PICO MEGA DESIGN LABS

HF DONGLE READER

Pico HF RFID reader series
HF Dongle Reader ID-HF4A-RO1B
Reference manual

1st Edition March 2004

For more information, please contact www.pico-mega.com

First edition - March 2004

This is the first edition of the manual, it describes about

Pico HF Dongle Reader ID-HF4A-RO1B

Reference Manual

Firmware version 4.1.0

Document overview

1. Introduction

1.1. Document description

This document describes about hardware, operational features, commands and response data formats of Pico HF RFID Mini reader, ID-HF2A-G1A. This first edition of the document is meant for the firmware version v4.1.0.

- **All data format in the command frame should be given in hexadecimal format only.**
- **The hexadecimal value in brackets "[ ]" indicates a control byte (command).**
- **During the reading of a transponder, it must be ensured that the transponder is located within the detection range of the Mini Reader during the process.**
- **Mini Reader is also referred as Reader in the entire document.**

1.2. Abbreviations

ASK	Amplitude Shift Keying
bps	Bits per second
FSK	Frequency Shift Keying
ID	Identification
LRC	Longitudinal Redundancy Check
MHZ	Megahertz
Min	Minutes
ms	Milliseconds
MSB	Most Significant Byte
Mbit	Megabit
RF	Radio Frequency
RTC	Real Time Clock
Sec	Seconds
UID	Unique Identifier (read only serial number)

2 .Hardware Description

2.1. General Description – Mini Reader

Pico RFID line of 13.56 MHz Dongle brings the efficiency in industrial automation, process control, warranty management, etc.,

The RFID Dongle is based on Texas Instruments RFID technology and operates at 13.56 MHz frequency that is compliance with the ISO/IEC 15693 vicinity card standards. The Dongle features include an on board antenna, two onboard LEDs and CMOS level RS232 interface.

2.2. System Overview

HF Dongle works on the ‘Readers-talks-first’ principle. As soon as the reader is powered it generates an electromagnetic field around the antenna and starts sending a modulated command to read the transponder UID in the field. The transponder when enters in the vicinity of the RF field converts the electromagnetic field energy to an operational energy and demodulates the command sent by the reader and responds to it accordingly.

2.3. Interfacing PC – Reader

The Reader is interfaced with the PC by a RS232 interface serial port cable through a RS232 interface circuit. The serial communication occurs at CMOS level using 1 start bit, 8 data bits and 1 stop bit, no parity, no hard ware flow control at a fixed baud rate of 19200 bps.

2.4. Functional specifications

Part Number	ID-HF4A-RO1B
Operating frequency	13.56 MHz
Transmitter power level	200 mW (pulsed)
Antenna connection	On board antenna
Antenna impedance	50 ohms @ 13.56 MHz
Communication interface	CMOS level UART interface
Baud rate	19200 bps
Visual / Audio Interface	Two LED's
Operating temperature	-20°C to + 65°C
Storage temperature	-40°C to + 85°C

2.5. Mechanical specifications

The Dongle Reader has a simple mechanical construction where all the components are mounted on the Printed Circuit Board. The PCB also carries the connectors for the power supply and serial cable. The outer dimension and weight of the board is given below.

Dimensions	45(L) x 40(W) x 7(H) all in mm
Weight	10 grams

2.6. Power Supply

The input supply voltage ranging from +4.9V to 5.1 V dc can be given to the Time Machine. The reader consumes 150 mA current.

Input Supply voltage	+4.9 V to +5.1 V dc power supply
Current consumption	150 mA

2.7. Output RF power

RF output power / antenna	200 mW

2.8. RF Physical layer

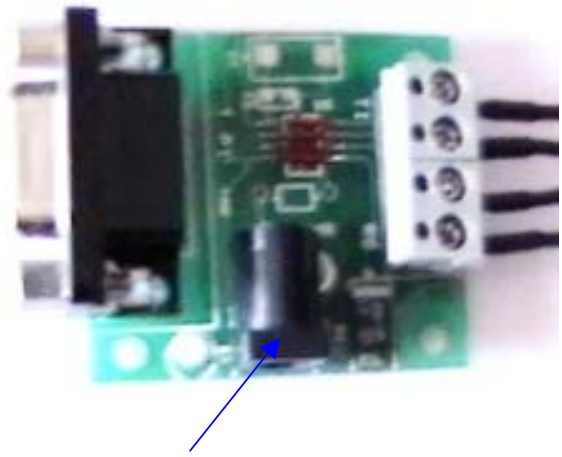
Reader to transponder	10% - 30 %(nominally 20%) ASK
Transponder to reader	FSK / High speed data rate

2.9. Antenna parameters

Impedance	50 ohms @ 13.56 MHz
Loaded Q	10 < Q < 30

3. Connection Procedure

3.1. Power Supply Connection procedure



Power Supply connector

12V DC Adapter

The Dongle reader module has to be connected to a converter board for its power supply. The location of the power supply connector in the converter board is shown in the above picture. A 12 V DC adapter with 1 A current rating is used to power the reader.

3.2. Converter Board interface Procedure

The Reader is connected to the converter board using the 4 wired data cable as shown in the fig.3.2.a

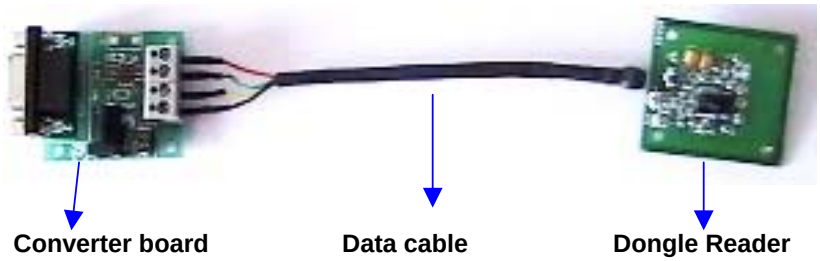


Fig 3.2.a Dongle Reader connected with converter board

The data cable has four wires in one end and a plug connector at other end.

Fig 3.2.b Data Cable

The four wired end which is connected to Vcc, GND, Tx and Rx of dongle reader are connected to the converter board as shown in the fig 3.2.c

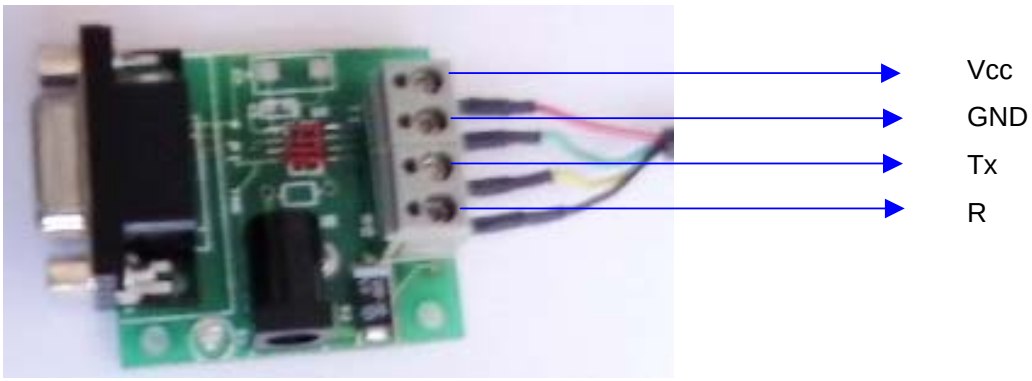


Fig 3.2.c Converter board to four wired end of cable

The plug end of cable is connected to the receptor of the dongle reader as shown in the fig 3.2.d

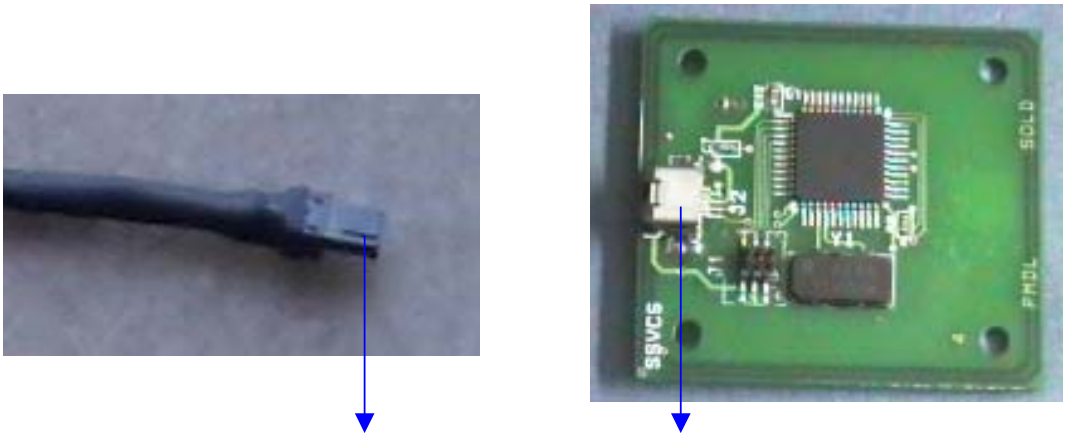


Fig 3.2.d Plug end of cable to Receptor end of Dongle Reader

3.3. RS232 serial port interfacing procedure

A RS232 serial cable which has a RS232 DB9 female connector at one end and RS232 DB9 male connector at other end is used for serial communication. The DB9 female connector is connected to a COM port of host and DB9 male connector to the Converter board of Dongle reader.

Fig 3.3.a RS232 Cable

Data transmission through the serial port is carried out using only 3 pins of the DB9 female connector as shown below.

Pin Number	Signal
DB2	TX
DB3	RX
DB5	GND
DB1,DB4,DB6,DB7,DB8,DB9	NC

The serial port communication setting of the reader is given below.

Baudrate : 19200 bps

Start bit : 1 bit

Data bits : 8 bits

Stop bit : 1 bit

Flow control : None

4. Response format

4.1 Protocol Frame

The General Protocol format used for all the PICO products is given below. All bytes transfer occurs with the most significant bit (MSB) first. Here we consider only the response format of Dongle Reader as soon as the card is flashed in front of the antenna of the reader.

1	2	3	4	5	6 … n-2	n-1	N
Start Byte (0x01)	Device Address	Antenna ID	Data Length	Command Byte	**Protocol Data**	**LRC**	Stop Byte (0x04)

General Protocol Format

Dongle Reader's Response Format:

1	2	3	4	5	6..21	22	23
0x01	0x01	0x01	0x17	[0xF3]	UID	LRC	0x04

Start Byte

The start byte of any command is 0x01.

Device Address

The reader can be addressed using the user defined reader identification number of one byte length. The device ID is fixed as 0x01 to the Dongle Reader.

Antenna ID

The antenna ID byte denotes antenna number allocated for the antenna. The antenna ID for this reader is fixed as 0x01.

Data Length

The data length byte refers the length of single protocol data frame i.e., the number of bytes in a single command or response. Here it is 0X17.

Command Byte

Command byte performs the function related to the byte. The command byte used for reading the UID is 0xF3.

Protocol Data

The 'Protocol Data' refers to the Data of the command byte. The UID of the card is got as the Data byte.

LRC Calculation

The Longitudinal Redundancy Check (LRC) is a one-byte data. LRC is calculated by adding the successive bytes in the command and discarding the carries and then two's complementing the result.

Stop Byte

The stop byte of any command is 0x04 (ASCII character 0x04). Care must be taken by the host to identify the correct 'stop byte' using the 'Data Length' byte.

UID representation

The UID is 8 byte length (64 bits) which contains 16 characters. In this reader the UID of a transponder is represented by 16 byte data. i e each character is represented by it's corresponding ASCII value. For an example, the first two characters 'E0' of a UID 'E007000002CDE5F7' is represented by 45h 30h. The ASCII value of 'E' is 0x45 and '0' is 0x30.