Universal

Hopper

Series

Manual

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1. Diary of Changes

Issue 2.0...15th May 2003
> 1st Issue in new format.

Issue 2.1..July 2003
> Added details of High Security Exit Window (Section 8.8).
> Updated details in Table 2.
> Added Universal Hopper 'Lite' details.

Issue 2.2..July 2003
> Changed High level to Top level sense available for UH Lite

2.   Introduction

Money Controls' Universal Hoppers were first introduced in 1984. The MKII and MKIII models proved themselves to be exceptionally reliable, with high count accuracy. The MK4 is the latest generation of this extremely successful series.

The MK4 Universal Hopper can be used as a direct replacement for MKII and MKIII Hoppers. Any specific variances are clearly indicated, where appropriate, in this manual. When ordering MK4 Universal Hoppers as a replacement, it is important to specify which version is being replaced.

The Universal Hopper 'Lite' is a cost effective solution for standard applications. Unlike the other Universal Hoppers, the 'Lite' has been designed to only work in Mode 1.

3.   Safety Note - MK4 Hoppers only

To meet the requirements for EN 60950 the equipment must be installed according to the following requirements:-

> ➤   The equipment must be protected by a 3A fuse.
> ➤   The equipment must be supplied from a SELV limited power source.
> ➤   The equipment must be installed in an enclosure but positioned so that it is external to any fire enclosure area within the main enclosure.

4. General Description

The Universal Hopper is an "intelligent" large capacity coin and token dispenser ideal for a wide range of applications including Gaming, Vending and Transportation systems.
MKII and MKIII hoppers will handle most coins in the range 16.25mm - 30mm diameter and 1.25mm - 3.5mm thick, giving the following approximate capacities:-

Table 1: Approximate Hopper Capacities.

Diameter	Thickness	Approx. Capacity
28.4mm	2.21mm	800
24.25	1.75	1600

The MK4 and 'Lite' have extended the range to include 31mm diameter and 1mm thick coins.
The rate of payout, whilst being dependent on the coin dimensions and also the volumes of coins in the Hopper at any given time, is approximately 3 coins per second.
Precise payout is ensured through optical sensing and verifying of coin dispensing with an electronic security signal which alerts against coin jams, failed sensors and a bad power supply. LED indicators are provided for easy visual checking of power supply, security status and coin sensors.
The Universal Hopper has the in-built facility to operate in 3 modes:-

Mode 0 (Not available on the 'Lite' version)
the direct switching mode.

Mode 1
the hopper is controlled directly by a LOGIC (Motor) CONTROL LINE. When the line is 'active', the motor runs.

Mode 2 (Not available on the 'Lite' version)
the hopper is driven by pulses on the control line which allows the hopper to be used in place of a solenoid payout with no software and few hardware changes.

5. Options

There is a standard Universal Hopper handling coins in the diameter range of 21mm - 30mm, and the small coin Universal Hopper handling coins in the diameter range of 16.25mm - 20.9mm. Both of these models can be supplied with a number of options:-

5.1 Connector Position

The 12-pin connector can be in one of two positions, either on the opposite side of the coin exit, known as the standard position, or on the same side as the coin exit, known as the adjacent position.

Figure 1: Connector Position Options
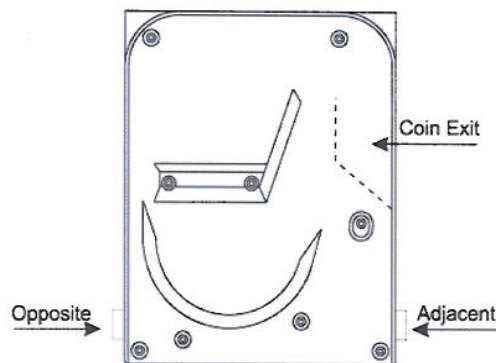
5.2 Level Sensing

Universal Hoppers can be supplied with a choice of coin sensing positions, these can be either:- High level or Top level.
High Level is NOT available with the Universal Hopper Lite.
All Hoppers are automatically supplied with a low level function to indicate coin starvation.

Figure 2: Sense Plate Position Options
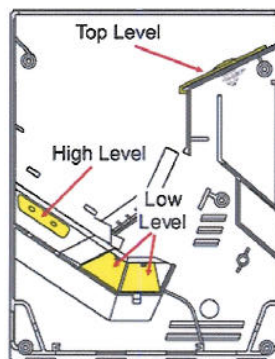
5.3   Connector Options

MK4 Universal Hoppers are available with connectors compatible with MKII and MKIII Hopper installations. It is important, when ordering, MK4 Hoppers as a replacement to specify which version is being replaced.
Universal Hopper Lite is ONLY available with the 'Cinch' plug.

Figure 3: Connector Types

MKII Cinch Plug   MKIII Bulgin Plug

5.4   Coin Sizes

Table 2: Coin Size v Track Type.

Track Type	Coin Range	Hopper Type
Large coin	(30.1 - 31.0 mm dia.)	MK4
Standard coin	(21.0 - 30.0 mm dia.)	MKII, MKIII and MK4
Euro track	(€2, €1, 50c, 20c, 10c, 5c)	MK4
Euro small coin	(16.25 - 20.9 mm dia) previously called the small coin.	MKII, MKIII and MK4

5.5   EMC

See section 9.1.2

5.6   Passive Overflow

Either the top, the bottom, both or neither panel can be specified to be removed.

Figure 4: Passive Overflow Positions
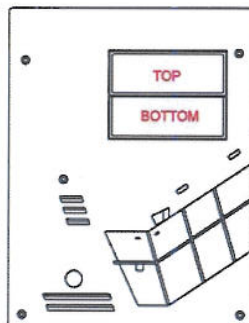
5.7   Baseplate

The baseplate can be ordered with the following options:-

- ➢ fitted to the hopper
- ➢ packed separately
- ➢ supplied with no connector
- ➢ connector only (no baseplate)
- ➢ no baseplate
- ➢ the connector can be packed separately

All of the above options must be specified when ordering.

6.   Installation

Important: Power should not be applied until the installation is complete.

1.   Secure the baseplate in position, using the six fixing holes. The hole positions are shown in Figure 18.

2.   Wire up the baseplate connector to the host machine - see section 11.3 for connector details, and sections 8.8 & 10 for interfacing recommendations.

**NOTE: The wire to be used should have a maximum length of 3 metres, and must be capable of handling the maximum currents and voltages specified in section 11.**

3.   Slide the hopper into the baseplate and ensure that the two halves of the connector are securely mated.

4.   Turn on the power.

6.1   Safety

1.   Do not put a hand into the hopper while the motor is running.

2.   Static. It is possible for coins paid out to have a static charge on them.

3.   Coins should be discharged to earth before being presented to the user.

**IMPORTANT:**
**The hopper should not be installed/removed from baseplate with power connected.**
**Avoid inhalation of coin dust during any servicing operations.**

7. Mechanical Description

7.1 General

The hopper is mounted in a machine via the base plate.

Electrical connection to the hopper is made via the 12 pin socket on the baseplate which mates with the corresponding plug on the hopper body. Coins are stored in the cashbox section of the hopper and fed onto the elevator belt via a passage in the centre plate. The cut-out in the centre plate has been designed to regulate the flow of coins onto the belt. The stirrer agitates the coins in the coin box in order to minimise the occurrence of bridging. The elevator belt is driven by a motor, gearbox, and idler gear. Coins are picked up at the bottom of the belt and carried up to the exit window. Optical sensors in the exit window detect the coins as they roll out of the hopper.

A cable connects the main control board to the 12 way socket and carries all power supplies and control signals.

7.2 Differences Between MKII, MKIII, MK4 and Lite Hoppers

Table 3: Hopper Differences.

Feature	MKII	MKIII	MK4	Lite
Motor Drive	Belt	Belt	Direct	Direct
Gears	Plastic	Plastic	Metal & Plastic	Metal & Plastic
µP PCB Location	Centre Plate	Centre Plate	Coin Box	Exit Window
LED's Location	PCB	PCB	Exit Window	None
Opto Sensors	2 sets	1 set	3 sets	3 sets
Track Guard	Blue	Green	None	None

7.3 Track guard Removal and Refitting (MKII and MK III only)

See Figure 14.

Firstly, locate cut away slots in Centre plate and End plate at the base of the track guard opposite the PCB. Push track guard up to reveal a gap between body moulding and the guard. Insert broad flat bladed screwdriver or equivalent into gap and gently lever out the guard until the leading edge is above the outside edge of the body mouldings. Now slide the guard down towards the cut out and gradually withdraw it. Slide back the track guard to refit.

7.4 Coin Box Removal and Refitting

Please refer to the Universal Hopper Service Manual TSP053

7.5 Track and 12-Pin Plug access

Please refer to the Universal Hopper Service Manual TSP053

8.   Electronic Description

8.1   General Electronic Description

Operation of the hopper is controlled by a 8-bit microprocessor.
The microprocessor allows the choice of 3 different operating modes (except for 'Lite' which only has Mode 1). It also provides the motor control drive via a darlington bridge and an optical payout detection output.
Separate power supplies are recommended for the motor supply input and the logic supply input. *Note:- The 'Lite' version only has one supply input.*

8.2   Operating Mode Selection (Universal Hopper Lite – Mode 1 ONLY)

Three modes of operation are available, selected via inputs IN1 and IN2 (pins 4 and 8 of the 12 way connector). Input signals may be controlled by the host machine, or may be hardwired. Additionally, input IN3 (pin 12) is the logic control line, used in modes 1 and 2. These inputs are passive pull-up active pull-down. The signals therefore default to logic '1' if left open circuit.

NOTE: It is strongly recommended that if these inputs are to be controlled by the host machine, then open collector NPN transistors, referenced to logic OV (connector pin 2) be used to set the input levels to IN1, IN2 and IN3.

With the exception of 'RESET' mode which can be applied at any time (with instantaneous effect), Mode selection is determined at power-up. The hopper allows a 100ms time-out after power-up, then reads the inputs IN1 and IN2. The hopper will remain in the selected mode until the power is removed, i.e., any further changes in the levels at IN1 and IN2 will be ignored. See Table 4.
Refer to section 10.5 for recommendations for driving input signals on pins IN1, IN2 and IN3.

Table 4: Mode Selection Logic Input.

Mode	IN1	IN2
0	1	1
1	0	0
2	1	0
Reset	0	1

8.2.1   MODE 0 - DIRECT SWITCHING (NOT 'LITE')

This is the default operating Mode, and is selected when all of the input selectors are left open circuit. When the 24V line is established, the motor starts in the forward direction and when the 24V power line is removed, the motor is braked.

8.2.2   MODE 1 - LOGIC CONTROL

In this mode the logic and 24V power supplies can be permanently connected and motor function is determined via a logic level on the IN3 input.
When IN1 (pin 4) and IN2 (pin 8) are pulled down to OV at power up, mode 1 is selected.
The operation of the motor is now controlled via a logic signal on IN3 (pin 12). With the 24V supply present, a low level on IN3 starts the motor and a high level on IN3 brakes the motor.

8.2.3 MODE 2 - COIN COUNTING (NOT 'LITE')

In this mode, the hopper will pay out a coin for every pulse it receives on input IN3.

Mode 2 is selected by setting IN1 (pin 4) high and IN2 (pin 8) low at power up. Once selected, the processor continually scans input IN3. When a pulse is detected on IN3, an internal register is incremented. When a coin is paid out, it is detected and the register is decremented.

The motor is started when the internal coin register is non-zero and is stopped when it returns to zero. The maximum count for the coin register is 4095 coins. Should the 24V line fail at any point, the motor is braked. When the 24V line re-appears, the payout of coins continues until the coin register returns to zero. Coin counting on IN3 can take place while coins are being paid out.

Figure 5: Minimum Timings
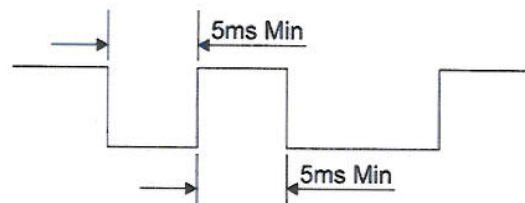
A pulse is defined as a falling edge followed by a rising edge.

Pulse edges may be no closer than 5ms (see Figure 5). This is so that the processor has adequate time to poll the IN3 pin and debounce. This represents a maximum pulse rate of 100Hz.

There is no lower limit. The waveform duty cycle is unimportant.

At power-up in mode 2, IN3 is high. The first falling edge will be recognised as the first pulse and the hopper motor will start running.

Pulsing on IN3 should not commence earlier than 130ms after the logic supply has been established. This will allow for the power-up time-out of 100ms and further processing time prior to running the main program.

8.2.4 RESET FUNCTION (NOT 'LITE')

The reset function is available on MKIII and, when specified on the MK4 version. In this mode the Hopper is reset, i.e. processor reset and motor drive disabled. This function is provided as added security enabling the host machine to immediately stop the Hopper irrespective of its mode of operation.

Whilst in this mode connecting IN3 (pin 12) to ground turns the exit window sensor off in order to test it is operative. Confirmation would be given as a signal output on pin 3 and 11 of the 12 pin connector.

8.3   Optical Sensors

Optical sensors are fitted in the exit window to detect coin payout.
The signal on Pin 11 is the 'Raw' coin output signal (Not applicable to the 'Lite'). A de-bounced coin output is available on Pin 3. When no coins are present at the exit window, the optical sensors are clear, the output transistors are open circuit, and the LED indicator is off. Coins passing the optical sensors obstruct the light path causing the output transistors to pull down to 0V and the LED "SENSOR" indicator switches on.

8.4   Optical Security Feature

The output of the optical sensor is monitored by the microprocessor and if the sensor remains obstructed for more than one second, the motor will be braked and will remain off until either the sensor is cleared or power down takes place. This action will result if a coin jams in the exit window or if the optical sensor fails which could be checked by toggling IN3 in Reset mode.
If the security feature should operate, the security output on output pin 5 and the LED "SECURITY" indicator will be switched off. The optical security feature operates identically in all 3 Modes.
Note: The security feature works the same on the Universal Hopper Lite but there is no output pin to indicate to the host machine that there is a security issue.

8.5   Motor Operation

The DC motor is controlled by the processor via a transistor bridge. The motor will run provided that one of the sets of conditions shown below is met. If any single condition fails then the motor is braked and remains so until all conditions become true, or a power down occurs.

Mode 0 Motor Start Conditions: Security feature true - 24V line true.
Mode 1 Motor Start Conditions: Security feature true - 24V line true - IN3 input low.
Mode 2 Motor Start Conditions: Security line true - 24V line true - internal coin count non-zero.

When braking is initiated and for whatever reason, 50ms braking is carried out even if the fault condition recovers before that time. This guarantees that the motor is stationary when the bridge drivers change state, so that no excess current flows in the motor windings.

8.6   Motor Current Limit

The motor current is monitored by the processor. When the motor initially starts a high current flows generating maximum torque to force the coin belt up to speed. After a short time the motor current is reduced to a fraction of the initial surge current.
At any time after the initial surge, if the current rises above a pre-set value, then a jam is deemed to have occurred. The motor is braked for 50ms then reversed for 150ms. After a further 50ms
braking, the motor is started in the forward direction again. The current is tested after 100ms and if the jam has not been cleared the reversing cycle will be repeated. This action will continue until the jam has cleared. This reversing action is effective in clearing soft jams.
One further action is to test the current in the reverse direction during the final 50ms of the reversing cycle. If during that time period an over current is detected, then the motor will be braked for 50ms and then disabled for 1 second. This action limits the duty cycle sufficiently in the case where a jam is solid in order to prevent motor damage.

8.7   Coins With Holes

The MKII hopper has **not** been designed to handle coins with holes and cannot be guaranteed to perform correctly with such coins.

The MKIII hopper can count most coins with holes correctly, but requires a jumper, on the control board, to be set in the right position for small or standard coins - see below.

Figure 6: Jumper positions for coins with holes (MKIII Only)
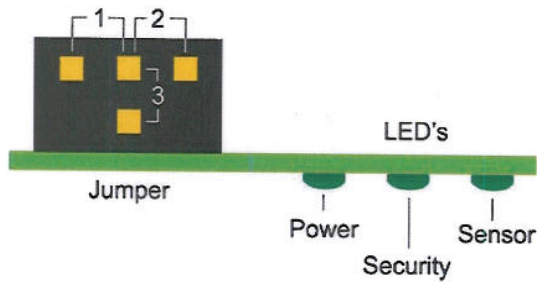
If a MKIII hopper is converted from one coin size to the other, the jumper position must also be altered. This is achieved by removing the track guard, as described in 7.3, placing the jumper in the required positions, then refitting the track guard.

Table 5: Guide To Coinage v Jumper Position.

Coinage	Position 2 Small coin 17.5 - 21mm	Position 1 Standard coin 21 - 30mm
Danish 1 Kroner	x	
Danish 2 Kroner		x
Danish 5 Kroner		x

The MK4 exit window has been designed so that more coins with holes will be counted correctly. No adjustments are necessary to cope with standard and small coins.

Note:- Jumper position 3 is not used.

8.8   High Security Exit Window (Available for MK4 EMC version ONLY)

The high security version of the exit window has been designed to be retro-fittable into existing MK4 EMC hoppers. Hence, high security hoppers will use the same main control board as the existing EMC product and will retain the same operating modes.

The high security function will detect any attempts to "blind" the optical sensors by shining an external light onto them. Such an action could cause the hopper to miscount.

The detection procedure, during normal operation – stationary or paying out – is:-

i).   The infra-red LED's will be turned off for a fixed time, T_{off};
ii).   At the end of the time period, the state of the phototransistors will be examined;
iii).   If the phototransistors are in the correct state, i.e. not seeing any light, the LED's will be turned on again;
iv).   After a defined time, T_{int}, the test will be repeated.

The detection sequence, in the case of a fault – stationary or paying out – is:-

i).   The infra-red LED's will be turned off for a fixed time, T_{off};
ii).   At the end of the time period, the state of the phototransistors will be examined;
iii).   If the phototransistors are switched on, i.e. still seeing light, the LEDs will be left off and also the phototransistors will be disconnected for a defined time, T_{fault}. This time must be greater than 1 second;
iv).   When the phototransistors have been disconnected for 1 second, the main control board will recognise the condition as a blocked opto. The hopper motor will be stopped and the security output will be turned off. This will alert the host machine to the problem;
v).   At the end of the time period, T_{fault}, the optos will be turned on again and testing will resume.

It is the responsibility of the host machine to monitor the security signal and to take whatever action is deemed appropriate. All other functions of the hopper, i.e. motor control, jam clearing, coin counting, etc, are the same as the existing product.

NOTE: During the 1 second period, between the fault being detected and the motor stopping, it is possible that a few coins may be paid out and not counted.

8.8.1   TIMER VALUES

T_{off}	-	500 µsecs +/-10%
T_{int}	-	50 msecs +/-10%
T_{fault}	-	2 secs +/-10%

8.8.2   OPTO TEST

By holding the hopper in reset and toggling the IN3 line, the optics can be checked for a blockage prior to paying out.
During Reset, a High on IN3 will cause a low on "Output 1" and "Output 2". Alternately a Low on IN3 will cause a high on "Output 1" and "Output 2".
NOTE:- This is only true if the optics are NOT blocked.

# 9. Electrical Specification Power Supply Requirements

9.1 Power Supply

For ease of use and maximum noise suppression, the 0 volt logic line (pin 2) and the motor 0 volt line (pin 1) are **not** commoned inside the hopper. This means the outputs from the hopper (Opto and Security) are noise free.

9.1.1 SUGGESTED CONNECTION

A suggested connection diagram is shown in Figure 7.
A twisted wire pair is recommended for the motor power leads to reduce the radiated noise. The TIP 126 arrangement shown would only be required for Mode 0 operation where power line interruption is the method of motor control. In Modes 1 and 2 the power line can be left permanently on and the TIP 126 and 1K and 4K7 resistors can be omitted.

Figure 7: Recommended Connection Diagram
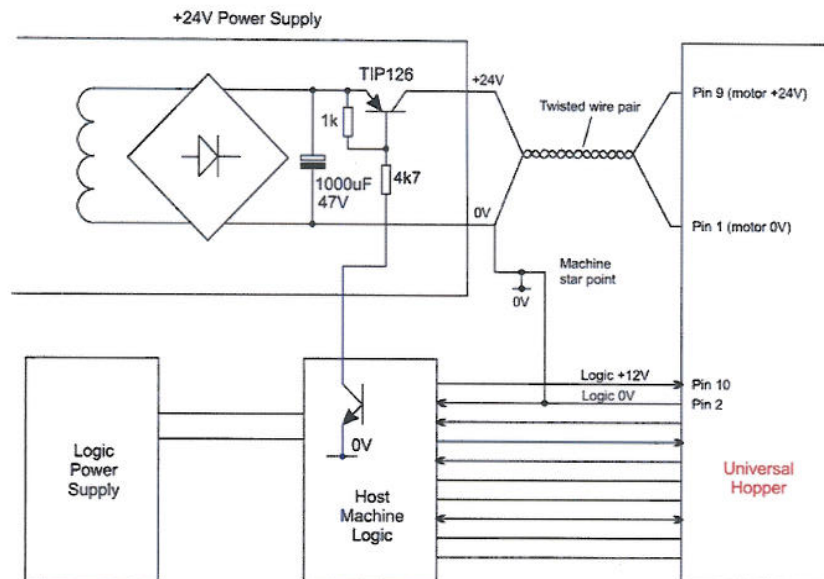
9.1.2 EMC

The MKIII hopper is EMC hardened. There is a version of the MK4 hopper which is also EMC hardened. This is to help users to meet the European EMC regulations (EN50081 & EN50082). Further precautions should be taken with the installation to minimise the effects of electrical noise, i.e. –

i)   Max cable length = 3 metres
ii)   All wires to the hopper should be bundled together.
iii)   Minimum capacitance between the logic supply rails = 100µF

10. Applications

10.1 Output Sensor Interfacing

Both sensor outputs are open collector NPN transistors, as shown in Figure 8.

When a coin is paid out, the raw sensor output will switch on, connecting output Pin 11 (Not connected on the 'Lite' version) to OV, the Sensor output on Pin 3 will switch on approximately 5ms later - see Figure 9. Both outputs will stay switched on until the coin has left the exit window. The open collector outputs are provided for easy interfacing to TTL, CMOS or relay inputs, see Figure 10.

NOTE: A flywheel diode is required on any output which has an inductive load connected, e.g. a relay. A 30V maximum can be tolerated on these outputs (positive with respect to 0V).
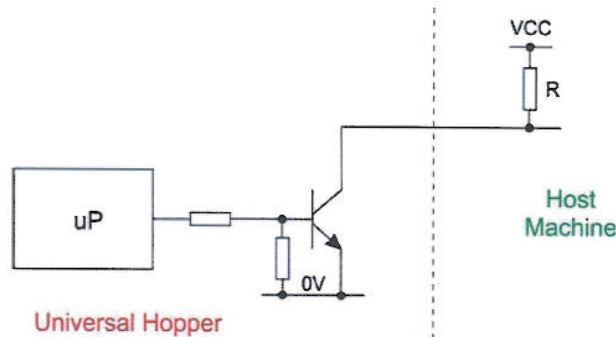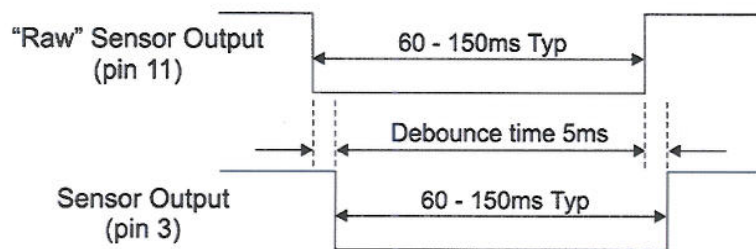
Figure 8: Sensor Output Cct.

Figure 9: Sensor Output Waveforms.

10.2 Motor Switch Off Time

When using the hopper in mode 0 (see section 8.2.1) the host machine applies power to the motor and monitors the payout sensors, disconnecting the motor power when it has counted out the correct quantity of coins. The motor power should be removed within 30ms of the leading edge of the output. Similarly, to avoid erroneous payout in mode 1, IN3 should be taken high within 30ms of the leading edge of the opto SENSOR output (pin 3).
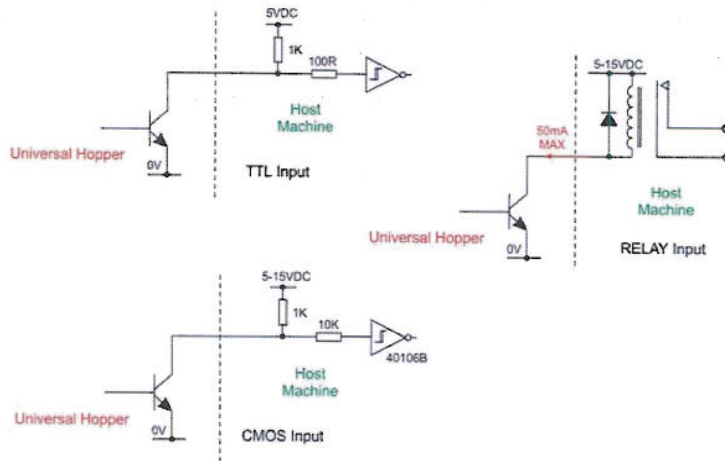
10.3 Security Output (Not 'Lite')

The security output is an open collector NPN transistor which should be connected as shown in Figure 8. In normal operation the transistor will be switched on, i.e. the output pin will be connected to 0V. The transistor will switch off if a fault is detected – see section 8.4.

Figure 10: Recommended Security Output Sensor Interfaces.
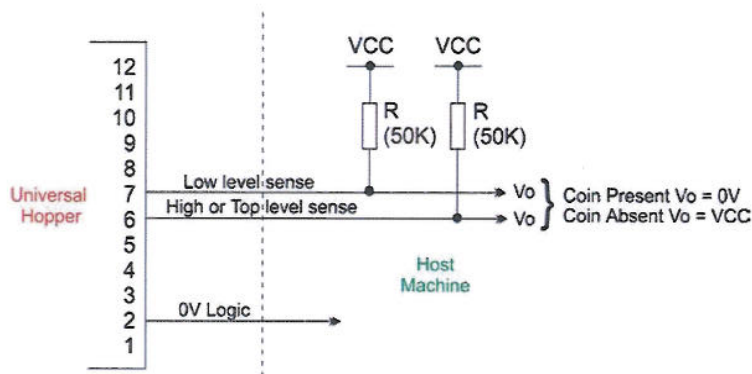

10.4 Level Sense Plates

Brass plates are used for level sensing. One plate is connected to the logic 0 volts and the other plates are wired to the 12 way connector - pin 7 for low level; pin 6 for either high or top level. See Figure 11. The signal levels on these pins will be determined by the presence or absence of an electrical contact, via the coins, between the 0 volt plate and the other plates.
Note:- High Level is not available with the Universal Hopper Lite.

Figure 11: Recommended Level Sense Plate Interfaces.

Tip:- When the hopper motor is running, coins will be moving across the level plates. This could cause incorrect level signals. It is recommended that the level sense outputs are read when the hopper motor is switched off.

10.5 IN1 to IN3 and Motor Control Inputs

These are the control signals from the host to the hopper which determine the Mode of operation. These are input to the hopper microprocessor via a resistor as shown in Figure 12. IN3, if used, should always be driven via an open collector transistor referred to logic OV. IN1 and IN2 can also be driven via open collector transistors (see Figure 12) or if no change of mode is required, then strapped to logic OV or left floating (internal pull-up) depending on the mode required.

Figure 12: Recommended INx and Motor Control Inputs.
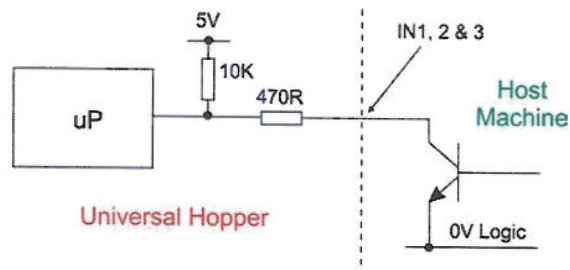
10.6 LED Indicators (Not 'Lite')

Three LED indicators are fitted on the hopper. On MKII and MKIII hoppers they are visible under the track guard at the top corner, at the side of the coin exit. MK4 hoppers have the LED's mounted in the coin exit area.

See Figure 6 for details. The LED designations/positions are the same for all universal hoppers.

11. Technical Specifications

11.1 Coin Sizes

Please refer to Table 2.

The MK4 hopper however has extended this range to include 31mm diameter coins. Coins falling outside of the above ranges may be used but would require special qualification. For more information contact Money Controls Technical Services Department.

11.2 Capacity

Approximate, (±10%), coin capacities can be estimated by applying the following formula.

$$\text{Capacity} = \frac{\text{Hopper Volume}}{\text{Coin Volume}}$$
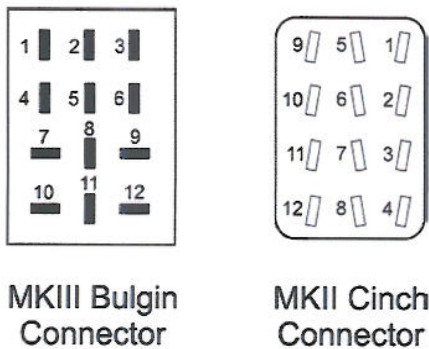
$$= \left[\frac{1,200,000}{\left(\frac{\pi \times D^2}{4} \right) \times T} \right]$$

Where D = Coin diameter (mm)
T = Coin thickness (mm)

Alternatively a calculator program can be obtained from the Money Controls Technical Services Department.

11.3 Connections

Figure 13: Connector Pin-outs

MKIII Bulgin
Connector

MKII Cinch
Connector

Note:- Shown from back of
connector on baseplate.

Table 6: Connector Pin-outs

Pin	Description	'Lite'
1	Motor supply 0 volt	Motor supply 0 volt
2	Logic 0 volt	Logic 0 volt
3	uP Sensor Output	uP Sensor Output
4	IN1	N.C.
5	Security output	N.C.
6	High or top level sense output	Top level sense output
7	Low level sense output	Low level sense output
8	IN2	N.C.
9	Motor supply	+24V Supply
10	Logic supply	N.C.
11	Raw Sensor Output	N.C.
12	IN3	Motor Control I/P

11.4 Motor Supply – Pin 9

Table 7: Motor Supply Requirements

Current consumption at 24V DC:-	
Nominal running current	0.5A
Nominal reverse current	1.0A
Nominal cut-out current during a reverse	1.5A
Nominal start-up current	2.0A
Power supply requirement	**24V DC at 2 Amps**
Supply Voltage:-	
Nominal voltage	24V DC
Absolute minimum voltage	18V DC
Absolute maximum voltage	27V DC
Maximum rise/fall time	50ms
Absolute worst case ripple at 24V	+3V/-6V

11.5 Logic Supply (Not 'Lite')

Table 8: Logic Supply Requirements

Description	Value
Nominal Supply	12V DC at l00mA
Absolute minimum voltage	11V DC
Absolute maximum voltage	27V DC
Maximum rise/fall time	100ms
Absolute worst case ripple	+/-1V

11.6 Logic Inputs (IN1, IN2, IN3 and Motor Control I/P)

Table 9: Logic Input Requirements

Description	Value (Vin)
Absolute maximum logic 0 input	<= 0.6V
Absolute minimum logic 1 input	=> 2.4V

11.7 Logic Outputs (Sensors, Security)

Table 10: Logic Output Parameters

Description	Value
Absolute maximum 'true' output Vout	<= 0.3V at 50mA
Absolute maximum sink current	100mA
Absolute maximum Voff	30 Volts
Sensor output typical pulse width	MKII/III 50 - 100ms MK4 70 - 120ms

11.8 Important Supply Notes

1. The specified maximum motor and logic +ve voltages must not be exceeded, otherwise damage/injury could result.
2. Hopper speed (and payout rate) varies with applied motor voltage
3. The power supply fall time is critical if the hopper is being used in mode 0. When the host machine has counted out the required number of coins, it must disable the +24 Volt supply. The motor is not disabled until the power line falls below a pre-set level of 18 volts DC, therefore there is a danger of extra coins being paid out if the power supply fall time is greater than 5ms. A power supply switching device such as a transistor, darlington or MOSFET is therefore recommended.
4. The standby current is the current drawn when the motor is disabled, e.g. if the coin register is zero in mode 2 or if IN3 is high in mode 1.

11.9 Environment

Table 11: Environmental Parameters

Description	Value
Operating temp	0 to 60°C
Storage temp	-20 to 60°C
Life	Up to 3 million coins
Mounting	±3° of vertical in any direction

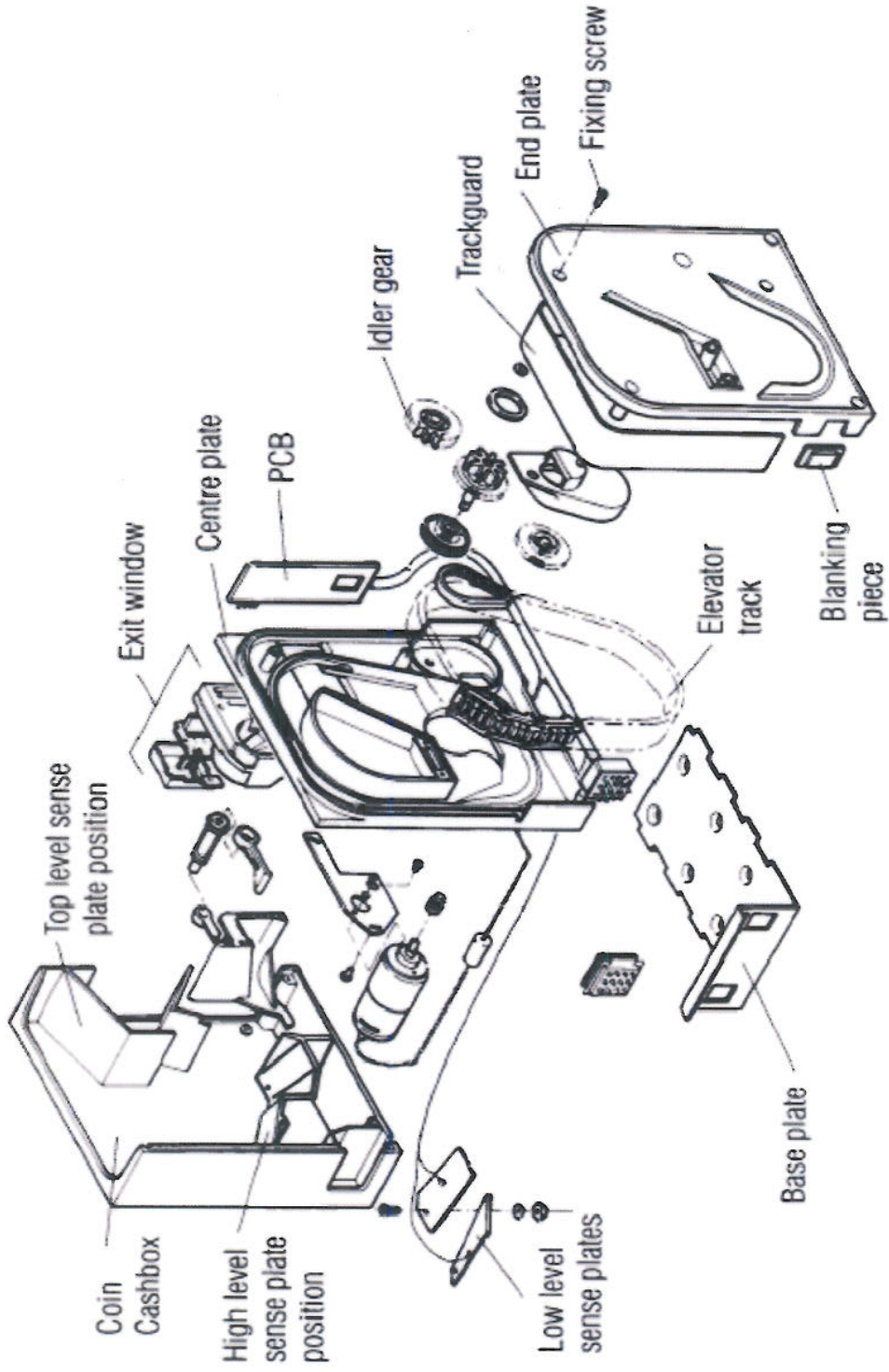*NOTE: DO NOT use the hopper in an explosive atmosphere.*

12. Hopper Dimensions and Exploded Diagrams

Figure 14: MKII and MKIII Exploded Diagram

Top level sense plate position

Exit window

Centre plate

PCB

Idler gear

Trackguard

End plate

Fixing screw

Coin Cashbox

High level sense plate position

Low level sense plates

Elevator track

Blanking piece

Base plate

Figure 15: MKII and MKIII Dimensions
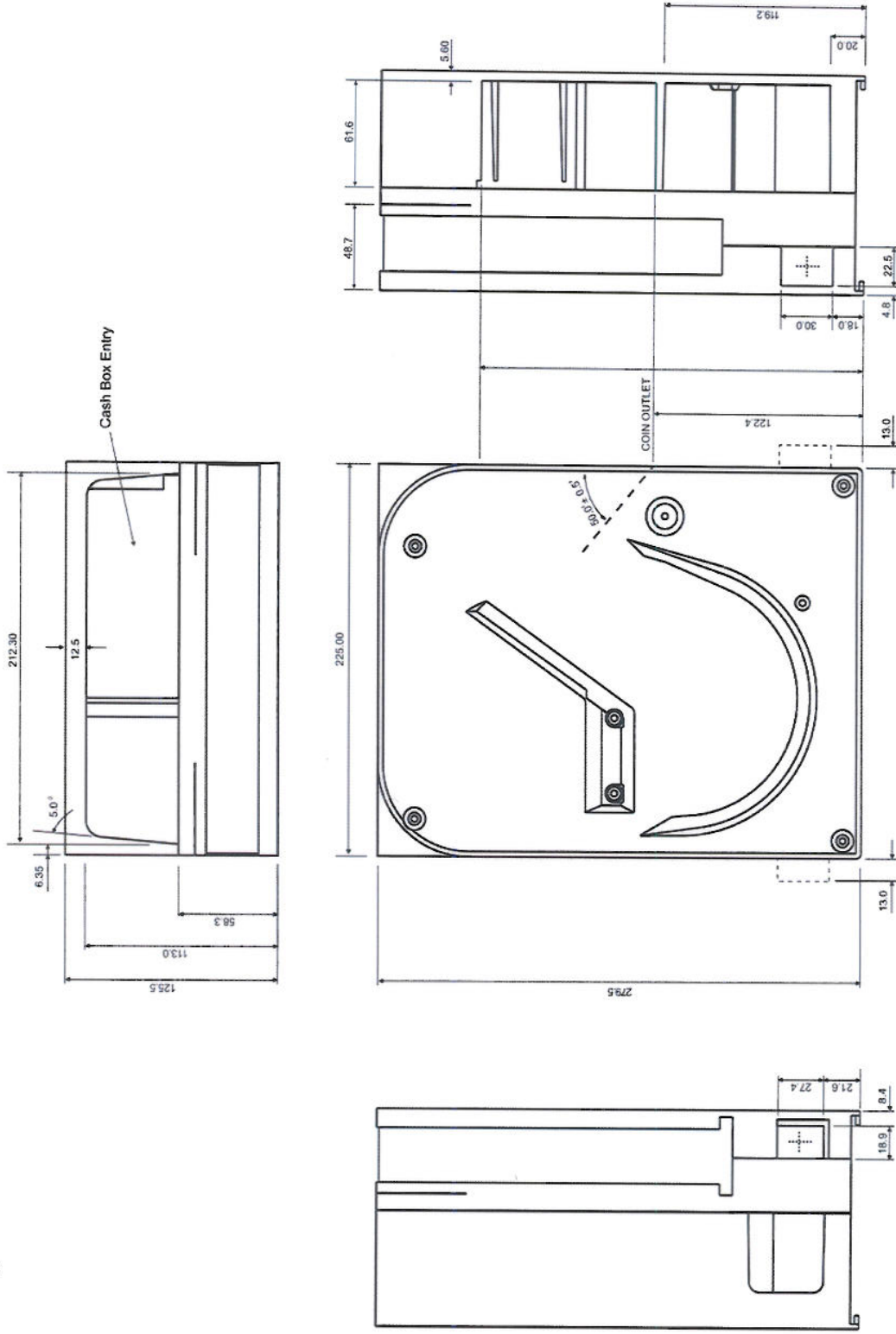
Figure 16: MK4 Exploded Diagram
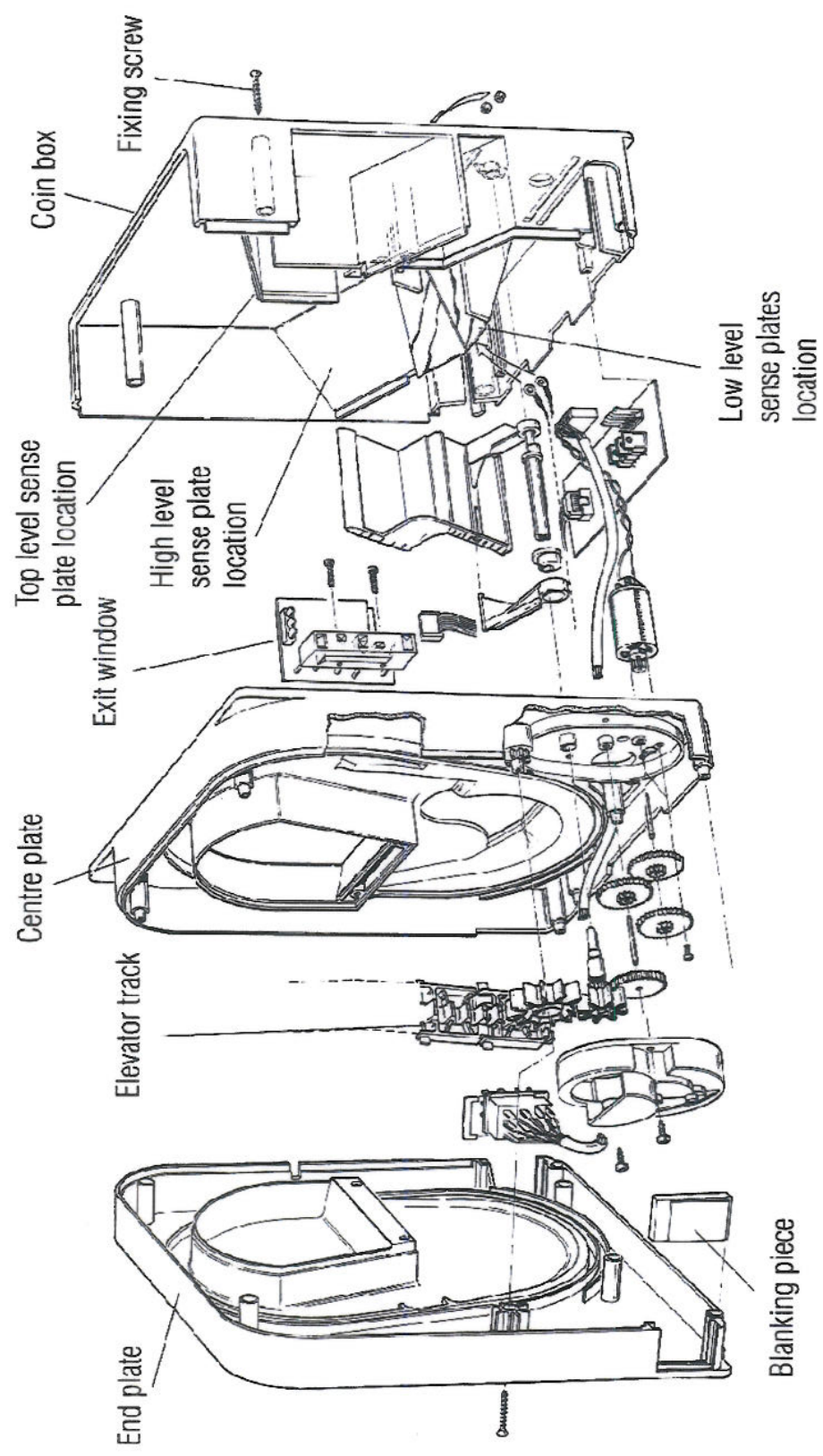
Fixing screw

Coin box

Top level sense plate location

High level sense plate location

Low level sense plates location

Exit window

Centre plate

Elevator track

End plate

Blanking piece

Figure 17: MK4 and 'Lite' Dimensions

Figure 18: Baseplate Dimensions
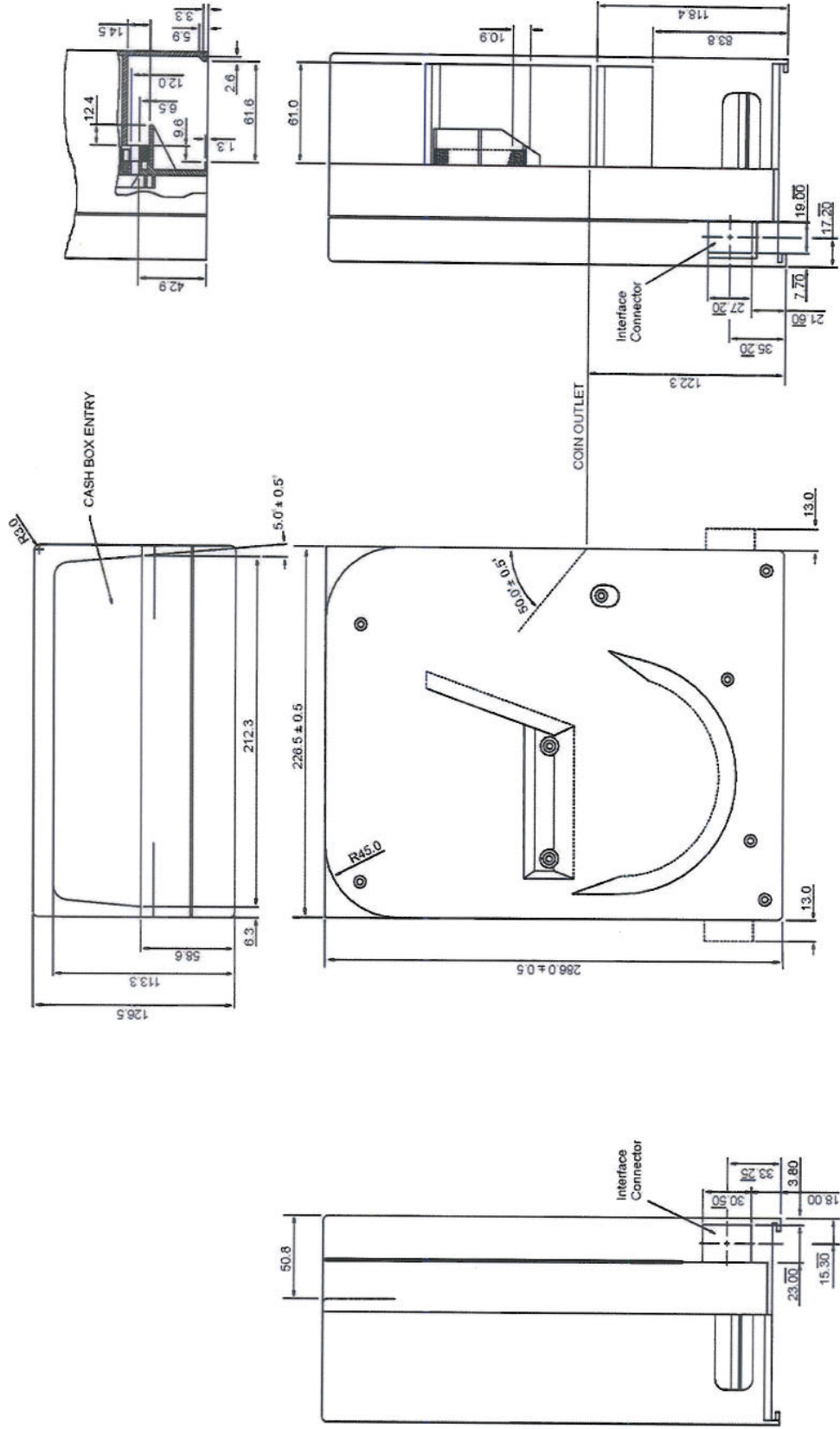
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