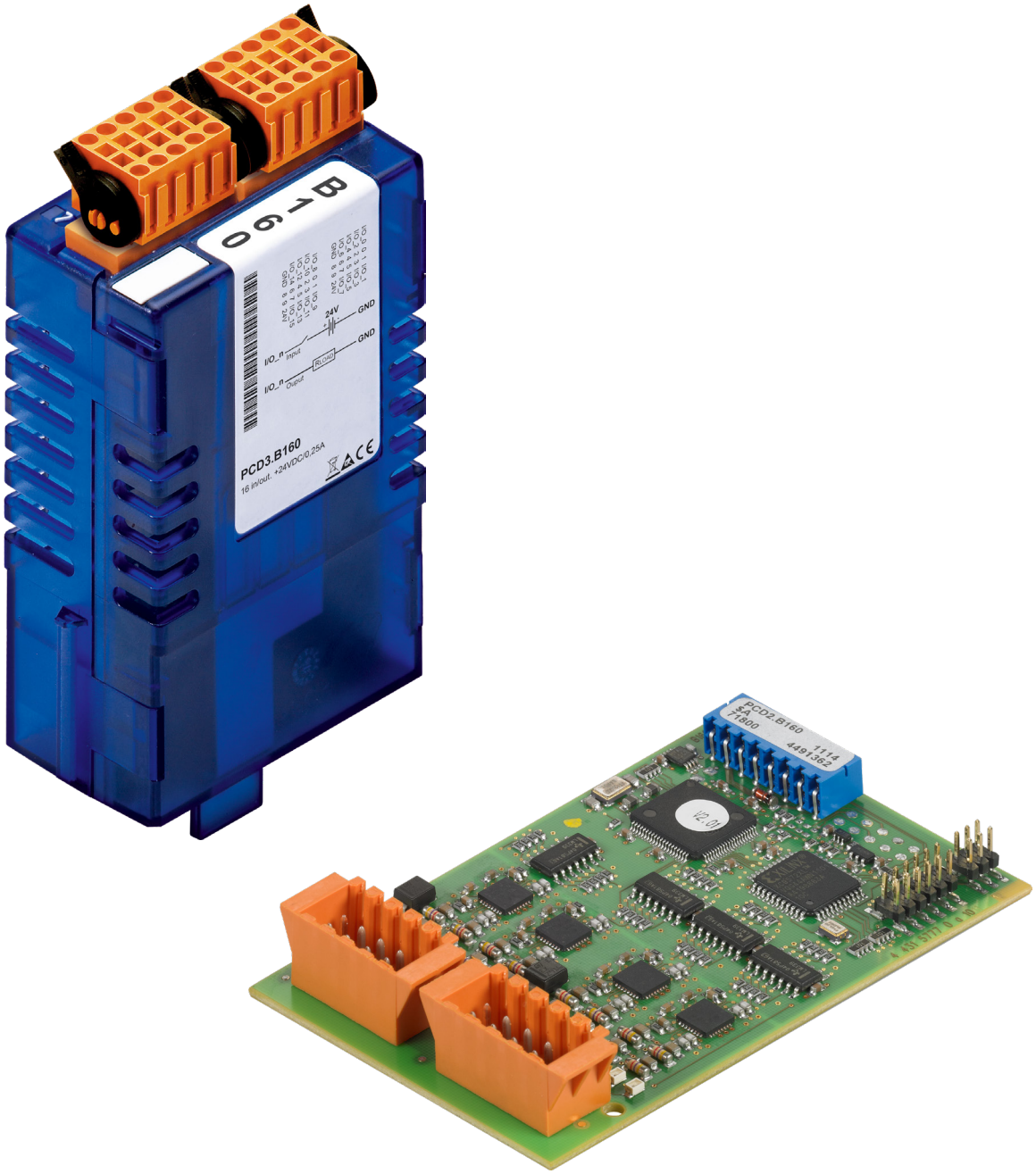

PCD2.B160 & PCD3.B160
Digital Input&Output-module with 16 I/O

Document-No. 27-601 | Edition ENG05 | 2023-03

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0.1 Document-History

Version	Published	Changed	Remarks
EN01	2011-11-01 2011-12-08		First Edition Published
EN02	2011-12-16	Ch5.1	IL example
EN03	2013-08-15	entire	Logo and name changed
ENG04	2018-01-31	Ch2	Except slot #15 instead of solt #7
ENG05	2023-03	Ch2	Added a new section “2.10. Precautions”

0.2 Trademarks

Saia PCD® and Saia PG5®
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Technical changes are subject to the state of technology

Published in Switzerland

1 Module Overview

The configurable digital in- and output module offers on smallest space the possibility to configure 16 I/Os in groups of four either as in- or as output.

In terms of expandability and maximum space usage this modules leaves no wishes

- Module current consumption: 120 mA from the +5V Bus
- Input: typ. 24 VDC
- Input filter: 0.2/8 ms configurable
- Galvanic isolation: none
- Outputs: 0.25 A / 18 …30 VDC
- Protection against short circuit
- I/O connector type K
- Configuration with PG5 Device Configurator (Service Pack 2)

Compatibility:

- FW 1.16.52 or higher
- PG5 2.0 official release PG5 V2.0.210 or higher
- Supported platforms PCD3, PCD2.M5_ and PCD1.M2_

2 Hardware

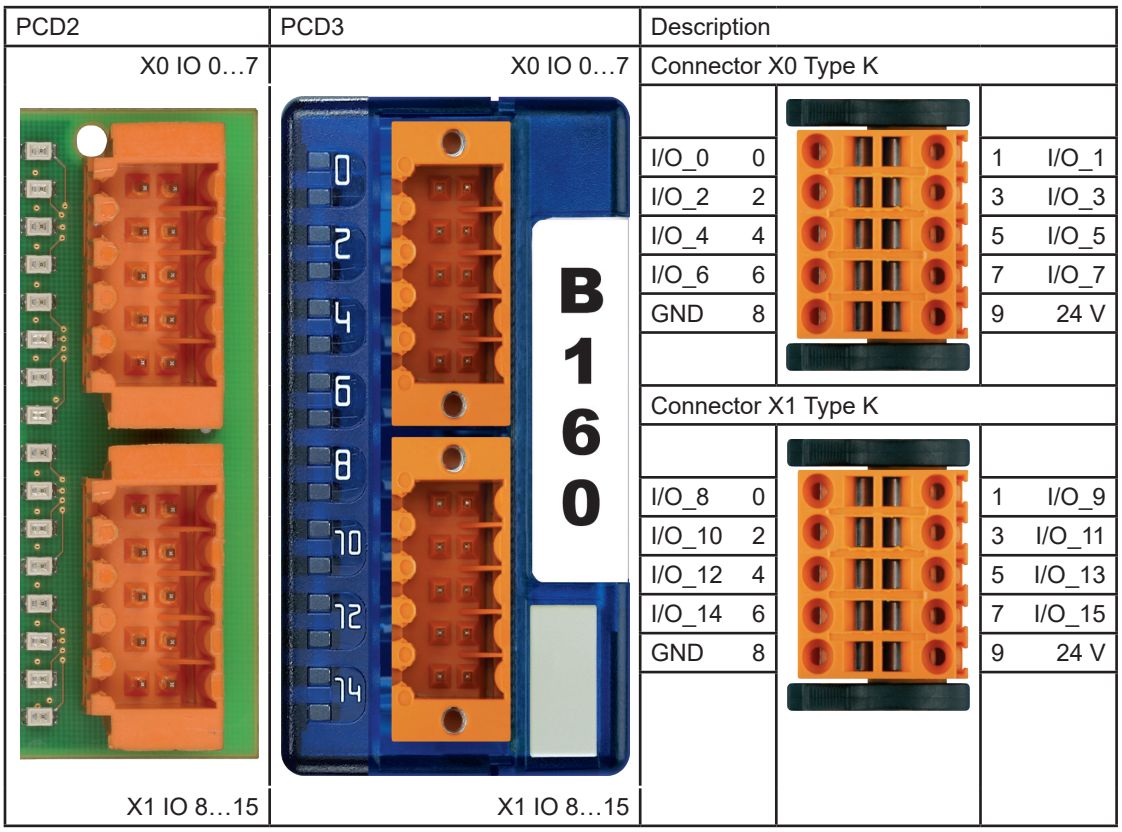
The configuration of the I/O is done in groups of four.

Following combinations are possible:

16O/0I, 12O/4I, 8O/8I, 4O/12I, 0O/16I

The I/O module can be placed on any slot of a PCD1.M2_, PCD2.M5_, PCD3.M and their corresponding IO-Extension modules (except slot 15 because of the watch dog - I/O address 255).

2.1 I/O connection



X0		X1		Description:
0	IO_0	0	IO_8	Mixed In-/Output
1	IO_1	1	IO_9	Mixed In-/Output
2	IO_2	2	IO_10	Mixed In-/Output
3	IO_3	3	IO_11	Mixed In-/Output
4	IO_4	4	IO_12	Mixed In-/Output
5	IO_5	5	IO_13	Mixed In-/Output
6	IO_6	6	IO_14	Mixed In-/Output
7	IO_7	7	IO_15	Mixed In-/Output
8	GND	8	GND	GND extern
9	24V	9	24V	+24 V extern

2.2 LED signalization

The module has 16 LEDs. Each channel has its own LED.

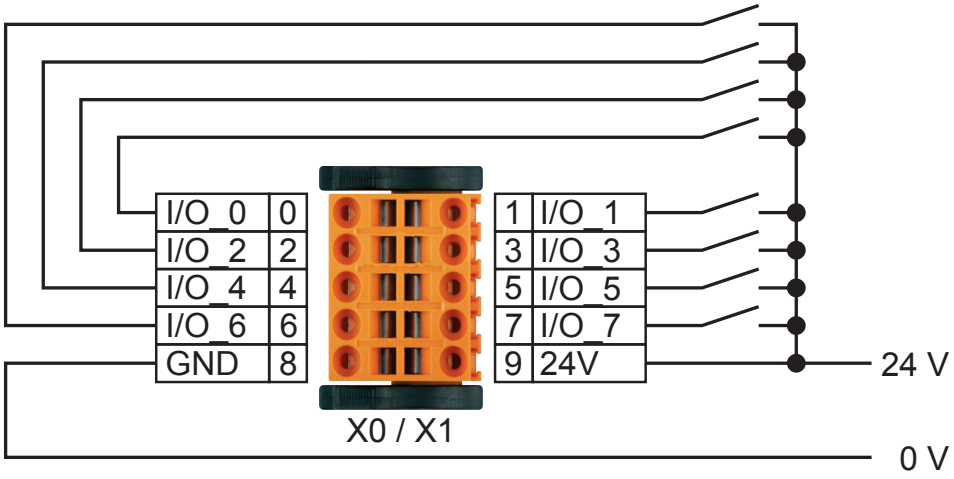
2.3 General technical data on inputs and outputs

Internal current consumption:(from +5 V bus)	120 mA
Internal current consumption:(from V+ bus)	4 mA
External current consumption:	22 mA (for driver) at 24 V (without load current)
Terminal	Type K (Part No. 4 405 5048 0)

2.4 Technical data on inputs

Number of inputs	16, source operation, not isolated (in groups of 4)
Input voltage	typ. 24 VDC
Input current	typ. 3 mA at 24 VDC
Input delay	8 ms (default) or 0.2 ms (configurable)
Overvoltage protection	Transient Suppressor Diode 39 V

2.5 Input wiring

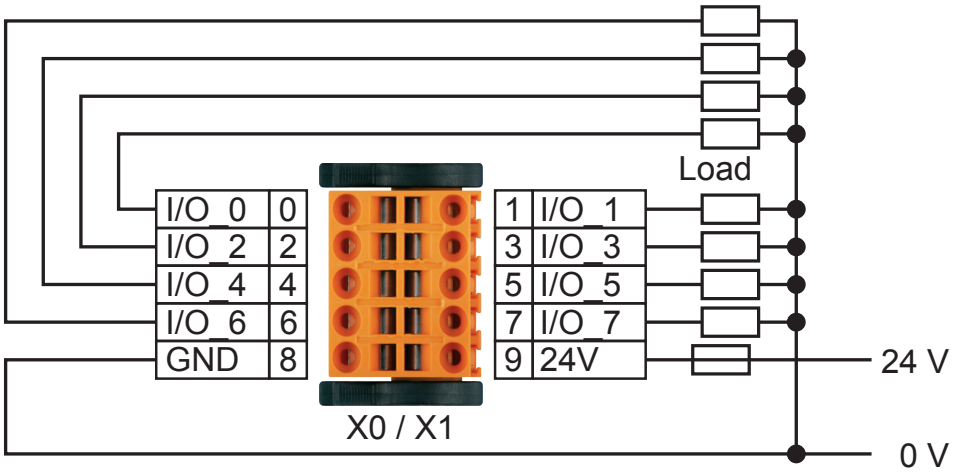


The supply pins of each connector must be powered.
Be careful of the power polarity.

2.6 Technical data on outputs

Number of outputs:	16, source operation, not isolated (in groups of 4)
Voltage range:	18…30 VDC
Output current:	250 mA per channel
Total module current:	2 A
Output delay (on/off):	typ. 2 µs
Inductive loads:	Transient Suppressor Diode 39 V
Short circuit proof:	Yes

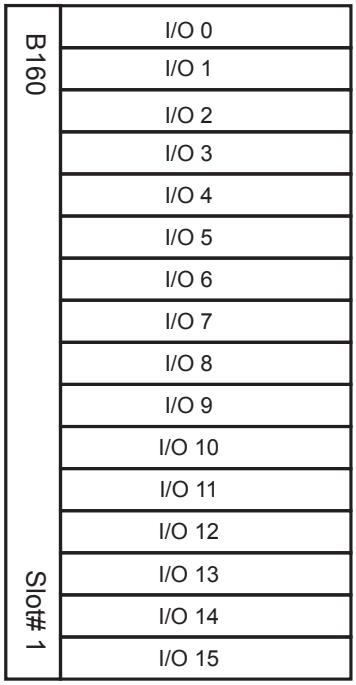
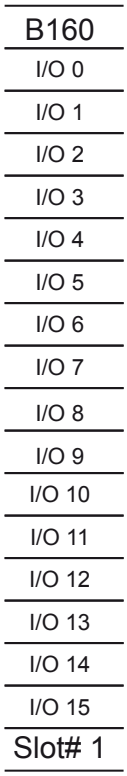
2.7 Output wiring



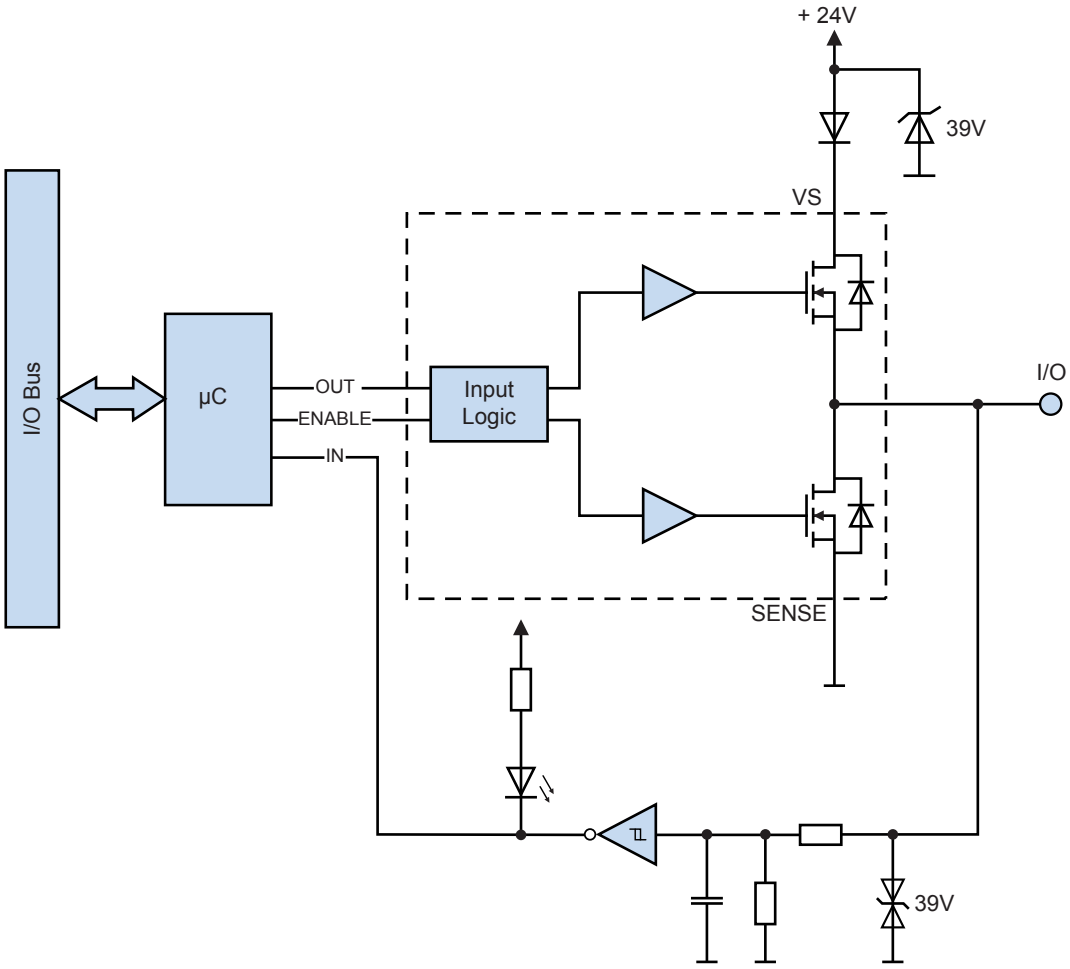
The supply pins of each connector must be powered.
Be careful of the power polarity.

Fuse: It is recommended that each supply connection should be separately protected with a fast-blow (S) fuse. The value depends on the application.

2.8 Label Editor

for PCD2.B160	for PCD3.B160
	

2.9 Bloc Diagram



2.10 Precautions

The 16 channels of the module are divided into 4 groups of four channels each. It's possible to define for each of the 4 groups if the 4 channels of the group are configured as input or as output.

The I/O definition of the 4 groups is saved permanently into flash memory on the PCDx.B160.

At power-up, the I/O definition is loaded from flash memory, and the channels are configured accordingly as input or outputs.

When downloading the PG5 application program, the input/output configuration of the PCDx.B160 defined in the PG5 device configurator is saved permanently on the flash memory of the PCDx.B160.

All channels of the PCDx.B160 are defined as factory delivery setup as inputs.

ATTENTION

The PCDx.B160 modules can be damaged if the I/O configuration of the PCDx. B160 is changed and the PCDx.B160 is wired and if 24 VDC is applied to the I/O.

If the I/O's of the PCDx.B160 are configured as outputs, and the configuration for this group of 4 channels is changed to inputs, 24 VDC is applied to one I/O of that group. Following the loading of the application program, all four channels in the group will be damaged, leaving the four channels unusable. .

To avoid the damage:

1. Power off the 24VDC of the PCD and the PCDx.B160
2. Remove the 2 I/O terminals from the PCDx.B160
3. Power on the 24VDC of the PCD
4. Load the modified PG5 device configuration and the PG5 application program.
5. Match the wiring of the PCDx.B160 I/O terminals to the loaded I/O configuration.
6. Plug-in the 2 I/O terminals to the PCDx.B160

If the configuration of the PCDx.B160 device is not changed, then it's possible to download modified user programs without removing the IO plugs each time.

3 Configuration in PG5 device Configurator

Media Mapping For Inputs, Outputs **Yes**	To use values of this module in Fupla programming the media mappig must be active.
Channels Direction Direction Channels 0 To 3 **Output** Direction Channels 4 To 7 Input Direction Channels 8 To 11 Input Direction Channels 12 To 15 Input	The channel direction defines whether the four data points are used as input or output.
Filter Input Filter Enabled Yes	Filter for the inputs: yes = 8 ms (default) no = 0.2 ms
Media Mapping Read Error Output Detection Media Type Flag Number Of Media 16	Output error flag These flags indicate an error on the outputs. The flags are always set by two. When a corresponding flag is set, the output is in high-impedance. example: if the Output Error Detection flags equal: 0000000000000011 That indicates an error on I/O 0 or I/O 1 like an over-current or short circuit. These outputs are in high-impedance.

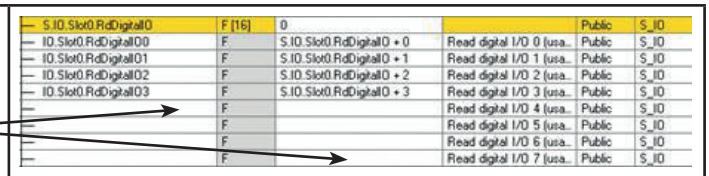
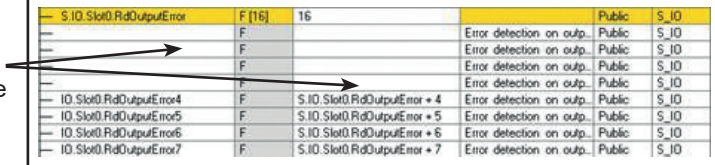
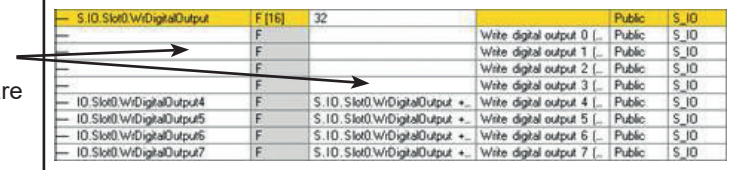
Per default all channels of the modules act as input. They are configured during the power-up sequence of the PCD CPU.

After a first use, the module configuration is saved into flash memory and is loaded at power-up.

To use the PCDx.B160 module no F-Boxes are needed.

In order to optimize the memory used on a PCD it is possible to delete the unused symbols in the media mapping window. After compilation no flag or register will be assigned to the unused symbols:

Example: I/O 0…3 => Inputs & I/O 4…7 => Output with Output Error detection

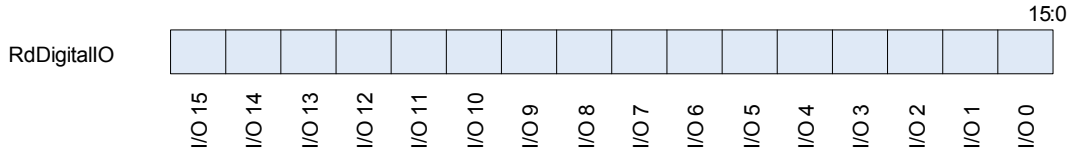
Inputs 0…3 Delete the symbols that are not assigned to inputs.	
Output Error 4…7 Delete the media & address that are not assigned to the outputs .	
Outputs 4..7 Delete the media & address that are not assigned to the outputs .	

4 Media Mapping

4.1 Symbol name & description

4.1.1 RdDigitalIO

This array of 16 flags returns the states of each I/O whatever their configuration. We can read each flag separately with the symbol RdDigitalIO"y" where "y" = the number of the flag. Each flag corresponds to one I/O.

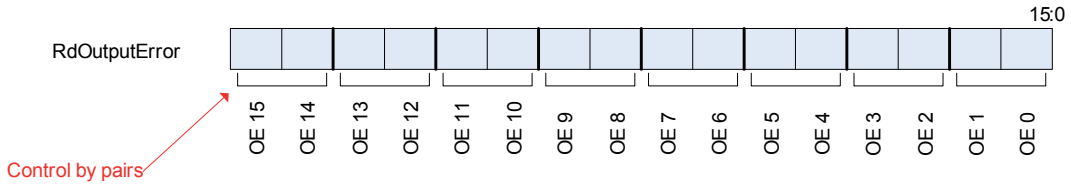


4.1.2 RdOutputError

This array of 16 flags returns the status of the outputs. They indicate if an output is not functioning correctly and is set in high impedance. The module puts the outputs in high impedance if there is a short circuit, an overcurrent or the supply pins of the connectors are not powered when using output.

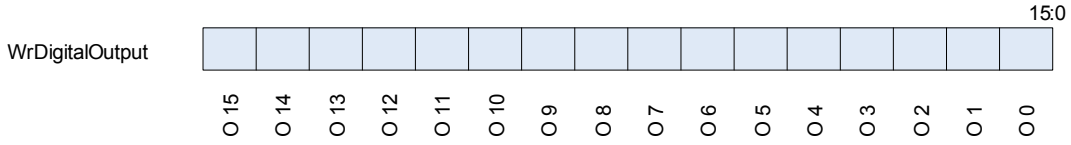
The module controls the outputs by pairs.

For example: if there is a short circuit on output 0 then the outputs 0 & 1 will be in high impedance and their respective status flags are set. The flags will be: RdOutputError = 00000000 00000011.



4.1.3 WrDigitalOutput

This array of 16 flags contains the value you want writing on the outputs. Each flag corresponds to one output. If you write a flag whose I/O is not configured in output, nothing happens.



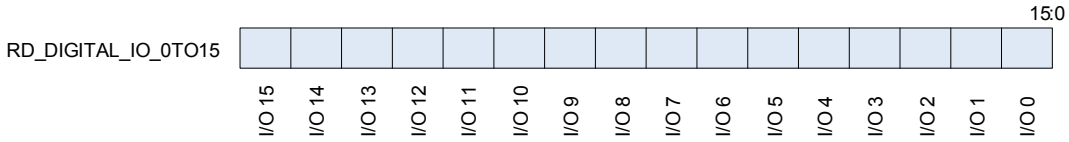
5 Direct input or output access in IL

With IL commands it is possible to do accesses to the module independent of the media mapping.

5.1 Symbol name & description

5.1.1 RD_DIGITAL_IO_0TO15

This symbol returns the states of each I/O whatever their configuration.

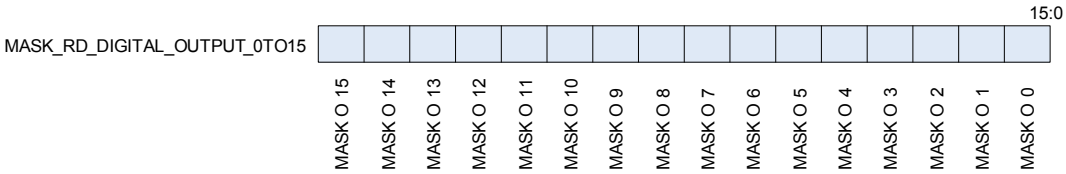


IL example:

```
RDPW  IO.Slot0.IOAccess.RD_DIGITAL_IO_0TO15
      IO_0_15
```

5.1.2 MASK_RD_DIGITALOUTPUT_0TO15

This symbol gives us which I/O are configured in outputs. In case you want have only the outputs value from the symbol RD_DIGITAL_IO_0TO15, you can do a mask.



IL example:

```
RDPW IO.Slot0.IOAccess.RD_DIGITAL_IO_0TO15
     IO_0_15

LD   MASK
     O.Slot0.IOAccess.MASK_RD_DIGITAL_OUTPUT_0TO15

AND  IO_0_15
     MASK
     OUT_0_15
```

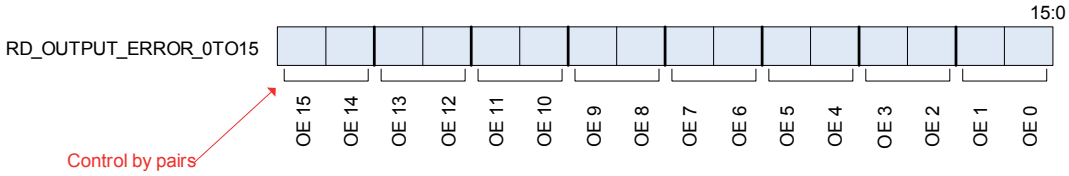
5.1.3 RD_OUTPUT_ERROR_0TO15

This symbol returns the status of the outputs. They indicate if an output is not functioning correctly and is set in high impedance. The module puts the outputs in high impedance if there is a short circuit, an overcurrent or the supply pins of the connectors are not powered when using output.

The module controls the outputs by pairs.

For example: if there is a short circuit on output 0 then the outputs 0 & 1 will be in high impedance and their respective status flags are set.

The flags will be: RD_OUTPUT_ERROR_0TO15 = 00000000 00000011.

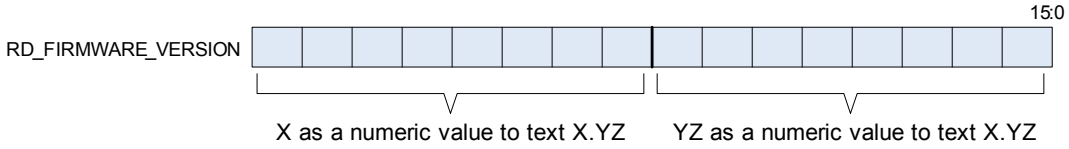


IL example:

```
RDPW  IO.Slot0.IOAccess.RD_OUTPUT_ERROR_0TO15
      OE_0_15
```

5.1.4 RD_FIRMWARE_VERSION

This symbol returns the firmware version of the module in ASCII.



Example: if the RD_FIRMWARE_VERSION = 00000010 00000011 then the firmware version is 2.03.

IL example:

```
RDPW  IO.Slot0.IOAccess.RD_FIRMWARE_VERSION
      FW_VERSION
```

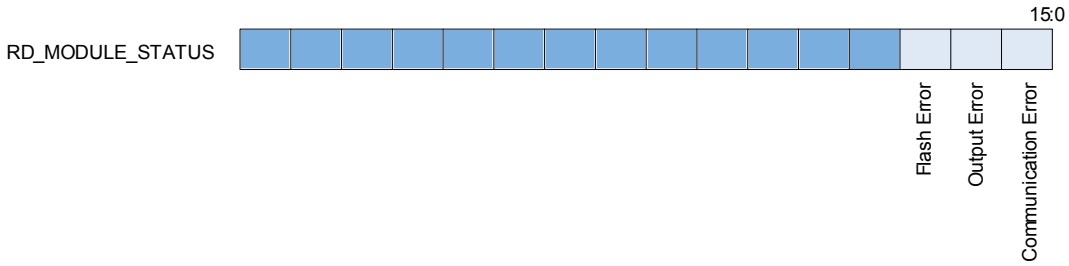
5.1.5 RD_MODULE_STATUS

This symbol returns the status of the module. When there is no error all the bits are low. Symbol clears automatically after reading.

Communication Error: Sets when an error occurs during the communication between the PCD & the module.

Output Error: Sets when outputs are in high impedance because of short circuit, overcurrent or no power on connector.

Flash Error: Sets when module failed to save configuration into flash.

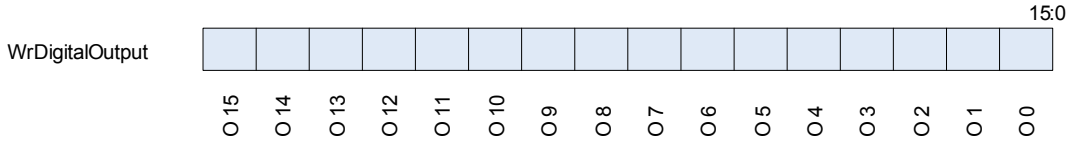


IL example:

```
RDPW  IO.Slot0.IOAccess.RD_MODULE_STATUS
      Status
```

5.1.6 WR_DIGITAL_OUTPUT_0TO15

This symbol is used to write the outputs. Each bit corresponds to one output. If you write a bit whose I/O is not configured in output, nothing happens.



IL example:

```
LD    Data_Out
      0FFFFH
WRPW  IO.Slot0.IOAccess.WR_DIGITAL_OUTPUT_0TO15
      Data_Out
```

5.2. Error PCD XOB 13

An XOB 13 is called in following cases:

- If module is not present into the PCD slot and Program tries to access it with ‘Direct Access Instructions’
- During an internal reset of the module

If XOB13 is not programmed then Error Flags is set.

6 Direct input or output access in IL

The XOB 13 error happens if the PCD wants communicate with the module but it is not in the slot.

In case of reset of the module (Watchdog UC), XOB13 happens if PCD try access to the module during restart.

A Appendix

A.1 Icons

	In manuals, this symbol refers the reader to further information in this manual or other manuals or technical information documents. As a rule there is no direct link to such documents.
	This symbol warns the reader of the risk to components from electrostatic discharges caused by touch. Recommendation : at least touch the Minus of the system (cabinet of PGU connector) before coming in contact with the electronic parts. Better is to use a grounding wrist strap with its cable attached to the Minus of the system.
	This sign accompanies instructions that must always be followed.
	Explanations beside this sign are valid only for the Saia PCD® Classic series.
	Explanations beside this sign are valid only for the Saia PCD® xx7 series.

A

A.2 Address for Saia-Burgess Controls AG

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Route Jo-Siffert 4
1762 Givisiez
Switzerland

Email support: ..... support@saia-pcd.com
Supportsite: ..... www.sbc-support.com
SBC site: ..... www.saia-pcd.com

International Represetatives &
SBC Sales Companies: ..... www.saia-pcd.com/contact

Postal address for returns from customers of the Swiss Sales office

Saia-Burgess Controls AG
Route Jo-Siffert 4
1762 Givisiez
Switzerland

A