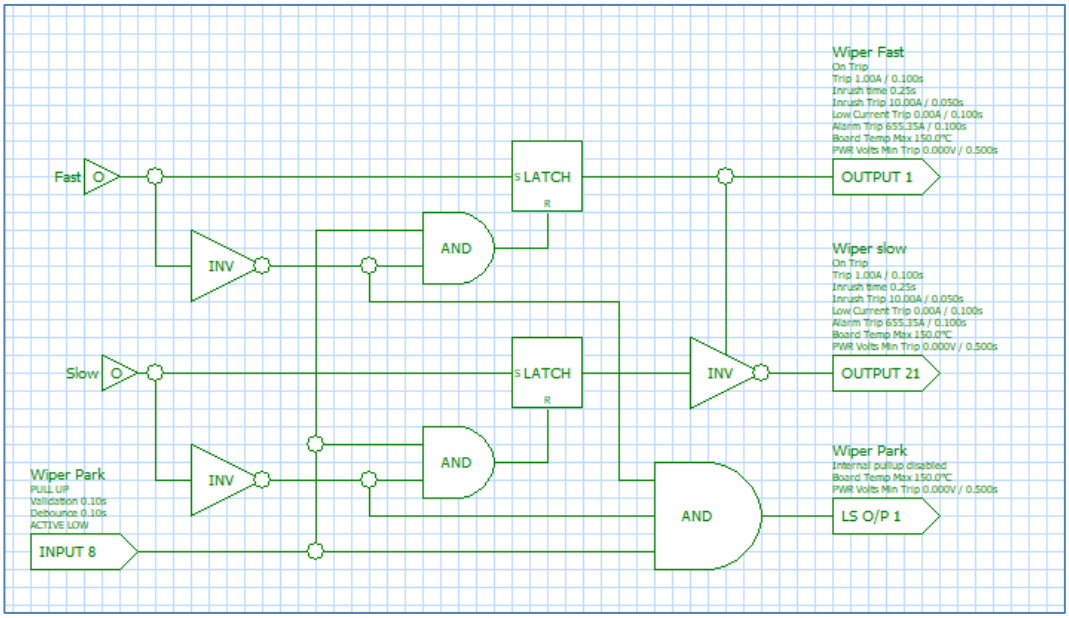
Similar to the fault circuit, this is how to reset the PDU from either keypad switch. Again I would expect this to be replaced by a schematic to share the keypad switches between both PDUs and reset when either one of them is pressed. It might be a good idea to set a big validation time on the circuit switch input component (not done here) so you can't reset with just a quick tap on the switch but have to hold down for a second or two. Note that the PDU has an internal protection so you can only reset once per two seconds. This applies no matter whether the reset request come from the schematic like this, from a reset frame, or from the PDU hard reset input (shorting the fault LED output to ground).



5.5 Additional Examples

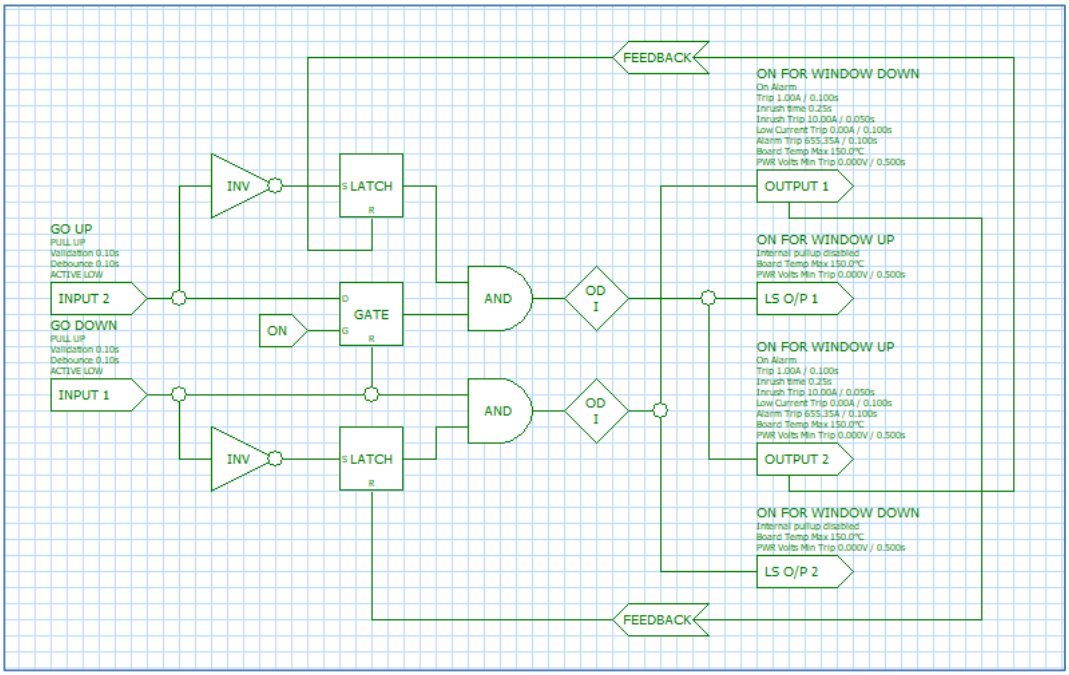
5.5.1 Wiper Control

This example shows how to utilise a 2-speed wiper using the dedicated wiper output of the “x series”. The dedicated wiper output is noted with a “D” in the datasheet pinout as it includes a diode. It should be connected to the slow speed output. The standard output pin should not be connected when this is in use.



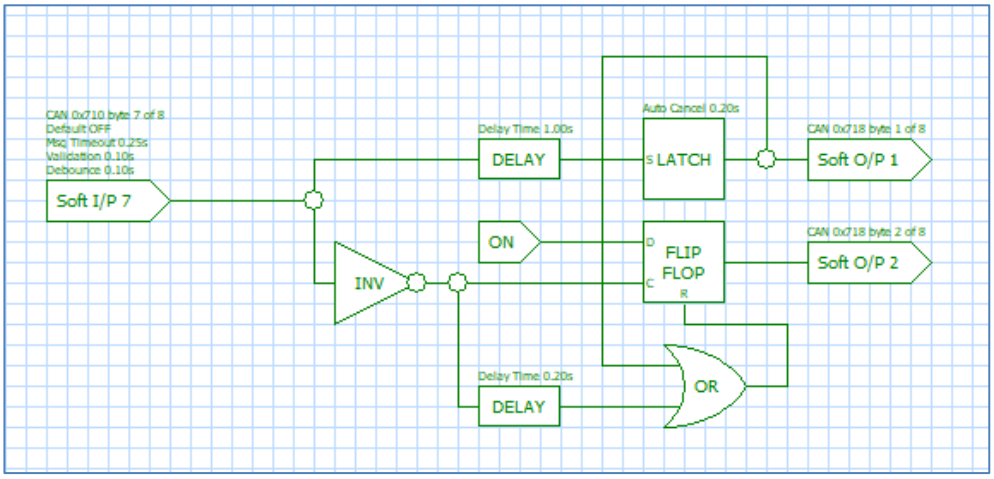
5.5.1 Window Control

This example shows how to use high and low side capable outputs in a full bridge configuration including an auto stop on overcurrent when the window hits an obstacle or the top of is travel.



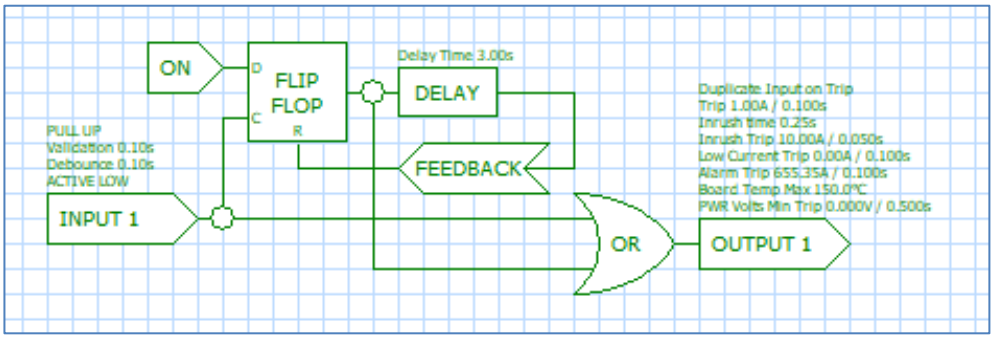
5.5.2 Short/Long Press Input

This example shows how a single output can be used for 2 different functions depending on the duration of the input as defined by the delay time.



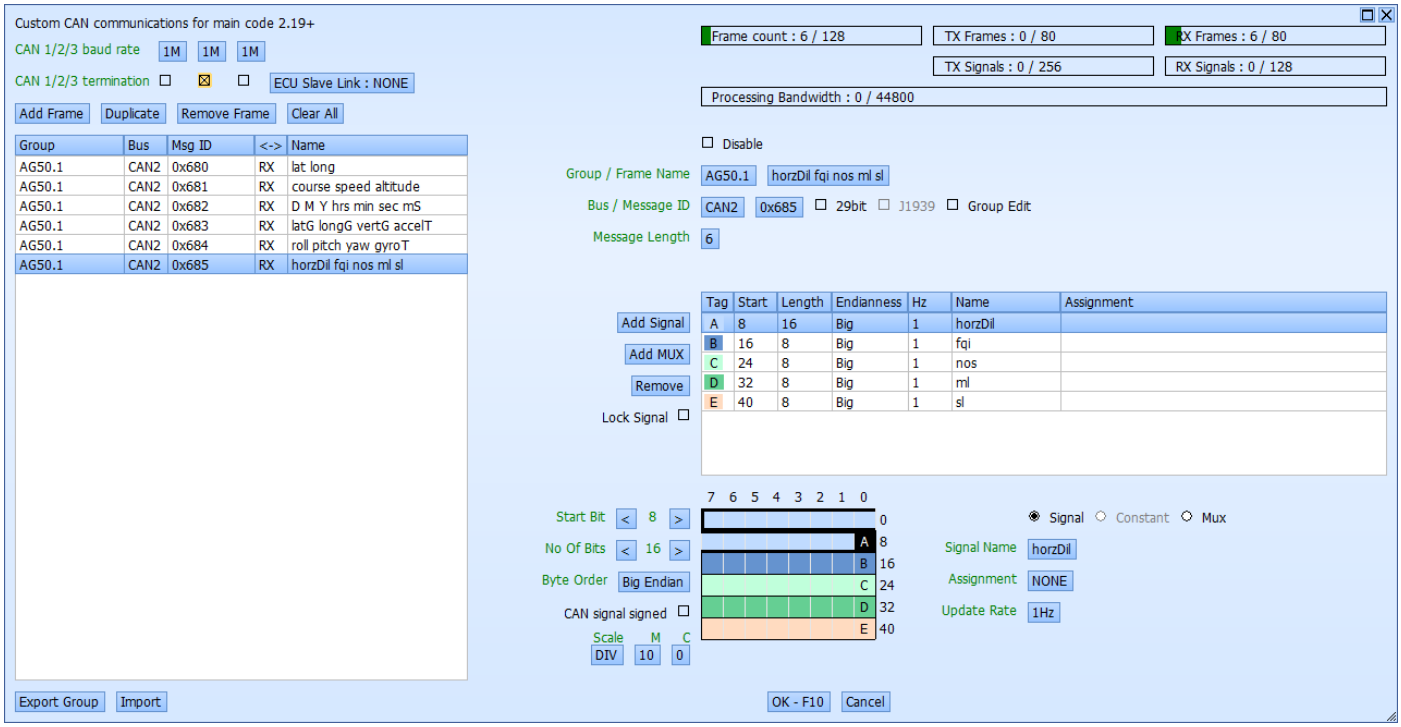
5.5.3 Minimum On Time

This example shows how a flip flop used with a delay can stretch an input to create a minimum on time as defined by the delay value.



6 Custom CAN

Communication settings can be adjusted under *Cal, Custom CAN*. Information regarding the PDUX's current CAN setup can be seen in the top right corner.



CAN 1/2/3 baud rate

Select the baud rate of the respective CAN bus. All devices on a bus must be running at the same speed. Baud rate options are 50K, 100K, 125K, 250K, 500K, 1M.

CAN 1/2/3 termination resistor

Toggles the termination resistor on the respective bus. This should be selected if the device is at the end of the CAN chain on that bus. Else, it should not be toggled.

ECU Slave Link

Toggles ECU slaving on a desired bus. The selected bus must be clear of any defined frames. Only available for Life Racing ECUs only.

Add frame

Basic frame types supported:

- (RX) : receive frame with option for single MUX item
- (TX): Standard Transmit frame that has configurable frequency options.
- (TXT): Triggered frame will only be sent when schematic logic component is used. This can be toggled from a standard TX with a tick box.
- (TXG): Transmitted gate frame will retransmit a received frame to another frame with custom message ID and bus at time of reception.
- (TXC): Transmit copy frame will duplicate either a received or transmitted frame but may define its own transmission rate, address and bus.

Duplicate

Duplicate either the frame or entire group of the highlighted CAN frame

Remove Frame/clear all
Removes the selected frame or clears all from device.

Add Signal
Creates a 1-24 bit signal within the current CAN frame. The length of the signal, along with the start bit, can be adjust either by using the No of Bits/Start Bit adjustment or physically dragging the signal within the frame diagram. Use Byte Order to set the endianness of the signal. The signal can then be assigned to a PDUX device attribute, input or output property by using Assignment.
Update rate defines the rate at which the signal will be updated against values within the PDUX device.
Signed / Unsigned message tick box.
Scaling of CAN messages received using *Scale M and C.* Scaled value can be seen in the schematic on assigned Soft Inputs.

Add Constant
Adds a numerical constant signal to a TX frame. Use Assignment: CONSTANT to set the value. The start bit and length of the constant can be manipulated in the same manner as a TX signal.

Lock Signal
Prevents changes being made to the selected signal.

Export Group
Exports the desired group of CAN frames into a .lrcgg file that can be imported into other Life Racing software.

Import
Import either a .lrcgg group file or import CAN information from a .lrc ECU calibration
Find default data streams between Life Racing products and various keypad options in Downloads | Life Racing

7 Sleep

The PDUX and PDUXB are able to enter a low power “sleep” state. When sleeping, the device cannot execute any schematic logic but is able to start-up very quickly in response to one or more physical or CAN triggers.

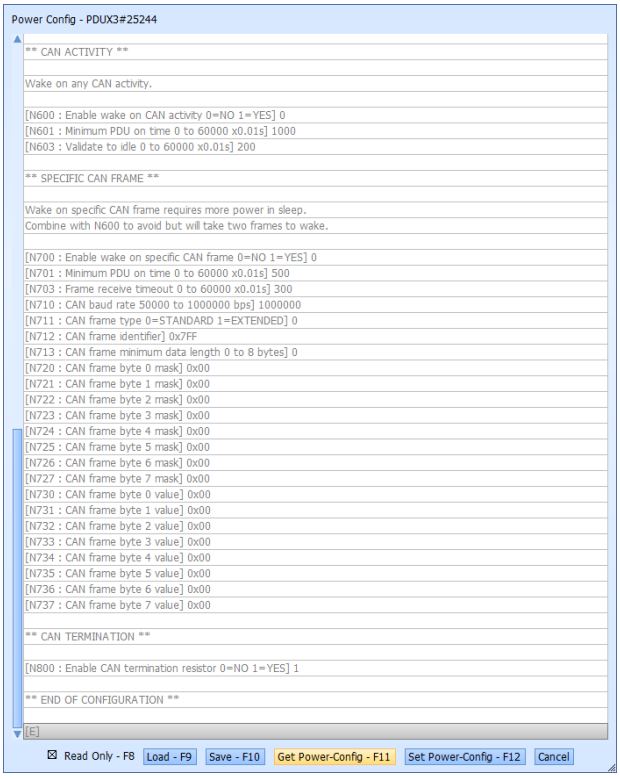
7.1 Power Config

The Power Config file defines the sleep behaviour of the PDU devices as well as the configuration of wake triggers.

Wake trigger options include:

- Dedicated wake pin.
- One of four specific inputs High/Low Side. (LR recommends High-Side)
- Any CAN activity.
- Specific CAN activity and content.

To access the power config, select *Device, Power Config* while not live connected to the device. Note that the power config is not part of the overall logic schematic calibration, it is a standalone .txt file than can be manipulated and loaded into other devices. The *“Save”* and *“Load”* buttons refer to offline configs stored on the PC. The *“Get Power-Config”* and *“Set Power-Config”* buttons refer to the config stored in the connected device.
To edit the sleep config, ensure “read only” is unchecked and type in the text area. Only modify the numbers after the square brackets “[ ]”. The format required is described in the config itself. A comment can be added with “//” followed by the comment however these are only stored offline and will not be retained in the device. This file can also be edited in any text editor such as notepad.



Overall sleep enable	N10	This can be set to 0 to allow the sleep/wake functionality. Otherwise, the PDU will be awake whenever power is available.
Dedicated wake pin	N101	This defines how long the PDU will take to enter sleep after the wake signal have been removed.
	N103	Time required for the OFF input state to be considered valid.
INPUT 13, 14, 15, 16	N200 N300 N400 N500	A non-zero value allows this input to be used for wake/sleep functionality. Setting 1 or 2 makes the pin behaviour wake-on-high or wake-on-low respectively.
	N201 N301 N401 N501	This defines how long the PDU will take to enter sleep after the validated wake signal have been removed.
	N202 N302 N402 N502	Time required for the ON input state to be considered valid.
	N203 N303 N403 N503	Time required for the OFF input state to be considered valid.
CAN activity	N600	Setting 1 will instruct the PDU to wake when any activity is seen on the CAN bus
	N601	This defines how long the PDU will take to enter sleep after the lack of CAN activity has been validated.
	N603	Length of time the CAN bus must be quiet for until the PDU validates the state.
Specific CAN frame	N700	Setting 1 will instruct the PDU to wake when a specific CAN frame is received
	N701	This defines how long the PDU will take to enter sleep after the lack of specific CAN activity has been validated.
	N703	The time taken to validate the absence of the specified frame
	N710	Defines the CAN bus baud rate
	N711	Defines whether the wake CAN frame is a standard or extended frame
	N712	Sets the expected frame identifier
	N713	Sets the minimum acceptable data length
	N720-N727	Used to set the mask for bytes 0-7 respectively
	N728-N737	Defines the expected value of byte 0-7 respectively
CAN termination	N800	Used to toggle the CAN bus termination resistor

It's important to note that if inputs 13, 14, 15, or 16 are configured to wake when pin level is HIGH, they MUST be switched up to a suitable, constant 12V source whilst being pulled to ground via a resistor.

In addition, if inputs 13, 14, 15, or 16 are configured to wake when pin level is LOW, the input MUST be pulled up to a constant 12V supply via a resistor to maintain the HIGH state whilst it isn't being switched to ground. (This will result to slightly higher power consumption in sleep mode, dependent on resistance values. 10k / 0.6W resistor is advised.)

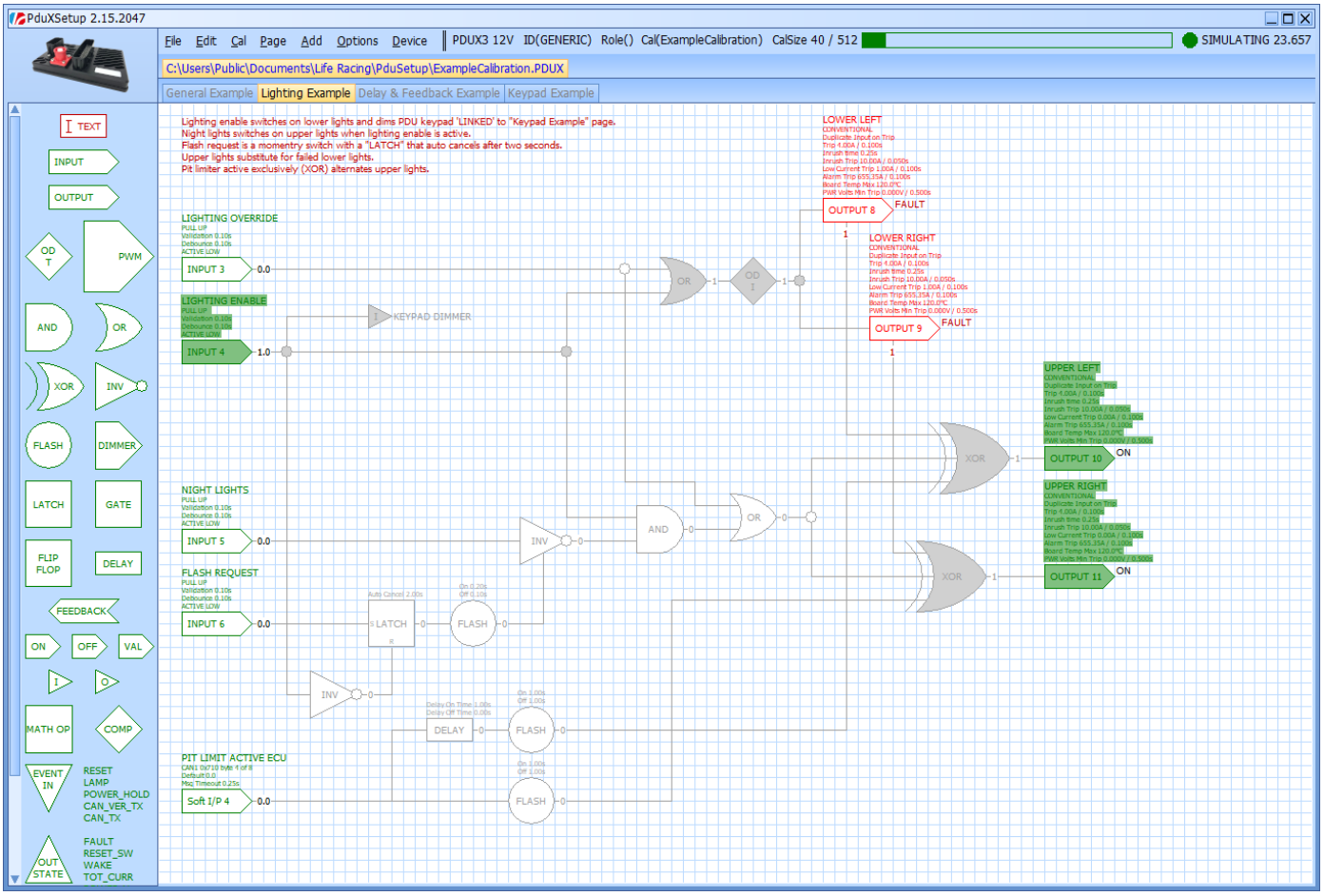
7.2 Sleep Components

Two EVENT components allow sleep functions to be integrated into the schematic. The Wake component will reflect the state of the dedicated wake pin of the PDU. The PWR HLD component will hold the PDU awake while active, allowing for a controlled shutdown of vehicle systems.

8 Tools

8.1 Simulation

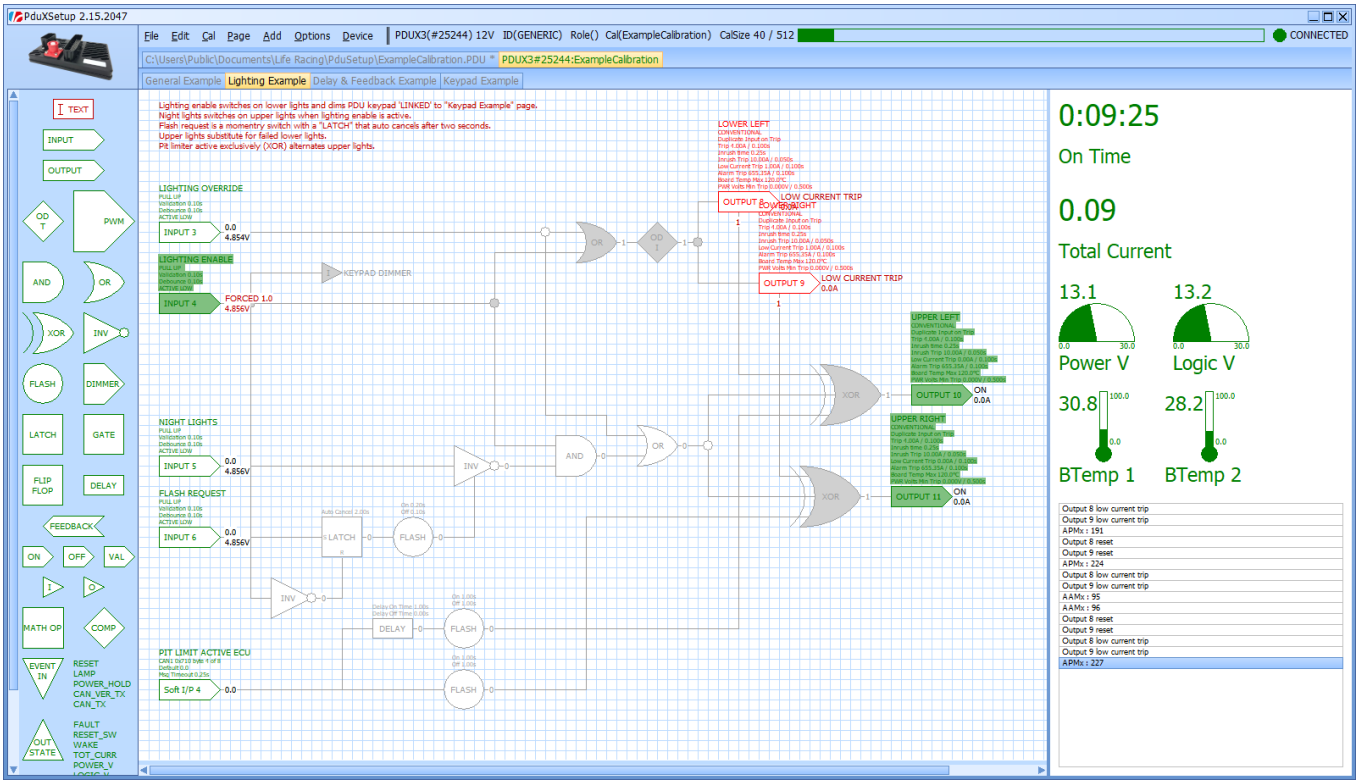
A complete or partial calibration can be simulated to test that the calibration is behaving as intended. All input nodes must be assigned before simulation but output nodes can remain free. Simulation includes the state of all internal components so each step can be monitored. Toggle simulation mode by selecting *Cal, Start/Stop Simulation*. The connection status should be flashing green and display 'SIMULATING'. In this mode, components will all become locked so they cannot be moved or edited. Inputs can be toggled on and off by selecting them. Selecting an output will simulate a fault if enabled. Components will be shaded when active. Faults are displayed in red.



8.2 Monitor

Select *Device, Connect* to connect to a PDU. This will automatically retrieve the calibration stored and begin monitoring all inputs and outputs as well as supply voltage, board temperature and general messages displayed to the right of the main display. The contents of the message box can be saved to a text file in the working director by selecting *Device, eXport messages*.

The message box can be cleared by selecting *Device, clear Messages*.



In this mode, components will become locked so they cannot be moved or edited. Input and output states as well as internal logic can be monitored. Inputs and outputs can be forced into on or off states by right clicking to bring up the options. Selecting automatic will revert the component to display real time states.

To stop monitoring and enable editing select *Device, Disconnect*.

8.3 I/O summary

Go to *Cal, IO Summary* to open a window containing a table for all soft inputs, hard inputs, soft outputs and hard outputs. Each defined IO channel will be displayed along with all relevant information. Use Find F5 to search the summary for a desired channel. CSV Export F11 will export the entire IO summary into a CSV file for further analysis. Use Goto F12 to go to the highlighted channel within the logic schematic.

8.4 Options

These general options are found under the *Options* menu.

Enable/Disable Grab and drag
Toggle between the ability to drag the screen using the mouse and the ability to select multiple components using the mouse.

Enable/Disable Auto Offline
With auto offline active, if a device has been disconnected for more than 5 seconds PduXSetup will revert to Offline mode and will require a manual *Device, Connect* to re-establish a connection or begin a new connection with a different device. If deactivated, it will continue to search for the same device only and automatically reconnect if available.

8.5 Global Options

Global options affect all applications and can be found under *File, Global Options*.

Black-on-White colour scheme
Toggle the colour scheme of all Life Racing applications between a white background and a black background. The best option will be dependent on-screen quality, ambient lighting and user preference.

Colour Blind (yellow/green)
Changes fixed yellows to purple to aid with yellow/green confusion.

Reverse Folder Order (in file menu)
Folders are ordered alphabetically in the file menu. Tick this box to reverse this order.

Floating Mouse Focus (in dialogs)
Causes whatever the mouse pointer is hovering over to be highlighted as if it was selected with the keyboard.

9 LIN OEM functionality

The PDUXB devices contain some pre-programmed support for Bosch WDA wiper units and Pierburg CWA400 water pumps. These can be accessed by using the EVENT_IN and OUT_STATE schematic logic components and selecting the desired OEM function number. OEM functions are as follows:

Bosch WDA wiper		
EVENT_IN	OEM1	INT (intermittent operation request)
	OEM2	S1 (speed 1 operation request)
	OEM3	S2 (speed 2 operation request)
	OEM4	SST (single stroke operation request)
	OEM5	IM (intermittent interval; set to 1/5/9/13)

Pierburg CWA400 water pump		
EVENT_IN	OEM8	SIG_CWA_CTRL_SETSPEED (set speed 0-255)
	OEM7	SIG_CWA_CTRL_OVSH (post-run request 0-7)
OUT_STATE	OEM6	SIG_CWA_ST_CURRENT (current in A)
	OEM7	SIG_CWA_ST_TEMP (temperature in degC)
	OEM8	SIG_CWA_ST_CURRSPEED (current actual speed 0-255)

10 Document Revision History

2023-07-19	AA/TV V1.1	Written in new format on PduXSetup v2.15.2047<
2024-04-22	TV V1.2	Updated details on Output Soft Starting and Wake capabilities
2024-05-30	TV V1.3	Addition of LIN OEM functionality