TECHNICAL INFORMATION MANUAL

Revision 02 – 11 June 2019

RA0003

UHF Antenna Multiplexer

CAENRFID

Visit RA0003 web page, you will find the latest revision of data sheets, manuals, certifications and technical drawings. All you need to start using your product in a few clicks!

Scope of Manual

The goal of this manual is to provide the basic information to work with the UHF Antenna multiplexer RA0003.

Change Document Record

Date	Revision	Changes	Pages
30 Sep 2011	00	Preliminary release.	-
11 Dec 2012	01	Added *CONTROLLING THE RA0003* chapter	7
11 Jun 2019	02	Modified RA0003 image	1, 5
		Added *REGULATORY COMPLIANCE* chapter	13, 14

Reference Document

[RD1] EPCglobal: EPC Radio-Frequency Identity Protocols Class-1 Generation-2 UHF RFID Protocol for Communications at 860 MHz – 960 MHz, Version 2.0.1 (April, 2015).

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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.


RoHS
COMPLIANT

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1 INTRODUCTION

Product Description

The RA0003 module is a 1 to 4 UHF antenna multiplexer that allows to expand read points management of CAEN RFID easy2read© product line.

Typical usages of the device are the following:

- Extension of number of read points of single antenna readers (i.e. QuarkUp R1270C or Quark R1230CB) for low/medium range portal applications, access control and all others low cost installations requiring up to 4 antenna management.
- Extension of number of read points of multiantenna readers (i.e. Proton R4320P or Ion R4301P) for smart shelves installations, manufacturing lines and all others applications requiring a large number of antennas to be connected.

RA0003 has SMA RF connectors, is able to manage up to 2W RF power and can be used in the whole range of UHF RFID worldwide band.

The module has an extended supply voltage range (9Vdc ÷ 36Vdc) and TTL level address signal.

Five LEDs provide the user with information about module operation.

Fig. 1.1: RA0003 UHF Antenna Multiplexer

Ordering Options

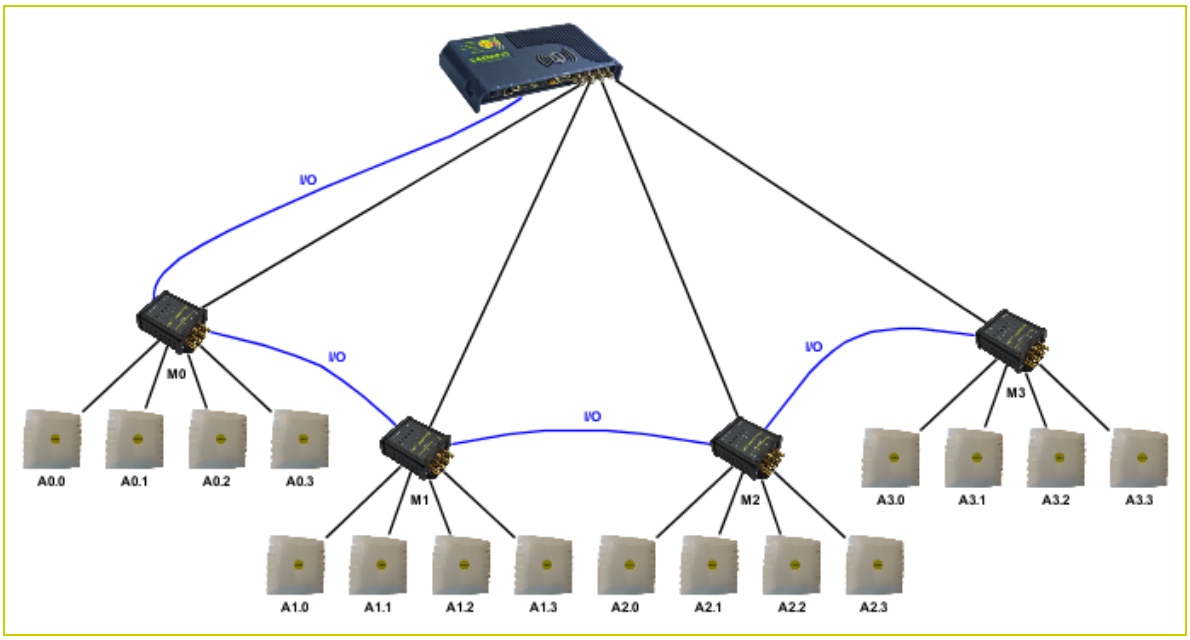
Code	Description
WRA0003XAAAA	RA0003 - UHF Antenna Multiplexer

2 CONTROLLING THE RA0003

This chapter explains how to use the CAEN RFID RA0003 Antenna Multiplexer in order to extend the number of read points connected to the same CAEN RFID reader.

In order to understand the content of this chapter, the reader should have a basic knowledge of the CAEN APIs (for detailed explanation on CAEN RFID APIs please refer to our web site, Manuals & Documents and Software & Firmware area).

Consider a sample setup. The setup is built around a CAEN RFID R4301P reader; each antenna connector of the reader is connected to the IN connector of a CAEN RFID RA0003 Antenna Multiplexer and each output (OUT_0 … OUT_3) of a multiplexer is connected to an antenna. The multiplexers are controlled by two address lines (A_0 and A_1) as described in Tab. 2.3 and Fig. 2.2; in our configuration the A_0 input of all the multiplexers are connected to the $GPIO_0$ line of the reader and the A_1 input of all the multiplexers are connected to the $GPIO_1$ line of the reader. The following figure depicts the described configuration.



Let consider the following assumptions:

- we want to perform an inventory activating the antennas in the sequence: $A_{0.0}$, $A_{1.0}$, $A_{2.0}$, $A_{3.0}$, $A_{0.1}$, $A_{1.1}$, $A_{2.1}$, $A_{3.1}$, $A_{0.2}$, $A_{1.2}$, $A_{2.2}$, $A_{3.2}$, $A_{0.3}$, $A_{1.3}$, $A_{2.3}$, $A_{3.3}$;
- the first Logical Source is populated by the Read Points “Ant0”, “Ant1”, “Ant2” and “Ant3”;

Then the code-snippet below describes how to obtain the result:

```
myReader.SetIO(0x00);              // Select the OUT0 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.0, A1.0, A2.0 and A3.0
// Elaborate the detected tags
myReader.SetIO(0x01);              // Select the OUT1 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.1, A1.1, A2.1 and A3.1
// Elaborate the detected tags
myReader.SetIO(0x02);              // Select the OUT2 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.2, A1.2, A2.2 and A3.2
// Elaborate the detected tags
myReader.SetIO(0x03);              // Select the OUT3 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.3, A1.3, A2.3 and A3.3
```

```
// Elaborate the detected tags
```

The example above is the simplest and more efficient in handling the multiplexers: it sets an address line output one time for all the multiplexers and then it uses the internal multiplexing functionality of the reader to provide the RF power to the multiplexer in sequence. Handling different orders for the antennas sequence is more complicated because the internal multiplexing functionality of the reader does not help so much. For example let consider the following sequence: $A_{0.0}$, $A_{0.1}$, $A_{0.2}$, $A_{0.3}$, $A_{1.0}$, $A_{1.1}$, $A_{1.2}$, $A_{1.3}$, $A_{2.0}$, $A_{2.1}$, $A_{2.2}$, $A_{2.3}$, $A_{3.0}$, $A_{3.1}$, $A_{3.2}$, $A_{3.3}$. In this case we have to define the Logical Source in the reader as follow:

- LogicalSource(0) = {“Ant0”}
- LogicalSource(1) = {“Ant1”}
- LogicalSource(2) = {“Ant2”}
- LogicalSource(3) = {“Ant3”}

And the code snippet to perform the inventory with the required antenna sequence is the following:

```
myReader.SetIO(0x00);              // Select the OUT0 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.0
// Elaborate the detected tags
myReader.SetIO(0x01);              // Select the OUT0 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.1
// Elaborate the detected tags
myReader.SetIO(0x02);              // Select the OUT0 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.2
// Elaborate the detected tags
myReader.SetIO(0x03);              // Select the OUT0 output of every multiplexer
myTags = myLS(0).InventoryTag();   // Use antenna A0.3
// Elaborate the detected tags
myReader.SetIO(0x00);              // Select the OUT0 output of every multiplexer
myTags = myLS(1).InventoryTag();   // Use antenna A1.0
// Elaborate the detected tags
myReader.SetIO(0x01);              // Select the OUT1 output of every multiplexer
myTags = myLS(1).InventoryTag();   // Use antenna A1.1
// Elaborate the detected tags
myReader.SetIO(0x02);              // Select the OUT2 output of every multiplexer
myTags = myLS(1).InventoryTag();   // Use antenna A1.2
// Elaborate the detected tags
myReader.SetIO(0x03);              // Select the OUT3 output of every multiplexer
myTags = myLS(1).InventoryTag();   // Use antenna A1.3
// Elaborate the detected tags
myReader.SetIO(0x00);              // Select the OUT0 output of every multiplexer
myTags = myLS(2).InventoryTag();   // Use antenna A2.0
// Elaborate the detected tags
myReader.SetIO(0x01);              // Select the OUT1 output of every multiplexer
myTags = myLS(2).InventoryTag();   // Use antenna A2.1
// Elaborate the detected tags
myReader.SetIO(0x02);              // Select the OUT2 output of every multiplexer
myTags = myLS(2).InventoryTag();   // Use antenna A2.2
// Elaborate the detected tags
myReader.SetIO(0x03);              // Select the OUT3 output of every multiplexer
myTags = myLS(2).InventoryTag();   // Use antenna A2.3
// Elaborate the detected tags
myReader.SetIO(0x00);              // Select the OUT0 output of every multiplexer
myTags = myLS(3).InventoryTag();   // Use antenna A3.0
// Elaborate the detected tags
myReader.SetIO(0x01);              // Select the OUT1 output of every multiplexer
myTags = myLS(3).InventoryTag();   // Use antenna A3.1
// Elaborate the detected tags
myReader.SetIO(0x02);              // Select the OUT2 output of every multiplexer
myTags = myLS(3).InventoryTag();   // Use antenna A3.2
// Elaborate the detected tags
myReader.SetIO(0x03);              // Select the OUT3 output of every multiplexer
myTags = myLS(3).InventoryTag();   // Use antenna A3.3
// Elaborate the detected tags
```

It is evident from the code snippet above that much more coding is needed and that the efficiency in changing from one antenna to the other is lower.

3 TECHNICAL SPECIFICATIONS

Technical Specifications Table

Function	1 to 4 multiplexer
RF Ports Impedance	50Ω
Operating Frequency	860 ÷ 960 MHz
RF Power Handling	up to 2W
Insertion Loss	1.5dB typ.
Return Loss	22dB typ.
Isolation	27dB typ.
RF Connectors Type	SMA jack
Dimensions	(W)65 x (L)93 x (H)35 mm^3 (2.6 x 3.7 x 1.4 $inch^3$)
Supply Voltage Range	9Vdc ÷ 36Vdc
Power Consumption	< 350mW
Control Voltage Range	0V ÷ 6V
Operating Temperature	-20°C to +70°C
User interface	Green LED: power Yellow LEDs: selected antenna information
IP Rating	IP30
Weight	155g

Tab. 3.1: Technical Specifications Table

The location of the connectors is shown in *Fig. 3.1: Connectors Location*.

Their specifications are listed below:

Antenna Ports: RF coax connector SMA plug type

Supply and control connector: 4 poles push in terminal (allowed wire section from 0.2 to 1.5 mm²)

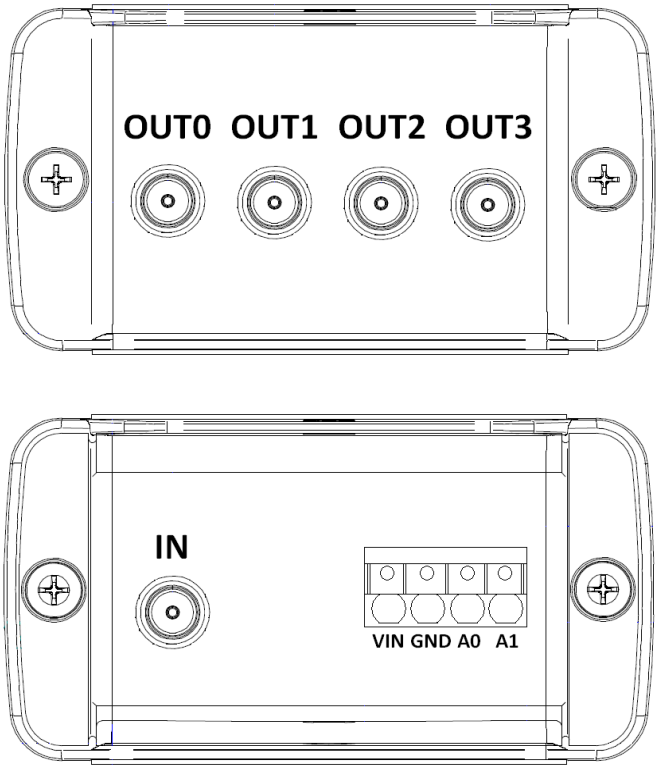


Fig. 3.1: Connectors Location

Supply and control connector pinout are shown in the following table:

Pin #	Signal	Description
1	Vin	Supply voltage
2	GND	Ground
3	A0	Input - Address bit 0
4	A1	Input - Address bit 1

Tab. 3.2: Connector Pinout

The control settings and the functional diagram of the multiplexer are shown in the table and in the figure below:

A1	A0	Signal path
Low	Low	IN connected to OUT0
Low	High	IN connected to OUT1
High	Low	IN connected to OUT2
High	High	IN connected to OUT3

Tab. 3.3: Control Settings

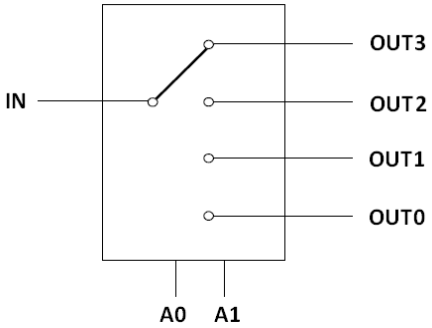


Fig. 3.2: Functional Diagram

RA0003 supply and control connector electrical characteristics[1]

Pin name	Pin No.	Parameter	Min	Typ.	Max	Unit
Vin	1	Supply voltage	9		36	V
		Supply current	9	15	40	mA
Ground	2					
A0	3	VIL	-0.5		0.8	V
		VIH	2		5.5	V
		Input current			1	µA
A1	4	VIL	-0.5		0.8	V
		VIH	2		5.5	V
		Input current			1	µA

Tab. 3.4: Supply and Control Connector Electrical Characteristics

[1] Exceeding maximum values reported in the table may cause permanent damage to the model.

Antenna ports specifications

The pinout of RA0003 RF ports antenna is shown in the following table:

Pin #	Function	Direction	Description
INNER	RF OUT	OUT	RF output
OUTER	GND	-	Ground

Tab. 3.5: RF Ports Pinout

Parameter	Min.	Typ.	Max.	Unit
RF power handling			2	W
Impedance		50		Ω
Insertion Loss		1.5	1.8	dB
Return Loss	20	22		dB
Isolation	25	27		

Tab. 3.6: RF Ports Electrical Characteristics

Mechanical drawings

The mechanical drawings of RA0003 are shown in the figure below[2]:

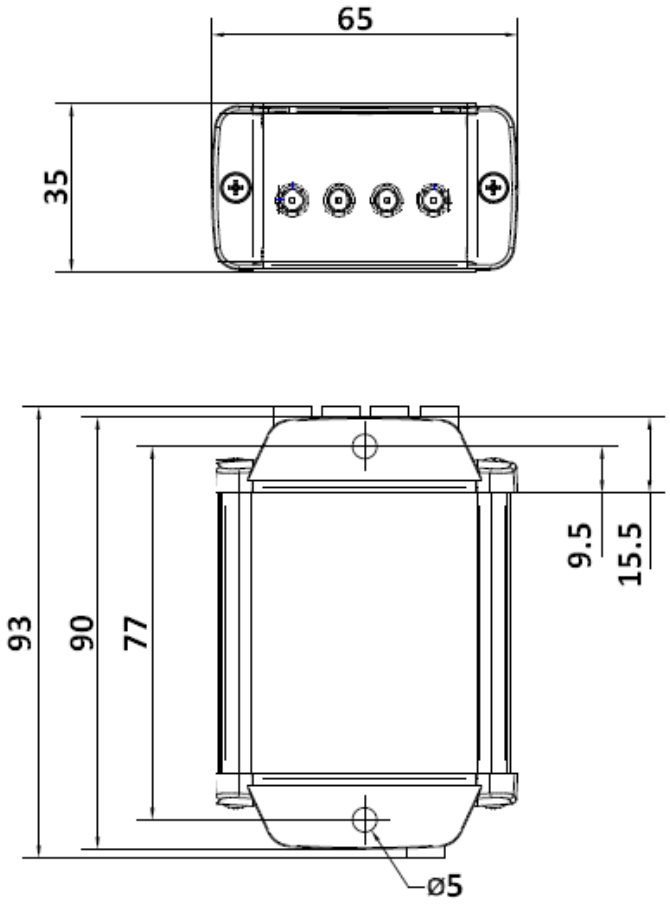


Fig. 3.3: Mechanical Drawings

[2] All dimensions are in millimeters.

4 REGULATORY COMPLIANCE

CE Compliance

Reference standard:

ETSI EN 301 489-1 V2.2.0:2017

ETSI EN 301 489-3 V2.2.1:2017

EN 55032:2015

CEI EN 55024:2013 +/A1:2015

CEI EN 60950-1:2007 +/A11:2010 +/A2:2014 +/A12:2014 + A1:2014

See § *RA0003 CE Declaration of Conformity* page 14 for the RA0003 CE Compliance Certificate.

RoHS EU Directive

RA0003 UHF Antenna Multiplexer is compliant with the EU Directive 2011/65/CE on the Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS2).

RA0003
CE DECLARATION OF CONFORMITY

We

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herewith declare under our own responsibility that the product:

Code: **WRA0003XAAAA**

Description: **RA0003 - UHF Antenna Multiplexer**

corresponds in the submitted version to the following standards:

ETSI EN 301 489-1 V2.2.0:2017

ETSI EN 301 489-3 V2.2.1:2017

EN 55032:2015

CEI EN 55024:2013 +/A1:2015

CEI EN 60950-1:2007 +/A11:2010 +/A2:2014 +/A12:2014 + A1:2014

and declare under our sole responsibility that the specified product meets the principle requirements and other applicable regulations of directives 2014/53/EU (RED) and 2011/65/EU (RoHS2).

Date: 11/06/2019

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Adriano Bigongiari (Chief Executive Officer)

On the basis of this declaration, this product will bear the following mark: CE