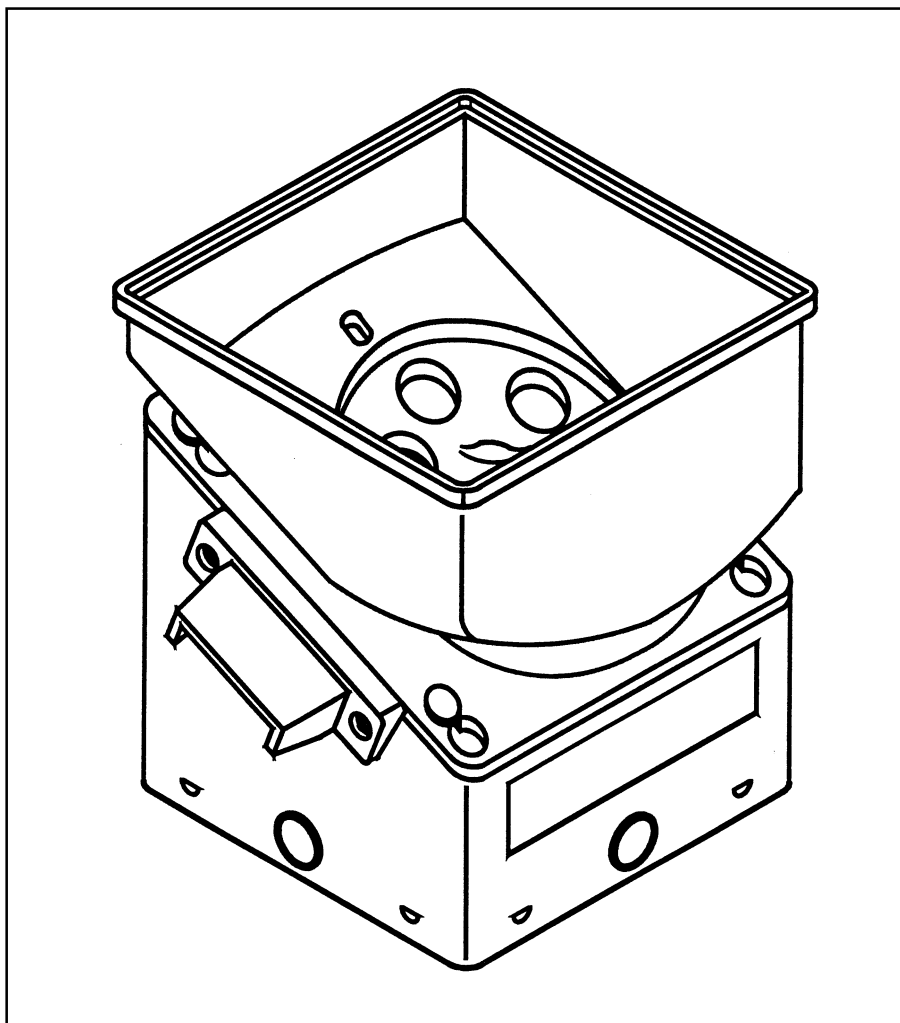


DUO HOPPER[®] MKII

Product Manual

**Model 10-2100-99
(model with cctalk interface)**

Version 0.1 / June 2007



Serving the coin-machine industries since 1955

Attention!

Always turn power off before removing or installing the hopper in order to prevent any damage due to surge currents!

Revision History

Revision	Date	Comment	By
0.0	21 June 2007	First Release Duo Hopper.	R.T.
0.1	22 June 2007	Minor changes	R.T.

Contents

Tables	5
Figures.....	5
1. Product description	6
1.1 Features of the cctalk Cube Hopper	6
Serial Communication: More control over the devices	8
2. CCTalk implementation on Suzo Cube Hopper	9
2.1 Serial Connector Pinout	9
2.2 Interface circuit.....	10
2.3 Device Address	10
3. Commands	12
3.1 Command / Response frame format.....	13
3.2 Hopper Setup and Initialisation commands	13
Simple Poll (header 254).....	13
Address Poll (header 253).....	13
Request comms revision (header 004)	14
Request comms status variables (header 002)	14
Clear comms variables (header 003).....	14
Reset device (header 001).....	14
Request Manufacturer id (header 246).....	14
Request Equipment Category id (header 245)	14
Request Product Code (header 244).....	15
Request Serial Nr (header 242)	15
Request Software Revision (header 241)	15
Request data storage availability (header 216)	15
Read Opto States (header 236).....	15
Request build code (header 192).....	16
Request address mode (header 169)	16
Enter PIN number (header 218).....	16
Enter New PIN number (header 219).....	16
Modify variable settings (header 165).....	18
Request variable settings (header 247).....	18
3.3 Hopper Dispense value procedure	19
Test Hopper (header 163).....	19
Request Hopper Polling Value (header 133)	21
Emergency Stop Value (header 132).....	22
Enable Hopper (header 164).....	22
Pump RNG (header 161)	22
Request Cipher Key (header 160)	22
Dispense Hopper Value (header 134).....	23
Request Payout high/low status (header 217)	24
Request hopper coin value (header 131).....	25
Request indexed hopper dispense count (header 130).....	25
Read Data Block (header 215).....	25
Write Data Block (header 214).....	25
3.4 Coin Jams during payout	26
3.5 Power failures	26
4. Electrical, Timing and Environmental Specifications.....	27
Appendix 1: PC Interface Circuit	29
Appendix 2: Mechanical dimensions	30
Appendix 3: Maintenance	31
Removing the Motor and Gearbox.....	31
Removing and re-installing the hopper	31
Cleaning and Materials.....	31
Disassembly.....	32
How to remove the disc.....	32
How to remove the coin insert plate.....	32
How to re-configure the Cube Hopper	32

Appendix 4: troubleshooting	33
Coins fail to unjam	33
Motor fails to run.	33
Over payout of coins.	33
Under payout of coins.	33
CCTalk communication trouble shooting	33
Appendix 5: Optional add-ons	34
Cup extension (Part No. 10-0200)	34
Appendix 6: Payout discs and inserts	35
Appendix 7: Reference chart	36
THE "EURO-HOPPERS"	37
Appendix 8: Exploded view	38

Tables

Table 1: Connector pinout	9
Table 2: Address select pins	10
Table 3: Address DIPSwitch setting	11
Table 4: Hopper commands	12
Table 5: Hopper Product Codes	15
Table 6: Address mode	16
Table 7: Hopper Variable Settings	18
Table 8: Duo Status Register 1	19
Table 9: Duo Status Register 2	19
Table 10: Duo Status Register 3	19
Table 11: LevelStatus bit definition	24
Table 12: Coin description.....	25
Table 13: Electrical specifications	27
Table 14: Timing specifications	27
Table 15: EEPROM Memory Description	28
Table 16: Environmental specifications	28
Table 17: Payout discs	35
Table 18: Coin insert plates.....	35

Figures

Figure 1: Traditional machine wiring	7
Figure 2: Network wired machine	7

1. Product description

The DUO HOPPER is a cctalk Cube hopper with an extra coin sensor added. This extra sensor makes it possible to discriminate between a 1 and 2 euro coin diameter. The cctalk command set is expanded with 6 new commands in order to make use of the dual coin payout system.

An important difference between the standard cctalk and the duo cctalk hopper is that the standard hopper pays out a number of coins (ex. payout 5 coins), and the duo hopper pays out a value (ex. payout 8 euro). The duo hopper is filled with 1 and 2 euro coins. During a payout, the payout value will be updated: if 1 euro is ejected, the payout value will be decremented with 1 euro and if a 2 euro coin is ejected, the payout value will be decremented with 2 euro. If the payout value becomes lower than 2 euro, the payout stops, since it is not sure that the next coin ejected will be a 1 euro coin. The rest value must be paid using a second hopper, filled with for example 50 euro cent coins.

If the Duo is used as a standard cctalk hopper, the coin payout system can be made universal by using the relevant payout disc and coin insert plate (See Appendix 6: Payout discs and inserts). It can be used with all round coins with a diameter between 18.00 and 31.00mm and a thickness ranging from 1.50 to 3.20mm.

The hopper is square and easy to mount by means of a standard mounting-bracket (included). By using a unique "sun and planet" gearbox system this hopper offers the possibility to contain and count up to 1,000 coins of € 0.50 (if fitted with two cup-extensions). The hopper is protected by an auto-reverse anti-jam system and has an indirect optical readout.

Refer to the following documents from <http://www.cctalk.org/> for a complete cctalk specification:
- cctalk Serial Communication Protocol, Generic Specification, Issue 4.2

1.1 Features of the cctalk Cube Hopper

- wide power supply voltage range: hopper runs on any voltage between 12 – 24 Volt.
- excellent anti-jam performance.
- full bridge MosFet motor drive (no mechanical motor switch).
- Pulse Width Modulated (20kHz) motor control giving:
 - constant pay out speed control (at 24VDC)
 - low motor start-up current, prevents systems power-dips.
- secured payout commands.
- continuous opto-sensor check.
- anti-jam operation prevents hopper blocking.
- low level sense plates are standard on the cube hopper.
- high level sense pin optional.
- software is watch-dog protected.

1.2 Serial Communication: Why and how to use it

This section describes some differences between a conventional build machine and a machine using a network like cctalk.

Serial Communication: One (cheap) network cable does it all

Traditional build machines have a central control board that controls all attached devices.

Each hopper is connected to the board with its own 4 wire cable and connectors.

Money acceptors are connected to the board using flat cables of 10 wires or more with their own connectors.

See Figure 1: Traditional machine wiring

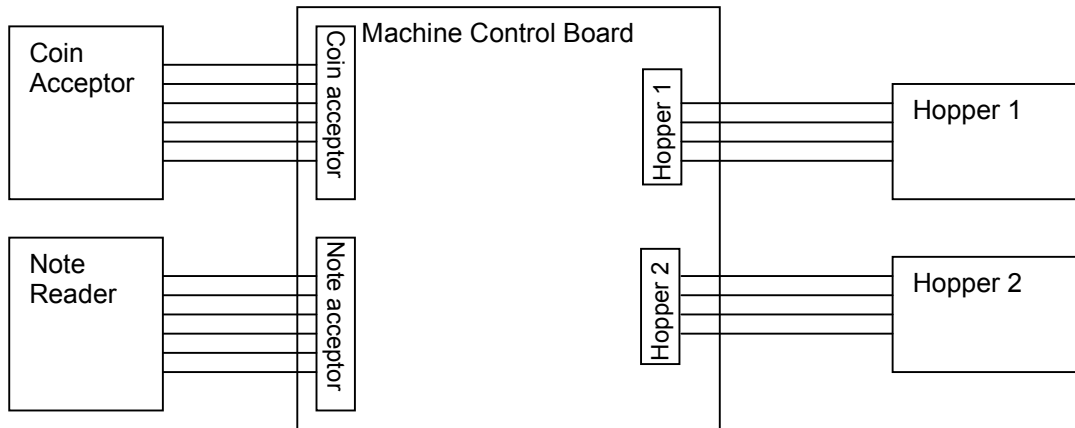


Figure 1: Traditional machine wiring

From fig. 1 can be seen that you need often 3 different cables (1 coin acceptor, 1 note acceptor and 2 hoppers) in order to build a system. This is a quite expensive system.

Figure 2 shows how a system looks if a cctalk network is used.

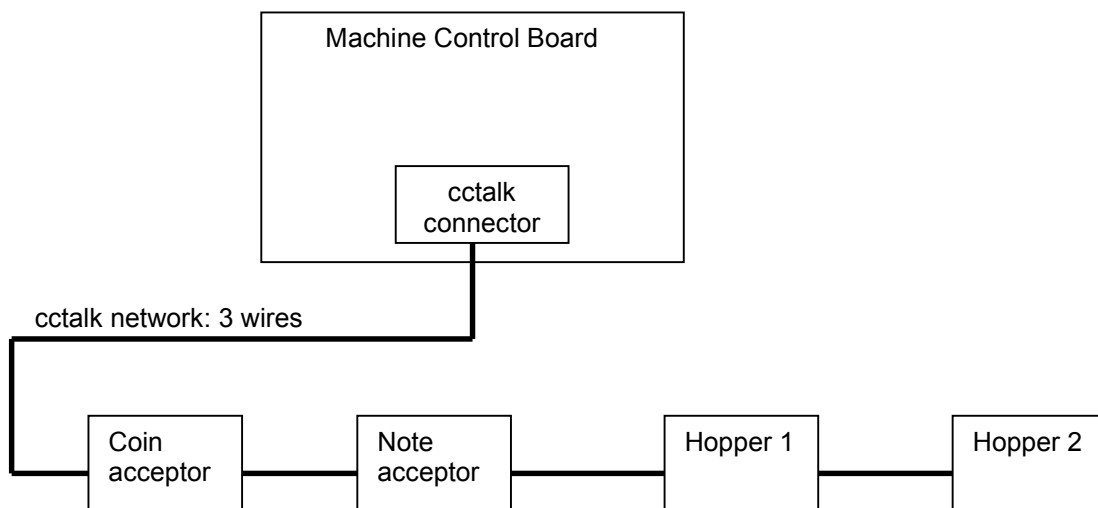


Figure 2: Network wired machine

As can be seen from figure 2, a networked solution is much simpler, because only 1 long cable consisting of 3 wires (power, data, and ground) connect all devices to the control board. Each device would typically use the same connector.

Serial Communication: More control over the devices

The machine controls the devices by sending data over the network, just like the famous RS232 communication network. The data consists of bytes that are grouped together to form cctalk messages. Each device has it's own set of command messages and has it's own unique cctalk address. If the machine sends a message to a hopper, it's will put the hopper's address into the message and send it over the network to the hopper.

The cctalk protocol defines all messages that are used to communicate with all devices.

There are messages to start the hopper, stop the hopper, return coin level, etc.

So much more control over each device is achieved by using device control messages.

2. CCTalk implementation on Suzo Cube Hopper

Baudrate settings:

9600 baud
 1 start bit
 8 data bits
 no parity
 1 stop bit

2.1 Serial Connector Pinout

Connector type: Molex 22-05-7108 header with friction lock.

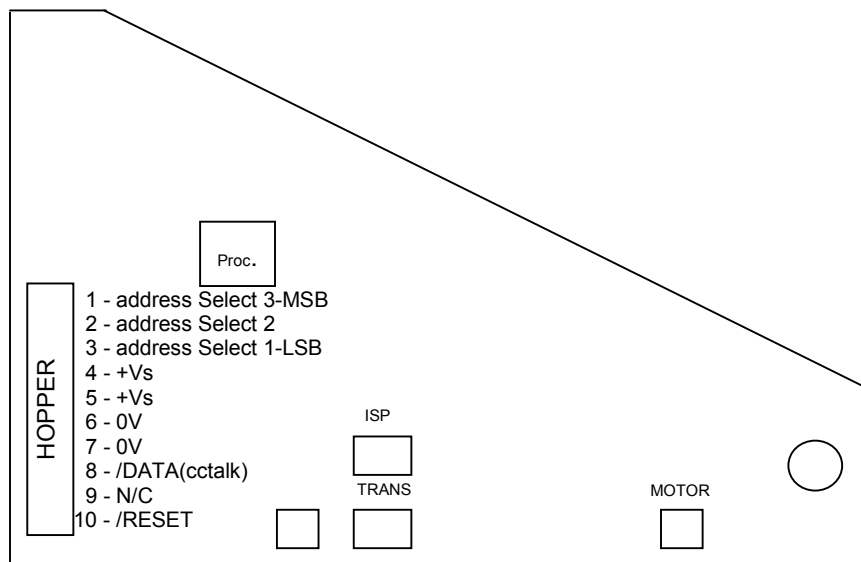
The following socket connector can be used from Molex: 22-01-1103 and crimp terminals 08-50-0032 or equivalent with a pitch of 0.1" (2.54mm).

Be careful with the pin numbering of the connector, because not all manufacturers start numbering from the same pin.

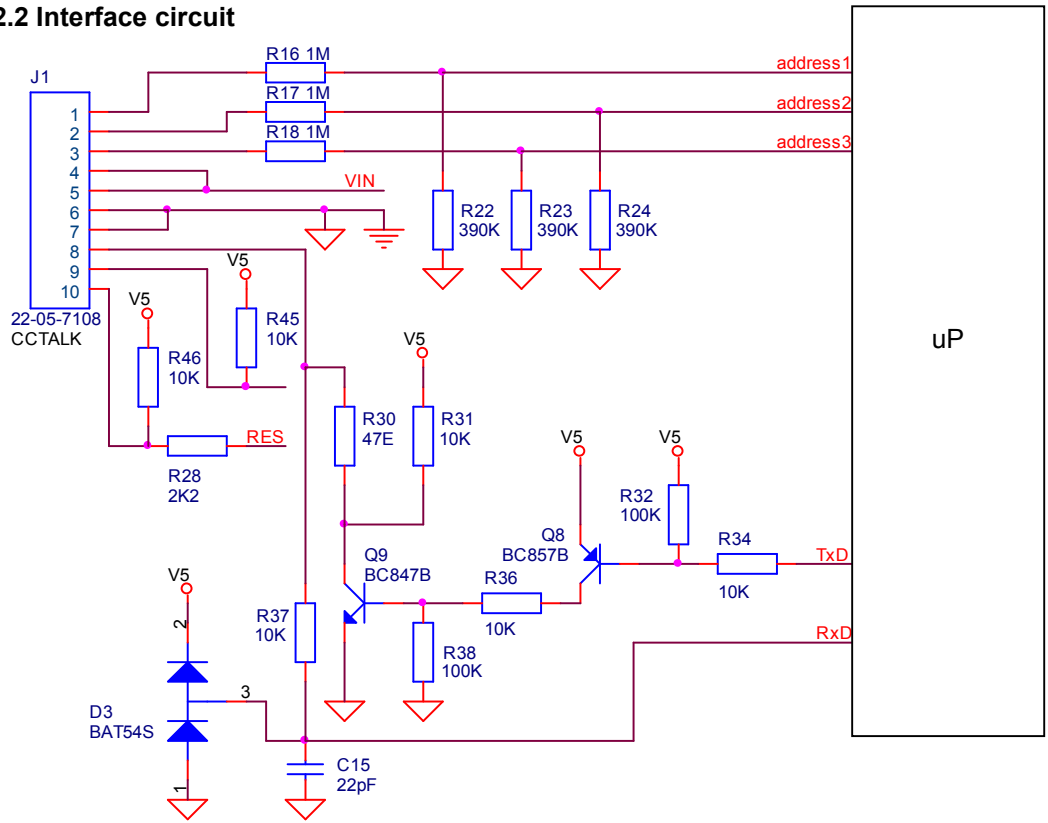
Pin	Function
1	Address select 3 - MSB
2	Address select 2
3	Address select 1 - LSB
4	+Vs
5	+Vs
6	0V
7	0V
8	/DATA (cctalk)
9	N/C
10	/RESET

Table 1: Connector pinout

Pins 4, 5 are linked together and pins 6,7 are linked together, and can be used to daisy-chain the power wires from hopper to hopper.



2.2 Interface circuit



2.3 Device Address

All Cube Hoppers leave the factory with **address 3**. Other addresses can be set by wiring the address select lines. See Table 2.

The address can be changed with serial commands. Unless you have an application requiring more than one cube hopper on the serial bus, it is strongly recommended you leave the address alone. The default addresses for coin acceptors and bill validators have been made different and will not clash with the cube hopper. When the hopper is powered up or reset, the hopper will always revert back to it's physical address. Other addresses can be set by commands.

For applications requiring more than one hopper on the serial bus, one or more of the address select lines may be connected to +Vs. A total of 8 unique bus addresses may be generated in this way, in the range 3 to 10 inclusive.

X = Connect to +Vs (Pin 4, 5)			Serial Address
Address select 3	Address select 2	Address select 1	
			3
		X	4
	X		5
	X	X	6
X			7
X		X	8
X	X		9
X	X	X	10

Table 2: Address select pins

Later hopper models are equipped with a small DIPswitch located inside the hopper. Remove the green bottom plate to access the DIPswitch. This dipswitch can also be used to set the hopper address, instead of the wiring method on the connector. See table below.

Dip Switch 1	Dip Switch 2	Address
OFF	OFF	3
ON	OFF	4
OFF	ON	5
ON	ON	6

Table 3: Address DIPSwitch setting

3. Commands

The following cctalk commands are currently implemented in the cctalk cube hopper.

Header	Data bytes	Response (default)	Description
254	<none>	ACK	Simple poll
253	<none>	{variable delay} [slave address]	Address poll
252	<none>	{variable delay} [slave address]	Address clash
251	[new address]	ACK	Address change
250	<none>	ACK	Address random
247	<none>	[current_limit] [motor stop delay] [payout timeout] [max current measured] [supply voltage] [connector address]	Request variable set
246	<none>	"Suzo Int (NL)"	Request manufacture id
245	<none>	"Payout"	Request equipment category id
244	<none>	"10-2100-99"	Request product code (Response depends on factory settings)
242	<none>	[serial 1- LSB] [serial 2] [serial 3 – MSB]	Request serial number
241	<none>	"Cube V1.3"	Request software version
236	<none>	[opto state] (bit 7 set: path blocked)	Read opto states
219	[PIN1] [PIN2] [PIN3] [PIN4]	ACK	Enter new PIN number
218	[PIN1] [PIN2] [PIN3] [PIN4]	ACK	Enter PIN number
217	<none>	[level status] (bit 0 set: low level)	Request payout level status
216	<none>	[memory type] [read blocks] [read bytes per block] [write blocks] [writes per block]	Request data storage availability
215	[block number]	[data 1] [data 2] ... [data 8]	Read data block
214	[block nr] [data 1] ... [data 8]	ACK	Write data block
192	<none>	"Lev Lo"	Request build code
172	<none>	[payout coins remaining]	Emergency stop
171	<none>	"-----"	Request hopper coin
169	<none>	[address mode]	Request address mode
168	<none>	[nr coins 1 – LSB] [nr coins 2] [nr coins 3 – MSB]	Request hopper dispense count
167	[sec 1] [sec 2] [sec 3] [sec 4] [sec 5] [sec 6] [sec 7] [sec 8] [N coins]	[event counter]	Dispense hopper coins
166	<none>	[event counter] [payout coins remaining] [last payout: coins paid] [last payout: coins unpaid]	Request hopper status
165	[current limit] [motor stop delay] [payout TO] [max current measured] [supply voltage] [connector address]	ACK	Modify variable set
164	[enable code]	ACK	Enable hopper
163	<none>	[hopper status register1] [hopper status register 2]	Test hopper
161	[rnd 1] [rnd 2] [rnd 3] [rnd 4] [rnd 5] [rnd 6] [rnd 7] [rnd 8]	ACK	Pump RNG
160	<none>	[key 1] [key 2] [key 3] [key 4] [key 5] [key 6] [key 7] [key 8]	Request cipher key
134	[3 to 8 security bytes] [value LSB] [value MSB]	[event counter]	Dispense hopper value
133	<none>	[event counter] [payout value remaining] [last payout: value paid] [last payout: value unpaid]	Request hopper polling value
132	<none>	[payout value remaining]	Emergency stop value
131	[coin type]	[coin type data]	Request hopper coin value
130	[coin type]	[coin type total coins dispensed]	Request indexed hopper dispense count
004	<none>	[cctalk level] [major revision] [minor revision]	Request comms revision
003	<none>	ACK	Clear comms status variables
002	<none>	[rx timeouts] [rx bytes ignored] [rx bad checksums]	Request comms status variables
001	<none>	ACK	Reset device

Table 4: Hopper commands

3.1 Command / Response frame format

Dest. Addr	Nr Data Bytes	Source Addr	Header	Data 1	...	Data N	Checksum
------------	---------------	-------------	--------	--------	-----	--------	----------

The destination address (host address) is usually 1.
 The source address (hopper address) starts from 3.

Most responses from the slave have a ACK Header byte followed by zero or more data response bytes. If a command cannot be executed, a NAK Header (Hex 5) will be returned. For example the hopper dispense command which may return a NAK (Hex 5) if the dispense procedure could not be done (for example hopper disabled, busy, pin code not correct, opto-error, etc).

The ACK byte in the responses has value 0.
 The Checksum is calculated such that the 8-bit addition (modulus 256) of all bytes in the message from the start to the checksum itself is zero.

3.2 Hopper Setup and Initialisation commands

Before the hopper can be used, a number of initialisation steps have to be done.

Check communication

Transmit the SIMPLE POLL command to the hopper to check if it is responding with an ACK message:

Simple Poll (header 254)

```
Command : 03 00 01 FE FE
Response: 01 00 03 00 FC
```

Here a normal ACK is received. Device at address 3 is communicating ok.
 If no response is received then check the hopper address by sending the ADDRESS POLL command:

Address Poll (header 253)

```
Command : 00 00 01 FD 02
Response: 03
```

From the response can be seen that there is only 1 device on the bus with address 3.
 This command returns all device addresses of the devices on the cctalk bus. If each device has an unique address, then no communication clashes will occur. If a clash occurs, then some devices share the same address. (Address clashes should not occur after power up, since each device will revert to it's default address, which should be unique for every device used. See Table 2: Address select pins). Use the ADDRESS CLASH command (header 252) to check which address clashes. If an address clash occurs, the devices that clashes can be given a random address by using the ADDRESS RANDOM (header 250) command. Send the ADDRESS CLASH again to resolve any other address clashes. Once every device has an unique address, the addresses can be optionally changed to new addresses using the ADDRESS CHANGE (header 251) command.

Once communication is ok, device details can be requested. For your reference all commands are listed below. Most of the commands are not mandatory to operate the hopper.

Request comms revision (header 004)

Command : 03 00 01 04 F8
Response: 01 03 03 00 31 33 32 63

The 3 bytes (31 33 32) in the response have the following meaning:
[cctalk level] [major revision] [minor revision]. In our example: 1 3 2.

Request comms status variables (header 002)

Command : 03 00 01 02 FA
Response: 01 03 03 00 00 00 00 F9

The 3 data bytes (00 00 00) in the response have the following meaning:
[rx timeouts] [rx bytes ignored] [rx bad checksums]
This data can be used to test the quality and load of a cctalk network.

Clear comms variables (header 003)

Command : 03 00 01 03 F9
Response: 01 00 03 00 FC

This command is used to reset the comms status variables to 0.

Reset device (header 001)

Command : 03 00 01 01 FB
Response: 01 00 03 00 FC

After the hopper receives this command, the hopper takes the following actions:
- first, save all counter data in EEPROM (if data has changed, this will take up to 90ms)
- then, send an ACK message to the host
- finally, perform a software reset (about 40 ms)
During software resetting (can take up to 130ms) the hopper will not respond to commands.

⇒ After sending a reset command, wait at least 100ms before generating a receive timeout (followed by a retransmission). The ACK from the hopper may be delayed for 90ms in case data has to be saved. For all other commands the receive timeout is 25 ms.
After the reset, all hopper variables (including status flags) will be reset to their default values.

Request Manufacturer id (header 246)

Command : 03 00 01 F6 06
Response: 01 0D 03 00 53 75 7A 6F 20 49 6E 74 20 28 4E 4C 29 E8

The data bytes in the response (53 75 7A 6F 20 49 6E 74 20 28 4E 4C 29) give the manufacturer: "Suzo Int (NL)". Remember that the header byte in the response, here 00, means that an ACK is received.

Request Equipment Category id (header 245)

Command : 03 00 01 F5 07
Response: 01 06 03 00 50 61 79 6F 75 74 74

The data bytes in the response (50 61 79 6F 75 74) stand for "Payout".

Request Product Code (header 244)

Command : 03 00 01 F4 08

Response: 01 0A 03 00 31 30 2D 32 31 30 30 2D 39 39 02

The data bytes in the response (31 30 2D 32 31 30 30 2D 39 39) mean "10-2100-99".

The following hopper configurations can be obtained from factory:

Product Code	Description
10-2300-99	8 encrypted security bytes must be sent with the dispense command
10-2200-99	8 dummy bytes must be sent with the dispense command
10-2100-99	The hopper serial number must be sent with the dispense command

Table 5: Hopper Product Codes

Always check the Product Code first to determine the hopper operation mode. See also 3.3 Hopper Dispense value procedure.

Request Serial Nr (header 242)

Command : 03 00 01 F2 0A

Response: 01 03 03 00 4E 46 05 60

The 3 data bytes are the serial number (hex): 4E 46 05. This is decimal 345678.

The least significant bytes are transmitted first.

If the hopper Product Code is 10-2100-99, then be sure to send this serial number along with the dispense command in order to start a payout. See also Dispense Hopper Value (header 134).

Request Software Revision (header 241)

Command : 03 00 01 F1 0B

Response: 01 08 03 00 44 75 6F 20 56 32 2E 30 C6

The response data byte (44 75 6F 20 56 32 2E 30) mean "Duo V2.0".

Request data storage availability (header 216)

Command : 03 00 01 D8 24

Response: 01 05 03 00 02 06 08 07 08 D8

The 5 data bytes in the response have the following meaning:

[memory type] [read blocks] [read bytes per block] [write blocks] [write bytes per block]

In our example the memory type (02) is EEPROM (100.000 write cycles guaranteed),

There are 7 readable blocks (0 .. 6) consisting of 8 bytes.

There are 6 writeable blocks (0 .. 2, 4 .. 6) consisting of 8 bytes.

Refer to Table 15: EEPROM Memory Description for a description of the data blocks.

Read Opto States (header 236)

Command : 03 00 01 EC 10

Response: 01 01 03 00 81 7A

The Duo has 2 opto sensors. If one of the sensors is interrupted, bit 7 of the data byte is set.

Bit 0 and 1 indicated which sensor is interrupted: Bit 0 for coin sensor 1 and bit 1 for coin sensor 2.

Request build code (header 192)

Command : 03 00 01 C0 3C
 Response: 01 08 03 00 4C 65 76 20 20 20 4C 6F B2

This command returns the hopper option.
 There is only one option on the cube hopper: Low level detection plates, and these are always fitted.
 The data bytes in the response mean: " Lev Lo". The "Lev LoHi" response will never appear, since the cube hopper has no means of checking if the high level sensor is mounted or not.

Request address mode (header 169)

Command : 03 00 01 A9 53
 Response: 01 01 03 00 4A B1

This command is used to determine how the hopper address is handled. See next table.

Bit nr	Description
B0	Address is stored in ROM
B1	Address is stored in RAM
B2	Address is stored in EEPROM or battery-backed RAM
B3	Address selection via interface connector
B4	Address selection via PCB links
B5	Address selection via switch
B6	Address may be changed with serial commands (volatile)
B7	Address may be changed with serial commands (non-volatile)

Table 6: Address mode

In our example 4A is returned, meaning that the address is stored in RAM, with a selection via the interface connector and the address may be changed with serial commands.

Enter PIN number (header 218)

Command : 03 04 01 DA 31 32 33 34 54
 Response: 01 00 03 00 FC

The 4 bytes (31 32 33 34) transmitted along with the command are the PIN numbers.
 Here PIN number "1234" is transmitted. Correct pin codes are immediately acked.
 A factory fresh hopper will have the pin code mechanism disabled (check with Test Hopper command).
 To activate the PIN mechanism, send an ENTER NEW PIN CODE command:
 Use the hopper TEST command (header 163) to check if a pin code is enabled or not.

Enter New PIN number (header 219)

Command : 03 04 01 DB 31 32 33 34 53
 Response: 01 00 03 00 FC

The 4 bytes (31 32 33 34) transmitted along with the command are the new PIN numbers.
 In our example "1234" is entered.

Once a pin code has been sent to the cctalk cube hopper for better payout security, it must be entered always in order to start a payout.

The Hopper stores this pin code number into it's Non-volatile memory.

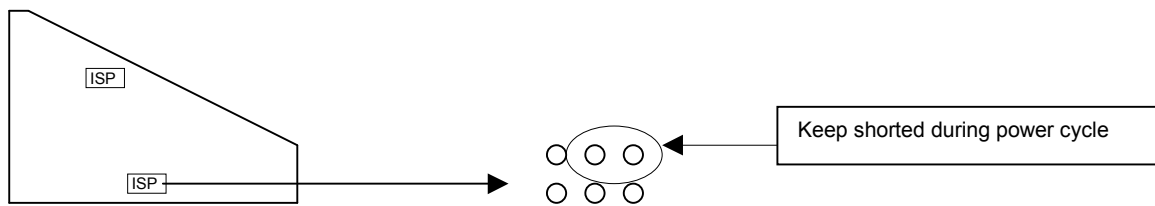
If you want to disable the pin code on the hopper, use the following steps:

1. Enter the current pin code of the hopper.
2. Enter a new pin code consisting of 4 zero bytes.
(Remember that '0' = ascii value 48, but you have to enter ascii value 0. Press ALT 0 four times to send 4 zero bytes).

The pin code will now be disabled.

If you don't remember the pin code anymore, the pin code must be disabled by hardware. Use the following steps:

1. Short pins 4 and 6 of the 6-pins Programming (ISP) pin-header.



2. Power cycle on/off the hopper.
3. Remove the short.

Pin code will now be disabled.

Modify variable settings (header 165)

Command :03 04 01 A5 14 00 64 01 DA
 Response: 01 00 03 00 FC

The 4 bytes (14 00 64 01) transmitted with the command have the following meaning:
 <current limit, motor stop delay, payout timeout, single coin mode>

In this example the hopper is set in single coin mode.
 (0 = multi coin mode (default), 1 = single coin mode)
 In single coin mode, only 1 coin at a time can be dispensed.
 => This mode can only be set to multi coin mode again by resetting the hopper.
 A hopper reset will set all variable settings to their default values.

Request variable settings (header 247)

Command : 03 00 01 F7 05
 Response: 01 06 03 00 22 00 1E 29 62 00 2B

The 6 data bytes in the response (22 00 1E 29 62 00) have the following meaning:

Item	Value N		Scaling and Units	Physical value	Default value
	Hex	Dec			
Motor Current Limit (see Table 13: Electrical specifications)	32	50	N / 15.1 Amp	3.3 A	3.3 A
Motor Stop Delay	0	0	N ms	0 ms	0 ms
Payout Timeout	1E	30	N * 0.333 sec	10 sec	10 sec
Peak current measured	27	39	N / 15.1 Amp	2.6 A	
Supply voltage	62	98	0.2 + N * 0.127 V	12.6 V	
Connector address	0	0	N + 3	3	3

Table 7: Hopper Variable Settings

[Motor current limit]

If the current through the motor is above the threshold level (3.3 A) during 160 ms, the motor will reverse for 250 ms to clear the blocking.

[Motor stop delay]

This is the time delay after the last coin is paid out before stopping. This should ensure a clean coin exit.

[Payout Timeout]

This is the total time each coin is allowed to leave the hopper, including some reverse time in jam situations. If the hopper is empty, the motor will stop after 10 sec (default value).

[Peak current measured]

This is the maximum motor current measured, and gives you an idea about the peak current your power supply must handle. Start and stop currents in the Cube hopper are software controlled and do not have steep slopes (about 0.5 Amp/ms). If the peak current exceeds the Absolute Maximum Current Level (6.3 Amp) after a delay of 2 seconds then the hopper will return a NAK response on a Start Payout command, because the bit B0 in the Hopper Status Reg1 will be set. A Reset command will clear the error.

[Supply voltage]

This is the measured supply voltage the hopper runs on.

[Connector address]

The address of the hopper after a power up or reset is equal to this address + 3

3.3 Hopper Dispense value procedure

Dispensing coins using a cctalk duo hopper requires some extra command steps before the actual dispense command can be executed successfully. Note that this manual explains the procedure for the Duo hopper. If the Duo hopper is used as a standard hopper, see the manual of the standard hopper.

Test Hopper (header 163)

Command : 03 00 01 A3 59
 Response: 01 03 03 00 C0 80 00 B9

First of all, check if any error flags are set in the status bytes. This can be checked by sending a hopper TEST command. Three status bytes are returned in response.

Duo Status Register 1		
Bit nr	Description	Default value after power up
B0	1 = Absolute maximum current exceeded	0
B1	1 = Payout timeout occurred	0
B2	1 = Motor reversed during last payout to clear a jam	0
B3	1 = Opto fraud attempt, path blocked during idle	0
B4	1 = Opto fraud attempt, short-circuit during idle	0
B5	1 = Opto blocked permanently during payout	0
B6	1 = Power-up detected	1
B7	1 = Payout disabled	1

Table 8: Duo Status Register 1

Duo Status Register 2		
Bit nr	Description	Default value after power up
B0	1 = Opto fraud attempt, short-circuit during payout	0
B1	1 = Single coin payout mode	0
B2	1 = Checksum A error	0
B3	1 = Checksum B error	0
B4	1 = Checksum C error	0
B5	1 = Checksum D error	0
B6	1 = Power fail during NV Memory write	0
B7	1 = Pin number mechanism enabled	0 or 1

Table 9: Duo Status Register 2

Duo Status Register 3		
Bit nr	Description	Default value after power up
B0	1 = Power Down during payout	0
B1	not used	0
B2	1 = Pin Number incorrect	0
B3	1 = Incorrect Payout Key	0
B4	1 = Encryption is enabled	0
B5	not used	0
B6	not used	0
B7	not used	0

Table 10: Duo Status Register 3

⇒ **Error flags can only be reset by sending a reset command or a power cycle.**

In our example the first status byte (C0) indicates that a power up is detected and the hopper is disabled. The second byte (80) tells us that the PIN number mechanism is enabled. To unlock the hopper, a pin code must be send to the hopper:

If no opto-error flags are set, the hopper enable command may be issued.

After a power up or a reset the hopper is disabled. Check the status bytes again. The first data byte contains the status of the hopper. If bit B7 is set, payout is disabled.

After checking the hopper status bytes, check if any residual (uncompleted) payout is pending. This can occur if a previous payout was aborted due to a power failure, a coin jam or hopper ran out of coins. Transmit the `REQ_HOPPER_POLLING_VALUE` command to check the status:

Request Hopper Polling Value (header 133)

Command : 03 00 01 85 77

Response: 01 07 03 00 06 00 00 90 01 58 02 04

The 7 data bytes (06 00 00 90 01 58 02) in the response have the following meaning:

Byte[0] : [event counter]

Byte [1][2]: [Last Payout: Value Remaining LSB] [Last Payout: Value Remaining MSB]

Byte [3][4]: [Last Payout: Value Paid LSB] [Last Payout: Value Paid MSB]

Byte [5][6]: [Last Payout: Value UnPaid LSB] [Last Payout: Value UnPaid MSB]

In our example 7 dispense commands have been issued, value remaining is 0, value paid is 0x0190 (400 dec) and value unpaid is 0x0258 (600 dec).

[event counter]

After each valid (no communication errors) Dispense coins command, this counter is incremented. Only after a hopper reset it is set to 0. This counter should be checked each time a dispense command is transmitted, to check if the command has been received by the hopper. This should prevent sending too many or too less payout commands resulting in wrong payouts. If the hopper status event counter is incremented, then check the payout results by checking the coin counters.

[Last Payout: Value Remaining]

After receiving a hopper dispense command, this value is set with the amount of money to pay.

Each time a coin (1 or 2 euro) is paid, this value is decremented.

If the payout operation completes successfully or abnormally, this value will be set to 0.

The Host software should always check this value if it has become 0. If it has become 0 and the Last Payout Value Unpaid is not equal to 0, then the dispense procedure has been aborted, because the remaining value is less than 2 euro. A Duo hopper with 1 and 2 euro coins will not payout any value below 2 euro, since the next coin to be paid is unknown.

[Last Payout: Value Paid]

After receiving a hopper dispense command, this value is set to 0.

Each time a coin is paid, this value is incremented with the coin value paid.

[Last Payout: Value UnPaid]

This value holds the amount that failed to payout after the hopper aborted the payout operation. If this value is larger than 2 euro, the Duo hopper is most probably empty. Any value less than 2 euro should be paid using a second (standard) cctalk cube hopper.

The paid and unpaid values are saved during a power failure.

If the hopper was running during a power failure, then the hopper will stop and save its status as soon as the power dips below 8V during 20ms.

The time to save all coin counters in EEPROM memory may take up to 90ms. If a coin is ejected during this EEPROM update moment (possible, because the coin can already be in the coin exit port if the power fails), then this coin will not be saved in EEPROM. The result will be an overpay of 1 coin value. In order to be sure that no payout fraud will be possible by unplugging the power of the machine during a payout, it may be wise to decrement the amount to be paid with 2 euro after power recovery.

Emergency Stop Value (header 132)

Command : 03 00 01 84 78
Response : 01 02 03 00 00 00 FA

The 2 data bytes in the response holds the unpaid value amount since the dispensing was aborted by the Emergency Stop command.

Enable Hopper (header 164)

Command : 03 01 01 A4 A5 B2
Response: 01 00 03 00 FC

Transmit the ENABLE HOPPER command with data byte 1 set to 165 (= A5 Hex) to enable payout. The hopper can be disabled by sending the ENABLE HOPPER command with data byte 1 set to any value other than 165. After transmitting the ENABLE HOPPER command the TEST HOPPER command can be issued again to check if the payout is enabled.

⇒ The hopper remains enabled until the hopper is reset or is disabled by command.

Once the hopper is enabled (and not blocked by a pin code) the payout can be started.

- If the hopper Product Code is "10-2300-99", then the DISPENSE VALUE command needs an 8-byte security code from the hopper in order to start a payout. Get the security code from the hopper by transmitting the REQUEST CIPHER KEY command. Optionally the PUMP RNG command may be transmitted prior to the Request Cipher Key command to randomize the security code from the hopper even more.

- If the hopper Product Code is "10-2200-99", then the DISPENSE VALUE command still needs an 8-byte code, but the value of the code does not matter.

- If the hopper Product Code is "10-2100-99", then the DISPENSE VALUE command needs its 3-byte serial number sent along with the command to enable a payout.

Pump RNG (header 161)

Command : 03 08 01 A1 5B DA AA 6F 9A 5D C5 06 43
Response: 01 00 03 00 FC

The 8 bytes transmitted with the Pump RNG command are random numbers generated by the host. These random numbers are used by the hopper to generate a random cipher code.

Request Cipher Key (header 160)

Command : 03 00 01 A0 5C
Response: 01 08 03 00 69 EE 8F 1C 25 FA AB 08 20

The Request Cipher Key returns 8 security bytes: (69 EE 8F 1C 25 FA AB 08).

Once the security key from the hopper is received, the payout can be started by transmitting the DISPENSE HOPPER VALUE command together with the (encrypted) security bytes and the value to payout. The software code to encrypt the cipher keys are described: see <http://www.cctalk.org/>

Dispense Hopper Value (header 134)

For the Duo type 10-2300-99, the Cipher Key from the previous command is sent encrypted (bytes: 28 DB 6A 16 7C 92 B9 C6), together with the dispense value command (0x86) and the value to pay.

For the Duo type 10-2200-99, the Cipher Key from the previous command is sent, but not used by the dispense command. Suggested is to send 8 zero's together with the dispense value command (0x86) and the value to pay.

For the Duo type 10-2100-99, the duo serial number (3 bytes) is sent along with the value command and the value to pay.

The response is a ACK message with 1 data byte: [event counter].
Each time a dispense command is transmitted without any communication errors, the event counter is incremented. The host software can check this value if any dispense commands are missing (due to communication errors).

If the hopper Product Code is 10-2100-99 the dispense command would look like follows:

Command : 03 05 01 86 87 D6 12 E8 03 17

Response: 01 01 03 00 08 F3

The 3-byte serial nr (87 D6 12) in the command string is followed by the value to pay (E8 03) = 0x03E8 (1000 dec).

The format of the serial number is explained in Request Serial Nr (header 242).

The maximum value to pay with 1 dispense command is 65535 (655.35 euro).

A NAK response is returned in the following situations (check with HOPPER TEST command):

- The coin exit is blocked
- The hopper is not enabled
- PIN code not transmitted
- Cipher key not requested
- Nr coins is not 1 in single coin mode
- Absolute Maximum Current Level has been exceeded.
- A Hopper Dispense command was sent when the hopper was already dispensing.

When the payout is started, all hopper status values are updated:

- [event counter] is incremented (also when a NAK is received)
- [payout value remaining] is set to the value to pay
- [payout value paid] is set to 0
- [payout value unpaid] is set to 0

During payout the values are updated as follows:

- [payout value remaining] is decremented with the coin value paid
- [payout value paid] is incremented with the coin value paid
- [payout value unpaid] is set to 0

After the payout operation has stopped normally or abnormally, the values are updated as follows:

- [payout value unpaid] is set to [payout value remaining]
- [payout coins remaining] is set to 0

Payout value remaining should always be checked during the coin dispensing. If it reached 0, the host software should check if the payment is completed or aborted by checking the value paid and value unpaid counters.

If a power reset occurred during a payout, all last payout values are saved in EEPROM. These values can be used to finish the pending payout if the power is back again.

During a payout, the payout values can be retrieved using the REQUEST HOPPER POLLING VALUE command (header 133). It is recommended to poll the hopper status each 100 ms during payout. Any display of the counter values can be monitored real-time.

If the host receives no reply to the REQUEST HOPPER POLLING VALUE command, it will be retransmitted 50ms later again (max 3 retries).

A final step in the payout procedure is:

Verify payout

After the dispensing of coins, the TEST command should be issued to verify if no abnormal situations have occurred. (opto blocks, jams, etc). The REQUEST HOPPER POLLING_VALUE and REQUEST INDEXED HOPPER DISPENSE COUNT commands should be issued to check if all coins have been dispensed properly.

- Check the dispense event counter to check if the dispense command is received.
- Check if any errors occurred during the payout with the hopper test command.
- Check if all coin counters balance with the request hopper status command.
- Check the coin level status (empty/full) (see next command)

Request Payout high/low status (header 217)

Command : 03 00 01 D9 23

Response: 01 01 03 00 10 EB

The returned data byte is the levelstatus.

The bits of levelstatus have the following meaning:

Bit nr	Description
0	Low Level status (1 = low level)
1	High Level status (1 = high level, if fitted)
2	not used
3	not used
4	Low Level sensor is fitted
5	not used
6	not used
7	not used

Table 11: LevelStatus bit definition

In our example the low level sensor is fitted and the level status is normal.

Request hopper coin value (header 131)

Command : 03 01 01 83 01 77
 Response: 01 08 03 00 45 55 31 30 30 41 64 00 24

This command returns the coin identifier string and coin value of the type indicated in the data byte of the transmitted command. In the example the coin value of type 01 is requested.

The return value is defined as follows:
 The first 6 bytes data[0] .. data[5] are the identifier string and the next 2 bytes are the coin value = data[6] + 256 * data[7].

Example:

Coin	Identifier	LSB	MSB
2 Euro	EU200A	C8	00
1 Euro	EU100A	64	00

Table 12: Coin description

Request indexed hopper dispense count (header 130)

Command : 03 01 01 82 01 78
 Response: 01 03 03 00 4B 00 00 AE

This command returns the total amount of coins (3 byte value) that have been dispensed since the counter was cleared. Two counters are implemented: coin type 1 and coin type 2. These counters reside in Block 6 of the EEPROM. See Table 15: EEPROM Memory Description.

The data byte in the command indicates the coin type, for which the counter value is requested. In our example, the total number of coins paid for type 1 is 4B 00 00 (hex) = 75 (dec).

To clear the counter, use the Write Block Header (214) command and write 4 zero's (incl. checksum) into the proper EEPROM locations.

Read Data Block (header 215)

Command : 03 01 01 D7 02 22
 Response: 01 08 03 00 2E 02 00 D0 01 FF 00 00 F4

In this example Read Data Block 2 is requested.
 The 8 bytes in the response (2E 02 00 D0 01 FF 00 00) contain the hopper dispense counter (2E 02 00) and a checksum (D0) over the counter.

Write Data Block (header 214)

Command : 03 09 01 D6 02 00 00 00 00 00 00 00 00 1B
 Response: 01 00 03 00 FC

In this example 8 bytes (00 00 00 00 00 00 00 00) were send to EEPROM Block 2. This means that Hopper Dispense count, coins paid and coins unpaid are all reset to 0.

3.4 Coin Jams during payout

During a payout, a coin may block the hopper (for example if the hopper is loaded too heavily, or a wrong coin has slipped into the hopper). In this case the motor current will rise quickly. A fully blocked hopper motor will draw peak currents up to 7 Amp. When the power supply is not able to deliver this peak current, the voltage on the hopper will drop.

We recommend the following power supply types from Suzo:

- 42PP0520 (dual supply: 5VDC and 12VDC)
- 42PP0530 (dual supply: 5VDC and 24VDC)

When the voltage drops below the `POWER_FAIL_TRESHOLD` (see Table 13: Electrical specifications) during 20ms, the hopper will reset, aborting the payout procedure. This 20ms may seem a short time, but remember that if the power supply is 8.0V and falling, the hopper must be able to stop and save all payout settings before the power is gone totally.

As long as the power supply on the hopper is above the `POWER_FAIL_TRESHOLD` level, the hopper will start an anti-jam operation by reversing and restarting the hopper motor.

If the motor current is greater than 3.3A during 160ms, the motor will start reversing in order to un-jam the hopper. During anti-jamming, the current may rise to levels of 6 Amp peak.

3.5 Power failures

The hopper measures the voltage each ms.

If the voltage drops below the `POWER_FAIL_TRESHOLD` during 20ms, the hopper will stop immediately if it was running, and save all counters (`CoinsPaid`, `CoinsUnpaid`) in Non-volatile memory.

A power dip of more than 20ms will stop the hopper and save all data.

If the power returns again, the host software must retrieve the hopper status and take appropriate action if there are, for example, unpaid coins left.

4. Electrical, Timing and Environmental Specifications

Parameter	Min	Typ @ 12V	Typ @ 24V	Max	Units
Supply voltage	11	12	24	26	Vdc
Idle current		30	30		mA
Motor_start current		2.2	2.2	5	A
Motor_running_current		0.5	0.6	0.9	A
Vtrip (Power fail threshold)		8.0 during 20ms	8.0 during 20ms		Vdc
Motor_current_reverse level		> 3.3 A during 160 ms	> 3.3 A during 160 ms		A
Thermal fuse protection		5.5	5.5		A

Table 13: Electrical specifications

Parameter	Description	Value	Units
Brate	Serial communication speed	9600	baud
Trxout	Receive data timeout	25	ms
TPinit	Power up initialisation time	630	ms
TSinit	Software reset init time	40	ms
PWMFreq	Motor drive PWM frequency	20	kHz
TMreverse	Motor reverse time	250	ms
Ifuse	Fuse trip time @ 5.5 A	5	sec
Tlevdeb	Level sensor debounce time	2	sec
TEESave	EEProm write time per byte	7	ms
TEESave-PowerDown	Save time hopper status at power down	20 - 90	ms
TResetAck	ACK delay after receiving a reset command	max 90	ms
TResponse	Command response time (except for command headers 1, 253, 252)	max 2	ms

Table 14: Timing specifications

Block Nr.	Length (bytes)	Description	Read/Write Permission
0	8	User data	R / W
1	6	Coin name	R / W
1	2	User data	R / W
2	3	Hopper dispense count	R / W
2	1	Checksum A	R / W
2	1	Last payout: coins paid	R / W
2	1	Checksum B	R / W
2	1	Last payout: coins unpaid	R / W
2	1	Checksum C	R / W
3	3	Hopper life dispense count	R
3	1	Checksum D	R
3	1	Black Box Recorder A	R
3	1	Black Box Recorder B	R
3	1	Black Box Recorder C	R
3	1	Black Box Recorder D	R
4	8	User Data 1	R / W
5	8	User Data 2	R / W
6	3	Coin Type 1 dispense count	R / W
6	1	Checksum E	R / W
6	3	Coin Type 2 dispense count	R / W
6	1	Checksum F	R / W

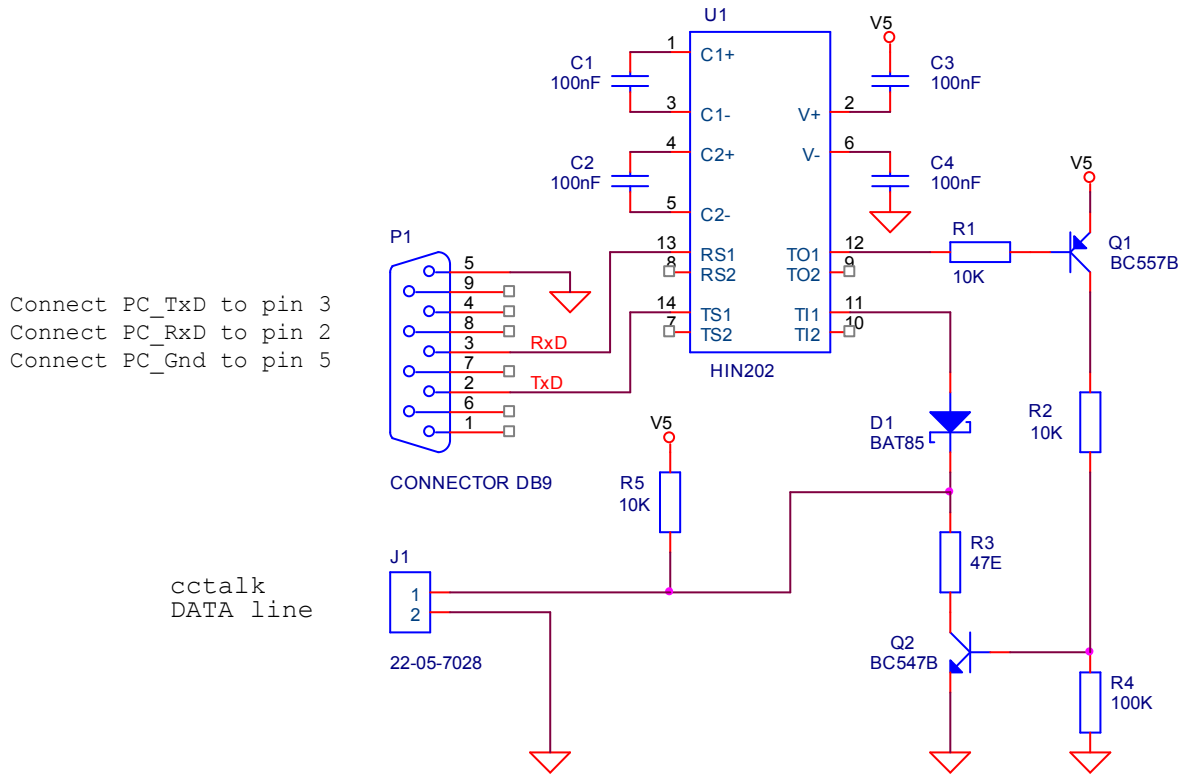
Table 15: EEPROM Memory Description

Storage temperature	-20° C to +70° C
Operating temperature	0° C to +50°C
Storage humidity	10% to 95% non-condensing
Operating humidity	10% to 75% RH
General	Keep coin exit clear from any obstacles

Table 16: Environmental specifications

Appendix 1: PC Interface Circuit

The circuit diagram below shows an interface that can be used to connect a 9-pin serial port of a PC to a cctalk data bus.



Appendix 2: Mechanical dimensions

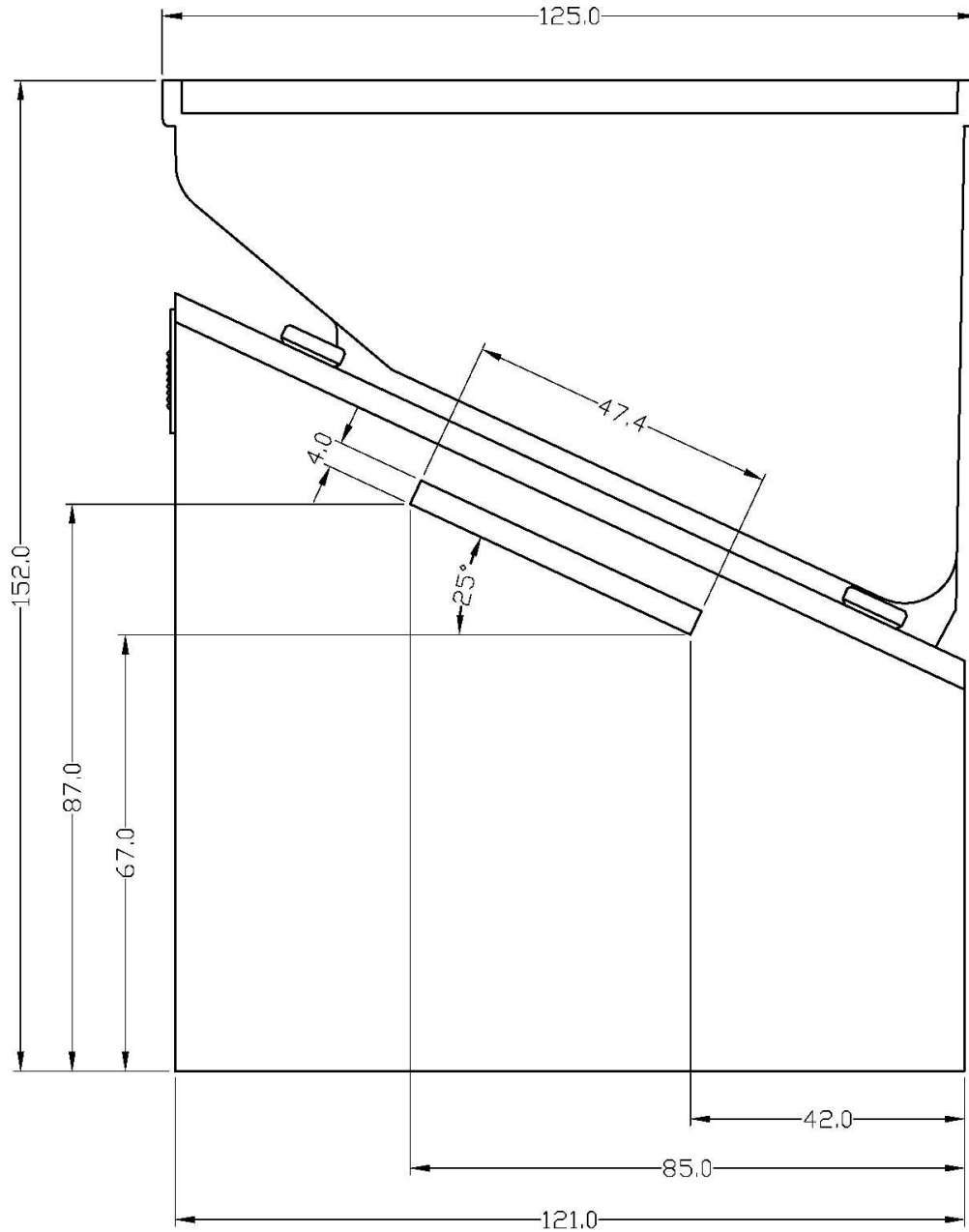
Dimensions:

D: 125mm

W: 125mm

H: 152mm

Weight:
780 grams



PAY-OUT SIDE

Appendix 3: Maintenance

Removing the Motor and Gearbox

The motor is controlled by the PCB and operates the disc by means of gears and shafts.

The gearbox is constructed according to the sun and planet system.

The motor can easily be exchanged by first unplugging the connector from the PCB and then dismantling the motor holder which is connected to the gear box by means of a bayonet catch.

Press down the engraved slide on the motor housing and turn the motor housing in an anti-clockwise direction to take it off.

Now take a new motor and refit into the motor holder.

The gearbox can also be removed completely by unscrewing the three screws, which attach the gearbox to the platform and removing the rolling-pin on top of the motor shaft.

The Counter Pawl fits an Opto output detector with a transmitter inside the Hopper. The Counter Pawl makes sure that the coin always leaves the Hopper and the construction is done in such a way that once the coin leaves the disc it can never return to the Hopper.

Important: shut-off power from the host machine before starting any cleaning activities.

Removing and re-installing the hopper

The hopper can easily be removed by pressing on the red release button on the mounting plate and then removing the connector.

Re-installing the hopper:

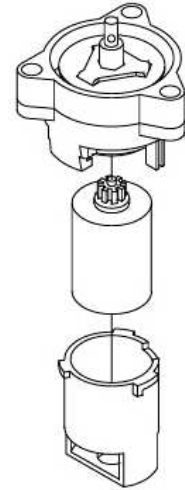
First plug the connector into the Hopper at the reverse side and slide it into the two red hooks on the mounting bracket, then press the red button with lever slightly backwards and push the hopper onto the bracket.

Cleaning and Materials

All reachable places where the coins pass through the hopper should be cleaned at least every 6 months or after counting 500,000 coins (whichever situation occurs first) with a moist cloth with dry silicon spray (Part No. 20-0124-1).

In particular the opto coupler needs to be kept clean.

Dirt could obstruct or disrupt the optic signal, resulting in unreliable coin counting.



Disassembly

How to remove the disc

Slide the green button on the back to “down” position.
Remove the coin cup by sliding it upwards and lift the cup from the platform.
You are now able to remove the disc from the platform.

How to remove the coin insert plate

Remove the cup and disc from the platform as described above.
Remove the outlet bridge by pulling it up firmly.
Gently lift up the coin insert plate using a small screwdriver.

How to re-configure the Cube Hopper

Remove the coin cup.
Remove the disc and/or coin insert plate (if necessary) and replace them with the ones necessary to achieve the desired configuration.
Before placing the new disc onto the platform:
Please check that the correct coin insert plate is mounted on the platform under the bridge. (See Reference Chart)
Don't forget to put the black Teflon bearing in the centre of the platform. Make sure that the metal ring in the disc is present as well.
Bring the coin cup onto the platform and slide the green button to the up position to lock it in place.
NOTE: Please look up the correct configuration for your hopper in the Reference Chart.

Appendix 4: troubleshooting

Coins fail to unjam

Are you using a solid power supply? (12V, 5A peak)

We recommend the following types from Suzo:

- 42PP0520 (dual supply: 5VDC and 12VDC)
- 42PP0530 (dual supply: 5VDC and 24VDC)

Are you using the correct coin insert plate? (see Reference Chart)

Are you using the right disc? (see Reference Chart)

Be sure Opto Coupler is clear!

Are there bad or incorrect coins in the hopper?

Motor fails to run.

Check the hopper fuse of the host machine.

Protection device tripped - wait for 30 seconds with the power switched off.

Over payout of coins.

Check the opto coupler for accumulated dirt or dust.

Check exit monitoring by the host machine.

Check if the hopper's power is not disconnected too slowly. Power should be disconnected directly after the registration of the ejection of the last coin of the payout.

Are you using the correct coin insert plate? (see Reference Chart)

Under payout of coins.

Make sure the hopper has sufficient coins.

Incorrect registration by the host machine.

Incorrect exit output, debouncing by the host machine.

Bad contact with the hopper.

CCTalk communication trouble shooting

No response received after transmitting a command

- Check if the message contains the proper hopper address.
- Check if the transmitted message is correct (checksum ok. etc).
- Use a PC test program (can be obtained from Suzo) to check if the message is correct.
- Check the quality of the cctalk data line signal using a digital oscilloscope.
- Check if you can see the response from the hopper on the oscilloscope.

Appendix 5: Optional add-ons

Cup extension (Part No. 10-0200)

A 65mm high extension together with standard coin-cup increases the capacity of the cup from 400 to 700 coins of €0.50 (24.25mm in diameter, 2.4mm thick). It can be used with all coins with diameters up to 31mm.

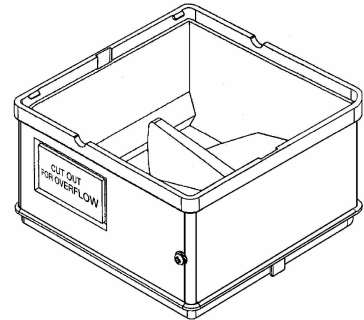
A second extension is possible for coins with a maximum diameter of 25.6mm. This increases the capacity to 1,000 coins of €0.50.

Hopper dimensions - with one extension: Weight

D: 125mm W: 125mm H: 217mm 860 grams

Hopper dimensions - with two extensions:

D: 125mm W: 125mm H: 282mm 940 grams



Appendix 6: Payout discs and inserts

<i>Payout discs</i>				
New mark	Old mark	Diameter (mm)	Thickness (mm)	Part no
2	A	18.00 - 22.09	1.50 - 2.09	10-0240-2
22		18.00 - 22.09	1.30 - 1.45	10-0240-22
3	AA	18.00 - 22.09	2.10 - 3.20	10-0240-3
4	B	22.10 - 25.59	1.50 - 2.09	10-0240-4
44		22.10 - 25.59	1.30 - 1.45	10-0240-44
5	BB	22.10 - 25.59	2.10 - 3.20	10-0240-5
8	6 / C	25.60 - 31.00	1.50 - 2.09	10-0240-8
9	7 / CC	25.60 - 31.00	2.10 - 3.20	10-0240-9
99		€0.20 - €0.50 - €1.= - €2		10-0240-99

Table 17: Payout discs

<i>Coin insert plates</i>		
Plate mark	Diameter (mm)	Part no
11	18.00 - 18.99	10-0238-11
A	19.00 - 22.09	10-0238
B1	22.10 - 23.89	10-0238-1
B2	23.90 - 25.59	10-0238-2
C1	25.60 - 27.89	10-0238-3
C2	27.90 - 30.09	10-0238-4
5	30.10 - 31.00	10-0238-5
7	for €0.20	10-0238-7

Table 18: Coin insert plates

PLEASE NOTE:

Changes have been made to the previously used configuration of the Cube Hopper.

- Payout disc 10-0240-6: replaced by 10-0240-8.
- Payout disc 10-0240-7: replaced by 10-0240-9.
- Hopper 10-1900-60: replaced by 10-1900-83.
- Hopper 10-1900-61: replaced by 10-1900-84.
- Hopper 10-1900-70: replaced by 10-1900-93.
- Hopper 10-1900-71: replaced by 10-1900-94.

Which hopper to use for which Euro-coin:

€0.01	Not available	€0.20	10-1700-25
€0.02	10-1700-15	€0.50	10-1700-99
€0.05	10-1700-20	€1.00	10-1700-99
€0.10	10-1700-20	€2.00	10-1700-99

Appendix 7: Reference chart

Model no.10-1900-15

Diameter 18.00 to 18.99mm. Thickness 1.50 to 2.09mm.
Disc is marked "2" (Part no. 10-0240-2).
Use coin insert plate 11 (Part no. 10-0238-11).

Model no.10-1900-20

Diameter 19.00 to 22.09mm. Thickness 1.50 to 2.09mm.
Disc is marked "2" (Part no. 10-0240-2).
Use coin insert plate A (Part no. 10-0238).

Model no.10-1900-30

Diameter 19.00 to 22.09mm. Thickness 2.10 to 3.20mm.
Disc is marked "3" (Part no. 10-0240-3).
Use coin insert plate A (Part no. 10-0238).

Model no.10-1900-40

Diameter 22.10 to 23.89mm. Thickness 1.50 to 2.09mm.
Disc is marked "4" (Part no. 10-0240-4).
Use coin insert plate B1 (Part no. 10-0238-1).

Model no.10-1900-41

Diameter 23.90 to 25.59mm. Thickness 1.50 to 2.09mm.
Disc is marked "4" (Part no. 10-0240-4).
Use coin insert plate B2 (Part no. 10-0238-2).

Model no.10-1900-50

Diameter 22.10 to 23.89mm. Thickness 2.10 to 3.20mm.
Disc is marked "5" (Part no. 10-0240-5).
Use coin insert plate B1 (Part no. 10-0238-1).

Model no.10-1900-51

Diameter 23.90 to 25.59mm. Thickness 2.10 to 3.20mm.
Disc is marked "5" (Part no. 10-0240-5).
Use coin insert plate B2 (Part no. 10-0238-2).

Model no.10-1900-83

Diameter 25.60 to 27.89mm. Thickness 1.50 to 2.09mm.
Disc is marked "8" (Part no. 10-0240-8).
Use coin insert plate C1 (Part no. 10-0238-3).

Model no.10-1900-84

Diameter 27.90 to 30.09mm. Thickness 1.50 to 2.09mm.
Disc is marked "8" (Part no. 10-0240-8).
Use coin insert plate C2 (Part no. 10-0238-4).

Model no.10-1900-85

Diameter 30.10 to 31.00mm. Thickness 1.50 to 2.09mm.
Disc is marked "8" (Part no. 10-0240-8).
Use coin insert plate 5 (Part no. 10-0238-5).

Model no.10-1900-93

Diameter 25.60 to 27.89mm. Thickness 2.10 to 3.20mm.
Disc is marked "9." (Part no. 10-0240-9).
Use coin insert plate C1 (Part no. 10-0238-3).

Model no.10-1900-94

Diameter 27.90 to 30.09mm. Thickness 2.10 to 3.20mm.
Disc is marked "9." (Part no. 10-0240-9).
Use coin insert plate C2 (Part no. 10-0238-4).

Model no.10-1900-95

Diameter 30.10 to 31.00mm. Thickness 2.10 to 3.20mm.
Disc is marked "9." (Part no. 10-0240-9).
Use coin insert plate 5 (Part no. 10-0238-5).

THE “SPECIAL-HOPPERS”

Model no. **10-1900-82** “Special-hopper”

For 50 pence UK coins.

Disc is marked “**8**” (Part no. **10-0240-8**).

Use coin insert plate **B2** (Part no. **10-0238-2**).

THE “EURO-HOPPERS”

Model no. **10-1900-25**, “Euro-hopper”

For €0.20 coins.

Disc is marked “**99**”. (Part no. **10-0240-99**).

Use coin insert plate **7** (Part no. **10-0238-7**)

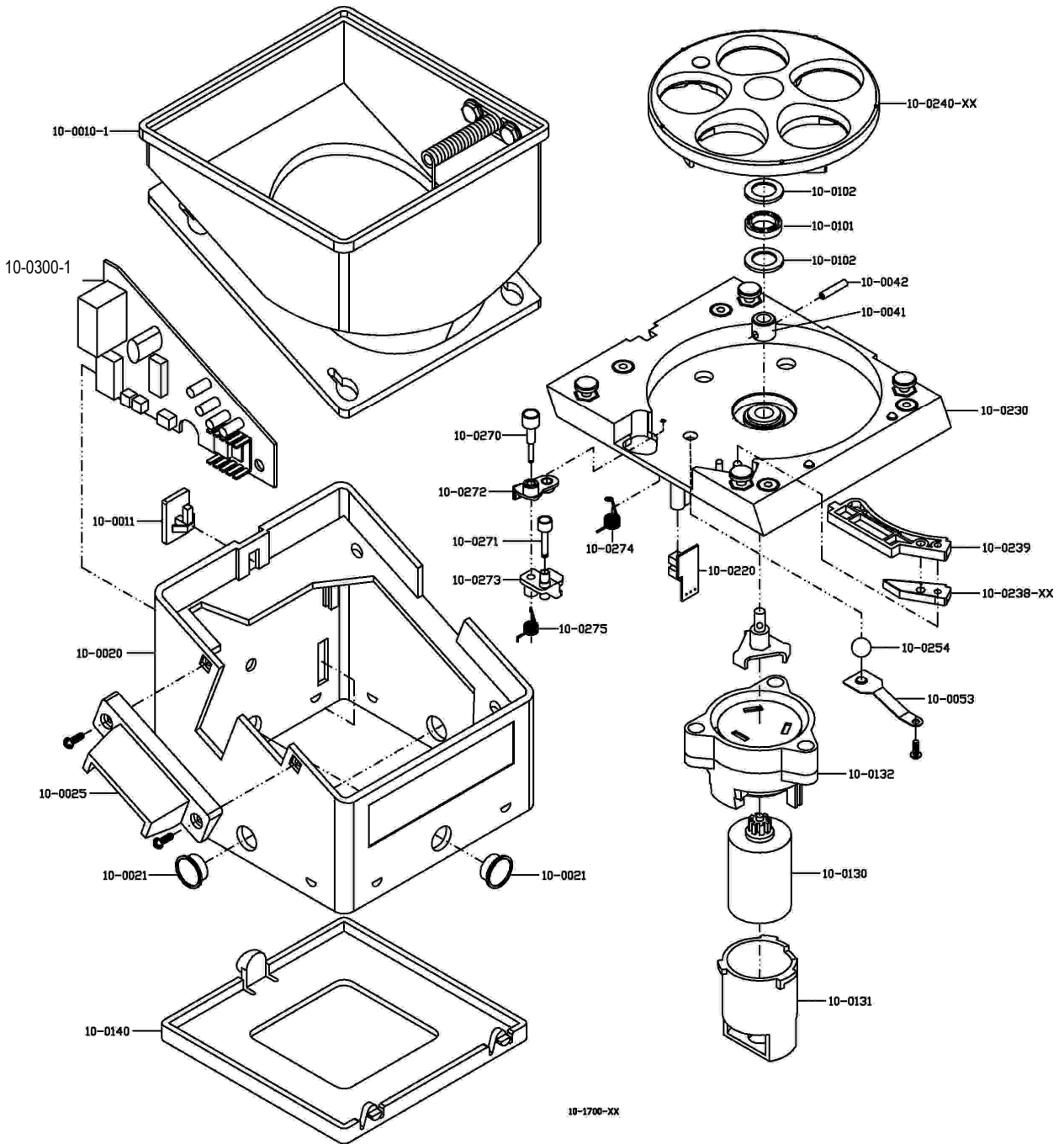
Model no. **10-1900-99**, “Euro-hopper”

For €0.50, €1.00 and €2.00 coins.

Disc is marked “**99**”. (Part no. **10-0240-99**).

Use coin insert plate **B1** (Part no. **10-0238-1**)

Appendix 8: Exploded view



Design and specifications are subject to change without notice.
Wijzigingen in ontwerp en technische gegevens voorbehouden, zonder kennisgeving.
La conception et les spécifications sont modifiables sans préavis.
El diseño y especificaciones están sujetos a cambios sin previo aviso.

This manual is intended only to assist the reader in the use of this product and therefore Suzo International shall not be held liable for any loss or damage whatsoever arising from the use of any information or particulars in, or any omission from this manual or any incorrect use of the product.

WARNING!

Failure to observe the interface requirements specified in this technical manual may result in miscounts, damage to the electronics and the motor of the hopper or create unacceptable voltage drops, affecting other units depending on the same powersupply.



SUZO INTERNATIONAL (NL) B.V.
Antonie van Leeuwenhoekstraat 9
3261 LT Oud Beijerland The Netherlands
TEL: +31 (0)186 64.33.33 * FAX: +31 (0)186 64.33.22