



V4KF Series Dip Card Reader Data Transmission Specifications

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Advanced Modules Business Company

OMRON

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[Specification History of Modification]

Rev.	Date	Section Number	Content
A	Feb 25, 2004	--	First Official Release

1. Introduction

1.1 Introduction

This specification provides the transmission specifications between the V4KF Series Card Reader and the HOST terminal.

1.2 Applicable Card Handling Device

	Magnetic write/read			IC Card Controller	Lock	Host I/F	SAM	Module Name
	Tr 1	Tr 2	Tr 3					
A	R	R	R	Y	Y	RS232	Y	V4KF-01JS-001
B	R	R	R	Y	Y	RS232	Y	V4KF-01JF-001

*1 R : Magnetic reading function is provided
 *2 Y : Provided
 *3 N : Not provided

1.3 Normative References

The following standards contain the provisions that are referred in this specification.

ISO/IEC 7816-3:1997	Identification cards - Integrated circuit(s) cards with contacts Part 3: Electronic signals and transmission protocols
ISO/IEC 7816-4:1995	Identification cards - Integrated circuit(s) cards with contacts Part 4: Inter-industry commands for interchange
ISO/IEC 7810: 1995-08-15	Identification cards - Physical characteristics
ISO/IEC 7811-1: 1995-08-15	Identification cards - Recording technique Part 1:Embossing
ISO/IEC 7811-2: 2001-02-01	Identification cards - Recording technique Part 2:Magnetic stripe - Low coercivity
ISO/IEC 7811-3: 1995-08-15	Identification cards - Recording technique Part 3:Location of embossed characters on ID-1 cards
ISO/IEC 7811-4: 1995-08-15	Identification cards - Recording technique Part 4:Location of read-only magnetic tracks - Tracks 1 and 2
ISO/IEC 7811-5: 1995-08-15	Identification cards - Recording technique Part 5:Location of read-only magnetic tracks - Tracks 3
ISO 2111: 1985-02-01	Data communication -Basic mode control procedures -Code independent information transfer
EMV 4.0: December, 2000	EMV2000 Integrated Circuit Card Specification for Payment Systems Book 1 Application Independent ICC to Terminal Interface Requirements
Memory Card	SIEMENS SLE4432/SLE4442 Data Books SIEMENS SLE4418/SLE4428Data Books

1.4 Notice for IC card (ICC)

OMRON standard ICC controller and FW (firmware) cannot perfectly execute almost all customers' ICC(s) because ISO standard and also ICC(s) are modified frequently. OMRON should check your customer's ICC if you can get it and its specification.

1.5 Definition of Terminology

(1) General

C/R	Card Reader
Default	Value set by the C/R when the power is turned on
DL	Program Downloading
FW	Firmware
HOST	HOST Terminal
ICC	Integrated Circuit Card. A card into which one or more integrated circuits are inserted to perform processing and memory functions.
max.	Maximum
min.	Minimum
Partial FW	ICC or SAM protocol modules that can be downloaded by each ICC standard.
Standard FW	A firmware that excludes ICC or SAM protocol.
SAM	Security Application Module

(2) Mechanical

S1 Sensor	Front sensor to detect the insertion and ejection of the cards.
S2 Sensor	Rear sensor to detect the completion of card insertion and the start of card ejection.
Lock	Lock to prevent the card from being pulled out during ICC activation.

(3) Host Interface

DTR	Data Terminal Ready
CTS	Clear to send

(4) Magnetic Card

SS	Magnetic Data Start Sentinel
ES	Magnetic Data End Sentinel
LRC	Magnetic Data Longitudinal Redundancy Check
VRC	Magnetic Data Vertical Parity

(5) IC Card

APDU	Application Protocol Data Unit
ATR	Answer to Reset
BWI	Block Waiting Time Integer
BWT	Block Waiting Time
CLA	Class Byte of the Command Message
Cold Reset	The reset of the ICC that occurs when the supply voltage (VCC) and other signals to the ICC are raised from the inactive state and the reset (RST) signal is applied.
D	Indicated values of the bit rate adjustment factor
etu	Elementary Time Unit
F	Indicated values of the clock rate conversion factor
IFS	Information Field Size
IFSD	Information field size for the interface device
Lc	Exact Length of Data Sent by Terminal in Response to a Case 3 or 4 Command
Le	Maximum Length of Data Expected by the terminal in Response to a Case 2 or 4 Command
LEN	Length
NAD	Node Address
P1	Parameter 1
P2	Parameter 2
P3	Parameter 3
PCB	Protocol Control Byte
PPS	Protocol and Parameter Selection
SAD	Source Node Address
SW1	Status Word One
SW2	Status Word Two
T=0	Character-oriented asynchronous half duplex transmission protocol
T=1	Block-oriented asynchronous half duplex transmission protocol
TCK	Check Character
Warm Reset	The reset that occurs when the reset (RST) signal is applied to the ICC while the clock (CLK) and supply voltage (VCC) lines are maintained in their active state.

(6) Character Code Expression Method

XXh	shows the HEX Code.
"X"	shows the ASCII Code.

2. Transmission Specifications

2.1 Basic Transmission Specifications

Item	Content
Electronic Interface	RS232 Interface
Synchronous Method	Start-Stop Synchronization Method
Communication Method	Half~duplex Method
Transmission Speed	1200, 2400, 4800, 9600, 19200, 38400bps Automatic Recognition *1
Character Format	Start Bit 1 bit
	Data 8 bit
	Vertical Parity Bit: 1 bit (Even)
	Stop Bit: 1 bit
Character Code	ASCII, Binary
Error Detector	Horizontal Parity Check (BCC) Even
	Vertical Parity Check: Even
Bit Sending Sequence	LSB Priority

*1 After the power is turned on, downloading is successfully completed, or the host receives a response to the command of "d3" (Prohibition on use of FW), the host shall confirm the DTR signal of C/R turns on, and shall send an "Initial Reset" command. This "Initial Reset" command determines the transmission speed to be used between the host and the C/R. When the host sends data other than an "Initial Reset" command (e.g. DLE EOT), it shall send an "Initial Reset" command after 15 ms.

2.2 Transmission Control Method

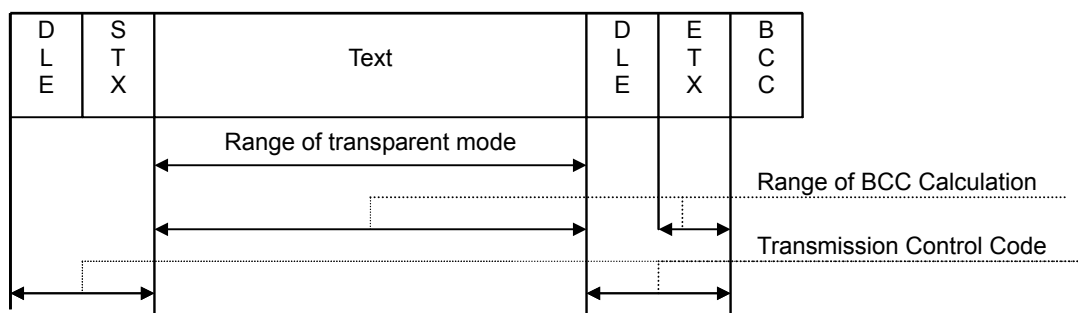
- Command/Response Method
- The C/R executes processes in accordance with commands sent by the host.
- Results obtained from those processes are sent to the host as responses to those commands.

2.3 Transmission Control Codes

Code	Value	Meaning
DLE STX	10H 02H	Representing the start of text in a command or a response.
DLE ETX	10H 03H	Representing the end of text in a command or a response.
DLE ENQ	10H 05H	Requiring the C/R to execute a command or to resend a response
DLE ACK	10H 06H	Positive response from the C/R reporting having successfully received a command sent by the host.
DLE NAK	10H 15H	Negative response from the C/R reporting having failed in receiving a command sent by the host.
DLE EOT	10H 04H	Instructing the C/R to interrupt a transmission or execution of command.
DLE	10H	Representing a control code in text in transparent mode.

2.4 Message Format

2.4.1 Command/Response Format



- Each text contains one command or response.
- BCC is obtained by calculating the exclusive OR (XOR) from the beginning of the text (the next character of the STX) to ETX.
- However, the following are excluded from the BCC calculation.
 - DLE (10H) in the transparent mode
 - DLE (10H) in "DLE ETX" of a transmission control code
- The Vertical Parity of BCC is regarded as the BCC Parity.
- The maximum transmission delay between each character from DLE to BCC sent from the host or the C/R is less than 5sec.

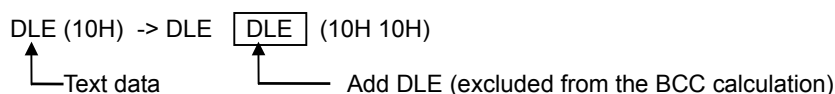
2.4.2 Usable Codes in Text

					b8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
					b7	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1
					b6	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
					b5	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
b4	b3	b2	b1		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	0	0	0		DLE*1	S	P	0	@	P	`	p							
0	0	0	1	1			!	1	A	Q	a	q								
0	0	1	0	2	STX		"	2	B	R	b	r								
0	0	1	1	3	ETX		#	3	C	S	c	s								
0	1	0	0	4	EOT		\$	4	D	T	d	t								
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u								
0	1	1	0	6	ACK		&	6	F	V	f	v								
0	1	1	1	7			'	7	G	W	g	w								
1	0	0	0	8			(	8	H	X	h	x								
1	0	0	1	9			)	9	I	Y	i	y								
1	0	1	0	A			*	:	J	Z	j	z								
1	0	1	1	B			+	;	K	[	k	{								
1	1	0	0	C			,	<	L	\	l	|								
1	1	0	1	D			~	=	M	]	m	}								
1	1	1	0	E			.	>	N	^	n	~								
1	1	1	1	F			/	?	O	_	o									

*1 [Transparent Mode]

When "DLE (10H)" is used in text as a part of a command or a response, add one more "DLE (10H)" to the text, totaling 2 characters on the transmission line.

For details, refer to "4. Presentation of data" and "5. Reception of data" in ISO 2111.

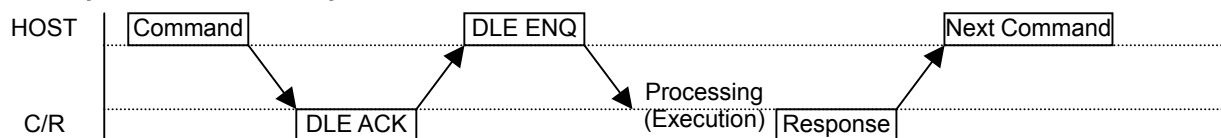


2.5 Transmission Control Procedure

2.5.1 Transmission Start

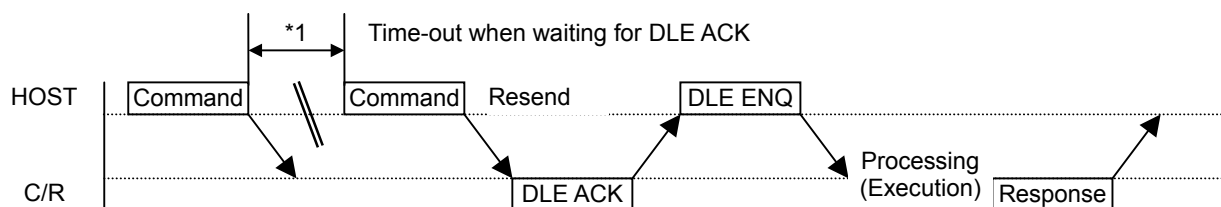
The transmission speed (baud rate) between the C/R and the host is automatically determined by the first "Initial Reset" command from the host. Therefore, the host shall send an "Initial Reset" command as the first command after power is turned on. If the host sends data (e.g. DLE EOT) other than an "Initial Reset" command, it shall send an "Initial Reset" command after 15 ms.

2.5.2 Sequence in Normal Operation



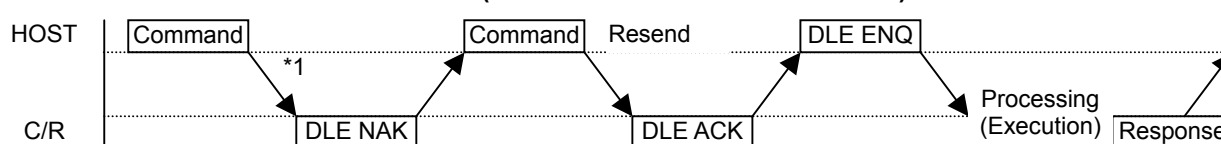
2.5.3 Sequence in Recovery Operation

(1) Monitoring time-out occurs while the host is waiting for ACK from the C/R. (The host resends the command.)



*1: See 1.6 "Transmission Control Matrix"

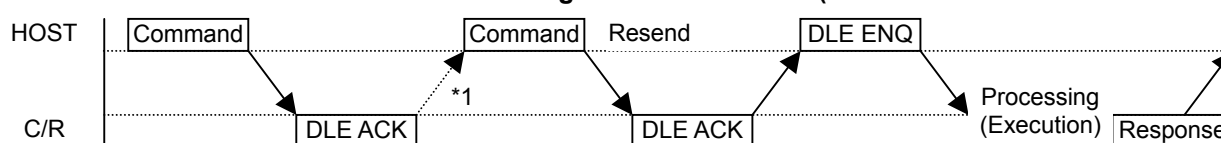
(2) The host receives NAK from the C/R. (The host resends the command.)



*1: The C/R detected a receiving error.

(Errors include vertical parity, BCC and monitoring time-out between characters.)

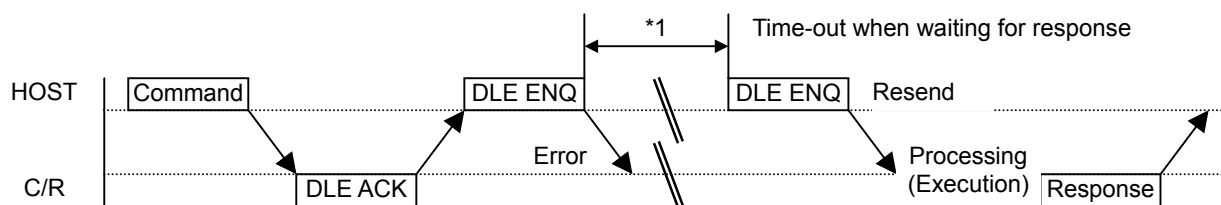
(3) The host detects an error while it is receiving ACK from the C/R. (The host resends the Command.)



*1: The host detected a receiving error.

(4) Monitoring time-out occurs while the host is waiting for a response from the C/R.

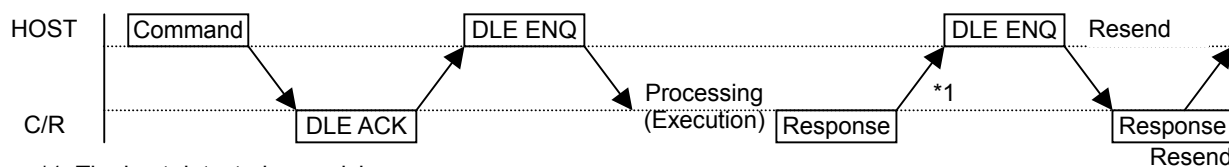
(The host resends ENQ, requesting a response from the C/R.)



*1: See 2.6 "Transmission Control Matrix"

(5) The host detects an error during receiving a response from the C/R.

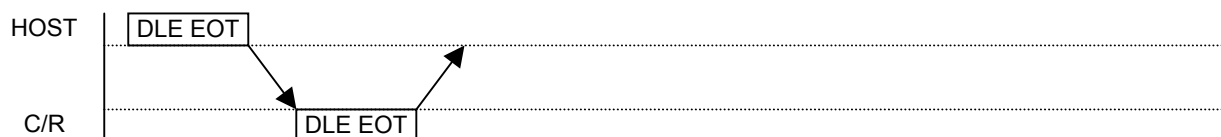
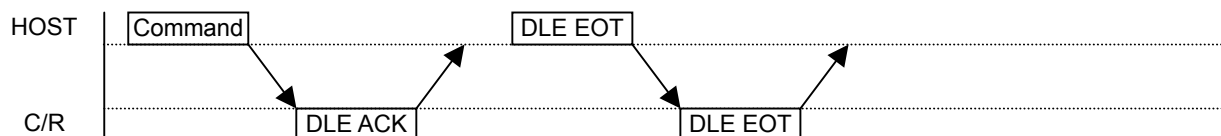
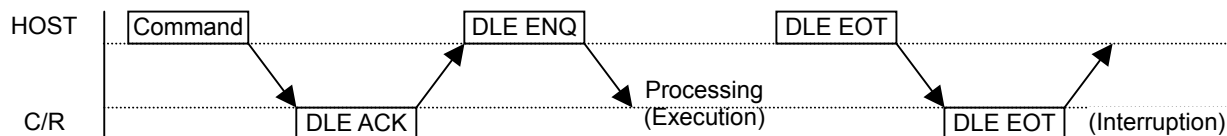
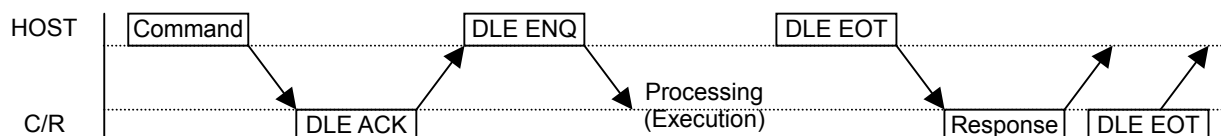
(The host resends ENQ, requesting the C/R to resend the response.)



*1: The host detected a receiving error.

2.5.4 Interruption of Transmission and Command sent by the host to the C/R

By sending "DLE EOT" from the host to the C/R, transmission and execution of a command can be interrupted any time except while downloading is in process.

(1) Before the host sends a command (Interrupting transmission from the host to the C/R)**(2) After the host sends a command (Canceling the command from the host to the C/R)****(3) After the host sends ENQ (The host forcefully interrupts the command in process.)****(4) While the C/R is sending a response (The host interrupts the transmission.)**

2.6 Transmission Control Matrix

2.6.1 Control by the host (provided for reference)

Code/Event Status of HOST		Codes received from C/R				Reception monitor by HOST	
		DLE ACK	DLE NAK	DLE STX	DLE ETX BCC	Other Codes	Time-out Monitoring Time
1	Waiting for DLE ACK after sending a command	Sends DLE ENQ -> 2	Resends the command -> 1 *3	Ignores	Ignores	Ignores	Resends the command -> 1 *3
2	Waiting for a response after sending DLE ENQ	Ignores	Ignores	Clears buffer -> 3	Ignores	Ignores	Resends DLE ENQ -> 2 *3
3	Waiting for DLE ETX BCC during receiving a response	Ignores	Ignores	Clears buffer -> 3	Sends the next command when the reception was successful -> 1 Resends DLE ENQ when the reception was failed -> 2 *3	Stores data -> 3	Resends DLE ENQ -> 2 *3

*1: Monitoring Time for waiting "DLE ACK" after transmission of a command by the host shall be set to 5.02sec or more. When an Initial Reset Command sent from the host extends the transmission/reception switching time of the C/R side, 5.02 more sec shall be added to this Monitoring Time.

*2: The monitoring time for which the host waits for a response varies depending on each command. Usually 10 seconds or more is recommended. For responses to commands that require user's operation (e.g., Inserting, taking out), add the operation time to the monitoring time.

*3: The host side shall define the number of retransmission, and the number shall be one or more. When all the retries end up with failure, the host shall regard it as an error.

*4: This monitoring time varies depending on the transmission speed and the data length of the response. The monitoring time in 9600 bps is 3 sec, but that in 1200 bps is 20 sec.

2.6.2 Control by C/R

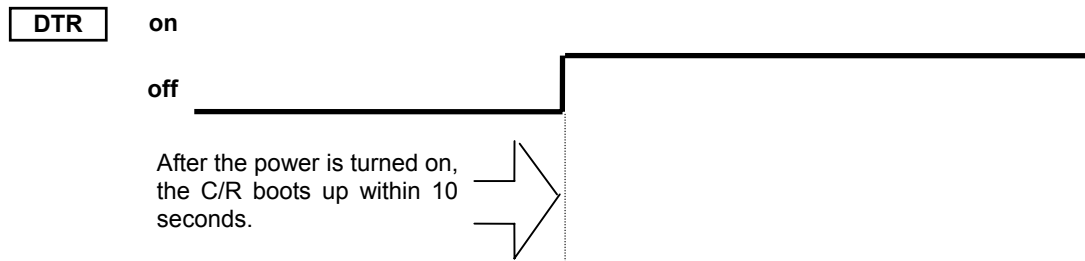
Code/Event Status of HOST		Codes received from HOST				Reception monitor by C/R	
		DLE ENQ	DLE STX	DLE EOT	DLE ETX BCC	Other Codes	Time-out Monitoring Time
1	Idle	Resends the response -> 1	Clears buffer -> 2	Execution Interrupted -> 1	Ignores	Ignores	Ignores
2	Waiting for DLE ETX BCC during receiving a command	Ignores	Clears buffer -> 2	Execution Interrupted -> 1	Sends DLE ACK, when the reception is successful -> 3 Sends DLE NAK, when reception was failed -> 1	Stores data -> 2	Sends DLE NAK -> 1
3	Waiting for DLE ENQ after sending DLE ACK	Sends a response after executing a command -> 1	Clears buffer -> 2	Execution Interrupted -> 1	Ignores	Ignores	Ignores

Whenever the C/R is processing a command, except when DL is in process, all characters other than "DLE EOT" from the host are ignored. For details about "DLE EOT" during downloading.

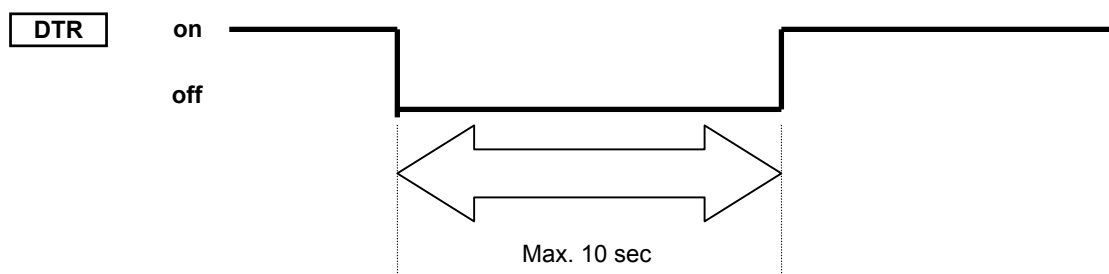
3. Time Chart of Transmission Control Signal Line

The signal names shown below represent the signals on the C/R side.

3.1 DTR Signal



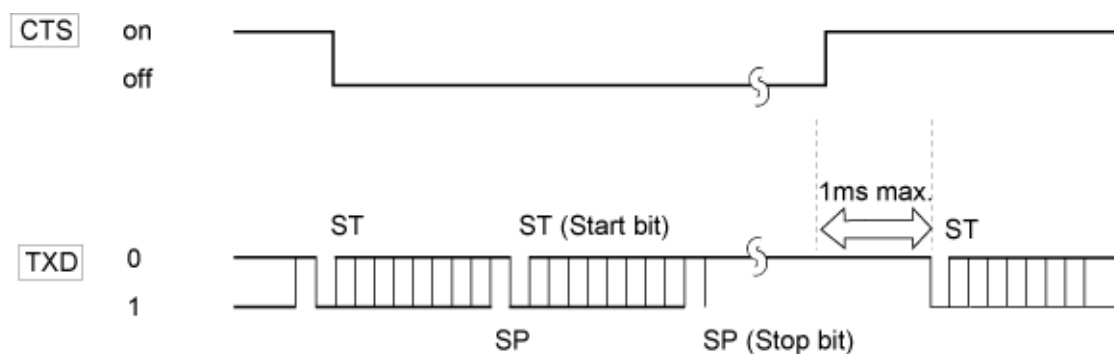
- (1) The host shall send Initial Reset after the DTR Signal is turned ON. After confirming that the DTR Signal is turned on, the host shall send an Initial Reset command, for example ("07") but other Initial Reset are also allowed
- (2) After the power is turned on, the C/R boots up within 4sec.



- (3) After the host receives a response of either DL Completion (Command "d2") or DL Preparation (Command "d3"), the DTR Signal is turned off for 300 ms at most.

3.2 Interruption of Transmission by the CTS Signal

The figure shown below represents the case that the CTS Signal from the host is turned off while the C/R is transmitting a response.



- (1) When the CTS Signal from the host is turned OFF during transmission of a response from the C/R, the C/R interrupts the transmission after sending two or less characters.
- (2) The C/R resumes transmission within 1ms after the CTS Signal is turned on.
- (3) If the CTS Signal has been turned off before C/R's transmitting a response, the C/R sends a response after the CTS Signal is turned on.

4. Encryption Specifications

4.1 Concept

The C/R has the encryption and decryption function of all transaction data in order to prevent them from being stolen by the other device. When the host send the key exchange command ("Cg6") to the C/R, it transmits the encrypted data to the host.

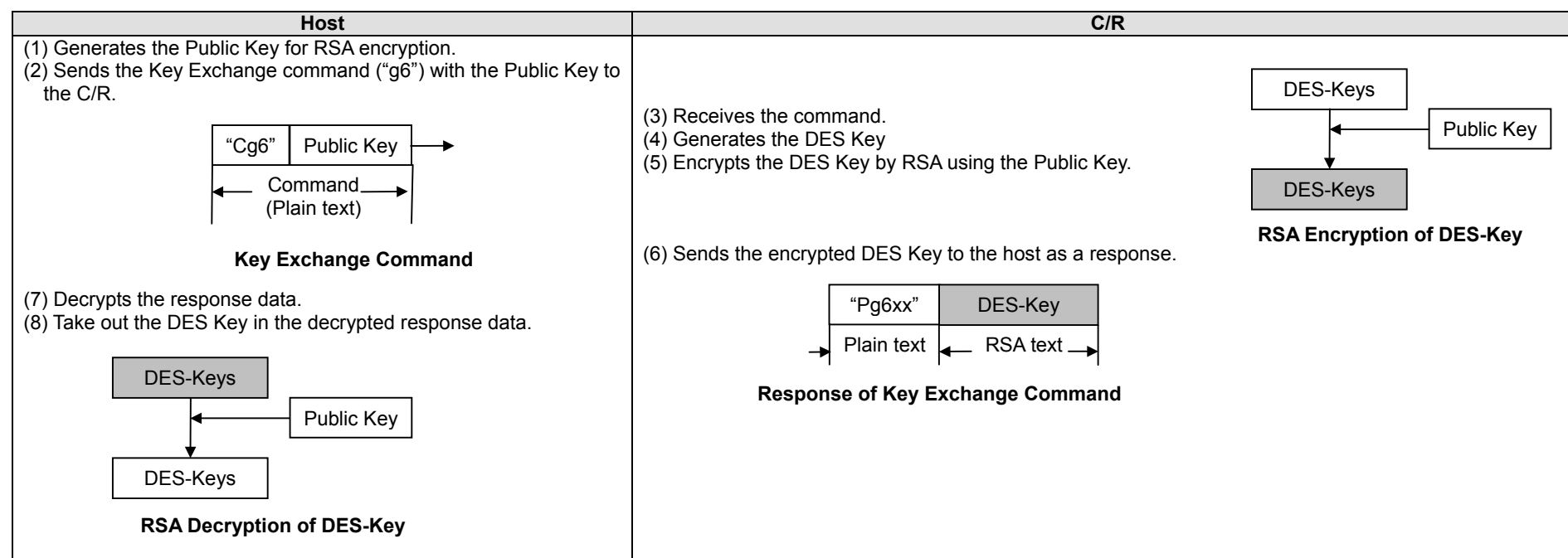
When the host does not send the key exchange command ("Cg6") to the C/R, it can transmit the plain data to the C/R.

- The encryption is the RSA and the single DES.
- First, the C/R exchanges the DES Keys by the RSA.
- All transmission data is decrypted and encrypted by the DES after exchanging the DES Keys.

4.2 Key Exchange Sequence

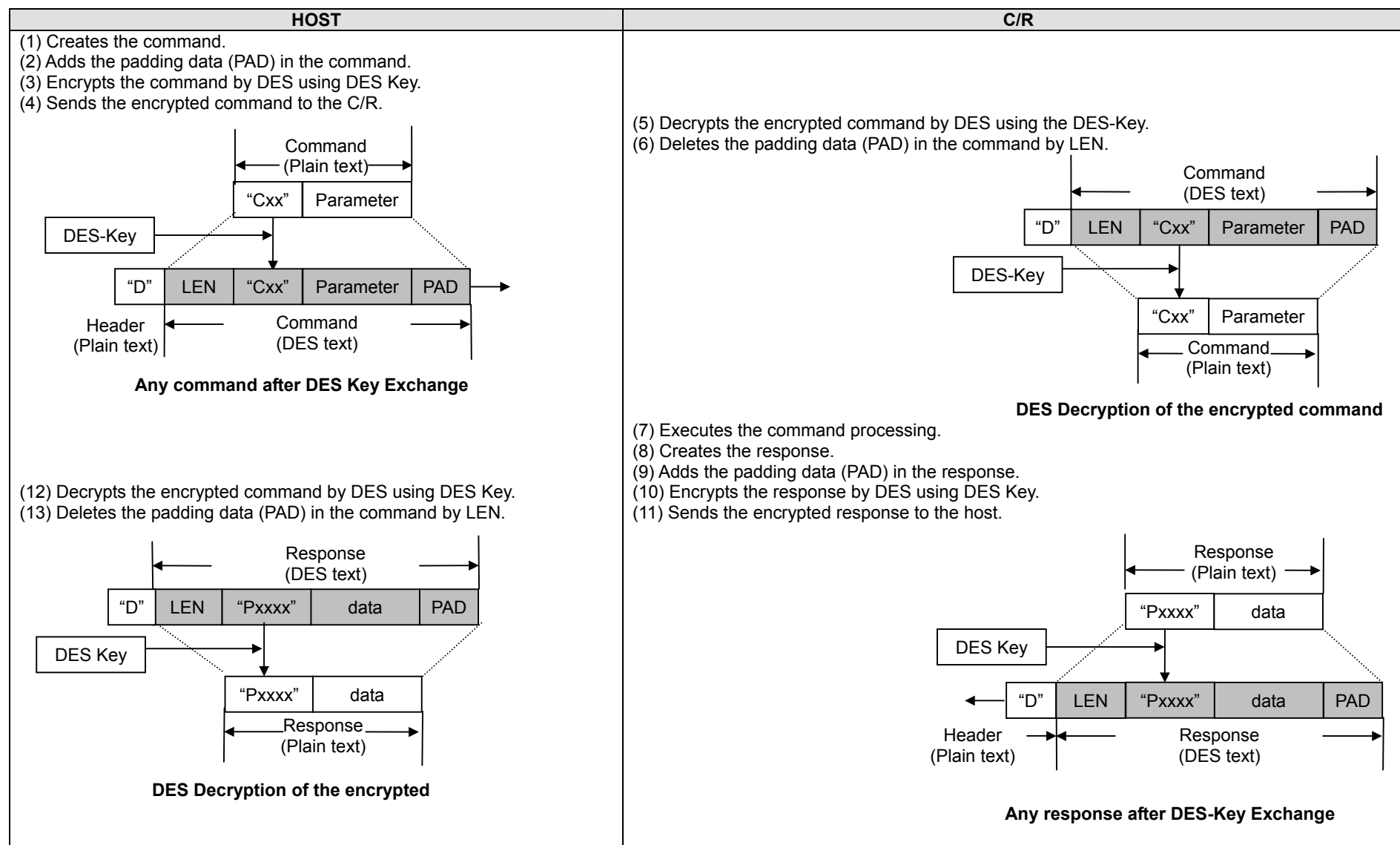
Step 1: Exchanging the DES Key (After power on)

After the power on, the C/R exchanges the DES Key for the encryption of the transaction data by the RSA.



Step 2: Encrypt Data Transmission during the transaction

After exchanging the DES Key (Step 1), the C/R and the host encrypt all transaction data by DES and transmit them.



5. Message Specifications

Each line in the tables is specified as shown below:

5.1 Pain Text Format

5.1.1 Command Format (HOST -> C/R)

The host sends the data to the C/R in the following format.

IDN (1byte)	CMD (2bytes)	Parameter (xx bytes)
----------------	-----------------	-------------------------

Field	Length	Value(s)	Meaning
IDN	1	"C" (43h)	Indicates Command
CMD	2	xxxxh	Specifies a command.
Parameters	0~2054	xxxxh	Command parameter. Depends on CMD

5.1.2 Response Format (C/R -> HOST)

The host receives the data from the C/R in the following format.

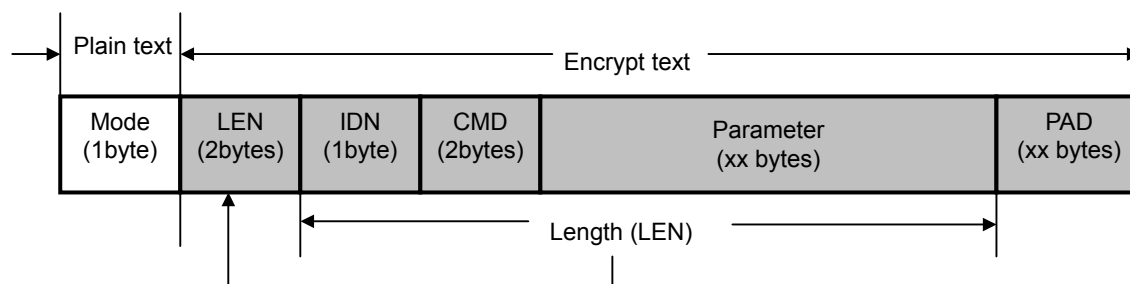
JDG (1byte)	RCM (2bytes)	RES (2bytes)	SAM RES (0 or 2bytes)	Response Data (xx bytes)
----------------	-----------------	-----------------	--------------------------	-----------------------------

Field	Length	Value(s)	Meaning
JDG	1	"P" (50h)	Specifies a positive response that the process was normally completed.
	1	"N" (4Eh)	Specifies a negative response that the process was abnormally completed.
RCM	2	xxxxh	Same code as the command (CMD).
RES	2	xxxxh	If JDG is P, RES specifies the position of a card. If JDG is N, RES specifies an error resulted from the command process.
SAM RES	0 or 2	xxxxh	SAM RES in the Response Message specified.
Response Data	0~1000	xxxxh	The data obtained by processing a command. Some responses do not have any response data.

5.2 Encrypt Text Format

5.2.1 Command Format (HOST -> C/R)

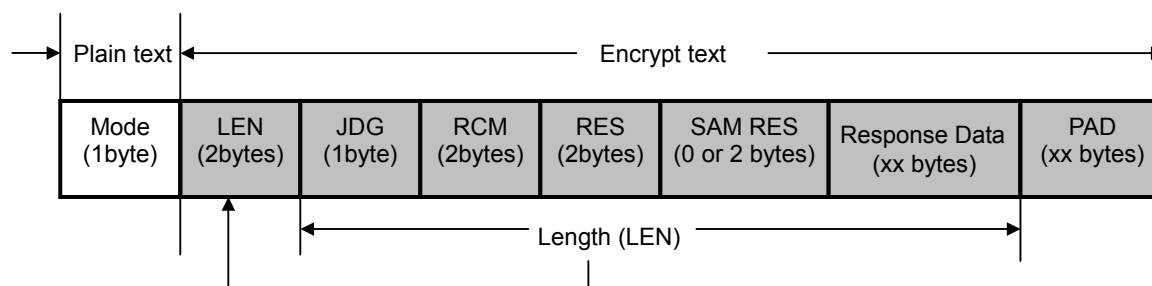
The host sends the data to the C/R in the following format.



Field	Length	Value(s)	Meaning
MODE	1	"D" (44h)	Encrypt Mode
LEN	2	Below Table	Length from "IDN" ("C") to "Parameter"
IDN	1	"C" (43h)	Indicates Command
CMD	2	xxxxh	Specifies a command
Parameters	0~2054	xxxxh	Command parameter. Depends on CMD
PAD	---	xxxxh	Padding Data so that the length of the data from IDN to PAD become multiple of 8 bytes.

5.2.2 Response Format (C/R -> HOST)

The host receives the data from the C/R in the following format.



Field	Length	Value(s)	Meaning
MODE	1	"D" (44h)	Encrypt Mode
LEN	2	Below Table	Length from "JDG" ("P" or "N") to "Response Data"
JDG	1	"P" (50h)	Specifies a positive response that the process was normally completed.
	1	"N" (4Eh)	Specifies a negative response that the process was abnormally completed.
RCM	2	xxxxh	Same code as the command (CMD).
RES	2	xxxxh	If JDG is P, RES specifies the position of a card. If JDG is N, RES specifies an error resulted from the command process.
SAM RES	0 or 2	xxxxh	SAM RES in the Response Message specified.
Response Data	0~1000	xxxxh	The data obtained by processing a command. Some responses do not have any response data.
PAD	---	xxxxh	Padding Data so that the length of the data from LEN to PAD becomes multiple of 8 bytes.

6. Command Tables

6.1 Basic Commands

Command Name	CMD (ASCII)	Function	Ref
Initial Reset	"00"	Initializes the C/R.	8.1
Key Exchange	"96"	Sets the RSA Public key and reads the encrypted DES Key. And starts encrypted data communication.	8.61
Transaction Setting	"6"	Sets the magnetic read method and the lock timing.	8.70
C/R Status Sense	"10"	Reads the C/R status.	8.2
C/R Sensors Sense	"11"	Reads the sensors status.	8.3
Card Status Monitoring	"92"	Monitors the C/R status.	8.9
ISO#1 Read	"61"	Sends the ISO #1 read data.	8.4
ISO#2 Read	"62"	Sends the ISO #2 read data.	8.5
ISO#3 Read	"63"	Sends the ISO #3 read data.	8.6
Multi-track Read	"6a"	Sends the multiple tracks data.	8.7
Read Data Clear	"6s"	Clears the read buffer.	8.8
LED OFF	"P6"	Turns off the LED.	8.32
LED ON	"P7"	Turns on the LED. (Green, Red or Orange)	8.33
LED Blinking	"P8"	Blinks the LED. (Green, Red or Orange)	8.34
Error Log Read	"J0"	Reads the local error log.	8.26
Sensor Level Read	"L0"	Reads the voltage of sensors.	8.27
Life Counter Read	"M0"	Reads the number of movement of each part of the C/R.	8.28
Maintenance Result Read	"M8"	Reads the results executed by the maintenance SW.	8.29
Option Read	"N0"	Reads the information of options installed.	8.30
Automatic LED control	"N3"	Sets the validation of the automatic LED control.	8.31
Main FW Version	"V0"	Reads the FW version.	8.35
ICC FW Version	"V1"	Reads the FW version of ICC control part.	8.36
SAM FW Version	"V2"	Reads the FW version of SAM control part.	8.37
User Information for Main FW	"u0"	Reads the user information for standard FW.	8.68
User Information for Partial FW	"u1"	Reads the user information for partial FW (ICC or SAM FW).	8.69

6.2 ICC Commands

Command Name	CMD (ASCII)	Function	Ref
Lock	"C0"	Sets the lock.	8.10
Unlock	"C1"	Releases the lock.	8.11
ICC Activation	"C2"	Activates ICC. (Initiates a cold reset.)	8.12
ICC Deactivation	"C3"	Deactivates ICC.	8.13
ICC Cold Reset	"E0"	Activates ICC. (Initiates a cold reset.) Then executes the PPS request, If possible.	8.16
ICC Warm Reset	"E1"	Activates the ICC. (Initiates a warm reset.) Then executes the PPS request, If possible.	8.17
ICC Multiple Processing	"C5"	Lock + ICC Activation ("C0"+"C2")	8.14
	"C6"	ICC Deactivation + Unlock ("C3"+"C1")	8.15
	"G1"	Lock + ICC Cold Reset ("C0"+"E0")	8.25
T=0 Transmission	"F0"	Transmits the data to ICC on T=0 protocol.	8.18
T=1 Transmission	"F1"	Transmits the data to ICC on T=1 protocol.	8.19
T=1 Chaining Transmission	"F2"	Sends the chained data to ICC on T=1 protocol.	8.20
T=1 Chaining Reception	"F3"	Receives the chained data from ICC on T=1 protocol.	8.21
T=1 Chaining Cancel	"F4"	Cancels the chaining transmission on T=1 protocol.	8.22
PPS Request	"F8"	Executes a PPS request.	8.23
T=0 / T=1 Transmission	"FC"	Transmits the data to ICC on T=0 or T=1 protocol. The protocol type is automatically determined.	8.24

6.3 SAM Commands

Command Name	CMD (ASCII)	Function	Ref
SAM Status Sense	"e0"	Reads SAM status.	8.49
SAM Activation	"e1"	Activates SAM. (Initiates a cold reset.)	8.50
SAM Deactivation	"e2"	Deactivates SAM.	8.51
SAM Cold Reset	"e3"	Activates SAM. (Initiates a cold reset.) Then executes the PPS request, If possible.	8.52
SAM Warm Reset	"e4"	Activates SAM. (Initiates a warm reset.) Then executes the PPS request, If possible.	8.53
T=0 Transmission	"f0"	Transmits the data to SAM on T=0 protocol.	8.54
T=1 Transmission	"f1"	Transmits the data to SAM on T=1 protocol.	8.55
T=1 Chaining Transmission	"f2"	Sends the chained data to SAM on T=1 protocol.	8.56
T=1 Chaining Reception	"f3"	Receives the chained data from SAM on T=1 protocol.	8.57
T=1 Chaining Cancel	"f4"	Cancels the chaining transmission on T=1 protocol.	8.58
PPS Request	"f8"	Executes a PPS request.	8.59
T=0 / T=1 Transmission	"fC"	Transmits the data to SAM on T=0 or T=1 protocol. The protocol type is automatically determined.	8.60

6.4 Protocol Handling for ICC & SAM

Command Name	CMD (ASCII)	Function	Ref
ICC and SAM Control Information	"Y0"	Reads the control information of ICC and SAM.	8.38
	"Y2"	Sets the monitoring time for waiting for reception used in the commands related to ICC and SAM.	8.39
	"Y3"	Sets the IFSD control method used in the commands related to ICC and SAM.	8.40
	"Y4"	Sets the TCK control method used in the commands related to ICC and SAM.	8.41
	"Y5"	Sets the ICC supply voltage (5V/3V) in the commands related to ICC.	8.42
	"Y6"	Sets the reference standard used in the commands related to ICC.	8.43
	"Y7"	Sets the reference standard used in the commands related to SAM.	8.44

6.5 Memory Card Command

Command Name	CMD (ASCII)	Function	Ref
Activation	"m2"	Activates the memory card.	8.62
Deactivation	"m3"	Deactivates the memory card.	8.63
Multiple processing	"m5"	Lock + memory card activation ("C0"+"m2")	8.64
	"m6"	Memory card deactivation + Unlock ("m3"+"C1")	8.65
Transmission and Reception	"m7"	Sends and receives the data between the host and the memory card.	8.66
PSC Verification	"m8"	Executes the verification of memory card.	8.67

6.6 Download Function

Command Name	CMD (ASCII)	Function	Ref
DL Start	"d0"	Starts the DL procedure.	8.45
DL Transmission	"d1"	Sends the DL Data (FW).	8.46
DL Completion	"d2"	Completes the DL procedure.	8.47
DL Preparation	"d3"	Prepares the downloading.	8.48

7. Response Tables

7.1 Table of Positive Response Status

Response statuses (RES) of Positive Response Format are shown in the table below:

RES (ASCII)	Meaning	Hardware Status		
		S1 Sensor	S2 Sensor	Lock
"00"	No card is in the C/R.	OFF	OFF	--
"01"	The card is in the C/R.	ON	OFF	--
"02"	The card is in the C/R completely.	ON	ON	OFF
"10"	The card is locked.	ON	ON	ON
"11"	The IC card is activated.	ON	ON	ON
"20"	Transmission with ICC Completion (With/ without Reception Data, with SW1 + SW2)	ON	ON	ON
"21"	In the process of Continuous Reception from ICC (With Reception Data, without SW1 + SW2)	ON	ON	ON
"22"	In the process of Continuous Transmission to ICC (Without Reception Data, without SW1 + SW2)	ON	ON	ON
"23"	Abort Completion of ICC Transmission by Forced Interruption	ON	ON	ON
"30"	In the Process of Downloading	--	--	--
"31"	Downloading Normal Completion. Waiting for Initial Reset	--	--	--

7.2 Status Table of SAM Positive Response

SAM statuses (SAM RES) of SAM Positive Response Format are shown in the table below.

SAM RES (ASCII)	Meaning	Hardware Status		
		S1 Sensor	S2 Sensor	Lock
"40"	The SAM is deactivated.	--	--	--
"41"	The SAM is activated.	--	--	--
"50"	Transmission to SAM Completion (with/without Receiving Data, with SW1+SW2)	--	--	--
"51"	Continuous Reception Status from SAM (with Receiving Data, without SW1+SW2)	--	--	--
"52"	Continuous Transmission Status to SAM (without Receiving Data, without SW1+SW2)	--	--	--
"53"	Abort Completion of SAM Transmission by Forced Interruption.	--	--	--

7.3 Table of Negative Response Status (Error Code)

Response statuses (RES) of Negative Response Format are shown in the table below:

(1) Error code table (1/3)

RES (ASCII)	Sorts of Error	Meaning	Host processing after error
"00"	Reception of Undefined Command	<ul style="list-style-type: none"> The received command is not included in the specification. 	The host must check the content and sequence of the command.
"01"	Command Sequence Error	<ul style="list-style-type: none"> The received command is not available in the current state. 	The host must check the content and sequence of the command.
"02"	Command Parameter Error	<ul style="list-style-type: none"> The parameter of the received command is not appropriate. 	The host must check the content and sequence of the command.
"07"	No Exchange Key Error	<ul style="list-style-type: none"> The command except the Key Exchange command ("g6") was received before the DES Keys were not exchanged. 	The host should send the Key Exchange command ("g6") if the host want to transmit a encrypted data with C/R.
"08"	Not decrypt Error	<ul style="list-style-type: none"> The C/R cannot decrypt the received command. 	The host must check the content and sequence of the command.
"09"	Command Mode Error	<ul style="list-style-type: none"> The mode in the command format was not "D". 	The host must check the content and sequence of the command.
"0A"	Error during Maintenance	<ul style="list-style-type: none"> The maintenance SW was pressed and C/R is performing the maintenance procedures. 	The host shall send the initial reset command ("00") after completing the maintenance procedure.
"0B"	Error after Maintenance	<ul style="list-style-type: none"> The maintenance SW was pressed and the maintenance procedures have been completed. 	In case one of these errors occurs, the host shall send the initial reset command ("00").
"11"	Lock Error	<ul style="list-style-type: none"> The C/R has failed to release the lock. The C/R has failed to set the lock. When the C/R was releasing the lock, the echo switch of the lock was turned off. When the C/R was setting the lock, the echo switch of the lock was turned on. 	In case one of these errors occurs, the host shall send the initial reset command ("00").
"18"	Power-down Detection	<ul style="list-style-type: none"> Power down has been detected while a command (including initial reset command) was being processed or before it is processed. 	In case one of these errors occurs, the host shall send the initial reset command ("00").
"19"	Waiting for Initial Reset	<ul style="list-style-type: none"> The C/R has received a command other than the Initial Reset Commands after the power was turned on. The C/R has received a command other than the Initial Reset Commands after the C/R sent the response of Waiting for Initial Reset ("19"). 	In case one of these errors occurs, the host shall send the initial reset command ("00").
"33"	Data Error in Flash Memory	<ul style="list-style-type: none"> The SUM value in the data stored in the flash memory is incorrect. The memory might have been destroyed. The C/R has failed to write the correct data on the flash memory. 	The host can send the next command after it receives the error code.

(2) Error code table (2/3)

RES (ASCII)	Sorts of Error	Meaning	Host processing after error
"40"	Read Error (SS error)	<ul style="list-style-type: none"> The C/R has failed to detect the SS code in the read data. 	Although the C/R detected the magnetic data error, the host can send the next command.
"41"	Read Error (ES error)	<ul style="list-style-type: none"> The C/R has failed to detect the ES code after the SS code in the read data. 	Although the C/R detected the magnetic data error, the host can send the next command.
"42"	Read Error (VRC error)	<ul style="list-style-type: none"> Vertical parity error (VRC error) has been detected in the read data (excluding SS and ES codes). 	Although the C/R detected the magnetic data error, the host can send the next command.
"43"	Read Error (LRC error)	<ul style="list-style-type: none"> The next character of ES in the read data did not agree with the LRC calculation result. 	Although the C/R detected the magnetic data error, the host can send the next command.
"44"	Read Error (Not Encoded)	<ul style="list-style-type: none"> The read magnetic data was not encoded. 	Although the C/R detected the magnetic data error, the host can send the next command.
"45"	Read Error (No Data)	<ul style="list-style-type: none"> The next character of SS in the read data was ES, and the next character agreed with the LRC calculation result. 	Although the C/R detected the magnetic data error, the host can send the next command.
"46"	Read Error (Jitter Error)	<ul style="list-style-type: none"> Not above Read Error ("40"~"45"). More than 10 Bits = Over Permission Value of Jitter in Read Data 	Although the C/R detected the magnetic data error, the host can send the next command.
"49"	Read Track setting Error	<ul style="list-style-type: none"> The specified track has not been read. 	Although the C/R detected the magnetic data error, the host can send the next command.
"4A"	Read Error (Card Held by User)	<ul style="list-style-type: none"> When a card was inserted or pulled out, it was held by an end user. 	Although the C/R detected the magnetic data error, the host can send the next command.
"61"	Time-out of Intake Monitoring	<ul style="list-style-type: none"> A card was not taken in the C/R within the intake monitoring time. 	The host can send the next command.
"64"	Lock Error by Card Insertion	<ul style="list-style-type: none"> The C/R has failed to set the lock by the card insertion. 	The host can send the next command after it receives the error code.
"70"	Imperfect Program	<ul style="list-style-type: none"> The SUM value in the program stored in the flash memory is incorrect. The memory might have been destroyed. The C/R has received any command other than DL Command during DL. The C/R found the downloading of FW unfinished after the power was turned on. 	The host shall download the FW, following the downloading sequence.
"71"	Initial Reset Waiting after DL Completion	<ul style="list-style-type: none"> The C/R has received any command other than the Initial Reset Commands after the downloading was normally completed. 	In case one of these errors occurs, the host shall send the initial reset command ("00").
"72"	Partial Firmware Error in Flash Memory	<ul style="list-style-type: none"> The C/R has failed to extend the partial FW into Program Work Filed in the flash memory. 	The host shall download the FW, following the downloading sequence.

(3) Error code table (3/3)

RES (ASCII)	Sorts of Error	Meaning	Host processing after error
"80"	Reception from ICC Impossible	<ul style="list-style-type: none"> The C/R has detected that receiving data from the SAM is over buffer size of the C/R in execution of T=0, T=1 protocol and PPS. The C/R has failed to complete sending and receiving in execution of T=0, T=1 protocol and PPS when monitoring time was up. 	ICC shall be deactivated. The host shall release the IC Contacts, and then press them and activate ICC.
"82"	ICC Activation Error	<ul style="list-style-type: none"> The C/R has detected short circuit (when Vcc supply) during activation. Time-out or parity error has occurred during activation. 	ICC shall be deactivated. The host shall release the IC Contacts, and then press them and activate ICC.
"84"	ICC Communication Error	<ul style="list-style-type: none"> Time-out or parity error has occurred in protocol T=0 or T=1 and retry has failed. 	The host may send the next command after it receives this error code. However, we recommend reactivating ICC after the deactivation.
"85"	ICC Compulsory Abort Reception	<ul style="list-style-type: none"> Compulsory abort (S (Abort, req)) has been received in protocol T=1. 	The host may send the next command after it receives this error code. However, we recommend reactivating ICC after the deactivation.
"87"	Unsupported ICC	<ul style="list-style-type: none"> ATR that the C/R does not support is received. 	ICC mode may not be set correctly. The host should be deactivated to ICC and re-set to a correct ICC mode.
"88"	ICC Movement	<ul style="list-style-type: none"> When the card is locked, the S2 Sensor is turned off. 	In case one of these errors occurs, the host shall send the initial reset command ("00").
"89"	Disagreement of Verification Code	<ul style="list-style-type: none"> The card has failed to be verified because of disagreement of the verification code. 	The card has to be checked whether it can be verified.
"8A"	Inappropriate Verification Card	<ul style="list-style-type: none"> The card was rejected the verification. The EC area of the card was 00h, or the protect bit in the EC area was protected. 	The card has to be checked whether it can be verified.
"A0"	Reception from SAM Impossible	<ul style="list-style-type: none"> The C/R has detected that receiving data from the SAM is over buffer size of the C/R in execution of T=0, T=1 protocol and PPS. The C/R has failed to complete sending and receiving in execution of T=0, T=1 protocol and PPS when monitoring time was up. 	ICC shall be deactivated. The host shall activate SAM.
"A2"	SAM Activation Error	<ul style="list-style-type: none"> The C/R has detected short circuit (when Vcc supply) during activation. Time-out or parity error has occurred during activation. 	SAM shall be deactivated. The host shall activate SAM.
"A4"	SAM Communication Error	<ul style="list-style-type: none"> Time-out or parity error has occurred in protocol T=0 or T=1 and retry has failed. 	The host may send the next command after it receives this error code. However, we recommend reactivating SAM after the deactivation.
"A5"	SAM Compulsory Abort Reception	<ul style="list-style-type: none"> Compulsory abort (S (Abort, req)) has been received in protocol T=1. 	The host may send the next command after it receives this error code. However, we recommend reactivating SAM after the deactivation.
"A7"	Unsupported SAM	<ul style="list-style-type: none"> ATR that the C/R does not support is received. 	SAM mode may not be set correctly. The host should be deactivated to SAM and re-set to a correct SAM mode.
"A9"	SAM chip pull up	<ul style="list-style-type: none"> SAM chip is pulled up during SAM activation. 	The host should check the lock of the SAM socket and existence of SAM chip.

8. Command Specification

8.1 (00) Initial Reset

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"0"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"0"	"0"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"0"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R checks the lock movement and releases the lock when the S1 sensor is turned off.
- It clears the magnetic read data.
- It turns off the LED.

Error Processing

- None

8.2 (10) Status Sense (C/R Sense)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"1"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"1"	"0"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"1"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- When the C/R is normal, it sends "**C/R Status**" ("**RES**").
- If any mechanical error, the C/R sends a negative response of mechanical error.
- But when the previous command is a warning response (ex. N61), the C/R sends the same response as the previous one.

Error Processing

- None

8.3 (11) Status Sense (Sensor Sense)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"1"	"1"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (20bytes)			
"P"	"1"	"1"	"xx"	<1>	...	<5>	<6>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	1	"0"	Off (no card)	S1 Sensor (Front Sensor)
		"1"	On	
<2>	1	"0"	Off (no card)	S2 Sensor (Rear Sensor)
		"1"	On	
<3>	1	"0"	Unlock	Lock Solenoid Echo
		"1"	Lock	
<4>	1	"0"	Not Destroyed	Rear Destruction Detection
		"1"	Destroyed	
<5>	1	"0"	ICC Deactivation	ICC Activation
		"1"	ICC Activation	
<6>	15	"0"	Spare	Spare

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"1"	"1"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sends the sensor status.

Error Processing

- None

8.4 (61) Magnetic Read (ISO#1)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"6"	"1"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (1~76bytes)
"P"	"6"	"1"	"xx"	<1>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1~76	Card Data	Magnetic Read Data in ISO #1

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"6"	"1"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT *1 (1~76bytes)
"N"	"6"	"1"	"4" "6"	<1>

*1: For the jitter error ("N46"), the C/R adds the read data to this negative response, and then sends the jitter error.
For details, see below.

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1~76	Card Data	Magnetic Read Data in ISO #1

(4) Detailed Functions

Normal Processing

- The C/R reads the ISO#1 track data.

Error Processing

- The C/R will return the negative response with magnetic data only for the jitter error ("N46").

8.5 (62) Magnetic Read (ISO#2)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"6"	"2"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (1~37bytes)
"P"	"6"	"2"	"xx"	<1>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1~37	Card Data	Magnetic Read Data in ISO #2

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"6"	"2"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT *1 (1~37bytes)
"N"	"6"	"2"	"4"	"6"

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1~37	Card Data	Magnetic Read Data in ISO #2

*1: For the jitter error ("N46"), the C/R adds the read data to this negative response and then sends the jitter error.
For details, see below.

(4) Detailed Functions

Normal Processing

- The C/R reads the ISO#2 track data.

Error Processing

- The C/R will return the negative response with magnetic data only for the jitter error ("N46").

8.6 (63) Magnetic Read (ISO#3)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"6"	"3"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (1~104bytes)
"P"	"6"	"3"	"xx"	<1>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1~104	Card Data	Magnetic Read Data in ISO #3

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"6"	"3"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT *1 (1~104bytes)
"N"	"6"	"3"	"4" "6"	<1>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1~104	Card Data	Magnetic Read Data in ISO #3

*1: For the jitter error ("N46"), the C/R adds the read data to this negative response and then sends the jitter error.
For details, see below.

(4) Detailed Functions

Normal Processing

- The C/R reads the ISO#3 track data.

Error Processing

- The C/R will return the negative response with magnetic data only for the jitter error ("N46").

8.7 (6a) Magnetic Read (Multiple Tracks)

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"6"	"a"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	1	"1"	ISO#1
		"2"	ISO#2
		"3"	ISO#3
		"4"	ISO#1 + ISO#2
		"5"	ISO#1 + ISO#3
		"6"	ISO#2 + ISO#3
		"7"	ISO#1 + ISO#2 + ISO#3

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (1~233bytes)						
"P"	"6"	"a"	"xx"	<1>	<2>	<3>	<4>	<5>	...	<10>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	1	"1"~"7"	Specified track number by command.	
<2>	0 or 2	Result of Reading	ISO #1	No order: no data
<3>	0 or 2	Result of Reading	ISO #2	Normal magnetic data: "00"
<4>	0 or 2	Result of Reading	ISO #3	Magnetic data error: "4x"
<5>	0 or 3	Length	ISO #1	Not designated: No data
<6>	0 or 3	Length	ISO #2	Normal magnetic data: Magnetic Data Length
<7>	0 or 3	Length	ISO #3	Magnetic data error: "000"
<8>	0~76	Card Data	ISO #1	Not designated: No data
<9>	0~37	Card Data	ISO #2	Normal magnetic data: Magnetic data
<10>	0~104	Card Data	ISO #3	Magnetic data error: No data

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"6"	"a"	"xx"

(4) Detailed Functions**Normal Processing**

- The C/R reads the magnetic data of the Multiple Track(s).

Error Processing

- None

8.8 (6s) Magnetic Read Data Clear

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"6"	"s"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"6"	"s"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"6"	"s"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R clears the magnetic data (ISO#1~ISO#3).

Error Processing

- None

8.9 (92) Card Status Monitoring

(1) Command

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"C"	"9"	"2"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning	
<1>	2	"01"~"99"	1~99 sec	Monitoring time (Unit = sec)
		"00"	Nothing	

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (5bytes)				
"P"	"9"	"2"	"xx"	<1>	<2>	<3>	<4>	<5>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	1	"0"	No Reading	ISO#1 Read Result
		"1"	Positive Reading	
		"2"	Negative Reading	
		"3"	No Read Data	
<2>	1	"0"	No Reading	ISO#2 Read Result
		"1"	Positive Reading	
		"2"	Negative Reading	
		"3"	No Read Data	
<3>	1	"0"	No Reading	ISO#3 Read Result
		"1"	Positive Reading	
		"2"	Negative Reading	
		"3"	No Read Data	
<4>	1	"0"	Spare	Spare
<5>	1	"0"	Spare	Spare

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"9"	"2"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R monitors the card status (completion of magnetic read and card position change)
- It sends the response when any change of card status from the previous status is detected. At the inlet for card insertion, however, it is considered that the status has changed only when the card remains there for 1 seconds or longer.
- It replies with the current card status, unless the card status has changed within the monitoring time specified by the command parameter.
- It sends the latest card status when more than one card status change has been detected.

Error Processing

- None

(5) Note

- In case that the read result in the response data is "No Reading("0"), the C/R sends the "**Read Track setting Error(N49)**" as a response of the read command.
- In case that the read result in the response data is "Positive Reading("1"), the C/R sends the positive response with the read data as a response of the read command.
- In case that the read result in the response data is "Negative Reading("2"), the C/R sends the negative response as a response of the read command.
- In case that the read result in the response data is "No Read data("3"), the C/R sends the "**Not encode error (N44)**" as a response of the read command.

8.10 (C0) Lock

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"C"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"C"	"0"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"C"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets the lock.

Error Processing

- When the C/R has failed to set the lock, it sends a "**Lock Error**"("N11").
- When the S1 sensor is ON and the S2 sensor is OFF, the C/R sends a "**Sequence Error**"("N01").
- In case that there is no card in the C/R, when the C/R has failed to set the lock by the card insertion, it sends a "**Lock Error by Card Insertion**"("N64").

8.11 (C1) Unlock

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"C"	"1"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"C"	"1"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"C"	"1"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R releases the lock.

Error Processing

- When the C/R has failed to release the lock, it sends a **"Lock Error"("N11")**.

8.12 (C2) ICC Activation

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (0 or 2bytes)	
"C"	"C"	"2"	<1>	<2>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default value	
<1>	0-1	"0"~"7"	"0"	NAD (Node Address) of ICC
<2>	0-1	"0"~"7"	"0"	NAD of C/R

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)				
"P"	"C"	"2"	"xx"	<1>	<2>	<3>	<4>	<5>

RDT	Length (Bytes)		Data (BIN)	Meaning	
<1>	1		00H~FFH	TS	Initial Character
<2>	1		00H~FFH	T0	Format Character
<3>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<4>		0~15	00H~FFH	T1~Tk	Historical Characters
<5>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"C"	"2"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)				
"N"	"C"	"2"	"8" "7"	<1>	<2>	<3>	<4>	<5>

*1: Only for **"Unsupported ATR Error" ("N87")**, the C/R sends the error with the ATR information as a response.
(For details, see below)

RDT	Length (Bytes)		Data (BIN)	Meaning	
<1>	1		00H~FFH	TS	Initial Character
<2>	1		00H~FFH	T0	Format Character
<3>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<4>		0~15	00H~FFH	T1~Tk	Historical Characters
<5>		0~1	00H~FFH	TCK	Check Character

(4) Detailed Functions

Normal Processing

- The C/R activates the ICC (**Cold Reset**).
- It sends an ATR received from the card.
- It sets the NAD value that is used by the T=1 protocol (only when it is specified by the command parameter).

Error Processing

- When an ATR unsupported by the C/R has been received after the ICC activation, the C/R sends an ATR with an "**Unsupported ATR Error**" ("N87").

8.13 (C3) ICC Deactivation

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"C"	"3"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"C"	"3"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"C"	"3"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R deactivates an ICC.

Error Processing

- None

8.14 (C5) ICC Lock+ Activation

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (0 or 2bytes)	
"C"	"C"	"5"	<1>	<2>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default value	
<1>	0-1	"0"~"7"	"0"	NAD (Node Address) of ICC
<2>	0-1	"0"~"7"	"0"	NAD of C/R

For details, see ISO/IEC 7816-3.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)				
"P"	"C"	"5"	"xx"	<1>	<2>	<3>	<4>	<5>

RDT	Length (Bytes)		Data (BIN)	Meaning	
<1>	1		00H~FFH	TS	Initial Character
<2>	1		00H~FFH	T0	Format Character
<3>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<4>		0~15	00H~FFH	T1~Tk	Historical Characters
<5>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"C"	"5"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)					
"N"	"C"	"5"	"8"	"7"	<1>	<2>	<3>	<4>	<5>

*1: Only for the "**Unsupported ATR Error**" ("**N87**"), the C/R sends the error with the ATR information as a response. (For details, see below)

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	00H~FFH	TS	Initial Character
<2>	1	00H~FFH	T0	Format Character
<3>	0~31	Undefined	TA1~TDn	Interface Character
<4>		0~15	T1~Tk	Historical Characters
<5>		0~1	TCK	Check Character

(4) Detailed Functions**Normal Processing**

- The C/R locks the ICC.
- It activates the ICC (**Cold Reset**).
- It sends an ATR received from the card.
- It sets the NAD value that is used by the T=1 protocol (only when it is specified by the command parameter).

Error Processing

- When the C/R has failed to lock the ICC, it sends a "**Lock Error**" ("**N11**").
- When an ATR unsupported by the C/R has been received after the ICC activation, the C/R sends an ATR with an "**Unsupported ATR Error**" ("**N87**").

8.15 (C6) ICC Deactivation+Unlock

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"C"	"6"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"C"	"6"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"C"	"6"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R deactivates the ICC.
- It releases the lock.

Error Processing

- When the C/R has failed to unlock the ICC, it sends a "Lock Error"("N11").

8.16 (E0) ICC Cold Reset

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1 or 3bytes)		
"C"	"E"	"0"	<1>	<2>	<3>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default Value	
<1>	1	"0"	--	C/R executes PPS automatically after receiving ATR.
		"1"	--	C/R doesn't execute PPS automatically after receiving ATR.
<2>	0~1	"0"~"7"	"0"	NAD (Node Address) of ICC
<3>	0~1	"0"~"7"	"0"	NAD of C/R

For details, see ISO/IEC 7816-3.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (3~34bytes)					
"P"	"E"	"0"	"xx"	<1>	<2>	<3>	<4>	<5>	<6>

RDT	Length (Bytes)	Data (BIN)		Meaning	
<1>	1	"0"		Enables to execute protocol type T=0 immediately	
		"1"		Enables to execute protocol type T=1 immediately	
		"P"		Needs to select protocol type by PPS Request Commands	
		"N"		Incompletion of PPS Execution	
		"?"		Command Parameter is " No PPS Execution automatically	
<2>	1	00H~FFH		TS	Initial Character
<3>	1	00H~FFH		T0	Format Character
<4>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<5>		0~15	00H~FFH	T1~Tk	Historical Characters
<6>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"E"	"0"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)					
"N"	"E"	"0"	"8"	"7"	<2>	<3>	<4>	<5>	<6>

*1: Only for the "**Unsupported ATR Error**" ("**N87**"), the C/R sends the error with the ATR information as a response. (For details, see below)

RDT	Length (Bytes)		Data (BIN)	Meaning	
<2>	1		00H~FFH	TS	Initial Character
<3>	1		00H~FFH	T0	Format Character
<4>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<5>		0~15	00H~FFH	T1~Tk	Historical Characters
<6>		0~1	00H~FFH	TCK	Check Character

(4) Detailed Functions**Normal Processing**

- It activates the ICC (**Cold Reset**).
- It sends an ATR received from the card.
- If possible, it executes the PPS request (only when it is specified by the command parameter).
- It sets the NAD value that is used by the T=1 protocol (only when it is specified by the command parameter).

Error Processing

- When an ATR unsupported by the C/R has been received after the ICC activation, the C/R sends an ATR with an "**Unsupported ATR Error**" ("**N87**").

8.17 (E1) ICC Warm Reset

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1 or 3bytes)		
"C"	"E"	"1"	<1>	<2>	<3>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default Value	
<1>	1	"0"	--	C/R executes PPS automatically after receiving ATR.
		"1"	--	C/R doesn't execute PPS automatically after receiving ATR.
<2>	0~1	"0"~"7"	"0"	NAD (Node Address) of ICC
<3>	0~1	"0"~"7"	"0"	NAD of C/R

For details, see ISO/IEC 7816-3.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (3~34bytes)					
"P"	"E"	"1"	"xx"	<1>	<2>	<3>	<4>	<5>	<6>

RDT	Length (Bytes)		Data (BIN)	Meaning	
<1>	1		"0"	Enables to execute protocol type T=0 immediately	
			"1"	Enables to execute protocol type T=1 immediately	
			"P"	Needs to select protocol type by PPS Request Commands	
			"N"	Incompletion of PPS Execution	
			"?"	Command Parameter is " No PPS Execution "	
<2>	1		00H~FFH	TS	Initial Character
<3>	1		00H~FFH	T0	Format Character
<4>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<5>		0~15	00H~FFH	T1~Tk	Historical Characters
<6>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"E"	"1"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)					
"N"	"E"	"1"	"8"	"7"	<2>	<3>	<4>	<5>	<6>

*1: Only for the "**Unsupported ATR Error**" ("N87"), the C/R sends the error with the ATR information as a response. (For details, see below)

RDT	Length (Bytes)	Data (BIN)	Meaning	
<2>	1	00H~FFH	TS	Initial Character
<3>	1	00H~FFH	T0	Format Character
<4>	0~31	Undefined	TA1~TDn	Interface Character
<5>		0~15	T1~Tk	Historical Characters
<6>		0~1	TCK	Check Character

(4) Detailed Functions**Normal Processing**

- The C/R activates the ICC (**Warm Reset**).
- It sends an ATR received from the card.
- If possible, it executes the PPS request (only when it is specified by the command parameter).
- It sets the NAD value that is used by the T=1 protocol (only when it is specified by the command parameter).

Error Processing

- When an ATR unsupported by the C/R has been received after the ICC activation, the C/R sends an ATR with an "**Unsupported ATR Error**" ("N87").

8.18 (F0) ICC T=0 Transmission

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (4~261bytes)						
"C"	"F"	"0"	<1>	<2>	<3>	<4>	<5>	<6>	<7>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	00H~FEH	CLA	Instruction Class
<2>	1	00H~FFH	INS	Instruction Code
<3>	1	00H~FFH	P1	Instruction Parameter 1
<4>	1	00H~FFH	P2	Instruction Parameter 2
<5>	0 or 1	01H~FFH	Lc field	Number of Byte present in Command Data Field
<6>	Variable = Lc (0~255)	00H~FFH	Data field	String Byte sent in Command Data Field
<7>	0 or 1	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/IEC 7816-4. However, the Case 1 to Case 4 in the table below are enabled.

ISO/IEC 7816-4: Annex A Transportation of APDUs by T=0				Remarks
A.1	Case 1			Enable
A.2	Case 2 short	Case 2S.1	Accepted Le	Enable
		Case 2S.2	Definitely not accepted Le	Enable
		Case 2S.3	Not accepted Le, specified La	*1
A.3	Case 3 short			Enable
A.4	Case 4 short	Case 4S.1	Not accepted Command	*1
		Case 4S.2	Accepted Command	*1
		Case 4S.3	Accepted Command with Information Added	*1
A.5	Case 2 Extended			Disable
A.6	Case 3 Extended			Disable
A.7	Case 4 Extended			Disable

*1: It is enabled to use only when ICC reference standard is "EMV3.1.1", "CB" or "ZKA".

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~258bytes)		
"P"	"F"	"0"	"xx"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~256	ICC Data	INF	ICC Data (Information Field)
<2>	1	ICC Data	SW1	Status-1
<3>	1	ICC Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"F"	"0"	"xx"

(4) Detailed Functions**Normal Processing**

- The C/R sends or receives data between the host and ICC using T=0 protocol.

Error Processing

- None

(5) Notes

- For Case 1, the host has to send the data to the C/R without Lc=00. The C/R sends the command parameter with Lc=00 to ICC. For details, see ISO7816-4 Annex A.
- When a **Cancel Request ("E")** is received during a command execution, the command processing is aborted **with the ICC remained activated**.

8.19 (F1) ICC T=1 Transmission

(1) Command

(1-1) Normal Transmission (Lc < or = 353 Command)

IDN (1byte)	CMD (2bytes)		CMP (4~360bytes)						
"C"	"F"	"1"	<1>	<2>	<3>	<4>	<5>	<6>	<7>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	00H~FEH	CLA	Instruction Class
<2>	1	00H~FFH	INS	Instruction Code
<3>	1	00H~FFH	P1	Instruction Parameter 1
<4>	1	00H~FFH	P2	Instruction Parameter 2
<5>	0, 1 or 3	01H~FFH	Lc field	Number of Byte present in Command Data Field
<6>	Variable = Lc (0~353)	00H~FFH	Data field	String Byte sent in Command Data Field
<7>	0, 1 or 3	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/ICE 7816-4.

(1-2) The Last Block of Continuous Transmission (Lc > 353 Command)

IDN (1byte)	CMD (2bytes)		CMP (0~360bytes)						
"C"	"F"	"1"	<6>						

CMP	Length (Bytes)	Data (BIN)	Meaning	
<6>	0~360	00H~FFH	Data field	String Byte sent in Command Data Field

For details, see ISO/ICE 7816-4.

(2) Positive Response***(2-1) Transmission Completion(RES="20")***

JDG (1byte)	RCM (2bytes)		RES (2bytes)		RDT (2~320bytes)		
"P"	"F"	"1"	"2"	"0"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~318	ICC Data	INF	ICC Data (Information Field)
<2>	1	ICC Data	SW1	Status-1
<3>	1	ICC Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

(2-2) Continuous Reception State(RES="21")

JDG (1byte)	RCM (2bytes)		RES (2bytes)		RDT (0~320bytes)	
"P"	"F"	"1"	"2"	"1"	<1>	<2>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	0~320	ICC Data	INF	ICC Data (Information Field)
<2>	0 ~1	ICC Data	SW1	Status-1

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"N"	"F"	"1"	"xx"	

(4) Detailed Functions**Normal Processing**

- The C/R sends or receives the data between the host and ICC using T=1 protocol.

Error Processing

- None

(5) Notes

- When a **Cancel Request("E")** is received during a command execution, the command processing is aborted **with the ICC remained activated**.

8.20 (F2) ICC T=1 Continuous Transmission

(1) Command

The first block of continuous transmission (Lc>353 command)

IDN (1byte)	CMD (2bytes)		CMP (4~360bytes)						
"C"	"F"	"2"	<1>	<2>	<3>	<4>	<5>	<6>	<7>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	00H~FEH	CLA	Instruction Class
<2>	1	00H~FFH	INS	Instruction Code
<3>	1	00H~FFH	P1	Instruction Parameter 1
<4>	1	00H~FFH	P2	Instruction Parameter 2
<5>	0, 1 or 3	01H~FFH	Lc field	Number of Byte present in Command Data Field
<6>	Variable = Lc (0~353)	00H~FFH	Data field	String Byte sent in Command Data Field
<7>	0, 1 or 3	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/ICE 7816-4.

Lc>353 Commands Except The Top And Last

IDN (1byte)	CMD (2bytes)		CMP (0~360bytes)						
"C"	"F"	"2"	<6>						

CMP	Length (Bytes)	Data (BIN)	Meaning	
<6>	0~360	00H~FFH	Data field	String Byte sent in Command Data Field

For details, see ISO/ICE 7816-4.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"P"	"F"	"2"	"2"	"2"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"N"	"F"	"2"	"xx"	

(4) Detailed Functions

Normal Processing

- The C/R sends the chained data of T=1 protocol.

Error Processing

- None

8.21 (F3) ICC T=1 Continuous Reception

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"F"	"3"

(2) Positive Response

Transmission Completion (RES="20")

JDG (1byte)	RCM (2bytes)		RES (2bytes)		RDT (1~320bytes)		
"P"	"F"	"3"	"2"	"0"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	0~318	ICC Data	INF	ICC Data (Information Field)
<2>	0~1	ICC Data	SW1	Status-1
<3>	1	ICC Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

Continuous Reception Status (RES="21")

JDG (1byte)	RCM (2bytes)		RES (2bytes)		RDT (320bytes)		
"P"	"F"	"3"	"2"	"1"	<1>	<2>	

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	319	ICC Data	INF	ICC Data (Information Field)
<2>	1	ICC Data	SW1	Status-1

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"N"	"F"	"3"	"xx"	

(4) Detailed Functions

Normal Processing

- The C/R receives chained data of T=1 protocol.

Error Processing

- None

(5) Notes

- When a **Cancel Request("E")** is received during a command execution, the command processing is aborted **with the ICC remained activated**.

8.22 (F4) ICC T=1 Interruption Completion

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"F"	"4"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"P"	"F"	"4"	"2"	"3"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"N"	"F"	"4"	"xx"	

(4) Detailed Functions

Normal Processing

- The C/R forcedly terminates the transmission or the receipt of the data in T=1 protocol type.

Error Processing

- None

8.23 (F8) ICC PPS Exchange

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (0~1byte)
"C"	"F"	"8"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	0 or 1	"0"	Selection of protocol type T=0.
		"1"	Selection of protocol type T=1.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (1byte)
"P"	"F"	"8"	"xx"	<1>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1	"0"	Enable to execute T=0.
		"1"	Enable to execute T=1.
		"N"	Incompletion PPS Execution

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"F"	"8"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R executes a PPS request between the host and the ICC in order to change "F and D" or "Protocol type"..

Error Processing

- None

8.24 (FC) ICC T=0 / T=1 Transmission

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (4~261bytes)						
"C"	"F"	"C"	<1>	<2>	<3>	<4>	<5>	<6>	<7>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	00H~FEH	CLA	Instruction Class
<2>	1	00H~FFH	INS	Instruction Code
<3>	1	00H~FFH	P1	Instruction Parameter 1
<4>	1	00H~FFH	P2	Instruction Parameter 2
<5>	0 or 1	01H~FFH	Lc field	Number of Byte present in Command Data Field
<6>	Variable = Lc (0~255)	00H~FFH	Data field	String Byte sent in Command Data Field
<7>	0 or 1	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/ICE 7816-4. However, the Case 1 to Case 4 in the table below are enabled.

ISO/IEC 7816-4: Annex A Transportation of APDUs by T=0				Remarks
A.1	Case 1			Enable
A.2	Case 2 short	Case 2S.1	Accepted Le	Enable
		Case 2S.2	Definitely not accepted Le	Enable
		Case 2S.3	Not accepted Le, specified La	*1
A.3	Case 3 short			Enable
A.4	Case 4 short	Case 4S.1	Not accepted Command	*1
		Case 4S.2	Accepted Command	*1
		Case 4S.3	Accepted Command with Information Added	*1
A.5	Case 2 Extended			Disable
A.6	Case 3 Extended			Disable
A.7	Case 4 Extended			Disable

*1: It is enabled to use only when ICC reference standard is "EMV3.1.1", "CB" or "ZKA".

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~258bytes)		
"P"	"F"	"C"	"xx"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~256	ICC Data	INF	ICC Data (Information Field)
<2>	1	ICC Data	SW1	Status-1
<3>	1	ICC Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"N"	"F"	"C"	"xx"	

(4) Detailed Functions**Normal Processing**

- The C/R sends or receives the data with ICC by T=0 or T=1 protocol.
- It determines the protocol type by analyzing ATR.

Error Processing

- None

(5) Notes

- When a **Cancel Request ("E")** is received during a command execution, the command processing is aborted **with the ICC remained activated**.

8.25 (G1) ICC Lock + Cold Reset

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1 or 3bytes)		
"C"	"G"	"1"	<1>	<2>	<3>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default Value	
<1>	1	"0"	--	C/R executes PPS automatically after receiving ATR.
		"1"	--	C/R doesn't execute PPS automatically after receiving ATR.
<2>	0~1	"0"~"7"	"0"	NAD (Node Address) of ICC
<3>	0~1	"0"~"7"	"0"	NAD of C/R

For details, see ISO/IEC 7816-3.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (3~34bytes)					
"P"	"G"	"1"	"xx"	<1>	<2>	<3>	<4>	<5>	<6>

RDT	Length (Bytes)	Data (BIN)		Meaning	
<1>	1	"0"		Enables to execute protocol type T=0 immediately	
		"1"		Enables to execute protocol type T=1 immediately	
		"P"		Needs to select protocol type by PPS Request Commands	
		"N"		Incompletion of PPS Execution	
		"?"		Command Parameter is " No PPS Execution "	
<2>	1	00H~FFH		TS	Initial Character
<3>	1	00H~FFH		T0	Format Character
<4>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<5>		0~15	00H~FFH	T1~Tk	Historical Characters
<6>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"G"	"1"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)					
"N"	"G"	"1"	"8"	"7"	<2>	<3>	<4>	<5>	<6>

*1: Only for the "**Unsupported ATR Error**" ("**N87**"), the C/R sends the error with the ATR information as a response. (For details, see below)

RDT	Length (Bytes)		Data (BIN)	Meaning	
<2>	1		00H-FFH	TS	Initial Character
<3>	1		00H-FFH	T0	Format Character
<4>	0~31	Undefined	00H-FFH	TA1~TDn	Interface Character
<5>		0~15	00H-FFH	T1~Tk	Historical Characters
<6>		0~1	00H-FFH	TCK	Check Character

(4) Detailed Functions**Normal Processing**

- The C/R locks the ICC.
- It activates the ICC (**Cold Reset**).
- It sends an ATR received from the card.
- If possible, it executes the PPS request (only when it is specified by the command parameter).
- It sets the NAD value that is used by the T=1 protocol (only when it is specified by the command parameter).

Error Processing

- When the C/R has failed to lock the ICC, it sends a "**Lock Error**" ("**N11**").
- When an ATR unsupported by the C/R is received after the ICC activation, the C/R sends an ATR with an "**Unsupported ATR Error**" ("**N87**").

8.26 (J0) Local Error Log

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"J"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (0~1000bytes)			
"P"	"J"	"0"	"xx"	<1>	<2>	...	<200>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	5	2	RCM	Received command
		2	RES	Error code
		1	DATA	Error Track Number
<2>	5	2	RCM	Received command
		2	RES	Error code
		1	DATA	Error Track Number
:	:	:	:	:
<200>	5	2	RCM	Received command
		2	RES	Error code
		1	DATA	Error Track Number

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"J"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R returns up to 200 error log information from the top of local error log information.

Error Processing

- None

8.27 (L0) Sensor Level Read

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"L"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (8bytes)			
"P"	"L"	"0"	"xx"	<1>	<2>	<3>	<4>

RDT	Length (Bytes)	Data (ASCII)		Meaning	
<1>	2	"00"~"33"	0.0~3.3V	Sensor S1 (Front Sensor)	Sensor Voltage
<2>	2	"00"~"33"	0.0~3.3V	Sensor S2 (Rear Sensor)	
<3>	2	"00"~"33"	0.0~3.3V	Echo Sensor of Lock	
<4>	2	"00"	Spare	Extra	

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"L"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reads the voltage of each sensor in the C/R.

Error Processing

- None

8.28 (M0) Life Counter Read

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"M"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (160bytes)			
"P"	"M"	"0"	"xx"	<1>	<2>	...	<20>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	8	"00000000" ~ "16777215"	Number of Head pass
<2>	8	"00000000" ~ "16777215"	Number of Lock
<3>	8	"00000000" ~ "16777215"	Number of Insertion read
<4>	8	"00000000" ~ "16777215"	Number of ISO #1 insertion read error occurrence
<5>	8	"00000000" ~ "16777215"	Number of ISO #2 insertion read error occurrence
<6>	8	"00000000" ~ "16777215"	Number of ISO #3 insertion read error occurrence
<7>	8	"00000000"	Spare 1
<8>	8	"00000000"	Number of back read
<9>	8	"00000000" ~ "16777215"	Number of ISO #1 back read error occurrence
<10>	8	"00000000" ~ "16777215"	Number of ISO #2 back read error occurrence
<11>	8	"00000000" ~ "16777215"	Number of ISO #3 back read error occurrence
<12>	8	"00000000"	Spare 2
<13>	8	"00000000" ~ "16777215"	Number of IC activation error occurrence
<14>	8	"00000000" ~ "16777215"	Number of IC communication error
<15>	8	"00000000" ~ "16777215"	Number of SAM activation error occurrence
<16>	8	"00000000" ~ "16777215"	Number of SAM communication error
<17>	8	"00000000" ~ "16777215"	Number of Memory card activation error occurrence
<18>	8	"00000000" ~ "16777215"	Number of Memory card communication error
<19>	8	"00000000"	Spare 3
<20>	8	"00000000"	Spare 4

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"M"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reads each life counter in the memory.

Error Processing

- None

8.29 (M8) Maintenance Result Read

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"M"	"8"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (0~450 bytes)						
"P"	"M"	"8"	"xx"	<1-1>	<1-2>	<2-1>	<2-2>	...	<9-1>	<9-2>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1-1>	0 or 1	"0"	Normal Completion	Latest Maintenance Result
		"1"	Sensor OFF Error	
		"2"	Sensor ON Error	
		"3"	Lock Error	
		"4"	Unlock Error	
		"5"	Activation Error	
		"6"	Read Error	
<1-2>	0 or 8	"00000000" ~ "16777215"	Head Pass Counter before the latest maintenance	
<2-1>	0 or 1	"0" ~ "6"	Maintenance Result before two maintenance	
<2-2>	0 or 8	"00000000" ~ "16777215"	Head Pass Counter before two maintenance	
:	:	:	:	
<9-1>	0 or 1	"0" ~ "6"	Maintenance Result before nine maintenances	
<9-2>	0 or 8	"00000000" ~ "16777215"	Head Pass Counter before nine maintenances	

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"M"	"8"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reports the maintenance results executed by the maintenance SW.

Error Processing

- None

8.30 (N0) Option Read

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"N"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (32bytes)					
"P"	"N"	"0"	"xx"	<1>	<2>	<3>	<4>	...	<13>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	1	"0"	Without Lock	Presence of Lock
		"1"	With Lock	
<2>	1	"0"	Invalid	IC card control function
		"1"	Valid	
<3>	1	"0"	Spare	Spare
<4>	1	"0"	No head	ISO #1 head type
		"1"	Read-only	
<5>	1	"0"	No head	ISO #2 head type
		"1"	Read-only	
<6>	1	"0"	No head	ISO #3 head type
		"1"	Read-only	
<7>	3	"0"	Spare	Spare
<8>	1	"0"	Invalid	Automatic LED control
		"1"	Valid	
<9>	10	"0"	Spare	Spare
<10>	1	"0"	Without SAM board	Presence of SAM board
		"2"	With SAM board	
<11>	1	"0"	Without SAM chip	Presence of SAM chip
		"1"	With SAM chip	
<12>	4	"0"	Spare	Spare
<13>	6	"0"	Spare	Spare

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"N"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reads the information of the installed options.

Error Processing

- None

8.31 (N3) Automatic LED control

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"N"	"3"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	1	"0"	The C/R does NOT automatically control the LED.
		"1"	The C/R automatically control the LED.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"N"	"3"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"N"	"3"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets the validation of the automatic LED control.

Error Processing

- None

(5) Notes

- The setting value of this command can be read by the option information read command("CN0").
- When the C/R has shipped from the factory, the C/R can automatically control the LED.

8.32 (P6) LED OFF

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"P"	"6"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"P"	"6"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"P"	"6"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R turns off the LED.

Error Processing

- None

8.33 (P7) LED ON

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"P"	"7"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	1	"1"	Green
		"2"	Red
		"3"	Orange

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"P"	"7"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"P"	"7"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R turns on the LED. The LED color is specified by the command parameter.

Error Processing

- None

8.34 (P8) LED Blinking

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (2bytes)	
"C"	"P"	"8"	<1>	<2>

CMP	Length (Bytes)	Data (ASCII)	Meaning	
<1>	1	"1"	Green	LED Color
		"2"	Red	
		"3"	Orange	
<2>	1	"1"	ON: 4sec, OFF: 4sec	Blinking Cycle
		"2"	ON: 2sec, OFF: 2sec	
		"3"	ON: 1sec, OFF: 1sec	
		"4"	ON: 0.5sec, OFF: 0.5sec	
		"5"	ON: 0.25sec, OFF: 0.25sec	

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"P"	"8"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"P"	"8"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R blinks the LED according to the command parameter.

Error Processing

- None

8.35 (V0) FW Version Read (ROM and Total FW)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"V"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (62bytes)			
"P"	"V"	"0"	"xx"	<1>	<2>	...	<9>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	12	"AAAAAAAAAAAA"	FW Type in CPU ROM
<2>	2	"AA"	FW Version in CPU ROM
<3>	6	"000000"~"FFFFFF"	SUM Value of FW in CPU ROM
<4>	12	Spare	Spare
<5>	2	Spare	Spare
<6>	6	Spare	Spare
<7>	12	"AAAAAAAAAAAA"	Total FW Type in Flash Memory
<8>	2	"AA"	Total FW Version in Flash Memory
<9>	8	"00000000"~"FFFFFFF"	SUM Value of Total FW in Flash Memory

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"V"	"0"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (62bytes)			
"N"	"V"	"0"	"7" "0"	<1>	<2>	...	<9>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	12	"AAAAAAAAAAAA"	FW Type in CPU ROM
<2>	2	"AA"	FW Version in CPU ROM
<3>	6	"000000"~"FFFFFF"	SUM Value of FW in CPU ROM
<4>	12	Spare	Spare
<5>	2	Spare	Spare
<6>	6	Spare	Spare
<7>	12	Spare	Total FW Type in Flash Memory
<8>	2	Spare	Total FW Version in Flash Memory
<9>	8	Spare	SUM Value of Total FW in Flash Memory

(4) Detailed Functions

Normal Processing

- The C/R reads the FW information (Type, Version and Sum value) in the CPU ROM and the flash memory.

Error Processing

- None

8.36 (V1) FW Version Read (ICC FW)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"V"	"1"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (22bytes)		
"P"	"V"	"1"	"xx"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	12	"AAAAAAAAAAAA"	FW type in Memory
<2>	2	"AA"	FW Version in Memory
<3>	8	"00000000"~"FFFFFFF"	SUM Value in Memory

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"V"	"1"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reads the ICC FW information (Type, Version and Sum value) in the flash memory.

Error Processing

- None

8.37 (V2) FW Version Read (SAM FW)

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"V"	"2"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (22bytes)		
"P"	"V"	"2"	"xx"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	12	"AAAAAAAAAAAA"	FW type in Memory
<2>	2	"AA"	FW Version in Memory
<3>	8	"00000000"~"FFFFFFF"	SUM Value in Memory

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"V"	"2"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reads the SAM FW information (Type, Version and Sum value) in the flash memory.

Error Processing

- None

8.38 (Y0) ICC Control Information Read

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"Y"	"0"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (16bytes)						
"P"	"Y"	"0"	"xx"	<1>	<2>	<3>	<4>	<5>	<6>	<7>

RDT	Length (Bytes)	Data (ASCII)	Meaning	
<1>	2	"??"	Not selected (*3)	Transmission control standard for ICC (Setting value by "Y6" command)
		"00"	ISO 7816-3 (*1) (*2)	
		"05"	EMV / GIE-CB	
		"06"	ZKA	
<2>	2	"06" ~ "99" ("10")	Seconds (Default value when shipping =10sec)	Monitoring time of receiving ICC and SAM command (Setting value by "Y5" command)
<3>	1	"0"	Automatic IFSD Request (*1)	Automatic IFSD request at starting T=1 protocol for ICC and SAM (Setting value by "Y3" command)
		"1"	No IFSD Request	
<4>	1	"0"	TCK Check (Default)	Presence/absence of TCK inspection of ATR for ICC and SAM (Setting value by "Y4" command)
		"1"	No TCK Check	
<5>	1	"0"	From high voltage level (5V->3V) (*1)	Control method of VCC for ICC or SAM (Setting value by "Y5" command)
		"1"	From low voltage level (3V->5V)	
		"2"	5V only	
		"3"	3V only	
<6>	2	"??"	Not selected (*3)	Transmission control standard for SAM (Setting value by "Y7" command)
		"00"	ISO 7816-3 (*1) (*2)	
		"05"	EMV / GIE-CB	
		"06"	ZKA	
<7>	7	"0000000"	Spare	

*1: Denotes the factory setting

*2: Denotes the setting value when turning on the power

*3: When the ICC firmware or the SAM firmware is downloaded, "??" is indicated.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"Y"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reads the control information for handling the ICC or the SAM.

Error Processing

- None

8.39 (Y2) ICC Control Information Setting(Timer value of Waiting for reception from ICC)

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (2bytes)
"C"	"Y"	"2"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	2	"00 "	420 sec >S (WTX req), INF=255, BWT=4)
		"06" - "99"	Seconds (Default ="10"(10sec))

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"Y"	"2"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"Y"	"2"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets the monitoring time for waiting for the reception from ICC or the SAM.

Error Processing

- When this command is received during ICC activation, the C/R sends a **"Sequence Error"("N01")**.

8.40 (Y3) ICC Control Information Setting(IFSD Control Method)

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"Y"	"3"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"0"	Automatic IFSD Request (Default)
		"1"	No IFSD Request

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"Y"	"3"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"Y"	"3"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets the IFSD control method when it sends the data to the ICC or the SAM using T=1 protocol.

Error Processing

- When this command is received during ICC activation, the C/R sends a **"Sequence Error"("N01")**.

8.41 (Y4) ICC Control Information Setting(TCK Control Method)

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"Y"	"4"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"0"	TCK Checks (Default)
		"1"	No TCK Check

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"Y"	"4"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"Y"	"4"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets the TCK control method when it activates ICC or the SAM.

Error Processing

- The C/R sends a **"Sequence Error"("N01")** when it receives this command during ICC activation.

8.42 (Y5) ICC Control Information Setting (Supply Voltage Level)

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"Y"	"5"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"0"	Activates the ICC from high voltage level. (5V -> 3V) (Default)
		"1"	Activates the ICC from low voltage level. (3V -> 5V)
		"2"	Activates the ICC with 5V only.
		"3"	Activates the ICC with 3V only.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"Y"	"5"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"Y"	"5"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets the ICC supply voltage during activation.

Error Processing

- The C/R sends a "**Sequence Error**" ("**N01**") when it receives this command during ICC activation.

(5) Notes

- This command is effective only when ICC mode is ISO7816-3 (mode0). In the other standards, only 5V enables activation.

8.43 (Y6) ICC Control Information Setting (ICC Control Mode)

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (2bytes)
"C"	"Y"	"6"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	2	"00"	ISO7816
		"05"	EMV / GIE-CB
		"06"	ZKA

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"Y"	"6"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"Y"	"6"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets ICC control mode for handling ICC.

Error Processing

- The C/R sends a "**Sequence Error**"("N01") when it receives this command during ICC activation.
- The C/R sends a "**Sequence Error**"("N01") when the FW of mode specified by a command parameter has not been downloaded yet.

(5) Notes

- Set "00" as default value after the shipment.
- Reset "00" as the default value after power on.

8.44 (Y7) ICC Control Information Setting (SAM Control Mode Setting)

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (2bytes)
"C"	"Y"	"7"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	2	"00"	ISO7816
		"05"	EMV / GIE-CB
		"06"	ZKA

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"Y"	"7"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"Y"	"7"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets ICC control mode for handling SAM.

Error Processing

- The C/R sends a "**Sequence Error**" ("**N01**") when it receives this command during SAM activation.
- It sends a "**Sequence Error**" ("**N01**") when the FW of mode specified by a command parameter has not been downloaded yet.

(5) Notes

- Set "00" as default value after the shipment.
- Reset "00" as the default value after power on.

8.45 (d0) DL Start

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (30~230bytes)				
"C"	"d"	"0"	<1>	<2>	<3>	<4>	<5>

CMP	Length (Bytes)		Data (ASCII)	Meaning	
<1>	4		"2054"	One Block Size of Download Firmware	
<2>	4		"0001"~"9999"	Total Block Number of Download Firmware	
<3>	20		Variable	Download Identification Information	
<4>	2		"00"~"10"	Downloadable CPU Number (N)	
<5>	N X 10 (0~200)	12	Variable	CPU Type	Information for CPU No.1
		2	Variable	CPU Version	
		6	Variable	CPU SUM Value	
		12	Variable	CPU Type	Information for CPU No.2
		2	Variable	CPU Version	
		6	Variable	CPU SUM Value	
		:	:	:	:
		12	Variable	CPU Type	Information for CPU No.N
		2	Variable	CPU Version	
		6	Variable	CPU SUM Value	

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"d"	"0"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"d"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R confirms if the firmware is downloadable.
- It determines the method for download (Standard FW Download or Partial FW Download).
- It deletes the data in the area that is necessary for downloading flash memory.

Error Processing

- None

8.46 (d1) DL Transmission

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (2054bytes)			
"C"	"d"	"1"	<1>	<2>	<3>	<4>

CMP	Length (Bytes)	Data (BIN)	Meaning
<1>	2	0000H~FFFFH	Block Number of Download Firmware
<2>	4	Variable	Start Address of Download Firmware
<3>	2044	Variable	Data of Download Firmware
<4>	4	Variable	SUM Value of Data

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"d"	"1"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"d"	"1"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R stores the download firmware data into flash memory.

Error Processing

- None

8.47 (d2) DL Completion

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"d"	"2"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (20 or 22bytes)		
"P"	"d"	"2"	"xx"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	12	"AAAAAAAAAAAA"	FW type in Flash Memory
<2>	2	"AA"	FW Version in Flash Memory
<3>	6	"000000"~"FFFFFF"	SUM Value in Subset FW
	8	"00000000"~"FFFFFFF"	SUM Value in Total FW

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"d"	"2"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R completes writing to the flash memory and confirms whether the writing was normal. It sends a **"DL Completion Response"("31")**.
- Turns off the DTR signal and the new program downloaded in the flash memory runs.
- Turns on the DTR signal and waits for an **"Initial Reset Command"**.

Error Processing

- None

(5) Notes

- The host has to send an **"Initial Reset Command"** after turning on the DTR signal if it receives a **"DL Completion Response"("31")** to the **"DL Preparation"("d2")**.

8.48 (d3) DL Preparation

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (22bytes)		
"C"	"d"	"3"	<1>	<2>	<3>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	12	"AAAAAAAAAAAA"	FW type in Flash Memory
<2>	2	"AA"	FW Version in Flash Memory
<3>	8	"00000000" ~ "FFFFFFF"	FW SUM Value in Flash Memory

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"d"	"3"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"d"	"3"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R copies the program relating DL into RAM.
- It becomes downloadable and waits for the **"DL Start Command"("d0")**.

Error Processing

- None

(5) Notes

- The program in RAM runs until DL completion.
- The host should send a **"DL Start Command"("d0")** if it receives a normal response to the **"DL Preparation"("d3")**.

8.49 (e0) SAM Status Sense

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"e"	"0"	<1>

CMP	Length (Byte)	Data (BIN)	Meaning
<1>	1	"1"	SAM Number (Fixed)

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)
"P"	"e"	"0"	"xx"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"e"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R reads the SAM status.

Error Processing

- None

8.50 (e1) SAM Activation

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1 or 3bytes)		
"C"	"e"	"1"	<1>	<2>	<3>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default Value	
<1>	1	"1"	--	SAM Number
<2>	0~1	"0"~"7"	"0"	NAD (Node Address) of SAM
<3>	0~1	"0"~"7"	"0"	NAD of C/R

For details, see ISO/IEC 7816-3.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (2~33bytes)				
"P"	"e"	"1"	"xx"	"4"	"1"	<1>	<2>	~	<4>	<5>

RDT	Length (Bytes)	Data (BIN)		Meaning	
<1>	1	00H~FFH		TS	Initial Character
<2>	1	00H~FFH		T0	Format Character
<3>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<4>		0~15	00H~FFH	T1~Tk	Historical Characters
<5>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"e"	"1"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)						
"N"	"e"	"1"	"A"	"7"	<2>	<3>	<4>	5>	<6>	

*1: Only for the **"Unsupported ATR Error"("A7")**, the C/R sends the error with the ATR information as a response. (For details, see below)

RDT	Length (Bytes)	Data (BIN)		Meaning	
<2>	1	00H~FFH		TS	Initial Character
<3>	1	00H~FFH		T0	Format Character
<4>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<5>		0~15	00H~FFH	T1~Tk	Historical Characters
<6>		0~1	00H~FFH	TCK	Check Character

(4) Detailed Functions

Normal Processing

- The C/R activates the SAM (Cold Reset).
- It sends an ATR received from the card.
- It specifies the NAD value that is used for T=1 protocol (only when specified by the command parameter).

Error Processing

- When any ATR unsupported by the C/R is received after the ICC activation, the C/R sends an ATR with an “**Unsupported ATR Error” (“NA7”)**.

8.51 (e2) SAM Deactivation

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"e"	"2"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"1"	SAM Number (Fixed)

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)	
"P"	"e"	"2"	"xx"	"4"	"0"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"e"	"2"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R deactivates the SAM.

Error Processing

- None

8.52 (e3) SAM Cold Reset

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (2 or 4bytes)			
"C"	"e"	"3"	<1>	<2>	<3>	<4>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default Value	
<1>	1	"1"	--	SAM Number (Fixed)
<2>	1	"0"	--	C/R executes PPS automatically after receiving ATR.
		"1"	--	C/R doesn't execute PPS automatically after receiving ATR.
<3>	0~1	"0"~"7"	"0"	NAD (Node Address) of SAM
<4>	0~1	"0"~"7"	"0"	NAD of C/R

For details, see ISO/IEC 7816-3.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (3~34bytes)				
"P"	"e"	"3"	"xx"	"4"	"1"	<1>	<2>	~	<5>	<6>

RDT	Length (Bytes)	Data (BIN)		Meaning	
<1>	1	"0"		Enables to execute protocol type T=0 immediately	
		"1"		Enables to execute protocol type T=1 immediately	
		"P"		Needs to select protocol type by PPS Request Commands	
		"N"		Incompletion of PPS Execution	
		"?"		Command Parameter is " No PPS Execution automatically	
<2>	1	00H~FH		TS	Initial Character
<3>	1	00H~FFH		T0	Format Character
<4>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<5>		0~15	00H~FFH	T1~Tk	Historical Characters
<6>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"e"	"3"	"xx"

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (2~33bytes)					
"N"	"e"	"3"	"A"	"7"	<2>	<3>	<4>	<5>	<6>

*1: Only for the **"Unsupported ATR Error"("A7")**, the C/R sends the error with the ATR information as a response. (For details, see below)

RDT	Length (Bytes)	Data (BIN)	Meaning	
<2>	1	00H~FFH	TS	Initial Character
<3>	1	00H~FFH	T0	Format Character
<4>	0~31	Undefined	TA1~TDn	Interface Character
<5>		0~15	T1~Tk	Historical Characters
<6>		0~1	TCK	Check Character

(4) Detailed Functions**Normal Processing**

- The C/R activates the SAM (Cold Reset).
- It sends an ATR received from the SAM.
- If possible, it executes the PPS request (only when specified by the command parameter).
- It specifies the NAD value that is used for T=1 protocol (only when specified by the command parameter).

Error Processing

- When any ATR unsupported by the C/R is received after the ICC activation, the C/R sends an ATR with an **"Unsupported ATR Error" ("NA7")**.

8.53 (e4) SAM Warm Reset

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (2 or 4bytes)			
"C"	"e"	"4"	<1>	<2>	<3>	<4>

CMP	Length (Bytes)	Data (ASCII)		Meaning
		Value	Default Value	
<1>	1	"1"	--	SAM Number
<2>	1	"0"	--	C/R executes PPS automatically after receiving ATR.
		"1"	--	C/R doesn't execute PPS automatically after receiving ATR.
<3>	0~1	"0"~"7"	"0"	NAD (Node Address) of the SAM
<4>	0~1	"0"~"7"	"0"	NAD of C/R

For details, see ISO/IEC 7816-3.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (3~34bytes)				
"P"	"e"	"4"	"xx"	"4"	"1"	<1>	<2>	...	<5>	<6>

RDT	Length (Bytes)	Data (BIN)		Meaning	
<1>	1	"0"		Enables to execute protocol type T=0 immediately.	
		"1"		Enables to execute protocol type T=1 immediately.	
		"P"		Needs to select protocol type by PPS Request Commands.	
		"N"		Incompletion of PPS Execution	
		"?"		Command Parameter is " No PPS Execution automatically.	
<2>	1	00H~FFH		TS	Initial Character
<3>	1	00H~FFH		T0	Format Character
<4>	0~31	Undefined	00H~FFH	TA1~TDn	Interface Character
<5>		0~15	00H~FFH	T1~Tk	Historical Characters
<6>		0~1	00H~FFH	TCK	Check Character

For details, see ISO/IEC 7816-3.

(3) Negative Response

JDG (1byte)	RCM (2bytes)	RES (2bytes)
"N"	"e" "4"	"xx"

JDG (1byte)	RCM (2bytes)	RES (2bytes)	RDT (2~33bytes)			
"N"	"e" "4"	"A" "7"	<2>	<3>	<4>	<5> <6>

*1: Only for the **"Unsupported ATR Error"("A7")**, the C/R sends the error with the ATR information as a response. (For details, see below)

RDT	Length (Bytes)	Data (BIN)	Meaning	
<2>	1	00H~FFH	TS	Initial Character
<3>	1	00H~FFH	T0	Format Character
<4>	0~31	Undefined	TA1~TDn	Interface Character
<5>		0~15	T1~Tk	Historical Characters
<6>		0~1	TCK	Check Character

(4) Detailed Functions**Normal Processing**

- The C/R activates the SAM (Warm Reset).
- The C/R sends an ATR received from the SAM.
- If possible, the C/R executes the PPS request (only when it is specified by the command parameter).
- The C/R sets the NAD value that is used by the T=1 protocol (only when it is specified by the command parameter).

Error Processing

- When any ATR unsupported by the C/R is received after the SAM activation, the C/R sends an ATR with an **"Unsupported ATR Error" ("NA7")**.

8.54 (f0) SAM T=0 Transmission

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (5~262bytes)							
"C"	"f"	"0"	<1>	<2>	<3>	<4>	<5>	<6>	<7>	<8>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	"1"	SAM Number (Fixed)	
<2>	1	00H~FEH	CLA	Instruction Class
<3>	1	00H~FFH	INS	Instruction Code
<4>	1	00H~FFH	P1	Instruction Parameter 1
<5>	1	00H~FFH	P2	Instruction Parameter 2
<6>	0 or 1	01H~FFH	Lc field	Number of Byte present in Command Data Field
<7>	Variable = Lc (0~255)	00H~FFH	Data field	String Byte sent in Command Data Field
<8>	0 or 1	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/ICE 7816-4. However, the Case 1 to Case 4 in the table below are enabled.

ISO/IEC 7816-4: Annex A Transportation of APDUs by T=0				Remarks
A.1	Case 1			Enable
A.2	Case 2 short	Case 2S.1	Accepted Le	Enable
		Case 2S.2	Definitely not accepted Le	Enable
		Case 2S.3	Not accepted Le, specified La	*1
A.3	Case 3 short			Enable
A.4	Case 4 short	Case 4S.1	Not accepted Command	*1
		Case 4S.2	Accepted Command	*1
		Case 4S.3	Accepted Command with Information Added	*1
A.5	Case 2 Extended			Disable
A.6	Case 3 Extended			Disable
A.7	Case 4 Extended			Disable

*1: It is enabled to use only when ICC reference standard is "EMV3.1.1", "CB" or "ZKA".

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (2~258bytes)		
"P"	"f"	"0"	"xx"	"5"	"0"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~256	ICC Data	INF	ICC Data (Information Field)
<2>	1	ICC Data	SW1	Status-1
<3>	1	ICC Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"f"	"0"	"xx"

(4) Detailed Functions**Normal Processing**

- The C/R sends or receives the data between the host and the SAM using T=0 protocol.

Error Processing

- None

(5) Notes

- For Case 1, the host has to send the data to the C/R without Lc=00. The C/R sends the command parameter with Lc=00 to the SAM. For details, see ISO7816-4 Annex A.
- When a **Cancel Request("E")** is received during a command execution, the command processing is aborted **with the SAM remained activated.**

8.55 (f1) SAM T=1 Transmission

(1) Command

(1-1) When Normal Transmission

IDN (1byte)	CMD (2bytes)		CMP (5~361bytes)							
"C"	"P"	"1"	<1>	<2>	<3>	<4>	<5>	<6>	<7>	<8>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	"1"	SAM Number (Fixed)	
<2>	1	00H~FEH	CLA	Instruction Class
<3>	1	00H~FFH	INS	Instruction Code
<4>	1	00H~FFH	P1	Instruction Parameter 1
<5>	1	00H~FFH	P2	Instruction Parameter 2
<6>	0, 1 or 3	01H~FFH	Lc field	Number of Byte present in Command Data Field
<7>	Variable = Lc (0~353)	00H~FFH	Data field	String Byte sent in Command Data Field
<8>	0, 1 or 3	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/ICE 7816-4.

(1-2) The last block when continuous transmission

IDN (1byte)	CMD (2bytes)		CMP (1~361bytes)							
"C"	"P"	"1"	<1>	<7>						

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	"1"	SAM Number (Fixed)	
<7>	0~360	00H~FFH	Data field	String Byte sent in Command Data Field

For details, see ISO/ICE 7816-4.

(2) Positive Response**(2-1) Transmission Completion(RES="20")**

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (2~320bytes)		
"P"	"P"	"1"	"xx"	"5"	"0"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~318	ICC Data	INF	SAM Data (Information Field)
<2>	1	ICC Data	SW1	Status-1
<3>	1	ICC Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

(2-2) Continuous Reception State(RES="21")

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (0~320bytes)	
"P"	"P"	"1"	"xx"	"5"	"1"	<1>	<2>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~320	ICC Data	INF	SAM Data (Information Field)
<2>	0 ~1	ICC Data	SW1	Status-1

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"P"	"1"	"xx"

(4) Detailed Functions**Normal Processing**

- The C/R sends or receives the data between the host and the SAM using T=1 protocol.

Error Processing

- None

(5) Notes

- When a **Cancel Request("E")** is received during a command execution, the command processing is aborted **with the SAM remained activated**.

8.56 (f2) SAM T=1 Continuous Transmission

(1) Command

(1-1) The first block when continuous transmission

IDN (1byte)	CMD (2bytes)		CMP (5~361bytes)							
"C"	"f"	"2"	<1>	<2>	<3>	<4>	<5>	<6>	<7>	<8>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	"1"	SAM Number (Fixed)	
<2>	1	00H~FEH	CLA	Instruction Class
<3>	1	00H~FFH	INS	Instruction Code
<4>	1	00H~FFH	P1	Instruction Parameter 1
<5>	1	00H~FFH	P2	Instruction Parameter 2
<6>	0, 1 or 3	01H~FFH	Lc field	Number of Byte present in Command Data Field
<7>	Variable = Lc (0~353)	00H~FFH	Data field	String Byte sent in Command Data Field
<8>	0, 1 or 3	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/ICE 7816-4.

(1-2) Block except the top and last when continuous transmission

IDN (1byte)	CMD (2bytes)		CMP (1~361bytes)							
"C"	"f"	"2"	<6>							

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	"1"	SAM Number (Fixed)	
<7>	0~360	00H~FFH	Data field	String Byte sent in Command Data Field

For details, see ISO/ICE 7816-4.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)	
"P"	"f"	"2"	"xx"	"5"	"2"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"f"	"2"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sends the chained data of T=1 protocol.

Error Processing

- None

(5) Notes

- When a **Cancel Request("E")** is received during a command execution, the command processing is aborted **with the SAM remained activated**.

8.57 (f3) SAM T=1 Continuous Reception

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"f"	"3"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"1"	SAM Number (Fixed)

(2) Positive Response

Transmission Completion (RES="50")

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (1~320bytes)		
"P"	"f"	"3"	"xx"	"5"	"0"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~318	ICC Data	INF	ICC Data (Information Field)
<2>	0~1	ICC Data	SW1	Status-1
<3>	1	ICC Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

Continuous Reception State (RES="51")

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (320bytes)	
"P"	"f"	"3"	"xx"	"5"	"1"	<1>	<2>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	319~320	SAM Data	INF	ICC Data (Information Field)
<2>	0~1	SAM Data	SW1	Status-1

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"f"	"3"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R receives chained data of T=1 protocol.

Error Processing

- None

(5) Notes

- When a **Cancel Request ("E")** is received during a command execution, the command processing is aborted **with the SAM remained activated**.

8.58 (f4) SAM T=1 Interruption Completion

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"f"	"4"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"1"	SAM Number (Fixed)

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)	
"P"	"f"	"4"	"xx"	"5"	"3"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"f"	"4"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R forcedly terminates the transmission or the receipt of the data in T=1 protocol type.

Error Processing

- None

(5) Notes

- When a **Cancel Request ("E")** is received during a command execution, the command processing is aborted **with the SAM remained activated**.

8.59 (f8) SAM PPS Request

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1~2byte)	
"C"	"f"	"8"	<1>	<2>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	1	"1"	SAM Number (Fixed)
<2>	0 or 1	"0"	Selection of protocol type T=0
		"1"	Selection of protocol type T=1

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (1byte)
"P"	"f"	"8"	"xx"	"5"	"0"	<1>

RDT	Length (Bytes)	Data (ASCII)	Meaning
<1>	1	"0"	Enable to execute T=0
		"1"	Enable to execute T=1
		"N"	Incompletion PPS Execution

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"f"	"8"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R executes a PPS request between the host and the SAM in order to change "F and D" or "Protocol type".

Error Processing

- None

8.60 (fC) SAM T=0 / T=1 Transmission

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (5~262bytes)							
"C"	"f"	"C"	<1>	<2>	<3>	<4>	<5>	<6>	<7>	<8>

CMP	Length (Bytes)	Data (BIN)	Meaning	
<1>	1	"1"	SAM Number (Fixed)	
<2>	1	00H~FEH	CLA	Instruction Class
<3>	1	00H~FFH	INS	Instruction Code
<4>	1	00H~FFH	P1	Instruction Parameter 1
<5>	1	00H~FFH	P2	Instruction Parameter 2
<6>	0 or 1	01H~FFH	Lc field	Number of Byte present in Command Data Field
<7>	Variable = Lc (0~255)	00H~FFH	Data field	String Byte sent in Command Data Field
<8>	0 or 1	00H~FFH	Le field	Maximum Number of Byte expected in Data Field of Response to Command

For details, see ISO/IEC 7816-4. However, the Case 1 to Case 4 in the table below are enabled.

ISO/IEC 7816-4: Annex A Transportation of APDUs by T=0				Remarks
A.1	Case 1			Enable
A.2	Case 2 short	Case 2S.1	Accepted Le	Enable
		Case 2S.2	Definitely not accepted Le	Enable
		Case 2S.3	Not accepted Le, specified La	*1
A.3	Case 3 short			Enable
A.4	Case 4 short	Case 4S.1	Not accepted Command	*1
		Case 4S.2	Accepted Command	*1
		Case 4S.3	Accepted Command with Information Added	*1
A.5	Case 2 Extended			Disable
A.6	Case 3 Extended			Disable
A.7	Case 4 Extended			Disable

*1: It is enabled to use only when ICC reference standard is "EMV3.1.1", "CB" or "ZKA".

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	SAM RES (2bytes)		RDT (2~258bytes)		
"P"	"f"	"C"	"xx"	"5"	"0"	<1>	<2>	<3>

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	0~256	SAM Data	INF	SAM Data (Information Field)
<2>	1	SAM Data	SW1	Status-1
<3>	1	SAM Data	SW2	Status-2

For details, see ISO/IEC 7816-4.

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"f"	"C"	"xx"

(4) Detailed Functions**Normal Processing**

- The C/R sends/receives the data with the SAM by the protocol type that is analyzed by the C/R, either T=0 or T=1 protocol.

Error Processing

- None

(5) Notes

- When a **Cancel Request ("E")** is received during a command execution, the command processing is aborted **with the SAM remained activated**.

8.61 (g6) Key Exchange

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (66bytes)	
"C"	"g"	"6"	<1>	<2>

CMP	Length (Bytes)	Data (BIN)	Meaning
<1>	2	"11"	Decrypt Type
<2>	64	xxxxh	Public Key

The order of the public key is as follows.

Please arrange the byte order of public key by little endian (sets the least figure at the first byte).

(bytes)								Key data
0	1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15	
:	:	:	:	:	:	:	:	
48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	

If Public key is "0x012345 ... ABCDEF" then

CMP [0] = 0xEF;

CMP [1] = 0xCD;

CMP [2] = 0xAB;

...

CMP [61] = 0x45;

CMP [62] = 0x23;

CMP [63] = 0x01;

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (64bytes)				
"P"	"g"	"6"	"xx"	<1>	<2>	~	<4>	<5>

RDT	Length (Bytes)	Data (BIN)	Meaning
<1>	8	xxxxxxh	DES Key
<2>	1	00h	Fixed data
<3>	53	xxxxxxh	Padding data (Random data)
<4>	1	02h	Fixed data
<5>	1	00h	Fixed data

The order of the response data including DES Key is as follows.

Please arrange the data so that MSB becomes bit0.

MSB						LSB (bits)		
0	1	2	...	...	61	62	63	Key data

MSB								LSB (bytes)	
0	1	2	3	4	5	6	7	DES Key	
8	9	10	11	12	13	14	15	Fixed data + Padding data	
16	17	18	19	20	21	22	23	Padding data	
:	:	:	:	:	:	:	:	:	
48	49	50	51	52	53	54	55	Padding data	
56	57	58	59	60	61	62	63	Padding data + Fixed data	

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	
"N"	"g"	"6"	"xx"	

(4) Detailed Functions**Normal Processing**

- The C/R generates the DES Key and encrypts them by RSA using Public Key.
- It sends the encrypted DES Key to the host as a response.
- After this command, the C/R starts the encrypted data communication.

Retry and Error Processing

- When the C/R cannot decrypt the received command, it sends the **"Not decrypt Error" ("N08")** to the host as a response.

(5) Notes

- This command and the response are in the plain text format.

8.62 (m2) Memory Card Activation

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"m"	"2"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"0"	SLE 4442
		"1"	SLE 4432
		"2"	SLE 4428
		"3"	SLE 4418

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (4bytes)
"P"	"m"	"2"	"xx"	<1>

RDT	Length (Bytes)	Data (BIN)	Meaning
<1>	1	00H~FFH	Data 1
<2>	1	00H~FFH	Data 2
<3>	1	00H~FFH	Data 3
<4>	1	00H~FFH	Data 4

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"m"	"2"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R activates a memory card.
- It sends an ATR received from the card (4bytes).

Error Processing

- When all the data in ATR are 00h or FFh, the C/R deactivates a memory card and sends an **Activation Error ("N82")**.

8.63 (m3) Memory Card Deactivation

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"m"	"3"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"m"	"3"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"m"	"3"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R deactivates a memory card.

Error Processing

- None

8.64 (m5) Lock + memory card activation

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1byte)
"C"	"m"	"5"	<1>

CMP	Length (Byte)	Data (ASCII)	Meaning
<1>	1	"0"	SLE 4442
		"1"	SLE 4432
		"2"	SLE 4428
		"3"	SLE 4418

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (4bytes)
"P"	"m"	"5"	"xx"	<1>

RDT	Length (Bytes)	Data (BIN)	Meaning
<1>	1	00H~FFH	Data 1
<2>	1	00H~FFH	Data 2
<3>	1	00H~FFH	Data 3
<4>	1	00H~FFH	Data 4

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"m"	"5"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R locks and activates a memory card.
- It sends an ATR received from the card (4bytes).

Error Processing

- When the C/R has failed to lock the card, it sends a **"Lock Error" ("N11")**.
- When all the data in ATR are 00h or FFh, the C/R deactivates a memory card and sends an **Activation Error ("N82")**.

8.65 (m6) Memory card deactivation + Unlock

(1) Command

IDN (1byte)	CMD (2bytes)	
"C"	"m"	"6"

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"m"	"6"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"m"	"6"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R deactivates a memory card.
- It unlocks the card.

Error Processing

- When the C/R has failed to unlock the card, it sends a **"Lock Error"("N11")**.

8.66 (m7) Memory Card Transmission

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (5~260bytes)						
"C"	"m"	"7"	<1>	<2>	<3>	<4>	<5>	<6>	<7>

CMP	Length (Byte)	Data (ASCII)	Meaning		
<1>	1	00H~FFH	CLA	Class	Card Type
<2>	1	00H~FFH	INS	Instruction	Command Code
<3>	1	00H~FFH	P1	Parameter 1	Address (High)
<4>	1	00H~FFH	P2	Parameter 2	Address (Low)
<5>	0 or 1	00H~FFH	Lc field (P3)	Length	Number of Byte Present in Command Data Field
<6>	Variable = Lc	Variable	Data field	Data	String of Byte sent in Command Data Field
<7>	0 or 1	00H~FFH	Le field (P3)	Length	Maximum Number of Byte expected in Data Field of Response to Command

Command Parameter for SIEMENS SLE4442

The format of the command parameter for SIEMENS SLE4442 is shown below.

The card type for SIEMENS SLE4442 is "0"(30H). Therefore, CLA of every command is fixed to 30H.

Memory Card Command	CLA	INS	P1	P2	P3	DATA
Read Main Memory	30H	30H	00H	Start address (00H~FFH)	Read data length (00H~FFH) *1	Not provided
Update Main Memory *3	30H	38H	00H	Start address (00H~FFH)	Write data length (01H~FFH)	Write data
Read Protection Memory	30H	34H	FFH	FFH	04H *2	Not provided
Write Protection Memory	30H	3CH	00H	Start address (00H~1FH)	Write data length (01H~20H)	Write data *6
Read Security Memory	30H	31H	FFH	FFH	04H *2	Not provided
Update Security Memory *4	30H	39H	00H	Start address (00h) (01H~03H)	Write data length (01H) (01H~03H)	Write data
Compare Verification Data	30H	33H	00H	01H~03H	01H03H	Compare data
PSC Verification *5	30H	FFH	00H	00H	03H	PSC Code (00H~FFH)

*1: When "00h" is specified for P2, the length of the read data is 256 bytes.

*2: Since the length of the read data is 4 bytes, the value of P3 is fixed to 04H.

*3: Even if the locked data has failed to be written, the C/R sends a positive response to the host.

*4: When P2 is 00h, P3 is fixed to 01h. When P2 is between 01H and 03H, P3 is also between 01H and 03H.

*5: The C/R automatically sends the seven commands required for PSC Verification.

*6: Write data is sent to a memory card along with the Write Protection Memory Command.

The memory card compares its storing memory with the write data in order to decide whether to protect the data or not.

Command Parameter for SIEMENS SLE4432

The format of command parameter for SIEMENS SLE4432 is shown below.

The card type for SIEMENS SLE4432 is "1"(31H). Therefore, CLA of every command is fixed to 31H.

Memory Card Command	CLA	INS	P1	P2	P3	DATA
Read Main Memory	31H	30H	00H	Start address (00H~FFH)	Read data length (00H~FFH) *1	Not provided
Update Main Memory *3	31H	38H	00H	Start address (00H~FFH)	Write data length (01H~FFH)	Write data
Read Protection Memory	31H	34H	FFH	FFH	04H *2	Not provided
Write Protection Memory	31H	3CH	00H	Start address (00H~FFH)	Write data length (01H~20H)	Write data

*1: When "00h" is specified for P2, the length of the read data is 256 bytes.

*2: Since the length of the read data is 4 bytes, P3 is fixed to 04H.

*3: Even if the locked data fails to be written, the C/R sends a positive response to the host.

Command Parameter for SIEMENS SLE4428

The format of command parameter for SIEMENS SLE4428 is shown below.

The card type for SIEMENS SLE4428 is "2"(32H). Therefore, CLA of every command is fixed to 32H.

Memory Card Command	CLA	INS	P1	P2	P3	DATA
Write and erase with Protect bit *2	32H	31H	Start address (0000H~03FFH)		Write data length (01H~FFH)	Write data
Write and erase without Protect bit *2	32H	33H	Start address (0000H~03FFH)		Write data length (01H~FFH)	Write data
Write protect bit with data Comparison (verification) *2	32H	30H	Start address (0000H~03FFH)		Write data length (01H~FFH)	Write data
Read 9 bits, data with Protect bit *3	32H	0CH	Start address (0000H~03FFH)		Read data length (00H~FFH) *1	Not provided
Read 8 bits, data without Protect bit	32H	0EH	Start address (0000H~03FFH)		Read data length (00H~FFH) *1	Not provided
Write error counter	32H	32H	Start address (03FDH)		01H	00H~FFH
Verify PCB byte(s)	32H	0DH	Start address (0000H~03FFH)		01H~02H	Compare data (00H~FFH)
PSC Verification *4	32H	FFH	0000H		02H	PSC Code (00H~FFH)

*1: When "00h" is specified for P2, the length of the read data is 256 bytes.

*2: Even if the locked data has failed to be written, the C/R sends a positive response to the host. The users shall take the responsibility of protection in the EC and PSC areas.

*3: When the data is sent from a memory card to the C/R, PB (protection bits) is added to 8-bit data. Therefore, the data sent from the C/R to the host is twice as much as the data sent from the card to C/R. However, the valid value is only the one in bit 0, and the values from bit 7 to bit 1 are fixed to 0.

*4: The C/R automatically sends the seven commands required for PSC Verification.

Command Parameter for SIEMENS SLE4418

The format of command parameter for SIEMENS SLE4418 is shown below.

The card type for SIEMENS SLE4418 is "3"(33H). Therefore, CLA of every command is fixed to 33H.

Memory Card Command	CLA	INS	P1	P2	P3	DATA
Write and erase with Protect bit *2	33H	31H	Start address (0000H~03FFH)		Write data length (01H~FFH)	Write data
Write and erase without Protect bit *2	33H	33H	Start address (0000H~03FFH)		Write data length (01H~FFH)	Write data
Write protect bit with data Comparison (verification) *2	33H	30H	Start address (0000H~03FFH)		Write data length (01H~FFH)	Write data
Read 9 bits, data with Protect bit *3	33H	0CH	Start address (0000H~03FFH)		Read data length (00H~FFH) *1	Not provided
Read 8 bits, data without Protect bit	33H	0EH	Start address (0000H~03FFH)		Read data length (00H~FFH) *1	Not provided

*1: When "00h" is specified for P2, the length of the read data is 256 bytes.

*2: Even if the locked data has failed to be written, the C/R sends a positive response to the host. The users shall take the responsibility of protection in the EC and PSC areas.

*3: When the data is sent from a memory card to the C/R, PB (protection bits) is added to 8-bit data. Therefore, the data sent from C/R to the host is twice as much as the data sent from the card to C/R. However, the valid value is only the one in bit 0, and the values from bit 7 to bit 1 are fixed to 0.

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (0~512bytes)
"P"	"m"	"7"	"xx"	<1>

RDT	Length (Bytes)	Data (BIN)	Meaning
<1>	0~512	Variable	Reception Data from Memory Card

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"m"	"7"	"xx"

(4) Detailed Functions**Normal Processing**

- The C/R sends and receives the data between the host and the Memory Card.
- It checks the validity of commands but does not check the procedure of the sequence.

Error Processing

- When the parameters specified by the Memory Card Transmission Command ("m7") differ from the card type specified by the Memory Card Activation Command, the C/R sends a **"Sequence Error"("N01")"**.

(5) Notes

- The command parameters and response data are the same as APDU.
- For the details of APDU, see ISO/IEC 7816-4.

8.67 (m8) Memory Card PSC Certification

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (5~260bytes)						
"C"	"m"	"8"	<1>	<2>	<3>	<4>	<5>	<6>	<7>

CMP	Length (Byte)	Data (BIN)	Meaning		
<1>	1	00H~FFH	CLA	Class	Card Type
<2>	1	00H~FFH	INS	Instruction	Command Code
<3>	1	00H~FFH	P1	Parameter 1	Address (High)
<4>	1	00H~FFH	P2	Parameter 2	Address (Low)
<5>	0 or 1	00H~FFH	Lc field	Length	Number of Byte present in Command Data Field
<6>	Variable = Lc	Variable	Data field	Data	String of Byte sent in Command Data Field
<7>	0 or 1	00H~FFH	Le field	Length	Maximum Number of Byte expected in Data Field of Response to Command

Command Parameter for each memory card

Memory Card Command	CLA	INS	P1	P2	P3	DATA
PSC Verification for SLE4442	30H	FFH	00H	00H	03H	PSC Code (000000H~FFFFFFH)
PSC Verification for SLE4428	32H	FFH	00H	00H	02H	PSC Code (0000H~FFFFH)

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"m"	"8"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"m"	"8"	"xx"

(4) Detailed Functions

Normal Processing

- Normal Processing: The C/R automatically sends a memory card the commands necessary for verification. (See "SIEMENS SLE4442 Data Book" or "SIEMENS SLE4428 Data Book".)
- Retry and Error Processing: If the PSC code specified by the command parameter is not correct, it fails PSC verification, then transmits a Disagreement of Verification code ("N89").
- When a memory card has failed to execute the PSC verification successively, and the EC of memory card that has protected the PSC verification is 00h, an Inappropriate Verification Code ("N8A") is returned as a response.
- When the host sends the Memory Card Verification Command ("m8") to a card not supporting the PSC verification, the C/R sends a **"Sequence Error"("N01")**.

Error Processing

- None

8.68 (u0) USER Information Read

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (3bytes)
"C"	"u"	"0"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	3	"001" - "256"	Data Length of User Information

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (1~256bytes)
"P"	"u"	"0"	"xx"	<1>

RDT	Length (Bytes)	Data (BIN)	Meaning
<1>	1~256	Variable	User Information

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"u"	"0"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sends the User Information from the top whose length is specified by the command parameter.

Error Processing

- None

8.69 (u1) USER Information Read for Partial FW

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (1bytes)
"C"	"u"	"1"	<1>

CMP	Length (Bytes)	Data (ASCII)	Meaning
<1>	1	"1"	ICC
		"2"	SAM

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)	RDT (36~172bytes)						
"P"	"u"	"1"	"xx"	<1>	<2>	<3>	...	<5>	<7>	...

RDT	Length (Bytes)	Data (BIN)	Meaning	
<1>	2	"01"~"04"	Changed ICC or SAM mode number	
<2>	0 or 2	"00"	ICC / SAM Module Name	ISO Mode
<3>	32	Variable	User Information for ICC or SAM Module	
<4>	0 or 2	"05"	ICC / SAM Module Name	EMV Mode
<5>	0 or 32	Variable	User Information for ICC or SAM Module	
<6>	0 or 2	"06"	ICC / SAM Module Name	ZKA Mode
<7>	0 or 32	Variable	User Information for ICC or SAM Module	
:	:	:	:	:

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"u"	"1"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sends the User Information for all ICC modules or SAM module.

Error Processing

- None

8.70 (:6) Transaction Setting

(1) Command

IDN (1byte)	CMD (2bytes)		CMP (4bytes)			
"C"	"."	"6"	<1>	<2>	<3>	<4>

CMP	Length (Bytes)	Data (ASCII)	Meaning	
<1>	1	"0"	No Reading	Magnetic Read Direction
		"1"	Insertion Reading	
		"2"	Back Reading	
<2>	1	"0"	No Reading	Magnetic Read Track(s) (When this value is not "0", the value of the CMP <1> has to be "1" or "2".)
		"1"	ISO#1	
		"2"	ISO#2	
		"3"	ISO#3	
		"4"	ISO#1 + ISO#2	
		"5"	ISO#1 + ISO#3	
		"6"	ISO#2 + ISO#3	
		"7"	ISO#1 + ISO#2 + ISO#3	
<3>	1	"0"	Unlock	Automatic lock at the card insertion
		"1"	Lock	
<4>	1	"0"	Unlock	Automatic lock at the card ejection
		"1"	Lock	

(2) Positive Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"P"	"."	"6"	"xx"

(3) Negative Response

JDG (1byte)	RCM (2bytes)		RES (2bytes)
"N"	"."	"6"	"xx"

(4) Detailed Functions

Normal Processing

- The C/R sets the magnetic read direction, the track and whether or not the lock is automatically set.
- It clears the magnetic data of all tracks stored in the C/R.
- It unlocks the card.

No Reading (CMP <1>="0")

- The magnetic read is disabled.
- If S1 and S2 are OFF when this command is received, the green LED will blink and the C/R will wait for a card to be inserted. If a card exists, the C/R will wait for the card to be pulled out. (S1 and S2 are OFF.)
- After S2 turns ON, the LED will go out and the card is locked.
- After the card is unlocked, the orange LED will blink until the card is pulled out. (S1 and S2 are OFF.)

Magnetic Insertion Reading (CMP <1>="1")

- If S1 and S2 are OFF when this command is received, the green LED will blink and the C/R will wait for a card to be inserted. If a card exists, the C/R will wait for the card to be pulled out. (S1 and S2 are OFF.)
- Until S2 turns ON or for the specific time elapses since S1 turns ON, the C/R will read the magnetic data of the track specified by the command parameter.
- If the card lock is not needed, the LED will go out. (S1 is ON, S2 is OFF.) If the card lock is needed, the LED will go out after S2 turns ON. (S1 and S2 are ON.)
- When one or more tracks are normally read, the green LED will light up. Unless all tracks are normally read, the red LED will light up.
- If the card is pulled out during the magnetic reading (S1 and S2 are OFF.), the C/R will stop the magnetic reading, blink the green LED and wait for the card to be inserted.
- When the card is pulled out after completion of the Insertion reading (S1 and S2 are ON -> S1 and S2 are OFF), the C/R will clear the magnetic data in the C/R and wait for the next card to be inserted with the Insertion reading available.

Magnetic Back Reading (CMP <1>="2")

- If S1 and S2 are OFF, the orange LED will blink and wait for the card to be inserted. If no card exists in the C/R, the C/R will wait for the card to be inserted.
- Until S1 turns OFF or for the specific time elapses since S2 turns OFF, the C/R will read the magnetic data of the track specified by the command parameter. When S2 turns OFF, the LED will go out.
- When one or more tracks are normally read, the green LED will light up. Unless all tracks are normally read, the red LED will light up.
- If the card is inserted again during the magnetic reading (S1 and S2 are ON.), the C/R will stop the magnetic reading, make the orange LED light up and wait for the card to be pulled out. (S1 and S2 are OFF.)
- When the next card is inserted after completion of the magnetic reading (S1 and S2 are OFF -> S1 and S2 are ON.), the C/R will clear the magnetic data in the C/R and wait for the next card pulled out with the Back reading available.

Automatic Lock at the Card Insertion (CMP <3>="1")

- When the state change from "S1=OFF and S2=OFF" to "S2=ON" is detected, the lock will be set.

Automatic Lock at the Card Ejection (CMP <4>="1")

- When the state change from "S2=ON" to "S1=OFF and S2=OFF" is detected, the lock will be set.

Error Processing

- When the command parameter is "0000" or "0001", the C/R sends a **Command Parameter Error ("N02")**.

9. Maintenance Button

9.1 Maintenance Procedures

When the maintenance button is pressed for three seconds, the C/R will inspect each function in accordance with the following procedures. However, when the parts to be inspected are not equipped, the inspection item will be skipped.

- (1) The processing for the command under execution stops.
- (2) The green LED blinks and the C/R waits for a card to be inserted.
- (3) When a card is inserted, the C/R will lock and activate the card.
- (4) The C/R deactivates and unlock the card, blinks the orange LED and waits for the card to be pulled out.
- (5) When the card is pulled out, the C/R will perform the back reading to complete the maintenance procedures.

9.2 LED Indicator

The meaning of LED indicator under maintenance procedures is as follows:

LED Indicator	C/R Status
Green LED Blinking (ON: 0.5sec, OFF: 0.5sec)	Waiting for the card to be inserted
Orange LED Blinking (ON: 0.5sec, OFF: 0.5sec)	Waiting for the card to be pulled out
Green LED ON	Maintenance procedures has completed successfully. (C/R is waiting for Initial Reset Command)
Red LED ON	Error in Magnetic Reading
Red LED Blinking (ON: 4sec, OFF: 4sec)	Error in IC Activation
Red LED Blinking (ON: 1sec, OFF: 0.5sec)	Error in the lock
Red LED Blinking (ON: 0.25sec, OFF: 0.25sec)	Error in the sensor
Orange LED Blinking (ON: 1sec, OFF: 1sec)	Error which may indicate the rear destroy

9.3 Command Response Specifications

- Send the **Initial Reset Command ("C00")** from the host to stop the maintenance procedures. When the C/R receives any command other than Initial Reset Command, it will respond with the **Error during Maintenance ("N0A")**.
- After the maintenance procedures complete, send the **Initial Reset Command ("C00")** to return to the normal state. When the C/R receives any command other than Initial Reset Command, it will respond with the **Error after Maintenance ("N0B")**.

10. Host Sequence

This section describes the recommended sequence for the host.

10.1 Insertion Reading

- (1) The host specifies the Insertion Reading with the Transaction Setting Command (C:6). The command parameter specifies which track is to be magnetically read. (ex: Send C:61700.)
- (2) The host polls the insertion of magnetic card (Completion of Insertion Reading) with Card Status Monitoring Command (C92). Set the polling time with a command parameter. (ex: Send C9210.)
- (3) The host obtains the read data with Read Command (C6x) when the magnetic read is completed (Read Result in the response of C92 Command becomes Positive Reading). (ex: Send C6a7 when P920211100 is received for C9210.)
- (4) The host polls the ejection of the inserted card with Card Status Monitoring Command (C92).
- (5) The host waits for the card to be pulled out with Card Status Monitoring Command (C92). When RES=00, go to (2) for next transaction.

10.2 Back Reading

- (1) The host specifies the Back Reading with Transaction Setting Command (C:6). The command parameter specifies which track is to be magnetically read. (ex: Send C:62700.)
- (2) The host polls the insertion of magnetic card with Card Status Monitoring Command (C92). Set the polling time with a command parameter. (Send C9210 and wait for P9202.)
- (3) Next, the host polls the ejection (Completion of Back Reading) with Card Status Monitoring Command (C92). (ex: Send C9210.)
- (4) The host obtains the read data with Read Command (C6x) when the magnetic read is completed (Read Result in the response of C92 Command becomes Positive Reading). (ex: Send C6a7 when P920011100 is received for C9210.)
- (5) Go to (2) for next transaction, if any.

10.3 Insertion Reading + ICC Transaction

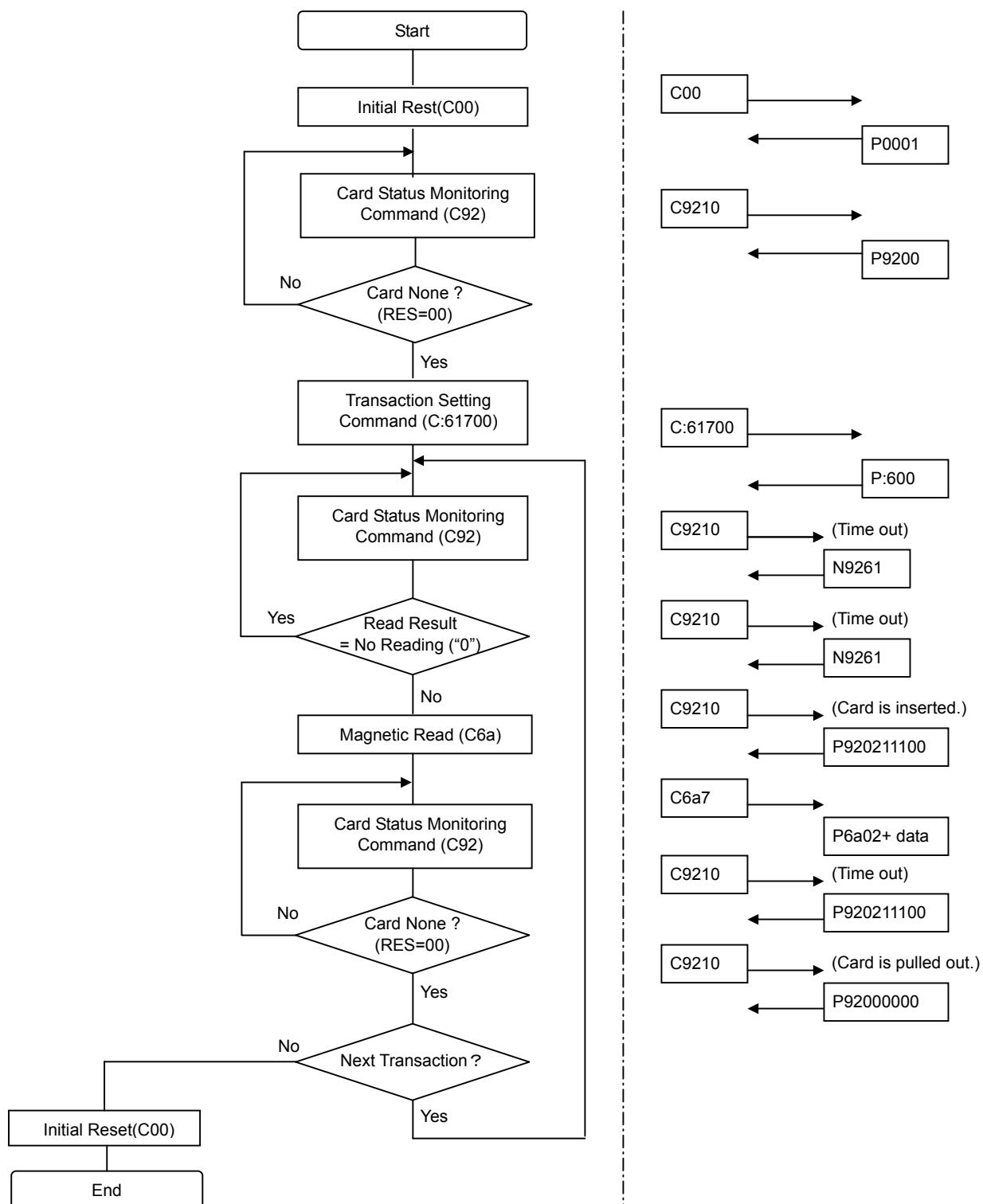
- (1) The host specifies the Insertion Reading with Transaction Setting Command (C:6). The command parameter specifies which track is to be magnetically read. (ex: Send C:61710.)
- (2) The host polls the insertion of magnetic card (Completion of Magnetic Read) with Card Status Monitoring Command (C92). Set the polling time with a command parameter. (ex: Send C9210.)
- (3) The host obtains the read data with Read Command (C6x) when the magnetic read is completed (Read Result in the response of C92 Command becomes Positive Reading). At this time, the card has been already locked. (ex: Send C6a7 when P921011100 is received for C9210.)
- (4) Next, for the transaction with the ICC, ICC is activated and the data are transmitted. (ex: Send CC2 and CF1 Commands.)
- (5) When data transmission with ICC is completed, ICC is deactivated and unlocked. (ex: Send CC3 and CC1.)
- (6) The host waits for the card to be pulled out with Card Status Monitoring Command (C92). When RES=00, go to (2) for next transaction.

10.4 Back Reading + ICC Transaction

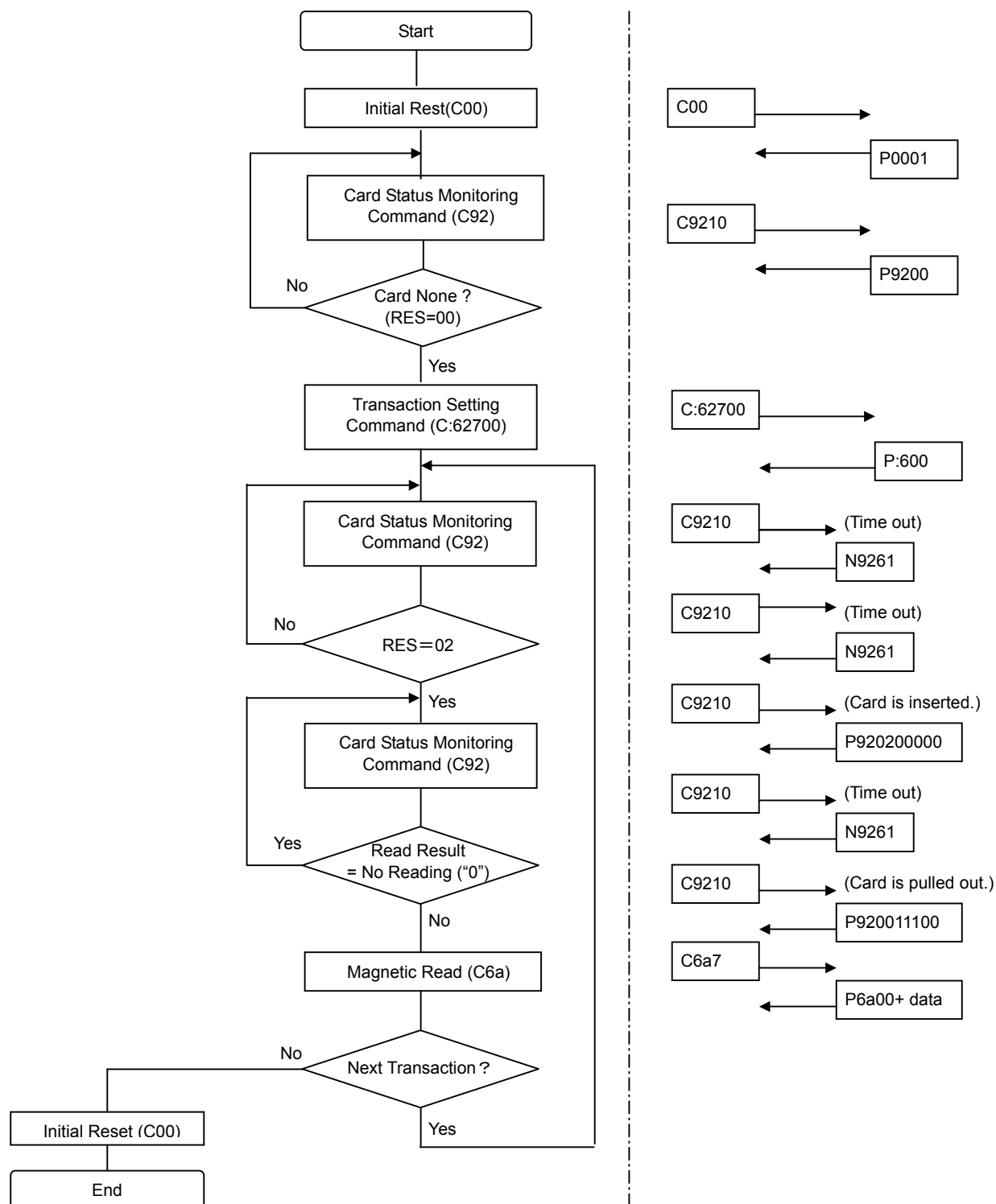
- (1) The host specifies the Back Reading with Transaction Setting Command (C:6). The command parameter specifies which track is to be magnetically read. Also, make the setting so that the card will be locked after card insertion is completed. (ex: Send C:62710.)
- (2) The Host polls the card insertion with Card Status Monitoring Command (C92). Set the polling time with a command parameter. (ex: Send C9210.)
- (3) When the card insertion is completed (when the response of C92 Command becomes RES=10), the ICC card is activated and the data are transmitted for the transaction with ICC. (ex: Send CC2 and CF1 Commands.)
- (4) When data transmission with ICC is completed, ICC is deactivated and unlocked. (ex: Send CC3 and CC1.)
- (5) The Host waits for the card to be pulled out with Card Status Monitoring Command (C92). When RES=00, go to (2) for next transaction.

11. Host Sequence Flowchart

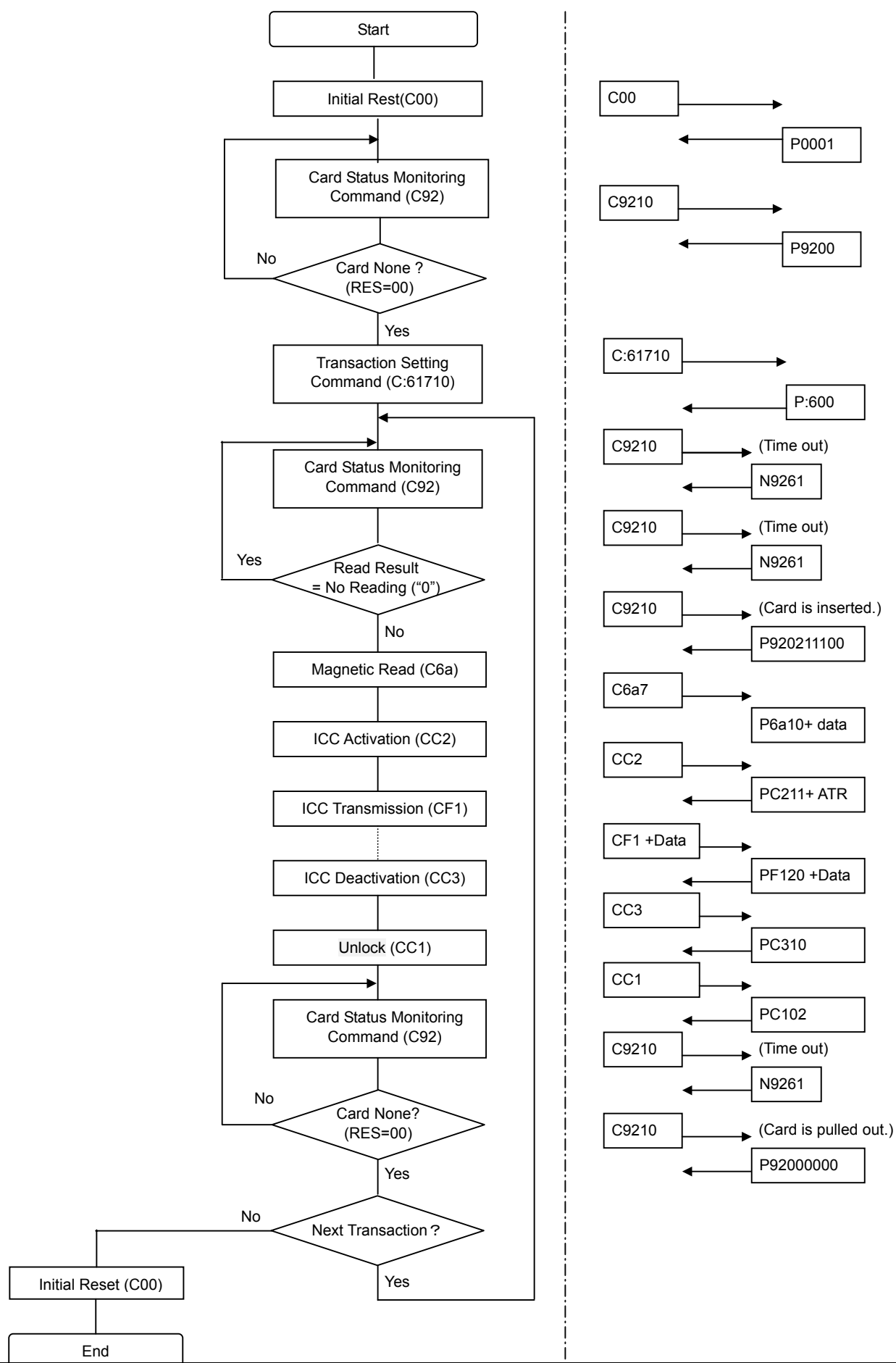
11.1 Insertion Reading



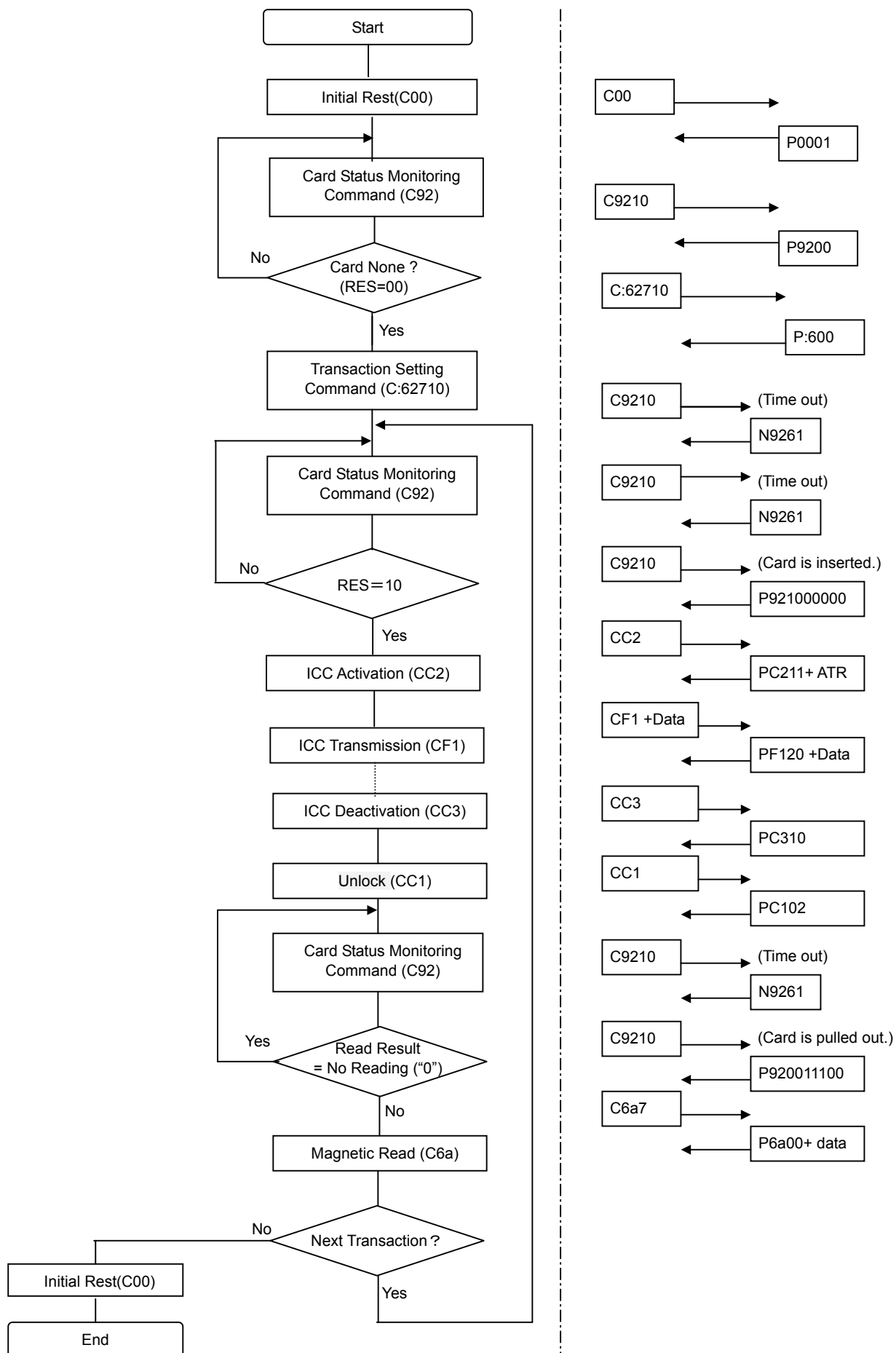
11.2 Back Reading



11.3 Insertion Reading + ICC Transaction

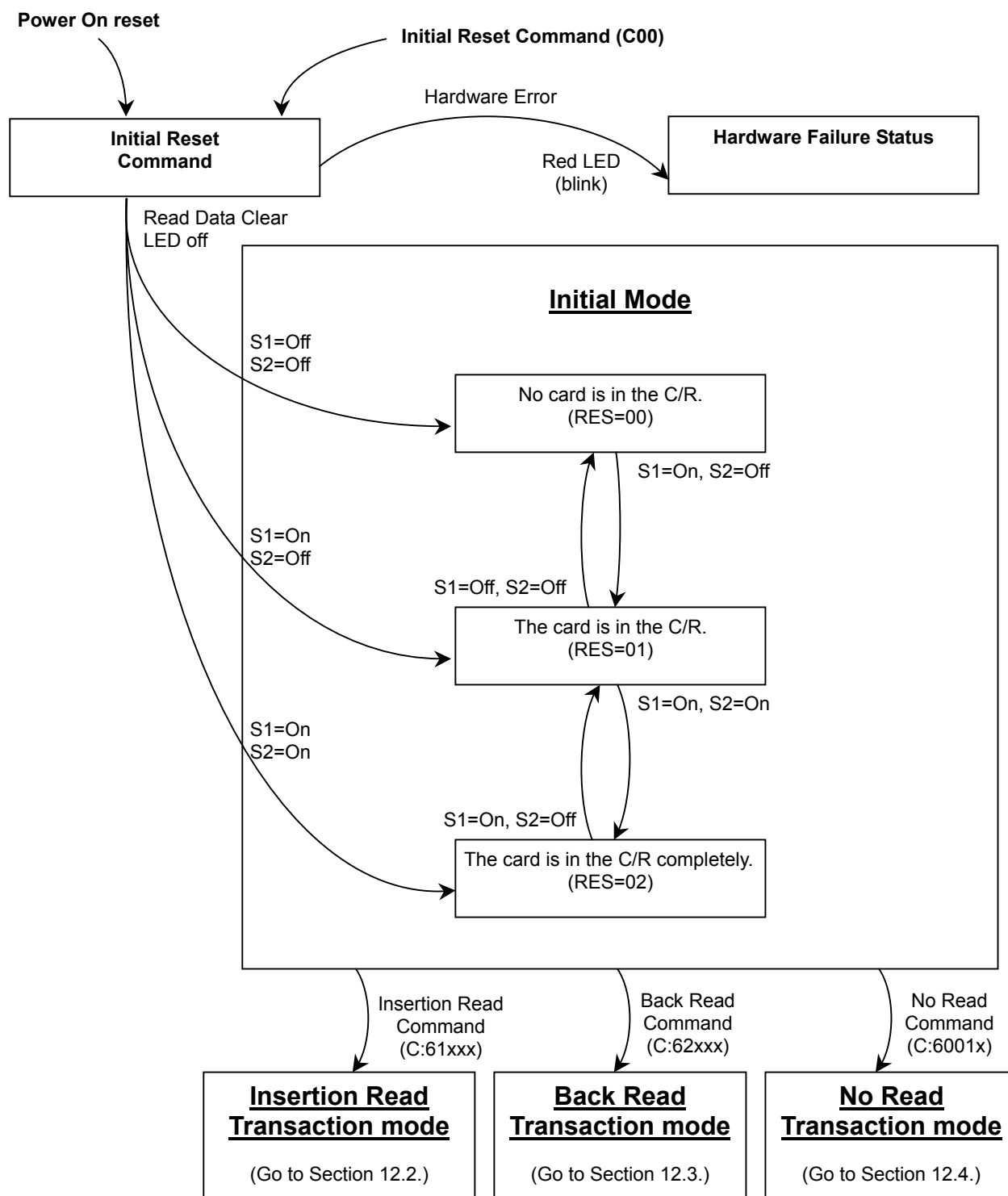


11.4 Back Reading + ICC Transaction

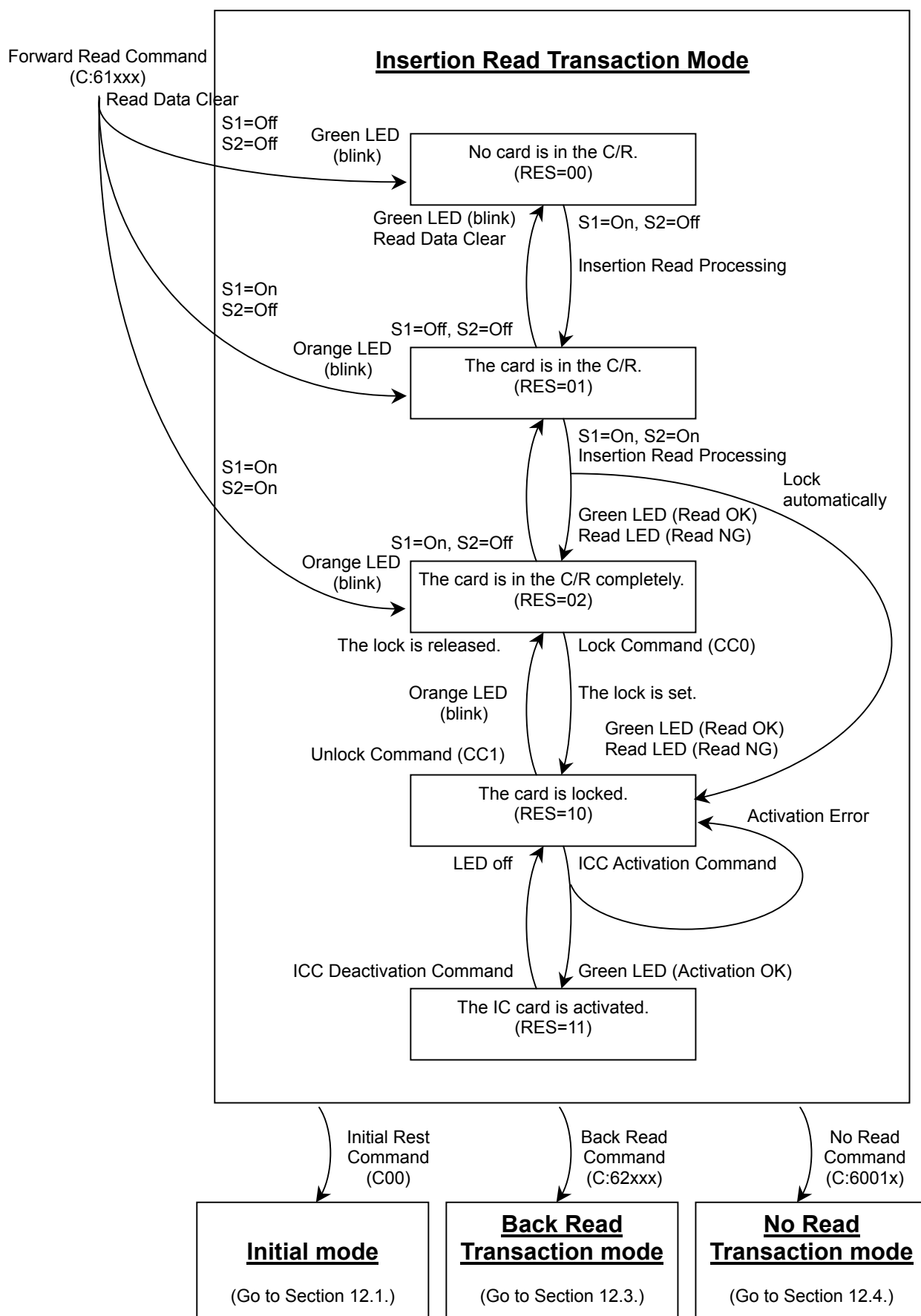


12. Card Reader Status Change Chart

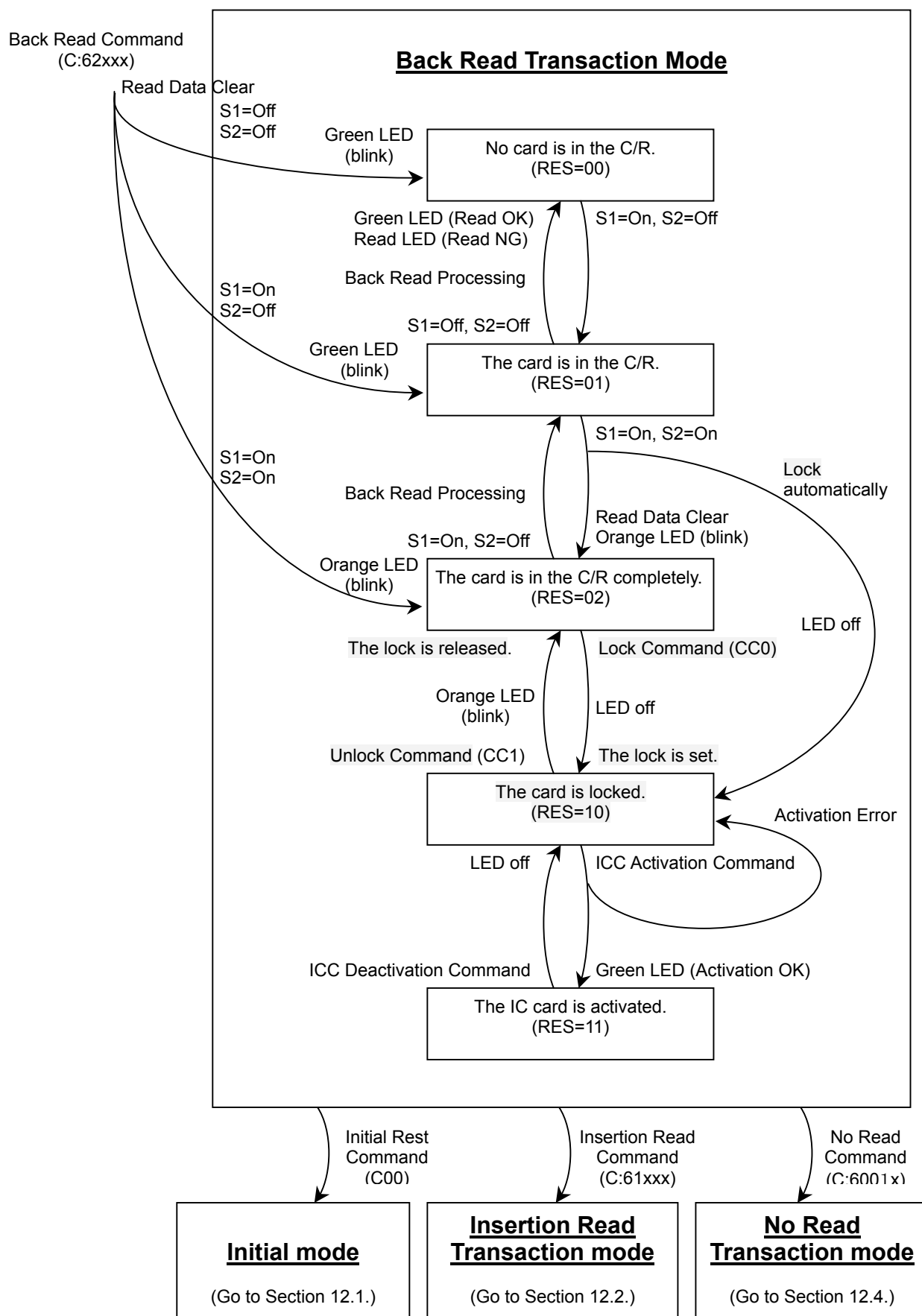
12.1 No Read Mode



12.2 Insertion Read Mode



12.3 Back Read Mode

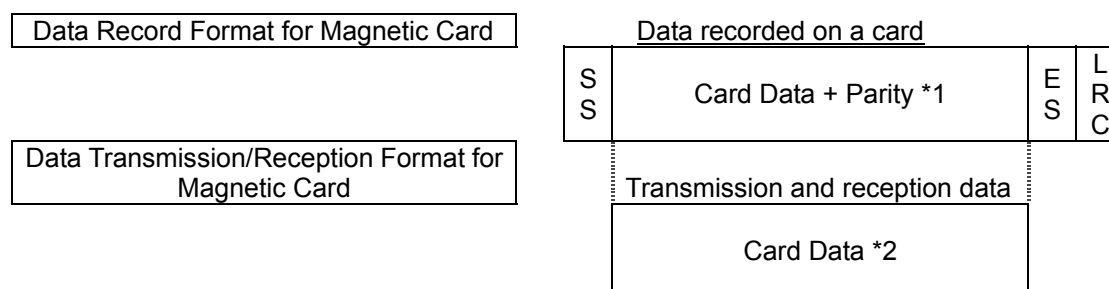


13. Magnetic Card Data Record Format

Item	Track	ISO 1	ISO 2	ISO 3
Character Length (including parity)		7 bits	5 bits	5 bits
Parity		odd	odd	odd
Longitudinal Calculation Method (LRC) *1		even LRC	even LRC	even LRC
Top Character		"SP"	"0"	"0"
Start Sentinel (SS)		"0/"	"."	"."
End Sentinel (ES)		"?"	"?"	"?"
Data Length (byte)		1-76	1-37	1-104

(1) Card Data Configuration of ISO Track (1 - 3)

All the data recorded on a card except parity are transmitted and received in ASCII code as a command or a response by the Host and the C/R.



*1 Data recorded on a card includes both card data and parity data.

*2 The data transmitted/received by the HOST or the C/R is only card data not including the parity data.

(2) Character Code Setting of ISO 1 Track

One character on the ISO 1 Track consists of 6 bits. Only the ASCII codes shown below are usable.

				b6	0	0	1	1
				b5	0	1	0	1
b4	b3	b2	b1	row column	2	3	4	5
0	0	0	0	0	SP	0	@ (*1)	P
0	0	0	1	1	! (*1)	1	A	Q
0	0	1	0	2	" (*1)	2	B	R
0	0	1	1	3	# (*3)	3	C	S
0	1	0	0	4	\$	4	D	T
0	1	0	1	5	% (*4)	5	E	U
0	1	1	0	6	& (*1)	6	F	V
0	1	1	1	7	' (*1)	7	G	W
1	0	0	0	8	(	8	H	X
1	0	0	1	9	)	9	I	Y
1	0	1	0	A	* (*1)	: (*1)	J	Z
1	0	1	1	B	+ (*1)	; (*1)	K	[(*2)
1	1	0	0	C	, (*1)	< (*1)	L	(*2)
1	1	0	1	D	-	= (*1)	M	] (*2)
1	1	1	0	E	.	> (*1)	N	^ (*4)
1	1	1	1	F	/	? (*1)	O	_ (*1)

*1. These characters can be used only for hardware control. Do not use in card data.

*2. Do not use these characters for cards used internationally.

*3. These characters have been prepared for use as the additional diagram characters. Do not use in the Card Data.

*4. Each character represents as follows:

"%": Start Sentinel (SS)

"?": End Sentinel (ES)

"^": Separator

Because the restrictions shown above, however, do not apply to LRC, all codes in the table are usable for LRC.

(3) Character Code Setting of ISO 2 and 3 Track

Each character on the ISO 2 and 3 consists of 4 bits. Only the following ASCII codes are usable:

bit				row	Character
b4	b3	b2	b1		
0	0	0	0	0	0
0	0	0	1	1	1
0	0	1	0	2	2
0	0	1	1	3	3
0	1	0	0	4	4
0	1	0	1	5	5
0	1	1	0	6	6
0	1	1	1	7	7
1	0	0	0	8	8
1	0	0	1	9	9
1	0	1	0	A	: (*1)
1	0	1	1	B	; (*2)
1	1	0	0	C	< (*1)
1	1	0	1	D	= (*3)
1	1	1	0	E	> (*1)
1	1	1	1	F	? (*4)

*1. These characters can be used only for hardware control. Do not use in card data.

*2. ",:": Start Sentinel (SS)

*3. "=": Separator

*4. "?": End sentinel (ES)

Because the restrictions shown above, however, do not apply to LRC, all codes in the table are usable for LRC.

14. Supportable Transmission Factors F and D

14.1 IC Card handling

(1) Specific Mode

C/R supports the following TA1 (F and D) in the specific mode.

TA1(BIN)	F	D	Frequency (MHz)	Transmission speed (usec/1etu)
01H	372	1	3.5712	About 104 usec (9600bps)
02H	372	2	3.5712	About 52 usec (19200bps)
03H	372	4	3.5712	About 26 usec (38400bps)
11H (Default)	372	1	3.5712	About 104 usec (9600bps)
12H	372	2	3.5712	About 52 usec (19200bps)
13H	372	4	3.5712	About 26 usec (38400bps)
31H	744	1	7.1424	About 104 usec (9600bps)
32H	744	2	7.1424	About 52 usec (19200bps)
33H	744	4	7.1424	About 26 usec (38400bps)
34H	744	8	3.5712	About 26 usec (38400bps)
48H	1116	12	3.5712	About 26 usec (38400bps)
52H	1488	2	7.1424	About 104 usec (9600bps)
53H	1488	4	7.1424	About 52 usec (19200bps)
54H	1488	8	7.1424	About 26 usec (38400bps)
55H	1488	16	3.5712	About 26 usec (38400bps)
69H	1860	20	3.5712	About 26 usec (38400bps)

(2) Negotiable Mode (PPS request)

The C/R executes PPS request when the ATR is the following TA1 (F and D) with the negotiable mode.

TA1			PPS1 of PPS Request			Transmission speed after PPS success.	
Value (BIN)	F	D	Value (BIN)	F	D	Frequency (MHz)	Time of 1 etu
01H	372	1	01H	372	1	3.5712	About 104 usec (9600bps)
02H	372	2	02H	372	2	3.5712	About 52 usec (19200bps)
03H	372	4	03H	372	4	3.5712	About 26 usec (38400bps)
04H	372	8					
05H	372	16					
06H	372	32					
08H	372	12					
09H	372	20					
11H	372	1	11H	372	1	3.5712	About 104 usec (9600bps)
12H	372	2	12H	372	2	3.5712	About 52 usec (19200bps)
13H	372	4	13H	372	4	3.5712	About 26 usec (38400bps)
14H	372	8					
15H	372	16					
16H	372	32					
18H	372	12					
19H	372	20					
31H	744	1	31H	744	1	7.1424	About 104 usec (9600bps)
32H	744	2	32H	744	2	7.1424	About 52 usec (19200bps)
33H	744	4	33H	744	4	7.1424	About 26 usec (38400bps)
34H	744	8					
35H	744	16					
36H	744	32					
38H	744	12					
39H	744	20					
48H	1116	12	48H	1116	12	3.5712	About 26 usec (38400bps)
52H	1488	2	52H	1488	2	7.1424	About 104 usec (9600bps)
53H	1488	4	53H	1488	4	7.1424	About 26 usec (38400bps)
54H	1488	8	54H	1488	8	7.1424	
55H	1488	16	55H	1488	16	3.5712	
69H	1860	20	69H	1860	20	3.5712	

14.2 SAM handling

(1) Specific Mode

The C/R supports the following TA1 (F and D) in the specific mode.

TA1(BIN)	F	D	Frequency (MHz)	Transmission speed (usec/1etu)
01H	372	1	3.5712	About 104 usec (9600bps)
02H	372	2	3.5712	About 52 usec (19200bps)
03H	372	4	3.5712	About 26 usec (38400bps)
11H (Default)	372	1	3.5712	About 104 usec (9600bps)
12H	372	2	3.5712	About 52 usec (19200bps)
13H	372	4	3.5712	About 26 usec (38400bps)
34H	744	8	3.5712	About 26 usec (38400bps)
48H	1116	12	3.5712	About 26 usec (38400bps)
55H	1488	16	3.5712	About 26 usec (38400bps)
69H	1860	20	3.5712	About 26 usec (38400bps)

(2) Negotiable Mode (PPS request)

The C/R executes PPS request when the ATR is the following TA1 (F and D) with the negotiable mode.

TA1			PPS1 of PPS Request			Transmission speed after PPS success.	
Value (BIN)	F	D	Value (BIN)	F	D	Frequency (MHz)	Time of 1 etu
01H	372	1	01H	372	1	3.5712	About 104 usec (9600bps)
02H	372	2	02H	372	2	3.5712	About 52 usec (19200bps)
03H	372	4	03H	372	4	3.5712	About 26 usec (38400bps)
04H	372	8					
05H	372	16					
06H	372	32					
08H	372	12					
09H	372	20					
11H	372	1	11H	372	1	3.5712	About 104 usec (9600bps)
12H	372	2	12H	372	2	3.5712	About 52 usec (19200bps)
13H	372	4	13H	372	4	3.5712	About 26 usec (38400bps)
14H	372	8					
15H	372	16					
16H	372	32					
18H	372	12					
19H	372	20					
48H	1116	12	48H	1116	12	3.5712	
55H	1488	16	55H	1488	16	3.5712	
69H	1860	20	69H	1860	20	3.5712	