IND903 UHF RFID serial Interface protocol

V2.2
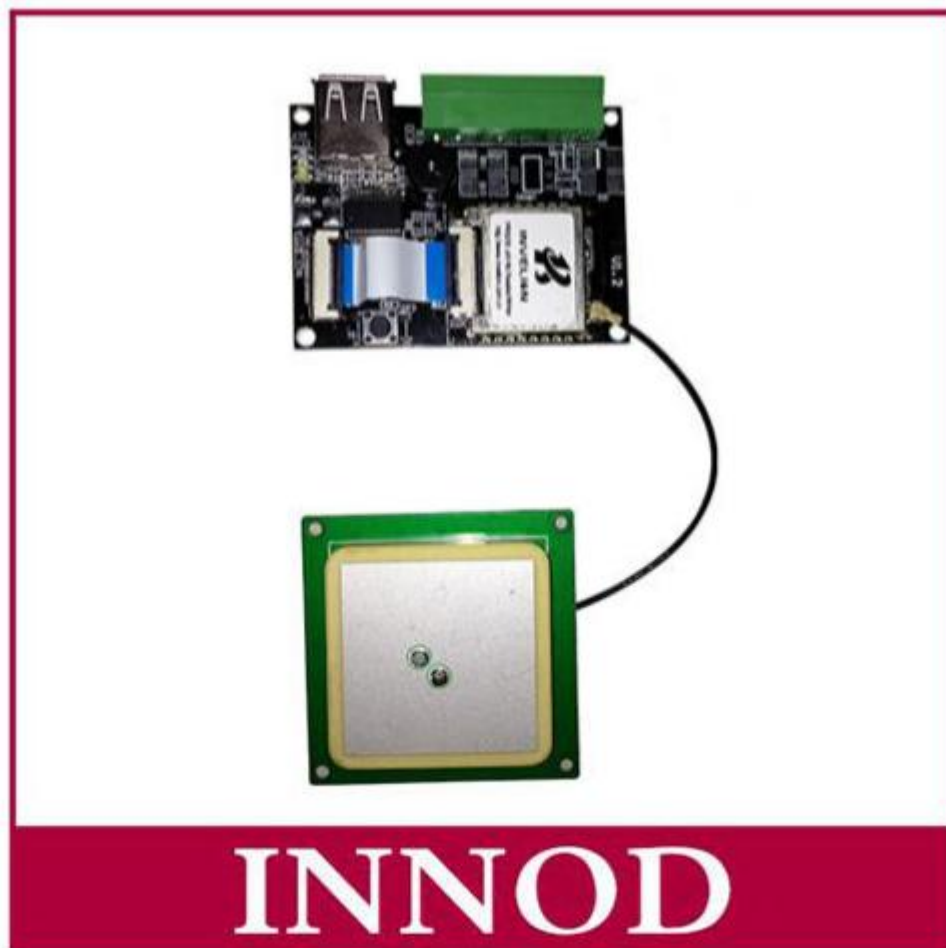
1 Specification of the Data Packet

This protocol is a communication specification for controlling the UHF RFID reader by

host computer via serial interface.

Commands and responses consist of byte streams. The lengths of the streams are variable, and the packets are checked by checksum.

1.1 RS-232 Configuration

The physical interface is compatible with the RS – 232 specifications.

1start bit、8 data bits、1 stop bit、no even odd check..

The baud rates are 9600bps、19200bps、38400bps、115200bps. The default baud rate is 115200bps.

1.2 Data Packet Definition

1.2.1 Host Command Data Packet Definition

Head	Len	Address	Cmd	Data[0…N]	Check
0xA0	1 Byte	1 Byte	1 Byte	N Bytes	1 Byte

Parameter Discription	Head	Head of the packet, every packet starts with 0xA0.
	Len	Length of the packet bytes. Starts from the third byte, the Head, Len bytes are exclusive.
	Address	Reader's address. The common addresses are 0～254(0xFE), 255（0xFF）is the public address. The reader accepts the address of itself and the public address.
	Cmd	Command byte.
	Data[0…N]	Command parameters.
	Check	Checksum. Check all the bytes except itself.

1.2.2 Response Packet Definition

Head	Len	Address	Data[0…N]	Check
0xA0	1 Byte	1 Byte	N Bytes	1 Byte

Parameter Discription	Head	Head of the packet, every packet starts with 0xA0.
	Len	Length of the packet bytes. Starts from the third byte, the Head, Len bytes are exclusive.
	Address	Reader's address.
	Data	Data from the reader.
	Check	Checksum. Check all the bytes except itself.

2 Command Definition

Comprehensive Command Table

ID	Code	Name	Description
Reader Control Commands			
1	0x70	cmd_name_reset	Reset reader.
2	0x71	cmd_name_set_uart_baudrate	Set baud rate of serial port.
3	0x72	cmd_name_get_firmware_version	Get firmware version.
4	0x73	cmd_name_set_reader_address	Set reader's address.
5	0x74	cmd_name_set_work_antenna	Set working antenna.
6	0x75	cmd_name_get_work_antenna	Query current working antenna.
7	0x76	cmd_name_set_output_power	Set RF output power.
8	0x77	cmd_name_get_output_power	Query current RF output power.
9	0x78	cmd_name_set_frequency_region	Set RF frequency spectrum.
10	0x79	cmd_name_get_frequency_region	Query RF frequency spectrum.
11	0x7A	cmd_name_set_beeper_mode	Set reader's buzzer hehavior.
12	0x7B	cmd_name_get_reader_temperature	Check reader's internal temperature.
13	0x7C	cmd_name_set_drm_mode	Set DRM mode.
14	0x7D	Cmd_name_get_drm_mode	Get DRM mode.
15	0x60	cmd_name_read_gpio_value	Get GPIO1, GPIO2 status.
16	0x61	cmd_name_write_gpio_value	Set GPIO3, GPIO4 status.
17	0x62	cmd_name_set_ant_connection_detector	Set antenna detector status.
18	0x63	cmd_name_get_ant_connection_detector	Get antenna detector status.
EPC C1G2 Commands			
19	0x80	cmd_name_inventory	Inventory EPC C1G2 tags to buffer.
20	0x81	cmd_name_read	Read EPC C1G2 tag(s).
21	0x82	cmd_name_write	Write EPC C1G2 tag(s).
22	0x83	cmd_name_lock	Lock EPC C1G2 tag(s).
23	0x84	cmd_name_kill	Kill EPC C1G2 tag(s).
24	0x85	cmd_name_set_access_epc_match	Set tag access filter by EPC.
25	0x86	cmd_name_get_access_epc_match	Query access filter by EPC.

26	0x89	cmd_name_real_time_inventory	Inventory tags in real time mode.
27	0x8A	cmd_name_fast_switch_ant_inventory	Real time inventory with fast ant switch
ISO18000-6B Commands.			
28	0xB0	cmd_name_iso18000_6b_inventory	Inventory 18000-6B tag(s).
29	0xB1	cmd_name_iso18000_6b_read	Read 18000-6B tag.
30	0xB2	cmd_name_iso18000_6b_write	Write 18000-6B tag.
31	0xB3	cmd_name_iso18000_6b_lock	Lock 18000-6B tag data byte.
32	0xB4	cmd_name_iso18000_6b_query_lock	Query lock 18000-6B tag data byte.
Buffer control Commands.			
33	0x90	cmd_name_get_inventory_buffer	Get and clear buffered data.
34	0x91	cmd_name_get_and_reset_inventory_buffer	Get buffered data without clearing.
35	0x92	cmd_name_get_inventory_buffer_tag_count	Query how many tags are buffered.
36	0x93	cmd_name_reset_inventory_buffer	Clear buffer.
37	0x94	cmd_name_set_buffer_data_frame_interval	Set time interval between packets while getting buffered data.
38	0x95	cmd_name_get_buffer_data_frame_interval	Query time interval between packets while getting buffered data.

2.1 Reader Control Commands

2.1.1 cmd_name_reset

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x70	

◆**Succeeded:** No data response, reader resets and restarts. buzzer beep.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x70		
Parameter Description	Error_Code	Error code.			

2.1.2 cmd_name_set_uart_baudrate

Host packet:

Head	Len	Address	Cmd	Baudrate	Check
0xA0	0x04		0x71		
Parameter Description	Baudrate	0x01	9600 bps.		
		0x02	19200 bps.		
		0x03	38400 bps.		
		0x04	115200 bps.		

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x71	command_success	

When reader gets this command right, it responses with previous baud rate, then reader resets. The new baud rate parameter is preserved in the internal flash, won't be lost when power off.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x71		
Parameter Description	Error_Code	Error code.			

2.1.3 cmd_name_get_firmware_version

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x72	

Response packet:

Head	Len	Address	Cmd	Major	Minor	Check
0xA0	0x05		0x72			
Parameter Description	Major	The major firmware version.				
	Minor	The minor firmware version.				

2.1.4 cmd_name_set_reader_address

Host packet:

Head	Len	Address	Cmd	Address	Check
0xA0	0x04		0x73		
Parameter Description	Address	Reader's address, from 0 to 254.			

◆Succeeded:

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x73	command_success	

The new reader address take effect immediately, and preserved in the internal flash, won't be lost when power off.

◆Failed:

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x73		
Parameter Description	Error_Code	Error code.			

2.1.5 cmd_name_set_work_antenna

Host packet:

Head	Len	Address	Cmd	Antenna _ID	Check

0xA0	0x04		0x74		
Parameter Description	Antenna_ID	Working Antenna	0x00	Antenna 1.	
			0x01	Antenna 2.	
			0x02	Antenna 3.	
			0x03	Antenna 4.	

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x74	command_success	

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x74		
Parameter Description	Error_Code	Error code.			

2.1.6 cmd_name_get_work_antenna

Host packet:

Head	Len	Address	Cmd	Check

0xA0	0x03		0x75	

Response packet:

Head	Len	Address	Cmd	Antenna ID	Check
0xA0	0x04		0x75		
Parameter Description	Antenna ID	Current Working Antenna	0x00	Antenna 1.	
			0x01	Antenna 2.	
			0x02	Antenna 3.	
			0x03	Antenna 4.	

2.1.7 cmd_name_set_output_power

Host packet:

Head	Len	Address	Cmd	RF_Power	Check

0xA0	0x04		0x76		
Parameter Description	RF_Power	RF output power, range from 20-33(0x14 – 0x21), the unit is dBm.			

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x76	command_success	

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x76		
Parameter Description	Error_Code	Error code.			

2.1.8 cmd_name_get_output_power

Host packet:

Head	Len	Address	Cmd	Check

0xA0	0x03		0x77	

Response packet:

Head	Len	Address	Cmd	Output_Power	Check
0xA0	0x04		0x77		
Parameter Description	Output_Power		Current RF output power.		

2.1.9 cmd_name_set_frequency_region

Host packet:

Head	Len	Address	Cmd	Region	StartFreq	EndFreq	Check
0xA0	0x06		0x78				
Parameter Description	Region	Spectrum regulation	0x01	FCC			
			0x02	ETSI			
			0x03	CHN			
	StartFreq	Start frequency of the spectrum		Setup the range of the RF output spectrum. The rules are: 1,Start frequency and end frequency should be in the range of the specified regulation. 2,Start frequency should be lower than end frequency. 3, End frequency – start frequency > 4.			
	EndFreq	End frequency of the spectrum					

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x78	command_success	

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x78		
Parameter Description	Error_Code	Error code.			

2.1.10 cmd_name_get_frequency_region

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x79	

Response packet:

Head	Len	Address	Cmd	Region	StartFreq	EndFreq	Check
0xA0	0x06		0x78				
Parameter Description	Region	Spectrum regulation	0x01	FCC.			
			0x02	ETSI.			
			0x03	CHN.			
	StartFreq	Start frequency		Start frequency of the spectrum.			
	EndFreq	End frequency		End frequency of the spectrum.			

2.1.11 cmd_name_set_beeper_mode

Host packet:

Head	Len	Address	Cmd	Mode	Check
0xA0	0x04		0x7A		
Parameter Description	Mode	Buzzer behavior	0x00	Quiet.	
			0x01	Beep after every inventory round if tag(s) identified.	
			0x02	Beep after every tag has identified.	

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x7A	command_success	

If this command succeeded, the value will be stared in the internal flash, won't be lost when power off.

Attention:

Buzzer behavior 0x02(Beep after every tag has identified) occupies CPU process time that affect anti collision algorithm significantly. It is recommended that this option should be used for tag test.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x7A		
Parameter Description	Error_Code	Error code.			

2.1.12 cmd_name_get_reader_temperature

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x7B	

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	PlusMinus	Temp	Check
0xA0	0x05		0x7B			

Parameter Description	PlusMinus	0x00	Plus.
		0x01	Minus.
	Temp	Celsius degree.	

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x7B		

Parameter Description	Error_Code	Error code.

2.1.13 cmd_name_set_drm_mode

Host packet:

Head	Len	Address	Cmd	DrmMode	Check
0xA0	0x04		0x7C		
Parameter Description	DrmMode		0x00	Close DRM.	
			0x01	Open DRM.	

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x7C	command_success	

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x7C		
Parameter Description	Error_Code	Error code.			

2.1.14 cmd_name_get_drm_mode

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x7D	

Response packet:

Head	Len	Address	Cmd	DrmStatus	Check
0xA0	0x04		0x7D		
Parameter Description		DrmStatus	0x00	DRM is closed.	
			0x01	DRM is opened.	

2.1.15 cmd_name_read_gpio_value

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x60	

Response packet:

Head	Len	Address	Cmd	Gpio_1	Gpio_2	Check
0xA0	0x05		0x60			
Parameter Description		Gpio_1	0x00	Gpio1 is low.		
			0x01	Gpio1 is high.		
		Gpio_2	0x00	Gpio2 is low.		
			0x01	Gpio2 is high.		

2.1.16 cmd_name_write_gpio_value

Host packet:

Head	Len	Address	Cmd	Choose_Gpio	Gpio_value	Check

0xA0	0x05		0x61			
Parameter Description	Choose_Gpio	0x03		Set GPIO 3.		
		0x04		Set GPIO 4.		
	Gpio_value	0x00		Set to low level.		
		0x01		Set to high level.		

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x61		
Parameter Description	Error_Code	Error code.			

2.1.17 cmd_name_set_ant_connection_detector

Host packet:

Head	Len	Address	Cmd	DectectorStatus	Check
0xA0	0x04		0x62		
Parameter Description	DectectorStatus	0x00	Close connection detector.		
		0x01	Open connection detector.		

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x62		
Parameter Description	Error_Code	Error code.			

2.1.18 cmd_name_get_ant_connection_detector

Host packet:

Head	Len	Address	Cmd	Check

0xA0	0x03		0x63	

Response packet:

Head	Len	Address	Cmd	DectectorStatus	Check
0xA0	0x04		0x63		
Parameter Description		DectectorStatus	0x00	Connection detector is closed.	
			0x01	Connection detector is opened.	

2.2 EPC C1G2 Commands

2.2.1 cmd_name_inventory

Host packet:

Head	Len	Address	Cmd	Channel	Check
0xA0	0x04		0x80		
Parameter Description	Channel	How many RF carrier's frequency hopping channels are going to be used per inventory round. When Channel = 255, The inventory duration is minimized. For example, if the RF field only has one or two tags, the inventory duration could be only 30-50 mS, this function provides a possibility for fast antenna switch applications on multi-ant devices.			

When reader gets this command, the inventory for EPC GEN2 tags starts, tag data will be stored in the internal buffer.

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Ant_ID	TagCount	ReadRate	Total_Read	Check
0xA0	0x0C		0x80		2 Bytes	2Bytes	4Bytes	
Parameter Description		Ant_ID		Antenna ID just used.				
		TagCount		How many tags have been identified. Tags are differed by EPC, Tags with the same EPC are considered as one. If reader buffer is not cleared, tag count will be added up if reader buffer is not cleared.				
		ReadRate		Tag identification speed (tag/second). Communications from the same tag are counted.				
		Total_Read		Total tag identification count. Communications from the same tag are counted.				

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x80		
Parameter Description	Error_Code		Error code		

2.2.2 cmd_name_read

Host packet:

Head	Len	Address	Cmd	MemBank	WordAdd	WordCnt	Check
0xA0	0x06		0x81				

			0x00	RESERVED.
	MemBank	Tag memory bank	0x01	EPC.
			0X02	TID.
Parameter Description			0X03	USER.
	WordAdd	Read start address	Please see the tag's spec for more information.	
	WordCnt	Read data length	Data length in WORD(16bits) unit. Please see the tag's spec for more information.	

◆**Succeeded:**

Response packet: This command may have multiple response packets, The quantity of response packets equals to the quantity of tags that response.

Head	Len	Address	Cmd	TagCount	DataLen	Data[0…N]	ReadLen	AntID	ReadCount	Check
0xA0			0x81	2 Bytes						

	TagCount	How many tags have been read.16bits.
	DataLen	Length of useful data for a tag. （PC+CRC+EPC+ read data）, unit is byte.
Parameter Description	Data[0…N]	Useful data of the tag. PC (2 bytes) + EPC (bytes) + CRC (2 bytes) + read data.
	ReadLen	Length of read data, unit is byte.
	AntID	The high 6 bits are frequency parameter; the low 2 bits are antenna ID.
	ReadCount	How many times the tag has been successfully read.

Attention: If two tags have the same EPC, but different read data, then these two tags are considered different tags.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x81		

Parameter Description	Error_Code	Error code

2.2.3 cmd_name_write

Host packet:

Head	Len	Address	Cmd	PassWord	MemBank	WordAdd	WordCnt	Data	Check
0xA0			0x82	4 Bytes				WordCnt *2	

	PassWord	Access password, 4 bytes.		
Parameter Description	MenBank	Tag memory bank	0x00	RESERVED
			0x01	EPC
			0x02	TID
			0x03	USER
	WordAdd	Write start address	The unit is WORD(16bits). When write EPC area, notice that EPC starts from address 02, the first two 2 words are for PC+CRC.	
	WordCnt	Write data length	The unit is WORD(16 bits)	

◆**Succeeded:**

Response packet: This command may have multiple response packets, The quantity of response packets equals to the quantity of tags that response.

Head	Len	Address	Cmd	TagCount	DataLen	Data[0…N]	ErrCode	AntID	WriteCount	Check
0xA0			0x82	2 Bytes						

	TagCount	How many tags have been written, 16 bits.
Parameter Description	DataLen	Length of useful data of a tag.（PC+CRC+EPC）. The unit is byte.
	Data[0…N]	Useful data of the tag. PC(2 bytes) + EPC (bytes) + CRC (2bytes)
	ErrCode	Operation result which is Error code.
	AntID	The high 6 bits are frequency parameter; the low 2 bits are antenna ID.
	WriteCount	How many times the tag has been written.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x82		

Parameter Description	Error_Code	Error code

2.2.4 cmd_name_lock

Host packet:

Head	Len	Address	Cmd	PassWord	Menbank	LockType	Check
0xA0	0x09		0x83	4 Bytes			

	PassWord	Access password, 4 bytes.		
	Menbank	Tag memory bank	0x01	User Memory.
			0x02	TID Memory.
Parameter			0x03	EPC Memory.
Description			0x04	Access Password.
			0x05	Kill Password.
	LockType	Lock operation type	0x00	Open.
			0x01	Lock.
			0x02	Permanent open.
			0x03	Permanent lock.

◆**Succeeded:**

Response packet: This command may have multiple response packets, The quantity of response packets equals to the quantity of tags that response.

Head	Len	Address	Cmd	TagCount	DataLen	Data[0…N]	ErrCode	AntID	LockCount	Check
0xA0			0x83	2 Bytes						

	TagCount	How many tags have been locked.16 bits.
	DataLen	Useful data for the tag（PC+CRC+EPC）.The unit is byte.
Parameter Description	Data[0…N]	Useful data of the tag. PC(2 bytes) ＋ EPC (bytes) ＋ CRC (2bytes)
	ErrCode	Operation result which is Error code.
	AntID	The high 6 bits are frequency parameter; the low 2 bits are antenna ID.
	LockCount	How many times the tag has been locked.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x83		

Parameter Description	Error_Code	Error code

2.2.5 cmd_name_kill

Host packet:

Head	Len	Address	Cmd	PassWord	Check
0xA0	0x07		0x84	4 Bytes	

	Parameter Description	PassWord	Kill password

◆**Succeeded:**

Response packet: This command may have multiple response packets, The quantity of response packets equals to the quantity of tags that response.

Head	Len	Address	Cmd	TagCount	DataLen	Data[0…N]	ErrCode	AntID	KillCount	Check
0xA0			0x84	2 Bytes						

Parameter Description	TagCount	How many tags have been killed.16bits.
	DataLen	Useful data for the tag（PC+CRC+EPC）.The unit is byte.
	Data[0…N]	Useful data of the tag. PC(2 bytes)　+ EPC (bytes)　+ CRC (2bytes).
	ErrCode	Operation result which is Error code.
	AntID	The high 6 bits are frequency parameter, the low 2 bits are antenna ID.
	KillCount	In this case, this byte only can be 1, because a tag only can be killed once.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x84		
Parameter Description	Error_Code	Error code.			

2.2.6 cmd_name_set_access_epc_match

Host packet:

Head	Len	Address	Cmd	Mode	EpcLen	Epc	Check
0xA0			0x85				

Parameter Description	Mode	0x00	Set EPC match effective.
		0x01	Clear EPC match.
	EpcLen	Length of EPC.	
	Epc	EPC, Length equals EpcLen.	

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x85		

Parameter Description	Error_Code	Error code.

2.2.7 cmd_name_get_access_epc_match

Host packet:

Head	Len	Address	Cmd	Check
0xA0			0x86	

Response packet:

Head	Len	Address	Cmd	Status	EpcLen	EPC	Check
0xA0			0x86				

Parameter Description	Status	0x00	EPC match is effective.
		0x01	EPC match is not effective.
	EpcLen	The length of the EPC which EPC match is effective, if EPC match is not effective, this byte doesn't return from reader.	
	EPC	The EPC which EPC match is effective, if EPC match is not effective, this byte doesn't return from reader.	

2.2.8 cmd_name_real_time_inventory

Host packet:

Head	Len	Address	Cmd	Channel	Check
0xA0	0x04		0x89		

Parameter Description	Channel	How many RF carrier frequency hopping channels are going to be used per inventory round.

When reader gets this command, the inventory for EPC GEN2 tags starts, tag data will **NOT** be stored in the internal buffer. The tag data is transferred in real time.

The anti collision ability of is command is not as good as cmd_name_real_time_inventory, but user can get tag data instantly, and tag RSSI, carrier frequency can also be updated in real time.

Attention: Please make sure the baud rate of the serial port has been set to 115200 bps, slower serial port speed can significantly reduce the efficiency of the anti collision algorithm.

If there is(are) tag(s), reader responses below packets(multiple).

Head	Len	Address	Cmd	Freq_Ant	PC	EPC	RSSI	Check
0xA0			0x89		2 bytes	N bytes		

Parameter Description	Freq_Ant	The high 6 bits are frequency parameter; the low 2 bits are antenna ID.
	PC	Tag's PC. 2 bytes.
	EPC	Tag's EPC.
	RSSI	The RSSI when tag is identified.

After that, the command response is:

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Ant_ID	Total_Read	Check
0xA0	0x08		0x89		4 bytes	

Parameter Description	Ant_ID	The antenna ID of this inventory round.
	Total_Read	Total tag identification count. Communications from the same tag are counted.

◆**Failed:**

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x89		

Parameter Description	Error_Code	Error code.

2.2.9 cmd_name_fast_switch_ant_inventory

Host packet:

Head	Len	Address	Cmd	First_Ant	Second_Ant	Thrid_Ant	Fourth_Ant	Repeat	CC
0xA0	0x08		0x8A						
Parameter		First_Ant		First working ant (00 – 03). If set this byte above 03 means ignore it.					

Description	Second_Ant	Second working ant (00 – 03). If set this byte above 03 means ignore it.
	Third_Ant	Third working ant (00 – 03). If set this byte above 03 means ignore it.
	Fourth_Ant	Fourth working ant (00 – 03). If set this byte above 03 means ignore it.
	Repeat	Repeat the inventory with above ant switch sequence.

When reader gets this command, the inventory for EPC GEN2 tags starts, tag data will **NOT** be stored in the internal buffer. The tag data is transferred in real time.

Meanwhile, the inventory duration is minimized in order to switch to the next antenna as soon as possible. If there's no tag ,or only one or two tags in the RF field, the inventory duration on one antenna could be around 30mS. If there are more tags, the inventory duration on one antenna will increase. This command is an ideal solution for fast antenna switch applications on multi ant devices.

Attention: Please make sure the baud rate of the serial port has been set to 115200 bps, slower serial port speed can significantly reduce the efficiency of the anti collision algorithm.

If there is(are) tag(s), reader responses below packets(multiple).

Head	Len	Address	Cmd	Freq_Ant	PC	EPC	RSSI	Check
0xA0			0x8A		2 bytes	N bytes		

Parameter Description	Freq_Ant	The high 6 bits are frequency parameter; the low 2 bits are antenna ID.
	PC	Tag's PC. 2 bytes.
	EPC	Tag's EPC.
	RSSI	The RSSI when tag is identified.

If the antenna detector is on , and antenna is not well connected, you might get below data package:

Head	Len	Address	Cmd	Ant_ID	Error_Code	Check
0xA0	0x05		0x8A		0x22	

Parameter Description	Ant_ID	Unconnected antenna ID(00 – 03).
	Error_Code	0x22, error code for antenna is missing.

After that, the command response is:

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Total_Read	Command_Duration	Check
0xA0	0x0B		0x8A	4 bytes	4 bytes	

Parameter Description	Total_Read	How many tag data have been sent. an integer is stored in 4 bytes, high bits are aligned to the left.

	Command_Duration	Command duration in millisecond, an integer is stored in 4 bytes, high bits are aligned to the left.

◆**Failed:**

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x8A		

Parameter Description	Error_Code	Error code.

2.3 ISO 18000-6B Commands

2.3.1 cmd_name_iso18000_6b_inventory

Host packet:

Head	Len	Address	Cmd	Check

0xA0	0x03		0xB0	

When reader gets this command , the inventory for EPC GEN2 tags starts, tag data will **NOT** be stored in the internal buffer. The tag data is transferred in real time.

If there is(are) tag(s), reader responses below packets(multiple).

Head	Len	Address	Cmd	Ant_ID	UID	Check
0xA0	0x0C		0xB0		8 bytes	

Parameter	Ant_ID	Antenna ID.
Description	UID	ISO 18000-6B tag UID (8 bytes).

After that, the command response is:

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Ant_ID	Tag_found	Check
0xA0	0x05		0xB0			

Parameter	Ant_ID	The antenna ID of this inventory round.
Description	Tag_found	How many unique tags are found.

◆**Failed:**

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0xB0		

Parameter Description	Error_Code	Error code

2.3.2 cmd_name_iso18000_6b_read

Host packet:

Head	Len	Address	Cmd	UID	Start_Address	Length	Check
0xA0	0x0D		0xB1	8 bytes			

Parameter	UID	The UID of the tag which is being read.

Description	Start_address	Start address for read.
	Length	Read data length.

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Ant_ID	Data	Check
0xA0			0xB1		N bytes	

Parameter	Ant_ID	The antenna ID of this read operation.
Description	Data	Read data.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0xB1		

Parameter Description	Error_Code	Error code.

2.3.3 cmd_name_iso18000_6b_write

Host packet:

Head	Len	Address	Cmd	UID	Start_Address	Length	Data	Check
0xA0			0xB2				N bytes	

	UID	The UID of the tag which is being written.
	Start_address	Start address for write.
	Length	Write data length.

	Data	Data to be written.

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Ant_ID	Written_Count	Check
0xA0	0x05		0xB2			

Parameter Description	Ant_ID	The antenna ID of this read operation.
	Written_Count	How many bytes have been successfully written.

Attention: This command can write multiple bytes once. But when a byte is failed to write, the following bytes won't be written. Then the response packet returns the quantity of successfully written bytes.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0xB2		

Parameter Description	Error_Code	Error code.

2.3.4 cmd_name_iso18000_6b_lock

Host packet:

Head	Len	Address	Cmd	UID	Lock_Address	Check
0xA0	0x0C		0xB3	8 bytes		

Parameter Description	UID	The UID of the tag which is being locked.
	Lock_address	The address to be locked.

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Ant_ID	Status	Check
0xA0	0x05		0xB3			
Parameter Description	Ant_ID	The antenna ID of this read operation.				
	Status	0x00			The byte is successfully locked.	
		0xFE			The byte is already locked.	
		0xFF			The byte can't be locked.	

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0xB3		
Parameter Description	Error_Code	Error code.			

2.3.5 cmd_name_iso18000_6b_query_lock

Host packet:

Head	Len	Address	Cmd	UID	Query_Address	Check
0xA0	0x0C		0xB4	8 bytes		
Parameter	UID	The UID of the tag which is being locked.				

Description	Query_address	The address to be queried.

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	Ant_ID	Status	Check
0xA0	0x05		0xB4			

Parameter Description	Ant_ID	The antenna ID of this read operation.	
	Status	0x00	The byte is not locked.
		0xFE	The byte is locked.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0xB4		

Parameter Description	Error_Code	Error code.

2.4 Buffer Operation Commands

2.4.1 cmd_name_get_inventory_buffer

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x90	

◆**Succeeded:**

Response packet: This command may have multiple response packets, the quantity of response packets equals to the quantity of tags that stored.

Head	Len	Address	Cmd	TagCount	DataLen	Data[0…N]	RSSI	FREQ	Freq_Ant	InvCount	Check
0xA0			0x90	2 Bytes							

Parameter Description			
	TagCount	How many tags are stored. 16bits.		
	DataLen	Length of useful data for a tag.（PC+CRC+EPC）, unit is byte.		
	Data[0…N]	Useful data of the tag. PC (2 bytes) + EPC (bytes) + CRC (2 bytes)		
	RSSI	The RSSI of the tag that has been identified in the first time.		
	Freq_Ant	The high 6 bits are frequency parameter; the low 2 bits are antenna ID.		
	InvCount	How many time the tag has been successfully identified. If the value is 0xFF, that means the identification time is equal or greater than 255.		

The data in the buffer won't be lost after execution of this command.
If the cmd_name_inventory is executed again, the tag data escalate in the buffer.

Attention;
Other EPC C1G2 commands can clear the buffer.

◆**Failed:**

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x90		
Parameter Description	Error_Code	Error code.			

2.4.2 cmd_name_get_and_reset_inventory_buffer

Please see cmd_name_get_inventory_buffer command.
After execution of this command , the buffer is cleared.

2.4.3 cmd_name_get_inventory_buffer_tag_count

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x92	

◆**Succeeded:**

Response packet:

Head	Len	Address	Cmd	TagCount	Check
0xA0	0x05		0x92	2 Bytes	
Parameter Description	TagCount	How many tags are stored.			

2.4.4 cmd_name_reset_inventory_buffer

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x93	

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x93	command_success	

2.4.5 cmd_name_set_buffer_data_frame_interval

Host packet:

Head	Len	Address	Cmd	Interval	Check
0xA0	0x04		0x94		

Parameter Description	Interval	When get data from buffer, this parameter determines the interval between two packets. The default value is set to 10 ms.

Response packet:

Head	Len	Address	Cmd	Error_Code	Check
0xA0	0x04		0x94		

2.4.6 cmd_name_get_buffer_data_frame_interval

Host packet:

Head	Len	Address	Cmd	Check
0xA0	0x03		0x95	

Response packet:

Head	Len	Address	Cmd	Interval	Check
0xA0	0x04		0x95		

Parameter Description	Interval	The interval between two packets when transfer the buffer data.

3 Error code

序号	Code	Name	Description
1	0x10	command_success	Command succeeded.
2	0x11	command_fail	Command failed.
3	0x20	mcu_reset_error	CPU reset error.

4	0x21	cw_on_error	Turn on CW error.
5	0x22	antenna_missing_error	Antenna is missing.
6	0x23	write_flash_error	Write flash error.
7	0x24	read_flash_error	Read flash error.
8	0x25	set_output_power_error	Set output power error.
9	0x31	tag_inventory_error	Error occurred when inventory.
10	0x32	tag_read_error	Error occurred when read.
11	0x33	tag_write_error	Error occurred when write.
12	0x34	tag_lock_error	Error occurred when lock.
13	0x35	tag_kill_error	Error occurred when kill.
14	0x36	no_tag_error	There is no tag to be operated.
15	0x37	inventory_ok_but_access_fail	Tag Inventoried but access failed.
16	0x38	buffer_is_empty_error	Buffer is empty.
17	0x40	access_or_password_error	Access failed or wrong password.
18	0x41	parameter_invalid	Invalid parameter.
19	0x42	parameter_invalid_wordCnt_too_long	WordCnt is too long.
20	0x43	parameter_invalid_membank_out_of_range	MemBank out of range.
21	0x44	parameter_invalid_lock_region_out_of_range	Lock region out of range.
22	0x45	parameter_invalid_lock_action_out_of_range	LockType out of range.
23	0x46	parameter_reader_address_invalid	Invalid reader address.
24	0x47	parameter_invalid_antenna_id_out_of_range	Antenna_id out of range.
25	0x48	parameter_invalid_output_power_out_of_range	Output power out of range.
26	0x49	parameter_invalid_frequency_region_out_of_range	Frequency region out of range.
27	0x4A	parameter_invalid_baudrate_out_of_range	Baud rate out of rage.
28	0x4B	parameter_beeper_mode_out_of_range	Buzzer behavior out of rage.
29	0x4C	parameter_epc_match_len_too_long	EPC match is too long.
30	0x4D	parameter_epc_match_len_error	EPC match length wrong.
31	0x4E	parameter_invalid_epc_match_mode	Invalid EPC match mode.

32	0x4F	parameter_invalid_frequency_range	Invalid frequency rage.
33	0x50	fail_to_get_RN16_from_tag	Failed to receive RN16 from tag.
34	0x51	parameter_invalid_drm_mode	Invalid DRM mode.
35	0x52	pll_lock_fail	PLL can not lock.
36	0x53	rf_chip_fail_to_response	No response from RF chip.
37	0x54	fail_to_achieve_desired_output_power	Can't achieve desired output power level.
38	0x55	copyright_authentication_fail	Can't authenticate firmware copyright.
39	0x56	spectrum_regulation_error	Spectrum regulation wrong.
40	0x57	output_power_too_low	Output power is too low.

4 Frequency Parameter Reference Table

Freq Para	Corresponding Frequency	Freq Para	Corresponding Frequency
0(0x00)	865.00 MHz	30(0x1E)	913.50 MHz
1(0x01)	865.50 MHz	31(0x1F)	914.00 MHz
2(0x02)	866.00 MHz	32(0x20)	914.50 MHz
3(0x03)	866.50 MHz	33(0x21)	915.00 MHz

4(0x04)	867.00 MHz	34(0x22)	915.50 MHz
5(0x05)	867.50 MHz	35(0x23)	916.00 MHz
6(0x06)	868.00 MHz	36(0x24)	916.50 MHz
7(0x07)	902.00 MHz	37(0x25)	917.00 MHz
8(0x08)	902.50 MHz	38(0x26)	917.50 MHz
9(0x09)	903.00 MHz	39(0x27)	918.00 MHz
10(0x0A)	903.50 MHz	40(0x28)	918.50 MHz
11(0x0B)	904.00 MHz	41(0x29)	919.00 MHz
12(0x0C)	904.50 MHz	42(0x2A)	919.50 MHz
13(0x0D)	905.00 MHz	43(0x2B)	920.00 MHz
14(0x0E)	905.50 MHz	44(0x2C)	920.50 MHz
15(0x0F)	906.00 MHz	45(0x2D)	921.00 MHz
16(0x10)	906.50 MHz	46(0x2E)	921.50 MHz
17(0x11)	907.00 MHz	47(0x2F)	922.00 MHz
18(0x12)	907.50 MHz	48(0x30)	922.50 MHz
19(0x13)	908.00 MHz	49(0x31)	923.00 MHz
20(0x14)	908.50 MHz	50(0x32)	923.50 MHz
21(0x15)	909.00 MHz	51(0x33)	924.00 MHz
22(0x16)	909.50 MHz	52(0x34)	924.50 MHz
23(0x17)	910.00 MHz	53(0x35)	925.00 MHz
24(0x18)	910.50 MHz	54(0x36)	925.50 MHz
25(0x19)	911.00 MHz	55(0x37)	926.00 MHz
26(0x1A)	911.50 MHz	56(0x38)	926.50 MHz
27(0x1B)	912.00 MHz	57(0x39)	927.00 MHz
28(0x1C)	912.50 MHz	58(0x3A)	927.50 MHz
29(0x1D)	913.00 MHz	59(0x3B)	928.00 MHz

5 RSSI Parameter Reference Table

RSSI Para	Corresponding Signal Strength	RSSI Para	Corresponding Signal Strength
98(0x62)	-31dBm	64(0x40)	-66dBm
97(0x61)	-32dBm	63(0x3F)	-67dBm
96(0x60)	-33dBm	62(0x3E)	-68dBm
95(0x5F)	-34dBm	61(0x3D)	-69dBm

94(0x5E)	-35dBm	60(0x3C)	-70dBm
93(0x5D)	-36dBm	59(0x3B)	-71dBm
92(0x5C)	-37dBm	58(0x3A)	-72dBm
91(0x5B)	-38dBm	57(0x39)	-73dBm
90(0x5A)	-39dBm	56(0x38)	-74dBm
89(0x59)	-41dBm	55(0x37)	-75dBm
88(0x58)	-42dBm	54(0x36)	-76dBm
87(0x57)	-43dBm	53(0x35)	-77dBm
86(0x56)	-44dBm	52(0x34)	-78dBm
85(0x55)	-45dBm	51(0x33)	-79dBm
84(0x54)	-46dBm	50(0x32)	-80dBm
83(0x53)	-47dBm	49(0x31)	-81dBm
82(0x52)	-48dBm	48(0x30)	-82dBm
81(0x51)	-49dBm	47(0x2F)	-83dBm
80(0x50)	-50dBm	46(0x2E)	-84dBm
79(0x4F)	-51dBm	45(0x2D)	-85dBm
78(0x4E)	-52dBm	44(0x2C)	-86dBm
77(0x4D)	-53dBm	43(0x2B)	-87dBm
76(0x4C)	-54dBm	42(0x2A)	-88dBm
75(0x4B)	-55dBm	41(0x29)	-89dBm
74(0x4A)	-56dBm	40(0x28)	-90dBm
73(0x49)	-57dBm	39(0x27)	-91dBm
72(0x48)	-58dBm	38(0x26)	-92dBm
71(0x47)	-59dBm	37(0x25)	-93dBm
70(0x46)	-60dBm	36(0x24)	-94dBm
69(0x45)	-61dBm	35(0x23)	-95dBm
68(0x44)	-62dBm	34(0x22)	-96dBm
67(0x43)	-63dBm	33(0x21)	-97dBm
66(0x42)	-64dBm	32(0x20)	-98dBm
65(0x41)	-55dBm	31(0x1F)	-99dBm

6 Checksum Function(Standard C Language)

```
unsigned char    CheckSum(unsigned char *uBuff, unsigned char uBuffLen)
{
    unsigned char i,uSum=0;
    for(i=0;i<uBuffLen;i++)
```

```
    {
        uSum = uSum + uBuff[i];
    }
    uSum = (~uSum) + 1;
    return uSum;
}
```