



Interface Specification

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MCT3Q8-3A0264

Spec. No.

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[INTERFACE SPECIFICATION]

1. Logic level

1.1 Transmission / Control Specification

- 1) Synchronous method : Asynchronous
- 2) Transmission method : Half duplex
- 3) Baud rate : 9,600 BPS, 19,200 BPS or 38,400 BPS (automatic recognition)

ST	b0	b1	b2	b3	b4	b5	b6	b7	P	SP
----	----	----	----	----	----	----	----	----	---	----

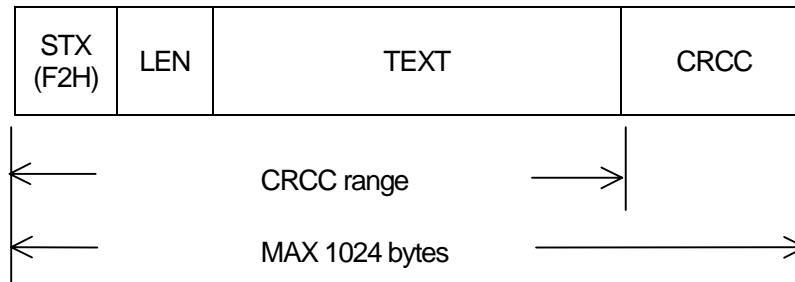
- 4) Data length : 8bit + 1 parity
- 5) Stop bit : 1 bit
- 6) Character Code : ASCII 8 bit code
- 7) Parity check method : Vertical (Even) parity check

1.2 Transmission control method

Command / Response method

ICRW executes particular operation according to text (command) received from HOST
then reports result of execution to HOST.

1.3 Transmission Format and Characters

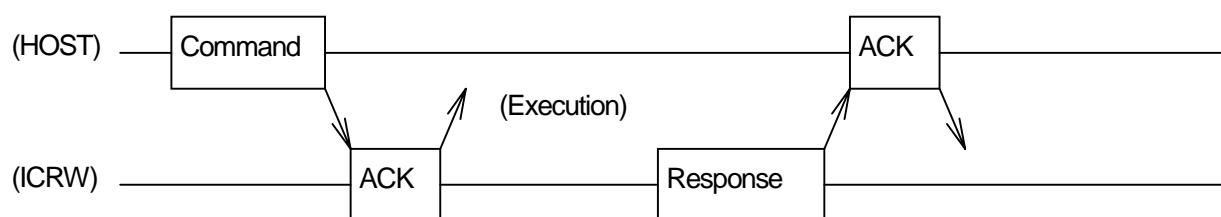


STX (F2H)	Indicate start of text. STX code is F2H.
ACK (06H)	Acknowledge.
NAK (15H)	Negative acknowledge.
DLE, EOT (10H, 04H)	Clear the line.
LEN (2bytes)	Text length.
TEXT	Command or response.
CRCC (2bytes)	Cyclic redundancy code.
	Polynomial $X^{16}+X^{12}+X^5+1$.
	Initial value is 0000H.

Note: 1. Gap between characters STX to CRCC is less than 250 msec.

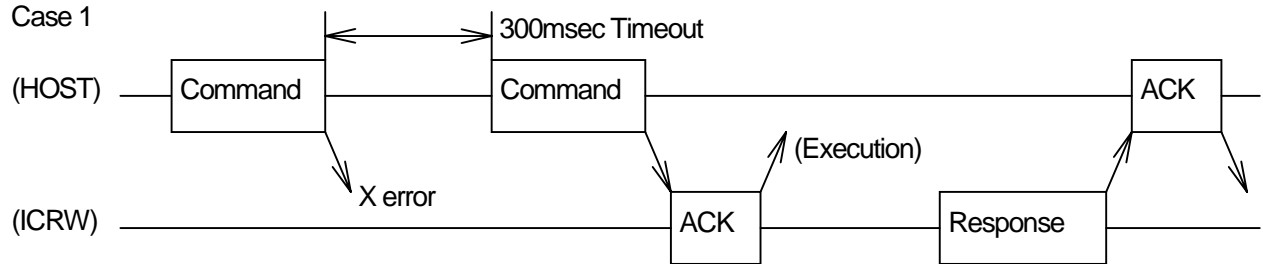
2. Transmission / Control protocol

2.1 Ordinary operation

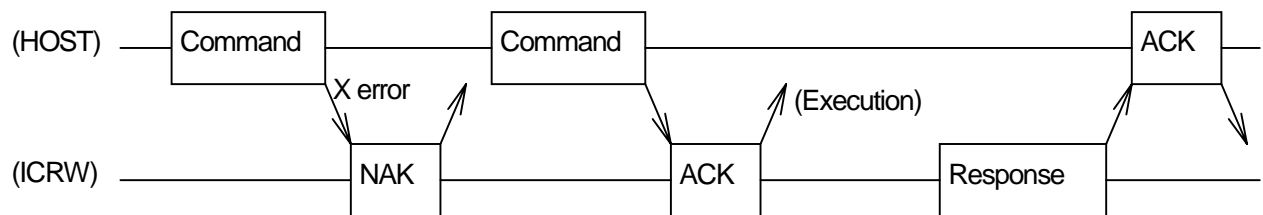


2.2 Irregular operation and back-up

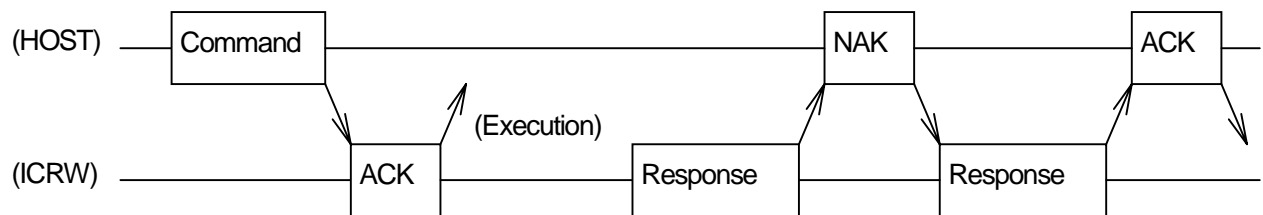
Case 1



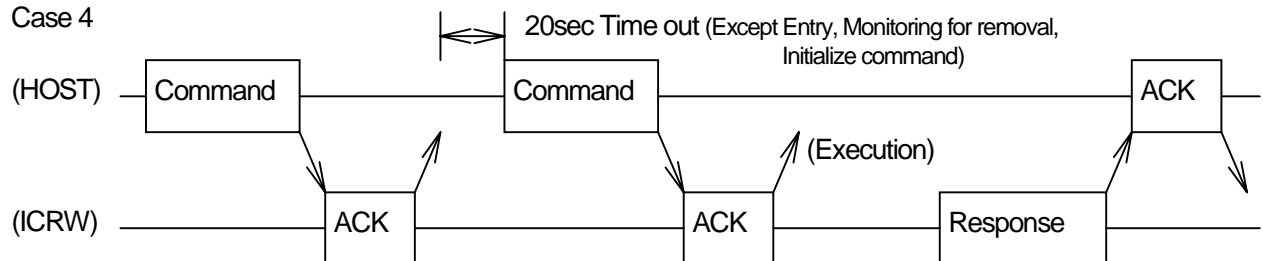
Case 2



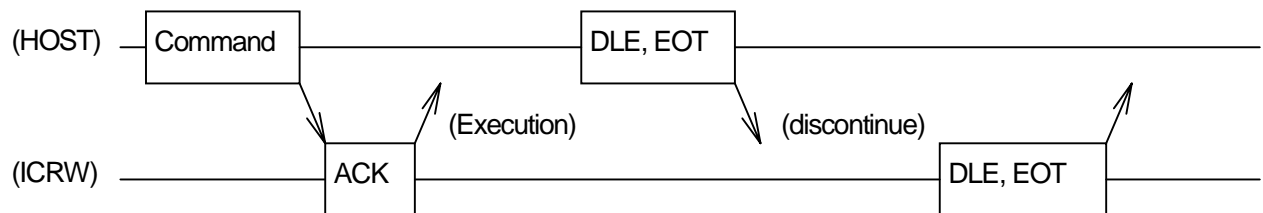
Case 3

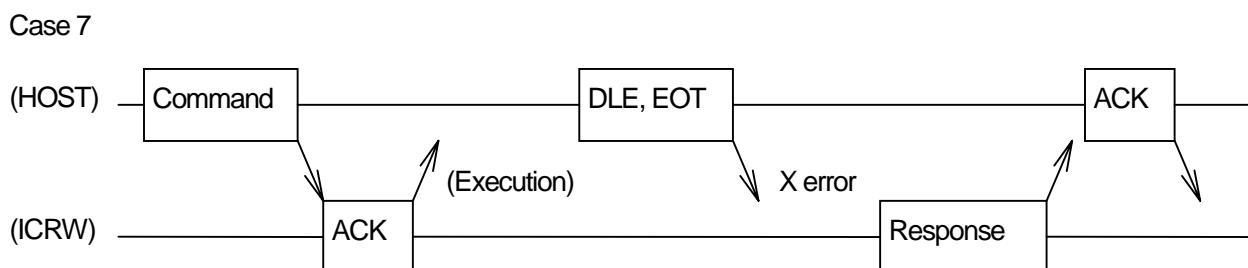
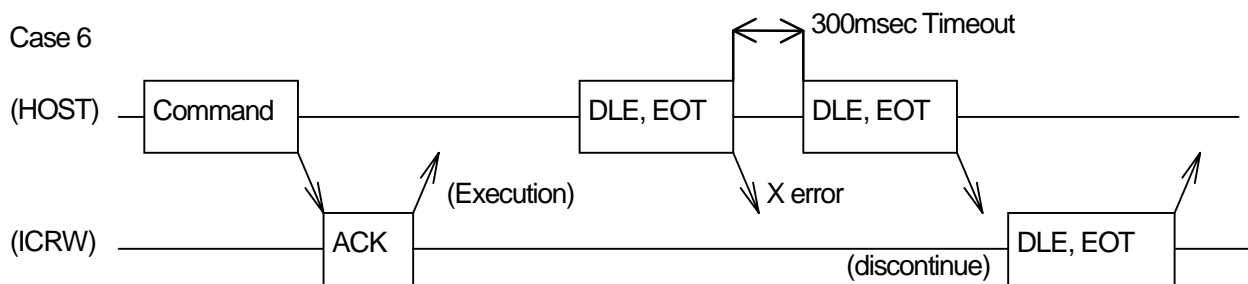


Case 4



Case 5





ICRW can not receive the data from HOST, at the time of the writing of F-ROM.

"At the time of the writing of F-ROM" means the renewal of during the setting of "Sensor standard value".

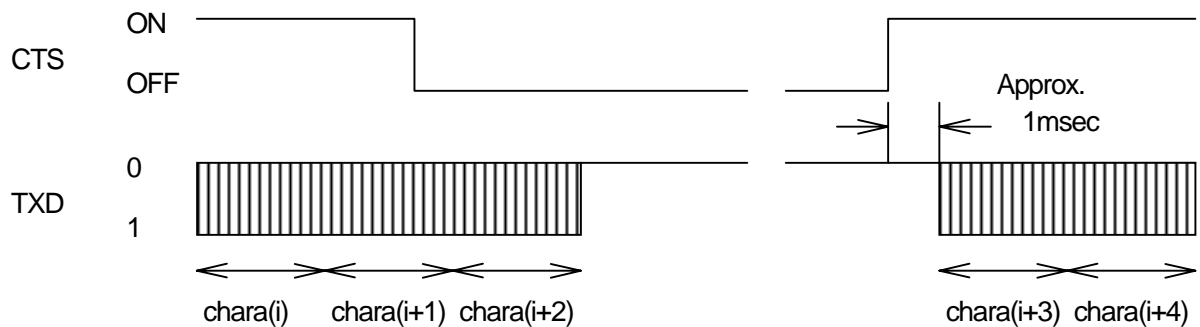
2.3 Timing chart (User program code area only)

1) Data gap

During receiving mode, if 250 msec Time-out occurs, ICRW assumes receiving the Text characters set data is completed.

2) Cancel/Resume of transmission

During text transmission from ICRW, when CTS signal goes OFF, ICRW stops its transmission with Max 2 characters' delay. Resumption is available within approx. 1 msec after CTS signal goes ON.



2.4 Cancel of command (User program code area only)

Whenever receive "DLE,EOT" characters' ICRW stops current execution right away, and wait for next command. Then ICRW sends "DLE,EOT".

If ICRW receives "DLE,EOT" command during response transmission, ICRW returns to neutral mode after completion of sending all response characters.

When Cancel command is received during processing command of Entry, Retrieve, Eject, Initialize or taking a card into ICRW in Enable mode, card is ejected only when the card is staying around the gate.

When Cancel command is received during processing command of ICC communication, the ICC is deactivated after one block transmission.

3. State transition matrix

1) HOST

Character Mode	ACK	NAK	STX(F2H)	Others	Time out	Timer
(1) Wait for ACK after command	Go to (2)	Re-send command Go to (1)*1	Ignore	Ignore	Re-send command Go to (1)*1	300msec
(2) Wait for response after ACK	Ignore	Ignore	Go to (3)	Ignore	Re-send command Go to (1)*1	20sec *2
(3) Wait for LEN	Receive 2 bytes as Length. Receive 2 bytes then go to (4)				Send NAK Go to (2)	250msec
(4) Wait for Text	Receive Text in the Length. Receive the Length bytes then go to (5)				Send NAK Go to (2)	250msec
(5) Wait for CRCC	Receive 2 bytes as CRCC. OK then Normal receipt: Send ACK & go to (1) NG then Irregular receipt: Re-send NAK & go to (2)				Send NAK Go to (2)	250msec

*1 : If it is over the re-try count, it will be judged an error.

*2 : Except Entry, Monitoring for removal, Initialize command.

2)ICRW

Character Mode	ACK	NAK	STX(F2H)	DLE,EOT	Others	Time out	Timer
(1) Neutral	Ignore	Ignore	Go to (2)	Go to (1) after send DLE,EOT	Ignore	None	
(2) Wait for LEN	Receive 2 bytes as Length. Receive 2 bytes then go to (3)					Send NAK & go to (1)	250 msec
(3) Wait for Text	Receive Text in the Length bytes Receive the Length bytes then go to (4)					Send NAK & go to (1)	250 msec
(4) Wait for CRCC	Receive 2 bytes as CRCC OK then send ACK, execute command and go to (5) NG then send NAK and go to (1)					Send NAK & go to (1)	250 msec
(5) Wait for ACK after sending Resp	Go to (1)	Resend Resp. Go to (5)	Go to (2)	Go to (1) after send DLE,EOT	Ignore	Go to (1)	300 msec

During command execution, all characters except "DLE, EOT" are ignored.

4. Command /Response

HOST sends command to ICRW and instruct operation. Command is followed by data necessary for operation. ICRW sends result of execution as response.

Command must be transmitted more than 5 msec after receipt of the response from ICRW.

4.1 Text format

1) Command format (HOST -> ICRW)

"C"	cm	pm	Data
-----	----	----	------

cm: Command code

pm: Parameters

This is a transmission format that HOST commands ICRW.

The first character should be "C"(=43H).

There are commands with data part and without data part.

2) Positive response format (ICRW -> HOST)

"P"	cm	pm	st1	st0	Data
-----	----	----	-----	-----	------

st1,st0: Status code

This is a transmission format that ICRW informs HOST of the proper completion of command execution.

The first character should be "P"(=50H).

There are positive responses with data part and without data part.

In this format cm and pm returns the same values which were received with command transmission.

3) Negative response format (ICRW -> HOST)

"N"	cm	pm	e1	e0	Data
-----	----	----	----	----	------

e1,e0: Error code

This is a transmission format that ICRW informs HOST of the abnormal completion of command execution.

The first character should be "N"(=4EH).

There are negative response with data part and without data part.

In this format cm and pm returns the same values which were received with command transmission.

4.2 Structure of Firmware areas

Firmware of ICRW are divided into two parts.

(1) Supervisor program code area

To execute the download firmware.

This area can not be changed later.

(2) User program code area

Store area of user's ICRW control firmware.

HOST can reprogram this area.

If the firmware is successfully downloaded in this area, ICRW executes this area after power on .

So HOST usually doesn't care Supervisor program code area.

In case error response "02" arises in Initialize command, User program code area is abnormal condition. And ICRW executes Supervisor program code area.

HOST should download the User program code.

Switch command is to switch Supervisor program code area and User program code area.

Initialize command shall be executed when after Switch command is executed.

5. Supervisor program code area

5.1 Command list

cm: Command code pm: Parameters

Command	cm	Function	pm	Details of operation
INITIALIZE	30H	Initialize ICRW	30H	Designate communication format
REVISION	41H	Revision	30H	Send the revision of Supervisor program code area
DOWNLOAD	4AH	Download	30H	Erase the User program code area
			31H	Execute download
			32H	Confirm User program code area
			34H	Download attestation
SWITCH	4BH	Area switch	30H	Switch to the User program code area

Notes. Example 30H present ASCII code, "0", "01" present ASCII character.

Initialize command includes fixed original data.

Do not use any other codes than those shown by this table.

5.2 Status code

st1, st0 : ICRW status code

status code	Meaning
"00"	always "00" in Supervisor program code area.

5.3 Error code

e1, e0 : error code

error code	Meaning
"00"	A given command code is unidentified
"01"	Parameter is not correct
"02"	Command execution is impossible. Under Supervisor program code area
"04"	Command data error
"70"	F-ROM write error
"71"	CRC error of User program code area
"B0"	Not received Initialize command

6. Command explanation of Supervisor program code area

6.1 Initialize command

Command	"C"	30H	3xH	3xH	3xH	3xH	3xH	3xH
Positive response	Nothing							
Negative response	"N"	30H	3xH	30H	32H			

Execute this command whenever power is turned on or after switch from User program code area.
ICRW recognizes baud rate automatically upon receipt of this command (Only one time after Power-on).

Positive response doesn't exit in Initialize command in this area.
Surely return error code "02" of negative response.

6.2 Revision command

Command

"C"	41H	30H
-----	-----	-----

Positive response

"P"	41H	30H	30H	30H	Supervisor code area revision
-----	-----	-----	-----	-----	-------------------------------

Negative response

"N"	41H	30H	e1	e0
-----	-----	-----	----	----

Send eight characters of Supervisor program code area's firmware revision to HOST.

Ex) "1234-01A"

6.3 Download command

Command	"C"	4AH	pm	Download data	
Positive response	"P"	4AH	pm	30H	30H
Negative response	"N"	4AH	pm	e1	e0

Above are used in case to write latest firmware.

pm=30H: Erase current User program code area.

Need to execute first to execute download.

Error "70" arise in case Erase isn't executed normally. This error relates to board degradation.
Need to change the board.

pm=31H: Write download data.

HOST use this command write the date of download data file, Sankyo supplies, per each line.
Download is completed when all download data file is sent.

Error "70" arise in case Write isn't executed normally. This error relates to board degradation.
Need to change the board.

pm=32H: Execute the CRC check of User program code area and confirm it's condition.

Error "71" arise in case CRC check is wrong.
Repeat the download again (from pm=30H).

pm=34H: Download attestation

A Supervisor program code area checks the right download file.

When this command is not executed or the negative response is returned,
the download cannot be executed.

6.4 Switch command

Command	"C"	4BH	30H		
Positive response	"P"	4BH	30H	30H	30H
Negative response	"N"	4BH	30H	e1	e0

Execute the CRC check of User program code area.

Switch the control to User program code area from Supervisor program code area in case of normal.

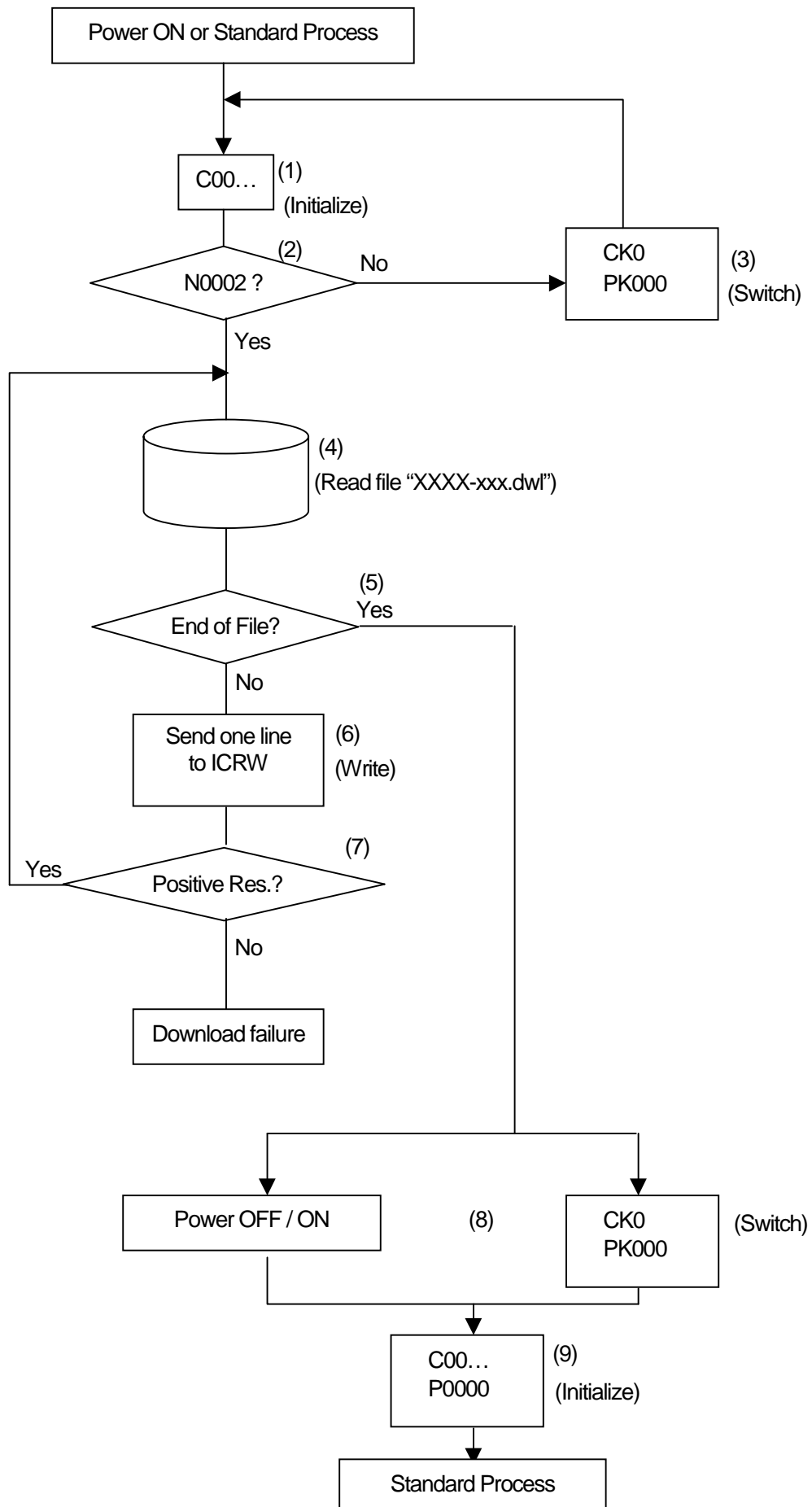
Error "71" arise and not switch to the User program code area, in case the CRC check is wrong.

Repeat the download again.

Note: Start from Initialize command of User program code area after the switch is completed.

7. Download Procedure

7.1 Flow Chart



- (1) Execute the Initialize command.
- (2) If response is "N0002", the program in "Supervisor program code area" is executed and moves to (4).
- (3) If response is not "N0002", move to the "Supervisor program code area" using "Switch command" and restart from (1).
- (4) Read characters per each line from the 2nd line of the Download data file that Sankyo provides.
- (5) If HOST find EOF then move to (8). Downloading is completed.
- (6) The characters read by (4) are sent to ICRW as a command.
- (7) If positive response is detected, repeat (4).
If negative response is detected, downloading is failure.
- (8) Turn off the ICRW. Or change to "User program code area" using "Switch command".
- (9) Execute "Initialize command".

7.2 Structure of the file for downloading

RevXXXX-xxx (CRLF)	(1)
CJ41xxxxxxx (CRLF)	(2)
CJ0 (CRLF)	(3)
CJ1xxx (CRLF)	(4)
CJ1xxx (CRLF)	(5)
CJ1xxx (CRLF)	(n)
CJ2 (CRLF)	(n+1)
(EOF)	

- (1): Header shows the revision of the firmware of file for downloading.
This is same as the response of the "Revision command (CA1)".
Purpose:
 - a) It is possible to check the revision of the file for downloading easily.
 - b) HOST processor can judge the necessity of downloading by comparing the revision in the file with the revision, which is received by "Revision command".
- (2): Attestation command.
- (3): Erase command.
- (4) - (n): Data for downloading to ICRW.
This line data include ICRW's command.
HOST processor or PC transmits these data per line to ICRW.
The length of each line = 179 characters fix.
- (n+1): CRC check command.

7.3 Conversion procedure in the Download command

HOST processor or PC completes the download by repeating n times (from (2) to (n+1)).
The data for downloading must be converted to send ICRW as the following.

LEN C Jxx

8. User program code area

8.1 Command list

List1 cm: Command code pm: Parameters

Command	cm	Function	pm	Details of operation
INITIALIZE	30H	Initialize ICRW	30H	If card is inside ICRW, move card to gate
			31H	If card is inside ICRW, capture card backward
			32H	If card is inside ICRW, retain the card inside of ICRW.
			33H	If card is inside ICRW, does not move the card
			34H	Same as 30H. And Retract counter will work
			35H	Same as 31H. And Retract counter will work
			36H	Same as 32H. And Retract counter will work
STATUS REQUEST	31H	Inquire status	30H	Report presence of card and its position
			31H	Report presence of sensor status in detail
			32H	Report presence of sensor status in detail (Exp.)
			33H	Report presence of sensor status in detail (Exp.)
ENTRY	32H	Card entry	30H	Does not refer to Pre-Head
		Card back entry	31H	Pre-Head detects ISO Tr. 2 or Tr. 3
			32H	Accept card from rear side of ICRW
CARD CARRY	33H	Eject	30H	Move card to Gate from inside ICRW
		Capture	31H	Capture card to rear side of ICRW
RETRIEVE	34H	Retrieve	30H	Retrieve card, which is in Gate position
Security and Spare Port	35H	OUT1	30H	To control External Output (OUT1)
		OUT2	31H	To control External Output (OUT2)
		OUT3	32H	To control External Output (OUT3)
		OUT4	33H	To control External Output (OUT4)
		External Input	38H	To request External Input status
Mag-Track READ	36H	Move card	30H	Only card movement
		ISO #1 read	31H	ISO Track #1 reads Transmit read data
		ISO #2 read	32H	ISO Track #2 reads Transmit read data
		ISO #3 read	33H	ISO Track #3 reads Transmit read data
		Clear memory	36H	Clear out all the stored data for reading and writing
		Read status	37H	Status read data buffer
		ISO #1 another read	39H	ISO Track #1 reads Transmit read data
		ISO #2 another read	3AH	ISO Track #2 reads Transmit read data
		ISO #3 another read	3BH	ISO Track #3 reads Transmit read data

List 2 cm: Command code pm: Parameters

Command	cm	Function	pm	Details of operation
Mag-Track WRITE	37H	mode set	30H	Set the mode for write operation
		Write data	31H	ISO Track #1 writes received data
			32H	ISO Track #2 writes received data
			33H	ISO Track #3 writes received data
			36H	Write received data to ISO Track #1 Data Buffer.
			37H	Write received data to ISO Track #2 Data Buffer.
			38H	Write received data to ISO Track #3 Data Buffer.
			39H	Write to all tracks from Data Buffer.
		start adjustment	52H	Mag-Track write start adjustment
		format assign	55H	Mag-Track read/write format assignment
ENABLE / DISABLE	3AH	Cleaning card	30H	Accepts cleaning card
		Disable	31H	Disable
		Enable	32H	Enable with referring pre-head
PORT IN / OUT	3DH		30H	Enter maintenance mode
			31H	Release maintenance mode
			32H	Output port
			33H	Input port
SENSOR LEVEL	3EH	NORMAL check	30H	Transmit the sensor A/D level
		for ADJUST	31H	Transmit the sensor A/D level
		Life check	32H	Transmit the sensor output decline rate
		Value set	33H	Sensor standard value set
IC CONTACT	40H	IC contact set	30H	Move card to IC contact position
		IC contact release	32H	Release IC contact
REVISION	41H	Revision read	31H	Version of User program code area
			32H	Version of EMV2000 code area
RETRACT COUNTER	43H	Counter read	30H	Retract counter read
		Counter set	31H	Retract counter SET

List3 cm: Command code pm: Parameters

Command	cm	Function	pm	Details of operation
IC CARD CONTROL	49H	Activate	30H	To cold reset IC card
		Deactivate	31H	To deactivate IC card
		Status	32H	To inquire IC card status
		Communication 0	33H	To exchange data between IC card by protocol T=0
		Communication 1	34H	To exchange data between IC card by protocol T=1
		Communication1-1	35H	To transmit continuously data. extended comm.
		Communication1-2	36H	To transmit last data. extended comm.
		Communication1-3	37H	To require next data. extended comm.
		Warm Reset	38H	To warm reset IC card
		Automatic Communication	39H	To exchange data between IC card by protocol T=0 or T=1
SAM CONTROL	49H	Activate	40H	To cold reset SAM
		Deactivate	41H	To deactivate SAM
		Status	42H	To inquire SAM status
		Communication 0	43H	To exchange data between SAM by protocol T=0
		Communication 1	44H	To exchange data between SAM by protocol T=1
		Communication1-1	45H	To transmit continuously data. extended comm.
		Communication1-2	46H	To transmit last data. extended comm.
		Communication1-3	47H	To require next data. extended comm.
		Warm Reset	48H	To warm reset SAM
		Automatic Communication	49H	To exchange data between SAM by protocol T=0 or T=1
		Select SAM	50H	To select SAM.
SWITCH	4BH	Area switch	30H	Switch to Supervisor program code area.
Monitoring For removal	54H	Monitoring card	30H	To monitoring for card removal.
I2C MEMORY CONTROL	55H	Activate I2C	30H	To activate I2C and To close the shutter
		Deactivate I2C	31H	To deactivate I2C
		Status of I2C	32H	To inquire status of I2C
		Communication	33H	To exchange data between I2C

Notes: Example 30H present ASCII code, "0", "01" present ASCII character.

Initialize command includes fixed original data.

Do not use any other codes than those shown by this table.

8.2 Status code

st1, st0 : ICRW status code

status code	Meaning
"00"	No card detected within ICRW (including card gate)
"01"	Card locates at card Gate
"02"	Card locates inside ICRW (Transport)

8.3 Error code

List 1 e1, e0 : error code

error code	Meaning
"00"	A given command code is unidentified
"01"	Parameter is not correct
"02"	Command execution is impossible.
"03"	- -
"04"	Command data error
"05"	- -
"06"	- -
"07"	- -
"08"	- -
"09"	- -
"10"	Card jam
"11"	Shutter failure
"12"	Sensor failure of PD1,PD2,PD3, PDI / Card remains inside.
"13"	Irregular card length (LONG)
"14"	Irregular card length (SHORT)
"15"	F-ROM error / EEPROM error
"16"	The card was moved forcibly.
"17"	Jam error at retrieve
"18"	SW1 or SW2 error
"19"	Card was not inserted from the rear

List 2 e1, e0 : error code

error code	Meaning
"20"	Read Error (Parity error) or (Clocking pulse error: keycard)
"21"	Read Error
"22"	Write Error
"23"	Read Error (Only SS-ES-LRC)
"24"	Read Error (no encode and/or no magnetic stripe)
"25"	Write Verify Error (Quality error)
"26"	Read Error (No SS) or (No postamble bits: keycard)
"27"	Read Error (No ES) or (No preamble bits: keycard)
"28"	Read Error (LRC error)
"29"	Write Verify Error (Data discordance)
"30"	Power Down
"31"	DSR signal was turned to OFF
"32"	--
"33"	--
"34"	--
"35"	--
"36"	--
"37"	--
"38"	--
"39"	--

List 3 e1, e0 : error code

error code	Meaning
"40"	Card was pulled out during capture
"41"	--
"42"	--
"43"	--
"44"	--
"45"	ICRW ejected the card forcibly.
"46"	The ejected card has not been withdrawn until the specified time.
"47"	--
"48"	--
"49"	--
"50"	Retract counter overflow
"51"	Motor error
"52"	--
"53"	--
"54"	--
"55"	--
"56"	--
"57"	--
"58"	--
"59"	--
"60"	Abnormal condition was found on the power-line (Vcc) of IC card.
"61"	Receiving error of ATR.
"62"	The specified protocol does not agree with that of IC card.
"63"	IC card communication error (IC card does not respond).
"64"	IC card communication error (Other than "63").
"65"	HOST sends command for IC card communication before receiving ATR.
"66"	Tried to communicate with IC card not supported in ICRW.
"67"	
"68"	
"69"	Tried to communicate with IC card not supported in Protocol EMV2000
"B0"	Not received Initialize command.

9. Command explanation of User program code area

9.1 Initialize command

* * * *

Command	"C"	30H	pm	33H	32H	34H	30H	fm	Pd	Wv	Sh	Ds	Ty	Cp
Positive response	"P"	30H	pm	st1	st0	Type recognizing code								
Negative response	"N"	30H	pm	e1	e0									

This is to set the operation conditions for ICRW and to initialize ICRW.

Execute this command whenever power is turned on.

ICRW determines text configuration and recognizes baud rate automatically upon receipt of this command.

(Baud rate recognizes is only one time after power on)

ICRW is initialized in Disable mode that card is not accepted by this command.

Use this command to recover from mechanical error and power down mode.

Note: 1. * These are the parameters to specify the tracks and the register in the decoder circuit is assigned for each track format as 3(IATA), 2(ABA), 4(MINTS), and 0 (Nothing).

pm : ICRW disposes a card which is held inside ICRW.

30H: Move the card to Gate portion and complete the command even if the card is not taken out.

Not to let the motor rotate, if ICRW is initialized with Sh ="1" and if the card covers SW1 only.

31H: Capture card to rear side of ICRW.

32H: If card is inside ICRW, detain the card inside of ICRW.

33H: If card is inside ICRW, does not move the card.

Sh="0" is invalid. ICRW does not test the shutter.

34H: Same as pm=30H, and Retract counter will work.

35H: Same as pm=31H, and Retract counter will work.

36H: Same as pm=32H, and Retract counter will work.

fm : Not use. Always 30H.

Pd : At Power down, ICRW controls Card by Pd.

30H: ICRW does card eject.

31H: Eject is unavailable during Mag-stripe WRITE operation.

32H: Eject is unavailable in any case (if.....)

33H: Any ICRW function to have been completed, then offer the card back to the customer and if the card is not taken by the customer after 30 seconds, capture the card.

Wv : Write command handling at power down.

30H: Unit stops the operation against power failure occurred during Mag-stripe WRITE operation.

31H: Unit continues operation neglecting power failure occurred during Mag-stripe WRITE operation.

Sh : Testing shutter operations (open/close).

30H: Unit tests open/close test of shutter when Initialize command is executed.

pm=33H Initialize ignore this test.

31H: Unit does not test open/close test of shutter when Initialize command is executed.

Ds : Monitoring transmission control signal DSR.

30H: Only at POWER ON, line control signal DSR is checked.

31H: Always, line control signal is checked. If the status is detected as OFF,
The card staying inside of the transport is ejected to the entrance gate.
All the SAM are deactivated.

32H: Always, line control signal is checked. If the status is detected as OFF,
The card staying at the entrance gate is carried into the transport.
All the SAM are deactivated.

Ty : Reader type recognition code.

30H: No data is contained in the response.

31H: Response includes type-recognizing code.

Type recognizing code

ISO#1	ISO#2	ISO#3	"0"	ICT/MCT	High-Co/ Low-Co	"0"	"0"	"0"	"0"
"0"	"0"	"0"	"0"	"0"	"0"				

Value of recognizing code:

Item	Explanation
ISO#1,ISO#2,ISO#3	"0" – None "1" -- Read only "2" -- Read/write
ICT/MCT	"0" – MCT "1" – ICT (Recognized IC unit) "3" – Vcc error
High-Co/Lo-Co	"0" - Low-Co writing only "1" - It can the High-Co writing.

Cp : Error status set against card pulled out when CAPTURE command is executed.

30H: Not regarded as error, even if the card is pulled out.

31H: Regarded as error and error code "40", if the card is pulled out.

Notes: * DSR signal is not monitored during execution of command.

* Wv, Sh, Ds, Ty and Cp are not always specified.

When any of them is not specified, it will have "0" as default value.

* When power failure occurs at the same timing of DSR OFF, power failure handling routine has priority.

9.2 Status request command

Command	"C"	31H	pm		
Positive response	"P"	31H	pm	st1	st0
Negative response	"N"	31H	pm	e1	e0

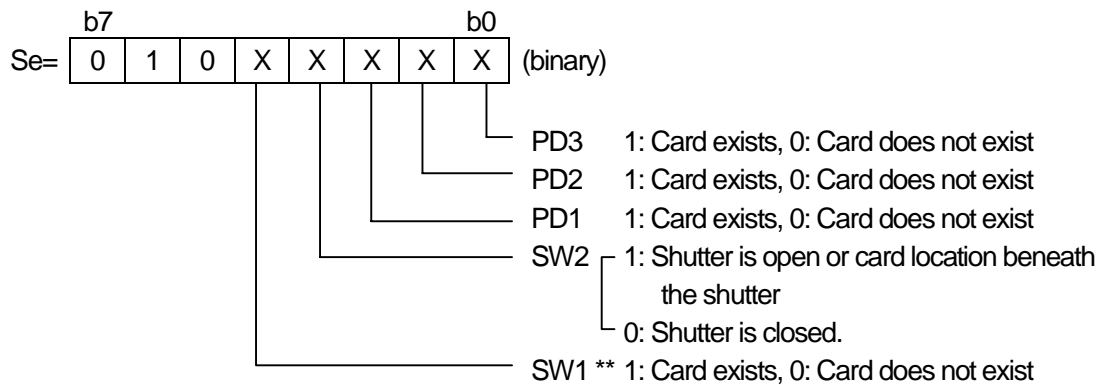
Se

Negative response is sent against Status request command if mechanical failure remains from the prior operation.

pm=30H : Report current status of after execution of previous command ICRW.

pm=31H : Response is returned in form of Se, with the status information obtained.

The locations of sensor are referred to appearance drawing.



** When edge of the card is on SW1, it turns to 0.

Expansion status request command

Command

"C"	31H	pm
-----	-----	----

Positive response

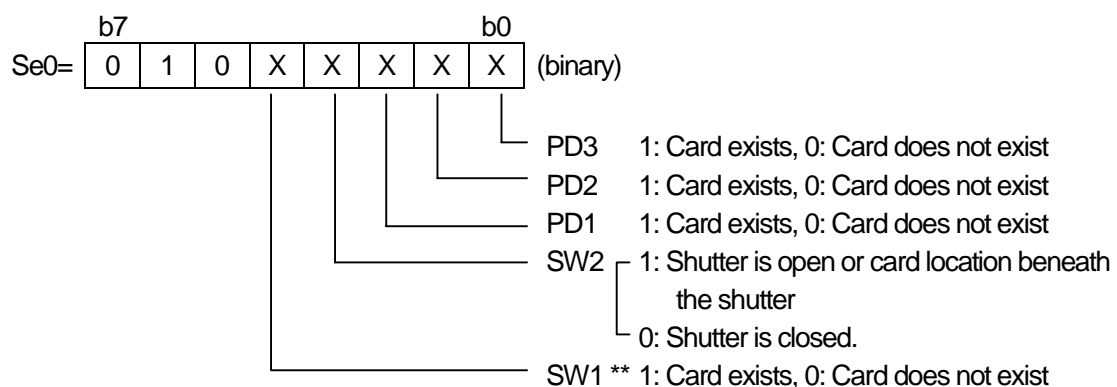
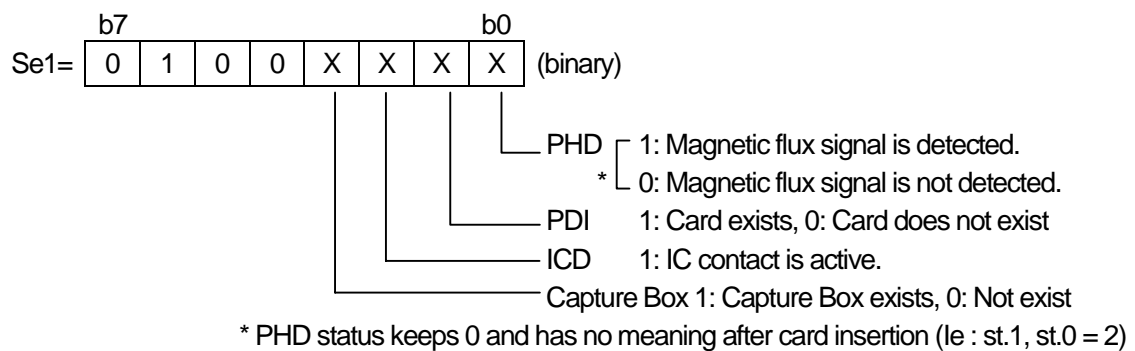
"P"	31H	pm	st1	st0	Se1	Se0	Se2	Se3
-----	-----	----	-----	-----	-----	-----	-----	-----

Negative response

"N"	31H	pm	e1	e0
-----	-----	----	----	----

pm=32H : Response is returned in form of Se1,Se0,Se2 and Se3, with the status information obtained.
The locations of sensor are referred to appearance drawing.

pm=33H : ICRW send positive response to HOST while mechanical error occurred.
ICRW send same data that case of pm=32H.



** When edge of the card is on SW1, it turns to 0.

Se2=

b7	0	1	0	X	0	0	0	0	b0
----	---	---	---	---	---	---	---	---	----

 (binary)

Life check 0: OK

1: The pass counter exceeded one million.

Se3=

b7	0	1	0	0	0	X	X	0	b0
----	---	---	---	---	---	---	---	---	----

 (binary)

Phd Enable condition 1: normal card 0: non-Mag card

EBL 1: Enable mode, 0: Disable mode

Ex)

0 0 Disable mode

0 1 Disable mode

1 0 Enable mode non-Mag card (without pre-head)

1 1 Enable mode normal card (with pre-head)

9.3 Entry command

Command	"C"	32H	pm		
Positive response	"P"	32H	pm	st1	st0
Negative response	"N"	32H	pm	e1	e0

Don't use this command, but use Enable/Disable command for HOST to observe the status of ICRW at any time.

This is to accept to carry the card inside ICRW. This command doesn't allow ICRW to send response to HOST until ICRW completes to carry the card inside ICRW.

If ICRW can not move the card on the way of carrying it, ICRW sends jam error to HOST.

If another card already stays inside ICRW, ICRW sends error "02" to HOST.

Send DLE+EOT from HOST in order to cancel this command.

While the card is carried inside ICRW, data on the mag-stripe is read to data buffer by ICRW.

(Even if read error occurs, ICRW sends positive response to HOST upon completion of carrying the card inside ICRW.)

pm=30H : To accept the card neglecting pre-head signal status

When receiving the command with this parameter, ICRW becomes card insertion waiting mode.

Detecting a card insertion allows ICRW to open the shutter and to rotate the motor forward at the same time, so that ICRW will start to carry the card inside ICRW.

When ICRW completes to carry the card to the inside shutter, ICRW closes the shutter, and card reach the rear position, ICRW stops the motor and sends positive response.

If the card is pulled out from ICRW during the card acceptance, ICRW becomes card insertion waiting mode without response of error.

pm=31H : To accept the card referring the pre-head signal status.

Same action as that of pm="30H" except that ICRW doesn't carry the card inside ICRW without detection of mag-stripe by the pre-head.

pm=32H : To accept the card from rear side of ICRW (BACK ENTRY)

When receiving the command with this parameter, ICRW rotate the motor backward for 10sec.

Detecting a card insertion allows ICRW to carry the card inside ICRW.

When ICRW completes to carry the card to the front position, ICRW stops the motor and sends positive response.

When ICRW can't detect a card insertion for 10sec, ICRW stops the motor and sends error "19" to HOST.

Read Method at Entry Command

	Track 1	Track 2	Track 3
Not include SAFLOK format	Differential with Low-Slice	Integral without Slice	Differential with Low-Slice
Include SAFLOK format	Differential with High-Slice	Integral without Slice	Differential with High-Slice

9.4 Card carry command

Command	"C"	33H	pm	tm100	tm10	tm1
Positive response	"P"	33H	pm	st1	st0	
Negative response	"N"	33H	pm	e1	e0	

If a card doesn't stay inside ICRW, ICRW sends error "02" to HOST against receipt of this command.

pm=30H : EJECT

This moves card (stay inside ICRW) to Gate portion.

When card reaches to Gate, the response is sent.

Recognition of card pull out is made by Status request command.

pm=31H : CAPTURE

This captures card to rear side of ICRW.

When ICRW is initialized with pm=34H-36H, Retract counter is increased upon receipt capture command.

When capture command is received against retract counter value 99, error "50" is replied in negative response.

Retract counter is not increased more than 99.

tm n : To Specify Card protrusive value (Effective only at pm=30H)

These data (tm) are expansion function.

When they (tm) are not specified, 30H is specified as default value (in this case, protrusive value is 0 msec).

Expansion time 1msec is equivalent to card moving distance 0.19mm.

Ex.) protrusive value = 16 msec	tm100	tm10	tm1
	↓	↓	↓
	30H	31H	36H

Maximum value = 20 msec

When using Card protrusive value, according to circumstances, a card is sometime off the roller, and retrieve of the card that is staying at Gate portion can not be guaranteed.

9.5 Retrieve command

Command

"C"	34H	30H
-----	-----	-----

Positive response

"P"	34H	30H	st1	st0
-----	-----	-----	-----	-----

Negative response

"N"	34H	30H	e1	e0
-----	-----	-----	----	----

Move card (stay in Gate portion) into inside ICRW (Transport).

While the card is carried inside ICRW, data on the mag-stripe is read to data buffer by ICRW.

(Even if read error occurs, ICRW sends positive response to HOST upon completion of carrying the card inside ICRW.)

Read Method at Retrieve Command

	Track 1	Track 2	Track 3
Not include SAFLOK format	Differential with Low-Slice	Integral without Slice	Differential with Low-Slice
Include SAFLOK format	Differential with High-Slice	Integral without Slice	Differential with High-Slice

9.6 Mag-Track Read command

Command	"C"	36H	pm		
Positive response	"P"	36H	pm	st1	st0
Negative response	"N"	36H	pm	e1	e0

This is to read data on the mag-stripe and to transmit the data to HOST.

pm=30H : Card movement only within ICRW.

The command with this parameter allows ICRW not to read the card or to transmit the data to HOST, but only to carry the card.

pm=31H : read data on ISO Track #1

pm=32H : read data on ISO Track #2

pm=33H : read data on ISO Track #3

The command with the above parameters allows ICRW not to read the card, but only to transmit the data of buffer, which have been normally read during the card acceptance. The transmitted data exclude SS, ES, LRC or postamble, preamble bits (keycard format) on the mag-stripe.

When Read Error occurs, ICRW makes retrying for 5 times.

When Read Error still occurs, ICRW sends negative response.

In case of card jamming, ICRW sends negative response too.

Short bits data on the mag-stripe is converted to ASCII code and transmitted.

EX):	IATA format		ABA,MINTS format
	bit 5 4 3 2 1 0		bit 3 2 1 0
	data=0 0 1 0 0 0 0	-> 30H	data=0 0 0 0 0 -> 30H
	data=A 1 0 0 0 0 1	-> 41H	data=9 1 0 0 1 -> 39H

When the card has no magnetic track or only SS-ES-LRC, ICRW makes no retrying and sends negative response.

Read Method at Read Command

ICRW is equipped with the following Read Methods.

No	Read Method	Track 1	Track 2	Track 3
1	Differential Detection without Slice	O	O	O
2	Differential Detection with Low-Slice	O	X	O
3	Differential Detection with High-Slice	O	O	O
4	Integral Detection without Slice	X	O	X

Notes: O means Support of the Read Method.

X means No-support of the Read Method.

Read Methods are controlled with Software in the following orders.

The one set consists of the following three forward and backward motions of the card.

	Read Try Number	Track 1	Track 2	Track 3
Not include SAFLOK format	1st	Differential without Slice (1)	Integral without Slice (4)	Differential without Slice (1)
	2nd			
	3rd	Differential with Low-Slice (2)	Differential without Slice (1)	Differential with Low-Slice (2)
	4th			
	5th	Differential with High-Slice (3)	Differential with High-Slice (3)	Differential with High-Slice (3)
	6th			
Include SAFLOK format	1st	Differential with High-Slice (3)	Differential with High-Slice (3)	Differential with High-Slice (3)
	2nd			
	3rd	Differential with Low-Slice (2)	Integral without Slice (4)	Differential with Low-Slice (2)
	4th			
	5th	Differential without Slice (1)	Differential without Slice (1)	Differential without Slice (1)
	6th			

pm=36H : This clears out all the stored data for reading and writing.

ICRW doesn't carry the card.

pm=37H : Indicates in response if track is encoded/not encoded.

ICRW doesn't carry the card.

ISO#1: 30H: ISO #1 is not encoded. 31H: ISO #1 is encoded.

ISO#2: 30H: ISO #2 is not encoded. 31H: ISO #2 is encoded.

ISO#3: 30H: ISO #3 is not encoded. 31H: ISO #3 is encoded.

ISO#1	ISO#2	ISO#3
-------	-------	-------

pm=39H : read data on ISO Track #1 by another way

pm=3AH : read data on ISO Track #2 by another way

pm=3BH : read data on ISO Track #3 by another way

The above parameters differ from pm=31H, 32H and 33H in the following contents.

1) This parameter transports card only one pass, even though the read error has occurred.

In this case, ICRW sends negative response.

2) If the parity error occurs, the ICRW tries to send the data row before the error portion.

This partial readied data is concatenated the negative response.

If SS is not detected, ICRW doesn't read data.

Read Method is only one in the following method

	Track 1	Track 2	Track 3
Not include ABA format	Differential with Low-Slice	Differential with Low-Slice	Differential with Low-Slice
Include ABA format	Differential with High-Slice	Differential with High-Slice	Differential with High-Slice

9.7 Mag-Track Write command

Command	"C"	37H	pm	data				
Positive response	"P"	37H	pm	st1	st0	Result #1	Result #2	Result #3
Negative response	"N"	37H	pm	e1	e0	Result #1	Result #2	Result #3

pm=31H : write data on ISO Track # 1

pm=32H : write data on ISO Track # 2

pm=33H : write data on ISO Track # 3

This is to write the track designated by the parameter.

Transmit Data part by ASCII code to ICRW. (IATA, ABA, MINTS format)

It is not necessary to add SS, ES, LRC and postamble, preamble bits (keycard format).

ASCII Data is written in after changing into a format of each track. (IATA, ABA, MINTS format)

EX):	IATA format				ABA, MINTS format											
		bit	5	4	3	2	1	0		bit	3	2	1	0		
	data=0	30H	->	0	1	0	0	0	0	data=0	30H	->	0	0	0	0
	data=A	41H	->	1	0	0	0	0	1	data=9	39H	->	1	0	0	1

As for the write of data, a card run is performed only in the state of the right rotation direction.

Therefore, when Write command is received in the state where a card is in the rear,

data is written in after moving a card to the front part.

Verify Read is performed only one time in back read.

Jitter check is performed at the same time as Verify Read.

If writing is done correctly, ICRW sends positive response with three results including Vf. (Each tracks)

When Write Error occurs, ICRW retries 2 times.

When Write Error still occurs, ICRW sends negative response with three results. (Each tracks)

In this case, error code is "22".

In case of card jamming, ICRW sends negative response.

ICRW has two read method of write verify.

Set the write mode before execution of Mag-Track Write command by Mag-Track Write mode set command. (see 9.7.3 Mag-Track Write mode set command)

When the mode is not set, read method is set normal mode, respectively as default value.

Vf : Verify Parameter:

Vf is added in the good write.

Vf=30H means the read-level is enough.

Vf=31H and 32H means that writing is successful, but the read-level of the Write result is not enough.

The detail of Vf is referred to 9.8.3 Mag-Track Write mode set command.

Result structure:

Good write "P" + "0" + Vf 3 characters

Bad write "N" + "2x" 3 characters "2x" are error codes. ("20", "24", "25", "26", "27", "28" or "29")

No write* "X" + "00" 3 characters

(* This track is not designated by the parameter.)

Ex) pm=31H

1) #1 good

Positive response "P0" + Vf #1 + 7EH + "X00" + 7EH + "X00" (7EH is Track separator)

2) #1 bad

Negative response e1, e0 are "22" "N" + "2x" + 7EH + "X00" + 7EH + "X00"

9.7.1 Mag-Track Buffer Write command

Command	"C"	37H	pm	data	
Positive response	"P"	37H	pm	st1	st0
Negative response	"N"	37H	pm	e1	e0

pm=36H : write data to ISO Track # 1 buffer

pm=37H : write data to ISO Track # 2 buffer

pm=38H : write data to ISO Track # 3 buffer

This is to write the data to ISO track buffer designated by the parameter.

Transmit Data part by ASCII code to ICRW. (IATA, ABA, MINTS format)

It is not necessary to add SS, ES, LRC, and postamble, preamble bits (keycard format).

ASCII Data is written in after changing into a format of each track. (IATA, ABA, MINTS format)

EX):	IATA format		ABA, MINTS format
		bit 5 4 3 2 1 0	bit 3 2 1 0
	data=0 30H ->	0 1 0 0 0 0	data=0 30H -> 0 0 0 0
	data=A 41H ->	1 0 0 0 0 1	data=9 39H -> 1 0 0 1

ICRW does not do writing operation.

After writing data to the buffer, use pm=39H, so ICRW write data to all three tracks simultaneously.

All the stored data are cleared when card is ejected.

All the stored data are cleared when ICRW receive Initialize command(" C00")

or Clear memory command(" C66").

9.7.2 Mag-Track Simultaneous Write command

Command	"C"	37H	39H					
Positive response	"P"	37H	39H	st1	st0	Result #1	Result #2	Result #3
Negative response	"N"	37H	39H	e1	e0	Result #1	Result #2	Result #3

pm=39H : All three tracks simultaneous write.

ICRW write data to all three tracks simultaneously.

ICRW write data to the card from the buffer.

Before writing operation, ICRW need to write data to the buffer.

If there is no data in the buffer, ICRW send back error code "02".

As for the writing of data, a card run is performed only in the state of the right rotation direction.

Therefore, when Write command is received in the state where a card is in the rear,

data is written in after moving a card to the front part.

Verify Read is performed only one time in back read.

Jitter check is performed at the same time as Verify Read.

If writing is done correctly, ICRW sends positive response with three results including Vf. (Each tracks)

When Write Error occurs, ICRW retries 2 times.

When Write Error still occurs, ICRW sends negative response with three results. (Each tracks)

In this case, error code is "22".

In case of card jamming, ICRW sends negative response.

ICRW has two read method of write verify.

Set the write mode before execution of Mag-Track Simultaneous Write command by Mag-Track Write mode set command. (see 9.7.3 Mag-Track Write mode set command)

When the mode is not set, read method is set normal mode, respectively as default value.

Vf : Verify Parameter:

Vf is added in the good write.

Vf=30H means the read-level is enough.

Vf=31H and 32H means that writing is successful, but the read-level of the Write result is not enough.

The detail of Vf is referred to 9.7.3 Mag-Track Write mode set command.

Result structure:

Good write "P" + "0" + Vf 3 characters

Bad write "N" + "2x" 3 characters "2x" are error codes. ("20", "24", "25", "26", "27", "28" or "29")

No write* "X" + "00" 3 characters

(*The data for writing this track was not stored.)

Ex)

1) #1 good, #2 good and #3 good

Positive response "P0" + Vf #1 + 7EH + "P0" + Vf #2 + 7EH + "P0" + Vf #3 (7EH is Track separator)

2) #1 good, #2 bad and #3 no write

Negative response e1, e0 are "22" "P0" + Vf #1 + 7EH + "N" + "2x" + 7EH + "X00"

9.7.3 Mag-Track Write mode set command

Command	"C"	37H	30H	co	mode
Positive response	"P"	37H	30H	st1	st0
Negative response	"N"	37H	30H	e1	e0

This is to set the mode for write operation.

co : set writing current

30H : Low-Co card writing.

mode : set Read Method at Write-Verify (default value : normal mode)

30H : normal mode

The one set consists of the following three forward and backward motions of the card.

		Track 1	Track 2	Track 3
1st	Write (Forward)	Write	Write	Write
	Read (Backward)	Differential with High-Slice	Differential with High-Slice	Differential with High-Slice
2nd	Write (Forward)	Write	Write	Write
	Read (Backward)	Differential with High-Slice	Differential with High-Slice	Differential with High-Slice

In case of the normal at the 1st and 2nd verification, positive response is returned with "Vf = 30H".

In this case, high threshold value compared with AMP output when reading is adopted.

The read-level of the Write result is enough.

The card roughly meets ISO standard.

		Track 1	Track 2	Track 3
3rd	Write (Forward)	Write	Write	Write
	Read (Backward)	Differential with Low-Slice	Integral	Differential with Low-Slice

In case of the normal at the 3rd verification, positive response is returned with "Vf = 31H".

In this case, the threshold value for AMP output when reading is let down.

The read-level of the Write result is not enough.

The card does not meet ISO standard.

(However, the card might be able to be read by most card readers.)

9.7.4 Mag-Track write start adjustment command

Command	"C"	37H	52H	32H	FMT	BITS
Positive response	"P"	37H	52H	st1	st0	
Negative response	"N"	37H	52H	e1	e0	

This is to set the mag-write start position adjustment value for each format
Adjustment value is appointed each format bits number

FMT: Set format for start position adjustment
4AH:SAFLOK keycard format

BITS: adjustment value "bits number" (default value: 00H)
ex) 01H: +1bit
FFH: -1bit

Each adjustment value is stored in RAM, and it does set default value
if power off or executed INITIALIZE command

9.7.5 Mag-Track format assignment command

Command	"C"	37H	55H	TR1	TR2	TR3	30H
Positive response	"P"	37H	55H	st1	st0		
Negative response	"N"	37H	55H	e1	e0		

This is to set the mag-track format for read/write operation.

TR1: Set format for Track1(ISO#1 track) (default value:33H)

33H: IATA format

30H: not use this track

TR2: Set format for Track2(ISO#2 track) (default value:32H)

32H: ABA format

30H: not use this track

TR3: Set format for Track3(ISO#3 track) (default value:34H)

34H: MINTS (THRIFT) format

4AH:SAFLOK keycard format

30H: not use this track

Each track's value is stored in RAM, and it does set default value if power off or executed INITIALIZE command.

9.8 Enable/Disable command

Command	"C"	3AH	pm		
Positive response	"P"	3AH	pm	st1	st0
Negative response	"N"	3AH	pm	e1	e0

Control command to accept/inhibit card entry.

ICRW sends response upon receipt of this command.

ICRW status should be recognized by Status request command from HOST.

Choose Enable/Disable command or Entry command according to customer's control system.

pm=30H : Enable to accept non-encoded card (mainly for cleaning card). (Enable mode)

pm=31H : Disable to accept card. (Disable mode)

pm=32H : Enable to accept encoded card. (Enable mode)

Notes: 1) In case of set a card by BACK ENTRY command, set pm=31H to protect card entry from front gate.

2) ICRW is in Disable mode in case of the following conditions.

- * Receipt of Initialize command.

- * When power failure occurred.

- * If ICRW is initialized with Ds="1" or "2", and if ICRW detected DSR signal OFF.

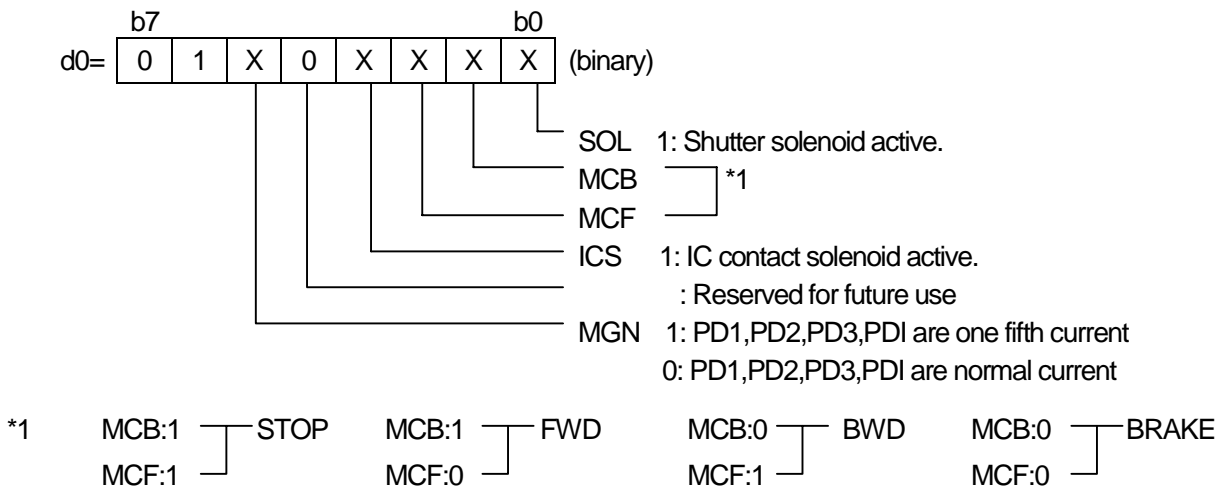
- * When the card is within ICRW, the shutter is opened forcibly.

9.9 Port In/Out command

Command	“C”	3DH	pm	d0					
Positive response	“P”	3DH	pm	st1	st0	Se1	Se0	Se2	Se3
Negative response	“N”	3DH	pm	e1	e0				

This is to check ICRW in maintenance. Operation checks can be done by this command for the motor, the solenoids, the switch, and the sensors.

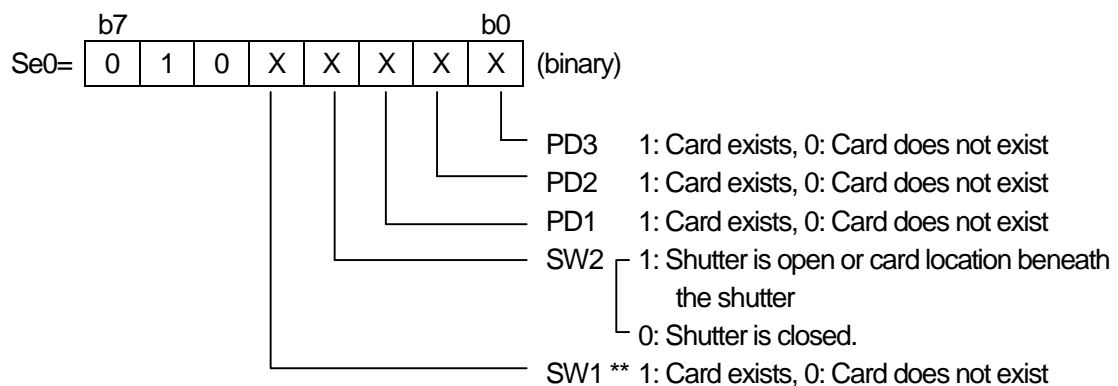
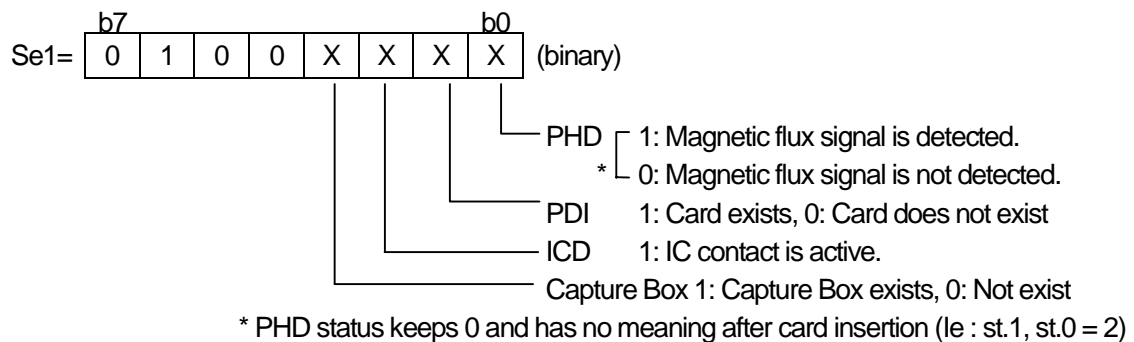
- pm=30H : To enter maintenance mode.
- pm=31H : To release maintenance mode. (Eject the card if it is within the reader transport)
- pm=32H : To output port.
To designate the operation for the motor and solenoids.



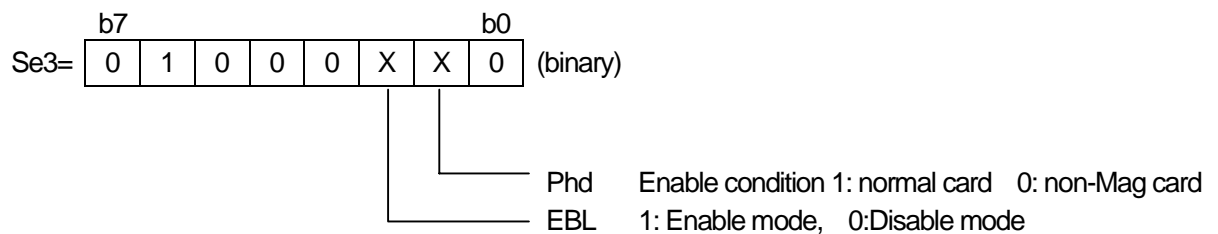
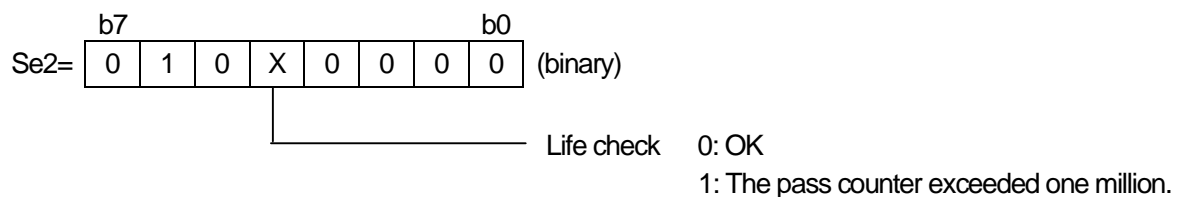
Note: Rotating the motor and IC contact set cannot be simultaneously performed because of a circuit.

pm=33H : To input port.

To input the status on the switch and the sensors.



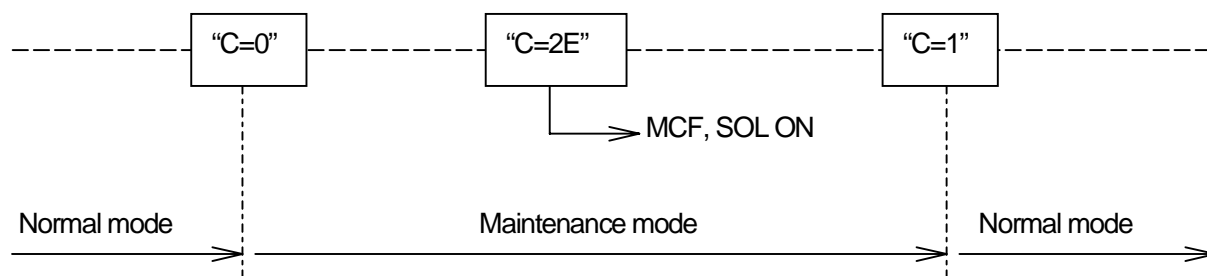
** When edge of the card is on SW1, it turns to 0.



Ex)

- | | | | |
|---|---|--------------|---------------------------------|
| 1 | 0 | Disable mode | |
| 2 | 1 | Disable mode | |
| 3 | 0 | Enable mode | non-Mag card (without pre-head) |
| 1 | 1 | Enable mode | normal card (with pre-head) |

** Basic flow (example)



The normal mode shows command modes other than the maintenance mode.

The method of going into the maintenance mode from the normal mode is only transmitting "C=0" command shown in the above figure.

In order to return from the maintenance mode to the normal mode, please transmit "C=1" command shown in the above figure.

If Initialize command execute in maintenance mode, ICRW is back to normal mode.

9.10 Sensor Level transmit command

Command

"C"	3EH	pm
-----	-----	----

Positive response

"P"	3EH	pm	st1	st0	v1h	v1l	v2h	v2l	v3h	v3l	v4h	v4l
-----	-----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Negative response

"N"	3EH	pm	e1	e0
-----	-----	----	----	----

This command converts voltage level of photo sensor from Analog to Digital and reports the value. "vih", "vil" are upper nibble and lower nibble divided from 1 byte of A/D conversion value and 30H added respectively.

Example;

A/D data=E5 (H)

Convert to the Voltage data.

$$E5(H)=229(D) \rightarrow 5[V] \times (229/255) = 4.5[V] \rightarrow vih=34(H), vil=35(H)$$

Comparison of vi and each sensor is as follows;

v1: PD1

v2: PD2

v3: PD3

v4: PDI

pm=30H:

Emission amount of LED is normal level.

pm=31H:

Emission amount of LED is around one fifth of normal level.

If sensor voltage is less than (1.2)V, maintenance such as sensor cleaning must be done immediately.

9.10.1 Sensor life check command

Command

"C"	3EH	32H
-----	-----	-----

Positive response

"P"	3EH	32H	st1	st0	v1	V2	V3	V4
-----	-----	-----	-----	-----	----	----	----	----

Negative response

"N"	3EH	32H	e1	e0
-----	-----	-----	----	----

pm=32H:

This command sends the ratio of voltage level of photo sensor, between the present measured value and setting value of the previous time.

The data that is sent is the setting value of the previous time, the present measured value in 64H (100D) as time. When the value is larger than FFH (255D), value FFH (255D) is sent.

Example;

A/D data of the previous time = 80(H)

Present A/D data = 7E(H)

Convert to the ratio data.

 $80(H) = 128(D)$ $7E(H) = 126(D)$ $(126 / 128) \times 100 = 98$ $98(D) = 62(H) \rightarrow v_i = 62(H)$ Comparison of v_i and each sensor is as follows;

v1: PD1

v2: PD2

v3: PD3

v4: PDI

Usage;

The presence of the card inside ICRW is judged depending on the output level of the photo-sensor inside ICRW. The output level of the photo-sensor gradually changes while ICRW is used. Therefore, there may be the necessity that changes the value that determines the presence of the card that depends to the photo-sensor, when it changed even from the value that there is the output level of a photo-sensor. This command is used how much it changed to monitor, when the output level of the photo-sensor, shipped ICRW or, from when the value is set up last time.

If v_i is between 43% to 115% the sensor is normal.

If v_i is not between 43% to 115%, the following processing should be accomplished.

1) Implement Sensor level transmit command. (pm=31H)

1-1) In case that the level is below 1.2V, the maintenance is necessary.

1-2) In case that the level is 1.2V over, please implement Sensor standard value setting command. (pm=33H)

9.10.2 Sensor standard value setting command

Command

"C"	3EH	33H
-----	-----	-----

Positive response

"P"	3EH	33H	st1	st0
-----	-----	-----	-----	-----

Negative response

"N"	3EH	33H	e1	e0
-----	-----	-----	----	----

pm=33H:

The sensor standard value is used to determine the presence of the card inside ICRW and be set up at the time of the shipment of ICRW.

This command sets up automatic the sensor standard value to an optimal value.

If the value that was answered with Sensor life check command (pm=32H) is not between 43% to 115%, Implement this command.

When Sensor level transmit command (pm=31H) is implemented, in case that the level is below 1.2V, this command is not implemented. And, error code 12 (the sensor error) is answered.

9.11 IC Contact command

Command	"C"	40H	pm		
Positive response	"P"	40H	pm	st1	st0
Negative response	"N"	40H	pm	e1	e0

If a card doesn't stay inside ICRW, ICRW sends error "02" to HOST against receipt of this command.

pm=30H : SET IC contact

To carry the card to IC contact position and set the IC contact.

ICRW carries a card to IC contact position, after carrying the card in ICRW to a rear position.

When a card cannot be normally set to the position, ICRW makes retrying for 2 times.

As a result of re-trial, in the case of an error, ICRW sends a negative response, after carrying the card to a rear position.

When receiving the command which performs card movement when IC contact is set, ICRW sends "05" errors.

However, when receiving Initialize command, ICRW releases IC contact and perform card movement according to pm of Initialize command.

pm=32H : RELEASE IC contact

To release the IC contact.

When IC contact cannot be released, ICRW sends a negative response.

If a card stay inside ICRW, even when IC contact is not set, ICRW sends a positive response.

9.12 Revision read command

Command

"C"	41H	pm
-----	-----	----

Positive response

"P"	41H	pm	st1	st0	data
-----	-----	----	-----	-----	------

Negative response

"N"	41H	pm	e1	e0
-----	-----	----	----	----

pm=31H: Indicates User program code area revision in positive response.

ex) "2345-01A" (The length of data = 8 bytes)

pm=32H: Indicates EMV2000 controller's firmware revision in positive response.

ex) "3456-01A" (The length of data = 8 bytes)

9.13 Retract counter command

9.13.1 Retract counter read

Command

"C"	43H	30H
-----	-----	-----

Positive response

"P"	43H	30H	st1	st0	ct10	ct1
-----	-----	-----	-----	-----	------	-----

Negative response

"N"	43H	30H	e1	e0
-----	-----	-----	----	----

Indicates the current counter value.

This command is only applicable when ICRW is initialized with parameter 34H-36H of Initialize command.

ct : Retract counter value

00 <= ct <= 99

Ex) Counter value = "90" -> ct10 =39H, ct1=30H

9.13.2 Retract counter set

Command	"C"	43H	31H	ct10	ct1
Positive response	"P"	43H	31H	st1	st0
Negative response	"N"	43H	31H	e1	e0

Set a value in Retract counter.

Acceptable value range is between 0 and 99.

This command is only applicable when ICRW is initialized with parameter 34H-36H of Initialize command.

ex) In case of setting "00" in Retract counter. -> ct10=30H, ct1=30H

9.14 IC card control command

9.14.1 Activate ICC command

Command	"C"	49H	30H	Vcc		
Positive response	"P"	49H	30H	st1	st0	ATR
Negative response	"N"	49H	30H	e1	e0	ATR

To cold reset IC card. The ICRW supplies power (VCC) and clock (CLK) , then reset (RST) release.

Vcc=30H :ICRW supplies with +5V to VCC and activates in line with the EMV2000 ver4.0.

Vcc=33H:ICRW supplies with +5V to VCC and activates in line with the ISO/IEC7816-3.

Vcc=35H:ICRW supplies with +3V to VCC and activates in line with the ISO/IEC7816-3. After ATR reception, ICRW supplies voltage to VCC in accordance with the value of ATR on T=15.

Vcc=36H:ICRW supplies with +5V to VCC and activates in line with the ISO/IEC7816-3. After ATR reception, ICRW supplies voltage to VCC in accordance with the value of ATR on T=15

In case there is no Vcc word, it will have 30H as default value.

Vcc=30H is used on EMV2000 ver4.0 comply card.

Vcc=33H is used on old ISO/IEC7816-3 card. (only 5v card)

Vcc=35H is used on ISO/IEC7816-3:1997 card.

Vcc=36H is used on ISO/IEC7816-3:1997/Amd.1:2001 card.

Also, Answer To Reset (ATR) from ICC is received and transmitted to HOST.

ATR	TS	TO	TA1	TB1	...	TCK
-----	----	----	-----	-----	-----	-----

When a power failure is recognized while a power supply is supplied to the card, error code "60" is returned.

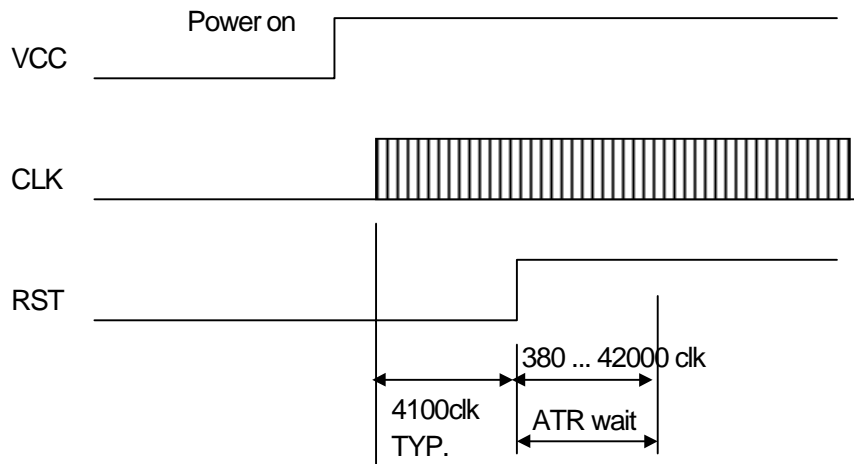
If ATR receive error is occurred, ICRW initiate the deactivation sequence, and sends back error code " 61", "63" or "64".

When content of ATR is not based on such protocol which is supported by EMV2000 ver4.0, ICRW initiate the deactivation sequence, and sends back error code " 69" (This error code is returned when Vcc=30H).

When content of ATR is not based on such protocol which is supported by ICRW, ICRW initiate the deactivation sequence, and sends back error code " 66" (This error code is returned when Vcc=33H, 35H or 36H).

Vcc parameter is not relation with IC card communication. IC card communication complies with EMV2000.

Time chart of activating IC card is as under:



9.14.2 Deactivate ICC command

This deactivates IC card.

Command

"C"	49H	31H
-----	-----	-----

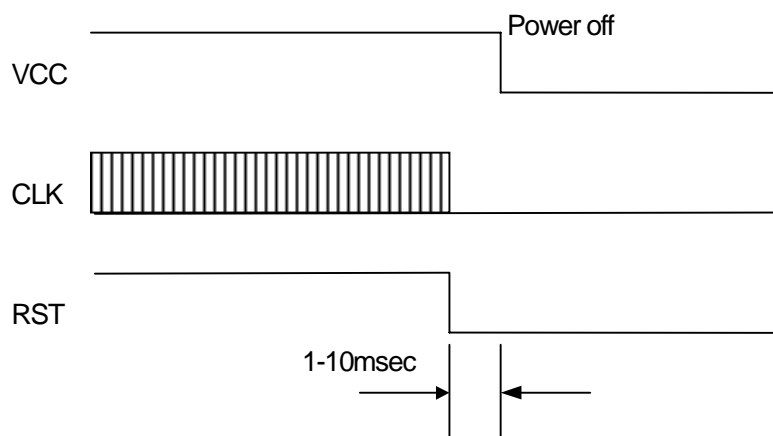
Positive response

"P"	49H	31H	st1	st0
-----	-----	-----	-----	-----

Negative response

"N"	49H	31H	er1	er0
-----	-----	-----	-----	-----

Time chart of deactivating IC card (ICC) is as under:



9.14.3 Inquire ICC status command

Command

"C"	49H	32H
-----	-----	-----

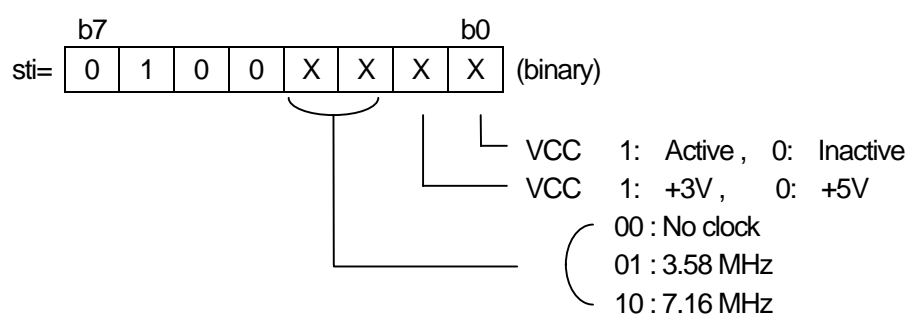
Positive response

"P"	49H	32H	st1	st0	sti
-----	-----	-----	-----	-----	-----

Negative response

"N"	49H	32H	er1	er0
-----	-----	-----	-----	-----

ICRW tells the status of IC card with sti.



While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

9.14.4 ICC communication T=0

Command

"C"	49H	33H	C-APDU
-----	-----	-----	--------

Positive response

"P"	49H	px	st1	st0	R-APDU
-----	-----	----	-----	-----	--------

Negative response

"N"	49H	33H	er1	er0
-----	-----	-----	-----	-----

This exchanges data between IC card by protocol T=0.

Set data to "C-APDU"

C-APDU

CLA	INS	P1	P2	Lc	Data1	...	Data(Lc)	Le
-----	-----	----	----	----	-------	-----	----------	----

ICRW returns "R-APDU" data to HOST

R-APDU

Data1	...	Data(Licc)	SW1	SW2
-------	-----	------------	-----	-----

px=33H : The IC card's data is 1000 bytes or less.

px=35H : The IC card's data is 1001 bytes or more. ICRW requires transmitting next IC card's data. HOST needs to receive the remaining data by using "CI7" command.

Maximum size of data ICRW can handle is 261 bytes. If HOST sends 262bytes or more, error code "04" is sent. Maximum length of R-APDU is 1000 bytes. If R-APDU length is 1001 bytes or more, ICRW returns parameter px=35H and first 1000bytes data.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of IC card is not T=0, error code "62" is sent.

If ICC does not respond within WWT(Working Wait Time), ICRW deactivates an IC card and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an IC card and error code "64" is sent.

If HOST tries to communicate before an IC card activation, error code "65" is sent.

Note) Licc is the data length which IC card returns. Please refer to specifications of IC card about length of Licc.

9.14.5 ICC communication T=1

Command

"C"	49H	34H	C-APDU
-----	-----	-----	--------

Positive response

"P"	49H	px	st1	st0	R-APDU
-----	-----	----	-----	-----	--------

Negative response

"N"	49H	34H	er1	er0
-----	-----	-----	-----	-----

This exchanges data between IC card by protocol T=1.

HOST should set "C-APDU". ICRW add Prologue field and Epilogue field, and sends to an IC card. If C-APDU length is greater than Information field size for the ICC (IFSC), ICRW divides its into several consecutive blocks.

C-APDU

CLA	INS	P1	P2	Lc	Data1	..	Data(Lc)	Le
-----	-----	----	----	----	-------	----	----------	----

chip data

NAD	PCB	LEN	CLA	INS	P1	P2	Lc	Data1	..	Data(Lc)	Le	EDC
Prologue field			Information field									Epilogue field

ICRW returns "R-APDU" data to HOST.

chip data

Prologue field			Information field					Epilogue field	
NAD	PCB	LEN	Data1	...	Data(Licc)	SW1	SW2	EDC	

R-APDU

Data1	...	Data(Licc)	SW1	SW2
-------	-----	------------	-----	-----

px=34H : The IC card's data is 1000 bytes or less.

px=35H : The IC card's data is 1001 bytes or more. ICRW requires transmitting next IC card's data. HOST needs to receive the remaining data by using "CI7" command.

px=3FH : ICRW received the S(ABTreq) block from the IC card, so suspended transmission, and deactivated the IC card. HOST should stop following data send.

Maximum size of ICRW can handle is 1000 bytes. If HOST sends 1001 bytes or more, error code "04" is sent. When data for transmitting is 1001 bytes or more, HOST should use "CI5" and "CI6".

Maximum length of R-APDU is 1000 bytes. If R-APDU length is 1001 bytes or more, ICRW returns parameter px=35H and first 1000bytes data.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of IC card is not T=1, error code "62" is sent.

If ICC does not respond within BWT(Block Waiting Time) or CWT(Character Waiting Time), ICRW deactivates an IC card and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an IC card and error code "64" is sent.

If HOST tries to communicate before an IC card activation, error code "65" is sent.

In case there is any trouble in sequence of command receipt, error code "02" shall be sent. If error code "02" is returned, please re-start from ATR.

Note)

Licc is the data length which IC card returns. Please refer to specifications of IC card about length of Licc.

9.14.6 ICC extend communication 1

Command

"C"	49H	35H	C-APDU	
-----	-----	-----	--------	--

Positive response

"P"	49H	px	st1	st0
-----	-----	----	-----	-----

Negative response

"N"	49H	35H	er1	er0
-----	-----	-----	-----	-----

In case the transmitted data to IC card is 1001 bytes or more, this command is used repeatedly. Host needs to divide the data by 1000 bytes or less.

px=37H : ICRW requires to receive next IC card's data. There is no data portion. HOST needs to transmit the remaining data by using command "CI5" or "CI6".

px=3FH : ICRW received the S(ABTreq) block from the IC card, so suspended transmission, and deactivated the IC card. HOST should stop following data send.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of IC card is not T=1, error code "62" is sent.

If ICC does not respond within BWT(Block Waiting Time) or CWT(Character Waiting Time), ICRW deactivates an IC card and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an IC card and error code "64" is sent.

If HOST tries to communicate before an IC card activation, error code "65" is sent.

9.14.7 ICC extend communication 2

Command	"C"	49H	36H	C-APDU		
Positive response	"P"	49H	px	st1	st0	R-APDU
Negative response	"N"	49H	36H	er1	er0	

This command is used when the last data are transmitted. The size of data Host can transmit (C-APDU) is 1000 bytes or less by ICC's data.

px=34H : The IC card's data is 1000 bytes or less.

px=35H : The IC card's data is 1001 bytes or more. ICRW requires transmitting next IC card's data. HOST needs to receive the remaining data by using "CI7" command.

px=3FH : ICRW received the S(ABTreq) block from the IC card, so suspended transmission, and deactivated the IC card. HOST should stop following data send.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of IC card is not T=1, error code "62" is sent.

If ICC does not respond within BWT(Block Waiting Time) or CWT(Character Waiting Time), ICRW deactivates an IC card and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an IC card and error code "64" is sent.

If HOST tries to communicate before an IC card activation, error code "65" is sent.

9.14.8 ICC extend communication 3

Command	"C"	49H	37H			
Positive response	"P"	49H	px	st1	st0	R-APDU
Negative response	"N"	49H	37H	er1	er0	

This command is used when receiving the followed data from ICRW. HOST should send this command repeatedly till the response "px=36H".

px=35H : The IC card's data is 1001 bytes or more. ICRW requires transmitting next IC card's data. HOST needs to receive the remaining data by using "CI7" command.

px=36H : ICRW does not have more transmit IC card's data.

px=3FH : ICRW received the S(ABTreq) block from the IC card, so suspended transmission, and deactivated the IC card. HOST should stop following data send.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If ICC does not respond within WWT(T=0), BWT(T=1) or CWT(T=1), ICRW deactivates an IC card and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an IC card and error code "64" is sent.

If HOST tries to communicate before an IC card activation, error code "65" is sent.

9.14.9 ICC Warm Reset

Command

"C"	49H	38H
-----	-----	-----

Positive response

"P"	49H	38H	st1	st0	ATR
-----	-----	-----	-----	-----	-----

Negative response

"N"	49H	38H	er1	er0	ATR
-----	-----	-----	-----	-----	-----

ICRW sends a reset pulse, keeping the status of the IC contact activated, then returns response upon receiving "ATR" again (Warm Reset).

This command will take as error when ATR content is not based on such protocol, which is supported by this device, ATR from ICC and error code "66" or "69" is sent.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If ATR receive error is occurred, ICRW initiate the deactivation sequence, error message "61", "63" or "64" is sent.

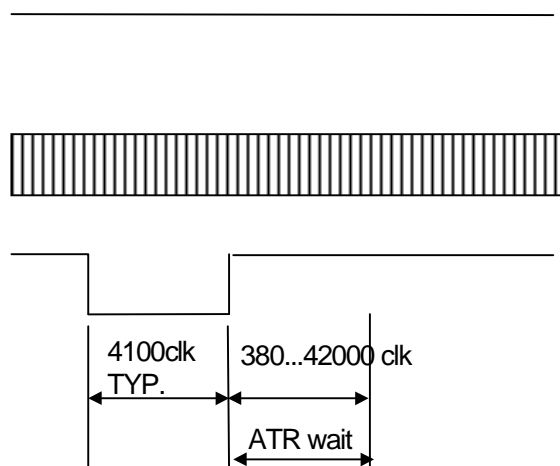
ICRW returns error code "65" if the IC card does not activated.

Time chart of warm reset sequence is as under:

VCC

CLK

RST



9.14.10 ICC automatic communication

Command	"C"	49H	39H	C-APDU		
Positive response	"P"	49H	px	st1	st0	R-APDU
Negative response	"N"	49H	39H	er1	er0	

This exchanges data between IC card by protocol T=0 or T=1. Protocol recognized automatically. Set Data to "C-APDU".

Set chipdata ICRW received from ICC to "R-APDU" and transmit HOST.

Maximum size of data (C-APDU) ICRW can handle is 1000 bytes for T=1 protocol, and 261 bytes for T=0 protocol.

px=34H : The IC card's data is 1000 bytes or less.

px=35H : The IC card's data is 1001 bytes or more. ICRW requires transmitting next IC card's data. HOST needs to receive the remaining data by using "CI7" command.

px=3FH : ICRW received the S(ABTreq) block from the IC card, so suspended transmission, and deactivated the IC card. HOST should stop following data send. (Only T=1 protocol).

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If ICC does not respond within WWT(T=0), BWT(T=1) or CWT(T=1), ICRW deactivates an IC card and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an IC card and error code "64" is sent.

If HOST tries to communicate before an IC card activation, error code "65" is sent.

When protocol is T=1 and data for transmitting is 1001 bytes or more, HOST should use "CI5" and "CI6".

9.15 SAM(Secure Application Module) control command

9.15.1 Activate SAM command

Command	"C"	49H	40H	Vcc		
Positive response	"P"	49H	40H	st1	st0	ATR
Negative response	"N"	49H	40H	e1	e0	ATR

To cold reset SAM. The ICRW supplies power (VCC) and clock (CLK) , then reset (RST) release.

Vcc=30H :ICRW supplies with +5V to VCC and activates in line with the EMV2000 ver4.0.

Vcc=33H:ICRW supplies with +5V to VCC and activates in line with the ISO/IEC7816-3.

Vcc=35H:ICRW supplies with +3V to VCC and activates in line with the ISO/IEC7816-3. After ATR reception, ICRW supplies voltage to VCC in accordance with the value of ATR on T=15.

Vcc=36H:ICRW supplies with +5V to VCC and activates in line with the ISO/IEC7816-3. After ATR reception, ICRW supplies voltage to VCC in accordance with the value of ATR on T=15

In case there is no Vcc word, it will have 30H as default value.

Vcc=30H is used on EMV2000 ver4.0 comply card.

Vcc=33H is used on old ISO/IEC7816-3 card. (only 5v card)

Vcc=35H is used on ISO/IEC7816-3:1997 card.

Vcc=36H is used on ISO/IEC7816-3:1997/Amd.1:2001 card.

Also, Answer To Reset (ATR) from SAM is received and transmitted to HOST.

ATR	TS	TO	TA1	TB1	...	TCK
-----	----	----	-----	-----	-----	-----

When a power failure is recognized while a power supply is supplied to the card, error code "60" is returned.

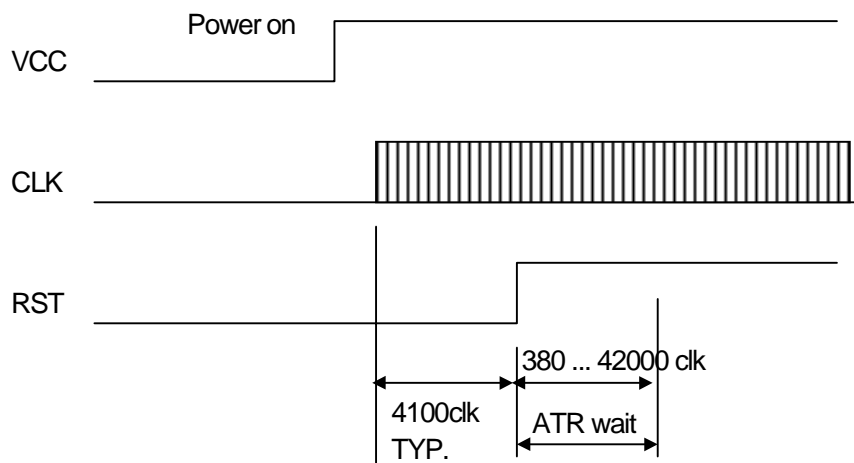
If ATR receive error is occurred, ICRW initiate the deactivation sequence, and sends back error code " 61", "63" or "64".

When content of ATR is not based on such protocol which is supported by EMV2000 ver4.0, ICRW initiate the deactivation sequence, and sends back error code " 69" (This error code is returned when Vcc=30H).

When content of ATR is not based on such protocol which is supported by ICRW, ICRW initiate the deactivation sequence, and sends back error code " 66" (This error code is returned when Vcc=33H, 35H or 36H).

Vcc parameter is not relation with SAM communication. SAM communication complies with EMV2000.

Time chart of activating SAM is as under:



9.15.2 Deactivate SAM command

Command

"C"	49H	41H
-----	-----	-----

Positive response

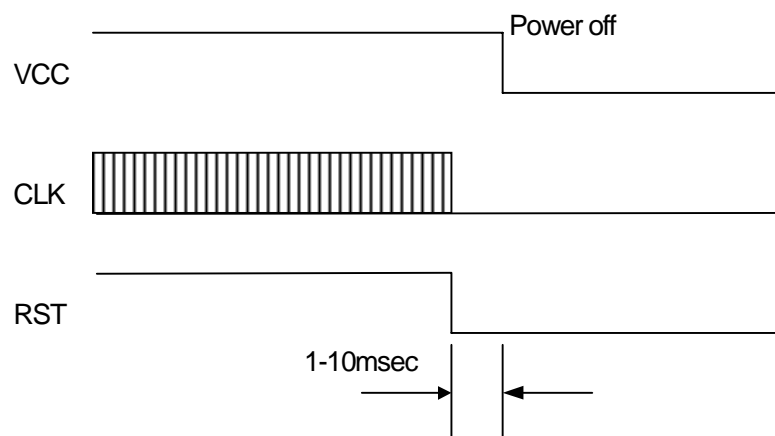
"P"	49H	41H	st1	st0
-----	-----	-----	-----	-----

Negative response

"N"	49H	41H	er1	er0
-----	-----	-----	-----	-----

This deactivates SAM.

Time chart of deactivating SAM is as under:



9.15.3 Inquire SAM status command

Command

"C"	49H	42H
-----	-----	-----

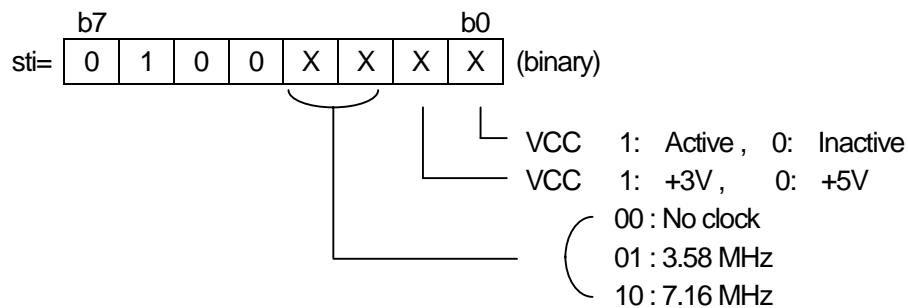
Positive response

"P"	49H	42H	st1	st0	sti	stj
-----	-----	-----	-----	-----	-----	-----

Negative response

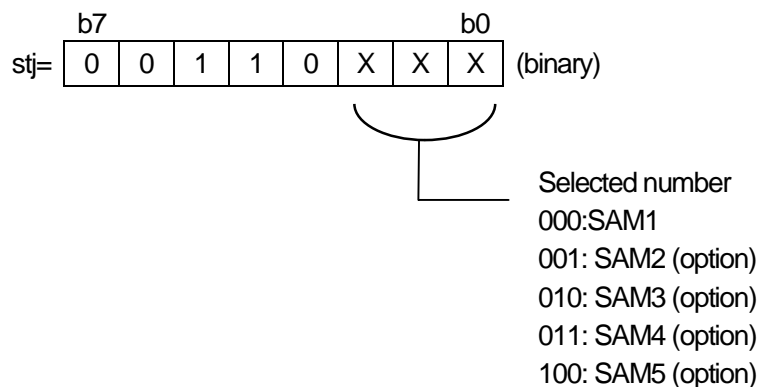
"N"	49H	42H	er1	er0
-----	-----	-----	-----	-----

ICRW tells the status of SAM with sti.



And also, ICRW tells the address of the selected SAM number with stj.

Before selecting SAM number, ICRW responds that ICRW selects SAM1



While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card).
An error "60" is returned when a power failure is detected.

9.15.4 SAM communication T=0

Command

"C"	49H	43H	C-APDU
-----	-----	-----	--------

Positive response

"P"	49H	px	st1	st0	R-APDU
-----	-----	----	-----	-----	--------

Negative response

"N"	49H	43H	er1	er0
-----	-----	-----	-----	-----

This exchanges data between SAM by protocol T=0.

Set data to "C-APDU"

C-APDU

CLA	INS	P1	P2	Lc	Data1	...	Data(Lc)	Le
-----	-----	----	----	----	-------	-----	----------	----

ICRW returns "R-APDU" data to HOST

R-APDU

Data1	...	Data(Licc)	SW1	SW2
-------	-----	------------	-----	-----

px=43H : The SAM's data is 1000 bytes or less.

px=45H : The SAM's data is 1001 bytes or more. ICRW requires transmitting next SAM's data. HOST needs to receive the remaining data by using "CIG" command.

Maximum size of data ICRW can handle is 261 bytes. If HOST sends 262bytes or more, error code "04" is sent. Maximum length of R-APDU is 1000 bytes. If R-APDU length is 1001 bytes or more, ICRW returns parameter px=45H and first 1000bytes data.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of SAM is not T=0, error code "62" is sent.

If SAM does not respond within WWT(Working Wait Time), ICRW deactivates an SAM and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an SAM and error code "64" is sent.

If HOST tries to communicate before an SAM activation, error code "65" is sent.

Note) Licc is the data length which SAM returns. Please refer to specifications of SAM about length of Licc.

9.15.5 SAM communication T=1

Command

"C"	49H	44H	C-APDU
-----	-----	-----	--------

Positive response

"P"	49H	px	st1	st0	R-APDU
-----	-----	----	-----	-----	--------

Negative response

"N"	49H	44H	er1	er0
-----	-----	-----	-----	-----

This exchanges data between SAM by protocol T=1.

HOST should set "C-APDU". ICRW add Prologue field and Epilogue field, and sends to an SAM. If C-APDU length is greater than Information field size for the ICC (IFSC), ICRW divides its into several consecutive blocks.

C-APDU

CLA	INS	P1	P2	Lc	Data1	..	Data(Lc)	Le
-----	-----	----	----	----	-------	----	----------	----

chip data

NAD	PCB	LEN	CLA	INS	P1	P2	Lc	Data1	..	Data(Lc)	Le	EDC
Prologue field			Information field									Epilogue field

ICRW returns "R-APDU" data to HOST.

chip data

Prologue field			Information field					Epilogue field
NAD	PCB	LEN	Data1	...	Data(Licc)	SW1	SW2	EDC

R-APDU

Data1	...	Data(Licc)	SW1	SW2
-------	-----	------------	-----	-----

px=44H : The SAM's data is 1000 bytes or less.

px=45H : The SAM's data is 1001 bytes or more. ICRW requires transmitting next SAM's data. HOST needs to receive the remaining data by using "CIG" command.

px=4FH : ICRW received the S(ABTreq) block from the SAM, so suspended transmission, and deactivated the SAM. HOST should stop following data send.

Maximum size of ICRW can handle is 1000 bytes. If HOST sends 1001 bytes or more, error code "04" is sent. When data for transmitting is 1001 bytes or more, HOST should use "CIE" and "CIF".

Maximum length of R-APDU is 1000 bytes. If R-APDU length is 1001 bytes or more, ICRW returns parameter px=45H and first 1000bytes data.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of SAM is not T=1, error code "62" is sent.

If SAM does not respond within BWT(Block Waiting Time) or CWT(Character Waiting Time), ICRW deactivates an SAM and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an SAM and error code "64" is sent.

If HOST tries to communicate before an SAM activation, error code "65" is sent.

In case there is any trouble in sequence of command receipt, error code "02" shall be sent. If error code "02" is returned, please re-start from ATR.

Note)

Licc is the data length which SAM returns. Please refer to specifications of SAM about length of Licc.

9.15.6 SAM extend communication 1

Command

"C"	49H	45H	C-APDU	
-----	-----	-----	--------	--

Positive response

"P"	49H	px	st1	st0
-----	-----	----	-----	-----

Negative response

"N"	49H	45H	er1	er0
-----	-----	-----	-----	-----

In case the transmitted data to SAM is 1001 bytes or more, this command is used repeatedly. Host needs to divide the data by 1000 bytes or less.

px=47H : ICRW requires to receive next SAM's data. There is no data portion. HOST needs to transmit the remaining data by using command "CIE" or "CIF".

px=4FH : ICRW received the S(ABTreq) block from the SAM, so suspended transmission, and deactivated the SAM. HOST should stop following data send.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of SAM is not T=1, error code "62" is sent.

If SAM does not respond within BWT(Block Waiting Time) or CWT(Character Waiting Time), ICRW deactivates an SAM and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an SAM and error code "64" is sent.

If HOST tries to communicate before an SAM activation, error code "65" is sent.

9.15.7 SAM extend communication 2

Command	"C"	49H	46H	C-APDU		
Positive response	"P"	49H	px	st1	st0	R-APDU
Negative response	"N"	49H	46H	er1	er0	

This command is used when the last data are transmitted. The size of data Host can transmit (C-APDU) is 1000 bytes or less by SAM's data.

px=44H : The SAM's data is 1000 bytes or less.

px=45H : The SAM's data is 1001 bytes or more. ICRW requires transmitting next SAM's data. HOST needs to receive the remaining data by using "CIG" command.

px=4FH : ICRW received the S(ABTreq) block from the SAM, so suspended transmission, and deactivated the SAM. HOST should stop following data send.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If protocol type of SAM is not T=1, error code "62" is sent.

If SAM does not respond within BWT(Block Waiting Time) or CWT(Character Waiting Time), ICRW deactivates an SAM and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an SAM and error code "64" is sent.

If HOST tries to communicate before an SAM activation, error code "65" is sent.

9.15.8 SAM extend communication 3

Command	"C"	49H	47H			
Positive response	"P"	49H	px	st1	st0	R-APDU
Negative response	"N"	49H	47H	er1	er0	

This command is used when receiving the followed data from ICRW. HOST should send this command repeatedly till the response "px=46H".

px=45H : The SAM's data is 1001 bytes or more. ICRW requires transmitting next SAM's data. HOST needs to receive the remaining data by using "CIG" command.

px=46H : ICRW does not have more transmit SAM's data.

px=4FH : ICRW received the S(ABTreq) block from the SAM, so suspended transmission, and deactivated the SAM. HOST should stop following data send.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If SAM does not respond within WWT(T=0), BWT(T=1) or CWT(T=1), ICRW deactivates an SAM and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an SAM and error code "64" is sent.

If HOST tries to communicate before an SAM activation, error code "65" is sent.

9.15.9 SAM Warm Reset

Command

"C"	49H	48H
-----	-----	-----

Positive response

"P"	49H	48H	st1	st0	ATR
-----	-----	-----	-----	-----	-----

Negative response

"N"	49H	48H	er1	er0	ATR
-----	-----	-----	-----	-----	-----

ICRW sends a reset pulse, keeping the status of the IC contact activated, then returns response upon receiving "ATR" again (Warm Reset).

This command will take as error when ATR content is not based on such protocol, which is supported by this device, ATR from SAM and error code "66" or "69" is sent.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

If ATR receive error is occurred, ICRW initiate the deactivation sequence, error message "61", "63" or "64" is sent.

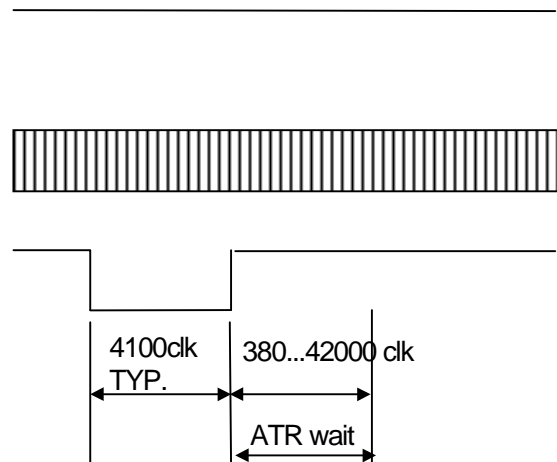
ICRW returns error code "65" if the SAM does not activated.

Time chart of warm reset sequence is as under:

VCC

CLK

RST



9.15.10 SAM automatic communication

Command	"C"	49H	49H	C-APDU		
Positive response	"P"	49H	px	st1	st0	R-APDU
Negative response	"N"	49H	49H	er1	er0	

This exchanges data between SAM by protocol T=0 or T=1. Protocol recognized automatically. Set Data to "C-APDU".

Set chipdata ICRW received from SAM to "R-APDU" and transmit HOST.

Maximum size of data (C-APDU) ICRW can handle is 1000 bytes for T=1 protocol, and 261 bytes for T=0 protocol.

px=44H : The SAM's data is 1000 bytes or less.

px=45H : The SAM's data is 1001 bytes or more. ICRW requires transmitting next SAM's data. HOST needs to receive the remaining data by using "CIG" command.

px=4FH : ICRW received the S(ABTreq) block from the SAM, so suspended transmission, and deactivated the SAM. HOST should stop following data send. (Only T=1 protocol).

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card).

An error "60" is returned when a power failure is detected.

If SAM does not respond within WWT(T=0), BWT(T=1) or CWT(T=1), ICRW deactivates an SAM and error code "63" is sent.

If any other protocol error occurs, ICRW deactivates an SAM and error code "64" is sent.

If HOST tries to communicate before an SAM activation, error code "65" is sent.

When protocol is T=1 and data for transmitting is 1001 bytes or more, HOST should use "CIE" and "CIF".

9.15.11 Select SAM

Command

"C"	49H	50H	Sel
-----	-----	-----	-----

Positive response

"P"	49H	50H	st1	st0
-----	-----	-----	-----	-----

Negative response

"N"	49H	50H	e1	e0
-----	-----	-----	----	----

HOST can select SAM 1,2,3,4 or 5.

Sel = 31H: SAM 1.

Sel = 31H: SAM 2. (option)

Sel = 32H: SAM 3. (option)

Sel = 33H: SAM 4. (option)

Sel = 34H: SAM 5. (option)

SAM commands are effective only in the module selection.

When Initialize command is executed, ICRW selects SAM1.

9.16 Switch command

Command

"C"	4BH	30H
-----	-----	-----

Positive response

"P"	4BH	30H	st1	st0
-----	-----	-----	-----	-----

Negative response

"N"	4BH	30H	e1	e0
-----	-----	-----	----	----

Switch the control to Supervisor program code area from User program code area.

Note: Start from Initialize command of Supervisor program code area after the switch is completed.

9.17 Security and Spare Port command

Command	"C"	35H	pm	mode	time
---------	-----	-----	----	------	------

Positive response	"P"	35H	pm	st1	st0	IN-P
-------------------	-----	-----	----	-----	-----	------

Negative response	"N"	35H	pm	e1	e0
-------------------	-----	-----	----	----	----

pm=30H : To control External Output (OUT1)

pm=31H : To control External Output (OUT2)

pm=32H : To control External Output (OUT3)

pm=33H : To control External Output (OUT4)

mode : control mode

30H : permanent L (LED on)

31H : permanent High-Z (LED off)

32H : one-shot

33H : blinking

34H : blinking stop

time : One-shot or blinking time (Only when "mode" is designated to 32H or 33H necessary)

30H : 250mS

31H : 500mS

32H : 750mS

33H : 1000mS

Response does not add IN-P

All the External Output become High-Z, when the power supply is supplied or when Initialize command is received.

pm=38H : To request External Input status (No need "mode" and "time")

ICRW report the External Input status at IN-P

	MSB				LSB			
IN-P =	0	0	1	1	IN4	IN3	IN2	IN1

9.18 Monitoring for removal command

Command	"C"	54H	30H	tm10	tm1
---------	-----	-----	-----	------	-----

Positive response	"P"	54H	30H	st1	st0
-------------------	-----	-----	-----	-----	-----

Negative response	"N"	54H	30H	e1	e0
-------------------	-----	-----	-----	----	----

ICRW monitors the removal of the ejected card for a specified time.

If the card is removed from the gate during this time, ICRW sends a positive response to HOST.

If the card is not removed during this time, a negative response with error code "46" is sent to HOST.

tm: To monitoring timer.

Acceptable timer range is 1 to 30 (sec).

ex) In case of setting 15 to timer

tm10	tm1
31H	35H

9.19 I2C memory card control command

9.19.1 I2C Power on

Command	"C"	55H	30H	Vcc	Wrd
Positive response	"P"	55H	30H	st1	st0
Negative response	"N"	55H	30H	e1	e0

To activate an I2C memory card.

ICRW supplies a power supply (Vcc) to the card. After that, ICRW initializes the card inside.

An error code "60" is returned when a power failure is recognized while a power supply is supplied to the card.

Vcc: The choice of a power supply voltage to supply

Vcc=30H : ICRW supplies with +5V to VCC and activates the card.

Vcc=31H : ICRW supplies with +3V to VCC and activates the card.

Wrd: The number of bytes of the word address of an I2C memory card to use

Wrd=31H : ICRW accesses an I2C memory card in the Word address of 1byte.

Wrd=32H : ICRW accesses an I2C memory card in the Word address of 2bytes.

9.19.2 I2C Power off

Command

"C"	55H	31H
-----	-----	-----

Positive response

"P"	55H	31H	st1	st0
-----	-----	-----	-----	-----

Negative response

"N"	55H	31H	e1	e0
-----	-----	-----	----	----

When this command is received, ICRW deactivates an I2C card.

ICRW suspends the supply of the power supply (Vcc). An I2C memory card is deactivated as a result.

9.19.3 Inquire Status of I2C

Command

"C"	55H	32H
-----	-----	-----

Positive response

"P"	55H	32H	st1	st0	sti
-----	-----	-----	-----	-----	-----

Negative response

"N"	55H	32H	e1	e0
-----	-----	-----	----	----

When this command is received, ICRW reports the condition of an I2C memory card by byte of "sti".

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card).
An error "60" is returned when a power failure is detected.

sti=

b7
0

1

0

X

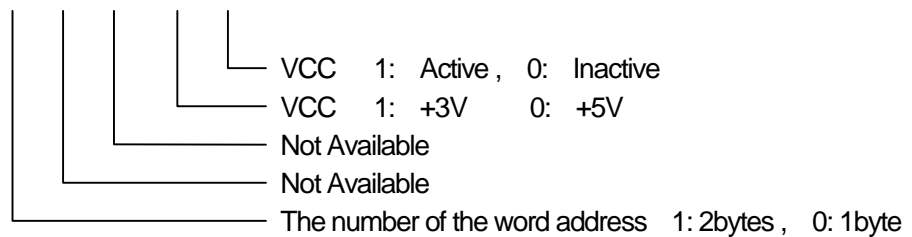
0

0

X

b0
X

 (binary)



9.19.4 I2C Communication

The I2C memory card has no protocol handler in it. So, ICRW builds in protocol handler to control this. When a usual IC card is controlled, ICRW doesn't check the contents of the data.

(A message is transmitted and received between ICRW and the IC card)

Then, the data that it was received from HOST are transmitted through ICRW to the IC card.

About the I2C memory card, ICRW must control the signal line of the I2C memory card directly about each data transmission by the hardware.

Therefore, some functions to control an I2C memory card were prepared in ICRW. These functions are specified by a command data form like C-APDU which format is based on ISO/IEC 7816-3 T=0 standard.

Therefore, ICRW recognizes the meaning of the command data, and carries out the treatment related to the card by controlling hardware.

After a command is carried out properly, ICRW returns 9000H by the positive response as if it was just received from the IC card.

When an error occurs during the communication with the I2C memory card, ICRW returns a positive response with status information in response data "sw1+sw2" which is based on T=0 standard of ISO/IEC7816-3.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

9.19.4.1 Read data from I2C

Command	"C"	55H	33H	00B0H + ab H + cd H + ef H
---------	-----	-----	-----	----------------------------

Positive response	"P"	55H	33H	st1	st0	Data
-------------------	-----	-----	-----	-----	-----	------

Negative response	"N"	55H	33H	e1	e0
-------------------	-----	-----	-----	----	----

This command is recognized as follows.

Value

ab H : The upper address of head address which begins to read data

cd H : The lower address of head address which begins to read data

ef H : The number of bytes of data to read

ICRW reads data from the I2C memory card, and transmits data on efH bytes from the address abcdH.

The value established with efH bytes is the value which makes the value which it can access without striding over a page by an I2C memory card to use an upper limit

When the following command is transmitted, data can be read from the I2C memory card.

ex). "CS3"+00B0000008

Note) It doesn't change to the next page automatically when it tries to read it by the bigger value than the page size of the used I2C memory card or when it changes in the next page from the middle of the page.

Therefore, access it not to cross the boundary of the page. If it is not so, it isn't finished normally.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

9.19.4.2 Write data into I2C

Command	"C"	55H	33H	00D0 H + ab H + cd H + ef H + gh H +	
---------	-----	-----	-----	---	--

Positive response	"P"	55H	33H	st1	st0	Data
-------------------	-----	-----	-----	-----	-----	------

Negative response	"N"	55H	33H	e1	e0
-------------------	-----	-----	-----	----	----

This command is recognized as follows.

ab H : The upper address of head address which begins to write data

cd H : The lower address of head address which begins to write data

ef H : The number of bytes of data to write

gh H : the data to write first (the head data of the data on ef H bytes)

ICRW writes data in the I2C memory card. ICRW returns a result after written data are checked.

The example which data on 8bytes are written in by the continuance from the head address of the I2C memory card is shown in the following.

ex). "CS3"+ 00D0000008 + Write Data (8bytes)

After command execution, ICRW returns response with 9000H or sw1+sw2 as the result.

Note) It doesn't change to the next page automatically when it tries to write it by the bigger value than the page size of the used I2C memory card or when it changes in the next page from the middle of the page.

Therefore, access it not to cross the boundary of the page. If it is not so, it isn't finished normally.

While a power supply is supplied to the card, the ICRW monitors VCC (the power supply line of the card). An error "60" is returned when a power failure is detected.

10. Explanation of error code

Every error status can be cleared by procedure of (Re-Start by Initialize to complete normal).

Also, eliminating the cause (i.e.: taking card out of ICRW) clear the error status.

In this case, uses Status request command and confirm before next step that no error code remain.

10.1 Error in communication soft

"00" Meaning: To shows that received command was undefined.

Clear: Cleared by receiving correct commands.

"01" Meaning: To show command parameter error.

Clear: Cleared by receiving command with correct parameter.

"02" Meaning: The reception of the command that impossible to implementation.
Cf. Receiving read command while card is not staying inside the ICRW.

Clear: Cleared by receiving executable command.

Meaning: To show that ICRW executes Supervisor program code area.
(Initialize command only)

"04" Meaning: To show that error data was included in command.

Clear: Cleared by receiving command including correct data.

10.2 Error at card feeding

"10" Meaning: To show that the card was not carried to the specific location after specified number of trial for specified time duration during execution of command of carrying card in various ways.

Clear: Cleared in case card is fed to specified location by the repeated command.
Or, cleared when the card is taken out from ICRW manually.
Confirm the recovery by Status request command in this case.

"13" Meaning: To show that the card longer than 92mm is inserted into ICRW.

Clear: Cleared in case card is returned to card gate by eject command.
(**Do not use CAPTURE command to eject the card)

"14" Meaning: To show that the card shorter than 78mm is inserted into ICRW.

Clear: Cleared in case card is returned to card gate by eject command.
(**Do not use CAPTURE command to eject the card)

"16"	Meaning:	To show that card staying inside the ICRW was moved up to the point where status request information changes. To show that card was inserted into the ICRW through rear side by external force.
	Clear:	Cleared in the case card is eject to the rear side of ICRW by CAPTURE command.
"17"	Meaning:	To show that the card was not carried to the specific location after specified number of trial for specified time duration during execution of RETRIEVE command.
	Clear:	Cleared in case card is fed to specified location by the repeated command. Or, cleared when the card is taken out from ICRW manually. Confirm the recovery by Status request command in this case.
"40"	Meaning:	To show that the card was pulled out from ICRW through entrance gate when CAPTURE command is being executed.
	Clear:	Error code "40" is returned against only that CAPTURE command and does not exist.
"45"	Meaning:	ICRW lost sight of the card when ICRW completed to carry the card to the rear position during the card acceptance, and ICRW ejected the card to entrance gate.
	Clear:	Cleared when the card is taken out from ICRW manually. Do not use CAPTURE command to eject the card. Check if the card is normal. If the card is normal, there could be a problem on ICRW and checking ICRW is required.
"46"	Meaning:	To show that the ejected card has not been withdrawn during execution of Monitoring for removal command.
	Clear:	Error code "46" is returned against only that command and does not exist.
10.3 Error on card reader mechanism		
"11"	Meaning:	1. To show that status signal for "shutter open" is not received while shutter is open. 2. When the card is within ICRW the shutter is opened forcibly. At this time, ICC and all the SAM are deactivated.
	Clear:	1. Cleared when any of outer force preventing shutter operation is eliminated. When the error is arising from mechanism failure of ICRW, cleared by mechanism adjustment. 2. Remove the factor that the shutter is opened forcibly, and eject the card by Initialize command or Card carry command.
"12"	Meaning:	To show that Sensor is damaged or more that one card is inside ICRW.
	Clear:	Check if the card is normal. If the card is normal, there could be a problem on ICRW and checking ICRW is required.

"15"	Meaning:	To show that data in F-ROM is damaged.
	Clear:	Cleared by either of re-writing F-ROM data or replacing PCB.
	Meaning:	To show that data in EEPROM is damaged.
	Clear:	Cleared by either of re-writing EEPROM data or replacing PCB.
"18"	Meaning:	To show that shutter open/close detection sensor (SW2) and card width check sensor (SW1) are not operating correctly.
	Clear:	Cleared when any of outer force preventing sensor operation is eliminated. When the error is arising from mechanism failure of ICRW, cleared by mechanism adjustment.
"19"	Meaning:	To show that a card was not inserted from the rear, even if 10 seconds had passed after the execution of BACK ENTRY command.
	Clear:	Cleared the moment this error code has been transmitted. Card is to be inserted from the rear within 10 seconds after the execution of BACK ENTRY command.
"51"	Meaning:	To show that Motor error has happened, through start / stop check in Initialize command.
	Clear:	Cleared when any of outer force preventing motor operation is eliminated. When the error is arising from mechanism failure of ICRW, cleared by mechanism adjustment.

10.4 Error in reading / writing card

"21"	Meaning:	To show that read error has happened in Multiple magnetic read command. The detail of the error for each track will be showed in the response. Note: Read is retried up to 6 times automatically (including initial read).
"20"	Meaning:	To show that track has parity error. or clocking pulse is not valid. (keycard format)
"23"	Meaning:	To show that only SS, ES, LRC are contained in the track (no retry).
"24"	Meaning:	To show that the card has no magnetic track (no retry).
"26"	Meaning:	To show that the track has no SS. or no postamble bits. (keycard format)
"27"	Meaning:	To show that the track has no ES. or no preamble bits. (keycard format)
"28"	Meaning:	To show that the track has LRC error.

"22" Meaning: To show that write error is detected through write / verify procedure.
 Notes: Write routine.
 Write: Write (forward) - Verifying read (backward)
 * The above one routine is completed by one round trip of card.
 Verifying read: To be completed by comparison between write data and read data.

Clear: Repeat write routine up to 2 times.

"25" Meaning: To show that quality error (Jitter, Preamble, Postamble) has happened in write verify.

"29" Meaning: To show that the discordance of write data has happened in write verify.

10.5 Other error codes

"30" Meaning: To show that power down (or power cut in short instant) is detected (or being detected).
 It is to be recognized as normal power down if back up power supply goes down below +12V.

Clear: Cleared when specified card handling procedure is completed after power recovery.

"31" Meaning: To show that DSR signal was turned to OFF (communication is cut).

Clear: Cleared by turning DSR signal ON.

"B0" Meaning : Received the other command before executing Initialize command.

Clear : Execute Initialize command.

10.6 Error on option mechanism or function

"50" Meaning: Retract counter overflow.

Clear: Set counter value (0 - 99) in Retract counter.

10.7 Error on F-ROM written mode

"70" Meaning: Failure at F-ROM operation.

Clear: Replace PCB.

"71" Meaning: firmware of User program code area is wrong.

Clear: Execute the download.

10.8 Error on ICC/SAM handling

- "60" Meaning : To show that there found abnormal condition on the power-line (Vcc) of ICC.
ICRW disconnects ICC/SAM automatically.
- Clear:
- Metal card (Ask customer to remove the card.)
 - Defect chip card ((Ask customer to remove the card.)
 - Vcc short to GND (Ask customer to remove the card and repair.)
 - RES and ICSEN turn on and Host should use IC power on command, "CI0".
- "61" Meaning : The receiving error of ATR.
ICRW has disconnected already.
- No ATR (TS is not received from 380 clock cycle and 42000 clock cycle after time set RST to High).
 - Parity error on ATR.
 - ATR interval time between two consecutive characters is over 9600etus.
 - ATR duration over 19200etus.
 - TCK error on ATR.
 - ATR length is longer than 64 byte (not include TS).
 - TS is neither 3FH nor 3BH
- Clear:
- No chip card. (Ask customer to remove the card)
 - Defect chip card. (Ask customer to remove the card.)
 - Contact broken. (Ask customer to remove the card and repair.)
- "62" Meaning : To show that the specified protocol does not agree with that of ICC.
ICRW still connected.
- Host use "CI4" or "CI5" command with T=0 protocol IC card.
 - Host use "CI3" command with T=1 protocol IC card.
 - Host use "CID" or "CIE" command with T=0 protocol SAM.
 - Host use "CIC" command with T=1 protocol SAM.
- Clear: Host should use correct command, "CI9". or "CII"
- "63" Meaning : In case T=1 cards, after ATR receiving, IFS exchange is failed. ICRW detects time out.
During communication with IC card, ICRW detects time out (WT, CWT or BWT).
ICRW disconnected the IC card.
- Clear: Defect chip card. (Ask customer to remove the card.)
Non ISO-standard card. IFSresp receiving error(Ask customer to remove the card.)
- "64" Meaning : In case T=1 cards, after ATR receiving, IFS exchange is failed. ICRW detects protocol error.
To show that there is protocol error. (other than "63")
T=0 IC card:
- 5 parity errors in received from IC card.
 - 5parity errors in transmitting mode to IC card.
 - Status byte error (SW1 is different from 6xH or 9xH).
 - Procedure byte error (Procedure bytes is different from INS, Not INS, 60H, 61H or 6CH).
- T=1 IC card:
- Bad NAD (NAD is different from 00H)
 - Bad PCB
 - Bad EDC
 - Parity error
- Clear: Defect chip card. (Ask customer to remove the card.)
- "65" Meaning : Host tried to communicate with IC card without card activation. ICRW has disconnected already.
- Clear: Host should activate ICC(SAM) command before communication.

- "66" Meaning : ICRW tried to activate with IC card, but the card returned ATR, which is not supported.
cf. ANNEX2, ANNEX3
ICRW has disconnected already.
This error is returned with "CI03", "CI05" or "CI06".
This error is returned with "CI@3", "CI@5" or "CI@6".
Clear: Ask customer to remove the card.
- "69" Meaning : ICRW tried to activate with IC card, but the card returned ATR, which does not match
EMV. cf. ANNEX2, ANNEX3
ICRW has disconnected already. This error is returned with "CI0", "CI00"
ICRW has disconnected already. This error is returned with "CI@", "CI@0"
Clear: Host try other activates command "CI03", "CI05" or "CI06".
Host try other activates command "CI@3", "CI@5" or "CI@6".
Or Ask customer to remove the card.

ANNEX1 Calculation method of CRCC

CRCC($X_{16}+X_{12}+X_5+1$) is made by the following method.

```
/*      [data]
      hex      0xF2, 0x00, 0x08, 0x43, 0x30, 0x30, 0x33, 0x32, 0x34, 0x30, 0x30
      CRC      0xFACE
*/
```

```
#define INIT      0x0000      /* Initial value */
#define POLYNOMIAL 0x1021      /* Polynomial  $X_{16}+X_{12}+X_5+1$  */
```

```
unsigned short calc_crc(unsigned short crc,unsigned short ch);
unsigned short GetCRC(unsigned char *p,unsigned short n);
```

```
unsigned short calc_crc(unsigned short crc,unsigned short ch)
{
    unsigned short i;
    ch <<= 8;
    for (i = 8; i > 0; i--) {
        if ((ch ^ crc) & 0x8000) {
            crc = (crc << 1) ^ POLYNOMIAL;
        } else {
            crc <<= 1;
        }
        ch <<= 1;
    }
    return crc;
}
```

```
/* Generate GetCRC */
unsigned short GetCRC(unsigned char *p,unsigned short n)
{
    unsigned char  ch;
    unsigned short i;
    unsigned short crc = INIT;

    for (i = 0; i < n; i++) {
        ch = *p++;
        crc = calc_crc(crc,(unsigned short)ch);
    }
    return crc;
}
```

```
int main(void)
{
    /* Transmission command
      STX : F2H
      LEN : 00 08H
      TEXT: Initialize command ("C0032400")
    */
    unsigned char TransCommand[13] = {0xF2,0x00,0x08,0x43,0x30,0x30,0x33,0x32,0x34,0x30, 0x30,0x00,0x00};
    unsigned short TextLength = 11;      /* length of (STX+LEN+TEXT) */
    unsigned short crc;      /* CRC */

    crc = GetCRC(TransCommand, TextLength);
    TransCommand[11] = (crc >> 8) & 0xFF;
    TransCommand[12] = crc & 0xFF;

    return 0;
}
```

ANNEX2 Values of ATR parameter (TA1 and TA2)

Table1: Supportable TA1 values

Vcc	Condition	Support (Yes/No)	Communication speed (F,D)
30H	TA1 = 'any' and TA2=none	Yes	9622bps (F=372, D=1)
	TA1 = 'any' and TA2.b5 = 0	Yes (*1)	Comply with Table3
	TA2.b5=1	No	-
33H	TA1 = '11' and TA2=none	Yes	9622bps (F=372, D=1)
35H 36H	TA1 = 'any' and TA2=none (Not including TA1='11')	Yes	If TA1 is shown in Table2, ICRW sends PPS request. communication speed depends on PPS response. If TA1 is not shown in Table2, ICRW does not sends PPS request. Communication speed is 9622bps (F=372, D=1).
	TA1='any' and TA2.b5=0	Yes(*1)	Comply with Table3
	TA1='any' and TA2.b5=1	Yes	9622bps (F=372, D=1)

(*1) When TA1 exists in table3, ICRW supports its TA1.

Table2: TA1 values that ICRW sends PPS request.

TA1	02, 12, 03, 13, 32, 33, 53, 54, 92, 93, B2, B3, D3, D4
-----	--

A meaning of Vcc parameter please refer “activate ICC command”.

Table 3: Supported TA1 values in specific mode.

D= F=	1	2	4	8	16	CLK frequency
372	01 (9622)	02 (19244)	03 (38490)	-	-	3.58MHz
372	11 (9622)	12 (19244)	13 (38490)	-	-	3.58MHz
558	-	-	-	-	-	-
744	31 (9622)	32 (19244)	33 (38490)	-	-	7.16MHz
1116	-	-	-	-	-	-
1488	-	52 (9622)	53 (19244)	54 (38490)	-	7.16MHz
1860	-	-	-	-	-	-
512	91 (6991)	92 (13983)	93 (27965)	-	-	3.58MHz
768	-	-	-	-	-	-
1024	B1 (6991)	B2 (13983)	B3 (27965)	-	-	7.16MHz
1536	-	-	-	-	-	-
2048	-	D2 (6991)	D3 (13983)	D4 (27965)		7.16MHz

Upper row: TA1 value

(Lower row): Communication speed (bps)

ANNEX3 Values of ATR parameter

Table4: Supported values of ATR

Vcc		30H	33H	35H	36H				
ATR	Supported values								
TS	'3F', '3B'								
TA1	See Table1								
TB1	'00' (cold reset) any value (warm reset) (*1)		any value (*1)						
TC1	any value								
TD1	m.s. nibble : any value l.s. nibble : '0' or '1'								
TA2	Table1 and TA2 l.s.nibble = TD1 l.s.nibble		See Table1						
TB2	None (prohibit)		any value (*1)						
TC2	'01'... 'FF'								
TD2	m.s. nibble : any value l.s. nibble : '1','E'		m.s. nibble : any value l.s. nibble : any value						
NOT T=15	'10'...'FE'		'01' ... 'FE'						
TA3,TA4									
TB3,TB4						m.s. nibble : '0'...'4' and l.s. nibble : '0'...'5' and 2 ^{CWI} > (N+1)		m.s. nibble : '0'...'9' and l.s. nibble : '0'...'15' and 2 ^{CWI} > (N+1)	
TC3,TC4						'00'		any value	
TD3,TD4						any value		any value	
T=15	(*2)		b1=1 b2=1 or b1=1						
TA3									
TB3,TC3,TD3	(*2)		any value						
TA4	b1=1		b1=1		b2=1 or b1=1				
TB4,TC4,TD4	any value								

A meaning of Vcc parameter please refer "activate ICC command".

(*1) ICRW does not generate Vpp.

(*2) 'F'(T=15) is prohibited in TD2 l.s.nibble.

ANNEX4 C-APDU Format

The C-APDU consists of a mandatory header of four consecutive bytes denoted CLA, INS, P1 and P2, followed by a conditional body of variable length. The meanings of every byte are below.

	byte	meanings
Mandatory Header	CLA	Instruction Class
	INS	Instruction Code
	P1	Instruction Parameter 1
	P2	Instruction Parameter 2
Conditional Body	Lc	Byte Length of Data Field
	Data	Data Field
	Le	Byte Length of Expected Response Length

About the details of each byte, refer to specifications of every card's standard.

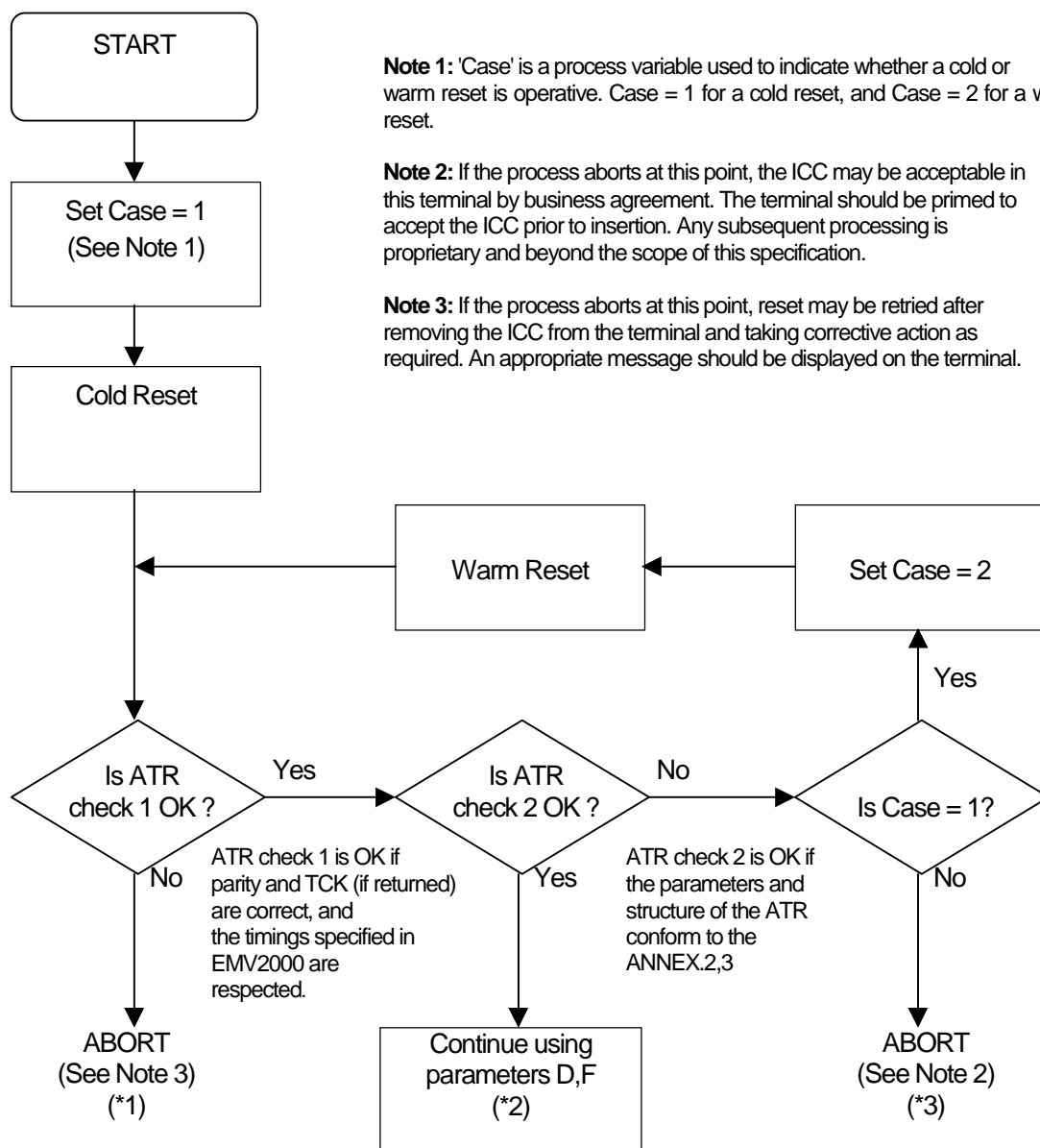
The C-APDU structure has following four cases.

Case	Structure
1	CLA INS P1 P2
2	CLA INS P1 P2 Le
3	CLA INS P1 P2 Lc Data
4	CLA INS P1 P2 Lc Data Le

The host shall transmit the command of Case1, Case2, Case3 and Case4 correctly.
Especially for the case 1 on T=0 protocol, ICRW adds '00' internally as the fifth byte of the command to the card.

ANNEX 5 Sequence of activating IC card / SAM

1. In case of Vcc=30H



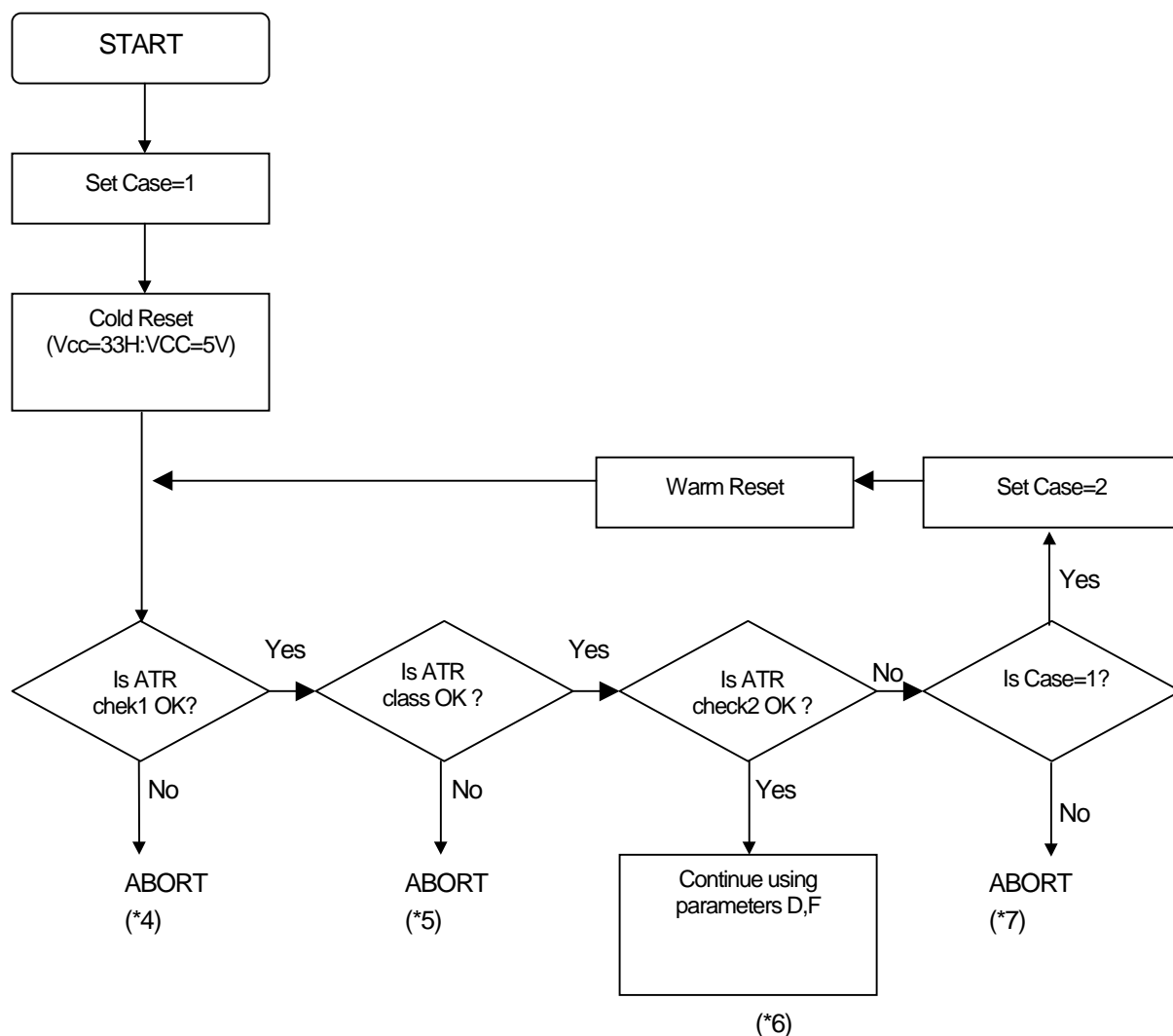
(*1)ICRW initiates the deactivation of ICC, and sends back error code "61".

(*2)After ICRW received ATR which shows T=1 protocol, ICRW transmits S (IFSreq) to ICC. If S (IFSresp) can't be received properly from ICC, ICRW initiates the deactivation of ICC, and sends back error code "63" or "64". When S (IFSresp) is received properly in the above or when ATR is not T=1 protocol, ICRW transmits the contents of ATR which is received from ICC to HOST.

(*3)When ATR content is not based on such protocol, which is supported by ICRW, error code "69" with ATR data will be sent back and ICRW will deactivate the IC card.

(Reference: EMV 2000 Integrated Circuit Card Specification for Payment Systems. version 4.0 December 2000)

2. In case of Vcc=33H



(*4)ICRW initiates the deactivation of ICC, and sends back error code “61”.

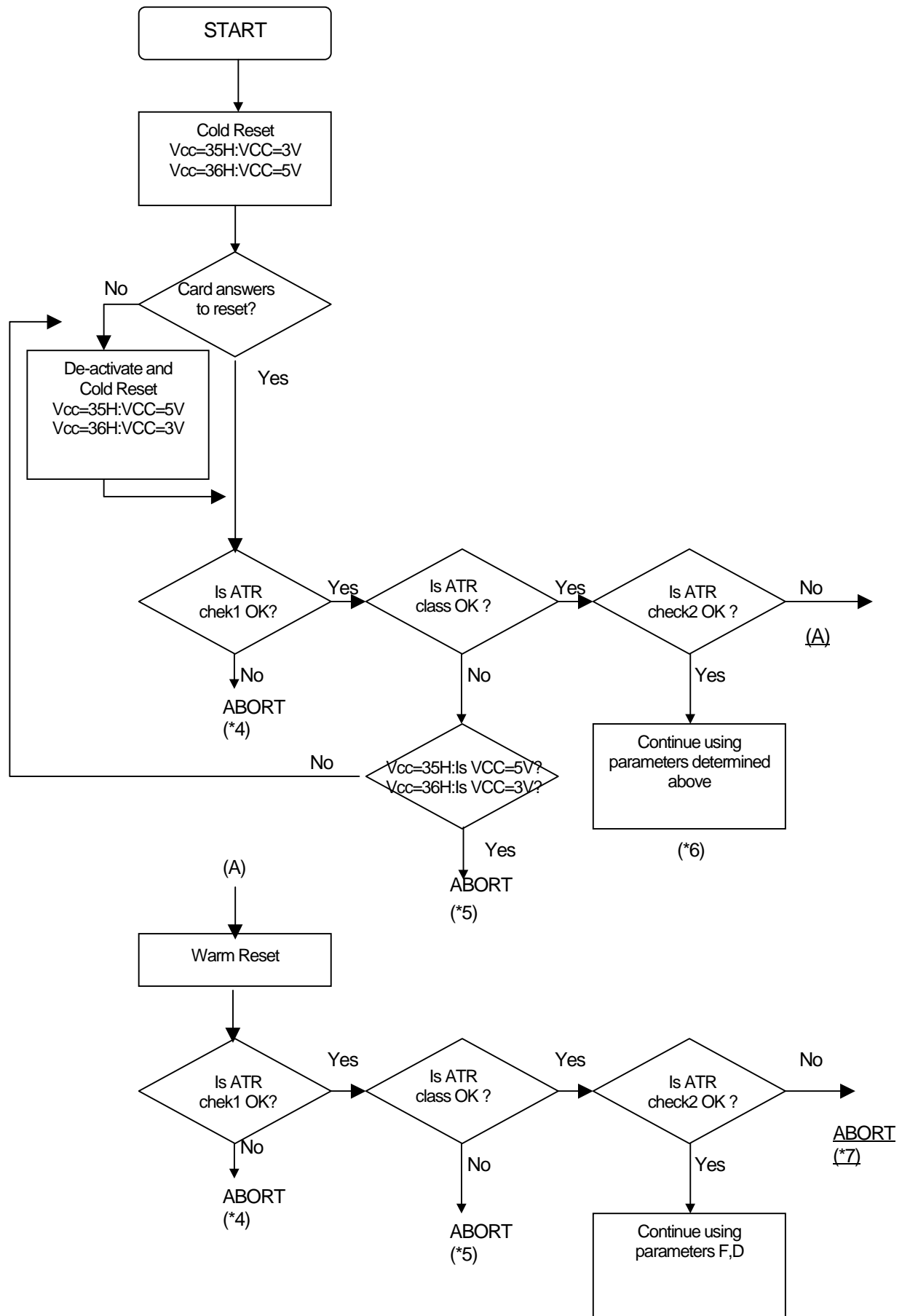
(*5)ICRW checks IC-card's class indicator, which is not supported by ICRW, error code “66” with ATR data will be sent back and ICRW will deactivate the IC card.

(*6) After ICRW received ATR which shows T=1 pccol, ICRW transmits S (IFSreq) to ICC. If S (IFSresp) can't be received properly from ICC, ICRW initiates the deactivation of ICC, and sends back error code " 63" or "64". When S (IFSresp) is received properly in the above or when ATR is not T=1 protocol, ICRW transmits the contents of ATR which is received from ICC to HOST.

(*7)When ATR content is not based on such protocol, which is supported by ICRW, error code “66” with ATR data will be sent back and ICRW will deactivate the IC card.

(Reference: ISO/IEC 7816-3:1997)

3. In case of Vcc=35H or 36H



(*4)ICRW initiates the deactivation of ICC, and sends back error code “61”.

(*5)ICRW checks IC-card's class indicator, which is not supported by ICRW, error code “66” with ATR data will be sent back and ICRW will deactivate the IC card.

(*6)After ICRW received ATR which shows T=1 protocol, ICRW transmits S (IFSreq) to ICC. If S (IFSresp) can't be received properly from ICC, ICRW initiates the deactivation of ICC, and sends back error code " 63" or “64”.

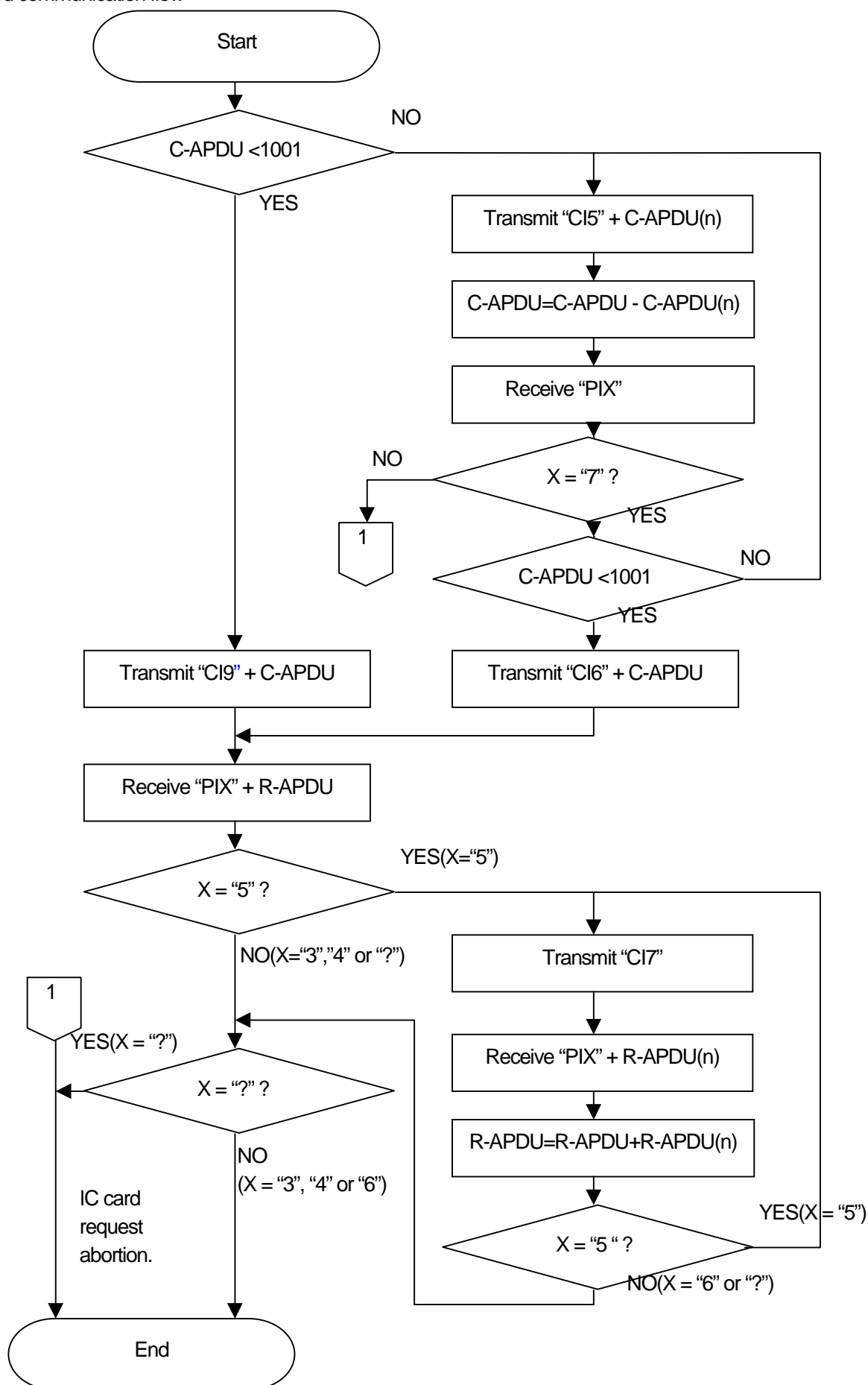
When S (IFSresp) is received properly in the above or when ATR is not T=1 protocol, ICRW transmits the contents of ATR which is received from ICC to HOST.

(*7)When ATR content is not based on such protocol, which is supported by ICRW, error code “66” with ATR data will be sent back and ICRW will deactivate the IC card.

(Reference: ISO/IEC 7816-3:1997/Amd.1: 2001)

ANNEX 6 Method of IC card communication

IC card communication flow



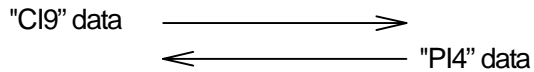
Example

HOST

ICRW

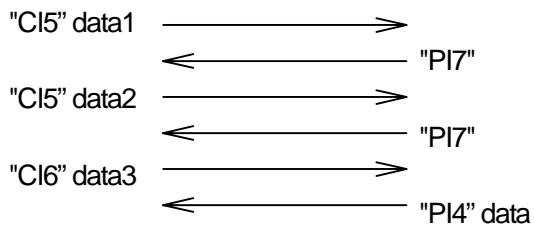
(exp.1) Transmit 1000 bytes or less of data.

Receive 1000 bytes or less of data.



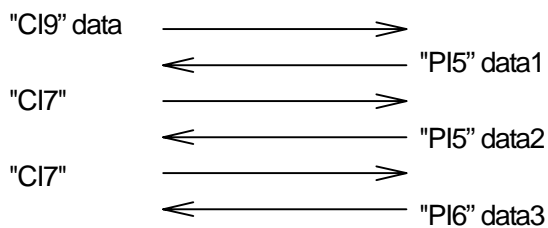
(exp.2) Transmit data by command chaining(Each data size is 1000 bytes or less)

Receive 1000 bytes or less of data



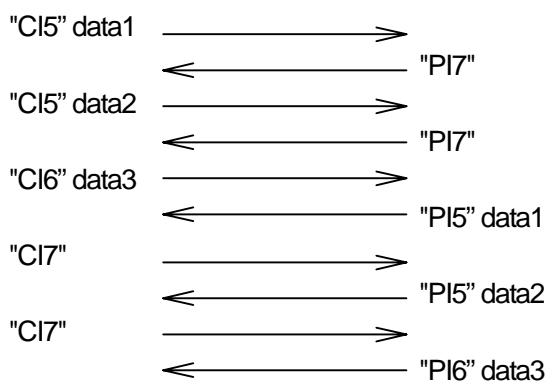
(exp.3) Transmit 1000 bytes or less of data

Receive data by command chaining (Each data size is 1000 bytes or less)

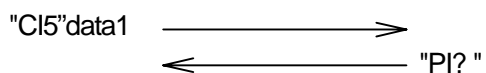


(exp.4) Transmit data by command chaining (Each data size is 1000 bytes or less)

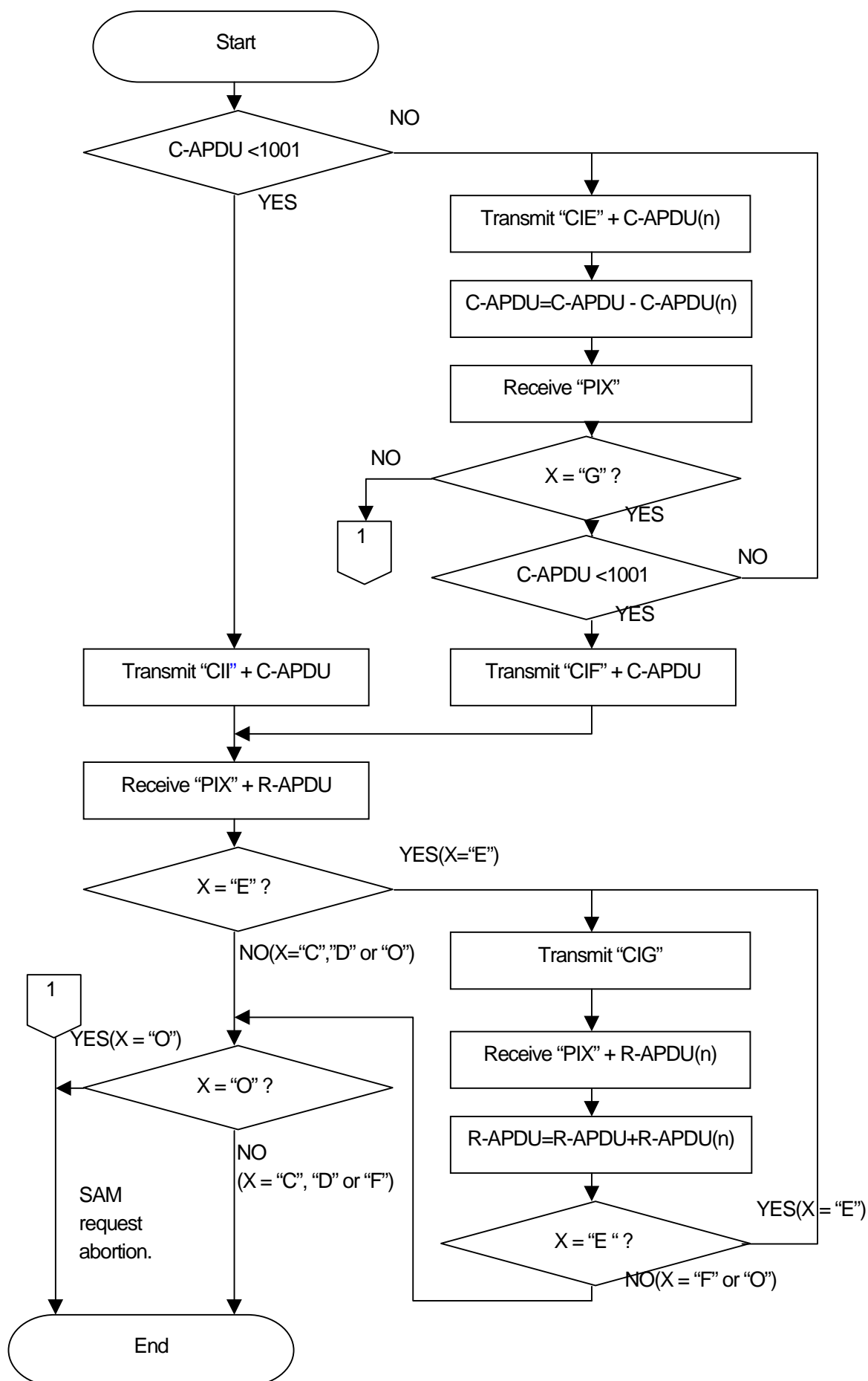
Receive data by command chaining (Each data size is 1000 bytes or less)



(exp.5) Interruption with receipt of ABORT request



SAM communication flow



Example

HOST

ICRW

(exp.1) Transmit data 1000 bytes or less of data.

Receive 1000 bytes or less of data.

"CII" data → "PID" data
←

(exp.2) Transmit data by command chaining(Each data size is 1000 bytes or less)

Receive 1000 bytes or less of data

"CIE" data1 → "PIG"
←
"CIE" data2 → "PIG"
←
"CIF" data3 → "PID" data
←

(exp.3) Transmit 1000 bytes or less of data

Receive data by command chaining (Each data size is 1000 bytes or less)

"CII" data → "PIE" data1
←
"CIG" → "PIE" data2
←
"CIG" → "PIF" data3
←

(exp.4) Transmit data by command chaining (Each data size is 1000 bytes or less)

Receive data by command chaining (Each data size is 1000 bytes or less)

"CIE" data1 → "PIG"
←
"CIE" data2 → "PIG"
←
"CIF" data3 → "PIE" data1
←
"CIG" → "PIE" data2
←
"CIG" → "PIF" data3
←

(exp.5) Interruption with receipt of ABORT request

"CIE" data1 → "PIO"
←

The end of the document.