UHF Reader

1.1.1

1.

Get transmitting power

1.1.2

Command Frame Definition

Get transmitting power of the reader as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Checksum	End
BB	00	B7	00	00	B7	7E

Frame Type: 0x00

Command code: 0xB7

Command Parameter Length PL: 0x0000

Checksum: 0xB7

Response Frame Definition

If the operation to get the channel is correct, then the response frame is:

Header	Type	Command	PL(MSB)	PL(LSB)	Pow(MSB)	Pow(LSB)	Checksum
BB	01	B7	00	02	07	D0	91
End							
7E							

Frame Type: 0x01

Command Code: 0xB7

Command Parameter Length PL: 0x0002

Power Parameter Pow: 0x07D0(Current power is decimalism 2000, i.e 20dBm)

Checksum: 0x91

Set transmitting power

Command Frame Definition

Set transmitting power of the reader as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Pow(MSB)	Pow(LSB)	Checksum
BB	00	B6	00	02	07	D0	8F
End							
7E							

Frame Type: 0x00

Command code: 0xB6

Command Parameter Length PL: 0x0002

Command Parameter Pow: 0x07D0(Current power is decimalism 2000，i.e 20dBm)

Checksum: 0x8F

Response Frame Definition

If the operation to get the channel is correct, then the response frame is:

Header	Type	Command	PL(MSB)	PL(LSB)	Parameter	Checksum	End
BB	01	B6	00	01	00	B8	7E

Frame Type: 0x01

Command code: 0xB6

Command Parameter Length PL: 0x0001

Command Parameter: 0x00

Checksum: 0xB8

Single polling command

Command frame definition:

finish the polling one time under EPC Class1 Gen2 portocol, will operate the inventory. The command is not including the Select operation. The speaker will be open or close before or after the polling command operation. At Single polling Inventory command, Query operate parameter is configurated by another command, and the firmware has the initial data. The single polling command is as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Checksum	End
BB	00	22	00	00	22	7E

Frame Type: 0x00

Command: 0x22

PL: 0x0000

Checksum: 0x22

Notice frame definition:

The chip received single polling command, if it could read the CRC correct tag, the MCU will

return data consists of RSSI、PC、EPC and CRC. If it read a EPC of tag will return a

response command, and many tags then many response commands. Such as below:

Header	Type	Command	PL(MSB)	PL(LSB)	RSSI	PC(MSB)	PC(LSB)
BB	02	22	00	11	C9	34	00
EPC(MSB)							
30	75	1F	EB	70	5C	59	04
			EPC(LSB)	CRC(MSB)	CRC(LSB)	Checksum	End
E3	D5	0D	70	3A	76	EF	7E

Frame Type: 0x02

Command: 0x22

PL: 0x0011

RSSI: 0xC9

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

CRC : 0x3A76

Checksum: 0xEF

RSSI is stands for the signal size of the chip input, it's excluding the antenna gain and directional-coupler attenuator etc. RSSI is the signal strength of chip input, it's hexadecimal, the unit is dBm. The above RSSI is 0xC9, stands for the chip input signal strength is -55dBm。

Response command definition

If no tag return or return data CRC parity error, will return the error code 0x15, such as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Parameter	Checksum	End
BB	01	FF	00	01	15	16	7E

Frame Type: 0x01

Command: 0xFF

PL: 0x01

Parameter: 0x15

Checksum: 0x16

Several times polling command:

Command frame definition:

The command require chip MCU go with several times polling Inventory operation, the polling times limitation is 0-65535 times. If the polling times is 10000 times, the command is as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Reserved	CNT(MSB)	CNT(LSB)
BB	00	27	00	03	22	27	10
Checksum	End						
83	7E						

Frame Type: 0x00

Command: 0x27

PL: 0x0003

Reserved: 0x22

CNT: 0x2710

Checksum: 0x83

Notice frame definition

The format of Several times polling Inventory command response frame and single polling Inventory response is the same, such as:

Header	Type	Command	PL(MSB)	PL(LSB)	RSSI	PC(MSB)	PC(LSB)
BB	02	22	00	11	C9	34	00
EPC(MSB)							
30	75	1F	EB	70	5C	59	04
			EPC(LSB)	CRC(MSB)	CRC(LSB)	Checksum	End
E3	D5	0D	70	3A	76	EF	7E

Frame Type: 0x02

Command: 0x27

PL: 0x0011

RSSI: 0xC9

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

CRC : 0x3A76

Checksum: 0xEF

Response frame definition:

It no tag return or return data CRC parity error, it will return the error code 0x15, such as the below:

Header	Type	Command	PL(MSB)	PL(LSB)	Parameter	Checksum	End

BB	01	FF	00	01	15	16	7E

Frame Type: 0x01

Command: 0xFF

PL: 0x01

Parameter: 0x15

Checksum: 0x16

Stop several times frame command

Command frame definition

During the chip internal MCU is operated several times polling procedure, could stop the several times polling operation, not the pause stop, the command is as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Checksum	End
BB	00	28	00	00	28	7E

Frame Type: 0x00

Command: 0x28

PL: 0x0000

Checksum: 0x28

Response frame command definition:

If stop the several times polling command operated successfully, the firmware will response as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Parameter	Checksum	End
BB	01	28	00	01	00	2A	7E

Frame Type: 0x01

Command: 0x28

PL: 0x0001

Parameter: 0x00

Checksum: 0x2A

Set Select parameter command

Command frame definition:

Set Select parameter, and set the Select mode to be 0x02. To send Select command before operating the polling. And if multi-tags, then could do polling, read and writing only for special tags according to the Select parameter. Such as:

Header	Type	Command	PL(MSB)	PL(LSB)	SelParam	Ptr(MSB)	
BB	00	0C	00	13	01	00	00
	Ptr(LSB)	MaskLen	Truncate	Mask(MSB)			
00	20	60	00	30	75	1F	EB
							Mask(LSB)
70	5C	59	04	E3	D5	0D	70
Checksum	End						
AD	7E						

Frame Type: 0x00

Command: 0x0C

PL：0x0013

SelParam: 0x01 (Target: 3'b000, Action: 3'b000, MemBank: 2'b01)

Ptr: 0x00000020(unit is bit, not word) start from EPC bit.

Mask Length: 0x60(6 words, 96bits)

Whether Truncate or not: 0x00(0x00 is Disable truncation, 0x80 is Enable truncation)

Mask: 0x30751FEB705C5904E3D50D70

Checksum: 0xAD

SelParam is with Byte，and Target owns 3bits, Action owns the 3bits in middle, MemBank owns the last 2bits.

MemBank definition as below:

2'b00: RFU data storage area of tag.

2'b00: EPC data storage area of tag.

2'b00: TID data storage area of tag.

2'b00: User data storage area of tag.

Target and Action detail definition, please check EPC Gen2 protocol.

When Select Mask length is longer than 80 bits(5 words), send Select command to set all tags under Inventoried Flag with A，SL Fla with ~SL condition. Then operate based on Action have been chosen. When Select Mask length is shorter than 80 bits(5 words), it will not appear the situation above mentioned.

Response frame definition:

When the Select parameter set successfully, the firmware return as the below showed:

Header	Type	Command	PL(MSB)	PL(LSB)	Data	Checksum	End
BB	01	0C	00	01	00	0E	7E

Frame Type: 0x01

Command: 0x0C

PL: 0x0001

Data: 0x00

Checksum: 0x0E

Set Select mode

Command frame definition:

If the Select parameter set successfully already, operate the command will set the Select mode. For example, if want to cancel the Select command:

Header	Type	Command	PL(MSB)	PL(LSB)	Mode	Checksum	End

BB	00	12	00	01	01	14	7E

Frame Type: 0x00

Command: 0x12

PL: 0x0001

Command parameter, Select mode: 0x01

Checksum: 0x14

Select Mode definition:

0x00: to choose the special tags through sending Select command before all opearations.

0x01: No sending Select command before tags operation.

0x02: only send Select command before tag operation(excluding the several times polling Inventory tags), such as

Before Reading, Writing, Locking, Killing, will choose the special tags through Select.

Response frame definition:

When cancel or send Select command successfully, the firmware return as the following:

Header	Type	Command	PL(MSB)	PL(LSB)	Data	Checksum	End
BB	01	0C	00	01	00	0E	7E

Frame Type: 0x01

Command: 0x0C

PL: 0x0001

Data: 0x00(operate successfully)

Checksum: 0x0E

Read data storage area of tag

Command frame definition:

For single tag, read the appointed address and length data in the memory bank of tag data storage area. Read the tag data area address offset SA and tag data storage length DL, their unit is Word, is 2Byte/16 Bits. And before this command, need set Select parameter to make

choose appointed tag to write available. If Access Password are all"0", then it will not send Access command.

Header	Type	Command	PL(MSB)	PL(LSB)	AP(MSB)		
BB	00	39	00	09	00	00	FF
AP(LSB)	MemBank	SA(MSB)	SA(LSB)	DL(MSB)	DL(LSB)	Checksum	End
FF	03	00	00	00	02	45	7E

Frame Type: 0x00

Command: 0x39

PL：0x0009

Access Password: 0x0000FFFF

MemBank: 0x03(User area)

Tag data area address offset SA: 0x0000

tag data storage length DL: 0x0002

Checksum: 0x45

Response frame definition:

Read the appointed tag data storage area, and parity CRC is correct, then return as the below:

Header	Type	Command	PL(MSB)	PL(LSB)	UL	PC(MSB)	PC(LSB)
BB	01	39	00	13	0E	34	00
EPC(MSB)							
30	75	1F	EB	70	5C	59	04
			EPC(LSB)	Data(MSB)			Data(LSB)
E3	D5	0D	70	12	34	56	78
Checksum	End						

B0	7E						

Frame Type: 0x01

Command: 0x39

PL: 0x0013

opearate tag PC+EPC length UL: 0x0E

operate PC: 0x3400

operate EPC: 0x30751FEB705C5904E3D50D70

Return Data: 0x12345678

Checksum: 0xB0

If the tag is not in the appointed zone or appointed EPC is wrong, will return error code 0x09, such as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	Checksum	End
BB	01	FF	00	01	09	0A	7E

Frame Type: 0x01

Command: 0xFF

PL: 0x0001

Error Code: 0x09

Checksum: 0x0A

If Access Password is wrong, then the return error code is 0x16, and will return the PC+EPC that operated, such as:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	UL	PC(MSB)
BB	01	FF	00	10	16	0E	34
PC(LSB)	EPC(MSB)						
00	30	75	1F	EB	70	5C	59

				EPC(LSB)	Checksum	End	
04	E3	D5	0D	70	75	7E	

Frame Type: 0x01

Command: 0xFF

PL: 0x0010

Error Code: 0x16

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Checksum: 0x75

If the operate tag return the Erroe codes ruled by EPC Gen2 protocol, the response frame will return the error codes returned or after 0xA0. Because the error codes ruled by EPC Gen2 is valid only with 4bits.

For example if the address offset or data length in command parameter sent is not correct, the data reading length is longer than tag data storage length, according to the EPC Gen2 protocol, the tag will return error code 0x03(storage area is over Memory Overrun). The response frame will return the error code 0xA3 and back to the PC+EPC of the operated tag, such as:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	UL	PC(MSB)
BB	01	FF	00	10	A3	0E	34
PC(LSB)	EPC(MSB)						
00	30	75	1F	EB	70	5C	59
				EPC(LSB)	Checksum	End	
04	E3	D5	0D	70	02	7E	

Frame Type: 0x01

Command: 0xFF

PL: 0x0010

Error Code: 0xA3

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Checksum: 0x02

Write Data storage area of tag

Command frame definition:

For single tag, read the appointed address and length data in the memory bank of tag data storage area. Read the tag data area address offset SA and tag data storage length DL, their unit is Word, is 2Byte/16 Bits. And before this command, need set Select parameter to make choose appointed tag to write available. If Access Password are all"0", then it will not send Access command.

Data length is shorter than 30words(64bytes/512bits) that be written to the data storage area, it means.

Header	Type	Command	PL(MSB)	PL(LSB)	AP(MSB)		
BB	00	49	00	0D	00	00	FF
AP(LSB)	MemBank	SA(MSB)	SA(LSB)	DL(MSB)	DL(LSB)	DT(MSB)	
FF	03	00	00	00	02	12	34
	DT(LSB)	Checksum	End				
56	78	6D	7E				

Frame Type: 0x00

Command code: 0x39

PL: 0x000D

Access Password: 0x0000FFFF

MemBank: 0x03

Tag data storage offset SA: 0x0000

DL: 0x0002

DT: 0x12345678

Checksum: 0x6D

Response frame definition:

After writing the data to the tag data storage area, if the reader chip receive the tag return data correct, the response frame will be as the following:

Header	Type	Command	PL(MSB)	PL(LSB)	UL	PC(MSB)	PC(LSB)
BB	01	49	00	10	0E	34	00
EPC(MSB)							
30	75	1F	EB	70	5C	59	04
			EPC(LSB)	Parameter	Checksum	End	
E3	D5	0D	70	00	A9	7E	

Frame Type: 0x01

Command: 0x49

PL: 0x0010

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Parameter: 0x00(operated successfully)

Checksum: 0xA9

If the tag is not in the appointed area or appointed EPC code is wrong, the return error code will be 0x10, such as the below:

Header	Type	Command	PL(MSB)	PL(LSB)	Parameter	Checksum	End
BB	01	FF	00	01	10	0A	7E

Frame Type: 0x01

Command: 0xFF

PL: 0x0001

Parameter: 0x10

Checksum: 0x0A

If Access Password is wrong, the return error code is 0x16, and back to the PC+EPC of the operated tag, such as the following:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	UL	PC(MSB)
BB	01	FF	00	10	16	0E	34
PC(LSB)	EPC(MSB)						
00	30	75	1F	EB	70	5C	59
				EPC(LSB)	Checksum	End	
04	E3	D5	0D	70	75	7E	

Frame Type: 0x01

Command: 0xFF

PL: 0x0016

Error Code: 0x16

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Checksum: 0x75

If the operate tag return the Erroe codes ruled by EPC Gen2 protocol, the response frame will
 return the error codes returned or after 0xB0.

For example if the address offset or data length in command parameter sent is not correct, the data writing length is longer than tag data storage length, according to the EPC Gen2 protocol, the tag will return error code 0x03(storage area is over Memory Overrun). The response frame will return the error code 0xB3 and back to the PC+EPC of the operated tag, such as:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	UL	PC(MSB)
BB	01	FF	00	10	B3	0E	34
PC(LSB)	EPC(MSB)						
00	30	75	1F	EB	70	5C	59
				EPC(LSB)	Checksum	End	
04	E3	D5	0D	70	12	7E	

Frame Type: 0x01

Command: 0xFF

PL: 0x0010

Error Code: 0xB3

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Checksum: 0x12

Lock data storage of tag

Command frame definition:

For single tag, Lock or Unlock its data storage area. Before sending the command, you need set Select parameter to choose the appointed tag to do the lock operation. For example, if you need lock Access Password, the command is as the following:

Header	Type	Command	PL(MSB)	PL(LSB)	AP(MSB)		
BB	00	82	00	07	00	00	FF

AP(LSB)	LD(MSB)		LD(LSB)	Checksum	End		
FF	02	00	80	09	7E		

Frame Type: 0x00

Command: 0x82

PL: 0x0007

Access Password: 0x0000FFFF

Lock operate data LD: 0x020080

Checksum: 0x09

The high 4bit of the Lock operate parameter LD is the remain bit, the last 20bits is the payload of Lock.(including Mask and Action, each be 10 bits from the high to the low by turns). More details please operate according to the Chapter 6.3.2.11.3.5 of EPC Gen2 protocol 1.2.0 version.

Mask is a mask off code, the Active will be valid only with the mask bit is 1. The active of each data area have 2 bits, 00~11, it's the under the turns to be open, permanent open, lock, permanent lock.

For example, Kill Mask is 2bits 00. No matter what's the Kill Action, Kill Action will not take effect. When the Kill Mask is 2bits 10, stands for the Kill Password is Locked (No Perma Lock), only could be read through effective Access Password.

The bit's definition of Mask and Action is as the following:

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		User Mask		Kill Action		Access Action		EPC Action		TID Action		User Action	

Masks and Associated Action Fields

	Kill pwd		Access pwd		EPC memory		TID memory		User 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

pwd-write	permalock	Description
0	0	Associated memory bank is writeable from either the **open** or **secured** states.
0	1	Associated memory bank is permanently writeable from either the **open** or **secured** states and may never be locked.
1	0	Associated memory bank is writeable from the **secured** state but not from the **open** state.
1	1	Associated memory bank is not writeable from any state.
pwd-read/write	permalock	Description
0	0	Associated password location is readable and writeable from either the **open** or **secured** states.
0	1	Associated password location is permanently readable and writeable from either the **open** or **secured** states and may never be locked.
1	0	Associated password location is readable and writeable from the **secured** state but not from the **open** state.
1	1	Associated password location is not readable or writeable from any state.

Response frame definition:

If Lock command operate correct, the tag return is valid, and the response frame is as the below:

Header	Type	Command	PL(MSB)	PL(LSB)	UL	PC(MSB)	PC(LSB)
BB	01	82	00	10	0E	34	00
EPC(MSB)							
30	75	1F	EB	70	5C	59	04
			EPC(LSB)	Parameter	Checksum	End	
E3	D5	0D	70	00	E2	7E	

Frame Type: 0x01

Command: 0x82

PL: 0x0010

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Parameter: 0x00(operate successfully)

Checksum: 0xE2

If the tag is not in the area or appointed EPC code is wrong, will return the error code 0x13, such as below:

Header	Type	Command	PL(MSB)	PL(LSB)	Parameter	Checksum	End
BB	01	FF	00	01	13	14	7E

Frame Type: 0x01

Command: 0xFF

PL: 0x0001

Parameter: 0x13

Checksum: 0x14

If the Access Password is not correct, the return error code is 0x16, and back to the PC+EPC of the operate tag, such as the below:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	UL	PC(MSB)
BB	01	FF	00	10	16	0E	34
PC(LSB)	EPC(MSB)						
00	30	75	1F	EB	70	5C	59
				EPC(LSB)	Checksum	End	
04	E3	D5	0D	70	75	7E	

Frame Type: 0x01

Command: 0xFF

PL: 0x0016

Error Code: 0x16

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Checksum: 0x75

If the operate tag return the error codes ruled by EPC Gen2 protocol, and response frame will return the error code or return after 0xC0.

For example, if the TID have been permanent locked, and Set the TID underopen situation through Lock command. According to EPC Gen2 protocol, the tag will return error code 0x04(storage area locked, Memory Locked). Then response frame return error code 0xC4, and back to PC+EPC of operated tag, such as:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	UL	PC(MSB)
BB	01	FF	00	10	C4	0E	34
PC(LSB)	EPC(MSB)						
00	30	75	1F	EB	70	5C	59
				EPC(LSB)	Checksum	End	
04	E3	D5	0D	70	23	7E	

Frame Type: 0x01

Command: 0xFF

PL: 0x0010

Command parameter Error Code: 0xC4

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Checksum: 0x23

Inactivate the tag

Command frame definition:

Before the command, you need set Select parameter to operate the Inactivate for the appointed tags. Inactivate the single tag as the below:

Header	Type	Command	PL(MSB)	PL(LSB)	KP(MSB)		

BB	00	65	00	04	00	00	FF
KP(LSB)	Checksum	End					
FF	67	7E					

Frame Type: 0x00

Command: 0x65

PL: 0x0012

Kill Password: 0x0000FFFF

Checksum: 0x67

Response frame definition:

If the inactivate(kill)command operate successfully, the tag return CRC correct, the response frame is as the below:

Header	Type	Command	PL(MSB)	PL(LSB)	UL	PC(MSB)	PC(LSB)
BB	01	65	00	10	0E	34	00
EPC(MSB)							
30	75	1F	EB	70	5C	59	04
			EPC(LSB)	Parameter	Checksum	End	
E3	D5	0D	70	00	C5	7E	

Frame Type: 0x01

Command: 0x65

PL: 0x0010

PC+EPC length UL:0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Command Parameter: 0x00(operate successfully)

Checksum: 0xC5

If the tag is not in area or appointed EPC code is wrong, will return the error code 0x12, such as the following:

Header	Type	Command	PL(MSB)	PL(LSB)	Parameter	Checksum	End
BB	01	FF	00	01	12	13	7E

Frame Type: 0x01

Command: 0xFF

PL: 0x0001

Parameter: 0x12

Checksum: 0x13

If the operate tag return the error codes ruled by EPC Gen2 protocol, and response frame will return the error code or return after 0xD0.

Note: If tag did not been set with Kill Password, means the Kill Passwordis 0, the tag will not be killed according to the EPC GEN2 protocol. The return error code is 0xD0, such as:

Header	Type	Command	PL(MSB)	PL(LSB)	Error Code	UL	PC(MSB)
BB	01	FF	00	10	D0	0E	34
PC(LSB)	EPC(MSB)						
00	30	75	1F	EB	70	5C	59
				EPC(LSB)	Checksum	End	
04	E3	D5	0D	70	2F	7E	

Frame Type: 0x01

Command: 0xFF

PL: 0x0010

Error Code: 0xD0

PC+EPC length UL: 0x0E

PC: 0x3400

EPC: 0x30751FEB705C5904E3D50D70

Checksum: 0x2F