

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	2 OF 22	2005. 04. 08.

C O N T E N T S

- 1. Overview**
- 2. Features**
- 3. System Block Diagram**
- 4. Specification**
- 5. Technical Drawing**
- 6. RS232C Interface**

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	3 OF 22	2005. 04. 08.

1. OVERVIEW

The KYT-4500 series is a compact read/write dummy terminal and supports ISO 14443 Mifare® Contactless Smart Cards.

All the process of KYT-4500 consists of Execution and Response according to the Commands from Host. And the Response includes Execution Results.

The KYT-4500 has the read/write data, increment/decrement value, and change the secret key. So it is suitable to be adopted in various applications like the Access Control, Time Attendance Control, Library, Automatic Payment System, etc...

KYT-4500 can save 3 Authentication Key, so can read/write 3 different cards which have different Key each other.

And the Keys can be kept in memory even for H/W Reset or Power On/Off.

Memory Architecture(map) of the RF card: 8Kbyte

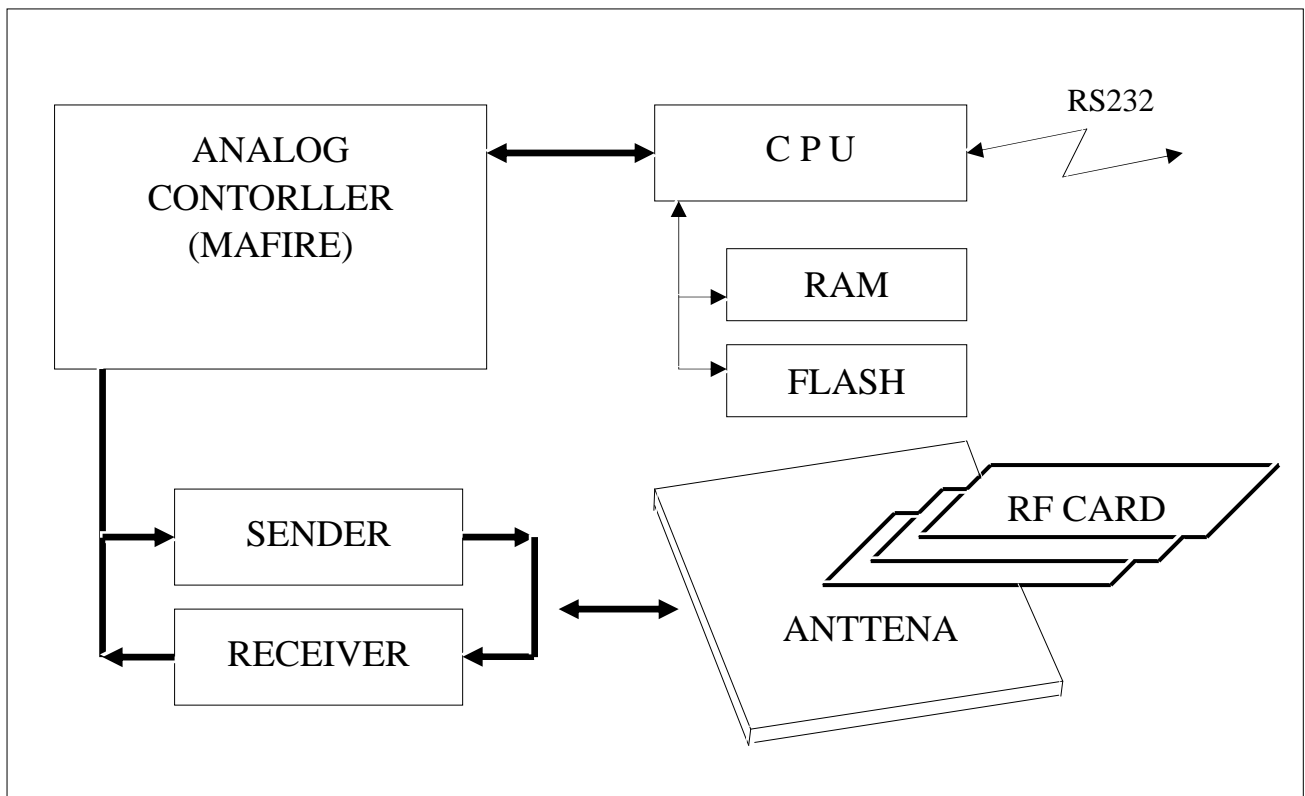
Sector	Block	Size	Detail	Note
Sector 0	Block 0	16Byte	RF Card Information	Can't use
	Block 1	16Byte		
	Block 2	16Byte		
	Block 3	16Byte	'Sector Key'	Can't use
Sector 1	Block 0	16Byte	User Available Memory	
	Block 1	16Byte		
	Block 2	16Byte		
	Block 3	16Byte	'Sector Key'	Can't use
Sector 2	Block 0	16Byte	User Available Memory	
	Block 1	16Byte		
	Block 2	16Byte		
	Block 3	16Byte	'Sector Key'	Can't use
---	---	---	---	---
Sector 15	Block 0	16Byte	User Available Memory	
	Block 1	16Byte		
	Block 2	16Byte		
	Block 3	16Byte	'Sector Key'	Can't use

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	4 OF 22	2005. 04. 08.

2. Features

1. RS232 Interface
2. Work by Commands
3. Support Mifare® Card
4. Single power supply.(DC +6V ~ +12V)
5. Small Size and easy installation

3. BLOCK DIAGRAM



Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	5 OF 22	2005. 04. 08.

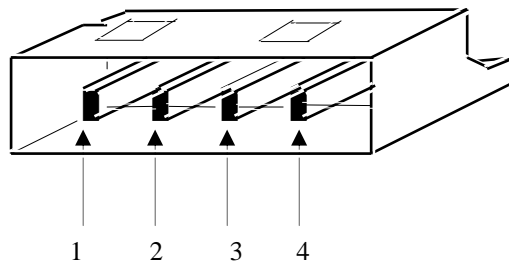
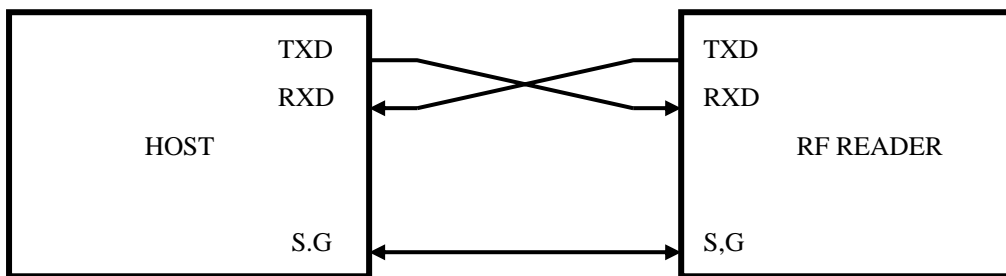
4. SPECIFICATIONS

	Specification	Remark
Dimension(mm)	50(W)*75(L)*25(H)	
Weight	71G	
Input power	DC 6V ~ DC 12V	
Current Consumption	Without Load : Max 70mA	
	With Load : Max 150mA	

☞ **Secure working distance : Read range 60mm.**

4.1 Interface

4.1.1 RS – 232 Connection



CASE 1) Part Number (J3) : Molex(53015-0410)

Pin No	INDEX	Remark
1	VCC	DC(+6V ~ +12V)
2	RXD	Receive
3	TXD	Transmit
4	GND	Ground

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	6 OF 22	2005. 04. 08.

4.2 Communication Methods

Protocol : Asynchronous, Half-duplex.

Baud Rate : 9600BPS, 19200BPS.(Default:9600Bps)

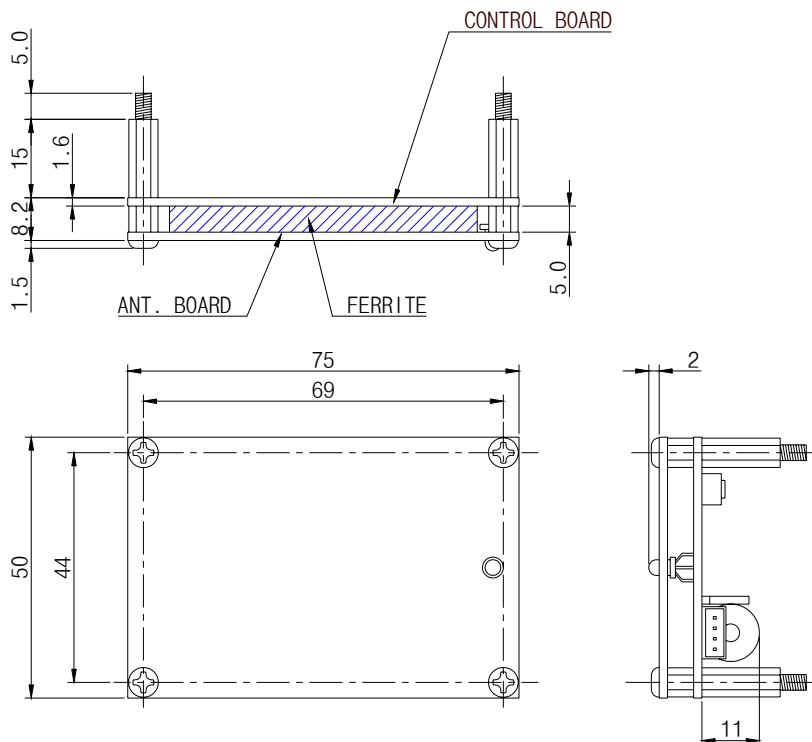
Start Bit : 1Bit

Data Length : 8Bits

Parity : None

Stop Bit : 1Bit

5. Technical Drawing



Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	7 OF 22	2005. 04. 08.

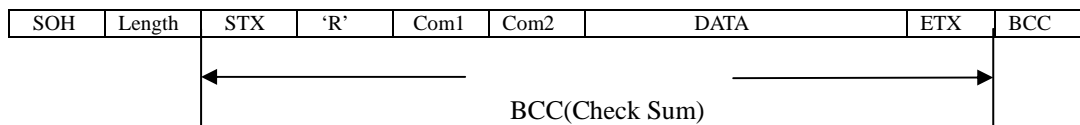
6. COMMAND DETAILS

6.1. RS232C Control Characters

NANE	Hex Value	Description
SOH	01	Start of Header
STX	02	Start of Text
ETX	03	End of Text
EOT	04	End of Transmission
ENQ	05	Enquiry
ACK	06	Positive Acknowledge
NAK	15	Negative Acknowledge
CAN	18	Cancel

6.2. Frame Format

6.2.1. Command structure

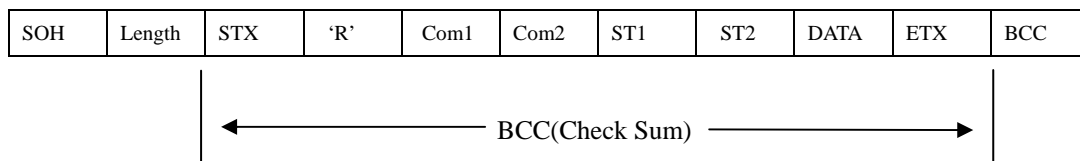


6.2.2. Response structure

SOH	Length	STX	'R'	Com1	Com2	ST1	ST2	DATA	ETX	BCC
-----	--------	-----	-----	------	------	-----	-----	------	-----	-----

6.2.3. BCC

$$BCC = STX \wedge 'R' \wedge Com1 \wedge Com2 \wedge ST1 \wedge ST2 \wedge Result \wedge DATA \wedge ETX$$



6.2.4. Define Words.

Name	Detail
Length	Byte length (constant 'R' and DATA length)
Com1,Com2	Refer to Command List
ST1, ST2	Normal : 0x0000(Hex), Error : "Error Code"
DATA	DATA length is variable(0~16byte)
BCC	Check Sum

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	8 OF 22	2005. 04. 08.

6.3. Command List.

Function	Cm1	Cm2	Explanation	Comparison
Get Sector/Block	0x30	0x30	Get the Sector/Block	
Card Detection		0x31	Check the Card Detection.	
Block Area		0x32	Set the Sector/Block Area.	
Baud Rate Setting		0x33	Change the Baud Rate (For details, see the Page 10)	
F/W Version		0x34	Get the ROM Version	
Serial Value		0x35	Get the RF Card Serial Value	
Read Block	0x31	0x30	RF Card Read.	
Balance Write		0x31	RF Balance Write.	
Character Write		0x32	RF Card Data String Write	
Increment		0x33	Increase the RF Card's Balance	
Decrement		0x34	Decrease the RF Card's Balance	
Read Balance		0x35	Read the RF Card's Balance	
Key change	0x32	0x30	Change the Key Value	
Card Key change		0x31	Change the Card Secret Key Value	
Authentication Key		0x32	Select the Authentication Key : KeyA or KeyB)	
Access Key change		0x33	Access Change the Card Secret Key Value	
Key change II		0x43	Change the Key Value	
Power On	0x33	0x30	Power On (the carrier wave emitted in antenna.)	
Power Off		0x31	Power Off(the carrier wave not emitted in antenna)	

6.4. Error Code List

Operation	ST1	ST2	Description
Normal	0x00	0x00	Normal
No Card	0x10	0x00	Not Detected at the Antenna.
Authentication Error	0x20	0x00	RF Card Error (On Authentication)
Select Error	0x20	0x01	RF Card Error (Not Selected RF Card)
Anti-collision Error	0x20	0x02	RF Card Error (Not Recognized RF Card Serial Value.)
RF Read Error	0x30	0x00	RF Card Read Error
RF Write Error	0x30	0x01	RF Card Write Error.
RF Increment Error	0x30	0x02	RF Card Increment Error
RF Decrement Error	0x30	0x04	RF Decrement Error
Read Val Error	0x30	0x05	Read Data Format Error(Character - Error)
Write Block Error	0x30	0x06	Block Error
Not command	0x40	0x00	Not Defined Command
Balance Error	0x40	0x01	Invalid Data Value (On Increment/ Decrement)
RC500Error	0x40	0x03	RF Initial Error
Power On Error	0x40	0x04	the carrier wave not emitted in antenna
Command Format Error	0x40	0x05	Command Format Error
EEPROM Write Error	0x40	0x06	Authentication Key Write Error
Carrier wave Error	0x50	0x01	The carrier wave not emitted in antenna.

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	9 OF 22	2005. 04. 08.

6.5. Command Structure.

6.5.1. Get Sector/Block

: Identify the sector and block set at terminal.

☞ Command Format

SOH	Length	STX	'R'	'0'	'0'	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----

☞ Response Format.

SOH	Length	STX	'R'	'0'	'0'	ST1	ST2	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	------	-----	-----

☞ Response DATA Structure

Sector(1Byte , Hex)	Block(1Byte , Hex)
---------------------	--------------------

6.5.2 Card Detection.

: Identify whether if the antenna detect the card.

☞ Command Format

SOH	Length	STX	'R'	'0'	'1'	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----

☞ Positive Response Format

SOH	Length	STX	'R'	'0'	'1'	ST1	ST2	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	------	-----	-----

☞ Negative Response Forma

SOH	Length	STX	'R'	'0'	'1'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

☞ Response Data Structure

Status Mode (1Byte, Hex)

<Status Mode>

Value	Detail
0x00	Card Detection
0x01	Card Non-Detection(= No Card)

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	10 OF 22	2005. 04. 08.

6.5.3 Set Sector/Block

: Change the sector and block set at terminal.

☞ Command Format.

SOH	Length	STX	'R'	'0'	'2'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

Sector(1Byte , Hex)	Block(1Byte , Hex)
---------------------	--------------------

Note: Sector Range: 0x00 ~ 0x0f, Block Range: 0x00 ~ 0x03.

☞ Positive Response Format

SOH	Length	STX	'R'	'0'	'2'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

☞ Negative Response Forma

SOH	Length	STX	'R'	'0'	'2'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

6.5.4 Baud Rate Setting.

: Set the baud rate at terminal. Selectable range : 9600Bps, 19200Bps

☞ Command Format.

SOH	Length	STX	'R'	'0'	'3'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

Baud Select(1Byte, Hex)

<Baud Select>

Value	Detail
0x00	9600BPS(Default)
0x01	19200BPS

☞ Response Format.

SOH	Length	STX	'R'	'0'	'3'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

☞ Negative Response Forma

SOH	Length	STX	'R'	'0'	'3'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	11 OF 22	2005. 04. 08.

6.5.5. F/W Version

: Get the ROM version.

☞ Command Format.

SOH	Length	STX	'R'	'0'	'4'	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----

☞ Response Format.

SOH	Length	STX	'R'	'0'	'4'	ST1	ST2	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	------	-----	-----

☞ Negative Response Forma

SOH	Length	STX	'R'	'0'	'4'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

☞ Response DATA Structure

Version H(1Byte , Hex)	Version L(1Byte , Hex)
------------------------	------------------------

Note: If the ROM version is 1.0, the Version H has 0x01 and the Version L has 0x00.

6.5.6. Serial Value

: Get the RF Card's serial.

☞ Command Format.

SOH	Length	STX	'R'	'0'	'5'	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----

☞ Positive Response Format

SOH	Length	STX	'R'	'0'	'5'	ST1	ST2	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	------	-----	-----

☞ Negative Response Forma

SOH	Length	STX	'R'	'0'	'5'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

☞ Response Data Structure

Serial Value(4Byte, Hex)

Note: The RF Card's serial consists of 4 Bytes..

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	12 OF 22	2005. 04. 08.

6.5.7. Read Block

: Read the data structure (16 Bytes) of the RF Card

Note: Sector Range: 0x00 ~ 0x0f, Block Range: 0x00 ~ 0x02.

☞ Command Format.

SOH	Length	STX	'R'	'1'	'0'	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----

☞ Response Format.

SOH	Length	STX	'R'	'1'	'0'	ST1	ST2	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	------	-----	-----

☞ Negative Response Forma

SOH	Length	STX	'R'	'1'	'0'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

☞ Response DATA Structure

DATA(16Byte, Hex)

6.5.8. Balance Write.

: Write the data at the specified block in the RF Card.

Note: Sector Range: 0x00 ~ 0x0f, Block Range: 0x00 ~ 0x02.

☞ Command Format.

SOH	Length	STX	'R'	'1'	'1'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

DATA(4Byte, Hex)	
LSB	MSB

☞ Response Format.

SOH	Length	STX	'R'	'1'	'1'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	13 OF 22	2005. 04. 08.

6.5.9. Character Write.

: Write the data string at the specified block in the RF Card.

Note: Sector Range: 0x00 ~ 0x0f, Block Range: 0x00 ~ 0x02.

☞ Command Format.

SOH	Length	STX	'R'	'1'	'2'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

DATA(16Byte, Hex)								
MSB							LSB

Cf)DATA : "1234567890123456"

MSB	LSB
0x31 0x32 0x33	0x35 0x36

☞ Response Format.

SOH	Length	STX	'R'	'1'	'2'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

6.5.10. Increment.

: Increase the RF Card's Balance as much as a given data value.

Note: Sector Range: 0x00 ~ 0x0f, Block Range: 0x00 ~ 0x02.

☞ Command Format.

SOH	Length	STX	'R'	'1'	'3'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

DATA(4Byte, Hex)			
LSB			MSB

☞ Response Format.

SOH	Length	STX	'R'	'1'	'3'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	14 OF 22	2005. 04. 08.

6.5.11. Decrement

: Decrease the RF Card's Balance as much as a given data value.

Note: Sector Range: 0x00 ~ 0x0f, Block Range: 0x00 ~ 0x02.

☞ Command Format.

SOH	Length	STX	'R'	'1'	'4'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

DATA(4Byte, Hex)		
LSB		MSB

☞ Response Format.

SOH	Length	STX	'R'	'1'	'4'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

6.5.12. Read Balance

: Read the RF Card's Balance.

Note: Sector Range: 0x00~ 0x0f, Block Range: 0x01 ~ 0x02.

☞ Command Format.

SOH	Length	STX	'R'	'1'	'5'	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----

☞ Response Format.

SOH	Length	STX	'R'	'1'	'5'	ST1	ST2	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	------	-----	-----

☞ Negative Response Forma

SOH	Length	STX	'R'	'1'	'5'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

☞ Response DATA Structure

DATA(4Byte, Hex)		
------------------	--	--

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	15 OF 22	2005. 04. 08.

6.5.13. Key Value Change

: Change the terminal Key Value for authentication.

↳ Command Format.

SOH	Length	STX	'R'	'2'	'0'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

↳ Command DATA Structure (Sector : 0x00 ~ 0x0f)

Sector	Key 1	KEY A	KEY B	Key 2	KEY A	KEY B	Key 3	KEY A	KEY B
Sector(1Byte, Hex)				Key1(1Byte, Hex)		DATA (6Byte, Hex)		DATA (6Byte,Hex)	

Sector : 0x00 ~ 0x0f

Key0 : 0x01 Key1 : 0x02 Key2 : 0x03

↳ Response Format.

SOH	Length	STX	'R'	'2'	'0'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

6.5.14. Card Secret Key Change.

: Change the RF Card Key Value.

↳ Command Format.

SOH	Length	STX	'R'	'2'	'1'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

↳ Command DATA Structure

Sector(1Byte, Hex)	KEYA(6Byte, Hex)	KEYB(6Byte,Hex)
--------------------	------------------	-----------------

Sector(0x00 ~ 0x0f)

↳ Response Format.

SOH	Length	STX	'R'	'2'	'1'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	16 OF 22	2005. 04. 08.

6.5.16 Authentication Key

: Select the authentication key: KeyA or KeyB.

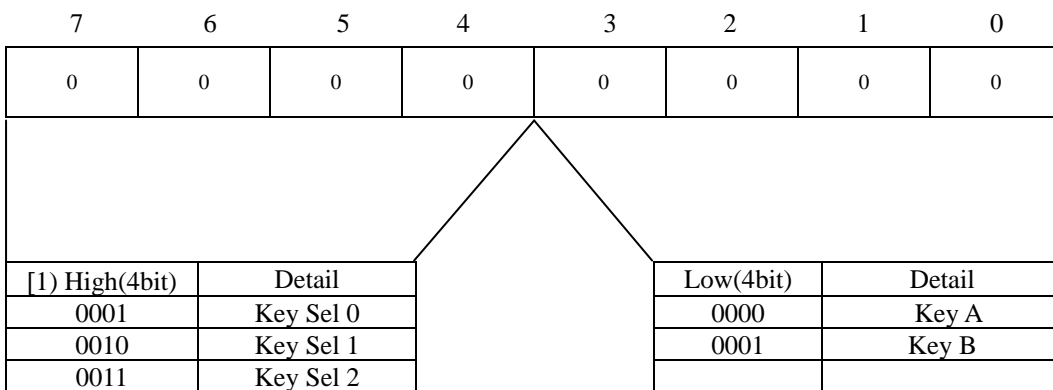
☞ Command Format.

SOH	Length	STX	'R'	'2'	'2'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

Key Select(1Byte, Hex)

<Key Select>



[1 : In case of Authentication failure for the RF Card, select to authenticate with different Key.

Key Sel 0 : Authenticate with the first Key saved in EEPROM.

Key Sel 1 : Authenticate from the first , second Key saved in EEPROM until authenticated.

Key Sel 2 : Authenticate from the first , second and third Key saved in EEPROM until authenticated.

☞ Response Format.

SOH	Length	STX	'R'	'2'	'2'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

* Initial Status : Key Sel 0, Key A

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	17 OF 22	2005. 04. 08.

6.5.17 Card Secret Key Change to other Key

: Change the RF Card Key Value.

☞ Command Format.

SOH	Length	STX	'R'	'2'	'3'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure

Sector(1Byte, Hex)	KEYA(6Byte, Hex)	Access(4Byte, Hex)	KEYB(6Byte,Hex)
--------------------	------------------	--------------------	-----------------

Sector(0x00 ~ 0x0f)

☞ Response Format.

SOH	Length	STX	'R'	'2'	'3'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

6.1.18 Key Value Change

: Change the terminal Key Value for authentication.

(only one key set of the specified sector – differ from “R20” command)

☞ Command Format.

SOH	Length	STX	'R'	'2'	'4'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Command DATA Structure (Sector : 0x00 ~ 0x0f)

Key(1Byte, Hex)	Sector(1Byte, Hex)	DATA (6Byte, Hex)	DATA (6Byte,Hex)
-----------------	--------------------	-------------------	------------------

* Key Name

Key Location	Value
Key 0	0x01
Key 1	0x02
Key 2	0x03

* Sector(1Byte, Hex) : 0x00 ~ 0x0F

☞ Response Format.

SOH	Length	STX	'R'	'2'	'4'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	18 OF 22	2005. 04. 08.

6.5.19 Power On.

: The carrier wave emitted in antenna.

☞ Command Format.

SOH	Length	STX	'R'	'3'	'0'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Response Format.

SOH	Length	STX	'R'	'3'	'1'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

6.5.20 Power Off

: The carrier wave not emitted in antenna.

☞ Command Format.

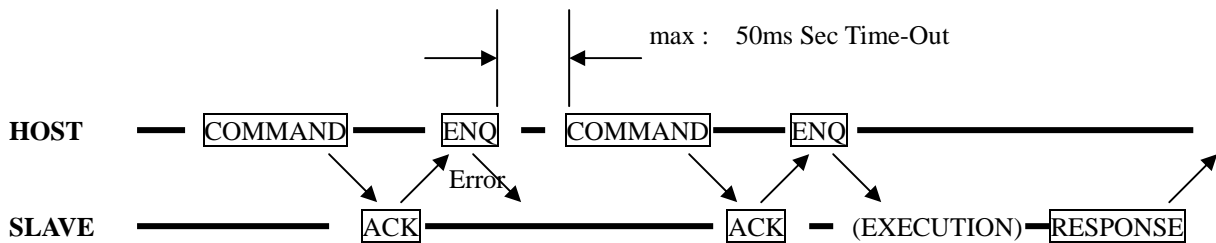
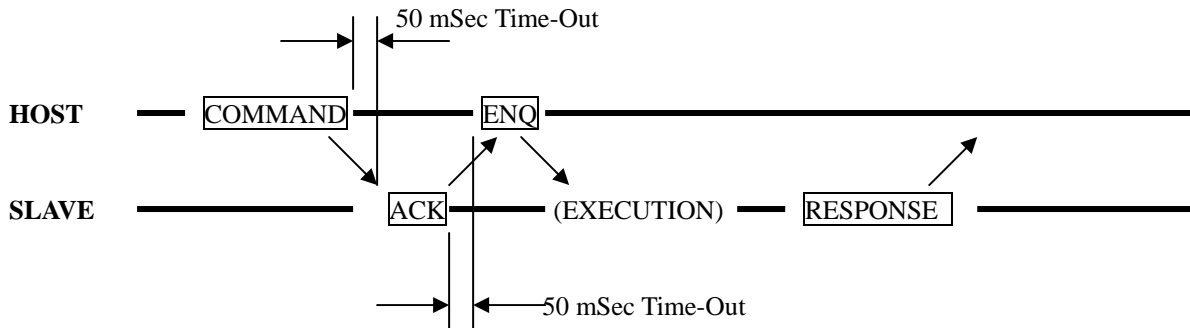
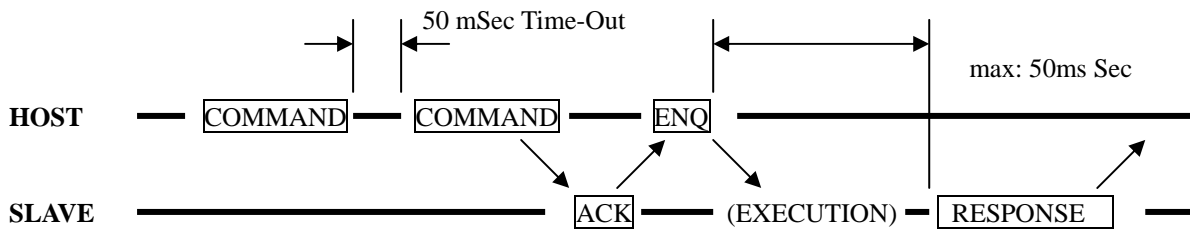
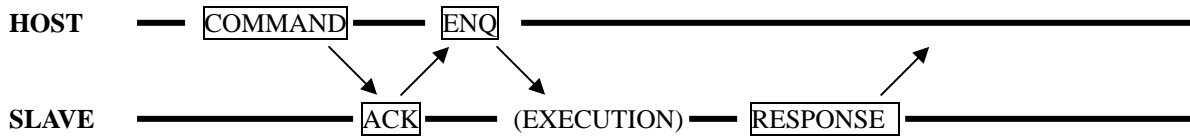
SOH	Length	STX	'R'	'3'	'1'	DATA	ETX	BCC
-----	--------	-----	-----	-----	-----	------	-----	-----

☞ Response Format.

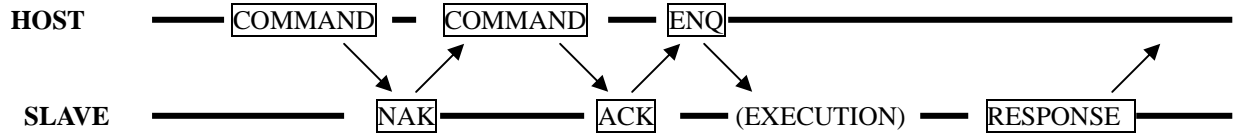
SOH	Length	STX	'R'	'3'	'1'	ST1	ST2	ETX	BCC
-----	--------	-----	-----	-----	-----	-----	-----	-----	-----

Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	19 OF 22	2005. 04. 08.

6.6 Communication Protocol Sequence & Timing



Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	20 OF 22	2005. 04. 08.

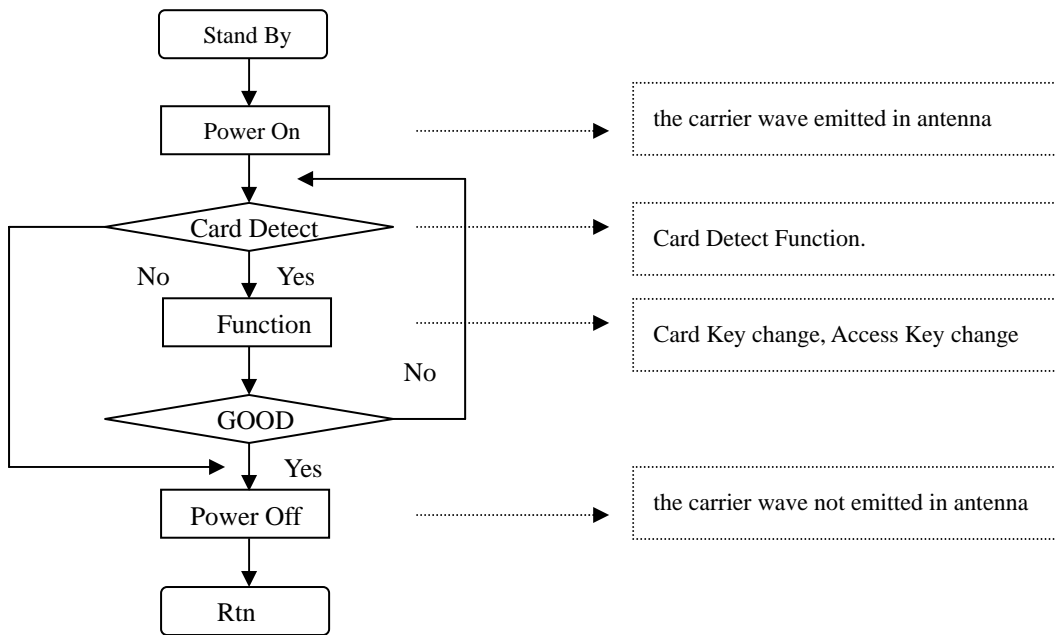


Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	21 OF 22	2005. 04. 08.

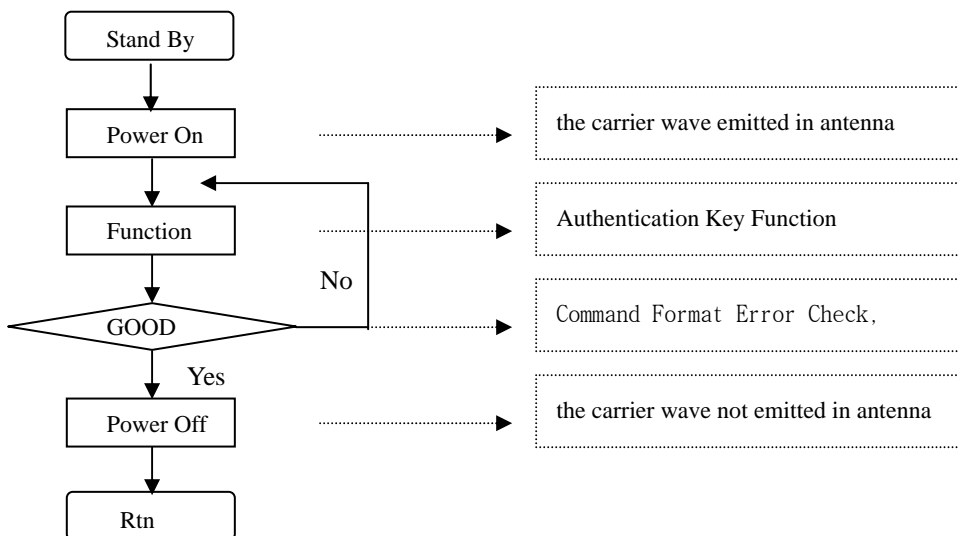
EXECUTION PROCEDURES

This is a flowchart that describes how to operate the read, write, increment and decrement command after detecting the card. However, it is possible to read, write, increase and decrease without detecting a card.

1. Card Key change, Access Key change Function.

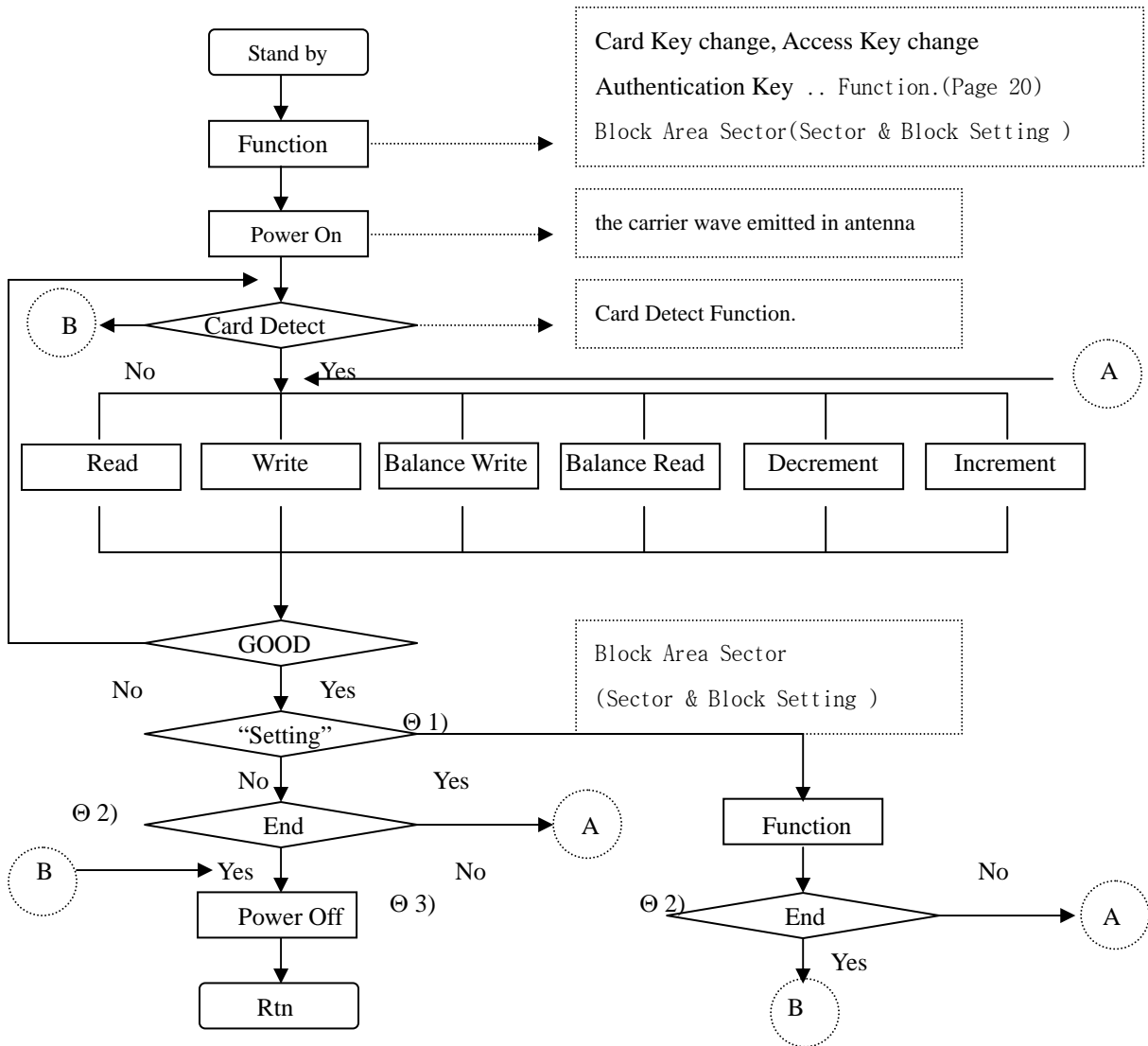


2. Authentication Key Function.



Doc No	KYT-4500 Series SPECIFICATION	REV	PAGE	DATE
		E	22 OF 22	2005. 04. 08.

3. Read/Write, Increment/Decrement, Balance Write/ Balance Read



- ⊖ 1 : “Setting” is for new Sector or Block, not previous Sector or Block
- ⊖ 2: Confirm all the process for present card is completed.
- ⊖ 3: the carrier wave not emitted in antenna

< LED Display >

Color	Detail
GREEN	Normal
ORANGE	The carrier wave emitted in antenna
RED	Error