NCR 5635
Spray Currency Dispenser
Service Manual

B006-6280-A000

April 2002

Federal Communications Commission (FCC) Radio Frequency Interference Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Class A Device Declaration

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Réglement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

Information to User

This equipment must be installed and used in strict accordance with the manufacturer's instructions. However, there is no guarantee that interference to radio communications will not occur in a particular commercial installation. If this equipment does cause interference, which can be determined by turning the equipment off and on, the user is encouraged to consult an NCR service representative immediately.

Caution NCR Corporation is not responsible for any radio or television interference caused by unauthorised modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by NCR. Such unauthorized modifications, substitutions, or attachments may void the user's authority to operate the equipment. The correction of interference caused by such unauthorized modifications, substitutions, or attachments will be the responsibility of the user.

Revision Record

Date	Page	Description of Change
April 2002	All	First issue of manual.

5635 Spray Currency Dispenser Service Manual

Preface

Purpose

This manual contains the information required to maintain the 5635 Currency Dispenser. It includes a functional description of the dispenser, adjustment procedures, calibration procedures, internal cabling, connector pinouts, strapping details, power requirements, and mechanical installation in the host.

Audience

This manual is intended for design engineers who will be designing a host cabinet for the dispenser and for service engineers who will be maintaining the dispenser.

Organisation

The manual is organised into four chapters and one appendix as follows:

Chapter 1 - **Functional Description**

Containers description, cassette identification, security levels, specification currency media, path of notes through dispenser, arrangement of sensors, power up/reset initialisation, and singularity detection.

Chapter 2 - **Installation**

How to mount the dispenser in a host.

Chapter 3 - **Operating Instructions**

How to load cassettes into the dispenser, and clear jams

Chapter 4 - **Maintenance Instructions**

Calibrating procedures, adjustment procedures, interpreting level 0 diagnostics, preventive maintenance procedures and module replacement procedures.

Appendix A - **Specifications**

Detailed specifications for the dispenser: environmental, physical dimensions, media, weight, power supply, interface and cabling (EMC)

Related Information Products

Other NCR publications relating to the 5635 currency dispenser are:

- *NCR 5635 Spray Currency Dispenser - Owner's Guide* (B006-6279-A000). Aimed at the person who will be responsible for the day to day running of the dispenser, this book describes the replenishment tasks of loading currency cassettes and clearing jams.
- *NCR 5635 Spray Currency Dispenser - Programmer's Manual* (B006-6283-A000). This book contains details of the command set, message protocol, and communications interfaces, necessary to write an application to control the dispenser.

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Chapter 1

Dispenser Functional Description

Introduction
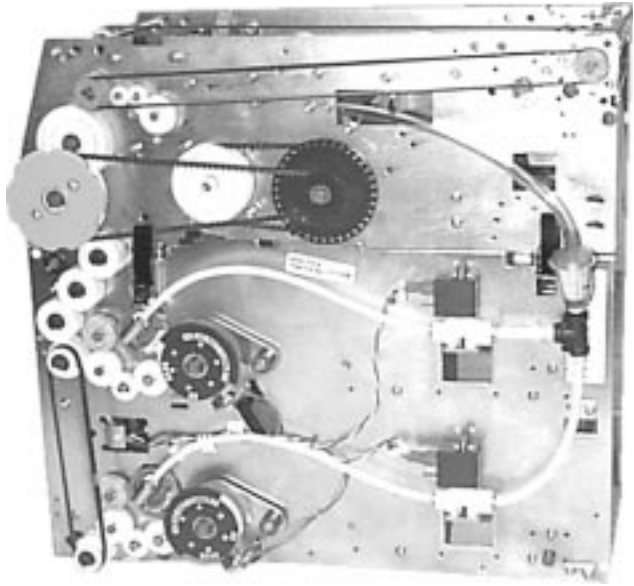
The 5635 Spray Currency Dispenser dispenser is designed to take currency bills from a secure storage, check them, and present them to the cardholder. The term **spray** is used to describe the way that the dispenser presents the bills in a continuous stream, or spray, rather than bunching them together and presenting the bills as a single bundle.

The dispenser operates as an intelligent device under the control of its own on-board microprocessors. It communicates with the PC core over an RS-232-C serial interface.

The dispenser consists of the following modules:

- Currency Containers
- Pick Modules
- Presenter
- Control Board.

The dispenser consists of from one to four pick modules hung beneath a spray presenter module to allow one, two, three or four pick positions. Pick position number 1 is immediately below the spray module, number 2 is below number 1, number 3 below number 2, and 4 below 3.

Cassettes containing the currency are latched into the pick modules and the currency is dispensed from the cassettes and transported to the exit slot to be collected by the cardholder. Misfed or faulty currency is diverted into a purge bin.

The path of notes through the dispenser is shown in the following diagram.
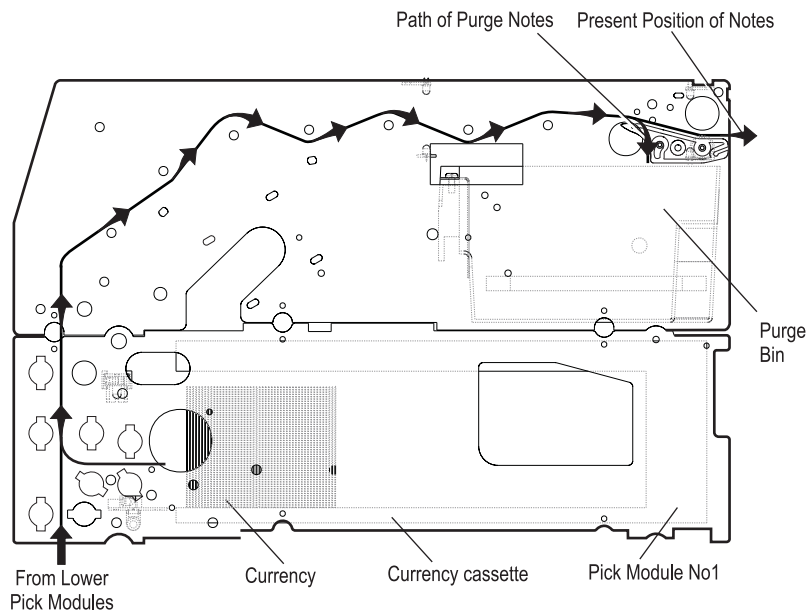
Path of Purge Notes   Present Position of Notes

Purge Bin

From Lower
Pick Modules   Currency   Currency cassette   Pick Module No1

Currency Containers

Currency in the dispenser is held in currency cassettes which can also be used to transport currency between a central loading area and the location of the Automated Teller Unit (ATM). Security is provided by a seal on the cassette lid latch.

Rejected currency is diverted to the purge bin in the dispenser. This bin can be just an open area fitted with a sealable flap or can be a container that latches into the dispenser.

Both the currency cassettes and the purge bin remain seal fast secure when the ATM is opened

Currency Cassettes

Currency cassettes are moulded in high impact polycarbonate in three parts: the lid, the body and the base.
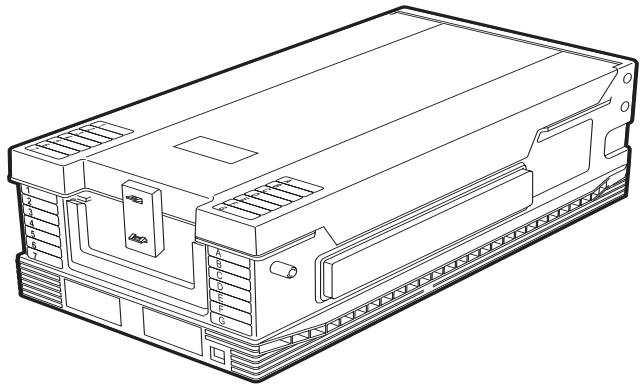
There are two types of cassette used with the 5635 dispenser; Standard and Tamper Indicating. The Tamper Indicating cassette has a counting mechanism in the base that counts the number of times the cassette is inserted into the dispenser up to a maximum of six. This feature provides additional security in the handling and movement of cassettes.

Spacers and note guides in the cassette are adjusted to hold a single currency denomination within the range of sizes of bills dispensed by the currency dispenser. This range is as follows:

Minimum		Maximum	
Width	Length	Width	Length
62mm (2.44in)	120mm (4.72in)	95mm (3.74in)	172mm (6.77in)

The illustration below shows an open currency cassette looking from the rear (handle) end towards the front (truck door) end.
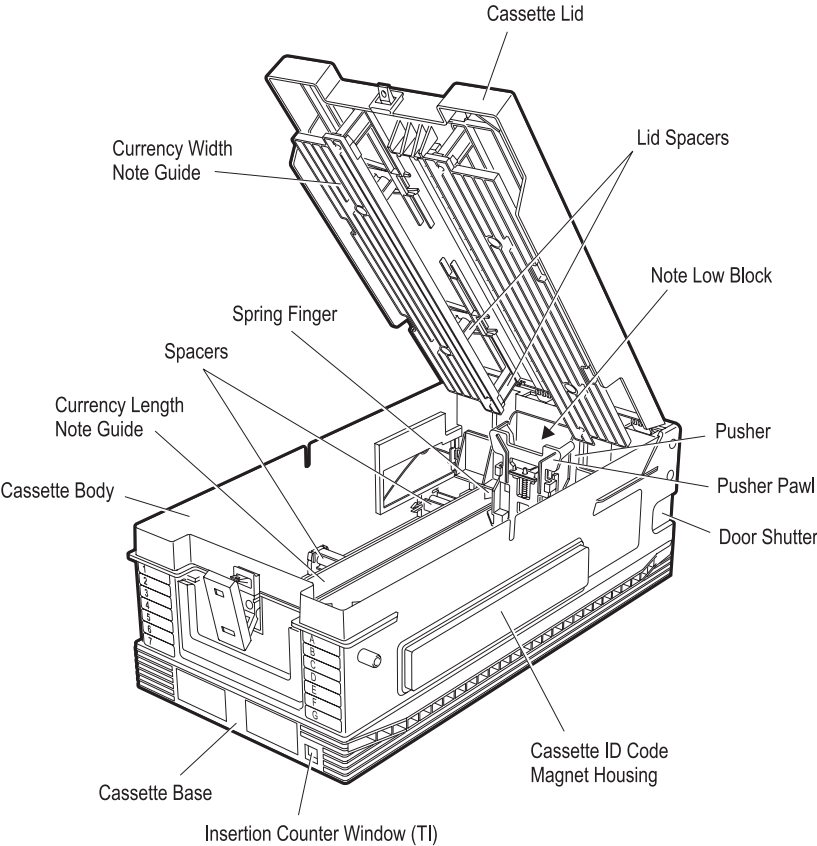
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Use pursuant to Company Instructions

The Cassette Lid

The cassette lid hooks into locating slots at the front of the body and is latched at the rear. A bank seal can be used to secure the latch.

The Cassette Body

The cassette body holds the stack of currency under pressure from a spring-loaded pusher mechanism. The front of the cassette is formed by a roller type truck door which is opened only when the cassette is inserted into the dispenser pick module. As notes are taken from the stack at this open end the pusher moves towards the front. A magnet attached to the pusher operates a reed switch in the pick module to signal a low currency condition when the stack has almost all been dispensed.

Other magnets, under a cover on the side of the cassette, in combination with reed switches on the pick module, produce a binary code that is used to identify the cassette type to the dispenser software, and, therefore, the value of the currency it contains. A cassette can be put in a pick module in any position and its type will be recognised from the magnet code. More than one cassette of a particular type can be installed. The dispenser treats all cassettes with the same type as one logical cassette.

The Cassette Base

The following illustration shows the components inside the cassette base.

Rubber
Bumper

Truck Door   Rachet Slide   Rachet Lever
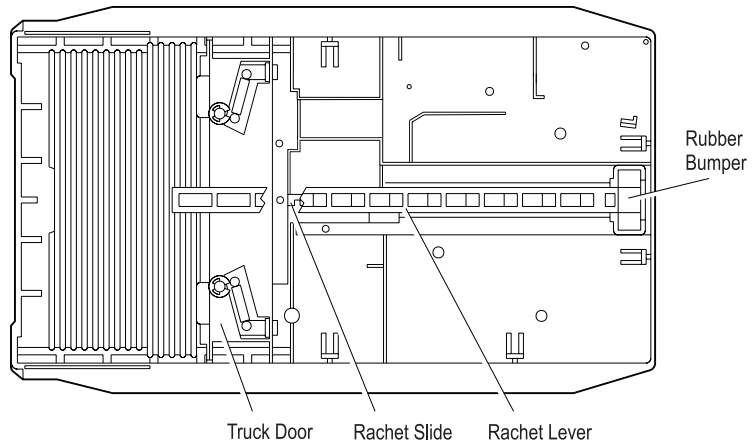
The base of the cassette holds the truck door and its retraction mechanism, the pusher ratchet slide and lever. The external shape of the base forms rails which slide into the cassette guides in the pick module.

Cassette Operation
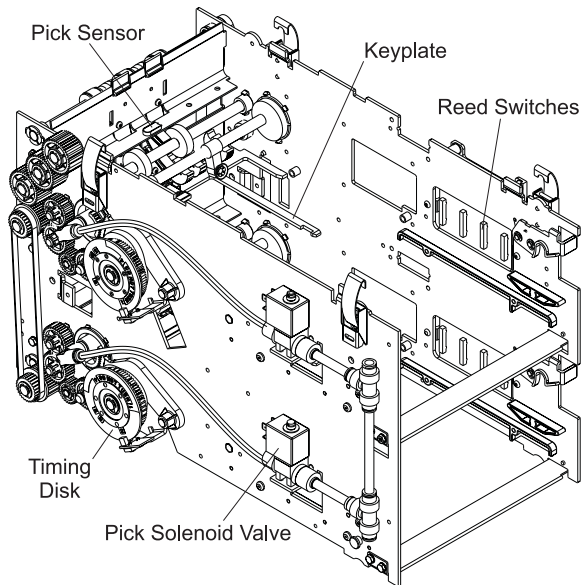
The above illustration shows the components of the dispenser pick module which mate with the cassette. When the cassette is inserted into the dispenser the prongs of the pick module keyplate enter the holes in the base of the cassette and push against locking pawls on the truck door. The door is pushed into the cassette base, leaving the front open to permit the currency to be picked from the cassette and dispensed.

Removal of the cassette from the dispenser automatically closes and latches the front door and the interior of the cassette can only be reached by opening the top access lid.

Purge Bin

The purge bin is located in the presenter module just where the currency exits from the dispenser. If a fault is detected during a dispense (say, double or damaged bills) then the reject gate is operated to deflect the bills into the purge bin.

There are two types of bin in the 5635 dispenser:

● Standard
● Latch fast.

The standard bin consists simply of a space below the presenter transport fitted with a flap door that can be sealed.
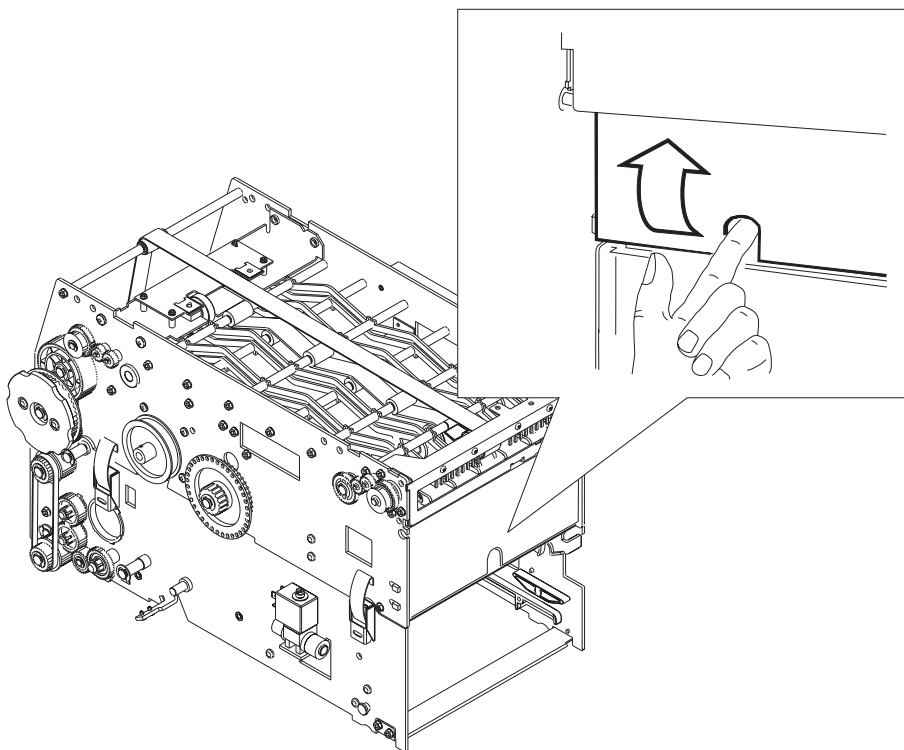
The latch fast bin is located in the same area but has a similar mechanism to the currency cassettes in that it is latched into place and keyplate prongs open a slot in the top of the bin to accept the rejected currency. Currency is removed from the latch fast purge bin through a door that can be sealed. A microswitch in the presenter informs the firmware that the latchfast bin is in place.
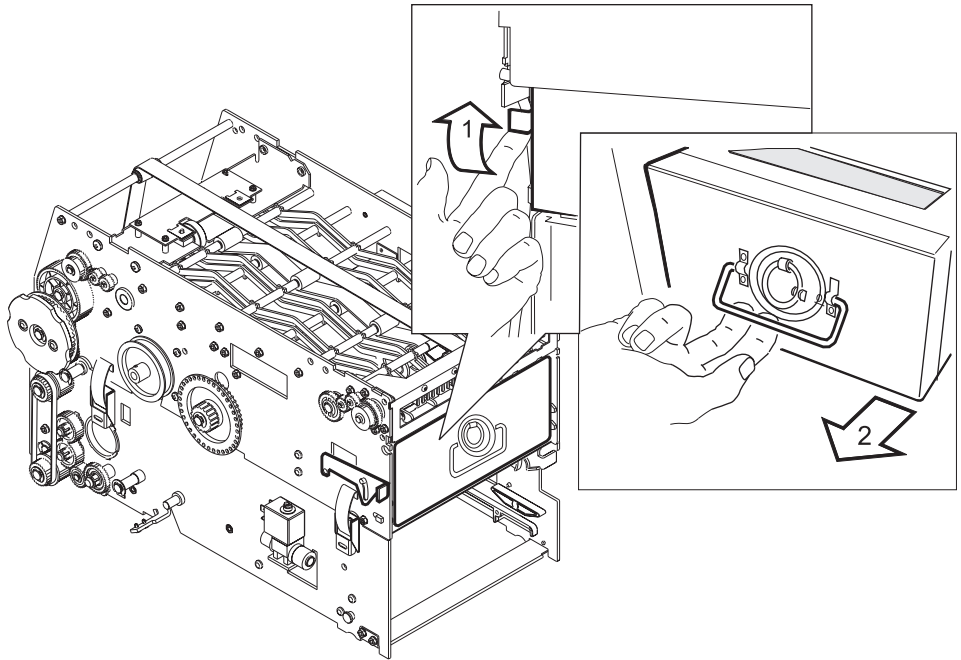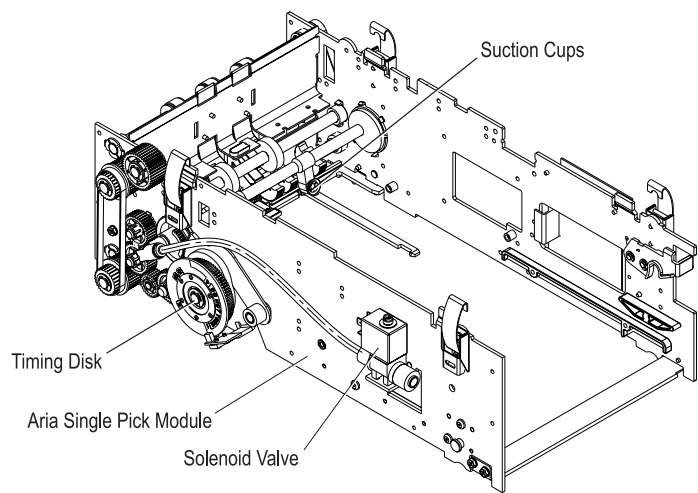
Pick Modules

The pick modules pick bills from the currency cassettes and transport them to the spray presenter. The movement of items through the transport is monitored. Pick modules can be either single or double (can hold one or two cassettes) and are fitted below the presenter to give one, two, three, or four cassette positions. Pick positions are numbered top to bottom with 1 at the top.

The table below lists the functions of the pick module and the components responsible for achieving the function:

Pick Module Functions	Components Responsible
Hold a currency cassette	Cassette guides and latch mechanism
Identify the inserted cassette	Cassette identity sensors
Open the front of the cassette	Pick module keyplate

Pick Module Functions	Components Responsible
Pick bills one by one from the cassette	Pick arms and suction cups Pick solenoids and timing disks Pick sensor
Detect when currency is running low	Cassette low sensor
Transport the bills to the next pick module above or to the spray presenter.	Belt and gear driven transport mechanism

Currency Cassette Guides and Latch

The currency cassette rests on rails in the side frames of the pick module. Upper guides on the side frames and a spring loaded catch hold the cassette firmly in position.

Cassette Identity Sensors

A PCB on the side of the pick module carries four (or eight on the double pick module) encapsulated reed switches. These switches are influenced by small permanent magnets housed on the side of the cassette. The magnets can be moved within the cassette housing, or left out, so that a given combination of switches is activated. This creates a binary code (see Chapter 4) which is used to identify the cassette to the firmware on the control board and thus to the terminal's application software which is then able to dispense bills of a specific denomination.

Pick Module Keyplate

When the cassette is inserted into the dispenser the prongs of the pick module keyplate enter the holes in its base. The cassette door is pushed into the cassette base, leaving the front open to permit access to the currency. On removal of the cassette, the keyplate draws the cassette door closed and secures the currency within the cassette.

Pick Action

Each pick module carries one pick solenoid, a vacuum system connected to the vacuum pump in the presenter, and a pick mechanism. The pick solenoid is energized to cause the vacuum to be applied to the suction cups. The pick solenoid stays energized when multiple bills are picked from the same cassette. For each pick cycle one bill is picked and fed into the transport mechanism.

In the case of a failure to pick a bill, the pick solenoid stays energized for an additional three or four cycles. After the first failure to pick, the firmware searches for another cassette of the same currency denomination. The search order is from cassette position 1 downwards. If the pick sensor still does not detect a bill, there is a delay of one second, to allow the vacuum to build up, and then another pick attempt is made. If this fails, there is a further delay of ten seconds and one more attempt is made to pick a bill. If a bill has not been picked after three attempts of four or five pick cycles, a status code identifying the pick failure is sent to the PC core.

Pick Mechanism Operation

After receipt of a valid dispense command, the dispenser motor is switched on to drive all the dispenser transport sections, swing the pick arms back and forth, and drive the vacuum pump.

A plastic disk printed with timing marks is attached to the drive cam that imparts the oscillating motion to the pick arms. A cut out section of the disk forms a timing arc which is detected by an optical switch and is used (ANDed with a signal from the currency dispenser control board) to produce the electrical pulses that energize and de-energize the pick solenoid valve. The solenoid valve is energized following a transition through sensor clear to sensor blocked and it remains energized while the segment on the disk is obscuring the optical sensor. This time corresponds to the time when the pick arms are just reversing away from the currency in the cassette until they are above the pick wheels of the transport.

When the solenoid valve is de-energized it closes off the pump section of tubing. The tubing to the pick arm vents to atmosphere via backflow through the de-energized solenoid. The note drops off the suction cups and is gripped by the pick and pressure wheels.

The letter D and numbers 1, 2, 3, and 4 printed on the timing disk are used to set and check the timing of individual pick modules and this adjustment is described in the "Adjustments" section of Chapter 4.

The following list summarises a single pick operation cycle:

● As the pick arm suction cups are about to touch the bills in the cassette, the pick solenoid energizes and the vacuum is applied to the suction cups

● The pick arm suction cups then hit and hold the end bill within the cassette
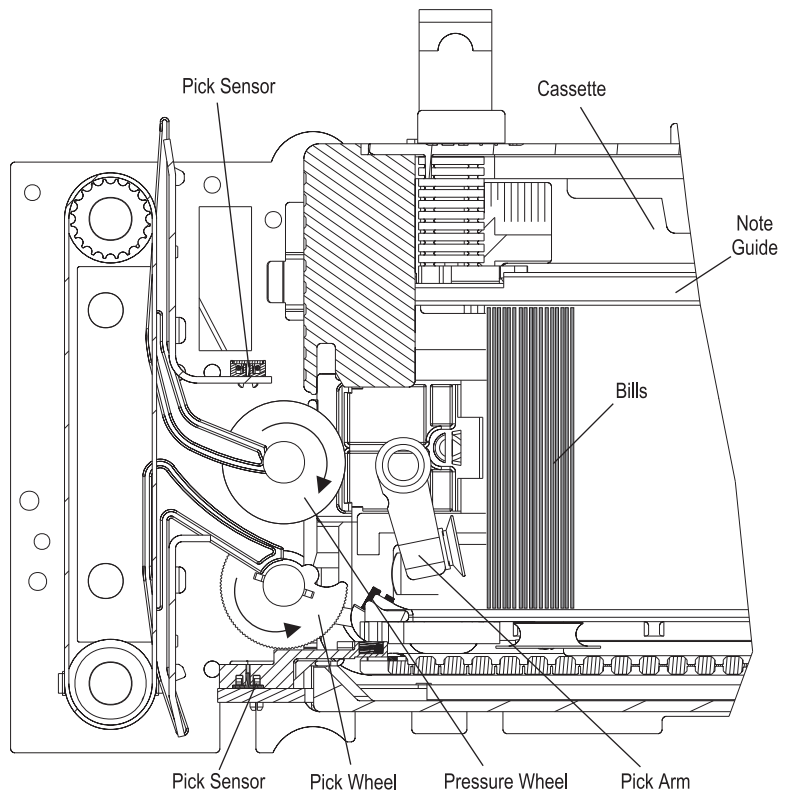
● The pick arms swing up and away from the cassette, removing the bill through the door opening and positioning it just above the pick wheels

● The bill is taken up between the pick and pressure wheels and fed into the transport section.

The above pick and feed operation repeats until the bill count of good bills at the pick sensor equals the number given by the dispense command.

Pick Sensor

A photosensor, mounted between the pick mechanism and the transport section, detects that a bill has been picked from the cassette. The pick sensor consists of two assemblies hard wired to the pick harness. A photo-transistor is on one assembly and an infra-red light emitting diode is on the other. The light emitting diode is in the same assembly as the cassette low sensor. The pick sensor and the LED are attached so that they "look" across the path of the notes so that when a note blocks the light path, it is detected. The pick sensor output is converted into note width by monitoring the number of interrupts while the sensor is blocked with the interrupts generated by the main transport timing disk on the presenter. A difference of plus 5 or minus 5 timing wheel ticks in width from the known width of the currency (stored in NVRAM) will cause the note to be rejected to the purge bin and the pick to be attempted three more times.

Cassette Low Sensor

The cassette low sensor consists of a reed switch attached to the pick module keyplate. The reed switch is held on a bracket which projects into the open door of the cassette. It operates when a permanent magnet attached to the currency pusher mechanism approaches the front of the cassette. In the plastic cassette, the position of this magnet can be set to actuate the switch when either 75 ± 50 or 200 ± 50 bills are left.

Pick Module Transport

The vertical transport of the pick modules on the 5635 dispenser consists of three belts stretched between an upper driven shaft and a lower idler shaft. Smooth plastic skid plates project between the centre belt and the two outer belts. The belts press the centre and ends of the notes beyond the top surface of the skid plates so that the notes are held in pinch and adopt a shallow W-shape as they are driven upwards into, either, the transport of a higher pick module, or the spray presenter transport.

NCR 5635 Spray Currency Dispenser Service Manual
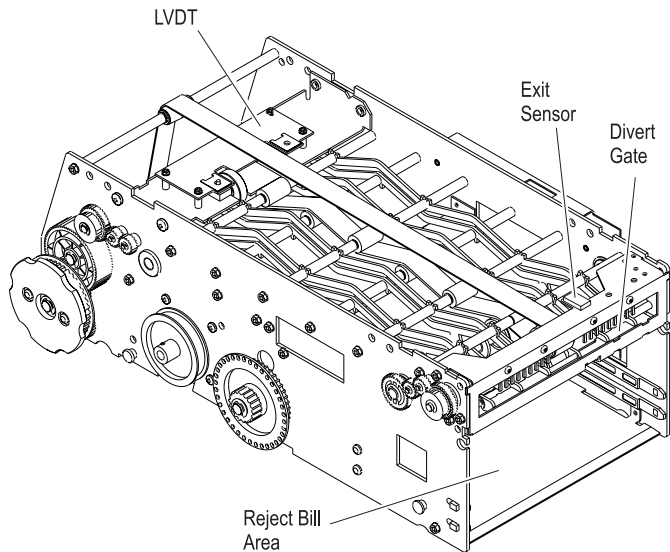
Presenter

The spray presenter is mounted above the uppermost pick module.
It receives bills passed up to it from the pick modules and transports
them to the exit slot of the Cash Dispenser terminal. If damaged or
double bills are detected, the divert gate in the spray presenter is
operated to deliver the currency into the purge bin. The dispenser
motor is housed in the presenter and, via gearing and drive belts, it
drives the transports of the presenter and all the pick modules.

The spray presenter houses the following assemblies:

● Dispenser motor and transport section
● Main timing disk
● Linear Variable Displacement Transducer
● Exit sensor
● Divert gate
● Purge bin.

Dispenser Motor and Transport

The spray presenter is supplied with either a 120 V or 240 V induction type motor. This motor drives the presenter transport and also, via toothed timing belts and gear trains, the transports and pick arms of the pick modules. It also powers the pick vacuum system.

In the presenter transport the bills are gripped between an upper and a lower belt and driven through plastic guides to the dispenser exit.

Main Timing Disk

The main timing disk is incorporated in the presenter transport attached to the LVDT reference wheel shaft. The beam of an opto-electronic sensor is chopped by the segments of the disk to create timing pulses. These timing pulses are used to measure the movement of the bills and as a reference in the measurement of bill width. The interval between each pulse represents a distance travelled by the bill of approximately 2 mm.

Linear Variable Displacement Transducer (LVDT)

The term "singularity" describes the parameters used by the dispenser to recognize a single currency bill. In the 5635 dispenser the detection of singularity of the currency is related to the cross-sectional area of the bills. This is measured by the Linear Variable Displacement Transducer assembly shown in the illustration below.
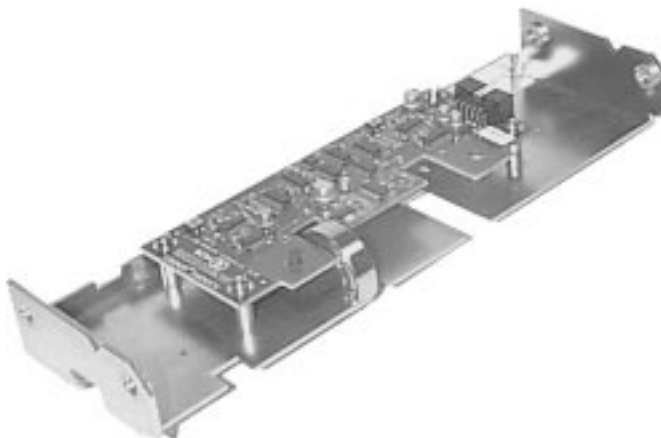
The LVDT is situated in the 5635 presenter transport. It gives an electrical output proportional to the displacement of a movable roller assembly caused by bills passing between it and a fixed reference roller. The movable roller is attached to a ferrite core which projects through a sensing coil printed on a pcb. The output from the coil is digitized, integrated, and is compared to the expected value (held in memory) for the currency being dispensed. In this way, torn, folded, or multiple bills are detected and diverted into the purge bin. Threshold values are stored in memory for each value of currency being dispensed.

Divert Gate

The function of the divert gate is to route double or damaged bills into the purge bin. It is located just before the exit shafts of the transport. The gate assembly is operated by a solenoid and a photo-sensor is used to detect a flag on the solenoid link drive arm so that the gate position is known. The operation of the divert gate is timed from the leading edge of the bill as it leaves the LVDT.

Exit Sensor

The exit sensor is located at the last shaft of the transport. The sensor verifies that bills have passed the divert gate and have left the last pinch of the transport on their way to the customer access tray.

Control Board
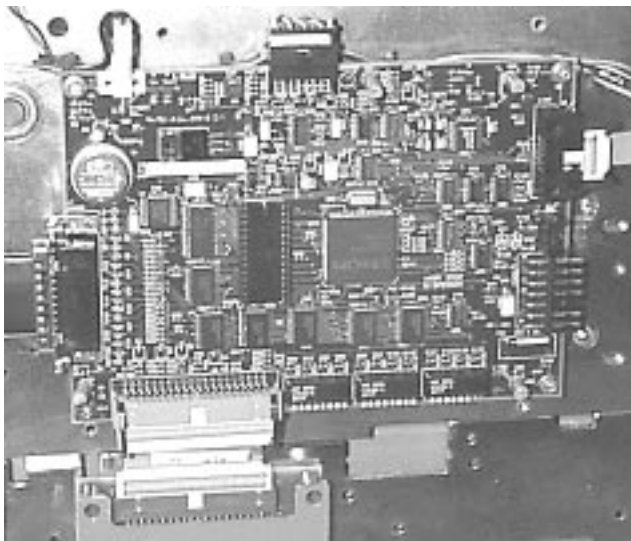
The control board is located on the presenter. It controls the main functions of the dispenser and provides an interface to the PC core of the terminal. The board controls the various sensors, solenoids and motors for the sensing and presenting of bills. This includes control for the divert mechanism and the transport drive. At power up the board executes level 0 (firmware) diagnostics which report using LEDs.

The control board is based around the Philips 80C562 microcontroller. There is addressing available for up to 64K of code memory (EPROM) and 64K of Data memory (SRAM). This design uses 64K EPROM and 32K of SRAM residing in the lower half of the data area. The board will also accept 32K EPROMs requiring a resistor jumper to be moved. The EPROM contains Level 0 diagnostics and executable code. The SRAM contains variables, buffers and other data. SRAM is battery backed.

The Level 0 diagnostic interface is implemented using 2 LED indicators on ports P4.0-P4.1 on the 80C562.

The selection of memory mapped peripherals and ports is accomplished by a 3 to 8 way decoder. The mapped devices consist of buffers used to interface to various Sensors, Comms Control hardware, diagnostic switches and user switches.

Firmware Description

The firmware provides the facility to deliver currency from the cassettes to the cardholder. This is a single stage operation that picks bills from the selected cassette and delivers them to the cardholder.

The 5635 Dispenser supports the following command set:

Command	Comments
Status	Reports sensor and cassette related information for the top cassette.
Purge	Attempts to clear the transport of bills.
Dispense	Dispenses notes from only the top cassette.
Test Dispense	Picks and rejects notes from only the top cassette.
Reset	Causes a firmware reset of the 5635.
Last Status	Reports the status of the last Dispense, Test Dispense, or Purge command. The 5635 specific, dispense/purge commands have no effect on this function.
Configuration Status	Reports the current firmware and hardware configuration.
Sensor Diagnostic	Picks a bill from the top cassette and reports its parameters.
Multi-cassette Status	Reports sensor and cassette related information for cassettes.
Multi-cassette Purge	Attempts to clear the transport of bills and reports the status per cassette type.
Multi-cassette Dispense	Dispenses bills from more than one cassette in a single transaction and reports the status per cassette type.
Multi-cassette Test Dispense	Dispenses bills from more than one cassette in a single transaction and reports the status per position.
Multi-cassette Last Status	Reports the last response based on cassette type.

Command	Comments
Multi-cassette Sensor Diagnostics	Picks a bill from a specified cassette and reports its parameters.
Report Pick Sensor Status	Reports the state of each pick sensor.
Set Singularities	Sets the singularity values for each cassette type.
Get Singularities	Reports the configured singularity values.
Set Bill Dispense Order	Sets the dispensing order cassette types.
Get Bill Dispense Order	Reports the configured dispense order.
Report Reject Reason	Reports the reject reason(s) relating to any notes that were rejected in the previous dispense command
Multi-cassette Position Dispense	Dispenses bills from more than one position in a single transaction and reports the status per cassette.
Learn Bill Parameters	Learns bill widths and singularities for each cassette installed.
Set Bill Sizes	Allows the media size parameters held in NVRAM to be set to specific values.
Get Bill Sizes	Reports the bill size parameter values by cassette to the application
Sensor Test	Reads the state of all sensors and switches on the 5635 dispenser.

Dispense Operation

The following description is of a successful dispense operation. It explains the interaction between the firmware and the mechanical and electrical components of the dispenser. A normal dispense operation consists of picking, transporting and delivering individual bills into a customer access tray.

When the dispenser receives a dispense command, the firmware first checks all the sensors and then turns on the dispenser motor. While the motor comes up to speed, the firmware checks the location of the first cassette to dispense from.

The normal dispense operation can be broken down into the following sequence of operations:

1   The PC core issues a dispense command specifying the number of bills to be picked from each cassette. The firmware checks all transport sensors are not blocked and the divert gate is in the reject position. If not, the firmware terminates the operation with an error indication.

2   The firmware checks that the first specified cassette is not empty. If the cassette is empty, the firmware searches for another cassette of the same type (search order is from the top cassette downwards). If another cassette of the same type is found and is not empty, it is used.

3   The transport motor is switched on and the pick solenoid of the selected cassette is energized to provide vacuum to the pick mechanism suction cups.

4   The selected pick module picks a bill which is fed through the module pick sensor to the transport section. The bill is detected by the pick sensor as it enters the pick module transport. It travels up to the spray presenter where it causes a deflection of the movable roller of the LVDT. The sudden rise in the monitored voltage waveform from the LVDT shows that a bill has arrived at the rollers and starts a "picked bill" reading. This reading is integrated and a stored reading, taken earlier, from the rollers without a bill present, is subtracted from it. The difference between the two readings represents the cross-sectional area (CSA) of the bill. This CSA reading is compared to a table representing single, double, and triple bills for the specific currency.

5   The picked bill is transported from the LVDT to the divert gate where:

a   If the bill is good, the divert solenoid is energized allowing the gate to pass the bill through the exit sensor to the customer access tray. The solenoid remains energized as long as good bills are sensed.

b   If the bill is bad, the solenoid de-energizes causing the gate to divert the bill into the purge bin.

As the picked bill travels through the dispenser, its passage is monitored by the pick sensor, LVDT, and exit sensor. These sensors control the following jam timers:

●   Time under pick sensor
●   Time from pick sensor to LVDT
●   Time under LVDT
●   Time from LVDT to exit sensor
●   Time under exit sensor.

If any predetermined bill passage time is exceeded, a jam is deemed to have occurred and the operation is terminated with an error indication.

The process of picking bills is repeated until the bill count of good bills at the LVDT equals the dispense command bill count. A status message is transmitted to the PC core.

Chapter 2
Installation

Mounting Dispenser

The dispenser is designed to be mounted in a host ATM. There are two methods of mounting the dispenser, at the top or at the bottom.

Top mounting is achieved using four M6 screws, two on either side of the dispenser. There are two pairs of holes provided on each side but only one from each pair needs to be used to mount the dispenser. Bottom mounting is provided via M4 screws through right-angled brackets at each side.

Left Side Mounting Locations

The locations of the top 6.8mm (0.27in.) diameter mounting holes on the left-hand side of the dispenser are given on the following diagram:
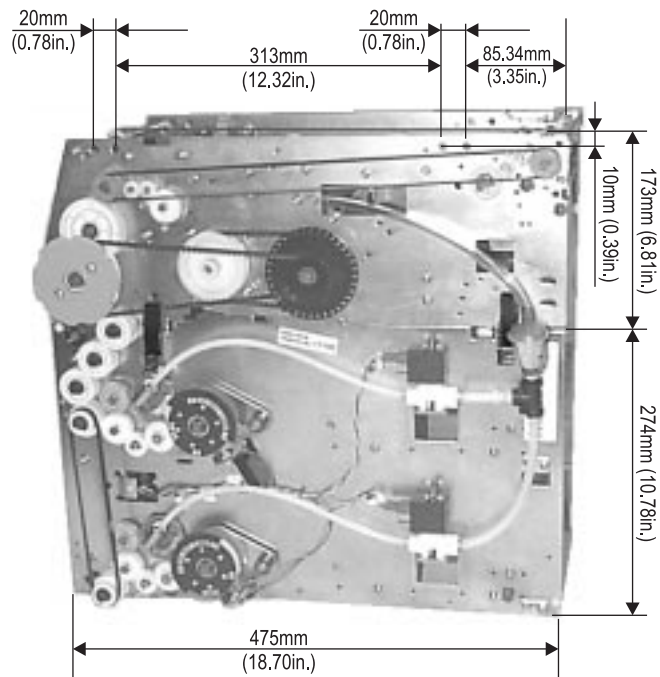
Note The height of a single pick unit is 137mm (5.4in.).

The illustration below shows the locations of the holes in the left-hand pallet mounting feet. These feet are suitable for supporting the dispenser on a retractable tray as is done in the NCR EasyPoint 55 terminal.
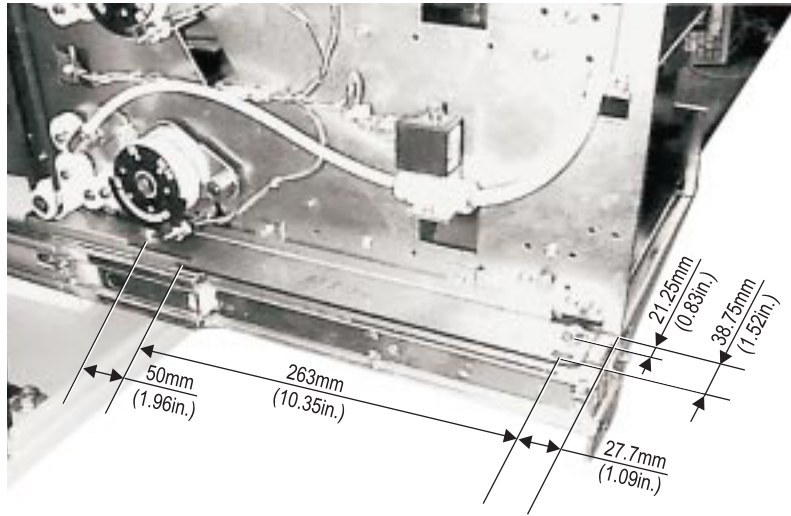
Note The width of the dispenser between the outer surfaces of the side plates is 225.075 millimetres (8.9in.) and to the outer edge of the mounting feet is 330 millimetres (13in.).

Right Side Mounting Locations

The locations of the right-hand side 6.8mm (0.27in.) dia. mounting holes are shown in the following illustration.

The right-hand side bottom mounting bracket is shown below:
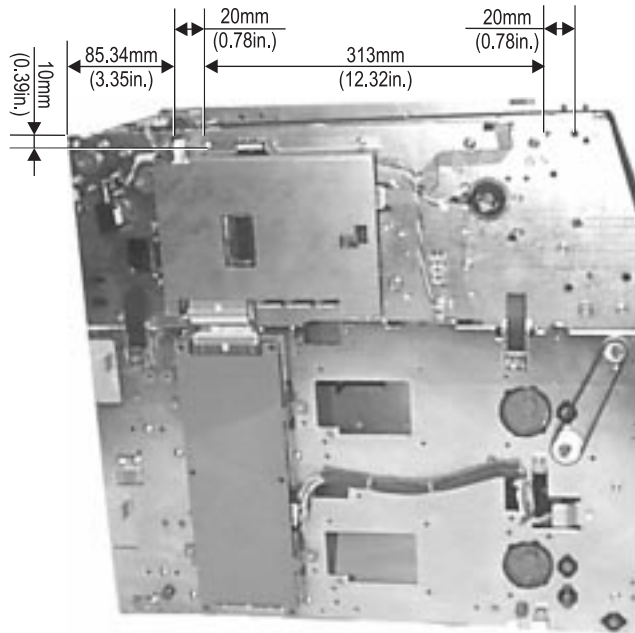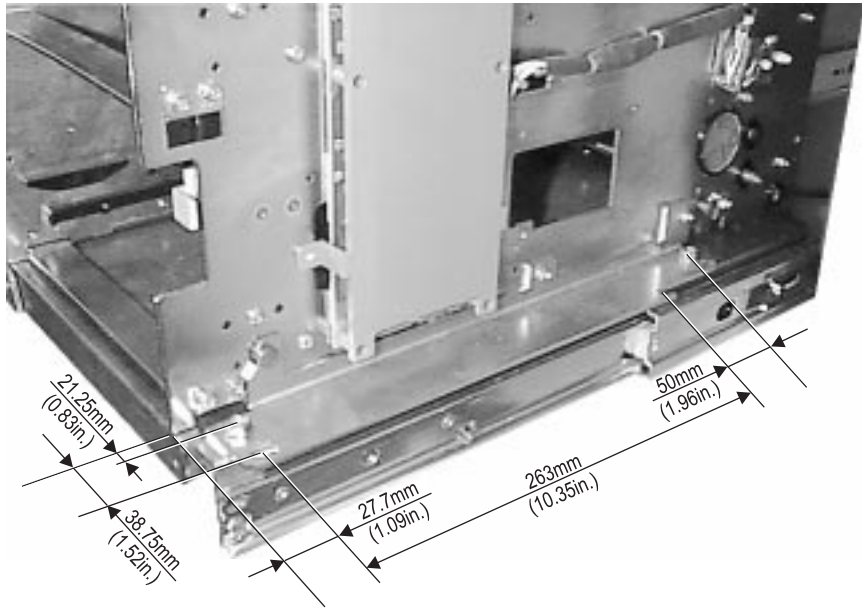

Note The width of the dispenser between the outer surfaces of the side plates is 225.075 millimetres (8.9in.) and to the outer edge of the mounting feet is 330 millimetres (13in.).

Power Requirements/Connections

AC Power

The AC power for the dispenser must conform to the following specification:

- 120VAC 5.5A RMS 20A surge
- 230VAC 3A RMS 10A surge

Live	1
Earth	2
Neutral	3

The required connector type is as follows:

- Housing = Tyco Electronics 1-480 700-0
- Crimp = Tyco Electronics 350218-0

DC Power

The DC power for the dispenser must conform to the following specification:

- +5V ± 5% 1.5A
- +24V ± 5% 2A

GND	1
+5V	2
GND	3
+5V	4
KEY	5
GND	6
+24V	7

The required connector type is as follows:

- Housing = Molex 39-01-2165
- Crimp = 39-00-0059

Power Connections

The AC and DC power connections to the dispenser are shown on the following illustration.
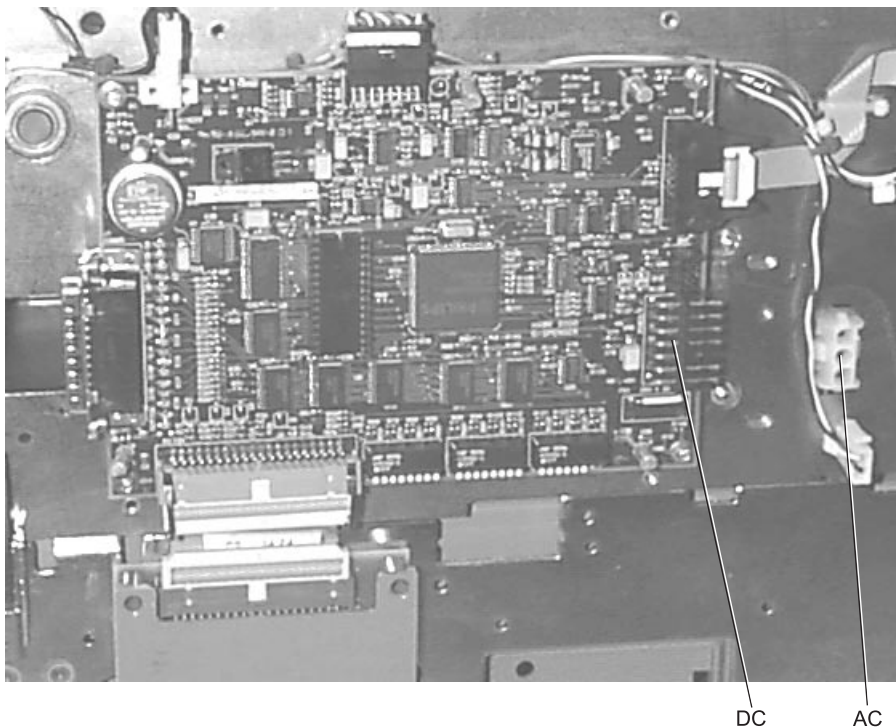
DC   AC

Interface Connection

The dispenser interface connector is a 25-way male D-type connector on the control board.
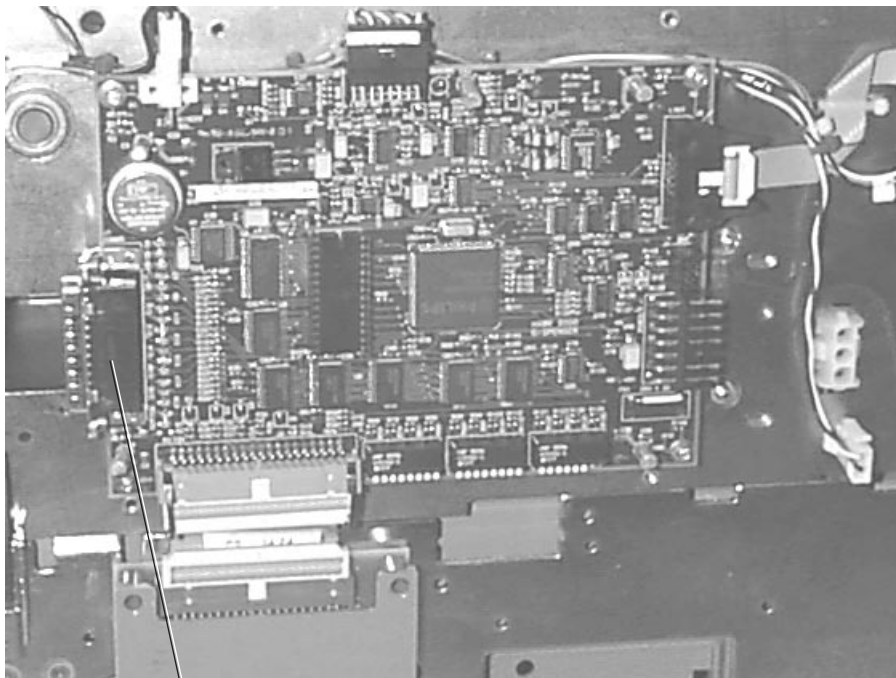
RS232

The pin connections are as follows

XRES	13	25	COMM_ID1
COMM_ID0	12	24	GND
E1	11	23	COMM_S1
GND	10	22	COMM_S0
E0	9	21	DB
N/C	8	20	+5V
GRD	7	19	DA
N/C	6	18	OOO
CTS	5	17	LRTS
RTS	4	16	LCTS
RXD	3	15	LTXD
TXD	2	14	LRXD
SCRN	1		

Electrical Connections

This interface is designed to the EIA RS 232 C standard. The dispenser is configured as DTE (data terminal equipment) and uses a subset of the handshake circuits.

RS 232 C is the default interface if no selection or enable links are present. The connector configuration for this interface is as follows:

Pin 1	SCRN	Cable screen
Pin 2	TXD	Transmitted data, FROM the dispenser
Pin 3	RXD	Received data, TO the dispenser

Pin 4	RTS	Request to send, FROM the dispenser. This circuit will become active (ON, +10V) when the dispenser is waiting to transmit.
Pin 5	CTS	Clear to send, TO the dispenser. This circuit is made active by the host controller in response to an ON state on RTS. The dispenser will only transmit after the CTS is active. Deactivating CTS in the middle of a message will temporarily halt the transmission until both RTS and CTS become active again.
Pin 7	GRD	Communications ground

Pins 2, 3, 4, 5 and 7 should be connected to their namesakes on a DCE (data communication equipment) interface. If the RTS and CTS handshake option is not required, pins 4 and 5 must be connected together.

The polled interface may be selected by linking pin 22 to pin 10. In this case the transmitter must be enabled by linking CTS to RTS (pins 4 and 5) and a communications identity address must be selected using pins 12, 24 and 25.:

Identity	Pin 12 (ID0)	Pin 25 (ID1)
0 (30H0		
1 (31H)	Pin 24	
2 (32H)		Pin 24
3 (33H)	Pin 24	Pin 24

Electrical Characteristics of Interfaces

The signal ground connection on pin 7 is connected to the dispenser ground via a 100 ohm series resistor. If this causes unacceptable voltage loss, pin 10 may be used instead. This provides a direct connection to the dispenser ground but may reduce noise immunity.

The logic level interfaces are designed to use the standard TTL voltage thresholds (High, greater than 2V; Low, less than 0.8V).

Note: The voltage on the logic interface must not exceed the dispenser's 5V supply voltage by more than 0.5V.

The host's input circuits may be standard TTL, no pull-up resistors are required. However, any pull-ups used must be at least 1K any pull-downs used must not exceed 1K.

The dispenser has two types of input circuit:

● The RXDL circuit may be driven by a standard LSTTL output, the input incorporates a TTL gate with a 10K pull-up.

● The CTSL (and RST) input incorporates an HCT TTL gate with a 1K pull-down resistor. This circuit may be driven by an open-collector TTL driver (for example, 7407) with a 470R pull-up resistor.

Note: If the handshake circuits are not used (CTSL and RTSL), then the standard LSTTL devices are capable of driving the interface.

Chapter 3

Operating Instructions

Replenishing the Currency Cassettes

Preparation of Currency

Before loading currency into a cassette, it must be prepared correctly as follows:

Used currency should be prepared by holding a bundle of approximately 100 notes in one hand and separating out with the other. While separating out, the currency should be checked for obvious defects such as:

- Adhesive tape on the surface of the currency
- Staples, pins or any foreign matter attached to the currency
- Torn or limp notes with pin holes
- Two or more notes stuck together
- Corner folds (straighten as required)
- Folded notes.

New or uncirculated currency should be separated (fanned) out several times before loading into the cassette. Any notes considered unacceptable should be removed.

To replenish the currency in the cassette proceed as follows:

1 Firmly push the cassette latch hasp down and then pull the bottom of the latch towards you
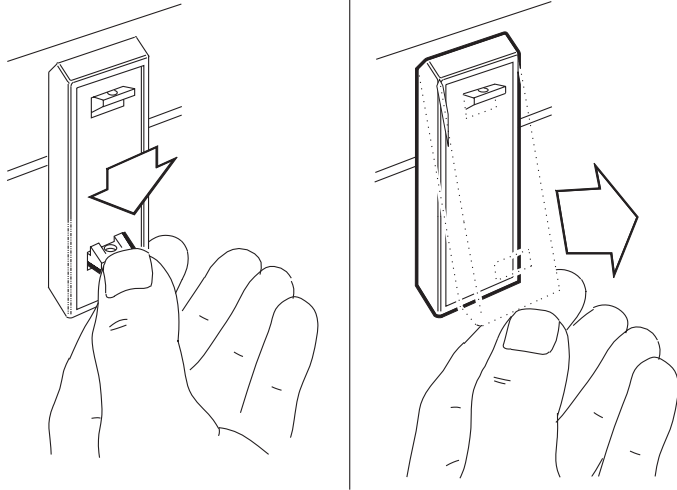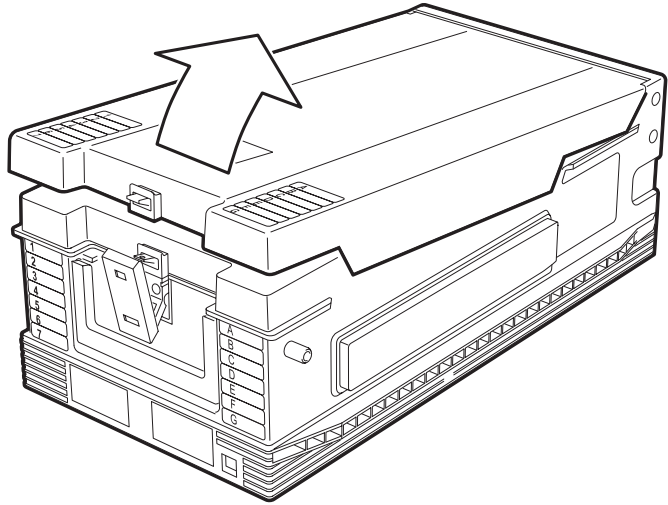

2 Lift the latch up a small amount. Pull the top of the latch towards you then hinge it down.
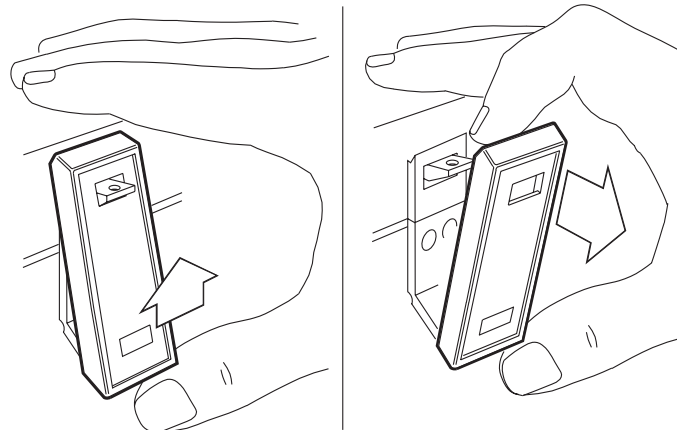
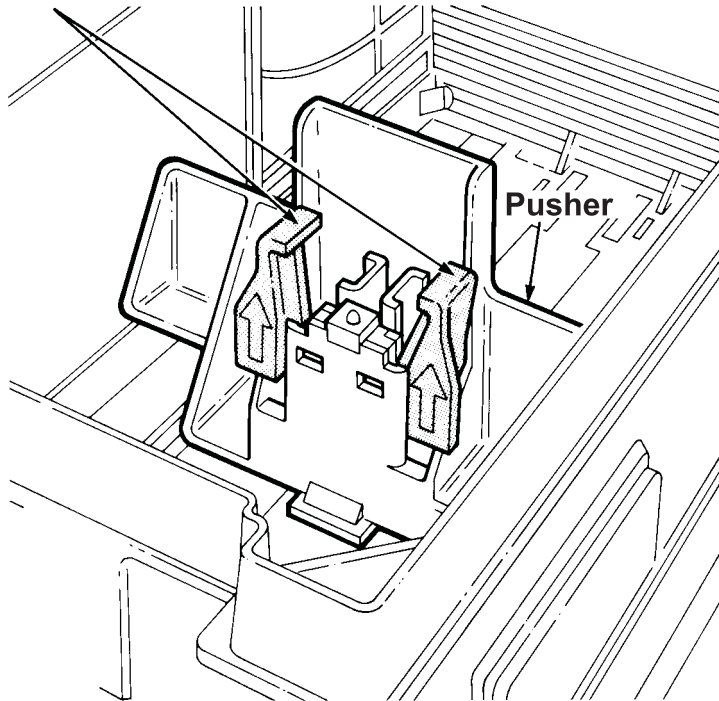**NCR - CONFIDENTIAL AND PROPRIETARY**
Use pursuant to Company Instructions

3 Raise the lid and, applying slight pressure at the front of the lid to help disengage the tags, remove the lid from the cassette base.

4 Lift the pusher arms and move the pusher to the rearmost position by pushing against the pusher.

LIFT - DO NOT SQUEEZE

5   Latch the pusher in the rear position by applying gentle
    pressure near the base of the pusher, then releasing the pusher
    arms.
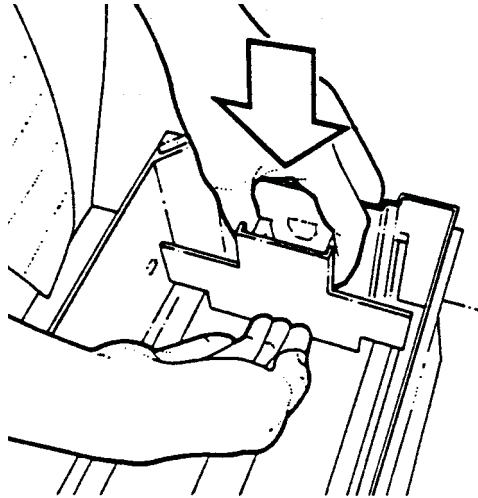
6   Align the edges of the bills in both planes by holding a bundle
    loosely between the fingers and thumbs of both hands and
    tapping lightly on a flat surface, then tapping the bill ends.
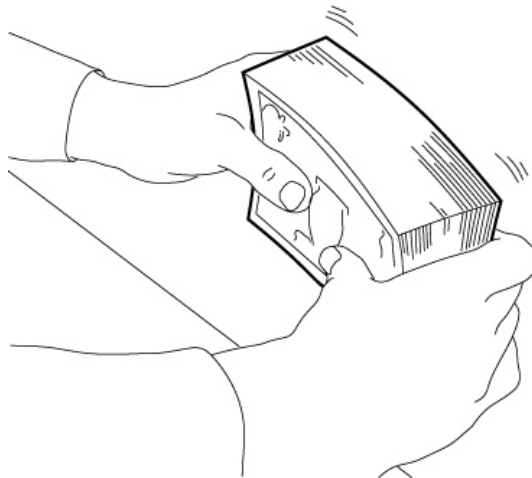
7   It is recommended that the cassette be placed at an angle so that each bill stack can be loaded without it falling over. For example, stand the cassette at an angle against a wall as shown. Load the bills into the cassette.

Note: When loading the cassette, alternate packs/bundles of 100 bills as shown, and make sure that any bowed bills are loaded with the bow towards the pusher.
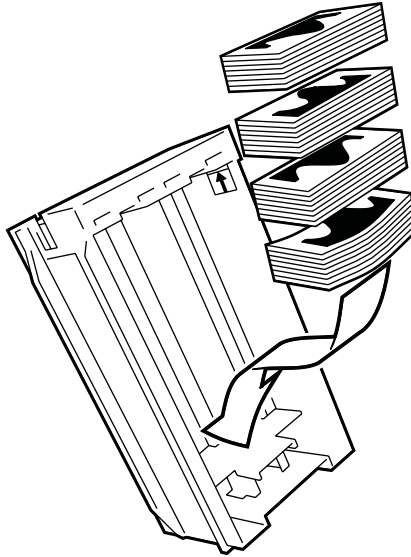
8   Continue loading until either the required amount is loaded or the Max Stack load point (indicated on a label inside the cassette) is reached.
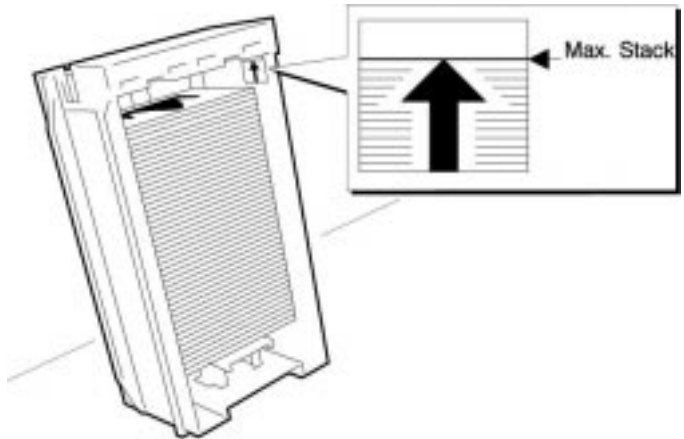
9   Lift the pusher arms and push the pusher and the bill stack upwards until the currency stack touches the front support, then release the pusher arms. The currency should remain between the front support and the pusher in an upright position, neatly stacked between the cassette guides.
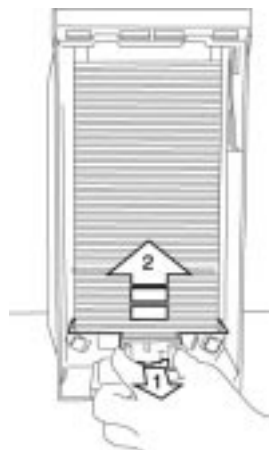
10 Insert the tongues on the cassette lid into the slots in the cassette base as shown and then lower the lid on to the cassette base.
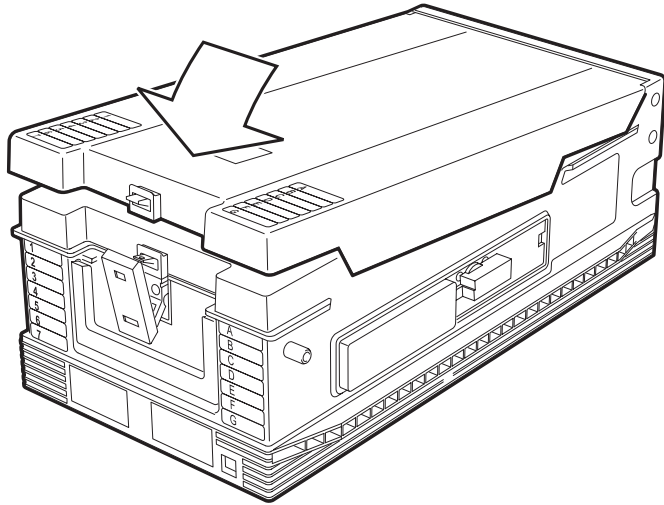
11 Lift the latch up and forward until it hooks on to the lid latch block.
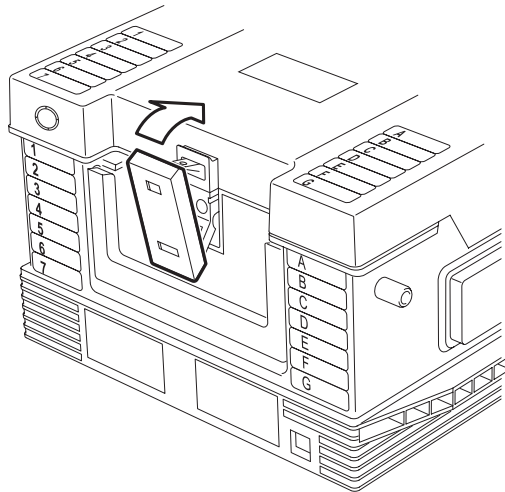
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Use pursuant to Company Instructions

12 Pull the latch down and forward until it clicks into the locked position.
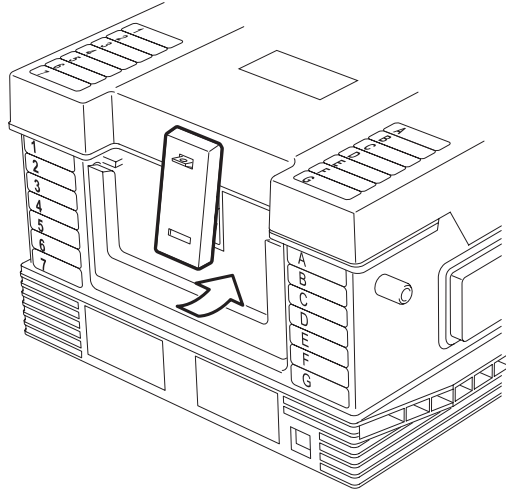
13 If required, seal latch.

14 Firmly push the full cassette into the terminal until the cassette latch clicks into place.

15 Repeat Steps 1 to 14 for all cassettes which require to be replenished.

Emptying the Currency Purge Bin

There are two styles of purge bin: Standard - an enclosed area with
flap - and Latch Fast bin.

Standard Currency Purge Bin

If the purge note area is fitted with a flap, lift the flap and remove
the currency from the note tray
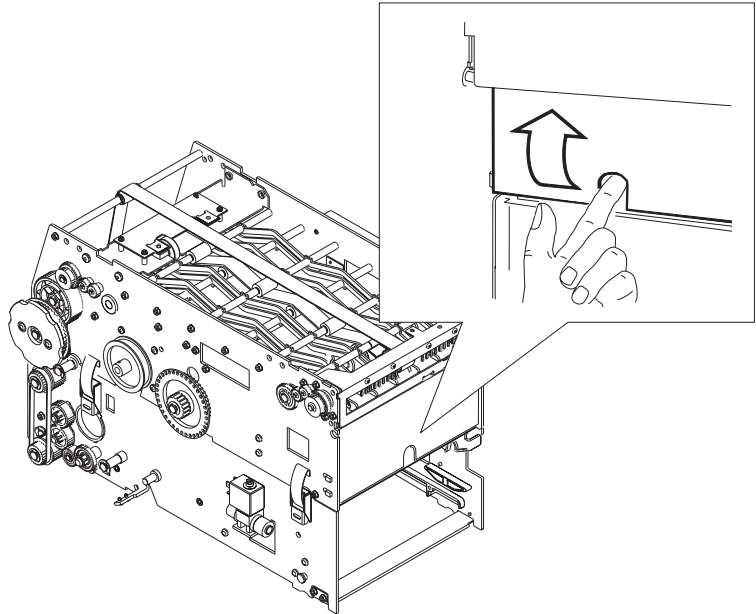
Latch Fast Currency Purge Bin

To empty the Latch Fast currency purge bin, proceed as follows:

1   Lift the catch on the left hand side of the currency purge bin and pull the bin out of the terminal.
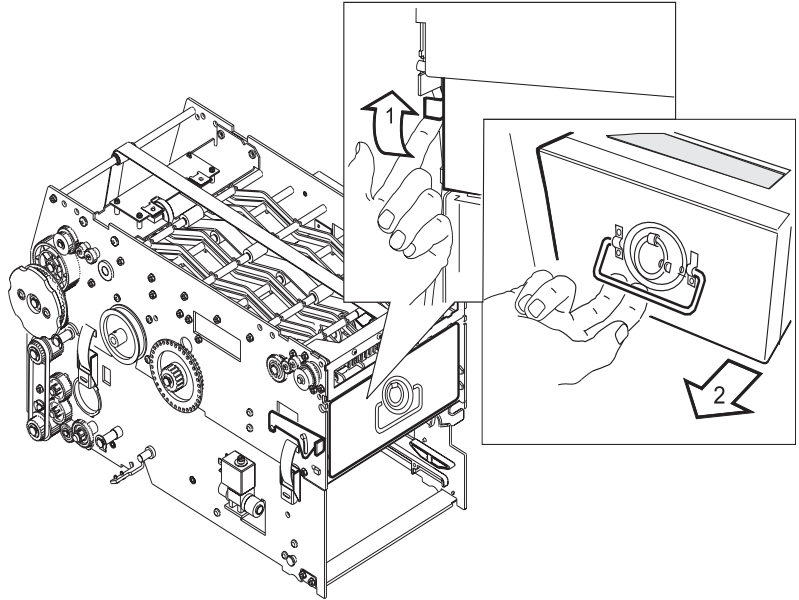
2   Remove any lock or seal from the bin.

3   Lift the ring and turn it counterclockwise.

4   Pull the door towards you to open the front of the bin.
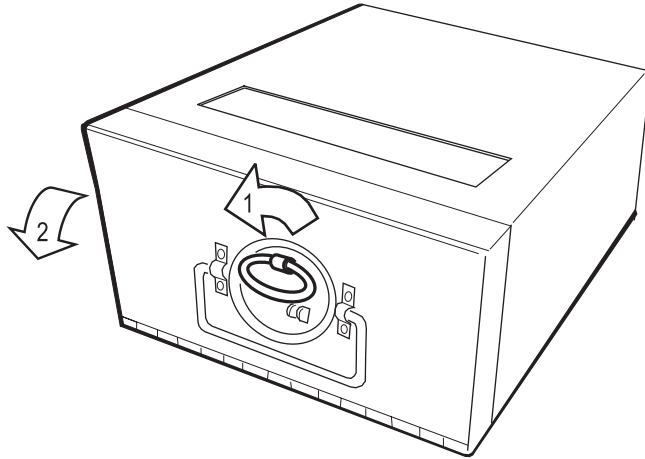
5   Remove the purged currency from the bin.

6   Close the front of the bin and refit the lock or a new seal.

7   Slide the empty purge bin into the terminal until it locks in place.

Note: Damaged or poor quality currency must not be re-cycled in the cassette for dispensing. It should be removed from the terminal and, to maintain accurate accounting, replaced with better quality currency.

Clearing Currency Dispenser Jams

To clear a currency jam proceed as follows:

1   The procedures for clearing a jam depends on where the jam is within the dispenser.

- If the jam is at the pick sensor/module proceed to Step 2
- If the jam in the main transport, proceed to Step 5.

2   Lift the green catch on the right-hand side of the currency cassette and pull the cassette out of the terminal.
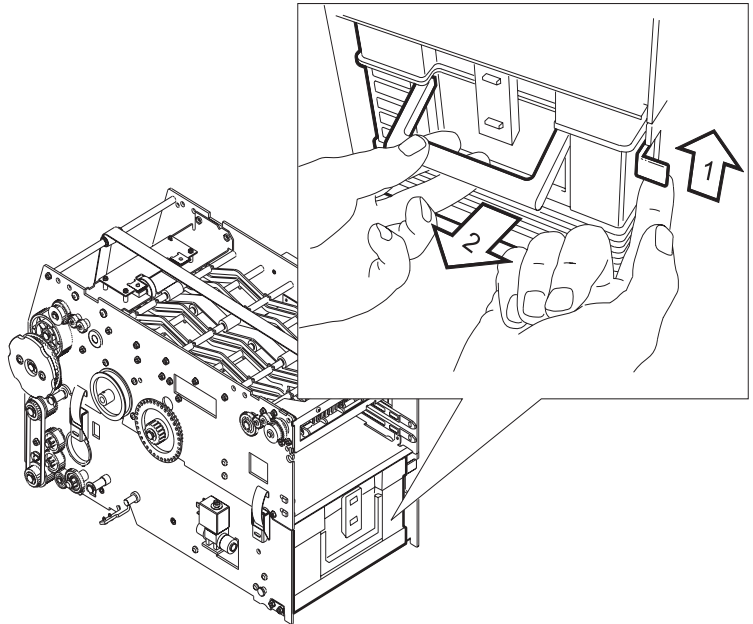
3   Reach inside the space vacated by the cassette and remove any jammed bills.

4   Push the cassette back into the terminal until the cassette latch clicks into place. Proceed to Step 5.

5 Look in the main transport to locate the jammed bill(s). The transport belts can be driven manually by using the handle indicated below. Carefully remove the jammed bill from within the transport.

Transport Belts

Drive Handle
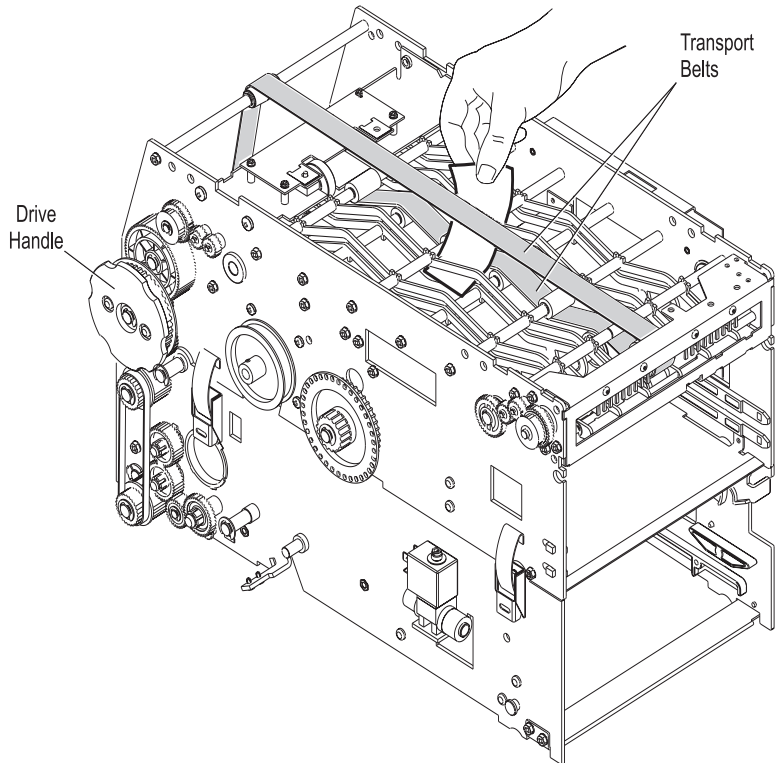
6 Once the bills have been removed from the main transport, make sure that the transport belts are still located on top of the pulleys

Chapter 4

Maintenance Instructions

Calibrating the Dispenser

For proper operation of the dispenser, certain adjustments have to be made. These adjustments are described in this section and include the following:

- Cassette identification code
- Cassette currency dimensions adjustment
- Currency singularity adjustment.

Cassette Adjustments

Note "Left" and "right" in the following adjustments and setting tables refer to the cassette when looked at from the front (truck door) end.

Cassette Identification Code

Each currency cassette shipped with a dispenser is set with a code that can be read by the dispenser software so that the cassette can be identified regardless of its position in the dispenser. The software matches the cassette code to a specific denomination of currency. Cassettes with the same code will be loaded with notes of the same value.

The cassette can be identified by writing the currency denomination on the inside or outside of both the body and lid, using an indelible ink pen.

- A: Colour coded stick-on labels 10 mm x 15 mm (0.4 in. x 0.6 in.) approximately
- B: Numerics for denoting cassette identification type
- C: Recessed areas for either marking with indelible ink pens or for attaching adhesive labels to denote currency denomination, etc. at the discretion of the financial institution
- D: Alphas for denoting additional cassette identification types or, for same use as B.
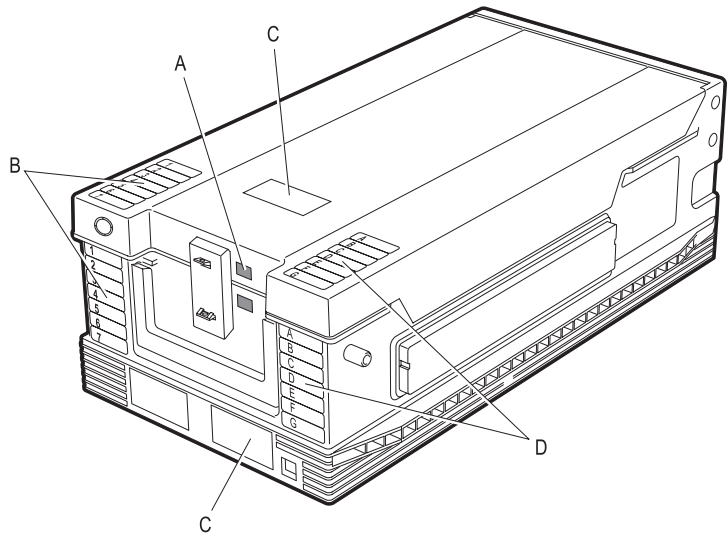
The cassettes provided with the four position dispenser are each set to a different code, that is Code 1, Code 2, Code 3 and Code 4. These can be changed so that, for example, the dispenser will dispense two different denomination notes from the four cassettes, that is with two cassettes set to Code 1 and two to Code 2.

The identification code of a cassette is set by up to four magnets contained in a plastic housing attached to the cassette side frame by a clip as shown in the following figure. The cassette has space in the

plastic housing for six magnets (positions A, B, 1, 2, 3 and 4), but only four (positions 1, 2, 3 and 4) are currently used.
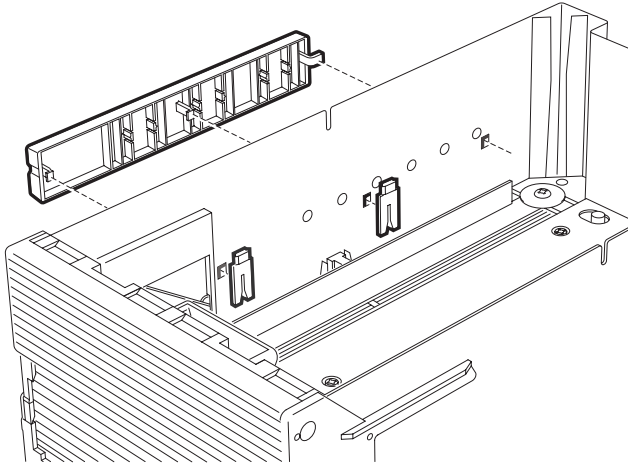
The magnets interact with four reed switches located on a printed circuit board attached to the frame of the dispenser pick module associated with the cassette location in the dispenser subsystem. The four reed switches have the following functions:

Depending upon whether a magnet is installed or not, and the orientation of the magnets, the reed switches provide a code representing the cassette identification number.

More than one cassette of a particular type can be installed. The dispenser treats all cassettes with the same type as one logical cassette. Selection order is from the uppermost pick module downwards.

Magnet Marking and Position

It is essential that the magnets are pointing in the correct direction, therefore, each magnet has a marked end, a red dot, to indicate which way round it should be installed in the housing.

Red Dot
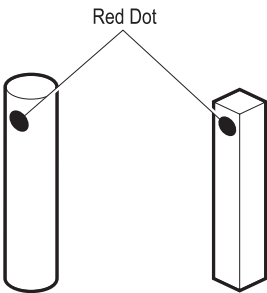
NOTE: Square and round section magnets are interchangeable.

The following table shows the location and orientation of the four magnets to produce the seven cassette identification codes. The "magnet position" in the table corresponds to the numbers 1 to 4 moulded into the plastic inside the housing.

Magnet Positions

Code	A	B	$\overline{1}$	2	3	4
1	not used	not used	$\overline{X}$	$\overline{X}$	0	0
2	not used	not used	$\overline{X}$	0	0	$\underline{X}$
3	not used	not used	$\overline{X}$	0	X	0
4	not used	not used	$\overline{X}$	X	$\underline{X}$	X
5	not used	not used	0	$\overline{X}$	X	0
6	not used	not used	0	X	$\underline{0}$	X
7	not used	not used	0	0	X	$\overline{X}$

Note 1. X = magnet inserted, 0 = magnet not present.

Note 2. The bar above or below the X indicates whether the magnet should be placed in the housing with the marked end up or down respectively.

**Currency
Dimensions
Adjustment**

The diagram below show the relationship of the currency dimensions to those of the cassette.
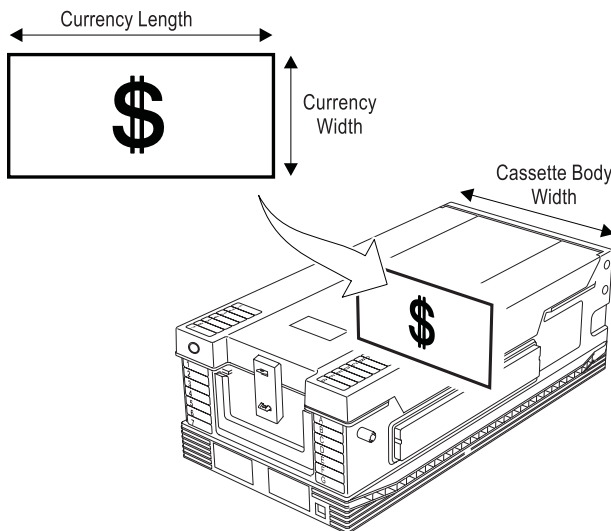
Three currency adjustments are provided on all versions of the cassette:

● Currency length (across the width of the cassette)

● Currency width (the internal height of the cassette)

● Note low sensing (two values).

The preceding figure shows what is meant by currency length and width.

Currency Length Adjustment

Adjustment is provided to allow the cassette to accommodate currency from 120 mm (4.72 in.) to 172 mm (6.77 in.) long.

The currency is held between note guides located along the floor of the cassette compartment. The note guides bear against spacer blocks known as E spacers.

The currency length is translated into note guide and E spacer codes read off from the table given under the heading "Currency Length Guide Codes and E Spacer Settings." The codes correspond to markings on the floor of the currency compartment, on the note guides themselves, and on the E spacers.

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Note Guides - Currency Length

The two note guides are installed along the left hand and right hand sides of the cassette. A triangular pointer on the front of the guide and a triangular mark at the rear line up with numbers embossed on the floor of the cassette compartment. This number is part of the guide code. The other part of the guide code is a letter, A or B, which is embossed on the note guides, A on one note guide and B on the other.

The A or B note guides can be installed along either the right or left hand note support plates (depending on the guide code) as shown in the following diagram.
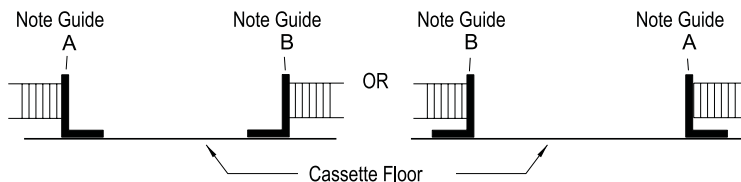
Note The note guides must always be installed with the spring finger end of the guide pointing to the number embossed at the front end of the cassette.

The note guides in the body of the cassette bear against spacer blocks known as E spacers. There are two types of E spacers:

- Segment Type Note Adjustment Spacer
- Fixed Size Note Adjustment Spacer.

Segment Type Note Adjustment Spacer
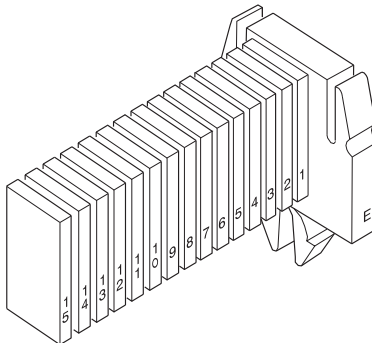
The segment type spacers have to be cut to certain lengths so that the note guides are supported the correct distance apart corresponding to the length of the currency being dispensed.

The spacer is embossed on one side with the letter E and the numbers 1 to 15 and is known as the E spacer. The E spacer is designed to snap-in to position without the use of tools.

The E spacer codes in the table, given under the heading "Currency Length Guide Codes and E Spacer Settings", tell you where to cut the two right-hand and two left-hand E spacers. You cut off the segments with higher numbers than the code. The procedure and example given after the code tables should make this clear.

Fixed Size Note Adjustment Spacer

Spacer Code
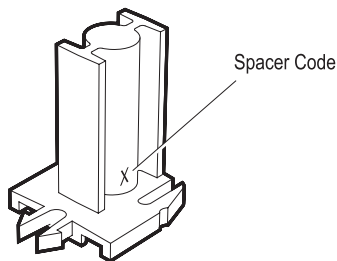
The fixed size spacer provides the same function as the Segment Type spacers described above, however, the fixed spacers must be

changed to suit the currency being dispensed, they can not be cut to size.

The spacer is embossed on one side with the letter E and the number from 1 to 15 (E1, E2, E3 and so on) and is also known as an E spacer and is designed to snap-in to position without the use of tools.

The E spacer codes in the table, given under the heading "Currency Length Guide Codes and E Spacer Settings", tell you which E spacer to use. The procedure and example given after the code tables should make this clear.

Currency Length Guide Codes and E Spacer Setting
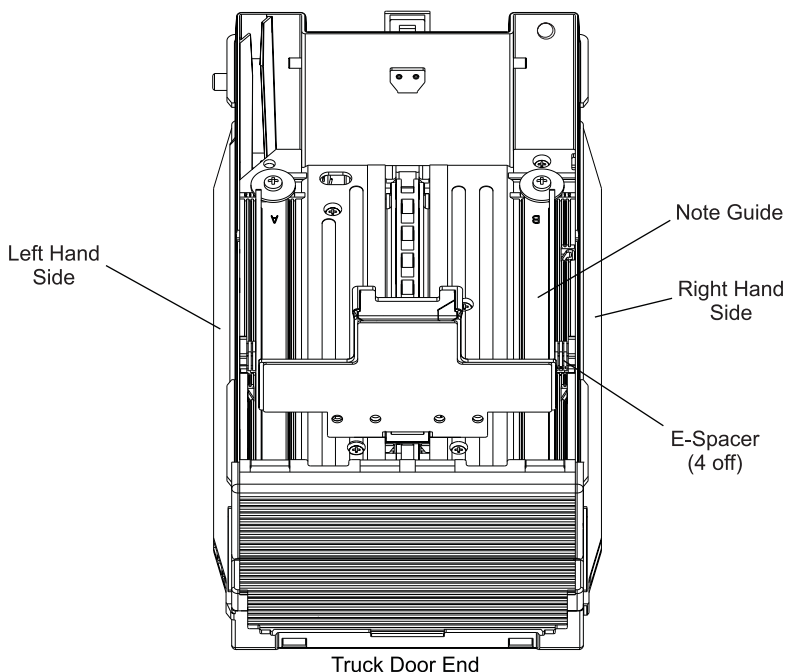
Currency Length		Note Guide		E Spacer	
mm	in.	L.H	R.H	L.H.	R.H
120	(4.72)	B3	A3	E9	E9
121	(4.76)	B3	A3	E9	E9

Currency Length		Note Guide		E Spacer	
mm	in.	L.H	R.H	L.H.	R.H
122	(4.80)	B3	A3	E9	E9
123	(4.84)	B4	A3	E8	E9
124	(4.88)	B4	A3	E8	E9
125	(4.92)	B4	A4	E8	E8
126	(4.96)	B4	A4	E8	E8
127	(5.00)	B4	A4	E8	E8
128	(5.04)	B5	A4	E7	E8
129	(5.08)	B5	A4	E7	E8
130	(5.12)	B5	A5	E7	E7
131	(5.16)	B5	A5	E7	E7
132	(5.20)	B5	A5	E7	E7
133	(5.24)	B6	A5	E6	E7
134	(5.28)	B6	A5	E6	E7
135	(5.32)	B6	A6	E6	E6
136	(5.36)	B6	A6	E6	E6
137	(5.40)	B6	A6	E6	E6
138	(5.44)	B6	A6	E6	E6
139	(5.48)	A5	B5	E5	E5
140	(5.52)	A5	B5	E5	E5
141	(5.56)	A5	B5	E5	E5
142	(5.60)	A5	B5	E5	E5
143	(5.64(	A5	B5	E5	E5
144	(5.68)	A6	B5	E4	E5
145	(5.72)	A6	B5	E4	E5
146	(5.76)	A6	B6	E4	E4
147	(5.80)	A6	B6	E4	E4
148	(5.83)	A6	B6	E4	E4
149	(5.87)	A7	B6	E3	E4
150	(5.90)	A7	B6	E3	E4
151	(5.94)	A7	B6	E3	E4
152	(5.98)	A7	B7	E3	E3
153	(6.02)	A7	B7	E3	E3
154	(6.06)	A8	B7	E2	E3
155	(6.10)	A8	B7	E2	E3
156	(6.14)	A8	B8	E2	E2
157	(6.18)	A8	B8	E2	E2
158	(6.22)	A8	B8	E2	E2
159	(6.26)	A9	B8	E1	E2

Currency Length		Note Guide		E Spacer	
mm	in.	L.H	R.H	L.H.	R.H
160	(6.30)	A9	B8	E1	E2
161	(6.34)	A9	B9	E1	E1
162	(6.38)	A9	B9	E1	E1
163	(6.42)	A9	B9	E1	E1
164	(6.46)	A10	B9	E	E1
165	(6.50)	A10	B9	E	E1
166	(6.54)	A10	B10	E	E
167	(6.58)	A10	B10	E	E
168	(6.62)	A10	B10	E	E
169	(6.66)	A11	B10	Nil	E
170	(6.70)	A11	B10	Nil	E
171	(6.74)	A11	B11	Nil	Nil
172	(6.78)	A11	B11	Nil	Nil

Procedure -   The procedure for adjusting the cassette to currency length using the E spacers is as follows:

1   Measure the length of the currency.

2   Read off the E spacer codes from the table.

3   Select fixed size E spacers with the correct codes or cut segment type E spacers to the size given by the codes.

4   Insert the E spacers in the cassette.

5   Put the note guides into the cassette.

6   Check that the triangular parts on the note guides point to the numbers on the floor of the cassette corresponding to the note guide codes.

Example - The following example adjusts the cassette for currency 120mm (4.72in) long.

Proceed as follows:

1 Measure the length of the new currency (120 mm).

2 Refer to the code table and, using the currency length, read the guide code and the E spacer setting for the currency.
For 120 mm the left hand guide code is B3 and the right hand guide code is A3. The spacers have a setting of E9 for the left hand guide and E9 for the right hand guide.

3 Move the pusher fully forward.

4 Unscrew and remove the screws and flat washers securing the note guides to the cassette floor.
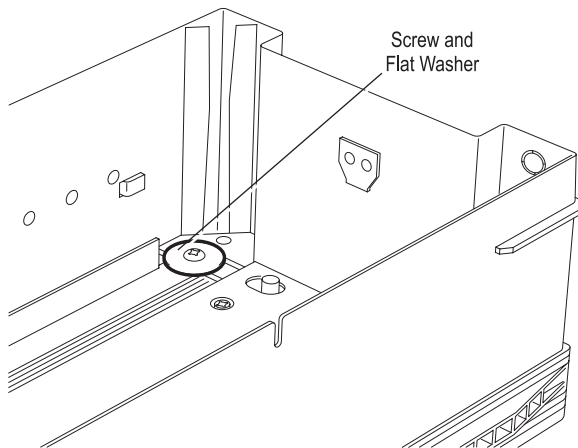
Screw and
Flat Washer

5   Slightly raise the rear end of the guide over the embossed
     numbers, push the guide towards the rear and lift it out of the
     cassette. Take care not to damage or bend the spring fingers.
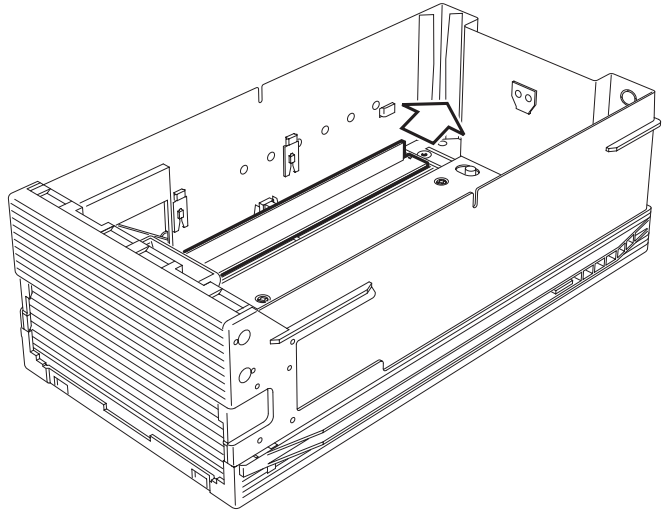
6   Unclip and remove the four E spacers from the base of the cassette. Turn the two E spacers at the handle end of the cassette through 90 degrees before pulling upwards.
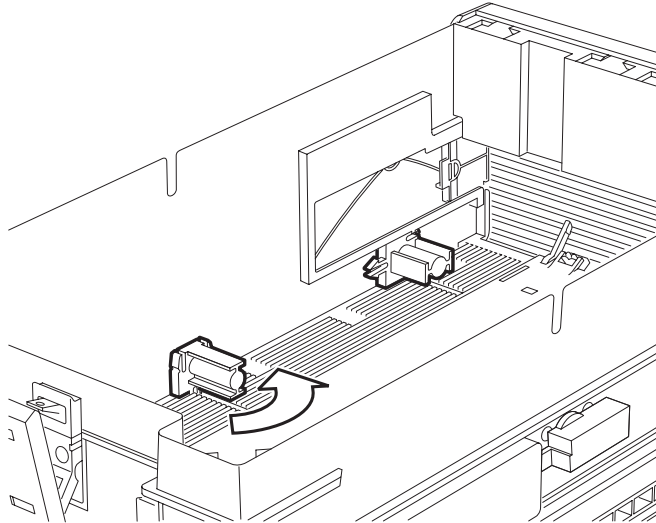
7   If fitting fixed size spacers select four E9 spacers and proceed to step 12. If using segment type spacers proceed with step 8.

8   Hold a new segment type E spacer on a work surface so that the letter E and the numbers 1 to 15 can be read.

9   Use a sharp knife to cut the spacer just above the number 11 so that you are left with a spacer that has the letter E and segments up to number 9.

10 Cut three more E9 spacers (see the following illustration) to give you two for the right-hand side and two for the left-hand side.
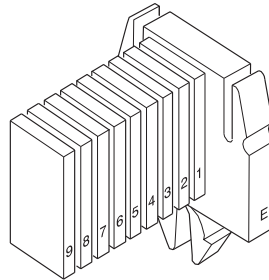
11 Flush the spacer surfaces by removing any burrs left after cutting.

12 Snap-in the four new E spacers in the correct positions in the floor of the cassette.

13 Insert the note guides back into the cassette hard against the E spacers. Check that the pointers   at either end of the guides are pointing at the code numbers for the new currency. For this example the left hand guide (B) should be pointing at the number 3 and the right hand guide (A) should also be pointing at the number 3. Refer to the following figure for an example of the right-hand guide.
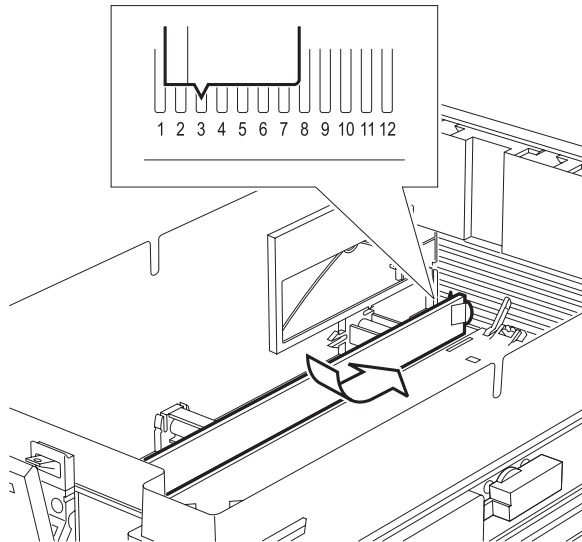
14 Replace the flat washers and screws in the base of the cassette.
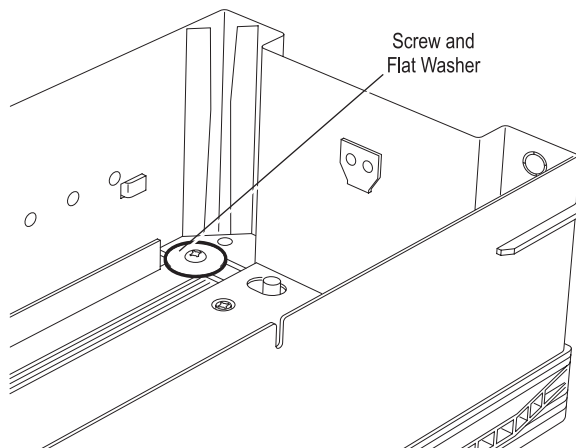
Screw and
Flat Washer

Currency Width Adjustment

The currency width adjustment is made by first establishing the width of the currency that the cassette is to hold then using this measurement to determine the setting of spacers located between two note guides and the cassette lid.

The setting of the spacers can be adjusted to accommodate currency of varying widths:

● Minimum width 62 mm (2.44 in.)
● Maximum width 95 mm (3.74 in.).

As with the length adjustment, there are two types of spacers:

● Segment type
● Fixed size.

Segment Type Note Adjustment Spacers

Cassette Lid (E and Yellow Spacer Locations) -   Four of these spacers are E spacers and are the same as the E spacers used when adjusting the currency length. Each E spacer is attached to the lid note guides by a cross headed screw - see the following illustrations.

The other four spacers are known as Yellow spacers, and are designed to clip into the cassette lid. Each Yellow spacer is also attached to the lid note guides by a cross headed screw - see the following illustrations.
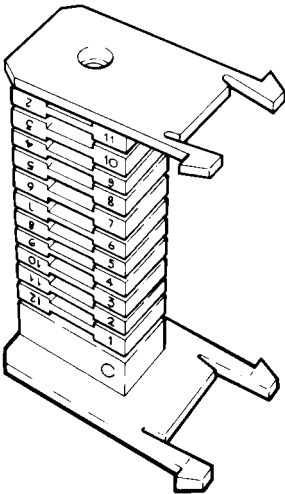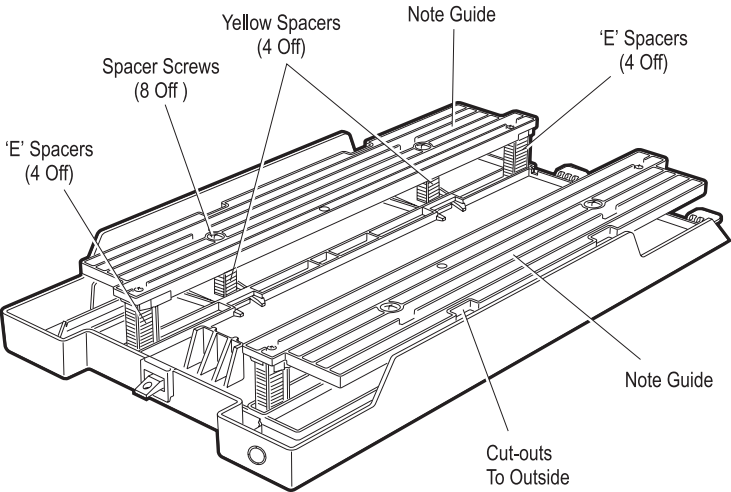
Yellow Spacers
(4 Off)

Note Guide

'E' Spacers
(4 Off)

Spacer Screws
(8 Off)

'E' Spacers
(4 Off)

Note Guide

Cut-outs
To Outside

Procedure -   Adjust the cassette for currency width as follows:

1   Measure the width of the currency.

2   Read off from the "Currency Width Spacer Codes" table the codes for the E spacers and yellow spacers.

3   Cut four E spacers and four yellow spacers.

4   Put a locking wedge into the first gap in each of the yellow spacers. Lubricate the wedge with soap to ease insertion.

5   Clip the yellow spacers into their locations in the cassette lid.

6   Screw two E spacers to each note guide.

7   Screw the note guides to the yellow spacers with the cutouts in the note guides facing out.

Example -   This example adjusts the cassette for currency 67 mm (2.64 in.) wide:

1   Open the cassette and remove the lid.

2   Remove the two note guides from the lid by undoing the cross head screws from the Yellow spacers then remove the E spacers from the note guides.

3   Remove the Yellow spacers from the lid by pressing in the two spring legs of each spacer then pushing them out of the lid.

4   Measure the width of the new currency.

5   Read the spacer codes for that currency width from the code table.

6   Set four new Yellow and four new E spacers to their spacer codes. For 67 mm the Yellow spacer should be set to C8 and the E spacer to E10.

7   Put the spacers on a work surface so that you can read the letters and numbers embossed on their sides.

8 The E spacers have the letter E and the numbers 1 to 15 embossed on them (refer to the example given in the currency length adjustment). The code E10 means that the E spacer is to be cut just above the number 10. Use a sharp knife to cut the four E spacers.

9 The Yellow spacers are embossed on one side with two sets of numbers 1 to 12 reading in opposite directions. One end has the letter C on it and the other has the letter D (see the illustration below). For the code C8 you count from the C end and, with a sharp knife, cut the spacer just above the number 8 so that you are left with end C and segments 1 to 8.

10 Flush the spacer surfaces by removing any burrs left after cutting.

11 Fit a locking wedge into the first gap in the cut yellow spacer (see the illustration below).
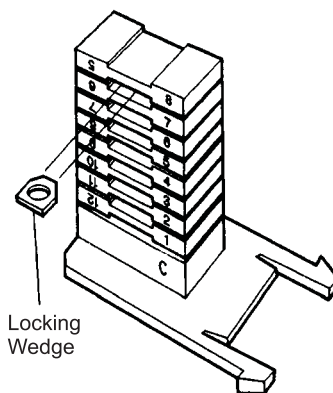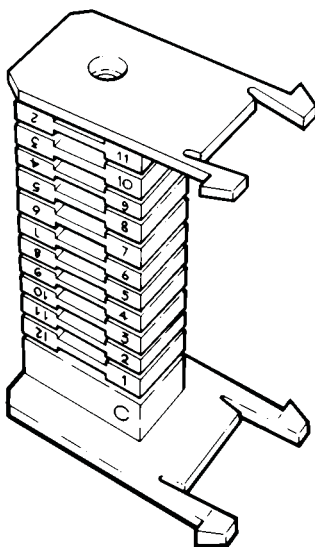
Locking
Wedge

12 Install the four new Yellow spacers by pressing the legs of the spacer together and pushing them into the apertures in the cassette lid.

13 Screw two new E spacers to each lid note guide.

14 Screw the lid note guides to the yellow spacers on the lid (make sure the cut out on the note guides are facing out).

Fixed Size Note Adjustment Spacers

Cassette Lid (E and Yellow Spacer Locations) -   Four of these spacers are E spacers and are the same as the E spacers used when adjusting the currency length. Each E spacer is clipped in to lid note guides - see the following illustrations.

The other four spacers are known as Yellow spacers, and are designed to clip into the cassette lid. Each Yellow spacer is also clipped in to the lid note guides - see the following illustrations.
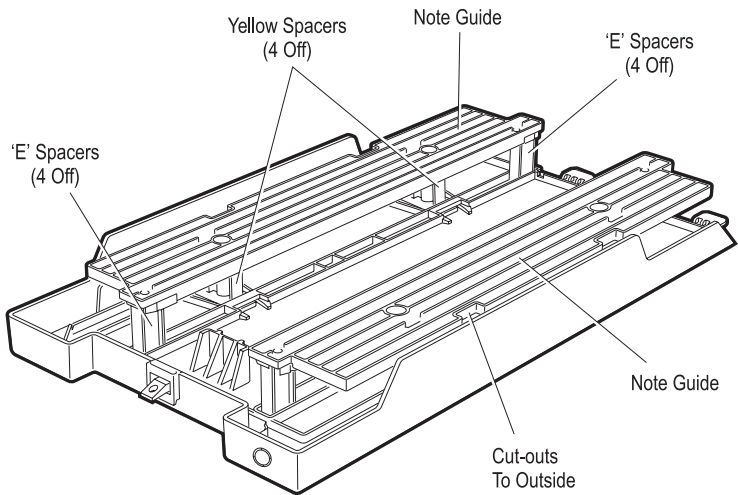
Spacer Code

**Procedure** - Adjust the cassette for currency width as follows:

1 Measure the width of the currency.

2 Read off from the table the codes for the E spacers and yellow spacers.

3 Select four E spacers and four yellow spacers.

4 Clip the yellow spacers into their locations in the cassette lid.

5 Clip two E spacers to each note guide.

6 Clip the note guides to the yellow spacers with the cutouts in the note guides facing out.

Example - This example adjusts the cassette for currency 67 mm (2.64 in.) wide:

1 Open the cassette and remove the lid.

2 Unclip and remove the two note guides from the lid then remove the E spacers from the note guides.

3 Remove the Yellow spacers from the lid by pressing in the two spring legs of each spacer then pushing them out of the lid.

4 Determine the width of the new currency.

5 Read the spacer codes for that currency width from the "Currency Width Spacer Codes" table.

6 Select four new Yellow and four new E spacers to their spacer codes. For 67 mm the Yellow spacer should be set to C8 and the E spacer to E10.
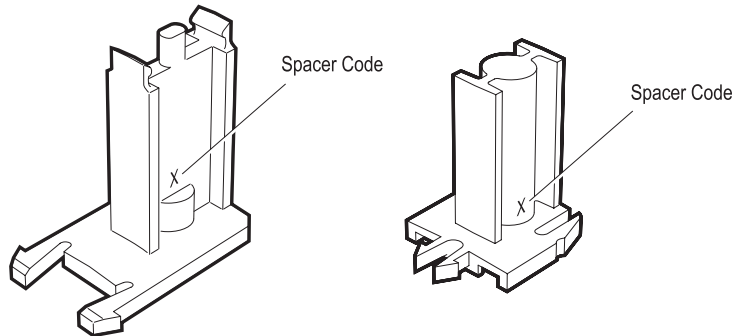
7 Install the four new Yellow spacers by pressing the legs of the spacer together and pushing them into the apertures in the cassette lid.

8 Clip two new E spacers to each lid note guide.

9 Clip the lid note guides to the yellow spacers on the lid (make sure the cut outs on the note guides are facing out).
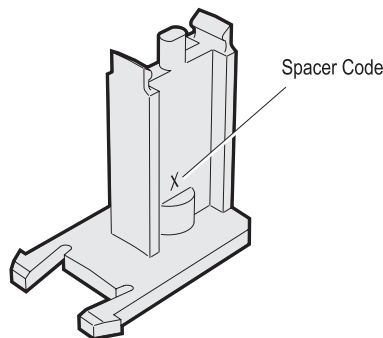
Currency Width Spacer Codes

Currency mm	Width in	Yellow Spacer Code	E Spacer Code
62	(2.44)	D9	E12
63	(2.48)	D9	E12
64	(2.52)	C9	E11
65	(2.56)	D8	E11
66	(2.60)	D8	E11
67	(2.64)	C8	E10
68	(2.68)	D7	E9
69	(2.72)	D7	E9
70	(2.76)	C7	E9
71	(2.80)	D6	E8
72	(2.83)	D6	E8
73	(2.87)	C6	E8
74	(2.91)	D5	E7
75	(2.95)	D5	E7
76	(2.99)	C5	E6
77	(3.03)	D4	E6
78	(3.07)	D4	E6
79	(3.11)	C4	E5
80	(3.15)	D3	E5
81	(3.12)	D3	E5
82	(3.23)	C3	E4
83	(3.27)	D2	E3
84	(3.31)	D2	E3
85	(3.35)	C2	E3
86	(3.39)	D1	E2
87	(3.43)	D1	Nil
88	(3.46)	C1	Nil
89	(3.50)	D*	Nil
90	(3.54)	D*	Nil
91	(3.58)	C*	Nil
92	(3.62)	Nil	
93	(3.66)	Nil	
94	(3.70)	Nil	
95	(3.74)	Nil	

Matching Cassette Bodies And Lids

Prevent lids being put on bodies set for a different currency by one of the recommended marking systems:

● Apply small stick-on labels of the same colour to the lid and the body

● Write the currency value in indelible ink on the interior surfaces of the lid and the body.

Note Low Sensing Adjustment

The note low block provides the dispenser subsystem with an indication of a note low condition. The block can be set to give two note low settings:

● 75 ± 50 notes

● 200 ± 50 notes
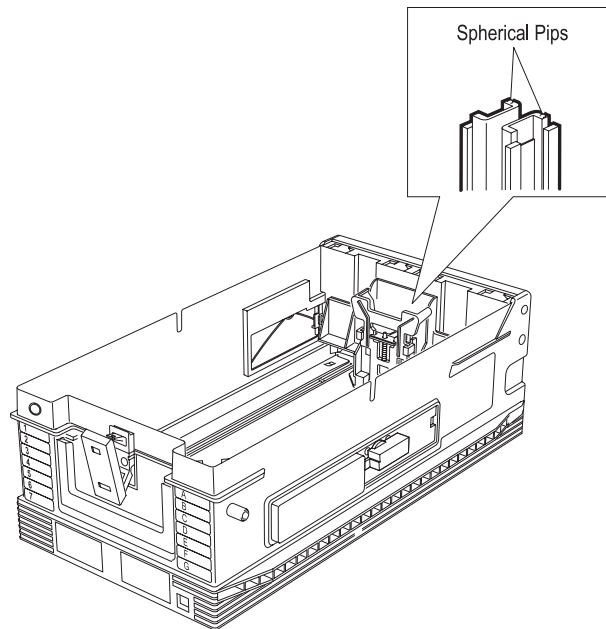
Spherical Pips

The settings are indicated by spherical pips on the flaps of the block. If the pips are towards the truck door end of the cassette, it is set for the 75 note setting. If the pips are set towards the handle of the cassette then it is set for the 200 note setting.

To change the note low setting proceed as follows:

1 Open the cassette and remove the lid.

2 Press the flaps of the note low block together until they touch then pull the block upwards and out of the pusher body.
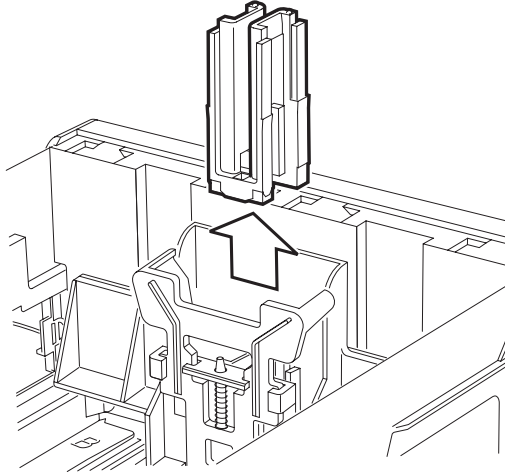
3 Turn the block around so that the pips face the opposite way then insert the block back into the pusher.
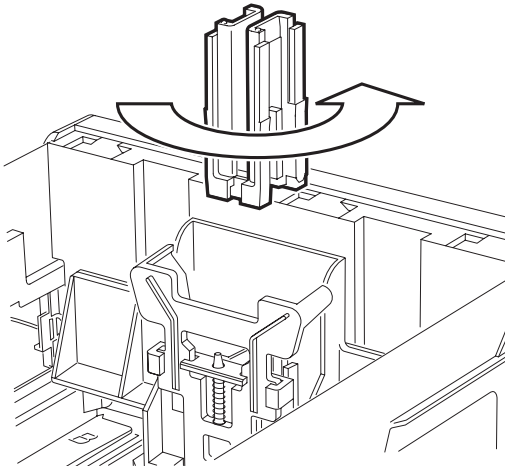
Currency Singularity

Singularity

The term "singularity" describes the parameters used by the dispenser to recognize a single currency bill. In the 5635 dispenser the LVDT determines whether a picked currency item is single by measuring the cross sectional area of the item. This measurement is compared with a threshold value held in NVRAM to determine whether a bill is single, multiple, folded, or torn. Invalid bills are detected and rejected. Threshold values are stored for each currency type.

For proper operation of the dispenser, the singularity thresholds must be configured correctly as described in this section.

Internal Compensation Factor

The dispenser maintains an internal compensation factor in NVRAM on the dispenser control board. This compensation factor allows for differences that exist between the singularities calculated by different LVDT assemblies because of mechanical tolerances. The dispenser adjusts the LVDT compensation factor automatically as currency items of a known singularity value are dispensed. While items are dispensed the actual average of good single item singularities is measured over 255 bills.

Condition of Currency

It is important that the currency dispensed to establish singularity is new. Used currency could result in a singularity threshold lower than a value which new currency can give.

The singularity thresholds must be established for each type of currency to be dispensed. Different denominations of currency notes must not be mixed in a single cassette. Also different issues of a denomination may have different physical parameters and they must not be mixed if the dimensions are different.

To calibrate the dispenser it is recommended to dispense around 2000 items of currency of a known singularity (test notes). The currency should be prepared as described in Chapter 3.

Calibrating the Dispenser

Proceed as follows to calibrate the dispenser:

1   Power on the dispenser.

2   Load the cassette with the test currency and insert it into the top pick position.

3   Use the Set Bill Sizes command to enter the size (width in millimetres) of the test currency.

4   Use the Set Bill Singularities command to enter the singularity of the test currency.

5   Use the Multi-Cassette Dispense command to dispense around 2000 items of the test currency.

The above procedure has adjusted the internal LVDT compensation factor around 8 times which allows for individual LVDT gain. The dispenser can now be considered to be calibrated and can be used to evaluate the currency to be dispensed as described in the next section.

Establishing Singularity and Size

In this procedure you have to cause the dispenser to calculate the singularity and size of 10 dispensed currency bills five times dispensed for each type of currency you wish to evaluate.

1   Prepare the cassettes to accept the currency you will normally be dispensing.

2   Load the cassette with at least 50 items of each denomination of the test currency and insert the cassettes into the pick positions.

3   Use the Learn Bill Parameters command to calculate the average width and singularity of the currency dispensed from the cassette, or cassettes.

4   Make a note of the figures of width and singularity returned by the command for each currency type.

5   Repeat steps 3 and 4 five times.

6   Total each set of five figures and divide by 5 to obtain the averages.

7   Use the Set Bill Singularities and Set Bill Sizes commands to write the average values to NVRAM.

The normalised figures you have obtained, using the above procedure on a calibrated dispenser, may be set into any other 5635 dispenser running the same currency, without the need for further calibration or calculation.

Diagnostic Tests

During the Automatic and Manual tests following start-up, LED
D 12 is used to show the Status Code (test result) for the test and
LED D11 is used to show the test number. LED D12 flashes the
number of times equivalent to the status code and LED D11 flashes
the number of times equivalent to the test number. If a fault is found
the indication cycles until power is removed from the board.
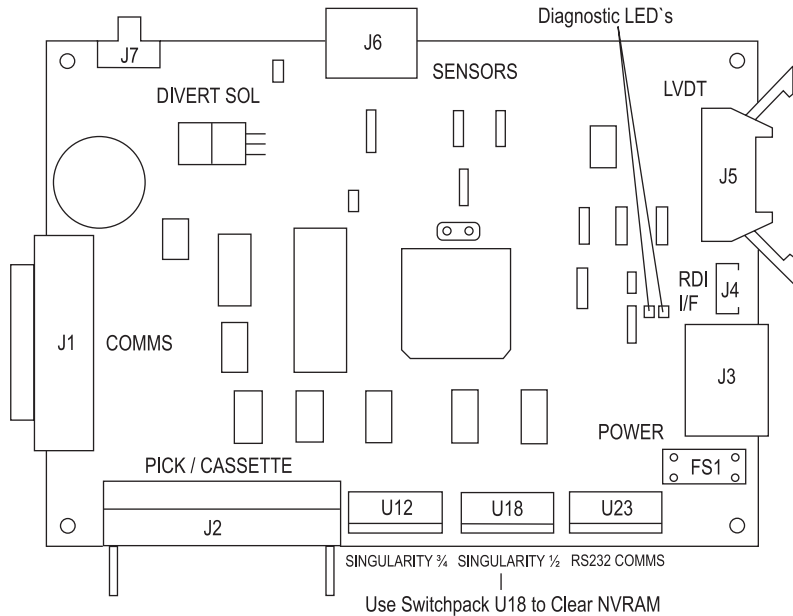
Start-Up Tests

A failure of the start-up diagnostic tests will result in one of the following patterns being shown continuously on the control board LEDs D11 and D12 (Where, 0 = LED off, 1 = LED on).

LED D11	LED D12	Meaning
1	0	Bad switch setting
0	1	CPU quick check failed

Automatic Tests

Tests 1, 2, and 3 are carried out automatically and, if successful both LEDs flash together to confirm that they have passed.

Test 1 - **Microcontroller Confidence and EPROM Sumcheck**

LED D11 is flashed once to signify that this is test 1.

LED D12 is then flashed the number of times equivalent to the status code.

Status Code	Status
0	Passed
8	MCU ALU fault
9	MCU RAM fault
10	MCU timer fault
11	MCU interrupt control register fault
12	MCU serial control register fault
13	EPROM sumcheck fail

Test 2 - **SRAM Data**

LED D11 is flashed two times to signify that this is test 2.

LED D12 is then flashed the number of times equivalent to the status code.

Status Code	Status
0	Passed
8	Internal data error in lower SRAM
9	Internal data error in upper SRAM
10	External data error in lower SRAM
11	External data error in upper SRAM

Test 3 - **SRAM Address**

LED D11 is flashed three times to signify that this is test 3.

LED D12 is then flashed the number of times equivalent to the status code.

Status Code	Status
0	Passed
8	Data error while verifying 000H write
9	Data error while verifying 0FFH write at address 0000H or 8000H
10	Lower SRAM address bus error in lower 8 lines BA 0 - 7
11	Lower SRAM address bus error in upper 8 lines BA 8 - 15

Status Code	Status
12	Upper SRAM address bus error in lower 8 lines BA 0 - 7
13	Upper SRAM address bus error in upper 8 lines BA 8 - 15
14	Chip select fault

Manual Tests

The two manual tests require the Singularity 1/2 switchpack to be set according to the test.

1 = Switch down

0 = Switch up

Note Switch 8 = 1 selects level 0 tests.

Test 4 - **All RAM Data Test and Clear NVRAM**

The Singularity 1/2 switchpack should be set as follows:

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
0	0	1	0	0	0	0	1

LED D11 is flashed four times to signify that this is test 4.

LED D12 is then flashed the number of times equivalent to the status code.

Status Code	Status
0	Passed
8	Internal data error in lower SRAM

Status Code	Status
9	Internal data error in upper SRAM
10	External data fault in lower SRAM
11	External data fault in upper SRAM

Test 5 - All RAM Address

The Singularity 1/2 switchpack should be set as follows:

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
1	0	1	0	0	0	0	1

LED D11 is flashed five times to signify that this is test 5.

LED D12 is then flashed the number of times equivalent to the status code.

Status Code	Status
0	Passed
8	Data error while verifying 000H write.
9	Data error while verifying 0FFH write at address 0000H or 8000H
10	Lower SRAM address bus error in lower 8 lines BA 0 - 7
11	Lower SRAM address bus error in upper 8 lines BA 8 - 15

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Status Code	Status
12	Upper SRAM address bus error in lower 8 lines BA 0 - 7
13	Upper SRAM address bus error in upper 8 lines BA 8 - 15
14	Chip select fault

Adjustments

The adjustments to the dispenser are the Pick Module timing and the Dispenser Motor drive belt tension.

Pick Module Timing

Pick modules on the 5635 Dispenser are known as the Aria pick modules. The gear trains of the Aria pick modules lock them together in a fixed timing relationship so that the timing must be set as the dispenser is assembled as described in the following sections.

The 5635 Spray Currency Dispenser is built in the following configurations:

1 High Dispenser	**2 High Dispenser**	**3 High Dispenser**	**4 High Dispenser**
Presenter	Presenter	Presenter	Presenter
P1 Timing Disk = 1	P2 Timing Disk = 1	P2 Timing Disk = 1	P2 Timing Disk = 1
	Timing Disk = 2	Timing Disk = 2	Timing Disk = 2
		P1 Timing Disk = 3	P2 Timing Disk = 3
			Timing Disk = 4

P1 = Single Pick Module

P2 = Double Pick Module

In a correctly timed dispenser, when the number **1** on the timing disk of the top pick module is alongside the timing sensor, then the number **2** of the second pick module should be alongside its sensor, the number **3** on the timing disk of the third pick module should be alongside its sensor, and the number **4** on the timing disk of the fourth pick module should be alongside its sensor.

Once set, this setting would only change because of a mechanical failure such as a broken timing belt or stripped gear. The following sections describe the timing checks necessary when building up the dispenser after separation because of such a failure.

You must carry out the procedures in the order given:

● Separating the Pick Units of the Double Pick Module
● Pick Unit Internal Timing
● Double Pick Module Pick Unit Relationship
● Pick Module to Presenter Timing
  ● 1 High Dispenser
  ● 2 High Dispenser
  ● 3 High Dispenser
  ● 4 High Dispenser.

Note 1. The procedures assume that the dispenser is hung from the top and that pick modules are added below the presenter, however, the procedure can adapted so that the dispenser is assembled by building from pick unit 4 upwards with the presenter added last.

Note 2. Re-configuration is required when downgrading from four to three, three to two, or two to one pick modules. The NVRAM must be cleared to de-configure the removed pick modules.

Separating the Pick Units of the Aria Double Pick Module

To adjust a double pick module you must first isolate the gear trains
of the two pick units by removing the timing belt (NCR part
number 445-0587791) shown in the following figure.
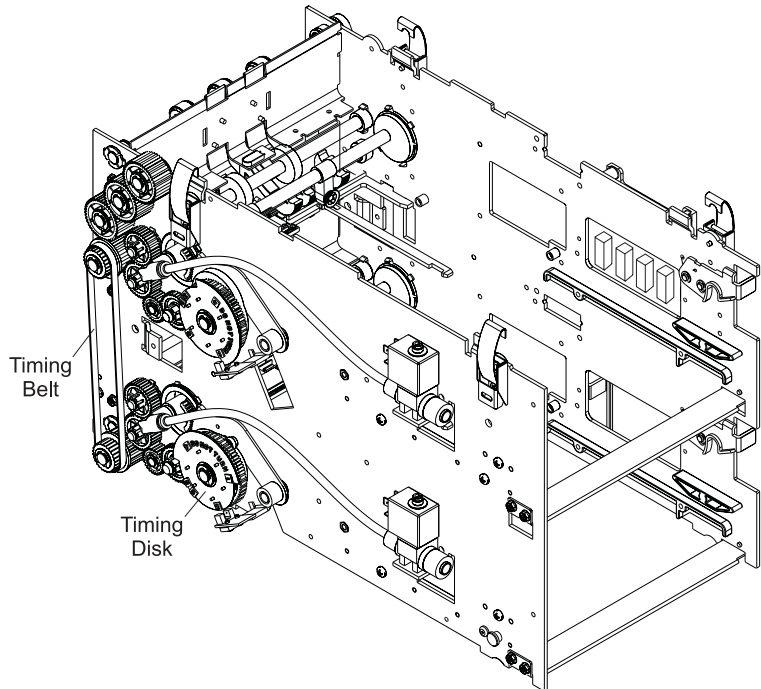
Retain the timing belt until required to reinstall it in the procedure
"Double Pick Module Pick Unit Relationship".

Internal Timing of 5635 (Aria-Type) Pick Modules

The only relationship to be set in the pick unit is between the pick wheel and the cam driven vacuum arm line.

**Note** In a double pick unit make the adjustment on the upper pick unit first

The method of setting is as follows:
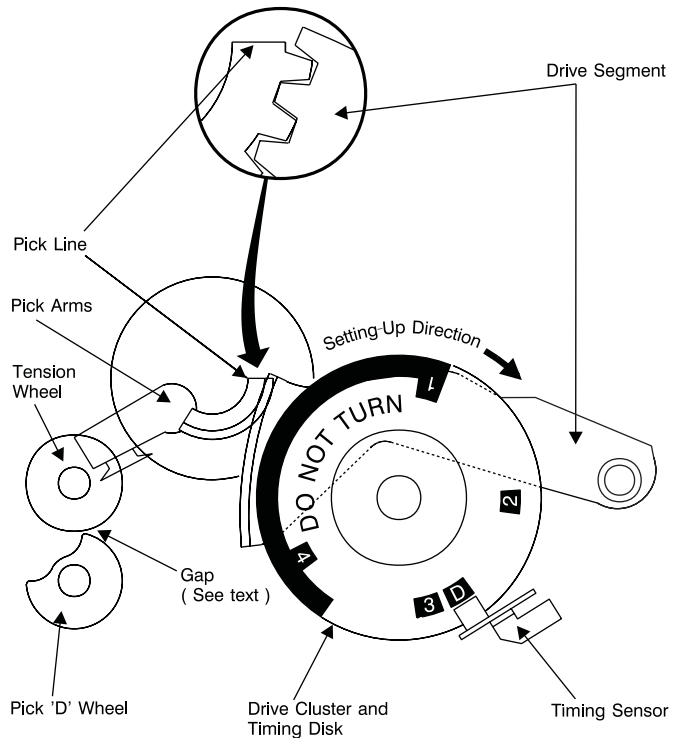
1   Position the teeth mesh between the drive segment and pick line so that the upper tooth of the drive segment is above the upper tooth of the pick line.

2   Take off and retain the 26T idler gear (NCR part number 445-0633190) directly below the pick line (left side of the module

looking from the currency cassette). See the following
illustration:.

26T Idler Gear   Timing Disk
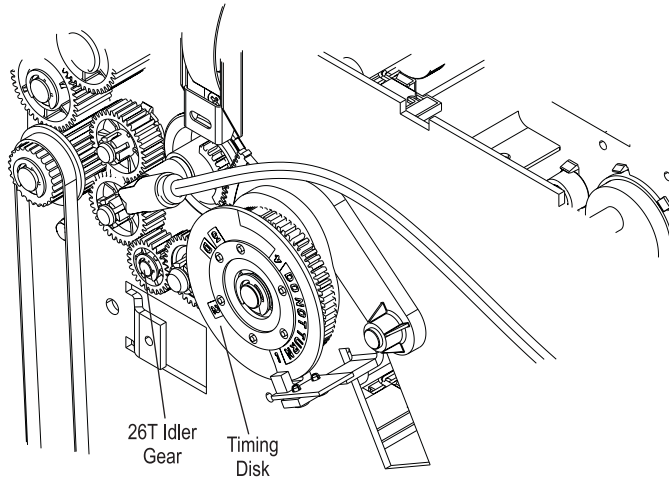
Note The above illustration shows the Aria double pick module but
can also be used to identify the gear on the Aria single pick module.

3 Turn the gears of the pick module transport until the pick D
   wheel is free of its mating tension wheel.

4 Turn the drive cluster in a clockwise direction until the **D**
   timing mark on the timing disk lines up with the timing sensor
   body.

5 Turn the gears of the pick module transport until the
   interrupted part of the pick D wheels is away from the pick
   arms. Turn the gears until a gap of 0.5 mm $\pm$ 0.5 mm
   (0.02 in. $\pm$ 0.02 in.) exists between the leading edges of the pick
   D wheels and the tension wheels as shown in the first figure
   above.

6 Replace the idler gear removed in step 2. Be careful not to
   dislodge the setting.

7 On a double pick module carry out steps 1 to 6 on the lower
   pick unit.

Aria Double Pick Module Pick Unit Relationship

When the internal timing of both pick units of the double pick module has been set, the pick units have to be locked in a fixed timing relationship. Proceed as follows:

1   Turn the gear train of the upper pick unit to move the timing disk in a clockwise direction until the 1 timing mark on the drive cluster timing disk lines up with the timing sensor body.
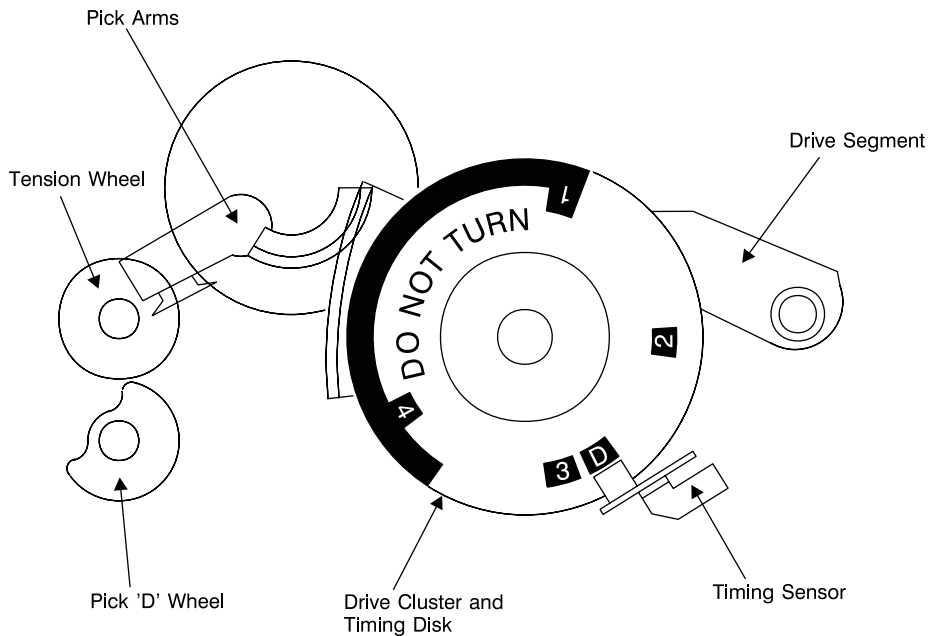
Caution   Always turn the gear train in its normal direction of travel. The pick timing disks should rotate clockwise. Do not move the gear train backwards and forwards.

2   Turn the gear train of the lower pick unit until the 2 timing mark on the drive cluster timing disk lines up with the timing sensor body.

3   Place the timing belt (removed in the procedure "Separating the Pick Units of the Aria Double Pick Module") around the pulley wheel of the lower pick position and put it on as many teeth as possible of the pulley wheel of the upper pick position, taking care not to dislodge the settings. Turn the upper gear train in the normal direction of travel (see Caution above) to ride the timing belt fully on to the pulley wheel.

Assembling Aria Pick Modules to the Presenter

Once the pick modules have been prepared, as in the previous procedures, the pick modules can be assembled with a 5635 spray presenter to produce the complete currency dispenser. There are no timing adjustments to the spray presenter.

Warning   The dispenser is heavy. Get help to lift it.

Pick Arms

Drive Segment

Tension Wheel

DO NOT TURN

1

2

4

3 D

Pick 'D' Wheel

Drive Cluster and
Timing Disk

Timing Sensor

1 High Dispenser

1 Rotate the gear train of the single pick module to move the timing disk in a clockwise direction until the **1** timing mark on the drive cluster timing disk lines up with the timing sensor body (see above illustration).

Caution Always rotate the gear train in its normal direction of travel. The pick timing disk should turn clockwise. Do not move the gear train backwards and forwards.

2 Attach the pick module to the presenter, taking care not to dislodge the settings.

3 Check that the timing mark is aligned. Timing mark **1** should be in line with the timing sensor body.

2 High Dispenser

1   Turn the gear train of the double pick module to move the timing disks in a clockwise direction until the **1** timing mark on the upper drive cluster timing disk lines up with the timing sensor body.

Caution   Always turn the gear train in its normal direction of travel. The pick timing disks should rotate clockwise. Do not move the gear train backwards and forwards.

2   Check that the **2** timing mark on the lower drive cluster timing disk lines up with the timing sensor body.

3   Attach the presenter to the double pick module.

4   Check that all the timing marks are aligned. Timing marks **1** and **2** should be in line with their respective timing sensor bodies.

3 High Dispenser

1   Rotate the gear train of the double pick module (observe the caution above) to move the timing disks in a clockwise direction until the **1** timing mark on the upper drive cluster timing disk lines up with the timing sensor body.

Caution   Always rotate the gear train in its normal direction of travel. The pick timing disk should turn clockwise. Do not move the gear train backwards and forwards.

2   Check that the **2** timing mark on the lower drive cluster timing disk lines up with the timing sensor body.

3   Attach the pick module to the presenter, taking care not to dislodge the settings.

4   Rotate the gear train of the single pick module (observe the caution above) to move the timing disks in a clockwise direction until the **3** timing mark on the cluster timing disk lines up with the timing sensor body.

5 Attach the single pick module to the bottom pick module of the double pick module, taking care not to dislodge the settings.

6 Check that all the timing marks are aligned. Timing marks **1**, **2**, and **3** should be in line with their respective timing sensor bodies.

4 High Dispenser

1 Rotate the gear train of the first double pick module to move the timing disks in a clockwise direction until the **1** timing mark on the upper drive cluster timing disk lines up with the timing sensor body.

Caution Always rotate the gear train in its normal direction of travel. The pick timing disks should turn clockwise. Do not move the gear train backwards and forwards.

2 Check that the **2** timing mark on the lower drive cluster timing disk lines up with the timing sensor body.

3 Attach the double pick module to the presenter, taking care not to dislodge the settings.

4 Rotate the gear train of the lower double pick module (observe the caution above) to move the timing disks in a clockwise direction until the **3** timing mark on the upper drive cluster timing disk lines up with the timing sensor body.

5 Check that the **4** timing mark on the lower drive cluster timing disk lines up with the timing sensor body.

6 Attach the double pick module to the bottom of the first double pick module, taking care not to dislodge the settings.

7 Check that all the timing marks are aligned. Timing marks **1**, **2**, **3,** and **4** should be in line with their respective timing sensor bodies.

Dispenser Motor Drive Belt Tension

The only adjustment to the spray presenter assembly is for the Dispenser Motor drive belt tension.

1   On the spray presenter, loosen the transport motor mounting screws.

Motor Securing Screws
(4 Places)
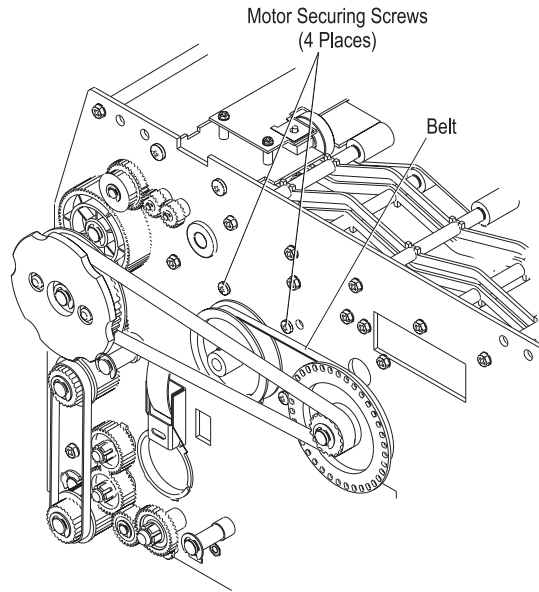
Belt

2   Adjust the belt tension to give a mid-span deflection of **3mm** (0.12 in) for a force of 3 Newtons (306 g *or* 10.8 oz.) applied at mid-span.

3   Maintaining this adjustment, tighten the transport motor mounting screws.

Preventive Maintenance

At each service call the Field Engineer should carry out cleaning tasks and check for wear on timing belts and moving parts. Particular attention should be paid to the pick arm suction cups.

Note: Vacuum the dust from all areas of the currency dispenser.

Pick Modules

Examine the pick modules as follows:

● Check that the reed switch housing is not cracked (replace if necessary)

Note: A note low condition may not be identified if the reed switch housing is damaged.

● Inspect the pick lines for broken nozzles. Replace the pick line if broken, cracked or bent

● Check and replace suction cups if necessary. Read the "Suction Cups" section following

● Check alignment of sensors

● Check for worn or broken gears. Replace gears where necessary. If gears are worn, check that all circlips on the associated shaft are in place. Lateral movement of shafts occur (accelerating gear wear) if circlips fall off

● Lubricate the pick modules and check their mechanical adjustment; refer to the "Lubrication" section in this chapter.

● Make sure that pick modules are properly timed.

Suction Cups

The following information is provided as a guide to formulating replacement schedules for individual ATMs:

● Lower usage ATMs (150 dispense operations daily, 1 bill per pick module per operation); replace suction cups annually

● Medium usage ATMs (250 dispense operations daily, 2 bill per pick module per operation); replace suction cups every six months

● Higher usage ATMs (350 dispense operations daily, 3 bill per pick module per operation); replace suction cups every three months.

Currency/Media Containers

Clean the purge bin area, latch fast bin (if fitted) and all cassettes (including spare cassettes) both inside and out (See "Cleaning").

Note: Pay particular attention to the front door of the cassette.

Lubrication

This section describes the lubrication of the currency dispenser during component replacement.

Lubricant Type

The following lubricants are recommended:

Lubricant	Type
A	No.2 General Purpose Oil
B	Synthetic Lubricating Grease (NCR Part No. 009-0004618 = 100gm containers)

For No.2 General Purpose Oil any one of the following lubricants can be used:

- Shell Oil Co. Donax T-6
- Mobil Oil Co. Mobil ATF 220
- Exxon Oil Co. ATF or Esso ATF.

General Instructions

The following general instructions must be observed:

1   Use clean lubricants from properly labelled containers.

2   Satisfactory operation of mechanical components depends upon proper lubrication. Follow the specific lubrication instructions in the following paragraphs in detail.

3   Avoid excessive lubrication. Apply only that amount which will provide a thin coating on the entire bearing area or surface, unless otherwise specified.

4   All parts to be lubricated must be free from dust, corrosion and metal chips.

5   Lubricate bearing areas and surfaces during assembly, unless conditions caused by subsequent handling are detrimental (for example, accumulation of chips, grit, and so on) to the proper operation of the part. In those cases lubrication should be applied after assembly.

6   Apply lubricants using the most convenient method when none is specified, that is by brushing, dipping, or oil can. Spraying is not recommended.

7   Lubricate all spring hooks and spring studs with lubricant B.

8   Working clipped or riveted assemblies should not be lubricated before riveting but only after all processes, handling, or storage involving exposure to dirt or serious atmospheric contamination are past.

9   On assemblies that have shafts on which one or more moving parts are assembled, lubricate both the shaft and the hub areas on each part with the specified lubricant.

10   Lubricants can cause serious deterioration of rubber. Avoid contamination of drive belts and drive rolls.

Caution   Make sure that no lubricant spills on to the teeth of gears as this may impair their performance.

Spray Module

Lubricate as follows:

● All plastic bearings (before assembly) - with A.

Pick Module

Lubricate as follows:

● Drive segment, inside hub, pivot stud - with A
● Gears turning on stationary stud, on the stud, in the bore - with B
● Cam cluster, bore and pivot stud - with B
● Pick line, bearing faces - with B
● Pick line hub bearing surface - with B
● Plastic bearings (before assembly) - with A
● Cassette latch stud - with B.

Cleaning

Clean the cassette with a cloth dampened with water. For stubborn marks and grease try a clean cloth dampened with isopropyl alcohol. Do not use any other cleaning agents or abrasives.

Replacement Instructions

Return faulty modules for repair/rework.

Warning 1: **When plugged into a power source this module contains dangerously high voltages. Incorrect handling could result in electrocution.**

Warning 2: **The currency dispenser and its constituent units can be heavy. Observe correct lifting techniques when handling these items.**

Replacing the Control Board

Removal of the dispenser control board is carried out as follows:

Note: Before removing the board, make a note of the cable connection positions. After fitting a new control board, refer to the "Configuration" section later in the chapter to set up the new board. It is also necessary to re-set the currency singularity.

The 5635 dispenser board is secured by 4 screws **A** and is behind a metal panel, itself secured by 4 screws **B**:
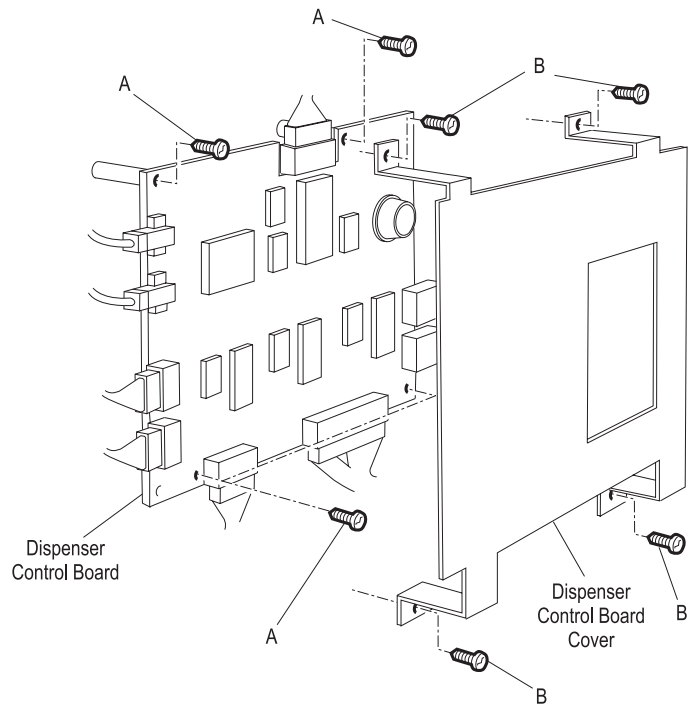
The following table and illustration indicate the purpose and position of each connector on the 5635 dispenser control board.

Board Reference	Control Board (5635 Dispenser)
J1	Communications *
J2	Pick module and cassette sensors
J3	Power *
J4	RDI Interface
J5	LVDT
J6	Presenter sensors
J7	Divert solenoid

Pin-out details for these connectors are at the end of the chapter.
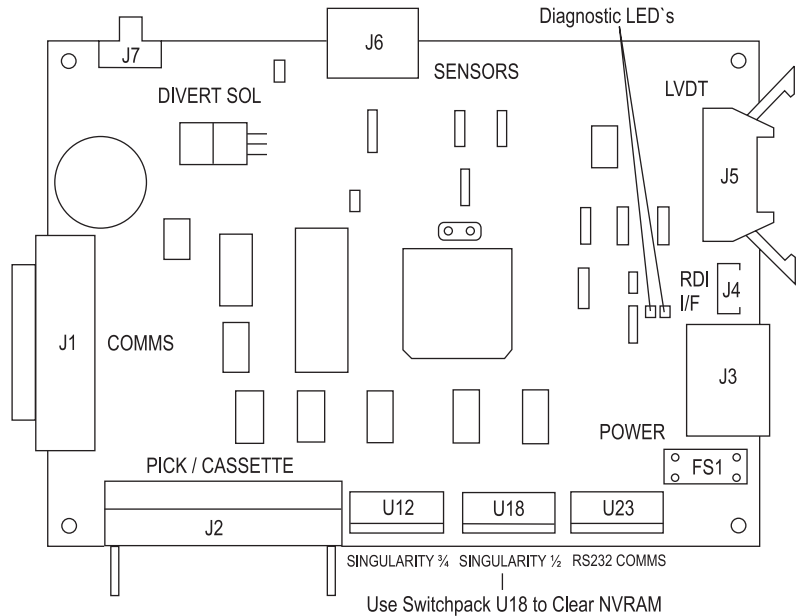
Replacing the 5635 Spray Presenter

Proceed as follows to remove the spray presenter from the 5635 dispenser:

● Switch off the terminal power.

● Disconnect the terminal cable from the dispenser control board power connector J3 and Comms connector J1.

● Cut any cable ties securing the terminal cable to the presenter.

● Disconnect the vacuum system below the filter.

● Release the four latches fastening the presenter to the first pick module.

● Lift the presenter away from the pick modules.

● Fit the new spray presenter.

Latches   Filter
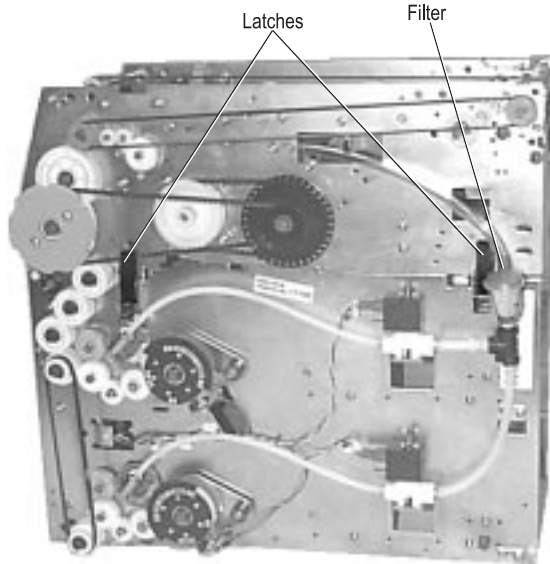
Replacing a 5635 Dispenser Pick Module

Pick modules on the 5635 dispenser are latched together and are known as Aria pick modules.

As necessary, release the four latches securing the pick module to the one below, separate the vacuum system at a convenient point, and unplug the ribbon cable between the pick interface boards.

Each pick module drives the one below via a gear train which keeps them in a fixed timing relationship. This relationship must be maintained as the dispenser is assembled as described in the "Adjustments" sections of this chapter.

Configuration

The items requiring configuration are the RS232 comms settings and bill opacity or singularity.

RS232 Comms

To select RS232 comms and baud rate, set the DIP switches (U23 on the 5635 control board), SW1-SW8 as follows:

Switch no.	1	2	3	4	5	6	7	8
Setting	1	1	1	0	1	0	0	0

where 0 = up and 1 = down.

Refer to the previous section on "Replacing the Control Board" to determine the type of board and the location of the switchpacks.

Bill Singularity

See the section "Entering Singularity and Size Values into NVRAM" in this Chapter for the method of configuring or changing singularity values.

Connector Pin-outs

The pin-outs of connectors on the dispenser are as follows.

AC Connector

The pinout and wire colours for the AC connector are shown below:

Live	**1**	Black
Earth	**2**	Green/Yellow
Neutral	**3**	White

RS232 Connector

The RS232 connector is a 25-way D-type male connector, J1 on the 5635 dispenser control board.

GND	**26**		
XRES	**13**	**25**	COMM_ID1
COMM_ID0	**12**	**24**	GND
E1	**11**	**23**	COMM_S1
GND	**10**	**22**	COMM_S0
E0	**9**	**21**	DB
N/C	**8**	**20**	+5V
GND	**7**	**19**	DA
N/C	**6**	**18**	OOO
CTS	**5**	**17**	LRTS
RTS	**4**	**16**	LCTS
RXD	**3**	**15**	LTXD
TXD	**2**	**14**	LRXD
N/C	**1**		
GND	**27**		

DC Connector

The dc connector is a 7-way header connector (J3 on the 5635 dispenser control board).

GND	**1**
+5V	**2**
GND	**3**
+5V	**4**
KEY	**5**
GND	**6**
+24V (Interlocked)	**7**

Appendix A
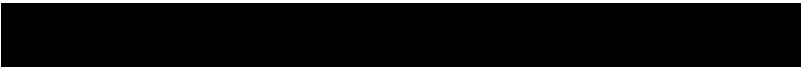
Specifications

Dispenser Specifications

Currency

The dispenser is capable of dispensing new or used currency of the following dimensions:

	Minimum	Maximum
Width	**62mm** (2.44in)	**95mm** (3.74in)
Length	**120mm** (4.72in)	**172mm** (6.77in)
Thickness	**0.06mm** (0.002in)	**0.26mm** (0.01in)

Tolerance on bill dimensions is ± **2mm**. (0.08in).

Currency Cassettes

The currency cassettes are adjustable to accommodate the currency sizes specified above and can hold a stack of up to **295mm** (11.6in) of new or used bills. This corresponds to approximately 2260 new or 1580 used U.S. dollars.

Reject Bin

The reject bin can hold 50 bills.

EMC

The dispenser meets the following EMC specifications:

Conducted and Radiated Emissions

The dispenser meets the following:

- EN55022 Class b conducted, Class B radiated (latest revision).

Harmonics and Flicker Emissions

The dispenser complies with the following:

- EN61000-3-2 (latest revision) Mains harmonics
- EN61000-3-3 (latest revision) Mains flicker

Radiated Immunity

As a stand-alone unit, the dispenser meets the following:

- EN 61000-4-2 (latest revision) ESD AD +/- 14kV, CD +/- 5kV
- EN 61000-4-3 (latest revision) Radiated Immunity 6V/m 80%am (1kHz) 80M - 1GHz
- EN 61000-4-4 (latest revision) EFT 1kV signal, 2kV Power
- EN 61000-4-5 (latest revision) Surge 1kV DM, 2kV CM
- EN 61000-4-6 (latest revision) Conducted RF 6V 80%am (1kHz) 30M - 80MHz
- EN 61000-4-8 (latest revision) Power Frequency Magnetics 3A/m, 50Hz
- EN 61000-4-11 (latest revision) Voltage Dips/Interruptions.

Power Requirements

DC Power:

- +5V $\pm$ 5% @ 1.5A
- +24V $\pm$ 10% @ 4.0A

AC Power:

- 115VAC 5.5A RMS 20.2A surge
- 230VAC 3.0A RMS 10.0 A surge.

Acoustic Noise

Maximum noise emission level = 84dB(a).

The noise emission given above is for the dispenser operating outside the parent terminal.

Weight

The weights of the component parts of the dispenser are:

Dispenser (4 high) with empty media containers	46 kg	101.20 lb.
Currency cassette (empty)	3.20 kg	7.04 lb.
Currency cassette (full)	6.0 kg	13.20 lb.
Reject bin (empty)	0.37 kg	0.81 lb.
Reject bin (full)	0.41 kg	0.90 lb.

Dimensions

The overall dimensions of the dispenser are:

Width (including gear train etc.)	300 mm	11.81 in.
Height (1 high)	310 mm	12.20 in.
Height (2 high)	447 mm	17.60 in.
Height (3 high)	584 mm	23.00 in.
Height (4 high)	720 mm	28.35 in.
Depth	475 mm	18.70 in.

Dimensions for the location of the dispenser securing holes are given in Chapter 2.

Note The height and depth dimensions above exclude any interfacing requirements to the ATM.

Environment

The environment is specified as existing within the host terminal.

● Normal operating range:

Temperature	
Dry bulb	10°C to 50°C
Change	10°C per hour (maximum)
Dew point	26°C (maximum)

Humidity	
Relative	20% to 80%
Change	10% per hour maximum (no condensation)

● Extreme power-on range:

Temperature	
Dry bulb	0°C to 55°C
Change	10°C per hour (maximum)

Humidity	
Relative	10% to 95%
Change	10% per hour maximum (no condensation)

The extreme power-on range does not represent an operating range but it is intended to indicate limits, which are likely, if the heating or air conditioning plant fails or has not yet brought the environment to operating conditions. Attempted operation outside this range is considered to be unlikely.

Note: After power down in extreme conditions, it will be necessary to allow a period for the module to return within operating limits.

Index

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Use pursuant to Company Instructions

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Number: B006-6280-A000   **Date:**   April 2002

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