

6 Repton Close | Basildon
Essex | SS13 1LE | United Kingdom
+44 (0) 1268 904124
info@liferacing.com
www.liferacing.com

PDU 2.20.x

Feature Description

Document revision:
V1.1

Document Release Date:
2022-10-17

Document Author:
A.A.

Overview

PduXSetup is a large rework of the PDU configuration tool. The headline changes include:

- Support for real numbers (floating point) in schematic
- New components that can manipulate and compare real numbers
- New INPUT properties including linearisation
- New OUTPUT properties including direct control of PWM
- Custom CAN configuration
- Variable frequency schematics

Latest release updates (2.15 - rel19):

IO Summary...

PduXSetup can now present a summarised IO configuration. The IO summary indicates Input/Output Name, Type, Page and further important details. All these can be exported as a .CSV file and located in the calibration using Goto "Selected Item" function.

IO Summary

SOFT INPUTS

	Name	Page	CAN	Default	Msg	Timeout
Soft I/P 1	Indicator Left	MAIN	CAN1 MSG(0x100) SIGNAL(40,8)	0.0		0.25s

SOFT OUTPUTS

	Name	Page	CAN
Soft O/P 1	LED Indicator	MAIN	CAN1 MSG(0x110) SIGNAL(56,8)

HARD INPUTS

	Name	Page	Pull	Analogue	High Threshold	Low Threshold	Validation	Debounce	Active
Input 1	FAN	MAIN	DOWN	YES	4.0V	1.0V	0.10s	0.10s	HIGH

HARD OUTPUTS

	Name	Page	PWM	Turn-ON Mode	LS Pullup	Status Output	Main Trip / time	Inrush time	Inrush trip	Soft start time	Soft start current / ramp	Low Current Trip	Alarm Trip	Board Temp Max	PWR Volts Min Trip
Output 1	FAN	MAIN	NO	SOFT START (Inductive)		N/A	40.00A / 0.100s			1.00s	25.00A / 0.100s	0.00A / 0.100s	655.35A / 0.100s	120.0°C	0.000V / 0.500s

Find - F5

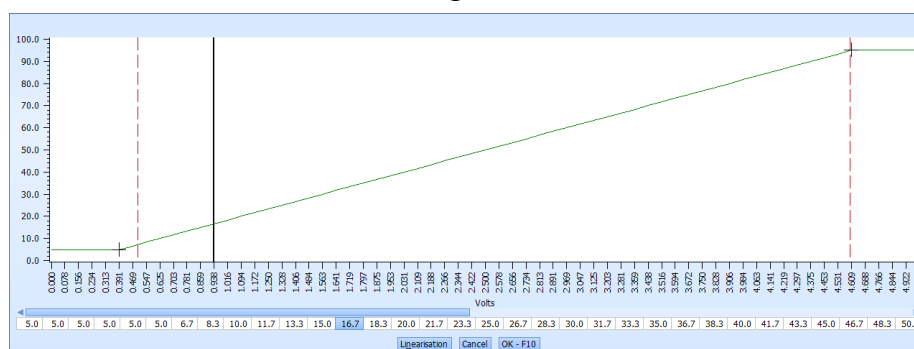
Close - F10

CSV Export - F11

Goto "Output 1" - F12

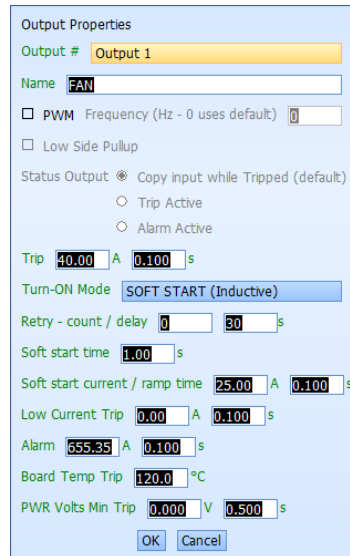
Input Linearisation...

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.



Output PWM and Turn-On Mode...

Output Properties dialog box has been updated providing a PWM operation and Frequency configuration. “Inductive Load” and “soft start” check boxes are replaced by “Turn-On Mode” drop down menu. Short description and examples is available when hovering over the options of Turn-ON Mode drop down menu. (See datasheets for specific OUTPUTS capable of PWM and SOFT START)



Output Properties

Output # **Output 1**

Name **FAN**

☐ PWM Frequency (Hz - 0 uses default) **0**

☐ Low Side Pullup

Status Output ☒ Copy input while Tripped (default)

☐ Trip Active

☐ Alarm Active

Trip **40.00** A **0.100** s

Turn-ON Mode **SOFT START (Inductive)**

Retry - count / delay **0** **30** s

Soft start time **1.00** s

Soft start current / ramp time **25.00** A **0.100** s

Low Current Trip **0.00** A **0.100** s

Alarm **555.35** A **0.100** s

Board Temp Trip **120.0** °C

PWR Volts Min Trip **0.000** V **0.500** s

OK **Cancel**

CONVENTIONAL

SOFT START (Inductive)

SOFT START (Capacitive)

Simulation reset...

Simulation Reset has been added when running in Simulation mode. This new feature is used to simulate a power cycle.

P	Pause Simulation
R	Run Simulation
S	Stop Simulation
Z	Reset Simulation

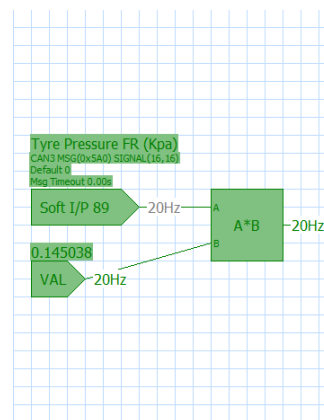
Page ordering...

Pages within a calibration can be re-ordered by dragging the page TAB with left mouse button down. Page moves can be undone via menu Edit\Undo or Ctrl-Z.

‘Expert Frequency Mode’...

Before PDU 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 budget but “Expert Frequency Mode” allows the user to choose where to spend that budget

1	PDUX3:ass *
C	Legacy Communications
K	Custom CAN
Z	IO Summary
P	PassPhrase
H	Hard Fuse Current
S	Start Simulation
T	Change Type
O	Change Operating Voltage
I	Change Identity
V	Validate
R	Revert
X	Enable eXpert frequency mode
F	Enable PDU10 FaultPin



Latch component...

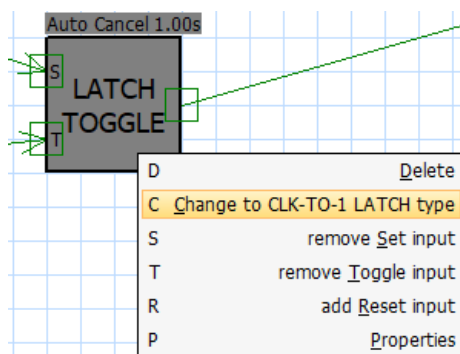
There are now 2 versions of the LATCH component. They behave in the same way apart from where the toggle (or clock) input is concerned.

TOGGLE-LATCH

The existing LATCH is renamed to a TOGGLE-LATCH if it has a toggle input. The functionality of the LATCH has been modified very slightly with respect to the toggle input. If at start-up there is a 1 (true) on the toggle input, it is not seen as a positive edge and ignored. This new behaviour is implemented in PDU main code 2.19.12.

CLK-TO-1-LATCH

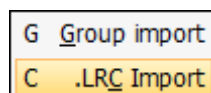
The new latch is named CLK-TO-1-LATCH if it has a clock input. This clock input is in the same position as the toggle input on the TOGGLE-LATCH. The new LATCH will output a 1 (true) on a positive edge on the clock input. In all other respects it acts in the same way as the existing LATCH. PDU main code 2.19.12 is also required for this new LATCH functionality.



Custom CAN

Custom CAN, also found in the Cal menu, allows high levels of complexity to be configured. As this complexity can quickly stack up, there are limits on both computation and transmission. These are displayed in the top right corner including a visual representation of how much is in use.

.LRC CAN setup can now be imported in custom CAN directly from a LifeCal Calibration through Import/.LRC Import.



Individual bus speed and termination can be selected in the top left. Individual frames can be added, duplicated and removed from the relevant buttons with the option of “grouping” frames together, typically per device. This allows easier management and the ability to export and import between calibrations.

When the “Group Edit” box is checked, any changes to the bus or message ID will affect the group as a whole, moving all frames to the same bus or shifting the frame addresses by the same amount. Coupled with the duplicate group ability, this makes adding multiples of the same device (such as multiple keypads) fast and simple.

Custom CAN c'tnd...

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.

Custom CAN communications for main code 2.19+

CAN 1/2/3 baud rate

CAN 1/2/3 termination ☒ ☐ ☐

Add Frame Duplicate Remove Frame Clear All

Group	Bus	Msg ID	<->	Name
V3 Datastream.1	1	0x700	TX	Base+00
V3 Datastream.1	1	0x701	TX	Base+01
V3 Datastream.1	1	0x702	TX	Base+02
V3 Datastream.1	1	0x704	TX	Base+04
V3 Datastream.1	1	0x706	TX	Base+06
V3 Datastream.1	1	0x708	TX	Base+08
V3 Datastream.1	1	0x709	TX	Base+09
V3 Datastream.1	1	0x70C	TX	Base+12
V3 Datastream.1	1	0x70D	TX	Base+13
V3 Datastream.1	1	0x70E	TX	Base+14
V3 Datastream.1	1	0x70F	TX	Base+15
V3 Datastream.1	1	0x710	TX	Base+16
V3 Datastream.1	1	0x711	TX	Base+17
V3 Datastream.1	1	0x712	TX	Base+18
V3 Datastream.1	1	0x713	TX	Base+19
V3 Datastream.1	1	0x714	TX	Base+20
V3 Datastream.1	1	0x715	TX	Base+21
V3 Datastream.1	1	0x716	TX	Base+22
V3 Datastream.1	1	0x717	TX	Base+23
V3 Datastream.1	1	0x718	TX	Base+24
V3 Datastream.1	1	0x719	TX	Base+25
V3 Datastream.1	1	0x71A	TX	Base+26
V3 Datastream.1	1	0x71B	TX	Base+27
V3 Datastream.1	1	0x71E	TX	Base+30
V3 Datastream.1	1	0x71F	TX	Base+31
V3 Datastream.1	1	0x730	TX	Base+48
V3 Datastream.1	1	0x731	TX	Base+49

Export Group Import Group

Frame count : 28 / 128 TX Frames : 28 / 80 RX Frames : 0 / 80

TX Signals : 175 / 256 RX Signals : 0 / 128

Processing Bandwidth : 1007 / 44800

☐ Disable

Group / Frame Name V3 Datastream.1 Base+00 ☐ Transmit Triggered

Bus / Message ID 1 0x700 ☐ 29bit ☐ J1939 ☐ Group Edit

Message Length 8

Initial Skipped frames / TX Freq 0 5Hz

Tag	Start	Length	Endianness	Hz	Name	Assignment
A	8	16	Big	5	bt1	Board Temperature 1
B	24	16	Big	5	bt2	Board Temperature 2
C	40	16	Big	5	powerV	Power Supply Volts
D	56	16	Big	5	logicV	Logic Supply Volts

Add Signal Add Constant Remove Lock Signal ☐

Start Bit < 8 >

No Of Bits < 16 >

Byte Order Big Endian

CAN signal signed ☒

Scale MUL 10 0

Signal Name bt1

Assignment Board Temperature 1

Update Rate 5Hz

OK - F10 Cancel

Once signals are added to a frame, they may be assigned to a component or monitoring value. For soft inputs and outputs, once the first signal is assigned, the rest will preselect the next available soft input or output from the list. The signal name will be copied to the input/output component in the schematic. Any assigned signal must have its corresponding component in the schematic but signals may be left as unassigned if they are not yet needed.

A completed frames content will be locked to "read only" to avoid any accidental changes. To edit an existing frame simply uncheck the "lock signal" box.

Please note Devices with firmware prior to 2.19.X cannot be programmed using PduXSetup. However, 'legacy' .pdu files relating to devices with firmware up to and including 2.18.X can be loaded and viewed using PduXSetUp. The legacy CAN dialogue has been retained for this functionality, and should not be used to modify CAN settings in any way.

Legacy Communications for 2.17 and 2.18 main code

☐ Mil CAN

Mil CAN Source Address

Mil CAN Tx Priority

Serial Baud Rate

CAN 1/2/3 Baud Rate

CAN 1/2/3 termination ☐ ☐ ☐

DataStream TX Rate (pre 2.17) Hz

Currents TX Rate (pre 2.17) Hz

☐ 29bit CAN IDs

☒ 0.2A CAN Resolution ☒ 0.02V ANxV CAN Resolution

Soft I/P Base (pre V2.9)

DataStream Base id Datastream Version

Fault Reset id

☐ Grayhill Switch Panels

☐ Switch Panel 1 ☐ Switch Panel 2

V1 CAN Datastream configuration

base+0 : input pre/post states	<input type="text" value="2Hz"/>	<input type="text" value="CAN#1"/>
base+1 : output state 1..8	<input type="text" value="10Hz"/>	<input type="text" value="CAN#1"/>
base+2 : output state 9..16	<input type="text" value="10Hz"/>	<input type="text" value="CAN#1"/>
base+3 : output state 17..24	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+4 : output state 25..32	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+5 : output current 1..8	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+6 : output current 9..16	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+7 : output current 17..24	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+8 : output current 25..32	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+9 : temperature and voltage	<input type="text" value="2Hz"/>	<input type="text" value="CAN#1"/>
base+10 : total current	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+11 : output state and current 33..36	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+12 : output state and current 37..40	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+13 : output state and current 41..44	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>
base+14 : output state and current 45..48	<input type="text" value="5Hz"/>	<input type="text" value="CAN#1"/>

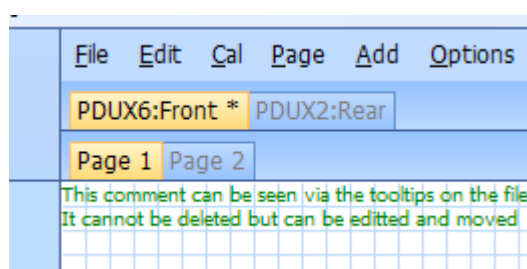
Legacy CAN c'tnd...

Soft Input/Output configuration

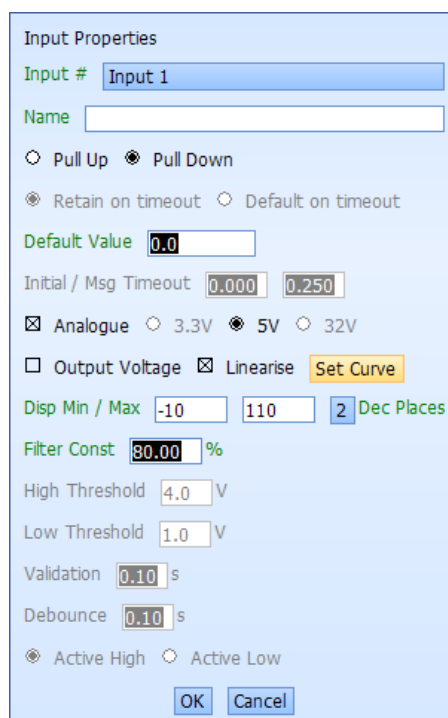
#1-8 I/P	<input type="text" value="710"/>	<input type="text" value="CAN#1"/>	#65-72 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#1-8 O/P	<input type="text" value="718"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>
#9-16 I/P	<input type="text" value="711"/>	<input type="text" value="CAN#1"/>	#73-80 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#9-16 O/P	<input type="text" value="719"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>
#17-24 I/P	<input type="text" value="712"/>	<input type="text" value="CAN#1"/>	#81-88 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#17-24 O/P	<input type="text" value="71A"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>
#25-32 I/P	<input type="text" value="713"/>	<input type="text" value="CAN#1"/>	#89-96 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#25-32 O/P	<input type="text" value="71B"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>
#33-40 I/P	<input type="text" value="714"/>	<input type="text" value="CAN#1"/>	#97-104 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#33-40 O/P	<input type="text" value="71C"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>
#41-48 I/P	<input type="text" value="715"/>	<input type="text" value="CAN#1"/>	#105-112 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#41-48 O/P	<input type="text" value="71D"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>
#49-56 I/P	<input type="text" value="716"/>	<input type="text" value="CAN#1"/>	#113-120 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#49-56 O/P	<input type="text" value="71E"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>
#57-64 I/P	<input type="text" value="717"/>	<input type="text" value="CAN#1"/>	#121-128 I/P	<input type="text" value="000"/>	<input type="text" value="CAN#1"/>	#57-64 O/P	<input type="text" value="71F"/>	<input type="text" value="1Hz"/>	<input type="text" value="CAN#1"/>

Earlier release notes (2.15 - rel17) still applicable :

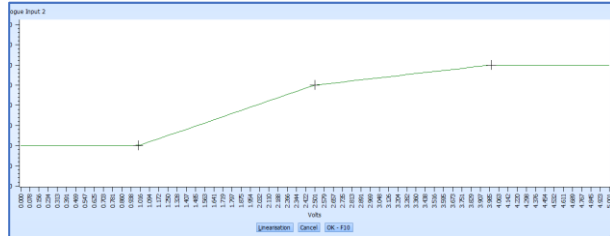
PduXSetup can now support loading multiple calibrations or connecting to multiple devices simultaneously that can be switched between using tabs. Each tab will be labelled with the device type, calibration name and file path. If the calibration has not yet been saved then the device “role”, defined when selecting “new”, will be used. An asterisk marks when a calibration has been edited from the version on file.



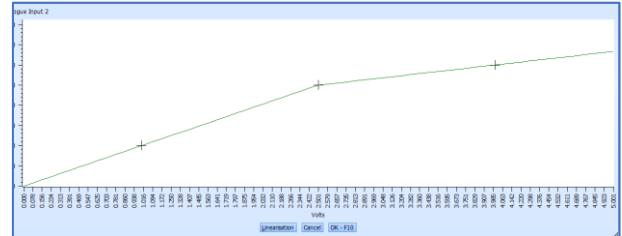
Inputs can be used as before as simple Boolean switches or even as analogue switches with voltage thresholds but may also now feed the raw voltage or a linearised value into the schematic with the relevant check boxes. To linearise a sensor, set the minimum and maximum unit values (this defines the Y-axis) then select “Set Curve”. Add “hint points” of voltage against value under the linearisation menu, choose the type of linearisation and select **Apply Hints**. Voltage thresholds can be applied that will cause the input to adopt its default value when exceeded. These are displayed as red vertical lines.



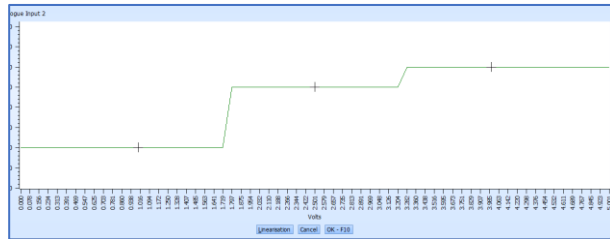
INTERPOLATE



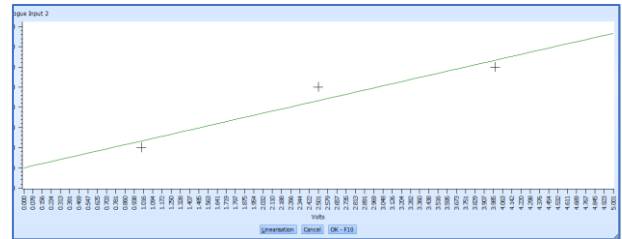
EXTRAPOLATE



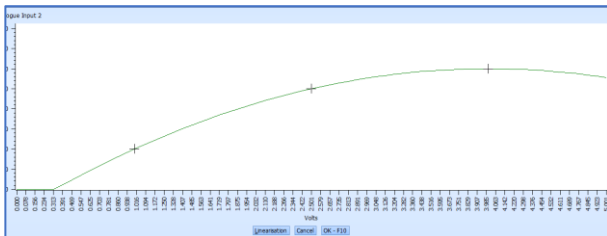
GEAR



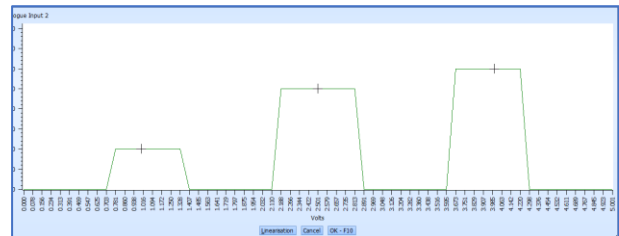
LINEFIT



CURVEFIT



KEYPAD



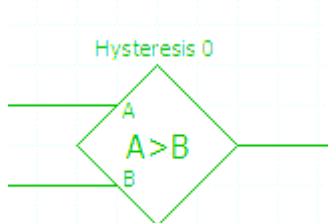
As well as forcing input and output states, it is now also possible to force a value in both simulation and **when live connected**. Components with output values other than zero or one will be coloured blue.

Several new components have been added to take advantage of the new decimal system. These include Maths Op, Comparator and Value. Both the comparator and the Maths Op components have multiple types which are described below.

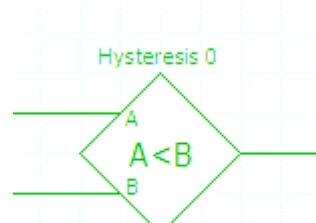
Value – A fixed number that can be used as an input to another component such as a comparator.



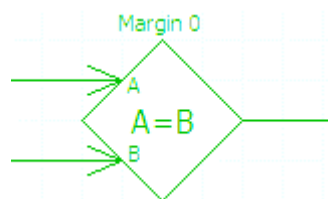
Comparators – Compare 2 inputs and output TRUE (1) or FALSE (0) depending on the type



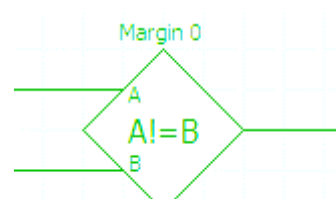
Is A more than B with optional hysteresis



Is A less than B with optional hysteresis

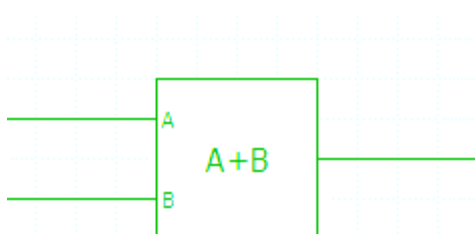


Is A equal to B with optional hysteresis

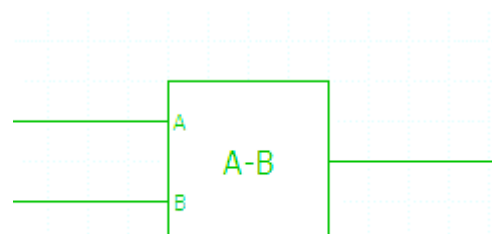


Is A not equal to B with optional hysteresis

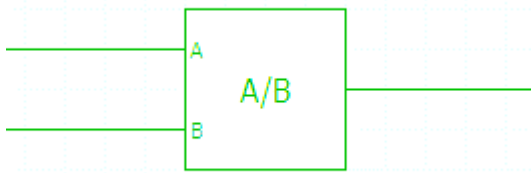
MathOp – Mathematical operation, depending on the type, applied to two inputs



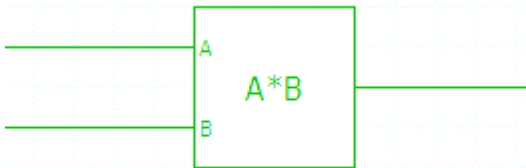
The value of A plus the value of B



The value of A minus the value of B



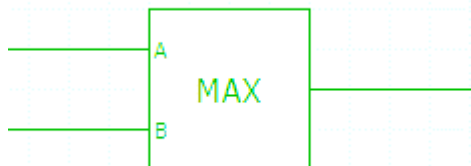
The value of A divided by the value of B



The value of A multiplied by the value of B



The lowest value of A and B



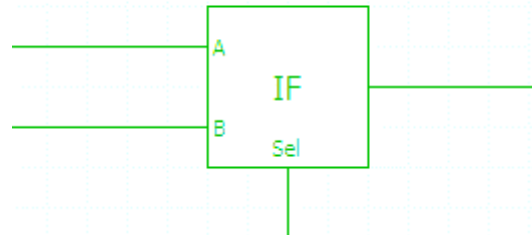
The highest value of A and B



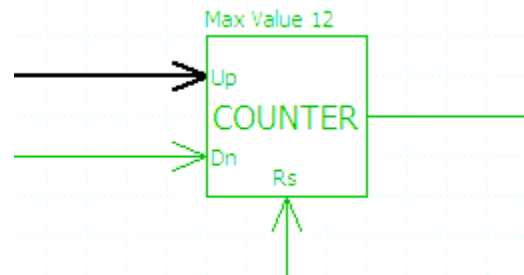
An “off time” has been added to the delay allowing it to also be used as a timed latch.



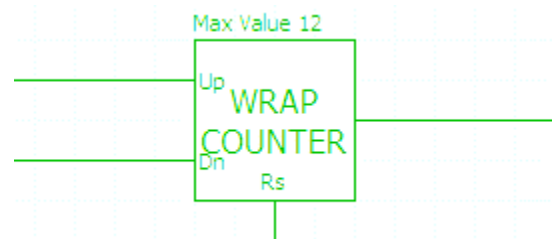
The absolute value of the input (makes negative numbers positive while leaving positive values alone)



An IF statement – If “Sel” is true (not zero) then output value of A else output value of B.

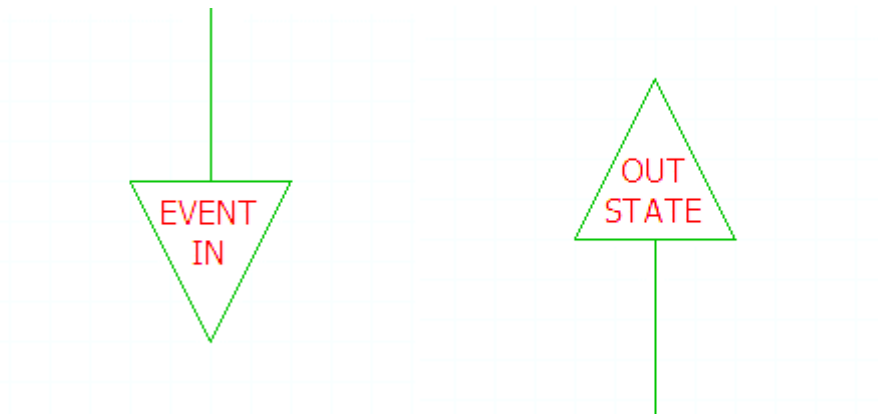


A counter that will increase the output by 1 on every rising edge of the “Up” input (up to the configurable maximum value) and decrease the output by 1 on every rising edge of the “Dn” input (down to zero). Reset to zero on the rising edge of the “Rs” input.



An alternative counter that works in the same way but rather than stay at the maximum value, another “Up” would wrap the counter back around to zero.

There are now just 2 event components (In and Out) which can have their type selected rather than having multiple fixed type events.



The EVENT IN component expects an input that will trigger a selected action. These actions include:

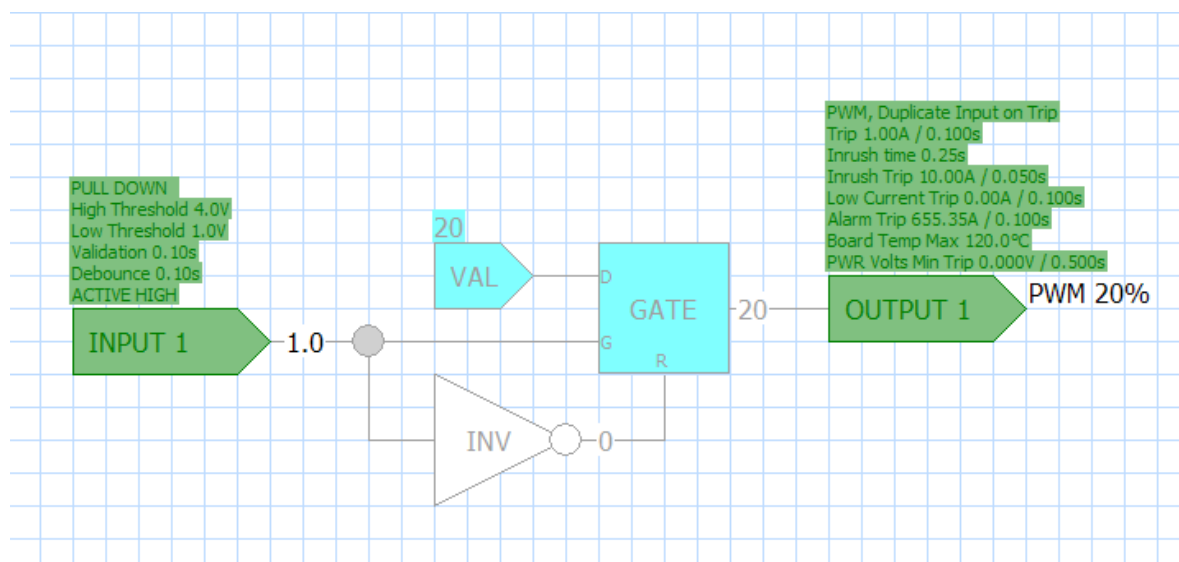
- RESET to reset all fused outputs
- LAMP to activate the fault pin (normally automatic with any trip)
- POWER HOLD to keep the pdu out of sleep state
- CAN_TX to trigger transmission of a specific CAN frame
- CAN_VER_TX is only used with a V3 DataStream to send the device information frames when needed rather than at a fixed frequency.

The STATE OUT component will output the selected value of internally monitored items such as:

- FAULT – whether or not an output has been tripped
- RESET_SW – the state of the reset input pin
- WAKE – the status of the wake pin
- TOT_CURR – total measured current
- POWER_V – the measured voltage on the power stud
- LOGIC_V – the measure voltage on the logic pin
- BT – the maximum measure board temperature
- CAN-RX – notification of CAN frame reception
- QTY – any other internally monitored item

Obsolete components

The PWM component is now redundant. Instead, a numerical value between 0 and 100 can be fed into an output which will translate into a duty percentage(see example). Note that for now PWM frequency is fixed at 20kHz on the flexible outputs and 125kHz on the fixed low side outputs. The PWM component is still available for compatibility with existing calibrations.



The KP DIM component is now redundant. Instead, values can be fed into numerous if functions providing many settings of brightness. The message can then be transmitted via CAN to the keypad used (see example).

