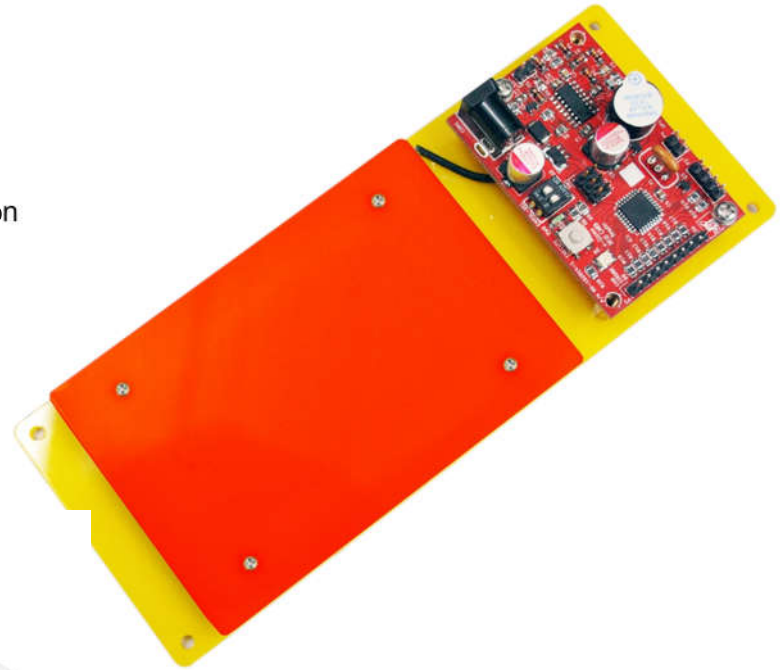
RFID Card Reader

Technical Manual Rev 2r0

The e-Gizmo The RFID card reader can store and authorize (enrol) up to 100 cards without the need for additional hardware (i.e. PC). Not all 125khz card are encoded in the 40-bit format recognized by this RFID card reader. To prevent compatibility issues, use only with qualified RFID cards and tags sold at e-Gizmo.



FEATURES:

- 100 cards storage stand alone operation
- Compatible with 125kHz 40-bit encoded cards
- Serial UART port
- 7-bit Parallel port
- Lock Release output
- Bicolor LED visual indicator

RFID Card (125kHz)

RFID Tags (125kHz)

GENERAL SPECIFICATION:

- **Supply Input:** 7.5V to 9V DC
- **On board IC:** ATMEL ATmega168
- **PCB Dimension:** 46 mm x 64 mm

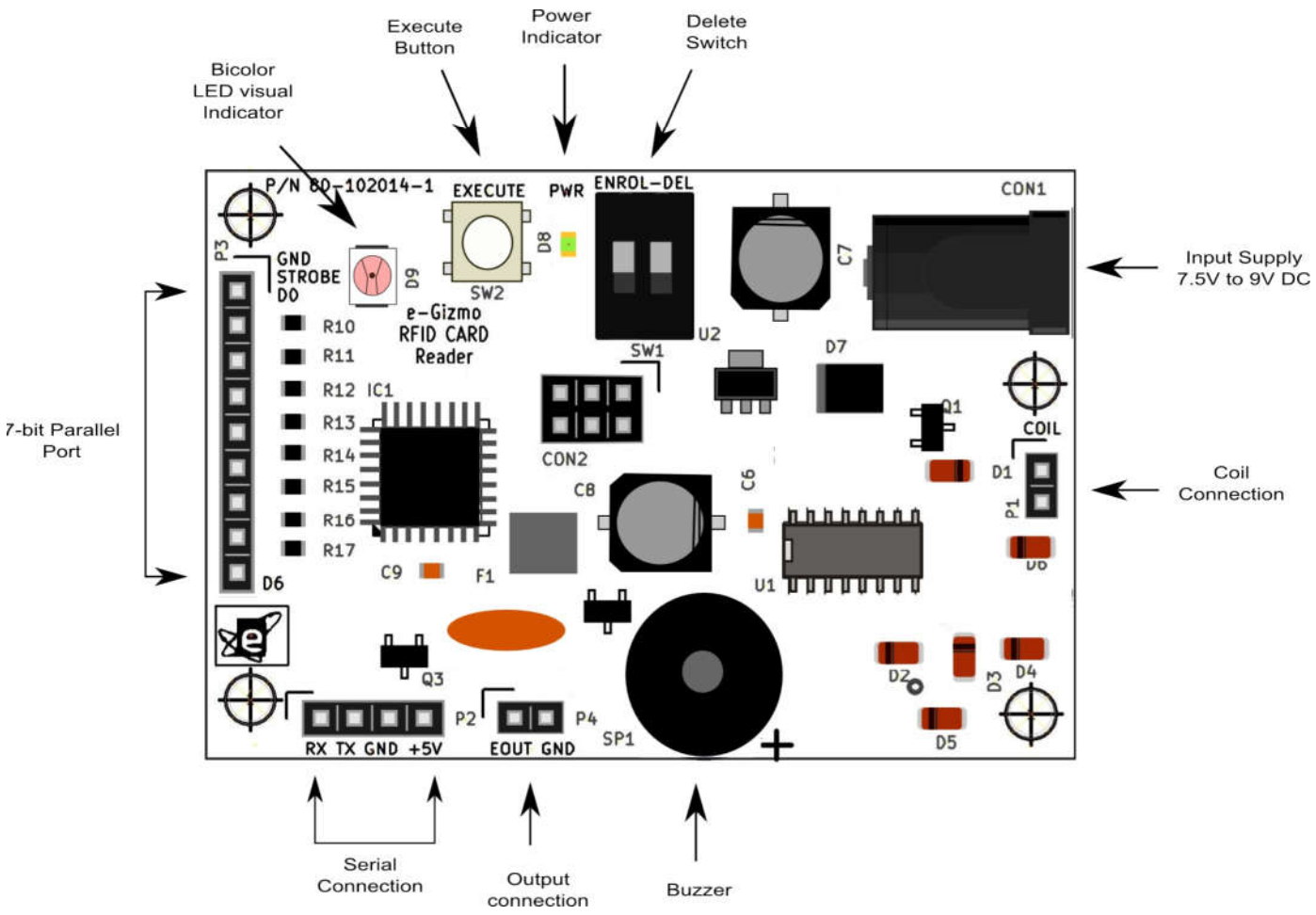


Figure 1. Major parts presentation of e-Gizmo RFID Card Reader

Table 1. ***P1*** connections and descriptions

PIN Name	Descriptions
COIL	Pin Connection of coil

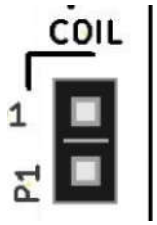


Figure 2. *P1 Illustration*

Serial UART Port

Allows access to advance functions and for external card readings, processing, and storage functions. Storage capacity is then limited only by the external hardware.

Table 2. ***P2*** connections and descriptions

PIN Name	Descriptions
RX	Receiver pin connection
TX	Transmit pin connection
GND	Ground
+5V	Input Supply

Figure 3. *P2 Illustration*

7-bit Parallel Port

For users still wanting to do things using parallel data source. The 7-bit port outputs the corresponding memory address of an enrolled (registered) card. (See Figure 4)

Table 3. ***P3*** connections and descriptions

PIN No.	Descriptions
1	Ground
2	STROBE
3	D0 (Bit 1)
4	D1 (Bit 2)
5	D2 (Bit 3)
6	D3 (Bit 4)
7	D4 (Bit 5)
8	D5 (Bit 6)
9	D6 (Bit 7)

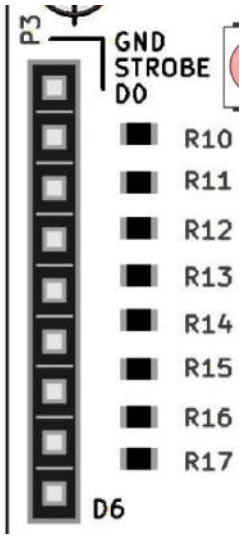
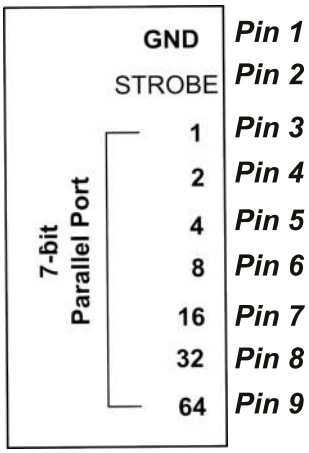
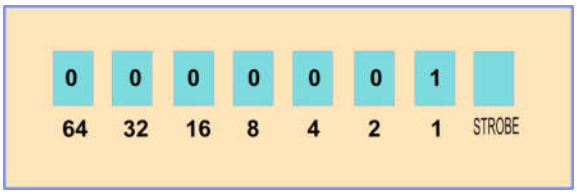


Figure 4. *P3 Illustration*

7-bit Parallel Port with Strobe

The 7-bit parallel port outputs and retain the memory address of the last swiped (enrolled)card. A normally high strobe output momentarily switch to low logic each time a new (enrolled) car is swiped and detected.





Example :

Address: 001 is ON High state
You can put a LED from GND to the D0. To recognize the number of a user.

Note: STROBE is normally HIGH if there is No Listing cards on memory.

Lock Release output

This open collector output momentarily switch ON each time an enrolled card is detected. This can be used to drive a relay driver that in turns activates to release a lock. Alternately, it can be used to drive an MCU input to indicate a card had just been read and validated.

Table 3. ***P4*** connections and descriptions

PIN No.	Descriptions
1	EOUT connection
2	Ground

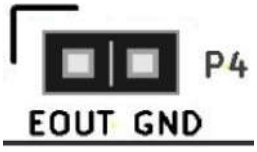


Figure 5. *P4 Illustration*

Important Notes:

Lock Release Output

1. Open collector NPN output. Compatible with any digital input with 3V to 12V logic.

2. Interfacing to an MCU. Pull up resistor to Vcc is REQUIRED. If used with a gizDuino/arduino, the internal pull up resistor can be enabled instead so that external pull up will no longer be required. This applies as well to other MCUs with internal pull up.

Enroll & Delete Switch

This will be the selection for Enroll or Deleting the Card. If you want to enroll a card just switch it form Pin4 - Pin 1. Then for deleting all the cards you need to switch it from Pin 3 - Pin 2, first. Before you send the corresponding commands. Later you will learn how to do delete it.

Table 4. ***SW1*** connections and descriptions

PIN No.	Descriptions
1	STOR (Store)
2	DEL (Delete)
3	GND (Ground)
4	GND (Ground)

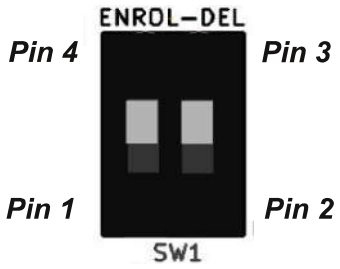


Figure 6. *SW1 Illustration*

Execute Button Switch

The Execute Button Switch is important ***to ENROLL*** specially if you want to enroll a card or multiple cards. Just ***Press and Hold the SW2 while tap the card near to the coil***. Once you heard a beep sounds it means that your card is enrolled/ stored to the memory.

Figure 7. *SW2 Illustration*

Buzzer

A short beep will sound each time a card is read.

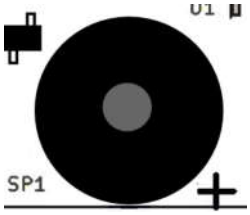


Figure 8. *SP1 Illustration*

LEDs indicator

Bicolor LED visual indicator (D9)

Provides visual indicator to the user if the card is read and validated. Unenrolled card will cause the LED to flash RED. Enrolled card will flash it GREEN.

Power LED indicator (D8)

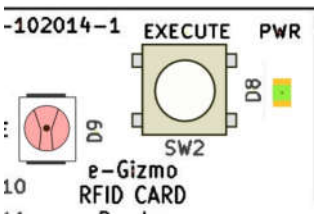


Figure 9. *D8 and D9 Illustration*

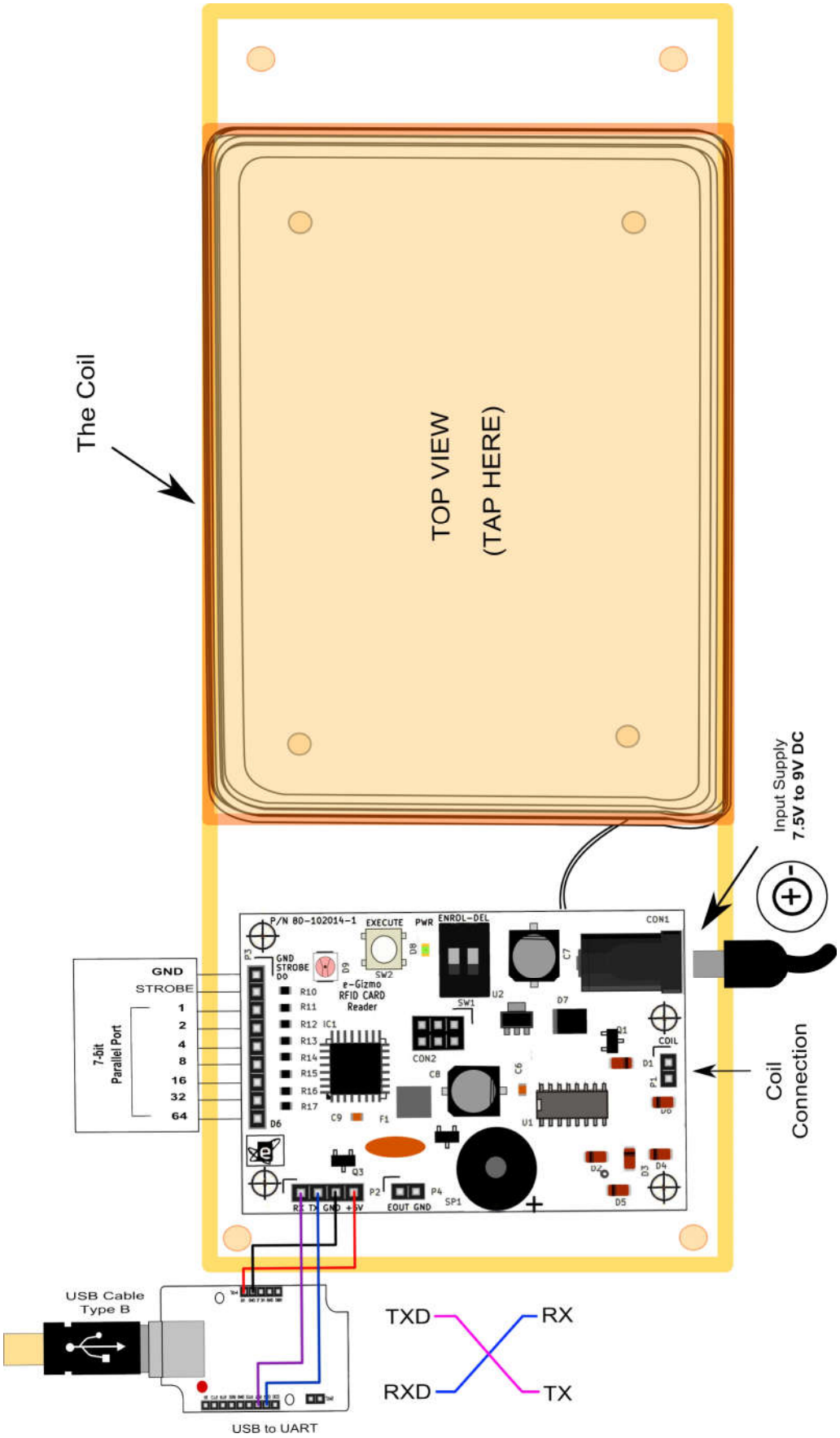


Figure 10. Major parts presentation of e-Gizmo RFID Card Reader

Open Terminal v1.9b by Br@y++.

SETTING-UP

- ***Select COM Port.***

COMMUNICATIONS MANUAL

- ***Baud Rate:*** ***9600***
- ***Data:*** ***8 Bit***
- ***Parity:*** ***NONE***
- ***Handshake:*** ***NONE***

Summary of Functions

vn	*- verbose ON/OFF:*
V	*- Firmware Version*
S	*- List card in Memory*
I	*- Initialize EEPROM*
Tn	*- Fine Tune ON/OFF*
Xnn	*- delete card*

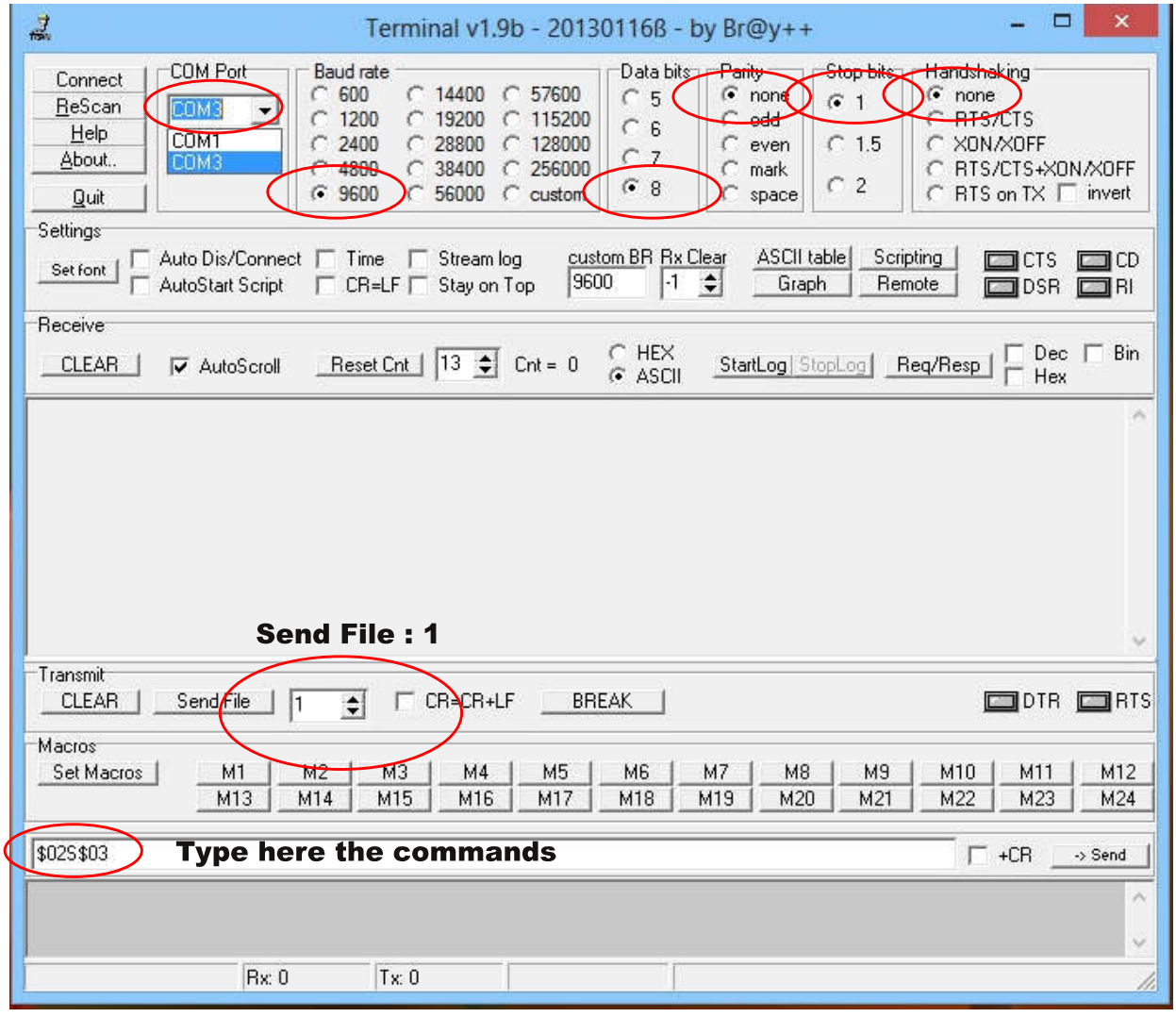


Figure 11. Setting Up Terminal Communications.

Communications Format

Every packet of data transmission are wrapped inside an [STX] and [ETX] marker.

[STX] – Start of transmission marker, ASCII value = 0x02
[ETX] – End of transmission marker, ASCII value = 0x03

The first character after the [STX] marker is a single character function specifier. Each transmission may contain just a function specifier only, or may contain a series of data in addition to the function specifier. End of transmission is signaled by the [ETX] marker.

[STX] and [ETX] are data packet markers and should not be transmitted as literal string. They should be send in their ASCII representation. The correct way of transmitting the [STX] and [ETX] markers are as shown in the following example:

Example 1: Show firmware Version

Transmission Format: ***Format: [STX]V[ETX]***

This should be transmitted in their ASCII code representation as shown in the following table:

Symbol	STX	V	ETX
Hex	0x02	0x56	0x03

Visual Basic:

Correct:

```
‘ correct way to send [STX] & ETX  marker
Serial1.print(chr(2)+”V”+chr(3))
```

Wrong:

```
Serial1.print(“[STX]V[ETX]”)   ‘WRONG!
```

Arduino:

Correct:

```
Serial.write(0x02);     // correct way to send [STX]
Serial.print(“V”);              // V
Serial.write(0x03);     // [ETX] marker
```

Wrong:

```
Serial.print(“[STX]V[ETX]”);        // WRONG!
```

Alternately, you can use the C/Arduino "\" operator to send the ASCII code of STX and ETX, together with the function and data:

Serial.print("\002V\003"); // "\002" = STX, "\003" = ETX

Notice that in the example, only the STX and ETX marker need to be manually converted to their ASCII code, for the simple reason that they have no equivalent printable characters. The three line implementation (long format)may make your program longer, but is more human readable. Hence, for clarity, all example codes given are shown in the long format. We leave it up to you if you want to convert and code it in short format.

READ CARD OUTPUT DATA FORMAT IN VERBOSE MODE "0"

Serial data output by default are presented in human readable format. To interface with a controller, it is much more convenient to use the CSV format, which can be activated by turning the verbose mode to off (see Function Description 1.0)

To turn of verbose mode, send
[STX]v0[ETX]

With verbose mode off, serial read is now reported by the reader in the following format:

[STX]e,aaa,ttt,nnnnnnnnn[ETX]
where:
- e - enrolled? 1=enrolled, 0=not enrolled
- aaa - Internal memory location where card is enrolled, "XXX" if not enrolled
- ttt - card type
- nnnnnnnnn - card number

Example:

[STX]0,XXX,126,0009398762[ETX]
- e=0 - card not enrolled
- aaa= XXX - not in memory
- ttt= 126 - card type
- nnnnnnnnnb= 0009398762 - card number

FUNCTION DESCRIPTION

1. **v** – *Verbose mode*

Verbose mode in ON state presents information in readable format. RFID replies are terminated with [carriage return] and are not wrapped with [STX][ETX] markers. This allows users to interact with the RFID conveniently.

Verbose mode in OFF state will generally suppress non essential messages and will present swiped card data in CSV format.

Format: [STX]vn[ETX]

Where: **n** = Mode setting 0-1
0 - Turn OFF verbose mode (default)
1 - Turn ON verbose mode

2. **V** - *Display Firmware Version*

Returns a four digit Firmware Revision stamp.

Format:[STX]V[ETX]

Note: Reply always wrapped with [STX][ETX] even with verbose ON.

3. **S** - *Show all enrolled cards.*

Will show a listing of all cards enrolled in memory. Listing is always in readable format and each item is terminated with [Carriage Return].

4. **ue-Gizmo** - *Unlock EEPROM*

This will enable ERASE EEPROM function to work. Wait at least 100ms after the unlock function is invoked before issuing the ERASE EEPROM command.

Format:[STX]ue-Gizmo[ETX]

5. **I** - *ERASE EEPROM*

Intialize EEPROM to its blank state.
Caution: All cards in registered in memory will be erased.

` ***Format:[STX]I[ETX]***

Note: Unlock EEPROM first as described in 4. Prior unlocking minimize the chance of accidentally erasing all cards enrolled in memory.

6. **X** - Delete a card

Allows deletion of enrolled card even when the card is not available.

Format: [STX]Xnn[ETX]

Where: **nn** = Card address 0-99

nnn is the address assigned by the RFID reader during the time the card is enrolled. Use the S command to find the address of the card you wish to delete using this function.

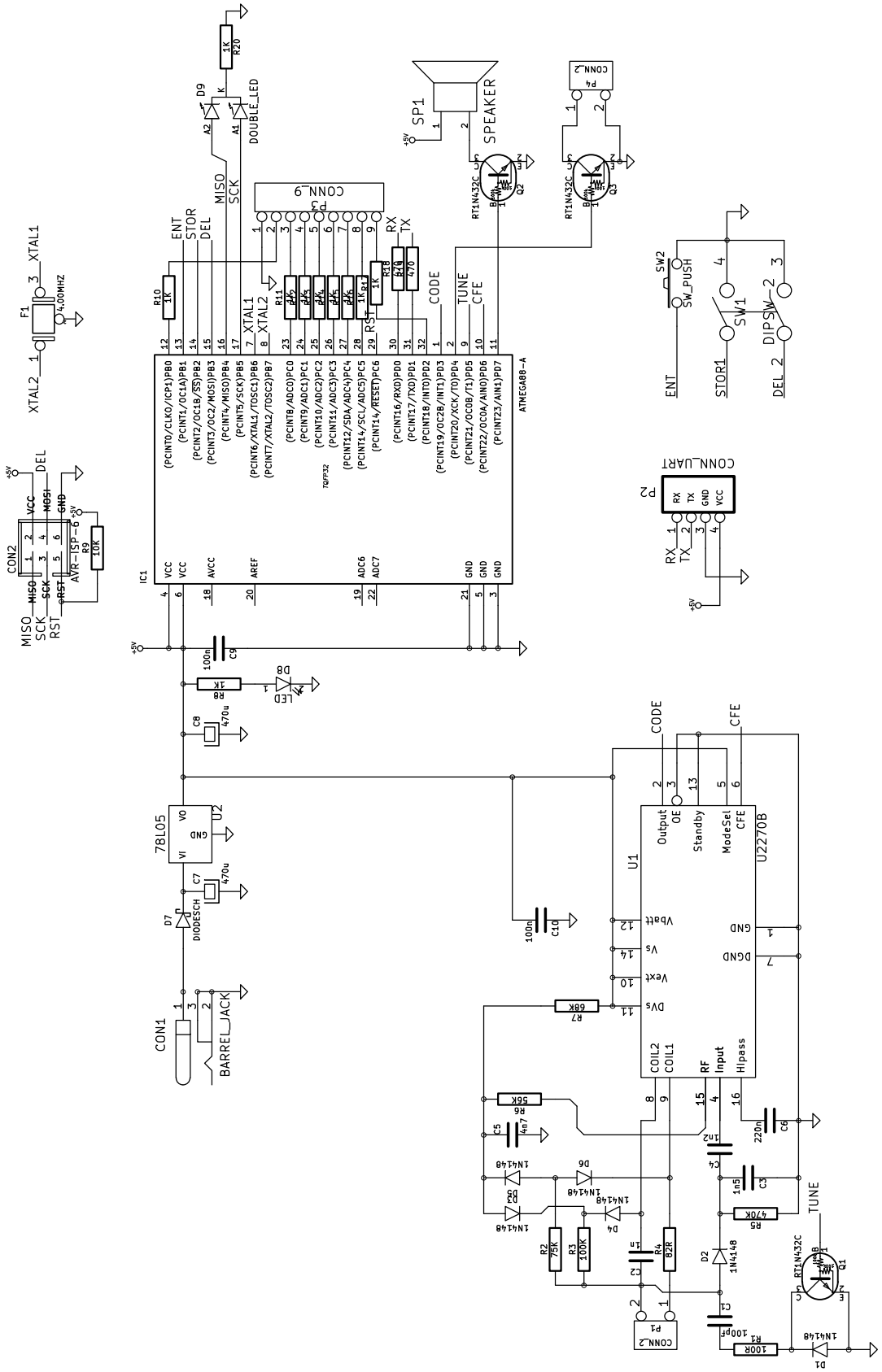


***Figure 12.** Schematic Diagram of e-Gizmo RFID Card Reader*

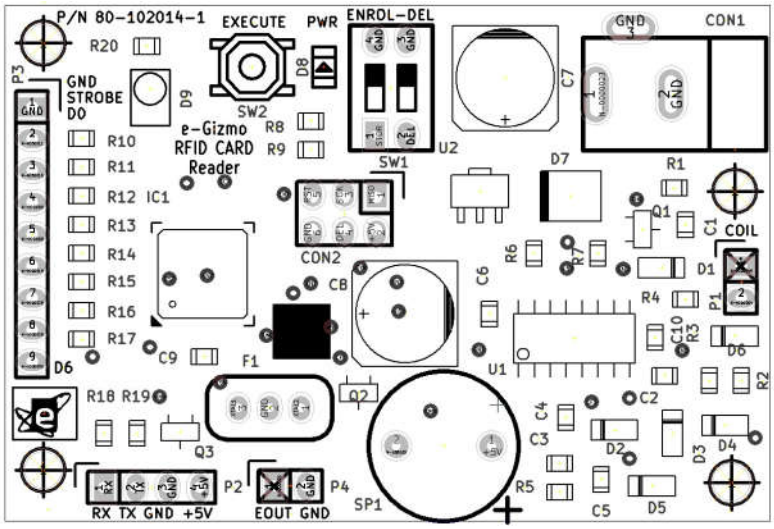


Figure 13. *Parts Placement*

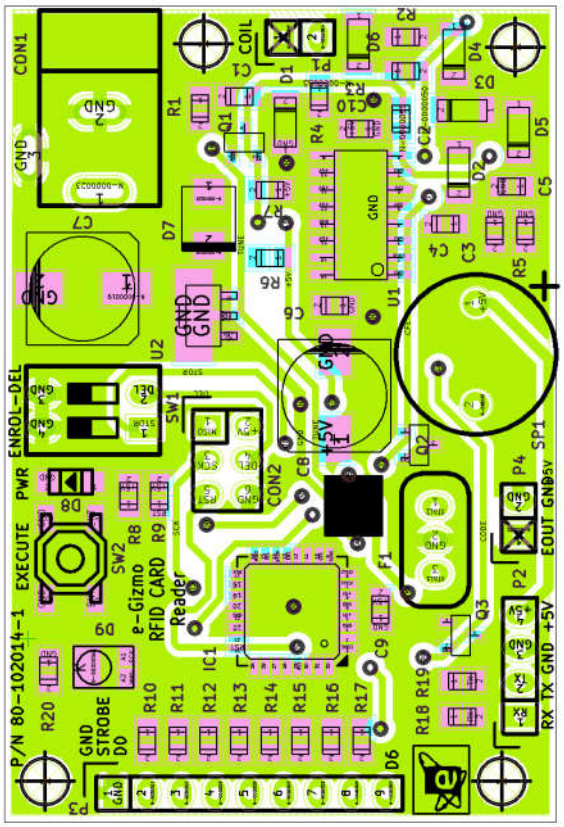


Figure 14. *BottomPCBGuide*

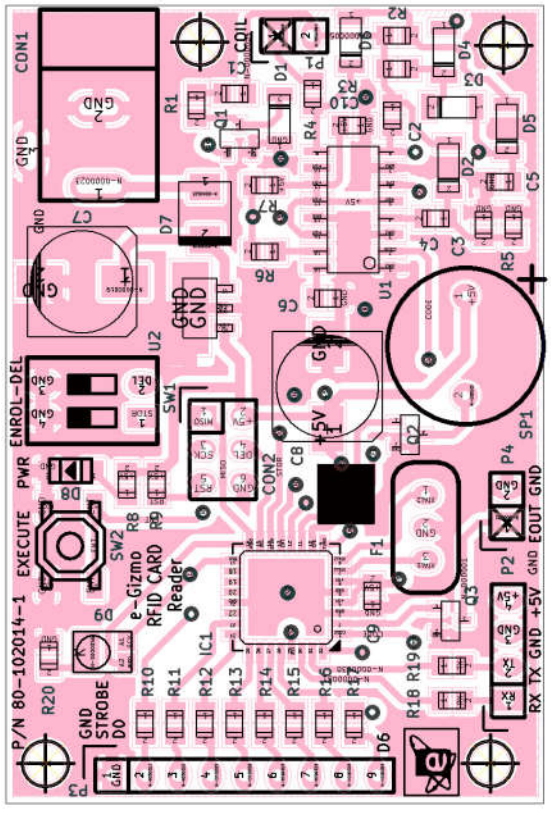


Figure 15. *TopPCBGuide*

How to Enroll a Card or multiple cards:

To monitor the insertion of cards in memory. Open your Terminal in PC using the USB-UART or RS232-TTL converter and set-up the communcation(page 7). (See Figure)

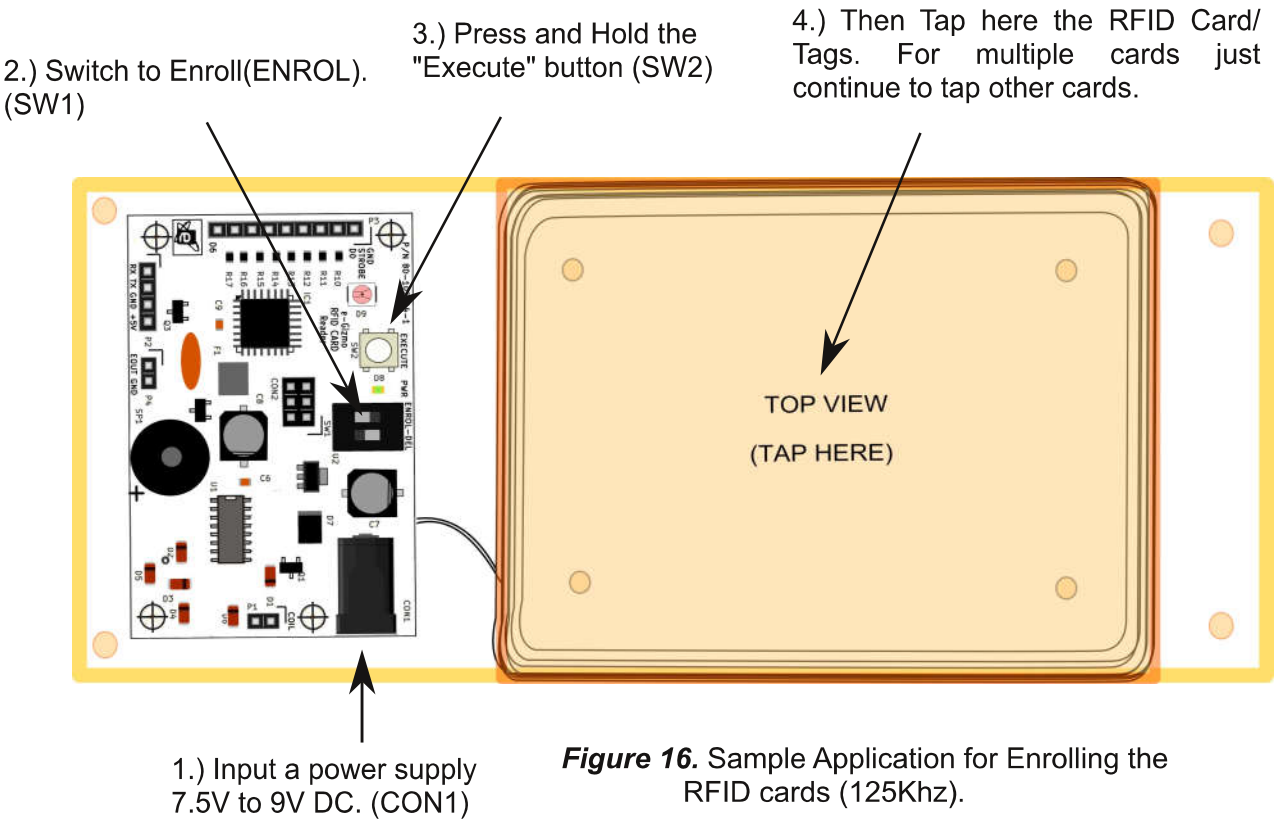
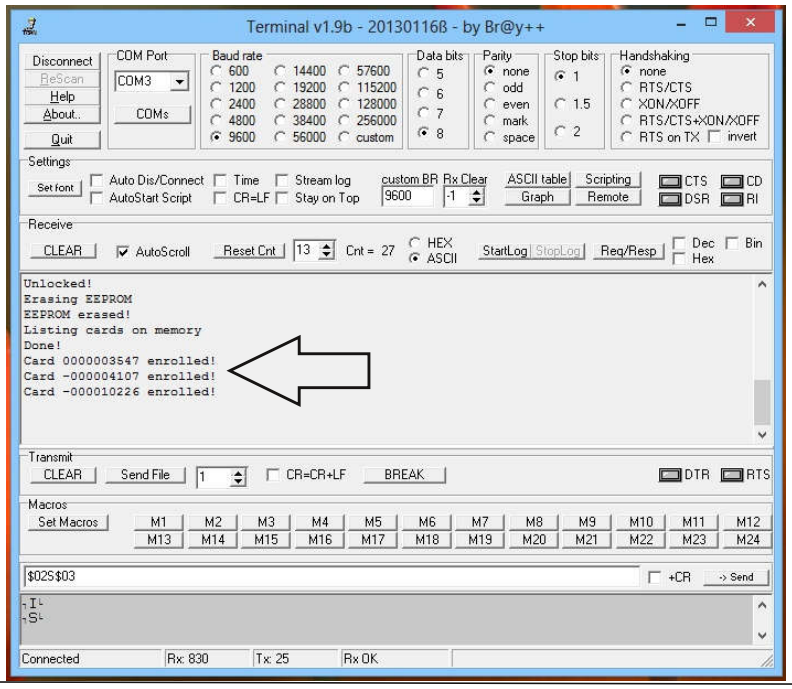


Figure 16. Sample Application for Enrolling the RFID cards (125Khz).

Figure 17. Enrolled Cards.



How to Delete a card:

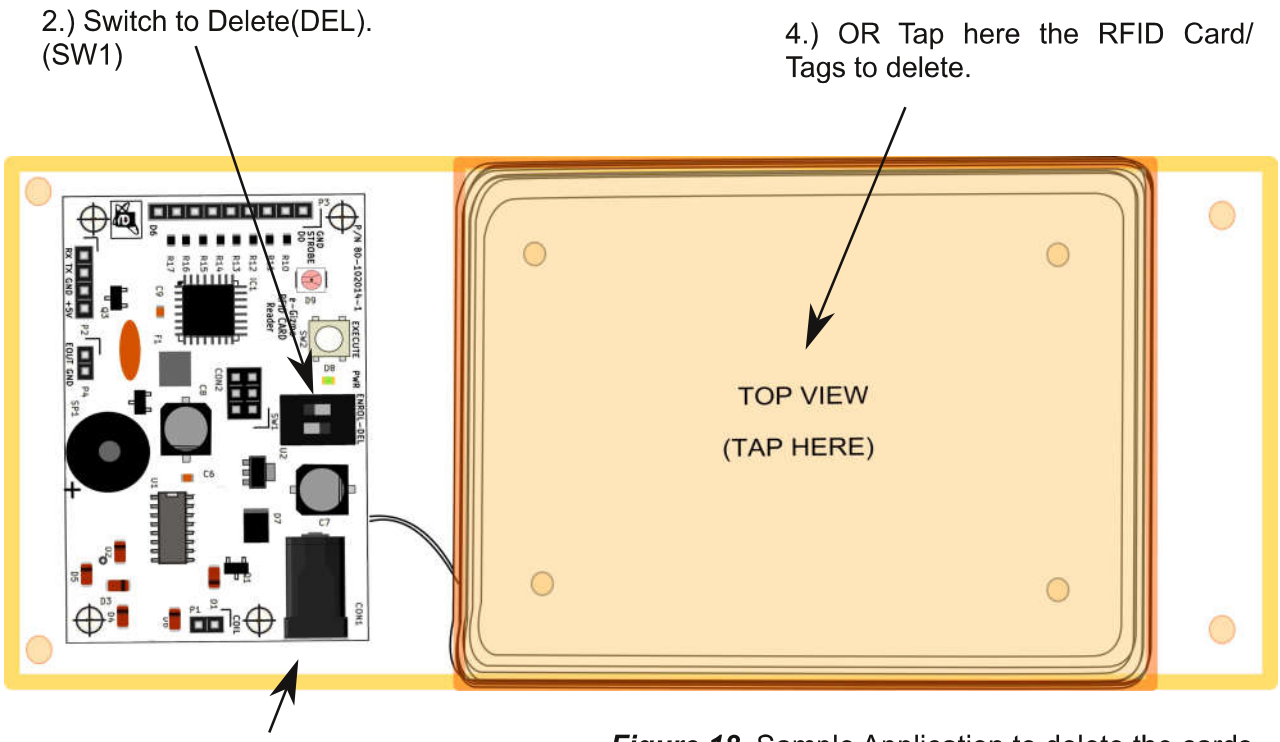


Figure 18. Sample Application to delete the cards.

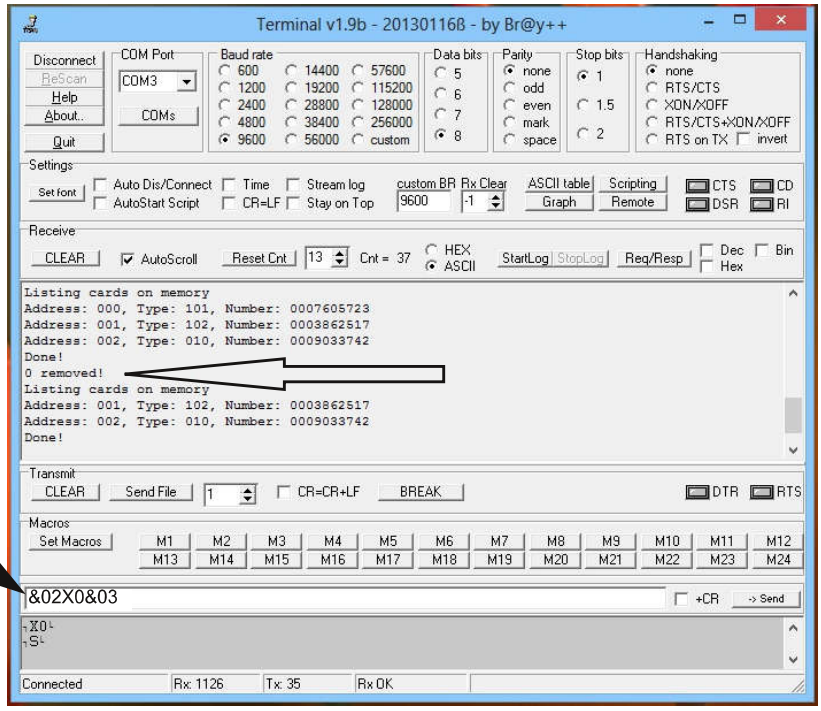
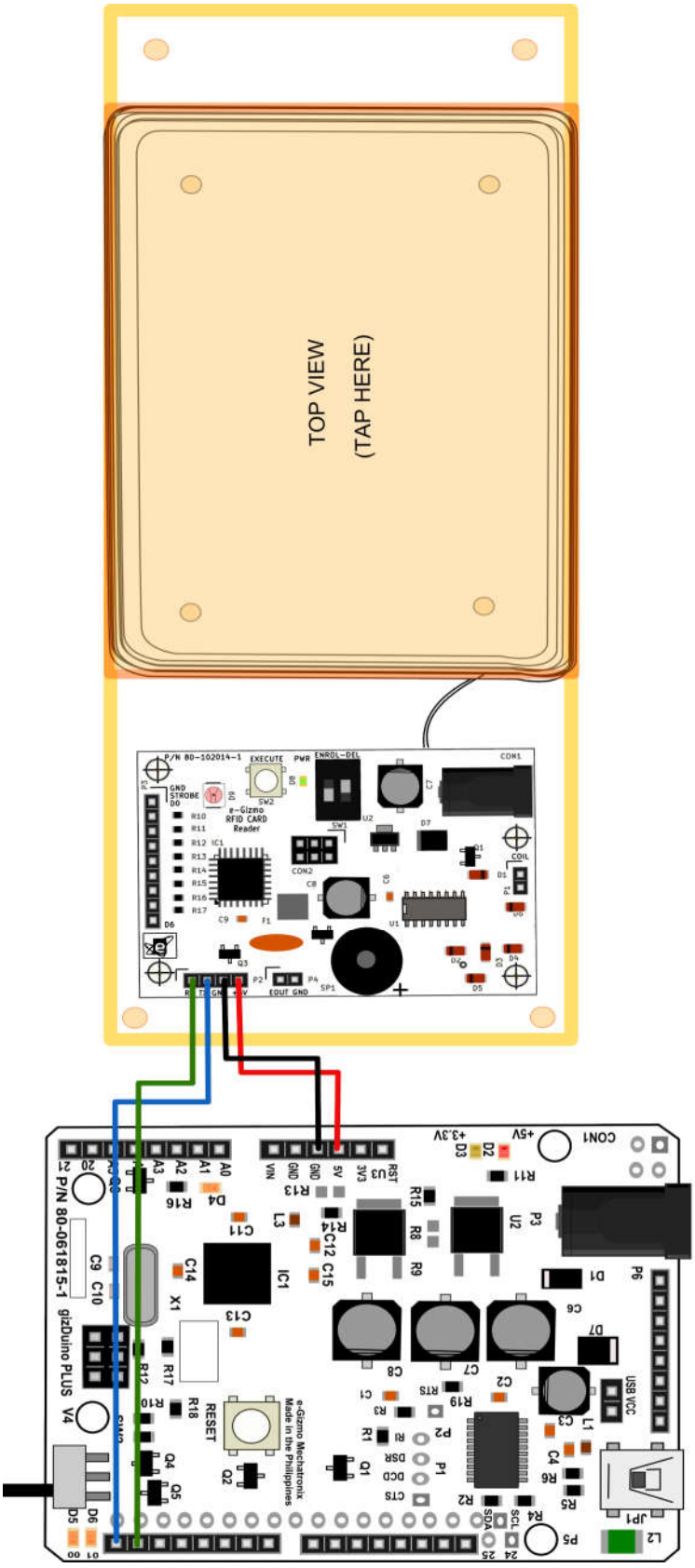


Figure 19. Deleted Card



```
/* e-Gizmo RFID kit Arduino Demo */

// defines used by the serial event
// do not modify
#define  STX 2
#define  ETX 3
#define  SERIALSTX 0
#define  SERIALETX 1
#define  SERIALRDY 2

// RFID read results
 String card_enrolled;   // = 0 if card is not enrolled = 1 if enrolled and valid
 String  card_addr;      // contains valid card index only if card is enrolled.
 String  card_type;      // card type identifier
 String  card_number;    // card serial number

byte  serial_state;
String serialinput;
boolean  carddetected=false;



void setup() {
  // initialize serial:
  Serial.begin(9600);
  pinMode(13,OUTPUT);
  Serial.println("e-Gizmo RFID reader Demo");
  delay(1000);
  Serial.print("\002v0\003");
  delay(500);
  serial_state=SERIALSTX;
  serialinput="";
  check_RFID();

}

void loop() {

  if(check_RFID()==true){

    /* Replace the following demo codes with your own
    */

    // Print the read information
    Serial.print("card enrolled: ");
    Serial.println(card_enrolled);
    Serial.print("card addr: ");
    Serial.println(card_addr);
    Serial.print("card type: ");
    Serial.println(card_type);
    Serial.print("card number: ");
```

```
    Serial.println(card_number);
    Serial.println("");

    // Sample function
    // Notify card is valid if detected as enrolled
    // and momentarily flash pin 13 LED

    if(card_enrolled.equals("1")){
      Serial.print("This card is valid and has index = ");
      Serial.println(card_addr);
      Serial.println("");
      // Flash LED
      digitalWrite(13,HIGH);
      delay(500);
      digitalWrite(13,LOW);
    }
  }

}


/* Do not modify anything in the following codes unless
  you absolutely know what you are doing :-) */

boolean check_RFID(void){

  int  strindex;
  int  strindexe;

     // Read if card data is available
    if(serial_state==SERIALRDY){

     //extract card enrolled portion
     strindex=serialinput.indexOf(",");
     card_enrolled=serialinput.substring(0,strindex);

     //extract card addr portion
     strindex++;
     strindexe=serialinput.indexOf(",",strindex);
     card_addr=serialinput.substring(strindex,strindexe);

     //extract card type portion
     strindex=strindexe+1;
     strindexe=serialinput.indexOf(",",strindex);
     card_type=serialinput.substring(strindex,strindexe);

     //extract card number portion
     strindex=strindexe+1;
     strindexe=serialinput.indexOf(",",strindex);
     card_number=serialinput.substring(strindex,strindexe);
```

```
      // clear received string and ready SERIAL for new stream
     serialinput="";
     serial_state=SERIALSTX;
     return(true);
   }
   return(false);  // return false if RFID data is not available
}


/* This is a interrupt driven serial Rx routine */

void serialEvent() {
  while (Serial.available()) {
    // get the new byte:
    char inChar = (char)Serial.read();

    // Wait for the STX character
    if(serial_state==SERIALSTX){
      if(inChar==STX){
        serial_state=SERIALETX;    // STX character detected, enable next phase
        return;
        }
    }

    // Store rx character to serial input until ETX is detected
    if(serial_state==SERIALETX){
      if(inChar!=ETX){
        serialinput += inChar;
        return;
        }
    }

      // Indicate serial data is ready after ETX is detected
      serial_state=SERIALRDY;
    }
  }
```