

Hopper Kid ccTalk

Manuale d'uso

Rev. 1.01

Hopper Kid ccTalk Standard / Reverse



Manuale d'uso

CE

Alberici[®]
CASH SOLUTIONS

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Congratulazioni per l'acquisto dell'erogatore di monete Alberici **Hopper Kid!**

Questo erogatore, progettato e realizzato nei laboratori di ricerca Alberici ricorrendo alle più moderne tecnologie di sviluppo sia nel settore dell'elettronica che della meccanica, nasce per coprire le esigenze di coloro che lavorano nel mercato dei pagamenti automatici.

L'apparecchio funziona con tensione di alimentazione + 24V.

I sensori di livello massimo (pieno) e minimo (riserva) possono essere ad elettrodo (Modello PLATE a lamelle), oppure a tecnologia ottica (Modello OPTO); in questo secondo caso si elimina ogni possibilità di malfunzionamenti dovuti a scariche elettrostatiche accumulate dalle monete.

In presenza di sensori a tecnologia ottica, è comunque raccomandato di collegare le lamelle alla terra della macchina.

1. Descrizione generale

1.1 Sfera di utilizzo

La tecnologia implementata permette all'Hopper Kid di contare autonomamente le monete da erogare, e di fermarsi nel caso sia vuoto.

Tutto questo avviene sfruttando una notevole quantità di routines di controllo per la gestione degli eventi interni ed esterni.

Si integra quindi con facilità sia in giochi con vincita che in impianti di cambio moneta.

Queste caratteristiche lo rendono facilmente compatibile con tutte le schede normalmente disponibili sul mercato.

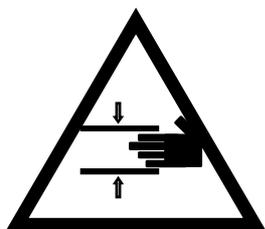
1.2 Sicurezza

L'Hopper dovrà essere installato all'interno di sistemi o di apparecchiature che siano dotati di dispositivi di disconnessione dell'alimentazione di rete.

Il montaggio e lo smontaggio dell'hopper dalla sua base a slitta deve avvenire ad alimentazione spenta.

Non introdurre le dita o le mani all'interno dell'hopper (parti meccaniche in movimento).

L'installazione deve essere eseguita come da specifiche al paragrafo 2.3 .



ATTENZIONE

PERICOLO !

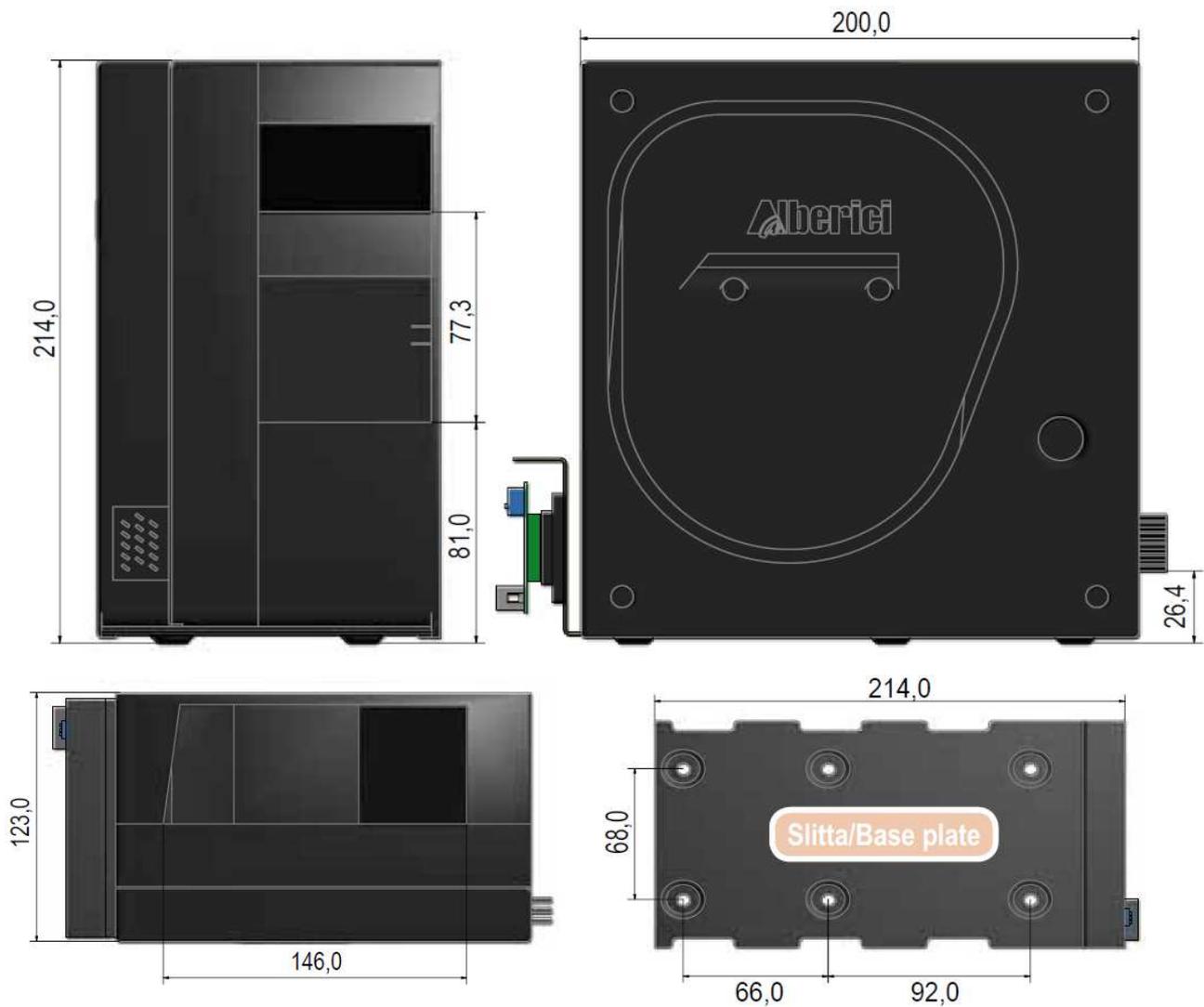
ORGANI MECCANICI IN MOVIMENTO

2. Caratteristiche meccaniche

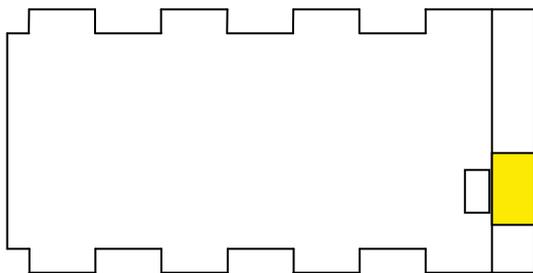
L'Hopper Kid ccTalk è disponibile in 2 distinte versioni, che si differenziano a seconda delle posizioni rispettive fra il connettore Cinch e l'uscita monete. Quando sono situate sui lati opposti, la versione è detta "STANDARD"; quando si trovano sullo stesso lato, la versione è detta "REVERSE".

Può gestire qualsiasi moneta il cui diametro sia compreso tra 16mm e 32mm (a scelta 2 catene: una da 16-24mm, e una da 22-32mm), e il cui spessore sia fra 2,0 mm e 3,4 mm.

2.1 Ingombri (inclusa base a slitta)

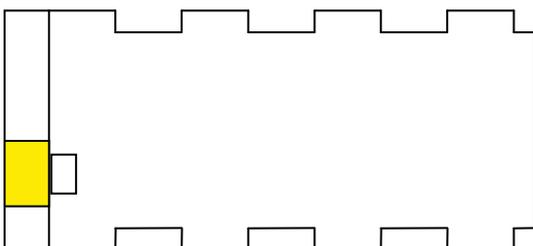


2.1 Posizione dei Connettori



Versione Reverse

(connettore sul lato di uscita delle monete)



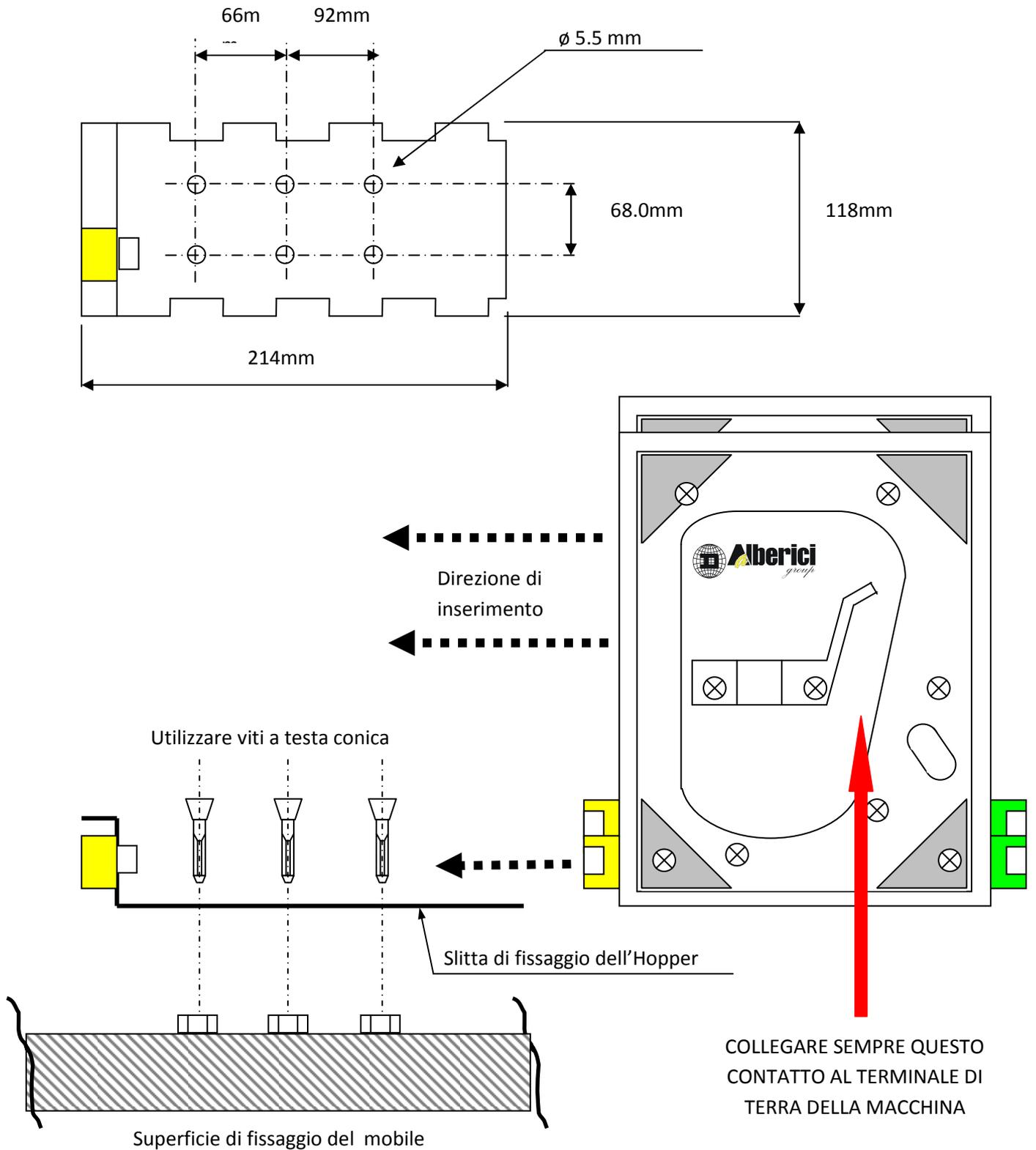
Versione Standard

(connettore sul lato opposto a quello di uscita delle monete)

2.3 Installazione

Per montare l'apparecchio:

- . fissare sul mobile la piastra di base: su questa andrà agganciato l'hopper
- . inserire l'hopper, facendolo slittare sulla piastra di base fino a completa battuta
- . effettuare i collegamenti elettrici (vedi capitolo 3)



3. Caratteristiche elettriche

Tutti i segnali gestiti dall'hopper sono in **logica negativa**: il segnale è considerato **attivo** quando si trova a **livello BASSO (GND)**.

3.1 Pinout connettore Cinch e connettore schedino 10poli

12 PIN CCTALK cinch				10 PIN CCTALK			
GND	1	2	VOID	Data ccTalk	1	2	VOID
VOID	3	4	Address 1	VOID	3	4	GND
DATA cctalk	5	6	VOID	VOID	5	6	VOID
VOID	7	8	Address 2	+24V	7	8	GND
+24V	9	10	VOID	VOID	9	10	+24V
VOID	11	12	Address 3				

3.2 Alimentazione

L'Hopper Kid deve essere alimentato con +24V in tensione continua sul pin 9 (pin 1 = GND), se si usa il connettore CINCH. Sul connettore 10p, i +24V vanno forniti sul pin 7; collegare la terra al pin 8.

La velocità di erogazione delle monete è proporzionale alla tensione di alimentazione del motore. Si raccomanda di non scendere mai al disotto di 18Vdc e di non superare i 27Vdc.

Con una tensione di 24 Vdc la quantità massima di gettoni erogabili è di 240 al minuto; aumentare la tensione di alimentazione non fa aumentare la velocità di erogazione.

In presenza di sensori di livello a tecnologia ottica, si raccomanda di collegare le lamelle comunque presenti sull'hopper alla terra della macchina.



COLLEGARE SEMPRE IL TERMINALE DELL'HOPPER QUI INDICATO AL TERMINALE DI TERRA DELLA MACCHINA, PER PREVENIRE EVENTUALI DANNEGGIAMENTI DOVUTI ALLE CARICHE ELETTROSTATICHE INTRODOTTE CON LE MONETE.

Consumi:

		A riposo	A vuoto	Sotto carico	In blocco (*)
Scheda	(+24Vdc)	20mA/0,24W	20mA/0,24W	40mA/0,48W	40mA/0,48W
Motore	(+24Vdc)	0mA/0m W	70mA/1,4W	1,2 A/28.8W	1,5mA*/30W
Totale		20mA/0,24 W	90mA/1,64W	1,24A/29,28W	1,54 /30,48W

* Il consumo del motore in blocco è limitato elettronicamente, e l'assorbimento qui indicato sarà reale solo per pochi secondi.

Communication ccTalk protocol

ccTalk® communication protocol is the Money Controls¹ serial communication protocol for low speed control networks. It was designed to allow the interconnection of various cash handling devices (*Hopper, Card reader, Bill validators, Coin selectors etc.*), mostly in AWP and gaming Industry, but also in other devices that use those components. **ccTalk®** is an open standard.

All documentation is available at web site: www.cctalk.org.

The communication protocol of the Alberici ccTalk HopperCD is implemented according to generic specification 4.2

Serial communication was derived from RS232 standard. Low data rate NRZ (*Non Return to Zero*) asynchronous communication: Baud rate 9600, 1 start bit, 8 data bits, no parity, 1 stop bit. RS232 handshaking signals (*RTS, CTS, DTR, DCD, DSR*) are not supported. Message integrity is controlled by means of checksum calculation.

1 Communication specifications

1.1 Baud rate

The baud rate of 9600 was chosen as compromise between cost and speed. Timing tolerances is same as in RS232 protocol and it should be less than 4%.

1.2 Voltage level

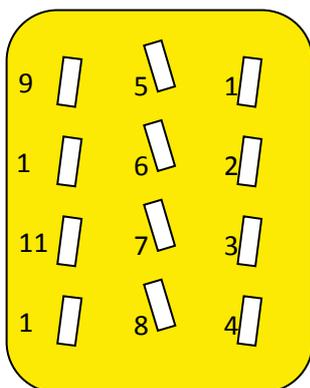
To reduce the costs of connections the “Level shifted “ version of RS232 is used. The idle state on serial connector is 5V, and active state is 0V.

Mark state (*idle*) +5V nominal from 3.5V to 5V Space state (active) 0V nominal from 0.0V to 1.0V

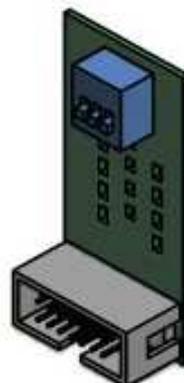
Data I/O line is “open collector” type, so it is possible to use device in systems with different voltage.

1.3 Connection

The connection of HopperCD at network is achieved by means of its 10-pin connector . Connector is used for power supply and for communication as well. For schematics and and connector appearance see picture at page 4.



PIN 1 : GND
PIN 2 : N.C.
PIN 3 : N.C.
PIN 4 : Add. Select 1
PIN 5 : Data cctalk
PIN 6 : N.C.
PIN 7 : N.C.
PIN 8 : Add. Select 2
PIN 9 : + 24 v
PIN 10 : N.C.
PIN 11 : N.C.
PIN 12 : Add. Select 3



PIN1: DATA CCTALK 1
PIN3: VOID 3
PIN5: VOID 5
PIN7: +24V 7
PIN9: VOID 9
2 PIN2: VOID
4 PIN4: GND
6 PIN6: VOID
8 PIN8: GND
10 PIN10: +24V

¹ Formally Coin Controls

1.4 Message structure

Each communication sequence consists of two message packets.
Message packets for simple checksum case is structured as follows:

[Destination address]
[Nr. of data bytes] [Source address] [Header] [Data 1] ... [Data n] [Checksum]

There is an exception of message structure when device answer to instruction Address poll and Address clash². The answer consists of only one byte representing address delayed for time proportional to address value. For CRC checksum case format is:

[Destination address]
[Nr. of data bytes] [CRC 16 LSB] [Header] [Data 1] ... [Data n] [CRC 16 MSB]

1.4.1 Address

Address range is from address 0 to address 255. Address 0 is special case or so called "broadcast" address and address 1 is default host address. The recommendations for address value of different devices are presented in table 1.

Device category	Address	Additional addr.	Note
Coin Acceptor	2	11 -17	Coin validator, selector, mech...
Payout	3	4 -10	Hopper
Bill validator	40	41 -47	Banknote reader
Card Reader	50		-
Display	60		Alphanumeric LC display
Keypad	70		-
Dongle	80	85	Safety equipment
Meter	90		Replacement for el.mec. counters
Power	100		Power supply

Table 1 Standard address for different types of devices

Address for Alberici HopperCDc is factory set at value 3, but the user can change the default address using MDCES instructions Address change or Address random or setting Hopper external switch.

² For details see cctalk42-2.pdf, Address poll

1.4.2 Number of data byte

Number of data byte in each transfer could be from 0 to 252. Value 0 means that there are no data bytes in the message, and total length of message packet will be 5 bytes. Although theoretically it will be possible to send 255 bytes of data because of some limitations in small micro controllers the number is limited to 252³.

1.4.3 Command headers (*Instructions*)

Total amount of possible cctalk command header is 255 with possibility to add sub-headers using headers 100, 101, 102 and 103. **Header 0** stands for **ACK** (*acknowledge*) replay of device to host. **Header 5** stands for **NAK** (*No acknowledge*) replay of device to host. **Header 6** is **BUSY** replay of device to host. In all three cases no data bytes are transferred. Use of ACK and NAK headers are explained later on, for each specific message transfer. Commands are divided into several groups according to application specifics:

Device category	Address	Additional addr.	Note
Coin Acceptor	2	11 -17	Coin validator, selector, mech...
Payout	3	4 -10	Hopper
Bill validator	40	41 -47	Banknote reader
Card Reader	50		-
Display	60		Alphanumeric LC display
Keypad	70		-

Alberici HopperCD use 24⁴ instructions-headers.

Details of all instruction use are explained in chapter 2.

1.4.4 Data

There are no restrictions on data formats used. Data could be BCD (*Binary Coded Decimal*) numbers, Hex numbers or ASCII strings. Interpretation as well as format is specific to each header use, and will be explained in separate chapter.

1.4.5 Checksum

Message integrity during transfer is checked by use of simple zero checksum calculation. Simple checksum is made by 8 bit addition (modulus 256) of all the bytes in the message⁵. If message is received and the addition of all bytes are non-zero then an error has occurred⁵. For noisy environment or higher security application it is possible to use more complex, 16 bit CRC CCITT checksum based on a polynomial of: $x^{16} + x^{12} + x^5 + 1$ and initial value of CRC register **0x0000**.

Hopper are using simple checksum, but they could be set to operate with CRC-16 checksum on customer demand.

³ 252 bytes of data, source address, header and checksum (total of 255 bytes)

⁴ First level of implementation

⁵ See Error handling

1.5 Timing specification

The timing requirements of cctalk are not very critical but there are some recommendations.

1.5.1 Time between two bytes

When receiving bytes within a message packet, the communication software must wait up to **50 ms** for next byte if it is expected. If time out occurs, the software should reset all communication variables and get ready to receive next message. The interbyte delay during transmission should be ideally **less than 2 ms** and **not greater than 10 ms**.

1.5.2 Time between command and replay

The time between command and reply is dependent on application specific for each command. Some commands return data immediately, and maximum time delay should be within **10 ms**. Other commands that must activate some actions in device may return reply after the action is finished.

1.5.3 Start-up time

After the power-up sequence HopperCD should be ready to accept and answer to a cctalk message within time period of less than 250 ms. During that period all internal check-up and system settings must be done, and HopperCD should be able to work fine.

1.6 Error handling

If slave device receives the message with bad checksum or missing data no further action is taken and receive buffer will be cleared. Host software should decide to re-transmit message immediately or after a fixed amount of time. In case when host receives message with error it has same options.

2. HopperCD Command header set

Table 2 shows the Command header set that host can use in communication with Hopper.

Code		Command header	Note
254	FE	Simple poll	Return ACK
253	FD	Address poll	MDCES support
252	FC	Address clash	MDCES support
251	FB	Address change	MDCES support, non volatile
250	FA	Address random	MDCES support, non volatile
246	F6	Request manufacturer id	'Alberici group'
245	F5	Request equipment category id	'Payout'
244	F4	Request product code	'HopperTwo ccTalk'
242	F2	Request serial number	From 0 to 16.777.215
241	F1	Request software revision	'X.xx'
219	DB	Enter new PIN number	Supported, non volatile
218	DA	Enter PIN number	ACK return if PIN is correct
217	D9	Request payout high/low stat.	Return empty/full status
216	D8	Request data storage availability	[00][00][00][00][00] ,not available
192	C0	Request build code	'ALH02v00'
172	AC	Emergency stop	Return ACK
169	A9	Request address mode	[B7] add.changed with serial command(nv)
168	A8	Request hopp.dispense count	From 0 to 16.777.215
167	A7	Dispense hopper coins	Data = Serial number + N°of coin to disp.
166	A6	Request hopper status	Return dispensed coin counters
164	A4	Enable hopper	Data must be A7
163	A3	Test hopper	Return hardware status
4	4	Request comms revision	[02][04][02] ,level2, issue4.2
1	1	Reset device	Software reset

10101 1041 1011 10R1 10IN1.1 SR10DIN010DIN010DIN4-MSR1 10h1

Table 2 List of Hopper cctalk command header

Command headers are divided in to 3 different groups:

- Common command headers -
- Hopper command headers -
- MDCES command headers

2.1 Common command headers

Common commands are used in all type of devices to detect there presence on cctalk network or to describe them. Information like: manufacturer or product type id, serial number, different settings etc. are transmitted to host.

2.1.1 Command header 254 [hexFE], Simple poll

The fastest way for host to detect all attached devices in cctalk network. Addressed device -Hopper answer with ACK (*Acknowledge*). If within predicted amount of time Hopper does not answer, probably is not connected, powered or simple not working properly. Message format is:

Host sends: [Dir] [00] [01] [FE] [Chk] Hopper answer: [01] [00] [Dir] [00] [Chk] Hopper default address is 3, example of message packet is:

Host sends: [03] [00] [01] [FE] [FE] Hopper answer: [01] [00] [03] [00] [FC] ACK message

2.1.2 Command header 246 [hexF6], Request manufacturer ID

Hopper answer with ASCII string representing manufacturer name.
Message format is:

Host sends: [Dir] [00] [01] [F6] [Chk] Hopper answer: [01] [Nr.b] [Dir] [00] [a1] [a2] [an] [Chk]
Nr.b is number of data bytes-characters sent by Hopper, and a1 to an are ASCII characters.
For **Alberici group** Hopper, example of message packet is:

Host sends: [03] [00] [01] [F6] [06] Hopper answer [01] [0E] [03] [00] [41] [6C] [62] [65] [72] [69] [63] [69] [20] [67] [72] [6F] [75] [70] [86]

2.1.3 Command header 245 [hexF5], Request equipment category ID

Answer to command header is standardized name for Hopper. It answer with ASCII string of characters representing standardized name for that type of device **Payout**. Message format is:

Host sends: [Dir] [00] [01] [F5] [Chk] Hopper answer: [01] [06] [Dir] [00] [50][61][79][6F][75][74][Chk]
Number of data byte is always 6, hex [06]. Example of message packets for coin selector (*address 3*) is:

Host sends: [03] [00] [01] [F5] [07] Hopper answer: [01] [06] [03] [00]] [50][61][79][6F][75][74] [74]

2.1.4 Command header 244 [hexF4], Request product code

Hopper answer with ASCII string of character, representing its factory type. For Alberici Hopper it's **HopperTwo ccTalk**. Message format is:

Host sends: [Dir] [00] [01] [F4] [Chk] Hopper answer: [01] [10] [Dir] [00] [a1][a2] . . . [an] [Chk] Number of data bytes sent by Hopper is 16, hex [10]. Example of message packets for Hopper (*address 3*) is :

Host sends: [03] [00] [01] [F4] [08]
Hopper answer: [01][10][03][00][48][6F][70][65][72][54][77][6F][20][63][63][54][61][6C] [6B][D2]

2.1.5 Command header 242 [hexF2], Request serial number

Hopper answer with three byte serial number.

Message format is:

Host sends: [Dir] [00] [01] [F2] [Chk] Hopper answer: [01] [03] [Dir] [00] [Serial 1 -LSB] [Serial 2] [Serial 3 -MSB] [Chk] Serial 1 – first data byte sent is LSB of serial number. Example of message packets for Hopper (*address 3*) and serial number **1-2-34567**, hex [BC][61][4E] is:

Host sends: [02] [00] [01] [F2] [0A] Hopper answer: [01] [03] [00] [4E][61][BC] [8E]

2.1.6 Command header 241 [hexF1], Request software revision

Hopper return ASCII string of character representing software version and revision.

Message format is:

Host sends: [Dir] [00] [01] [F1] [Chk] Hopper answer: [01] [Nr.b] [Dir] [00] [a1] [a2].... [an] [Chk] Number of data bytes in ASCII string is not limited and each producer has it's own system of labelling. Example of message packets for Hopper (*address 3*) is:

Host sends: [03] [00] [01] [F1] [0B] Hopper answer: [01] [04] [03] [00] [31] [2E] [32] [31] [36] Hopper answer is '1.21'.

2.1.7 Command header 192 [hexC0], Request build code

Hopper answer with ASCII string of character representing it's hardware version and revision⁶. Last revision of printed circuit board for Hopper is **ALH02v00**. Message format is:

Host sends: [Dir] [00] [01] [C0] [Chk] Hopper answer: [01] [Nr.b] [Dir] [00] [a1] [a2].... [an] [Chk]

Example of message packets for Hopper (*address 3*) is:

Host sends: [03] [00] [01] [C0] [3C] Hopper answer: [01] [08] [03] [00] [41] [4C] [48] [30] [32] [76] [30] [30] [E7]

⁶ Usually label printed on electronic circuit board

2.1.8 Command header 169 [hexA9], Request address mode

Hopper answer with one data byte⁷ information about address mode and options. Address could be stored in different type of memory (*RAM. ROM or EEPROM*). Some devices support address change with MDCES command headers⁸. Message format is:

Host sends: [Dir] [00] [01] [A9] [Chk] Hopper answer: [01] [01] [Dir] [00] [Address mode] [Chk]

Example of message packets for Hopper (*address 3*) is:

Host sends: [03] [00] [01] [A9] [53] Hopper answer: [01] [01] [03] [00] [B7] [44] Hopper answer with data [B7]. It means that address may be changed with serial command (non volatile). If answer is [B3], mean that address is selected via interface connector.

2.1.9 Command header 4 [hex04], Request comms revision

Hopper answer with three byte data information about level of cctalk protocol implementation, major and minor revision. Message format is:

Host sends: [Dir] [00] [01] [04] [Chk] Hopper answer: [01] [03] [Dir] [00] [Level] [Mag.rev.] [min. rev.] [Chk]

Example of message packets for Hopper (*address 3*), cctalk protocol issue **4.2**, is:

Host sends: [03] [00] [01] [04] [F8] Hopper answer: [01] [03] [03] [00] [01][04][02] [F2]

2.1.10 Command header 1 [hex01], Reset device

After acceptance of command Reset coin selector execute software reset and clear all variables in RAM or set them at the default value, including different counters, and any buffers. After reset coin selector replay with ACK message.. Host software must re enable hopper to perform a new payout:

Message format is:

Host sends: [Dir] [00] [01] [01] [Chk] Hopper answer: [01] [00] [Dir] [00] [Chk] ACK message

Example of message packets for hopper (*address 3*) **AL06V-c** is:

Host sends: [03] [00] [01] [01] [FB] Hopper answer: [01] [00] [03] [00] [FC] ACK message

⁷ Details of description see in public document cctalk42-2.pdf

⁸ Address change, Address random

2.2 Hopper command headers

Hopper use some specific commands, for paying or read itself status. Some of commands are shared with other device like banknote reader or coin selector devices.

2.2.0 Command header 219 [hexDB], Enter new PIN number

Host send four byte data of new PIN number. If correct PIN was previously received⁹ Hopper will accept the new PIN and answer with ACK message . Hopper has PIN number stored in EEPROM. Message format is:

Code	Command header	Note
254	FE Simple poll	Return ACK
253	FD Address poll	MDCES support
252	FC Address clash	MDCES support

Example of message packets for Hopper (*address 9*), with default PIN, hex[00][00][00][00] previously received and NEW pin hex[01][02][03][04] is:

Host sends: [03] [04] [01] [DB] [01][02][03][04] [13]

Hopper answer: [01] [00] [03] [00] [FC] ACK message

2.2.1 Command header 218 [hexDA], Enter PIN number

Host send four byte data of PIN number. If PIN is correct, Hopper will answer immediately with ACK message. If PIN is incorrect the NAK message will be sent with time delay of 100 ms. Hopper has PIN number stored in EEPROM. Message format is:

Host sends: [Dir] [04] [01] [DA] [PIN1-LSB][PIN2][PIN3][PIN4-MSB] [Chk]

Hopper answer: [01] [00] [Dir] [00] [Chk] ACK if PIN is correct

Hopper answer: [01] [00] [Dir] [05] [Chk] dly 100 ms ->NAK if PIN is incorrect

Example of message packets for Hopper (*address 3*), with default PIN, hex[00][00][00][00] and wrong pin is:

Host sends: [03] [04] [01] [DA] [01][00][00][00] [1E]

Hopper answer: [01] [00] [03] [05] [F7] dly 100 ms ->NAK if PIN is incorrect

2.2.2 Command header 217 [hexD9],Request Payout Hi-Lo status

This command allow the reading of High/low level sensor in payout systems. Hopper answer with one byte that describe the sensors status. The meaning of bits in that byte is the following:

BIT0 -Low level sensor status. 0 – Higher than or equal to low level trigger 1 – Lower than low level trigger
 BIT1 – High level sensor status 0 -Lower than high level trigger 1 -Higher than or equal to high level trigger

⁹ See next chapter

BIT4 -Low level sensor support 0 –
Features not supported or fitted 1 -
Features supported and fitted

BIT 5 -High level sensor support 0 -
Features not supported or fitted 1 -
Features supported and fitted

BIT2,3,6,7 are reserved bits Trigger level is set by fixed
sensor into hopper mechanism.

Message format is:

Host sends: [Dir] [00] [01] [D9] [Chk]

Hopper answer: [01] [01] [Dir] [00] [d1] [Chk]

Example of message packets for Hopper (*address 3*) is

Host sends: [03] [00] [01] [D9] [23]

Hopper answer: [01] [01] [03] [00] [31] [CA]

Data byte Hex[31] mean that Hopper high and low sensor are supported, and hopper is empty.

2.2.3 Command header 216 [hexD8], Request data storage availability

Hopper answer with five byte of data that describes type of memory and availability for host to read and to write. Message format is:

Host sends: [Dir] [00] [01] [D8] [Chk]

Hopper answer: [01] [05] [Dir] [00] [d1][d2][d3][d4][d5] [Chk]

Alberici Hopper, at the moment, does not support write or read to memory. Answer to command is always as in example:

Host sends: [03] [00] [01] [D8] [24]

Hopper answer: [01] [05] [03] [00] [00][00][00][00] [F7]

2.2.4 Command header 172 [hexAC], Emergency stop.

This command immediately halt the payout sequence and reports back the number of coin which failed to be paid out. After Emergency stop command hopper is disabled. To perform new payout sequence, hopper must be re-enabled.

Message format is:

Host sends: [Dir] [00] [01] [AC] [Chk]

Hopper answer: [01] [01] [Dir] [00] [d1] [Chk]

Example of message packets for Hopper (*address 3*) is

Host sends: [03] [00] [01] [AC] [50]

Hopper answer: [01] [01] [03] [01] [01] [FA]

Data byte Hex[01] mean that hopper remain one coin to be paid.

2.2.5 Command header 168 [hexA8], Request hopper dispense count.

This command show the total number of coin dispensed by hopper.

Message format is:

Host sends: [Dir] [00] [01] [A8] [Chk]

Hopper answer: [01] [03] [Dir] [00] [d1] [d2] [d3] [Chk]

Example of message packets for Hopper (*address 3*) is

Host sends: [03] [00] [01] [A8] [54]

Hopper answer: [01] [03] [03] [03] [54] [00] [00] [A5] In this example

hopper dispensed 84 coins (deicmal of Hex 54).

Maximum value of dispensed coin stored in hopper EEPROM is 16'777'215 (3Bytes).

2.2.6 Command header 167 [hexA7], Dispense hopper coin

This command dispense coin from the hopper. Maximum number of coin hopper can dispense with a single command is 255. After Dispense hopper coin command, hopper need to be enabled, else dispense action is not performed.

Alberici hopper answer correctly to two format of dispense coin command.

First message format is

Host sends: [Dir] [04] [01] [A7] [sn1] [sn2] [sn3] [N°Coin][Ch k] Hopper

answer: [01] [00] [Dir] [00] [Chk] ACK or NAK

Example of first type of message packets for Hopper (*address 3*) is

Host sends: [03] [04] [01] [A7] [12] [34] [56] [64][Chk] Hopper

answer: [01] [00] [03] [05] [F7] NAK

Command try to pay 100 coins (64H) but serial number sent to hopper isn't correct.

Second command format is

Host sends: [Dir][0A][01] [A7] [00] [00] [00] [00] [00] [00] [00] [00] [00] [N°Coin][Chk] Hopper

answer: [01] [00] [Dir] [00] [Chk] ACK or NAK

Example of second type of message packets for Hopper (*address 3*) is

Code	Command header	Note
254	FE Simple poll	Return ACK
253	FD Address poll	MDCES support
252	FC Address clash	MDCES support
251	FB Address error	MDCES support non volatile

2.2.7 Command header 166 [hexA6], Request hopper status

This command return four counters that explain the status of payment.

These four bytes are:

1. Event Counter that show the number of good dispense events since last reset.
2. Payout coins remaining that show how many coins are still to pay.
3. Last Payout: coins paid, that show how many coins paid out since last dispense command (increments with each coin dispensed)
4. Last Payout: coins unpaid, that show how many coins was unpaid during last payout.

First two counters are saved in ram, while last two are saved in eeprom. Default value of Event Counter and Payout coins remaining is 0, at reset and after Emergency stop command. If a reset occurs, Event Counter and Payout coins remaining values are saved in two Last Payout counters, in eeprom. Thus, after reset or power-off, hopper can return coin paid and unpaid during last payout.

Command format is

Host sends: [Dir] [00] [01] [A6] [Chk]

Hopper answer: [01] [04] [Dir] [00] [d1] [d2] [d3] [d4] [Chk]

Example of message packets for Hopper (*address 3*) is

Host sends: [03] [00] [01] [A6] [56]

Hopper answer: [01] [04] [03] [00] [00] [00] [07] [03] [EE]

In this example hopper is not perform a payout. During last payout the hopper was power off while paying. It had to pay 10 coin, but only 7 was really paid. Three remained.

Another example of message packets for Hopper (*address 3*) is

Host sends: [03] [00] [01] [A6] [56]

Hopper answer: [01] [04] [03] [00] [0B] [09] [02] [00] [E2]

In this example hopper is performing a payout. It's the 11th payout before last reset. A coin is paid (9 are remaining) and during last payout 2 coin was paid.

2.2.8 Command header 164 [hexA4], Enable Hopper

This command enable hopper before paying out coin.

Command format is

Host sends: [Dir][01][01] [A4] [d1][Chk]

Hopper answer: [01] [00] [Dir] [00] [Chk] ACK

d1 must be Hex [A5] in order to enable hopper. Example of message packets for Hopper (*address 3*) is

Host sends: [03][01][01] [A4] [A5][B2]

Hopper answer: [01] [00] [03] [00] [FC] ACK

2.2.9 Command header 163 [hexA3], Test Hopper

This command is used to test hopper hardware. It reports back a bit mask that show various hopper error. Bit meaning is shown here :

BIT0 – Absolute maximum current exceeded
BIT1 – Payout timeout occurred
BIT2 – Motor reverse during last payout to clear a jam
BIT3 – Opto fraud attempt, path blocked during idle
BIT4 – Opto fraud attempt, short circuit during idle
BIT5 – Opto blocked permanently during payout
BIT6 – Power up detected
BIT7 – Payout disabled

Command format is

Host sends: [Dir][00][01] [A3][Chk]

Hopper answer: [01] [00] [Dir] [00] [d1] [d2] [Chk]

Example of message packets for Hopper (*address 3*) is

Host sends: [03][00][01] [A3][59]

Hopper answer: [01] [02] [03] [00] [C0] [00] [3A]

The data byte Hex[60] means that Opto are blocked permanently during payout and Power up was detected.

2.3 MDCES command headers

MDCES stands for **M**ulti-**D**rop **C**ommand **E**xtension **S**et, or so called Multi-drop buss commands. Multi-drop buss commands gives additional functionality to systems that require change of address for devices in cctalk network. Some of commands has different message format than usual cctalk message. Commands are:

Code	Command header	Note
254	FE Simple poll	Return ACK
253	FD Address poll	MDCES support
252	FC Address clash	MDCES support
251	FB Address change	MDCES support, non-volatile

Because host always use address 1 and address 0 is for broadcast message all commands that changes the address should not accept this settings.

All changes are stored in non-volatile memory, EEPROM !

2.3.1 Command header 253 [hexFD], Address poll

This is a broadcast message used by host to determinate all address of device attached on cctalk network. Hopper answer with only one byte (*non-standard message format*), after a delay that is proportional to address value multiplied with 4 milliseconds. Message format is:

Host sends: **[00] [00] [01] [FD] [Chk]** Broadcast message Hopper answer: **Dly -> [Address]** Example of message packets for Hopper (*address 3*) is:

Host sends: **[00] [00] [01] [FD] [02]** Hopper answer: **Dly=12 ms -> [03]** Address is 3 Example of message packets for Hopper (*address 250*) is:

Host sends: **[00] [00] [01] [FD] [02]** Hopper answer: **Dly=1 s -> [FA]**
Address is 250

2.3.2 Command header 252 [hexFC], Address clash

Command Address clash has same answer from Hopper, like address poll command, but host issue this command with specific device address and not using broadcast address. Hopper answer with only one byte (*non-standard message format*), after a random value of time delay to prevent collision if two devices share same address. Message format is:

Host sends: **[Dir] [00] [01] [FC] [Chk]** Hopper answer: **Random Dly -> [Address]**
Example of message packets for Hopper (*address 3*) is:

Host sends: **[03] [00] [01] [FC] [00]** Hopper answer: **Random Dly -> [03]** Address is 3

2.3.3 Command header 251 [hexFB], Address change

Command Address change is issued to a specified device only. Hopper answer with ACK message. Message format is:

Host sends: **[Dir] [01] [01] [FB] [Address] [Chk]** Hopper answer: **[01] [00] [03] [00] [FC]** ACK Example of message packets for Hopper (*address 3*) and change in to address 20:

Host sends: **[03] [01] [01] [FB] [14] [EC]** Hopper answer: **[01] [00] [03] [00] [FC]** ACK Address is now 20
Hopper does not answer to attempt of change an address to 0 or 1.

2.3.4 Command header 250 [hexFA], Address random

Command Address random has the same answer from coin selector. New address is not sent because each device set its own random address. Host software sometime can issue this command as broadcast. This will cause change of all device addresses. Hopper answer with ACK message. Message format is:

Host sends: **[Dir] [00] [01] [FA] [Chk]**
Hopper answer: **[01] [00] [03] [00] [FC]** ACK

Example of message packets for Hopper (*address 3*) is:

Host sends: [03] [00] [01] [FA] [02]

Hopper answer: [01] [00] [03] [00] [FC] ACK *Address is changed*

Example of broadcast message packets for Hopper is:

Host sends: **[00] [00] [01] [FA] [05]** Broadcast message

Hopper answer: **[01] [00] [00] [00] [FD]** ACK Address is changed

Hopper has internal mechanism that prevent setting of address 0 or 1.



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