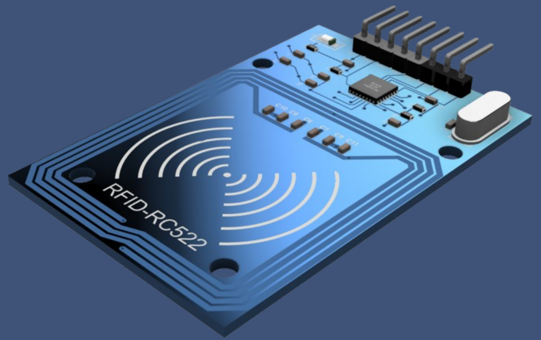
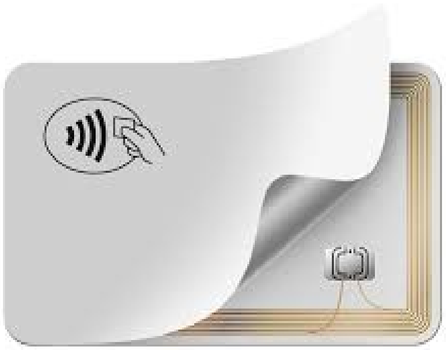
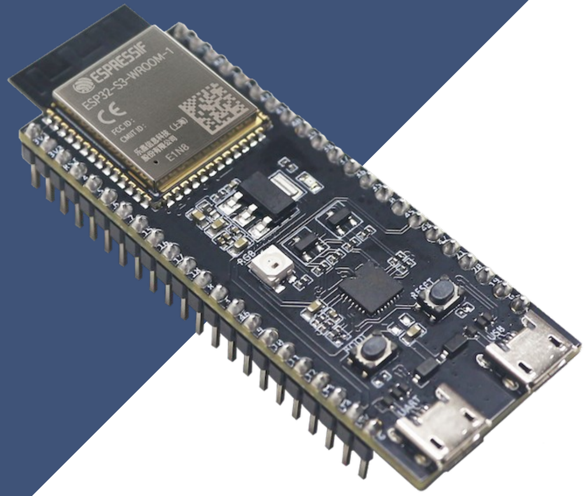
RFID
ID u EEPROM-u MIKROKONTROLERA



RFID RC522 READER

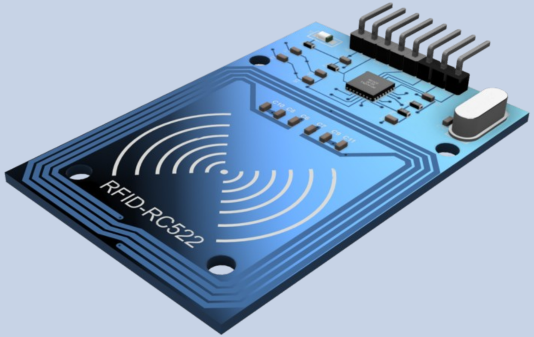


RFID TAGS AND CARDS



ESP32 S3 DEVELOPMENT BOARD

1



RFID RC522 READER

RFID RC522

RC522 (MFRC522) 13.56Mhz SPI RFID Writer Reader Wireless modul

RC522 Chip IC radna frekvencija: 13.56MHz, Brzina razmjene podataka: Max. 10Mbit/s

Podržava Mifare1 S50 identifikatore

Dimenzije: 40mm x 60mm

RFID RC522

RFID RC522 čitač je popularan RFID (Radio-Frequency Identification) modul koji radi na frekvenciji od 13,56 MHz.

Obično se koristi za čitanje i pisanje RFID oznaka i kartica, posebno onih usklađenih sa standardom ISO/IEC 14443 tipa A, uključujući Mifare kartice.

Evo kratkog opisa čitača RC522:

- **Frekvencija:** radi na frekvenciji od 13,56 MHz, što je često korištena frekvencija za RFID komunikaciju.
- **Kompatibilnost:** Podržava različite RFID oznake i kartice u skladu sa standardom ISO/IEC 14443 tipa A, uključujući Mifare kartice kao što je Mifare 1K.
- **Komunikacijski interfejs:** Obično se povezuje s mikrokontrolerima ili razvojnim pločama kao što je Arduino putem SPI (Serial Peripheral Interface) protokola, što olakšava integraciju u različite projekte.
- **Domet očitanja:** Učinkoviti domet očitanja zavisi o faktorima kao što su dizajn antene i napajanje, ali obično je unutar nekoliko centimetara.
- **Funkcionalnost:** Mogućnost čitanja i pisanja podataka na RFID oznake i kartice. Može čitati jedinstvene identifikacijske brojeve (UID) pohranjene na oznakama/karticama i u nekim slučajevima dodatne podatke pohranjene u memorijskim sektorima.

RFID RC522

- **Radni napon:** radi na 3.3 V.
- **Antena:** Obično dolazi s ugrađenom antenom, iako se vanjske antene mogu spojiti za prošireni domet ili posebne primjene
- **Primjene:** Obično se koriste u raznim projektima i aplikacijama uključujući sisteme kontrole pristupa, upravljanje inventarom, sisteme praćenja prisutnosti i još mnogo toga.

Modul RC522 relativno je jednostavan za korištenje i pruža troškovno isplativo rješenje za projekte i aplikacije temeljene na RFID-u. Stekao je popularnost u zajednici proizvođača zbog svoje svestranosti i lakoće integracije s platformama mikrokontrolera, poput Arduina.

RFID RC522

Za rad sa RC522 čitačem iz Arduino razvojnog okruženja potrebno je instalirati bibilioteku, koja se može preuzeti sa linka:

https://github.com/miguelbalboa/rfid

Za instaliranje biblioteke potrebno je odraditi sljedeća tri koraka:

Dodajte biblioteku selektovanjem Add ZIP u SKETCH meniju, INCLUDE Library opcija.

Otvoriti arduino IDE

Zatim, selektovati .zip fajl sa lokacije na kojoj je fajl sačuvan.

Detaljnije informacije o biblioteci mogu se vidijeti na adresi:

http://www.neilkolban.com/esp32/docs/cpp_utils/html/class_m_f_r_c522.html

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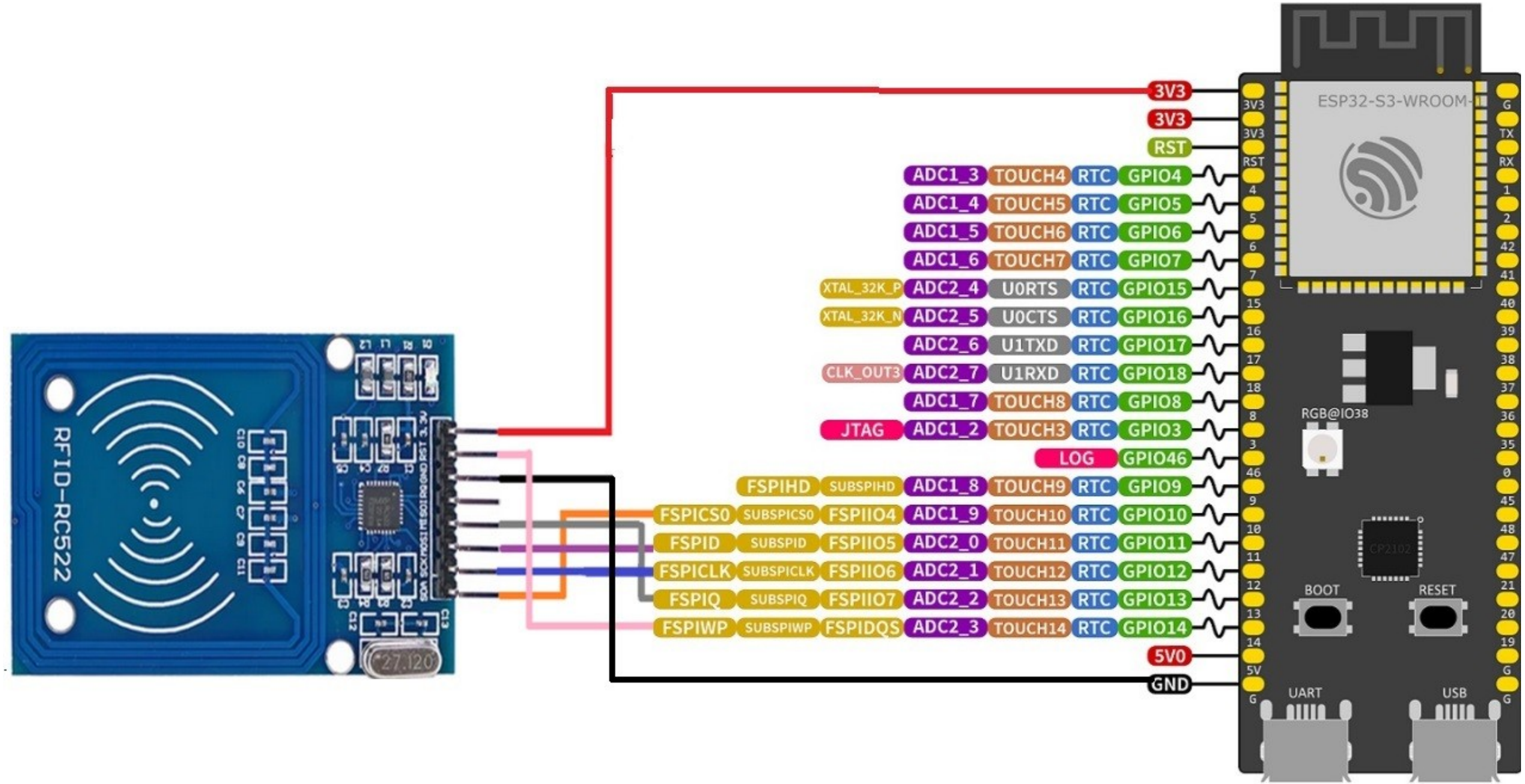
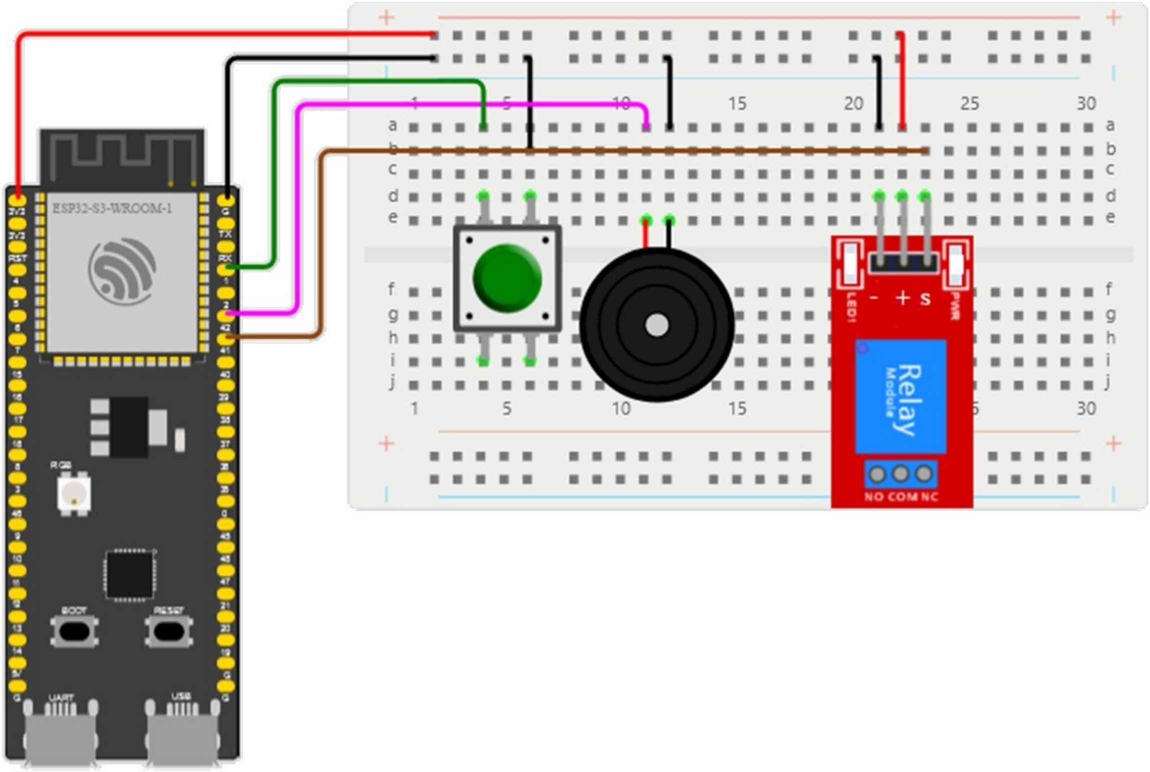
POVEZIVANJE

RFID RC 522 i ESP32S3

KAKO POVEZATI RFID-RC522



KAKO POVEZATI TASTER, BUZER i RELE



Uspješnost povezivanja RFID-RC522 sa ESP32S3, kao i tastera, bazera, relea provjeriti pomoću skeča:

IDCardBasic.ino

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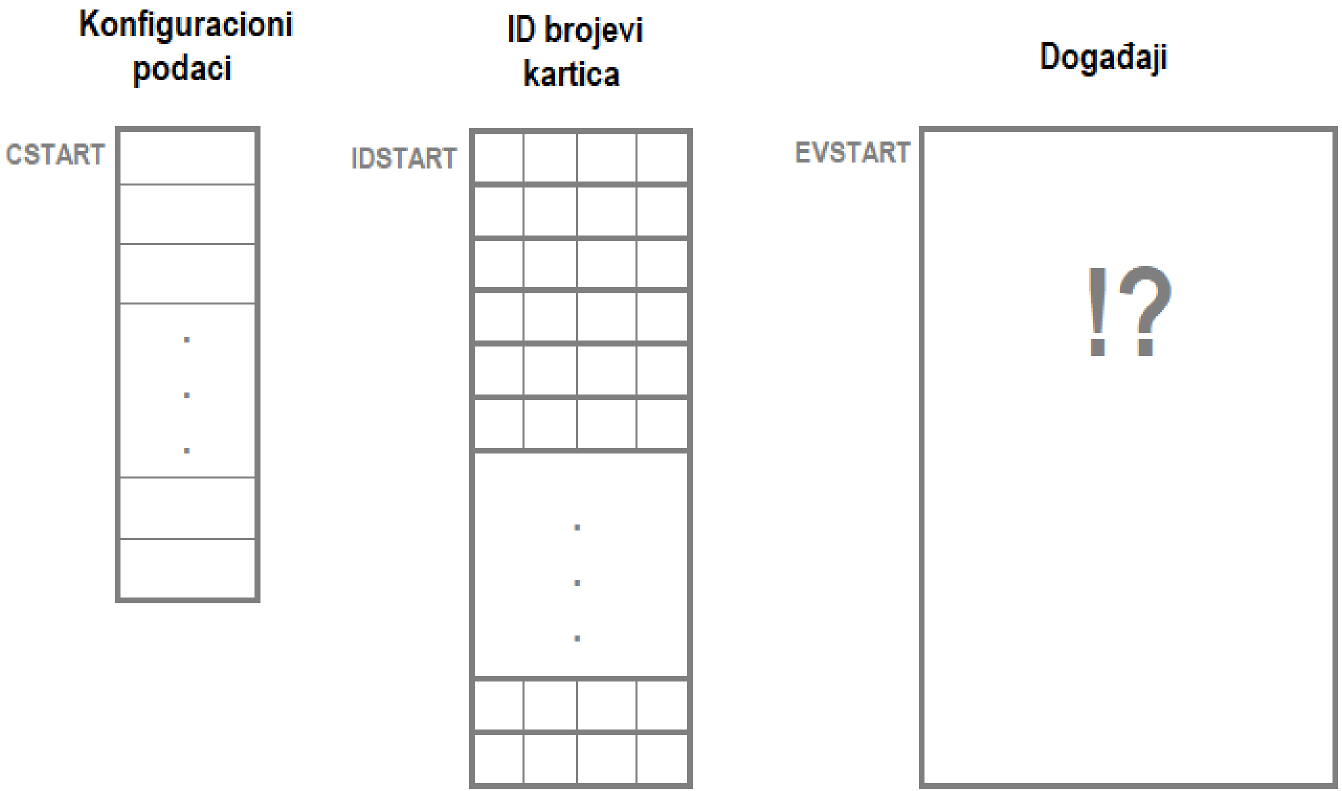
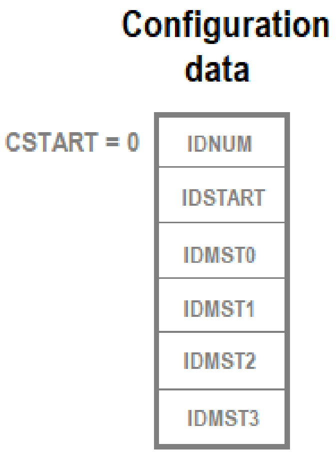
ID u EEPROM-u MIKROKONTROLERA

POTREBNI PODACI U EEPROM-U MIKROKONTROLERA

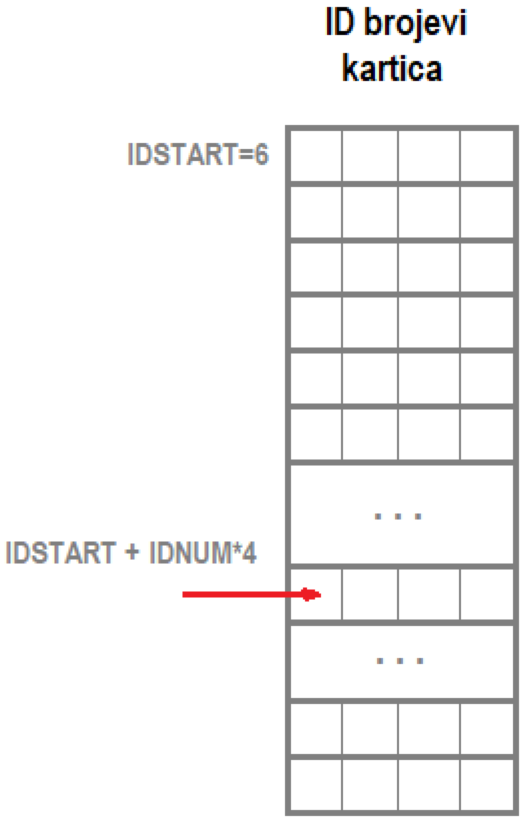


KONFIGURACIONI PODACI

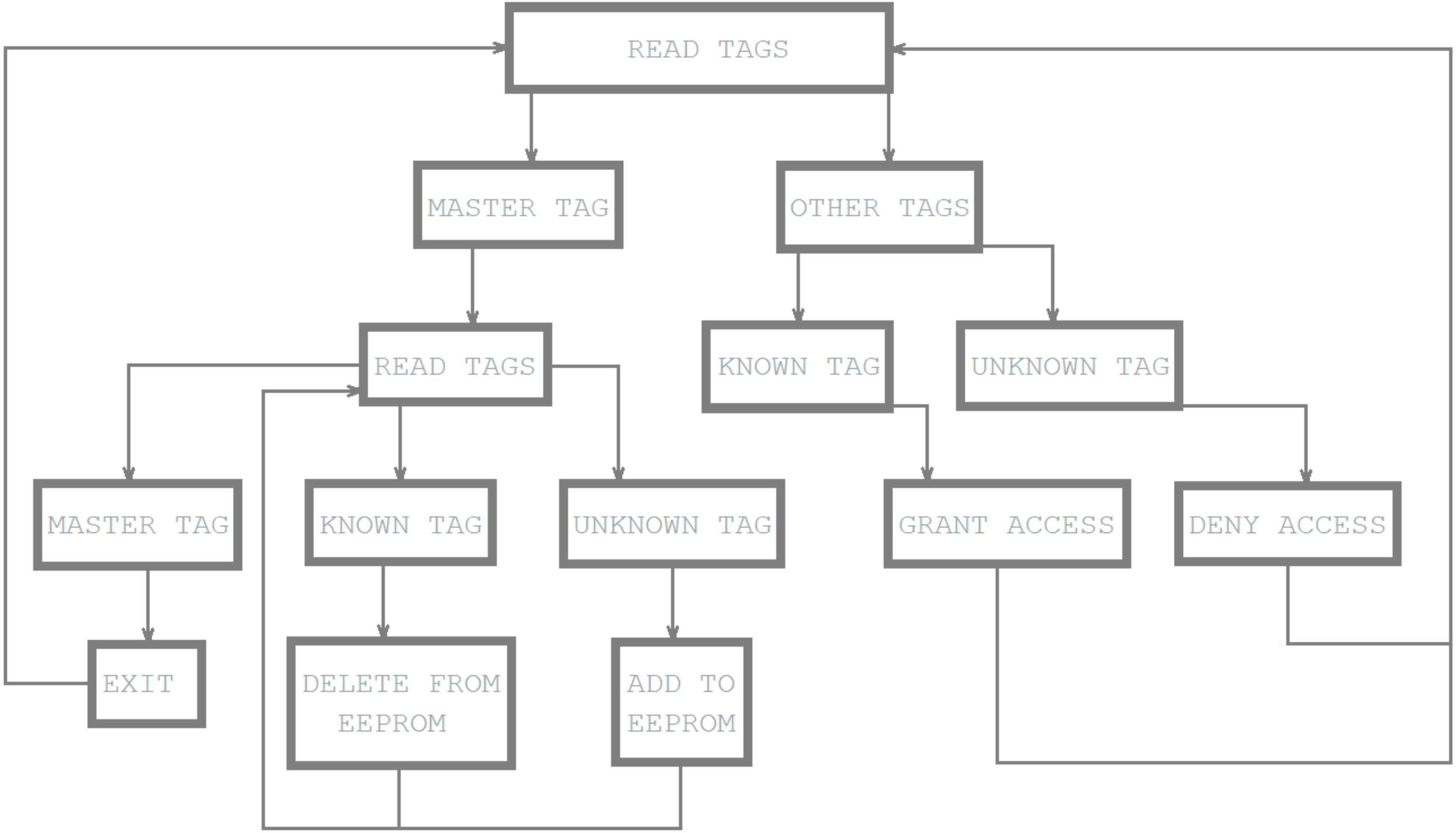



```
// Writing New Master ID to EEPROM
byte writeNewMasterID(byte* newMasterCard) {
  uint8_t start = 2;  // Figure out where the next slot starts
  for ( uint8_t j = 0; j < 4; j++ ) {   // Loop 4 times
    EEPROM.write( start + j, newMasterCard[j] );  // Write the array
  }
  EEPROM.commit();
  Serial.println(F("Succesfully writed New Master ID record to EEPROM"));
  return (1);
}

// Reading Master ID from EEPROM
void readMasterID(byte* masterTag) {
  uint8_t start = 2; // Figure out starting position
  for ( uint8_t i = 0; i < 4; i++ ) { // Loop 4 times to get the 4 Bytes
    masterTag[i] = EEPROM.read(start + i); // Assign values read from EEPROM to array
    Serial.print(masterTag[i], HEX); Serial.print(" ");
  }
  Serial.println();
  Serial.println(F("Succesfully read Master ID record from EEPROM"));
}
// Check to see if the ID passed is the master programing card
bool isMaster( byte test[] ) {
  return checkTwo(test, masterCard);
}
```

ID BROJEVI IDENTIFIKATORA

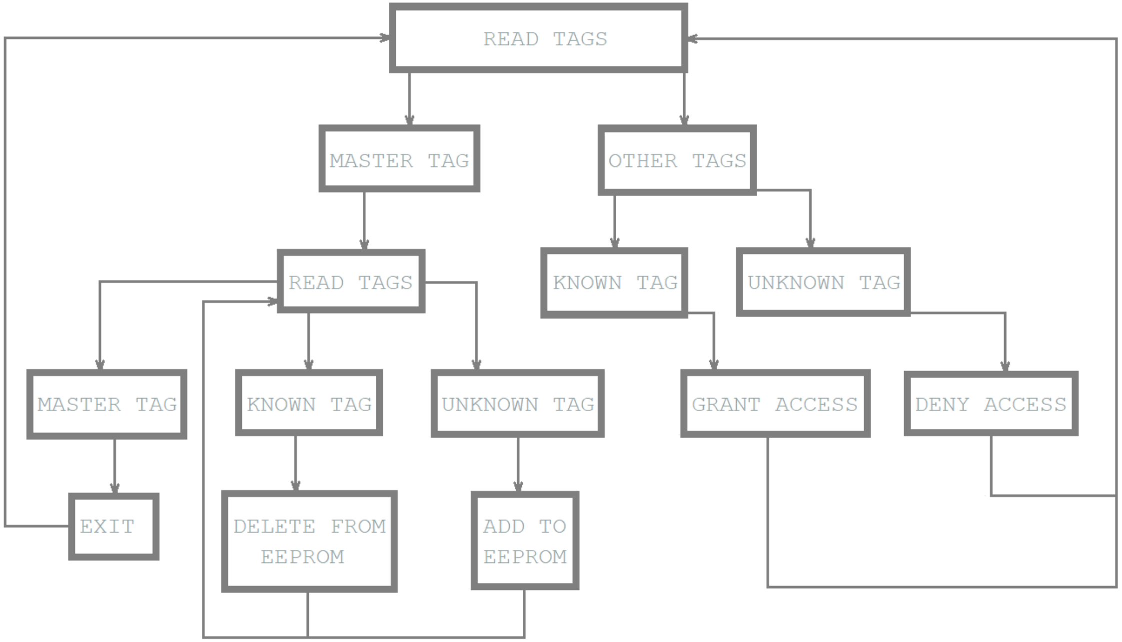


DIJAGAM TOKA PROGRAMA U MIKROKONTOLERU



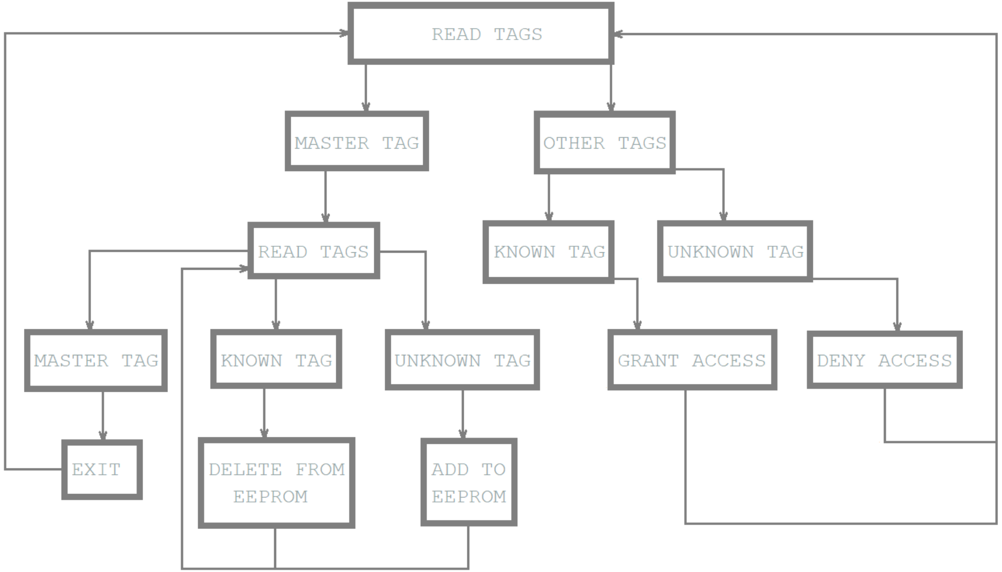
ČITANJE ID BROJA IDENTIFIKATORA

```
//Read card ID
uint8_t ReadCardID(byte* readTag) {
  if ( ! mfrc522.PICC_ReadCardSerial()) { //Since a PICC placed get Serial and continue
    return 0;
  }
  // We support 4 byte card ID
  Serial.println(F("Scanned card ID:"));
  for ( uint8_t i = 0; i < 4; i++) {
    readTag[i] = mfrc522.uid.uidByte[i];
    Serial.print(readTag[i], HEX);
  }
  readTag[4] = '\0';
  Serial.println("");
  return 1;
}
```



PRONALAŽENJE ID BROJA IDENTIFIKATORA U MEMORIJI

```
// Find card ID in EEPROM
bool findID() {
  uint8_t k;
  uint8_t count = EEPROM.read(0); // Read the first Byte of EEPROM that
  for ( uint8_t i = 0; i < count; i++ ) { // Loop once for each EEPROM entry
    readID(i); // Read an ID from EEPROM, it is stored in storedID
    for (k = 0; k < 4; k++ ) {   // Loop 4 times
      if ( readCard[k] != storedCard[k] ) { // IF a != b then false (one fails, all fail)
        break;
      }
    }
    if (k == 4)return true;
  }
  // If not, return false
  return false;
}
```

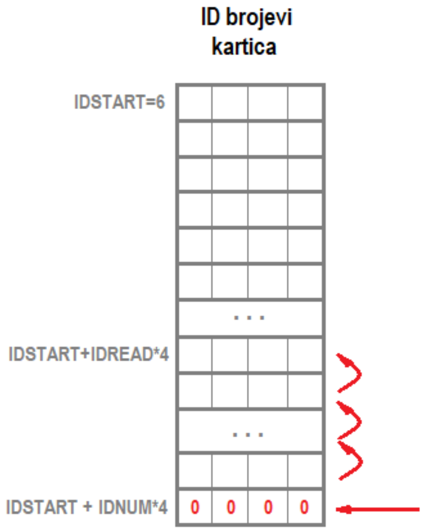


UPISIVANJE I ČITANJE ID BROJA IDENTIFIKATORA

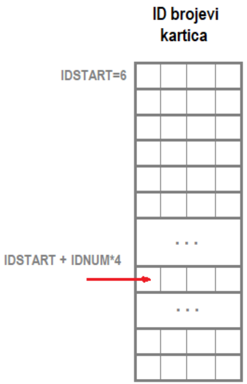
```
// Add tag(card) ID to EEPROM
byte writeID() {
  uint8_t num = EEPROM.read(0); // Get the numer of used spaces,
  uint8_t start = ( num * 4 ) + 6; // Figure out where the next slot starts
  num++; // Increment the counter by one
  EEPROM.write( 0, num ); // Write the new count to the counter
  for ( uint8_t j = 0; j < 4; j++ ) { // Loop 4 times
    EEPROM.write( start + j, readCard[j] ); // Write the array values to EEPROM
  }
  EEPROM.commit();
  Serial.println(F("Succesfully added ID record to EEPROM"));
  return (1);
}

// Read an ID from EEPROM
void readID( uint8_t number) {
  uint8_t start = (number * 4 ) + 6; // Figure out starting position
  for ( uint8_t i = 0; i < 4; i++ ) { // Loop 4 times to get the 4 Bytes
    storedCard[i] = EEPROM.read(start + i); // Assign values read from EEPROM to array
    delay(1);
  }
}
```

BRISANJE ID BROJA IDENTIFIKATORA

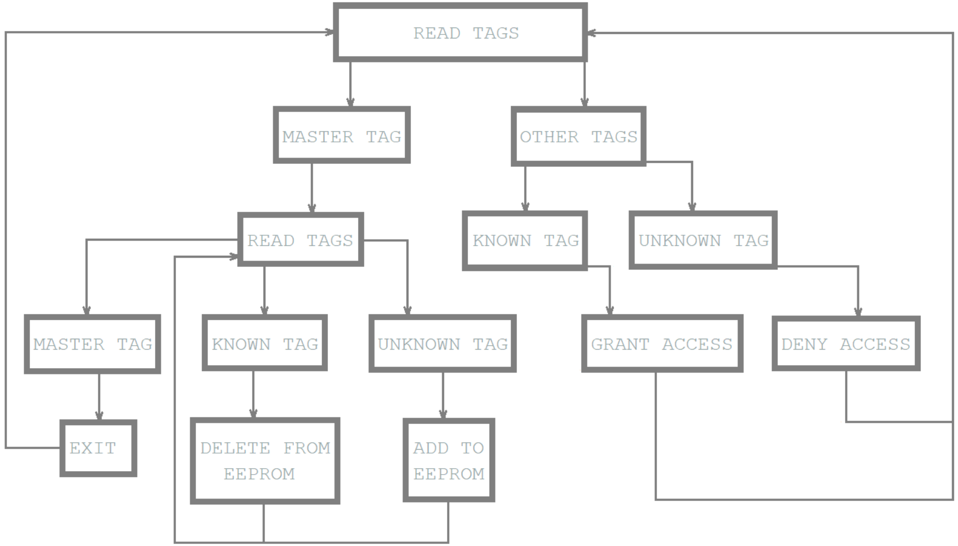
```
// Remove ID from EEPROM
byte deleteID() {
  uint8_t num = EEPROM.read(0);   // Get the number of used spaces
  uint8_t slot;       // Figure out the slot number of the card
  uint8_t start;      // = ( num * 4 ) + 6; // Figure out where the next slot start
  uint8_t looping;    // The number of times the loop repeats
  uint8_t j;

  slot = findIDSLOT();   // Figure out the slot number of the card to delete
  start = (slot * 4) + 6;
  looping = ((num - slot) * 4);
  num--;      // Decrement the counter by one
  EEPROM.write( 0, num );   // Write the new count to the counter
  for ( j = 0; j < looping; j++ ) {         // Loop the card shift times
    EEPROM.write( start + j, EEPROM.read(start + 4 + j));   // Shift the array values to 4 places
  }
  for ( uint8_t k = 0; k < 4; k++ ) {   // Shifting loop. Write zero to the last four character in EEPROM
    EEPROM.write( start + j + k, 0);
  }
  EEPROM.commit();
  Serial.println(F("Succesfully removed ID record from EEPROM"));
  return (1);
}
```



BRISANJE ID BROJA IDENTIFIKATORA




```
// Find Slot
uint8_t findIDSLOT() {
  uint8_t k;
  uint8_t count = EEPROM.read(0);       // Read the first Byte of EEPROM that
  for ( uint8_t i = 0; i < count; i++ ) {    // Loop once for each EEPROM entry
    readID(i); // Read an ID from EEPROM, it is stored in storedCard[]
    for (k = 0; k < 4; k++ ) {    // Loop 4 times
      if ( readCard[k] != storedCard[k] ) { // IF a!=b then false (one fails, all fail)
        break;
      }
    }
    if (k == 4)return (i);
  }
  return (0);
}
```



BRISANJE SVIH ID BROJEVA IDENTIFIKATORA

```
//Delete all tags ID from EEPROM
void deleteEEPROM() {
  neopixelWrite(RGB_BUILTIN,RGB_BRIGHTNESS,0,0); // Red light
  Serial.println(F("Wipe Button Pressed"));
  Serial.println(F("You have 10 seconds to Cancel"));
  Serial.println(F("This will be remove all records and cannot be undone"));
  bool buttonState = monitorWipeButton(10000); // Give user enough time to cancel operation
  if (buttonState == true && digitalRead(wipeB) == LOW) {    // If button still be pressed, wipe EEPROM
    Serial.println(F("Starting Wiping EEPROM"));
    for (uint16_t x = 0; x < EEPROM.length(); x = x + 1) {    //Loop end of EEPROM address
      if (EEPROM.read(x) != 0) EEPROM.write(x, 0);  //If EEPROM value on address != 0 clear it, it takes 3.3mS
    }
    EEPROM.commit();
    Serial.println(F("EEPROM Successfully Wiped"));
    // visualize a successful wipe
    neopixelWrite(RGB_BUILTIN,RGB_BRIGHTNESS,0,0); delay(200); // Red light
    neopixelWrite(RGB_BUILTIN,RGB_BRIGHTNESS,RGB_BRIGHTNESS,RGB_BRIGHTNESS); delay(200); // White light
    neopixelWrite(RGB_BUILTIN,RGB_BRIGHTNESS,0,0); delay(200); // Red light
    neopixelWrite(RGB_BUILTIN,RGB_BRIGHTNESS,RGB_BRIGHTNESS,RGB_BRIGHTNESS); delay(200); // Red light
    neopixelWrite(RGB_BUILTIN,RGB_BRIGHTNESS,0,0); // Red light
  }
  else {
    Serial.println(F("Wiping Cancelled")); // Show some feedback that the wipe button did not pressed for 15
seconds
    neopixelWrite(RGB_BUILTIN,RGB_BRIGHTNESS,0,0); // Red light
  }
}
```

MONITORING TASTERA

```
//Monitoring of the Wipe button
bool monitorWipeButton(uint32_t interval) {
  uint32_t now = (uint32_t)millis();
  while ((uint32_t)millis() - now < interval)  {
    // check on every half a second
    if (((uint32_t)millis() % 500) == 0) {
      if (digitalRead(wipeB) != LOW)
        return false;
    }
  }
  return true;
}
```

ZA VJEŽBU

1. Modifikovati kod tako da se u MASTER mod ulazi svaki put nakon brisanja EEPROM-a (1)

2. Modifikovati kod tako da se u MASTER mod ulazi ukoliko ID kod MASTER identifikatora nije upisan u EEPROM mikrokontrolera, u za njega predviđenom prostoru (očitane sve 0 ili sve FF) (1).

3. Modifikovati kod tako da se izmjena ID koda MASTER identifikatora inicira zadržavanjem na čitaču važećeg MASTER identifikatora, duže od 4 sekunde (3-2-1).

4. Modifikovati deleteEEPROM funkciju tako da se EEPROM briše ukoliko se MASTER identifikator zadrži na čitaču duže od 10 sekundi (2-1).

Poeni riješenih zadataka se sabiraju!