AdvanGPIO™-100

User Guide

Version**: 1.2**

Date: **25th July 2014**

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Change Document record

Date	revision	Changes
27th September 2012	1.0	Initial version of the document
3th December 2012	1.1	Added regenerate signals examples
25th July 2014	1.2	Updated list of supported devices

Products Covered by this Guide

This guide pertains to AdvanGPIO™ that have the following part numbers:
ADMX-adbd-100.01, AdvanGPIO-100.01

Before You Begin

Warning!

Please read this document in its entirety before operating AdvanGPIO, as equipment damage may result from improper use.

Electrostatic Discharge (ESD) sensitive device!

AdvanGPIO devices may be damaged due to ESD. Please follow the basic manipulation instructions in Keonn Wiki site avoid ESD problems.

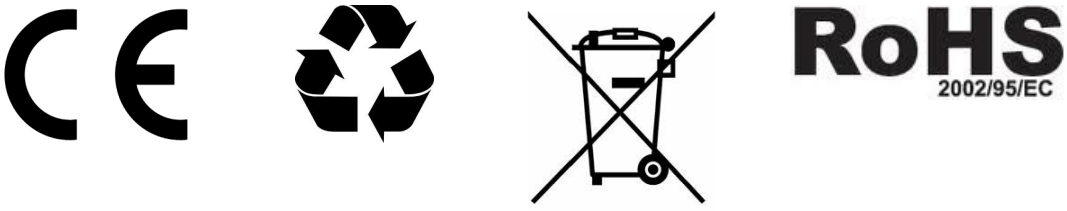
Extreme caution must be taken at any danger sign found

Additional caution must be taken at any warn sign found

Informative note

Disposal of the product

Do not dispose the product in municipal or household waste. Please check your local regulations for disposal/recycle of electronic products.



Content table

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1- Introduction

1.1- About this guide

This guide describes the installation and operation of AdvanGPIO-100.

This guide does not intend to cover any introduction to RFID nor to cover the installation and set up of RFID readers.

1.2- Intended audience

Intended readers of this guide are systems engineers and IT staff with basic understanding of RFID and RFID systems management.

This guide assumes audience are familiar with RFID readers and in particular they are familiar with the set up and operation of the GPIO capabilities of the specific RFID reader that will be connected to AdvanGPIO.

1.3- General information

AdvanGPIO™ is an adaptor board for Keonn AdvanMux™ family: AdvanMux-4, AdvanMux-8, AdvanMux-12, AdvanMux-16 and AdvanPhaser-2-4.

AdvanGPIO™ is the required companion board for those cases where RFID readers do not provide the required electronic levels or power supply for AdvanMux™ normal operation.

AdvanGPIO™ must be fed with:

- Input data: up to 4 digital input lines to control AdvanMux™/AdvanPhaser™ operation.
  - AdvanMux-4 requires 2 lines.
  - AdvanMux-8 requires 3 lines.
  - AdvanMux-12 and AdvanMux-16 require all the 4 lines.,
  - AdvanPhaser-2-4 requires only 2 lines.
- Power: AdvanGPIO™ is an active component and it must be powered in order to operate it. Three power supply methods are available:
  - PoE: 802.3af (or 802.3at type I) class devices.
  - External power supply by using a DC jack connector.
  - External power supply by using a terminal block connector.

The table below summarizes some common use cases for AdvanGPIO™.

AdvanGPIO™ use cases	
Reader models without GPIO power supply	AdvanGPIO™ can be used when the RFID readers do not provide an external power supply to be used in GPIO circuitry.
Reader models without an adaptor cable	AdvanGPIO™ can be used as a substitute for the adaptor cables available for some reader models.
Reader models without enough power	• AdvanGPIO™ can be used when the overall consumption of all AdvanMux connected into the same power source exceeds the maximum output power of the power source. • AdvanGPIO™ can be used when the RFID reader output voltage is less than 5 V. • AdvanGPIO™ can be used when the RFID reader output voltage is bigger or equals to 5 V but the number of AdvanMux™ connected in daisy-chain exceeds 4 units.
Reader models with incompatible GPO electronics to work with AdvanMux	AdvanGPIO™ adapts electronic levels between RFID readers GPO circuitry and AdvanMux. Note: See the compatibility tables in AdvanMux™ User Guide.
Reader models without GPO circuitry	Whenever the RFID reader in use does not provide any GPO functionality, AdvanGPIO™ can be used as a helping device to control AdvanMux™/AdvanPhaser™ units or any other device that requires digital lines to be controlled. Note this use case does require external synchronization between the reader and the multiplexers.
Systems with dozens of AdvanMux/advanPhaser devices	AdvanGPIO™ can be used to inject power and to regenerate digital signals in systems with a the large number of AdvanMux™/AdvanPhaser™ installed.

Table 1: AdvanGPIO™ frequent use cases

1.4- What is not AdvanGPIO™?

AdvanGPIO™ is not an RF component as it does not handle RF signals in any way.

1.5- Specifications

Specifications Table	
Connectors	**Data input connectors**: • *Reader connector* – RJ45 connectorSee appendix I for connector pin-out. • *IN connector*: 6-way terminal block connector (compatible with Phoenix Contact MC 1,5/6-G-3,81, the male companion Phoenix Contact is provided with AdvanGPIO™). **Data output connectors:** • *AdvanMux connector*: RJ45 connector for direct connection to AdvanMux/AdvanPhaser through standard Ethernet 8-wire UTP cables. **Power input connectors**: • *PoE connector*: RJ45 connector. • *24 V in connector*: sealed power jack for 24 V in. Compatible with SWITCHCRAFT L712RA jack connector.
Power supply	There are 3 power supply alternatives • **PoE:** *PoE connector* supports 802.3af (802.3at type I)[1] compliant PoE devices. • **External power supply:** *24 V in* connector accepts 9 V to 24 V in either polarity. Maximum rating is 30 V. • **RFID reader:** *IN connector* accepts 7 V to 24 V. See appendix for detailed pin-out.
Current consumption	< 15 mA @ 48 V (through PoE) < 3.5 mA @ Vin = 9 V (through receptacle or plug connectors) < 4 mA @ Vin = 12 V (through receptacle or plug connectors) < 4.5 mA @ Vin = 15 V (through receptacle or plug connectors) < 6 mA @ Vin = 24 V (through receptacle or plug connectors)
Digital inputs	0 V/5 V TTL or open collector Note 1: B0..B3 are provided with 2.2 kohm pull-up resistors Note 2: Reader outputs must sink 2 mA (maximum) Note 3: 3.3 V readers which are not 5 V tolerant need to adjust AdvanGPIO manually[2].

1 *PoE specification 802.3af is equivalent to 802.3at type I*

2 *AdvanGPIO internal circuitry is powered by using 5V but can be changed to 3.3 V*

Compatibility with RFID UHF readers	Impinj, Motorola, Sirit, Alien, ThingMagic See User's guide for more detailed information about specific reader models
Control connection to AdvanMux or AdvanPhaser devices	Through standard Ethernet 8-wire UTP cables
Power on indicator	White SMD LED
Weight	35 g
Operating temperature	-40 °C to 55 °C (-40 °F to 131 °F)
Storage temperature	-40 °C to 55 °C (-40 °F to 131 °F)
EU Directives	RoHS compliant (2002/95/EC) EMC (2004/108/EC)

Table 2: Detailed specifications

Output GPO signals use pull-up configuration, therefore if input control lines are missing will be set to 'high'. That is, B0, B1, B2 and B3 will be set to 'high'.

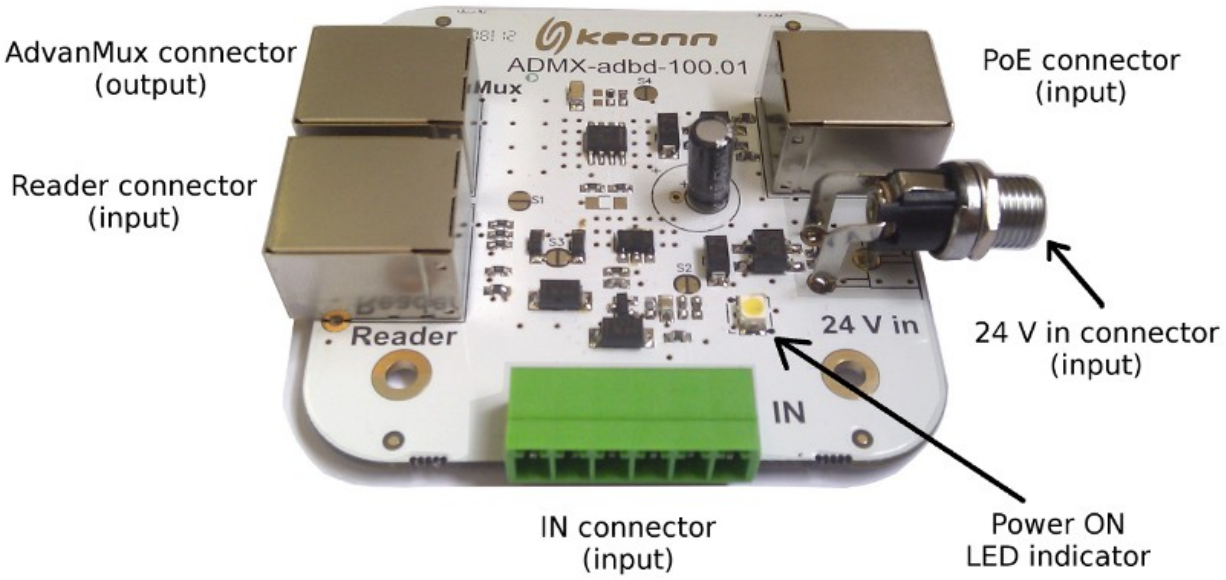
When using RFID readers with GPIO circuitry working at 3 V which are not 5 V tolerant, please inform Keonn when placing an order.

2- Installation

2.1- AdvanGPIO™ ports and LEDs

This chapter details the installation steps to connect AdvanGPIO™ to an RFID reader and to an AdvanMux™/AdvanPhaser™ device.

The image below illustrates all connectors and status LED in AdvanGPIO™.



Capture 1: AdvanGPIO™ ports and LEDs

Detailed description of each connector and port can be found on the tables below.

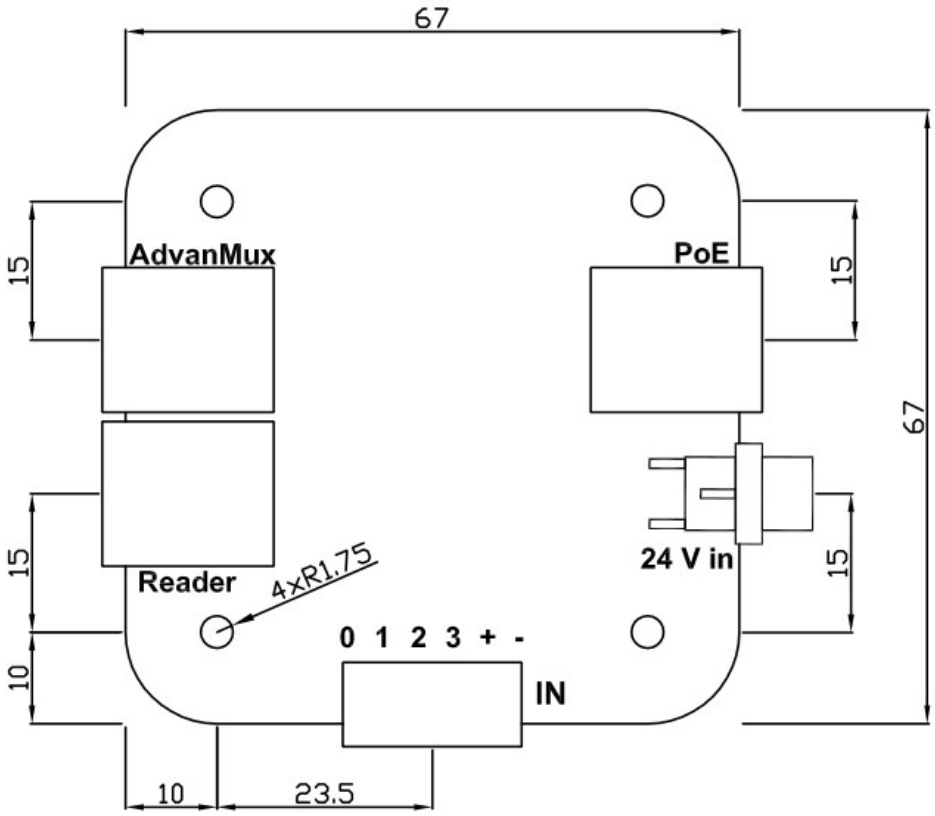
Connector	Type and direction	Description
PoE	RJ45 (input)	Used as a power source for the device with PoE 802.3af (802.3at type I) equipment.
24 V IN	Sealed DC jack (input)	Used as a power source for the device to be used by external power supplies.
IN	Female terminal block (input)	Used to feed both data and power to the device. This connector can be used in any possible combination: • Data and power. • Data only. • Power only.
Reader	RJ45 (input)	Used to feed data to the device. This connector is designed to be used with Keonn provided adaptor cables for readers that do not provide a suitable power source for AdvanMux / AdvanPhaser devices. When using this connector one of the 3 methods to power up AdvanGPIO™ must be used.
AdvanMux	RJ45 (output)	Used to connect to an AdvanMux/AdvanPhaser device. A standard UTP 8-wire Ethernet cable is required.

Table 3: Connector description

LED	Description
Power ON LED	Power status. LED is on when AdvanGPIO™ is powered.

Table 4: Status LED

2.2- Mechanical specifications



Capture 2. AdvanGPIO Mechanical Specification. All sizes in mm

2.3- Connecting AdvanGPIO™

2.3.1- Data connections

In AdvanGPIO™ context data means the 4 digital lines required to control an AdvanMux™/AdvanPhaser™ device.

Data enters AdvanGPIO™ either through *Reader connector* or through *IN connector,* and comes out through *AdvanMux™ connector*.

There are 2 alternatives to feed data into AdvanGPIO™.

Input data options	
Reader connector	RJ45 connector that can be used to provide AdvanGPIO™ with up to 4 digital input lines.
IN connector	The male terminal block connection can be used to screw up to 4 digital input lines.

Table 5: Input data options

Only one method must be used at a time.

Using both methods to supply data into AdvanGPIO™ at the same time will result in unpredictable behaviour and may damage the devices feeding data into AdvanGPIO™.

2.3.2- Power connections

There are 3 alternatives to feed power to AdvanGPIO™.

Power options	
PoE	*PoE connector* supports 802.3af (802.3at type I) compliant PoE devices.
24 V IN	*24 V in* connector accepts 9 V to 24 V in either polarity.
IN	*IN connector* accepts 7 V to 24 V. AdvanGPIO™ is protected against reverse polarity. The device will not be powered when negative polarity is used.

Table 6: Power options

At least one of the alternatives must be used. AdvanGPIO™ is protected in case more than one power option is used at the same time.

3- Operating AdvanGPIO™

AdvanGPIO™ does not contain any intelligence on-board and therefore it does not require any operation rather than connecting it.

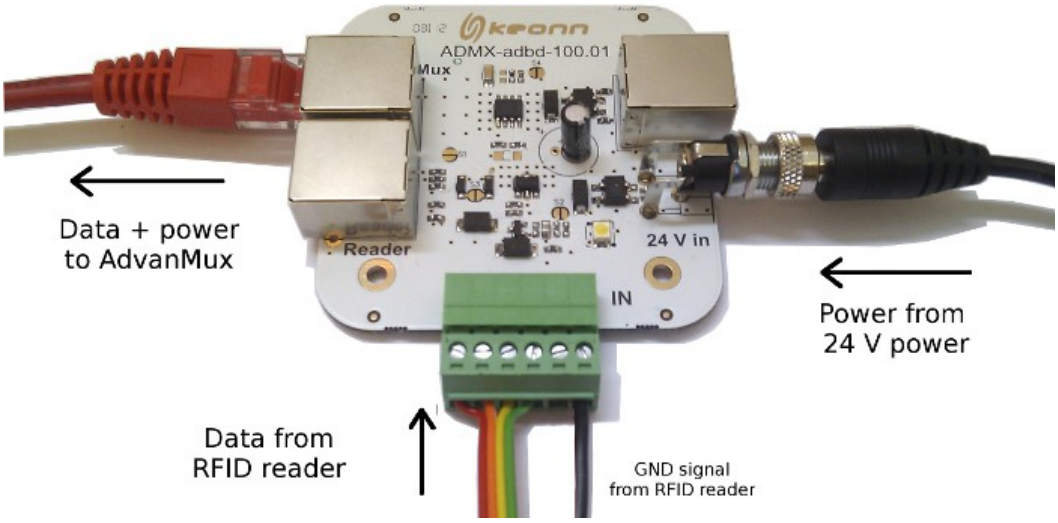
Please read AdvanMux™/AdvanPhaser™ User Guide for a detailed explanation on how to operate those devices.

3.1- AdvanGPIO™ Use cases

3.1.1- Use case 1: reader models without an external power supplies

For those RFID readers that do provide GPO signals but lack an external power supply to feed AdvanMux™/AdvanPhaser™ devices, AdvanGPIO™ can be used to supply the required power to them.

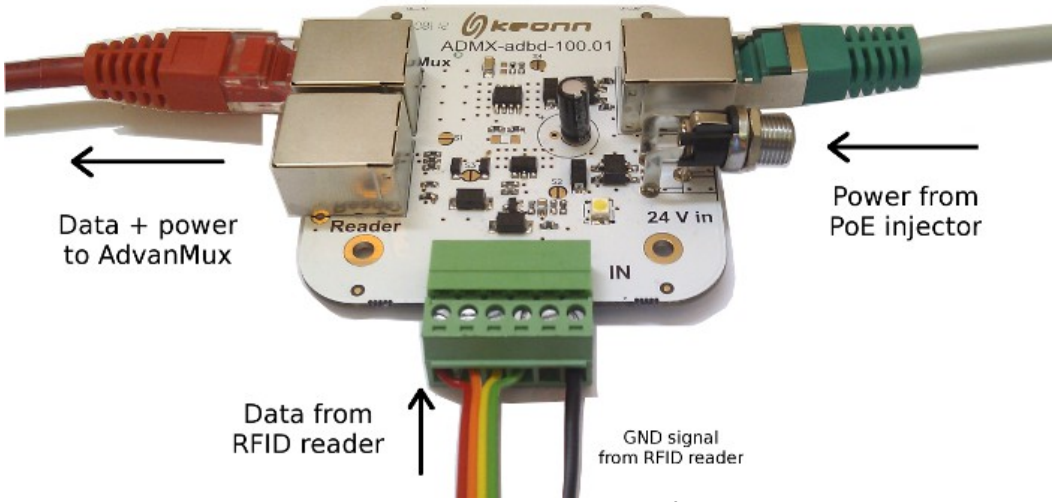
The first possible configuration would be to use an external power supply.



Capture 3: Use case 1.a

Please note the GND signal from the RFID reader.

The second possible configuration would be to use an external PoE injector.



Capture 4: Use case 1.b

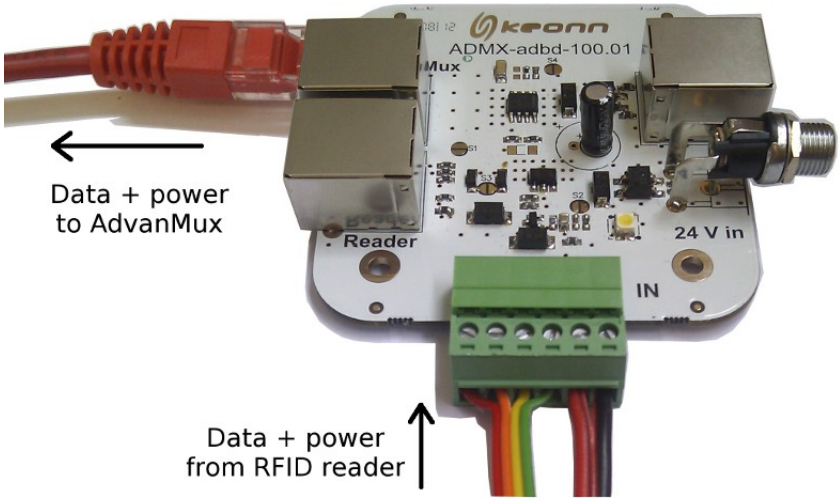
Please note the GND signal from the RFID reader.

When using AdvanGPIO™ straight Ethernet cables MUST always be used. Device damage may result from the use of improper cables.

3.1.1- Use case 2: reader models without an adaptor cable

For those RFID readers that do provide GPO signals and an external power supply but there is no adaptor cable available, AdvanGPIO™ can be used to connect the reader to AdvanMux™/AdvanPhaser™.

The best possible configurations would be to use the RFID reader to supply both data and power to AdvanGPIO™.



Capture 5: Use case 2

Power supply could also be taken from a PoE injector or an external 24 V power supply. In the previous use case it can be seen how to power AdvanGPIO™ using those methods.

3.1.2- Use case 3: reader models without enough output power

This is the same scenario as presented in case 1. Please refer to use case 1 for reference.

3.1.3- Use case 4: reader models with incompatible GPO electronics

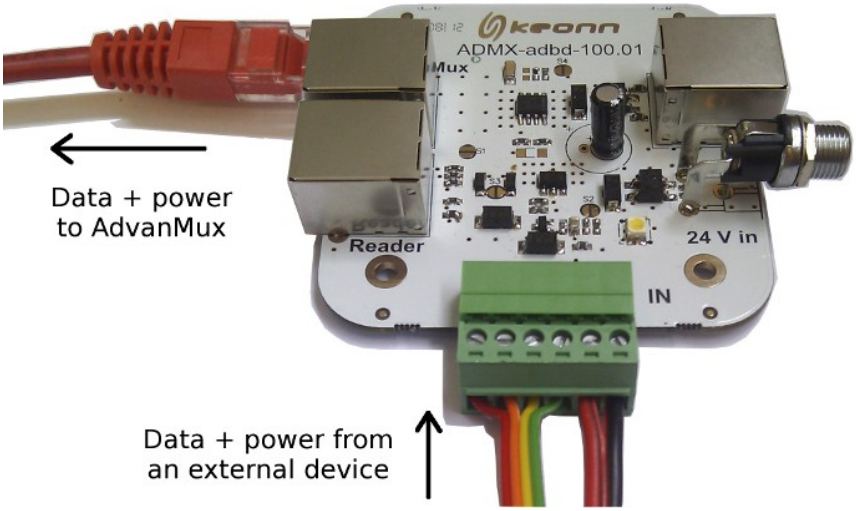
This is an equivalent scenario as presented in case 2. Please refer to use case 2 for reference.

3.1.4- Use case 5: reader models without GPO circuitry

For those RFID readers that do not provide any GPO functionality, AdvanGPIO™ can be used as a helper device to connect the reader to AdvanMux™/AdvanPhaser™.

Note in this scenario, the data signals and synchronization have to be generated by some external device. An example could be a computer software.

Configuration will be equivalent to use case 2.



Capture 6: Use case 5

Power supply could also be taken from a PoE injector or an external 24 V power supply. See previous use cases using those methods.

3.1.5- Use case 6: systems with dozens of AdvanMux™/AdvanPhasers™ devices

For installations containing dozens of AdvanMux™/AdvanPhaser™ devices controlled by the same reeader, it could happen the data signal levels and/or power source needed to be rebuild at some point. AdvanGPIO™ can be used for that purpose without altering the logical values of the data.

In those scenarios, configuration would be as follows.

Capture 7: Use case 6

The configuration would work as follows:

- The *Reader connector* would receive signal and power from the AdvanMux™ chain.
- AdvanGPIO™ would receive additional power either through a PoE injector, an external 24 V power supply or even through the terminal block connector.
- Re-generated data and power levels would be outputed through *AdvanMux™ connector*.

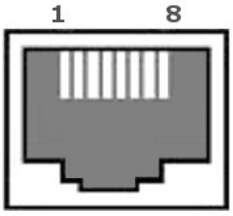
When using AdvanGPIO™ to regenerate data and power levels, straight Ethernet cables MUST be used. Device damage may result from the use of improper cables.

When using AdvanGPIO™ to regenerate data and power levels, it's advisable to use the same power method. If a PoE injector was used initially, the regenerate points should use also PoE injectors.

Appendix I. Connectors pin-out

Reader connector pin-out

RJ45 connector pin-out.



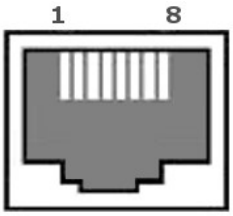
Reader connector: RJ45 female control connector pin-out.

Pin	Name	AdvanGPIO™ Value
1	GPO-0	Bit #0 (Least Significant Bit) from RFID reader output
2	GPO-1	Bit #1 from RFID reader output
3	GPO-2	Bit #2 from RFID reader output
4	VCC-1	VCC
5	VCC-2	VCC
6	GPO-3	Bit #3 from RFID reader output
7	GND-1	GND
8	GND-2	GND

Table 7: Reader connector pin-out

AdvanMux™ connector pin-out

RJ45 connector pin-out.



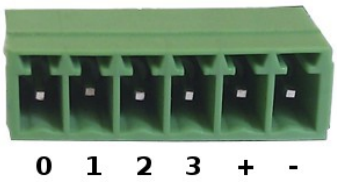
AdvanMux connector: RJ45 female control connector pin-out.

Pin	Name	AdvanGPIO™ Value
1	GPO-0	Bit #0 (Least Significant Bit)
2	GPO-1	Bit #1
3	GPO-2	Bit #2
4	VCC-1	VCC
5	VCC-2	VCC
6	GPO-3	Bit #3 from RFID reader output
7	GND-1	GND
8	GND-2	GND

Table 8: AdvanMux connector pin-out

IN connector pin-out

Female receptacle connector pin-out. Phoenix Contact compatible.



IN connector: female receptacle connector pin-out.

Pin	Name	AdvanGPIO™ Value
0	GPO-0	Bit #0 (Least Significant Bit)
1	GPO-1	Bit #1
2	GPO-2	Bit #2
3	GPO-2	Bit #3
+	VCC	VCC
-	GND	GND

Table 9: IN connector pin-out