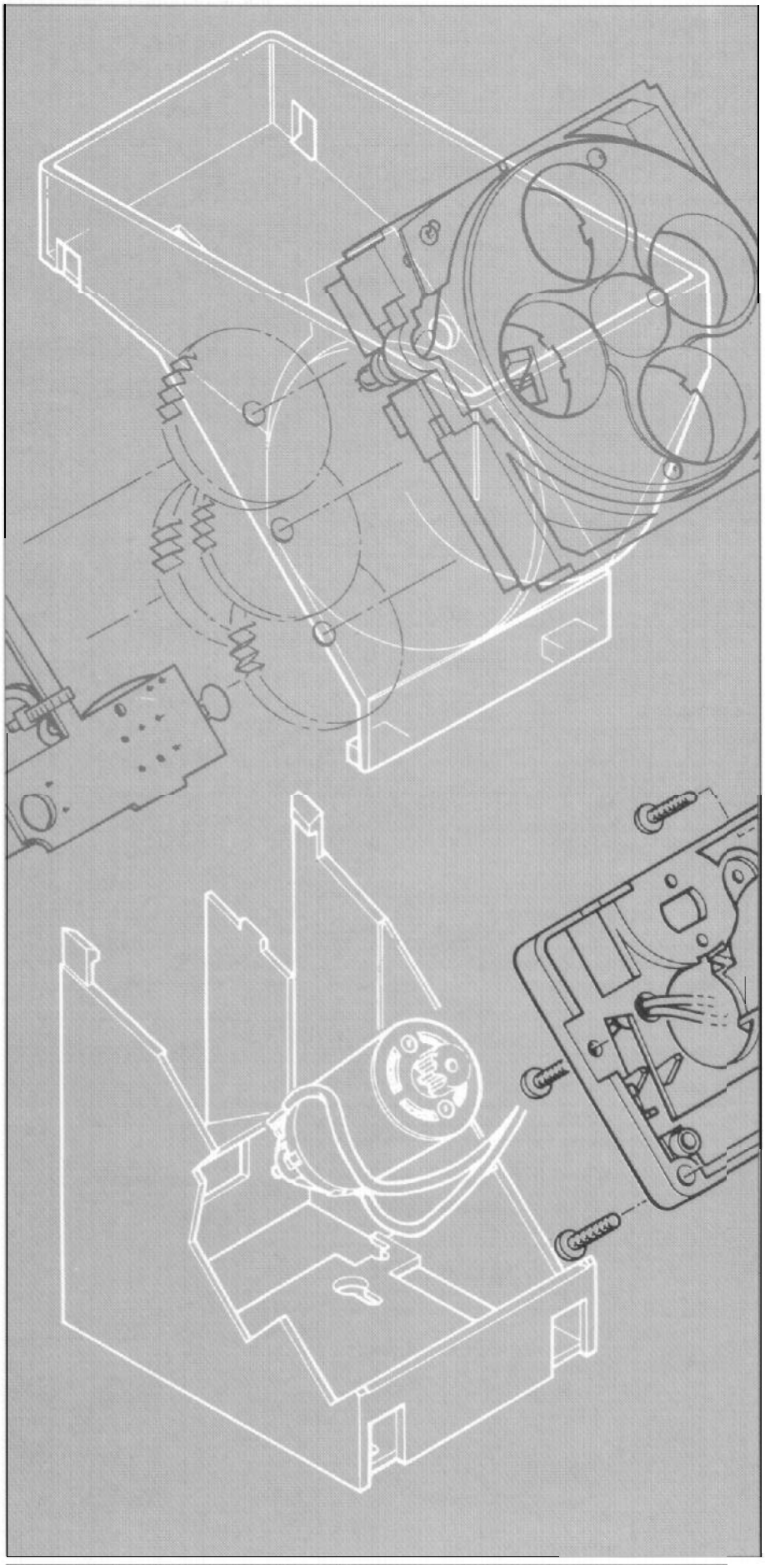

Compact Hopper

Compact Hopper Technical Manual

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GENERAL DESCRIPTION 1.0

The Compact Hopper is a simple single coin denomination payout unit, providing a jam resistant, high speed payout of coins or tokens.

1.1 Product overview

A disc, driven when power is applied to the Hopper, rotates and collects coins from a storage bowl. These coins are dispensed from the Hopper at a typical rate of 10 coins per second.

The orientation of the motor assembly can be simply altered to allow exit of payout coins from either the side or the rear of the hopper.

An optical sensing output is provided to enable host machine counting of output coins.
Jam detection is incorporated within the unit to minimise any internal coin jam situations that may occur.

In normal operation it is expected that there are always coins left in the hopper after any payout. Note, however, that if the hopper is operated until empty, the last coin may take in excess of 4 seconds to payout, whilst very small coins may not completely empty.

The host machine controls when payout is to commence and cease, and must provide the required drive as detailed in Section 4.

WARNING:
Coins may leave the hopper at a high velocity. Ensure that the coins cannot strike any part of the body and cause injury.

1.2 Mechanical features

1.2.1 Hopper dimensions

The Hopper overall dimensions, mounting arrangement and coin entry and exit points are detailed in Figure 4. Note that, when used in the side exit mode, the rear of the motor protrudes from the rear of the casing, within the overall dimensions of the hopper envelope.

1.2.2 Hopper Weight

570 gms - empty

1.2.3 Coin size range

Hoppers can be configured to pay out coins in the diameter range 15.0 to 28.4mm, within the thickness range 1.20 to 3.20mm. However each coin needs to be qualified on an individual basis. For further information on the qualification of coins, please contact Money Controls Technical Services.

1.2.4 Coin capacity

The coin capacity of the hopper is between 200 and 700 coins, depending on their physical size.

1.3 Electrical Features

Circuitry within the Hopper permits control of coin payout and provides a digital signal representative of the presence of a coin at the exit window.

Output coins are sensed as they obscure an infra red light path between an emitter and a light guide leading to a photo transistor at the exit.

The hopper will automatically brake when placed in the off state by the Host machine, thus preventing overrun and excessive coin payout.

An overcurrent detection circuit reverses the hopper momentarily in the event of a coin jam, and then attempts to continue payout. This oscillation of the disc will continue until either the coins are freed, the hopper is switched off, or the overload trip switches.

Should the latter occur the hopper supply must be disconnected, the fault condition must be corrected and the trip be allowed time to cool (Approx 30 secs) before the hopper will restart.

INSTALLATION AND REMOVAL 2.0

WARNING:
Ensure that power has been removed from the hopper before removal.

2.1
Dismantling the hopper

i. Gently pull outwards the securing clips on the back of the base.

ii. Tilt the bowl forward until it is clear of the clips.

iii Slide the bowl forward until the locating lugs, at the front of the bowl are clear of the slots in the base.

iv. Lift the motor assembly out of the base.

v. Disconnect the cable (if fitted) from the motor assembly.

2.2
Securing the hopper base

Two sets of fixing holes have been provided in the base to allow the hopper to be secured in a host machine - 3 x 4mm holes, and 3 keyholes. See Fig. 4c for positions of the hole centres.

2.2.1
Using the 4mm holes

i. Drill 3 holes on the centres shown in Fig. 4c.

ii. Dismantle the hopper as described in section 2.1.

iii Place the base over the holes.

iv. Fix the base into position using M3 screws.

2.2.2
Using the keyholes

i. Drill 3 holes on the centres shown in Fig. 4c.

ii. Insert 3 x M3.5 screws. Do not tighten.

iii Dismantle the hopper as described in section 2.1.

iv. Place the base over the screws and push back as far as possible.

v. Tighten the screws to fix the base in position.

NOTE:
Studs may be used in place of two of the screws.

After the base has been secured, the hopper should be re-assembled as described in section 2.3.

2.3
Hopper assembly

i. Connect the cable to the motor assembly, ensuring that it is the correct way round.

ii, Lower the motor assembly into the base, ensuring that the coin exit is in the desired position
(side or rear).

iii Locate the lugs, on the front of the bowl, into the slots at the front of the base.

iv. Gently press down on the top of the bowl until the securing clips, on the base, click into the slots in the bowl.

2.4
Coin spillage

With some coin types a coin can occasionally jump upwards out of the bowl. If this is likely to be a problem the user may wish to fit his own version of the coin entry chute or baffle which is most suited to the application.

MECHANICAL DESCRIPTION 3.0

3.1
Operation

Each disc contains a number of holes in which the coins are held in short stacks. The disc is driven by the motor via a gear train. As the disc rotates, the coin at the bottom of one of the stacks will make contact with the ejector fingers and start to push the fingers back. Further rotation of the disc will cause the coin to start to move outwards into the exit slot. At this point the spring will be free to pull the ejector fingers forward and push the coin through the exit slot.

An optical detector is formed by an LED transmitter and photo-detector on the PCB. The infra-red light beam is routed across the exit slot via a light guide. When a coin passes through the exit, the light beam will be broken and a coin output signal will be generated.

There are a range of discs, ejector fingers and adjuster plates available to provide optimum performance for coins within the specified range.

3.2
Coin routing

Coins are entered into the hopper through the top of the bowl, and exit through the side or the rear of the hopper as shown in Figure 4.

ELECTRICAL INTERFACE 4.0

Failure to observe the interface requirements specified in this document may result in erroneous counts, incorrect payout rate, damage to the hopper or cause unacceptable voltage drops affecting other units dependent upon that supply.

The supply wiring to the hopper should be of sufficient current rating and run as a twisted pair (+24V and 0V) over a maximum length of 3 metres.

4.1

Interface options

Interfacing is standard across all the coinage variants of the Compact Hopper.

4.2

Interface connections and functions

4.2.1

Connector

Pin 1	24V positive supply and motor control.
Pin 2	OV common supply.
Pin 3	Opto supply.
Pin 4	Coin count output.

The on board 'wall polarised' plug requires a 0.2" (5.08mm) pitch connector, MOLEX 3001 series 4 way crimp terminal housing or equivalent.

4.2.2

Motor control

The motor is controlled simply by the application and interruption of the positive supply. The motor is automatically braked when the supply is disconnected.

+24V applied to pin 1 causes the hopper motor to start up, and provided the bowl contains coins, payout will commence.

When the supply is interrupted to stop the hopper, it is essential that no capacitance exists between the OV and 24V supply input to the hopper.
If a capacitance greater than 0.1 µF is present the hopper will be unable to brake efficiently, giving the potential for an excessive coin payout.
(ie. hopper over-run).

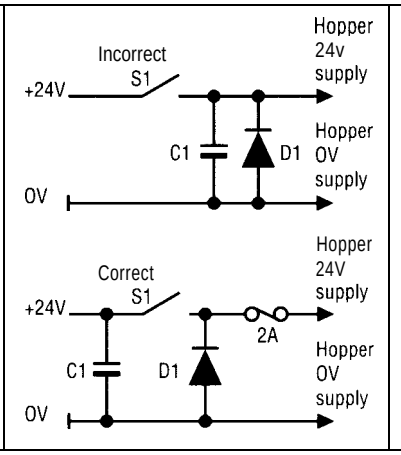

Figure 1 Motor supply switching

NOTE: Switch S1 should be a suitable semiconductor device or relay contact.
D1 is required if a semiconductor is used as Switch 1.
If a relay is used for Switch 1, the contacts should be appropriately protected for the inductive load of the hopper motor.
The rating of Switch 1 should be sufficient to handle the load requirements of the hopper.
See Section 4.3.

4.2.3

Opto supply

The optical sensor can be powered separately from the motor by connecting 24V to Pin 3. This will ensure that the coin count output remains at OV when the motor supply is turned off. It is also possible to test that the optical sensor is operating correctly prior to turning on the motor. This is achieved by:

i) Ensuring motor supply (Pin 1) is turned off and opto supply (Pin 3) is on.
ii) Check that coin count output (Pin 4) is at OV.
iii) Turn off opto supply.
iv) Check that coin count output switches to +V.
v) Turn on opto supply again.
vi) Check that coin count output returns to OV.

4.2.4

Coin counting

The coin count output, on pin 4, is an open collector npn transistor which acts like a switch. This output should have a pull-up resistor connected to it, as shown in Fig. 2.

When the exit slot is clear, i.e. no coin is being dispensed, the transistor is switched on and the output signal is connected to OV. As a coin is paid out it will block the optical sensor and the transistor will turn off. This will cause the output signal to be pulled up to the +V voltage in the host machine. The transistor will remain off until the coin has cleared the exit, as shown in Fig. 3.

The output transistor will be turned off when power is removed from the hopper. This condition should not be interpreted by the host as a coin count signal. See Fig. 3.

It is recommended that the count output signal is debounced by the host machine to ensure that any short pulses, which may appear during power on or power off, are ignored. See section 4.2.6 for timing details.

Maximum +V voltage	-	30 V d c
Maximum current	-	30 mA
"No coin" voltage (transistor is on)	-	0.5V max

4.2.5

Stopping the hopper

When the required number of coins (low to high transitions) have been detected at the exit output, the +24V supply must be removed, thus stopping the hopper motor and applying the internal brake. If the power supply is not removed within the time specified in section 4.2.6, additional coins may be paid out.

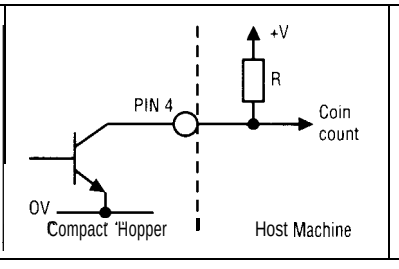

Figure 2 Opto output details

4.2.6
Coin Dispensing Timing

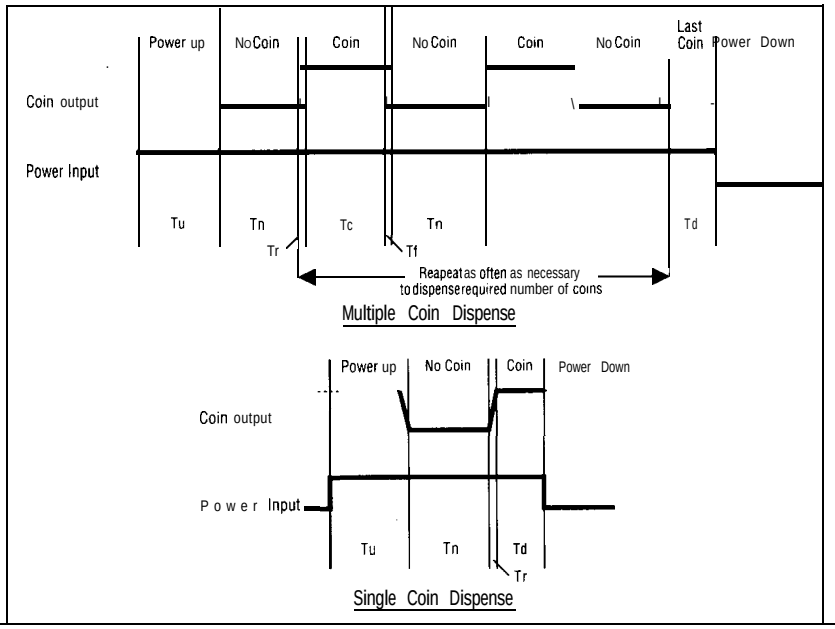

Figure **3**

Universal Timings

Symbol	Description	Min	Max
Tu	Time from application of power to the output signal being valid		3 mSecs
Tr	Recommended debounce time on rising edge of output signal	1 mSecs	2 mSecs
Tf	Recommended debounce, time on falling edge of output signal	1 mSecs	10 mSecs
Tc	Time during which coin is present in the opto-detector i.e. coin present signal	5 mSecs	-
Tn	Time when coin is not present in the opto detector i.e. time between two coins	25 mSecs	-

Motor Delay Timings – Td

Disc	Minimum (mSecs)	Maximum (mSecs)
Grey	0	10
Black	0	10
Brown	0	10
Blue	0	10
Green	10	20
Purple	10	20
Red	22.5	27.5

4.3
Power supply requirements

4.3.1
Voltage

24V DC. Nominal.

Maximum ripple voltage
+/- **2.0V**

Absolute maximum **26V.**

Minimum 19V.

The supply must be able to maintain voltage within the above limits whilst switching from no load to delivering 4A into a non-inductive load.
Although the unit incorporates overload protection, a **2A** anti surge/delay type fuse is recommended in the +24V line, (see Fig 1.).

The hopper must not be operated outside these limits.

4.3.2
Current consumption

Current is Zero whilst stopped (Supply disconnected).

With max coin load
(Hopper on) 800 mA average.

With no coin load
(Hopper on) 350 mA average.

Opto supply: 25mA

Motor start up and reversing surge may reach 5000 mA for 5ms falling to 3000 mA for 30ms before settling to consumption as defined above after 200ms.

4.3.3
Duty cycle

The hopper is designed for intermittent operation only and must not be permitted to run continuously for longer than 30 Seconds.

ON/OFF ratio: 1: 1

The ON period must average no more than the previous OFF time. Failure of the host machine to limit the ON time can result in overheating and degradation of the motor.

4.4
Environment

4.4.1
Temperature

Storage temperature
-20°C to +70°C.

Operating temperature
0°C to +50°C.

4.4.2
Humidity

Storage humidity 5 to 95% RH non condensing.

Operating humidity 10 to 85% RH non condensing.

4.4.3
General

Do not permit bright light or infrared radiation to fall on the exit window area.

Ensure coins can always move freely away from the exit.

4.4.4
Static

It is possible for coins paid out by the hopper to have a static charge on them. It is desirable that coins are discharged to earth before being presented to the user.

4.4.5
Explosive atmosphere

The hopper should not be operated in an explosive atmosphere.

4.4.6
Audible noise

Audible noise generated by an empty hopper is typically 80-85 dBs.

NOTE: Noise measurement taken at a distance of 1m from the hopper.

MAINTENANCE 5.0

WARNING:
Coin dust may accumulate in the hopper during use. Inhalation of the dust should be avoided during maintenance operation. Ensure that power has been removed from the hopper before any maintenance operations are performed.

5.1
Routine cleaning

All accessible parts of the coin route should be cleaned every 100,000 coins or 3 months, using a mild detergent on a damp cloth. No spray solvents should be used.

Particular attention should be paid to the opto sensor at the coin exit, as excessive dirt build up on the optical surfaces may cause unreliable coin counting.

5.2
Clearing a coin jam

1. Remove all coins from bowl.
2. Remove motor assembly from base as described in section 2.1
3. Clear the jammed coin by either:
   a. rotating the disc manually first anti-clockwise then clockwise to free the coin
   OR
   b. push the coin back in using the edge of similar coin.

NB. Common cause is damaged or bent coins. Do not return damaged coins to bowl.

4. Remove any debris from the disc bed assembly.
5. Clean the exit window opto with a clean dry cloth.
6. Re-assemble, as described in section 2.3.
7. Re-fill and test the hopper.

FIELD ADJUSTMENTS 6.0

The only field adjustment possible on the Compact Hopper is:-

6.1
Coin exit position

This can be altered to allow either a side or rear coin exit point by altering the orientation of the motor assembly within the body once the hopper bowl has been removed.

The hopper is supplied from Money Controls set to pay out coins from the side of the hopper.

FAULT FINDING AND REPAIR
7.0

7.1
Test equipment

General purpose test equipment (Meter etc.) is all that is required for on-site diagnosis of Compact Hopper fails.

7.2
Fault diagnosis

7.2.1
Coins fail to unjam

Ensure coin exit clear.

Ensure no incorrect coins in hopper.

Ensure no badly bent coins in hopper.

7.2.2
Motor fails to run

Check supply fuse.

Protection device tripped. Wait 30 seconds with supply OFF.

7.2.3
Over payout of coins

Check opto area/coin exit area for dirt.

Ensure no bright light or infrared radiation is falling on the exit window.

Incorrect exit monitoring by the host machine.

Incorrect exit output debouncing by the host machine.

Late power down by the host machine once the correct coin output count has been achieved.

7.2.4
Under payout of coins

Ensure hopper contains sufficient coins.

Incorrect exit monitoring by the host machine.

Incorrect exit output debouncing by the host machine.

Poor connection to hopper.

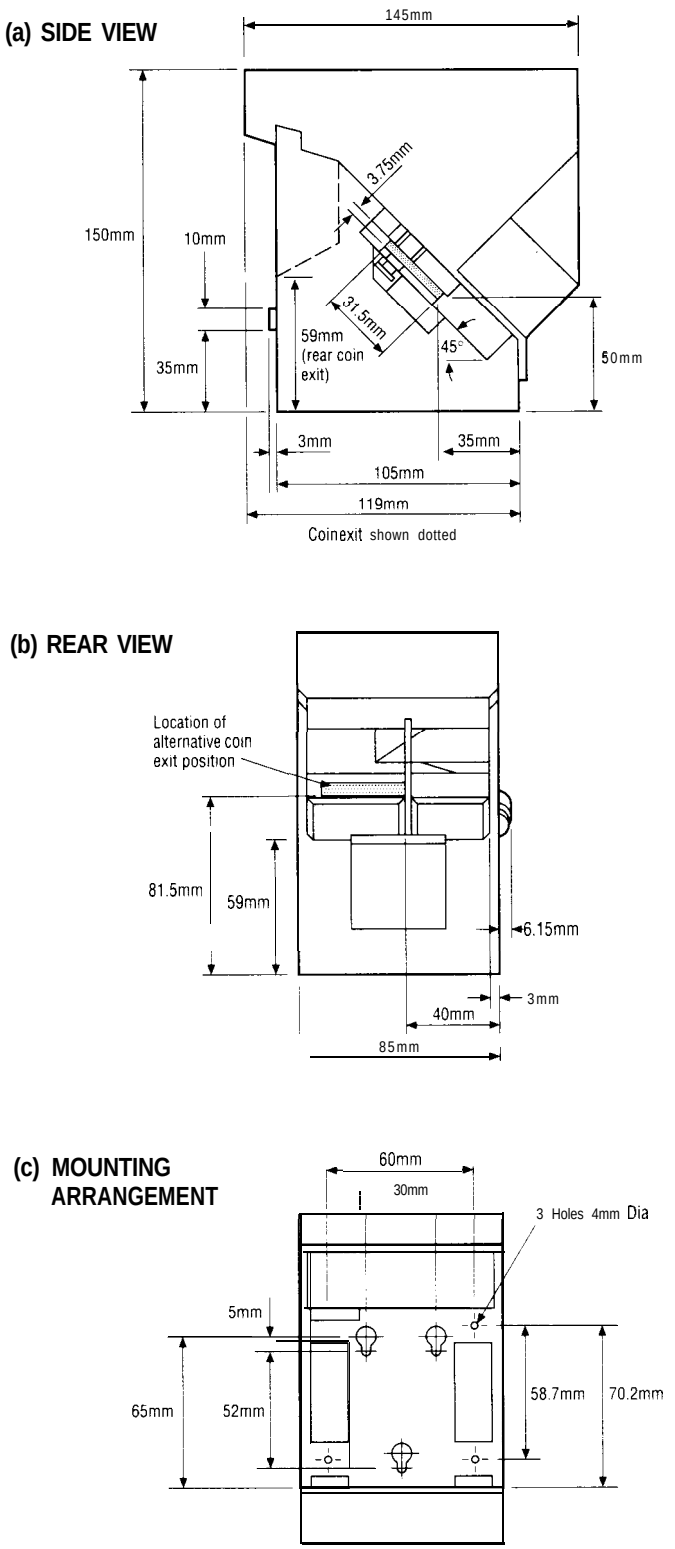

Figure 4 Mechanical Dimensions

This manual is intended only to assist the reader in the use of this product and therefore Money Controls shall not be liable for any loss or damage whatsoever arising from the use of any information or particulars in, or any incorrect use of the product. Money Controls reserve the right to change product specifications on any item.