



PG5 Starter Training *PG5 Core and Fupla*

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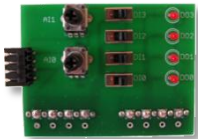
Lesson 3 - PG5 Core Introduction

Material required:

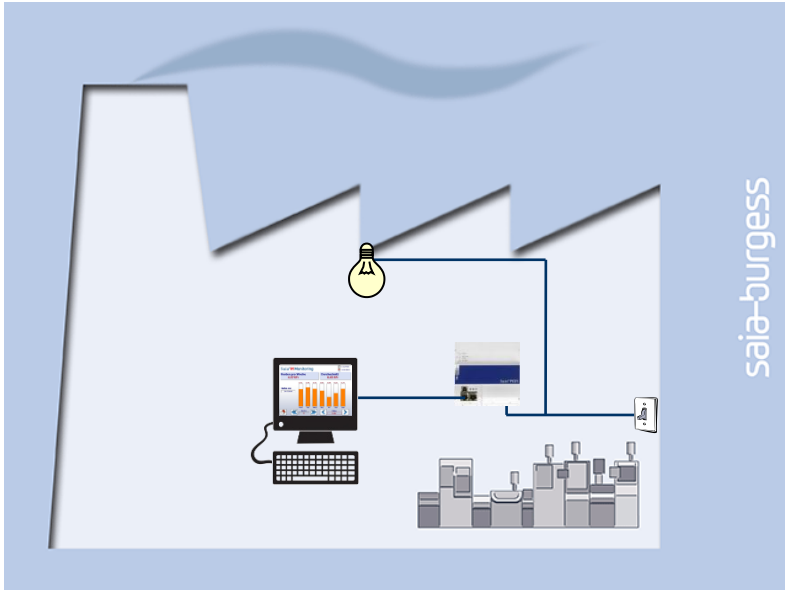
- Notebook or computer
- PCD1 E-Controller
- USB cable
- Training board

Aims of the PG5 Core starter course

- Simple circuits should be produced using PG5 Core
- Basic understanding of the Saia-Burgess programming environment



Lesson 3 - PG5 Core Introduction

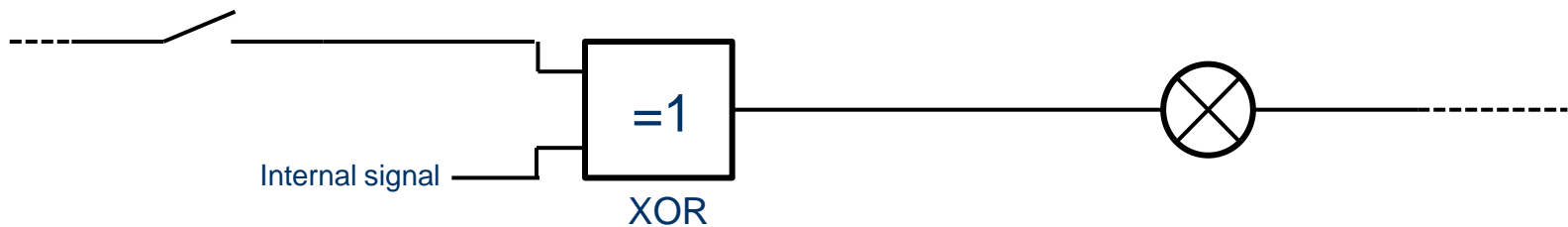


Explanation / Introduction

- Initially, the light in the cellar should come on when switch pressed.
- In addition, the light should also be activated via an internal signal from the controller, so that the latter can subsequently be addressed via the web visualization.

What is necessary to achieve this?

- Switch, light, logical link



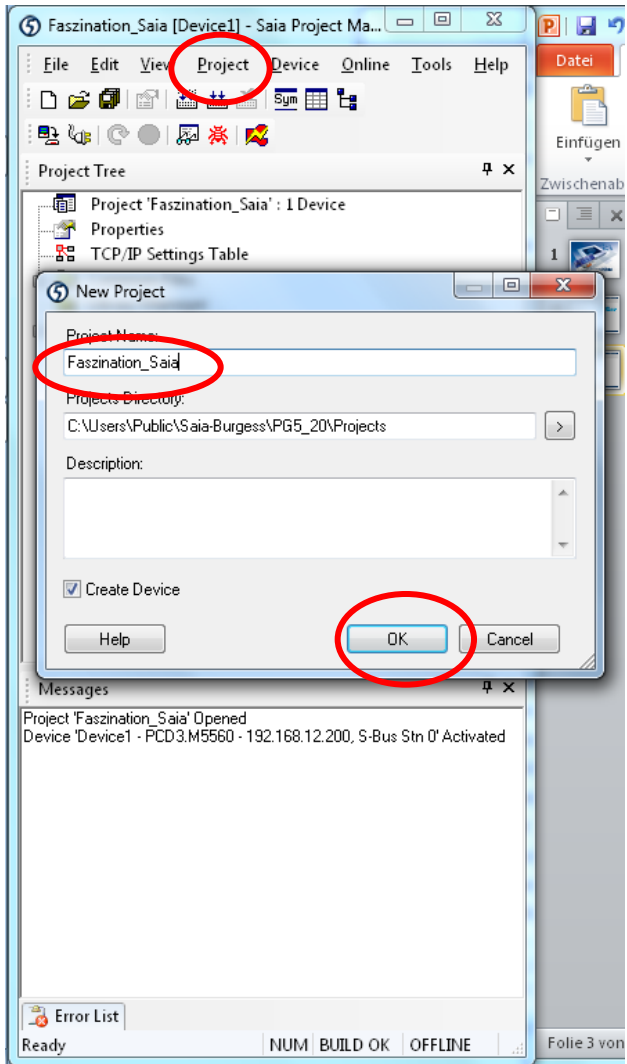
Lesson 3 - PG5 Core

Create first project

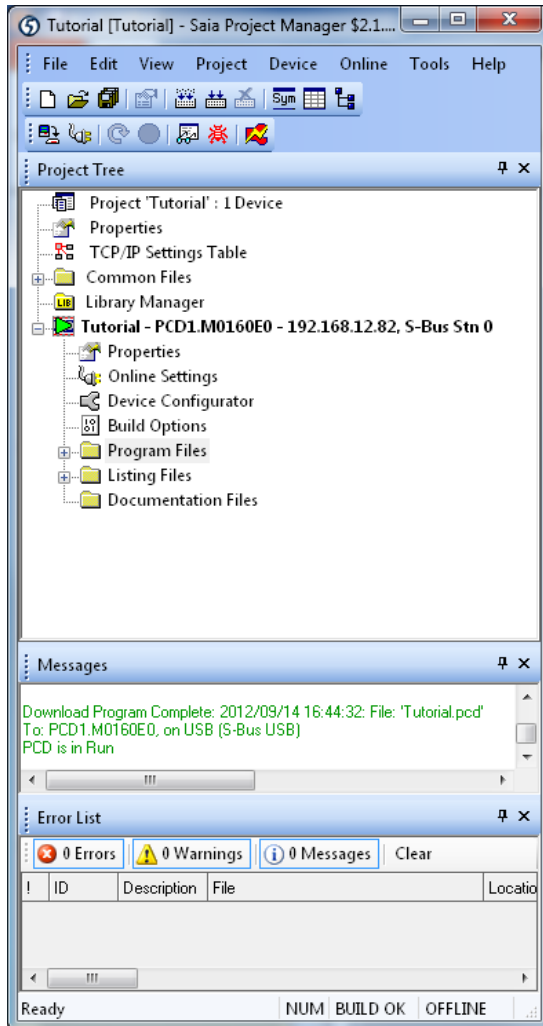
Open PG5 on desktop

Create a new project:

- Project → New
- Project name: Faszination_Saia
- Confirm with OK





Lesson 3 - PG5 Core Saia Project Manager




The Saia Project Manager manages all files belonging to the project

Various basic functions can be executed from the toolbar

- 

 - **Rebuild All Files** → Translates all files into machine code
- 

 - **Download Program** → Downloads the program to the Saia® PCD
- 

 - **Online Configurator** → Configures connection to the Saia® PCD


Lesson 3 - PG5 Core

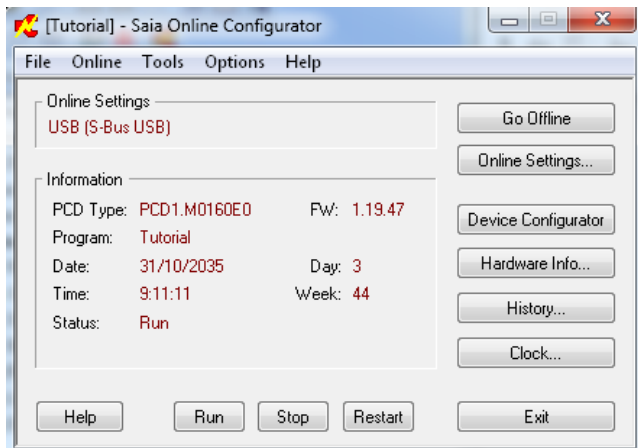
Connect controller to PC and check connection

Setting up the hardware

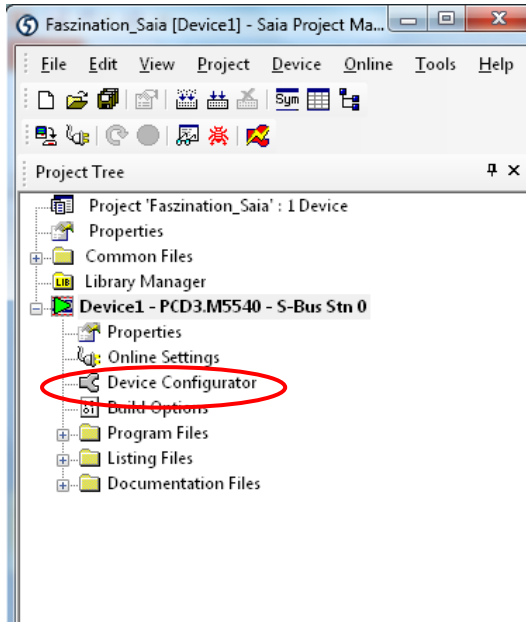
- Connect USB cable to Saia® PCD and PC
- Plug training board into slots X1 and X0

The connection can be tested with the Online Configurator in the PG5


- The Online Configurator is opened with the symbol 
- To connect with USB, the PGU must be set to «Yes» in the Online Settings
- The Saia® PCD's clock can be synchronized with the computer via «Clock»



Lesson 3 - PG5 Core Configuration of inputs and outputs



First we the program needs to know how the signal is connected to the PCD

- This can be set in the Device Configurator. Via the Media Mapping function, Saia® PCD inputs are automatically labelled and created as symbols.
→ Open Device Configurator in Project Manager
- Via  Upload Configuration, the current controller configuration is uploaded to the PC

The E-Controller has a preconfigured S-Monitoring function. Since another program is to be created, this must be disabled.

- First go to Onboard RS-485/S-Net and disable S-Bus Metering
- Then, under Monitoring, disable the Monitoring function

Onboard Communications		
Location	Type	Description
Onboard	RS-485/S-Net	RS-485 port for Profi-S-Bus or general-purpose comm
Onboard	USB	Universal Serial Bus port, PGU or general-purpose.
Onboard	Ethernet	Ethernet port. IP Settings, DHCP.
Socket A		

Ethernet Protocols	
Section	Description

S-Bus Mode and Timing	
S-Bus Mode	Data Mode
Baud Rate Serial S-Bus	9600 Baud
Response Timeout [ms]	0
Training Sequence Delay [ms]	0
Turnaround Delay [ms]	0

S-Bus Metering	
Port Number S-Bus Metering	0
S-Bus Metering Enabled	No
Baud Rate S-Bus Metering	Default (recommended)
Response Timeout [ms]	0
Number Of Retries	2
Maximum S-Bus Address	??



Memory Slots		
Slot	Type	Description
M1		

Monitoring	
Section	Description
Monitoring	Monitoring and logging of meter data. Automatical scanning of S-Bus me

Monitoring Enabled		No
Data Logging		
Data Hold Time [year]	4	

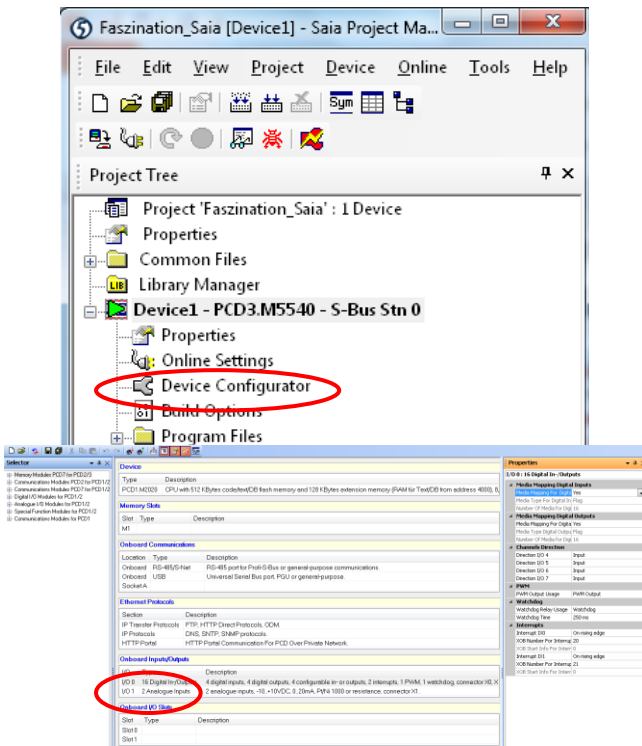
Lesson 3 - PG5 Core Configuration of inputs and outputs

Enable Media Mapping for digital inputs

- Under Onboard Inputs/Outputs select 16 Digital In-/Outputs
- Enable Media Mapping in Settings on right

Enable Media Mapping for analogue inputs

- Under Onboard Inputs/Ouputs select 2 Analogue Inputs
- Enable Media Mapping in Settings on right



I/O 0 : 16 Digital In-/Outputs

Media Mapping Digital Inputs

Media Mapping For Digital Inputs **Yes**

Media Type For Digital In: Flag

Number Of Media For Digital In: 16

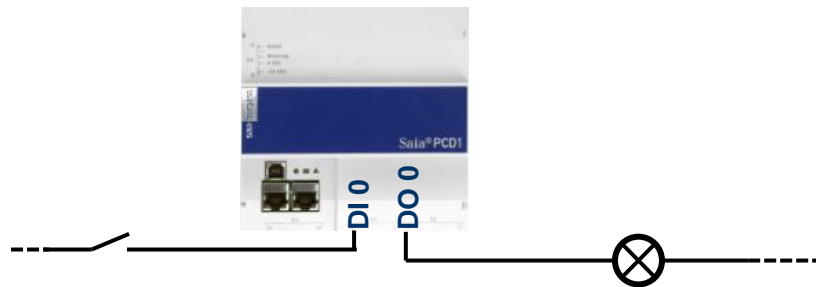
Media Mapping Digital Outputs

Media Mapping For Digital Outputs **Yes**

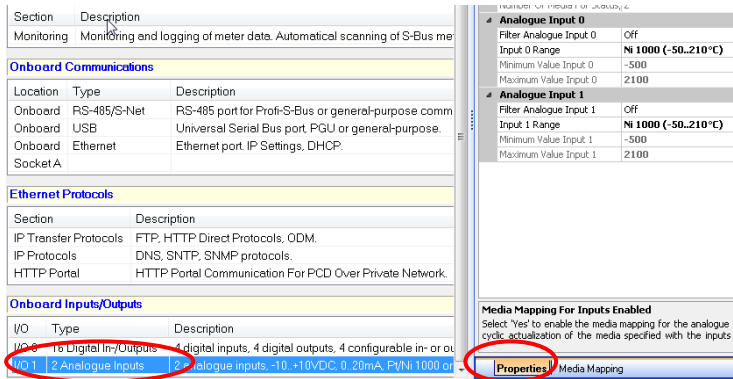
Media Type Digital Output: Flag

Number Of Media For Digital Output: 16

Channels Direction



Lesson 3 - PG5 Core Configuration of inputs and outputs



Enable Media Mapping for analogue inputs

- Under Onboard Inputs/Outputs select 2 Analogue Inputs
- Enable Media Mapping in Settings on right

Adjust value range of both analogue inputs

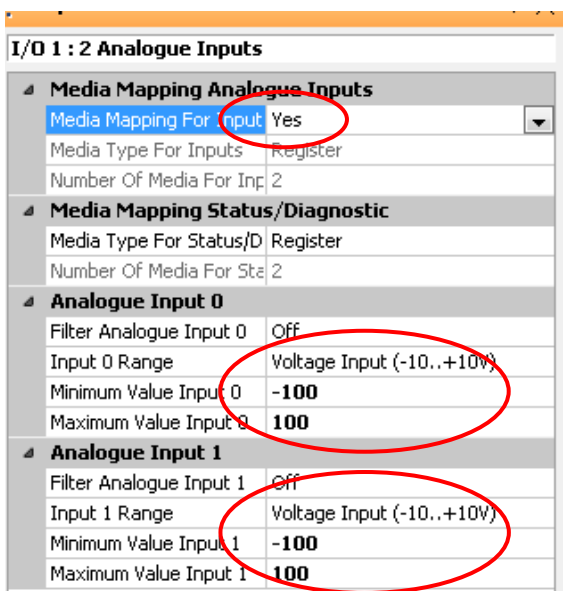
- Select Voltage Input (-10..+10V)
- Minimum Value Input: -100
- Maximum Value Input: 100

Via Download Configuration the new controller configuration is downloaded to the controller

- Download controller (inc. «Memory Allocation» settings)

Close Device Configurator

- Rebuild All Files, so that Media Mapping symbols will be created automatically.

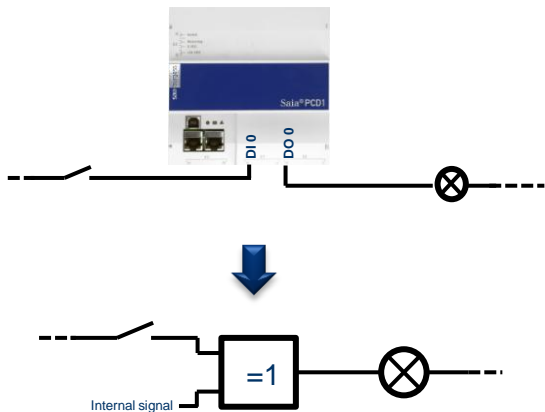


Lesson 3 - PG5 Core

Create new FUPLA file

Basic requirements are present:

- Cables are connected to PCD and signal are present
- Signals are labelled internally in the PCD
- These must now be logically connected together



Lesson 3 - PG5 Core

Create new FUPLA file

There are several ways of doing this:

First way: Instruction List

- Saia® S-Edit

Cyclical Organisation Block

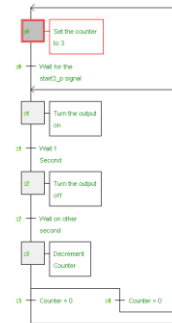
```

COB  0      ; Cyclical program
      0      ; No supervision time

STH  Car_incoming      ; A car comes into the parking:
DYN  Dynamise_incoming_car_signal ; On the positiv Flank of incoming signal
DEC  Number_of_free_slots ; Decrement the number of free parking slots
    
```

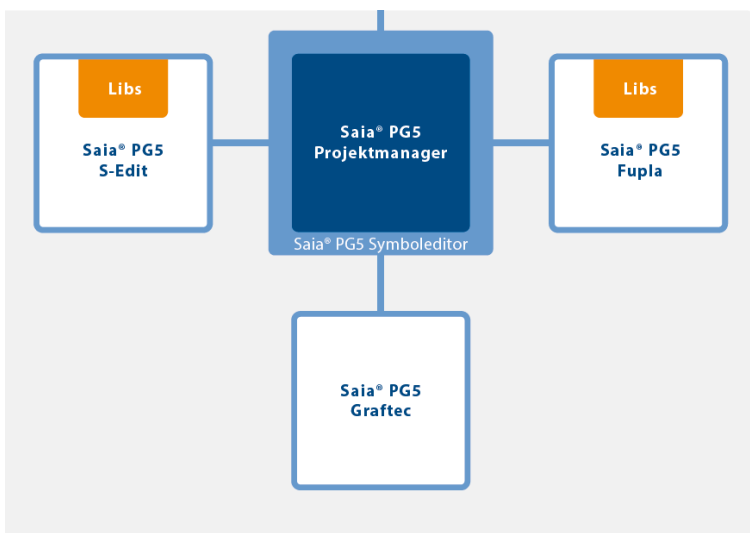
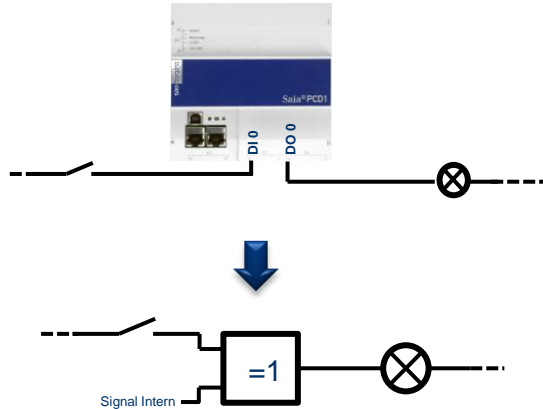
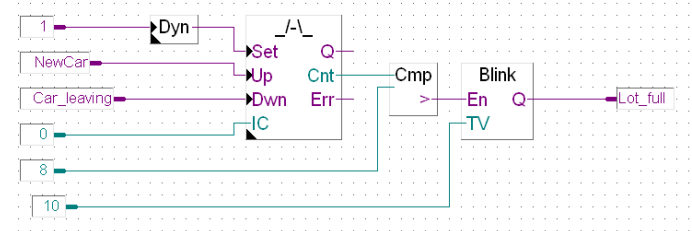
Second way: Sequential control

- Saia® Graftec



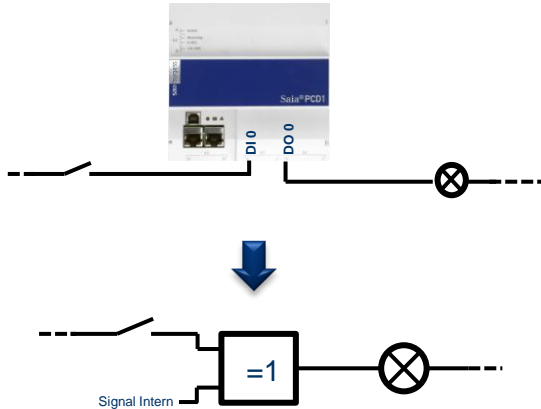
Third way: Function block diagram

- Saia® Fupla



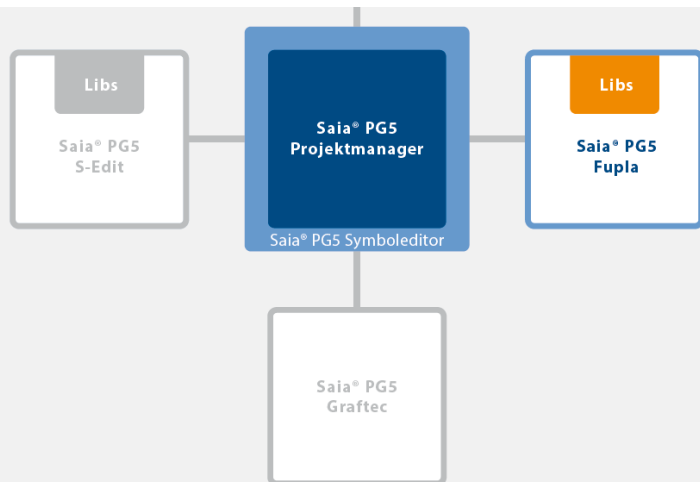
Lesson 3 - PG5 Core

Create new FUPLA file



Fupla is used in 95% of all applications for the following reasons:

- Easy programming with built-in function objects (FBoxes) for all standard functions
- Complex application programs can be constructed with little programming knowledge simply by placing and linking FBoxes
- Extensive, powerful FBox families for communications tasks and building automation
- Detailed, context-sensitive FBox information, clear descriptions and graphical displays in the function block diagram editor (Fupla) produce clear, easy-to-read programs
- On-line display of process values and adjustment of process parameters can simplify operation and reduce maintenance costs
- FBox libraries are available in various languages



Lesson 3 - PG5 Core

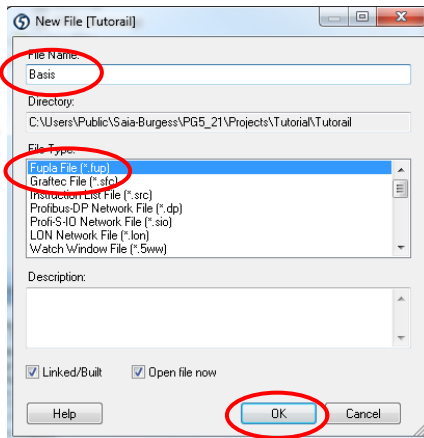
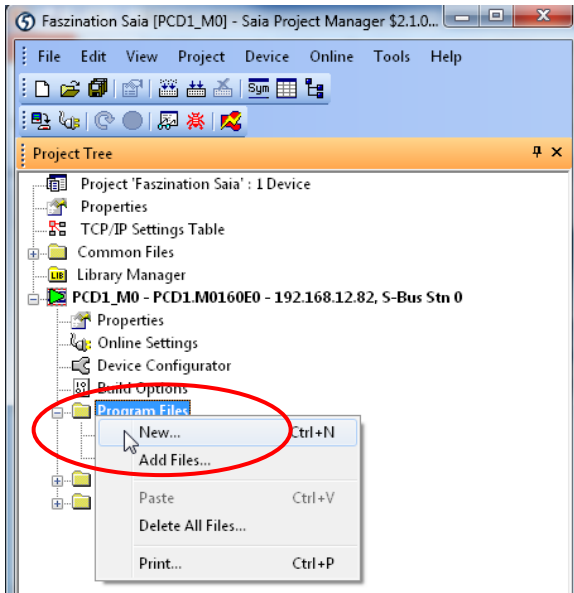
Create new FUPLA file

All program files are stored under Program Files

Create a new Fupla page

- Right click on Program Files and «New»
- Assign name «Basic»
- Select Fupla File
- OK button

Fupla window opens automatically





Lesson 3 - PG5 Core FUPLA file environment

Wahl der Bibliothek

Prozess-
Eingangsgrößen

Seitenübersicht

Struktureller Aufbau des Fupla Editor

Symbol Name	DE Type	DE description	DE comment	Scope
COB	ROOT			Local
COB_COPD453	COB			Local
NewCar	K	1	Neue car anbei	Local
Lot_full	I	32	Parking place is full	Local
Car_leaving	I	11	Car is leaving the lot	Local
En	E	0		Local
Er	E	8		Local
IC	K	10		Local

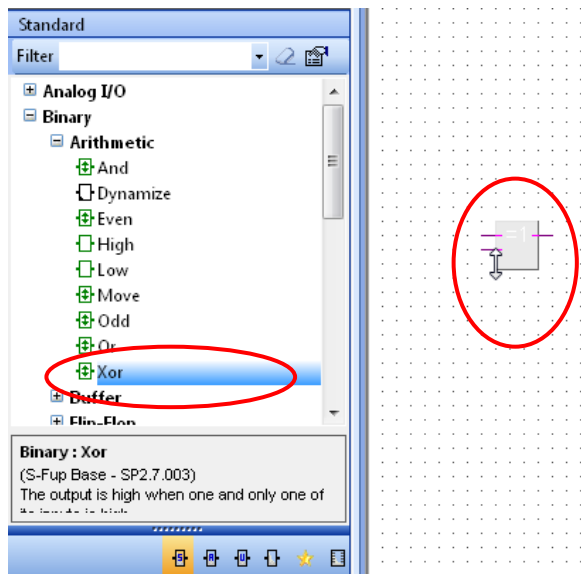
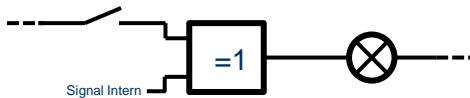
Prozess-
Ausgangsgrößen

Verwendete
Prozessgrößen

Under View, you can enable the various windows

Lesson 3 - PG5 Core

Complete first link



Placing an OR link

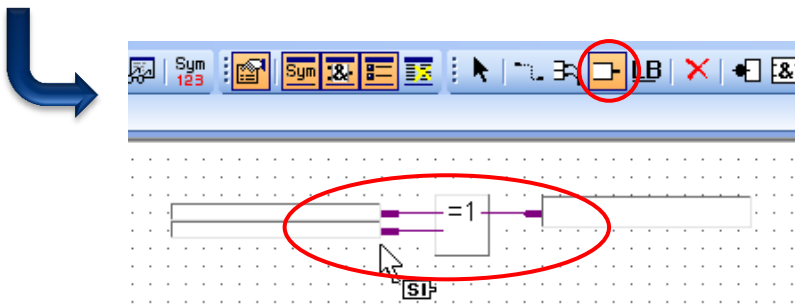
- Find XOR in the FBox library, binary family, and drag it into place in the middle window
- After the first click, the number of inputs can be adjusted by moving the mouse.
- Drag to two inputs and place with a click

FBox handling

- FBox Help is available by selecting the FBox with one click and then pressing F1
- FBoxes can be moved horizontally. To move them vertically, press Shift simultaneously.

Placing Inputs and outputs

- Add inputs and outputs to the FBox with the «Add Connector» button (toolbar)
- In the toolbar, return to «Select Mode» (pointer). This can also be done with a right click.

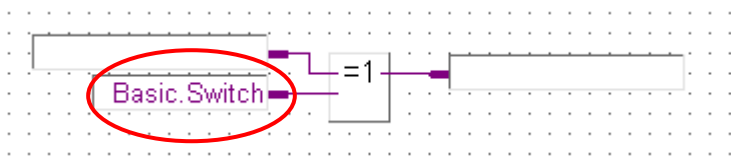


Lesson 3 - PG5 Core

Complete first link

Link symbols to FBox

- The internal symbol can be named directly in the Connector as Basic.Switch.
- Open the Symbol Editor with F5
- The symbol will be entered here automatically
- For greater clarity, folder structures can be created. These are separated with a point in the symbol name. The Switch symbol is therefore in the Basic folder



Symbol Editor

Find: Type a substring to find

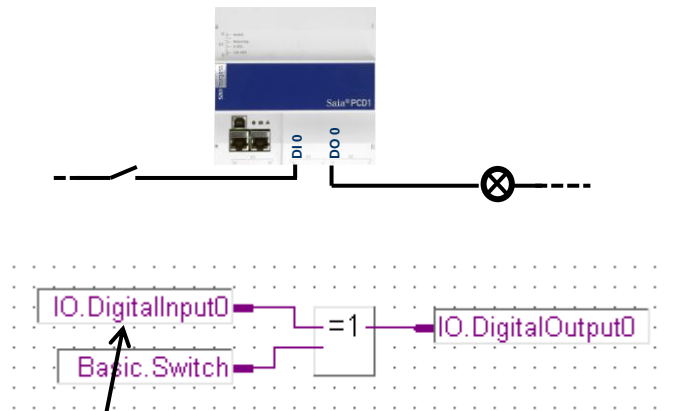
Symbol Name	Type	Address/Value	Comment	Tags	Scope
Basic.fup	ROOT				
IO	GROUP				
Basic	GROUP				
Switch					Public
COB_0	COB				Local

Lesson 3 - PG5 Core

Complete first link

Link symbols to FBox

- Media Mapping has already listed In-/Outputs in the symbol table under All Publics.
- Symbols have been divided into groups for greater clarity.
- Drag & drop can be used to connect the inputs DigitalInput0 and 1 and the output DigitalOutput0 to the FBox. (The appropriate symbol is taken with the mouse on the arrow in front of the marked column).



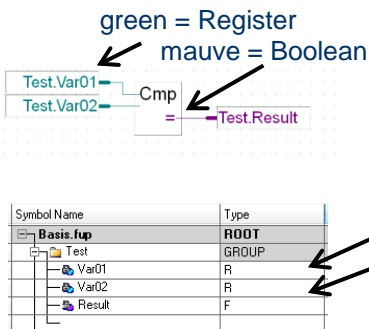
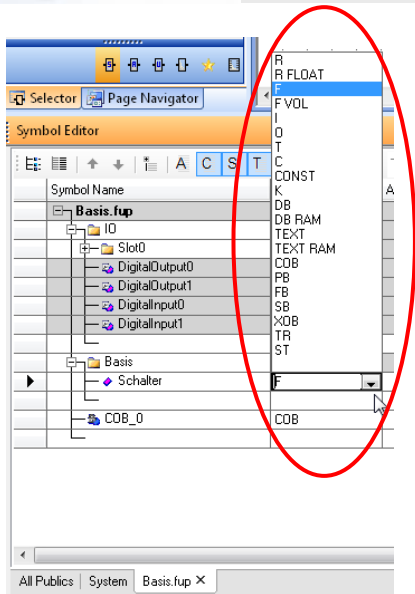
drag & drop

Symbol Editor

Symbol Name	Type	Address/Value	Comment
All Publics	ROOT		
IO	GROUP		
Slot0	GROUP		
IOAccess	GROUP		
AnalogueInput0	R	S.IO.Slot0.AnalogueInput + 0	Analogue input 0
AnalogueInput1	R	S.IO.Slot0.AnalogueInput + 1	Analogue input 1
AnalogueInput2	R	S.IO.Slot0.AnalogueInput + 2	Analogue input 2
AnalogueInput3	R	S.IO.Slot0.AnalogueInput + 3	Analogue input 3
AnalogueOutput0	R	S.IO.Slot0.AnalogueOutput + 0	Analogue output 0
AnalogueOutput1	R	S.IO.Slot0.AnalogueOutput + 1	Analogue output 1
DigitalInput0	F	S.IO.Slot0.DigitalInput + 0	Digital input 0
DigitalInput1	F	S.IO.Slot0.DigitalInput + 1	Digital input 1
DigitalInput2	F	S.IO.Slot0.DigitalInput + 2	Digital input 2
DigitalInput3	F	S.IO.Slot0.DigitalInput + 3	Digital input 3
DigitalInput4	F	S.IO.Slot0.DigitalInput + 4	Digital input 4
DigitalInput5	F	S.IO.Slot0.DigitalInput + 5	Digital input 5
DigitalInput6	F	S.IO.Slot0.DigitalInput + 6	Digital input 6
DigitalInput7	F	S.IO.Slot0.DigitalInput + 7	Digital input 7
DigitalOutput0	F	S.IO.Slot0.DigitalOutput + 0	Digital output 0
DigitalOutput1	F	S.IO.Slot0.DigitalOutput + 1	Digital output 1

System | Basis.fup

Lesson 3 - PG5 Core Complete first link



Symbol data types

- Since the symbol Basic.Switch was entered directly in Fupla, its data type has been automatically adapted to the connected FBox
- Saia provides several data types:

I	Input	Bool
O	Output	Bool
F	Flag	Bool
T	Timer	unsigned 31-bit
C	Counter	unsigned 31-bit
R	Register	32-bit data (binary, decimal, hexadecimal, floating point or IEEE)
DB	Data Block	Block of different Data Types
- The colour of FBox connections indicates whether Boolean-type or register-type data is expected.

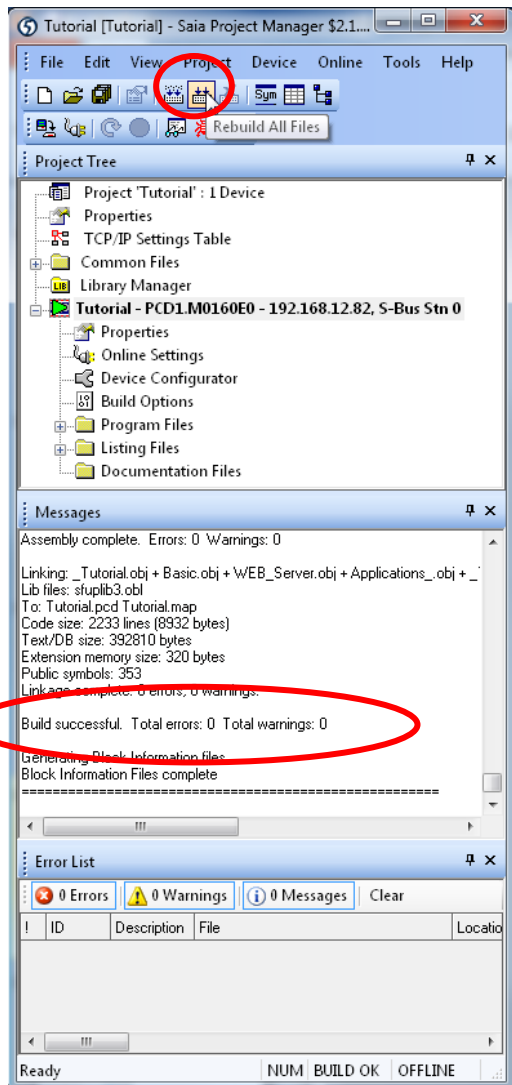
Scope of symbols

- Symbols can be assigned to three areas

Local	Symbol is only visible within the Fupla file
Public	Symbol is also visible in other program parts
External	Symbol originates from another program file (I/Os were configured in the Device Configurator and are therefore external symbols within the Fupla file)
- Since the symbol Basic.Switch must later be accessible in web visualization, the Public area is selected
- Save and exit the Saia® Fupla Editor

Symbol Name	Type	Address/Value	Comment	Tags	Scope
Basis.fup	ROOT				
IO	GROUP				
Slot0	GROUP				
DigitalOutput0	F		Digital output 0	S_IO	External
DigitalOutput1	F		Digital output 1	S_IO	External
DigitalInput0	F		Digital input 0	S_IO	External
DigitalInput1	F		Digital input 1	S_IO	External
Basis	GROUP				
Schalter	F		Schalter, der üb...		Public
COB_0	COB				

Lesson 3 - PG5 Core Build



To translate files into machine code, it is necessary to generate a **Build**

- Change to the Project window
- Press Build all 
- Check Messages window → Build successful

All data has now been translated into machine code and can be downloaded to the controller.

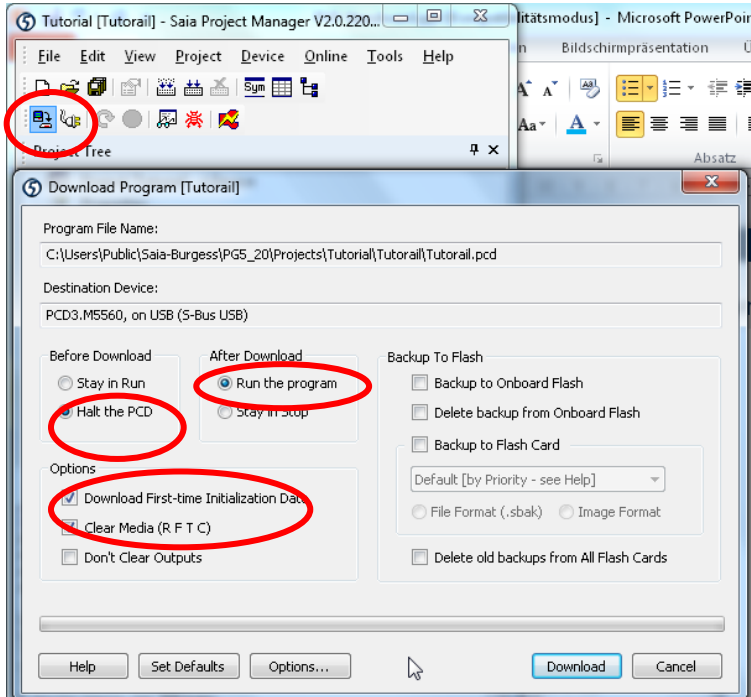
Lesson 3 - PG5 Core Download

Press Download button

Set Download properties

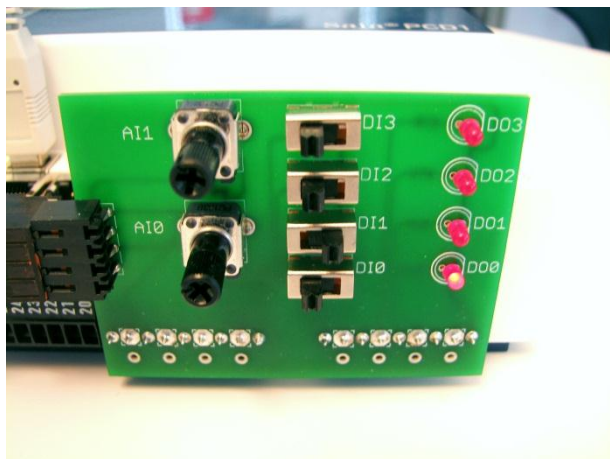
- Before Download Halt the PCD
- After Download Run the program
- Download first time Initialization Data
- Clear Media (RFTC)
- Do not select Backup to Onboard Flash

Press Download



Lesson 3 - PG5 Core Test switch and LED

Switch DI0 can now be used to switch digital output D00

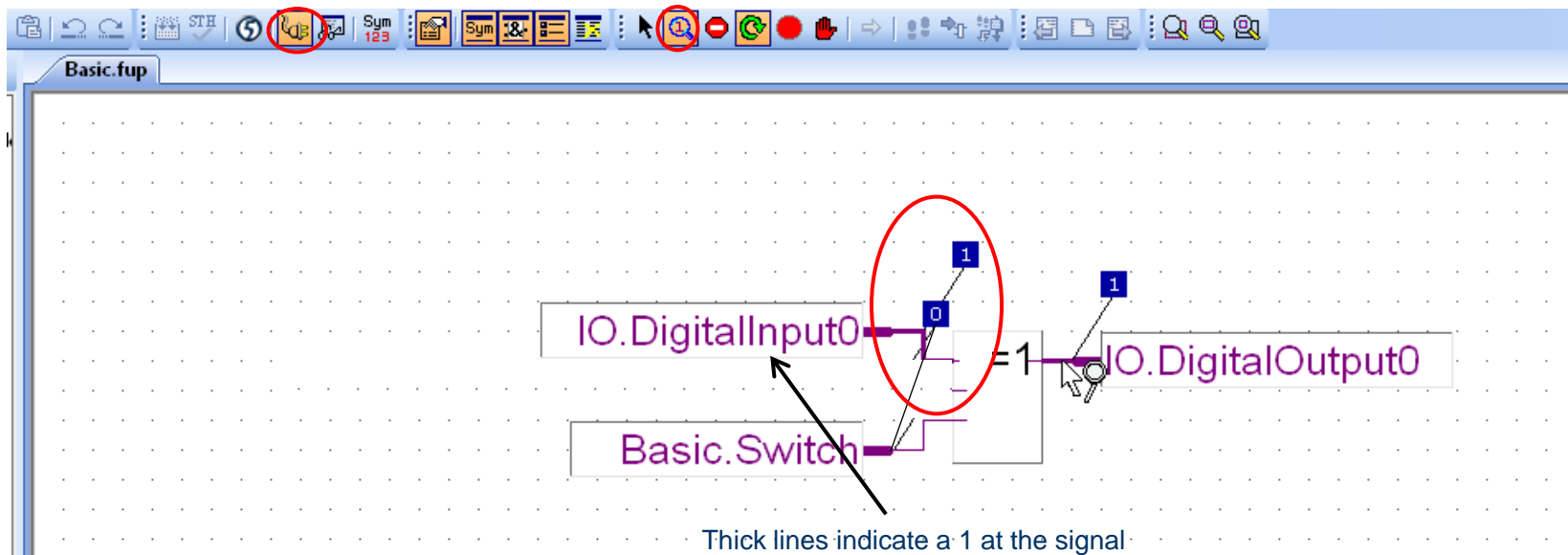




Lesson 3 - PG5 Core Go online

In online mode, symbol values can be observed directly in Fupla

- Open Basic.fup
- Press Online button
- With zoom tool, select the three connecting lines
- When the switch is operated, variables in Fupla change their status
- Set flag in program (double click on Variables field, Edit field Flag control)



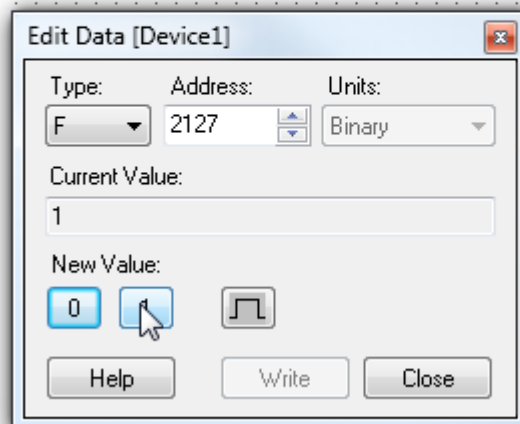
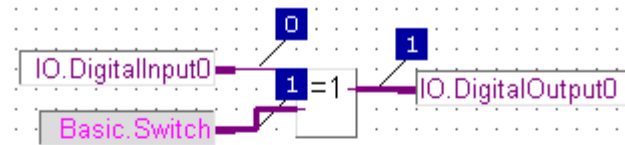
Lesson 3 - PG5 Core

Go online

Symbol values can be modified in Fupla

(does not work with I/O symbols, as these are connected via hardware)

- Double click on symbol Basic.Switch
- «New Value» buttons can be used to set Basic.Switch to 1



Lesson 3 - PG5 Core

Backup & restore for project data

The project can be saved via Backup

- Project → Backup
- This method can be used to copy a project to other computers

Restore can be used to reload the project.

