HOPPER U- II

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1. INTRODUCTION

This manual contains the technical information on the rotating hoppers in the **Hopper U-II.** The following models are included in this family of products:

- **Hopper U-II cctalk**
- **Hopper U- II cctalk encrypted**
- **Hopper U-II cctalk plus**
- **Hopper U- II cctalk plus encrypted**
- **Hopper U-II conventional**
- **Hopper U-II conventional plus**

The rotating Hopper U-II is a result of the redesigning process of the traditional Hopper U, obtaining an optimised version of the hopper. This product is 100% compatible with the previous Hopper U model.

This document contains all the characteristics of this new product, concentrating especially on the benefits this hopper provides in comparison to the traditional Hopper U.

2. GENERAL DESCRIPTION.

A *rotating hopper* of the **U- II** series is an intelligent mechanism designed for the return or payout of change of a particular coin type. It works in combination with another intelligent mechanism that governs it and of which it forms part (gaming, vending, parking machines, etc).

These *hoppers* have a **multicoin** extraction system. The multicoin system is defined as a system that allows these *hoppers* to payout **a coin** whose dimensions are between 12 and 32 mm in diameter and 1.2 to 3.5 mm thick.

The product is highly reliable, and has a useful life that guarantees a minimum of 2 million coin extractions.

2.1. CAPACITY OF THE HOPPER U-II.

The quantity of coins that can be stored in the coin bay of the hopper depends on the model. There are 4 different models in the series that provide a range of coin capacities. There is also the possibility to increase their capacity by the use of supplements.

Small hopper	Medium Hopper	Intermediate hopper	Large hopper
L=115mm and **250** coins	L=154 mm and **400** coins	L=189 mm and **525** coins	L=228mm and **600** coins
Coins of Ø 24 mm and thickness 2.8 mm	**Coins of Ø 24 mm and thickness 2.8 mm**	**Coins of Ø 24 mm and thickness 2.8 mm**	**Coins of Ø 24 mm and thickness 2.8 mm**

Figure 1. Hopper U-II

Consult section "*COIN BAY.*" to see the exact capacities depending on the size of coin, and also the supplements.

2.2. RANGE OF COINS.

The multicoin extraction system of the hopper U-II, guaranties the payout of coins whose dimensions are between 1.2 and 3.5 mm thick, and 12 to 32 mm in ø.

Consult section "COIN EXTRACTOR DISK" for more details.

2.3. DETECTION OF FULL AND EMPTY

The Hopper U-II has detection mechanisms that detect the full and empty levels of the coins in the coin bay.

The detection of empty is done by using an electronic infrared photocell system. (See details in section "COIN LEVEL DETECTORS.)

The detection of full is carried out in two different ways:

- Using two infrared photocells that work in the same way as the empty detection photocells. (See details in section "COIN LEVEL DETECTORS.).
- Using electromechanical scales. (See details in section "4.13.3. Electromechanical scales.").

2.4. DOUBLE COUNTING.

The Hopper U-II has a coin exit control system that provides added protection against attempts of fraud. When the Hopper U-II has this mechanism installed, it is called Hopper U-II plus.

It is a mechanism based on an optic system that controls the movement of the trigger, in a way that the exit of the coin is announced by this mechanism and confirmed by the optic sensor that counts the coins. This mechanism is available for the Hopper U-II parallel, and for the Hopper U-II cctalk.

2.4.1 Hopper U-II plus cctalk.

When any anomaly occurs, which could be an attempt at fraud, it will be communicated by the Hopper U-II plus cctalk as a reply to the cctalk error command "163 Test Hopper" (See details in the manual ***"Protocol cctalk Hopper U-II"***)

It is possible to transform a standard Hopper U-II into a Hopper U-II plus with a kit. Once the kit is installed, it is only necessary to change the position of dipswitch 7 (to ON) so that the standard U-II standard works as a Hopper U-II plus.

2.4.2 Hopper U-II plus conventional.

When any anomaly occurs, which could be an attempt at fraud, it will be communicated by the Hopper U-II plus conventional using the corresponding error commands (see details in the manual ***"Protocol conventional Hopper U-II"***).

It is possible to transform a standard Hopper U-II into a Hopper U-II plus with a kit. Once the kit is installed, it is only necessary to change the position of dipswitch 7 (to ON), this is explained in *"Figure 17. Configuration Hopper U-II standard or plus.*

2.5. PAYOUT SPEED.

The Hopper U-II pays out up to 8 coins per second. This speed varies with the different disks used. See details in section "COIN EXTRACTOR DISK".

2.6. PROTOCOLS.

The Hopper U-II can work with parallel protocol (conventional) and cctalk protocol. To see the conventional Hopper U-II protocol, consult the manual ***"Conventional Hopper U-II Protocol"***

To see the cctalk Hopper U-II protocol, consult the manual ***"cctalk Hopper U-II Protocol"***

2.7. IN-LINE CONFIGURATION.

Two hoppers can be configured in line with one another to maximise the use of space.

Figure 2. Configuration of the Hopper U-II in line.

Figure 3 indicates the positions that the bases of the Hopper U-II should be placed to achieve optimum performance of the two hoppers in line.

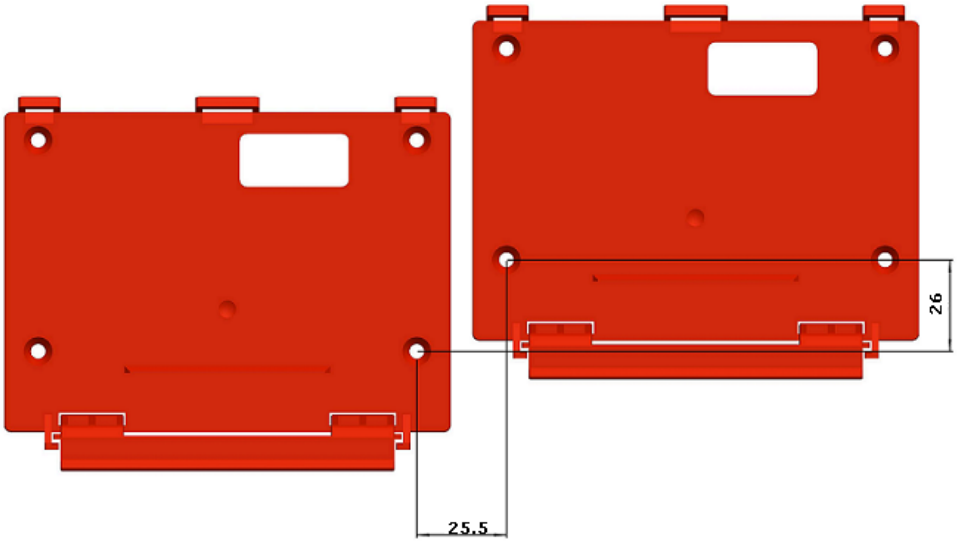


Figure 3. Position of the bases of two Hoppers U-II in line.

2.8. ANTI-JAM AND ANTI-SPAN SYSTEMS

Jam. The hopper has a current draw detector that, when there is a coin jam, reverses the spin direction of the disk motor for 1.5 seconds to free the jammed coins.

Span. The name given to the time between the extraction of two coins. When the hopper detects a time span of more than 5 seconds the hopper reverses the spin direction of the disk

motor for 1.5 seconds to move the pile up of coins in the hopper and get them into a position to be extracted.

3. TECHNICAL CHARACTERISTICS

3.1. POWER SUPPLY.

This hopper is capable of working correctly in a range of voltages from **12 V** (±10%) and **24 V** (±10%).

3.2. CURRENT DRAW.

	12Vdc – 24 Vdc (±10%)
Start up current	3 A ± 20%
Standby current	50 mA ± 5%
Coin pay out current	450 mA ± 20%

Table 1. Current draw.

3.3. DIMENSIONS.

Tolva	Largo (mm)
Pequeña	115
Mediana	154
Intermedia	189
Grande	228

Tolva	Largo (mm)
Mediana	191
Grande	228

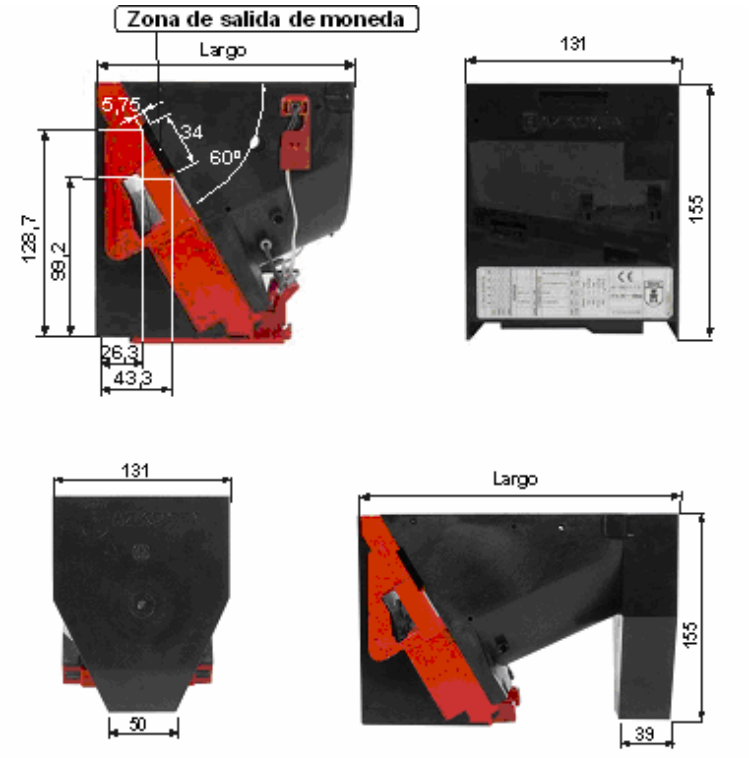


Figure 4. Dimensions Hopper U-II

3.4. ELECTRICAL DIAGRAMS AND PIN OUT.

3.4.1. - Electrical diagram of the Hopper U-II cctalk.

The following diagram shows the cctalk driver included in the Hopper U-II.

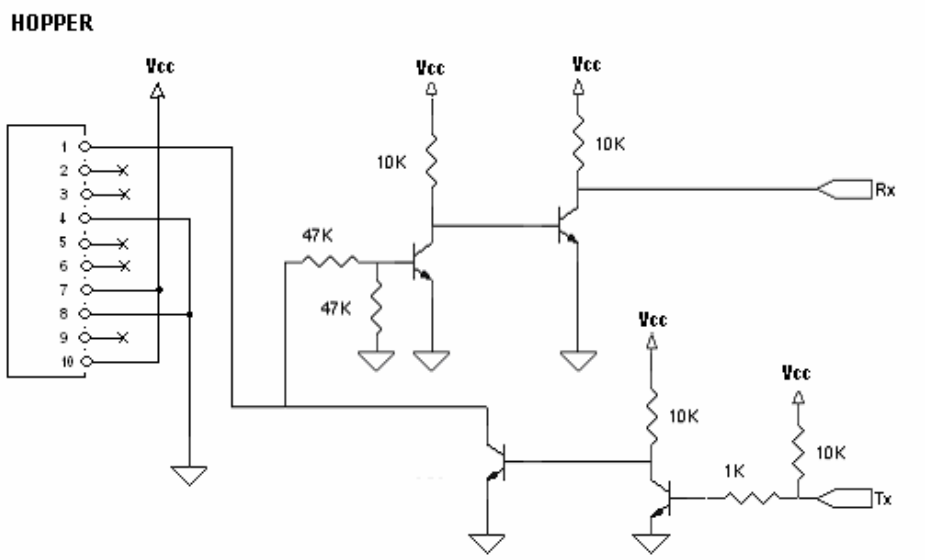


Figure 5. Diagram Hopper U-II cctalk.

3.4.2. - Electrical diagram of the Hopper U-II conventional.

The following diagram shows the conventional driver included in the Hopper U-II.

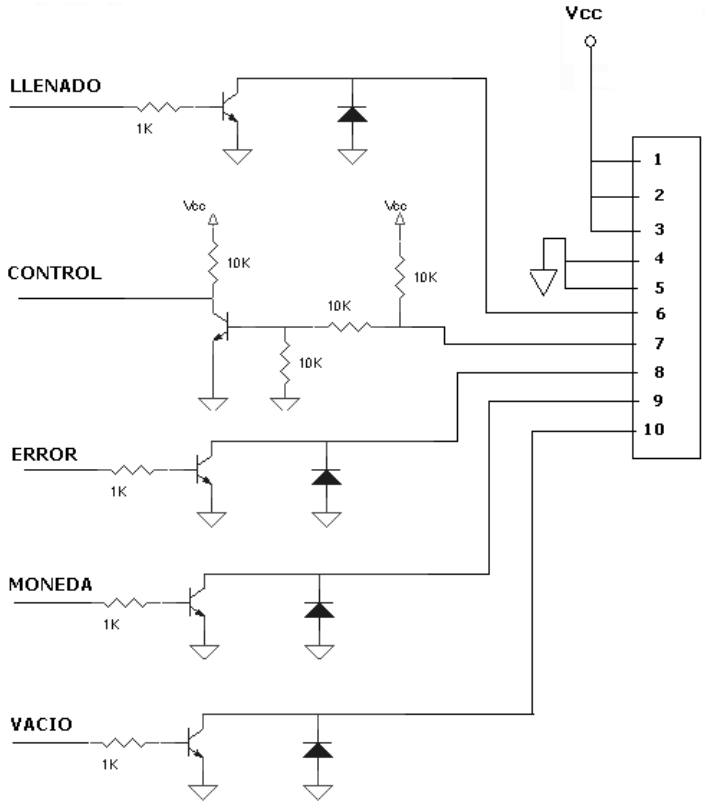


Figure 6. Diagram Hopper U-II conventional.

4. DESCRIPTION OF COMPONENTS.

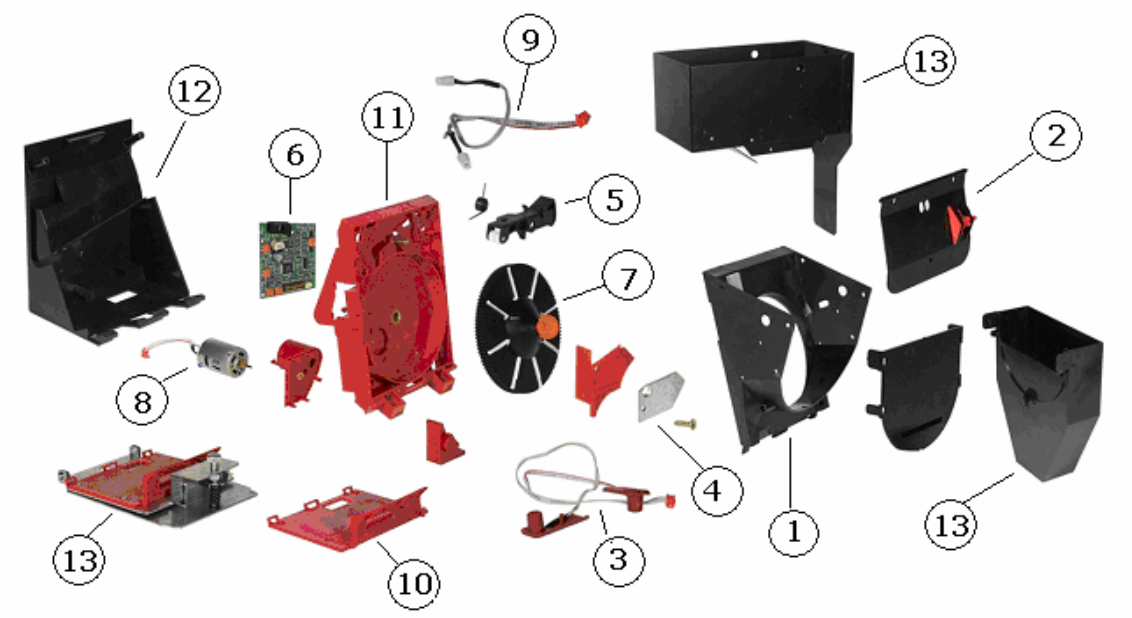


Figure 7. Components of the Hopper U-II.

4.1. COIN BAY.

The coin bay is where the Hopper U stores the coins and where they are extracted from when ordered to do so by the machine. Its design allows the storage of the maximum number of coins in the minimum space, taking into account that even the last coin can be extracted.
There are various models with different capacities.

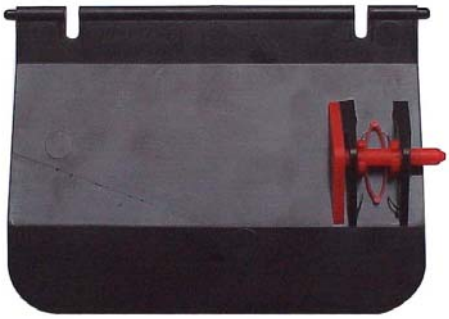
Hopper							
Coin bay	*Capacity of coins*						
	Ø 24 mm Thickness 2.8 mm	**5 cent €**	**10 cent €**	**20 cent €**	**50 cent €**	**1 €**	**2 €**
Small	250	450	450	350	250	275	225
Medium	400	775	775	600	375	425	325
Intermediate	525	975	975	775	525	600	475
Large	600	1,100	1,100	975	700	750	650

Table 2. Capacity of the Hopper U-II

4.2. MOVING FLAP.

This element moves and doses the flow of coins that move from the coin bay to the extractor disk.

The flap is fixed to the coin bay at the top and the lower part rests on the axis of the disk. This way the spinning disk transmits a rocking motion to the flap that moves the coins in the hopper; this movement moves the coins towards the extraction system. For coins of more than 29 mm in diameter, a different flap is used; it is called the short flap (it allows the bigger coins to pass under the flap to reach the extractor disk). This flap is not recommended for use with smaller coins as it will allow too many coins to reach the disk causing problems with their extraction.



Large flap

Small flap

Figure 8. Types of flaps

4.3. COIN LEVEL DETECTORS.

The Hopper U-II has full and empty detection sensors.

Empty detection.

Empty detection is carried out by a photocell (photodiode and phototransistor) that is located in the holes at the bottom of the coin bay.

The photodiode emits a beam of light that is detected by the phototransistor when there are no coins in the hopper. When the coin level is lower than the height established for the photocells, the control board detects this and advises the machine.

Full detection.

Full detection, as with the empty detection, is carried out by a photocell (photodiode and phototransistor) that is located in the holes at the top of the coin bay.

The photodiode emits a beam of light that is detected by the phototransistor when the coin level is lower than the photocells. When the coin level is higher lower than the height established for the photocells, the control board detects this and advises the machine.

The application of this system is possible in all the hopper models.

4.4. BLADE.

The function of this element is to slice between the coin and the disk making the coin leave the hopper. The *hoppers* can have two types of blade:

Long blade: for disks of 7 and 8 ridges.
Short blade: for disks of 12 ridges.

Long blade Short blade

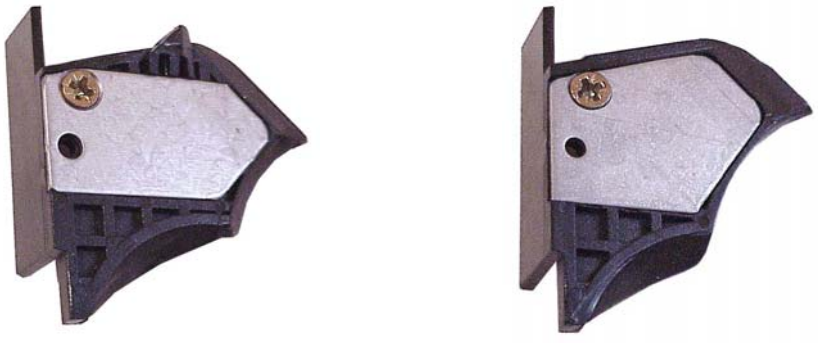


Figure 9. Types of blade

Both models have a metallic reinforcement which is held on the blade with a screw.

	Thickness accepted	Diameter accepted	Cavities in the disk
Long blade	1.5mm – 3.2mm	22mm – 32mm	7
		18mm – 30mm	8
Short blade	1.5mm – 3.2mm	12mm – 20mm	12
Modified short blade	1.2mm – 1.5mm	12mm – 20mm	12

Table 3. Coin dimensions.

4.5. TRIGGER. Improved!

In the coin extraction process this device compresses the trigger spring and at a certain point it shoots the coin out of the hopper.

The Hopper U-II has only one type of trigger, whereas previous models had two. It is made of plastic.

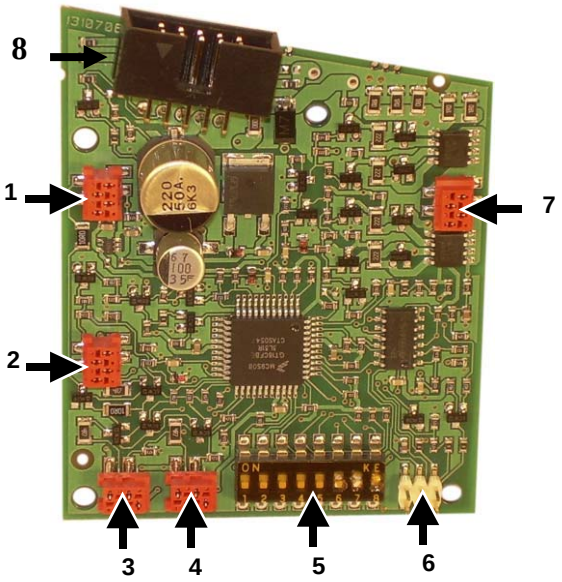
4.6. CONTROL BOARD. Improved!

This element governs the *hopper* and communicates with the machine. The wiring looms that correspond to the counting, filling and emptying functions and motor are connected to it. There are different models depending on the protocol used (cctalk or conventional) and its operation with Azkoyen tools.

4.6.1. Cctalk control board. Switches and connectors. Improved!

There is only one model of the board for all the Hoppers U-II cctalk.

The following figure shows the use of each one of the connectors and switches located on the control board.



1- Coin exit detection

2- Double count

3- Empty sensor

4- Full sensor

5- Switch

6- Connector for programming tools

7- Connection of the motor

Figure 10. Control board cctalk

Connectors.

Connector cctalk:

This connector is used for communication with the machine, which is cctalk. It is a 10-pin connector.

The pin out of the connector is the following:

Pin 1- Data

Pins 7 and 10 Power

Pins 4 and 8 Ground

Connector 6 pins.

This connector is used for communication with Azkoyen programming tools. (See chapter "TL20 AND HEUS.)

The pin out is the following:

Pin	Function
1	-
2	GND
3	RX
4	-
5	TX
6	+5V

Table 4. Pin out connector Tools

This connector is not operative in the hoppers U-II for Italy.

Switches

The configuration of the address of the Hopper U-II, as with other functions, is done with the *dip switches,* 8 switches located on the board which is accessible from the underside of the hopper as shown in the illustration.

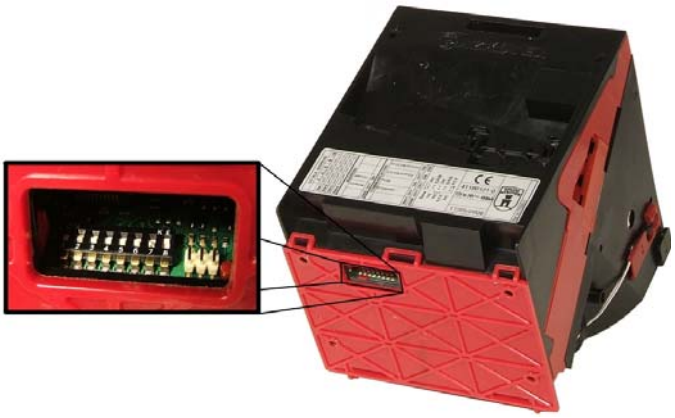


Figure 11. Position of the switches

The function of the switches is shown in the following tables.

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Selection of the address of the Hopper				Not used	Selection of the address mode	Selection of the working mode	

Table 5. Switches.

- With the switches 1, 2, 3 and 4 up to 16 Hoppers U-II can be addressed, as indicated in the following table:

	cctalk address	SW1	SW2	SW3	SW4
	3	OFF	OFF	OFF	OFF
	4	ON	OFF	OFF	OFF

	5	OFF	ON	OFF	OFF
	6	ON	ON	OFF	OFF
	7	OFF	OFF	ON	OFF
		…	…	…	…
	18	ON	ON	ON	ON

Table 6. Addresses for switch combinations.

- Switch 5 is not used.
- Switch 6 is used to select the address of the hopper U-II; the address can be selected by using the switches of by the address saved in the memory of the hopper (which can be modified using cctalk commands).
- Switches 7 and 8 are used to select the working mode of the Hopper U-II as shown in the following table:

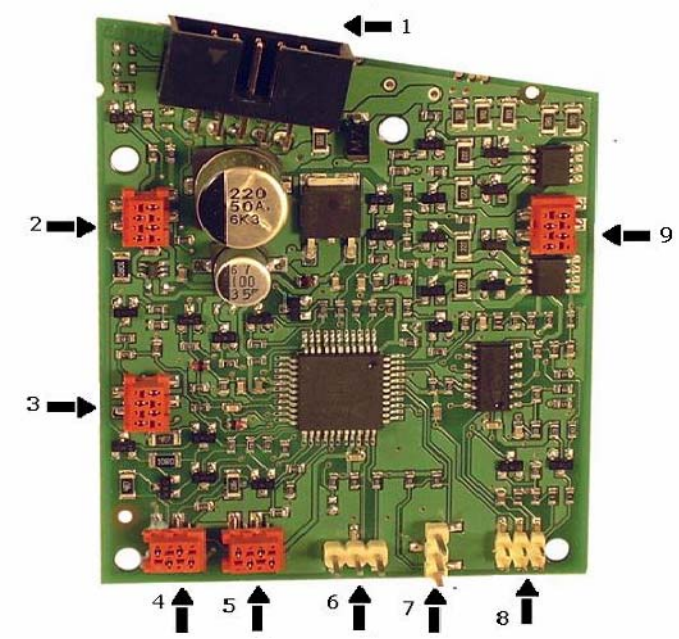
WORKING MODE	SW7	SW8
STANDARD	OFF	OFF
STANDARD ENCRYPTED	OFF	ON
PLUS	ON	OFF
PLUS ENCRYPTED	ON	ON

Table 7. Working mode for switch combinations.

4.6.2. Control board conventional. Jumpers and connectors. Improved!

There is only one model of board for all the Hopper U-II conventional.

The function of each one of the connectors and jumpers on the control board are shown in the following figure.



1- Protocol connector
2- Detection of coin exit
3- Double count
4- Empty sensor
5- Full sensor
6- Logic selection
7. Double count selection
8- Programming tool connector
9- Motor connection

Figure 12. Control board conventional

There is only one model of control board for all the Hopper U-II conventional. Improved!

Connector for communication with the machine (conventional protocol).

The Hopper U-II uses a connector of 10 pins (2x5) of 2.5mm, series Molex 8624 or similar, for communication with the machine.

The pin out of this connector depends on the function of the Hopper:

Pin	Function
1,2,3	Vdc
4,5,6	GND
7	Control
8	Error
9	Coin

Figure 13. Pin out Hopper U-II conventional standard.

Pin	Function
1,2,3	Vdc
4,5,6	GND
7	Control
8	Error
9	Coin
10	Empty

Figure 14. Pin out Hopper U-II conventional with empty detection.

Pin	Function
1,2,3	Vdc
4,5	GND
6	Full
7	Control
8	Error
9	Coin
10	Empty

Figure 15. Pin out Hopper U-II conventional with full and empty detection.

Connector for the control of the working logic.

Using connector 6 in figure 9 you can select the working mode of the Hopper U-II for the control of signal levels.

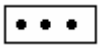
Position of the pins	Working modes
	Control with negative logic digital signal
	Control with positive logic digital signal
	Control by pulses

Figure 16. Types of control of the working mode

Consult the manual “Protocol conventional Hopper U-II_v0.doc” to see details of the conventional protocol.

Connector for control of the communication.

With configuration of connector 7 in figure 9, you can configure the working mode of the Hopper U-II, as shown in figure 17:

Position of the pins	Working modes
	Standard
	Plus
	Standard

Figure 17. Configuration Hopper U-II standard or plus.

Connector for communication with Azkoyen tools.

This connector is used to carry out communication with the Azkoyen tools. (See chapter "TL20 AND HEUS.). It is a 6-pin connector with the following pin out:

Pin	Function
1	-
2	GND
3	RX
4	-
5	TX
6	+5V

Figure 18. Position of the switches

4.7. COIN EXTRACTOR DISK

The disk picks up the coins in the coin bay and carries them to a position to be ejected from the hopper. The cogs on the outside of the disk mesh with the reduction gear, which makes it spin.

It has ridges to hold the coins and drag from the bottom of the coin bay to top where they are ejected by the trigger.

The disk has pivots that are used to move the coins in the coin bay. The knob on the disk moves the flap.

There are three different coin *extractor disks*. The three accept the same thickness coins which are between 1.2 mm minimum and 3.5 mm maximum.

Disk with 8 ridges and a red pivot: for coins with diameters between 18 and 30 mm. This disk can reach a payout speed of 5.3 coins/second.

Disk with 12 ridges and a yellow pivot: for coins with diameters between 12 and 20 mm. This disk can reach a payout speed of 8 coins/second.

Disk with 7 ridges and a black pivot: for coins with diameters between 20 and 32 mm. This disk can reach a payout speed of 4.6 coins/second.

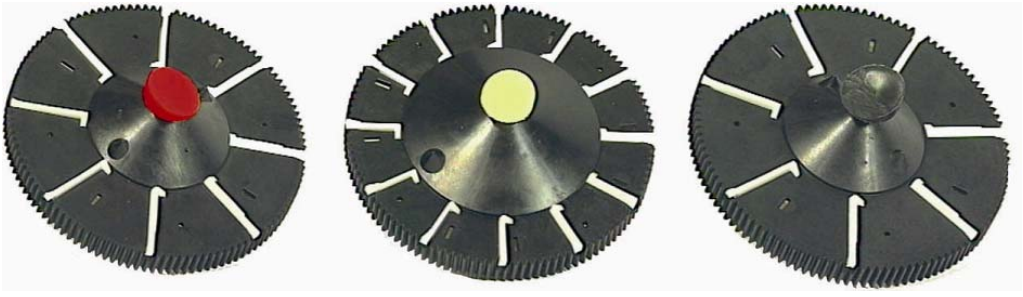


Figure 19 Types of disk.

4.8. DISK COIN EXTRACTOR MOTOR. Improved!

This element spins the disk for the extraction of coins from the coin bay.

The Hopper U-II uses a motor of 12 V Improved! that be powered from 12V to 24V (± 10 %).

Its electrical characteristics are:

Current	12 Vdc
Start up	3 A ± 20 %
Spinning	350 mA ± 20%

Table 8. Current of the electric motor.

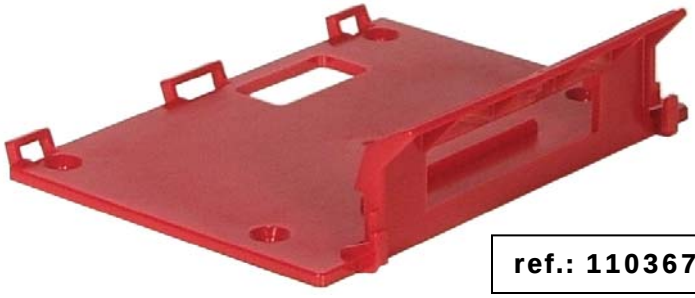
4.9. INFRARED PHOTOCELLS FOR COIN COUNTING. Improved!

On leaving the hopper, the coin cuts through an infrared beam generated by these photocells. The pulse is considered correct when it is at least 18 milliseconds long. If the pulse exceeds one second, it is considered as an error and the hopper is placed out of order.

4.10. HOPPER BASE Improved!

This is an accessory of the hopper that is used to *attach the hopper to* the machine. It has holes for its fixture to the machine and with clips for holding the hopper.

The Hopper U-II has a new version of base that much improves the fixture of the hopper.



ref.: 11036721

Figure 20. Hopper base.

4.11. DISK SUPPORT

The disk support assembly holds the coin extraction components that make up the extraction system and the control board. It has been designed so that the fixture of all these elements is quick and simple, and incorporated the reduction gear for transmitting movement to the disk and the extraction trigger that ejects the coins from the hopper.

The disk, the blade and reduction gear support is fitted in one side and the motor and the control board on the other.

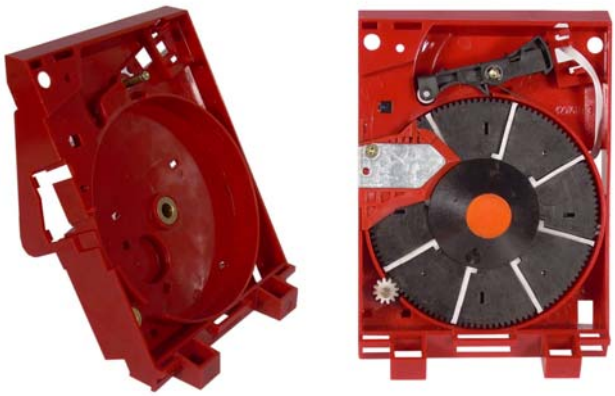


Figure 21. Disk support.

4.12. DISK SUPPORT COVER. Improved!

This element covers and protects the different elements that are installed on the front of the hopper. It has been modified so that it covers the components completely to prevent external intervention.

Figure 22. Disk support cover.

This element also has guides for the attachment of a second hopper in installations where the hoppers are placed “in line”.

4.13. ACCESSORIES.

4.13.1. Mechanical supplement to increase the capacity of the hopper.

This element is an accessory of the *hopper* that increases its capacity. There are different

models and sizes for each of the different types of hopper.

Hopper	Capacity for coins from Ø 24 mm and 2.8 mm thick			
	Capacity of the hopper without extension	**Type of extension**	**Capacity of the extension**	**Total capacity**
Medium	400	Height 80 mm	300	**700**
Large	600	Height 80 mm	500	**1 100**
Extra	600	Height 105 mm	1000	**1 600**

Table 9. Capacities of the extensions.

Figure 23. Extensions.

4.13.2. Overflow.

A mechanical system that is based on the overflow of the coins from the hopper through gravity.

Figure 24. Overflow.

4.13.3. Electromechanical scales.

A detection system to detect if the Hopper U-II is full that is based on the weight control of the hopper with coins. When the weight of the coins in the coin bay goes above a set weight, which is adjustable with a screw, a micro switch is activated. The *scales* are an accessory of the hopper that are installed under the base of the hopper.

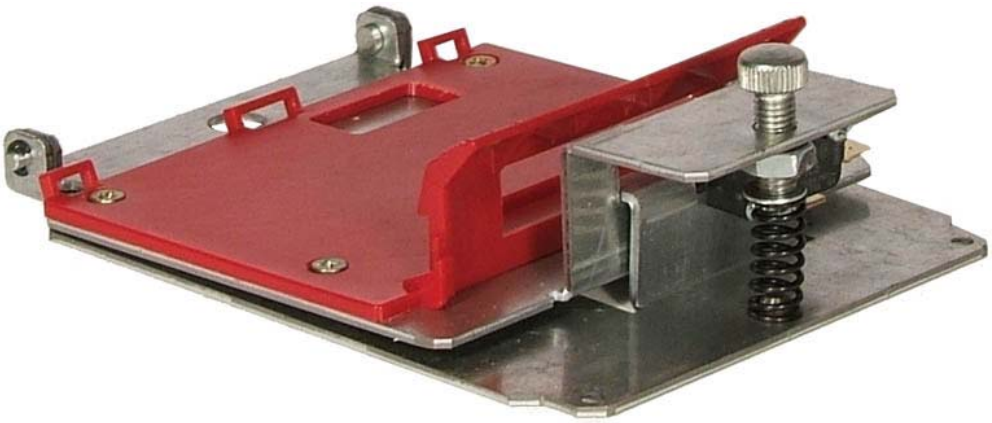


Figure 25. Electromechanical scales.

The electromechanical scales can be installed with all the Hopper U-II models.

5. TOOLS.

The Hopper U-II uses a microcontroller with flash memory that allows the updating of the software using cctalk commands and the use of the Azkoyen tools.

5.1. TL20 AND HEUS.

The TL20 is a programming device for Azkoyen Payment systems' products that allows coin programming, updates, firmware etc. in coin validators and also the firmware of the new Hopper U-II.

It is an easy tool to use that should be used together with the HEUS software.

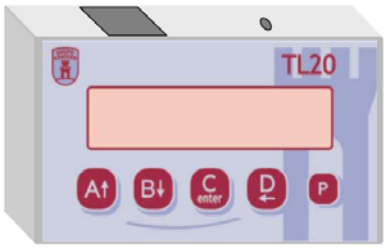


Figure 26. TL20

The operation of these devices can be summed up in the following points:

- The user should upload the firmware of the Hopper U-II for updating from the PC to the TL20, using the HEUS software. This software can be obtained from Azkoyen from the website or via email.
- Following the instructions for the use of the TL20, connect the Hopper U-II with a 6-pin cable and upload the new firmware to the hopper.

There is a TL20 and HEUS instruction manual available on the website of Azkoyen that can be consulted for more detailed instructions on the use of these tools.

6. WORKING CONDITIONS AND NORMS.

Optimum results from using this equipment can be obtained by meeting the following requirements:

- Power the hopper with a transformer that meets the EN-60742 Norm and provides a maximum of 42.5 Vac without load.
- Install the hopper U-II series with a maximum inclination of +/- 3ºon all axes.
- Temperatures:
  - Storage: from -25 to +70ºC.
  - Working: from +5 to +55ºC.
- Humidity: maximum 95% (relative humidity without condensation)
- Norms that are met:
  - Electromagnetic compatibility:
    - Emission: UNE-EN 61000-6-3:2002
      - Radiation Emission: EN 55011:1999/A1:2000/A2:2003
      - Conductive Emission: EN 55011:1999/A1:2000/A2:2003
    - Immunity: UNE-EN 61000-6-1:2002

- ESD: UNE-EN 61000-4-2:1997, /A1:1999, /A2:2001, 2004 Erratum
- Radiation Immunity: UNE-EN 61000-4-3:2003, 2003 Erratum, /A1:2004
- Peaks and spikes immunity: UNE-EN 61000-4-4:2005
- Magnetic Field: UNE-EN 61000-4-8:1996, /A1: 2001

➘ Electric Security: EN 60950:2002

➘ Meets the BACTA norm, “Binary Interface V1.0E”.

➘ **CE**

Comment: Cable for Rode U-II cctalk connexion should be shorter than 3 meters.

7. CLEANING AND MAINTENANCE

The maintenance required for the hopper can be summed up as:

- General cleaning of the apparatus after 500,000 coin extractions
- It is recommended to clean the coin exit area where the optic sensors are more frequently. This can be done with cotton wool bud dipped in alcohol.

Figure 27. Cleaning of the Hopper U-II

WARNING:

➘ Never use products that contain benzene hydrocarbons. These products severely degenerate the plastic parts producing irreparable damage.

➘ Never submerge the hopper in any liquid.