



A^{RF32} Bluetooth[®] Modules



ARF7044B – FCC approved version

User Guide

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ADEUNIS RF

283, rue Louis Néel
38920 Crolles
France

Phone +33 (0)4 76 92 07 77

Fax +33 (0)4 76 08 97 46

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About this Document

This guide describes the A^{RF32} devices, their options and accessories.

Declaration of CE Conformity



Manufacturer's name:
Manufacturer's address

ADEUNIS R.F.
Parc Technologique PRE ROUX IV
283 rue Louis NEEL
38920 CROLLES - FRANCE

declares that the product if used and installed according to the user guide available on our web site : www.adeunis-rf.com

Product Name: **ARF32**
Product Number(s): **ARF7044B**

is designed to comply with the RTTE Directive 99/5/EC:

EMC: according to the harmonized standard EN 301 489.

Safety: according to the standard EN 60950-1/2001

Radio: according to harmonized standard EN 300-328 covering essential radio requirements of the RTTE directive.

Notes: - Conformity has been evaluated according to the procedure described in Annex III of the RTTE directive.

- Receiver class (if applicable): 3.

According to the 1999/519/EC recommendation, minimum distance between the product and the body could be required depending on the module integration.

Warning : - CE marking applies only to End Products: Because this equipment is only a subassembly, conformity testing has been reduced (equipment has been design in accordance to standards but full testing is impossible). Manufacturer of End Products, based on such a solution, has to insure full conformity to be able to CE label marking.

- As the integration of a radio module requires wireless technological knowledge, ADEUNIS RF proposes its technical proficiency to its customers for a pre-compliance qualification of end products. In case of no-conformity, ADEUNIS RF will not be held back responsible if this stage has not been.

Crolles, November 6th, 2007
VINCENT Hervé / Quality manager

Download of the user guide

Thank you for having chosen the ADEUNIS RF products.

User guides can be uploaded directly on our web site www.adeunis-rf.com

Index **Products**

Paragraph **OEM Modules > Bluetooth® Module**

Print version available upon request

1. Tel : +33 4 76 92 07 77

2. Email : arf@adeunis-rf.com

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

The ARF7044B is a sub assembly: the end product to integrate this module has to be clearly identified on the label that this end product contains an FCC approved RF module. The format of such statement could be “Contains transmitter with FCC ID: V33ARF7044” or similar.

WARNING!**FCC and IC RF Radiation Exposure Statement:**

This module complies with FCC and Industry Canada RF radiation exposure limits set forth for general population/uncontrolled environment. To maintain compliance, this module must not be co-located or operating in conjunction with any other antenna or transmitter.

This transmitter module is authorized to be used in other devices only by OEM further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product.

Exigences pour le CANADA

Requirements for Canada users

Cet appareil numérique de la classe B respecte toutes les exigences du règlement sur le matériel brouilleur du Canada.

This class B digital apparatus meets all requirements of the Canadian Interference- causing equipment regulations.

L'utilisation de ce dispositif est autorisé seulement aux deux conditions suivantes: (1) il ne doit pas produire de brouillage, et (2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

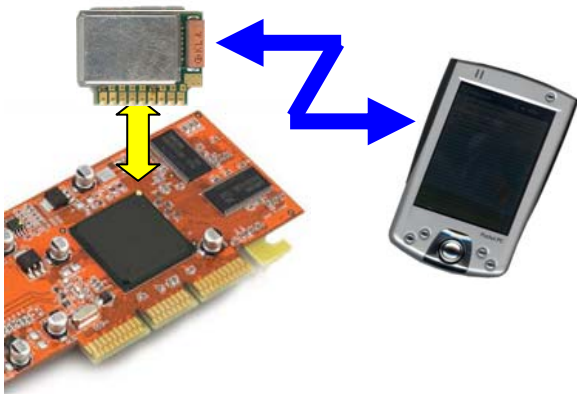
Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Overview

The A^{RF32} module enables Bluetooth® compliant duplex communications over a 20-meter range in the worldwide 2.45 GHz frequency band.

The A^{RF32} module fully complies with the V2.0 Bluetooth® standard and data rate goes up to 723 kbps. Data exchange and set-up are only done through an UART data port, under SPP profile. A miniature antenna is integrated.

A^{RF32} can be used in two modes:

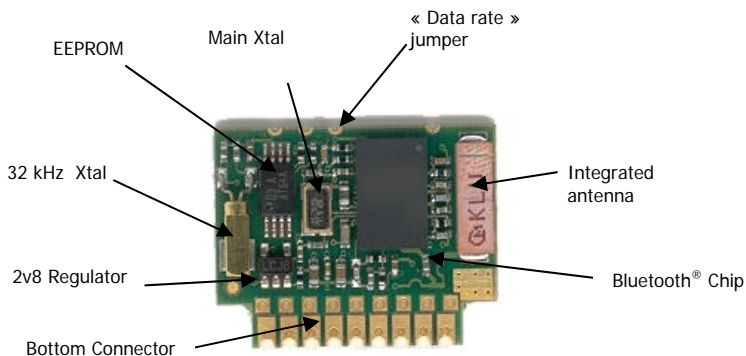


Classical Bluetooth® mode : Master starts with GAP identification, then, SDAP profile review, SPP connection and transparent communication.

Automatic Bluetooth® mode: Identification, profile review and connection to 1 to 3 known slaves are recorded by the master. After booting, Bluetooth® link is directly open in transparent mode.

A^{RF32} modules are available as standalone ARF7044 module or in the ARF7069 DemoKit. This DemoKit can be fully set-up and used with the National Semiconductors® "Simply Blue Commander" Software.

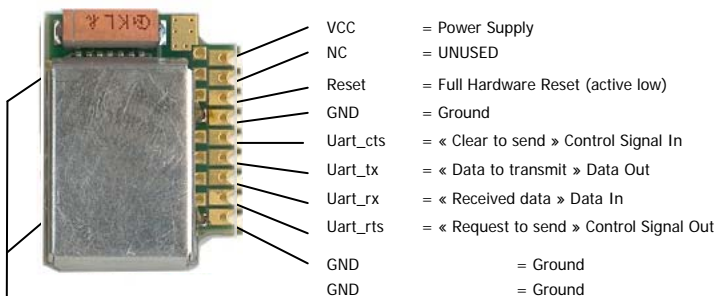
Hardware essentials



INTERNAL VIEW

Pin-out

All connections are located on the A^{RF32} bottom connector:



Interface

Pin description

Signal	I/O	Designation	Comment
VCC	I	Main power supply	2.85 < VCC < 3.6 V and I < 65 mA (Internally 2.8V regulated)
NC	-	Not Connected	NOT TO BE USED
Reset	I	Hardware reset	A ^{RF32} reset when Low
Uart_cts	I	Clear to send Signal	Serial port Flow control Input (MUST BE USED)
Uart_tx	O	Data to transmit	Serial port Data Output (0/Vcc level)
Uart_rx	I	Received data	Serial port Data Input (0/Vcc level)
Uart_rts	O	Request to send Signal	Serial port Flow control Output (MUST BE USED)
GND	-	Common Ground	Connected to motherboard ground

NOTE

For all I/Os :

$$0.7 \times VCC$$

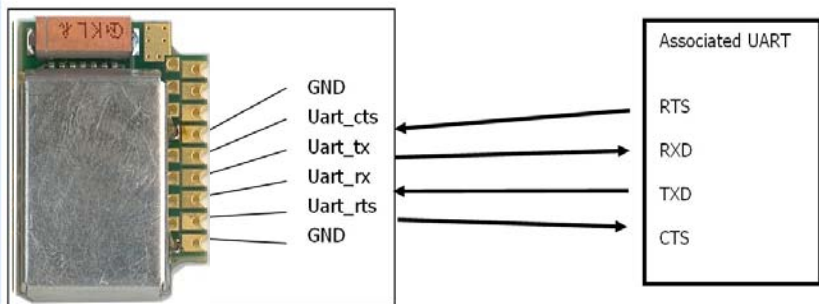
$$- 0.2 V$$

$$< \text{Logical 1} <$$

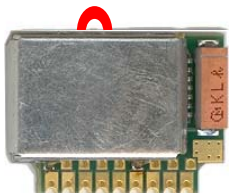
$$< \text{Logical 0} <$$

$$VCC + 0.2 V$$

$$0.25 \times VCC$$

**Use of the Data Rate Jumper**

The purpose of this jumper is to access the A^{RF32} module by forcing the UART data rate in case of unknown UART parameters.

Data Rate Jumper**(red link)**

In case of setup error while evaluating, communication with ARF32 module can be lost (bad UART parameters setup).

By connecting the "Data Rate Jumper", UART settings are forced to :

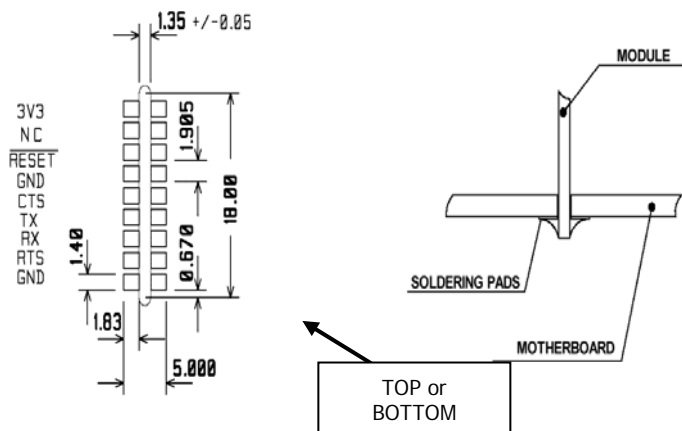
- Data rate = 9600 bps

NB : other settings (Parity, Stop bit & Flow control...) remain the same and have to be checked for recovery values..

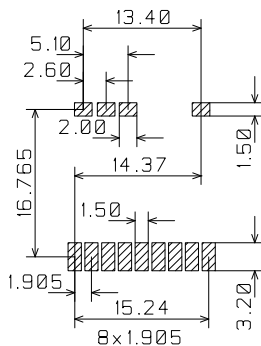
It becomes possible to re-program the "Non volatile Settings" to access again the ARF32 Module. When done, jumper can be removed.

Footprint

Recommended plugged footprint

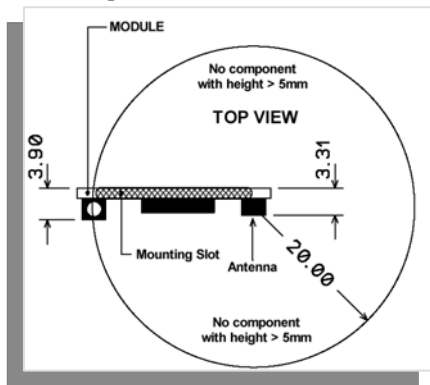


Recommended SMD footprint

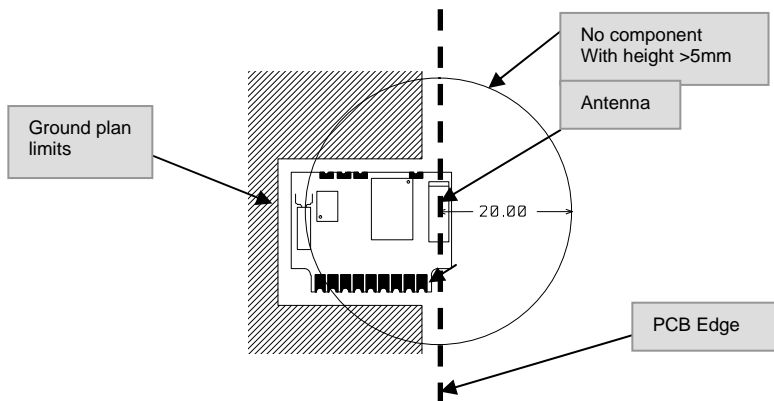


Recommended exclusion zone around antenna

For plugged mounting



For SMD mounting



Ideally, the module can be placed in edge of the PCB.

NOTE

If needed, ARF7044 modules may use a 2-mm pitch connector.

Usable references for mass production are:

- SAMTEC TMM-109-01-LL-S-RA
- RADIOSPARE 132-1083

Standalone ARF7044 module doesn't include this connector because of the suggested plugged mounting.

Software management

Non Volatile Default Settings

Parameter	Default Value	Description
BDADDR	HARD CODED	Bluetooth® Device Address
Local Name	Serial port device	
PIN Code	0000	Bluetooth® PIN Code
Operation Mode	Automatic ON	Automatic mode ON or OFF
Default connections	0	Up to seven default devices to ON or OFF
SDP database	1 SPP entry : Name : COM1 Authentif. & Encrypt. enabled	Service discovery database, control for supported profiles
UART speed	9600	Speed of the physical UART interface
UART settings	1 Stop bit, parity none	Settings of the physical UART interface
Ports to open	0000 0001	Defines the RF Comm port to open
Link keys	No link keys	Link keys for paired devices
Security mode	2	Security mode

Operating modes

There are two main operating modes in the module : command mode and transparent mode.

The command mode is used to set up the Bluetooth[®] link between two pieces of Bluetooth[®] equipment.

The transparent mode is used to transfer data between two pieces of Bluetooth[®] equipment.

Command mode

A specific protocol is used to send commands to the Bluetooth[®] module.

The frame format is the following :

All the values are in hexadecimal format.

Start delimiter	Packet type	Operation code	Data length	Check-sum	Data	End delimiter
1 byte	1 byte	1 byte	2 bytes	1 byte	<data length> bytes	1 byte

Start delimiter: 02 (<STX>)

Packet type : 52 ('R' for request), 69 ('i' for indication), 43 ('C' for confirm)

Operation code : command dependent

Data length : size of data. First byte is the Least Significant Byte and second byte is the Most Significant Byte

Checksum: Sum of all bytes from the packet type field to the data length field

Data : command data

End delimiter : 03 (<ETX>)

Example of the inquiry command

Start delimiter	Packet type	Operation code	Data length	Check-sum	Data	End delimiter
02	52	00	03 00	55	0A 00 00	03

Frame : 02 52 00 03 00 55 0A 00 00 03

Transparent mode

In this mode all the data received on the UART RX pin are sent by radio to the target Bluetooth[®] module and will be available on the target Bluetooth[®] module UART TX pin.

Mode selection

A specific command (transparent mode) is used in order to switch from command mode to transparent mode.

A specific pattern : "UART break" is used to switch from transparent mode to command mode.

Setting up a link using the command interface

Quick start using "Simply Blue Commander" SBC software (*) :

Connect one module with the RS232 link to a PC supporting SBC software. Setup "SBC Configuration / Transport layer" at the current baudrate (default 9600), 8 bits, 1 stop, no parity, "Low level driver" & "CTS output flow control" enabled.

Power up the two Bluetooth[®] modules. SBC must return:

< Rx: Event: SimplyBlue Ready, SW Version: 0212

It means Master Module, serial port setup and connection are OK

Open "SBC ARF32 DATA over SPP quick start" commands sub directory.

- > Click "BT environment inquiry" & "Send"
 - < All BT devices nearby send their own BDADDR & Class of Device
(SPP modules class of devices = 000000)
- > Click "SPP link establishment", replace FFs with slave **BDADDR** & "Send"

In bold : address of the target Bluetooth[®] module, discovered during previous step.

 - < Target module will confirm the connection (State has to be 00)
- > Click "Enter SPP transparent mode" & "Send"
 - < Target module will confirm entering transparent mode (State has to be 00)

You can now close SBC and use any kind of terminal software to exchange data or files through the Bluetooth SPP link.

(*) : SBC software zip package is downloadable from www.adeunis-rf.com web site.

Final use with a PC terminal or a microcontroller

Power up the two Bluetooth® modules. Connect one module with the RS232 link to a PC or Notebook or PDA. Use a terminal software configured at the current baudrate (9600 by default), 8 bits, 1 stop, no parity, flow control material.

Please find below a typical request / response sequence in order to establish a typical link. All requests must be sending by the PC / NB / PDA (i.e. the master). All indication and confirm responses are sent by the Bluetooth® slave module:

```

> GIAC Inquiry request:          02 52 00 03 00 55 0A 00 00 03
  < Inquiry module indication:   02 69 01 09 00 73 34 BE 1F 17 00 08 00
                                00 00 03

In bold : address of the target Bluetooth® module. This address will be used within the
command SDAP Connect and the command SPP Connect
  < Inquiry module confirm:      02 43 00 01 00 44 00 03
> SDAP connect request:         02 52 32 06 00 8A 34 BE 1F 17 00 08 03
  < SDAP connect module confirm: 02 43 32 01 00 76 00 03
> SDAP service browse SPP request: 02 52 35 02 00 89 01 11 03
  < SDAP service browse SPP module confirm: 02 43 35 0D 00 85 00 01 02 10 01
                                         11 01 05 43 4F 4D 31 00 03
> SDAP disconnect request:      02 52 33 00 00 85 03
  < SDAP disconnect module confirm: 02 43 33 01 00 77 00 03
> SPP connect request:          02 52 0A 08 00 64 01 34 BE 1F 17 00 08
01 03
  < SPP connect module confirm:    02 43 0A 02 00 4F 00 01 03
  < SPP connect module indication: 02 69 3E 04 00 AB 01 0C 00 00 03
> Enter transparent mode:       02 52 11 01 00 64 01 03
  < Enter transparent mode module confirm: 02 43 11 02 00 56 00 01 03

```

Now you can exchange data in transparent mode between the two Bluetooth® modules.

To come back to the command mode you have to send an UART break.

Automatic connection

For serial cable replacement the A^{RF32} master can be configured to connect automatically to a specific A^{RF32} slave and switch to transparent mode. The automatic connection is done on boot or reset. The A^{RF32} master tries 3 times the link establishment.

In order to do this the following commands have to be entered **one time** on the A^{RF32} master with for example the "Simply Blue Commander Software:

```
> Store default connection request :      02 52 13 0A 00 6F 01 01 01 34 BE 1F 17
                                         00 08 01 03
      < Store default connection confirm    02 43 13 01 00 57 00 03
In bold : address of the target bluetooth module.

> Write operation mode (auto) request :   02 52 4A 01 00 9D 01 03
      < Write operation mode confirm       02 43 4A 01 00 8E 00 03
```

Advanced commands

Other commands are available in command mode. Please refer to the National Semiconductors "Simply Blue Commander Software and "Software User Guide"

Specifications

Rough data rate	723 Kbps
UART programmable data rates	Standards from 9.6 to 921.6 kbps
UART ports	TXD - RXD - RTS – CTS
Frequency	FHSS / 2.402 to 2.480 GHz
Radiated RF power	2 mW (3 dBm)
Sensitivity	-85 dBm for BER 10^{-3} / PN9
Operating range	>20 m when plugged (with exclusion zone)
Operating voltage	3.3V nominal (2.85 to 3.6 V) (Internally 2.8V regulated)
TX / RX consumption	40 mA
PowerDown current	250µA (When software powered down)
Operating temperature	-35°C / +70°C
Dimensions	20 x 24 x 6 mm

References :

ARF7044B : Plugged Bluetooth® Class 2 Module
ARF7069B : RS232 Demo Kit

ARF7469 DemoKit schematics

