Hopper AH4 II Discriminator

Operator's manual

Rev. 1.02

Hopper AH4 DISCRIMINATOR

24Vdc ccTalk

Operator's Manual

CE

Alberici® CASH SOLUTIONS

Progettazione e produzione di sistemi di pagamento e accessori per macchine Gaming, Vending e Car-Wash

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STORICO REVISIONI			
Revisione n°	**Data**	**Modifica**	**Note**
Creazione 1.00	14.09.10	Creazione	
Rev. 1.01	24.09.13	Aggiornamento nuova sede	
Rev. 1.02	22.07.15	Nuovo frontespizio	

1 GENERAL DESCRIPTION

Dear Customer,

we would like to thank you and congratulate for your choice. We trust that you will appreciate the quality and performance of the AH4 Discriminator Hopper.
This machine operates by cctalk protocol, the well-established serial communication mode that provides security and precision.

Please read carefully this handbook, to obtain the most from your AH4.

1.1 Operation

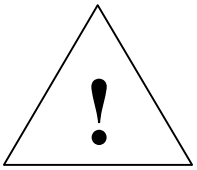
The multi-coin Hopper AH4 Discriminator can be installed onto machines preset for single-coin cctalk HopperOne or similar Universal Hoppers, using the existing built-in supports, structure and cables. It contains the disk-driven HopperCD Discriminator II, that identifies the different coins by means of inductive discrimination. Moreover it is endowed with the exclusive ***Alberici SPS (Smart Pick System)***, the patented device that locates and parks the smaller coins, so a sto pick them up and pay them out whenever needed to top up the requested amount, which produces fast and complete payments.

The Hopper AH4 Discriminator can discriminate and count coins and coin-like tokens, whose diameter ranges from 20 mm to 26,5 mm, and 1,7-3,5 mm thick. The coins and the coin-like tokens must be round, without indentations, grooves or thick-reliefs. The AH4 is preset to handle the following coins: 50 €cents, 1 € and 2 €.
The machine board will instruct the Hopper AH4 to pay an amount, not its composition.
A protection system prevents the darkening/blazing of the output sensor, frustrating possibleattempts at cheating the hopper.
In case the output gets jammed or obstructed, the hopper board will detect the overcurrent draw and will command the motor to briefly rotate the other way round, so as to release the output and restore the proper operation. This action shall be repeated if one time is not sufficient.
Infra-red sensors allow to monitor the minimum level of the coins contained.Maximum output speed is 180 coins per minute.
The hopper ccTalk address can be software-defined or hardware-preset: to this purpose, one Dip-Switch row is made available on the black side of the Hopper; setting the one next to the cctalk 10p connector has no effect on hopper address.

1.2 Safety

The Hopper unit must be installed into systems endowed with ON-OFF mains switch.

Before disconnecting the Hopper AH4 Discriminator, always switch power off.
This product contains rotating and moving mechanical parts: if it is necessary to keep the machine or this product powered up during servicing or inspecting, DO NOT PUT YOUR FINGERS INSIDE IT, even though the hopper is not in operation.
Install the AH4 Hopper according to the instructions given in section 2.3. Guarantee decays if installation is not performed correctly.



DANGER !

Mechanical parts in motion

WARNING:
the Hopper AH4 flings the coins out at high speed (4-5 pieces per second): do not keep sensitive body parts or fragile objects in front of the output.

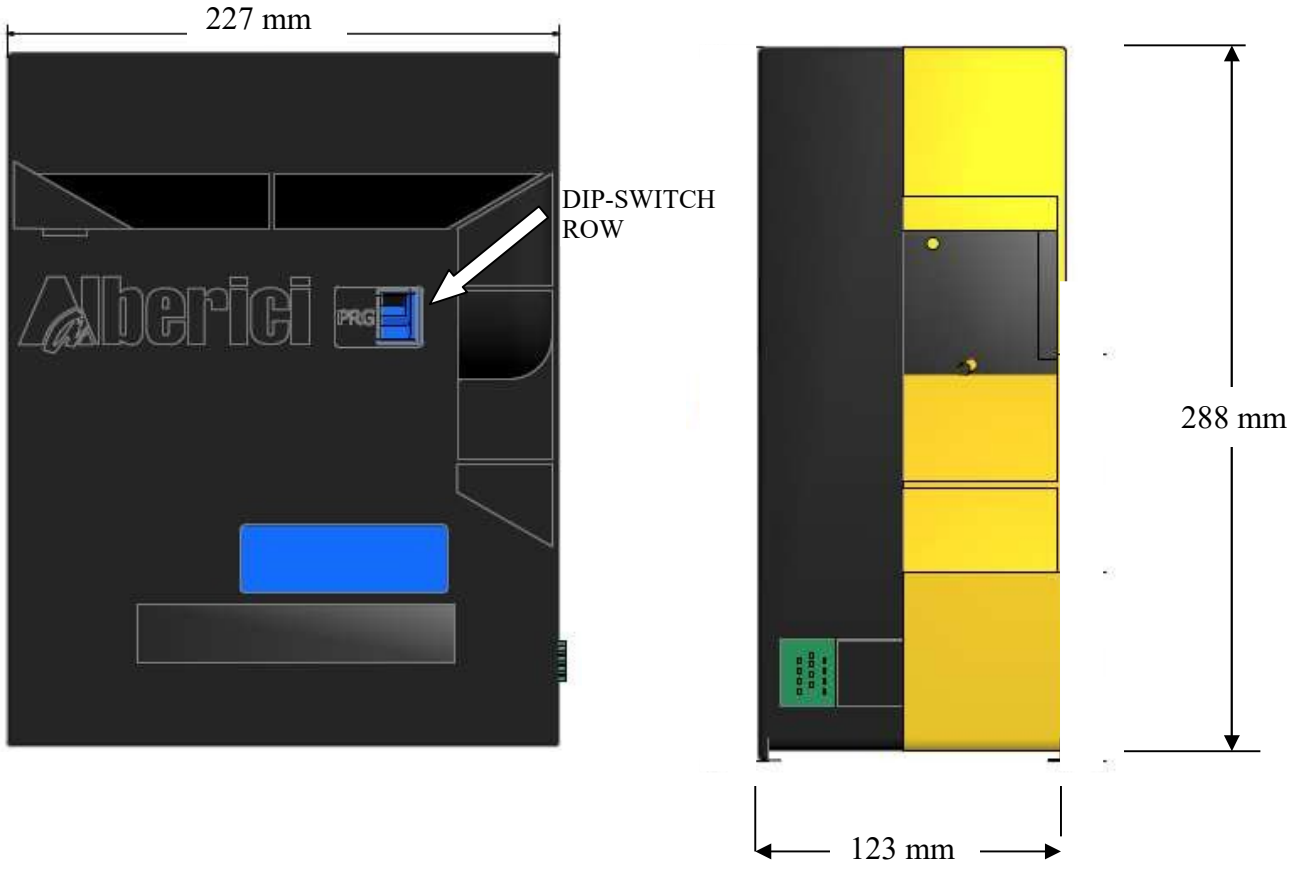
2. TECHNICAL DATA

Protocol	ccTalk 24V
Speed	200 coins/min
Capacity	800-1200 mixed coins
Coins Diameter	20 - 26,5 mm
Coins Thickness	1,7 - 2,6 mm
Current draw max.	1 A
Current draw stand-by	70 mA
Operating Voltage	24 Vdc
Operating Temperature	0°C ÷ 50°C
Humidity	20% - 75%
Average operating life	500.000 payouts
Operating life expected	≥ 500.000 payouts
Size (mm)	123 (w) x 288 (h) x 227 (d)

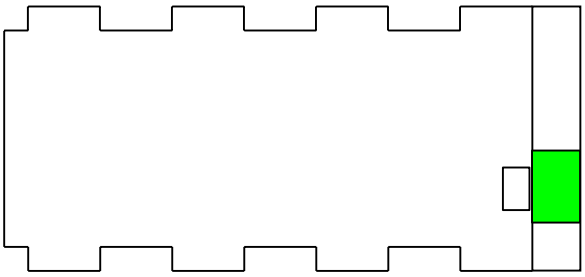
3. MECHANICAL DESCRIPTION

3.1 Overall dimensions

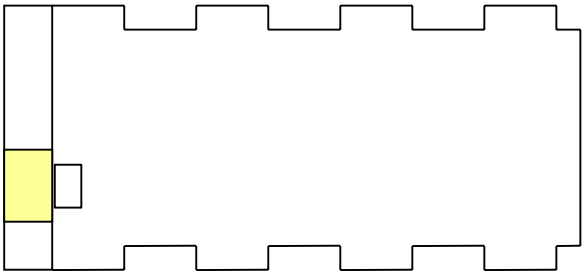
The Hopper AH4 Discriminator is mechanichally interchangeable with HopperOne (or the like by other Manufacturers).



3.2 Position of the connector



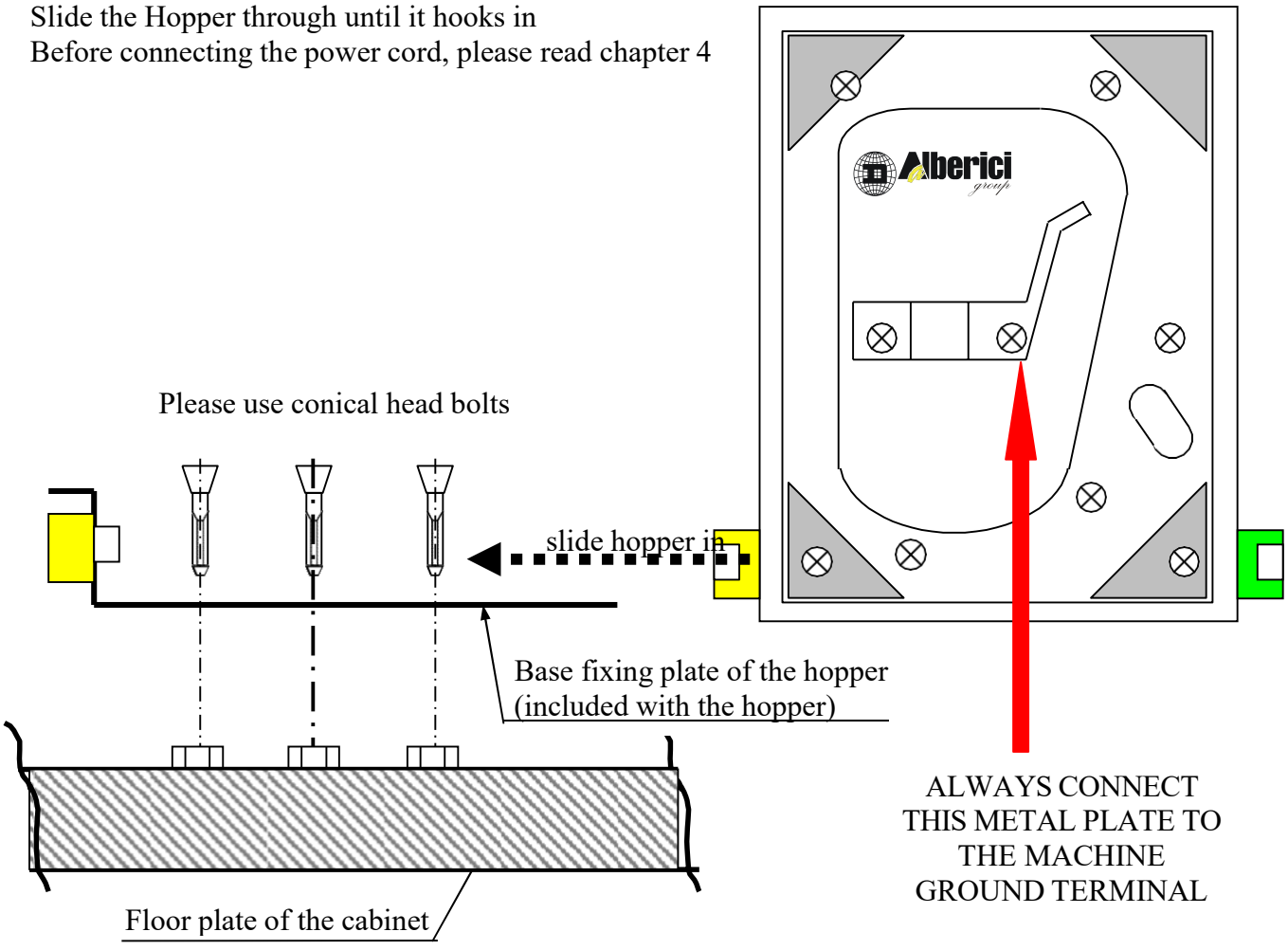
Reverse Version
(connector on same side as coin outlet)



Standard Versione
(connector at opposite side of coin outlet)

3.2 Installation

- Fasten the support plate on the cabinet support
- Slide the Hopper through until it hooks in
- Before connecting the power cord, please read chapter 4



4. ELECTRICAL DESCRIPTION

4.1 *Power supply*

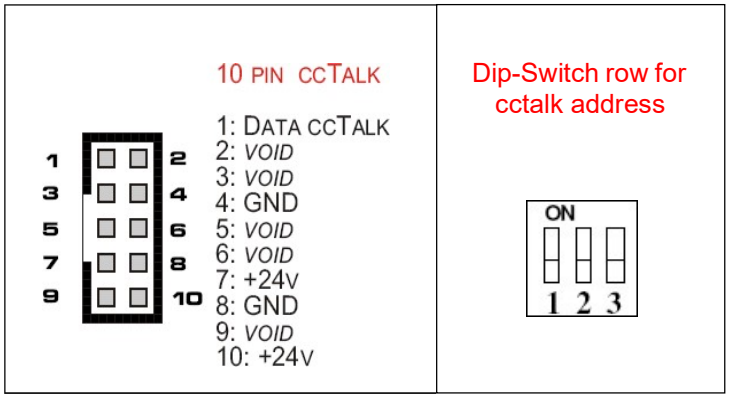
Power the Hopper AH4 Discriminator by 24 Vdc (+/-10%) on pin 7 (GND = pin 1).The wire section must be compatible with the current draw.

4.2 *Current draw*

		Standby		A vuoto		Carico (*)	
Circuit board	(+24 Vdc)	30 mA	0.72 W	70 mA	1.68 W	70 mA	1.68 W
Motor	(+24 Vdc)	0 mA	0 mW	150 mA	3.60 W	1 A *	24.00 W
Total current draw			0.72 W		5.28 W		25.68 W

(*) The motor overload current draw shall always be limited by the electronic circuit. The 1 A draw,corresponding to hold-up of the motor, will therefore be reached only for a few msec.

4.3 *Connector*



4.4 *Address setting by hardware (dip-switches)*

The serial address of the hopper can be set or modified by software (ccTalk MDCES commands) or by hardware, through the on-board (*) Dip-Switch row, according to thefollowing chart :

Dip-Switch 1	Dip-Switch 2	Dip-Switch 3	N° hopper	Serial address
			1	3
ON			2	4
	ON		3	5
ON	ON		4	6
		ON	5	7
ON		ON	6	8
	ON	ON	7	9
ON	ON	ON	8	10

The state of the new configuration will be read only at reset, therefore any changemade without switching power off and again on will have no effect.

(*) ***The Dip-switch row is located on the black side wall***, signposted by the acronym PRG. setting the one next to the cctalk 10p connector has no effect on hopper address.

5. MAINTENANCE

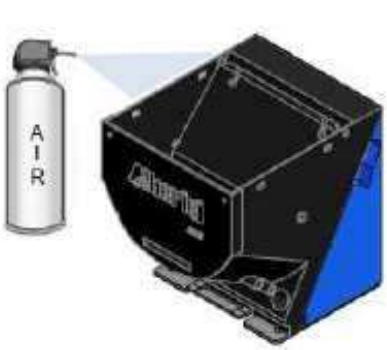
Prior to any maintenance operation, switch power off and disconnect the power cord.
The Hopper AH4 houses the Hopper CD Discriminator II Mini. Every 100.000 pay-outs, disassemble the yellow and black side covers, and clean the disk of the Hopper CD Discriminator II Mini by blowing pressurized air.

The sloped shape of the optic sensor housing prevents the build-up of the dirt, so reducing the need to clean it too frequently. Whenever you clean the disc, it is anyway advised to clean alsothe output optic sensor.

Check from time to time that the reservoir and the disc do not contain debris or bent / warpedcoins, and always remove them, since they can obstruct the output or the rotation, hamper theoperation of the hopper, damage the Hopper parts and thwart its performance.

To clean the Hopper, pull up its flap, and blow dry pressurized air onto the disc parts and thesensors slots (accessible through the coin pits), as well as through the coin outlet slot.

CAUTION: if any parts need to be dismounted for deeper cleansing or other maintenance operations, please send the Hopper Discriminator II to Alberici S.p.A., that will properly carryout the necessary service repairs, cleaning and updating.



6. CCTALK PROTOCOL

6.1 CcTalk commands

NOTICE: the chart below lists the commands needed to implement the Hopper AH4 Discriminator into the machine board.

ccT Code	Hexa. Code	Command header	Notes
254	FE	Simple poll	Return ACK
253	FD	Address poll	MDCES support
246	F6	Request manufacturer id	"Alberici"
245	F5	Request equipment category id	"Payout"
244	F4	Request product code	"AH DSC 1"
242	F2	Request serial number	[Ser nr-L][Ser nr][Ser nr-H]
241	F1	Request software revision	un.n pm.m.m
217	D9	Request payout high/low status	Return empty/full status
197	C5	Calculate ROM checksum	[Mon][Prog][Data]
164	A4	Enable hopper	Enable = 0xA5
163	A3	Test hopper	Supported
134	86	Dispense hopper value	Supported
133	85	Request hopper polling value	Supported
132	84	Emergency stop value	Supported
131	83	Request hopper coin value	Supported
130	82	Request indexed hopper dispense count	Supported
1	1	Reset device	Software reset

Section 6.2 cctalk Protocol for Hopper AH4 Discriminator explains in detail the communication between Hopper AH4 and host (machine p.c. board).

6.2 Cctalk Protocol for Hopper AH4 Discriminator

ccTalk® communication protocol is the Money Controls (formally Coin Controls) 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 thosecomponents.

ccTalk® is an open standard. All documentation is available at web site: www.cctalk.org.

Communication protocol of Alberici Hopper AH04 Discriminator is implemented according togeneric specification 4.4

1 Communication specifications

ccTalk serial communication is derivation of RS232 standard.

Low data rate NRZ (***N****on* ***R****eturn to* ***Z****ero*) 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.

1.1 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

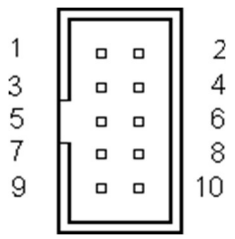
Space state (active) 0V nominal from 0.0V to 1.0V

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 Hopper at network is achieved by means of 10 pole IDC connector compatible with Azkoyen standard ccTalk 2+2 (Two wires for power supply + and two for GND connector). Connector is used for power supply and communication as well.

For schematics and connector pinout see image and table below.



PIN Nr.	Function
1	ccTalk Data
2	Not used
3	Not used
4	GND
5	Not used
6	Not used
7	+24 V
8	GND
9	Not used
10	+24 V

Table 1 AH04 - ccTalk connector

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 253 "Address poll" and 252 "Address clash". The answer consists of only one byte representing address delayed for time proportional to address value or random delay.

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 recommendation for address value of different devices are presented in table 2.

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 2 Standard address for different types of devices

Address for ALBERICI Hoppers is factory set to value 3, but the user can change the default address by setting the Hopper PCB switch.

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 252[2].

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** (***ack****nowledge*) replay of device to host.

Header 5 stands for **NAK** (***N****o* ***ack****nowledge*) 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 is explained separately for each specific message transfer.

Commands are divided in to several groups according to application specifics:

- Basic general commands
- Additional general commands
- Commands for Coin acceptors
- Commands for Bill validators
- Commands for Payout
- MDCES commands

1.4.4 Data

There is no restrictions for data format use. Data could be BCD (***B****inary* ***C****oded* ***D****ecimal*)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 message. If the addition of all bytes are non-zero then an error has occurred.

1.5 Timing specification

The timing requirements of ccTalk are not very critical but there are some recommendation.

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 inter byte 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 actions in device may return reply after action is ended.

1.5.3 Start-up time

After the power-up sequence Hopper 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 concluded, and hopper should be in condition to operate properly.

1.6 Error handling

If slave device receive 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 receive message with error it has same options.

2. Hopper Command header set

Command header set, that host could use in communication with Hopper is given in table 3.

Code / Hex.		Command header	Note
254	FE	Simple poll	Return ACK
253	FD	Address poll	MDCES support
246	F6	Request manufacturer id	“Alberici”
245	F5	Request equipment category id	“Payout”
244	F4	Request product code	“AH DSC 1”
242	F2	Request serial number	[Ser nr-L][Ser nr][Ser nr-H]
241	F1	Request software revision	un.n pm.m.m
217	D9	Request payout high/low status	Return empty/full status
197	C5	Calculate ROM checksum	[Mon][Prog][Data]
164	A4	Enable hopper	Enable = 0xA5
163	A3	Test hopper	Supported
134	86	Dispense hopper value	Supported
133	85	Request hopper polling value	Supported
132	84	Emergency stop value	Supported
131	83	Request hopper coin value	Supported
130	82	Request indexed hopper dispense count	Supported
1	1	Reset device	Software reset

Table 3 List of Hopper AH4 Discriminator ccTalk command headers

Command headers are divided in to 4 different groups:
- Common command headers
- Hopper command headers
- MDCES command headers
- ALBERICI specific command headers

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. In this case the hopper answer will be `**Alberici** `.

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. The 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][86]
```

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

The answer to command header is standardized name for Hopper. Hopper will answer with ASCII string of characters representing standard 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 hopper (*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 Hoppers it is '**AH DSC 1**'. Message format is:

```
 Host sends: [Dir][00][01][F4][Chk]
Hopper answer: [01][nr.byte][Dir][00][a1][a2]...[an][Chk]
```

Number of data bytes sent by Hopper is 8, hex [08].

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

```
Host sends: [03][00][01][F4][08]
Hopper answer: [01][08][03][00][41][48][20][44][43][69][20][01][20]
```

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][Ser.1-LSB][Ser.2][Ser.3-MSB][Chk]**

The first data byte sent is LSB of serial number.

Example of message packets for Hopper (*address 3*) and serial number **12345678,** hex [BC][61][4E] is:
Host sends: **[03][00][01][F2][0A]**
Hopper answer: **[01][03][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][0B][03][00][75][31][2E][30][20][70][31][2E][30][2E][30][70]

In this case the Hopper answer is **'u1.0 p1.0.0'**. New generation of Hopper controllers has main firmware(program)FLASH up-grade capability built in small monitor program.

Monitor program version is marked with ASCII letter **'u'** and two digit's for minor and major changes. Main program is marked with letter **'p'** and three digit's for changes.

First digit is major program changes, second digit is for minor program changes and third is for error or bug corrections.

2.1.7 Command 197 [hexC5], Calculate ROM checksum

Hopper respond with three bytes of micro controller internal memory checksum.

First byte is monitor program FLASH checksum, second is main program FLASH checksum

and third is data(in RAM) checksum. Any changes in program memory or data will change the respond of hopper. Message format is:
Host sends: **[Dir][00][01][C5][Chk]**
Hopper answer: **[01][3][Dir][00][Cksum 1][Cksum 2][Cksum 3][Chk]**

Example of message string for Hopper(*address 3*) is:
Host sends: **[03][00][01][C5][37]**
Hopper answer: **[01][03][03][00][53][6E][CC][6C]**

2.1.8 Command header 1 [hex01], Reset device

After acceptance of command Reset hopper execute software reset and clear all variables in RAM or set them at the default value, including different counters, and any buffers. After reset hopper 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*) is:
Host sends: **[03][00][01][01][FB]**
Hopper answer: **[01][00][03][00][FC]** ACK message

2.2 Hopper specific command headers

Hoppers are using some specific commands, for pay-out control, test of status and description. Some of commands are shared with other devices like banknote reader or hopper devices, but has different response or message format.

2.2.0 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 status byte is the following:

Bit 0 - Low level sensor status.
0 – Higher than or equal to low level trigger
1 – Lower than low level trigger

Bit 1 – High level sensor status
0 - Lower than high level trigger
1 - Higher than or equal to high level trigger

Bit 4 - 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

Bit's 2,3,6,7 are reserved bits

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*) AH24 with no coins(*empty*) is:
Host sends: **[03][00][01][D9][23]**
Hopper answer: **[01][01][03][00][11][EA]**

Only low sensor is supported, and hopper is empty.

2.2.1 Command header 164 [hexA4], Enable Hopper

This command enable hopper dispense. It must be sent once after power-on, Reset or Emergency stop command but before Dispense hopper coins command.

Message string format is:
Host sends: **[Dir][01][01][A4][d1][Chk]**
Hopper answer: **[01][00][Dir][00][Chk]** ACK

Data [d1] must be **hex [A5]** in order to enable hopper. Any other code will disable it.

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

2.2.2 Command header 163 [hexA3], Test Hopper

This command is used to test hopper hardware and report some problems in during dispense of coins. As response to that command hopper send to host a 2 bytes of data.

Each byte represent bit mask that show various hopper error. Bit meaning is shown below :

[Error mask 1]
Bit 0 – Absolute maximum current exceeded
Bit 1 – Payout time-out occurred
Bit 2 – Motor reverse during last payout to clear a jam
Bit 3 – Opto fraud attempt, path blocked during idle
Bit 4 – Opto fraud attempt, short circuit during idle
Bit 5 – Opto blocked permanently during payout
Bit 6 – Power up detected
Bit 7 – Payout disabled

[Error mask 2]
Bit 0 – Opto shorted during payout
Bit 1 – Flash data crc error
Bit 2 – Use other hopper to pay
Bit 3 – NU read 0
Bit 4 – Motor reverse limit end
Bit 5 – Unrecognized coin reverse limit
Bit 6 – Sorter blocked
Bit 7 – PIN mechanism active

Message string format is:
Host sends: **[Dir][00][01][A3][Chk]**
Hopper answer: **[01][02][Dir][00][err 1][err 2][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][BA]**

This response is example of hopper state after power-up.

2.2.3 Command header 134 [hex86], Dispense hopper value

This command is used to dispense coin value from a discriminator hopper. The coin value is based as the lowest unit of coin(*1 cent, 1 pence etc.*). Maximum possible value to pay with one instruction is 65535(ie. cents or 655 Eur).

Hopper must be enabled before use of this command.

Message format is:
Host sends: **[Dir][05][01][86][sn1][sn2][sn3][Val-lo][Val-hi][Chk]**
Hopper answer: **[01][00][Dir][00][Chk]** ACK or NAK

Data string [sn1][sn2][sn3] is serial number, [Val-hi/lo] value to pay 8

First format message string example for hopper with ser. number (dec 1), to pay out 5 Euro is:
Host sends: **[03][05][01][86][01][00][00][F4][01][7B]**
Hopper answer: **[01][01][03][00][FC]** ACK

2.2.4 Command header 133 [hex85], Request hopper polling value

This command will return the value of four counters that are representing the state of current payment or last payment. These four counters are:

[Event Counter]

Each time a valid Dispense hopper coins command is received, event counter is incremented till it reach the value of 255. After that next pay out command will set this value to 1.

After power down or reset, value of event counter is 0.

[Payout value remaining]

This 2 byte counters will decrement for coin value after each coin is dispensed till it reach the value 0(both bytes) or stop of pay out. It shows us how much value is left to pay. Counter is set to new value after a valid dispense hopper value command.

It is cleared after Reset, after Emergency stop or after automatic pay stop.

[Last Payout: value paid]

This 2 byte counters will increment during the pay out with each dispensed coin.

The value of counter is saved in non-volatile FLASH memory in case if power failure occourr during the pay out cycle or after that. It is cleared at the begining of nex pay out comand.

It show us how much value has been paid out since last dispence command was lounched.

[Last Payout: value unpaid]

This 2 byte counters will also decrement during the pay out cycle in same way as counter

[Payout value remaining]. The difference is that this counter will be saved in non-volatile FLASH memory if power failure occourr during or after(*value 0*) pay out. It show us how much value was unpaid during last payout.

Message format is:

Host sends: **[Dir][00][01][85][Chk]**
Hopper answer: **[01][07][Dir][00][d1][d2-l][d2-h][d3-l][d3-h][d4-l][d4-h][Chk]**

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

Host sends: **[03][00][01][85][77]**
Hopper answer: **[01][07][03][00][01][00][00][00][00][96][00][5E]**

In this example hopper didn't not perform a complete payout. The last payout was 3 Euro and 50 censts of 5 Euro to be paid.

2.2.5 Command header 132 [hex84], Emergency stop value.

This command immediately halt the payout sequence(*break the motor*) and reports back the value of coins which failed to be paid out. Hopper answer has 100 ms delay for last coin to exit. After Emergency stop value command, the hopper will be disabled.
To perform new payout sequence, hopper must be re-enabled.

Message format is:

Host sends: **[Dir][00][01][84][Chk]**
Hopper answer: **[01][02][Dir][00][d1-l][d1-h][Chk]**

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

Host sends: **[03][00][01][84][78]**
Hopper answer: **[01][02][03][00][7E][04][78]**

Data bytes hex[7E][04] represent hex 047E or dec 1150. That mean that there is 11 Euro and 50 cents left unpaid due to Emergency stop.

2.2.13 Command header 131 [hex83], Request hopper coin value.

This command return the "name" of specified coin as well as its value.
Coin name is standardized 6 byte ASCII characters[4]. It is possible to program different coin names that describe the one used in hopper. Unprogrammed coins has code:**'--------'** .
This code is reserved for unknown(*any type*) of coin.

Message format is:

Host sends: **[Dir][01][01][83][01][Chk]**
Hopper answer: **[01][08][Dir][00][a1][a2][a3][a4][a5][a6][Val-lo][Val-hi][Chk]**

Data a1 to a6 represent the coin "name"(*description*). Data Val-lo and hi are coin value.

Example of message packets for Hopper(*address 3*) coin nr. 1(*2 Euro*) is:

Host sends: **[03][01][01][83][77]**
Hopper answer: **[01][08][03][00][45][55][32][30][30][41][C8][00][BF]**

Data bytes hex[45][55][32][30][30][41] are ASCII 'EU200A'.

Data bytes hex[C8][00] represent hex 00C8 or dec 200, the value of 2 Euro in cents.

2.2.14 Command header 130 [hex82], Request indexed hopper dispense count.

This command show the total number of each type of coins dispensed by hopper.
Each coin counter is non-volatile and has three bytes. LS byte is sent first.

Message format is:

```
 Host sends: [Dir][01][01][82][coin nr.][Chk]
Hopper answer: [01][03][Dir][00][d1][d2][d3][Chk]
```

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

```
 Host sends: [03][00][01][82][02][54]
 Hopper answer: [01][03][03][00][54][00][00][A5]
```

In this example hopper dispensed 84 coins(*hex 54*) programmed on second channel.

Maximum value of dispensed coins stored in hopper FLASH is **16 777 215**.

2.3 MDCES command headers

MDCES stands for **M**ulti-**D**rop **C**ommand **E**xtension **S**et, or so called Multi-drop bus commands.

2.3.1 Command header 253 [hexFD], Address poll

This command is usually sent as a broadcast message by the host to determinate all address of device attached on ccTalk network. Hopper will 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] Brodcast message
Hopper answer: Dly=4x[Address] -> [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
```

3.0 Setting Hopper Address via on-board DIP-SW

Alberici hoppers can also change the default address by setting the switches on hopper PCB. The following table shows the possible Switch combinations to set the Hopper address.

Sw 3	Sw 2	Sw 1	Address
Off	Off	Off	3
Off	Off	On	4
Off	On	Off	5
Off	On	On	6
On	Off	Off	7
On	Off	On	8
On	On	Off	9
On	On	On	10

Table 5 Address selection for hoppers AH03-CD.

Input address switch are read once after power-up or reset.
Changing Address by dip-switch during normal operation will have no effects.

1For details see ccTalk44-2.pdf, Address poll
2252 bytes of data, source address, header and checksum (total of 255 bytes)
3See Error handling
4Refer to Appendix 3.1 of protocol document cctalk43-3.pdf

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