



CARINA

User Guide



Enabling **smart** Cities™

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Your safety is extremely important. Read and follow all warnings and cautions in this document before handling and operating RFID equipment. You can be seriously injured, and equipment and data can be damaged if you do not follow the safety warnings and cautions.

A caution alerts you to an operating procedure, practice, condition, or statement that must be strictly observed to prevent equipment damage or destruction, or corruption or loss of data.

Note: Notes either provide extra information about a topic or contain special instructions for handling a condition or set of circumstances.

1.1. Overview

CARINA integrated RFID Reader with embedded Circular Polarized Antenna.

CARINA uses RS232 Interface.

It supports EPC C1G2, ISO 18000-6C Protocol.

1.2. Features

- Supports EPC Class1 Gen2, ISO/IEC 18000-6C protocol.
- Smart design
 - Environment-friendly with its compact size and smart-design.
- High reading speed
 - Can read up to 100 tags per second.
- High temperature range
 - Ideal to use in outdoor condition
- Easy to upgrade the firmware
 - It is possible to upgrade to newest version for performance improvements.
- System interface
 - RS 232

2. Components

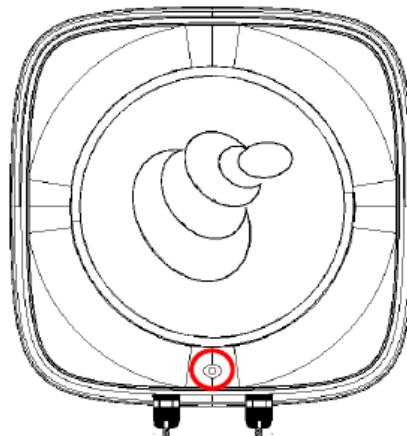


<p>Carina Integrated RFID Reader</p>	 A white, square-shaped integrated RFID reader with a circular antenna on top. It has a small black cable at the bottom.
<p>Pipe Type Mounting bracket (Optional)</p>	 A rectangular metal mounting bracket with a central slot and several mounting holes.
<p>Wall Type Mounting bracket (Optional)</p>	 A black, multi-hole metal mounting bracket designed for wall installation.
<p>Reader Software</p>	<p>Request the software support on https://star-int.net/support/</p>

3. Description

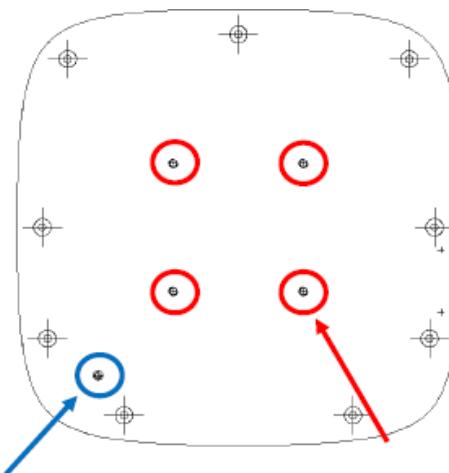


Status LED



RED LED	BLUE LED	Reader status
OFF	OFF	Power OFF
ON	OFF	Power ON, Reader Inventory Operating
ON	blinking	Reading tag(s)

Reader Fixing & Grounding parts

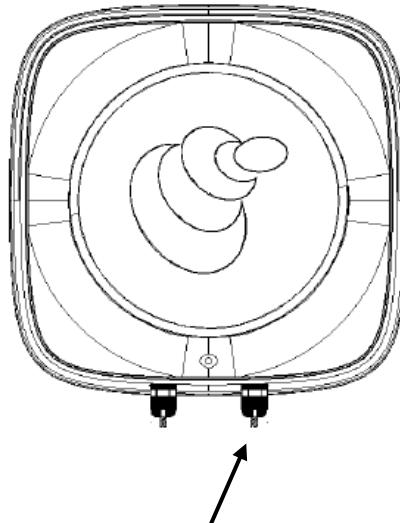


Reader Grounding bolt

Reader Fixing bolt

To place brackets
for reader (4pcs)

Interface



Power & RS232

5C x 18AWG Pin assignment of the connecting cable



1	Black	VCC(+/-), Nonpolar
2	Red	VCC(+/-), Nonpolar
3	Blue	GND(RS-232)
4	Green	TXD (RS-232)
5	White	RXD (RS-232)
6	Yellow/Green	Shield GND

* Shield GND is added on No.6. This is counter measure to avoid external noise.
Please connect this pin to GND.

4. Reader Specification



4.1. Reader Performance

	Description
Model	Carina
Architecture	UHF RFID Integrated Reader
Protocol	EPC Class1 Gen2 ISO 18000-6C
Frequency	902MHz to 928MHz (USA) 865MHz to 868MHz (Europe) 840MHz to 960MHz (Customizable)
Max Tx Power	36dBm (4W) EIRP Reader module : 30dBm (1W) Antenna : 6dBiL
Power control	5dBm to 30dBm (1dB step)
Hopping Channels	50 (USA), 4 (Europe)
Channel Spacing	600KHz (Europe), 500KHz (USA)
Channel Dwell time	< 0.4 seconds
Modulation Method	PR-ASK
Supply voltage	12Vdc
Max Current (max power)	< 600mA
Tag Read Distance (Max.)	>10m
Operating Temperature	-20°C to +50°C
LED Indicators	Power, Data
Signaling	RS-232 : Baud rate (9600bps, 115200bps)
Compliance Certification	CE, FCC

4.2. Interface

Interface Cable : 18AWG x 5C	BLACK	VCC+/- (nonpolar)
	RED	VCC+/- (nonpolar)
	BLUE	GND (RS-232)
	GREEN	TXD (RS-232)
	WHITE	RXD (RS-232)
	YELLOW/GREEN	Shield GND

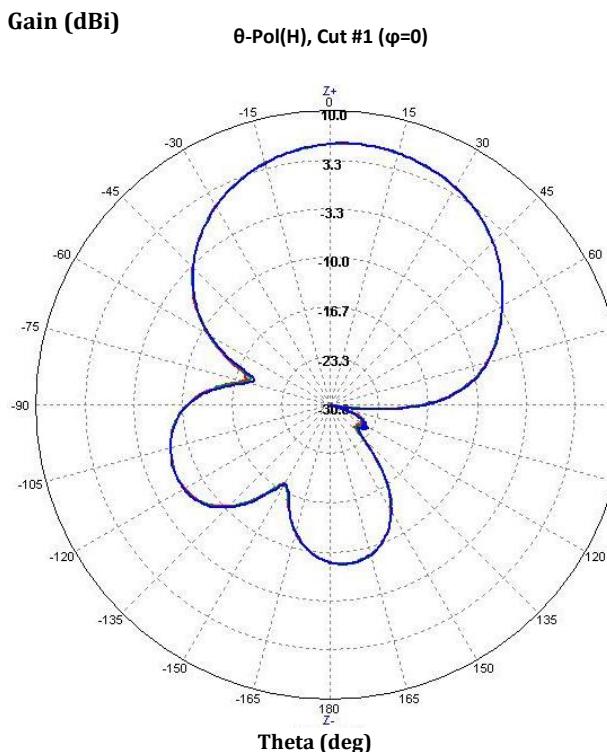
4.3. Physical Dimension

Size	261mm x 261mm x 42mm
Weight	852g

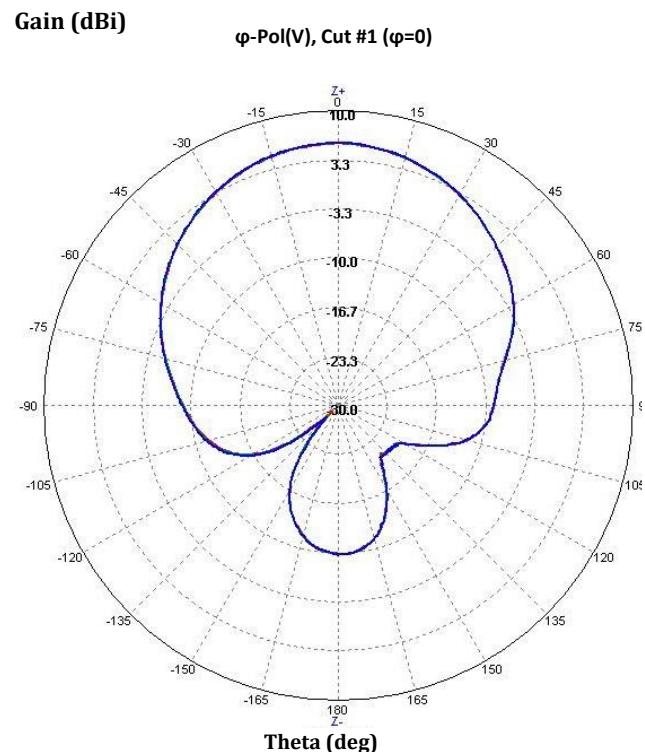
4.4. Antenna Specification

ETSI	
Material	Al-free
Frequency band	865~867MHz
Gain (Max.)	5.89dBiL
Polarization	RHCP
VSWR (Max.)	2:1
Impedance	50 ohm
3dB Beam Width	61° (typ.)

H-Pol.



V-Pol.

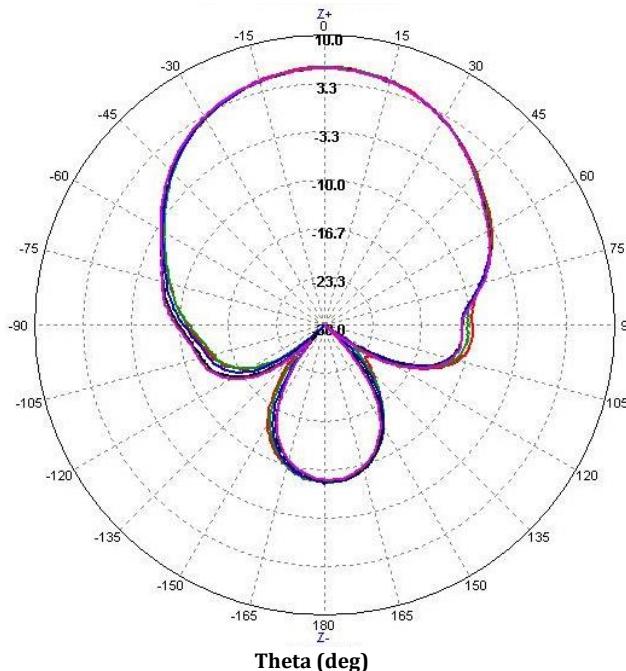


FCC	
Material	Al-free
Frequency band	902~928MHz
Gain(Max.)	6dBiL
Polarization	RHCP
VSWR(Max.)	2:1
Impedance	50 ohm
3dB Beam Width	59°(typ.)

H-Pol.

Gain (dBi)

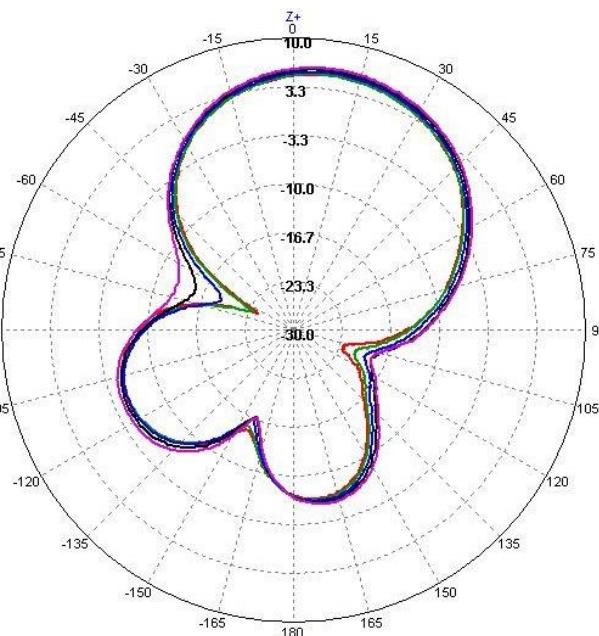
θ -Pol(H), Cut #1 ($\varphi=0$)



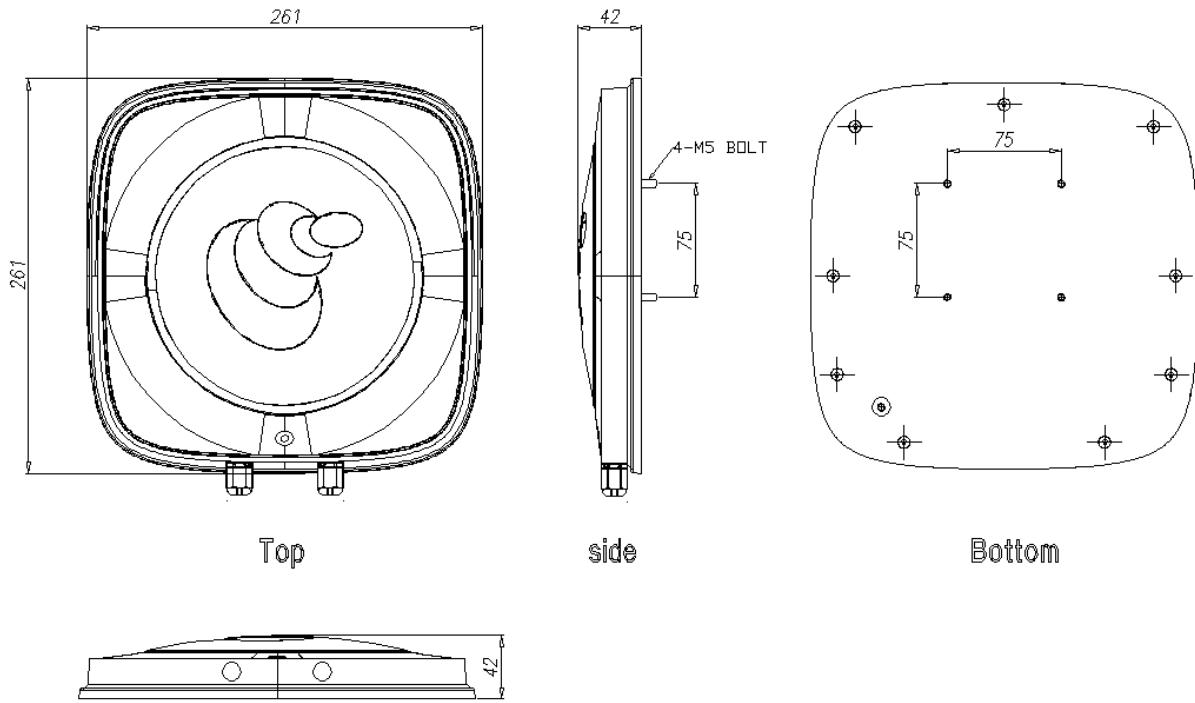
V-Pol.

Gain (dBi)

φ -Pol(V), Cut #1 ($\varphi=0$)



4.5. Mechanical Dimension



5. Reader Command



1. Inventory

'Inventory' is a command to read the tag's EPC (Tag ID). The reader sends a response packet including PC+EPC to the host whenever a tag is read during Inventory. 'Inventory' continues to run until you receive a 'Stop' command.

[Format - Command]

[TABLE Inventory]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	66	f
Trailer	1	0D	\r

[Example]

Inventory
CHAR : >f\r
HEX : 3E 66 0D

Reader sends the ACK packet for the Inventory command received from the host.

[Format – ACK Reply]

[TABLE Inventory]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	66	f
Trailer	1	0D	\r

[Example]

Inventory ACK
CHAR : >Af\r\n
HEX : 3E 41 66 0D 0A

[Format – Data Reply]

[TABLE Inventory Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	54	T
PC	4		
EPC	variable		
(Packet Option)	variable		
Trailer	2	0D0A	\r\n

***Note** The reader continues to send a Data Reply each time the tag is read until a Stop Command is received.

[Example]

Data Reply : CHAR(HEX)

>T30001112222333444455550000\r\n (3E 54 33 30 30 30 31 31 31 31 ...)

>T30001112222333444455551111\r\n (3E 54 33 30 30 30 31 31 31 31 ...)

>T30001112222333444455552222\r\n (3E 54 33 30 30 30 31 31 31 31 ...)

[Packet Option]

[TABLE Packet Option]

	Length (byte)	HEX	CHAR
Packet Option Code	1	3B	;
Packet Option Type	1	53(RSSI)	R(RSSI)
Packet Option Value	variable		

***Note** Refer to Packet Option for instructions on how to set the Packet Option.

***Note** Among Packet Options, RSSI is a 16-bit value with a sign. (Signed short) The unit is 0.1dBm
(TIP: Make sure to substitute the value changed to Hex into the signed short variable.)

[Example]

>T30001112222333444455556666;RFD96\r\n

(3E 54 33 30 30 30 31 31 31 ... 36 36 36 36 3B 52 46 44 39 36 0D 0A)

RSSI Value : FD96(46h 44h 39h 36h)

FD96 = -618 (Change to Coded Decimal)

-618 x 0.1 = -61.8dBm (Changed in dBm)

2. Stop

Commands that immediately terminate the reader's running command.
Header omitted unlike other packets.

[Format - Command]

[TABLE Stop Command]

	Length (byte)	HEX	CHAR
Command	1	33	3
Trailer	2	0D	\r

[Example]

Stop
CHAR : 3\r
HEX : 33 0D

Reader sends the ACK packet for the Stop command received from the host.

[Format – ACK Reply]

[TABLE Inventory]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	66	3
Trailer	2	0D0A	\r\n

[Example]

Stop ACK
CHAR : >A3\r\n
HEX : 3E 41 33 0D 0A

3. InventoryNRead

As a command to read not only EPC but also Tag's specific memory data while running Inventory, the reader sends a response packet containing PC+EPC+Memory Data to the host. Inventory N Read continues to run until you receive a Stop Command.

[Format - Command]

[TABLE InventoryNRead]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	66	3
Space	1	20	“
Bank	1		
Space	1	20	“
address	variable		
Space	1	20	“
Length	variable		
Trailer	1	0D	\r

[Bank]

[TABLE Bank]

Bank	HEX	CHAR	Description
Reserved	30	0	
EPC	31	1	
TID	32	2	
User	33	3	

[Address]

Start address of the tag memory to be read, set to word units (16 bits).

[Length]

Length of Tag Memory to Access (Read), set to word units (16 bits).

[Example]

EPC Bank의 EPC부터 1word Read

CHAR : >i 1 2 1\r

HEX : 3E 69 20 31 20 32 20 31 0D

* Note PC value of EPC Bank is the first address, and EPC starts at the second address.

Reader sends the ACK packet for the Inventory N Read command received from the host.

[Format – ACK Reply]

[TABLE ACK Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	69	i
Trailer	2	0D0A	\r\n

[Example]

InventoryNRead ACK
 CHAR : >Ai\r\n
 HEX : 3E 41 69 0D 0A

[Format - Data Reply]

[TABLE InventoryNRead Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	54	T
PC	4		
EPC	Variable		
Space	1	20	“
Memory Data	Variable	Memory Data	
Trailer	2	0D0A	\r\n

[Example]

PC +EPC : 3000111122223333444455556666 TID 2word : E200680A
 CHAR : >T3000111122223333444455556666 E200680A\r\n
 HEX : 3E 54 33 30 30 30 31 31 31 31 32 32 32 32 33 33 33 33 34 34 34 34 34 34 35 35 35 35 36 36
 36 36 20 45 32 30 30 36 38 30 41 0D 0A

[Format - Error Code Reply]

[TABLE Error Code Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	43	C
PC	4		
EPC	Variable		
Space	1	20	“
Error Code	2		
Trailer	2	0D0A	\r\n

[Error Code]

[TABLE Tag Error Code]

Name	Code (CHAR)	Code (HEX)	Description
Other Error	00	30 30	Another undefined error has occurred.
Memory Overrun	03	30 33	Out of the memory range of the tag you are Accessing.
Memory Locked	04	30 34	If the memory of the tag you are Accessing is locked.

[Example]

Memory Overrun

CHAR : >C3000111122223333444455556666 03\r\n

HEX : 3E 43 33 30 30 30 31 31 31 31 32 32 32 33 33 33 33 34 34 34 34 34 35 35 35 35 35 36 36 36 36 20
30 33 0D 0A

* **Note** The reader will continuously transmit Data Reply or Error Code Reply until receiving the Stop Command.

4. Memory Read

It is a Command for directly Access and reading Tag's Memory. If the reader successfully reads or receives an error code from the Tag, it stops running and sends a response packet to the host.

[Format - Command]

[TABLE Memory Read]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	72	r
Space	1	20	''
Bank	1		
Space	1	20	''
address	variable		
Space	1	20	''
Length	variable		
Trailer	1	0D	\r

[Bank]

[TABLE Bank]

Bank	HEX	CHAR	Description
Reserved	30	0	
EPC	31	1	
TID	32	2	
User	33	3	

[Address]

Start address of the tag memory to be read, set to word units (16 bits).

[Length]

Length of Tag Memory to Access (Read), set to word units (16 bits).

[Example]

EPC Bank의 EPC부분 1word Read

CHAR : >r 1 2 1\r

HEX : 3E 72 20 31 20 32 20 31 0D

* Note PC value of EPC Bank is the first address, and EPC starts at the second address.
Reader sends the ACK packet for the Read command received from the host.

[Format – ACK Reply]

[TABLE ACK Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	72	r
Trailer	2	0D0A	\r\n

[Example]

InventoryNRead ACK

CHAR : >Ar\r\n

HEX : 3E 41 72 0D 0A

[Format - Data Reply]

[TABLE Inventory&Memory Read Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	54	T
PC	4		
EPC	Variable		
Space	1	20	“
Memory Data	Variable		
Trailer	2	0D0A	\r\n

[Example]

PC +EPC : 3000111122223333444455556666 TID 2word : E200680A

CHAR : >T3000111122223333444455556666 E200680A\r\n

HEX : 3E 54 33 30 30 30 31 31 31 31 32 32 32 32 33 33 33 33 33 34 34 34 34 34 35 35 35 35 35 36 36 36 36 20 45 32 30 30 36 38 30 41 0D 0A

[Format - Error Code Reply]

[TABLE Error Code Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	43	C
PC	4		
EPC	Variable		
Space	1	20	“
Error Code	2		
Trailer	2	0D 0A	\r\n

[Error Code]

[TABLE Tag Error Code]

Name	Code (CHAR)	Code (HEX)	Description
Other Error	00	30 30	Another undefined error has occurred.
Memory Overrun	03	30 33	Out of the memory range of the tag you are Accessing.
Memory Locked	04	30 34	If the memory of the tag you are Accessing is locked.

[Example]

Memory Overrun

CHAR : >C300011122223333444455556666 03\r\n

HEX : 3E 43 33 30 30 30 31 31 31 31 32 32 32 33 33 33 34 34 34 34 35 35 35 35 36 36 36 20
30 33 0D 0A

5. Memory Write

It is a Command for directly Access and writing Tag's Memory. If the reader successfully Write or receives an error code from the Tag, it stops running and sends a response packet to the host.

[Format - Command]

[TABLE Memory Write]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	77	w
Space	1	20	''
Bank	1		
Space	1	20	''
Address	variable		
Space	1	20	''
Data	variable		
Trailer	1	0D	\r

[Bank]

[TABLE Bank]

Bank	HEX	CHAR	Description
Reserved	30	0	
EPC	31	1	
TID	32	2	
User	33	3	

[Address]

The starting address of the Tag memory to write, set to word units (16 bits).

[Data]

Data to write, set to word units (16 bits), Can write up to 16 words.

[Example]

Write 1word from the EPC part of the EPC Bank.

CHAR: >w 1 2 1234\r

HEX: 3E 77 20 31 20 32 20 31 32 33 34 0D

* Note PC value of EPC Bank is the first address, and EPC starts at the second address.

* Note The password for writing the locked tag is set using Set Control.

* Note Data can be written up to 16 words at a time.

Reader sends the ACK packet for the Write command received from the host.

[Format – ACK Reply]

[TABLE ACK Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	77	w
Trailer	2	0D0A	\r\n

[Example]

Write ACK
 CHAR : >Aw\r\n
 HEX : 3E 41 77 0D 0A

[Format – Result Reply]

[TABLE Memory Write Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	43	C
PC	4		
EPC	Variable		
Space	1	20	“
Result Code	2		
Trailer	2	0D 0A	\r\n

[Result Code]

[TABLE Memory Write Result Code]

Name	Code (CHAR)	Code (HEX)	Description
Other Error	00	30 30	Another undefined error has occurred.
Success	01	30 31	When success to Tag Access such as Memory Write & Read, Memory Lock, Tag kill, etc.
Memory Overrun	03	30 33	Out of the memory range of the tag you are Accessing.
Memory Locked	04	30 34	If the memory of the tag you are Accessing is locked.

[Example]

Write Success

CHAR : >C3000111122223333444455556666 01\r\n

HEX : 3E 43 33 30 30 31 31 31 31 32 32 32 33 33 33 33 34 34 34 34 35 35 35 35 36 36 36 20
30 31 0D 0A

6. Memory Lock

It is a command for directly Access and Lock Tag's Memory. If the reader successfully Lock or receives an error code from the Tag, it stops running and sends a response packet to the host.

[Format - Command]

[TABLE Memory Lock]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	6C	
Space	1	20	''
Action Mask	4		
Space	1	20	''
Action	4		
Trailer	1	0D	\r

[Action Mask/Action]

[TABLE Memory Lock Action/Mask]

9	8	7	6	5	4	3	2	1	0	Bit Offset
Kill Pwd		AccessPwd		EPC		TID		User		Memory Field
pwd	lock	pwd	lock	pwd	lock	pwd	lock	pwd	lock	

[Pwd/Lock]

[TABLE Memory Lock Pwd/Lock]

Pwd		Lock		Description	
0		0		Accessible	
0		1		Accessible (Permanently)	
1		0		Pwd Accessible	
1		1		Not Accessible (Permanently)	

- * **Note** Kill & Access password can set the pwd/Lock for both Read/Write, but the rest Memory Field can set the pwd/lock only for the Write.
- * **Note** In order to Lock the Tag with password, the password must be set on the reader. Access password must be set using Set Control.
- * **Note** Check Appendix for examples and detailed instructions on using Memory Lock.

[Example]

Set EPC Bank to Pwd Accessible
 CHAR : >I 0020 0020\r
 HEX : 3E 6C 20 30 30 32 30 20 30 30 32 30 0D
 Reader transmits an ACK packet for the Lock command received from the host.

[Format – ACK Reply]

[TABLE ACK Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	6C	I
Trailer	2	0D0A	\r\n

[Example]

Write ACK
 CHAR : >AI\r\n
 HEX : 3E 41 6C 0D 0A

[Format – Result Reply]

[TABLE Memory Lock Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	43	C
PC	4		
EPC	Variable		
Space	1	20	“
Result Code	2		
Trailer	2	0D 0A	\r\n

[Result Code]

[TABLE Memory Lock Result Code]

Name	Code (CHAR)	Code (HEX)	Description
Other Error	00	30 30	Another undefined error has occurred.
Success	01	30 31	When you success Tag Access such as Memory Write & Lock, Tag Kill, etc.
Memory Overrun	03	30 33	Out of the memory range of the tag you are Accessing.
Memory Locked	04	30 34	If the memory of the tag you are Accessing is locked.

[Example]

Write Success

CHAR : >C3000111122223333444455556666 01\r\n

HEX : 3E 43 33 30 30 30 31 31 31 31 32 32 32 32 33 33 33 33 34 34 34 34 35 35 35 35 35 36 36 36 36 20

30 31 0D 0A

7. Tag Kill

It is a command to Kill the Tag to no longer be used. If the reader does 'Kill' successfully or receives an error code from the Tag, it stops running and sends a response packet to the host.

[Format - Command]

[TABLE Tag Kill]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	6B	k
Space	1	20	''
kill password	8		
Trailer	1	0D	\r

[Example]

Kill password가 “12345678”로 Tag Kill

CHAR : >k 12345678\r

HEX : 3E 6B 20 31 32 33 34 35 36 37 38 0D

* **Note** To set the Kill password on the tag, write any password in the Kill Password area of the Reserved Bank. Password should be written with a value other than '0'.

* **Note** Once Killed, the Tag can't be used again, so use it carefully

Reader transmits an ACK packet for the Kill command received from the host.

[Format – ACK Reply]

[TABLE ACK Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	6B	k
Trailer	2	0D0A	\r\n

[Example]

Kill ACK

CHAR : >Ak\r\n

HEX : 3E 41 6B 0D 0A

[Format – Result Reply]

[TABLE TAG Kill Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	43	C
PC	4		
EPC	Variable		
Space	1	20	“
Result Code	2		
Trailer	2	0D 0A	\r\n

*** Note** Even if the Tag Kill command is successful and Tag sends a Success message, the reader may not receive a response properly once depending on the RF environment. For this reason, if there is no response continuously, you should check if it became Kill with a command such as Inventory.

[Result Code]

[TABLE TAG Kill Result Code]

Name	Code (CHAR)	Code (HEX)	Description
Other Error	00	30 30	Another undefined error has occurred.
Success	01	30 31	When you success Tag Access such as Memory Write & Lock, Tag Kill, etc.
Memory Overrun	03	30 33	Out of the memory range of the tag you are Accessing.
Memory Locked	04	30 34	If the memory of the tag you are Accessing is locked.

[Example]

Kill Success

CHAR : >C3000111122223333444455556666 01\r\n

HEX : 3E 43 33 30 30 30 31 31 31 31 32 32 32 33 33 33 33 34 34 34 34 35 35 35 35 36 36 36 36 20
30 31 0D 0A

[Tag Kill Example]

1.

Set the Kill Password on the Tag.

Kill Password : "12345678"

>w 0 0 12345678\r

2.

Check the Password set on the Tag.

>r 0 0 2\r

3. Tag Kill

>k 12345678\r

8. Sensor Tag Read

It is a command to read the temperature sensor value of AXZON TAG. Depending on the Continue Mode, it can be set to read only once or continuously.

[Format - Command]

[TABLE Sensor Tag Read]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	6B	t
Space	1	20	“
continue mode	1	30 or 31	0 or 1
Trailer	1	0D	\r

[Example]

Read the temperature sensor Tag once.

CHAR: >t 0\r

HEX: 3E 74 20 30 0D

Read the temperature sensor Tag continuously.

CHAR: >t 1\r

HEX: 3E 74 20 31 0D

Reader transmits an ACK packet for the Sensor Tag read command received from the host.

[Format – ACK Reply]

[TABLE ACK Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	74	t
Trailer	2	0D0A	\r\n

[Example]

Sensor TAG Read ACK

CHAR : >At\r\n

HEX : 3E 41 74 0D 0A

[Format – Result Reply]

[TABLE Sensor TAG Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	54	T
Command	1	74	t
PC	4		
EPC	Variable		
Space	1	20	‘’
Temp. Sensor Data	variable		
Trailer	2	0D0A	\r\n

* Note The temperature sensor data is in units of 0.1°C. Negative numbers are followed by a ‘’.

[Example]

Reply Sensor Data : 25.2 °C

CHAR: >T300011122223333444455556666 252\r\n

HEX: 3E 43 33 30 30 30 31 31 31 31 32 32 32 32 33 33 33 33 34 34 34 34 35 35 35 35 35 36 36 36 20 32 35 32 0D 0A

Reply Sensor Data : -5.6 °C

CHAR: >T300011122223333444455556666 -56\r\n

HEX: 3E 43 33 30 30 30 31 31 31 31 32 32 32 32 33 33 33 33 34 34 34 34 34 35 35 35 35 36 36 36 20 2D 35 36 0D 0A

9. Untraceable

'Untraceable', an optional command for Gen2 V2, is a command that can hide TAG memory from view. In order to use 'Untraceable' function, the Access Password of TAG must be set. Since Untraceable is an optional command, only certain Tags that support Untraceable operate.

[Format - Command]

[TABLE Sensor Tag Read]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Command	1	75	
Space	1	20	''
continue mode	1	30 or 31	0 or 1
Trailer	1	0D	\r

[Option]

[TABLE Sensor Tag Read]

Option	Length (byte)	Bit Value
RFU(MSB)	4	0000
U	1	Refer to table below.
EPC	6	Refer to table below.
TID	2	Refer to table below.
User	1	Refer to table below.
Range	2	Refer to table below.

	Command	RFU	U	EPC	TID	User	Range	RN	CRC
# of bits	16	2	1	6	2	1	2	16	16
description	11100010 00000000	00	0: Deassert U in XPC_W1 1: Assert U in XPC_W1	MSB (show/hide): 0: show memory above EPC 1: hide memory above EPC 5 LSBs (length): New EPC length field (new L bits)	00: hide none 01: hide some 10: hide all 11: RFU	0: view 1: hide	00: normal 01: toggle temporarily 10: reduced 11: RFU	handle	CRC-16

***Note** Option should convert the 16-bit value back to the ASCII value of 4byte.

[Example]

```

Option: All Memory Hide
Bit: 0000 1 100000 10 1 00 (0x0c14)
CHAR: 0c14
HEX: 30 63 31 34
CMD:
CHAR: >u 0c14\r
HEX: 3E 75 20 30 63 31 34 0D
Option: All Memory Show (EPC 6 Word)
Bit: 0000 0 000110 00 0 00 (0x00c0)
CHAR: 00c0
HEX: 30 30 63 30
CMD:
CHAR: >u 00c0\r
HEX: 3E 75 20 30 30 63 30 0D

```

Reader transmits an ACK packet for the Untraceable command received from the host.

[Format – ACK Reply]

[TABLE ACK Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	41	A
Command	1	75	u
Trailer	2	0D0A	\r\n

[Example]

```

Sensor TAG Read ACK
CHAR: >Au\r\n
HEX: 3E 41 75 0D 0A

```

[Format – Result Reply]

[TABLE TAG Untraceable Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Reply Type	1	43	C
PC	4		
EPC	Variable		
Space	1	20	“
Result Code	2		
Trailer	2	0D 0A	\r\n

[Result Code]

[TABLE TAG Kill Result Code]

Name	Code (CHAR)	Code (HEX)	Description
Other Error	00	30 30	Another undefined error has occurred.
Success	01	30 31	When you success Tag Access such as Memory Write & Lock , Tag Kill, etc.
Memory Overrun	03	30 33	Out of the memory range of the tag you are Accessing.
Memory Locked	04	30 34	If the memory of the tag you are Accessing is locked.

[Example]

Untraceable Success

CHAR: >C30001112223334445556666 01\r\n

HEX: 3E 43 33 30 30 30 31 31 31 31 32 32 32 33 33 33 34 34 34 34 35 35 35 35 36 36
36 36 20 30 31 0D 0A

[Untraceable Example]

1. Set the Access Password to the Tag.
Access Password: "12345678"
>w 0 2 12345678\r
2. Set the Access Password to the Reader.
>x w 12345678\r
3. Untraceable
>u 0c14\r\n
4. Set the Access Password '0' to the Reader.
>x w 0\r
5. Check if Memory Overrun responds by Memory Read operation.
>r 1 2 1\r
>r 2 0 1\r
>r 3 0 1\r

6. Setup Command



1. Set Control Command

Commands for changing the reader's key configuration values.

[Target]

Host -> Reader

[Format - Command]

[TABLE Set Control Packet]

	Length (byte)	HEX	CHAR
Header	1	3E	>
CMD Type	1	78	x
SP	1	20	“
Control Type	1	[Table Control Type]	[Table Control Type]
(SP)	1	20	“
(Value)	variable		
Trailer	1	0D	\r

[Format – Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Control Type	1	[Table Control Type]	[Table Control Type]
(Sp)	1	20	“
(Value)	variable		
Trailer	1	0D	\r\n

[Control Type]

[TABLE Control Type]

	Control Type (CHAR)	Control Type (HEX)	Name	Value Range (CHAR)	Default (CHAR)
1	b	62	Buzzer	0, 1	1 (On)
2	d	64	All Default Set		
3	f	66	Global Band	0~ MAX	0 (KOREA)
4	p	70	Power Gain	0~300	300 (30dBm)
5	v	76	Firmware Version		Read Only
6	x	78	Reader Mode	0 ~ MAX	0
7	0	30	Power Idle Time	0~1000	100 (ms)
8	1	31	Baud Rate	9600~92160 0	9600 or 115200
9	3	33	Repeat Tag Interval	0~10	0 (sec)
10	8	38	Select Action	0, 1	0
11	9	39	Select Bank	0~3	1
12	;	3B	Select Bitptr		16
13	Y	59	Select Mask		x
14	w	77	Access Password	8 CHAR	0
15	q	71	Q	0~15	4
16	j	6A	Dwell Time	50~1000	100
17	s	73	Session	0~3	1
18	g	67	Toggle Target	0, 1	1
19	l	6C	Link Profile	0~3	1
20	i	69	Packet Option	0 ~ 7	0
21	Q	51	Query Target	0, 1	0

[Example]

Power Set 30dBm
 HEX) 3E 78 20 70 20 33 30 30 0D
 CHAR) >x p 300\r
 Reply
 HEX) 3E 70 20 33 30 30 0D
 CHAR) >p 300\r

* Note Numbers in all Values use ASCII characters. ex) 0 -> 0x30, 1 -> 0x31

2. Get Control Command

Commands for reading the reader's key configuration values.

[Target]

Host -> Reader

[Format - Command]

[TABLE Set Control Packet]

	Length (byte)	HEX	CHAR
Header	1	3E	>
CMD Type	1	79	Y
SP	1	20	''
Control Type	1	[Table Control Type]	[Table Control Type]
Trailer	1	0D	\r

[Format – Reply]

	Length (byte)	HEX	CHAR
Header	1	3E	>
Control Type	1	[Table Control Type]	[Table Control Type]
SP	1	20	''
Value	variable		
Trailer	1	0D	\r

[Example]

```

Get Power
HEX) 3E 79 20 70 0D
CHAR) >y p\r\n
Reply
HEX) 3E 70 20 33 30 30 0D
CHAR) >p 300\r\n

```

3. Control Type

Define the details for each function of the Control Type.

3.1 Buzzer

Set the Buzzer On/Off.

[TABLE Buzzer]

Buzzer Switch	Value (CHAR)	Description
Off	0	Buzzer off
On	1 (default)	Buzzer on

3.2 All Default Set

Set all configurations to Default. But, some important Control Types are excluded because they can have a fatal impact during reader operation.

[TABLE All Default Set]

Default Excluded
Reader Mode

3.3 Global Band

Set the frequency band for each country.

[TABLE Global Band]

Region Description	Region Description
KOREA	0 (default)
EUROPE (ETSI)	1
NORTH AMERICA (FCC)	2
CHINA	3
TAIWAN	4
(Reserved)	5
MALAYSIA	6
HONG KONG	7
JAPAN	8
(Reserved)	9~16
SINGAPORE	17
THAILAND	18
(Reserved)	19
VIETNAM	20

* Note In the case of Japan band, changing to another country is unavailable.

3.4 Power Gain

Set the RF output level of the Reader.

[TABLE Power Gain]

Power Level	Value (CHAR)	Description
default (x0.1dBm)	300	It can be set in units of 0.1 dBm, default power gain is 30dBm.
range (x0.1dBm)	50 ~ 300	It can be set in units of 0.1 dBm, and up to 300(30dBm).

3.5 Firmware Version

The Version information of Firmware.

[TABLE Firmware Version]

Version	Value (CHAR)	Description
IDRO900MISP	xxxxxxxxxx	8 bytes

* Note It's Read Only so only Get Control Command is available.

3.6 Reader Mode

Set the Reader Mode.

[TABLE Reader Mode]

Reader Mode	Value (CHAR)	Description
Normal Mode	0 (default)	Default Operation Mode. (Waiting for command after Boot.)
Inventory Auto Mode	1	Automatically run Inventory Command (">f\r") after Boot.

* Note After changing Reader Mode, the reader must be rebooted before the changed mode is applied.

3.7 Power Idle Time

Set the Idle Time of Inventory Command. It is necessary to minimize interference between readers in a multi-reader environment, and to prevent overheating of readers due to full-time operation for a long time. The reader receives & transmits RF Power during Dwell Time (200ms) and then RF Power is turned off during Power Idle Time (ms).

[TABLE Power Idle Time]

Power Idle Time	Value (CHAR)	Description
default (ms)	100 (default)	
range (ms)	0 ~ 1000	

3.8 Baud Rate

Set the reader's Serial (RS-232) Baud Rate.

[TABLE Baud Rate]

Baud Rate	Value (CHAR)	Description
default (ms)	115200 9600	IDRO900MISP : 115200
range (ms)	9600 ~ 921600	

3.9 Repeat Tag Interval

Set the Tag Report Interval for duplicates tags.

[TABLE Repeat Tag Interval]

Repeat Tag Interval	Value (CHAR)	Description
default (sec)	0	'0' responds unconditionally without Repeat Tag check.
range (sec)	0 ~ 10	

* **Note** Available only in environments where 10 or fewer tags are read within the set interval time.

3.10 Select Action

Set the Action applied when using the Tag Selection function. When set to Matching, Select the tag that matches the Mask, and when set to non-Matching, select the tag that does not match the Mask.

[TABLE Select Action]

Select Action	Value (CHAR)	Description
Matching	0 (default)	Select a Tag that matches the Mask.
Non-Matching	1	Select a Tag that non-matches the Mask.

3.11 Select Bank

Set the Bank applied when using the Tag Selection function.

[TABLE Select Bank]

Bank	Value (CHAR)	Description
Reserved	0	
EPC	1 (default)	
TID	2	
User	3	

3.12 Select BitPtr

BitPtr is the starting address to be Matched/Non-Matched with Mask and is in **Bit units**. BitPtr of EPC Bank has a starting address of 16 for PC and 32 for EPC. The rest of the bank starts at 0.

[TABLE Select BitPtr]

Select Bitptr	Value (CHAR)	Description
default	16	Starting address of EPC Bank PC.
range	0 ~	User Bank, TID Bank starts from 0.

3.13 Select Mask

When the Select Mask is set to 'x', the Select function is disabled, and the Select function is enabled when a character other than 'x' is set. It can be set up to 31 words (496 bits).

[TABLE Select Mask]

Select Mask	Value (CHAR)	Description
Disable	x (default)	Select Disable
Enable	1~31 word	Select Enable, Mask data

3.14 Access Password

Set the Password to Access the tag with the Password set. When set to "00000000", Access Password is not used when executing the Access Command (Read/Write/Lock), and if value other than "00000000" is set, the Access Password is used.

[TABLE Access Password]

Access Password	Value (CHAR)	Description
Not use	00000000 (default)	Not use Access Password when executing Access Command.
Use	xxxxxxxx	Use the Access Password set at the time of the Access Command execution. Ex) 12345678

* Note Access Password must be set from 0~F(HEX) 8 characters.

3.15 Q

In a Multi Tag Read environment, set the Start Q value of the Anti-collision algorithm.

[TABLE Q]

Q	Value (CHAR)	Description
default	4	Suitable for 10 ~ 50 Tags read.
range	0 ~ 15	
single Tag	1	Suitable for 1~2 Tags read.
multiple Tag	7	Suitable for 100 ~ 200Tags read.

3.16 Dwell Time

The reader transmits & receives RF during Dwell Time stops during Idle Time, and then receives RF again.

[TABLE Dwell Time]

Dwell Time	Value (CHAR)	Description
default (ms)	100	RF transmission & reception for 100ms
range (ms)	50 ~ 10,00	Minimum 50ms, Maximum 1000ms

3.17 Session

Set the Tag's Session. You can adjust the interval between repeated responses of the Tag due to the Inventoried Flag attribute of the Session. (If the Toggle Target is '0'.)

[TABLE Session]

Session	Value (CHAR)	Description
0	0	Tag responds repeatedly every 0.1 ~ 0.2 seconds.
1	1 (default)	Tag responds repeatedly every 0.5 ~ 1 seconds.
2	2	Tag responds just once.
3	3	Tag responds just once.

* **Note** Setting a Session to adjust the repetitive response interval of a Tag may cause errors due to environmental factors such as the type of tag, wireless environment, temperature, and read distance etc.

* **Note** In an environment with a large number of tags, multi read performance can be improved by increasing the probability of reading a new Tag by setting the repetitive response interval to be long (Session1).

* **Note** If Toggle Target is '1', it does not operate with the characteristics shown in the table because the reader inventory by changing the Target Inventoried Flag.

3.18 Toggle Target

If Toggle Target is Off, the reader will continue to inventory only the tag with Inventoried Flag A, and If Toggle Target is On, the reader will inventory while switching the Tag with Inventoried Flag A and B.

[TABLE Toggle Target]

Toggle Target	Value (CHAR)	Description
Off	0	Tag Inventory with Inventoried Flag A: The response period varies depending on the set Session value.
On	1 (default)	Switching Inventory with Inventoried flag A and B: Continuous read regardless of Session.

3.19 Link Profile

Set the communication environment between the Tag & Reader. It can be set in four modes.

[TABLE Link Profile]

Profile	Value (CHAR)	Description
0	0	DSB-ASK, Tari 25, FM0, LF 40KHz, Data rate 40Kbps
1	1 (default)	PR-ASK, Tari 25, Miller4, LF 250KHz, Data rate 62.5Kbps
2	2	PR-ASK, Tari 25, Miller4, LF 300KHz, Data rate 75Kbps
3	3	FM0, Tari 6.25, FM0, LF 400KHz, Data rate 400Kbps

* Note Link Profile is applied on reboot after setup.

3.20 Packet Option

Set the Reader's Reply Packet format option.

[TABLE Packet Option]

Packet Option	BIT	Description
Reserved	0	
RSSI	1	0 : RSSI Off 1 : RSSI On
Reserved	2	

[Example]

RSSI On : 2
RSSI Off : 0

3.21 Query Target

The reader will inventory with the set value of Query Target A or B.

[TABLE Query Target]

Query Target	Value (CHAR)	Description
A	0(default)	Tag Inventory with Inventoried Flag A.
B	1	Tag Inventory with Inventoried Flag B.

* **Note** Applies only when Toggle Target is OFF (0).

3.22 CH State

Select the frequency channel for the reader to use. This function only supports ETSI countries in the 800MHz band.

[TABLE Packet Option]

Packet Option	BIT	Description
CH 1	0	0 : Enable 1 : Disable
CH 2	1	0 : Enable 1 : Disable
CH 3	2	0 : Enable 1 : Disable
CH 4	3	0 : Enable 1 : Disable
CH 5	4	0 : Enable 1 : Disable
CH 6	5	0 : Enable 1 : Disable

* **Note** Countries that CH set available: EUROPE, INDIA, MOROCCO, RUSSIA, LAOS, NIUE, NEWZEALAND

* **Note** CH State Value should always be transmitted in Hex format in 2byte units.

[Example]

```

All CH Enable : 00 ⇒ _>x n 00\r
1 CH Disable : 01 ⇒ _>x n 01\r
1,2 CH Disable : 03 ⇒ _>x n 03\r
1,2,3 CH Disable : 07 ⇒ _>x n 07\r
1,2,3,4 CH Disable : 0F ⇒ _>x n 0F\r
6 CH Disable : 20 ⇒ _>x n 20\r

```

7. Appendix



How to use Memory Lock

Use the Memory Lock command to set Tag Data to be able to be changed (write) or no longer be changed only by users who know the password. Lock can be set individually for 5 Tag memory areas, and the Kill & Access Password area is Locked for both Read & Write, but the remaining 3 areas, EPC, TID, and User Bank are Locked only for Write. That is, EPC, TID, and User Bank areas may always be read regardless of the Lock setting.

[TABLE Lock Type]

Memory Field	Read Lock	Write Lock
Kill Password	O	O
Access Password	O	O
EPC Bank	X	O
TID Bank	X	O
User Bank	X	O

[Action]

Memory Lock can select four options using the Action field. The Action field is composed of 2 bits for each Memory field and operates as follows.

[TABLE Lock Action]

Bit Offset	Memory Field	Action
0	User Bank	PermaLock
1		Pwd
2	TID Bank	PermaLock
3		Pwd
4	EPC Bank	PermaLock
5		Pwd
6	Access Password	PermaLock
7		Pwd
8	Kill Password	PermaLock
9		Pwd
10		0
11		0
12		0
13		0
14		0
15		0

[TABLE Lock Action Description]

Pwd	PermaLock	Description
0	0	read/write is possible without authentication.
0	1	read/write is permanently possible without authentication.
1	0	read/write is possible for password authentication.
1	1	Unable to read/write permanently.

* **Note** To set a Password to a Tag, Write any Password in the Access Password area of the Reserved Bank. Password should be set with a value other than '00000000'.

* **Note** PermaLock can't be changed once it is set, so use it carefully.

[Mask]

Memory Lock can be individually Locked for five Memory Fields using the Mask field. Mask must be set in units of 1 bit for each Memory field, and only the Memory field with mask bit of '1' executes the action.

[TABLE Lock Mask]

Bit Offset	Memory Field	Action
0	User Bank	Mark 0
1		Mark 1
2	TID Bank	Mark 0
3		Mark 1
4	EPC Bank	Mark 0
5		Mark 1
6	Access Password	Mark 0
7		Mark 1
8	Kill Password	Mark 0
9		Mark 1
10		0
11		0
12		0
13		0
14		0
15		0

[TABLE Lock Mask Description]

Mask1	Mask0	Description
0	0	Skip.
1	1	Execute Action

[Example]

EPC Bank Password Lock Mask
 CHAR : 0020
 HEX : 30 30 32 30

EPC Bank Password Lock Action
 CHAR : 0020
 HEX : 30 30 32 30

[Tag Lock Example]

1. Set the Password on the Tag.
 Password "12345678"
 >w 0 2 12345678
2. Check the Password set in the Tag.
 >r 0 2 2
3. Set the Password on the Reade.
 >x w 12345678
4. Set the Lock on the Tag.
 EPC Bank Password Lock
 >l 0020 0020
5. Write on the Tag without Password.
 Reader password '0'
 >x w 0
 EPC Bank 1word "1234" write
 >w 1 2 1234
6. Write on the Tag after authenticating the Password.
 Reader password '0'
 >x w 12345678
 EPC Bank 1word "1234" write
 >w 1 2 1234

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FCC Information to User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE:

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

RSS-GEN Section

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RSS-102 RF Exposure

L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins 20 cm entre la source de radiation (l'antenne) et toute personne physique. Cet appareil ne doit pas être installé ou utilisé en conjonction avec une autre antenne ou émetteur.



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