

DL810 & DL5510 Long Range RFID Reader User Manual

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1. COMMUNICATION INTERFACE SPECIFICATION

DL810 & DL5510 series reader communicates with host (MCU , MPU , Controller) using serial communication interface RS232 or RS485 and complete corresponding operation according to the host command. The communication parameter is 19200bps 1 start bit, 8 data bits, 1 stop bit without parity check bit. In the process of serial communication, the least significant bit of one byte is transmitted first and the least significant byte of command data sequence is transmitted first.

2. PROTOCOL DESCRIPTION

A communication procedure is sponsored by the host sending commands and data to the reader and the reader returns the result status and data to host after command execution.

The DL810 & DL5510 reader with RS232 interface will send 4 bytes data once to check whether the RXD and TXD (pin2&3 in DB9) are connected when powered on. If RXD and TXD are connected, the reader will turn into “demo mode”. The function is void for the reader with RS485 interface.

The following table shows the process of the host computer command:

HOST	DIRECTION	READER	COMMENT
Command Data Block	→		The interval between two consecutive bytes in the command data block should be less than 15ms. During command data block sending, synchronization will lost if the host receives any data from DL810(DL5510) and the host should stop command sending and restart the communication after 15ms.

The command data block the post sending to the reader should conform to the format of the protocol. The block includes address, operation command symbol, operation control symbol command operand and CRC-16 checksum.

The reader completes command execution in 1s (not including host sending data time) except inventory command after receiving host command and returns the results. During the period, it doesn't process any host data. The feedback of command execution results is as follows:

READER	DIRECTION	HOST	COMMENT
Response data block	→		The interval between two consecutive bytes in the response data block should be less than 15ms.

The response data block includes address, command execution result status and response data. After the feedback, a whole communication process finishes.

3. DATA BLOCK FORMAT

A. COMMAND DATA BLOCK

Len	Com_adr	Cmd	State	Data[]	LSB-CRC16	MSB-CRC16
-----	---------	-----	-------	--------	-----------	-----------

Len: Command data block length 1 byte (not including itself). Value range is 5~25. The number of Len equals the length of Data[] plus 5.

Com_adr: Reader address, 1 byte. Value range is 0~254. Only will the reader conforming to the address response the command data block.. Value 255 is broadcasting address. All the readers will response to the command data block with a broadcasting address.

Cmd: Operation command symbol, 1 byte. It defines 34 commands.

State: Operation control symbol, 1 byte. Low 4-bytes control operation mode (refer to each command description for details); High 4-bytes control operation style that value "0" means ISO/IEC 15693 protocol command, value "F" means reader-defined command and value "E" means transparent command. Other values are reserved.

Data[]: Operation command parameters. There is no parameters if the LEN item equals 5.

CRC16: CRC-16 checksum, 2 bytes with least significant byte first.

B. RESPONSE DATA BLOCK

Len	Com_adr	Status	Data[]	LSB-CRC16	MSB-CRC16
-----	---------	--------	--------	-----------	-----------

Len: Response data block, 1 byte. Value range is 4~28. The number of Len equals the length of Data[] plus 4.

Com_adr: Reader address, 1 byte. Value rang is 0~254.

Status: Result status value, 1byte. Refer to following table for details.

Data[]: Response data. There is no this item if Len equals 4.

CRC16: CRC-16 checksum, 2 bytes with least significant byte first.

The reader won't response if any error found in command data block.

The default value of the reader address Com_adr is 0x00. The host may change it by using reader-defined command "Write Com_adr".

Cyclic Redundancy Check (CRC) computation includes all data from Len. The CRC generation polynomial is the same as that defined in ISO/IEC 15693 protocol without reversing the computation result. For example, a data block is presented as follows: 0x05, 0xFF, 0x01, 0x00, LSB-CRC, MSB-CRC. CRC checksum is $LSB-CRC = 0x5D$, $MSB-CRC = 0xB2$. A reference CRC computation program is presented as follow:

Polynomial: POLYNOMIAL=0x8408;

Start Value: PRESET_VALUE=0xffff;

C-Example:

```
int          i,j;
unsigned int  current_crc_value=PRESET_VALUE;
```

```

for(i=0;i<len;i++) /*len=number of protocol bytes without CRC*/
{
    current_crc_value=current_crc_value^((unsigned int)pData[i]);
    for(j=0;j<8;j++)
    {
        if(current_crc_value&0x0001)
        {
            current_crc_value=(current_crc_value>>1)^POLYNOMIAL;
        }
        else
        {
            current_crc_value=(current_crc_value>>1);
        }
    }
}

pData[i++]=(unsigned char)(current_crc_value&0x00ff);
pData[i]=(unsigned char)((current_crc_value>>8)&0x00ff);

```

4. OPERATION COMMAND (CMD) SUMMARY

DL810 & DL5510 series reader supports 34 commands. Multi-mode operation could be realized by defining operation control symbol (state) when host transmits a command data block. The detailed description of every command can be found in the latter chapters.

13 out of 34 commands are ISO/IEC 15693 protocol command (shown in the following table). The high 4-bits of the operation control symbol (State) should be set to “0” when host transmits the commands.

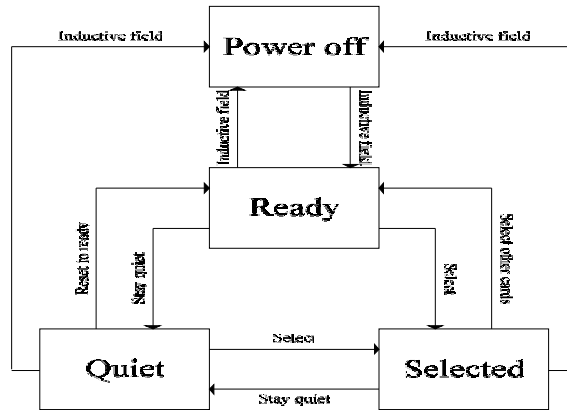
COMMAND		PARAMETER		Receive (if operation successes)	COMMENT
NAME	VALUE	Addressed mode	Selected mode		
Inventory	0x01	—		_DSFID, _UID	Check if any tag exist in the effective field
Stay Quiet	0x02	_UID	—	—	Turn appointed tag into Quiet state and no response to further inventory command.
Read Single Block	0x20	_UID , _block number	_block number	_block security status , _data	Read out data in appointed block which is 4 or 8 bytes and its security state.
Write Single Block	0x21	_UID , _block number , _data	_block number , _data	—	Write data of 4 or 8 bytes into appointed block.

Lock Block	0x22	_UID , _block number	_block number	—	Lock appointed block to turn it into a “read- only” one.
Read Multiple Block	0x23	_UID, _first block number, _number of block	_first block number, _number of block	_block security status , _data (repeating _number of block times)	Read out data of appointed multiple blocks synchronously and their security state.
Select	0x25	_UID	—	—	Turn appointed tag into “selected state”.
Reset to Ready	0x26	_UID	—	—	Turn appointed tag into “Ready state”.
Write AFI	0x27	_UID , _AFI	_AFI	—	Write the Application Family Identifier of appointed tag.
Lock AFI	0x28	_UID	—	—	Lock the Application Family Identifier of appointed tag.
Write DSFID	0x29	_UID , _DSFID	_DSFID	—	Write the Data Storage Format Identifier of appointed tag.
Lock DSFID	0x2A	_UID	—	—	Lock the Data Storage Format Identifier of appointed tag.
Get System Information	0x2B	_UID	—	_Information Flag , _UID , _DSFID , _AFI , _Memory , _IC reference	Get detailed information of appointed tag.

- ◆ Remark : AFI, the Application Family Identifier.
- ◆ Remark : DSFID, the Data Storage Format Identifier.
- ◆ Remark : UID, Unique Identifier, every tag holds an unique UID(8 bytes) as follows:

Bit64~bit57	Bit56~bit49	Bit48~bit1
0xE0	Manufacturer code	Unique serial number

- ◆ Remark : The tags conforming to ISO/IEC protocol stores data in the blocks with 4 or 8 bytes size.
- ◆ Remark : Access mode which contains tags' UID is “addressed operation mode”.
- ◆ Remark : Access mode which doesn't contain tags' UID is “selected operation mode”. To access tag in this operation mode, “Select” command should be executed first on a tag to make it in “Selected stated”. Then all command operation in “selected operation mode” will be aimed at this tag.
- ◆ Remark : The following figure shows the state transfer of a tag.



18 out of the 34 commands are reader-defined commands (shown in the following table). When host send them, the high 4-bits of operation control symbol (State) should be “F”.

COMMAND		PARAMETER		COMMENT
NAME	VALUE	SEND	RECEIVE	
Get Reader Information	0x00	—	_Version, _Reader_type, _Tr_type, _Inventory Scan Time	Gain reader address ,reader software version, reader type, reader protocol information and Inventory Scan Time.
Close RF	0x01	—	—	Close inductive field. When the field closed, the reader will not execute any ISO/IEC 15693 protocol command the host sends and return corresponding error code.
Open RF	0x02	—	—	Open inductive field.
Write Com_adr	0x03	_Com_adr	—	Set reader address of the reader.
Write InventoryScan Time	0x04	_Inventory ScanTime	—	Set InventoryScanTime value.
Set General Output	0x05	_Output	—	Set Output1 and Output2 state (TTL level).
Get General Input	0x06	—	_Input	Get the state of Input1(TTLlevel).
Set Relay	0x07	_Relay	—	Set the state of the relay in the reader.
Set Active ANT	0x08	_ANT_status	—	Set the current effective antenna.

Get ANT Status	0x09	—	_ANT_status	Get the current antenna setting.
Set Defined Block Length	0x80	_Block_len	—	Set the user defined block length.
Get Defined Block Length	0x90	—	_Block_len	Get the value of user defined block length.
Set Scan-Mode	0x0a	_Scan-Mode	—	Set the reader enter/exit Scan Mode. The host also uses this command to define output data content and format under Scan Mode.
Get Scan-Mode Status	0x0b	—	_Scan-Mode	Get the reader's current Scan Mode setting
Set Receive Channel	0x0e	_Channel	—	Set effective receive channel
Get Receive Channel Status	0x0f	—	_Channel	Get current receive channel setting
Set Parse Mode	0x70	_ParseMode	—	Set parsing mode in multiple tags processing
Get Parse Mode	0x71	—	_ParseMode	Get current parsing mode setting

3 out of the 34 commands are transparent commands (shown in the following table). When host send them, the high 4-bits of operation control symbol (State) should be "E".

COMMAND		PARAMETER		COMMENT
NAME	VALUE	SEND	RECEIVE	
TransparentRead	0x02	_RSP-Length, _Custom-Data	_Data	Use the reader as a RF front-end engine to read data from tag. The timing is according to ISO15693.
TransparentWrite	0x03	_Option, _RSP-Length, _Custom-Data	_Data	Use the reader as a RF front-end engine to write data into tag. The timing is according to ISO15693.
TransparentCustomizedCmd	0x04	_RSP-Time, _RSP-Length, _Custom-Data	_Data	Use the reader as a RF front-end engine to read data from tag. The timing is user defined.

5. LIST OF COMMAND EXECUTION RESULT STATUS

The high 4-bits and low 4-bits of command execution result status byte have different meaning. Low 4-bits indicates command execution result and high 4-bits indicates protocol style. High 4-bits are all zero for ISO/IEC 15693 protocol. The following table show the details:

RESPONSE DATA BLOCK					STATUS	COMMENT
Len	Com_adr	Status	Data[]	CRC-16		
Legnth of Data[] +4	0xXX	0x00	...	LSM+MSB	Success	Return status 0 to host after command is executed successfully. Data block contains result data.
4	0xXX	0x01	—	LSM+MSB	Command operand length error	Return status 1 to host when the number of command operands doesn't conform to the command request.
4	0xXX	0x02	—	LSM+MSB	Command not supported	Return status 2 to host when the reader does not support the command the host sends.
4	0xXX	0x03	—	LSM+MSB	Operand out of range	Return status 3 to host when one or more operand of command data block sent by host are out of range.
4	0xXX	0x05	—	LSM+MSB	Inductive field closed	Return status 5 to host when the inductive field is closed and the host sends a ISO/IEC 15693 command.
4	0xXX	0x06	—	LSM+MSB	EEPROM operation error	Return status 6 to host when the reader encounters error in EEPROM access.
4	0xXX	0x0A	—	LSM+MSB	Inventory-Scan-Time overflow	Return status 0x0A when the reader execute an Inventory command and does not get one complete tag's UID before user-defined Inventory-ScanTime overflows.
4	0xXX	0x0B	—	LSM+MSB	Inventory not finished before Inventory-Scan-Time overflows	Return status 0x0B when the reader execute an Inventory command and does not get all tag's UIDs before user-defined Inventory-ScanTime overflows.

4	0xXX	0x0C	—	LSM+ MSB	ISO error	Return status 0x0C when the reader finds one or more tag response in a way that is not compatible with ISO/IEC 15693 protocol definition.
4	0xXX	0x0E	—	LSM+ MSB	No tags	Return 0x0E when the reader finds no active tag in the inductive field.
5	0xXX	0x0F	Error_ code	LSM+ MSB	Operation error	Return status 0x0F when an error occurred in command execution and the further information of the error is defined by the Error_code in response data block.

◆ Remark : The length (Len) of response data block when a command finished successfully will vary from command to command. Further information could be found in following detailed description of individual command.

◆ Remark : When the reader return status 0x0F, the Error_code in response data block indicate further explanation to the error occurred in command execution. The definition of Error_code is available in following chapter.

6. ERROR_CODE DEFINITION

When the reader return status 0x0F, the Error_code in response data block indicate further explanation to the error occurred in command execution. The value of Error_code is predefined by the ISO/IEC 15693 protocol as follows:

CODE	COMMENT
0x01	Commands not support. For example: invalid command code
0x02	Commands can not be identified. For example: invalid command format
0x03	Operation not supported
0x0f	Unknown error
0x10	Appointed block is not available or don't exist.
0x11	Appointed block has been locked and can't be locked again.
0x12	Appointed block is locked and can't change its content.
0x13	Appointed block does not operate normally.
0x14	Appointed block can't be locked normally.
0xA0~0xDF	User-defined error code.

7. DETAILED DESCRIPTION OF OPERATION COMMAND

DL810 & DL5510 series reader supports 34 commands. Every command may run in multiple modes. Detailed description of the supported commands is presented as follows:

7.1 ISO 15693 PROTOCOL COMMAND

DL810 & DL5510 series reader supports 13 ISO/IEC 15693 protocol commands. When host sends these commands, high 4-bits of operation control style (State) should be set to all 0s.

ISO/IEC 15693 protocol commands could only be available when the inductive field is on. The inductive field could be turned on by reader-defined command “Open RF”. The default state of inductive field is on when the reader is powered on.

7.1.1 Inventory

Applied to: All models

The function of inventory command is to check the existence of any ISO/IEC 15693 compatible tags in inductive field and get the UIDs of the tags.

Before running the inventory command, users can set InventoryScanTime according to their requirement. The default value of InventoryScanTime is 3s. Its value can be changed by reader-defined command “Write InventoryScanTime”. The range of InventoryScanTime is 3*100ms~255*100ms. In most cases, Value 3s is a good choice in most circumstances. User can appropriately set the time to meet their specific requirements. Two points should be taken into consideration. One is the value could be set a smaller value to speed up the response of inventory command, the other one is the value should not be set too small to process all the tags in inductive field efficiently especially when there are a lot of tags at the same time.

If the InventoryScanTime value is set a too small value to get one tag's UID in the set time limit, the reader will return a response data block as follow:

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x0A	—	LSB	MSB

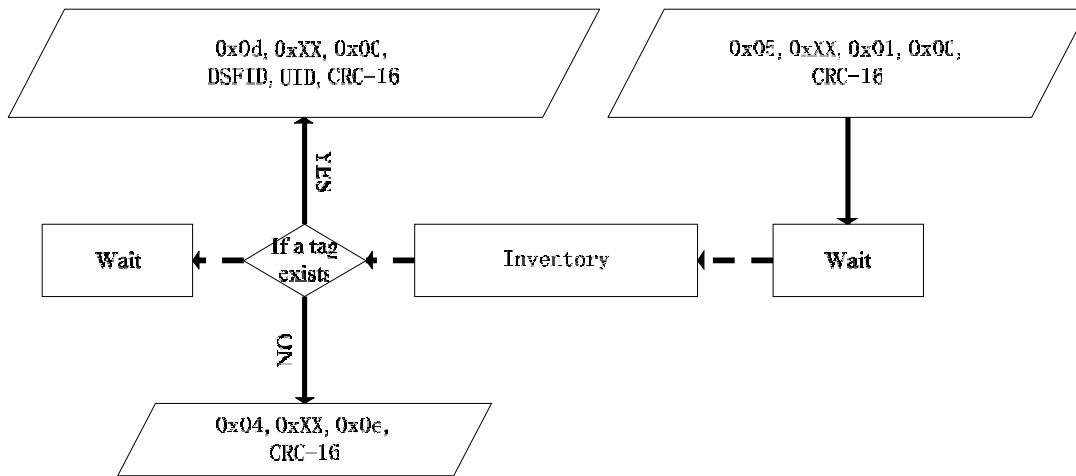
Six operation modes are available for Inventory command:

MODE	STATE	DATA[]	COMMENT
Inventory without AFI	0x00	-	All Ready state tags will respond. Only one tag's UID will be returned and that tag will be turned into Quiet state.
Inventory with AFI	0x01	_AFI	All Ready state tags with the appointed AFI will respond. Only one tag's UID will be returned and that tag will be turned into Quiet state.

Inventory-scan without AFI	0x06	—	Renewed Style. The reader will run “Close RF” and “Open RF” automatically before command execution to wake up all the tags in inductive field. So all tags will respond and the reader will return all UIDs that have been decoded before InventoryScanTime overflows. The reader will turn the tags whose UIDs have been decoded into Quiet state.
	0x02	—	Consecutive Style. All Ready state tags will respond. The reader will return all UIDs that have been decoded before InventoryScanTime overflows. The reader will turn the tags whose UIDs have been decoded into Quiet state.
Inventory-scan with AFI	0x07	_AFI	Renewed Style. The reader will run “Close RF” and “Open RF” automatically before command execution to wake up all the tags in inductive field. So all tags with the appointed AFI will respond and the reader will return all UIDs that have been decoded before InventoryScanTime overflows. The reader will turn the tags whose UIDs have been decoded into Quiet state
	0x03	_AFI	Consecutive Style. All Ready state tags with the appointed AFI will respond. The reader will return all UIDs that have been decoded before InventoryScanTime overflows. The reader will turn the tags whose UIDs have been decoded into Quiet state.

7.1.1.1 Inventory without AFI

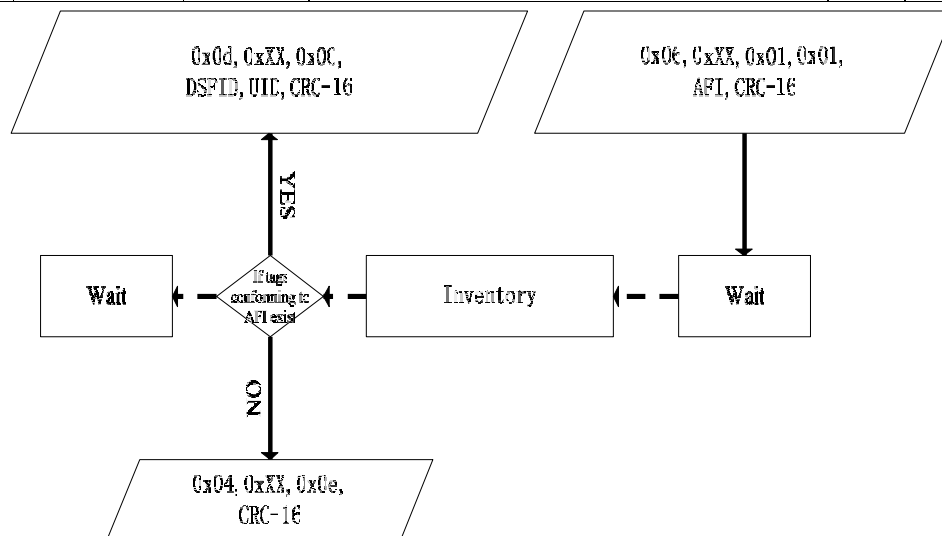
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x01	0x00	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x0d	0xXX	0x00	DSFID, UID		LSB	MSB



- ◆ Remark: The tag whose UID have been decoded by the readers will be turn into Quiet state.
- ◆ Remark: If there is at least one Ready state tag in the field and the reader could no decode its UID before InventoryScanTime overflows(for example, the InventoryScanTime has been set to a too small value), the reader will return the response data block: 0x04,0xXX,0x0A,CRC-16.

7.1.1.2 Inventory with AFI

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x01	0x01	AFI	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x0d	0xXX	0x00	DSFID, UID		LSB	MSB



- ◆ Remark: The tag whose UID have been decoded by the readers will be turn into Quiet state.
- ◆ Remark: If there is at least one Ready state tag in the field and the reader could no decode its UID before InventoryScanTime overflows(for example, the InventoryScanTime has been set to a too small value), the reader will return the response data block: 0x04,0xXX,0x0A,CRC-16.

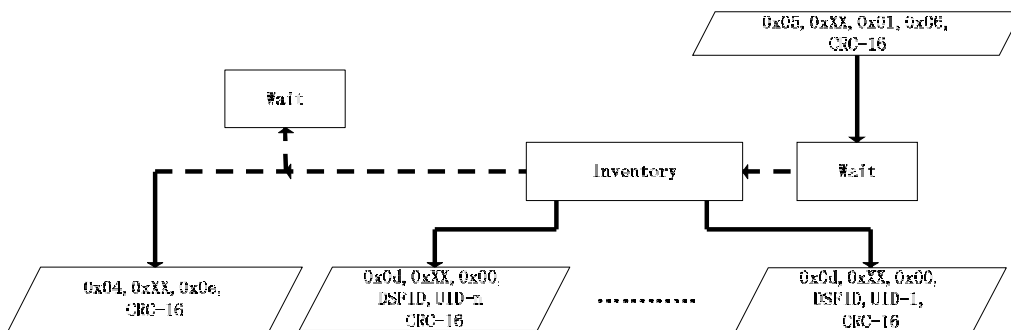
When the reader runs inventory command in Scan Mode, the reader will try to decode all available tags in field and feedback their UIDs. If the InventoryScanTime has been set to a small value and there are many tags in field, the reader may not be able to decode all tags before InventoryScanTime overflows. Under this circumstance, the reader will send back the following response data block after sending UIDs collected.

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x0B	—	LSB	MSB

Users can send a consecutive style inventory-scan command next to let the reader decodes the remaining tags in the field.

7.1.1.3 Inventory-scan without AFI

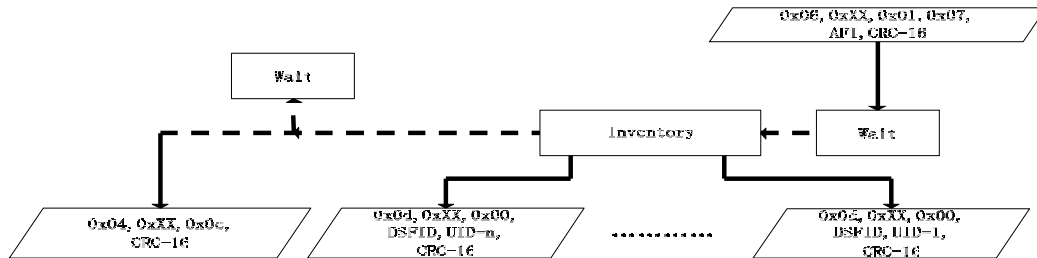
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x01	0x06(renewed style)	—	LSB	MSB
0x05	0xXX	0x01	0x02(consecutive style)	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x0d	0xXX	0x00	DSFID, UID-1		LSB	MSB
0x0d	0xXX	0x00	DSFID, UID-2		LSB	MSB
0x0d	0xXX	0x00	.....		LSB	MSB
0x04	0xXX	0x0e	—		LSB	MSB



- ◆ Remark: The number of response data blocks containing UID equals the number of tags have been decoded.
- ◆ Remark: There are three types of response data blocks indicate the end of inventory-scan command:
 Scan over: 0x04,0xXX,0x0E,CRC-16 ;
 InventoryScanTime overflows and no one UID has been decoded: 0x04,0xXX,0x0A,CRC-16;
 InventoryScanTime overflows and not all UIDs have been decoded: 0x04,0xXX,0x0B,CRC-16;

7.1.1.4 Inventory-scan with AFI

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x01	0x07(renewed style)	_AFI	LSB	MSB
0x06	0xXX	0x01	0x03(consecutive style)	_AFI	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x0d	0xXX	0x00	DSFID, UID-1		LSB	MSB
0x0d	0xXX	0x00	DSFID, UID-2		LSB	MSB
0x0d	0xXX	0x00	.....		LSB	MSB
0x04	0xXX	0x0e	—		LSB	MSB



- ◆ Remark: The number of response data blocks containing UID equals the number of tags have been decoded.
- ◆ Remark: There are three types of response data blocks indicate the end of inventory-scan command:
Scan over: 0x04,0xXX,0x0E,CRC-16 ;

InventoryScanTime overflows and no one UID has been decoded: 0x04,0xXX,0x0A,CRC-16;

InventoryScanTime overflows and not all UIDs have been decoded: 0x04,0xXX,0x0B,CRC-16;

7.1.2 Stay Quiet

Applied to: All models

The host sends this command to let the reader turn the corresponding tag into Quiet state. When a tag in Quiet state, it will not reply any inventory command. But it will still reply any command in addressed mode. There are three ways to make the tag leave Quiet state:

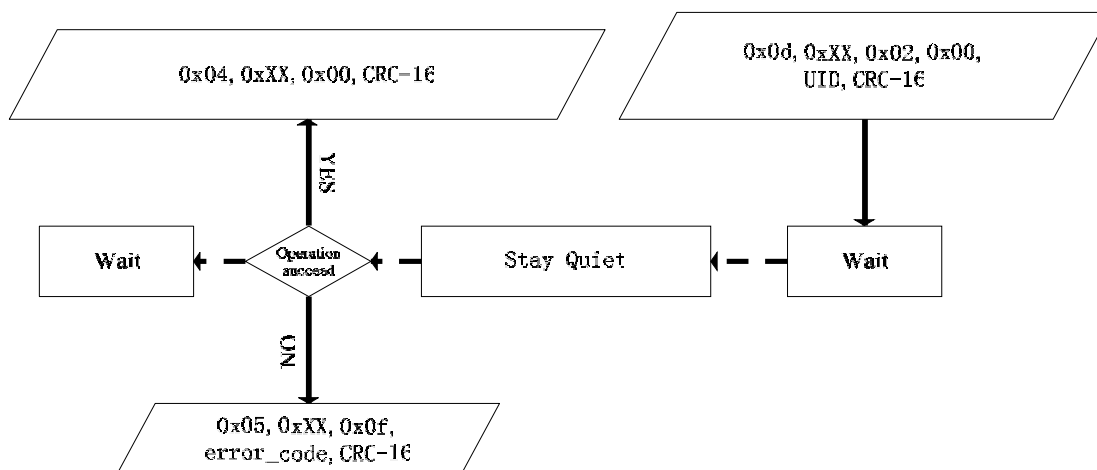
Tag is taken out of effective field and reentry in it.

Use Select command to turn the tag into Selected mode.

Use Reset to ready command to turn the tag into Ready state.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x02	0x00	UID	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x04	0xXX	0x00	—	LSB	MSB



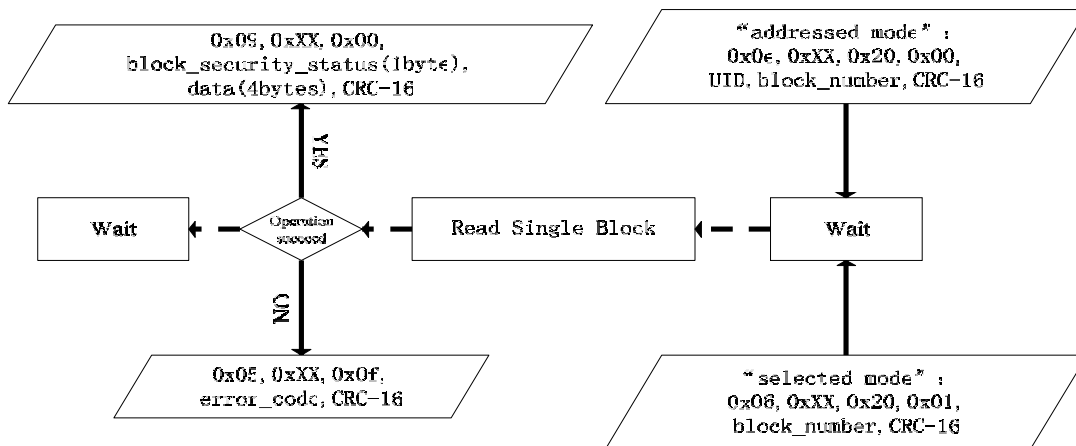
7.1.3 Read Single Block

The host sends this command to let the reader read out the corresponding tag's one block content(4 or 8 bytes) and its security status byte.

The blocks number and the size of a block may differ from tag to tag with different manufacturer. Please refer to appendix 1.

7.1.3.1 4-Byte Block

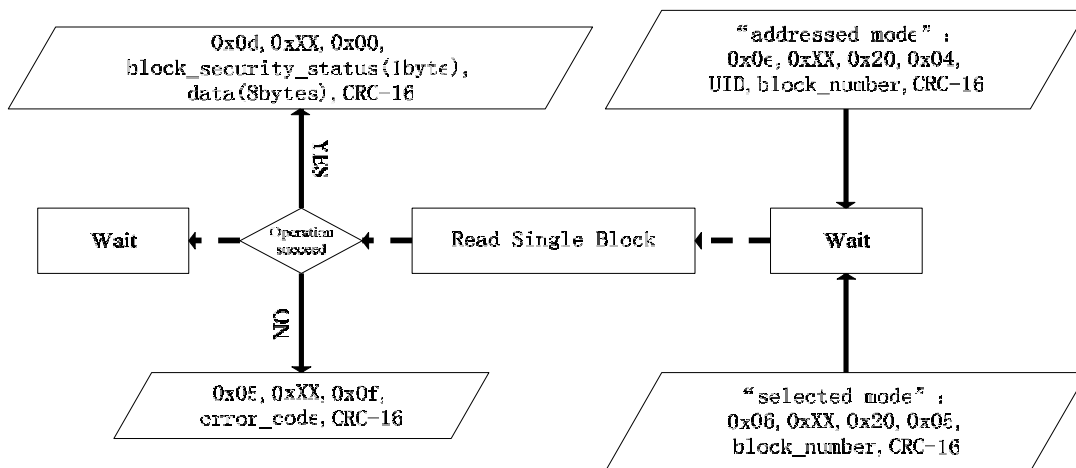
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x20	0x00	UID, block_number	LSB	MSB
0x06	0xXX	0x20	0x01	block_number	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x09	0xXX	0x00	block_security_status, block_data(4bytes)		LSB	MSB



◆ Remark: When no tag in the field, please refer to former chapter for the content of the response data block.

7.1.3.2 8-Byte Block

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x20	0x04	UID, block_number	LSB	MSB
0x06	0xXX	0x20	0x05	block_number	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x0d	0xXX	0x00	block_security_status, block_data(8bytes)		LSB	MSB



◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.4 Write Single Block

The host sends this command to let the reader write corresponding tag's one block content(4 or 8 bytes). The blocks number and the size of a block may differ from tag to tag with different manufacturer. Please refer to appendix 1.

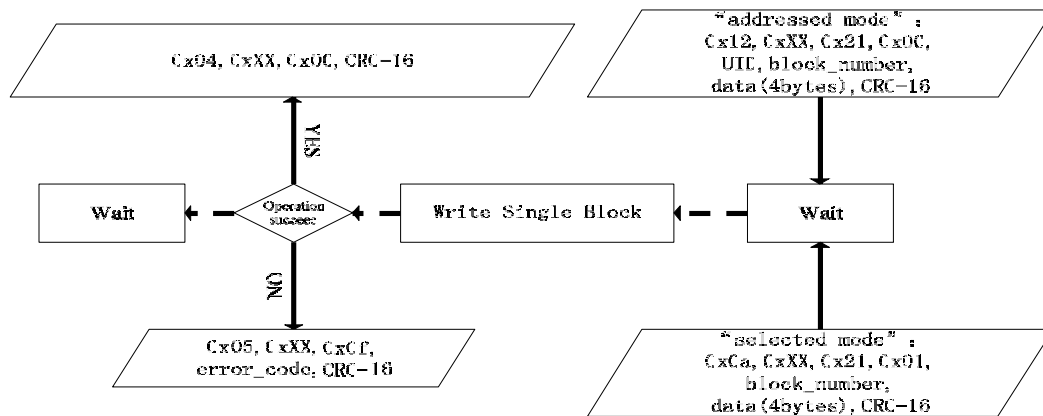
If the appointed block has been locked, operation will fail and the reader will return the error_code.

7.1.4.1 4-Byte Block

There are two types of write operation feedback style corresponding to the Option_flag bit in ISO/IEC defined write command's flag byte. When tag supports write operation with Option_flag=1, it is a type A tag. When tag supports write operation with Option_flag=0, it is a type B tag. Please refer to appendix 1.

Tags of type A :

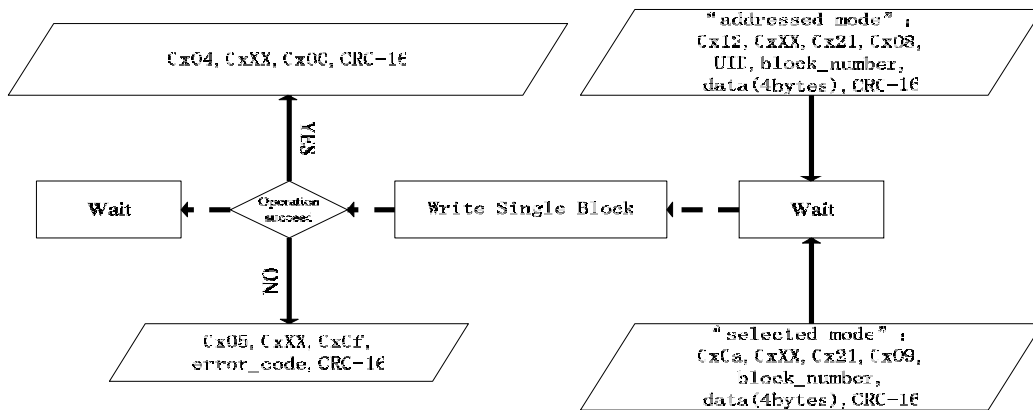
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x12	0xXX	0x21	0x00	UID, block_number, data(4bytes)	LSB	MSB
0x0a	0xXX	0x21	0x01	block_number, data(4bytes)	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B:

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x12	0xXX	0x21	0x08	UID, block_number, data(4bytes)	LSB	MSB
0x0a	0xXX	0x21	0x09	block_number, data(4bytes)	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



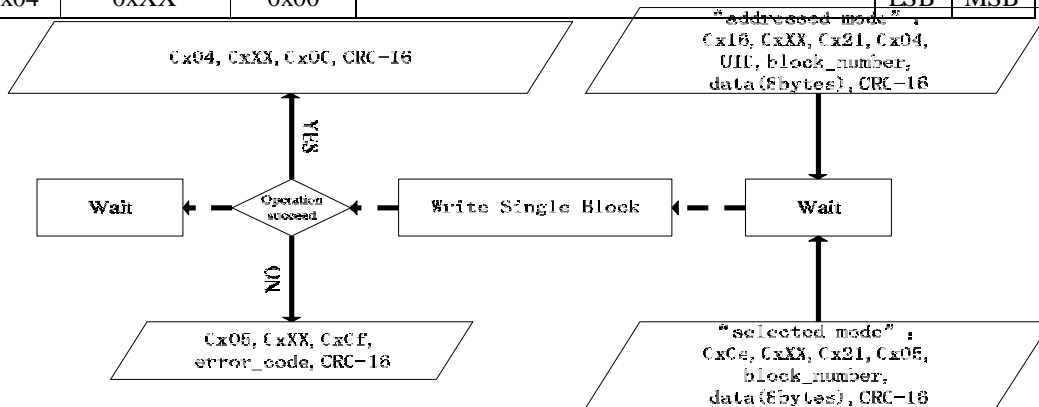
- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.4.2 8-Byte Block

There are two types of write operation feedback style corresponding to the Option_flag bit in ISO/IEC defined write command's flag byte. When tag supports write operation with Option_flag=1, it is a type A tag. When tag supports write operation with Option_flag=0, it is a type B tag. Please refer to appendix 1.

Tags of type A :

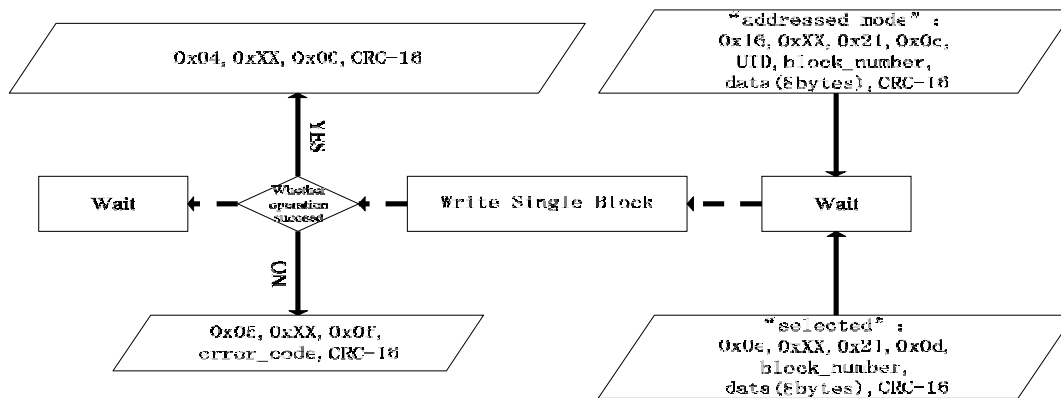
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x16	0xXX	0x21	0x04	UID, block_number, data(8bytes)	LSB	MSB
0x0e	0xXX	0x21	0x05	block_number, data(8bytes)	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B :

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x16	0xXX	0x21	0x0C	UID, block_number, data(8bytes)	LSB	MSB
0x0e	0xXX	0x21	0x0D	block_number, data(8bytes)	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

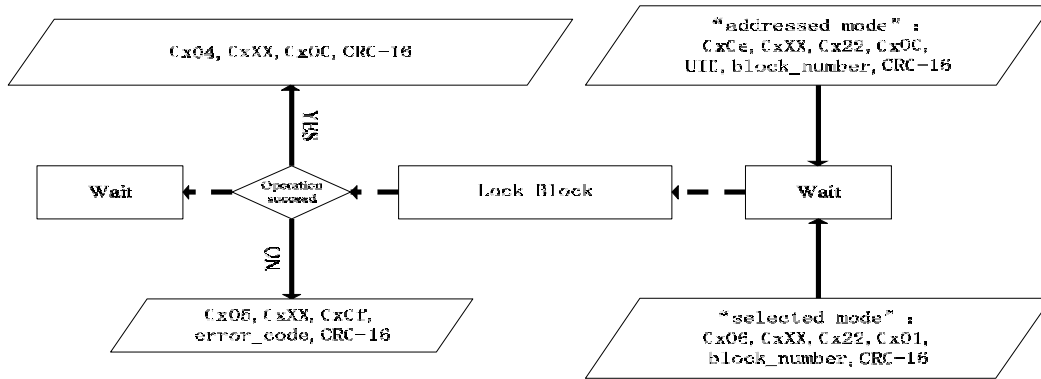
7.1.5 Lock Block

The host sends this command to let the reader lock the appointed block. When a block has been locked, its content should not be able to change any more.

Lock block is a write-alike command and also has two styles according to the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A :

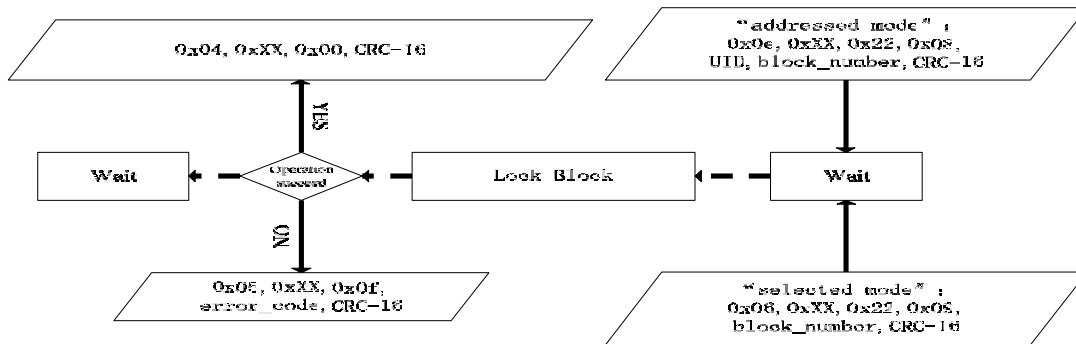
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x22	0x00	UID, block_number	LSB	MSB
0x06	0xXX	0x22	0x01	block_number	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B :

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x22	0x08	UID, block_number	LSB	MSB
0x06	0xXX	0x22	0x09	block_number	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

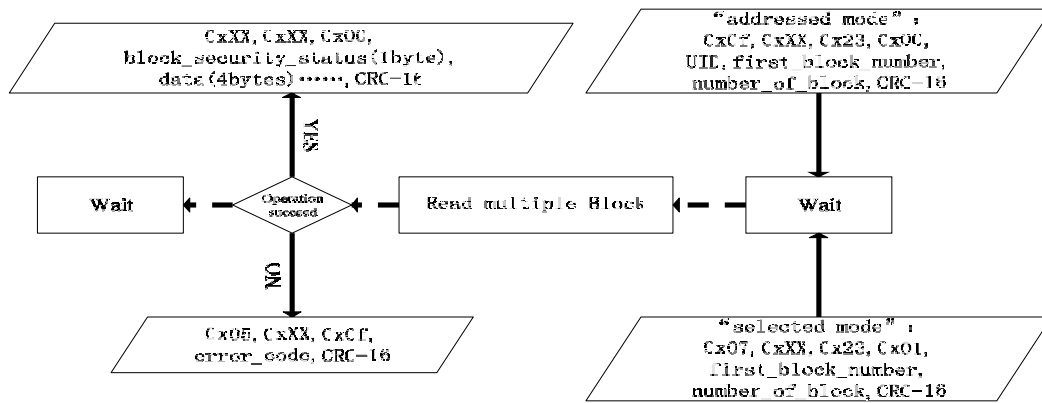
7.1.6 Read Multiple Block

The host sends this command to let the reader read out the corresponding tag's several blocks' content(4 or 8 bytes per block) and their security status bytes. The blocks number and the size of a block may differ from tag to tag with different manufacturer. Please refer to appendix 1.

The reader can read out as many as 28 blocks one time with block size is 4 bytes and as many as 15 blocks with block size is 8 bytes.

7.1.6.1 4-Byte Block

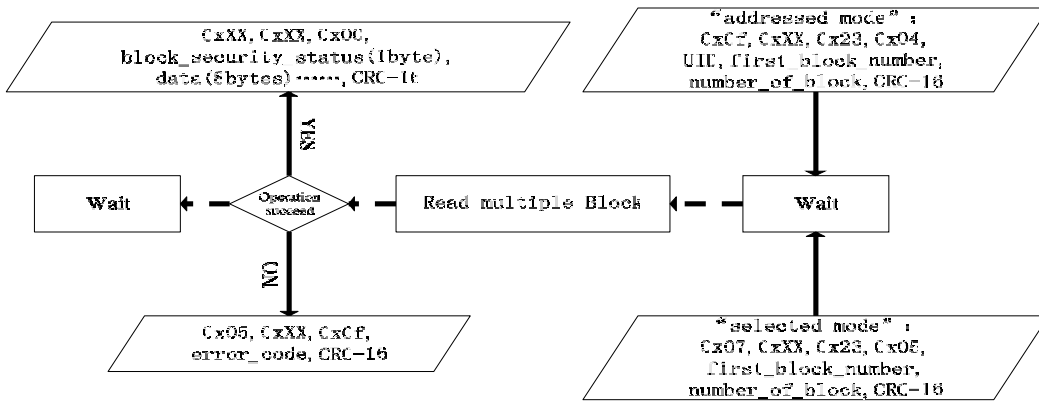
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0f	0xXX	0x23	0x00	_UID, _first block number, _number of blocks	LSB	MSB
0x07	0xXX	0x23	0x01	_first block number, _number of blocks	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0xXX	0xXX	0x00	block_security_status, block_data(4bytes) (Repeated times equals _number of blocks)		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.6.2 8-Byte Block

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0f	0xXX	0x23	0x04	_UID, _first block number, _number of blocks	LSB	MSB
0x07	0xXX	0x23	0x05	_first block number, _number of blocks	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0xXX	0xXX	0x00	block_security_status, block_data(8bytes) (Repeated times equals _number of blocks)		LSB	MSB

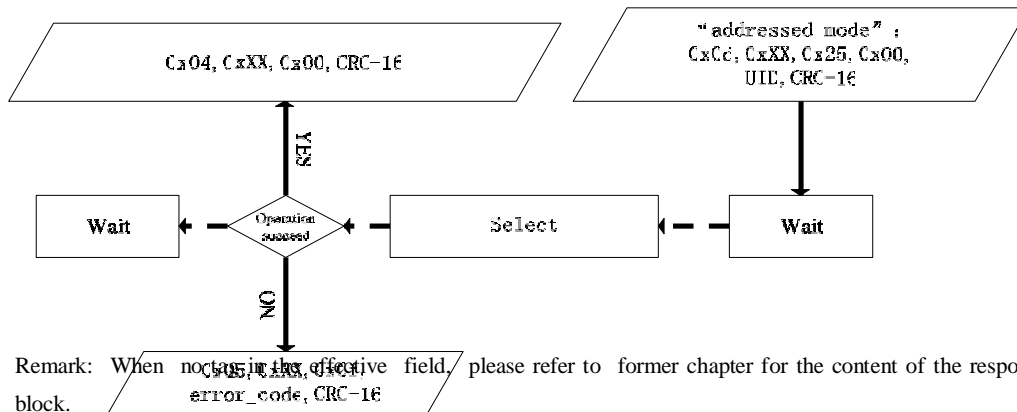


- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.7 Select

The host sends this command to let the reader turn the appointed tag into Selected state. All selected mode commands are aiming to the tag in Selected state. There is only one tag in Selected state at a time in the effective field. When turning a new tag into Selected state, the former Selected state tag will turn into Ready state. User can also use this command to turn a tag from Quiet state into Selected state. This command can only run in Addressed mode and the command data block must contain UID of the appointed tag.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x25	0x00	UID	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



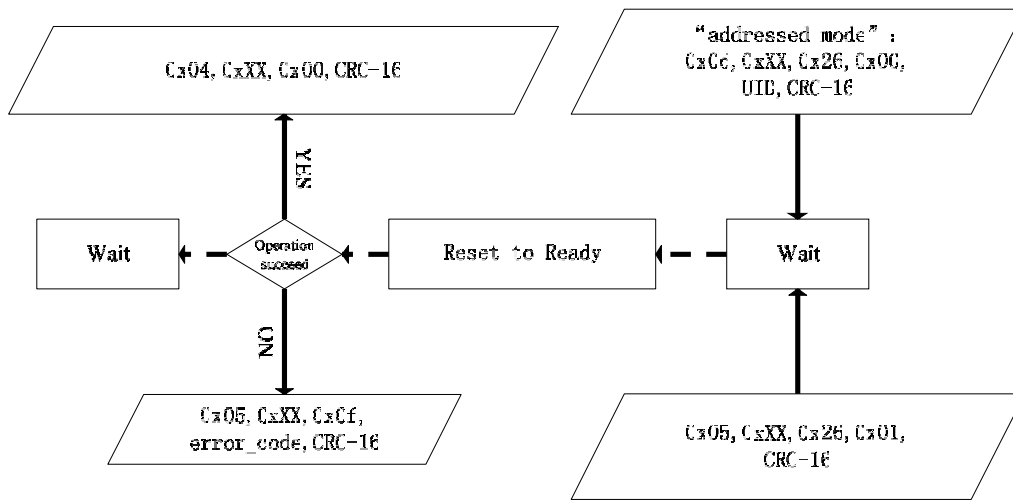
- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.8 Reset to Ready

The host sends this command to let the reader turn the appointed tag from Quiet state into Ready state.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x26	0x00	UID	LSB	MSB
0x05	0xXX	0x26	0x01	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

This command with state=0x01 will turn all the tags in field from Quiet state into Ready state.



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.9 Write AFI

The host sends this command to let the reader write a new AFI value to the appointed tag.

MSB of AFI	LSB of AFI	SIGNIFICATION
0	0	Entire types and subtypes
X	0	Entire subtypes of X type
X	Y	Y subtype of X type
0	Y	Entire Y subtypes
1	0,Y	Transportation
2	0,Y	Finance

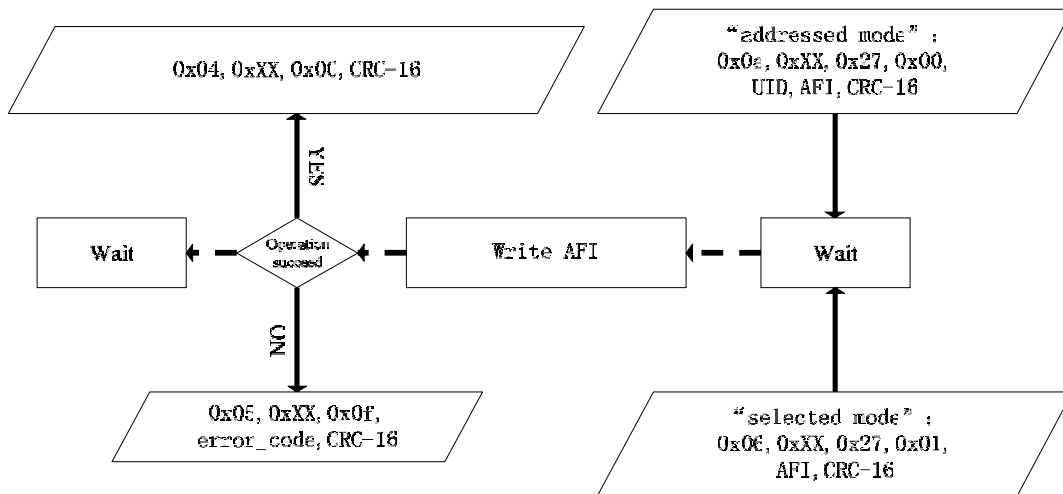
3	0,Y	Identity authentication
4	0,Y	Communication
5	0,Y	Medicine
6	0,Y	Multimedia
7	0,Y	Gambling
8	0,Y	Data storage
9	0,Y	Item management
A	0,Y	Express package
B	0,Y	Post office
C	0,Y	Airmail package
D	0,Y	
E	0,Y	
F	0,Y	

◆ Both “X” and “Y” represents 1~F

Write AFI is a write-alike command and also has two styles according the tag’s A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A :

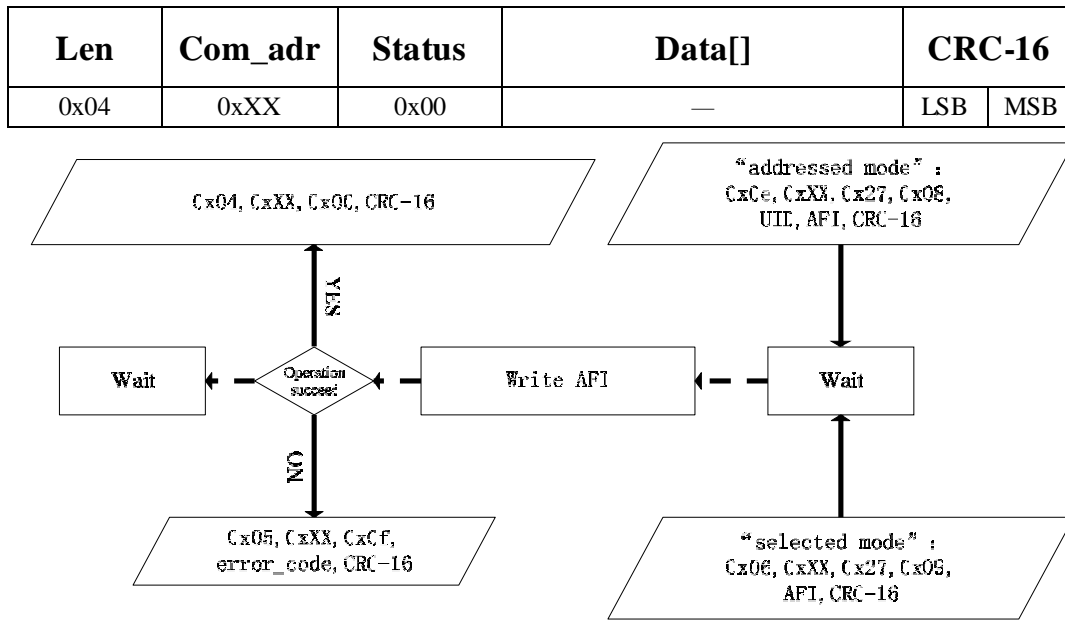
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x27	0x00	UID, AFI	LSB	MSB
0x06	0xXX	0x27	0x01	AFI	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B :

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x27	0x08	UID, AFI	LSB	MSB
0x06	0xXX	0x27	0x09	AFI	LSB	MSB

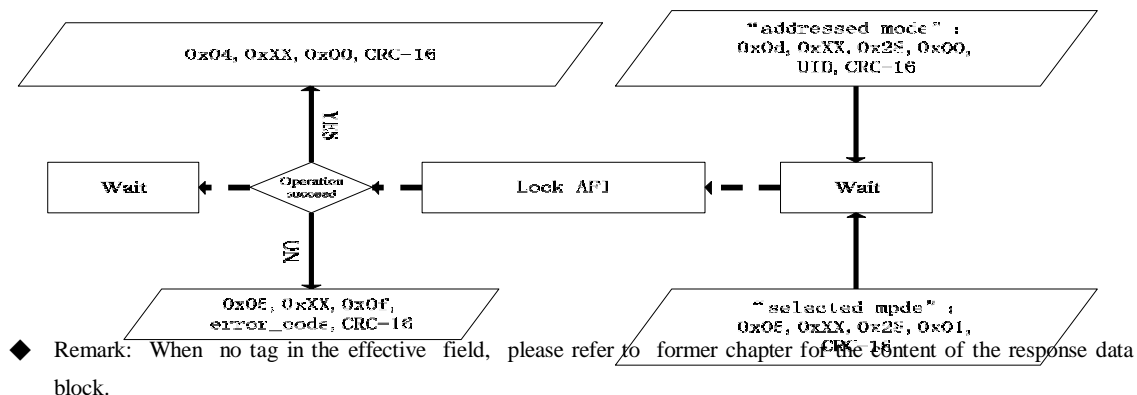
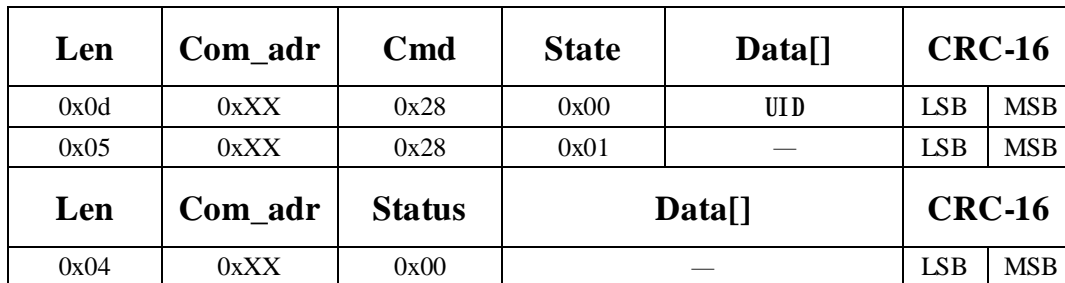


◆ Remark: When no tag in the field, please refer to former chapter for the content of the response data block.

7.1.10 Lock AFI

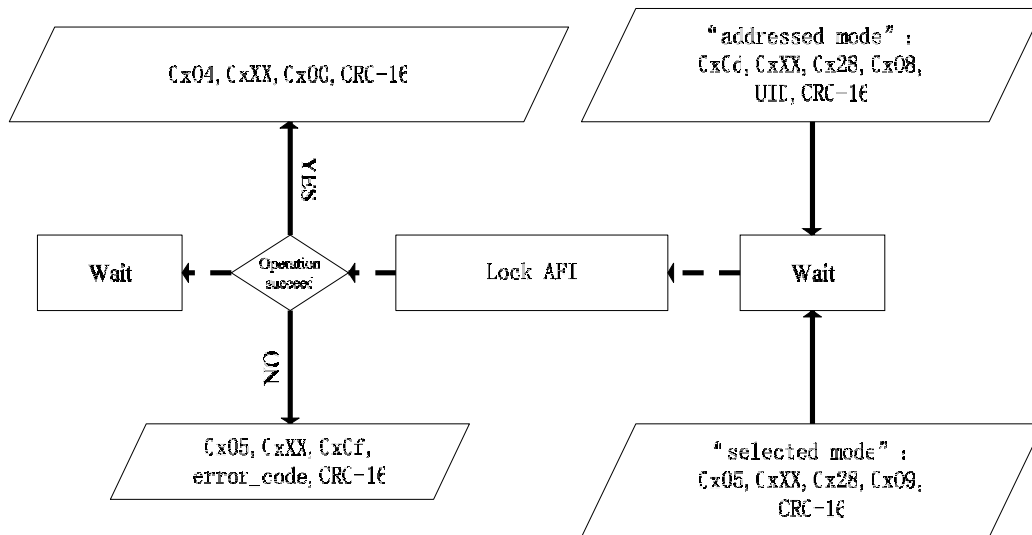
The host sends this command to let the reader lock the tag's AFI value. When a tag's AFI has been locked, its value should not be able to change any more. Lock AFI is a write-alike command and also has two styles according the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A :



Tags of type B :

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x28	0x08	UID	LSB	MSB
0x05	0xXX	0x28	0x09	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.11 Write DSFID

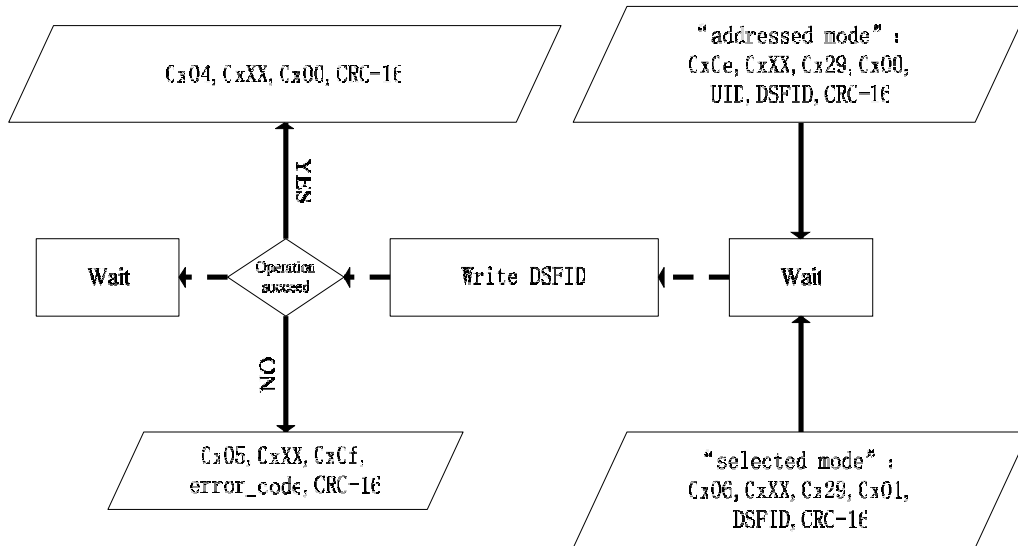
The host sends this command to let the reader write a new DSFID value to the appointed tag.

Write DSFID is a write-alike command and also has two styles according to the tag's A or B type.

Please refer to 7.1.4 and appendix 1.

Tags of type A :

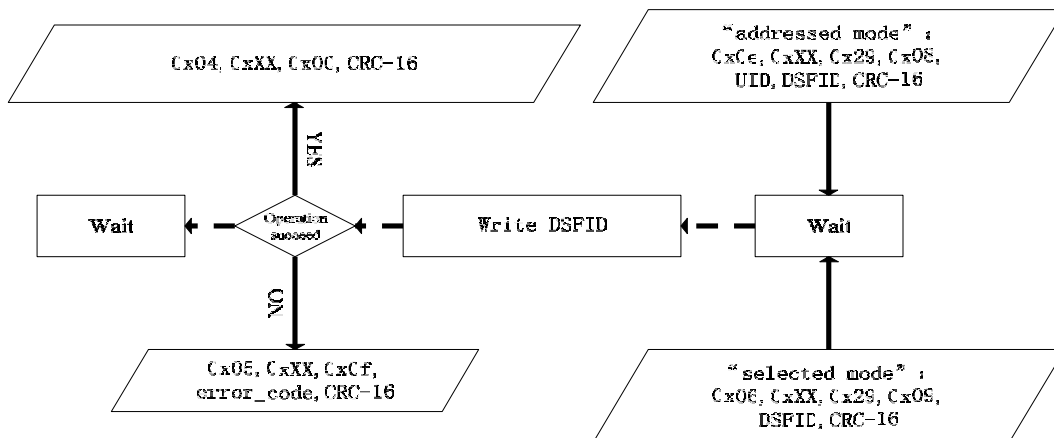
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x29	0x00	UID, DSFID	LSB	MSB
0x06	0xXX	0x29	0x01	DSFID	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



◆ Remark: When no tag in the field, please refer to former chapter for the content of the response data block.

Tags of type B :

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0e	0xXX	0x29	0x08	UID, DSFID	LSB	MSB
0x06	0xXX	0x29	0x09	DSFID	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

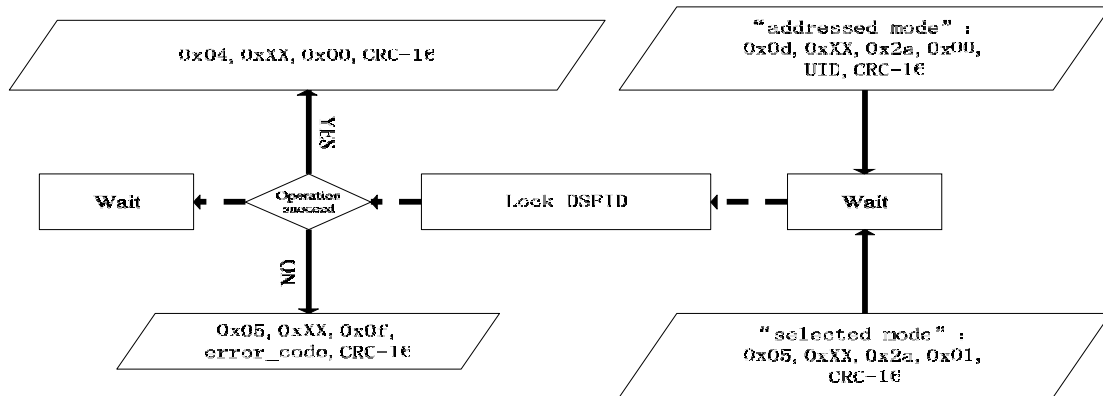
7.1.12 Lock DSFID

The host sends this command to let the reader lock the tag's DSFID value. When a tag's DSFID has been locked, its value should not be able to change any more.

Lock DSFID is a write-alike command and also has two styles according to the tag's A or B type. Please refer to 7.1.4 and appendix 1.

Tags of type A :

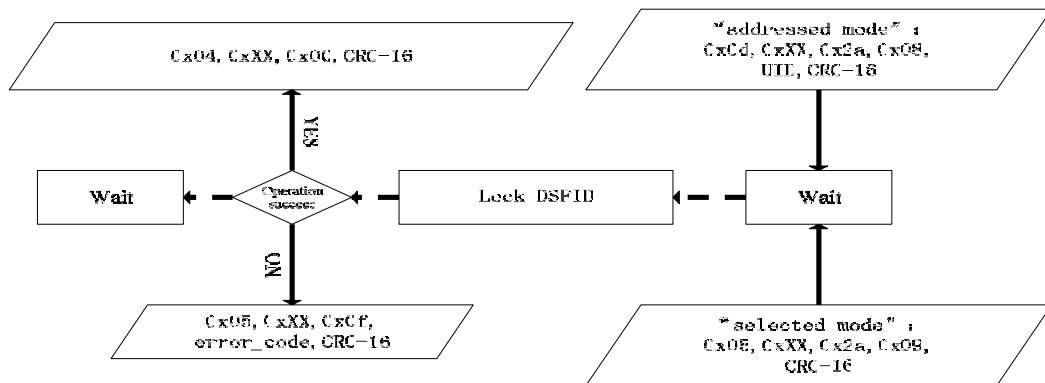
Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x2A	0x00	UID	LSB	MSB
0x05	0xXX	0x2A	0x01	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

Tags of type B :

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x2A	0x08	UID	LSB	MSB
0x05	0xXX	0x2A	0x09	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



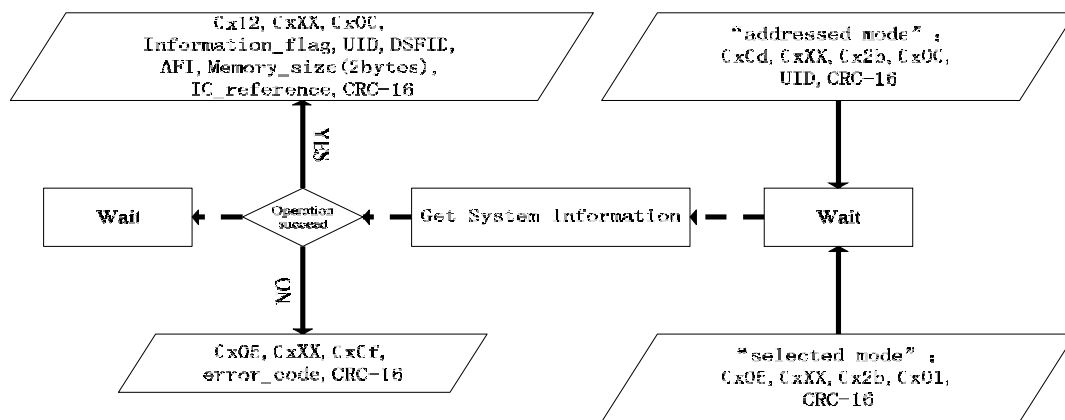
◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.

7.1.13 Get System Informatio

The host sends this command to let the reader get the detailed information of the appointed tag's. The information include 1 byte information_flag, 8 byte UID, 1 byte DSFID, 1 byte AFI, 2 bytes Memory_size and 1 byte IC_reference. The every bit meaning of the information_flag is as follows:

BIT	NAME	STATUS	COMMENT
Bit1	DSFID	0	DSFID nonexistence or nonsupport
		1	DSFID existence or support
Bit2	AFI	0	AFI nonexistence or nonsupport
		1	AFI existence or support
Bit3	Memory_size	0	Memory_size nonexistence or nonsupport
		1	Memory_size existence or support
Bit4	IC_Reference	0	IC_Reference nonexistence or nonsupport
		1	IC_Reference existence or support
Bit5	RFU	—	Set to 0
Bit6	RFU	—	Set to 0
Bit7	RFU	—	Set to 0
Bit8	RFU	—	Set to 0

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0d	0xXX	0x2B	0x00	UID	LSB	MSB
0x05	0xXX	0x2B	0x01	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x12	0xXX	0x00	Information_flag, UID, DSFID, AFI, Memory_size(2bytes), IC_reference		LSB	MSB



- ◆ Remark: When no tag in the effective field, please refer to former chapter for the content of the response data block.
- ◆ Remark: The above chart only describe the situation when "Information flag"=0x0f. If Information_flag is other value, the length and contents of the response data block will alter according to Information_flag's definition.

7.2 READER-DEFINED COMMANDS

18 reader-defined commands are supported to facilitate the using of the DL810&DL5510 reader. When the host sends these commands, the high 4 bits of the operation control(state) byte in command data block should be “F”.

7.2.1 Get Reader Information

Applied to: All models

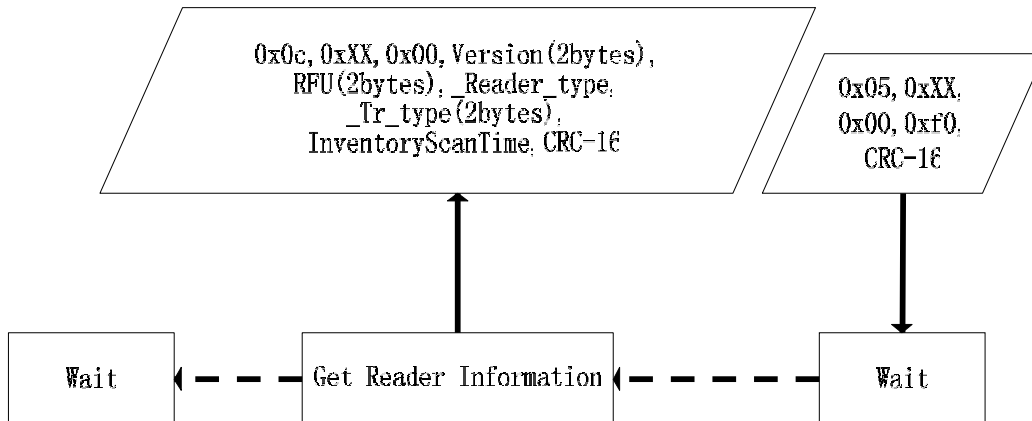
The host sends this command to get the reader's information including reader's address(Com_adr), firmware version, reader type(_reader_type), supported protocol(_tr_type) and InventoryScanTime value(default value is 0x1e for 3s).

The supported protocol byte is reserved to 0x00 and 0x08 as follows:

Bit	15	14	13	12	11	10	9	8
Function	—	—	—	—	—	—	—	—
Bit	7	6	5	4	3	2	1	0
Function	—	—	—	—	ISO/IEC 15693	—	—	—

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x00	0xf0	—	LSB	MSB

Len	Com_adr	Status	Data[]	CRC-16	
0x0c	0xXX	0x00	Version(2bytes), RFU(2bytes), _Reader_type, _Tr_type(2bytes), _InventoryScanTime	LSB	MSB

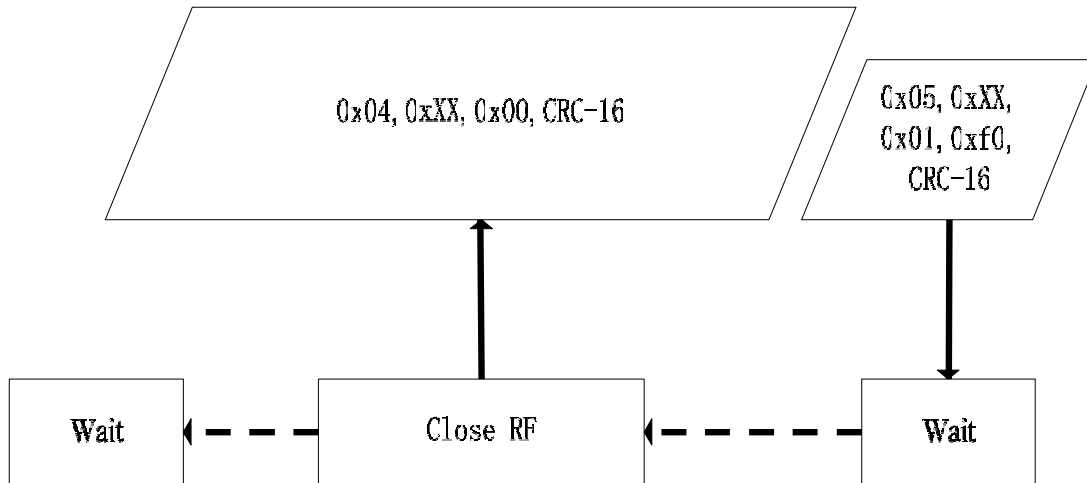


7.2.2 Close RF

Applied to: All models

The host sends this command to turn off the RF output of the reader and close the inductive field. When the field is closed, the reader would not run the ISO/IEC 15693 commands and return a response data block indicating the field closed.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x01	0xf0	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

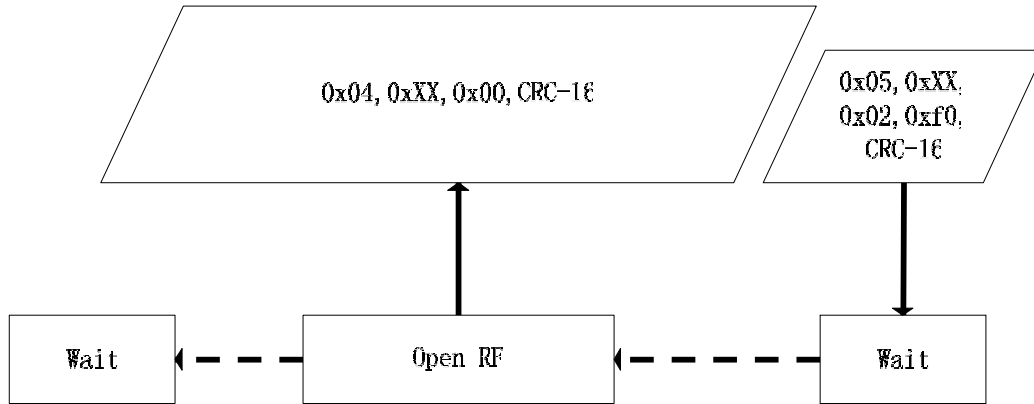


7.2.3 Open RF

Applied to: All models

The host sends this command to turn on the RF output of the reader and establish the inductive field. The RF is open when the reader is powered on.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x02	0xf0	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

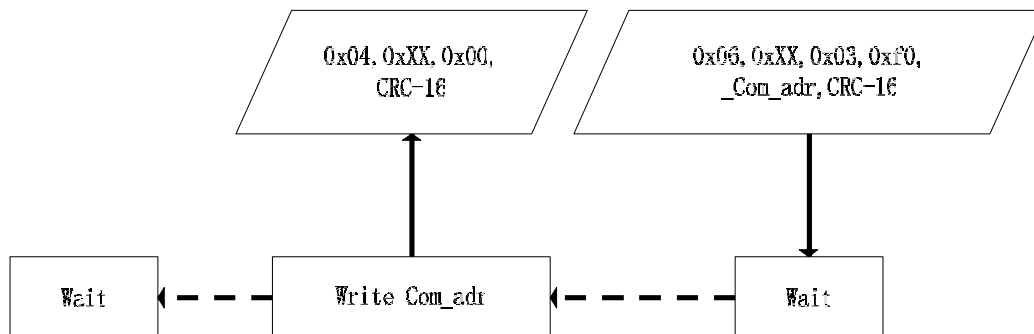


7.2.4 Write Com_adr

Applied to: All models

The host sends this command to change the address(Com_adr) of the reader. The address data is stored in the reader's inner EEPROM and is nonvolatile after reader powered off.. The default value of Com_adr is 0x00. The range of Com_adr is 0x00~0xFE. When the host tries to write 0xFF to Com_adr, the reader will set the value to 0x00 automatically.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x03	0xf0	_Com_adr	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

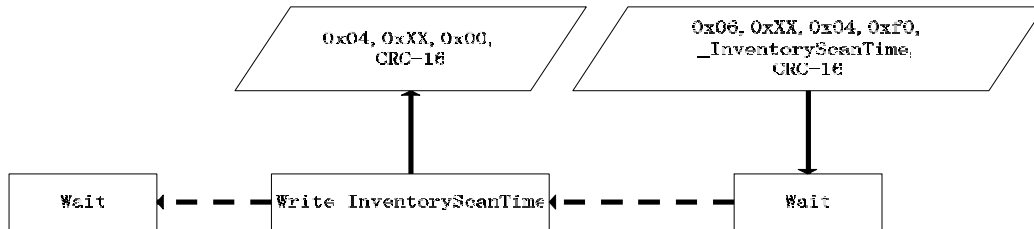


7.2.5 Write InventoryScanTime

The host sends this command to change the value of InventoryScanTime of the reader. The value is stored in the reader's inner EEPROM and is nonvolatile after reader powered off.. The default value is 0x1E (corresponding to 30*100ms=3s). The value range is 0x03~0xFF(corresponding to 3*100ms~255*100ms). When the host tries to set value 0x00~0x02 to InventoryScanTime, the reader

will set it to 0x03 automatically. In various environments, the actual inventory scan time may be 0~75ms longer than the InventoryScanTime defined.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x04	0xf0	_InventoryScanTime	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



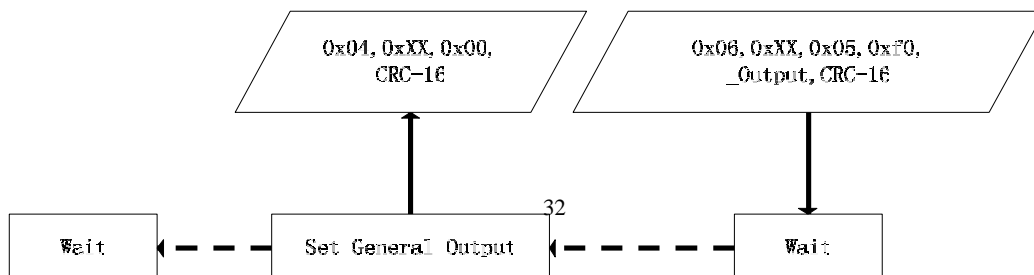
7.2.6 Set General Output

The host sends this command to set the output level(TTL level) of the two general output ports of the reader. The default level of these two general output ports is 0 (low level) when powered on.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x05	0xf0	_Output	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

Data byte (_Output) defines the level of the two general output ports as follows:

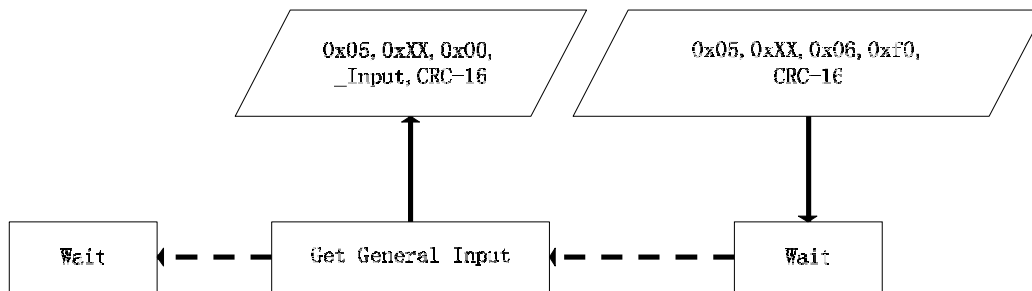
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Corresponding general output port	—	—	—	—	—	—	Output2	Output1



7.2.7 Get General Input

The host sends this command to get the level(TTL level) of the general input port of the reader. The input port is internally pulled up to +5V by a 20Kohm resistor.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x06	0xf0	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x05	0xXX	0x00	_Input		LSB	MSB



Data byte (_Input) indicates the level of the general input port as follows:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Corresponding general input port	—	—	—	—	—	—	—	Input

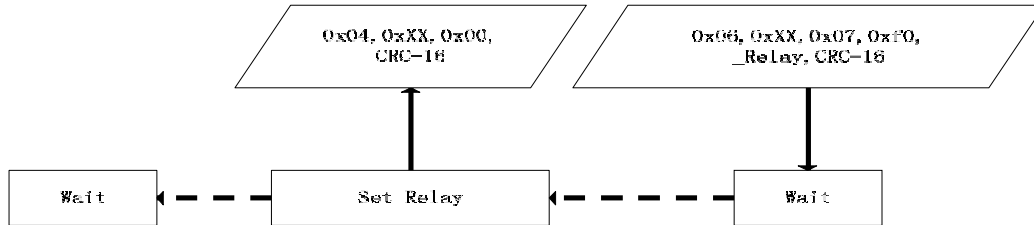
7.2.8 Set Relay

The host sends this command to activate or release a relay in the reader. The Common, NormalOpen and NormalClose contacts of the relay have been routed to the reader's DB9 interface to facilitate using the relay to control other equipments.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x07	0xf0	_Relay	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

Data byte (_Relay) controls the state of the relay as follows:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Relay state	—	—	—	—	—	—	—	Released= 1
	—	—	—	—	—	—	—	Active=0



7.2.9 Set Active ANT

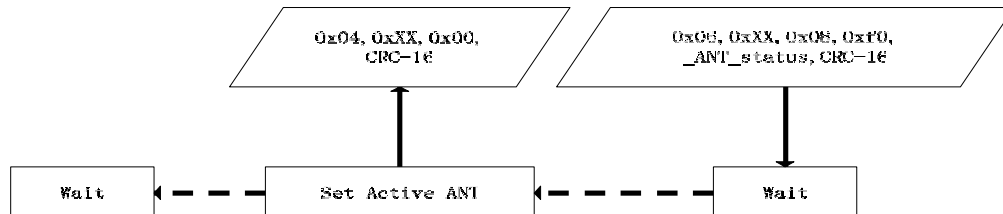
The host sends this command to select one antenna to be active for further operation. The default active antenna when powered on is antenna 1. Only one antenna can be active at one time.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x08	0xf0	_ANT_status	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

_ANT_status is used to defined the active antenna:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Active Antenna	—	—	—	—	ANT4	ANT3	ANT2	ANT1

◆ Remark: When a bit set to 1, its corresponding antenna will be active. Only one bit can be set to 1 at one time.



7.2.10 Get ANT Status

The host sends this command to get the current active antenna status.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x09	0xf0	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x05	0xXX	0x00	_ANT_status		LSB	MSB

_ANT_status show the active antenna:

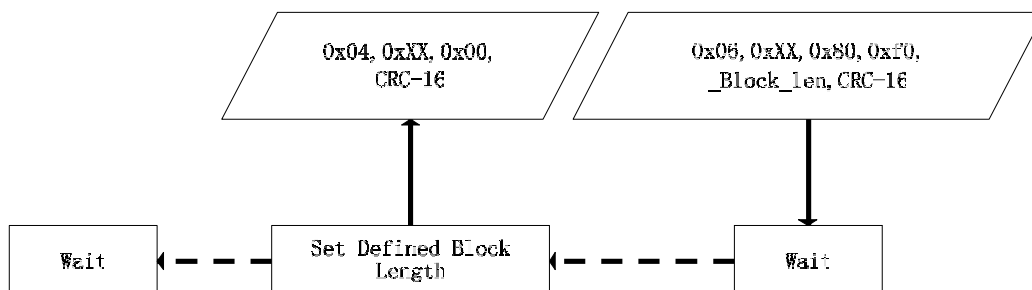
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Active Antenna	—	—	—	—	ANT4	ANT3	ANT2	ANT1

◆ Remark: When a bit set to 1, its corresponding antenna is active.

7.2.11 Set Defined Block Length

The host sends this command to define a block length used in ScanMode or in other situation. The value will be stored in the reader's eeprom. The length value is from 1 to 8.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x080	0xf0	_Block_len	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB



In Scan Mode, the reader will be constrained to use this value. In ReadSingleBlock, WriteSingleBlock and ReadMultipleBlock commands, the host can force the reader to use this value as block length by setting the most significant 4 bits of the State byte to 1010.

ReadSingleBlock command using defined block length:

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0E	0xXX	0x20	0xA0	UID, block_number	LSB	MSB
0x06	0xXX	0x20	0xA1	block_number	LSB	MSB

WriteSingleBlock command using defined block length (Type A tag):

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0xXX	0xXX	0x21	0xA0	UID, block_number, data	LSB	MSB
0xXX	0xXX	0x21	0xA1	block_number, data	LSB	MSB

WriteSingleBlock command using defined block length (Type B tag):

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0xXX	0xXX	0x21	0xA8	UID, block_number, data	LSB	MSB
0xXX	0xXX	0x21	0xA9	block_number, data	LSB	MSB

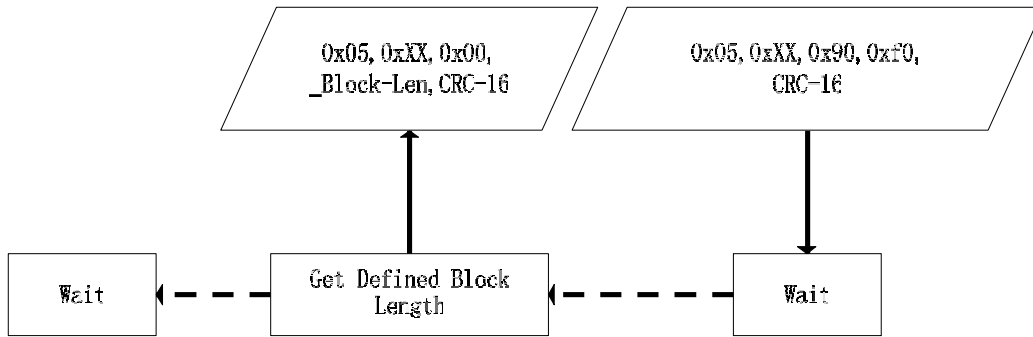
ReadMultipleBlock command using defined block length:

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x0F	0xXX	0x23	0xA0	_UID, _first block number, _number of block	LSB	MSB
0x07	0xXX	0x23	0xA1	_first block number, _number of block	LSB	MSB

7.2.12 Get Defined Block Length

The host sends this command to get the current value of defined block length.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x90	0xf0		LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x05	0xXX	0x00	_Block_len		LSB	MSB



7.2.13 Set Scan Mode

The host sends this command to set the reader's in Scan Mode. The host can also use this command to define the reader's output data content and format.

In Scan Mode, the reader can still accept commands from the host. But it will only respond to reader-defined commands. Other commands can not be executed when the reader in Scan Mode.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x10	0xXX	0x0a	0xf0	_Scan-Mode	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

◆ Note: Scan Mode configuration words _Scan-Mode will be stored in reader's eeprom and be effective until changed explicitly.

_Scan-Mode consists of 11 bytes that are defined as follows:

	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6
Function	Reader_Mode	Scan-Mode_status	First_Block _Number	Number_of_ Block	First_Byte	Number_of_ Byte

	Byte7	Byte8	Byte9	Byte10	Byte11
Function	Sep_Char	Sep_User	End_Char	End_User	RFU

Reader_Mode Byte:

Bit0: Scan Mode enable
 =1 enter Scan Mode
 =0 exit Scan Mode

Bit1: RFU

Bit2: RFU

Bit3: RFU

Bit4: RFU

Bit5: RFU

Bit6: RFU

Bit7: RFU

Scan-Mode_Status Byte:

Bit0: When it is on, the reader will send its Com_Adr before data content.

=1 on

=0 off

Bit1: When it is on, the reader will include tag's UID in its response data..

=1 on

=0 off

Bit2: When it is on, the reader will include tag's predefined data content in predefined blocks.

=1 on

=0 off

Bit3: When it is on, the reader will send every block's security status byte before the block's data.

When it is off, the reader will send a fixed 0x00 byte before the block's data.

=1 on

=0 off

Bit4: Set the format of the data feedback from the reader.

=1 hexadecimal

=0 ASCII

Bit5: Set if the reader will switch off/on its RF output once before every scan.

=1 switch off/on once

=0 no action

Bit6: Set if the reader will beep in operation.

=1 beep once when decodes one tag

=0 no action

Bit7: Set if the reader will flash its green LED in operation.

=1 flash once when decodes one tag

=0 no action

First_Block_Number Byte: When the reader need to feedback the data content in the tag, this byte defines the start block number.

Number_of_Block Byte: When the reader need to feedback the data content in the tag, this byte defines the number of consecutive blocks to read out.

First_Byte Byte: When the reader need to feedback the data content in the tag, this byte defines the start byte in each block.

Number_of_Byte Byte: When the reader need to feedback the data content in the tag, this byte defines the number of consecutive bytes in each block to read out.

Sep_Char: Define the separate character in output data stream.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
ASCII	USERS	“ ”	“ , ”	“ , , ”	TAB	LF	CR	CR+LF
Hex	“Sep_User”	0x20	0x2C	0x3B	0x07	0x0A	0x0D	0x0D&0x0A

- ◆ Note: Only one bit in this byte can be set to 1 every time otherwise the reader will set this byte to its default value 0x20. When bit7 set to 1, the separate character is defined in Sep_User byte. When all bits of this byte set to 0, no separate character will be included in output stream.

Sep_User: ASCII of user defined separate character. End_Char:

Define the ending character in output data stream.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
ASCII	USERS	“ ”	“ , ”	“ , , ”	TAB	LF	CR	CR+LF
Hex	“End_User”	0x20	0x2C	0x3B	0x07	0x0A	0x0D	0x0D&0x0A

- ◆ Note: Only one bit in this byte can be set to 1 every time otherwise the reader will set this byte to its default value 0x01. When bit7 set to 1, the ending character is defined in Sep_User byte. When all bits of this byte set to 0, no ending character will be included in output stream.

End_User: ASCII of user defined ending character.

Appendix 2 gives out some further explanation and examples about Scan Mode.

7.2.14 Get Scan Mode

The host sends this command to get the reader's current Scan Mode status setting.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x0b	0xf0		LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x0f	0xXX	0x00	_Scan-Mode		LSB	MSB

_Scan-Mode string's definition is illustrated in 7.2.8.

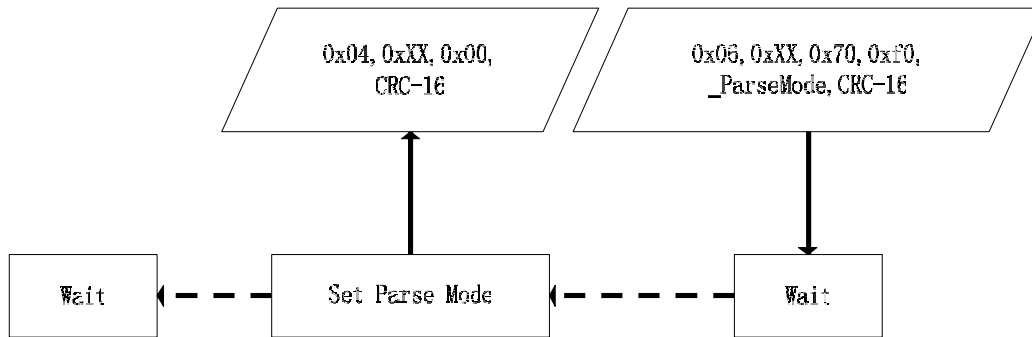
7.2.15 Set Parse Mode

The host sends this command to set the reader's parsing mode when processing multiple tags. The host can select DPPM(Depth Priority Parse Mode) or WPPM(Width Priority Parse Mode). The read will remain in its effective parsing mode until it is changed explicitly. The default parsing mode is DPPM.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x70	0xf0	_ParseMode	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

_ParseMode defines the parsing mode setting:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Parsing Mode	—	—	—	—	—	—	—	DPPM = 1
								WPPM = 0



7.2.16 Get Parse Mode

The host sends this command to get the reader's current parsing mode setting.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x71	0xf0	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x05	0xXX	0x00	_ParseMode		LSB	MSB

_ParseMode shows the reader's current parsing mode:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Parsing Mode	—	—	—	—	—	—	—	DPPM=1
								WPPM=0

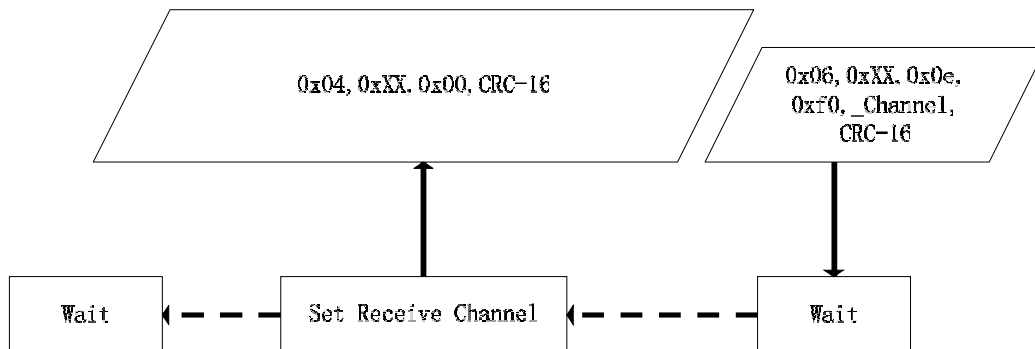
7.2.17 Set Receive Channel

The host sends this command to configure the reader's effective receive channel.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x06	0xXX	0x0e	0xf0	_Channel	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x04	0xXX	0x00	—		LSB	MSB

_Channel is used to configure the receive channel. When a bit set to 1, its corresponding channel will be selected.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Receive Channel	—	—	—	—	—	—	Main channel	Auxiliary channel



7.2.18 Get Receive Channel Status

The host sends this command to get the reader's effective receive channel status.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0x05	0xXX	0x0f	0xf0	—	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0x05	0xXX	0x00	_Channel		LSB	MSB

_Channel shows the receive channel configuration. When a bit set to 1, its corresponding channel is effective.

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Receive Channel	—	—	—	—	—	—	Main channel	Auxiliary channel

7.3 TRANSPARENT COMMANDS

3 transparent commands are supported to facilitate the develop of new feature and advance function of the tags from various vendors. When the host sends these commands, the high 4 bits of the operation control(state) byte in command data block should be "E".

Transparent commands are only available for readers with firmware version 6.0 or above, the reader's whose model type with suffix T.

7.3.1 TransparentRead

The host sends this command to turn the reader into a RF front-end engine to send user specified raw data to tags and feedback respond data from tags to the host. The command is used to read data from tags. The operation timing complies with ISO15693 regulation.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0xXX	0xXX	0x02	0xe0	_RSP-Length, _Custom-Data	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0xXX	0xXX	0x00	.....		LSB	MSB

◆ Note: _RSP-Length byte ranging from 3 to 120 bytes defines the byte length of the responses expected from tags.

- ◆ Note: _Custom-Data byte ranging from 1 to 120 bytes defines the number of bytes the reader should encapsulate and send to the tags.
- ◆ Note: If operation succeeds, the byte length of response data should be 4+_RSP-Length.

7.3.2 TransparentWrite

The host sends this command to turn the reader into a RF front-end engine to send user specified raw data to tags and feedback response data from tags to the host. The command is used to write data into tags. The operation timing complies with ISO15693 regulation.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0xXX	0xXX	0x03	0xe0	_Option, _RSP-Length, _Custom-Data	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0xXX	0xXX	0x00	.....		LSB	MSB

- ◆ Note: 4 bytes long _Option is a multiple function configuration string as follows:

Byte1	Byte2	Byte3	Byte4	Comment
0x00	_Max-delay	_revise(LSB 11Bits valid)		The operation is intended to a Type B tag. The host defines the reader to decode the tag's response data from time $(302.1 + \text{_revise} * (2/13.56\text{M})) \mu\text{s}$ to $(302.1 * \text{_Max-delay} + \text{_revise} * (2/13.56\text{M})) \mu\text{s}$. _Max-delay is represented as a 256-complement. For more details, please refer to ISO15693 part 3.
0x01	RFU	_EOF-DelayTime		The operation is intended to a Type A tag. The host defines the reader to send EOF signal to tag at time defined by _EOF-DelayTime and decode the tag's response data from then on. The actual EOF sending time is $(\text{_EOF-DelayTime} * 100) \mu\text{s}$. For more details, please refer to ISO15693

- ◆ Note: _RSP-Length byte ranging from 3 to 120 bytes defines the byte length of the responses expected from tags.
- ◆ Note: _Custom-Data byte ranging from 1 to 120 bytes defines the number of bytes the reader should encapsulate and send to the tags.
- ◆ Note: If operation succeeds, the byte length of response data should be 4+_RSP-Length.

7.3.3 TransparentCustomizedCmd

The host sends this command to turn the reader into a RF front-end engine to send user specified raw data to tags and feedback response data from tags to the host. The command is used to read data from tags. The operation timing is partly defined by the host.

Len	Com_adr	Cmd	State	Data[]	CRC-16	
0xXX	0xXX	0x04	0xe0	_RSP-Time, _RSP-Length, _Custom-Data	LSB	MSB
Len	Com_adr	Status	Data[]		CRC-16	
0xXX	0xXX	0x00	.....		LSB	MSB

- ◆ Note: 2 bytes long _RSP-Time defines the start point the reader to receive response from the tag. The actual time is $(_RSP-Time * 10 * (2/13.56M)) \mu s$.
- ◆ Note: _RSP-Length byte ranging from 3 to 120 bytes defines the byte length of the responses expected from tags.
- ◆ Note: _Custom-Data byte ranging from 1 to 120 bytes defines the number of bytes the reader should encapsulate and send to the tags.
- ◆ Note: If operation succeeds, the byte length of response data should be $4 + _RSP-Length$.

Appendix 1

MANUFACTURER	Manu. CODE	BLOCK INFORMATION		TYPE	
		BLOCK NUMBER	BLOCK SIZE	TYPE A	TYPE B
Infineon (ISO Address mode)	0x05	256 (user available range:0~249)	4 bytes		✓
		64 (user available range:0~57)	4 bytes		✓
STMicroelectronics (LRI512)	0x02	16 (user available range:0~15)	4 bytes		✓
Fujitsu (MB89R116)	0x08	256 (user available range:0~249)	8 bytes	✓	✓
Philips (I-Code SLI)	0x04	32 (user available range:0~27)	4 bytes		✓
Texas Instruments (Tag-it HF-I)	0x07	64 (user available range:0~63)	4 bytes	✓	
EM Microelectronics	0x16	50 (user available range:13~48)	8 bytes	✓	
		14 (user available range:3~11)	4 bytes	✓	

◆ As to tags not included in the appendix, please refer to their datasheets.

Appendix 2: Application Notes of Scan Mode

To make the reader into Scan Mode, the host should send command SetScanMode with the bit0 of Reader_Mode byte set to 1. On the other hand, the host can return the reader to normal mode by sending SetScanMode command with bit0 of Reader_Mode byte set to 0.

If the reader is set to Scan Mode and powered off, it will remember its mode and enter Scan Mode when powered on next time.

When the reader is in Scan Mode, it will beep three times at the time of power on. In normal mode, it will beep once. In Scan Mode, the reader will not respond to any host command except reader-defined commands.

We present several examples to illustrate the reader's Scan Mode as follows:

Let's suppose there is one tag in effective field of a reader of Com_Adr 0 and the tag's general information is list below with all data in hexadecimal:

UID	Block Data(4 bytes/Block)			
	Block3	Block4	.....
DB 18 AC 02 00 01 04 E0	00 10 20 00	00 01 02 00	.....

◆ Note: Block3's security status byte is 0x01 and block4's security status byte is 0x00.

Example 1:

We plan to make the reader scan the field with following features:

1. Send reader address Com_Adr;
2. Send the tag's UID;
3. Send the tag's block content from block 3 to block 4 with byte 2 to byte 3 in each block. The security status byte of each block is included;
4. Switch off/on the RF field once after each scanning;
5. Flash once and beep once when one tag detected;
6. Choose “,” as separate character in data stream;
7. Choose “CR+LF” as ending character in data stream;
8. Data will be sent in ASCII format

The 11 bytes long _Scan-Mode string the host should send to the reader will be:

“10 01 0A F0 01 EF 03 02 02 02 20 00 01 00 00 3B 81”

And the reader will response “04 01 00 8A 43” when accept the command correctly.

After the reader entering Scan Mode, it will keep scanning its effective field and feedback data stream as follows:

Com_Adr	Sep_Char	UID	Sep_Char	Block Data				End_Char
				Block2		Block3		
				Security-Status	Data	Security-Status	Data	
01	,	DB18AC02000104E0	,	01	1020	00	0102	CR+LF

Example 2:

We plan to make the reader scan the field with following features:

1. Do not send reader address Com_Adr;
2. Send the tag's UID;
3. Do not send the tag's block content;
4. Do not switch off/on the RF field once after each scanning;
5. Do not flash but beep once when one tag detected;
6. Do not use separate character in data stream;
7. Choose “;” as ending character in data stream;
8. Data will be sent in ASCII format

The 11 bytes long _Scan-Mode string the host should send to the reader will be:

“10 01 0A F0 01 42 00 00 00 00 00 10 00 00 B7 27”

And the reader will response “04 01 00 8A 43” when accept the command correctly.

After the reader entering Scan Mode, it will keep scanning its effective field and feedback data stream as follows:

Com_Adr	Sep_Char	UID	Sep_Char	Block Data	End_Char
		DB18AC02000104E0			;

Example 3:

We plan to make the reader scan the field with following features:

1. Do not send reader address Com_Adr;
2. Send the tag's UID;
3. Send the tag's block content from block 3 to block 4 with byte 2 to byte 3 in each block. The security status byte of each block is excluded;
4. Switch off/on the RF field once after each scanning;
5. Flash once but do not beep when one tag detected;
6. Choose user defined separate character(ASCII 0x0F) in data stream;
7. Choose user defined ending character (ASCII 0xF0)in data stream;
8. Data will be sent in hexadecimal format

The 11 bytes long _Scan-Mode string the host should send to the reader will be:

“10 01 0A F0 01 B6 03 02 02 02 80 0F 80 F0 00 19 35”

And the reader will response “04 01 00 8A 43” when accept the command correctly.

After the reader entering Scan Mode, it will keep scanning its effective field and feedback data stream as follows:

Com_Adr	Sep_Char	UID	Sep_Char	Block Data				End_Char
				Block2		Block3		
				Security-Status	Data	Security-Status	Data	
		DB18AC02000104E0	0F	00	1020	00	0102	F0

◆ Note: Block's security status byte is replaced with a fixed value 0x00