RA0003

UHF Antenna Multiplexer

CAENRFID

Technical Information Manual

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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 CAEN RFID RA0003 Antenna Multiplexer* chapter	6-8

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1 Introduction

This Chapter gives general information about the **RA0003 UHF Antenna Multiplexer**. It contains these topics:

- General Information
- Ordering Code

General Information

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

Typical usages of the device are the following:

- Extension of number of read points of single antenna readers (i.e. A528 or Quark) 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. A941 or Ion) 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 a extended supply voltage range (9Vdc ÷ 36Vdc) and TTL level address signal.

Five leds provide the user with information about module operation.

Ordering Code

Code	Description
WRA0003XAAAA	RA0003 - UHF Antenna Multiplexer

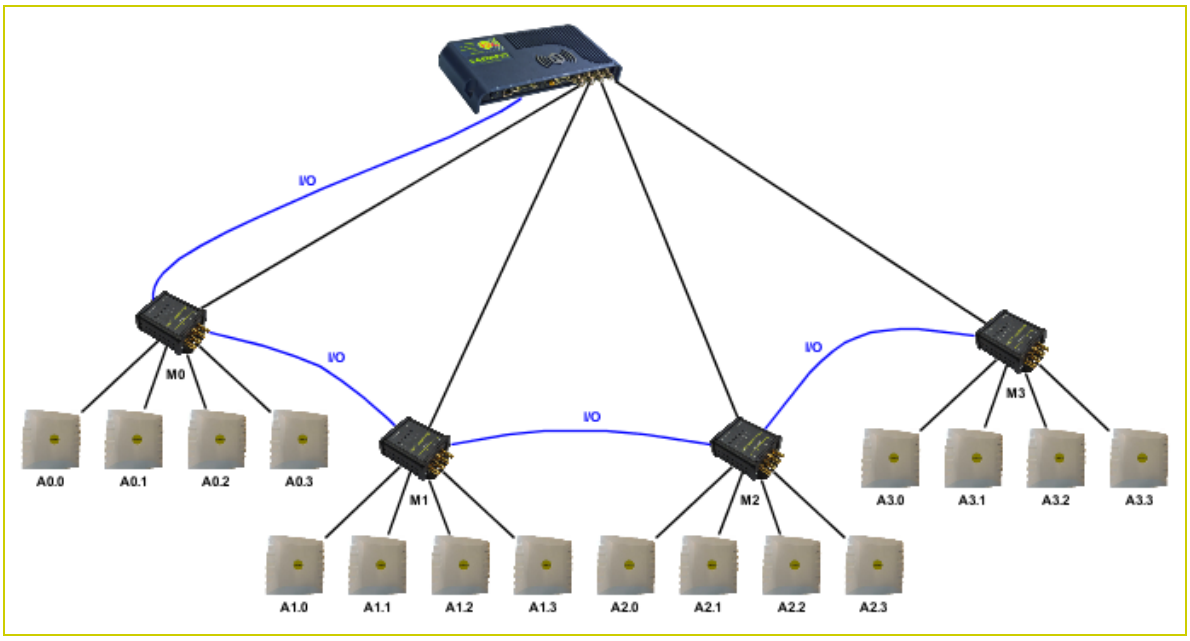
2 Controlling the CAEN RFID RA0003 Antenna Multiplexer

This Chapter explains how to use the **RA0003 UHF antenna multiplexer**.

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 of CAEN RFID APIs please refer to our web site).

Consider a sample setup. The setup is built around a CAEN RFID R4300P 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 RA0003 Technical Specifications

This Chapter describes the technical specifications of the **RA0003 UHF antenna multiplexer**. It contains these topics:

- Technical Specifications Table
- External Connection
- Mechanical drawings

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: RA0003 Technical Specifications

External Connections

The location of the connectors is shown in *Fig. 3.1: RA0003 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 mm^2)

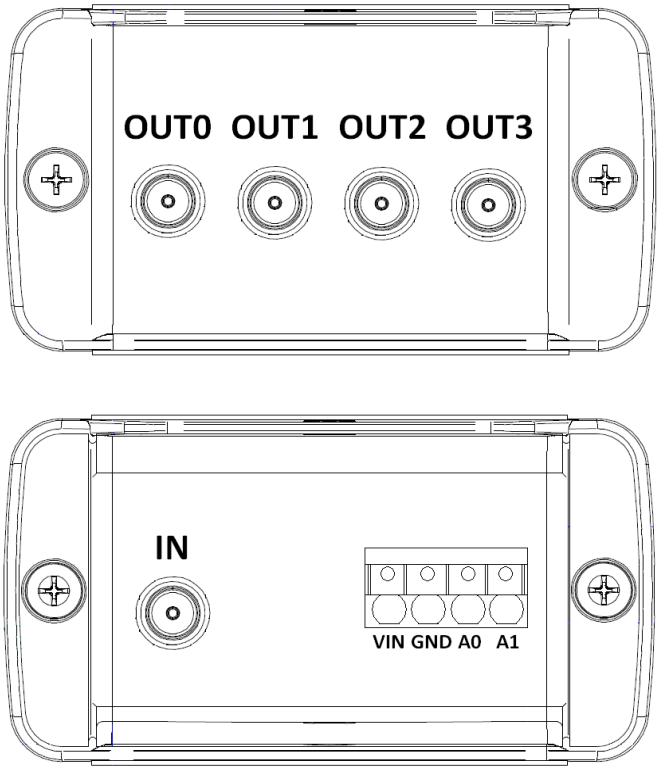


Fig. 3.1: RA0003 Connectors Location

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: RA0003 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: RA0003 Control Settings

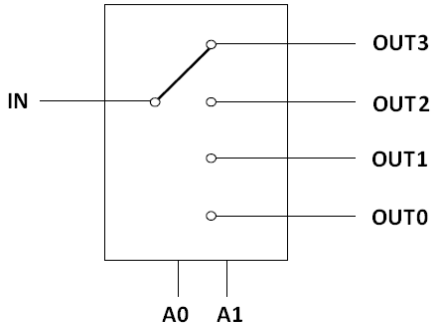


Fig. 3.2: RA0003 Functional Diagram

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: RA0003 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: RA0003 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: RA0003 RF Ports Electrical Characteristics

Mechanical drawings

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

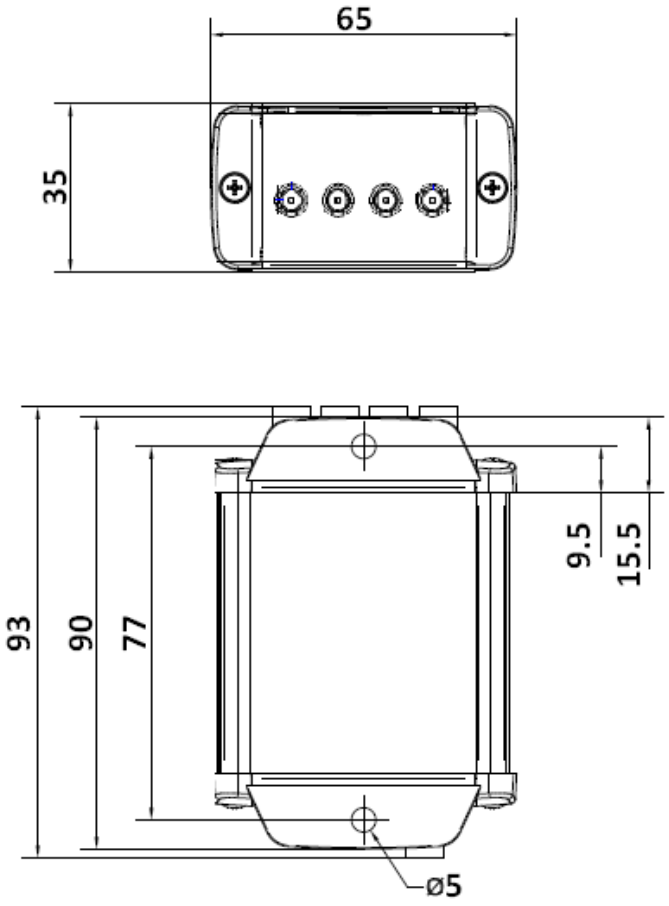


Fig. 3.3: RA0003 Mechanical Drawings

[2] All dimensions are in millimeters.