



Interface Specification

Model : LCDM-2000
(Cash Dispensing Module)

Total Page : 19 Page (including cover)

Date : 2002. 2

Version : V2.3

Rom Version : Ver1.6



PULOON Technology Inc.



1. Preview

The document includes the interface specification between LCDM-2000 and the HOST, which make use of serial communication to transfer commands and responses. Each command has to match the response to the signal and for the communication process, the status of FRAME, which is normal or abnormal, should be sent.

2. Components

2.1 Frame Format

This defines interface standard between HOST and LCDM-2000.

2.1.1 The basic DATA FORMAT is like below.

Command Protocol

E	I	S	C	DATA	E	B
O		T	M		T	C
T	D	X	D		X	C

Response Protocol

S	I	S	C	DATA	E	B
O		T	M		T	C
H	D	X	D		X	C

2.1.2 BCC of command protocol is determined by "XOR" for the values from EOT to ETX.

2.1.3 BCC of response protocol is determined by "XOR" for the values from SOH to ETX.

2.1.4 Assignment of Value

EOT - 04H

ID - 50H

STX - 02H

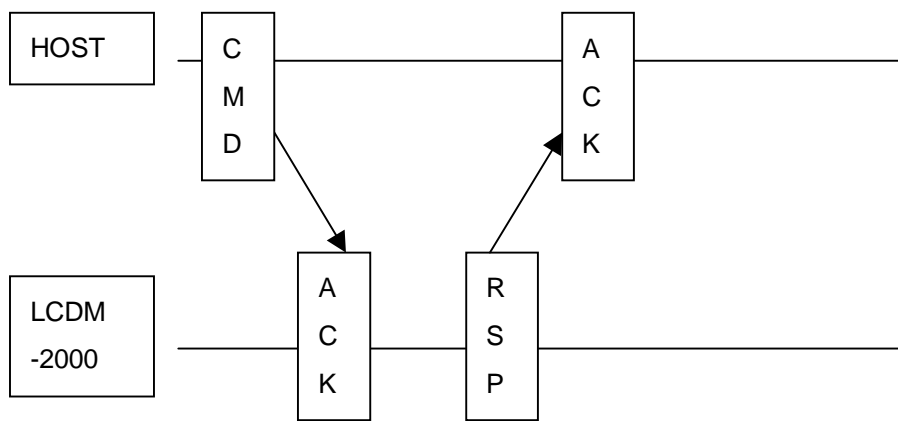
ETX - 03H

SOH - 01H



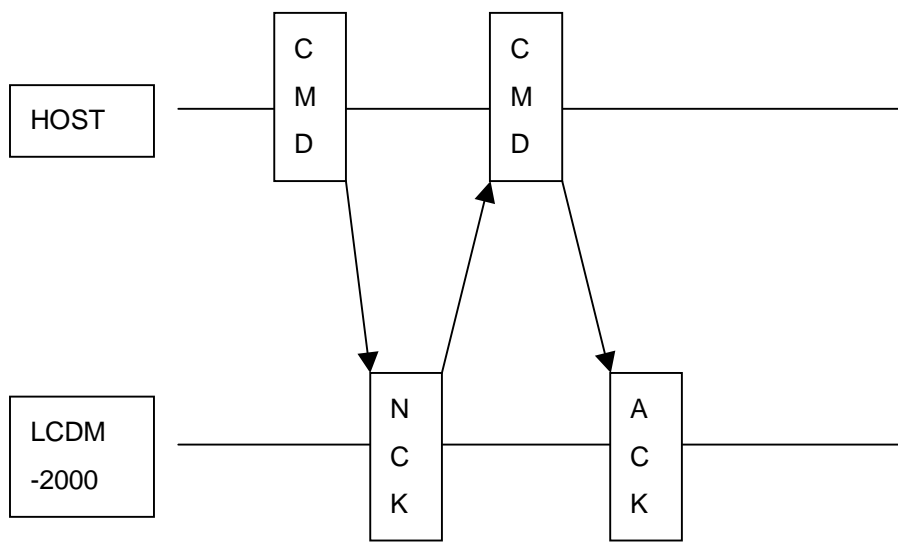
2.2 Definition of Interface between HOST and LCDM-2000

2.2.1 The basic communication is like below



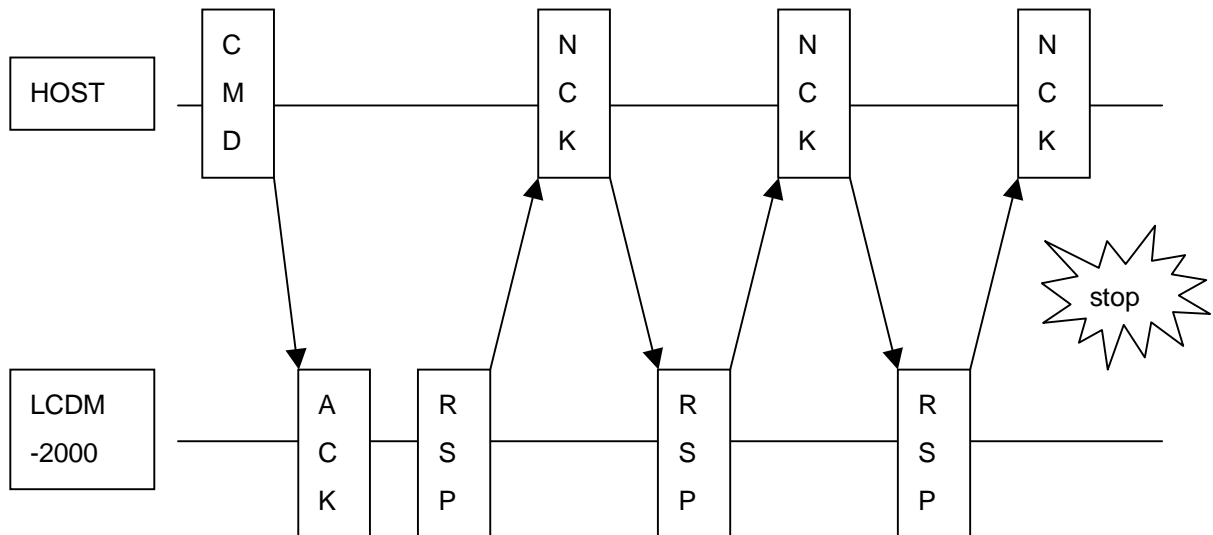
2.2.2 Troubling in HOST COMMAND

The data of HOST COMMAND could be damaged by communication error or BCC ERROR could happen.





2.2.3 Troubling in RESPONSE COMMAND

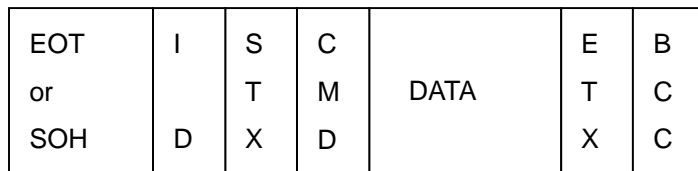


NCK could be sent even 3 times for the RESPONSE, but in this case, the transaction would stop and LCDM would send no more RSP. When there is no response, RSP would be also sent 3 times until TIMEOUT.

2.3 Definition of Timeout

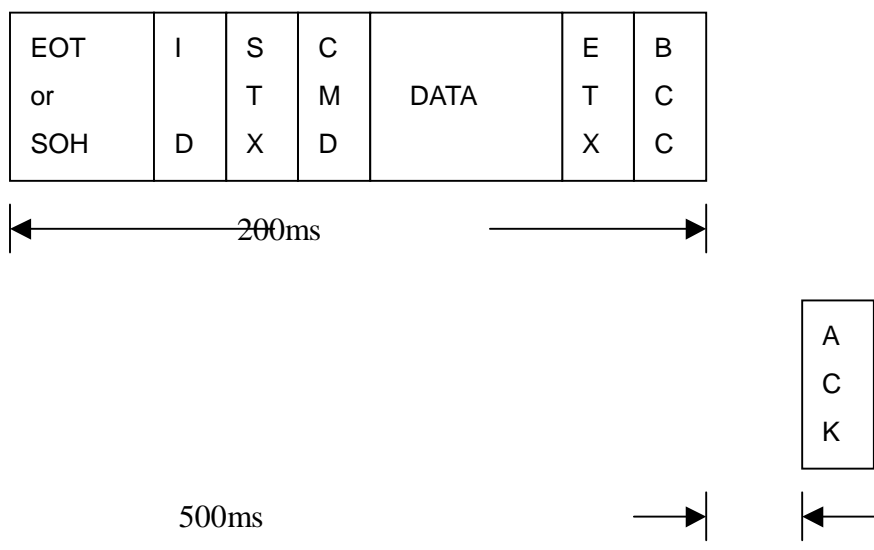
Each FRAME defines TIMEOUT as below.

2.3.1 TIMEOUT in basic communication FRAME

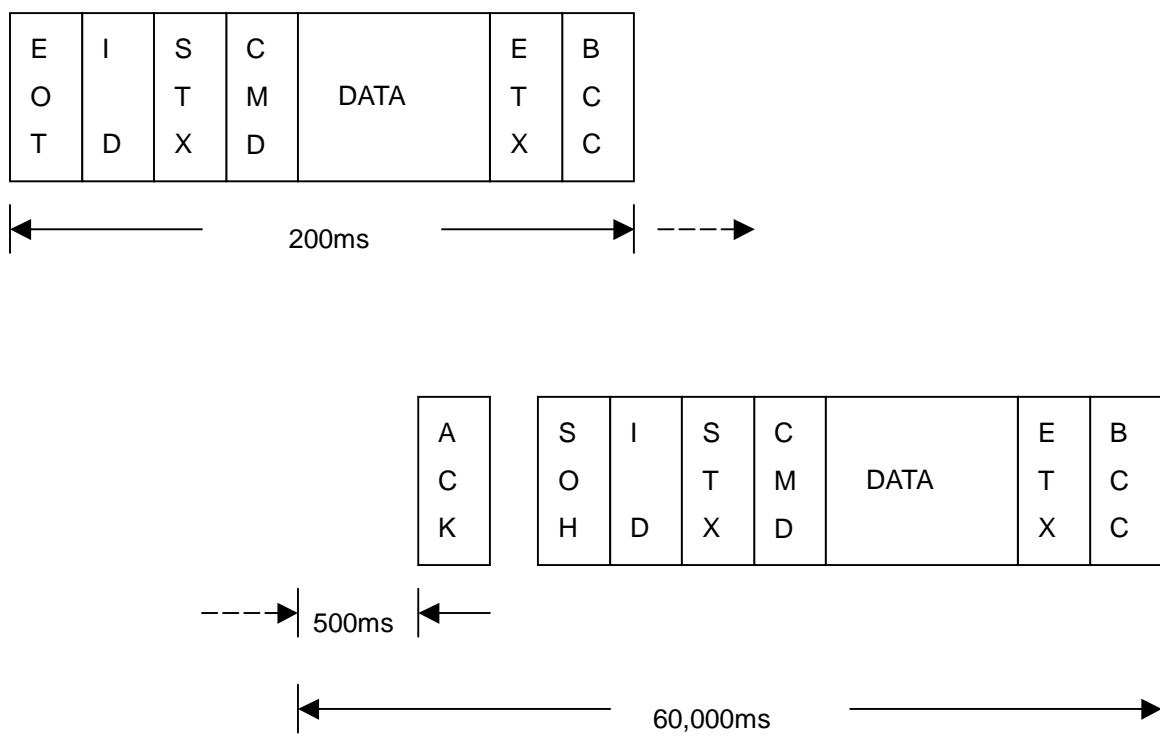


The TIMEOUT in communication FRAME is defined the duration from EOT/STX to BCC

2.3.2 Response TIMEOUT to basic communication FRAME



2.3.3 Response TIMEOUT to COMMAND





2.4 COMMAND FORMAT

The COMMAND(or CMD) is the data frame from HOST to LCDM-2000.

EOT
ID
STX
COMMAND
10's of the requested bills (ASCII)
1,s of the requested bills (ASCII)
ETX
BCC

2.4.1 COMMANDS

COMMAND	The details
0x44H	to initialize the module (to check the operation of the module by initialization of the unit and clear banknotes in the path by exit or eject)
0x45H	to dispense banknotes in the Upper Cash Box (the requested number of banknotes to dispense is memorized and send the data to LCDM-2000)
0x55H	to dispense banknotes in the Lower Cash Box (the requested number of banknotes to dispense is memorized and send the data to LCDM-2000)
0x56H	to dispense banknotes in the Upper and Lower Cash Box
0x46H	to call for the current status of the module and to send RESPONSE of the result to detect troubles mechanism in the format of code
0x47H	to ask for ROM version



2.4.2 Each COMMAND Format

A. Initialization of module (0x44H)

04H (EOT)
50H (ID)
02H (STX)
44H (Reset)
03H (ETX)
XXH (BCC 04H ~ 03H)

B. Upper Dispensing Notes (0x45H)

04H (EOT)
50H (ID)
02H (STX)
45H (Upper dispense)
XXH (ASCII: '0' ~ '2')
XXH (ASCII: '0' ~ '9')
03H (ETX)
XXH (BCC 04H ~ 03H)

→ 10's of the requested bills

→ 1's of the requested bills

Requested bill count → 1 ~ 20

When the user instructs the LCDM to dispense 10 bills from the upper cash cassette, the command should be as follows.

04H 50H 02H 45H 31H 30H 03H BCC

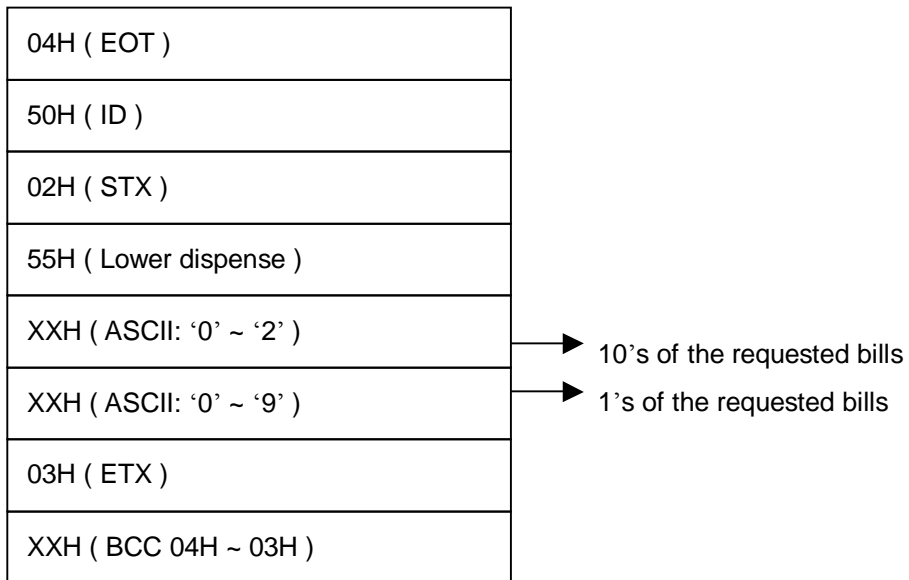
↓ ↓

10's 1's

('1') ('0')



C. Lower Dispensing Notes (0x55H)



Requested bill count → 1 ~ 20

When the user instructs the LCDM to dispense 15 bills from the lower cash cassette, the command should be as follows.

04H 50H 02H 55H 31H 35H 03H BCC
 ↓ ↓
 10's 1's
 ('1') ('5')

D. Upper and Lower Dispensing Notes (0x56H)



04H (EOT)	
50H (ID)	
02H (STX)	
56H (Upper and Lower Dispense)	
XXH (ASCII: '0' ~ '2')	→ 10's of the requested bills (Upper)
XXH (ASCII: '0' ~ '9')	→ 1's of the requested bills (Upper)
XXH (ASCII: '0' ~ '2')	→ 10's of the requested bills (Lower)
XXH (ASCII: '0' ~ '9')	→ 1's of the requested bills (Lower)
ETX	
BCC	

Requested bill count → 1 ~ 20

When the user instructs the LCDM to dispense 15 bills from the upper and lower cash cassette, the command should be as follows.

04H	50H	02H	56H	31H	35H	31H	35H	03H	BCC
				↓	↓	↓	↓		
				10's	1's	10's	1's		
				('1')	('5')	('1')	('5')		
				UPPER		LOWER			

E. Request of status of Mech. (0x46H)



04H (EOT)
50H (ID)
02H (STX)
46H (Status)
03H (ETX)
XXH (BCC 04H ~ 03H)

F. ROM VERSION (0x47H)

04H (EOT)
50H (ID)
02H (STX)
47H (Rom version)
03H (ETX)
XXH (BCC 04H ~ 03H)

2.5 RESPONSE Code Format

The RESPONSE(or RSP) is the data frame from LCDM-2000 to HOST.



SOH
ID
STX
CMD CODE
10's of the dispensed bills in the Check sensors
1's of the dispensed bills in the Check sensors
10's of the dispensed bills in the Eject sensor
1's of the dispensed bills in the Eject sensor
ERROR CAUSE
Current status of cash box
ETX
BCC

2.5.1 ERROR Format

ERROR Code informs HOST of the information of troubles when the normal stopping doesn't happen and an error occurs in dispensing.

- ERROR CODE Format

ERROR CODE is configured by 1 byte.

- ERROR CODE Index

Code	The details
30/31H	Normal stop/Good
32H	Pickup error



33H	Upper Check sensor JAM
34H	Overflow bill
35H	Exit or Eject sensor JAM
36H	Divert sensor JAM
37H	Undefined command
3AH	Check sensor and Eject sensor count is mismatched
3BH	The Host instructs the LCDM-2000 to dispense 0 bill, more than 20 bills or the bill count is corrupted
3CH	Divert timeout
3DH	Bill Count Error
3EH	Sensor error
3FH	Reject Tray doesn't contacted
41H	It occurs motor running too slow or no running
42H	Timeout occurs between Check sensors and Eject sensor
43H	Timeout occurs between Divert sensors and Eject sensor
45H	No Upper Cash Box
46H	No Lower Cash Box
47H	Dispensing timeout
48H	Eject sensor JAM
4BH	The counting bills on Divert and Check sensor are mismatched
4CH	Lower Check sensor JAM
4DH	The counting bills on Eject and Exit sensor are mismatched
4EH	REVERSE JAM
4FH	The bill is dispensed from the wrong Cash Box
50H	Timeout occurs between Check and Divert sensor
38H	Upper Bill End
40H	Lower Bill End
49H	Diverter is not operated normally or solenoid sensor error
4AH	Bills are not dispensed because Diverter is abnormal

2.5.2 Each RESPONSE Format

A. Initialization of module

01H (SOH)
50H (ID)
02H (STX)
44H (Reset)
03H (ETX)



B. Upper Dispensing Notes

01H (SOH)	
50H (ID)	
02H (STX)	
45H (Dispense)	
XXH (ASCII: '0' ~ '2')	→ 10's of the requested bills (Upper Check Sensor)
XXH (ASCII: '0' ~ '9')	→ 1's of the requested bills (Upper Check Sensor)
XXH (ASCII: '0' ~ '2')	→ 10's of the requested bills (Eject Sensor)
XXH (ASCII: '0' ~ '9')	→ 1's of the requested bills (Eject Sensor)
XXH (ERROR CAUSE)	→ See 2.5.1
30/31H (Status of cash box)	
03H (ETX)	
XXH (BCC 01H ~ 03H)	

Status of cash box is like this

30H → Normal

31H → Status of Near end

C. Lower Dispensing Notes

01H (SOH)
50H (ID)
02H (STX)
55H (Dispense)
XXH (ASCII: '0' ~ '2')
XXH (ASCII: '0' ~ '9')
XXH (ASCII: '0' ~ '2')



→ 10's of the requested bills (Lower Check sensor)

→ 1's of the requested bills (Lower Check sensor)

→ 10's of the requested bills (Eject Sensor)

→ 1's of the requested bills (Eject Sensor)

→ See 2.5.1

Status of cash box is like this

30H → Normal

31H → Status of Near end

D. Upper and Lower Dispensing Notes

01H (SOH)
50H (ID)
02H (STX)
56H (Upper and Lower Dispense)
XXH (ASCII: '0' ~ '2')
XXH (ASCII: '0' ~ '9')
XXH (ASCII: '0' ~ '2')

10's of the requested bills (Upper Check Sensor)

1's of the requested bills (Upper Check Sensor)



→
→

→ 10's of the requested bills (Eject Sensor)
→ 1's of the requested bills (Eject Sensor)

→ 10's of the requested bills (Lower Check Sensor)
→ 1's of the requested bills (Lower Check Sensor)

→ 10's of the requested bills (Eject Sensor)
→ 1's of the requested bills (Eject Sensor)

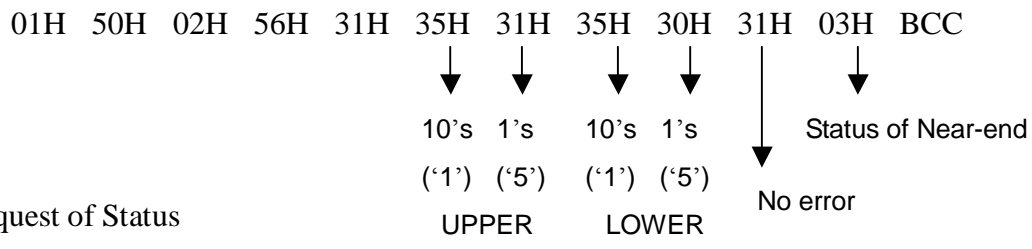
→ See 2.5.1

Status of cash box is like this

30H → Normal

31H → Status of Near end

When the user instructs the LCDM to dispense 15 bills from the upper and lower cash cassette, the response should be as follows.



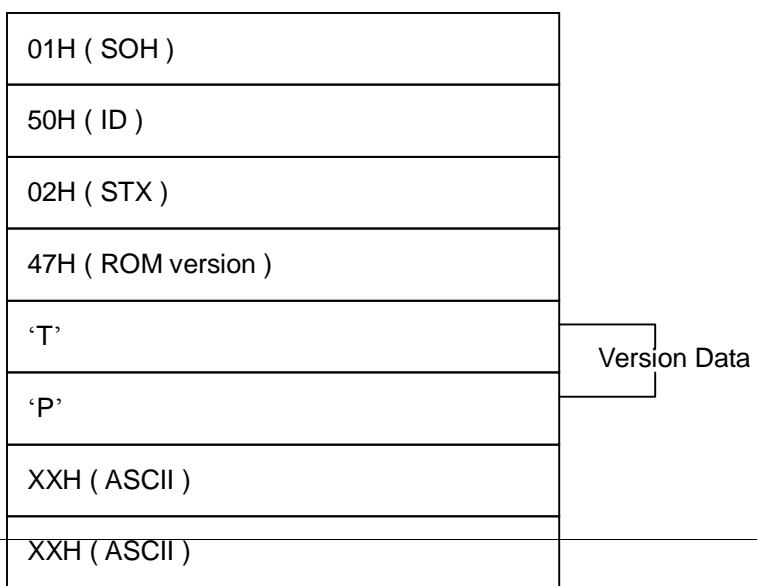
E. Request of Status

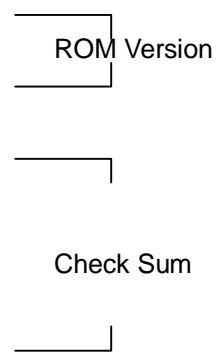
01H (SOH)
50H (ID)
02H (STX)
46H (Status)
50H
XXH (ERROR CAUSE)
XXH (SENSOR0)

See 2.5.1



F. ROM VERSION

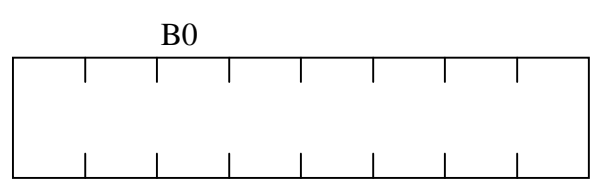




Check Sum is equal to the value supported by the ROM writer

2.5.3 SENSOR STATUS

B7
Sensor 0



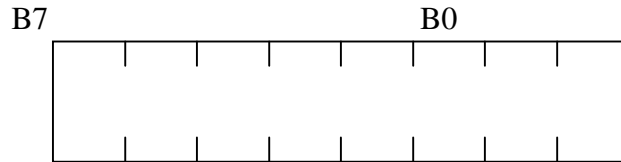
- B0 : CHECK SENSOR 1
- B1 : CHECK SENSOR 2
- B2 : DIVERT SENSOR 1
- B3 : DIVERT SENSOR 2
- B4 : EJECT SENSOR
- B5 : EXIT SENSOR



B6 : UPPER NEAR END

B7 : Always '1'

Sensor 1



B0 : SOLENOID SENSOR

B1 : CASH BOX UPPER

B2 : CASH BOX LOWER

B3 : CHECK SENSOR 3

B4 : CHECK SENSOR 4

B5 : LOWER NEAR END

B6 : Reject tray

B7 : Not used

2.5.4 Others

- Reject Codes

Reject Code	The details
33H	Too close between bills
35H	The length of bill is smaller than standard size by over the 20%
36H	Overflow Bill More bills than requested are dispensed
38H	Too seriously skewed bill
3CH	Double feeding or too thicker note than standard
3DH	Too thinner bill than standard
3EH	The length of bill is smaller than standard by over the 20%



3FH	A kind of skew In case of bill checked by the only one sensor
40H	In case of dispensing bills without being detected by check sensors