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CashCode® FL BDP

Interface Descriptions

 PT# MAN-BDP-FL Rev.A1 01/00

1. Introduction

This specification describes specifications at the data level of interfacing between the Acceptor and Controller. In regard to electrical connections and operation, refer to the specification manuals for each model.

FL BDP interface is 2-way serial interface. Control over the status and of the Acceptor is made by polling [STATUS REQUEST] and by commands ([OPERATION COMMAND] [SETTING COMMANDS]) from the Controller and also setting and confirming of functions can be made.

2. Communication format

2.1. **Common message's format**

FCh	LNG	CMD	DATA	CRC

LNG : 1 byte — Data length (Total number of bytes of entire message) or 0x05h if no data

C/R : 1 byte — Command or response (status)

DATA: 0 to 250 byte — Data if

CRC: 2 byte — Check code by CRC method

DATA — Object section is from message's begin to end of DATA

(Initial value = 0)

Error control method — Error detection CRC method

$$\left[\begin{array}{l}\text{CRC - CCITT}\\ P(X) = X^{14} + X^{12} + X^{5} + 1\end{array}\right]$$

2.1.2. Controller's message set:

Polling (status request)

FCh	05h	11h	2756h

Acknowledgement (ACK)

FCh	05h	50h	AA05h

Command

FCh	LNG	C/R	DATA	CRC

LNG : Data length
C/R : Command
DATA : Command's data
CRC : Check code by CRC method

2.1.3. Acceptor's message set:

Acknowledgement (ACK)

FCh	05h	50h	AA05h

Response format I

FCh	LNG	C/R	CRC

LNG : Data length
C/R : Status code, returned from acceptor
CRC : Check code by CRC

Response format II

FCh	LNG	C/R	DATA	CRC

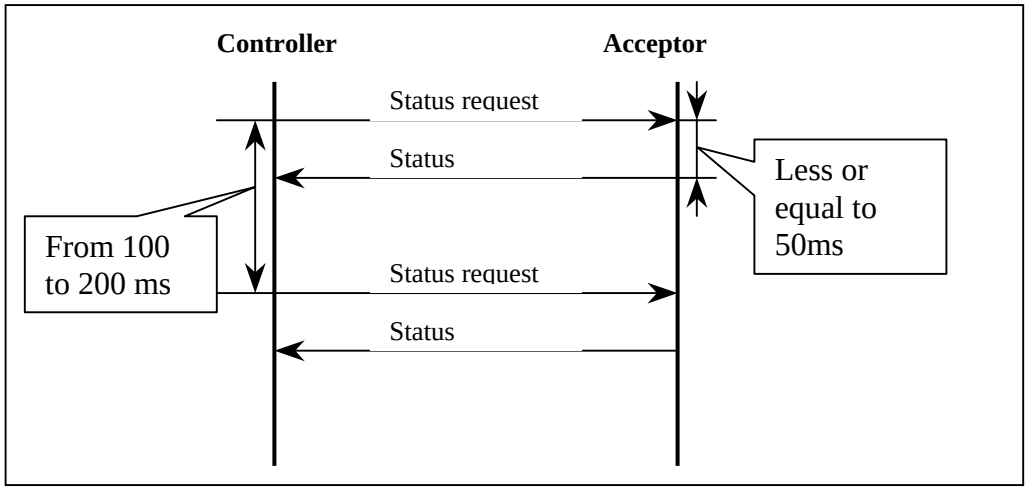
LNG : Data length
C/R : Response
DATA : Response's Data
CRC : Check code by CRC method

2.2. Transmission specifications

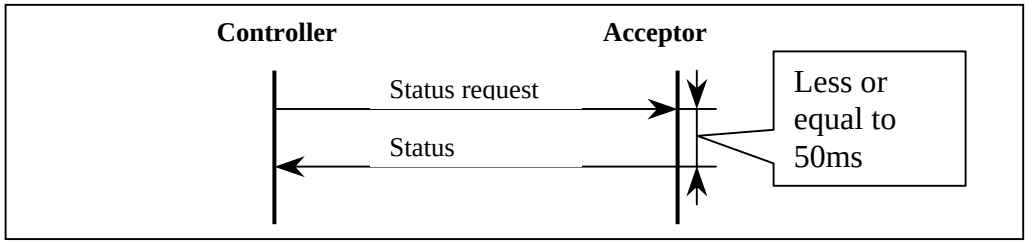
Transmission method	Full duplex transmission	
Transmission speed	9600 bps/19200 bps (Depending on the model, setting by DIP switches is possible.)	
Synchronizing method	Asynchronous method	
Connection control method	Polling method	
Data format	Start bit	1
	Data bit	8
	Parity bit	EVEN
	Stop bit	1
	X parameter	None

3. Communication flow

3.1. Transmission of STATUS REQUEST

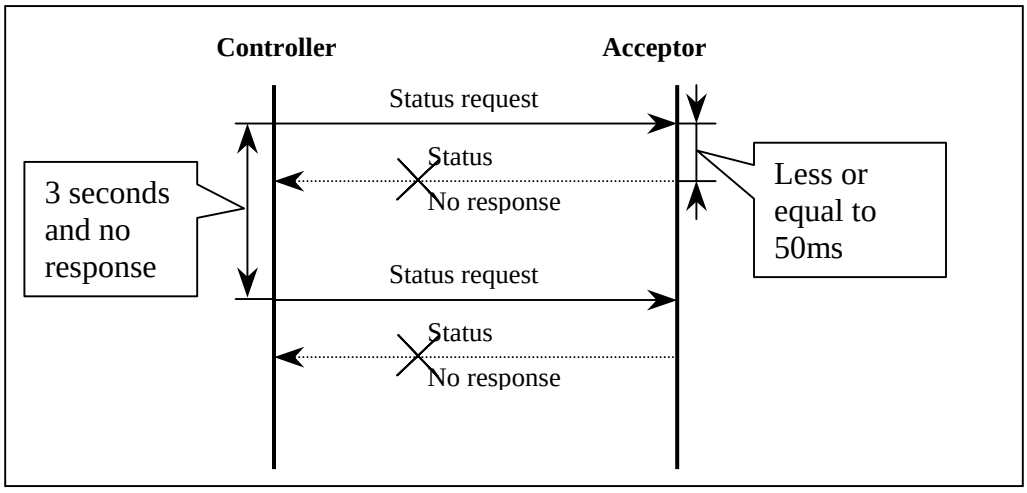


3.2. Transmission command to Acceptor



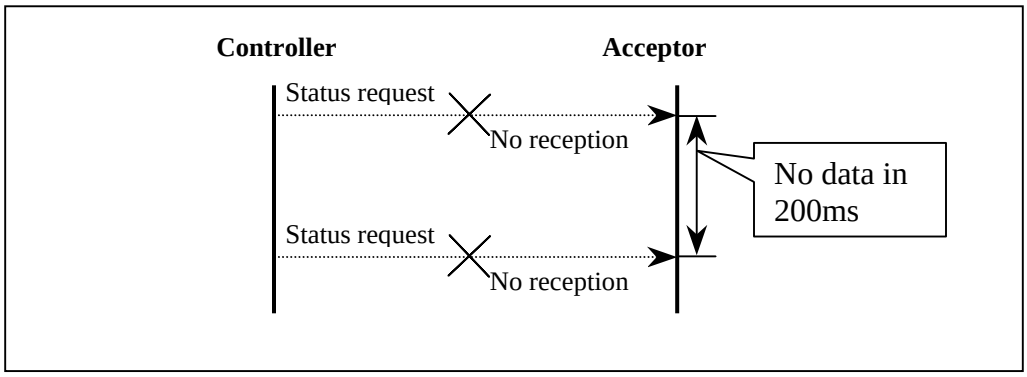
3.3. Communication error I

(Failure of communication system and power source OFF, failure etc. of acceptor.)

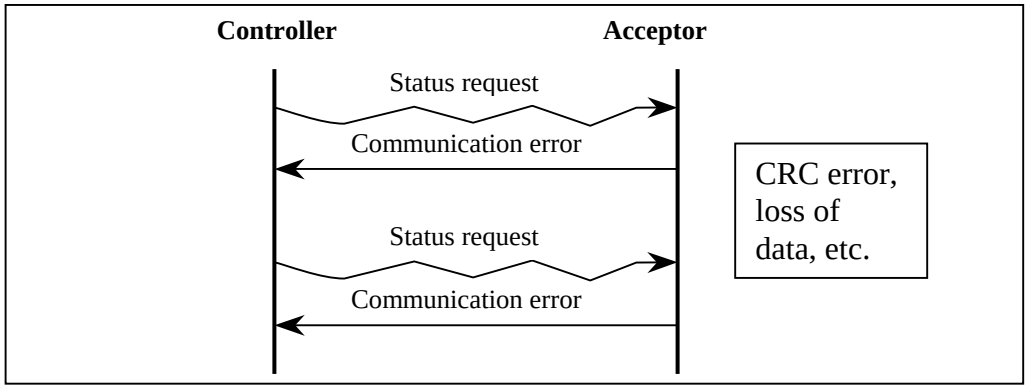


3.4. Communication error II

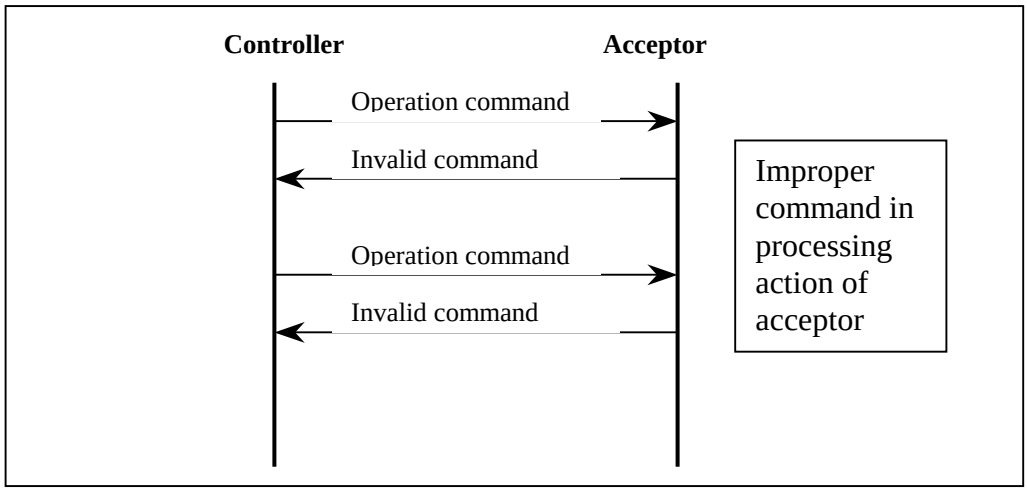
(Failure etc. of communication system)



3.5. Communication error III



3.6. Communication error IV



4. Command/response description

4.1. Status

4.1.2. STATUS REQUEST

- Request from Controller to Acceptor on status of Acceptor. By this command, the Controller monitors operation status, resetting from error status etc. of the Acceptor.
- Response from Acceptor expresses the present status of the Acceptor which is normally divided into *normal status*, *power-up status* and *error status*.
- By the power supply ON status, the Acceptor returns the following status. Also, this status is held until a [RESET] command is sent from the Controller. (Refer to 7-2).
- Method for releasing error status differs by model. For details, refer to the [Specification manual] and [DATA] setting specification manual] by model.

Controller's command code: 11h.
Acceptor's response: one from the following.

<table>
<tr><td colspan="3">Status</td></tr>
<tr><td>11h</td><td>ENABLE (IDLING)</td><td>Bill accepting standby status and operation able status.</td></tr>
<tr><td>12h</td><td>ACCEPTING</td><td>Status in which bills are taken in and validating is being conducted.</td></tr>
<tr><td rowspan="11">13h + Data</td><td rowspan="11">ESCROW</td><td>Status in which bill validation is completed and command from the Controller is awaited (The bill is held inside the Acceptor) [ESCROW DATA] (accepted denomination) of 1 byte is added. If [STATUS REQUEST] cannot be received from the Acceptor within 3 seconds while in the [ESCROW] status, and when an operation command from the Controller is not transmitted within 10 second after transmission, the bill is returned.
ESCROW DATA (Accepted denomination)</td></tr>
<tr><td><table><tr><td>DATA</td><td>Denomination</td></tr><tr><td>61h</td><td>01</td></tr><tr><td>62h</td><td>02</td></tr><tr><td>63h</td><td>03</td></tr><tr><td>64h</td><td>04</td></tr><tr><td>65h</td><td>05</td></tr><tr><td>66h</td><td>06</td></tr><tr><td>67h</td><td>07</td></tr><tr><td>68h</td><td>08</td></tr></table></td></tr>
<tr><td>*) The accepted denominations are described in the [DATA setting specifications] for each model.</td></tr>
<tr><td>14h</td><td>STACKING</td><td>Status in which bills are conveyed to the stacker and stored in accordance with OPERATION COMMAND's [STACK-1] and [STACK-2] from the Controller. (Refer to 6-3. 7-2)</td></tr>
</table>

<table>
<tr><td>15h</td><td>VEND VALID</td><td>Confirming signal of bill acceptance. Against [VEND VALID], the Acceptor holds its status until [ACK] is sent from the Controller. The Controller conducts credit up by [VEND VALID]. (Refer to 7-2)</td></tr>
<tr><td>16h</td><td>STACKED</td><td>Status from; the time bill is stored up to the time accepting of the next bill from [VEND VALID] becomes possible ([ENABLE] status)</td></tr>
<tr><td>17h + DATA</td><td>REJECTING</td><td>A status in which unacceptable bills as the result of bill validating by the Acceptor or bills by an [INHIBIT] command from the Controller are returned. (Refer to 7-3)'. [REJECT DATA] (description of rejection) of 1 byte is added.
REJECT DATA (Rejection description)
<table>
<tr><th>DATA</th><th>Description</th></tr>
<tr><td>71h</td><td>Insertion error</td></tr>
<tr><td>72h</td><td>Mag error</td></tr>
<tr><td>73h</td><td>Rejection action by remaining of bills etc. (Acceptor head section)</td></tr>
<tr><td>74h</td><td>Compensation error/multiplying factor error</td></tr>
<tr><td>75h</td><td>Conveying error</td></tr>
<tr><td>76h</td><td>Denomination assessing error</td></tr>
<tr><td>77h</td><td>Photo pattern error ①</td></tr>
<tr><td>7Sh</td><td>Photo level error</td></tr>
<tr><td>79h</td><td>Return by inhibit/insertion direction, denomination error in case a command against escrow is not transmitted</td></tr>
<tr><td>7Ah</td><td></td></tr>
<tr><td>7Bh</td><td>Operation error</td></tr>
<tr><td>7Ch</td><td>Rejecting action by remaining of bills and such (stacker section)</td></tr>
<tr><td>7Dh</td><td>Length error</td></tr>
<tr><td>7Eh</td><td>Photo pattern error ②</td></tr>
</table></td></tr>
<tr><td>18h</td><td>RETURNING</td><td>Against [ESCROW], a status in which a bill is returned by a [RETURN] command from the Controller. (Refer to 7-4)</td></tr>
<tr><td>19h</td><td>HOLDING</td><td>Against [ESCROW], a status in which a bill is held inside the Acceptor by a [HOLD] command from the Controller.</td></tr>
<tr><td>0Ah</td><td>DISABLE (INHIBIT)</td><td>A status in which acceptance of bills by the Acceptor is inhibited by a [INHIBIT] command from the Controller. (Refer to 7-5) Also a status in which all acceptable denominations are in a disable status by [ENABLE/DISABLE] command or where all receiving directions are in an inhibit status by a [DIRECTION] command.</td></tr>
</table>

<table>
<tr><td>1Bh</td><td>INITIALIZE</td><td>Status in which the Acceptor is conducting initializing action by [RESET] from the Controller. The setting command from the Controller is effective only in this status. (Refer to 7-1)</td></tr>
<tr><td colspan="3">Power Up Status</td></tr>
<tr><td>40h</td><td>POWER UP</td><td>A status in which status inside the Acceptor is normal with the Acceptor power on.</td></tr>
<tr><td>41h</td><td>POWER UP with BILL IN Acceptor</td><td>A status in which bills remain in the Acceptor head conveying section (a return possible position) with the power supply on. By a [RESET] command from the Controller, the Acceptor returns the bill and conducts initializing.</td></tr>
<tr><td>42h</td><td>POWER UP WITH BILL IN STACKER</td><td>A status in which bills remain in the stacker conveying section (a return possible position) with the power supply on. By a [RESET] command from the Controller, the Acceptor stores the bill and conducts initializing.</td></tr>
<tr><td colspan="3">Error Status</td></tr>
<tr><td>43h</td><td>STACKER FULL</td><td>A stacker box full condition (Refer to 7-6)</td></tr>
<tr><td>44h</td><td>STACKER OPEN (STACKER BOX REMOVE)</td><td>The stacker door is open or the stacker box is not mounted.</td></tr>
<tr><td>45h</td><td>JAM IN Acceptor</td><td>Jamming has occurred inside the Acceptor</td></tr>
<tr><td>46h</td><td>JAM IN STACKER</td><td>Jamming has occurred in the stacker conveying section.
An abnormal condition has developed at the tine of storing.</td></tr>
<tr><td>47h</td><td>PAUSE</td><td>A condition, which the Acceptor cannot operate because a second bill has been inserted while the first bill is being stored or conveyed (when the second bill is removed, conveying is started).</td></tr>
<tr><td>48h</td><td>CHEATED</td><td>An action thought to be mischievous against the Acceptor has been committed.</td></tr>
<tr><td>49h + DATA</td><td>FAILURE</td><td>A status in which normal operation cannot be made because of a failure, an abnormal condition, or incorrect setting of the Acceptor.
FAILURE DATA (abnormal contents)
<table>
<tr><th>DATA</th><th>Contents</th></tr>
<tr><td>A2h</td><td>Stack motor failure</td></tr>
<tr><td>A5h</td><td>Transport (feed) motor speed failure</td></tr>
<tr><td>A6h</td><td>Transport (feed) motor failure</td></tr>
<tr><td>ABh</td><td>Cash box not ready</td></tr>
<tr><td>AFh</td><td>Validator head remove</td></tr>
<tr><td>BOh</td><td>BOOT ROM failure</td></tr>
</table></td></tr>
</table>

		B1h	External ROM failure
		B2h	ROM failure
		B3h	External ROM writing failure
4Ah	COMMUNICATION ERROR	An error has developed in the communication data. (Refer to Communication error III)	
4Bh	INVALID C0MMAND	Command from the Controller is not valid. (Refer to Communication error IV)	

4.1. Operation commands

4.1.2. RESET

Controller's command code: 40h.
Acceptor's response: ACK.
A command for resetting the Acceptor. The Acceptor accepts this command regardless of its status. After the power supply is turned on (power up status), transmission is required without fail.

4.1.3. STACK-1

Controller's command code: 41h.
Acceptor's response: ACK in [ESCROW] status; otherwise [INVALID COMMAND] 4Bh.
A bill in an escrow status is conveyed to the stacker section and stored. The Acceptor becomes in a [VEND VALID] status when the bill passes the stacker lever.
*) The position of STACK-1 may differ by model.

4.1.4. STACK-2

Controller's command code: 42h.
Acceptor's response: ACK in [ESCROW] status; otherwise [INVALID COMMAND] 4Bh.
A bill in escrow status is conveyed to the stacker and stored. The Acceptor becomes in a [VEND VALID] status when a bill is stored (pushed in position).
*) The position of STACK-2 may differ by model.

4.1.5. RETURN

Controller's command code: 43h.
Acceptor's response: ACK in [ESCROW] status; otherwise [INVALID COMMAND] 4Bh.
Returns a bill in an escrow status.

4.1.6. HOLD

Controller's command code: 44h.
Acceptor's response: ACK in [ESCROW] status; otherwise [INVALID COMMAND] 4Bh.
A bill in escrow status is made to be held for 10 seconds. For continued holding, resenting of a [HOLD] command is necessary.

4.1.7. WAIT

Controller's command code: 45h.
Acceptor's response: ACK.

Status of Acceptor is made to be held for 2 seconds. To continue holding this status, resenting of a [WAIT] command is necessary.

4.2. Response to [VEND VALID]

4.2.2. ACK (Affirmative response)

Code: 50h
Acceptor's response against an [OPERATION COMMAND] from the Controller.
Controller's response against [VEND VALID] from the Acceptor.

4.3. Setting commands

4.3.2. ENABLE/DISABLE

Controller's command and data:

C0h	+	DATA1	+	DATA2

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA1	08	07	06	05	04	03	02	01	<- Denomination
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA2	0	0	0	0	0	0	0	0	

0:enable
1:disable (default: 00h)

Acceptor's response:

C0h	+	DATA1	+	DATA2	[echo back]

Accepting by each denomination is set.
[ENABLE/DISABLE DATA] of 2 bytes are added. Receiving is possible only then Acceptor is initialized. However INHIBIT is excluded.

4.3.3. SECURITY

Controller's command and data:

C1h	+	DATA1	+	DATA2

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA1	08	07	06	05	04	03	02	01	<- Denomination
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA2	0	0	0	0	0	0	0	0	

0: normal; 1: security level high (default: 00h)

Acceptor's response:

C1h	+	DATA1	+	DATA2	[echo back]

Validating level by each denomination is set. [SECURITYDATA] of 2 bytes is added. Receiving is possible only then Acceptor is initialized. However INHIBIT is excluded.

4.3.4. INHIBIT

Controller's command and data:

C3h	+	DATA(1byte)

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
DATA	0	0	0	0	04	03	02	01

0: not inhibit
1: inhibit (default: 01h)

Acceptor's response:

C3h	+	DATA(1byte)	[echo back]

Status of Acceptor is temporarily made acceptance inhibit. [INHIBIT DATA] of 1 byte are added.
* INHIBIT can be accepted in any status.

Set during acceptance of bill	Return bill and becomes in INHIBIT status
Set during validating of bill	
Set while in escrow status	
Set during storing of bill	After storing bill. becomes in INHIBIT status.
Set while in vend valid	

4.3.5. DIRECTION

Controller's command and data:

C4h	+	DATA(1byte)

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA	0	0	0	0	0	0	0	inh	<- Direction

0: not inhibit
1: inhibit

Acceptor's response:

C4h	+	DATA(1byte)	[echo back]

Sets accepting direction of bill.
[DIRECTION DATA] of 1 byte are added.

4.3.6. OPTIONAL FUNCTION

Controller's command and data:

C5h	+	DATA1	+	DATA2

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA1	08	07	06	05	04	03	02	01	<- OPTION
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA2	0	0	0	0	0	0	0	0	

0: disable
1: enable (default: 00h)

Acceptor's response:

C5h	+	DATA1	+	DATA2	[echo back]

Sets option function of Acceptor.
[OPTIONAL FUNCTION DATA] of 2 bytes is added.

4.4. Setting status request

4.4.2. ENABLE/DISABLE

Controller's command and data:

80h	+	DATA1	+	DATA2

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA1	08	07	06	05	04	03	02	01	<- Denomination
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA2	0	0	0	0	0	0	0	0	

0: enable
1: disable (default: 00h)

Acceptor's response:

80h	+	DATA1	+	DATA2	[echo back]

Transmission request for set acceptance status of acceptor by each denomination [ENABLE/DISABLE] commands as well as status of accepting denominations set by DIP switches are added as [ENABLE/DISABLE DATA] of 2 bytes.
*) Settings of DIP switches are described in the [Specification manual] for each model.

4.4.3. SECURITY

Controller's command and data:

81h	+	DATA1	+	DATA2

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA1	08	07	06	05	04	03	02	01	<- Denomination
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA2	0	0	0	0	0	0	0	0	

0: normal; 1: security level high (default: 00h)

Acceptor's response:

81h	+	DATA1	+	DATA2	[echo back]

Request for transmission of set status of validating level by each denomination
[SECURITY DATA] of 2 bytes are added.

4.4.4. INHIBIT

Controller's command and data:

83h	+	DATA(1byte)

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
DATA	0	0	0	0	04	03	02	01

0: not inhibit
1: inhibit (default: 01h)

Acceptor's response:

83h	+	DATA(1byte)	[echo back]

Transmission request for set status of acceptance inhibit of the Acceptor
[INHIBIT DATA] of 1 byte are added.

4.4.5. DIRECTION

Controller's command and data:

84h	+	DATA(1byte)

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA	0	0	0	0	0	0	0	inh	<- Direction

0: not inhibit
1: inhibit

Acceptor's response:

84h	+	DATA(1byte)	[echo back]

Request for transmission of set status of bill acceptance direction.
[DIRECTION DATA] of 1 byte are added

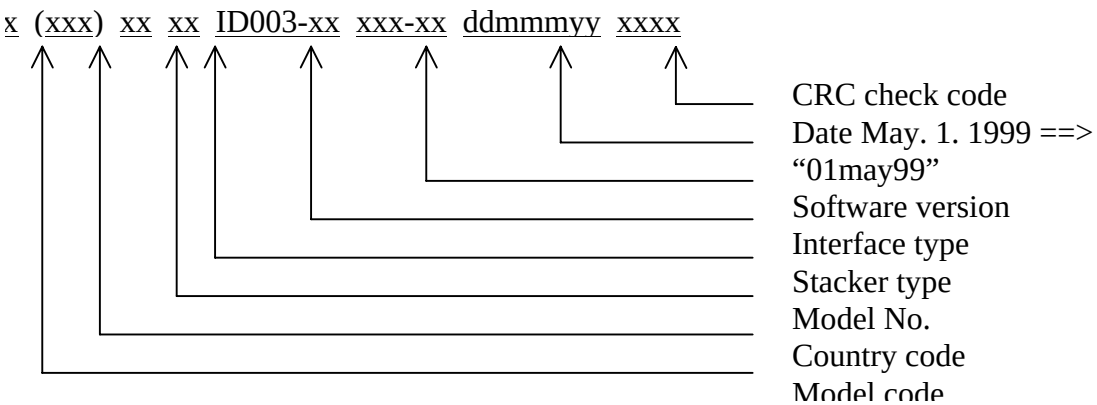
4.4.6. VERSION REQUEST

Controller's command code: 88h.
Acceptor's response:

88h	+	DATA

DATA

The Acceptor responds to MODEL/ID/VERS10N/CRS etc. by ASCII data.
Data length expresses the following meanings from the top, as
([LNG]-5) bytes (variable).



Request for transmission of Acceptor MODEL/ID/VERSION
ASCII data of 36 bytes are added

4.4.7. BOOT VERSION REQUEST

Controller's command code: 89h.
Acceptor's response:

89h	+	DATA(4byte)

DATA

The Acceptor responds to the BOOT VERSION by 4 byte ASCII data.

Request for of BOOT VERSION of Acceptor
ASCII data of 4 bytes are added.

4.4.8. OPTIONAL FUNCTION

Controller's command and data:

85h	+	DATA1	+	DATA2

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA1	08	07	06	05	04	03	02	01	<- OPTION
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
DATA2	0	0	0	0	0	0	0	0	

0: disable
1: enable (default: 00h)

Acceptor's response:

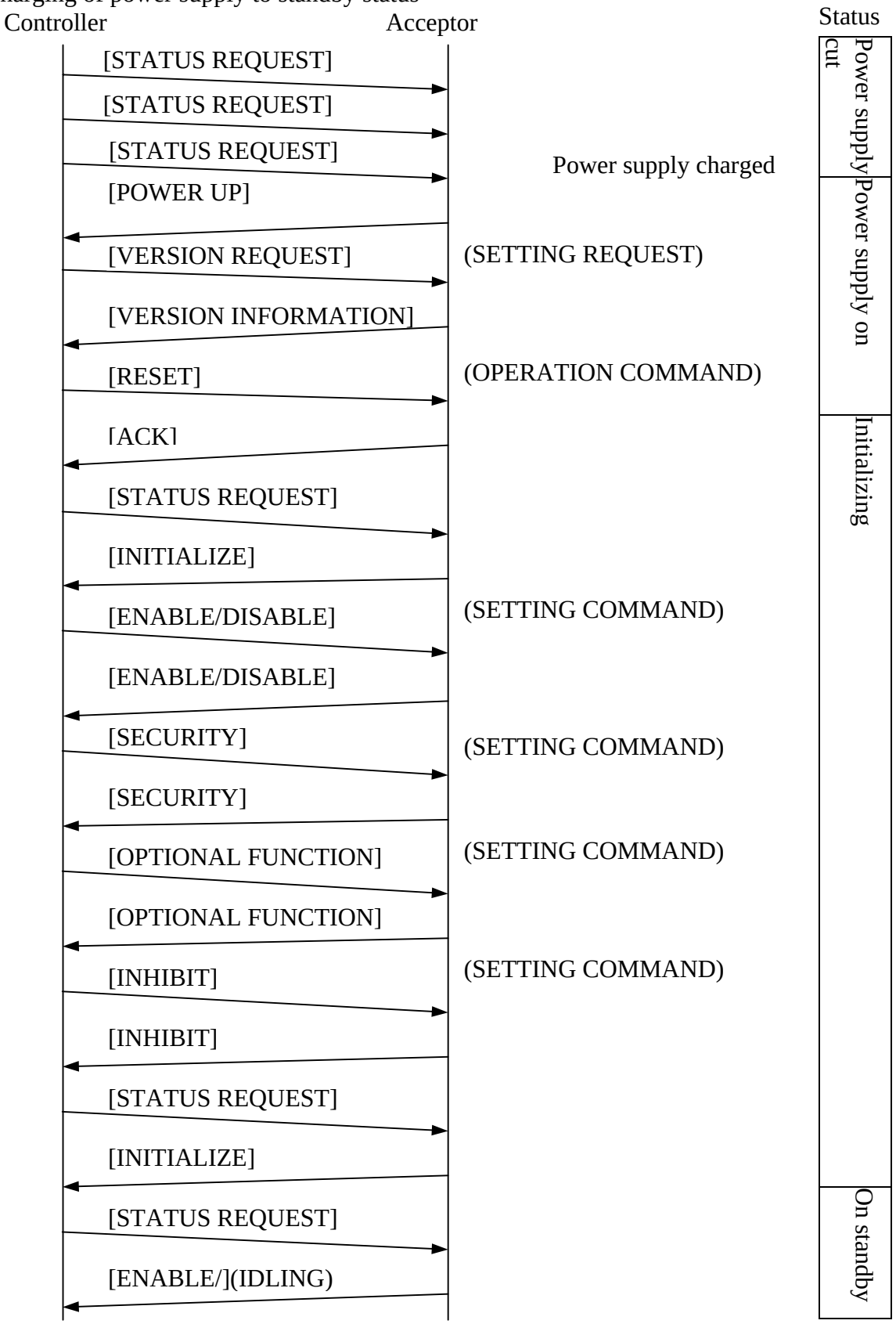
85h	+	DATA1	+	DATA2	[echo back]

Request for transmission of setting status of [OPTIONAL FUNCTION] command.
[OPTIONAL FUNCTION DATA] of 2 bytes are added

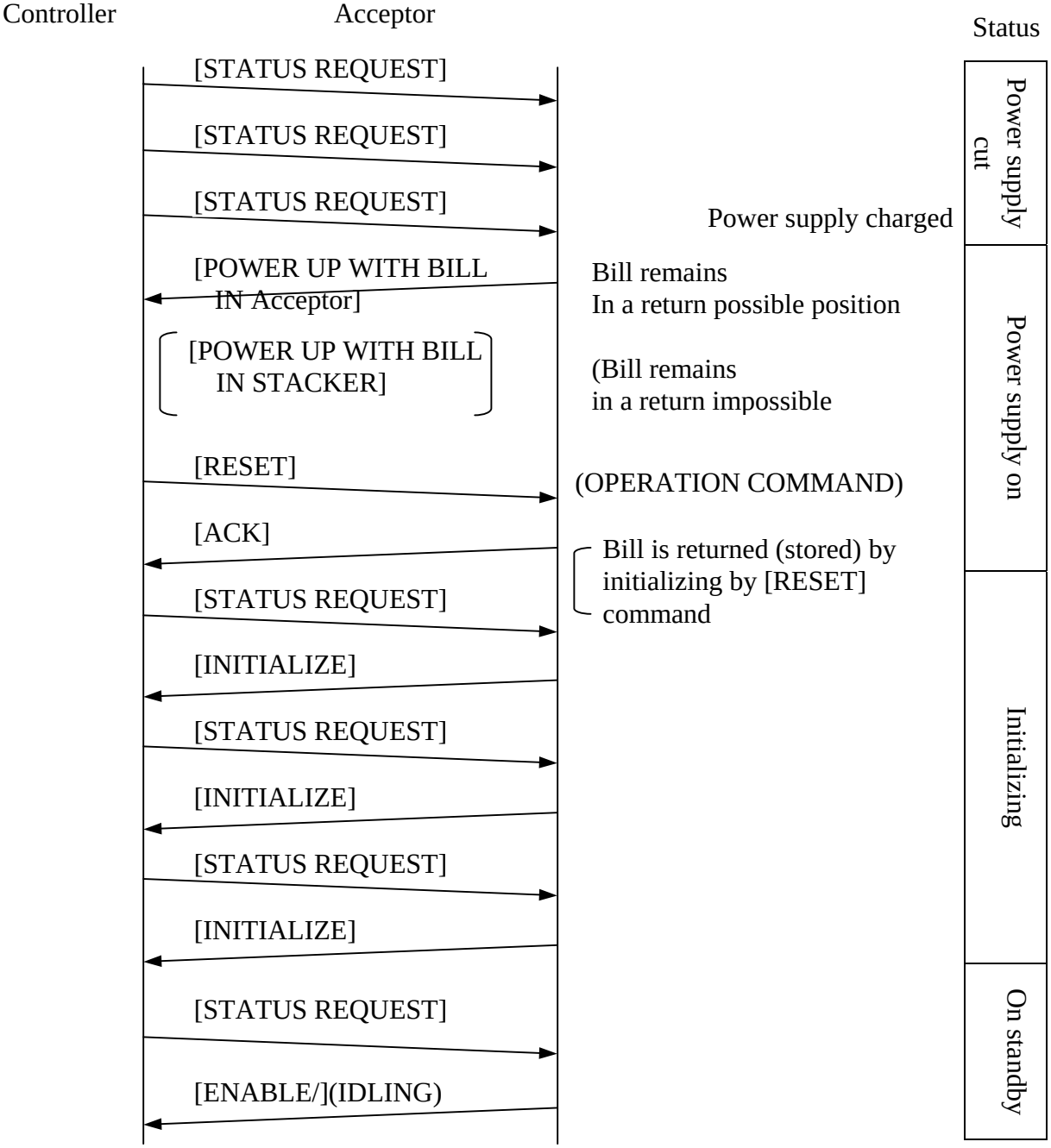
5. Timing chart

5.1. Power ON

From charging of power supply to standby status

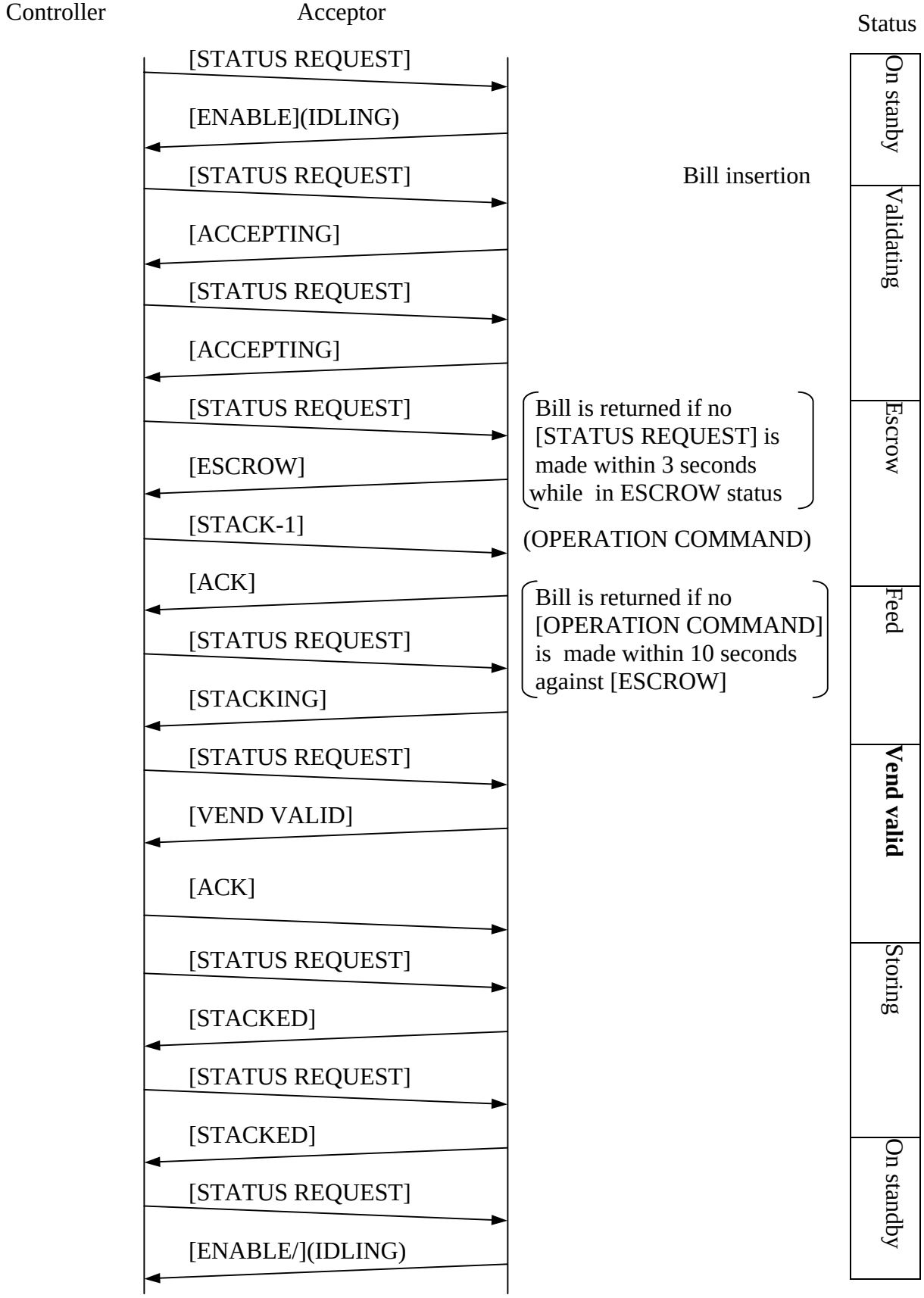


From charging of power supply to standby status
When bill remains inside the Acceptor at the time of power charging

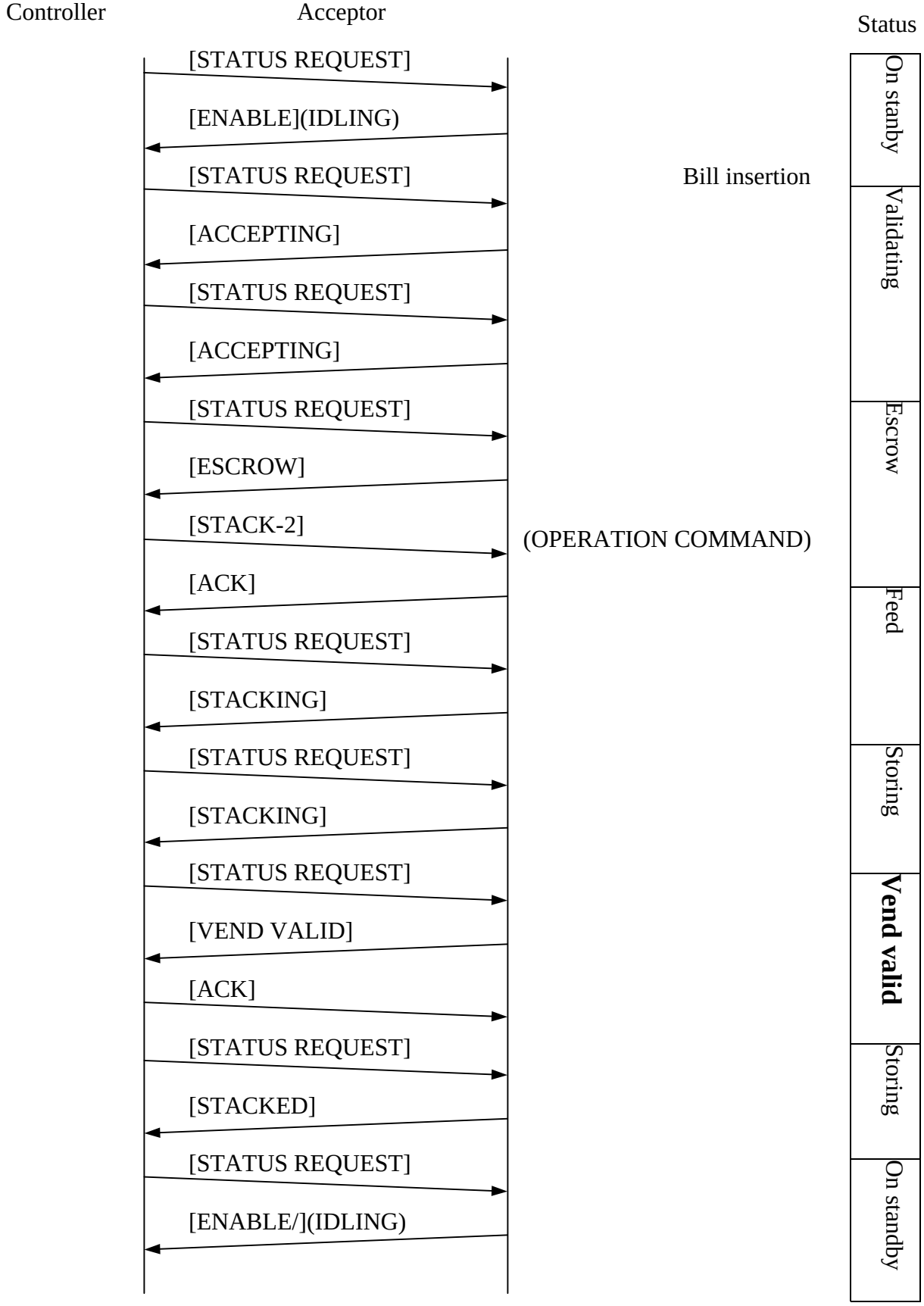


5.2. Accepting of bill

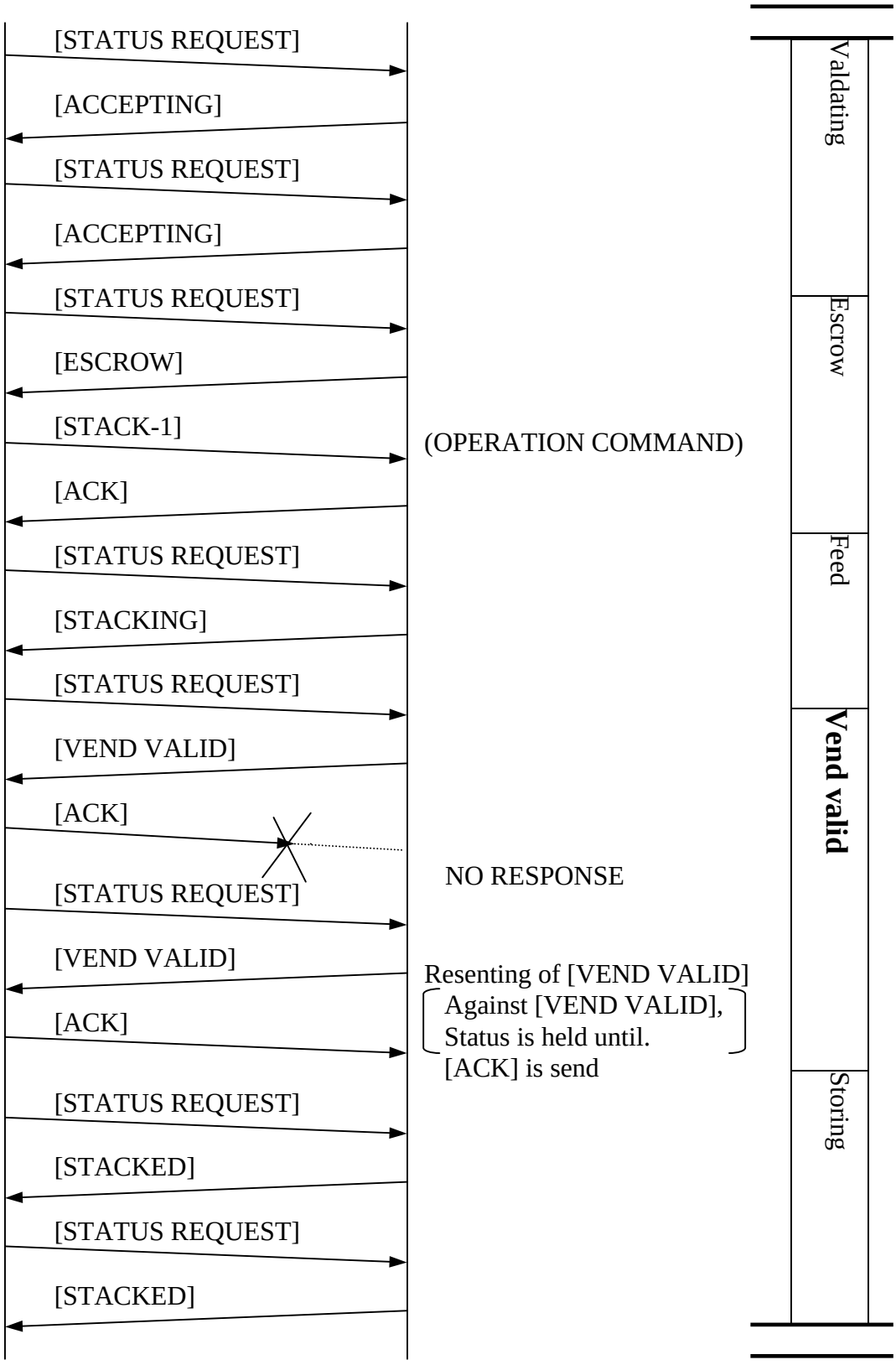
Accepting of bill by [STACK –1] command



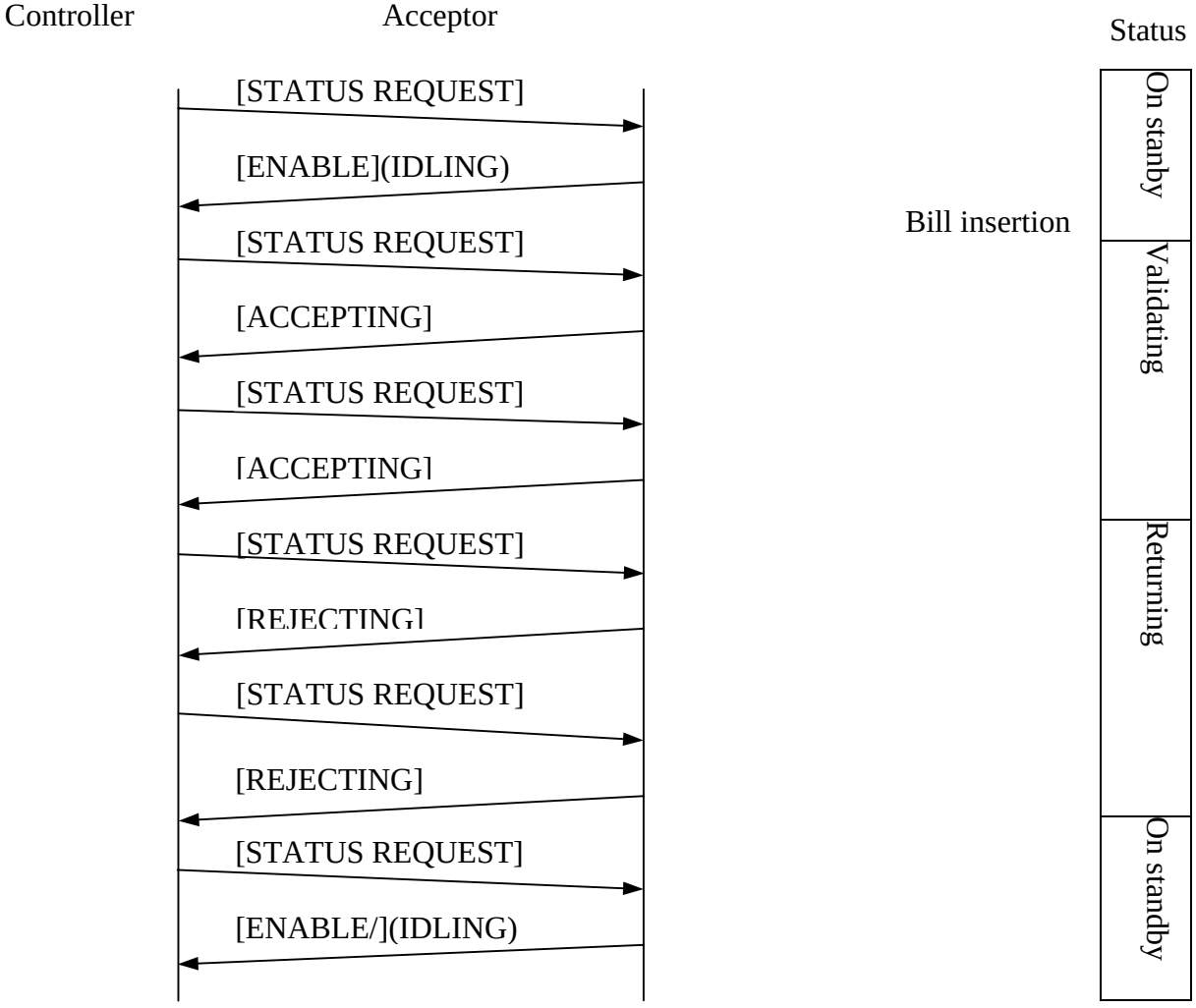
Accepting of bill by [STACK –2] command



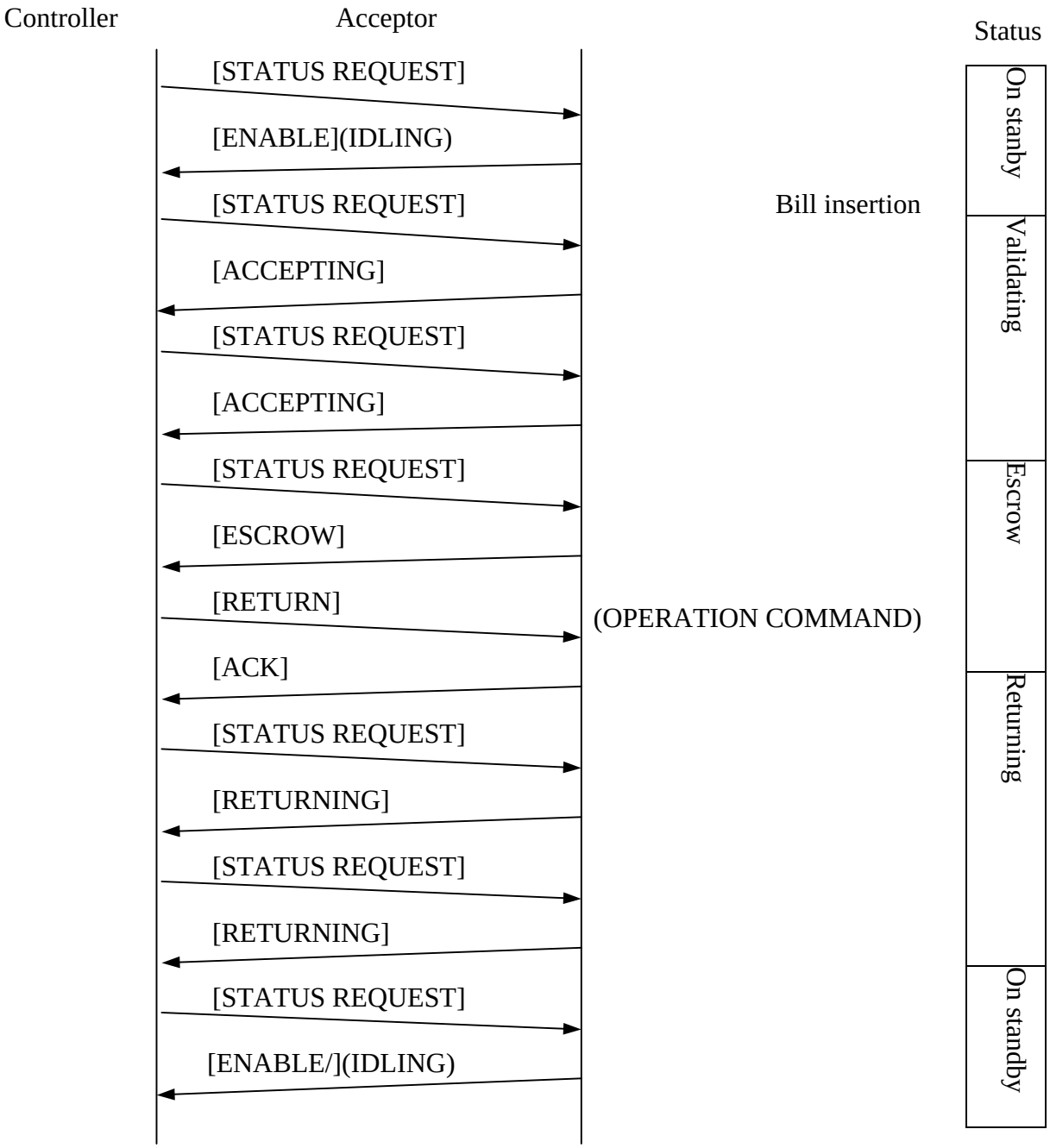
Resenting of [VEND VALID]



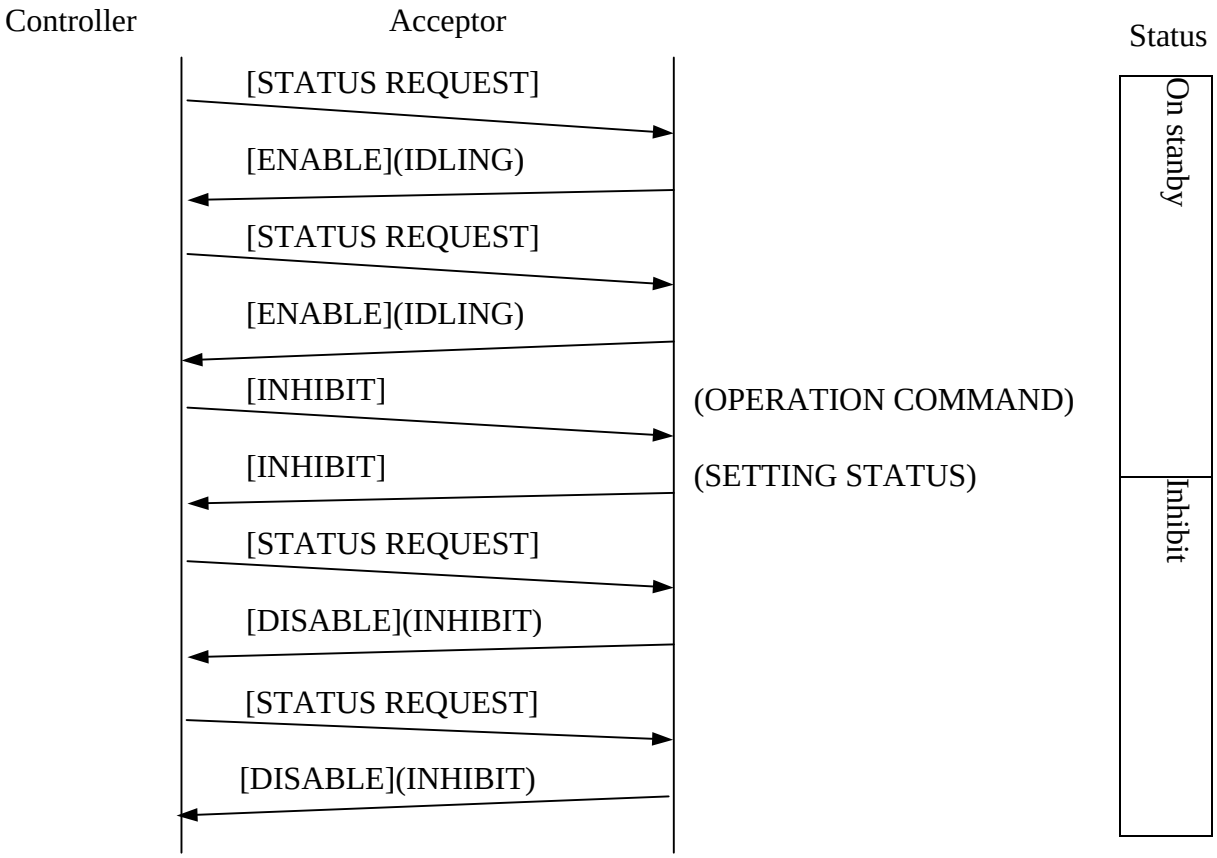
5.3. Rejection of bills by validating



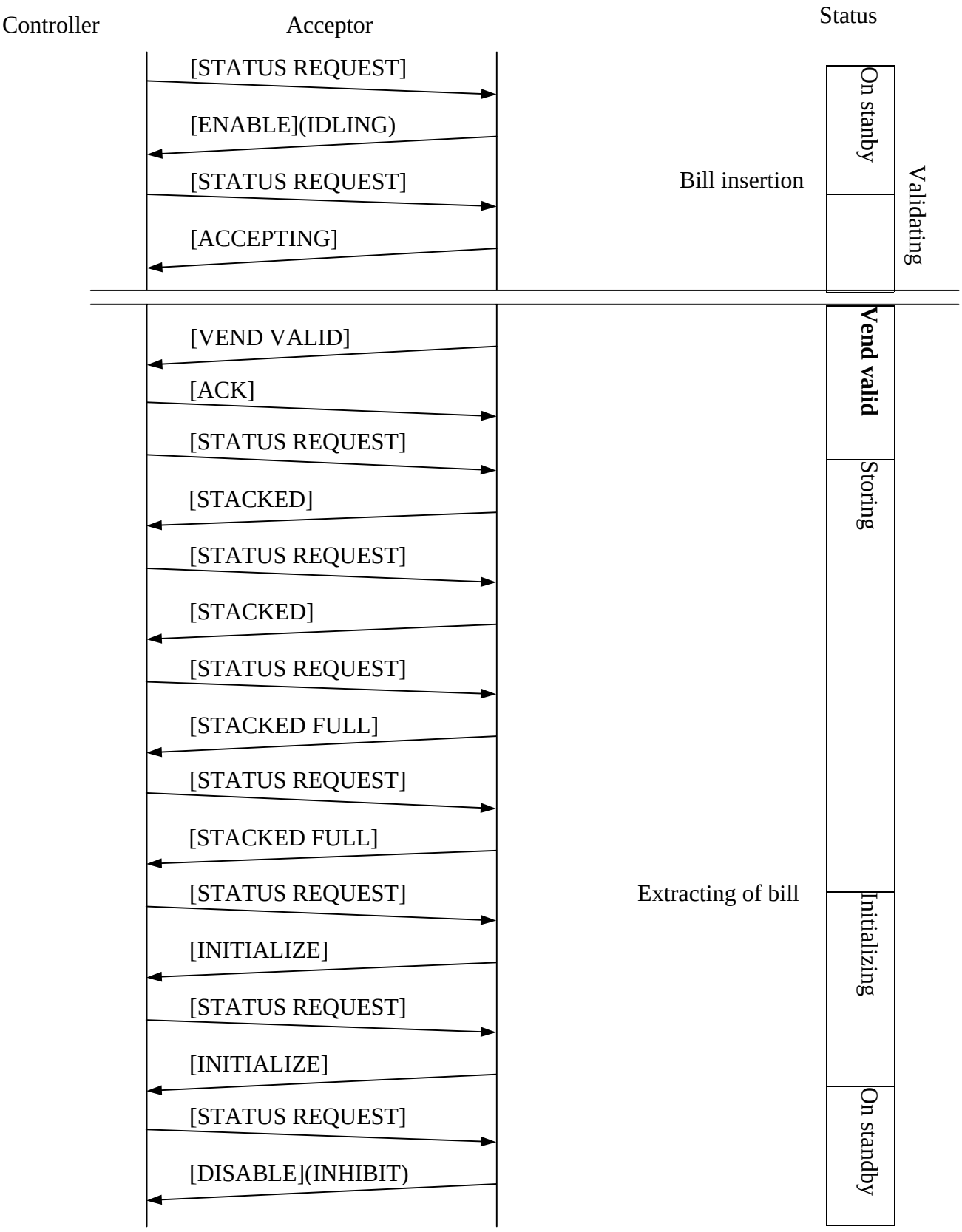
5.4. Returning of bill by [RETURN] command



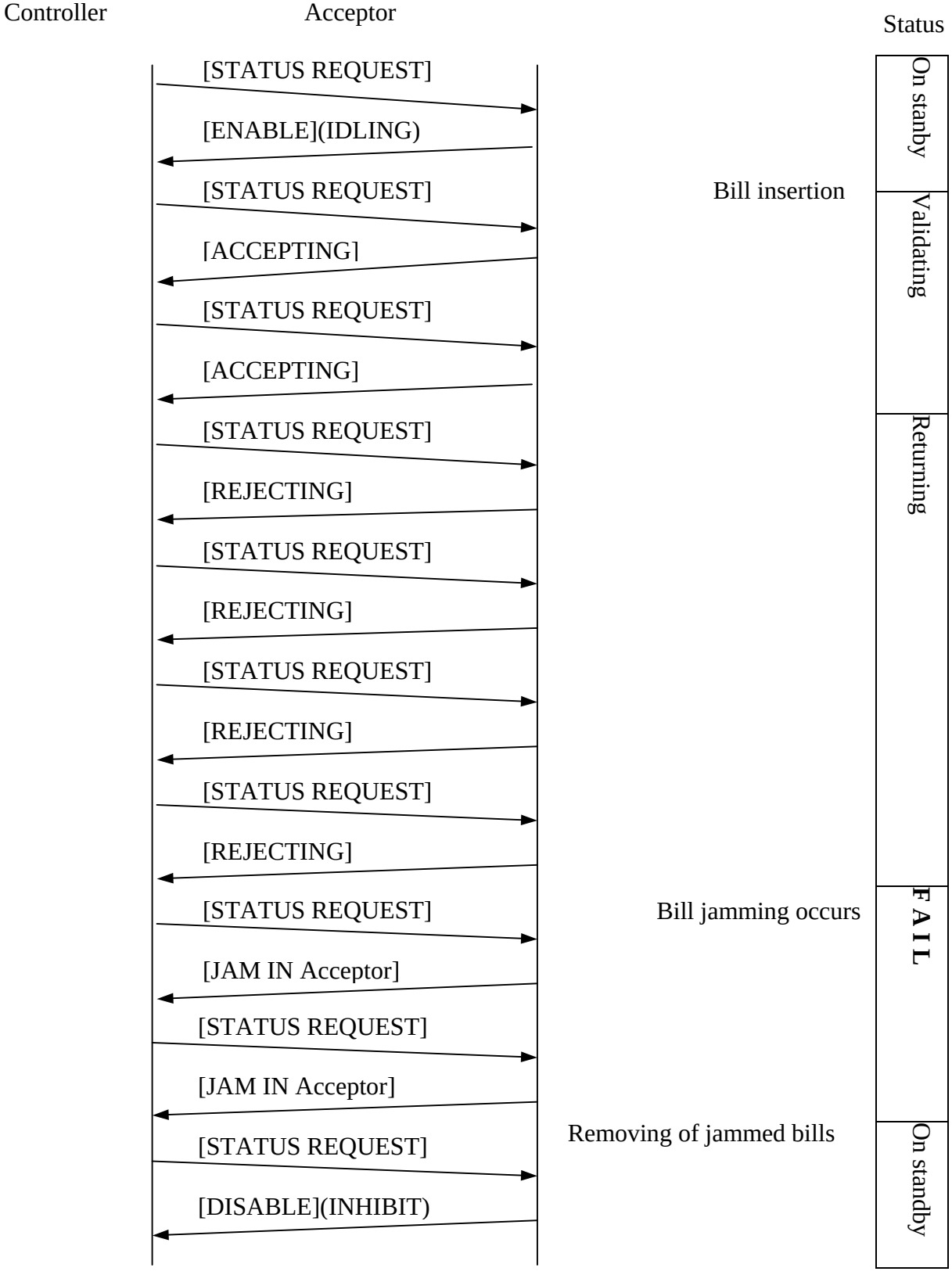
5.5. Inhibit of accepting by ACCEPTOR



5.6. Stacker full (STACK-1)



5.7. Bill jamming at the time of returning



6. Attachment 1. Command/response list

Controller ==> Acceptor		Acceptor ==> Controller	
STATUS			
STATUS REQUEST	11H	ENABLE (IDLING)	11H
		ACCEPTING	12H
		ESCROW	13H+DATA
		STAKING	14H
		VEND VALID	15H
		STACKED	16H
		REJECTING	17H+DATA
		RETURNING	18H
		HOLDING	19H
		DISABLE (INHIBIT)	1AH
		INITIALIZE	1BH
		POWER UP STATUS	
		POWER UP	40H
		POWER UP WITH BILL IN ACCEPTOR	41H
		POWER UP WITH BILL IN STACKER	42H
		ERROR STATUS	
		STACKER FULL	43H
		STACKER OPEN	44H
		JAM IN ACCEPTOR	45H
		JAM IN STACKER	46H
		PAUSE	47H
		CHEATED	48H
		FAILURE	49H+DATA
		COMMUNICATION ERROR	4AH
RESPONSE TO [VEND VALID]			
ACK	50H		
OPERATION COMMAND		RESPONSE TO OPERATION COMMAND	
RESET	40H	ACK	50H
STACK-1	41H	INVALID COMMAND	4BH
STACK-2	42H		
RETURN	43B		
HOLD	44H		
WAIT	45H		
SETTING COMMAND		RESPONSE TO SETTING COMMAND	
ENABLE/DISABLE (DENOMI	COH+DATA	ENABLE/DISABLE (DENOIII) : SECURITY (DENOMI)	C0H+ DATA
SECURITY (DENOMI)	C1H+DATA	INHIBIT (ACCEPTOR)	C1H+DATA
INHIBIT (ACCEPTOR)	C3H+DATA	DIRECTION	C3H+DATA
DIRECTION	C4H+DATA	OPTIONAL FUNCTION ;	C4H+DATA
OPTIONAL FUNCTION	C5H+DATA		C5H+DATA
SETTING STATUS REQUEST		SETTING STATUS	
ENABLE/DISABLE (DENOMI)	80H	ENABLE/DISABLE (DENOMI)	80H+DATA
SECURITY (DENOMI)	81H	SECURITY (DENOMI)	81H+DATA
INHIBIT (ACCEPTOR)	83H	INHIBIT (ACCEPTOR)	83H+DATA
DIRECTION	84H	DIRECTION	84H+DATA
OPTIONAL FUNCTION	85H	OPTIONAL FUNCTION	85H+DATA
VERSION REQUEST	88H	VERSION INFORMATION	88H+DATA
BOOT VERSION REQUEST	89H	BOOT VERSION INFORMATION	89H+DATA