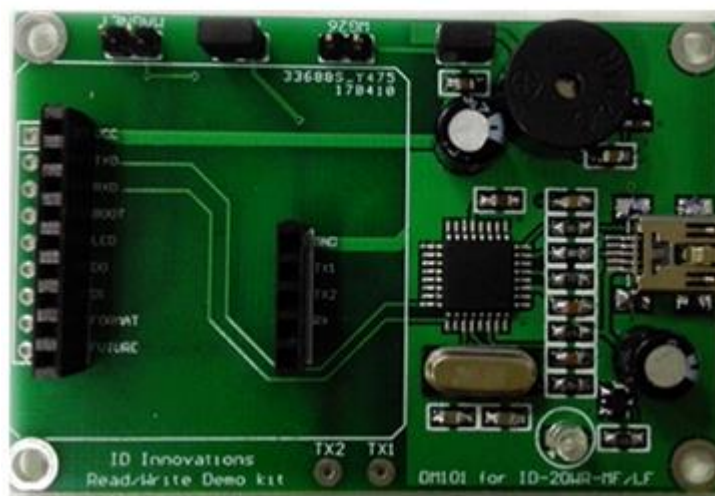


# ID-20MF

## Reader/Write Module

### User Manual

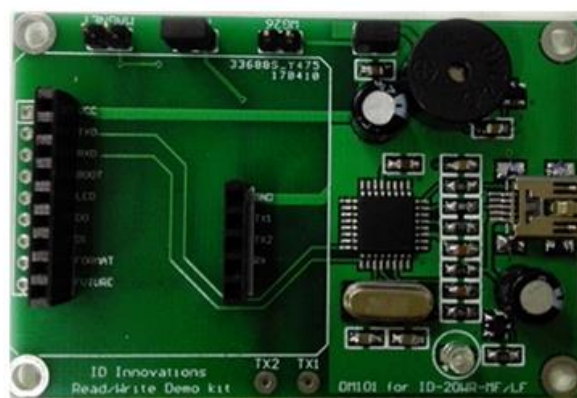


**ID Innovations**  
**Advanced Digital Reader Technology**  
**-----Better by Design**  
V3.06.3—2011-11-28

## Summary

The ID-20MF series contactless card Read/Write module is based on Mifare reader IC. They come with the choice of internal antenna or external antenna and are suitable for embedded applications and general Electronic Devices. The ID-20MF series are user friendly and can be controlled by command from a UART (serial port).

Functions are selected by a Pin jumper allowing full control of all functions.



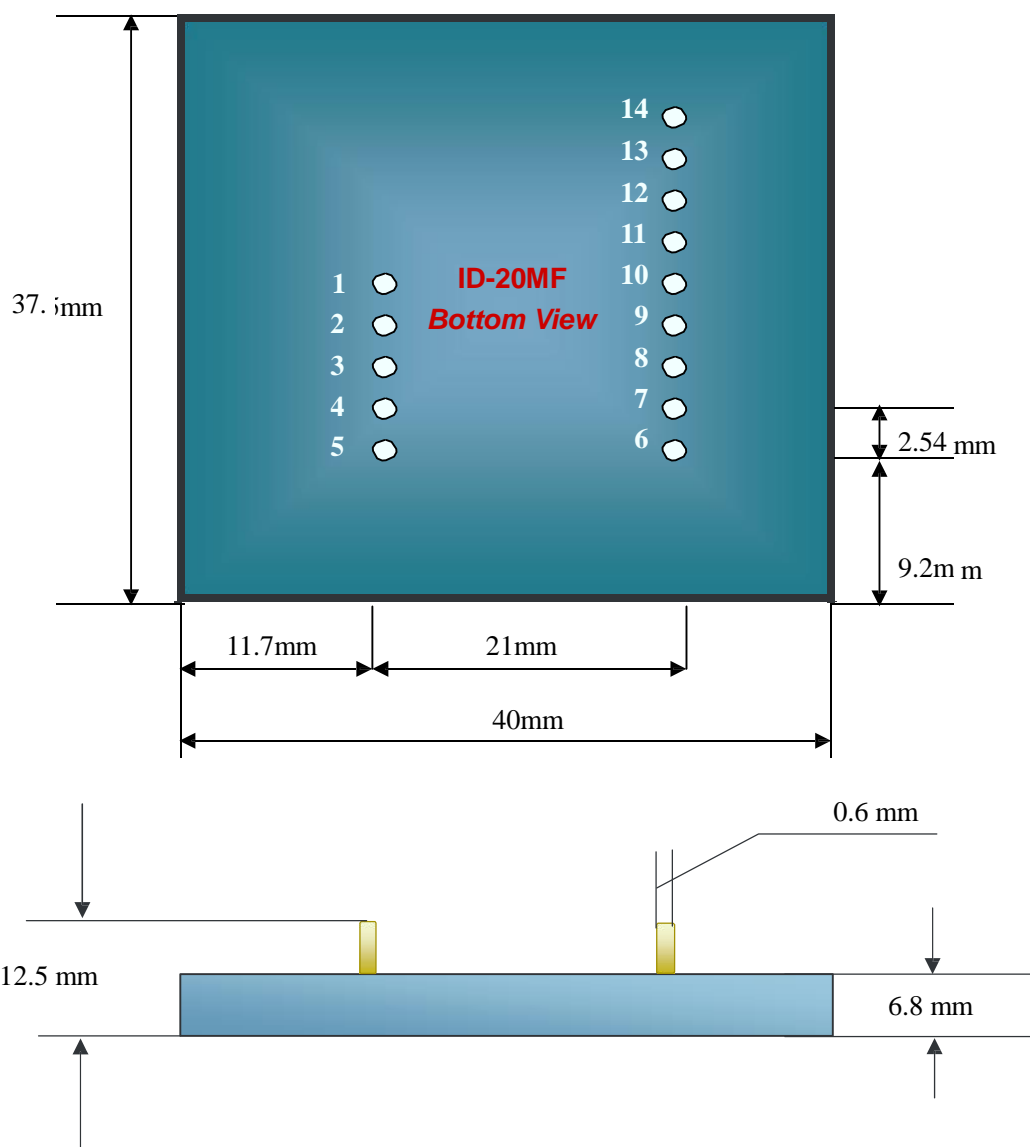
## Characteristic

- 1 2 options: internal antenna or external antenna
- 1 ISP(In System Program)function
- 1 Small outline
- 1 Low power consumption

## Specification

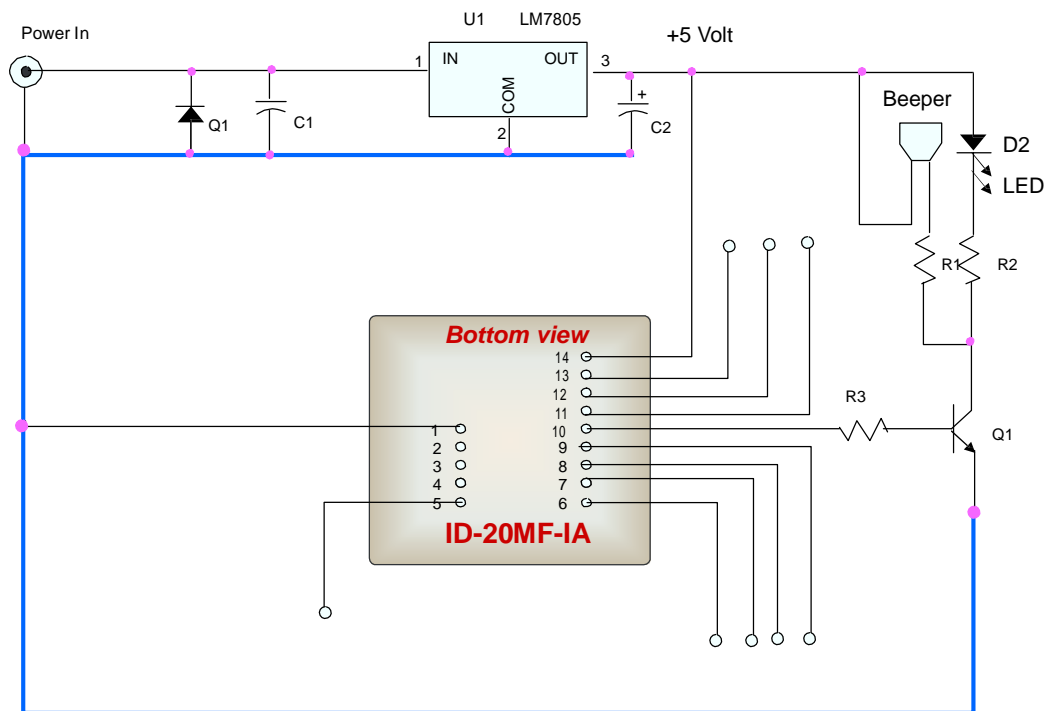
- 1 Support ISO/IEC14443 TypeA cards : Mifare One S50 b) Mifare One S70 c) Mifare Ultra Light
- 1 Model: ID-20MFIA (with internal antenna) ID-20MFWA (without internal antenna)
- 1 Frequency: 13.56 MHz  
 Read/Write distance: internal antenna --30mm external antenna—up to 80mm  
 (tested by ID Innovations cards, range can vary if card made by different manufactory)
- 1 Fast read/write speed.
- 1 Communication Port: (RS232) TTL / 2400-57600BPS N,8,1
- 1 Power: 5V DC
- 1 Current consumption: <60 mA PK<200MA
- 1 weight: 80g
- 1 Operating temperature: -20°C --- +75°C
- 1 Storage temperature : -40°C --- +85°C

## Dimensions and Pins(bottom view)

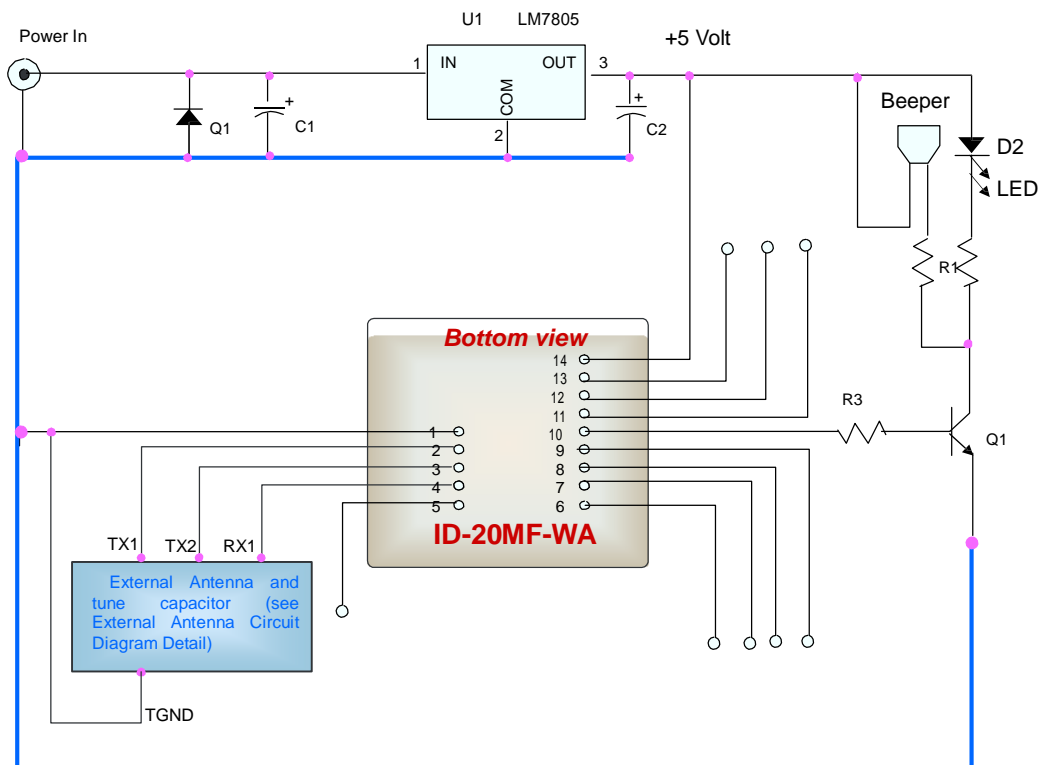


- 1-----GND
- 2-----external antenna TX1
- 3-----external antenna TX2
- 4-----external antenna RX1
- 5-----CP
- 6-----Future
- 7-----+/- (Format Select)
- 8-----D1(Data Pin 1)
- 9-----D0(Data Pin 0)
- 10----LED(LED/BEEPER)
- 11----NC
- 12----RXD
- 13----TXD
- 14----+5V

### Circuit Diagram for the ID20MF-IA



### Circuit Diagram for the ID20MF-WA



## Pin Description & Output Data Formats

| Pin.NO | Description                                  | ASCII                      | Magnet Emulation<br>(optional) | Wiegand26<br>(optional)    |
|--------|--|----------------------------|--------------------------------|----------------------------|
| 1      | Zero Volts and<br>tuning Capacitor<br>Ground | GND 0V                     | GND 0V                         | GND 0V                     |
| 2      | To External antenna<br>TX1                   | To External antenna<br>TX1 | To External antenna<br>TX1     | To External antenna<br>TX1 |
| 3      | To External antenna<br>TX2                   | To External antenna<br>TX2 | To External antenna<br>TX2     | To External antenna<br>TX2 |
| 4      | To External antenna<br>RX1                   | To External antenna<br>RX1 | To External antenna<br>RX1     | To External antenna<br>RX1 |
| 5      | Card Present                                 | No function                | Card Present                   | No function                |
| 6      | Future                                       | Future                     | Future                         | Future                     |
| 7      | Format Selector (+/-)                        | Strap to GND               | Strap to Pin 10                | Strap to +5V               |
| 8      | Data 1                                       | No function                | Clock                          | One Output                 |
| 9      | Data 0                                       | No function                | Data                           | Zero Output                |
| 10     | LED(LED/BEEPER)                              | Beeper / LED               | Beeper / LED                   | Beeper / LED               |
| 11     | No Connection                                | No Connection              | No Connection                  | No Connection              |
| 12     | RXD  | TTL RXD                    | No function                    | No function                |
| 13     | TXD  | TTL TXD                    | No function                    | No function                |
| 14     | DC Voltage Supply                            | +5V                        | +5V                            | +5V                        |

## UART Protocols

### I Command frame (9600,N,8,1)

|         | STX         | ID  | CMD/STATUS                             | LEN             | DATA      | BCC                  | ETX       |
|---------|-------------|---|--|-----------------|-----------|----------------------|-----------|
| VALUE   | 0x02        |   |  |                 |           |                      | 0x03      |
| LENGTH  | 1byte       | 1 byte  | 1 byte                                 | 1 byte          | LEN bytes | 1 byte               | 1 byte    |
| COMMENT | Start Frame | 0x00—0xff, Device Address<br><br>default:0x01 | When Sent: CMD<br>When receive: STATUS | <b>DATA NUM</b> | DATA      | XOR From STX to DATA | Frame end |

### I CMD/STAUS、DATA LENGTH、DATA

| Command Type   | Function    | Send      |             |      | Return            |             |      |
|----------------|-------------|-----------|-------------|------|-------------------|-------------|------|
|                |             | Command   | DATA Length | DATA | STAUS             | DATA Length | DATA |
| System Command | Link        | 0x00      | 0x00        |      | Ok=0<br>Err=Other | 0x00        |      |
|                | For Example | 0x00,0x00 |             |      | 0x00,0x00         |             |      |
|                | Reset       | 0x01      | 0x00        |      | Ok=0<br>Err=Other | 0x00        |      |
|                | For Example | 0x01,0x00 |             |      | 0x00,0x00         |             |      |

| Command Type   | Function  | Send            |                 |  | Return            |             |      |
|----------------|---|-----------------|-----------------|--|-------------------|-------------|------|
|                |   | Command         | DATA Length     | DATA   | STAUS             | DATA Length | DATA |
| System Command | Change baudrate   | 0x02            | 0x01            | B<br>Baudrate Baudrate value<br>2400 B=0x00<br>4800 B=0x01<br>9600 B=0x02 (default)<br>14400 B=0x03<br>19200 B=0x04<br>28800 B=0x05<br>57600 B= 0x06   | OK=0<br>Err=other | 0x00        |      |
|                | For example:  | 0x02, 0x01,0x01 |                 |  | 0x00,0x00         |             |      |
|                | Buzzer control  | 0x03            | 0x04 or<br>0x00 | ABCD<br>A=0x00 buzzer off<br>=0x01 buzzer on<br>=0x02 buzzer on<br>BCD*10 ms<br>BCD: When A=2 the time<br>is given by the value<br>BCD<br>For example, if the time<br>value is 123, then<br>B=0x01, C=0x02, D=0x03 | OK=0<br>Err=other | 0x00        |      |
| For example:   | A=0 or 1 : 0x03,0x04,0x00<br>A=2 :0x03,0x04,0x02,0x01,0x02,0x03 |                 |                 | 0x00,, 0x00,   |                   |             |      |

| Command Type              | Function       | Send   |             |   | Return  |             |  |
|---------------------------|----------------|--|-------------|---|---|-------------|--|
|                           |                | Command  | DATA Length | DATA  | STAUS   | DATA Length | DATA   |
| MF0 IC S50、S70<br>Command | Request Card   | 0x10   | 0x00        |   | Ok=0<br>Err=Other   | 0x02        | NN<br>0x4400 = ultra_light<br>0x0400 = Mifare_One(S50)<br>0x0200 = Mifare_One(S70)<br>0x4403 = Mifare_DESFire<br>0x0800 = Mifare_Pro<br>0x0403 = Mifare_ProX<br>0x0033 = SHC1102 |
|                           | For example:   | 0x10,0x00,                                     |             |   | 0x00,0x02,0x04,0x00   |             |  |
|                           | Halt Module    | 0x11   | 0x00        |   | Ok=0<br>Err=Other   | 0x00        |  |
|                           | For example    | 0x11,0x00,                                     |             |   | 0x00,, 0x00,  |             |  |
|                           | Read Seris No. | 0x12   | 0x00        |   | Ok=0<br>Err=Other   | 0x04        | NNNN   |
|                           | For example    | 0x12, 0x00,                                    |             |   | 0x00,, 0x04, 0x1B,0x2C,0x3D,0x4E  |             |  |
|                           | Read BlockData | 0x13   | 0x08        | BAPPPPPP<br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br>PPPPPP: 6bytes Key | Ok=0<br>Err=Other   | 0x0F        | DDDDDDDDDDDDDDDD<br>16 Bytes Data  |
|                           | For example    | 0x13,0x08, 0x01,0x00,0xFF,0xFF,0xFF,0xFF,0xFF, |             |   | 0x00, 0x0F, 0x11, 0x22, 0x33, 0x44, 0x55, 0x66, 0x77, 0x88, 0x99, 0x00, 0xAA, 0xBB, 0xCC, 0xDD, 0xEE, ,0xFF |             |  |



| Command Type              | Function           | Send   |             |  | Return            |             |      |
|---------------------------|--------------------|--|-------------|--|-------------------|-------------|------|
|                           |                    | Command  | DATA Length | DATA   | STAUS             | DATA Length | DATA |
| MF0 IC S50、S70<br>Command | Write<br>BlockData | 0x14   | 0x18        | BAPPPPPP<br>DDDDDDDDDDDDDDDD<br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br>PPPPPP: 6bytes Key<br>DDDDDDDDDDDDDDDD<br>16 Bytes Data | Ok=0<br>Err=Other | 0x00        |      |
|                           | For example        | 0x14, 0x18, 0x01,0x00,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF, 0x11, 0x22,<br>0x33, 0x44, 0x55, 0x66, 0x77, 0x88, 0x99, 0x00, 0xAA, 0xBB, 0xCC,<br>0xDD, 0xEE, ,0xFF |             |  | 0x00,, 0x00,      |             |      |
|                           | Verify Key A       | 0x15   | 0x0e        | BAPPPPPMMMMMM<br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br>PPPPPP: 6 Bytes Old Key A<br>MMMMMM: 6 Bytes Old Key A                 | Ok=0<br>Err=Other | 0x00        |      |
|                           | For example        | 0x15, 0x0e, 0x01,0x00,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF, 0x11, 0x22,<br>0x33, 0x44, 0x55, 0x66   |             |  | 0x00,, 0x00,      |             |      |

:

| Command Type           | Function    | Send  |             |  | Return                             |             |      |
|------------------------|-------------|---|-------------|--|------------------------------------|-------------|------|
|                        |             | Command   | DATA Length | DATA   | STAUS                              | DATA Length | DATA |
| MF0 IC S50、S70 Command | Read Purse  | 0x16  | 0x08        | BAPPPPPP<br><br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br><br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br><br>PPPPPP: 6 Bytes Key                                 | Ok=0<br>Err=Other                  | 0x04        | DDDD |
|                        | For example | 0x15, 0x0d, 0x01,0x00,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF                         |             |  | 0x00, 0x04, 0x11, 0x22, 0x33, 0x44 |             |      |
| MF0 IC S50、S70 Command | Write Purse | 0x17  | 0x0c        | BAPPPPPDDDD<br><br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br><br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br><br>PPPPPP: 6 Bytes Key<br>DDDD: 4 Bytes Purse Value | Ok=0<br>Err=Other                  | 0x00        |      |
|                        | For example | 0x17, 0x0c, 0x01,0x00,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF,0x11, 0x22, 0x33, 0x44, |             |  | 0x00, 0x00,                        |             |      |

| Command Type              | Function           | Send   |             |  | Return            |             |      |
|---------------------------|--------------------|--|-------------|--|-------------------|-------------|------|
|                           |                    | Command  | DATA Length | DATA   | STAUS             | DATA Length | DATA |
| MF0 IC S50、S70<br>Command | Increment<br>Purse | 0x18   | 0x0c        | BAPPPPPDDDD<br><br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br>PPPPPP: 6 Bytes Key<br>DDDD: 4 Bytes Purse Value | Ok=0<br>Err=Other | 0x00        |      |
|                           | For example        | 0x18, 0x0c, 0x01,0x00,0xFF,0xFF,0xFF,0xFF,0xFF,0x11, 0x22, 0x33, 0x44, |             |  | 0x00, 0x00,       |             |      |
| MF0 IC S50、S70<br>Command | Decrement<br>Purse | 0x19   | 0x0c        | BAPPPPPDDDD<br><br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br>PPPPPP: 6 Bytes Key<br>DDDD: 4 Bytes Purse Value | Ok=0<br>Err=Other | 0x00        |      |
|                           | For example        | 0x19, 0x0c, 0x01,0x00,0xFF,0xFF,0xFF,0xFF,0xFF,0x11, 0x22, 0x33, 0x44, |             |  | 0x00, 0x00,       |             |      |
|                           |                    |  |             |  |                   |             |      |

| Command Type              | Function                            | Send   |             |   | Return            |             |                |
|---------------------------|-------------------------------------|--|-------------|---|-------------------|-------------|----------------|
|                           |                                     | Command  | DATA Length | DATA  | STAUS             | DATA Length | DATA           |
| MF0 IC S50、S70<br>Command | Mult-Block<br>-Data bulk<br>Reading | 0x1A   | 0x09        | BAPPPPPPN<br>B: BlockNo.<br>S50:0x00-0x3f<br>S70:0x00-0xff<br>A:=0-PICC_AUTHENT1A<br>=1-PICC_AUTHENT1B<br>=2-NO_AUTHEN<br>P: 6 Bytes Key<br>N: Read Block Num<br>(warning: the password in all<br>sectors should be same) | Ok=0<br>Err=Other | N*16        | 16*N byte Data |
|                           | For example                         | 0x1A, 0x09, 0x00,0xFF,0xFF,0xFF,0xFF,0xFF,0x0c |             |   | 0x00, N*16,.....  |             |                |
| Command Extend            |                                     |  |             |   |                   |             |                |

## Card Operating

1. **Warning: Accesss Bits! Read card manual before proceeding or card may be blocked!!!**
2. Block operation:
  - a) For STD MF-S50'  
SECOTOR is from 0 to 15.The BLOCK is from 0 to 63
  - b) For STD MF-S70'  
SECOTOR is from 0 to 39(1 sector include 4 blocks in the first 32 sectors, and 1 sector include 16 blocks in the last 8 sectors), The BLOCK is from 0 to 255
  - c) For S70 or Ultralight  
.You may change the Block in the Protocols.
3. **Warning: BLOCK3 of each Sector is a control area which can change the password A and password B. It is very important to write the correct number in this block otherwise will cause the sector damaging!!!**
4. For the safety purpose, the demo software we provide is only available for password A operating which normally use very often. (you can change the password A)
5. For the Password B conducting, we locked the function for safety purpose. Please use the protocol as a reference to operate it.
6. You can switch the module into low consumption mode by using command "HALT Module" and command "REQUEST" before starting to use again.
7. When using the Purse function, you must Write Purse with any amount to initialize it.
8. When you operating the "write block" and "changing the password A", the VB demo will automatically add a "0"before the number you write. When you operating the purse "write" "increase" "decrease", the VB demo will automatically add a "0"followed the number you write.
9. The software will automatically do the Caps for the character you type in.
10. All the writing and password and purse operating can only between "0"—"F".
11. For the Purse "write" "increase" "decrease", the money amount is DDDD 4 bits. For example, 5\$ will be 0x00,0x00,0x00,0x05.
12. It is not necessary to have checksum password for the Ultralight card writing. It is A:=2-NO\_AUTHEN (Refer to the Protocols)
13. Input the key into EEPROM  
The address of RC500 for password saving is 80--1FF  
There are 6 bytes for Key A or Key B, plus the reversing saving, there are 12 bytes for each and 24 bytes as total.  
There are 384 bytes in EEPROM in total which can be saved in 16 blocks.