

BILL Validator

BVU-A7 / BVU-A7-SF / BVU-A7-SR

Russian version

Interface Specification

Ver.01.00

Date 2005.9.16

DIP SW setting

DIP switch setting designates the interface to use.
 Make sure to power down when setting DIP switch.

DIP Switch 1 (SW1) : Set to accept or reject a bill

1	Set for OFF	
2	Set for OFF	
3	ON	Reject RUR 10
	OFF	Accept RUR 10
4	ON	Reject RUR 50
	OFF	Accept RUR 50
5	ON	Reject RUR 100
	OFF	Accept RUR 100
6	ON	Reject RUR 500
	OFF	Accept RUR 500
7	ON	Reject RUR 1000
	OFF	Accept RUR 1000
8	Set for OFF	

DIP Switch 2 (SW2) : Interface setting

1	ON	Serial interface chosen	
	OFF	Pulse interface chosen	
2	Pulse width (ref. Table A) setting		Pulse interface only
3			
4	ON	1 pulse = RUR 0.5	Pulse interface only
	OFF	1 pulse = RUR 5	
5	ON	Exit sensor invalid	Common
	OFF	Exit sensor valid	
6	ON	“INHIBIT” signal low active	Pulse interface only
	OFF	“INHIBIT” signal high active	
7	ON	“ABN” signal low active	Pulse interface only
	OFF	“ABN” signal high active	
8	ON	Validation level high	Common
	OFF	Validation level standard	

Table-A (Pulse interface only)

DIPSW2-2	DIPSW2-3	Pulse width setting
OFF	OFF	80ms / 120ms
ON	OFF	150ms / 180ms
OFF	ON	50ms / 50ms
ON	ON	50ms / 300ms

Pulse interface

Signals

ID	I/O	Remarks
INH	IN	Inhibit signal
BUSY	OUT	Unit working
VEND	OUT	Accept value signal
ABN	OUT	Emergency signal

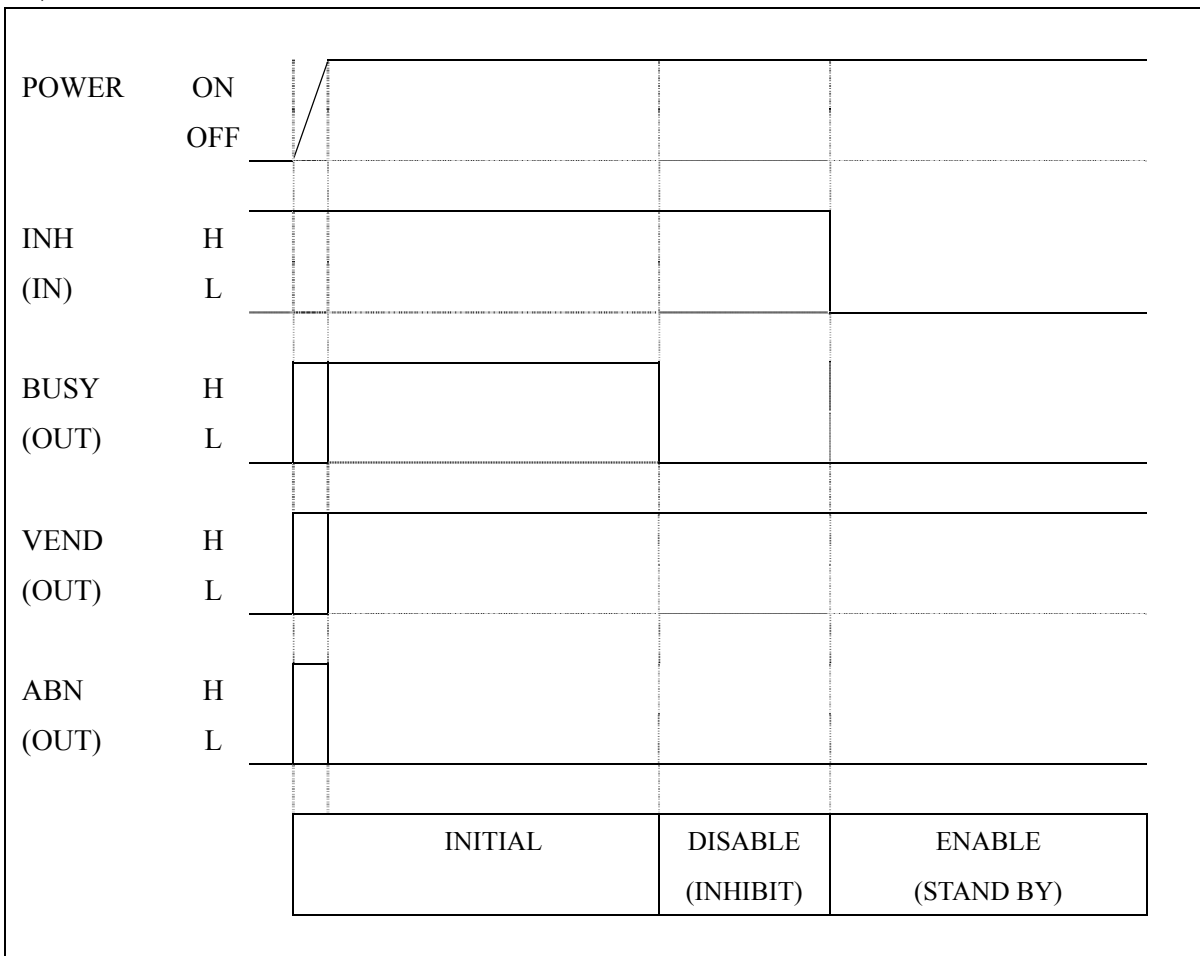
Time chart

Following is an example of time chart with the DIP switch 2 set as follows.

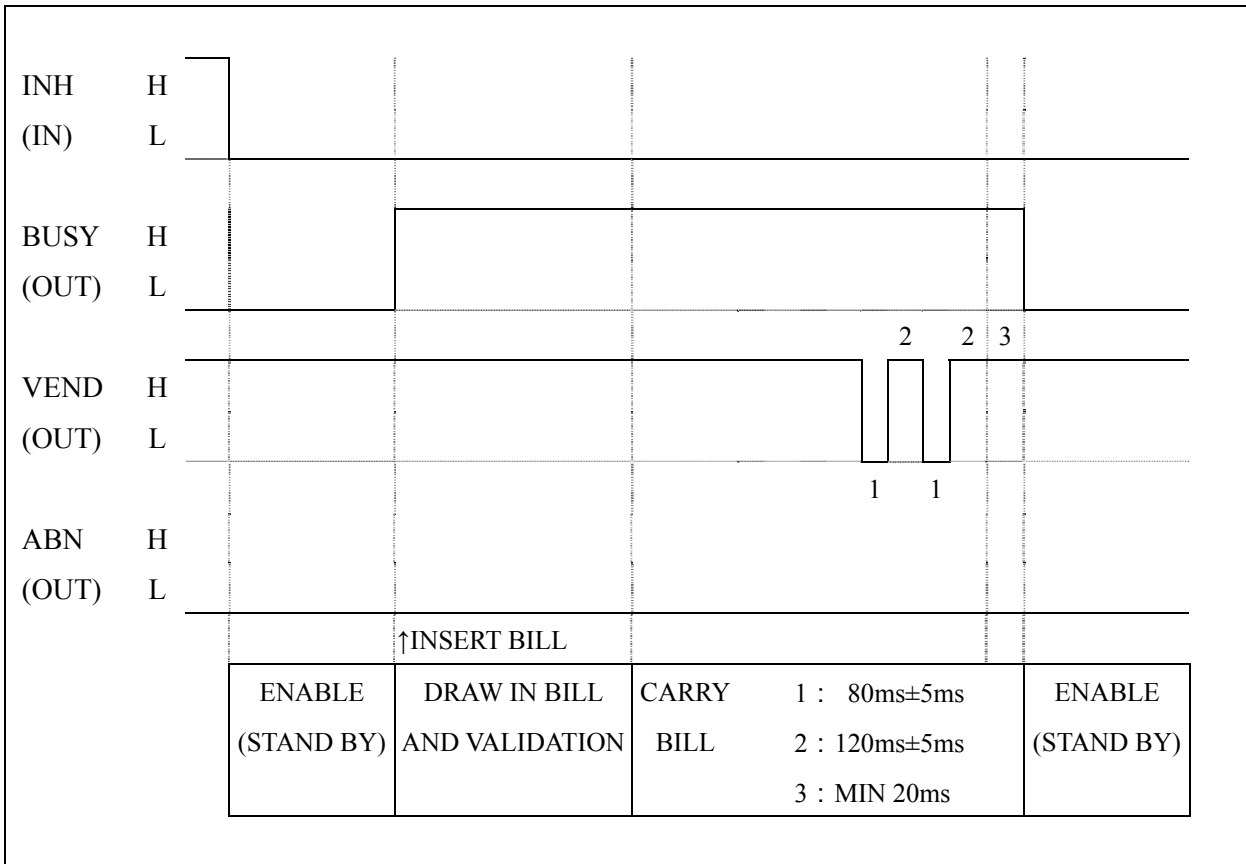
* Setting example of DIP switch 2 (SW2)

1	OFF	Pulse interface chosen
2	OFF	Pulse width set at 80ms / 120ms
3	OFF	
4	OFF	1 pulse = RUR 5
5	OFF	Exit sensor valid
6	OFF	“INHIBIT” signal high active
7	OFF	“ABN” signal high active
8	OFF	Validation level standard

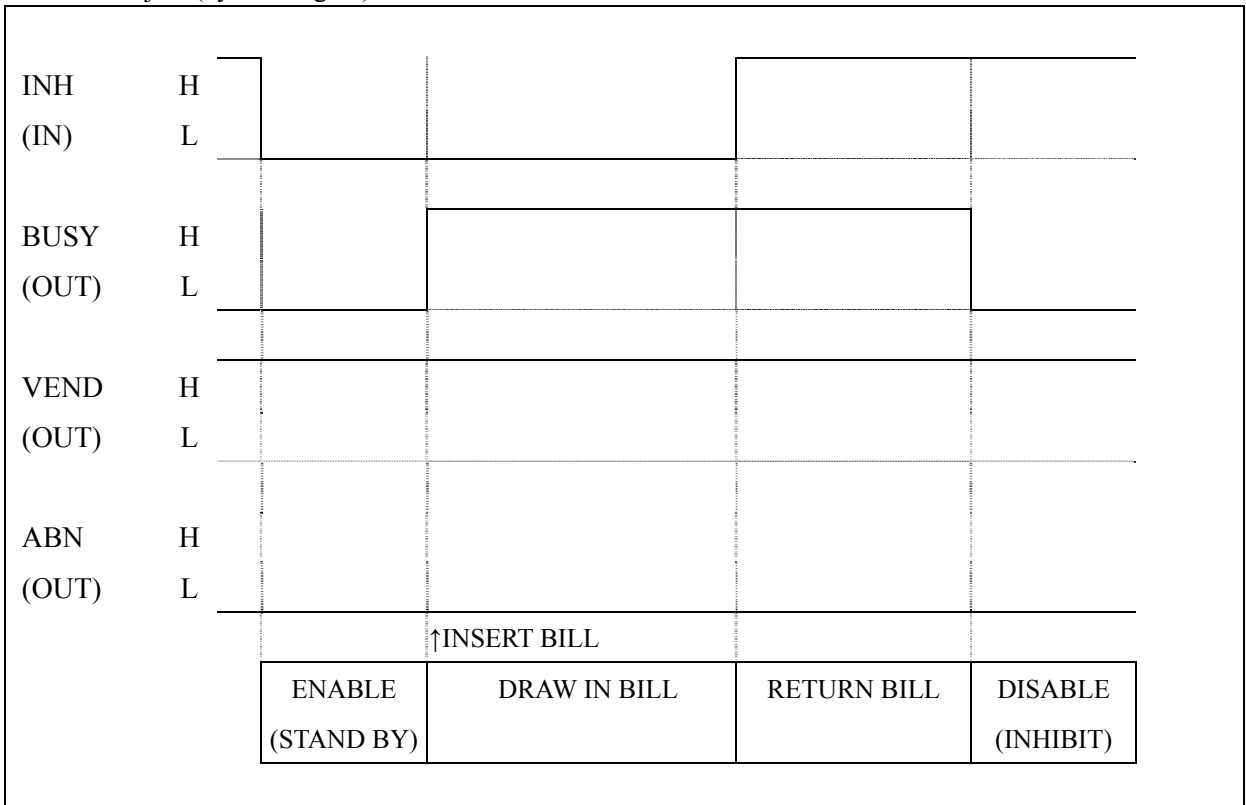
1、POWER UP



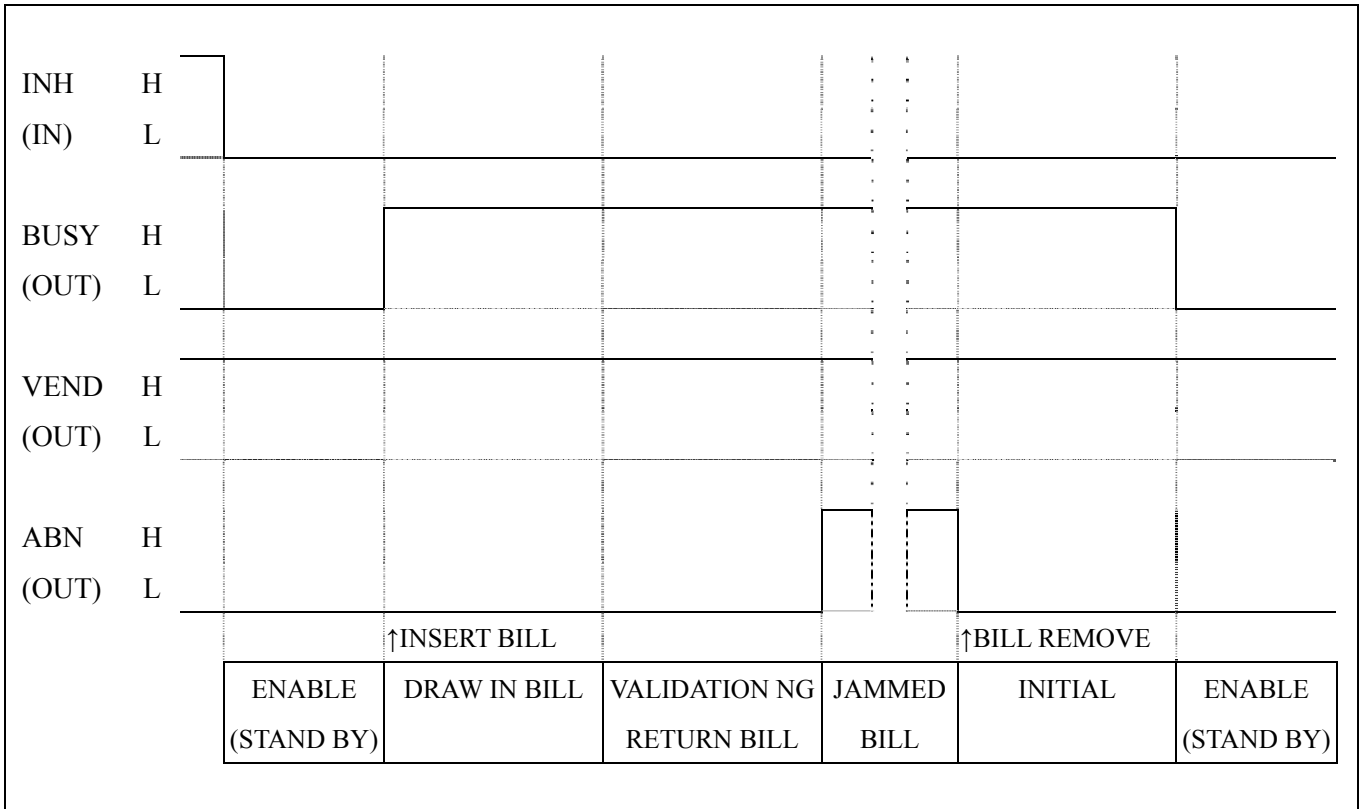
2、 Note acceptance (ex : RUR 10)



3、 Note reject (by INH signal)



4、Note stuck



Serial Interface

1、 Transmission control

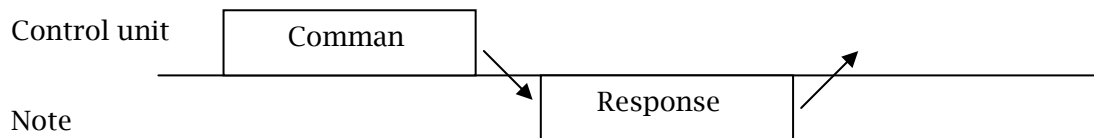
- 1) Transmission Semi-dual system
- 2) Transmission 9600bps
- 3) Synchronization method Asynchronous communication
- 4) Control method Polling
- 5) Data format Start bit: 1
Stop bit: 1
Data: 8
Even parity: 1
- 6) Flow control None

7) Command & response format

SYNC	LNG	CMD	DATA	CRC
------	-----	-----	------	-----

ID	Bite length	Description
SYNC	1	Leading letter to be discriminated
LNG	1	Total data from SYNC to CRC
CMD	1	Command
DATA	0 ~ 250	Added data(number of bite differs according to command)
CRC	2	CRC type check code for SYNC to DATA

Sends back response according to the command the control unit issued



8) Error control

CRC type

$$\left(\begin{array}{l} \text{CRC-CCITT} \\ P(x) = X^{16} + X^{12} + X^5 + 1 \end{array} \right)$$

2、Message format of command and response

Command and response are classified to the five types below

2 - 1、Message transmitted for the validator from control unit

1) Status request

SYNC	LNG	CMD	CRC
------	-----	-----	-----

S Y N C : F C h
L N G : 0 5 h
C M D : 1 1 h (Status Request)
C R C : CRC Check code

2) Command

SYNC	LNG	CMD	DATA	CRC
------	-----	-----	------	-----

S Y N C : F C h
L N G : Transmission data total (varies depending upon the command)
C M D : Command (See command list)
D A T A : Data to be added to Command
C R C : CRC Check code

2 - 2、Message transmitted from the validator to the control unit

1) Response I

SYNC	LNG	SST	CRC
------	-----	-----	-----

S Y N C : F C h
L N G : 0 5 h
S S T : Status code
C R C : CRC Check code

2) Response II

SYNC	LNG	CMD	DATA	CRC
------	-----	-----	------	-----

S Y N C : F C h
L N G : Transmission data total
C M D : Response
D A T A : Data added to Response
C R C : CRC Check code

2 - 3、Positive response

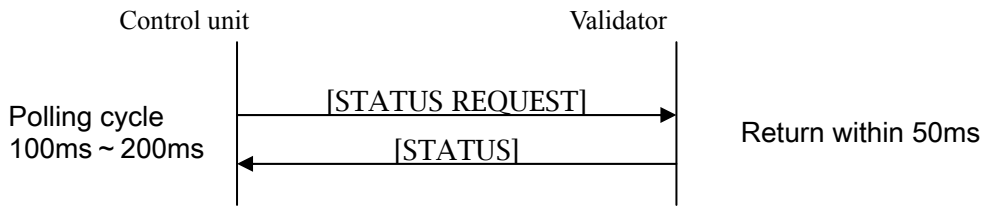
1) A C K

SYNC	LNG	CMD	CRC
------	-----	-----	-----

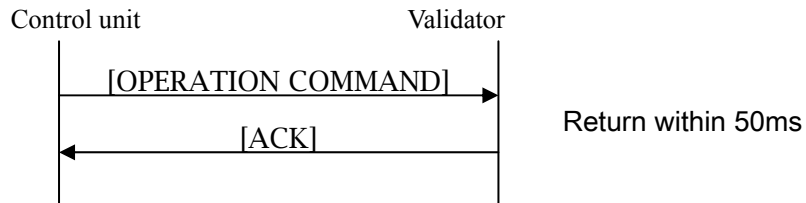
S Y N C : F C h
L N G : 0 5 h
C M D : 5 0 h
C R C : CRC Check code

3、Transmission chart

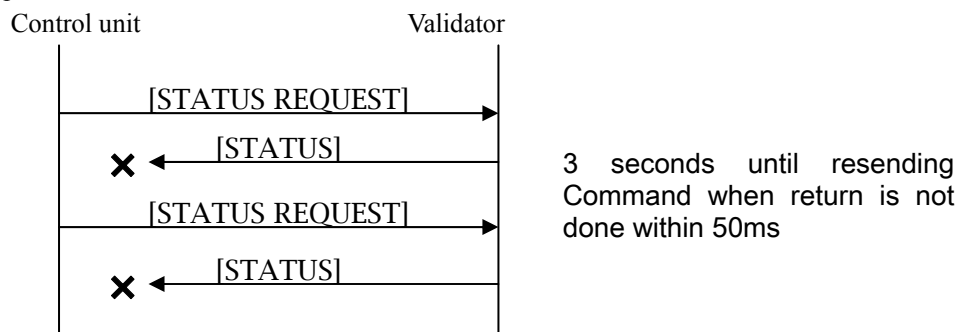
1) Transmission of STATUS REQUEST



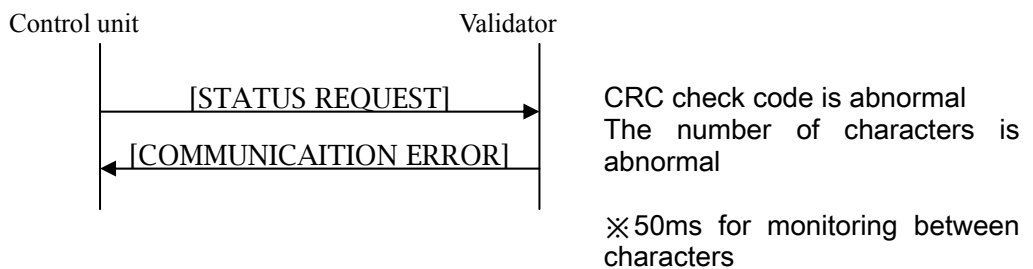
2) Transmission of Command



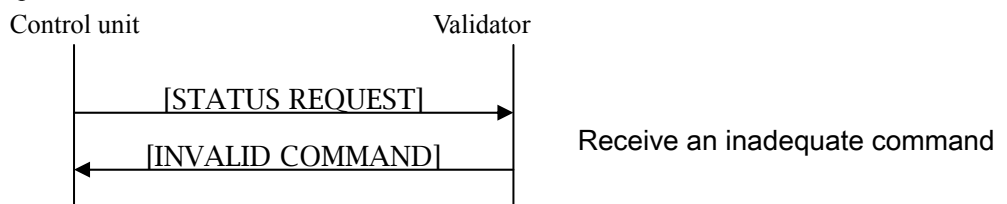
3) Communication problem 1



4) Communication problem 2



5) Communication problem 3



4、Command/Response List

Control unit → Validator	
Description	Code
Status request	
STATUS REQUEST	11h
Return to [VEND VALID]	
ACK	50h
Operation command	
RESET	40h
STACK-1	41h
STACK-2	42h
RETURN	43h
HOLD	44h
WAIT	45h
Setting command	
ENABLE DISABLE	C0h+DATA
SECURITY	C1h+DATA
INHIBIT	C3h+DATA
DIRECTION	C4h+DATA
OPTIONAL FUNCTION	C5h+DATA
Setting contents request	
ENABLE/DISABLE	80h
SECURITY	81h
INHIBIT	83h
DIRECTION	84h
OPTIONAL FUNCTION	85h
VERSION REQUEST	88h
BOOT VERSION REQUEST	89h

Validator → Control unit	
Description	Code
Status	
ENABLE (IDLING)	11h
ACCEPTING	12h
ESCROW	13h-DATA
STACKING	14h
VEND VALID	15h
STACKED	16h
REJECTING	17h-DATA
RETURNING	18h
HOLDING	19h
DISABLE (INHIBIT)	1Ah
INITIALIZE	1Bh
Status when power ON	
POWER UP	40h
POWER UP WITH BILL IN ACCEPTOR	41h
POWER UP WITH BILL IN STACKER	42h
Abnormal	
STACKER FULL	43h
STACKER OPEN	44h
JAM IN ACCEPTOR	45h
JAM IN STACKER	46h
PAUSE	47h
CHEATED	48h
FAILURE	49h-DATA
COMMUNICATION ERROR	4Ah
Return to Operation command	
ACK	50h
INVALID COMMAND	4Bh
Return to setting command	
ENABLE DISABLE	C0h+DATA
SECURITY	C1h+DATA
INHIBIT	C3h+DATA
DIRECTION	C4h+DATA
OPTIONAL FUNCTION	C5h+DATA
Setting contents	
ENABLE/DISABLE	80h+DATA
SECURITY	81h+DATA
INHIBIT	83h+DATA
DIRECTION	84h+DATA
OPTIONAL FUNCTION	85h+DATA
VERSION INFORMATION	88h+DATA
BOOT VERSION INFORMATION	89h+DATA

5、Details of Command/Response

5 - 1、Status request(control unit → validator)

The control unit monitors the status of the validator by this command. It instructs the operation according to the information returned.

STATUS REQUEST : [11h]

- Polling cycle to 100 – 200ms
- Transmission time is within 50ms
- When no return or [COMMUNICATION ERROR] is returned, the control unit re-sends command.

5 - 2、Status (Validator→Control unit)

Return to the [STATUS REQUEST] command transmitted from the control unit. It returns current status of validator.

5 - 2 - 1、Normal status(Valitor→Control unit)

ID	Code	Status and Description												
ENABLE	11h	Status to accept note												
ACCEPTING	12h	Status now accepting note												
ESCROW	13h+DATA	<p>Status holding note after validation. The information of 1 byte on the denomination is added. <input type="checkbox"/> This status continues without receiving Status request command within 3 seconds after it became this status or continues without receiving Operation command within 10 seconds, the note is returned. ESCROW added DATA list</p> <table border="1"> <thead> <tr> <th>DATA</th> <th>Denomination</th> </tr> </thead> <tbody> <tr> <td>63h</td> <td>RUR 10</td> </tr> <tr> <td>64h</td> <td>RUR 50</td> </tr> <tr> <td>65h</td> <td>RUR 100</td> </tr> <tr> <td>66h</td> <td>RUR 500</td> </tr> <tr> <td>67h</td> <td>RUR 1000</td> </tr> </tbody> </table>	DATA	Denomination	63h	RUR 10	64h	RUR 50	65h	RUR 100	66h	RUR 500	67h	RUR 1000
DATA	Denomination													
63h	RUR 10													
64h	RUR 50													
65h	RUR 100													
66h	RUR 500													
67h	RUR 1000													
STACKING	14h	Received Stack-1 or Stack 2 command from the control unit and is carrying the note to the storage area.												
VEND VALID	15h	Status when the note is properly captured. Keep this status until ACK command is received from the control unit.												
STACKED	16h	The note is being stacked into the storage.												
REJECTING	17h+DATA	<p>Being returning note Return reasoning information for 1 byte is added. REJECTING added DATA list</p> <table border="1"> <thead> <tr> <th>DATA</th> <th>Reason</th> </tr> </thead> <tbody> <tr> <td>71h</td> <td>Note insertion is abnormal</td> </tr> <tr> <td>76h</td> <td>Note validation is abnormal</td> </tr> <tr> <td>79h</td> <td>Inhibited denomination or Capture command was not received.</td> </tr> </tbody> </table>	DATA	Reason	71h	Note insertion is abnormal	76h	Note validation is abnormal	79h	Inhibited denomination or Capture command was not received.				
DATA	Reason													
71h	Note insertion is abnormal													
76h	Note validation is abnormal													
79h	Inhibited denomination or Capture command was not received.													
RETURNING	18h	Being returning note according to Return command												
HOLDING	19h	Received Hold command from the control unit during ESCROE												
DISABLE(INHIBIT)	1Ah	<p>Following conditions cause Disable (Inhibit) status.</p> <ul style="list-style-type: none"> · In case of inhibiting note according to Inhibit command · In case of inhibiting all denominations according to Enable/Disable command · In case of inhibiting insertion from any direction according to Direction command · In case of inhibiting all denominations according to DIPSW (2-8) setting 												
INITIALIZE	1Bh	Status to initialize after receiving Reset command from control unit												

5 - 2 - 2、Status of Power ON (Validator→Control unit)

When the power is ON, the bill validator returns the following statuses and it keeps that status until Reset command is received

ID	Code	Status and description
POWER UP	40h	Status of power ON
POWER UP WITH BILL IN ACCEPTER	41h	When a note is in a position on the path to able to be returned, the power turned ON. If Reset command is received, it returns the note on the path and initialize.
POWER UP WITH BILL IN STACKER	42h	A power supply is turned on when there is a note in the position that the note can not be returned in the carrier. If RESET command is received, the note is carried into the cash box and stuck, and initialize.

5 - 2 - 3、Abnormal Status(Validator→Control unit)

ID	Code	Status and description												
STACKER FULL	43h	Full of notes in the Cash box												
STACKER OPEN	44h	The Cash box doesn't sit proper position or No Cash box in the Chassis												
JAM IN ACCEPTER	45h	Notes got stuck on the path												
JAM IN STACKER	46h	Notes got stuck in the Stacker.												
PAUSE	47h	Operation of validator halts												
CHEATED	48h	Found vandalism such as stringing												
FAILURE	49h+DATA	An error or fault happened and it does not work normally. Fault information for 1 byte is added. FAILURE added DATA list <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>DATA</th> <th>Fault</th> </tr> </thead> <tbody> <tr> <td>A2h</td> <td>Stacking motor failure</td> </tr> <tr> <td>A6h</td> <td>Carrying motor</td> </tr> <tr> <td>ABh</td> <td>Carrier or Cash box failure</td> </tr> <tr> <td>B1h</td> <td>Sensor adjustment</td> </tr> <tr> <td>B2h</td> <td>EEPROM reading</td> </tr> </tbody> </table>	DATA	Fault	A2h	Stacking motor failure	A6h	Carrying motor	ABh	Carrier or Cash box failure	B1h	Sensor adjustment	B2h	EEPROM reading
DATA	Fault													
A2h	Stacking motor failure													
A6h	Carrying motor													
ABh	Carrier or Cash box failure													
B1h	Sensor adjustment													
B2h	EEPROM reading													
COMMUNICATION ERROR	4Ah	Communication error CRC check code error, Data figure error												
INVALID COMMAND	4Bh	Received invalid command												

5 - 3、 Operation command (Control unit→Validator)

The command that the control unit controls the operation of the validator. When the validator received this command, it returns ACK.

ID	Code	Description
RESET	40h	Reset validator This command is accepted regardless of the status of the validator When Power is ON, it starts working by receiving this command.
STACK-1	41h	Carry the note in escrow to stacking area. When carriage is completed, the validator becomes Vend Valid status. This command is valid only at the time of Escrow status.
STACK-2	42h	Carry the note in escrow to stacking area. When carriage is completed, the validator becomes Vend Valid status. This command is valid only at the time of Escrow status. * The contents of control are the same as STACK-1 in the case of no stacker.
RETURN	43h	Return the note in escrow. This command is valid only at the time of Escrow status.
HOLD	44h	Hold the note in escrow. If you want to keep holding, send this command as the note in escrow is automatically returned within 10 seconds. Keep holding for 10 seconds after receiving the command. This command is valid only at the time of Escrow status.
WAIT	45h	Keep Escrow status If not receiving Status Request command for 3 seconds during escrow, the note is automatically returned. If you want to keep that status, transmit this command. Keep that status for 3 seconds after receiving the command.

* Receiving either [STACK-1] or [STACK-2] command lead the validator to the same operation.

5 - 4、 Positive response

Return this command from the control unit to Vend Valid command of the validator.

ACK : [50h]

5 - 5、Setting command (Control unit→Validator)

The command to set functional change.

ID	Code	Descriptions	
ENABLE/DISABLE	C0h+DATA	Set enable/disable acceptance of each denomination. Set information for 2 byte is added. Validator returns the data received as it stands. <input type="checkbox"/> DIPSW1(2-4) has priority to this setting command.	
SECURITY	C1h+DATA	Validation accuracy can be set for each denomination. Set information of 2 byte is added Validator returns received data as it stands. <input type="checkbox"/> Setting DIPSW2(8) has priority to this command.	
INHIBIT	C3h+DATA	Inhibit note. Set information of 1 byte is added. Validator returns received data as it stands. <input type="checkbox"/> Command receipt timing and Operation	
		Note being accepted	Becomes to inhibit after note returned
		Note being validated	
		Note being in escrow	
		Note being staked	Becomes to inhibit after stacking note
[VEND VALID] Status time			
DIRECTION	C4h+DATA	Set each insertion direction to accept or not. Set information of 1 byte is added Validator returns received data as it stands.	
OPTIONAL FUNCTION	C5h+DATA	Set an optional function. Set information of 2 byte is added Validator returns received data as it stands.	

See 5-7 for the details of added set information.

5 - 6、Request for set information (Control unit→Validator)

Can confirm the contents of set information by Set command

Can also confirm the version of the Validator.

ID	Code	内容 Descriptions
ENABLE/DISABLE	80h	Confirm the contents set by Set command [ENABLE/DISABLE] Return from Validator adds the set information of [80h]+2byte
SECURITY	81h	Confirm the contents set by Set command [SECURITY] Return from Validator adds the set information of [81h]+2byte
INHIBIT	83h	Confirm the contents set by Set command [INHIBIT] Return from Validator adds the set information of [83h]+1byte
DIRECTION	84h	Confirm the contents set by Set command [DIRECTION] Return from Validator adds the set information of [84h]+1byte
OPTIONAL FUNCTION	85h	Confirm the contents set by Set command [OPTIONAL FUNCTION] Return from Validator adds the set information of [85h]+2byte
VERSION REQUEST	88h	Confirm the model No. of Validator. Return from Validator adds the set information of [88h]+35byte
BOOT VERSION REQUEST	89h	Confirm the information on [BOOT VERSION] of Validator Return from Validator adds the set information of [89h]+4byte

□ See 5-7 for the details of added set information.

5 - 7、Setting and added data of information

1) Added data of Command [ENABLE/DISABLE]

Control unit→Validator				Validator→Control unit				
[C0h] + [DATA1] + [DATA2]				[C0h] + [DATA1] + [DATA2]				
[80h]				[80h] + [DATA1] + [DATA2]				
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
DATA1	0	0	0	0				0
	RUR	RUR	RUR	RUR	RUR			
	1000	500	100	50	10			
DATA2	0	0	0	0	0	0	0	0
0: Enable to accept 1: Disable to accept (Initial:DATA1=00h,DATA2=00h)								

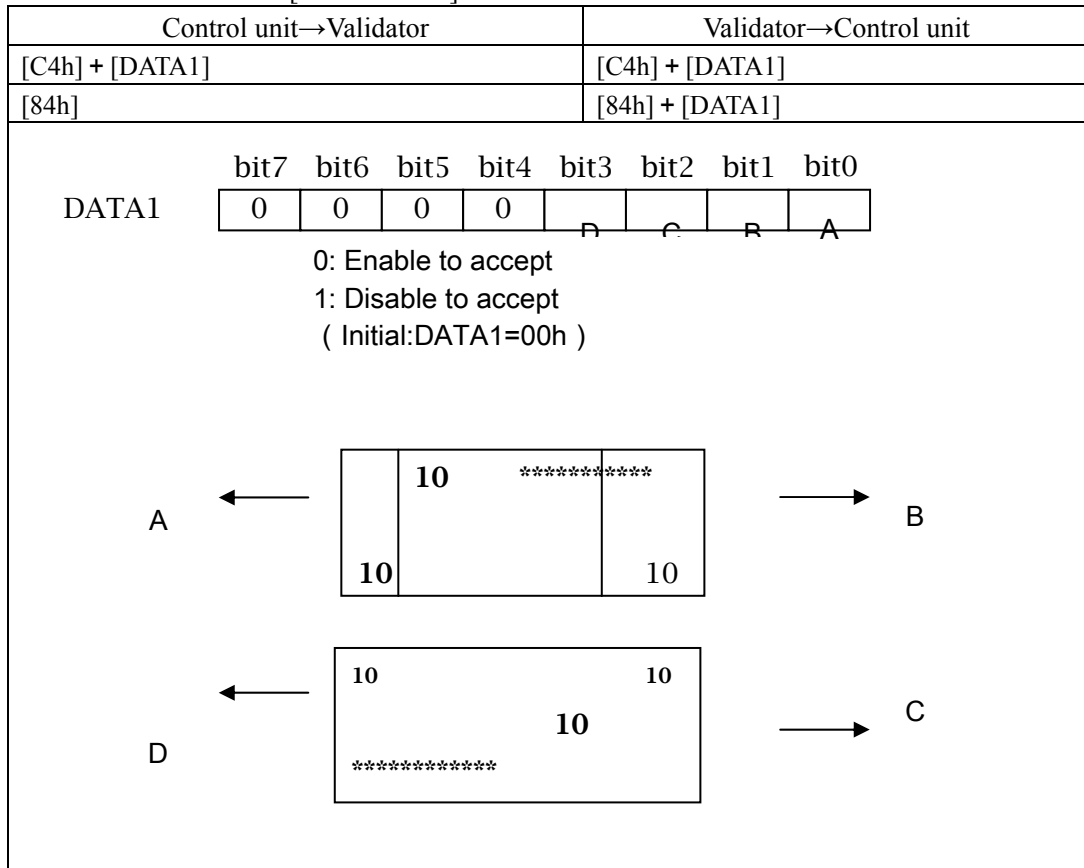
2) Added data of Command [SECURITY]

Control unit→Validator				Validator→Control unit				
[C1h] + [DATA1] + [DATA2]				[C1h] + [DATA1] + [DATA2]				
[81h]				[81h] + [DATA1] + [DATA2]				
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
DATA1	0	0	0	0				0
	RUR	RUR	RUR	RUR	RUR			
	1000	500	100	50	10			
DATA2	0	0	0	0	0	0	0	0
0:Standard 1:High accuracy (Initial:DATA1=00h,DATA2=00h) ※High accuracy lowers acceptance ratio to some extent								

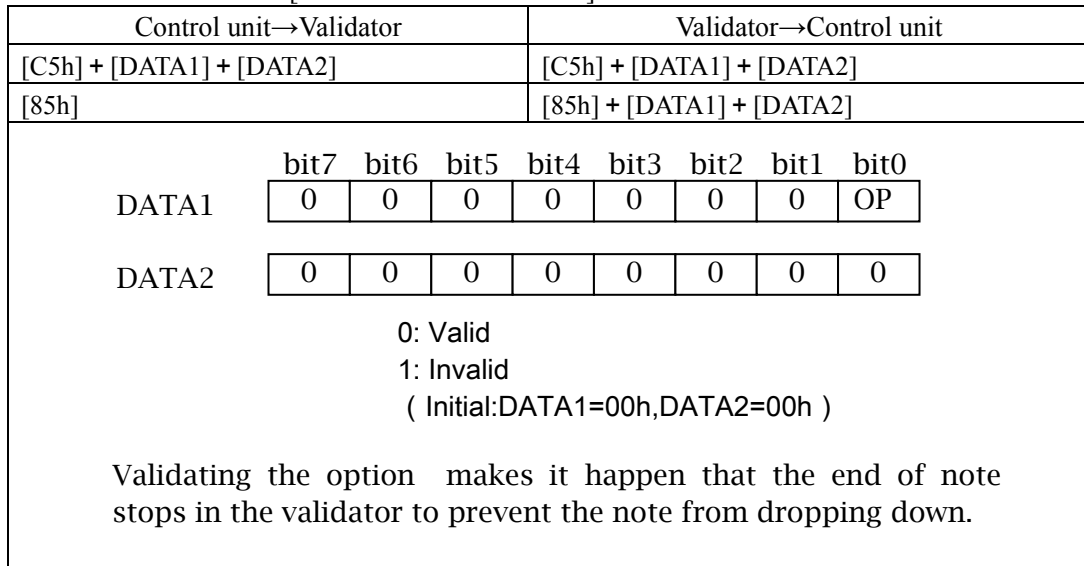
3) Added data of Command [INHIBIT]

Control unit→Validator				Validator→Control unit				
[C3h] + [DATA1]				[C3h] + [DATA1]				
[83h]				[83h] + [DATA1]				
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
DATA1	0	0	0	0	0	0	0	INH
0: Enable to accept 1: Disable to accept (Initial:DATA1=01h)								

4) Added data of Command [DIRECTION]



5) Added data of Command [OPTIONAL FUNCTION]



6) Added data of Command [VERSION REQUEST]

Control unit→Validator	Validator→Control unit
[88h]	[88h] + [DATA1](35byte)
<p>"BVU-07 xxx xxx Ver.xx.xx ddmmyyyy"</p> <p> Date Software version Interface Country Model No. </p> <p>※There is a space between each information</p>	

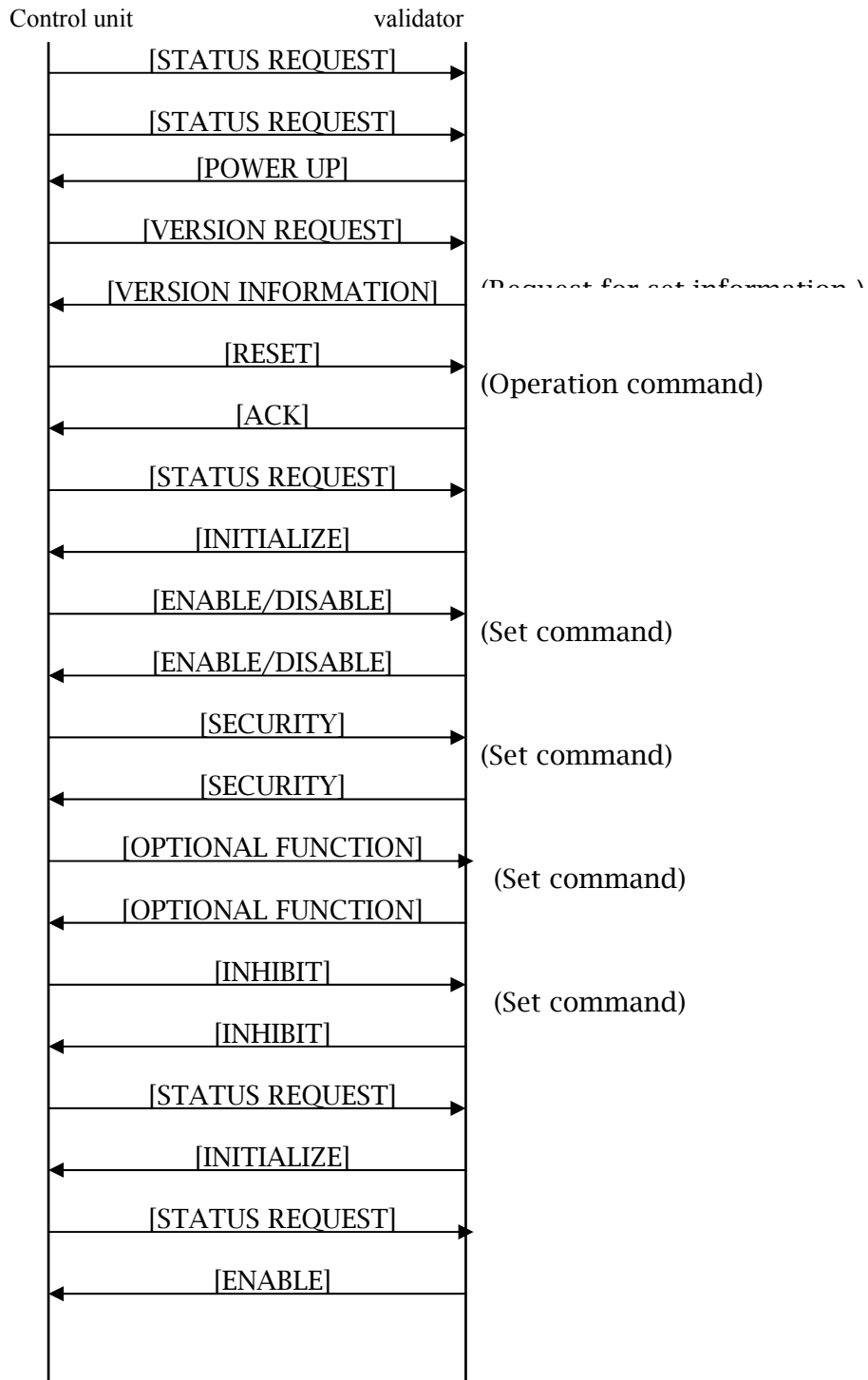
7) Added data of Command [BOOT VERSION REQUEST]

Control unit→Validator	Validator→Control unit
[89h]	[89h] + [DATA1](4byte)
<p>"Bxxx"</p> <p style="margin-left: 100px;">BOOT</p>	

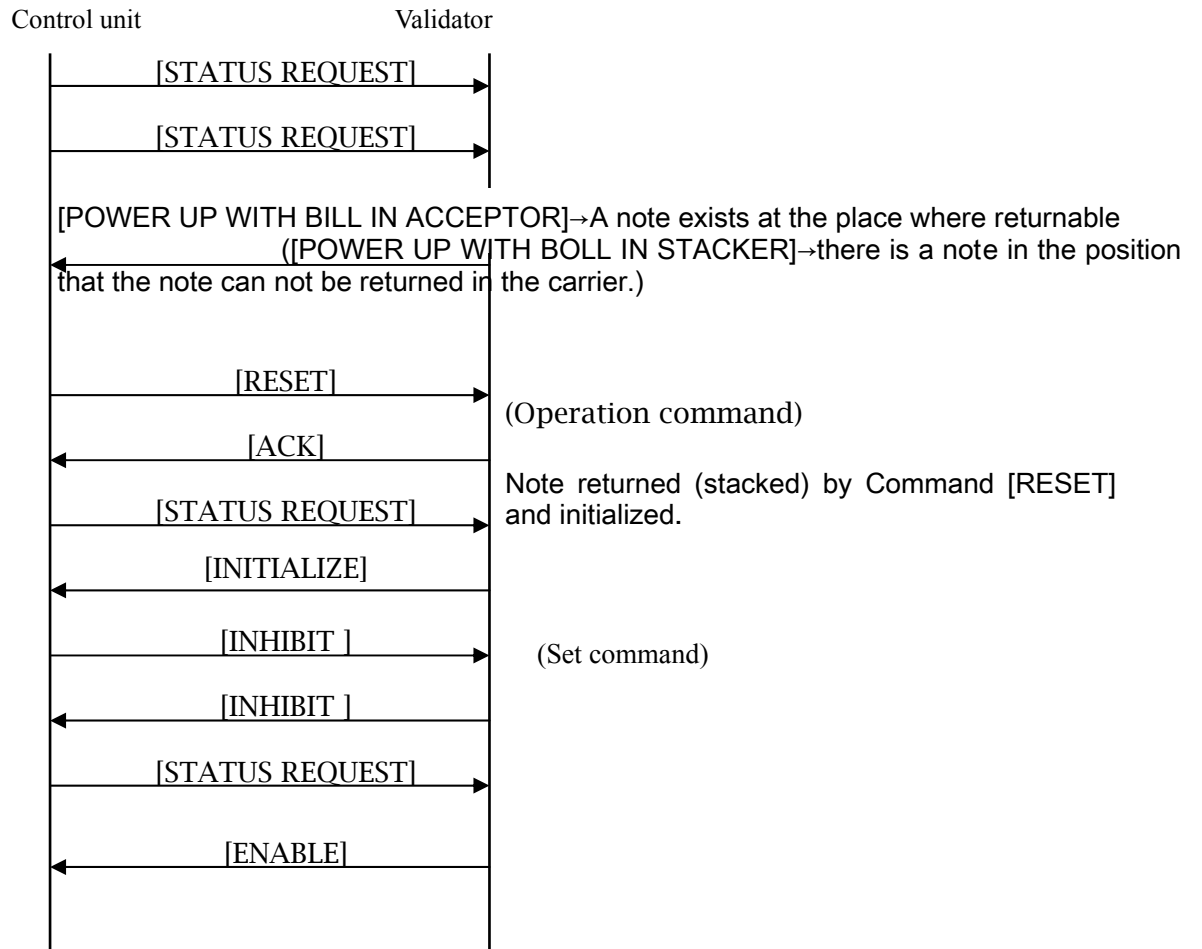
6、Timing Chart

6 - 1、Power ON

1) Power ON at Normal status

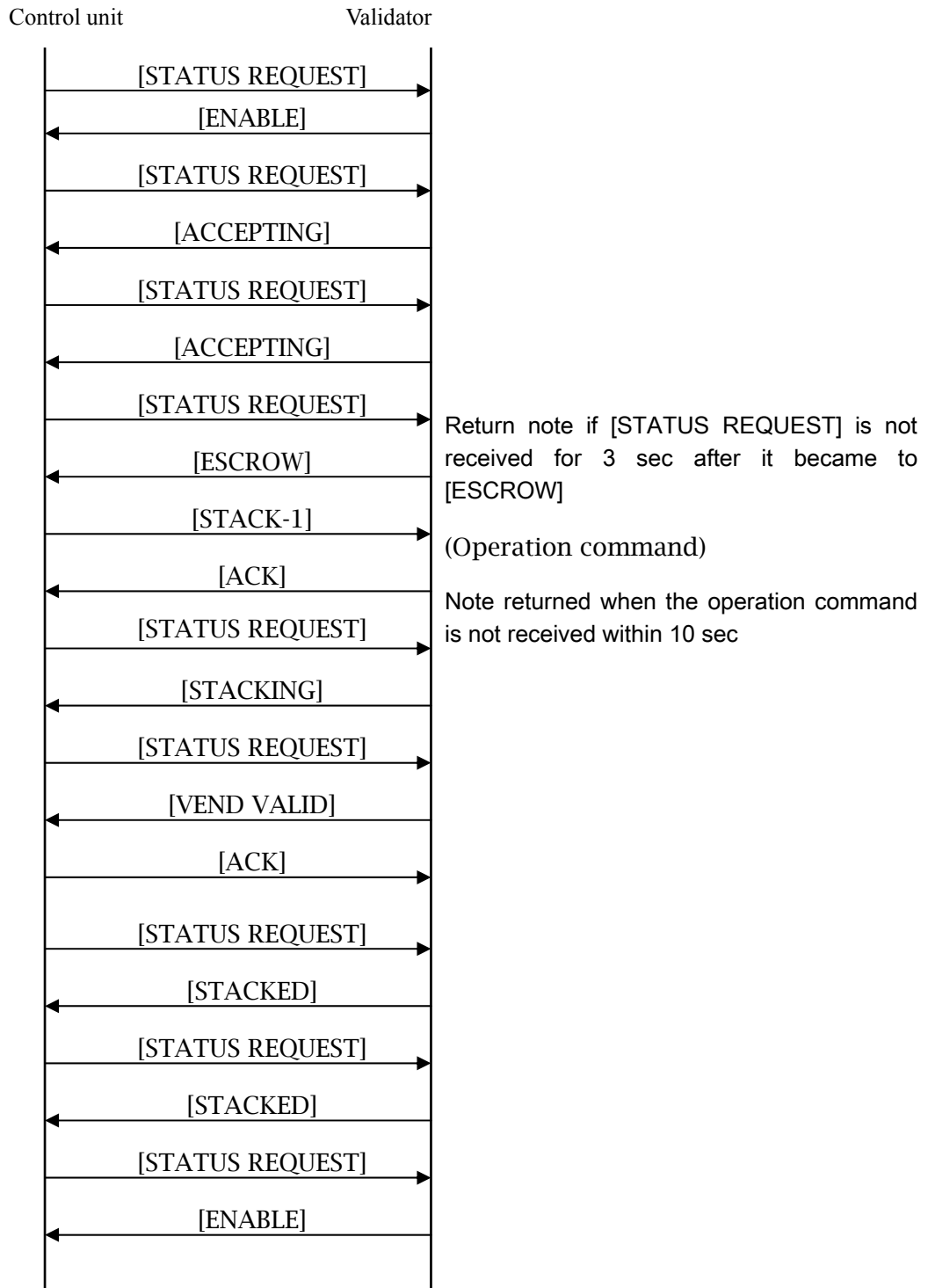


2) Power ON at the status of note on the path.

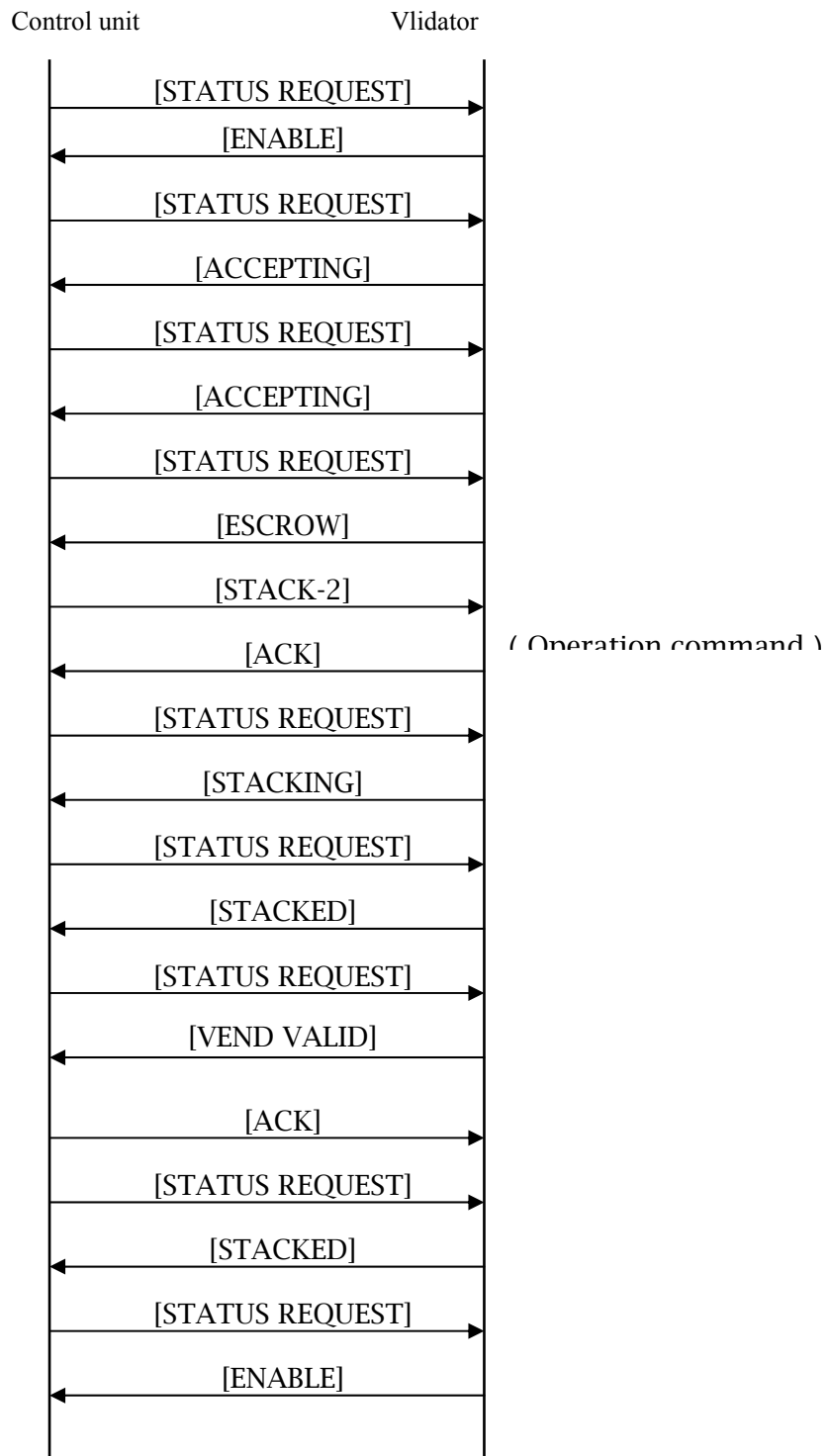


6 - 2、 Note acceptance

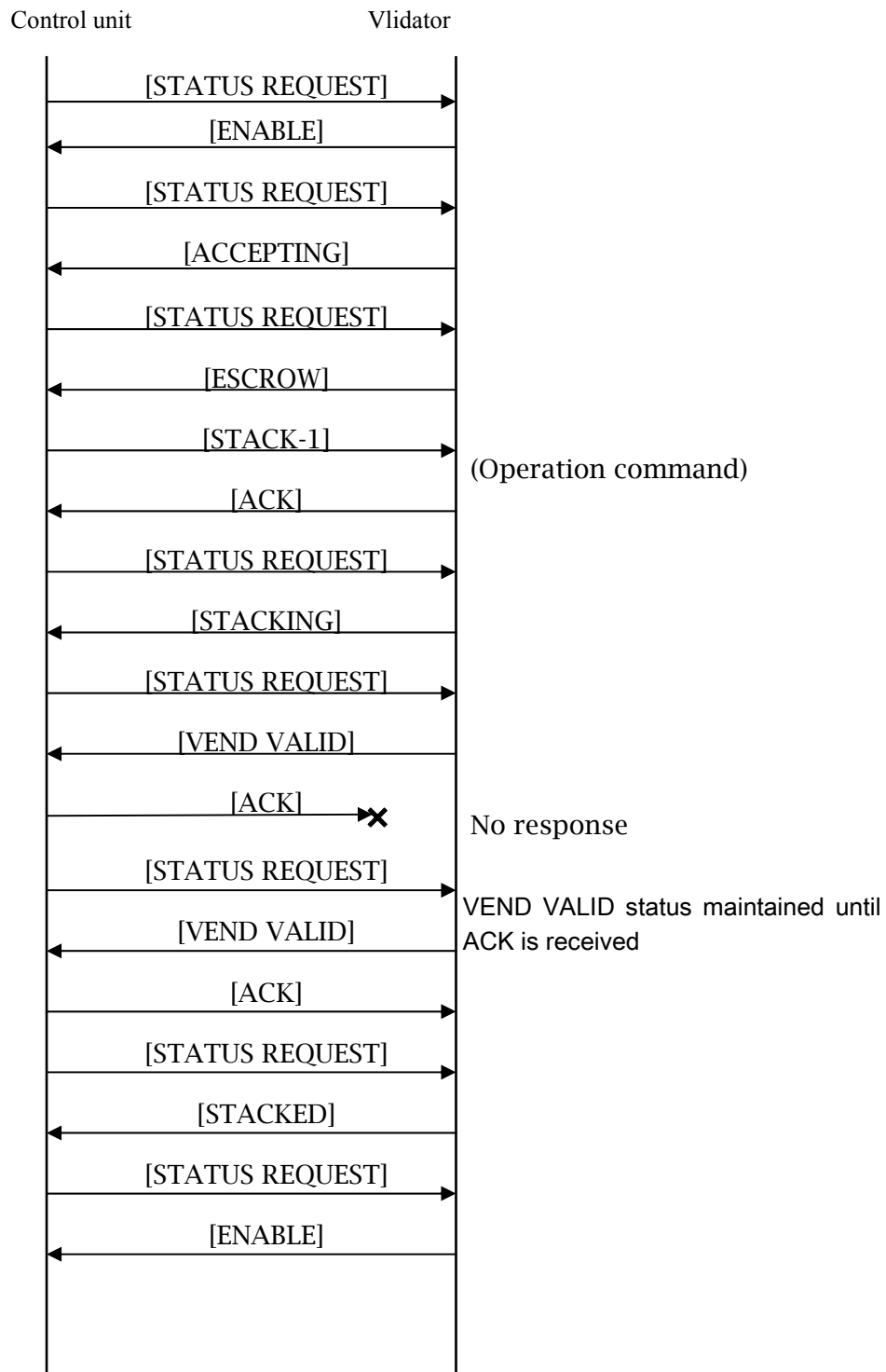
1) Accepted by Command [STACK-1]



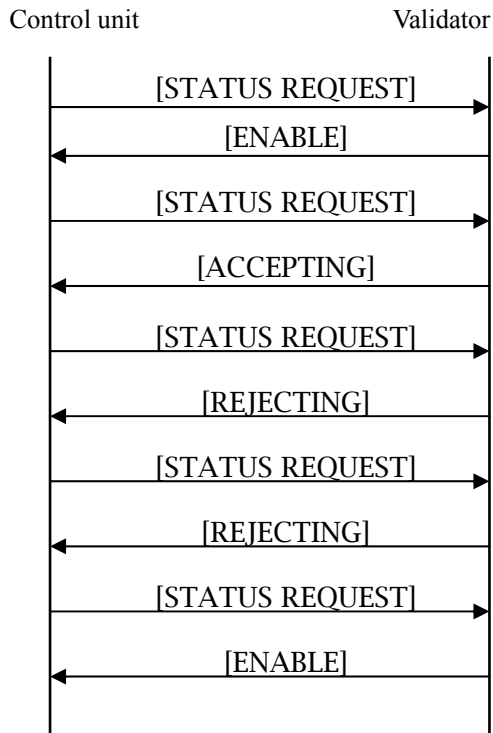
2) Accepted by Command [STACK-2]



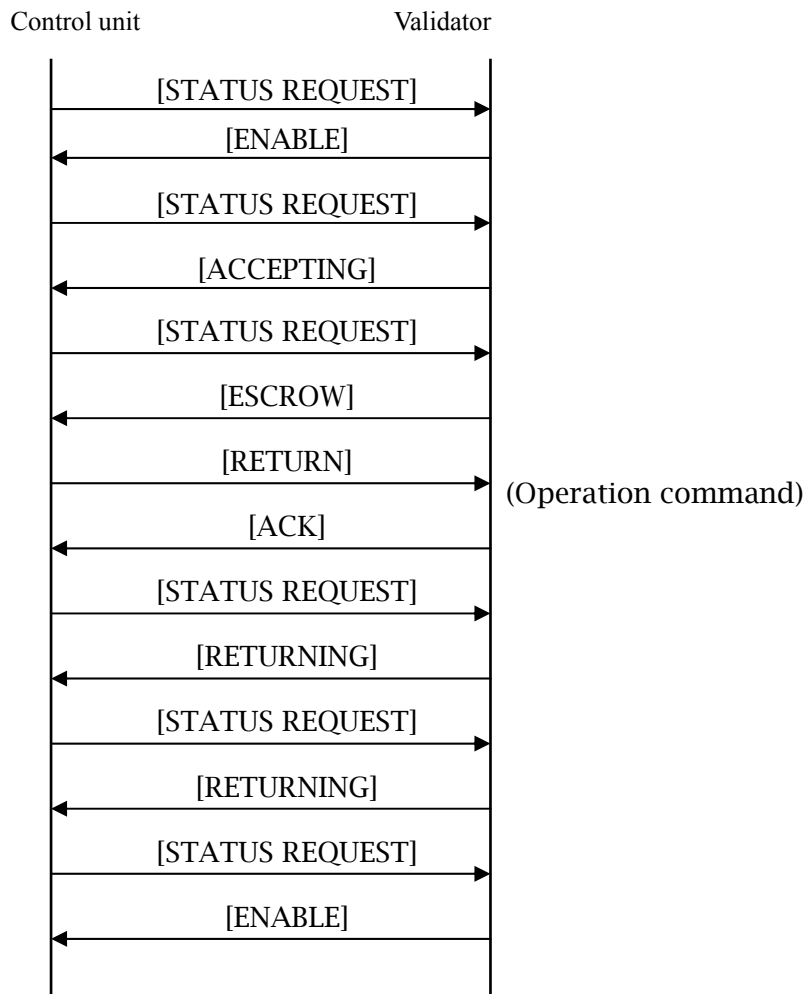
3) Re-send [VEND VALID]



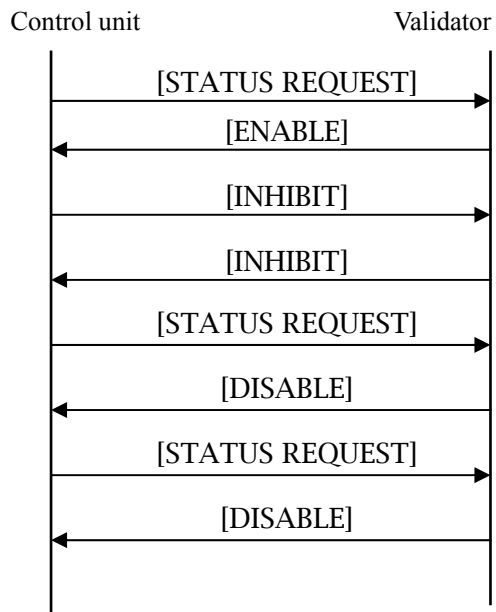
6 - 3、 Note return by not validating



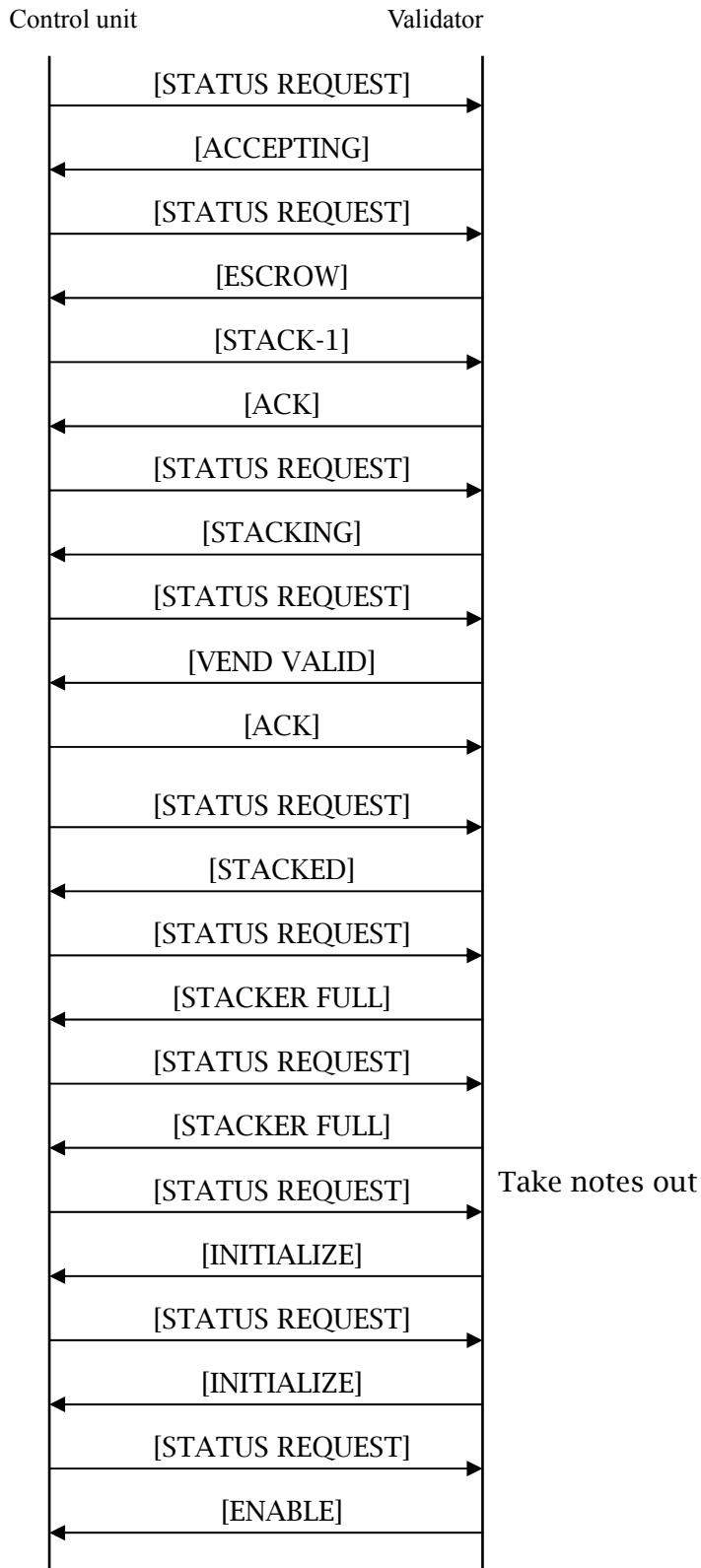
6 - 4、Note return by Command [RETURN]



6 - 5、 Inhibit



6 - 6 、 Full of notes in the Cash box



6 - 7 、 Note stuck on the way of being returned

