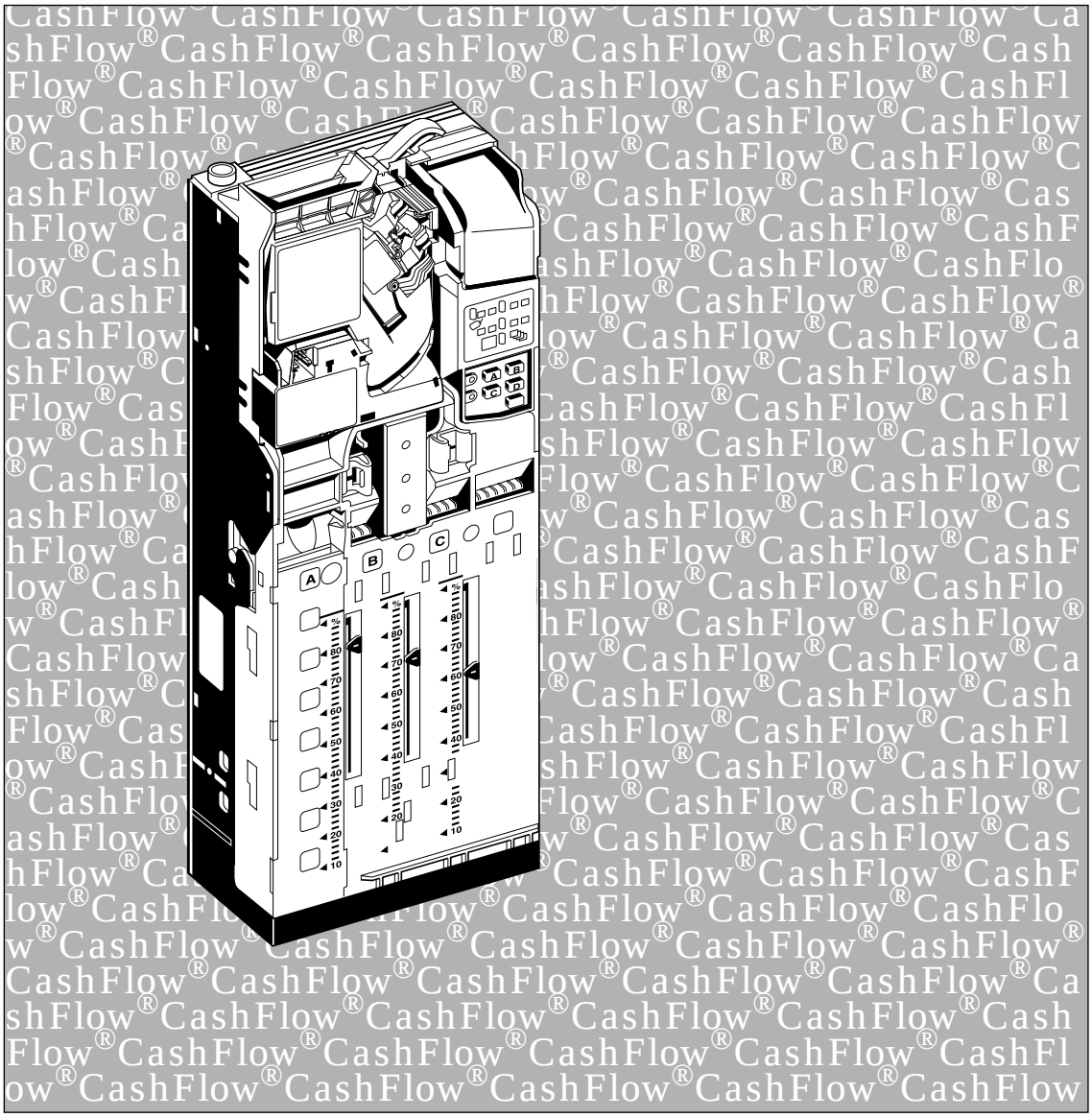
The

CASHFLOW® 520

REFERENCE SERIES

3 TUBE CHANGEGIVER

APPLICATIONS DESIGN GUIDE



Published by :

MEI

Internet: http://www.meigroup.com

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CashFlow® 520 Changegiver Applications Design Guide

Part Number : **143745044**

This Edition (November1995)

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SAFETY

International & National Standards Conformance

When installed and operated according to the instructions for the particular unit, CashFlow® 520 products are designed to meet the applicable Safety and Electro Mechanical Compatibility standards for any country in which they are used.

CashFlow® 520 products are of class II construction. No safety earth connection is necessary or provided.

Dangerous Environments

Do not operate in the presence of flammable gases, fumes or water.

Disposal of Product

Do not dispose of any parts of this product by incineration.

Rated Operating Voltage

The rated voltage is indicated on a clear see through label above the changegiver keypad.

Always operate the changegiver from the type of power source indicated on the label.

Warning: before removing or replacing modules **SWITCH OFF or ISOLATE the ELECTRICITY SUPPLY** to the host machine

THIS MANUAL IS PROVIDED FOR USE ONLY BY PERSONNEL TRAINED TO UNDERTAKE ELECTRICAL INSTALLATION

OVERVIEW

The CashFlow® 520 changegiver incorporates many new features as well as improving the high standards of security and reliability which have become the hallmark of all MEI products. The changegivers are completely modular making it quick and easy to remove or replace any necessary parts.

The 999 changegiver is currently available in the following formats:

- Cashflow® 520 4 - Price

  A 4 price electro-mechanical changegiver. Interfaces are provided for a credit display and credit relay if required.

- CashFlow® 520 - Executive

  This is a European Mode Executive changegiver product with an electronic Protocol A serial interface.

- CashFlow® 520 - BDV

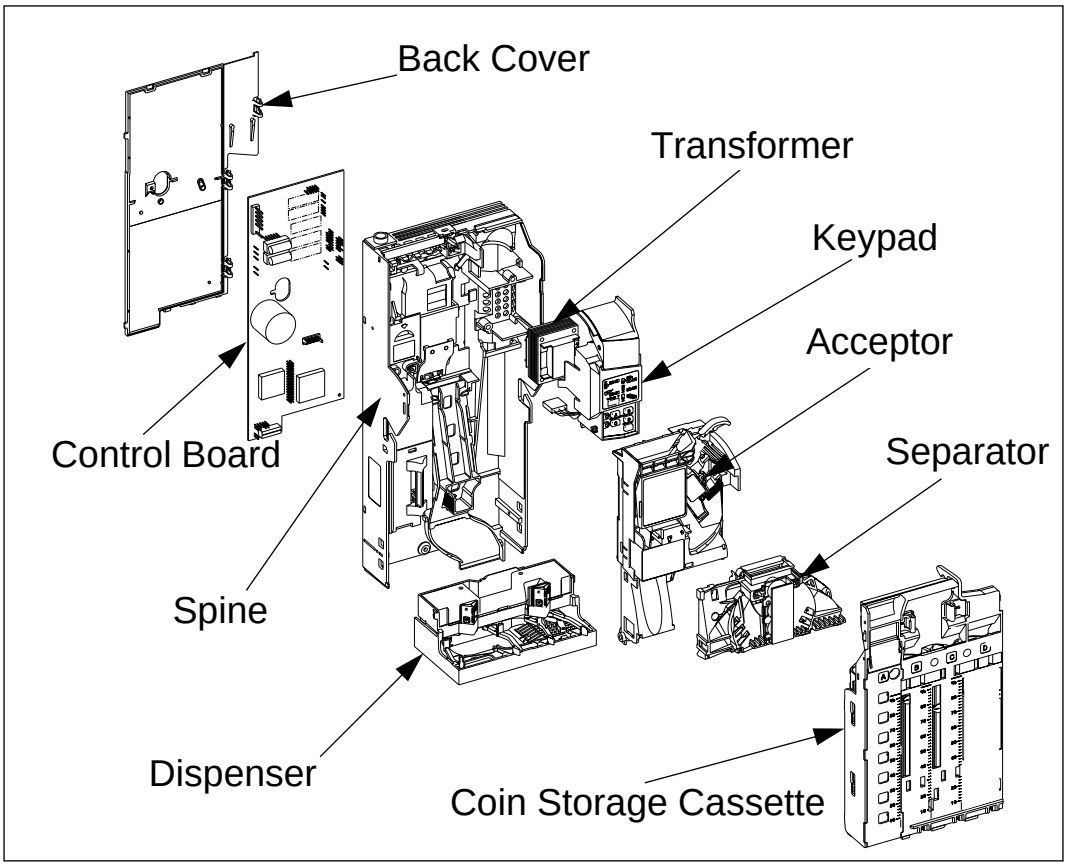
  A BDV changegiver product with an electronic BDV serial interface.

- CashFlow® 520 - MDB

  A MDB changegiver product with an electronic MDB serial interface.

All of these changegivers are made up of the following modules:

- Control Board
- Spine
- Transformer (not used on BDV and MDB product)
- Keypad
- Dispenser
- Acceptor
- Separator
- Coin Storage Cassette



There are several different types of machine interface loom available as well as optional four and five digit display looms. All changegivers have a keypad mounted on the front face. This keypad is used for manually dispensing coins and reconfiguring some of the settings which are accessible without requiring the use of a MEI® Route Alpha 250 Terminal. If you have this support terminal you can reconfigure the way the changer operates. This includes changing from single to multivend, inhibiting coins, setting the exact change equation etc.

The CashFlow® 520 product can be supplied with an audit fuction extension module (FEM) fitted, or this can be supplied for fitting at a later date.

The FEM allows for reports to be supplied either via a hand-held MEI® Audit 920 printer, or down-loaded via a terminal to a P.C..

These reports can include:

- Value of cash manually filled
- Value of cash retained in the changegiver
- Value of cash sales
- Value of token sales
- Value of cash taken by the machine
- Value of cash to cashbox
- Value of cash dispensed as change

The process of obtaining data is detailed in the section of this book concerned with the MEI® Route Alpha 250 terminal.

For further details of audit installation please refer to the MEI® Audit 900 Installation Guide, part number 143451999.

The products in this book can also be used in conjunction with a bill validator. Further application details are given in the Bill Validator Interface Installation (BVI) data sheet, part number 143949044.

Additional information on the BVI, audit FEM and the MEI® Audit 920 printer can be obtained from your MEI Distributor or MEI regional office, the addresses of which are shown at the end of this book.

PRODUCT OPERATION

GENERAL

When a coin is entered through the changegiver there are several conditions that are electronically checked.

After coins have been accepted and a product selection button is pressed a sense current flows through the changer sense circuit. When the changer detects that a product selection button has been pressed the changer looks up the price associated with the selection. If sufficient credit exists the changer turns the price line output on. This disconnects the safety line from price line common and connects the price line output to price line common. The vend motor relay within the vending machine is then energised (turning the vend motor on and closing a switch across the selection button).

When the vend cycle begins the blocker signal indicates to the changer that a vend has started. The price of the vend is deducted and the changer waits for the vend to finish. The price line output is turned off when the changer considers the vend to have finished.

Unused credit may be returned after the vend has finished either automatically or on customer demand, depending on how the changer has been set up.

If the changer detects a low-change condition the exact change relay is energised. The vending machine normally uses this signal to illuminate a lamp informing the customer to use the exact money for the vend.

If the vending machine becomes inhibited this is signalled to the changer by the blocker signal. During the inhibited state all coin acceptance is disabled. This condition may occur because there are no products left in the machine or the machine has developed a fault.

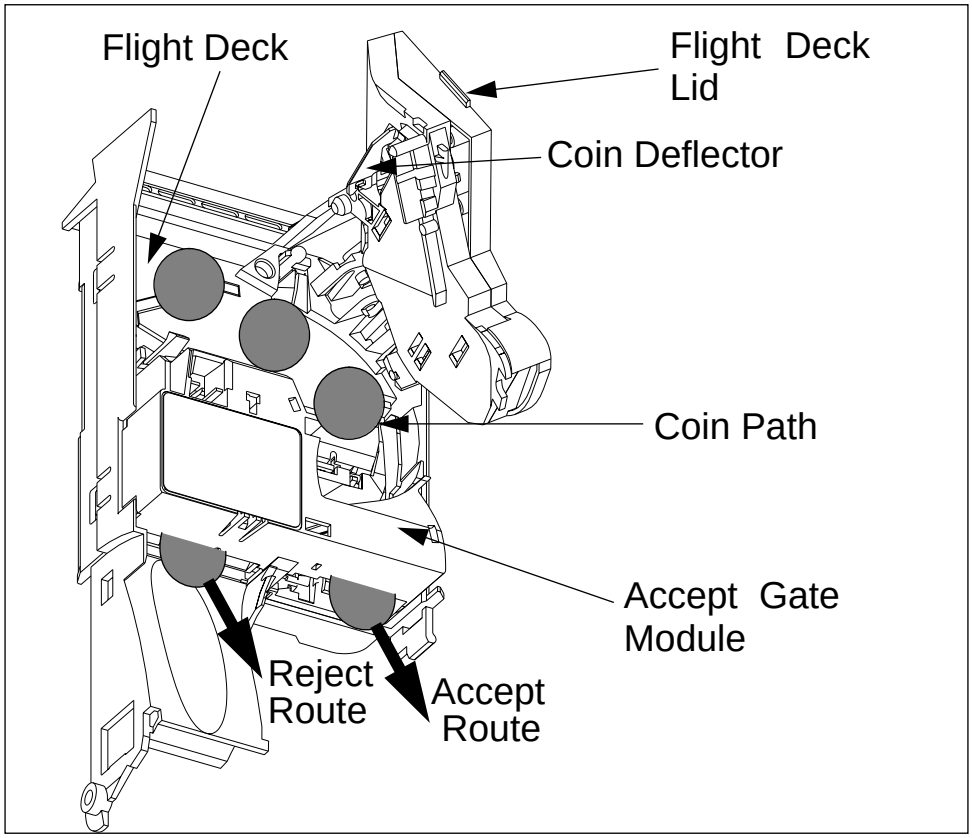
ACCEPTOR MODULE

There are some functions of the acceptor module which are common across the whole CashFlow® product range. These include coin discrimination, control and communication.

When a coin is put through the acceptor module it's validity is determined by measuring certain parameters. It also looks at the coin type status to define whether the payment is a valid coin or token, or an invalid coin. Finally, the inhibit status is checked. If the coin is not inhibited, it will be accepted, the accept gate opened, and

the coin routed to either a tube or cashbox. The acceptor module is made up of the discriminator, back cover and the accept gate.

The discriminator comprises a flight deck and lid which together form the coin control and flight path. On the inside of the flight deck lid is a mechanical device incorporated near the coin entry point. This device is known as the coin deflector and is used to bring coins under control as they enter the product



Acceptor module

A hinge at the top right hand side of the flight deck allows coupling of the lid via an intermediate component, known as the lid arm. This allows the lid to locate accurately to the flight deck independently of the hinge. The lid also maintains a parallel coin throat by being spaced from the deck on three bosses which locate the lid squarely to the deck.

The design of the lid arm hinge area allows the lid to open to 180 deg. relative to the deck. The opening is restricted to just over 100 deg. by the back cover to prevent the lid possibly fouling other parts.

The action of the lid arm hinge spring allows the lid to remain open when past about 100 deg. and will snap shut when closed to about

60 deg. although the lid will need to be pressed to ensure that it is correctly seated against the deck.

The acceptor connects to the control board via a 10 way ribbon cable.

On the front of the acceptor is a six way socket. This is for use with a MEI® Route Alpha 250 support terminal. The terminal is hand held and, when connected to the acceptor allows some of the operational aspects of the changegiver to be altered.

ACCEPT GATE MODULE

The accept gate module contains a solenoid operated gate, optical coin strobes and coin routing components. Coins that are correctly discriminated are routed to the accept exit by energising the accept gate. Coins that are rejected are routed to the reject exit.

SEPARATOR MODULE

The separator directs the coins into different routes, either to the coin storage tubes or the cashbox. It contains a solenoid bank and, at the bottom, a top level sensor assembly which is used to detect when tubes are full and then route coins to the cashbox, or to another tube.

CONTROL BOARD

This is the main PCB which controls the way in which the changegiver operates. There are several different control boards, but basically these are the 4 price for electromechanical machines, Executive, MDB, and BDV for electronic machines.

SPINE

The spine provides the housing for all of the other modules. On the rear are the three standard keyhole fixing points for fitting the changegiver firmly into the machine.

TRANSFORMER

The transformer assembly is housed behind the keypad cover. To gain access to the transformer is a screw located under the top flap of the keypad cover. Once this screw has been removed the keypad cover will lift off and the transformer is accessible. The transformer connects to the control board via two looms and is available in 24V, 100V, 120V, 220V, and 240V options.

KEYPAD

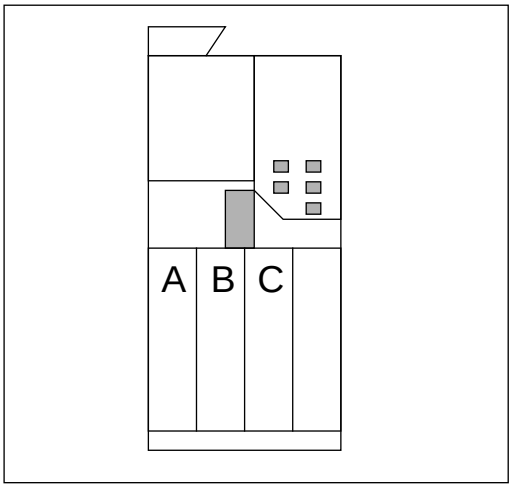
The keypad is used to float or dispense coins and to re-configure some aspects of the way in which the changer works.

DISPENSER

The dispenser is held in the spine by two clips, one on each side and connects to the control board via a loom. The dispenser contains three dispense arms which, when activated, dispense coins from each of the three storage tubes. The dispenser also contains low level sensors which detect when the tubes are low on coins. It is possible to dispense coins from tubes A, B or C during the same vending function.

COIN STORAGE CASSETTE

The coin storage cassette clips to the front of the changer and contains three independent coin storage tubes.



Prisms are located at the top of each tube which, when combined with the optos on the separator form the top level sensor. The top level sensors are used to indicate when a tube is full. When a tube is full any further coins are routed to the cashbox.

The cassette can be automatically filled by feeding coins through the product, or manually filled by removing the cassette from the changer.On the front of the cassette are float indicators which can be positioned manually by sliding them up and down.

COIN ACCEPTANCE, ROUTING & RETURN

The changer has a standard coin entry and exit chuting. Coin return via a reject lever is also standard. The coin acceptance, and the routing used on coin acceptance, are dependant on:

- The set up of various configuration items in the changer EEPROM
- Other changer conditions which will alter while the changer is in operation

As a result of this, both coin acceptance and coin routing are dynamic, i.e. changing in time as the state of the changer alters. The dependencies are detailed in the following.

COIN ACCEPTANCE

The acceptance of each coin is determined primarily by the set up of Default Inhibits in the EEPROM. This specifies which coins should always be inhibited (i.e. rejected). In addition to these defaults, extra inhibits will be imposed depending on the following conditions:

In normal mode with the overpay inhibit flag set:

- Coins which are not dynamically routed to the tubes will be inhibited and rejected if their value, plus the existing coin credit, cannot be returned due to lack of correct change coins
- Coins which would take the total system credit over the maximum allowed credit are inhibited
- Vend tokens are inhibited if the total system credit is not zero

In normal mode with the overpay inhibit flag clear:

- If use exact change has been signalled, the exact change inhibits are imposed
- Coins which would take the total system credit over the maximum allowed credit are inhibited
- Vend tokens are inhibited if the total system credit is not zero

In float mode:

- All coins which are not dynamically routed to the tubes will be inhibited

In price teach mode:

- Coins which would take the total system credit over the maximum allowed credit are inhibited
- Vend tokens are inhibited

Global coin inhibit

In addition to the individual coin inhibits described above, a global coin inhibit can be imposed. This will inhibit all coin acceptance regardless of any other conditions. A global inhibit is imposed when:

- Manually dispensing coins either from the key pad or the terminal
- Returning credit
- A vend is in progress
- A price is on the display due to a product selection being made with insufficient credit
- The value of tube contents is on the display
- Any bits in the EEPROM error register are set, apart from bit 5
- A Vend token has been accepted
- An executive type vending machine has indicated that it requires a free vend
- The host machine has indicated it is inhibited (i.e. sold out)
- The cashbox error bit or any of the protocol A error bits in MISC ERRORS is set

CHANGE PAYBACK

In general the changer will attempt to return any coin credit to the consumer, in the best possible coin mix. However, this simple statement requires clarification.

Use of Tubes:

- The changer will only attempt to use tubes which have not been disabled by the occurrence of sensor or dispenser faults
- If a tube is not disabled, it will be allowed to be used for change payback only if its tube counts are above the safe count value at the start of the change payback sequence
- The changer will not function if the coin storage cassette is not fitted

Best Change Calculation:

Once the tubes that can be used have been determined the best coin mix to pay back the change is calculated. Best coin mix is defined as the first of the following found to be possible:

- Correct change paid with minimum number of coins

- Correct change paid with non-optimal coin mix
- Closest change paid with minimum number of coins
- Closest change paid with non-optimal coin mix
- No change paid

Once the best coin mix has been determined the dispensers will commence to pay the change out. The software will drive as many motors as possible at once to expedite the change payback.

Should either of the following occur the dispense sequence will be suspended once each motor has got to its home position:

- The tube has run out of coins while coins are still required. This could occur should the low level sensor/s go from covered to uncovered, causing a tube count re-calibration, which reduced the number of coins held in the tube
- A dispenser error is detected (stall, etc.)

The software will then re-compute the best coin mix to pay back the credit still remaining. and re-start the dispensers with this new coin mix. The above will be repeated until all the change which can be dispensed has been paid.

Note that the best mix computation limits the total number of coins to 255 in each given invocation. This means that the maximum value of change which can be returned is determined by the 255 coins selected in the initial computation. Further computations may lead to more than 255 coins in total being dispensed, but the value will not increase.

TUBE SENSOR USAGE

This section describes the operation of the tube sensors in more detail. The sensor operation significantly affects the users perception of how the changer appears to operate.

Each tube has associated with it three sensors:

- The full level sensor (opto sensor)
- The low level sensor (opto sensor)
- The tube dispenser home position sensor (reed switch)

Full sensors

Effect on coin routing

The changer cannot read the tube full sensors directly, but must request their status from the acceptor module. The acceptor module defaults to performing a self-test of the full sensor prior to each read

of it. This self-test can be disabled by the changer (e.g. in float or price teach where sunlight may cause the test to fail). The acceptor module reports both the reading of the sensor, COVERED or UNCOVERED, and the outcome of the self-test, OK or FAILED. If sensor self-test is disabled, then the outcome will always be reported as OK.

The changer will perform the following actions (on a tube-by-tube basis) based on the self-test results and the sensor reading:

Self-Test Result	Sensor Reading	Changer Action
OK	UN-COVERED	This is the normally expected result. The changer will clear a full sensor error, if flagged. It does not take any further direct action, however the routes may be updated if the tube counts have got to their maximum level
OK	COVERED	This is a fault condition, as the maximum level a tube should reach is 3 coins from full. The changer will signal a full level sensor error. If the low level sensor is reading COVERED then there is a good chance that the tube is really full, so the changer will recalibrate the tube counts to the pre-programmed full number.
FAILED	UN-COVERED	This condition cannot occur, as the acceptor will always assume any FAILED sensors are COVERED, and will report this.

Self-Test Result	Sensor Reading	Changer Action
FAILED	COVERED	This is a fault condition, due to the failure of the acceptor module's sensor self-test (opto was seen ON with the LED being OFF). The changer will signal a full level sensor error. It will ignore the reported reading, and continue to use the last (good) reading before the failure. The routing will be updated. The tube is still used for dispense. If all 3 main tube sensors are reported as FAILED, then the cassette is assume to be removed (and a cassette out error will be flagged). Note that sunlight (or other intense light source) can affect the sensor self-test, causing it to fail. Thus the changer will inhibit the self-test feature when float or price teach mode is entered. When this mode of operation is selected, the self-test result will always be OK.

Coin cassette removal detection

If the coin storage cassette is removed, all the tube full sensors on the 3 tubes will read covered. Should the changer detect this all tubes full condition, it will flag a cassette removed error and will indicate a changer error on the error LED. No change payback will be attempted from the 3 tubes. Manual dispensing from the tubes will still be allowed, but the tube counts will not be decremented. Coins will still be accepted but routed to the cashbox.

The error will be cleared as soon as a coin is accepted or a dispense attempted with the coin cassette back in place. Note that if all tubes really are full then a cassette removed error will be indicated, but will clear once the tube level drops.

Full sensor error detection

The changer will detect full sensor errors on dispensing from a tube. If coin storage cassette removal has not been detected. The bit

appropriate to that tube in the full sensor error register will be set and a changer error will be indicated on the error LED. Since the sensor reads full the tube will no longer be routed to, but no other action will be taken, i.e. the tube will still be dispensed from.

The full sensors are read on initialisation, acceptance and dispensing coins. Full sensor errors relating to a tube are cleared whenever a full sensor reads uncovered. Note that this means that if more than 1 coin covers the full sensor, the full error for that tube will initially be set on dispensing from that tube, but it will be cleared again as soon as the sensor becomes uncovered.

Coin count re-calibration

When accepting coins, the full sensors will be used for re-calibrating the number of coins in the tubes. For any given coin type the number of coins that it takes to cover the full sensor can vary due to variations in coin thickness. For this reason the tube counts for a tube will be set to be their full re-calibration number only if:

- The sensor status has changed
- The result of the sensor self test was good
- A coin cassette error has not been detected
- The recorded tube counts are outside the following range:

  (Full recal number - MAX_FULL_COUNT_DIFF) ≤ tube count ≤ (full recal number + MAX_FULL_COUNT_DIFF)

The allowed variation from the full re-calibration number before re-calibration is performed (MAX_FULL_COUNT_DIFF) is set to 9.

Low sensor error detection

The low sensor is checked at the following times:

- On power-up
- Before beginning any dispensing (either manual dispensing, or credit return)
- While dispensing, immediately after every coin is paid out

The status of the low level sensors will be held in non-volatile memory, thus preserving this information for the next power-up.

Coin count re-calibration

Low level re-calibration is intelligent in its handling of tube storage cassette removal and replacement. The main assumption made is that the tube storage cassette is not removed during a change return operation. The following table gives the details of the low sensor

operation.

A tolerance of ± MAX_LOW_COUNT_DIFF is applied to the tube counts before re-calibration on low level sensors is done. This reflects the fact that due to the tolerances, both electrical and mechanical, it is unlikely that the maximum number of coins in a tube will be the same in all changers, in all tube positions.

Thus if the tube counts are within MAX_LOW_COUNT_DIFF of tube_low_count, no re-calibration will occur when the low sensor goes from COVERED to UNCOVERED.

The following table gives a brief summary of the low sensor operation.

Low Level Sensor Operation

Sensors Read At:	Old Sensor Reading	New Sensor Reading	Action (If tube count error is greater than specified requirement)
1) Power-up	C	U	Reset of counts to 0
	U	C	Reset of tube_ counts to tube _float_level
	C	C	None
2) Prior to dispense	U	U	None
	C	C	None
	C	U	Re-calibrate tube_counts to tube _low_count
	U	C	Reset of tube_ counts to tube _float_count
3) During dispense	U	U	None
	U	C	None
	C	U	Re-calibrate tube_counts to tube _low_count-1
	C	C	None
4) After dispense	U	U	None
	U	C	None
	C	U	Re-calibrate tube_counts to tube _low_count
	C	C	None

Key : U = uncovered C = covered

Home sensors

Only when the dispenser arm is in the centre of its park region will the home sensor register. The drive to the dispenser motor is removed when the dispense is seen to have failed.

It is possible for the dispenser arm to keep moving after the drive to the motor has been removed. It should not move out of the parked position but it could be possible for it to move into the part of the park region where the home sensor reads not home. It is valid therefore for the home sensor to read not home at the beginning of a dispense cycle.

The tube will not be used again until the next dispense cycle, when, if another incorrect home sequence is seen, it will be permanently disabled. If any tube has been disabled a changer error will be indicated on the error LED.

Once a tube has been permanently disabled it can only be re-enabled by removing the source of error (e.g. jam) and clearing the appropriate error register via the terminal or a manual invent. The dispenser error will then be cleared, and the tube re-enabled.

PRODUCT INTERFACES

The external interfaces to the changegiver product can be divided into two groups and are explained in the following pages.

- Electrical interfaces: includes looms to interface host machine with 4-price, Executive, BDV and MDB versions, connectors and power supplies.
- Man machine interfaces: includes keypad, terminal and credit display.

These are described in the following sections.

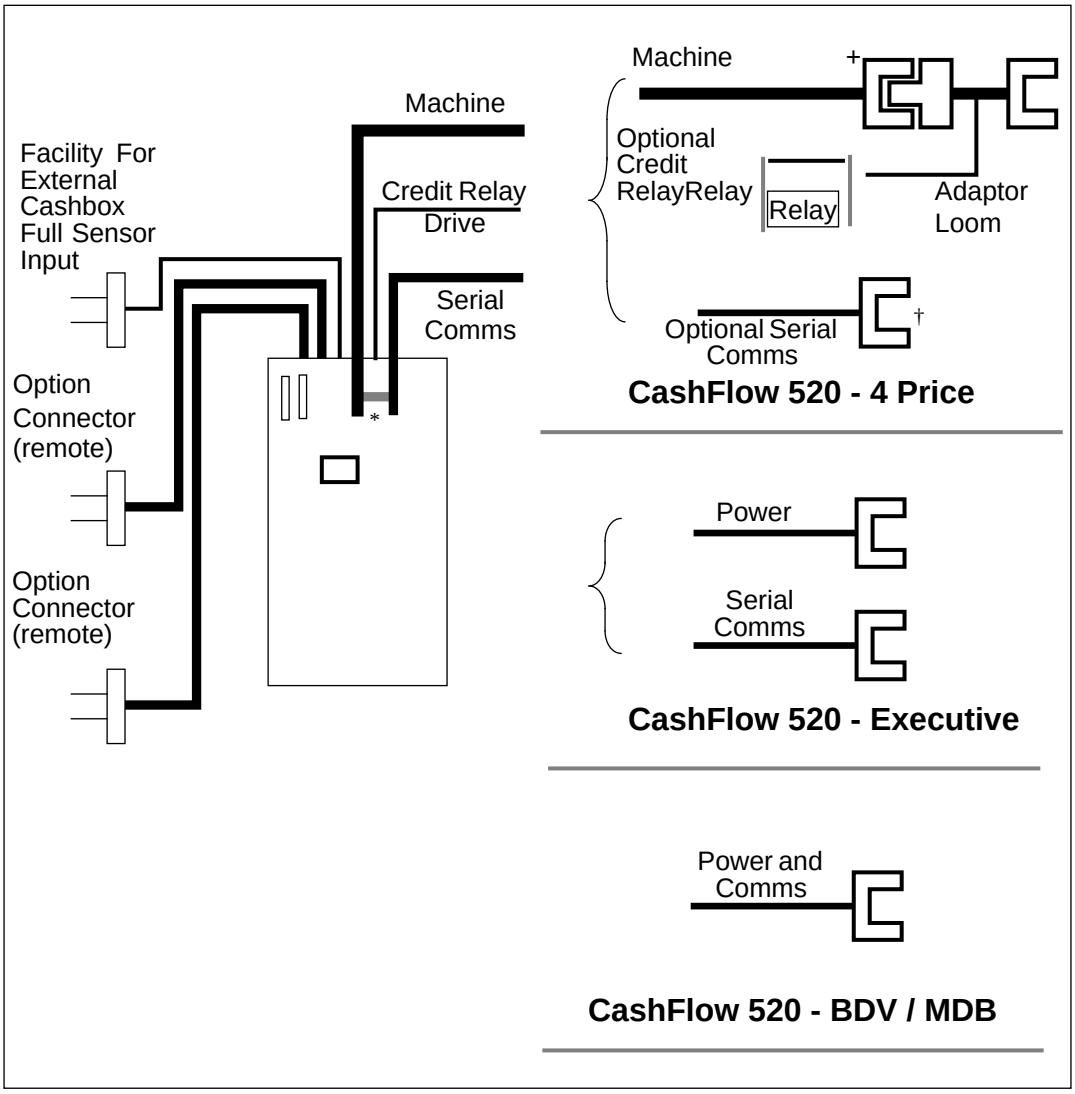
Mechanical Interface Drawings showing the space envolope, mounting detail, reject mechanism clearance detail and coin routing are at the end of the book in the Appendix.

The current product types available are;

- CashFlow® 520 - 4 price - A four price electromechanical changegiver
- CashFlow® 520 - Executive - changegiver with an electronic Protocol A serial interface
- CashFlow® 520 - BDV - changegiver with an electronic BDV serial interface
- CashFlow® 520 - MDB - changegiver with an electronic MDB serial interface

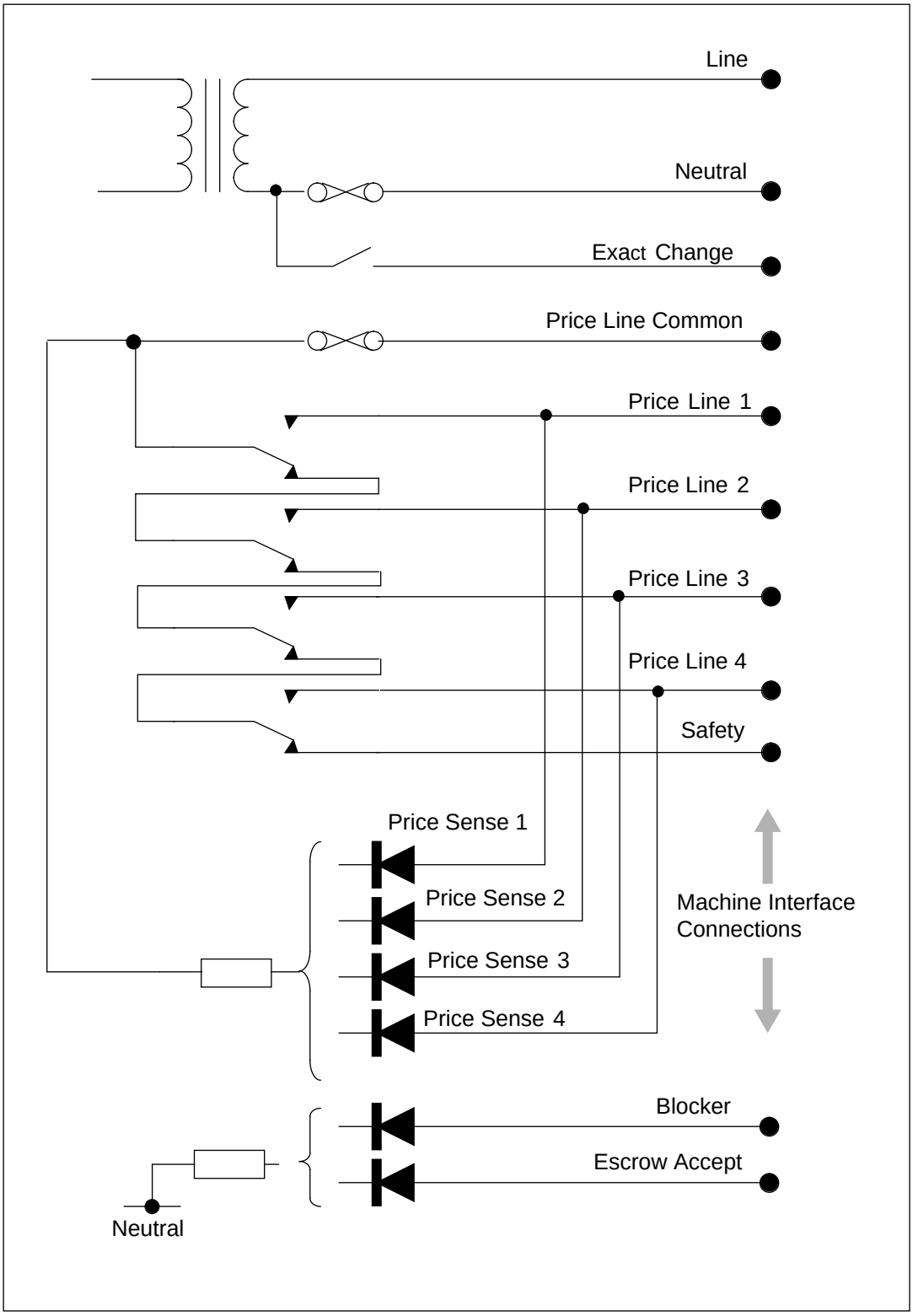
ELECTRICAL INTERFACES

The diagram below illustrates the external electrical interfaces and options for the CashFlow® 520.



NOTE: The machine and serial communications loom are connected together within the changegiver for the CashFlow® 520-BDV and MDB products.

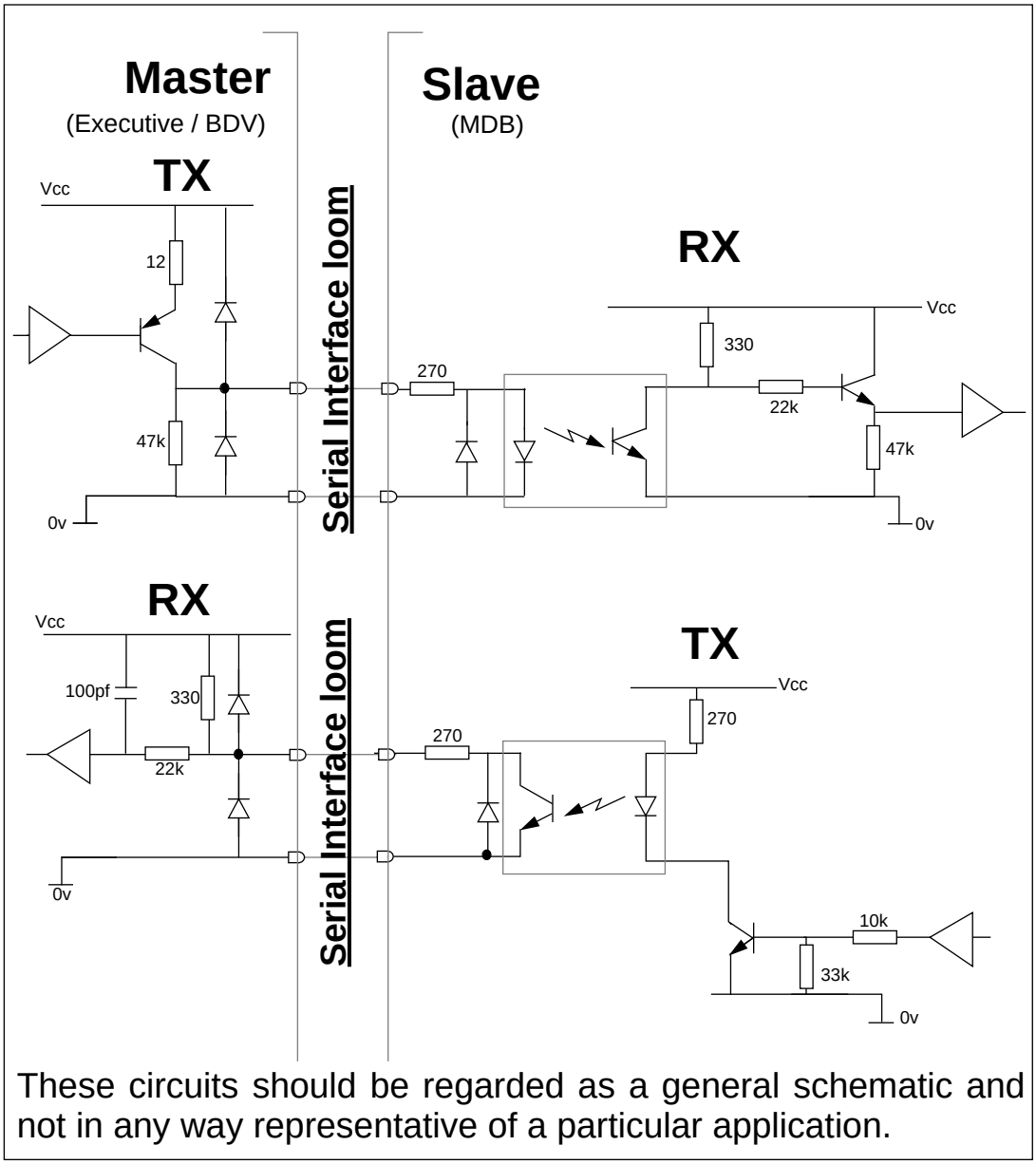
The mains electro-mechanical interface circuit diagram for CashFlow® 520 4 Price is shown below.



Host Interface for CashFlow 520 4 Price

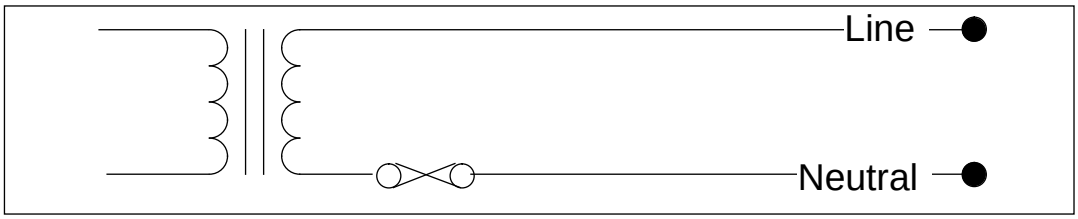
Protocol A Equivalent Circuit

As applicable to Executive, BDV and MDB versions.



These circuits should be regarded as a general schematic and not in any way representative of a particular application.

The CashFlow® 520 Executive, BDV and MDB products do not require any related electro-mechanical interfaces. However, the Executive does require a 24V A.C. power supply as illustrated below.



Interface for CashFlow® 520 Executive

ELECTRO MECHANICAL INTERFACE

All electro-mechanical interface connections between the changegiver and the host vending machine are electrically isolated. Outputs are isolated via the relays (i.e. price line outputs) and the inputs from the machine are current limited and optically isolated.
The standard electro-mechanical interface parameters for all changegivers defined in this specification are as follows:

EXACT CHANGE OUTPUT

(Switched neutral). Rated 0.5 Amps AC resistive load. Fused 1.6 Amps thermal. Fault rating 3.5 Amps.
When the changegiver detects the change available in the tubes is low it indicates exact change to the vending machine. The machine normally uses this signal to illuminate a lamp informing the customer to use the correct money.

CREDIT RELAY DRIVE

(Switched Ground). Open collector drive provided (includes flyback diode) - 20mA @12V.
The credit relay is only available on the 4 price changegiver as an option located outside the unit.

SAFETY LINE

(Switched Price Line Common). Rated 2.6 Amps. Fused (via price line common) 3.15 Amps fast. Fault rating 7.0 Amps.
This output is normally connected to price line common via all the price line relays (in their off state). When any price line becomes active the safety line becomes open circuit within the changegiver.

PRICE LINE COMMON

(Normally connected to Line). Rated 2.6 Amps AC inductive load. Fused 3.15 Amps fast. Fault rating 7.0 Amps.

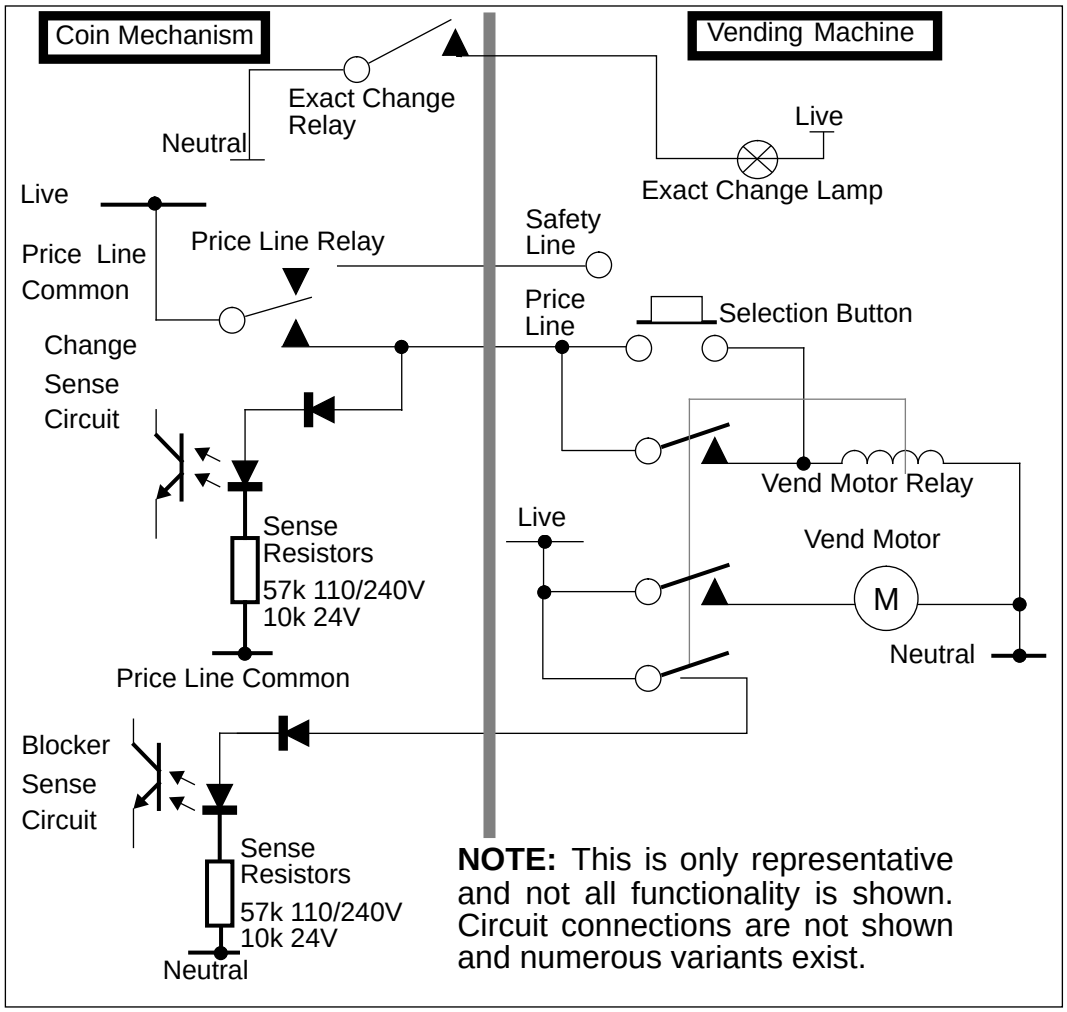
PRICE LINE OUTPUTS

Rated 2.6 Amps AC inductive load (worst case power factor of 0.5). Fused (via Price Line Common) 3.15 Amps fast. Fault rating 7.0 Amps.
A sense input will be seen when >1.5mA is flowing through the sense input. When a sense input becomes active the changegiver determines the price to be charged for the selection requested. If sufficient credit exists it will energise the appropriate price line relay. This relay will disconnect Safety from price line common and connect price line common to the selected price line output enabling the vending machine to proceed with the vend cycle.

MACHINE INTERFACE

The normal idle state of the Electro-mechanical / 4 Price machine interface with no credit is as follows:

- Blocker input active (connected to LINE)
- EA input (if present) - inactive
- Sense input lines inactive (open circuit)
- Safety Line output connected to price line common (via ALL price line relays)
- Price line outputs inactive (open circuit)
- Credit relay off (contacts open) - when optional box fitted
- Exact change output inactive (contacts open)



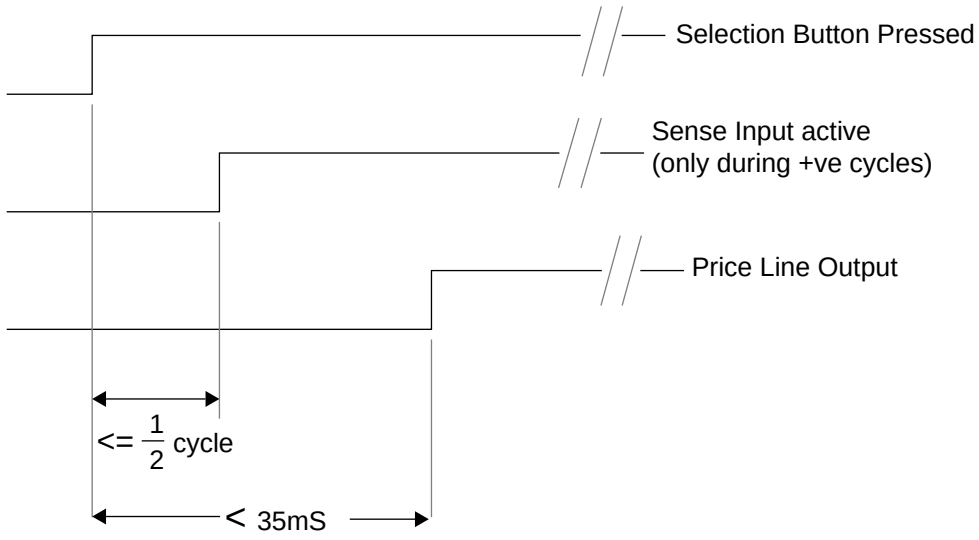
The 4 price changegiver has 4 input/output lines, providing for 4 sense inputs, and 4 price line outputs. When a product selection is detected the appropriate price line output is enabled (if sufficient credit exists). As the price line relay outputs are interlocked, enabling one price line output ensures that the other price line outputs are disabled. When the reset condition is detected the price relay is turned off.

SINGLE / MULTI VEND

Unused credit (change) is returned to the customer either automatically or on demand by pressing the reject lever. If the changegiver is set to single vend mode any unused credit is returned automatically immediately after the vend finished condition is met. In multi vend mode the credit balance is not returned until requested by the customer (or automatically after a selectable timeout period has elapsed).

SENSE INPUT TIMING

During the period between pressing the product selection button and the price line output becoming active the changegiver must determine the price line of the selection, look-up the vend price and decide whether to allow the vend, and if so energise the price line relay. If the sense input from the vending machine is A.C. the sense current is only detected during the positive half cycle, therefore it may be 1/2 cycle (i.e. 10mS) before the sense input is detected, leaving 25mS for everything else.



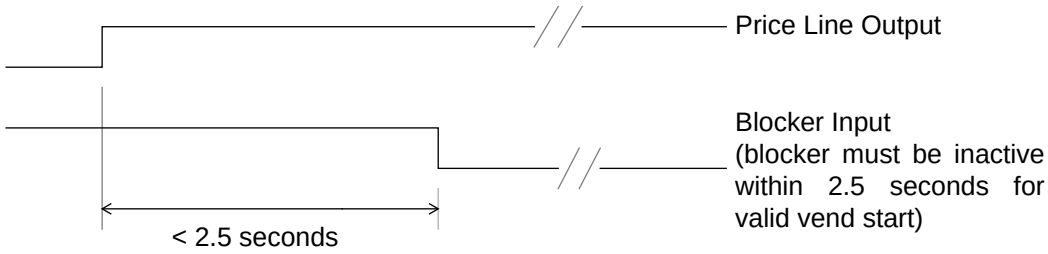
Note: Price line output becomes active only after the sense input is active and the changegiver has authorised the vend. (i.e. credit > vend price)

Price Line Output Timing

VEND START

When a price line output has been energised the changegiver will wait for the vend start signal. This is indicated by the blocker input becoming inactive. If the vend start signal is not seen within 2.5 +/- 0.5 seconds of the price line output being energised the price line

output is removed (excluding blocker hold reset mode). The price line output will be energised again if the sense input is still active and sufficient funds exist to pay for the product requested.



Note: If blocker does not become inactive within 2.5 seconds the price line output is turned off. It will turn on again when a valid sense input is detected.

Vend Start Timing

VEND FINISHED

While the vend is in progress the vending machine holds the blocker signal inactive. When the vend is finished the blocker signal returns to its normal active state. As far as the changegiver is concerned the vend is considered to have finished when the reset conditions are met, and the price line output is disabled. The changegiver can be programmed to several different reset conditions to suit different vending machine interfaces:

- Blocker reset
- Delayed blocker reset
- Blocker hold reset
- Escrow accept reset

If the reset conditions are not met (i.e. the vend failed), the vend price will be paid back to the customers credit balance.

BLOCKER RESET

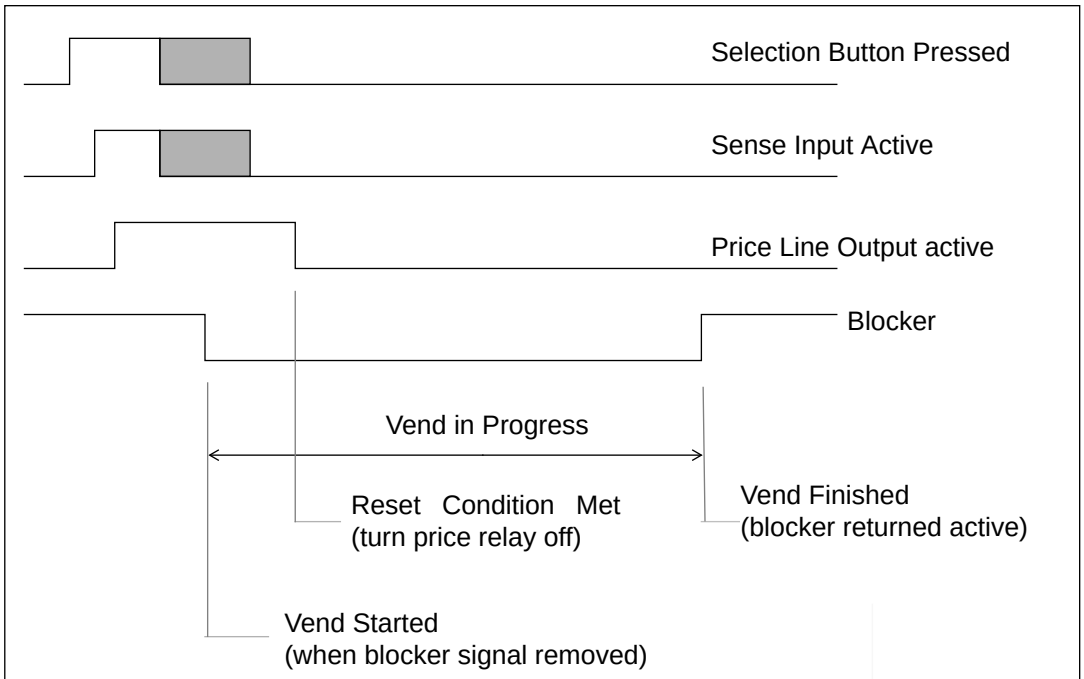
The changegiver assumes the vend has finished successfully as soon as the vend start signal is received (blocker signal is seen to be inactive). The price line output is turned off at this point, with no added delay. This is typically <30 mS.

DELAYED BLOCKER RESET

Blocker reset is the most commonly used reset condition

In this reset mode the price line output remains active for either 30 mS (most commonly used) or 200 +/- 10 mS after the vend start signal is detected (blocker signal removed). The vend is assumed to have finished successfully after this delay and the price line output is turned off. The product may be in either 30mS or 200mS mode.

The delay is required to ensure the price line output is active for sufficient time for some machines to latch the signal.



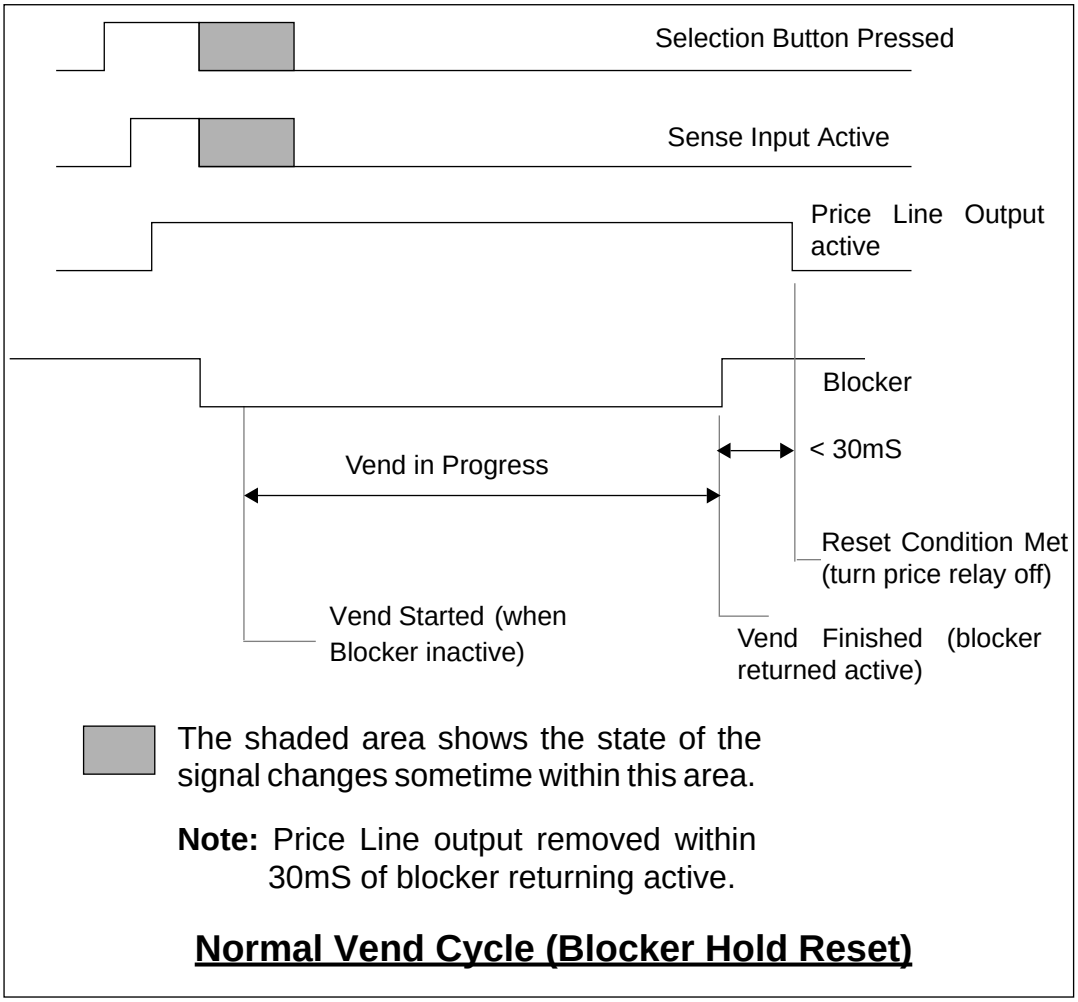
The shaded area shows the state of the signal changes sometime within this area.

Note: Price Line output removed ~30 or ~200mS after blocker becomes inactive.

Normal Vend Cycle (Delayed Blocker Reset)

BLOCKER HOLD RESET

The changegiver waits for the vend start signal (blocker) to return to its normal active state to indicate the vend cycle was successful. When blocker returns the reset condition is met the price line output is disabled.



The shaded area shows the state of the signal changes sometime within this area.

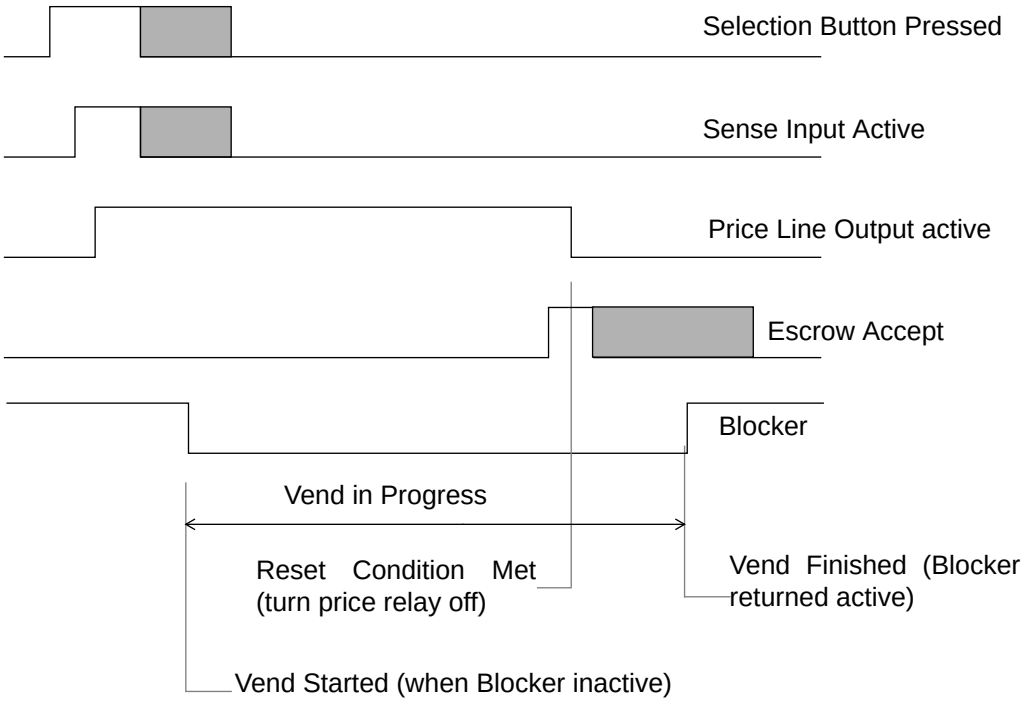
Note: Price Line output removed within 30mS of blocker returning active.

Normal Vend Cycle (Blocker Hold Reset)

ESCROW ACCEPT

In this mode the escrow accept (EA) input is used in conjunction with the blocker input to indicate a successful completion of a vend cycle. Normally, blocker removal signals the vend has started. The end of the vend is indicated when EA becomes active while blocker is still inactive. If the blocker signal returns to its active state before EA is active the vend is deemed to have failed, the price output is de-activated and price of the vend is added back to the credit so that the customer can try again or have his money back.

To allow for any fault condition the changegiver will only wait 1 minute (+/- 2 seconds) for the EA reset condition to be met. If this does not occur the vend is assumed to have failed and is dealt with in the same way as for blocker hold reset.



The shaded area shows the state of the signal changes sometime within this area.

Note: Price Line output removed when EA becomes inactive while blocker inactive.

Normal Vend Cycle (Escrow Accept Reset)

PRICE SENSE / BLOCKER / ESCROW ACCEPT / VEND START/ INHIBIT INPUTS

Rated < 100 mA. Fault protection by circuit impedance.

The maximum source impedance (from vending machine) to allow the changegiver to correctly sense an input is dependant on the voltage profile of the unit as follows.

Mains Voltage Profile Range	Mains Activated Minimum Source Impedance for OFF Condition	Mains Activated Max Load Impedance
20.4 - 26.4 VAC	118K ohms	10 k ohms
87 - 121 VAC	475K ohms	10 k + 47 k ohms
95 - 132 VAC	525K ohms	10 k + 47 k ohms
187 - 242 VAC	1 M ohms	10 k + 47 k ohms
212 - 264 VAC	1M1 ohms	10 k + 47 k ohms

VOLTAGE RANGES

The following profiled mains voltage ranges are supported across the defined 4 price and Executive product range:

- 20.4 - 26.4VAC covering voltages 24v +10%, -15%)
- 87 - 121VAC (covering voltages 100v -13%, +21%)
- 95 - 132VAC covering voltages 120v +10%, -20.8%)
- 187 - 242 VAC covering voltages 220v +10%, -15%)
- 212 - 264 VAC covering voltages 240v +10%, -11.7%)

For details of BDV and MDB product please contact your nearest regional MEI Electronics office.

POWER CONSUMPTION / RATING

	AC Profiles	BDV/MDB
Quiescent power	15VA @ 50Hz	4.5W
Maximum power	20VA @ 50Hz	8 W
Input current rating	3.52A (min)	2.2A (min)
Internal fuse rating	1.6A (Thermal Delay)	1.0A

TERMINAL CONNECTOR

This connector is on the front of the acceptor module. It is used with the MEI® Route Alpha 250 terminal to access and reconfigure certain aspects of the way in which the changegiver operates. A list of the items and relevant addresses can be found in a later section. The connector type is: Staked pins 0.1” DIL

Pin No	Function
1	Vneg (0V)
2	Data (Tx / Rx)
3	GND (0V Screen)
4	Busy
5	GND (0V Screen)
6	Vin (12V)

MAN MACHINE INTERFACES

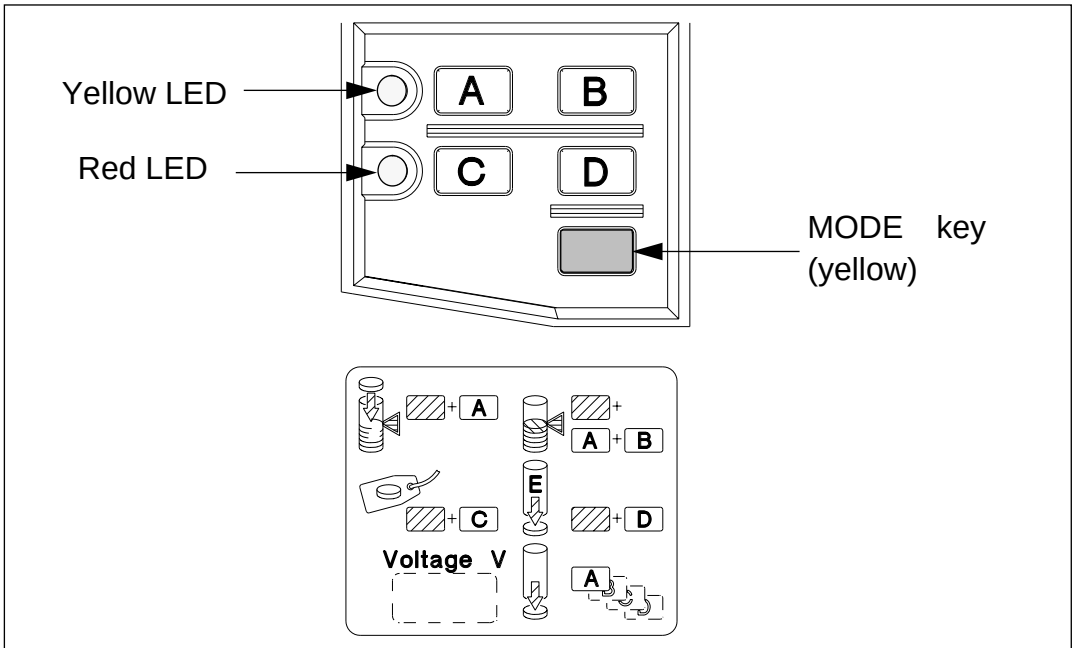
KEYPAD

All changegivers have a keypad mounted on the front face. Two LEDs are also mounted in this area to indicate the operational state of the changegiver. The keypad will enable the following functions to be performed:

- Dispense coins
- Set price(s). See Note below.
- Float the changegiver
- Reset tube counts
- Home the dispensers
- Display the value of coins in the tubes

NOTE: Setting Prices is available at all times with electro-mechanical product, unless Route Alpha terminal address 245 has been set to inhibit.
With BDV and Executive product it will apply only when Route Alpha 250 terminal address 238 has been activated.
Setting Prices function is not available for MDB product.

The keypad has four letter keys and a mode key. The mode key allows shifted functions to be associated with each of the letter keys. Two LEDs provide simple diagnostic information and will assist the use of the keypad. The diagram below shows the layout of the keypad and its associated labeling. The following sections describe its operation.



Keypad & Keypad Label

LED Usage

The top (yellow) LED is used to indicate whether the keypad is in normal or shifted mode. If the LED is off, the keypad mode is in normal mode. When the mode key is pressed, the yellow LED will start to flash at 2 Hz (± 1%) to indicate that the shifted functions defined by the icons on the keys, are accessible. Note that the mode key does not need to be held down to access the shifted functions.

If no further key is pressed within 10 seconds, or the mode key is pressed a second time, the keypad will return to its normal mode. The yellow LED will go off, and the shifted functions will be disabled. If a letter key is pressed within 10 seconds, then the changegiver will turn the yellow LED on continually, and attempt to perform the required action. See the following sections for details of the shifted functions.

The bottom (red) LED is used to indicate the fault status of the system. If there are no errors, the LED will be illuminated continually. If a changegiver error is detected, then the red LED will flash at 2Hz (± 1%). If a fault is detected on the host machine, then the red LED will be turned off. Machine faults will take precedence over changegiver faults.

If the state of the system requires that both LEDs flash, then they will be synchronized to each other in anti-phase (i.e. yellow on - red off, yellow off - red on).

Manual Coin Dispense

If the changegiver is idle (i.e. not vending or accepting coins), the user can manually dispense coins from the 4 tubes by simply pressing the relevant letter key. On a single press-and-release of a letter key, the changegiver will attempt to pay a single coin from the requested tube.

If you wish to get more than 1 coin from the tube, you can continue to hold the key down. This will cause the changegiver to start dispensing further coins at the rate of 1 coin every 0.5 seconds (subject to the dispenser cycle time being less than this).

If you release the key within 3 seconds of the initial press, then dispensing will stop after the current coin is dispensed. Multiple dispensing is not allowed on empty tubes (tube counts = 0).

If the key is held for more than 3 seconds, dispensing will latch, and release of the key will have no effect. The dispenser will continue to dispense a coin every 0.3 seconds (subject to the dispenser cycle

time being less than this) until the tube counts reach their programmed safe count, or any key is pressed.

If 2, or more, letter keys are pressed at the same time, then the changegiver will pay coins from the selected tubes in the same manner as described above. Note that the 3 second latch time is measured from the time the last key is pressed, and dispensing will not unlatch until all the selected tubes reach their programmed safe count.

Float Down Mode

When you wish to float down the tubes, simply press the mode key to get to the shifted functions, then press the A key to enter float mode, followed by the C key. At this point the changegiver will start to dispense coins until all tube counts reach the pre-programmed float levels. Note that if all counts were equal to or less than the float levels, then no dispense will occur.

Price Teach

Subject to the earlier note the prices held by the changegiver can be set using the price teach function. Price teach is only available if the changegiver is idle. To access price teach, press the mode key to get the shifted functions, then press the key with the price icon (key C). Entering price teach mode will clear any accumulated credit, and allow the user to clear credit, and will be indicated on the changegiver's credit display by all decimal points being lit.

On entry to price teach, a longer time-out of 45 seconds will commence. You can then enter coins via the acceptor to the value required for the price to be set. Any coins entered will be accumulated as credit, and displayed on the credit display, if fitted. This display value will be shown with the decimal point flashing.

If there is accumulated credit, then any selection which becomes active will have its price set to the value of credit accumulated. If no credit was accumulated, then any selections made will not have their price modified. This is to prevent inadvertent zeroing of prices on permanent sense machines. Price teach only allows the setting of non-zero prices. Should you wish to clear a price to zero, then the Route Alpha 250 terminal must be used.

The sequence of inserting coins then making a selection can be repeated for all selections for which you wish to modify the price. Note that the main principle of price teach is that selections will have their price set to the current accumulated credit value, so that if a number of selections are required to be set to the same price, once

the correct credit value is reached, all that needs to be done is to press the selection buttons.

During price teach the yellow LED will remain on, indicating that a shifted function is active. In addition, all keys except the price teach key will be ignored. The changegiver will exit price teach mode, and turn off the LED, if any of the following occur:

- No activity relating to price teach made during a 45 second period.
- The price teach key is pressed.

Note that on exiting price teach, there is no need to press the mode key first, as the shifted functions are already active. When price teach mode is exited the changegiver will attempt to return any accumulated credit to the user using the tube coins.

Note that on serial interface changegivers, the prices are not normally held in the changegiver and are thus inaccessible to this form of update, unless the price holding option is enabled via the support terminal.

Homing the Dispensers

You can home all the dispenser arms by first pressing the mode key to get the shifted functions, then pressing the mode key a second time. This will home each of the dispenser arms which are not seen to be at home, as read by the position sensors. This will only work if the tube cassette is removed.

Displaying Tube Value

You can easily get a display of the value of coins the changegiver thinks are contained in the tubes by pressing the mode key twice with the tube cassette fitted. This will cause the tube contents value to be displayed for 2 seconds on the changegiver's credit display.

Note that only tubes which are set up as fitted will be included in this calculation. Note also the calculation is based on tube counts and on the value of the first coin type in the tube.

INTERNAL DIAGNOSTICS & ERROR HANDLING

The indication of an error being present either in the host or in the changegiver is given by the red LED. This section details various errors, and the action taken by the changegiver.

- Host machine problems
- Coin handling problems
- On-board EEPROM problems
- Audit FEM problems
- FIB communication errors
- Miscellaneous errors

HOST MACHINE PROBLEMS

Host Inhibited

On both electro-mechanical and electronic hosts, an indication is provided to the changegiver if the host is inhibited (e.g. blocker inactive on electro-mechanical machines, no polling on MDB). The error handling for this condition is:

- Indicate host error on LED
- Disable all coin acceptance in normal mode
- Disable all coin acceptance in float mode
- Disable all coin acceptance in price teach mode
- Manual dispense is still allowed
- Route Alpha 250 terminal comms still allowed
- Changegiver will continually check if host is re-enabled

Removal of Blocker

The start of vend condition on electro-mechanical hosts is signalled by blocker becoming inactive after the price relay has been turned on. Normally there is a 2.5 second timeout on this, which will terminate the vend sequence with no loss of credit should blocker not go inactive. In blocker hold mode, due to the possibility of frauding certain machines, this timeout is not used. Therefore, if the start of the vend (as signalled by the removal of the blocker signal) does not occur, the following error state will result:

- Indicate host error on LED
- Inhibit all changegiver functions
- Changegiver will continually check if vend starts

Blocker Return

The end of vend condition on electro-mechanical hosts depends on the reset mode selected. In blocker hold mode, the end of vend is signalled by the return of the blocker signal. If this does not occur, the following error state will result:

- Indicate host error on LED
- Inhibit all changegiver functions
- Changegiver will continually check if host is re-enabled

Cashbox Full

An input is provided for a cashbox full sensor (provided by the host). The error handling for this sensor is:

- Indicate host error on LED
- Set cashbox full error flag (code 7 in error register)
- Disable all coin acceptance in normal mode
- Disable all coin acceptance in float mode
- Disable all coin acceptance in price teach mode
- Manual dispense is still allowed
- Terminal comms is still allowed
- Cashbox must be emptied to reset error

Bad Replies Received

Protocol A serial communications error handling is summarised below:

- Indicate host error on LED
- Suspend operation for 100mS
- Abort sequence and revert to sending status
- Disable all coin acceptance in normal mode
- Manual dispense is still allowed
- Allow return of credit
- Terminal comms is still allowed
- Changegiver will continually check if failure rectified

No Response

- Indicate host error on LED
- Disable all coin acceptance in normal mode
- Manual dispense is still allowed
- Allow return of credit
- Terminal comms is still allowed
- Changegiver will continually check if failure rectified

COIN HANDLING PROBLEMS

Full Sensor Failure

- Indicate changegiver error on LED
- Disable routing to affected tube
- Set required code in full sensor error register
- Dispense from tube is still allowed
- On coin acceptance or dispense, changegiver will check if failure rectified

Post Gate Strobe (PGS) Failure

- Indicate changegiver error on LED
- Set PGS error flag (code 7 in full sensor error register)
- On coin acceptance or rejection, changegiver will check if failure rectified

Tube Cassette Removal

- Indicate changegiver error on LED
- Disable routing to tubes (all coins to cashbox)
- Set cassette removed error flag (code 4 in operational error register)
- Dispense is still allowed
- Signal exact change
- On coin acceptance or dispense, changegiver will check if failure rectified

Home Sensor Failure

- Indicate changegiver error on LED
- Disable use of affected tube
- Set required bit(s) in disabled tubes error register
- Signal exact change
- Manual dispense attempts from the tube are still allowed
- Error can be cleared by removing the source of the error and performing a manual dispense, or by using the MEI® Route Alpha 250 terminal.

Motor Failure / Jam

- Indicate changegiver error on LED
- Disable use of affected tube(s)
- Set required codes in disabled tubes error register
- Signal exact change
- Manual dispense attempts from the tube are still allowed
- Error can be cleared by removing the source of the error and performing a manual dispense, or by using the MEI® Route Alpha 250 terminal.

ON-BOARD EEPROM PROBLEMS

Incorrect Configuration vsn. No.

If the configuration file version number in the on-board EEPROM does not match the version expected in the software, the following error handling applies:

- Set code 4 of EEPROM error register
- Indicate changegiver error on LED
- No upload of EEPROM data will occur
- All coin acceptance will be disabled
- The keypad will be disabled, apart from the mode key
- Terminal comms. still allowed
- No save of data to EEPROM on power fail

- The configuration version number must be corrected. The error will then be cleared on changegiver re-initialisation. This can be done by;
  - Clearing the error flag,
  - Updating the EEPROM version number,
  - Re-initialising.

EEPROM Corruption

If a corruption is detected in the EEPROM at upload time, the following error handling applies:

- Set code 0 - 1 of EEPROM error register
- Indicate changegiver error on LED
- No upload of EEPROM data will occur
- All coin acceptance will be disabled
- The keypad will be disabled, apart from the mode key
- Terminal comms is still allowed
- No save of data to EEPROM on power fail

While a reset device error appears to clear the error, note that there will be no configuration data uploaded into RAM, and hence the changegiver's operation will be indeterminate. After clearing the error, the checksum of the affected page should be corrected and the changegiver re-initialised.

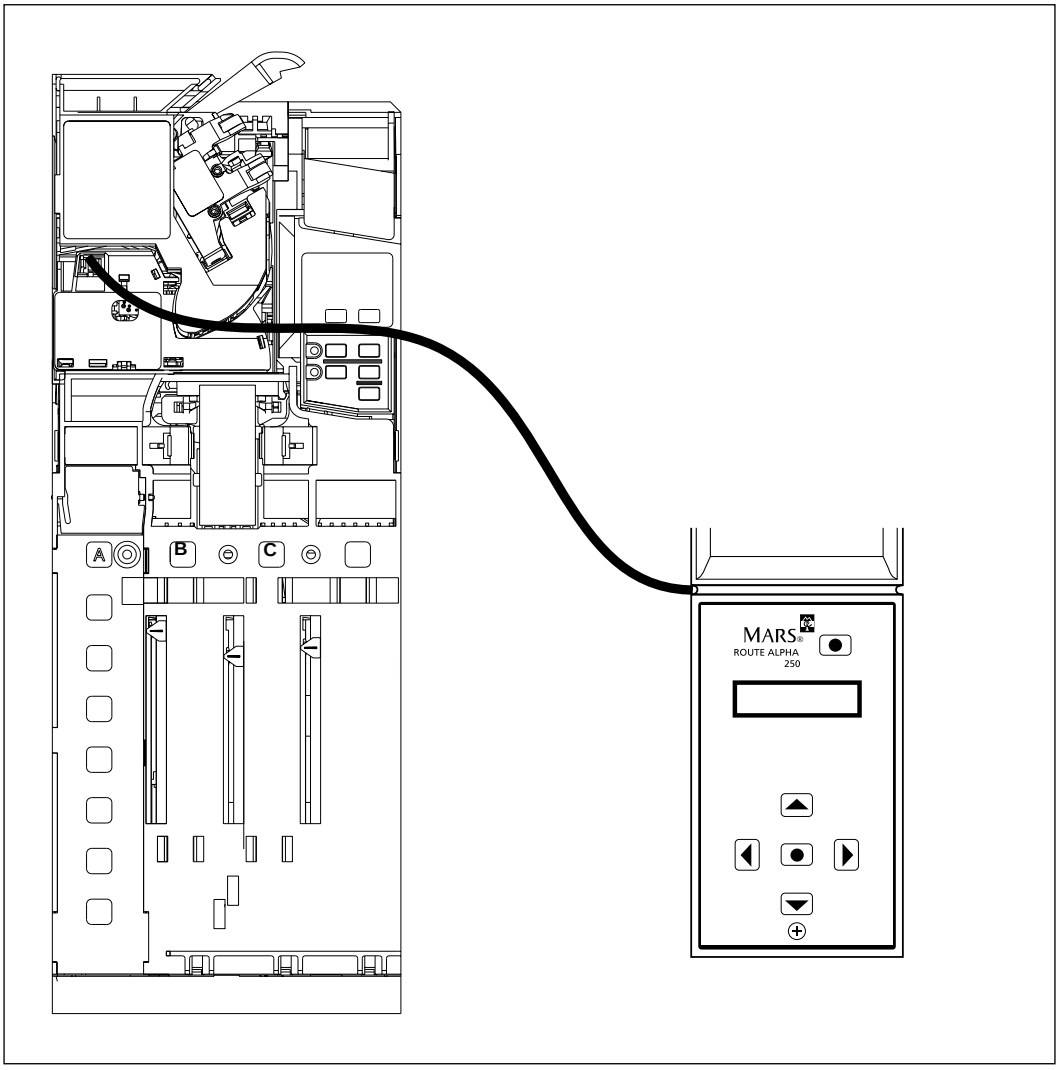
Write Timeout

If a timeout occurs when writing to the EEPROM, the following error handling applies:

- Set bit 7 of EEPROM error register
- Indicate changegiver error on LED
- All coin acceptance will be disabled
- The keypad will remain enabled, with manual dispense still allowed
- Terminal comms is still allowed
- No save of data to EEPROM on power fail
- Changegiver must be switched off to reset error.

MEI® ROUTE ALPHA 250 TERMINAL

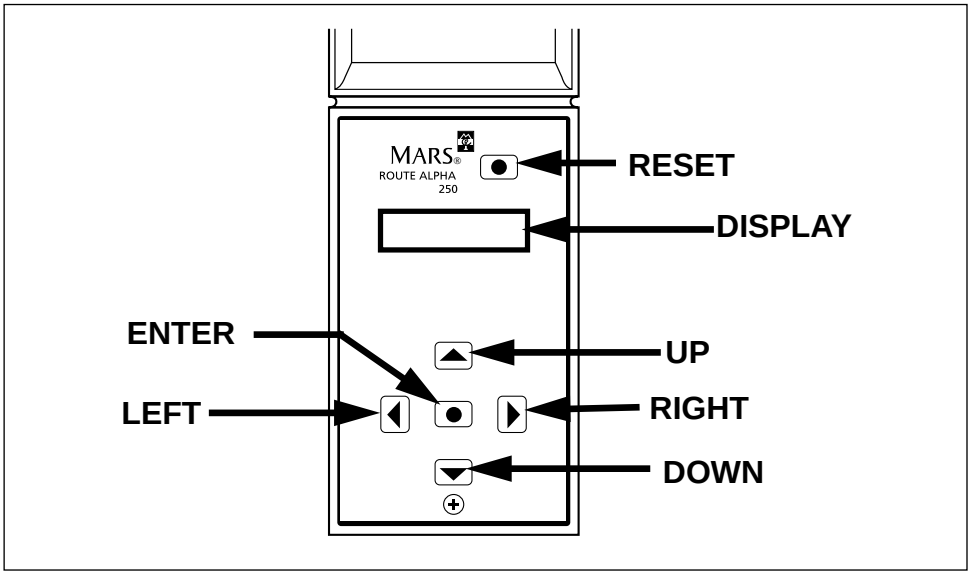
If you have access to a MEI® Route Alpha 250 terminal you can re-configure any of the functions available for a particular product. The terminal is connected to the acceptor via a six way connector which plugs into the front of the acceptor.



The terminal is used to check or change certain data which affects the way the totaliser operates. The data is held in addresses. Each address has a unique number which identifies the feature you wish to read or change e.g. if you want to change from single vend to multi vend then you need to go to address number 226 and put in a 1 (single vend is a 0).

The following pages will explain how to access and change the data in certain addresses. At the end of this section there is a list of addresses and the relevant values.

KEY FUNCTIONS



Reset Key: used to reset all modes and to initialise any settings that you have changed. If the reset key is pressed while an address is being updated then the address may not be updated. The reset key must be pressed to store the changes that you have made.

Up Key: used to increase the value displayed on the screen.

Down Key: used to decrease the value displayed on the screen.

Left Key: used to scroll the display to the left when a large number is being accessed that cannot be fully displayed on the screen.

Right Key: used to scroll the display to the right when a large number is being accessed that cannot be fully displayed on the screen.

Enter Key: used to change between the address and data displays.

Other Facilities of the Terminal

The terminal has several features to speed up its use. This includes the ability to scan at a higher speed with the keys auto repeating, to automatically roll over from its highest to lowest address and to inform the operator should a communication error occur.
Should you need to know which version numbers of the software is used in the totaliser the UP key is pressed while the terminal is in reset mode. The terminal will firstly display the acceptor HI^2 node address, if the UP key is pressed again the acceptor software version number will be displayed. Pressing the UP key again will display the acceptor EEPROM number and if pressed again the acceptor configuration code.
To return to normal operation press the RESET key.

Auto Repeating Keys

If either the UP or DOWN keys are kept pressed they automatically repeat. The repeat speed of the key increases the longer the key is held down.

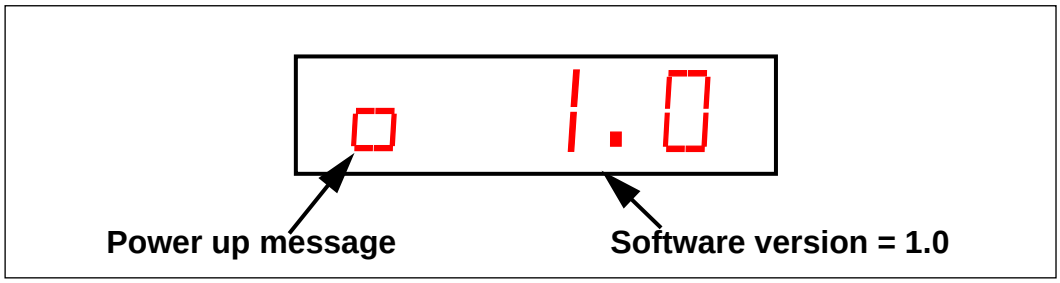
Double Click Hotkeying

If a key is doubled clicked (pressed twice in quick succession) then this causes the address number to increment by a larger amount. e.g. if the user starts at address number 1 then double clicks the UP key, the address will jump to 40, double click again the address will jump to address 100 etc. This is useful as the addresses used for the totaliser start at address 200. You can also double click the DOWN key to decrement by larger amounts.

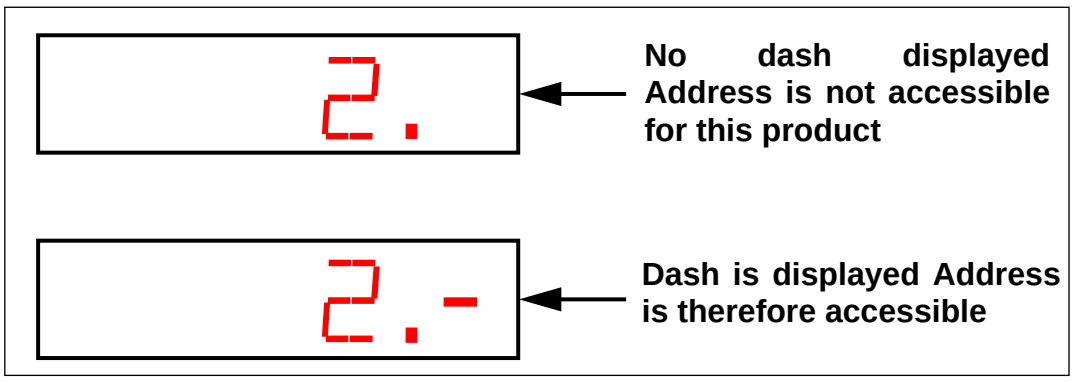
USING THE TERMINAL

As soon as the terminal is connected to a totaliser it powers up and interrogates the product.

The terminal display will clear and briefly show a message that indicates the version of software in the terminal. A display of [0 1.0] means software with a version number of 1.0 is fitted in the terminal.



After a few seconds the display will show the number [1.] or [1.-]. Not all configuration items are applicable to every product but all the address values are shown on the display. If the value for the address is applicable to the product a dash will be present at the far right position on the display. The value can then be accessed and changed if required.



The basic operation to alter the information held in an address is:

1 Connect the terminal to the CashFlow® product.

2 Wait for the terminal to power up correctly.

3 Select the address by using the UP and DOWN keys.

4 Examine the data by pressing the ENTER key.

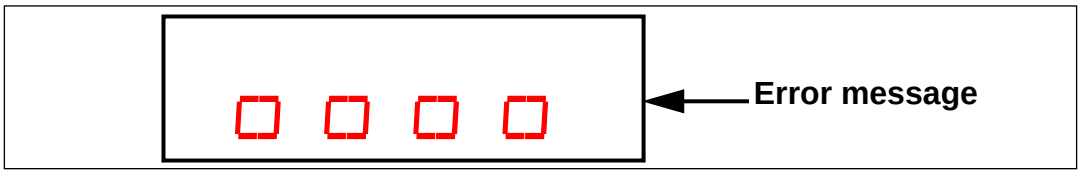
5 Alter the data value by pressing the UP or DOWN keys until the new value has been reached.

6 Press the ENTER key to return to displaying addresses.

7 Press the RESET key to initialise the new value.

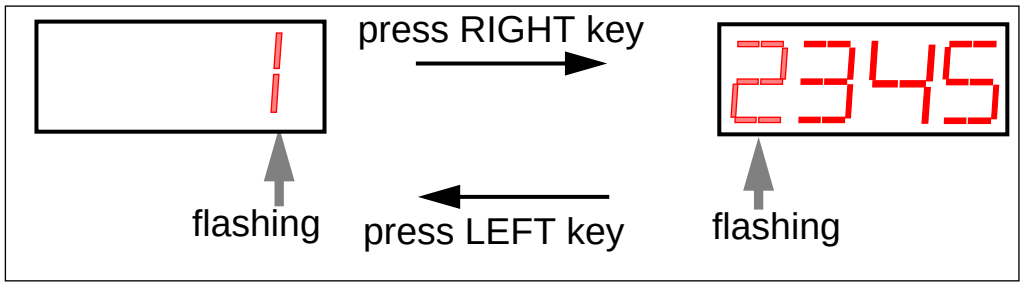
When the terminal is displaying values stored at addresses, no decimal point will be displayed.

If an error occurs with the communication between the terminal and the totaliser the display will show an error message of four half height zeroes.

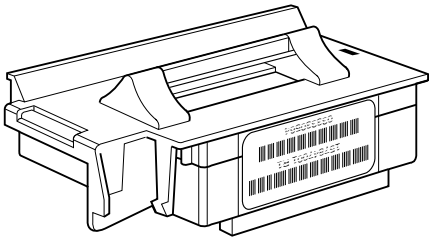


This message will stay on the display. Pressing the RESET key may clear the fault. The display will then revert to showing the current address. If the error occurred while updating an address then the value of that address should be checked as it may not have been updated correctly. If, after pressing the RESET key, the fault remains the error message will stay and you need to return the terminal for repair.

As the screen is capable of only displaying four digits at any one time the number displayed on the screen can be scrolled if it is greater than 9999 by using the LEFT and RIGHT keys. The left or rightmost digit will flash indicating an extra digit can be examined by use of the scrolling keys e.g. Value is 12345



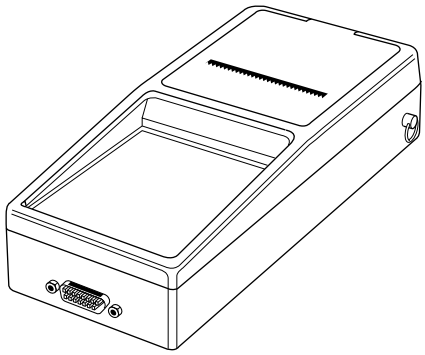
VISUAL AUDIT



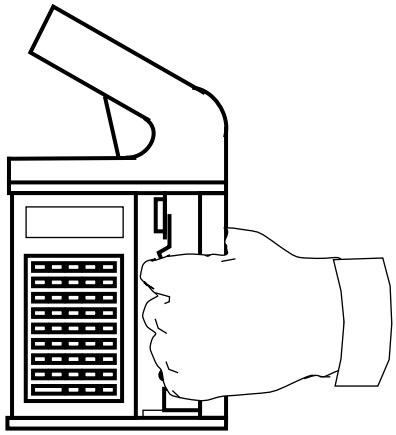
Function Expansion Module

Visual Audit can be obtained, from the electro-mechanical and Executive products only, when an audit function expansion module (FEM) is installed as an accessory on to the Control PCB.

Data can be viewed with the use of a Route Alpha 250 terminal and the process for using this method follows below. Data is also available via a MEI® hand-held printer which can be accessed through an interface loom from the changegiver, through a DEX/ UCS jack-plug connected to a MEI® MEQ terminal, or from an infra-red optical interrogation point in the side of the machine, also using the MEQ terminal.



MEI® Hand-Held Printer



MEI® MEQ Terminal

Visual Audit Interrogation

The Route Alpha 250 terminal display may not be able to show all details for each address. In order to ensure that all data has been read two quite separate addresses must be interrogated, one consisting of the least significant (ls) digits, and the other the most significant (ms) digits of the data.

To convert these two readings to a single audit value the (ms) value shown must be multiplied by 65536 and the (ls) figure added to the result.

The following process should be followed to use the Route Alpha 250 terminal for retrieval of data:

- Firstly select the required address using the Up and DOWN keys.
- Press ENTER to display the contents of the address. If the value exceeds four digits the LEFT and RIGHT keys are used to scroll the display left or right.

EXAMPLE. (To read the Cash In Tubes value)

- Select address 900
- Press ENTER to display the (ls) value, (e.g 54919)
- Press ENTER to return to address mode
- Press UP to select address 901
- Press ENTER to display the (ms) value, (e.g. 18)
- Multiply (ms) value by 65536 (18 x 65536 = 1179648) and add (ls) value. (1179648 + 54919 = 1234567)

NOTES
All values are displayed on the terminal with no decimal point.

In order to reset the interim values address 999 must be used, ensuring that it is set to 9.

All values displayed will be in the range of 0 - 65535.

The relevant addresses for the Route Aplha 250 terminal in the following list are 900-999.

Route Alpha 250 Address Applications

The symbols below appear on the following pages together with most of the following Route Alpha 250 address numbers. They can be used as an aid to indicate which variety of product that each address is used with.

Where no symbol is used this address applies to 4 price electro-mechanical products only.

✘ = Address used with 4 price and Executive only

✙ = Address used with 4 price, Executive and BDV only

▲ = Address used with 4 price, Executive, BDV and MDB

✔ = Address used with Executive and BDV only

✷ = Address used with BDV only

The table below shows you the address of each item that can be re-configured and their possible values.

ADDRESSES AND VALUES

Address	Parameter	Range	Meaning
✣ 21 - 32	Coin types 1 - 12	0-2	0 = coin 1 = value token 2 = vend token
✣ 200	Maximum credit	0-65,535	maximum credit
✣ 201-204	Prices 1 - 4	0-65,535	value of prices 1 - 4
✖ 205-225	Prices 1 - 25 (When advanced audit FEM fitted only)	0-65,535	value of prices 1 - 25
✣ 226	Single/Multivend	0 -1	0 = single vend 1 = multivend
✣ 227	Escrow return inhibit	0 -1	0 = escrow allowed 1 = escrow inhibited
228	Reset mode (Electromech only)	0 - 4	0 = blocker reset 1 = delayed blocker reset (20ms) 2 = delayed blocker reset (300ms) 3 = blocker hold reset 4 = after escrow signal
▲ 229	Coin inhibit, coins 1-4 for multiple coin inhibit, add together e.g. 1 + 8 = 9 so coins 1 & 4 are inhibited	0 -15	0 = no coins inhibited 1 = inhibit coin 1 2 = inhibit coin 2 4 = inhibit coin 3 8 = inhibit coin 4
▲ 230	Coin inhibit, coins 5-8	0 -15	0 = no coins inhibited 1 = inhibit coin 5 2 = inhibit coin 6 4 = inhibit coin 7 8 = inhibit coin 8

Address	Parameter	Range	Meaning
▲ 231	Coin Inhibit, coins 9 -12	0 -15	0 = no coins inhibited 1 = inhibit coin 9 2 = inhibit coin 10 4 = inhibit coin 11 8 = inhibit coin 12
✣ 235	Change delay	0 - 255	delay in 1/2 second steps 255 = infinite delay
✔ 238	Price hold (Protocol A only)	0 - 1	0 = do not hold price 1 = hold price
✣ 244	Keypad inhibit	0 -1	0 = keypad enabled 1 = keypad inhibited
✣ 245	Price teach inhibit	0 -1	0 = price teach allowed 1 = price teach inhibited
246	Fast sense (Electromech only)	0 -1	0 = normal 1 = fast sense
▲ 247	Auto Tube Inventory (float down)	0 -1	0 = float down disabled 1 = float down enabled
▲ 251-254	Tubes A - C float level options	0 - 255	number of coins in a tube to be floated to
▲ 310	Value of coins in tubes READ ONLY	0-65,535	value of coins in all tubes
▲ 311-314	Tubes A - C current coin count READ ONLY	0 - 255	current number of coins in tube
▲ 340	Full sensor errors READ ONLY	0 - 255	value = sum of codes where 1/2/4 = tubes A/B/C 128 = post gate strobe error
▲ 341	Tube dis-abled READ ONLY	0 - 31	value = sum of codes where 1/2/4 = tubes A/B/C
▲ 342	EEPROM errors (i) READ ONLY	0 - 15	1 = errors in page 0 2 = errors in page 1 4 = corrupt audit FEM 8 = audit FEM removed

Address	Parameter	Range	Meaning
▲ 343	EEPROM errors (ii) READ ONLY	0 - 15	1 = incorrect configuration version 2 = audit FEM not defined 4 = undefined 8 = internal write error
▲ 344	Operational errors (i) READ ONLY	0 - 15	1 = undefined 2 = acceptor error 4 = HII hardware error 8 = HII transmit error
▲ 345	Operational errors (ii) READ ONLY	0 - 15	1 = coin cassette removed 2 = protocol A transmit error 4 = protocol A receive error 8 = cashbox full error
✷ 346	BDV errors i	0 - 15	value = sum of codes where 1 = audit timed out 2 = vmc timed out 4 = cpc timed out 8 = audit not initialised
✷ 347	BDV errors ii	0 - 15	value = sum of codes where 1 = audit incompatible 2 = vmc incompatible 4 = cpc incompatible
▲ 349	Reset error flags	0 - 1	0 = do not reset 1 = reset error flags
✕ 360	Audit module - VMC identification code (When audit fitted)	0-65,535	vending machine ID
✕ 361	Audit module - printout language (When audit fitted)	0 - 4	0 = English 1 = French 2 = German 3 = Dutch 4 = Spanish
✕ 362	Audit module - printout type (When audit fitted)	0 - 2	0 = basic 1 = basic + interim vend report 2 = basic + interim vend + free vend report

Address	Parameter	Range	Meaning
✖ 363	Audit module - printout product limit (When audit fitted)	0 - 25	limit details on printout to first few specified price lines
✖ 364	Audit module - installation day (When audit fitted)	1 - 31	day of installation into the machine
✖ 365	Audit module - installation month (When audit fitted)	1 - 12	month of installation into the machine
✖ 366	Audit module - installation year (When audit fitted)	0 - 99	year of installation into the machine
✸ 382	Link Master ID	0 - 9999	ID code of link master node
✸ 385	audit unit is DBV	0 - 1	0 = audit unit is not BDV 1 = audit unit on system is BDV
✸ 386	VMC unit is BDV	0 - 1	0 = VMC is not BDV 1 = VMC is BDV
✸ 387	CPC unit is BDV	0 - 1	0 = CPC is not BDV 1 = CPC is BDV
✸ 388	Card Reval Allowed	0 - 1	0 = revaluation not allowed, 1 = revaluation allowed
✸ 389	Audit unit fitted	0 - 1	0 = not fitted 1 = audit unit fitted
✸ 390	VMC unit fitted	0 - 1	0 = not fitted 1 = VMC fitted
✸ 391	CPC unit fitted	0 - 1	0 = not fitted 1 = CPC fitted
✸ 392	BDV exact change equation	0 - 1	0 = normal operation 1 = use BDV exact change equation
✸ 393	Audit initialisation required	0 - 1	0 = initialisation not required 1 = initialisation required

Address	Parameter	Range	Meaning
◆ 421-432	MDB changegiver coin types 1 - 12	0 - 2	0 = coin 1 = value token 2 = vend token
✣ 600	Number of bills	0 -15	number of bill supported bt BVI
✣ 601	Value of bill 1	0-65535	bill value 1 in real currency units. Bill values should be in equal/ascending order
✣ 602	Value of bill 2	0-65535	bill value 2 in real currency units. Bill values should be in equal/ascending order
✣ 603	Value of bill 3	0-65535	bill value 3 in real currency units. Bill values should be in equal/ascending order
✣ 611	Bill scaling factor	0-65535	multiplier required to convert number of credit pulses received by the BVI to real currency units
✣ 612	Bill default inhibit map	0 -7	value = sum of codes where 1/2/4 = lowest / middle / highest bill inhibit
✣ 613	Bill exact change inhibit map	0 -7	value = sum of codes where 1/2/4 = lowest / middle / highest bill inhibit
✖ 900	Cash in tubes (ls)	0-65535	visual audit
✖ 901	Cash in tubes (ms)	0-65535	visual audit
✖ 902	Value of cash sales interim (ls)	0-65535	visual audit
✖ 903	Value of cash sales interim (ms)	0-65535	visual audit
✖ 904	Number of cash sales interim (ls)	0-65535	visual audit
✖ 905	Number of cash sales interim (ms)	0-65535	visual audit

Address	Parameter	Range	Meaning
X 906	Value of cash in (ls)	0-65535	visual audit
X 907	Value of cash in (ms)	0-65535	visual audit
X 908	Cash to cash-box (ls)	0-65535	visual audit
X 909	Cash to cash-box (ms)	0-65535	visual audit
X 910	Cash to tubes (ls)	0-65535	visual audit
X 911	Cash to tubes (ms)	0-65535	visual audit
X 912	Dispensed cash (ls)	0-65535	visual audit
X 913	Dispensed cash (ms)	0-65535	visual audit
X 914	Manually invented cash (ls	0-65535	visual audit
X 915	Manually invented cash (ms)	0-65535	visual audit
X 916	Overpay (ls)	0-65535	visual audit
X 917	Overpay (ms)	0-65535	visual audit
X 918	Exact change vend value (ls)	0-65535	visual audit
X 919	Exact change vend value (ms)	0-65535	visual audit
X 920	Value of cash manually filled (ls)	0-65535	visual audit
X 921	Value of cash manually filled (ms)	0-65535	visual audit
X 922	Value of free sales interim (ls)	0-65535	visual audit

Address	Parameter	Range	Meaning
X 923	Value of free sales interim (ms)	0-65535	visual audit
X 924	Number of free sales interim (ls)	0-65535	visual audit
X 925	Number of free sales interim (ms)	0-65535	visual audit
X 926	Printout number (ls)	0-65535	visual audit
X 927	Printout number (ms)	0-65535	visual audit
X 928	Last printout number (ls	0-65535	visual audit
X 929	Last printout number (ms)	0-65535	visual audit
X 930	Value of cash sales total (ls)	0-65535	visual audit
X 931	Value of cash sales total (ms)	0-65535	visual audit
X 932	Number of cash sales total (ls)	0-65535	visual audit
X 933	Number of cash sales total (ms)	0-65535	visual audit
X 934	Value of free sales total (ls)	0-65535	visual audit
X 935	Value of free sales total (ms)	0-65535	visual audit
X 936	Number of free sales total (ls)	0-65535	visual audit
X 937	Number of free sales total (ms)	0-65535	visual audit
X 938	Value of bills in total (ls)	0-65535	visual audit (when used with Bill Validator Interface)
X 939	Value of bills in total (ms)	0-65535	visual audit (when used with Bill Validator Interface)

Address	Parameter	Range	Meaning
X 940	Interim value of bills (ls)	0-65535	visual audit (when used with Bill Validator Interface)
X 941	Interim value of bills (ms)	0-65535	visual audit (when used with Bill Validator Interface)
X 942	Value of vend token sales (ls)	0-65535	visual audit
X 943	Value of vend token sales (ms)	0-65535	visual audit
X 946-966 (Evens only)	Interim of products 0-10 (ls)	0-65535	visual audit
X 947-967 (Odds only)	Interim of products 0-10 (ms)	0-65535	visual audit
999	Interim reset address	0-65535	must be set to 9 to cause interims to be reset

DIAGNOSING TERMINAL PROBLEMS

SYMPTON	CAUSE	SOLUTION
Terminal displays an error message at power up	Communications error	Press RESET
Terminal displays an error message when changing from address to data mode or vice versa	Communications error between terminal and product or the terminal does not recognise the product it has been connected to	Repeat last operation
Terminal powers up correctly but no addresses are accessible	The product is not compatible with the terminal	Requires a different terminal/ software
Terminal does not power up	Bad connections or Faulty cable	Check the connections at either end of lead. Replace lead
Terminal powers up but one of the keys does not work	Faulty key	Use the self test feature. If the key is faulty send unit for repair
Non standard characters printed on display	Faulty unit	Send unit for repair

TESTING THE TERMINAL

It is possible to test all the features of the terminal itself by putting the unit into a special test mode. To enter the test mode hold the ENTER key pressed when powering the unit up. The display will initially show three digits indicating the result of an automatic on board test. The display format is:

[<BUSY state> <DATA state> <AUTO TEST result>] where

<BUSY state> = current state of BUSY line, 0 = low, 1 = high

<DATA state> = current state of DATA line, 0 =low, 1=high

<AUTO TEST result> = result of automatic test

0 = Pass

1 = BUSY line error

2 = DATA line error

3 = BUSY and DATA line errors

Pressing the ENTER key activates the next stage of test.

The LCD is tested by displaying a pattern of four identical digits on the display. The digits alter every 1/2 second and the display should be examined to check all the digits are formed correctly.

Display will show:

[0000], [1111], [2222], [3333], [4444], [5555], [6666], [7777], [8888], [9999], [----], [oooo], [ ], [....].

Pressing the ENTER key activates the next stage of test.

The terminal keys are checked next. A single number is shown on the display indicating what key was pressed last. Display shows:

[**0**] No key pressed

[**1]** UP key pressed

[**2**] RIGHT pressed

[**3**] DOWN key pressed

[**4**] LEFT key pressed

[**5**] ENTER key pressed

This is the last test and the RESET key must be pressed to restart the terminal in normal operational mode.

COMPATIBILITY

The CashFlow® 520 product range is compatible with the majority of modern vending machines. It is a plug compatible replacement for the previous MS1500, MS1600, ME1600 and ME1900 series of changegivers. The options currently available are;

- CashFlow® 520 - 4 price - A four price electromechanical changegiver

Interfaces are provided for a credit display if required on the above variant.

- CashFlow® 520 - Executive - changegiver with an electronic Protocol A serial interface
- CashFlow® 520 - BDV - changegiver with an electronic BDV serial interface
- CashFlow® 520 - MDB - changegiver with an electronic MDB serial interface

The looms fitted to the CashFlow® 520 products have a range of connectors and pinouts to be fully compatible with existing machine wiring. The table below shows the new CashFlow® looms and the old interface looms which they replace.

CashFlow® Machine Loom No.	Replaces	Serial (Protocol A)	BDV	MDB	Electro mechanical	No. of Price Lines
T1	EA	✓				N/a
T2	E05,EB		✓			N/a
T3	B32,FI, F16				✓	1
T4	FF,B12,F 15, F26				✓	4
T5	FB,B03,B 62 F03,F10, F35				✓	4
T6	FJ, F02, F27, B02				✓	3

CashFlow® Machine Loom No.	Replaces	Serial (Protocol A)	BDV	MDB	Electro mechanical	No. of Price Lines
T7	FA, No credit relay	(Gen. purpose loom) Adaptor looms 3, 4, 5 and 6 are used in conjunction with this loom				
T8	FD,B74,F01				✓	4
T9	FC,B60,F08,F33				✓	4
T11	FE,F12				✓	4
T12	FG,F44				✓	4
T13	--				✓	4
Machine Loom 165972002	FF, F26 Adaptor				✓	4
MDB				✓		

ENVIRONMENTAL PERFORMANCE

Products are available to meet the following environmental specification.

TEMPERATURE RANGE

Working ambient	- 15 to 60°C
Max rate of change	15°C/hr non condensing
Storage	-40 to + 65°C
Solar radiation	Max. working ambient applies

HUMIDITY

Operational	Worst case up to 90% RH, non condensing at 43°C
Storage	Worst case up to 95% RH, non condensing at 65°C

VIBRATION

Operational - units will not be damaged by these conditions:

Vibration (through machine mounting)	0.25g at 5 to 500 Hz. Intermittent over the unit's life. Refer to BS2011: part 2.1 Fc:1983

INSTALLATION

To ensure that the changegiver operates correctly it must be mounted so that it hangs within +2° of vertical, in both front and side elevations.

TRANSPORTATION

Units in the packed state will not sustain any physical damage under these conditions:

Shock	Half sine, 30g shock, 18ms duration. Refer to BS 2011: part 2.1 Ea: 1977
Bump	1000 bumps 6ms duration at 25g. Refer to BS 2011: part 2.1 Eb: 1977
Free Fall	1000mm fall onto packing faces. Refer to BS 2011: part 2.I Ed: 1977
Crush	Neatly stacked units of the same type may be stacked to a height of 2 metres

LIQUIDS

Water

The units inclusive of PCB's will be splash protected.

The coin entry encourages excess water towards the reject path and the front of the product out of the coin path. Coin stall under these conditions is minimised.

The above should in no way be interpreted as a specification capable of operating at 100% RH.

Salt Water

As above.

Prolonged exposure in a salt laden atmosphere will lead to PCB corrosion damage.

Other Liquids

This includes: dilute carbonic acid, dilute citric acid, carbonated drinks, beer, tea, coffee, chocolate, soup, syrup and sugar residue, uric acid.

- Certain beverages and the dilute acids may cause similar effects to salt water if they contact the PCB's
- Wet performance will be similar to that described for 'water'
- Liquids which leave a residue on drying which affects the passage of coins could cause malfunction

VOLTAGE

Supply

The unit will operate to specification on the following supply voltages:

46 - 64 Hz AC RMS.

- 20.4 - 26.4 V RMS
- 87 - 121 V RMS
- 95 - 132 V RMS
- 187 - 242 V RMS
- 212 - 264 V RMS
- 207 - 244 V RMS* single transformer profile

Note: For each of the above voltage waveforms the peak voltage must be √2 *V RMS.

Note: During the life of the defined products, there will be a requirement for European equipment (whole vending machine) to operate at 230 V +6%, -10%. Most states except UK have agreed to this change. The 240V transformer design is such that this change can be accommodated.

VOLTAGE TRANSIENTS

Minimum performance can be regarded as that stated under the section on sucseptability.

The unit will perform to criteria A for supply loss (100%) of up to two cycles.

For supply loss of greater than 2 cycles then performance criteria B applies.

SAFETY CLASSIFICATIONS

CLASSIFICATION

The changer products will comply with :

- UL 756 “Coin and currency changers and actuators”
- IEC 335, 3rd Edition “Safety of household and similar electrical appliances”

PARTITIONS

All of the following lines are assumed to be at mains potential (live parts at hazardous voltage).

Mains input (live & neutral)

Exact change output

Price sense inputs

Price outputs

Blocker (vend start) input

Escrow accept input

Price line common input

Safety line output

All of the following lines, and any other circuits accessible without the removal of any covers using a tool are assumed to be unearthed accessible SELV circuits as defined in IEC 335.

Protocol A current loop

MEI terminal link

Credit display

Cashbox full connector

Acceptor serial link

Credit relay coil output

SAFETY INSULATION

Safety insulation is provided between :

a) All operator points of contact without tool access and hazardous voltages

b) SELV circuits and hazardous voltages

Safety insulation (as defined above) is provided as follows :

- Clearance through air ≥ 8.0 mm
- Creepage over insulation surface ≥ 8.0 mm
- Thickness through insulation (except for cables)
- Accessible reinforced insulation ≥ 2.0 mm
- Basic insulation ≥ 1.0 mm
- Dielectric strength of reinforced insulation : 3750 VAC RMS for 1 minute
- Dielectric strength of supplementary insulation : 2750 VAC RMS for 1 minute

Insulation is provided between poles of the supply input (live & neutral) and to other hazardous voltages as follows :

- Clearance through air before fuse ≥ 2.5 mm
- Clearance through air after fuse ≥ 1.0 mm
- Creepage over insulation surface before fuse ≥ 3.0 mm
- Creepage over insulation surface after fuse ≥ 1.0 mm
- Dielectric strength over basic insulation ≥ 1250 VAC RMS for 1 minute

ENERGY STORAGE

The maximum energy stored in the changers smoothing capacitor will be less than 5.1 Joules at maximum input voltage and no load.

FLAMMABILITY

All major plastic parts are moulded in materials with a flammability rating of UL 94 V-2 or better. Small parts which do not form part of the fire containment enclosure, or which are not located close (< 13.0 mm) to live (hazardous) parts, may be moulded from a material with a flammability rating of UL 94 V-HB.

ELECTRO-MECHANICAL AND MAINS INPUT RATINGS

- Input: (line and neutral) fused neutral only 1.6A thermal
  Fault rating 3.5A

- Exact change fused neutral only 1.6a thermal
  Load rating 0.5A
  Fault rating 3.5A

- Price line common
- Price lines, safety line fused PLC only 3.15A fast
  Load rating 2.6A
  Fault rating 7A

The changer will satisfy the requirements of class 2 equipment as defined in IEC 950.

MECHANICAL PARTS

The changer does not contain mechanically moving parts, or sharp edges, which can present a hazard in normal use.

MEI OFFICES

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V

APPENDIX

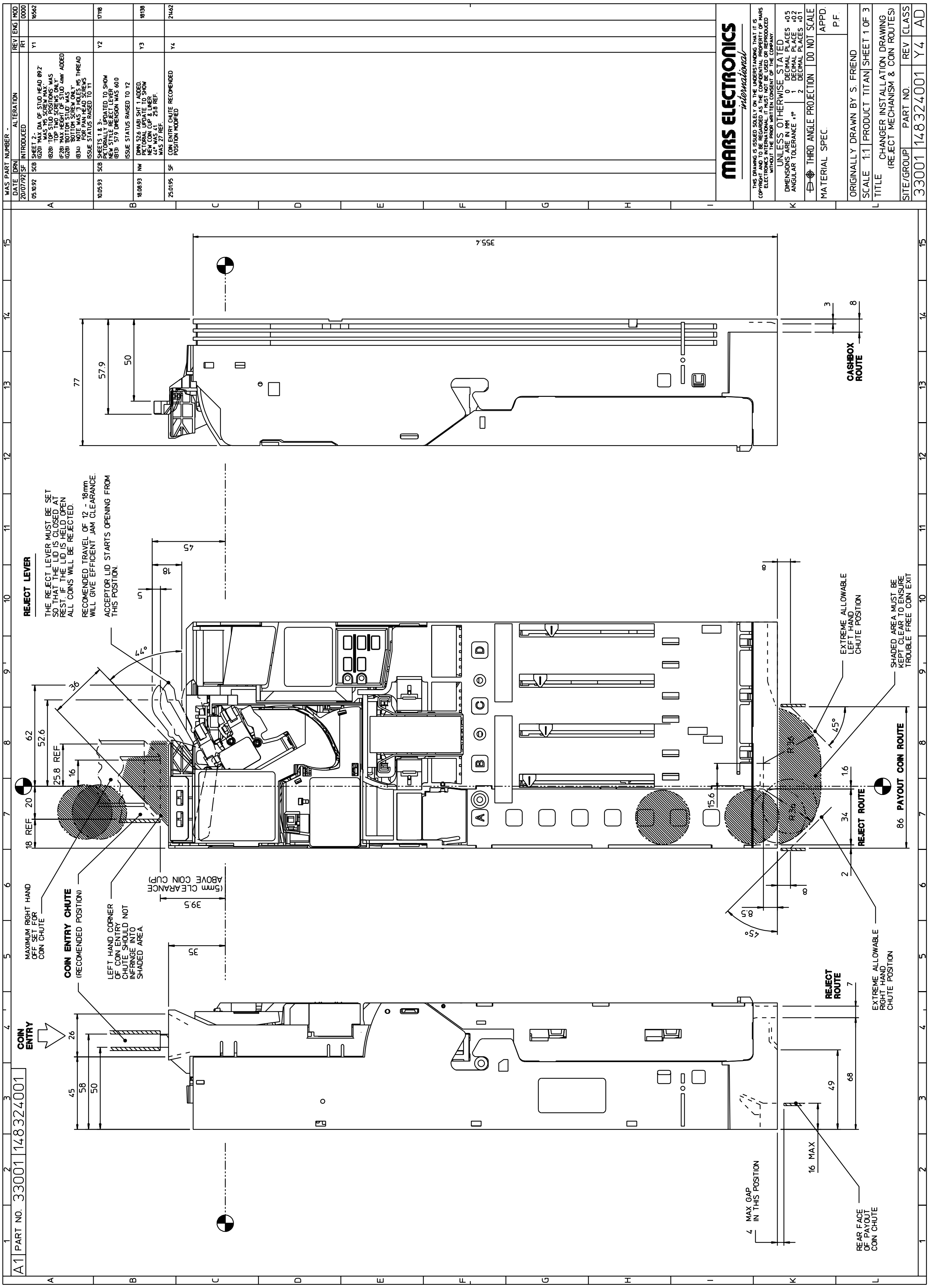
INTERFACE DRAWINGS

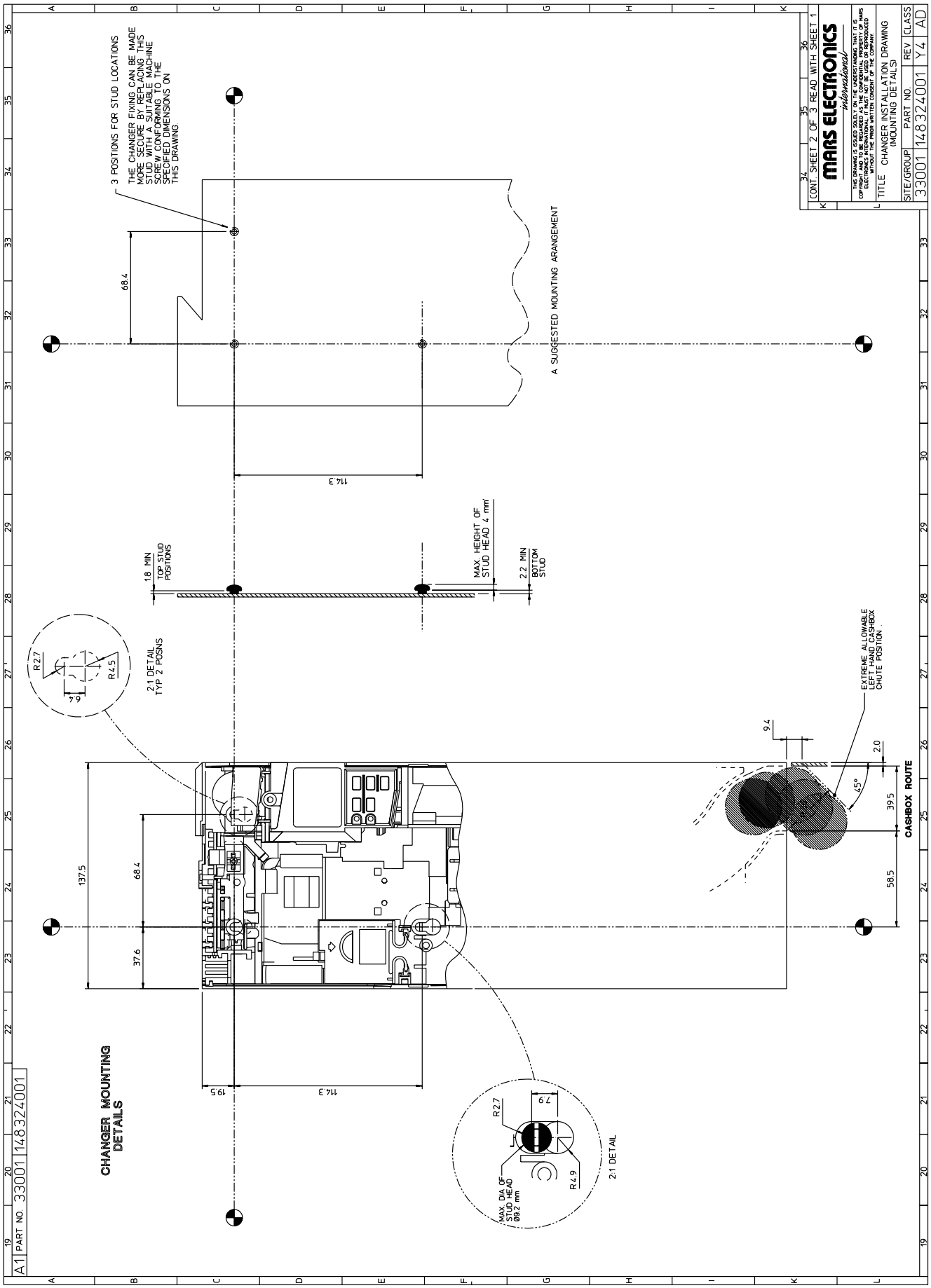
Mechanical interface drawing number 148324001, (consiting of 3 separate sheets), shows generic dimensional details of the CashFlow® range of changegiver products and is not to be considered specific to the CashFlow® 520 product.

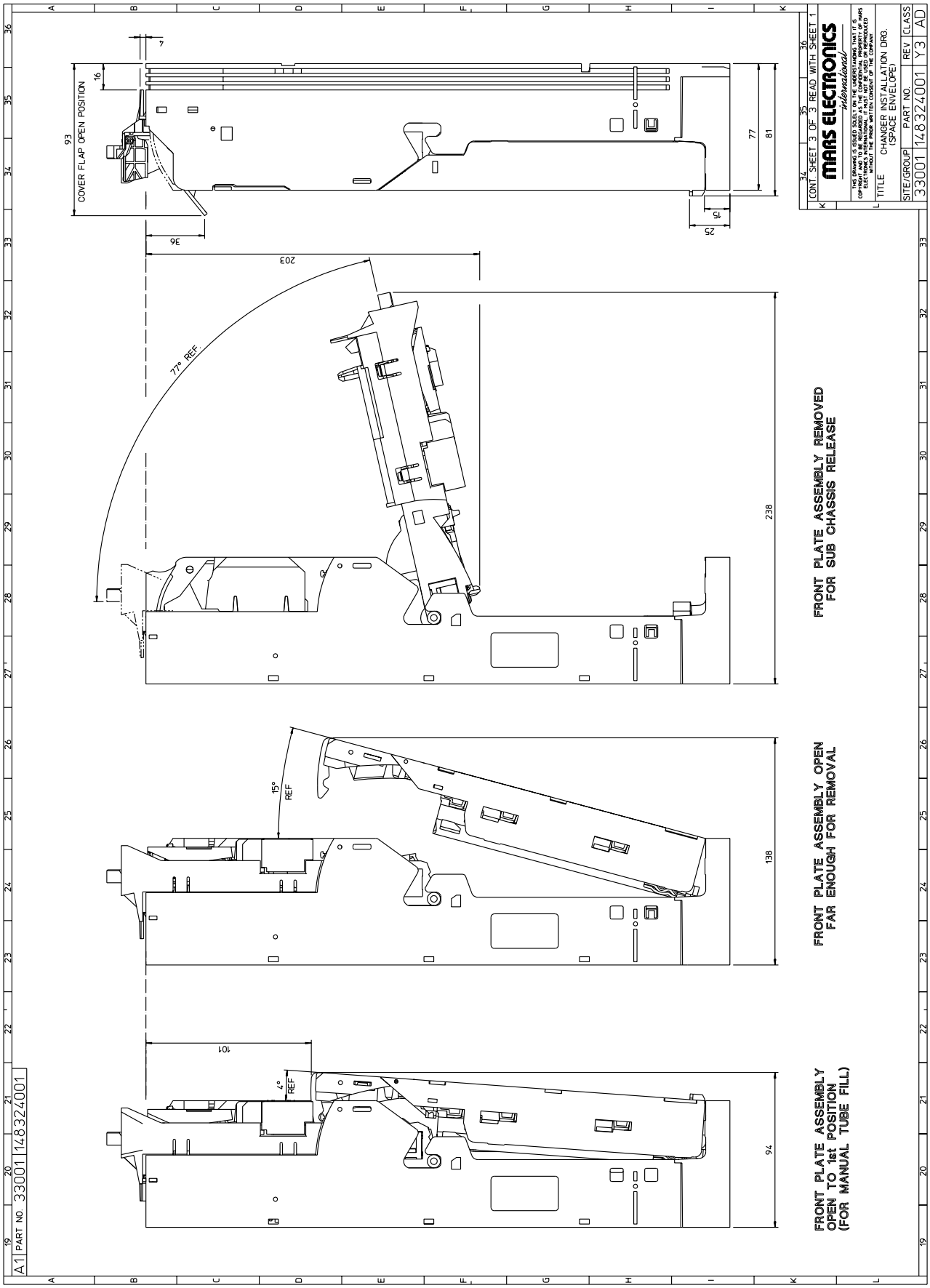
It follows that any indication of a fourth tube should be ignored. All external and internal measurements shown on drawing number 148324001 are, however, consistent with other CashFlow® changegiver products.

Details shown include the following:

- Reject Mechanism & Coin Routes
- Mounting Details
- Space Envelope


REJECT LEVER
THE REJECT LEVER MUST BE SET SO THAT THE LID IS CLOSED AT REST. IF THE LID IS HELD OPEN ALL COINS WILL BE REJECTED.
RECOMENDED TRAVEL OF 12 - 18mm WILL GIVE EFFICIENT JAM CLEARANCE.
ACCEPTOR LID STARTS OPENING FROM THIS POSITION.
COIN ENTRY CHUTE (RECOMENDED POSITION)
MAXIMUM RIGHT HAND OFF SET FOR COIN CHUTE
LEFT HAND CORNER OF COIN ENTRY CHUTE SHOULD NOT INFRINGE INTO SHADED AREA.
(5mm CLEARANCE ABOVE COIN CUP)
COIN ENTRY
CASHBOX ROUTE
PAYOUT COIN ROUTE
REJECT ROUTE
EXTREME ALLOWABLE LEFT HAND CHUTE POSITION
SHADED AREA MUST BE KEPT CLEAR TO ENSURE TROUBLE FREE COIN EXIT
EXTREME ALLOWABLE RIGHT HAND CHUTE POSITION
4 MAX GAP IN THIS POSITION
REAR FACE OF PAYOUT COIN CHUTE
MARS ELECTRONICS international
THIRD ANGLE PROJECTION
ORIGINALLY DRAWN BY S. FRIEND
PRODUCT TITAN
CHANGER INSTALLATION DRAWING (REJECT MECHANISM & COIN ROUTES)
33001 148324001


3 POSITIONS FOR STUD LOCATIONS
THE CHANGER FIXING CAN BE MADE MORE SECURE BY REPLACING THIS STUD WITH A SUITABLE MACHINE SCREW CONFORMING TO THE SPECIFIED DIMENSIONS ON THIS DRAWING
68.4
114.3
A SUGGESTED MOUNTING ARRANGEMENT
18 MIN TOP STUD POSITION
MAX HEIGHT OF STUD HEAD 4 mm
2.2 MIN BOTTOM STUD
R27
R45
6.4
2:1 DETAIL TYP 2 POSNS
EXTREME ALLOWABLE CHUTE POSITION
CASHBOX ROUTE
9.4
2.0
45°
39.5
58.5
137.5
68.4
37.6
19.5
114.3
R27
7.9
R49
MAX. DIA OF STUD HEAD Ø8.2 mm
2:1 DETAIL
CHANGER MOUNTING DETAILS
A1 PART NO 33001 148324001
CONT. SHEET 2 OF 3 READ WITH SHEET 1
MARS ELECTRONICS international
THIS DRAWING IS ISSUED SOLELY ON THE UNDERSTANDING THAT IT IS COPYRIGHT AND IS LOANED AS THE CONFIDENTIAL PROPERTY OF MARS ELECTRONICS INTERNATIONAL. IT MUST NOT BE USED OR REPRODUCED WITHOUT THE PRIOR WRITTEN CONSENT OF THE COMPANY.
TITLE CHANGER INSTALLATION DRAWING (MOUNTING DETAILS)
SITE/GROUP 33001
PART NO. 148324001
REV Y4
CLASS AD


COVER FLAP OPEN POSITION
93
16
7
36
77
81
15
25
203
77° REF
238
FRONT PLATE ASSEMBLY REMOVED FOR SUB CHASSIS RELEASE
15° REF
138
FRONT PLATE ASSEMBLY OPEN FAR ENOUGH FOR REMOVAL
101
7° REF
94
FRONT PLATE ASSEMBLY OPEN TO 1st POSITION (FOR MANUAL TUBE FILL)
mars electronics international
CONT SHEET 3 OF 3 READ WITH SHEET 1
TITLE CHANGER INSTALLATION DRG. (SPACE ENVELOPE)
SITE/GROUP 33001
PART NO. 148324001
REV Y3
CLASS AD
A1 PART NO 33001 148324001