

UHF RFID Module

RT400

Communication Protocol

CONTROLLED

Version 1.0

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StrongLink

General Format

Command Format

SOF	LEN	CMD	PAYLOAD	*CRC16	EOF
1	EBV	1	-	2	1

Response Format

SOF	LEN	CMD	STATUS	PAYLOAD	*CRC16	EOF
1	EBV	1	1	-	2	1

* CRC16 is optional.

SOF, should be '0xAA'.

LEN, the byte length from <SOF> to <EOF> which are <LEN>,<CMD>,<PAYLOAD>...<CRC16>.

CMD,

BIT	Bit 7	Bit 6	Bit 5	Bit 4	Bit3	Bit2	Bit 1	Bit 0
Description	CRC16 control bit		Command code.					
Function	0 = there is no CRC16 1 = these exists CRC16		See to command sets.					

STATUS,

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit3	Bit 2	Bit 1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 validation fails 0 = CRC16 validation succeeds	NA	NA	See to command sets status.			

PAYLOAD, command data, the maximum length is 512Bytes.

CRC16, calculate CRC16 valua for <LEN>,<CMD>,<STATUS>(for response),<PAYLOAD>.

EOF, should be '0x55'.

Inserted Byte:

If there is a '0x55', '0xAA', '0xFF' between <SOF> and <EOF>, there should be added a '0xFF' ahead of it. This inserted byte is added for avoiding misunderstanding <SOF> and <EOF>, and is not calculated for LEN. Examples see to the appendix.

Command Sets

Command	Code (hex)	Function	mode	RT400
RLM_GET_STATUS	00	Connect/Check connection.	Single	√
RLM_GET_POWER	01	Get RF output power	Single	√
RLM_SET_POWER	02	Set RF output power	Single	√
RLM_GET_FRE	05	Get frequency	Single	√
RLM_SET_FRE	06	Set frequency	Single	√
RLM_GET_VERSION	07	Get version.	Single	√
RLM_INVENTORY	10	Querie a single tag in loop mode	Loop	√
RLM_INVENTORY_ANTI	11	Querie multiple tags in loop mode	Loop	√
RLM_STOP_GET	12	Stop action.	Single	√
RLM_READ_DATA	13	Read data (indicating UII)	Single	√
RLM_WRITE_DATA	14	Write a word (indicating UII)	Single	√
RLM_ERASE_DATA	15	Erase data (indicating UII)	Single	√
RLM_LOCK_MEM	16	Lock MEM (indicating UII)	Single	√
RLM_KILL_TAG	17	Kill tag (indicating UII)	Single	√
RLM_INVENTORY_SINGLE	18	Querie a single tag in single mode.	Single	√
RLM_BLOCK_WRITE_DATA	19	Write multiple words (indicating UII)	Single	√
-	1A-1F	Reserved		
				√
				√
				√
				√
				√
				√
				√
				√
-	27-2F	Reserved		

-	34-37	Reserved		
-	3C-4F	Reserved		
RLM_ENTER_SLEEP	50	Enter sleep mode	Single	√
	51-52	Reserved		
	55	Reserved		
-	59-7F	Reserved		

Command Description

RLM_GET_STATUS

Command

SOF	LEN	CMD	*CRC16	EOF
1	EBV	1	2	1

Response

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

Status Byte Description

BIT	Bit 7 ~ 4	Bit 3 ~ 1	Bit 0
Function	NA	Reserverd	0 = connected successfully

Example

Send Command (hex)	Response (hex)
aa 02 00 55	Success: aa 03 00 00 55
	Failure: no response

RLM_GET_POWER

SOF	LEN	CMD	*CRC16	EOF
1	EBV	1	2	1

Successful Response

SOF	LEN	CMD	STATUS	POWER	*CRC16	EOF
1	EBV	1	1	1	2	1

Failure Response

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

Power Byte Description

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	RF output power (dbm)						

Example

Send Command (hex)	Response (hex)
aa 02 01 55	Success: aa 04 01 00 1a 55
	Failure: no response

RLM_SET_POWER

Command format

SOF	LEN	CMD	OPTION	POWER	*CRC16	EOF
1	EBV	1	1	1	2	1

Response format

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

OPTION Byte Description

OPTION	Bit 7 ~ 0
Description	Must be 0x01

Example

Send Command (hex)	Response (hex)
aa 04 02 01 1a 55	Success: aa 03 02 00 55
	Failure: no response

RLM_GET_FRE

Command format

SOF	LEN	CMD	*CRC16	EOF
1	EBV	1	2	1

Response format

SOF	LEN	CMD	STATUS	FRE MODE	FRE BASE	BF	CN	SPC	FREHO P	*CRC1 6	EOF
1	EBV	1	1	1	1	2	1	1	1	2	1

Example

Send Command (hex)	Response (hex)
aa 02 05 55	Success: aa 0a 05 00 00 01 73 05 10 02 00 55
	Failure: no response

RLM_SET_FRE

Command format

SOF	LEN	CMD	FRE MODE	FRE BASE	BF	CN	SPC	FREHOP	*CRC16	EOF
1	EBV	1	1	1	2	1	1	1	2	1

FREMODE

BIT	Bit7~Bit4	Bit3~Bit0
Function	Reserved	频率工作模式
		0000: 920-925MHz 0001: 840-845MHz 0010: ETSI(860-865MHz) 0011: fixed frequency (default: 922MHz) 0100: Custom. Other: Reserved.

FREBASE

BIT	Bit7~Bit1	Bit0
Function	Reserved	Frequency Base(for jump)
		0: 50 KHz 1: 125 KHz

BF

BIT	Bit15	Bit14~Bit5	Bit4~Bit0
Function	Reserved	Start Frequency (integer)	Start Frequency (decimal)

CN

BIT	Bit7 ~Bit0
Function	The number of signal channels

CN can not be 0.

SPC

BIT	Bit7 ~Bit4	Bit3~Bit0
Function	Reserved	Bandwidth (usually set as 2*FREBASE)

FREHOP

BIT	Bit7 ~Bit2	Bit1~Bit0
Function	Reserved	Frequency jumping method
		00: Random 01: High to low 10: Low to high other: Random

Response format

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

Example

Send Command (hex)	Response (hex)
aa 09 06 00 01 73 05 10 02 00 55	Success: aa 03 06 00 55
	Failure: no response

RLM_INVENTORY(Loop mode)

Command format

SOF	LEN	CMD	*CRC16	EOF
1	EBV	1	2	1

Response format

Enter inventory ACK(first)

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

Inventory respond UII(after above response)

SOF	LEN	CMD	STATUS	UII	*CRC16	EOF
1	EBV	1	1		2	1

Here UII including PC bits and UII.

Status

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserv erd	Reserverd	Reserver d	1: This is ACK response. 0: This is UII response.

Example

Send Command (hex)	Response (hex)	
aa 02 10 55	Success:	ACK response: aa 03 10 01 55
		UII response: aa 07 10 00 08 00 00 01 55 (loop responses)
	Failure:	aa 03 10 01 55 (only ACK response)

RLM_INVENTORY_ANTI(Loop mode)

Command format

SOF	LEN	CMD	Q	*CRC16	EOF
1	EBV	1	1	2	1

Q

Q	Bit 7 ~ Bit 4	Bit 3 ~ Bit 0
Description	Reserved	Q Bit 3 ~ 0

Q is 3 for common use, maximum detect $2^{(3+1)}=16$ tags.

ACK response

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

UII response

SOF	LEN	CMD	STATUS	UII	*CRC16	EOF
1	EBV	1	1		2	1

Status

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserver d	Reserve rd	Reserv erd	1: This is ACK response 0: This is UII response

Example

Send Command (hex)	Response (hex)	
aa 03 11 03 55	Success:	ACK response: aa 03 11 01 55
		UII response: aa 07 11 00 08 00 00 01 55 (loop responses)
	Failure:	aa 03 11 01 55 (only ACK response)

RLM_STOP_GET

This command is used for stopping any running command operation. Before a new command input, this command always be called.

Command format

SOF	LEN	CMD	*CRC16	EOF
1	EBV	1	2	1

Response format

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

Status

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserverd	Reserverd	Reserverd	0

Example

Send Command (hex)	Response (hex)
aa 02 12 55	Success: aa 03 12 00 55
	Failure: no response

RLM_READ_DATA

Command format

SOF	LEN	CMD	APWD	BANK	PTR	CNT	UII	*CRC16	EOF
1	EBV	1	4	1	EBV	1		2	1

APWD: Access password.

If it is not Reserved memory, APWD = 0x00000000.

If it is Reserved memory, APWD = ACCESS PASSWORD.

BANK:

Reserved zone, BANK=0x00

UII zone, BANK=0x01

TID zone, BANK=0x02

User zone, BANK=0x03

PTR: Start address.

CNT: Date to be read, unit:WORD (2Bytes),

Response format (CNT!=0)

SOF	LEN	CMD	STATUS	DATA	*CRC16	EOF
1	EBV	1	1	CNT*2	2	1

Response format (CNT=0)

SOF	LEN	CMD	STATUS	DATA_LEN	DATA	*CRC16	EOF
1	EBV	1	1	2	CNT*2	2	1

DATA_LEN is the length of DATA.

Failure response format

SOF	LEN	CMD	STATUS	*ECODE	*CRC16	EOF
1	EBV	1	1	1	2	1

STATUS

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserv ed	Reserv ed	Reserve d	1: there exists ECODE 0: there is no ECODE

Example

Send Command (hex)	Response (hex)
aa 0d 13 00 00 00 00 01 01 01 08 00 00 01 55	Success: aa 05 13 00 08 00 55
	Failure: aa 04 13 81 04 55

RLM_WRITE_DATA

Command format

SOF	LEN	CMD	APWD	BANK	PTR	CNT	DATA	UII	*CRC16	EOF
1	EBV	1	4	1	EBV	1	CNT*2		2	1

APWD: Access password.

BANK:

Reserved zone, BANK=0x00

UII zone, BANK=0x01

TID zone, BANK=0x02

User zone, BANK=0x03

PTR: Start address.

CNT: must be 0x01, because this command can only write a word.

DATA: Date to be written, 1 word(2bytes)

UII: tag's UII

Response format

SOF	LEN	CMD	STATUS	*ECODE	*CRC16	EOF
1	EBV	1	1	1	2	1

STATUS

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reser ved	Reserved	Reserved	1: there exists ECODE 0: there is no ECODE

Example

Send Command (hex)	Response (hex)
aa 0f 14 00 00 00 00 01 01 01 10 00 08 00 00 01 55	Success: aa 03 14 00 55
	Failure: aa 04 14 81 04 55

RLM_ERASE_DATA

Command response

SOF	LEN	CMD	APWD	BANK	PTR	CNT	UII	*CRC16	EOF
1	1	1	4	1	EBV	1		2	1

APWD: Access password.

BANK:

Reserved zone, BANK=0x00

UII zone, BANK=0x01

TID zone, BANK=0x02

User zone, BANK=0x03

PTR: Start address.

CNT: Date to be erased, unit:WORD (2Bytes),

UII: tag's UII

Response format

SOF	LEN	CMD	STATUS	*ECODE	*CRC16	EOF
1	EBV	1	1	1	2	1

STATUS

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserved	Reser ved	Reserve d	1: there exists ECODE 0: there is no ECODE

Example

Send Command	Response
aa 0d 15 00 00 00 00 11 01 01 08 00 00 01 55	Success: aa 03 15 00 55
	Failure: aa 04 15 81 04 55

RLM_LOCK_MEM

Command format

SOF	LEN	CMD	APWD	LOCKDATA	UII	*CRC16	EOF
1	EBV	1	4	3		2	1

APWD: Access password

LOCKDATA: MSB 4 bits reserved, LSB 20 bits are Lock-Command Payload,

Response format

SOF	LEN	CMD	STATUS	*ECODE	*CRC16	EOF
1	EBV	1	1	1	2	1

STATUS

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Descripton	1 =failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserv ed	Reserv ed	Reserve d	1: there exists ECODE 0: there is no ECODE

Example

Send Command	Response
aa 0d 16 00 00 00 00 00 10 04 08 00 00 01 55	Success: aa 03 16 00 55
	Failure: aa 04 16 81 04 55

RLM_KILL_TAG

Command format

SOF	LEN	CMD	KILLPWD	UII	*CRC16	EOF
1	EBV	1	4		2	1

KILLPWD: kill password。 When KILLPWD = , tag can not be killed。

Response format

SOF	LEN	CMD	STATUS	*ECODE	*CRC16	EOF
1	EBV	1	1	1	2	1

STATUS

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserv ed	Reserv ed	Reserve d	1: there exists ECODE 0: thers is no ECODE

Example

Send Command	Response
aa 0a 17 00 00 00 00 08 00 00 01 55	Success: aa 03 17 00 55
	Failure: aa 04 17 81 04 55

RLM_INVENTORY_SINGLE

Command format

SOF	LEN	CMD	*CRC16	EOF
1	EBV	1	2	1

Response format

SOF	LEN	CMD	STATUS	UII	*CRC16	EOF
1	EBV	1	1		2	1

Status

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~1	Bit 0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reserver d	Reserve rd	Reserverd	1: Inventory failure 0: Inventory success

Example

Send Command (hex)	Response (hex)
aa 02 18 55	Success: aa 07 18 00 08 00 00 01 55
	Failure: aa 03 18 01 55

RLM_BLOCK_WRITE_DATA

Command format

SOF	LEN	CMD	APWD	BANK	PTR	CNT	DATA	UII	*CRC16	EOF
1	EBV	1	4	1	EBV	1	CNT*2		2	1

APWD: Access password.

If it is not Reserved memory, APWD = 0x00000000.

If it is Reserved memory, APWD = ACCESS PASSWORD.

BANK:

Reserved zone, BANK=0x00

UII zone, BANK=0x01

TID zone, BANK=0x02

User zone, BANK=0x03

PTR: Start address.

CNT: Date length, can't be set 0, maximum set 220. Unit : word(2bytes)

DATA: Date to be written, 2*CNT bytes.

UII: tag's UII

Success response

SOF	LEN	CMD	STATUS	*CRC16	EOF
1	EBV	1	1	2	1

Failure response

SOF	LEN	CMD	STATUS	*ECODE	WRITED-LEN	*CRC16	EOF
1	EBV	1	1	1	1	2	1

WRITED-LEN, the length of data already written into tag and the unit is byte.

STATUS

BIT	Bit 7	Bit 6	Bit5	Bit 4	Bit 3~2	Bit 1~0
Description	1 = failure 0 = success	1 = CRC16 failure 0 = CRC16 success	Reser ved	Reserve d	Reserv ed	00 : there is no ECODE 01 : there exists ECODE , data written not finished 02 : there is no ECODE, data written not finished

STATUS Bit1~0 is available when Bit 7 = 1.

Example

Send Command (hex)	Response (hex)
aa 17 19 00 00 00 00 03 00 05 11 22 33 44 66	Success: aa 03 19 00 55
77 88 99 10 77 08 00 00 01 55	Failure: aa 03 19 80 55 aa 05 19 81 0b 00 55 或 aa 04 19 82 04 55

Appendix

Inserted Byte Example

- DATA need to be sent (hex): AA 04 55 00 01 55
- DATA sent (hex): AA 04 FF 55 00 01 55
- DATA need to be sent (hex): AA 05 00 00 01 AA 55
- DATA sent (hex): AA 05 00 00 01 FF AA 55
- ◆ DATA need to be sent (hex): AA 06 00 00 01 AA FF 55
- ◆ DATA sent (hex): AA 06 00 00 01 FF AA FF FF 55

About Mode

Loop mode indicates that the operation runs and doesn't stop.

Single mode indicates that the operation just runs once.

The mode doesn't be set additionally. It's the character of a specific command. Some commands belong to loop mode and the others to single mode.

Error codes

Error Code	Error Code (bin)	Error Code	Error
Error-specific	00000000	Other error	Other undefined error
	00000011	Memory overflow	
	00000100	Memory locked	
	00001011	Not enough battery	
Non-specific	00001111	NA	Tag doesn't support Error-specific