SERIAL INTERFACE SPECIFICATION FOR KAC-7600

Draft 1.0

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CONTENTS

PART I

Introduction

1.0 Introduction

This document defines a serial bus interface for KAC-7600 Board.
The interface is a 9600 baud Master-Slave arrangement where all peripherals are slave to a master controller(ex.IBM compatible PC).

KAC-7600 is a interface board used to connect coin selector, coin dispensor and hopper to master controller by RS-232C.

The user can select coin dispensor or hopper by setting jumper of KAC-7600's JP1. If user link marked «cd» pin and center pin, It is set to use coin dispensor or If user link marked «HP» pin and center pin, It is set to use Hopper.

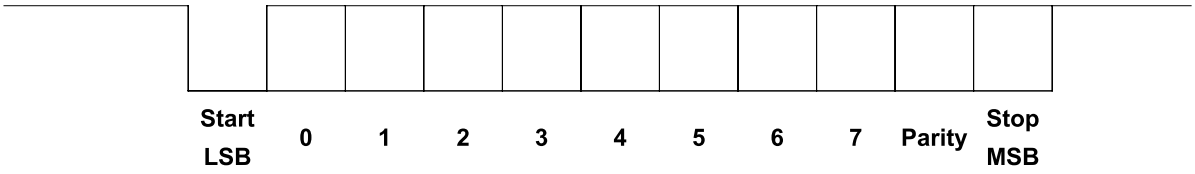
One of both, coin dispensor and Hopper is only can be used a time.

PART II

Communication Format

1.0 Byte Format

Baud Rate	9600 NRZ(non-return tozero)
Serial Bit Format	1 Start Bit 8 Data Bits 1 Parity Bits 1 Stop Bits 11 Bits Total



2.0 Command Format

Command consists of 2 bytes, first command byte and first command's inverted byte.

COMMAND (1Byte)	INVERTED COMMAND (1Byte)

MSB							LSB
0	1	1	1	0	0	0	0
		①				②	

①: Device No. (5bit)
②: Command No. (3bit)

3.0 Data Format

BC	DC	DATA	FCC

- BC : Byte Count(1 Byte)
  Total byte count including DC and DATA's byte.
- DC : Data Command(1 Byte)
  Data Command's Type
- DATA : N Bytes (N = 1,2,3, • • •)
  RX/TX Data
- FCC : Frame Check Code(1 Byte)
  Even LRC(BC Including)
  FCC = BC ^ DC ^ DATA0 ^ • • ^ DATAn

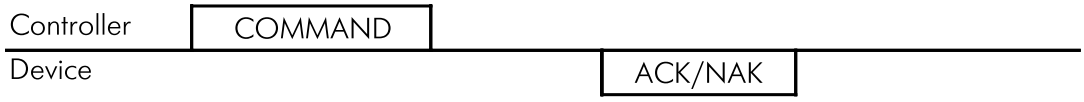
4.0 ACK/NAK Format

ACK/NAK consists of 1 byte.

Data(Hex)	Name	Description
11	ACK1	ACK responce except ACK2 through ACK4
22	ACK2	ACK when send 1 sort of data
33	ACK3	ACK when send 2 and above sorts of data
EE	NAK	NAK when not acknowledged data or command correctly

5.0 Communication Type

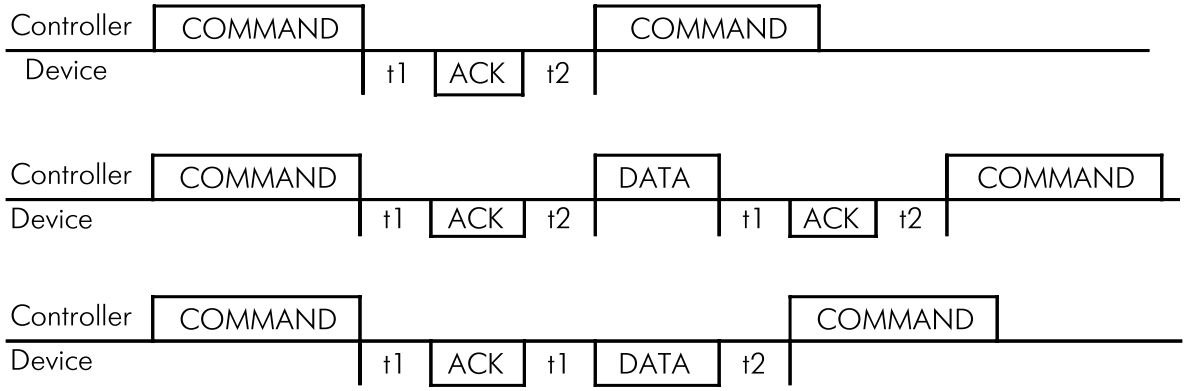
5.1.1 Controller send command to Device. and Device ACK or NAK.



5.1.2 Controller send command and data to Device. and Device ACK or NAK.

5.1.3 Device send data to Controller.

6.0 Time Chart

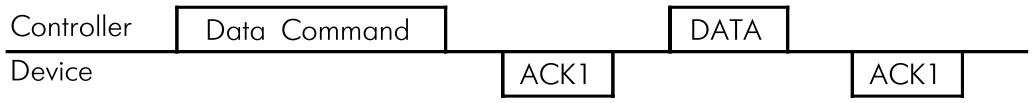


T1 : 100 μs ~ 2ms
T2 : 600 μs or above

7.0 Communication in detail

7.1 Data Command

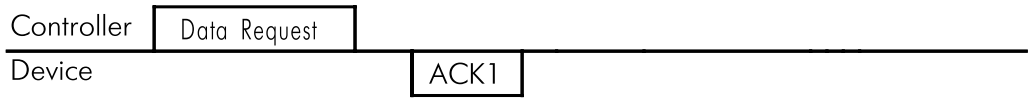
Device operate based on Data.



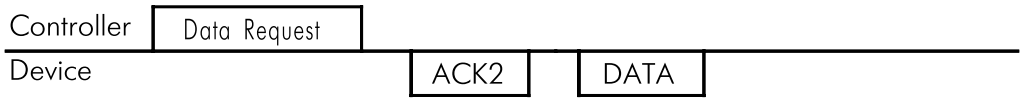
7.2 Data Request Command

There are 3 kinds of responce.

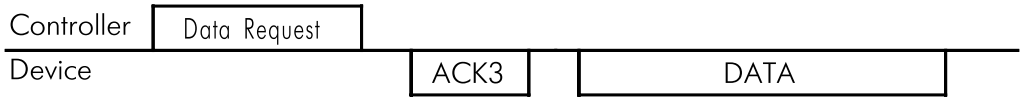
7.2.1 When Device's status doesn't changed, ACK1 just.



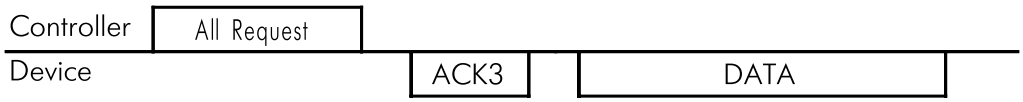
7.2.2 When device's status changed only one thing, ACK2 and changed data.



7.2.3 When device's status changed 2 things and above, ACK3 and changed data.



7.3 All Request Command Device transmit ACK1 with all data.



PART III

Connector Configuration

1.0 Power Connector(J1)

Pin	Signal	In/Out	Description
1	+ 24V	In	+24V DC
2	GND	In	GND

1.1. Connector Type : 5267-02(Molex)

1.2. Power Requirement : +24Vdc, 2.5A

2.0 RS-232 Connector(J10)

Pin	Signal	In/Out	Description
1	GND	In	GND
2	TX	Out	Tx signal
3	RX	In	Rx signal

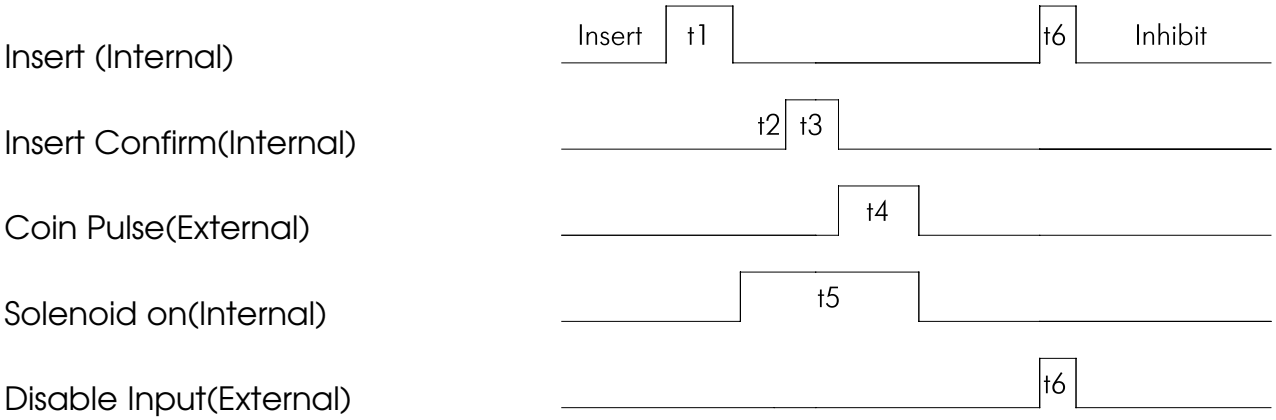
2.1. Connector Type : 5267-03(Molex)

3.0 Coin Selector (J2)

Pin	Signal	In/Out	Description
1	REJ	Out	Reject
2	DIS	In	Disable
3	Coin D	Out	Coin Signal D
4	Coin C	Out	Coin Signal C
5	Coin B	Out	Coin Signal B
6	Coin A	Out	Coin Signal A
7	-	-	Not used
8	-	-	Not used
9	-	-	Not used
10	GND	In	Power Ground
11	+5V	In	Power +5V
12	+24V	In	Power +24V

3.1. Connector Type : 53015-12(Molex)

3.2. Selector Timing Chart



- t1 = 55 ~ 70 ms
- t2 = 10 ~ 20 ms
- t3 = 35 ~ 50 ms
- t4 = 50 ms
- t5 = 300 ~ 340 ms
- t6 = 5 ms above

3.3. Coin Pulse in detail

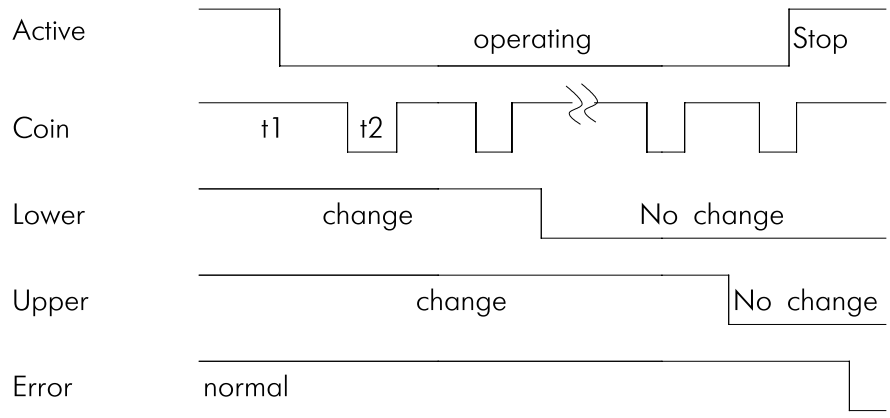
- 1 cent = Coin_C + Coin_D
- 2 cent = Coin_B + Coin_C + Coin_D
- 5 cent = Coin_D
- 10 cent = Coin_B
- 20 cent = Coin_C
- 50 cent = Coin_A
- 1 euro = Coin_A + Coin_D
- 2 euro = Coin_A + Coin_B

4.0 Coin Hopper (J6, J7, J8, J9)

Pin	Signal	In/Out	Description
1	+24V	Out	+24VDC
2	-	-	Not used
3	GND	Out	GND
4	Active	Out	HP Operating Signal
5	Coin	In	Coin ejecting Signal
6	Lower	In	Change Remain Signal (Lower)
7	Upper	In	Change Remain Signal (Upper)
8	Error	In	Error Signal

4.1. Connector Type : 35312-07(Molex)

4.2. Selector Timing Chart



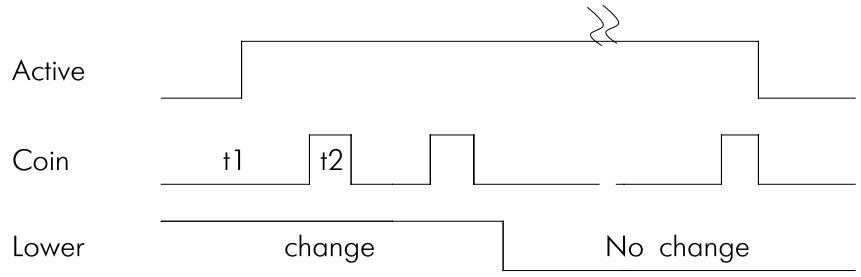
▶ t1 = 94 ± 2 ms ▶ t2 = 30 ± 2 ms

5.0 Coin Dispensor (J4, J5)

Pin	Signal	In/Out	Description
1	+24V DC	In	+24V DC
2	+5V DC	In	+5V DC
3	GND	In	GND
4	Enable_A	Out	Motor Enable (A Coin Dispensor)
5	Coin_A	In	Coin Out Pulse (A Coin Dispensor)
6	Change_A	In	Change Remain Signal (A Coin Dispensor)
7	Enable_B	Out	Motor Enable (B Coin Dispensor)
8	Coin_B	In	Coin Out Pulse (B Coin Dispensor)
9	Change_B	In	Change Remain Signal (B Coin Dispensor)

5.1. Connector Type : 5267-09(Molex)

5.2. Selector Timing Chart



▶ t1 = 94 ± 2 ms ▶ t2 = 30 ± 2 ms

PART IV

Hopper and Coin Dispensor Communication

1.0 COMMAND

Command(2bytes)		Name	Description
0x70	0x8F	Reset	Reset variables, error clear
0x71	0x8E	All Request	Request all data to Hopper
0x72	0x8D	Data Request	Request changed data to Hopper
0x73	0x8C	Command output	Command Hopper to act according to Data

1.1 DATA COMMAND

Direction	Name	DC	Description	Byte No.
Main Controller → Hopper	Dispence count	00	Set the dispence count each byte a Hopper	4
Hopper → Main Controller	Dispenced Count	15	Send the dispenced count each byte a Hopper	4
	Error	16	Send data when abnormal operation detected. ex)Jamming.	4
	Sensor Status	17	Send the remained coin detecting sensor status each byte a Hopper	4
	Operating Status	18	Send Hopper operating status ex)dispencing or end	1

1.2 Input / Output DATA in Detail

1.2.1 Dispence count

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	1	0	0	0	0	Header(0x00)
2nd byte	0	0	0	0	0	0	0	0	1st Hopper
3rd byte	0	0	0	0	0	0	0	0	2nd Hopper
4th byte	0	0	0	0	0	0	0	0	3rd Hopper
5th byte	0	0	0	0	0	0	0	0	4th Hopper

ex) If user want to dispence 5 coins using 2nd Hopper,
Then write 0x05(hex) to 2nd byte, and send that data to Hopper Interface Board.
Set possible coin count is 255 (decimal), 0xff(hex).
After Hopper Interface Board (KAC-7600) Acked,
The Hopper launch to dispence.

1.2.2 Dispenced Count

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	1	0	1	0	1	Header(0x15)
2nd byte	0	0	0	0	0	0	0	0	1st Hopper
3rd byte	0	0	0	0	0	0	0	0	2nd Hopper
4th byte	0	0	0	0	0	0	0	0	3rd Hopper
5th byte	0	0	0	0	0	0	0	0	4th Hopper

When main controller send Data Request(0x72,0x8d) command to KAC-7600, KAC-7600 will answer each Hopper's dispenced count.
ex) If 1st byte is 0x10, It means 1st Hopper dispenced 16 coins now.

1.2.3 Error

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	1	0	1	1	0	Header(0x16)
2nd byte	0	0	0	0	0	0	②	①	1st Hopper
3rd byte	0	0	0	0	0	0	②	①	2nd Hopper
4th byte	0	0	0	0	0	0	②	①	3rd Hopper
5th byte	0	0	0	0	0	0	②	①	4th Hopper

There are two type of responce from KAC-7600.

A. ② ① : 0 0 - Hopper normal
B. ② ① : 0 1 - Hopper abnormal

1.2.4 Sensor Status

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	1	0	1	1	1	Header(0x17)
2nd byte	0	0	0	0	0	0	②	①	1st Hopper
3rd byte	0	0	0	0	0	0	②	①	2nd Hopper
4th byte	0	0	0	0	0	0	②	①	3rd Hopper
5th byte	0	0	0	0	0	0	②	①	4th Hopper

There are two type of responce from KAC-7600.

A. ② ①: 0 0 - Hopper's bowl is empty.
B. ② ①: 0 1 - Hopper's bowl is filled to lower detecting sensor
C. ② ①: 1 0 - Hopper's bowl is filled to upper detecting sensor
If user use HP-1000 or HP-1500, user should don't care ② bit.
for HP-1000 or HP-1500 doesn't support upper detecting sensor.

1.2.5 Operating Status

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	1	1	0	0	0	Header(0x18)
2nd byte	0	0	1	0	0	0	0	①	

A. ① : 0 - dispence completed
B. ① : 1 - dispencing
C. ② : ØxØ1 - Coin dispensor Selected
D. ② : ØxØ2 - Hopper Selected

PART V

Coin Selector Communication

1.0 COMMAND

Command(2bytes)		Name	Description
0x61	0x9E	All Request	Request changed data to Coin Selector
0x62	0x9D	Data Request	Request all data to Coin Selector
0x63	0x9C	Command output	Command Coin Selector to act according to Data

2.0 DATA COMMAND

Direction	Name	DC	Description	Byte No.
Main Controller → Coin Selector	Control Command	00	Coin Selector control command	1
Coin Selector → Main Controller	Coin Count	08	Each coins inserted count	4
	Selector Status	0B	Coin Selector's Status	1

3.0 Input / Output DATA in Detail

3.0.1 Control Command

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	0	0	0	0	0	Header(0x00)
2nd byte	0	0	0	0	0	0	②	①	Data

If ① bit is set to one, Coin selector is enabled.
or ① bit is set to zero, Coin selector is disabled.
If user want to clear each coin's count, then set ② to one.
so user clear coin selector's coin count to zero.

3.0.2 Coin count

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	0	1	0	0	0	Header(0x08)
2nd byte	①								10 cent
3rd byte	②								20 cent
4th byte	③								50 cent
5th byte	④								1 dollor

each byte represents each coin's coin counts.
ex)If ① is set to 0x0a, all inserted 10cent is 10ea.

3.0.3 Selector status

Byte No.	MSB				Each bit(8bit all)			LSB	Byte Name
1st byte	0	0	0	0	1	0	1	1	Header(0x0B)
2nd byte	0	⑤	④	0	③	②	0	①	Data

If ① bit is set to one, Coin selector is enabled.

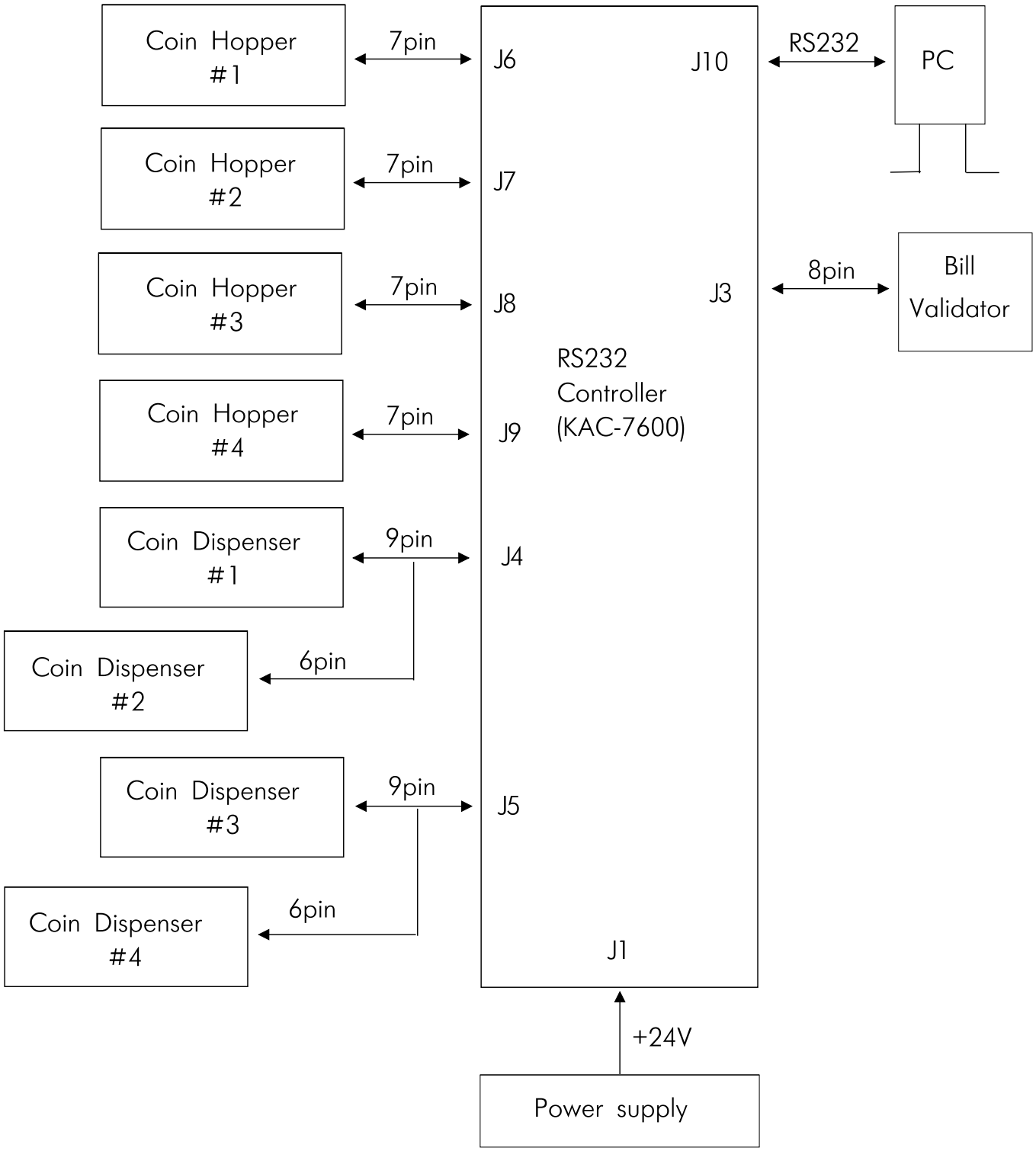
or ① bit is set to zero, Coin selector is disabled.

If ④ bit is set to one, Coin count is cleared

If ⑤ bit is set to one, Coin selector is errored.

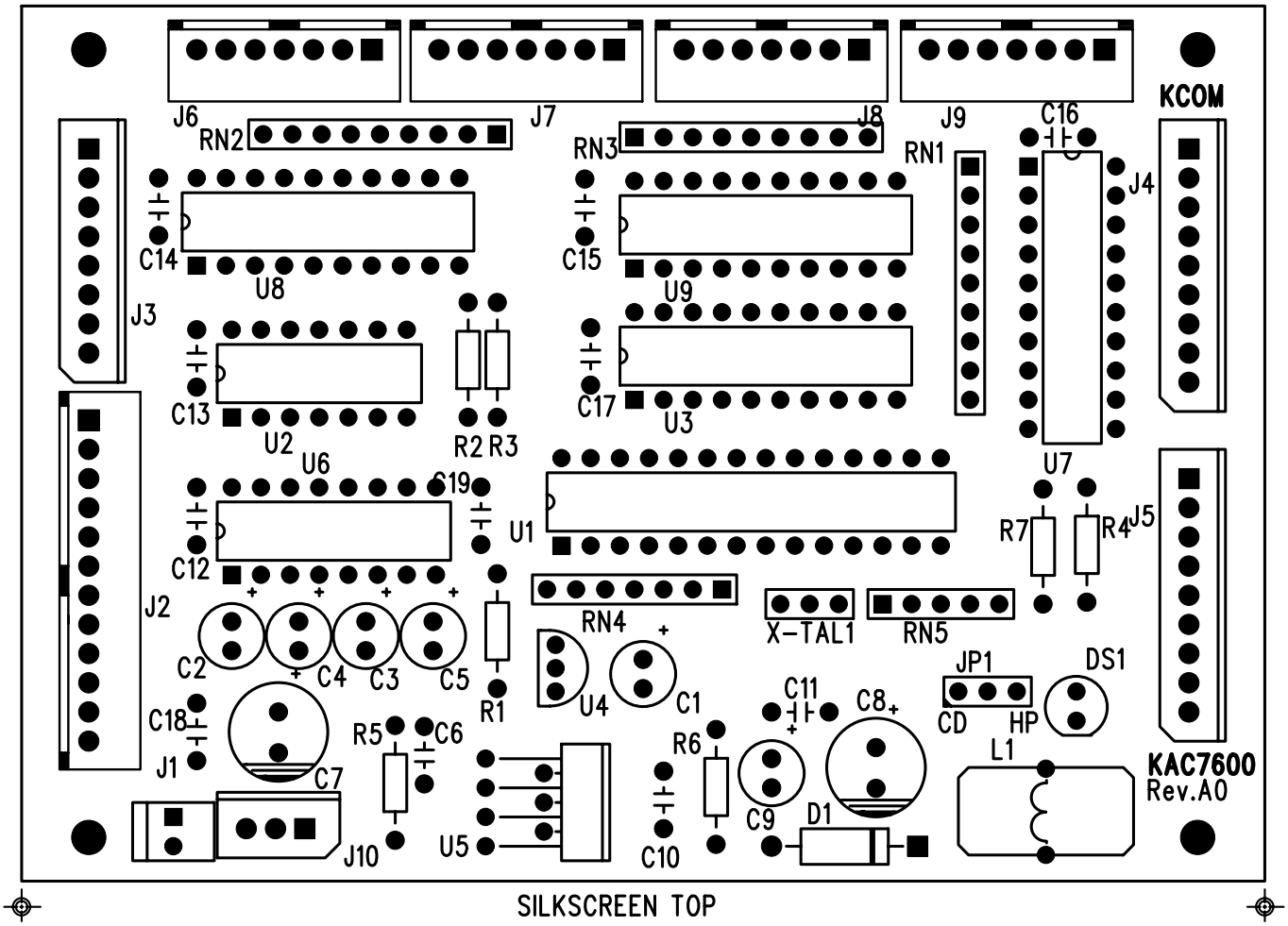
If ② bit is set to one, Coin selector's sensor is errored.

If ③ bit is set to one, Coin selector is jammed by coin.


Coin Hopper #1
7pin
J6
J10
RS232
PC
Coin Hopper #2
7pin
J7
Coin Hopper #3
7pin
J8
J3
8pin
Bill Validator
RS232 Controller (KAC-7600)
Coin Hopper #4
7pin
J9
Coin Dispenser #1
9pin
J4
Coin Dispenser #2
6pin
Coin Dispenser #3
9pin
J5
Coin Dispenser #4
6pin
J1
+24V
Power supply

PART VI

Block Diagram and Board dimension



SILKSCREEN TOP

Dimension (unit:mm)