UHF
RFID application layer communication protocol

(Version V2.1.2)

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1. Overview

The UHF RFID application layer communication protocol is the external communication protocol between the UHF module and the reader/writer. Through this protocol, data communication between external devices and the reader/writer module can be realized .

1、UHF module and the host computer use an asynchronous serial interface (UART , TTL level) for data communication. The default serial port baud rate is 115200 , 8 data bits, 1 stop bit, no check bit, and no hardware flow control. Data is transmitted in a fixed frame format.

2、to serial communication, UHF readers also support TCP/IP communication, but the data frame format is the same.

2. Data transmission frame format

The data frame consists of a frame header, frame length, CMD type, data, checksum and frame tail. See the following table . shown.

Data frame transmission format

Fram	Frame	CMD	data	BCC code	Fram
2 bytes	2 bytes	1 byte	N	1 byte	2 bytes

2.1. Frame header and frame trailer

header represents the beginning of the data packet, with a total of 2 bytes and a fixed value of 0xC8 , 0x8C or 0xA5 , 0x5A . The frame tail represents the end of the data packet, with a total of 2 bytes and a fixed value of 0x0D , 0x0A (carriage return plus line feed).

2.2. Frame length

The frame length is the length of a frame of data, that is, the length of the entire frame of data, including the frame header and frame tail.

The calculation formula is:
Frame length = frame header (2 bytes) + Frame length (2 bytes) + CMD type (1 byte) + Data (N bytes) + BCC code (1 byte) + Frame trailer (2 bytes) .

2.3. CMD Type List

The CMD type is the command type used to distinguish different control commands. The UHF module or reader performs corresponding operations according to the command type.

CMD Type List

Command Function	CMD Type
Get the hardware version number	0x00
Get hardware version number response	0x01
Get the firmware version number	0x02
Get firmware version number response	0x03
Get module ID	0x04
Get module ID response	0x05
Reserve	0x0A~0x0F
Set the transmit power	0x10
Set the transmit power response	0x11
Get the current device transmit power	0x12
Get the current device transmit power	0x13
Fixed frequency setting	0x14
Fixed frequency setting response	0x15
Get the current device fixed frequency	0x16
Get the current device fixed frequency	0x17
Setting Gen2 Parameters	0x20
Set Gen2 parameter response	0x21
Get the current Gen2 parameter	0x22
Get the current Gen2 parameter setting	0x23
CW Settings	0x24
CW Set Answer	0x25
Get Return Loss	0x26
Get return loss response	0x27
Antenna Settings	0x28
Antenna Setup Answer	0x29
Get the current device antenna	0x2A
Get the current device antenna	0x2B
Regional Settings	0x2C
Locale Answer	0x2D
Get locale	0x2E
Get locale answer	0x2F
Reserve	0x30-0x33
Get the current temperature of the	0x34
Get the current temperature response	0x35

Reserve	0x36 -0x4D
Get whether the antenna is connected	0x4E
Get the antenna connection response	0x4F
Reserve	0x50-0x51
Set the recommended RF link	0x52
Set the recommended RF link	0x53
Get the recommended RF link	0x54
Get the recommended RF link	0x55
Reserve	0x56-0x5B
Setting up the FastID feature	0x5C
Set up FastID function response	0x5D
Get FastID feature status	0x5E
Get FastID function status response	0x5F
Setting the TagFocus function	0x60
Set TagFocus function response	0x61
Get the TagFocus function status	0x62
Get TagFocus function status response	0x63
set up Fast Inventory Features	0x64
set up Fast Inventory Function Answer	0x6 5
Get Fast Inventory Feature Status	0x6 6
Get Fast Inventory function status	0x6 7
Software reset	0x68
Software reset answer	0x69
Reserve	0x6A-0x6D
Tag filter settings	0x6E
Search for tag filter settings answer	0x6F
Set the inventory mode of EPC+TID or	0x70
Set the inventory EPC+TID or	0x71
Get EPC+TID or EPC+TID+USER mode	0x72
Get EPC+TID or EPC+TID+USER mode	0x73

Restore factory settings	0x74
Restore factory parameters response	0x75
Reserve	0x76-0x7F
Single search tag	0x80
Single tag search response	0x81
Continuous search for tags	0x82
Continuous tag search response	0x83
Read Data	0x84
Read data response	0x85
Writing Data	0x86
Write data response	0x87
Lock Tags	0x88
Lock Tag Response	0x89
Kill Tags	0x8A
Kill Tag Response	0x8B
Stop continuous tag search	0x8C
Stop continuous tag search response	0x8D
Authenticate Tag	0x8E
Authenticate Tag Response	0x8F
Reserve	0x90-0x92
Block Write Tags	0x93
Block Write Tag Response	0x94
Block Erase Tags	0x95
Block Erase Tag Response	0x96
Reserve	0x97 -0x9E
Block Permalock Operation	0x9F
Block Permalock Operation Response	0xA0
Reserve	0xA1~0xFF

2.4. data

According to the CMD type, the data packet contains data and control information. For a command frame, it indicates control information, and for a response frame, it indicates returned data information.

2.5. BCC code

XOR of all bytes of each frame data (excluding the frame header and frame trailer).

For example:

0xC8 0x8C 0x00 0x0A 0x43 0x01 0x25 BCC 0x0 D 0x0 A

BCC = 0x00 ^ 0x0A ^ 0x43 ^ 0x01 ^ 0x25 = 0x6D

3. Communication data frame description

3.1. Device version

3.1.1. Get the hardware version number

Data: None

Function: Get the hardware version information , usually the version of the Ex10 chip.

Get hardware version command frame

Frame Header		Frame length		CMD Type	data	BCC code	Frame end
0xC8	0x8C	0x00	0x08	0x00	none	0x08	0x0D

Frame end
0x0A

Description: This command has no data.

Example: Get the card reader hardware version

Command: C8 8C 00 08 00 08 0D 0A

3.1.2. Get hardware version number response

Data: 3 bytes in total, including the major version, minor version, and supplementary version.
Function: Respond to hardware version information

Get hardware version response frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0x00	0x0B	0x01	Major version	Minor version	Supplement

B CC code	Frame end	
0xxx	0x0D	0x0A

Note: If it is an Ex10 module, the version number of the Ex10 chip is returned.
Example: The hardware (Ex10 hardware) version number is V 1.1.0 .
Command: C8 8C 00 0B 01 01 01 00 0A 0D 0A

3.1.3.Get the firmware version number

Data: None
Function: Get module firmware version information .

Get firmware version command frame

Frame Header		Frame length		CMD Type	data	BCC code	Frame end
0xC8	0x8C	0x00	0x08	0x02	none	0x0A	0x0D

Frame end
0x0A

Description: None

Example: Get the card reader firmware version .
Command: C8 8C 00 08 02 0A 0D 0A

3.1.4. Get firmware version number response

Data: 3 bytes in total, including the major version, minor version and supplementary version .
Function: Response firmware version information .

Get firmware version response frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0x00	0x0B	0x03	Major version	Minor version	Supplementary

BCC code	Frame end	
0xxx	0x0D	0x0A

Note: Get the firmware version number of the UHF module.

Example: The card reader with firmware version V3.01 responds.
Command: C8 8C 00 0B 03 03 00 01 0A 0D 0A

3.1.5. Get Get device ID

Data: None
Function: Get module ID.

Get module ID command frame

Frame Header		Frame length		CMD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x04	none	0x0C	0x0D

Frame end
0x0A

Description: None

Example: Get module ID
Command: C8 8C 00 08 04 0C 0D 0A

3.1.6. Get device ID answer

Data: Module ID, 4 bytes in total .
Function: Get module ID response.

Get module ID response frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0x00	0x0C	0x05	Dbyte3	DByte2	DByte1
data	BCC code	Frame end					
DByte0	0xxx	0x0D	0x0A				

Example : Reader with ID 0xF1 0xF2 0xF3 0xF4 responds
Command: C8 8C 00 0C 05 F1 F2 F3 F4 0D 0D 0A

3.2. Device parameter settings

3.2.1. Set the transmit power

Data: 6 bytes in total, 1 byte for Status , 1 byte for Antenna ID, 2 bytes for Read Power and 2 bytes for Write Power, both in dBm
Function: Set the read and write power for a specific antenna .

Set transmit power command frame

Frame Header		Frame length		CMD Type	data		
0xA5	0x5A	0x00	0x0E	0x10	Status	Antenna Number	Read (MSB)
data			BCC code	Frame end			
Read (LSB)	Write (MSB)	Write (LSB)	0xxx	0x0D	0x0A		

Status bit description

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Rev	Rev	Rev	Rev	Rev	Rev	0 : Do not save 1 : Save	Rev

Note: 1. When bit1 is 0 , the current setting will be lost after power failure. When bit1 is 1 , the current setting will be saved after power failure, and the default power value will be the setting value at the next power-on. The antenna number is expressed in hexadecimal; read and write power × 100 , and then converted to hexadecimal.

2. Reading power is currently reserved and has no real meaning.

Example: Set the read power of antenna 1 to 30dBm and the write power to 30dBm , then save.
Command: C8 8C 00 0E 10 02 01 0B B8 0B B8 1D 0D 0A

3.2.2. Set the transmit power response

Data: Set the success flag, success: 0x01 ;
failure: 0x00
Function: Set the transmit power successfully .

Set the transmit power response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame
0xC8	0x8C	0x00	0x09	0x11	OK-0x01 Fail-0x00	0xxx	0x0D

Frame end
0x0A

Description: None
Example: Setting the transmit power successfully
Command: C8 8C 00 09 11 01 19 0D 0A

3.2.3. Get the current device transmit power

Data: None
Function: Get the current device transmit power .

Get the current device transmit power command frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame
0xC8	0x8C	0x00	0x08	0x12	none	1A	0x0D

Frame end
0x0A

Description: None

Example: Get the current device transmit power

Command: C8 8C 00 08 12 1A 0D 0A

3.2.4. Get the current device transmit power response

Data: Status, antenna number and the read and write power of the antenna. The unit of read and write power is dBm.
Function: Get the read and write power of each antenna of the device .

Get the current device transmit power response frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0xxx	0xxx	0x13	Status	Antenna Number	Read (MSB)
data							
Read (LSB)	Write (MSB)	Write (LSB)	Antenna Number	Read (MSB)	Read (LSB)	Write (MSB)	Write (LSB)
data						BCC code	Frame
…	Antenna Number	Read (MSB)	Read (LSB)	Write (MSB)	Write (LSB)	0xxx	0x0D
Frame end							
0x0A							

Description: 1. Status , the default value is 0x00 , which is reserved for later expansion;

2. If it is a multi-port module, the power of each port is returned.

Example: A four-port module, the read power and write power of each port are both 30dBm .

C8 8C 00 1D 13 00 01 0B B8 0B B8 02 0B B8 0B B8 03 0B B8 0B B8 04 0B B8 0B B8 0A 0D 0A

3.2.5. Fixed frequency setting

Data: number of fixed - frequency points and fixed - frequency table .

Function: Set the fixed frequency of the device. Currently only one frequency is supported.

Fixed frequency setting command frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0xxx	0xxx	0x14	Fixed frequency	Freq[1] (MSB)	Freq[1]

data					B CC code	Frame end	
Freq[1] (LSB)	…	Freq[n] (MSB)	Freq[n]	Freq[n] (LSB)	0xxx	0x0D	0x0A

Note: The default number of fixed frequency points is 1. Freq[1] represents the fixed frequency point. The unit of the frequency point Freq is KHz.

Example: Set the fixed frequency to 920125KHz (0E0A3D)

Command: C8 8C 00 0C 14 01 0E 0A 3D 20 0D 0A

3.2.6. Fixed frequency setting response

Data: Setting success: 0x01 ; Setting failure: 0x00

Function: Frequency hopping setting response.

Fixed frequency setting response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x15	ok：0x01	0xxx	0x0D

Frame end
0x0A

Description: None

Example: Fixed frequency setting is successful

Command: C8 8C 00 09 15 01 1D 0D 0A

3.2.7. Get the current device fixed frequency setting status

Data: None

Function: Get the current device fixed frequency status and fixed frequency table.

Get the current device fixed frequency setting status command frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x16	none	0x1E	0x0D

Frame end
0x0A

Description: None

Example: Get the current device frequency hopping setting status
Command: C8 8C 00 08 16 1E 0D 0A

3.2.8. Get the current device fixed frequency setting status response

Data: Number of fixed
frequency points and fixed
frequency table
Function: Get the device fixed frequency status and fixed frequency table.

Get the current device fixed frequency setting response frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0xxx	0xxx	0x17	Frequency Hopping	Freq[1] (MSB)	Freq[1]
data				B CC code	Frame end		
Freq[1] (LSB)	…	Freq[n] (MSB)	Freq[n] (LSB)	0xxx	0x0D	0x0A	

Note: The number of fixed frequency points is 1, and Freq[1] represents the fixed frequency point. The unit of the frequency point Freq is KHz

Example: The fixed frequency point of the equipment is 920125 (0E0A3D) .
C8 8C 00 0C 17 01 0E 0A 3D 23 0D 0A

3.2.9. Setting up Gen2 parameter

Data: Session, Taget settings
Function: Set gen2 parameters.

Set gen2 command frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0x00	0x 10	0x 20	Dbyte3	DByte2	DByte1
data	BCC code	Frame end					
DByte0	0xxx	0x0D	0x0A				

Note: The definition of each bit of data is shown in the following table

Data definition description

DByte 3	DByte 2	DByte 1	DByte 0		
Reserve	Reserve	Reserve	Session	Target	bit2 - bit0

1. Session settings : The session parameter (bit7 - bit4) of the query command has the highest 4 bits.

S0	b '00 00
S1	b '0 00 1
S2	b ' 00 10
S3	b ' 00 11

2. G Setting : Target parameter of query command (bit3)

A	b '0
B	b '1

example:

1、Set Session 1, Target A

C8 8C 00 0C 20 00 00 00 10 3C 0D 0A

2、 Set up Session 2, Target A

C8 8C 00 0C 20 00 00 00 20 0C 0D 0A

3、 Set up Session 2, Target B

C8 8C 00 0C 20 00 00 00 28 04 0D 0A

3.2.10. Setting up Gen2 Parameter response

Data: Setting success: 0x01 ;
Setting failure: 0x00
Function: Set gen2 parameters.

Set gen2 parameter response frame

Frame Header		Frame length		C MD Type	data	B CC	Frame end
0xC8	0x8C	0x00	0x09	0x21	Ok：0x01	0xxx	0x0D

Frame end
0x0A

Description: None

Example: Setting gen2 parameters successfully
Command: C8 8C 00 09 21 01 29 0D 0 A

3.2.11. Get the current Gen2 Parameter settings

Data: None
Function: Get device gen2 parameter settings.

Get the current gen2 parameter command frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x22	none	0x2A	0x0D

Frame end
0x0A

Description: None

Example: Get the current device gen2 parameter settings
Command: C8 8C 00 08 22 2A 0D 0A

3.2.12. Get the current Gen2 Parameter setting response

Data: Session , Taget settings
Function: Get the device Gen2 parameter settings.

Get the current Gen2 parameter response frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0x00	0x 10	0x 23	Dbyte3	DByte2	DByte1

data	BCC code	Frame end	
DByte0	0xxx	0x0D	0x0A

Example: Response parameters are: Session 2, Target B
Command: C8 8C 00 0C 23 00 00 00 28 07 0D 0A

3.2.13. CW set up

Data: Open CW : 0x01 ; Close CW : 0x00
Function: Turn continuous wave on or off.

CW setting command frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x24	On: 0x01 Off: 0x00	0xxx	0x0D

Frame end
0x0A

Description: None

Example: Open CW
Command: C8 8C 00 09 24 01 2C 0D 0A

3.2.14. CW Set up answer

Data: Setting success: 0x01 ;
Setting failure: 0x00
Function: Turn on or off the continuous wave response.

CW setting response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x25	ok： 0x01	0xxx	0x0D

Frame end
0x0A

Description: None

Example: Setting successful
Command: C8 8C 00 09 25 01 2D 0D 0A

3.2.15. Get Return Loss

Data: None
Function: Get the return loss of each antenna port of the module.

Get module return loss command frame

Frame Header	Frame length	C MD Type	data	B CC code	Frame end

0xC8	0x8C	0x00	0x08	0x 26	none	0x 2E	0x0D
Frame end							
0x0A							

Description: None

Command: C8 8C 00 08 2 6 2 E 0D 0A

3.2.16. Get return loss response

Data: Each port of the module and the corresponding return loss data.

Function: Return the return loss of each port of the module.

Get module return loss response

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0xxx	0xxx	0x 2 7	Port1	ReLoss1	Port2
data				B CC code	Frame end		
ReLoss2	...	PortN	ReLossN	0xxx	0x0D	0x0A	

Description: PortN: port number of the module;

ReLossN: Return loss data of the corresponding port. The data is greater than or equal to 0. 0 means that the corresponding port has no Enable (the single-port module is 0, indicating that there is no antenna connected), the unit is dB, the larger the value, the greater the reflection.

If the module has N ports, it will return N sets of data.

like: C8 8C 00 10 27 01 12 02 01 03 00 04 00 20 0D 0A

The four-port module returns data, ports 1 and 2 are enabled, port 1 is connected to the antenna, port 2 is not connected to the antenna; ports 3 and 4 are not enabled.

C8 8C 00 28 27 01 10 02 04 03 05 04 05 05 00 06 00 07 00 08 00 09 00 0A 00 0B 00 0C 00 0D 00 0E 00 0F 00 10 00 0B 0D 0A

The 16-port module returns data. Ports 1, 2, 3, and 4 are enabled. Port 1 is connected to an antenna. Ports 2, 3, and 4 are not connected to an antenna. Ports 5, 6, 7, 8, 9, 10, 11, 12, and 13 are enabled. , 14, 15, and 16 are not enabled.

3.2.17. Antenna Settings

Data: 3 bytes in total , DByte2 is for power-off saving ; DByte1 and DByte0 are 16 bytes in total , each corresponding to an

antenna. When the bit is 1, the corresponding antenna is selected, and when the bit is 0, the corresponding antenna is deselected . After the antenna is selected, the selected antenna will be automatically rotated when the label is counted.

Function: The default antenna for a single-port module is 1.Setting other antennas is invalid.

Antenna setting command frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0x0B	0x28	DByte2	DByte1	DByte0
B CC code	Frame end						
0xxx	0x0D	0x0A					

Note: Dbyte2=0x01 means the antenna settings are saved when the power is off, Dbyte2=0x00 means the settings are not saved when the power is off.

The data bit definitions are shown in the following table :

Antenna setting data bit definition

DByte1							
Ant16	Ant15	Ant14	Ant13	Ant12	Ant11	Ant10	Ant9
DByte0							
Ant8	Ant7	Ant6	Ant5	Ant4	Ant3	Ant2	Ant1

Example: Select antenna No. 2 and antenna No. 14, and set the power-off saving

Command: C8 8C 00 0B 28 01 20 02 01 0D 0A

3.2.18. Antenna Setup Answer

Data: Setting success: 0x01 ;
Setting failure: 0x00
Function: Set the antenna used by the device

Antenna setup response frame

Frame Header		Frame length		C MD Type	data	B CC	Frame
0xC8	0x8C	0x00	0x09	0x29	ok : 0x01 fail : 0x00	0xxx	0x0D

Frame end
0x0A

Description: None

Example: Setting successful
Command: C8 8C 00 09 29 01 21 0D 0A

3.2.19. Get the current device antenna settings

Data: None
Function: Get the antenna number used by the current device

Get antenna setting command frame

Frame Header		Frame length		CMD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x2a	none	0x22	0x0D

Frame end
0x0A

Description: None

Example: Get the current device antenna settings
Command: C8 8C 00 08 2 A 22 0D 0A

3.2.20. Get the current device antenna settings response

Data: 2 bytes in total, 16 bits, each bit corresponds to an antenna. When the bit is 1, the corresponding antenna is selected, and when the bit is 0, the corresponding antenna is not selected.

Function: Get the antenna number used by the current device.

Get antenna setting response frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x2b	DByte1	DByte0	0xxx
Frame end							
0x0D	0x0A						

The data bit definition is shown in the table :

Antenna setting data bit definition

DByte1							
Ant16	Ant15	Ant14	Ant13	Ant12	Ant11	Ant10	Ant9
DByte0							
Ant8	Ant7	Ant6	Ant5	Ant4	Ant3	Ant2	Ant1

Example: Currently, antenna No. 1, antenna No. 5, antenna No. 10 and antenna No. 14 are commanded : C8 8C 00 0A 2 B 22 11 12 0D 0A

3.2.21. Frequency band area settings

Data: 2 bytes

Function: Set the area.

Locale Command Frame

Frame Header		Frame length		CMD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x2c	Save Settings	DByte0	0xxx
Frame end							
0x0D	0x0A						

Note: When the save setting flag is 0, the setting is not saved. When it is 1, the setting is saved and the current region is used by default the next time the computer is turned on. The definition of data bit DByte0 is shown in the table

China1	0x01
China2	0x02
Europe	0x04
USA	0x08
Korea	0x16
Japan	0x32
South Africa	0x3 3
Taiwan	0x34
Vietnam	0x35
Peru	0x36
Russia	0x37
Sri Lanka	0x38
Azerbaijan	0x39
Iran	0x3A
Malaysia	0x3B
Brazil	0x3C
ETSI_UPPER	0x3D
Australia	0x3E
Indonesia	0x3F
ISRAEL	0x40
HK	0x41
NEW_ZEALAND	0x42
880Mhz-930MHz	0x43
SINGAPORE	0x44
THAILAND	0x45

Example: Save the settings and set the region to USA

Command: C8 8C 00 0A 2C 01 08 2F 0D 0A

3.2.22. Frequency band area setting answer

Data: Setting success: 0x01 ;
Setting failure: 0x00
Function: Set area

Locale setting response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x2D	Ok： 0x01	0xxx	0x0D

Frame end
0x0A

Description: None

Example: Setting successful
Command: C8 8C 00 09 2D 01 25 0D 0A

3.2.23. Get frequency band area

Data: None
Function: Get the device's locale

Get the locale command frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x2E	none	0x26	0x0D

Frame end
0x0A

Description: None

Example: Get locale settings
Command: C8 8C 00 08 2E 26 0D 0

3.2.24. Get frequency band locale response

Data: 2 bytes
Function: Get the device's locale

Get locale response frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x2 F	Ok：0x01	DByte0	0xxx
Frame end							
0x0D	0x0A						

Note: The data bit definitions are shown in the table.

China1	0x01
China2	0x02
Europe	0x04
USA	0x08
Korea	0x16
Japan	0x32
South Africa	0x3 3
Taiwan	0x34
Vietnam	0x35
Peru	0x36
Russia	0x37
Sri Lanka	0x38
Azerbaijan	0x39
Iran	0x3A
Malaysia	0x3B
Brazil	0x3C
ETSI_UPPER	0x3D
Australia	0x3E
Indonesia	0x3F
ISRAEL	0x40
HK	0x41
NEW_ZEALAND	0x42
880Mhz-930MHz	0x43
SINGAPORE	0x44
THAILAND	0x45

Example: The current device region is set to China2
Command: C8 8C 00 0A 2F 01 02 26 0D 0A

3.2.25. Get the current temperature of the device

Data: None
Function: Get the current temperature of the device. The maximum error between this temperature value and the actual temperature value is ± 2℃ .

Get the current temperature of the device

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x34	none	0x3C	0x0D
Frame end							
0x0A							

Description: None

Example: Get device temperature
Command: C8 8C 00 08 34 3C 0D 0A

3.2.26. Get the current temperature response of the device

Data: Get flag, 0x01 success, 0x00 failure. Temperature value × 100 , occupies 2 bytes, unit is ℃
Function: Get the current temperature response of the device.

Get the current temperature response frame of the device

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0x0B	0x35	Ok：0x01	temperature	temperature
B CC code	Frame end						
0xxx	0x0D	0x0A					

Note: Temperature × 100 , after conversion to hexadecimal, negative numbers are complemented

Example: Acquisition is successful, the device temperature is 22 ℃
Command: C8 8C 00 0 B 35 01 08 98 AF 0 D 0 A

3.2.27. Get the device ’s antenna connection status

Data: None
Function: Get the antenna number used by the current device

Get antenna setting command frame

Frame Header		Frame length		CMD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x4E	none	0x22	0x0D
Frame end							
0x0A							

Description: None

Example: Get the current device antenna settings
Command: C8 8C 00 08 4E 46 0D 0A

3.2.28. Get the device antenna connection status response

Data: 2 bytes in total, 16 bits, each bit corresponds to a channel . When the bit is 1, the corresponding channel is connected to the antenna. When the bit is 0, the corresponding channel is not connected to the antenna .

Function: Get the connection status of the current device antenna .

Get an Antenna Connection

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x4F	DByte1	DByte0	0xxx
Frame end							
0x0D	0x0A						

The data bit definition is shown in the table :

Antenna connection data bit definition

DByte1							
Ant16	Ant15	Ant14	Ant13	Ant12	Ant11	Ant10	Ant9
DByte0							
Ant8	Ant7	Ant6	Ant5	Ant4	Ant3	Ant2	Ant1

Example: Ports 1, 2 , and 4 have antenna connections.

Command : C8 8C 00 0A 4F 00 0B 4E 0D 0

3.2.29. Set Recommended RF Link combination

Data: three bytes.
Function: Set the recommended RF link combination.

Set the recommended RF link combination

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0x0B	0x52	Rev	DByte1	DByte0
B CC code	Frame end						
0xxx	0x0D	0x0A					

Note: When DByte1 is 1, the settings are saved when the power is off, and when it is 0, the settings are not saved when the power is off. The settings of DByte0 are shown in the following table (0x01 is the best performance for R2000 modules , and 0x02 is the best performance for Ex10 modules); the Gen2X link only supports the latest tags such as Impinj M830 and M850.

DByte0	combination
0x00	PR _ASK /Miller 8 / 16 0KHz
0x01	PR _ASK /Miller4/ 250KHz
0x02	PR _ASK /Miller4/ 3 2 0KHz
0x03	PR _ASK /Miller4/ 64 0KHz
0x0 4	PR _ASK /Miller 2 / 3 2 0KHz
0x0 5	PR _ASK / Miller 2 / 640KHz
0x0A	Gen2X /Miller 8 / 16 0KHz
0x0B	Gen2X /Miller4/ 250KHz
0x0C	Gen2X /Miller4/ 3 2 0KHz
0x0D	Gen2X / Miller4/ 640KHz
0x0E	Gen2X /Miller 2 / 3 2 0KHz
0x0F	Gen2X / Miller 2 / 640KHz
other	invalid

Example: Set the RF link combination to PR _ASK /Miller4/ 3 2 0KHz The data will not be saved after power failure.
Command: C8 8C 00 0B 52 00 00 02 5B 0D 0A

3.2.30. Set Recommended RF Link Assembly Response

Data: success or failure flag, 0x01 for success, 0x00 for failure.
Function: Set the recommended RF link combination response.

Set the recommended RF link combination response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x53	Ok：0x01	0xxx	0x0D

Frame end
0x0A

Example: Setting successful
Command: C8 8C 00 09 53 01 5B 0D 0A

3.2.31. Get recommended RF Link Team Settings

Data : 2
sections.
Function: Get the recommended RF link combination settings.

Get the recommended RF link combination settings

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x54	Rev	Rev	0xxx

Frame end	
0x0D	0x0A

Description: None.

Example: Get recommended RF link combination settings
Command: C8 8C 00 0A 54 00 00 5E 0D 0A

3.2.32. Get recommended RF Link combination setup response

Data: three
bytes.
Function: Get the response of the recommended RF link combination settings.

Get the recommended RF link combination setting response

frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0x0B	0x55	Ok： 0x01	Rev	DByte0
B CC code	Frame end						
0xxx	0x0D	0x0A					

Note: DByte0 is set as shown in the following table

DByte0	combination
0x00	PR _ASK /Miller 8 / 16 0KHz
0x01	PR _ASK /Miller4/ 250KHz
0x02	PR _ASK /Miller4/ 3 2 0KHz
0x03	PR _ASK /Miller4/ 64 0KHz
0x0 4	PR _ASK /Miller 2 / 3 2 0KHz
0x0 5	PR _ASK / Miller 2 / 640KHz
0x0A	Gen2X /Miller 8 / 16 0KHz
0x0B	Gen2X /Miller4/ 250KHz
0x0C	Gen2X /Miller4/ 3 2 0KHz
0x0D	Gen2X / Miller4/ 640KHz
0x0E	Gen2X /Miller 2 / 3 2 0KHz
0x0F	Gen2X / Miller 2 / 640KHz
other	invalid

Example: The currently recommended RF link combination is PR _ASK /Miller4/ 64 0KHz

Command: C8 8C 00 0B 55 01 00 03 58 0D 0A

3.2.33. Setting up **FastID** Function

Data ：2 bytes .

Function: Enable or disable the **FastID** function .

Setting up FastID

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x5C	ON： 1 OFF： 0	Rev	0xxx
Frame end							
0x0D	0x0A						

Note: Enable: 0x01, Disable: 0x00 ; only Impinj tags support this function.

Example: Enable the FastID function.

Command: C8 8C 00 0A 5C 01 00 57 0D 0A

3.2.34. Setting up FastID Functional response

Data: One byte.
Function: Set the FastID function response.

Set FastID response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x5D	Ok：0x01	0xxx	0x0D

Frame end
0x0A

Example: Setting successful
Command: C8 8C 00 09 5D 01 55 0D 0A

3.2.35. Get FastID Functional status

Data: 2 bytes
Function: Get the current reader FastID status, whether it is enabled.

Get FastID status

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x5E	Rev	Rev	0xxx

Frame end	
0x0D	0x0A

Description: None.

Example: Get FastID status.
Command: C8 8C 00 0A 5E 00 00 54 0D 0A

3.2.36. Get FastID Functional status response

Data: two bytes.
Function: Get FastID status response .

Get FastID status response frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x5F	OK： 1 Fail： 0	ON： 1 OFF： 0	0xxx

Frame end	
0x0D	0x0A

Example: Acquisition is successful, and the current FastID function is enabled

Command: C8 8C 00 0A 5F 01 01 55 0D 0A

3.2.37. Setting **Tagfocus** Function

Data: 2 bytes

Function: Enable or disable the **TagFocus** function.

Setting **TagFocus**

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x60	ON : 1 OFF : 0	Rev	0xxx

Frame end	
0x0D	0x0A

Note: Enable: 0x01, Disable: 0x00 ; only Impinj tags support this function.

Example: Enable the TagFocus function.

Command: C8 8C 00 0A 60 01 00 6B 0D 0A

3.2.38. Setting **TagFocus** Functional response

Data: One byte.

Function: Set **TagFocus** function response.

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x61	Ok： 0x01	0xxx	0x0D

Frame end
0x0A

Example: Setting successful

Command: C8 8C 00 09 61 01 69 0D 0A

3.2.39. Get **TagFocus** Functional status

Data: 2 bytes.

Function: Get the current reader **TagFocus** status, whether it is turned on.

Frame Header	Frame length	C MD Type	data	B CC code

0xC8	0x8C	0x00	0x0A	0x62	Rev	Rev	0xxx
Frame end							
0x0D	0x0A						

Description: None.

Example: Get TagFocus status.
Command: C8 8C 00 0A 62 00 00 68 0D 0A

3.2.40. Get **TagFocus** Functional status response

Data: two bytes.
Function: Get **TagFocus** Status response.

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x63	OK : 1 Fail : 0	ON : 1 OFF : 0	0xxx
Frame end							
0x0D	0x0A						

Example: Acquisition is successful, and the current TagFocus function is enabled
Command: C8 8C 00 0A 63 01 01 69 0D 0 A

3.2.41. Setting up **Fast Inventory** Function

Data: 2 bytes
Function: Enable or disable **Fast Inventory** Function.

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0x0B	0x 64	Save logo	ON : 1 OFF : 0	Rev

B CC code	Frame end	
0xxx	0x0D	0x0A

Description: Save flag: 0 means no saving when power is off , 1 means saving when power is off ; Set to on: 0x01, off: 0x00 ;

Rev is a reserved byte.

Example: Enable **Fast Inventory** Function.
Order:

3.2.42. Setting up **Fast Inventory** Functional response

Data: One byte.
Function: Set up **Fast Inventory** Functional answer.

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x6 5	Ok : 0x01	0xxx	0x0D

Frame end
0x0A

Example: Setting successful
Command: C8 8C 00 09 65 01 6D 0D 0A

3.2.43. Get **Fast Inventory** Functional status

Data: 2 bytes.
Function: Get the current reader Fast Inventory Status: whether it is enabled.

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x6 6	Rev	Rev	0xxx
Frame end							
0x0D	0x0A						

Description: None.

Example: Get Fast Inventory state.
Command: C8 8C 00 0A 6 6 00 00 6 C 0D 0A

3.2.44. Get **Fast Inventory** Functional status response

Data: two bytes.
Function: Get Fast Inventory Status response.

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x6 7	OK : 1 Fail : 0	ON : 1 OFF : 0	0xxx
Frame end							
0x0D	0x0A						

Example: Successfully obtained, current Fast Inventory The function is turned on
Command: C8 8C 00 0A 6 7 01 01 6 D 0D 0A

3.2.45. Software reset

Data: 0 bytes
Function: software reset module.

Software reset

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x68	none	0x60	0x0D
Frame end							
0x0A							

Description: Sending a software reset command can reset the reader.

Example: Send a software reset command.
Command: C8 8C 00 08 68 60 0D 0A

3.2.46. Software reset answer

Data : One byte.
Function: Software reset response.

Software reset response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x69	OK : 1 Fail : 0	0xxx	0x0D
Frame end							
0x0A							

Description: None.

Example: Reset successful.
Command: C8 8C 00 09 69 01 61 0D 0A

3.2.47. Tag filter settings

Data: n bytes.

Function: Select the range of tag groups during tag search.

Tag filter settings

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0xxx	0x6E	DByte0	MMB	MSA (MSB)
data							
MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	…	…	…	MData (LSB)
B CC code	Frame end						
0xxx	0x0D	0x0A					

Note: DByte0：0x01 means saving the setting value when power is off, 0x00 means not saving;

MMB： The bank number of the filter operation， 0x01 represents EPC， 0x02 represents TID， 0x03 represents USR， and other values are illegal values;

MSA：The starting address for starting the filtering operation, in bits；

MDL：The length of the filtering data for starting the filtering operation， in bits． 0x00 means no filtering. MData：The data when starting the filtering, in bytes. If MDL is less than an integer multiple of bytes, the lower bits are filled with 0．

Example 1：Set tag search filtering rules: TID area filtering, filter address is TID area bit 0， filter length is 96 bits， filter data is 0xE2003414013301001038D2B5， and save the filter settings after power failure.

Command: C8 8C 00 1A 6E 01 02 00 00 00 60 E2 00 34 14

01 33 01 00 10 38 D2 B5 A9 0D 0A

Example 2: Set tag search filtering rules: no filtering, save the filtering settings after power failure.

Command: C8 8C 00 0E 6E 01 00 00 00 00 00 61 0D 0A

3.2.48. Search for tag filter settings answer

Data : One byte.
Function: Search for tags to filter and set responses.

Tag filtering setting response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x6F	OK : 1 Fail : 0	0xxx	0x0D

Frame end
0x0A

Description: None.

Example: Setting successful
Command: C8 8C 00 09 6F 01 67 0D 0A

3.2.49. EPC + TID or EPC + USER Mode Settings

Data: 4 bytes
Function: When the simultaneous reading of EPC+TID or EPC+TID+USER mode is turned on, the reader will read the EPC+TID or EPC+USER data of the tag simultaneously when continuously searching for tags.

Mode Settings

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0x00	0x0C	0x70	Dbyte0	Memory	A dress

data	B CC code	Frame end	
Lenth	0xxx	0x0D	0x0A

Description: Dbyte0 : 0x01 means saving the setting value when power is off, 0x00 means not saving;

Memory : 0x00, indicating off ; 0x01, indicating on EPC+TID mode (default address is 0x00, length is 6 words); 0x02 , indicating on EPC+TID+USER mode
A dress : It is the starting address of the USER area (in words).
L enth : The length of the USER area (in words) .

3.2.50. EPC + TID or EPC + TID + USER Mode Setting Answer

Data : 4 bytes.

Function: Read EPC+TID or EPC+TID+USER mode setting response at the same time.

Mode setting response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x71	OK : 1 Fail : 0	0xxx	0x0D

Frame end
0x0A

Description: None.

Example: Setting successful

Command: C8 8C 00 09 71 01 79 0D 0A

3.2.51. Read EPC + TID or EPC + TID + USER Mode Status

Data: 2 bytes

Function: Get the current reader to read EPC+TID or EPC+T ID +USER at the same time Mode setting status, whether it is enabled.

Read mode setting status

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x72	Rev	Rev	0xxx

Frame end	
0x0D	0x0A

Description: None.

Example: Get the status of the EPC+TID or EPC+TID+USER mode setting.

Command: C8 8C 00 0A 72 00 00 78 0D 0A

3.2.52. Read EPC + TID or EPC + TID + USER Mode status response

Data : 4 bytes.

Function: Get and read EPC + TID or EPC + TID + USER at the same time Mode setting status response.

Get mode setting status response frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0x00	0x0C	0x73	OK : 1	Memory	A dress

					Fail : 0		

data	B CC code	Frame end	
Lenth	0xxx	0x0D	0x0A

3.2.53. Restore factory settings

Data: 0 bytes

Function: Restore factory settings.

Restore factory settings

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x74	none	0x7C	0x0D

Frame end
0x0A

Example: Send a command to restore factory settings.

Command: C8 8C 00 08 74 7C 0D 0A

3.2.54. Restore factory settings answer

Data : One byte.

Function: Restore factory settings.

Restore factory settings response frame

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x09	0x75	OK : 1 Fail : 0	0xxx	0x0D

Frame end
0x0A

Description: None.

Example: Restoring factory settings successfully.

Command: C8 8C 00 09 75 01 7D 0D 0A

3.3. Tag Operations

3.3.1. Single Inventory Label

Data: None, two bytes reserved.

Function: Search for a tag . If a tag is found, only one tag will be returned . If no tag is found, no data response will be given.

Single inventory tag command frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x80	Rev	Rev	0xxx

Frame end	
0x0D	0x0A

Description: None

example:

Command: C8 8C 00 0A 80 00 00 8A 0D 0A

3.3.2. Single inventory tag response

Data: PC+EPC , RSSI .

Function: Inventory tag responses and return information related to tags and readers .

Single inventory tag response frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0xxx	0x81	PC (MSB)	PC (LSB)	EPC (MSB)
data							
EPC	EPC	EPC	EPC	EPC	EPC	EPC	EPC
data						B CC code	Frame end
EPC	EPC	EPC (LSB)	RSSI (MSB)	RSSI (LSB)	Ant Num	0xxx	0x0D

Frame end
0x0A

Note: RSSI is expressed in the form of two's complement, a total of 16 bits, which is the actual value × 10. For example, -65.7dBm, then RSSI=FD6F.

Note: The length of the EPC is determined by PC determines that this is based on the Gen2 protocol, so the frame length is not fixed. After the FastID function is turned on, if the tag's TID data is read, the EPC (LSB) of the response frame will add 96 bits of TID data, followed by the RSSI value.

Example: Tag PC=0x3000, EPC=0xE2003411B802011383258566 response, RSSI=-65.7dBm, antenna 2 is stored.

Command: C8 8C 00 19 81 30 00 E2 00 34 11 B8 02 01 13
83 25 85 66 FD 6F 02 12 0D 0A

3.3.3. Continuous Inventory Label

Data: 2 sections.
Function: Continuous inventory label.

Continuous inventory tag command frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x82	Num 1	Num 0	0xxx
Frame end							
0x0D	0x0A						

Note: After receiving this command, the module will continue to inventory tags until it receives a stop command.

Note: During the continuous inventory tag period, the reader does not respond to other commands. If you need to execute other commands, you need to send the stop continuous inventory tag command, wait for the stop continuous inventory tag to respond, and then send the command to be executed.

example:

1. Normal inventory label, Num 1 = 0x00, Num 0 = 0x00
Command: C8 8C 00 0A 82 00 00 88 0D 0A

2. Return the phase of the tag during inventory, Num1 = 0xFF, Num0 = 0xFF
Command: C8 8C 00 0A 82 FF FF 88 0D 0A

3.3.4. Continuous Inventory Tag Response

Data: PC+EPC, RSSI, antenna number.

Function: Inventory tag responses and return information related to tags and readers.

1. Normal inventory response frame (inventory parameters: Num1 = 0x00, Num0 = 0x00)

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0xxx	0x83	PC (MSB)	PC (LSB)	EPC (MSB)
data							
EPC	EPC	EPC	EPC	EPC	EPC	EPC	EPC
data						B CC code	Frame end
EPC	EPC	EPC (LSB)	RSSI (MSB)	RSSI (LSB)	Ant Num	0xxx	0x0D
Frame end							
0x0A							

Note: RSSI is expressed in the form of two's complement, a total of 16 bits, which is the actual value × 10. For example, -65.7dBm, then RSSI=FD6F.

Note: The length of EPC is determined by PC, which is based on the Gen2 protocol, so the frame length is not fixed. After the FastID function or EPC + TID or EPC + USER function is enabled, if the TID data of the tag is read, the data of the TID area or USER area will be added after the EPC (LSB) of the response frame, and then the RSSI value.

Example: Tag PC=0x3000, EPC=0xE2003411B802011383258566 response, RSSI=-65.7dBm, antenna 2 is stored.

Command: C8 8C 00 19 83 30 00 E2 00 34 11 B8 02 01 13

83 25 85 66 FD 6F 02 10 0D 0A

2. Return the response frame of the tag phase (inventory parameters: Num1 = 0xFF, Num0 = 0xFF)

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0xxx	0x83	PC (MSB)	PC (LSB)	EPC (MSB)
data							
EPC	EPC	EPC	EPC	EPC	EPC	EPC	EPC
data						B CC code	Frame end
EPC (LSB)	Phase (MSB)	Phase (LSB)	RSSI (MSB)	RSSI (LSB)	Ant Num	0xxx	0x0D
Frame end							
0x0A							

Note: Phase is 0 - 360 degrees

Example: The returned phase data is 00 3B which is 59 degrees

C8 8C 00 1B 83 34 00 E2 C4 55 66 A5 03 00 60 70 5D B2 C7 00 3B FE C8 01 2B 0D 0A

3.3.5. Stop continuous inventory tag

Data: None

Function: Stop continuous inventory of tags .

Stop continuous inventory tag command

Frame Header		Frame length		C MD Type	data	B CC code	Frame end
0xC8	0x8C	0x00	0x08	0x8C	none	0x84	0x0D
Frame end							
0x0A							

Example: Stop continuous inventory tag

Command: C8 8C 00 08 8C 84 0D 0A

3.3.6. Stop continuous inventory tag response

Data: Flag : Success: 0x01 ; Failure: 0x00

Function: Stop continuous inventory tag response

Stop continuous inventory tag response frame

Frame Header	Frame length	C MD Type	data	B CC code	Frame end

0xC8	0x8C	0x00	0x09	0x8D	Flag	0xxx	0x0D
Frame end							
0x0A							

Description: None

Example: Success

Command: C8 8C 00 09 8D 01 85 0D 0A

3.3.7. Authenticate Tag

command function in GS1™ UHF RFID Gen2 v2.0 protocol .

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0xxx	0xxx	0x8E	AP (MSB)	AP	AP
data							
AP (LSB	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
data							
MData	…	…	…	…	MData	MData (LSB)	DL
data							
KeyID	Data (MSB)	…	…	…	…	…	Data (LSB)
B CC	Frame end						
0xxx	0x0D	0x0A					

AP : 4- byte access password
MMB : Masked data area (0x00 is Reserved and 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR) .
MSA : Masked address.
MDL : The length of the mask.
Mdata : Mask data .
DL : The length of KeyID+Data (in bytes) , with a fixed length of 11.
KeyID : KeyID used for the Authenticate command , the default value is 0x00 , one byte .
Data : IChallenge_TAM1 data, fixed to 10 bytes .

3.3.8. Authenticate Tag Response

Frame Header	Frame length	C MD Type	data

0xC8	0x8C	0xxx	0xxx	0x8F	Flag	Errflag	DL (MSB)
data					Check	Frame end	
DL (LSB)	Data (MSB)	…	…	Data (LSB)	0xxx	0x0D	0x0A

Flag: Flag indicating whether the data reading is successful , success: 0x01; failure: 0x00

Errflag: error flag , 0x00 means Authenticate succeeds; 0x01 means Authenticate fails; 0x22 means the tag cannot be recognized

DL: The length of the returned data in words . If successful, it is 8 words (16 bytes); if failed, it is 0.

Data : The specific data returned; when Authenticate fails , there is no Data .

3.3.9. Read tag data area

Data: AP (access password), MMB , MSA , MDL , MData , memory Bank , SA start address (in words), DL The length of the data to be read (in words). The word length is 2 bytes .

Function: Read the data in the specified data area of the tag .

Read data command frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0xxx	0xxx	0x84	AP (MSB)	AP	AP
data							
AP (LSB)	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
data							
MData	…	…	…	…	MData	MData (LSB)	MB
data				B CC code	Frame end		
SA (MSB)	SA (LSB)	DL (MSB)	DL (LSB)	0xxx	0x0D	0x0A	

illustrate:

AP : 4- byte access password

MMB : Masked data area (0x00 is Reserved and 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR) .

MSA : Mask address (in bits).

MDL : The length of the mask (in bits).

Mdata : mask data .

MB : data area to be read (0x00 is Reserve 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR) .

SA : The address of the data area to be read (in words).
DL : The length of the data to be read (in words).

Example 1 : No filtering, read 3 words of data in the TID area , the starting address is 2 , and the access password is 0x55555555

Command: C8 8C 00 16 84 55 55 55 55 00 00 00 00 00 02

00 02 00 03 91 0D 0A

Example 2 : TID area filtering, the filter address is the 2nd bit of the TID area , the filter length is 13 bits , the filter data is 1110001000000 ’ b , read 6 words of data in the EPC area , the starting address is 2 , and the access password is 0x00000000

Command: C8 8C 00 18 84 00 00 00 00 02 00 02 00 0D E2

00 01 00 02 00 06 76 0D 0A

3.3.10.Read tag data area response

Read data response frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0xxx	0xxx	0x85	Flag	Errflag	DL (MSB)
data					Check	Frame end	
DL (LSB)	Data (MSB)	…	…	Data (LSB)	0xxx	0x0D	0x0A

Flag: Flag of whether the data reading is successful, success: 0x01; failure: 0x00

Errflag: Error flag. 0x00 means reading is successful; 0x01 means reading is failed; 0x22 means the tag cannot be identified.

DL: The length of the data read, in words (2 bytes).

Data: The data read.

Example: Successfully read 6 words of data in the TID area: E2 80 11 90 20 00 72 C7 82 ED 03 03

Command: C8 8C 00 18 85 01 00 00 06 E2 80 11 90 20 00 72 C7 82 ED 03 03 83 0D 0A

3.3.11.Write tag data area

Function: Write data to the specified storage area .

Write data command frame

Frame Header		Frame length		CMD Type	data		
0xC8	0x8C	0xxx	0xxx	0x86	AP (MSB)	AP	AP
data							
AP (LSB)	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
data							
MData	…	…	…	…	MData	MData (LSB)	MB
data							
SA (MSB)	SA (LSB)	DL (MSB)	DL (LSB)	Data (MSB)	…	…	Data (LSB)
B CC code	Frame end						

0xxx	0x0D	0x0A	

AP : 4- byte access password

MMB : Masked data area (0x00 is Reserved and 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR) .

MSA : Mask address (in bits).

MDL : The length of the mask (in bits).

Mdata : mask data .

MB : data area to be written (0x00 is Reserve 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR) .

SA : The address of the data area to be written .

DL : Length of data to be written (in words).

Data : The data to be written, with the high bit first .

Example 1 : No filtering, write 6 words of data in the EPC area , Data=0x00112233445566778899 aabb , start address is 2 , access password is 0x12345678

Command: C8 8C 00 22 86 12 34 56 78 00 00 00 00 00 01

00 02 00 06 00 11 22 33 44 55 66 77 88 99 AA BB A9 0D 0A

Example 2 : TID area filtering, the filter address is the 0th bit of the TID area , the filter length is 96 bits , the filter data is 0xE2003414013301001038D2B5 , and 6 words of data are written to the EPC area , Data=0x00112233 445566778899aabb , starting address is 2 , access password is 0x00000000

Command: C8 8C 00 2E 86 00 00 00 00 02 00 00 00 60 E2

00 34 14 01 33 01 00 10 38 D2 B5 01 00 02 00 06 00 11 22 33 44 55 66 77 88 99 AA BB 71 0D 0A

3.3.12. Write data area response

Data: Flag : Flag indicating whether data writing is successful , success: 0x01 ; failure: 0x00

Errflag : Error flag , the error flag returned after writing fails

Function: Write data response

Write data response frame

Frame Header		Frame length		CMD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x87	Flag	Errflag	0xxx
Frame end							

0x0D	0x0A

Description: Errflag: error flag. 0x00 means write success; 0x01 means write failure; 0x22 means tag cannot be recognized .

Example: Data writing fails, the error flag is 0x 22

Command: C8 8C 00 0C 85 00 22 00 00 AB 0D 0A

3.3.13. Lock tag

Data: AP (access password), MMB , MSA , MDL , MData , LD (3 bytes in total)

Function: Lock the tag's memory bank

lock tag command frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0xxx	0x88	AP (MSB)	AP	AP
data							
AP (LSB)	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
data							
MData	…	…	…	…	MData	MData (LSB)	LD (MSB)
data		B CC code	Frame end				
LD	LD (LSB)	0xxx	0x0D	0x0A			

illustrate:

AP : 4- byte lock password

MMB : Masked data area (0x00 is Reserved and 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR) .

MSA : Mask address (in bits).

MDL : The length of the mask (in bits).

Mdata : mask data .

LD : 3 bytes with 24 bits in total, of which the upper 4 bits are invalid, bits 0 to 9 (10 bits in total) are action bits, and bits 10 to 19 (10 bits in total) are mask bits , as shown in the figure below .

Lock-Command Payload

19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Kill Mask		Access Mask		EPC Mask		TID Mask		File_0 Mask		Kill Action		Access Action		EPC Action		TID Action		File_0 Action	

Masks and Associated Action Fields

	Kill pwd		Access pwd		EPC memory		TID memory		File_0 memory	
	19	18	17	16	15	14	13	12	11	10
Mask	skip/ write	skip/ write	skip/ write	skip/ write	skip/ write	skip/ write	skip/ write	skip/ write	skip/ write	skip/ write
	9	8	7	6	5	4	3	2	1	0
Action	pwd read/ write	perma lock	pwd read/ write	perma lock	pwd write	perma lock	pwd write	perma lock	pwd write	perma lock

example:

1. EPC Area filtering, filtering address is EPC The 32nd bit of the area , the filter length is 96 bits , the filter data is E2 00 00 17 01 0B 01 60 17 80 60 26 , non - permanent lock of EPC area + Access Password (LD=0x0 280A0) , the access password is 0x 11112222

   Command: C8 8C 00 20 88 11 11 22 22 01 00 20 00 60 E2 00 00 17 01 0B 01 60 17 80 60 26 02 80 A0 84 0D 0A

2. TID area filtering, the filtering address is TID Area 0 bit , filter length is 96bit , filter data is E2 00 34 12 01 2C FC 00 0B 45 E3 05, permanent lock EPC area + Access Password (LD =0x0 3C0F0) access password is 0x11112222

Command: C8 8C 00 20 88 11 11 22 22 02 00 00 00 60 E2 00 34 12 01 2C FC 00 0B 45 E3 05 03 C0 F0 44 0D 0A

3.3.14. Lock tag response

Data: whether the lock tag is successful flag : success: 0x01 ; failure: 0x00

Error flag Errflag : The error flag returned after the lock tag fails

Function: Lock tag answer .

Lock tag response frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x89	Flag	Errflag	0xxx
Frame end							
0x0D	0x0A						

Description: Lock operation is successful, error flag Errflag , 0x00 means Lock is successful; 0x01 means Lock fails; 0x22 means tag cannot be recognized.

Example: Locking success

Command: C8 8C 00 0A 89 01 00 82 0D 0A

3.3.15. Kill Label

Data: KP (kill password), MMB , MSA , MDL , MData

Function: kill tag

kill tag command frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0x00	0xxx	0x8A	KP (MSB)	KP	KP
data							
KP (LSB)	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
Data							BCC code
MData	…	…	…	…	MData	MData (LSB)	0xxx
Frame end							
0x0D	0x0A						

illustrate:

KP : 4- byte KILL password

MMB : Masked data area (0x00 is Reserved and 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR) .

MSA : Mask address (in bits).

MDL : The length of the mask (in bits).

Mdata : mask data .

the KillPwd field of a tag is 0x00000000 , the tag will ignore the kill command and the kill command will not succeed.

Example: EPC area filtering, the filter address is the 32nd bit of the EPC area , the filter length is 96 bits , the filter data is 0x00112233445566778899AABB , and the kill password is 0x760039AD

Command: C8 8C 00 1D 8A 76 00 39 AD 01 00 20 00 60 00 11 22 33 44 55 66 77 88 99 AA BB 34 0D 0A

3.3.16. Kill Tag reply

Data: whether the kill tag is successful flag : success: 0x01 ; failure: 0x00

Error flag Errflag : The error flag returned after the kill tag fails

Function: kill tag response

Kill tag response frame

Frame Header		Frame length		CMD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x8B	Flag	Errflag	0xxx
Frame end							
0x0D	0x0A						

Description: Error flag Errflag, 0x00 for Kill success; 0x01 for Kill failure; 0x22 for identification No label.

Example: kill succeeded

Command: C8 8C 00 0A 8B 01 00 80 0D 0A

3.3.17. Block Write data

Data: AP (access password), MMB, MSA, MDL, MData, memory Bank, SA start address (in words), DL data length to be written (in words), Data data to be written

Function: Block Write data of a specific length to a specific address of a tag.

Block Write command frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0xxx	0xxx	0x93	AP (MSB)	AP	AP
data							
AP (LSB)	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
data							
MData	…	…	…	…	MData	MData (LSB)	MB
data							
SA (MSB)	SA (LSB)	DL (MSB)	DL (LSB)	Data (MSB)	…	…	Data (LSB)
B CC	Frame end						
0xxx	0x0D	0x0A					

illustrate:

AP: 4- byte access password

MMB: Masked data area (0x00 is Reserved and 0x01 is EPC, 0x02 indicates TID, and 0x03 indicates USR).

MSA: Mask address (in bits).

MDL: The length of the mask (in bits).

Mdata: mask data.

MB: data area to be written (0x00 is Reserve 0x01 is EPC, 0x02 indicates TID,

and 0x03 indicates USR).

SA: The address of the data area to be written.

DL: Length of data to be written (in words).

Data: The data to be written, with the high bit first.

Example: Label PC=0x3000, EPC=0xE2003411B802011383258566, write to EPC area 6

Words of data, Data=0x00112233445566778899aabb, starting address is 2, access password is 0x74290fd8

Command: C8 8C 00 2B 93 74 29 0f d8 30 00 E2 00 34 11

B8 02 01 13 83 25 85 66 01 00 02 00 06 00 11 22 33 44 55 66 77 88 99 AA BB 2D 0D 0A

3.3.18. Block Write Data response

Data: Block Write data success flag: Success: 0x01; Failure: 0x00

Error flag Errflag: The error flag returned after the operation fails.

Function: Block Write data response.

Block Write data response frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x94	Flag	Errflag	0xxx
Frame end							
0x0D	0x0A						

Description: Error flag Errflag, 0x00 means Block Write is successful; 0x01 means Block Write fails; 0x22 means identification No label.

Example: Data Block Write fails, the error flag is 0x01

Command: C8 8C 00 0A 94 00 01 9F 0D 0A

3.3.19. Block Erase data

Data: AP (access password), MMB, MSA, MDL, MData, memory Bank, SA start address (in words), DL length to be erased (in words)

Function: Block Erase a specific length to a specific address of the tag.

Block Erase command frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0xxx	0xxx	0x95	AP (MSB)	AP	AP

data							
AP (LSB)	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
data							
MData	…	…	…	…	MData	MData (LSB)	MB
data				B CC code	Frame end		
SA (MSB)	SA (LSB)	DL (MSB)	DL (LSB)	0xxx	0x0D	0x0A	

illustrate:

AP : 4- byte access password

MMB : Mask data area , 0x01 is EPC , 0x02 indicates TID , and 0x03 indicates USR .

MSA : Mask address (in bits).

MDL : The length of the mask (in bits).

Mdata : mask data .

MB : The data area to be written .

SA : The address of the data area to be written .

DL : Length of data to be written (in words).

Example: Tag PC=0x3000 , EPC=0xE2003411B802011383258566 , Erase tag EPC
the area is 6 words, the starting address is 2 , and the access password is 0x74290fd8

Command: C8 8C 00 1F 95 74 29 0 FD 8 30 00 E2 00 34 11 B8 02 01
13 83 25 85 66 01 00 02 00 06 1F 0D 0A

3.3.20. Block Erase Data response

Data: Block Erase data success flag : Success: 0x01 ; Failure: 0x00
Error flag Errflag : The error flag
returned after the operation fails .

Function: Block Erase data response .

Block Erase data response frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0x0A	0x96	Flag	Errflag	0xxx
Frame end							
0x0D	0x0A						

Description: Error flag Errflag , 0x00 means Block Erase is successful; 0x01 means Block Erase fails; 0x22 means the tag cannot be recognized.

Example: Data Block Erase succeeds, error flag is 0x00
Command: C8 8C 00 0A 96 01 00 9D 0D 0A

3.3.21. Block Permalock operate

Data: AP (Access Password), MMB, MSA, MDL, MData, ReadLock, MemBank, BlockPtr, BlockRange, Mask.

Function: BlockPermalock operation.

Block Permalock operation command frame

Frame Header		Frame length		C MD Type	data		
0xC8	0x8C	0xxx	0xxx	0x9F	AP (MSB)	AP	AP
data							
AP (LSB)	MMB	MSA (MSB)	MSA (LSB)	MDL (MSB)	MDL (LSB)	MData (MSB)	MData
data							
MData	…	…	…	MData	MData (LSB)	ReadLock	MB
data							
BlockPtr (MSB)	BlockPtr (LSB)	BlockRange (MSB)	BlockRange (LSB	Mask (MSB)	…	…	Mask (LSB)
B CC code	Frame end						
0xxx	0x0D	0x0A					

Note: Only tags that support the Block Permalock command can respond to this command.

AP: Tag access password.

MMB: The bank number that starts the filtering operation. 0x01 is EPC, 0x02 is TID, 0x03 is USER area, and other values are invalid.

MSA: The starting address for starting the filtering operation, in bits.

MDL: The length of the filter data to start the filter operation, in bits. 0x00 means no filtering.

Mdata: The data when starting filtering, in bytes. If MDL is not an integer multiple of bytes, the low bits are filled with 0.

ReadLock: The upper 7 bits are reserved, bit0 is 0 for Read, bit0 is 1 for Permalock.

MB: memory bank, the data area to be operated.

BlockPtr: Block starting address, unit is 16 blocks, one block is 8

bytes .

BlockRange : block range, unit is 16 blocks

Mask : Block mask data, high bit first , two bytes of 16 bits corresponding to whether 16 blocks are selected.

Example: TID area filtering, the filter address is TID area bit 0 , the filter length is 96 bits , the filter data is 0xE2003414013301001038D2B5 , readlock=0 , MB=3 , BlockPtr=0, BlockRange=1, the access password is 0x00000000

Command: C8 8C 00 23 9F 00 00 00 00 02 00 00 00 60 E2
00 34 14 01 33 01 00 10 38 D2 B5 00 03 00 00 00 01
62 0D 0A

3.3.22. Block Permalock Operation response

Data: Flag is the success or failure flag , success: 0x01 ; failure: 0x00 ;

Errflag is an error flag , which is returned after the operation fails .

Function: Block Permalock operation response .

Block Permalock operation response frame

Frame Header		Frame length		C MD Type	data		B CC code
0xC8	0x8C	0x00	0xxx	0xA0	Flag	Errflag	0xxx
Frame end							
0x0D	0x0A						

Description: Error flag Errflag , 0x00 means Block Permalock succeeds; 0x01 means Block Permalock fails; 0x22 means the tag cannot be identified .

If Block The readlock parameter in the Permalock command is 0 , and there is a corresponding data response after Errflag , and the data length is BlockRange words .

Example: Block Permalock succeeds, Readlock=0 , BlockRange=1 , data is 0xF000

Command: C8 8C 00 0C A0 01 00 F0 00 5D 0D 0A