SMART RFID READER
USER MANUAL

Complete Solution for
Development Tools, Robots, Compilers

SMART RFID READER
USER MANUAL

Table of Contents

© 2009 BizChip Sdn Bhd

Smart RFID Reader Introduction

This Smart RFID reader operates at 125KHz. It can detect card within 60mm distance and record 50 RFID cards. The reader operates using 12VDC adapter/battery (the adapter will auto charge up the battery to 12VDC if connect battery and adapter together).

This device can work independent or controlled by Microcontroller / PC (through serial port or USB port). TTL I/O and relay output available for this product.

When no PC or Microcontroller connected, it can record up to 50 card IDs. And turned on TTL output / relay when recorded card detected (e.g. to open door). And there is a push button used to turn on the TTL output / relay without using card (e.g. the button will be installed in room to open door without card). User can also erase all recorded card ID by connecting a jumper.

If this device is connected to PC or Microcontroller it will send card ID to connected device through RS232 serial interfacing. The card ID perform as hexadecimal 6 bytes characters format when send to PC. And it perform as integer (0 to 255) 3 bytes format when send data to Microcontroller. User can control the reader through PC or Microcontroller to on/off the reader's output, read card ID, erase card ID, or read sensor input.

This product also comes with user manual. Email enquiry@bizchip-components.com for any enquiry.

Specification:

1. **Can connect to PC Serial, USB and Microcontroller:** The reader output signal support computer RS232 and Microcontroller TTL serial port. By adding USB to RS232 converter (buy separately, around RM30) user can link the reader to USB port also. The communication baud rate is 9600bps. For PC interface the data is in 6 bytes hexadecimal (00 to FF) format, total has 6 bytes characters e.g. A26F45 (A is 1 byte, 2 is 1 byte, 6 is 1 byte, F is 1 byte, 4 is 1 byte, 5 is 1 byte character). For Microcontroller interface the data is in 3 bytes integer (0 to 255) format e.g. 225 123 207 (255 is 1 byte, 123 is 1 byte and 207 also 1 byte integer all 3 bytes will send 1 by 1).

2. **Can operate independent or with computer and Microcontroller:** The reader can work independent it can also link to computer or Microcontroller through RS232 serial interfacing (baud rate 9600bps, no parity bit checking, each data in 8 bit form).

3. **Can record up to 50 cards:** The reader has reading mode and execute mode. Under reading mode the reader will auto record RFID card. The recording speed is 1 card/second. The recorded cards can be erased through a switch or through connected computer or Microcontroller. The recorded data can also sent to connected computer or Microcontroller through RS232 communication.

4. **Support 12VDC adapter and lead acid battery:** Smart RFID reader supports 12VDC power from adapter and 12V lead acid battery. If the battery is less than 12VDC, the 12VDC adapter power will also charge up the battery. However if 12VDC adapter is removed or off then the battery will automatic supply to the reader.

5. **With two TTL output:** The reader has two TTL outputs (0V or 5V). The two TTL output can be used to trigger buzzer, relay or LED. The TTL output can be controlled through connected computer or Microcontroller.

6. **With a relay module:** The TTL output of the reader can be connected to a relay module to on/off any high power DC/AC device e.g. magnetic lock, bulb and fan. The relay can be turned on/off through a switch or through connected computer or Microcontroller.

7. **Support a sensor input:** The reader supports a TTL input (0V or 5V) or switch input. This input can direct connect to sensors e.g. door magnetic switch, vibrate switch, PIR motion sensor, smoke sensor. Connected computer or Microcontroller can send command to request the sensor status anytime.

Package Include:

1 unit passive RFID reader, 125KHz, max detect range is 60mm

1 unit RFID reader control card

1 unit serial cable

1 unit 2 way connector

3 units RFID cards

> Any enquiry or need technical support please email to: enquiry@bizchip-components.com

Power Supply

Power supply from voltage regulator should be 12VDC. The **red LED** will be lighted on if the power switch is turned ON.

Warning 1: If power supply is connected/on and switch is turned on, but the power LED is still OFF, please off the power supply and check:
a. If the power supply polarity is reversed.
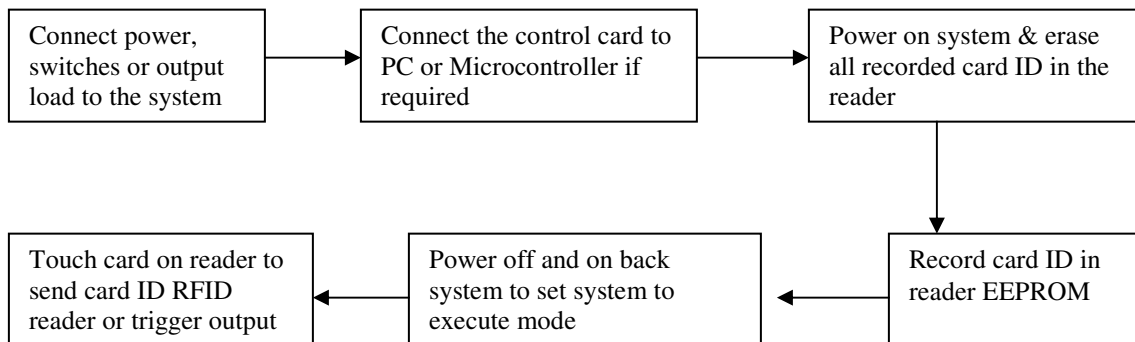b. If the power supply is fail or less than 12VDC.

Warning 2: Do not program the PIC Microcontroller on the Smart RFID reader. This will cause the system loss function.

Warning 3: This RFID reader uses a slide switch to switch system to record mode or execute mode. You need to power off the system to change mode and power on back to shift to another mode.

Label and Connection

Ref	Label	Connection
1.	SW1	On/Off system power.
2.	SW2	Switch to left to set system as record mode, switch to right to set system to execute mode.
3.	VCC	RFID reader 12V power line, red color.
4.	GND	RFID reader GND line, black color.
5.	+)7V – 18VDC	12V adapter power input.
6.	7V – 18VDC	12V battery power input.
7.	5V	5V output pin.
8.	0V	0V common ground pin.
9.	H1	Pin to interface to Microcontroller.
10.	H2	Pin to interface to PC.
11.	13	RFID reader signal pin, white color.
12.	14	RFID reader signal pin, green color.
13.	15	RFID reader enable pin, orange color.
14.	24	TTL output pin 1.
15.	25	Push button / TTL signal input pin.
16.	26	Data erase pin. Connect to 0V when want erase data.
17.	27	TTL output pin 2.
18.	OUTPUT	Relay output load.
19.	POWER	Power supply for relay output load.
20.	P3	TTL input pin to trigger relay on/off.
21.	LED1	Power on/off indicator.
22.	LED2	System progress indicator.
23.	LED3	Relay on/off indicator.
24.	NO	Connect jumper to here to set relay to normally open.
25.	NC	Connect jumper to here to set relay to normally close.

Command List

Ref	Command	Command Description
1.	A or a	Request last card ID touched on the reader. E.g. if you touched 3 cards on the reader, the last card ID will display on screen after execute this command.
2.	B or b	Request total card ID recorded in the reader. E.g. if you recorded 25 cards in EEPROM, you will get 000025 (6 bytes character) if using PC or 0 0 25 (3 bytes integer) at Microcontroller.
3.	C or c	Request all cards ID stored in the reader. E.g. if you already recorded 15 cards in the system. You will see each recorded card ID display on screen after execute this command. Data transfer speed is every 100ms display 1 card ID. The card ID is in hexadecimal format, total has 6 bytes characters.
4.	D or d	Clear all card ID in the reader. Yellow color LED will turn on during erase card. E.g. if you recorded 5 cards in this reader, after execute this command all 5 recorded card IDs will be erased.
5.	E or e	On TTL output 1 (pin 24). This output can be connected to buzzer or relay module through a jumper wire. So you can on/off high power device e.g. magnetic lock or siren.
6.	F or f	Off TTL output 1 (pin 24). This output can be connected to buzzer or relay module through a jumper wire. So you can on/off high power device e.g. magnetic door lock or siren.
7.	G or g	Read TTL / switch input (pin 25) digital state 0 / 1. E.g. if pin 25 connected to push button, whenever push button pressed 0 will send out. Else 1 will send out.
8.	H or h	On TTL output 2 (pin 27). This output can be connected to buzzer or relay module through a jumper wire. So you can on/off high power device e.g. magnetic door lock or siren.
9.	I or i	Off TTL output 2 (pin 27). This output can be connected to buzzer or relay module through a jumper wire. So you can on/off high power device e.g. magnetic door lock or siren.
10.	J or j	Record 1 card in EEPROM and display the recorded card ID will send out to PC or Microcontroller. Yellow color LED will on when reader is ready to record. Yellow color LED will off after 1 card is recorded. Warning: after this command executed, the reader will wait for a RFID card touching. Do not send other commands to reader during this period.

System Operation Block Diagram

Connect power, switches or output load to the system	→ Connect the control card to PC or Microcontroller if required	→ Power on system & erase all recorded card ID in the reader

↓

Touch card on reader to send card ID RFID reader or trigger output	← Power off and on back system to set system to execute mode	← Record card ID in reader EEPROM

<div style="background-color:red; color:white;">

Any enquiry or need technical support please email to: enquiry@bizchip-components.com

</div>

Device testing without PC or Microcontroller

1. Power off the smart RFID reader.
2. Connect RFID reader to control card pin headers. Reader white wire: control card pin 13, green wire: pin 14, orange wire: pin 15. Red wire: VCC, Black wire: GND.
3. **Make sure the mode setting switch is switched to left (if you want record card) or switch to right (if you want to detect card system). Normally we will switch to left for card recording and after all cards recorded only we will switch it back to right for execute mode.**
4. Connect power supply to the Smart RFID Reader (min 12VDC).
5. Power on the Smart RFID Reader using system power on/off button.
6. You should see the red LED indicator turned on for 1 sec then off. If you don't please check the adapter polarity or connection.
7. You will also find a yellow color LED blink for 1 time. It doesn't blink means system fail.
8. If you connect pin 24 to relay module input pin P3. The relay will also turn on when system start.
9. **If the RFID reader never used before, and you want to record card ID in the reader. You have to switch the slide switch to record mode and connect jumper between pin 26 and 0V to initialize the memory space. The yellow color LED will turn on during data erase/initialize. After all data erased/initialized the yellow color LED will turn off.**
10. **REMOVE THE JUMPER AFTER ALL DATA ERASED so you can record new card.**
11. If you using record mode (switch the slide switch to left). The card ID will be recorded in EEPROM (mean after power off the record still in the reader) when you touch. Before you touch the card, the yellow color LED is on. After card recorded the LED will off and on back. The maximum recording speed is 1 card / second. If the LED never turn off after you touched RFID card on reader. This means reader EEPROM is full. You have to erase old data before record new one.

12. The reader can record maximum 50 cards. If you find the yellow color LED turn on always (before and after you touch card) mean the system already recorded 50 cards. You need to erase all old cards to record new card ID.

13. **Under record mode if you want to erase card ID just connect jumper between pin 26 and pin 0V. The reader will check whether any card recorded. If no card recorded the yellow color LED remains off. Else if there are cards recorded it will start erase the card ID. Yellow color LED will turn on during erase period. When all records removed the yellow LED will turn off.**

14. Record new card ID after erase. You can record any amount of card (maximum: 50 cards).

15. After recorded all cards. You can switch the reader to execute mode by switching the mode switch to right.

16. Power off the reader and on it back after 3 seconds.

17. Under execute mode if you touch a valid / recorded card pin 24 will turned on for 1 sec then turned off. The pin 24 can be connected to buzzer or relay module pin P3 to trigger magnetic door lock. Nothing will happen if invalid card detected.

18. Connect a push button to pin 25 and 0V next to pin 25. Whenever push button pressed TTL output pin 24 will turn on. Else pin 24 remains off. This signal can be used to open door from inside room without card.

Device testing using PC Hyper Terminal program

1. Power off the smart RFID reader.

2. Turn on computer.

3. Hyper Terminal program is a program comes with window XP. It is under Accessories -> Communication. It is used for serial interfacing testing. This software is best solution for you get familiar with how the reader works. You can use Hyper Terminal to control the Smart RFID reader or read card ID from the Smart RFID reader (through command list above).

4. Under desktop environment click: Start -> Programs -> Accessories -> Communications -> Hyper Terminal.

5. **When enter Hyper Terminal program you can click: 'Cancel' -> 'Yes' -> 'Ok' -> Fill in 'abc' in blank -> 'Ok' -> 'Cancel' -> 'Yes' -> 'Ok'-> Select com port available for RS232 control (normal use COM1)(if you use USB to serial converter you can find the com port ID in 'My Computer' (right click mouse) -> 'Properties' -> 'Device Manager') -> 'Ok' -> 'Restore Defaults' (this will change: Bits per second: 9600, Flow control: None)-> 'Ok'.**

6. Now you already successfully setup Hyper Terminal.

7. Connect RFID reader to control card pin headers. Reader white wire: control card pin 13, green wire: pin 14, orange wire: pin 15. Red wire: VCC, Black wire: GND.

8. Connect RFID control card to computer through serial port cable (attached) or USB to serial converter (buy separately).

9. Switch the reader to execute mode (by switching the slide switch to right).

10. Connect power supply to the Smart RFID Reader (min 12VDC).

11. Power on the Smart RFID Reader using system power on/off button.

12. You should see the red LED indicator turned on. If you don't please check the adapter polarity or connection.

13. You will also find a yellow color LED blink for 1 time. It doesn't blink means system fail.

14. Touch RFID card on the reader within 6cm distance. The reader will beep for 2 times. And card ID will send to computer through serial port cable.

15. You should see the card ID display on screen in hexadecimal mode. The card ID is in hexadecimal format, total has 6 bytes characters.

16. There are 2 ways to record card ID in the reader. **Method 1:** You can off system then set the slide switch to record mode (switch to left) and start recording. After recorded all cards you can power off the system and switch it back to execute mode (to switch from record mode to execute mode you have change switch position then power off the system then on it back after 3 seconds). **Method 2:** You can send command 'J' or 'j' from hyper terminal and touch a card on RFID reader to record the card ID. Each time you send a 'J' or 'j' you can record 1 card. The card ID will be recorded in EEPROM (mean after power off the record still in the reader). The maximum recording speed is 1second / card. Before you touch card on reader the yellow color LED is on. After you touched LED on reader the yellow LED will off and on back. If the LED never turn off after you touched RFID card on reader. This means reader EEPROM is full. You have to erase old data before record new one.

17. Under execute mode. Whenever you touch a RFID card on reader. If the card ID is recorded before. The control card will also give a +5VDC output for 1 second at pin 24. This signal can be connected to relay module input pin P3 to turn on/off output devices. Else if invalid card detected nothing will happen.

18. You can also connect a push button at pin 25 and 0V next to pin 25 to turn on pin 24 directly (without using card). This is an additional application used to open door from inside room without RFID card. Whenever the push button connected at pin 25 is pressed the pin 24 will turned on for 2 seconds.

19. Now if you want to control the RFID reader through computer, you can just press command in command list above to erase card ID, read card ID, on/off relay or detect push button pressed/released. The replied data will be in 6 bytes hexadecimal character. E.g A2438F (6 bytes, each byte is character) or 000001 (6 bytes, each byte is character).

20. Under execute mode if you touch a valid / recorded card pin 24 will turned on for 1 sec then turned off. The pin 24 can be connected to buzzer or relay module pin P3 to trigger magnetic door lock. Nothing will happen if invalid card detected.

21. Connect a push button to pin 25 and 0V next to pin 25. Whenever push button pressed TTL output pin 24 will turn on. Else pin 24 remains off. This signal can be used to open door from inside room without card.

Device testing using Microcontroller

1. Power off the smart RFID reader.
2. Connect RFID reader to control card pin headers. Reader white wire: control card pin 13, green wire: pin 14, orange wire: pin 15. Red wire: VCC, Black wire: GND.
3. **Program your Microcontroller serial interface baud rate as 9600bps, 8 bit per data stream, each time can receive continuous 3 bytes, No parity checking.**
4. Connect RFID control card to Microcontroller through H1 pin header. RX to Microcontroller TX, TX to Microcontroller RX, 0V to Microcontroller Gnd, 5V to Microcontroller VDD / power pin (if Microcontroller already with own power supply, then don't need connect the 5V pin).
5. Connect power supply to the Smart RFID Reader (min 12VDC).
6. Power on the Smart RFID Reader using system power on/off button.
7. You should see the red LED indicator turned on. If you don't please check the adapter polarity or connection.
8. You will also find a yellow color LED blink for 1 time. It doesn't blink means system fail.
9. Under record mode / execute mode. Touch RFID card on the reader within 6cm distance. The reader will beep.
10. Every time when card is touched. A 3 bytes integer (0 to 255) card ID will send to Microcontroller.

11. There are 2 ways to record card ID in the reader. **Method 1:** You can off system then set the slide switch to record mode (switch to left) and start recording. After recorded all cards you can power off the system and switch it back to execute mode (to switch from record mode to execute mode you have change switch position then power off the system then on it back after 3 seconds). **Method 2:** You can send command 'J' or 'j' from hyper terminal and touch a card on RFID reader to record the card ID. Each time you send a 'J' or 'j' you can record 1 card. The card ID will be recorded in EEPROM (mean after power off the record still in the reader). The maximum recording speed is 1second / card. Before you touch card on reader the yellow color LED is on. After you touched LED on reader the yellow LED will off and on back. If the LED never turn off after you touched RFID card on reader. This means reader EEPROM is full. You have to erase old data before record new one.

12. Under execute mode. Any time when you touch a RFID card on reader. If the card ID is recorded before. The control card will also give a +5VDC output for 1 second at pin 24. This signal can be connected to relay module input pin P3 to turn on/off output devices. Else if invalid card detected nothing will happen.

13. You can also connect a push button at pin 25 and 0V next to pin 25 to turn on pin 24 directly (without using card). This is an additional application used to open door from inside room without RFID card. Whenever the push button connected at pin 25 is pressed the pin 24 will turned on for 2 seconds.

14. Now if you want to control the RFID reader through Microcontroller, you can just send command in command list above to erase card ID, read card ID, on/off relay or detect push button pressed/released. The replied data will be in 3 bytes integer (0-255) form. E.g. 221 126 023 or 0 0 1.

15. Connect a push button to pin 25 and 0V next to pin 25. Whenever push button pressed TTL output pin 24 will turn on. Else pin 24 remains off. This signal can be used to open door from inside room without card.

16. Under execute mode if you touch a valid / recorded card pin 24 will turned on for 1 sec then turned off. The pin 24 can be connected to buzzer or relay

module pin P3 to trigger magnetic door lock. Nothing will happen if invalid card detected.

Any enquiry or need technical support please email to: enquiry@bizchip-components.com