SR5i Technical Manual

Money Controls

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1. Diary of changes

Issue 1.0 ..... April 2004

- 1st issue based on functional spec V9.0

2. Introduction

The SR5i coin acceptor has been designed to be compatible with the standard 5" format currently used throughout the vending, amusement and leisure industries.

Through the development of Series Resonance technology, and now the incorporation of AccepTelligence™ an intelligent expert system, the SR5i offers increased levels of acceptance and security. Each acceptor will accept up to 16 different coins or 15 coins plus one token.

Depending on your requirements, the SR5 series can be set-up to be backwards compatible with the C220B, C420, C435, and C435 UK AWP. This will be determined by the ***Mode.***

Mode 1 = C435
Mode 2 = C435 - BACTA Binary

As with all new Money Controls products other enhancements have been made to the SR5i series as well as the new sensing technology.

These include:-

- **ccTalk** serial communication. (see sections 19 to 22)
- Extended **Teach and Run™** options.
- Coinless programming.
- Improved sorter coin detection.

3. Operation

Coin discrimination parameters are factory programmed for optimum acceptance of up to 16 different coins or tokens and therefore no field adjustment is necessary beyond token select / **Teach and Run™** (see page 34).
However, the SR5i can now be programmed on site without the use of coins and for total flexibility, if a new coin/token is required, the **Teach and Run™** function can be used to program all 16 coins and the token position 12.

Coins are inserted into a front or top entry acceptor and roll past a set of Series Resonant sensors. If the characteristics measured from the inserted coin match the stored window readings in all respects, then the coin is recognised as being true. The accept gate will then open and the coin will pass through the accept sensor. Once this happens the SR5i will send a predefined credit signal to the host machine which will correspond to the coin accepted.
Depending on the SR5i model configuration the coin may then be diverted to one of 4 different paths or 8 paths if using an active manifold.

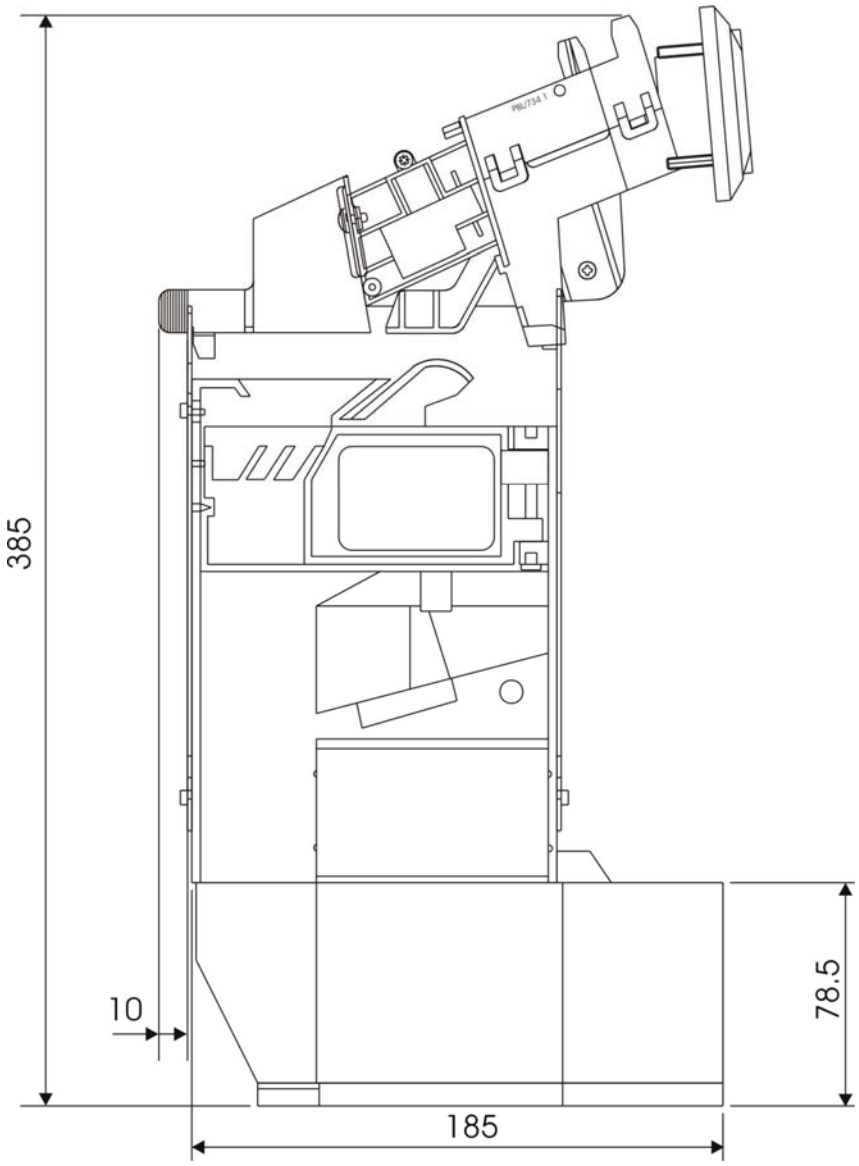
If, on comparing the inserted coins characteristics, to all the pre-programmed parameters, the coin readings do not match, this coin will be deemed invalid, the accept gate will remain closed and the coin will travel through to the reject via the reject path. The position of the reject path will be subject to whether a direct reject or indirect reject option has been fitted.

4. UK AWP Industry Standard

Shown below is the typical UK AWP Standard configuration and dimensions. The SR5i is covered in more detail in section 10.2.

Basically, this would consist of a Top Entry SR5i, Manifold 6, Universal Rundown and Coin Entry Bezel.

Figure 1: Standard Top Entry configuration using bezel and rundown



5. Electrical Connections

Figure 2: SR5i Connector Side

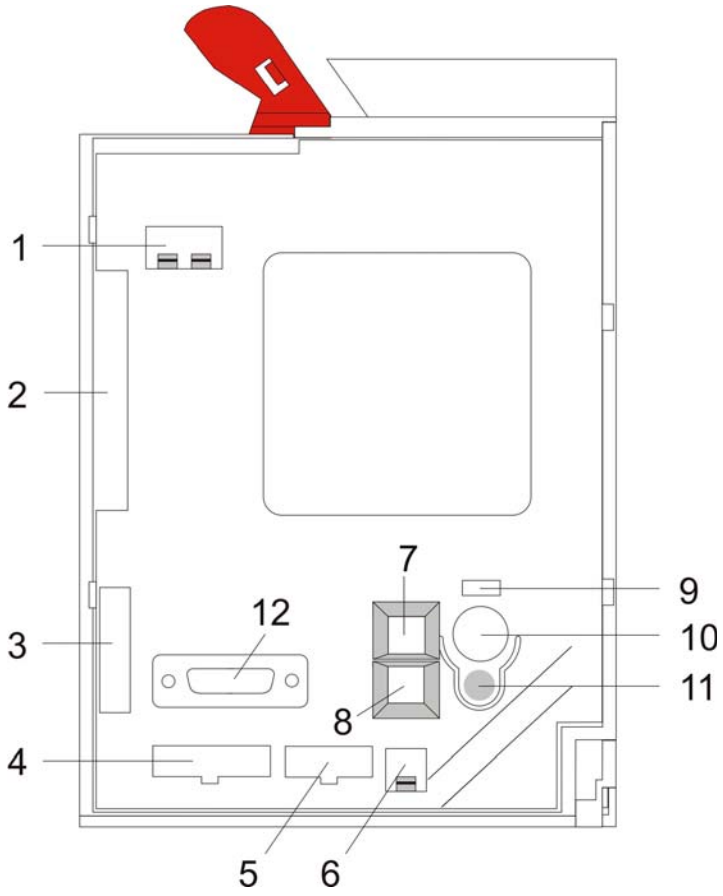


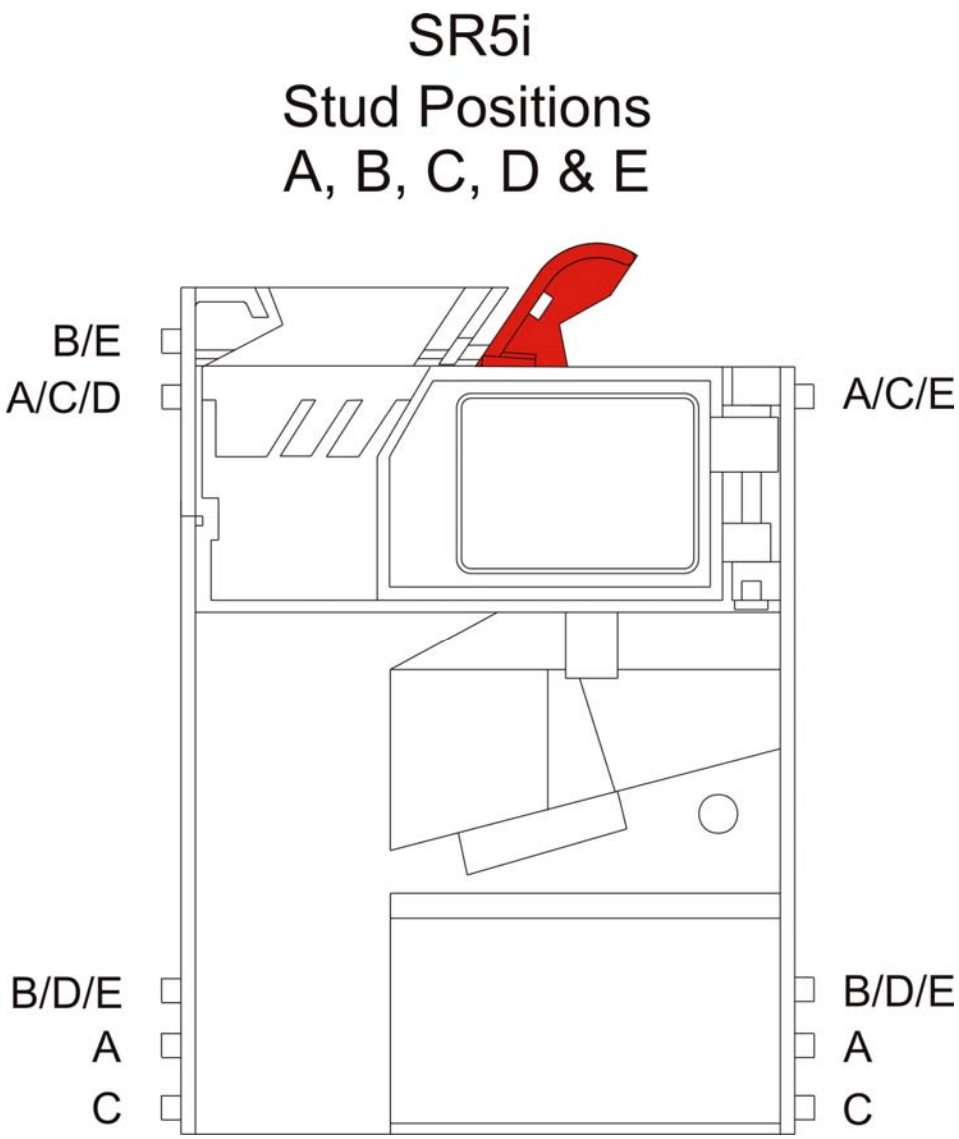
Table 1: SR5i Rear Cover Details.

1	DCE (Dual Coin Entry)	See section 9.
2	Parallel Interface	See section 10.
3	Sorter Override	See section 12.
4	Routing Plug	See section 13.
5	Serial interface (**ccTalk**)	See section 20.
6	Active Manifold	See section 14.
7	Flash Programming	See section 16.
8	Bank Select Switches	See section 17.
9	LED Indicator	See section 18.
10	Token Select / Function Switch	See section 18.
11	Program Button	See section 18.
12	RS232 Interface (cost option)	See section 15.

6. Stud Positions

The stud positions shown below are factory fitted at MCL.
“A” represents Money Controls back channel compatible.
“B” represents Industry Standard back channel compatible.
“C” is a customer specific requested option.
“D” is a customer specific requested option.
“E” is a customer specific requested option.

Figure 3: Stud Positions



7. Electrical Interface Requirements

Table 2: Power Supply

Voltage:	+12V to +24V DC +/- 10%
Absolute:	Min +10V Max +27V
Min / Max rise time:	5ms / 500ms (From 0V to within supply range)
Min / Max fall time:	5ms / 500ms (From within supply range to 0V)
Acceptor Power up time:	200 ms from the application of a valid voltage supply. A valid supply must be between the limits specified above.
Ripple voltage [< 120Hz]:	< 1 Volt
Ripple voltage [> 120Hz]:	< 100mV
Ripple voltage [> 1KHz]:	< 20mV

Table 3: Current Consumption

Typical:	70mA
Maximum:	2.0A with sorter. 3.0A with sorter and active manifold.

7.1 Accept Common (COM A)

This input is used to select the polarity of the accept signal and to provide the current for any user load, driven by an accept output.

Table 4: COM A DC Input Characteristics

Characteristic	Value	Condition
I leak max	1mA	Off load, i.e. no accept active
I in max	User load +20mA	On load i.e. accept active
V positive max	+24V	Positive Com A
V positive min	5V	Positive Com A
V negative min	0V	Negative Com A
V negative max	-24V	Negative Com A

7.2 Standard Inputs

All the following inputs have the same electronic configuration:

- Inhibits
- Bank Select
- Overrides
- Select

The hardware configuration for these inputs is shown below:

Figure 4: Input Hardware Configuration

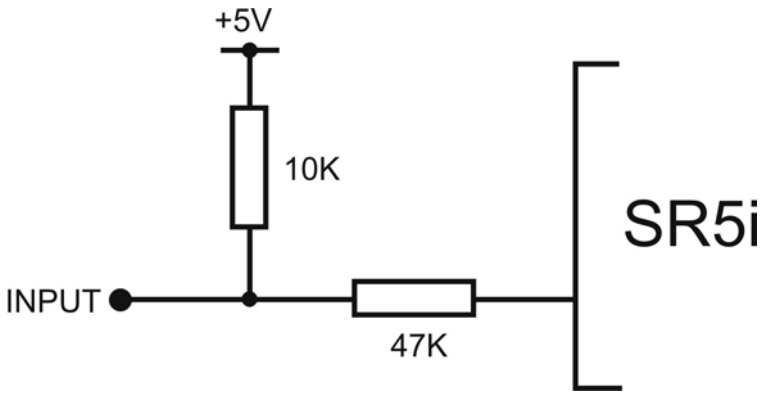


Table 5: Standard Input DC characteristics

Characteristic	Value
V in Low (max)	1V
V in High (min)	4V
I max @ V in Low	0.5mA

8. Alarms

When enabled, an alarm condition will activate the accept lines with the binary pattern 10111, (no Accept 4), for 80ms or for as long as the fault exists, depending on the alarm condition.

Conditions that will indicate an alarm condition are:

1. A coin travelling backwards past the inductive sensors which indicates a fraud is being attempted.

2. If the **sorter optos** are blocked for more than 1.5 seconds, the alarm signal will remain active, for the duration of the blockage.

3. If a coin blocks the accept sensor for more than 1.5 seconds, the alarm code is activated.

To turn the alarms ON or OFF see page 32 'Alarm and Rundown settings "D"'.

8.1 Power-up Diagnostics

When the SR5i powers up, it performs an EEPROM self-check. If there is a problem with the checksum, the LED will turn red and no coins will be accepted.

If diagnostic self check is **enabled**, the following are checked and if there is a problem then the accept lines will show the alarm code, for as long as the fault is present.

- Blockage in the sensor area / faulty sensor (AM, FM, Piezo & Credit sensors).
- If a DCE is fitted the optics are checked for a blockage.
- If a sorter is fitted the optics are checked for a blockage.

Note: If a sorter should be fitted but has been removed, then the SR5i will think the sorter optics are blocked and therefore the alarm condition will be permanent. This can only be rectified by re-fitting a sorter or re-programming the SR5i.

When the blockage / fault is rectified, the alarm code will automatically be removed.

9. Dual Coin Entry Rundown Interface (DCE)

Figure 5: DCE Connector Pin Outs

This interface is used with the dual coin rundown. It is used to provide information to the SR5i indicating whether a coin or a token has been entered.

Normally, when there is no coin or token in the entry, both the opto detectors are active as they are receiving infrared light from the corresponding emitter. This is the quiescent state.

When a coin or token is entered then the light path between the corresponding emitter and detector is broken and the detector becomes inactive.

Once the coin has passed the optics, the system returns to its quiescent state.

10. Parallel Interface

10.1 Mode 1

Introduction

The SR5i Mode 1 has been designed to be backwards compatible, form fit and function, with the standard C435 & SR5 coin acceptor.

Identifier

A Mode 1 SR5 is denoted by the 01 as shown in the example below.

Config No. e.g. B5E **01** AGB00014

Interface Details

Pin No.	Function		Input / Output / Power
	Dedicated	Binary	
1	Accept 6	Ident	Output
2	Accept 5		Output
3	Com A		Input / Power
4	Accept 1		Output
5	Key		
6	Accept 2		Output
7	Accept 3		Output
8	Select Line		Input
9	Accept 4		Output
10	Inhibit 4		Input
11	V supply		Power
12	0V		Power
13	Inhibit 3		Input
14	Inhibit 2		Input
15	Inhibit 1		Input
16	Inhibit 5		Input
17	Inhibit 6		Input
18	Inhibit 7		Input
19	Inhibit 8		Input
20	Bank Select 1		Input
21	Bank Select 2		Input

Note:

Inhibits are mapped directly from Bank 1 to Bank 2.

Output Codes

The **Select Line** (pin8) status determines the operating mode.

Select line >4V or O/C = **5 coin mode.**

Select line pulled to 0V = **16 coin mode.**

5 Coin Mode

Coin	Dedicated Outputs				
	A5	A4	A3	A2	A1
1 (9)	0	0	0	0	1
2 (10)	0	0	0	1	0
3 (11)	0	0	1	0	0
4 (12)	0	1	0	0	0
5 (13)	1	0	0	0	0
6 (14)	0	0	0	0	1
7 (15)	0	0	0	1	0
8 (16)	0	0	1	0	0

Notes:-

i. 1 denotes output ON (active).
ii. credit codes are repeated from 6 to 8.

16 Coin Mode

Coin		Binary Outputs						
		A6	A5		A4	A3	A2	A1
1	9	1	0	1	1	0	0	0
2	10	1	0	1	1	0	0	1
3	11	1	0	1	1	0	1	0
4	12	1	0	1	1	0	1	1
5	13	1	0	1	1	1	0	0
6	14	1	0	1	1	1	0	1
7	15	1	0	1	1	1	1	0
8	16	1	0	1	1	1	1	1

Notes:-

i. 1 denotes output ON (active).
ii. a credit is only valid when A4 is active.
iii. A5 is active for coins 9 to 16.
iv. A6 - Ident is ALWAYS Active.

10.2 Mode 2

Introduction.

The SR5i Mode 2 has been designed to be compliant with the BACTA published specification on the binary interface for use in UK AWP machines.

The SR5i Mode 2 is also backwards compatible, in form, fit and function with previous C435A and SR5 models designed around the BACTA Interface.

Identifier

A Mode 2 SR5i is denoted by the 02 as shown in the example below.

Config No. e.g. B5E **02** AGB00022

Interface Details

Pin No.	Dedicated Mode	Binary Mode
1	Accept 6 = 5p	Ident pin
2	Accept 5 = Token	Accept 5
3	Com A	Com A
4	Accept 1 = £1	Accept 1
5	Key	Key
6	Accept 2 = 50p	Accept 2
7	Accept 3 = 20p	Accept 3
8	Select Line	Select Line
9	Accept 4 = 10p	Accept 4
10	Inhibit 4 = 10p	Inhibit 4 (Reserved)
11	V supply	V supply
12	0V	0V
13	Inhibit 3 = 20p	Inhibit 3 = 20p
14	Inhibit 2 = 50pN & 50pO	Inhibit Linked to 5p, 10p, 50pN & 50pO
15	Inhibit 1 = £1	Inhibit 1 = £1
16	Inhibit 5 = Tkn	Inhibit 5 = Tkn
17	Inhibit 6 = 5p	Inhibit 6 = £2

Note:

Inhibits are mapped directly from Bank 1 to Bank 2.

Output Codes

The **Select Line** (pin8) status determines the operating mode.

Select line >4V or O/C = **Dedicated mode.**

Select line pulled to 0V = **Binary mode.**

Dedicated Output Mode

Coin	Value	Dedicated Outputs					
		A6	A5	A4	A3	A2	A1
1 (9)	£1	0	0	0	0	0	1
2 (10)	50p (N)	0	0	0	0	1	0
3 (11)	20p	0	0	0	1	0	0
4 (12)	10p	0	0	1	0	0	0
5 (13)	Tkn	0	1	0	0	0	0
6 (14)	£2	-	-	-	-	-	-
7 (15)	5p	1	0	0	0	0	0
8 (16)	50p (O)	0	0	0	0	1	0

Notes:-

i. 1 denotes output ON (active).
ii. £2 is inhibited.
iii. 5p credits on output A6.

Binary Mode

Coin	Value	Binary Outputs					
		A6	A5	A4	A3	A2	A1
1 (9)	£1	1	1	1	0	1	0
2 (10)	50p (N)	1	0	1	1	0	1
3 (11)	20p	1	0	1	0	1	1
4 (12)	10p	1	1	1	1	0	0
5 (13)	Tkn	1	0	1	1	1	0
6 (14)	£2	1	1	1	1	1	1
7 (15)	5p	1	0	1	0	0	0
8 (16)	50p (O)	1	1	1	0	0	1

Notes:-

i. 1 denotes output ON (active).
ii. a credit is only valid when A4 is active.
iii. A6 - Ident is ALWAYS Active.

10.3 Ident Pin

The ident pin (pin 1) can be used by the host machine to identify the SR5i acceptor and hence interpret the binary credit code outputs.
The ident pin is linked on board to COM A and will reflect COM A status providing pin 8, (select), is Low. The ident pin status will change within 10ms of a change in the select line status.

10.4 Coin Accept Outputs

These outputs are capable of functioning as current sink, (negative COM A) or current source (positive COM A).

If the value of COM A is outside the specification, then the performance of the Accept outputs is not guaranteed.

On acceptance of a true coin, the transistors (COM A dependant) are turned on for a period of 80ms[(2)] (+/- 5%) to within 1 volt of COM A at a Max. current source/sink of 50mA.

The host machine must look for valid credit pulses NOT LESS THAN 50ms duration. It is not sufficient to merely detect the edges of credit pulses. This 'de-bounce' will prevent credits being registered by the host machine as a result of any noise or false credit pulses being induced on the output lines.

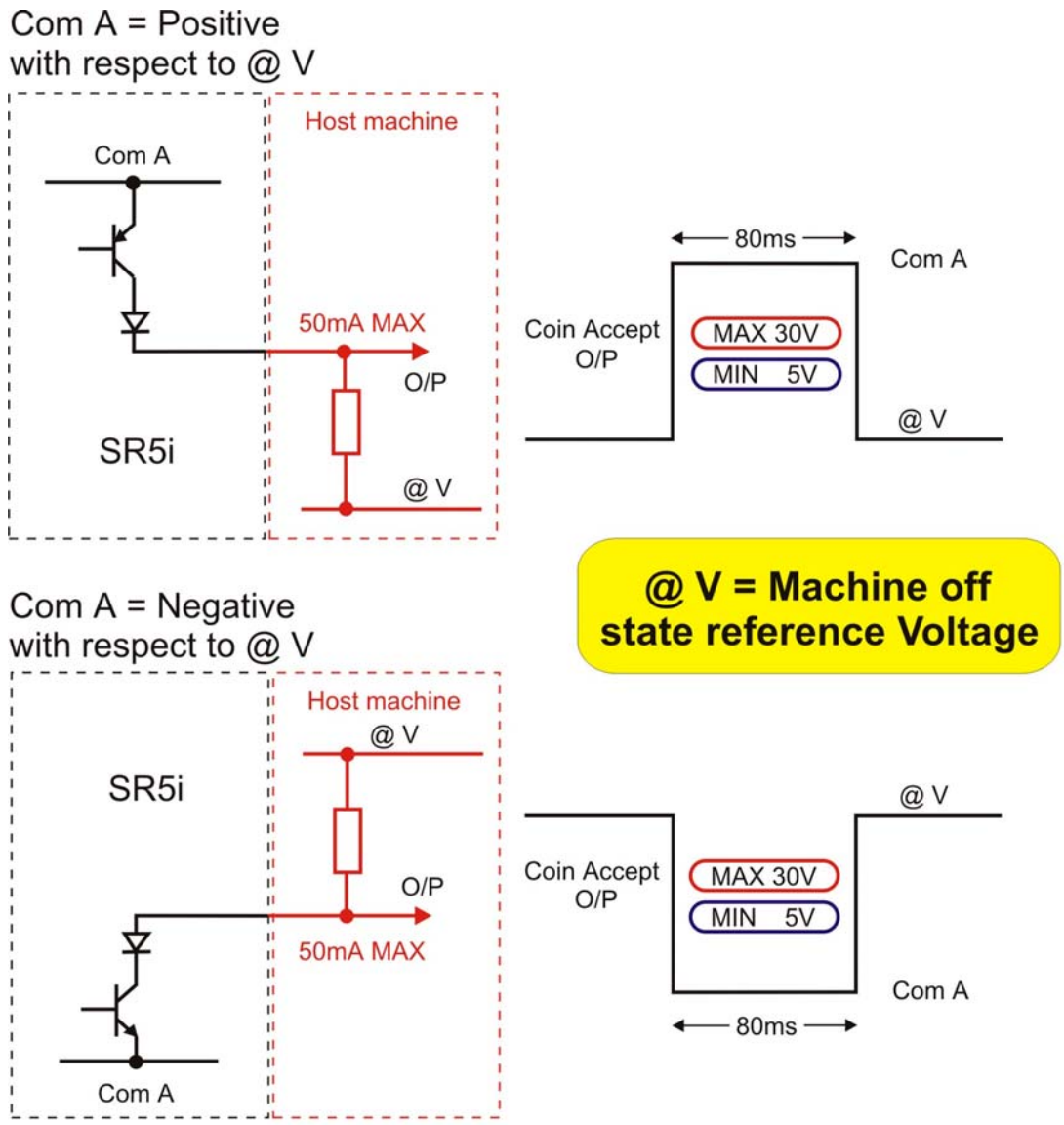
[(2)] Default time.

Table 6: Accept output DC characteristics

Characteristic	Value	Conditions
V out active min.	Com A minus 1V	Positive Com A
V out active max.	Com A plus 1V	Negative Com A
I max (sink or source)	50mA	Positive or Negative Com A
I Leakage	10μA	Off

Continued:-

Figure 6: Accept Outputs



Com A range = -24V to 0V or +5V to +24V

@ V range with respect to Com A = MIN 5V, MAX 30V

Therefore: Com A = @ V + Pulse V required

Examples:
1). If the host machine's reference is 5V and a +12V pulse is required then Com A = +17V.
2). If the host machine's reference is 0V and a -12V pulse is required then Com A = -12V.
3). If the host machine's reference is -12V and a +12V pulse is required then Com A = 0V.

10.5 Select Input

This input determines whether the SR5i is in 5 coin mode or 16 coin mode – SR5i Mode 1 (or Dedicated or Binary – SR5i Mode 2). 5 coin mode uses a single output per coin and is therefore limited to 5 different credit codes.
A High will select 5 coin mode (Dedicated) whilst a Low will select 16 coin mode (Binary).
The **default** condition is High and therefore 5 coin mode.

Please refer to section 10.1 Mode 1 and 10.2 Mode 2 for credit code outputs.

10.6 Inhibit Lines

The Inhibit inputs define whether a programmed coin will be accepted or not. Which coins are affected by the inhibit inputs is decided in conjunction with the Bank Select inputs. (See section 10.7).

If the Inhibit pin is not connected OR High then the corresponding coin will be inhibited i.e. Rejected.

If the Inhibit pin is Low then the corresponding coin will be accepted if deemed to be true.

The inhibit operation depends on the SR5i mode setting. Refer to Inhibit Options below.

Note: The default setting is for ALL inhibit inputs to be High and therefore coins are inhibited.

Table 7: Inhibit Pin Polarities

Inhibit Pin Status	Coin
High	Inhibited / Rejected
Not Connected	Inhibited / Rejected
Low	Enabled / Accepted

10.7 Bank Select Parallel Inputs (Mode 1 only)

The SR5i is capable of accepting up to 16 different coin types.

Whilst it is possible for the coins to operate entirely independently, for the purposes of inhibiting coins they are arranged in 2 banks of 8.
It is therefore only necessary to have 8 inhibit inputs (1 per coin in each bank).

Each of the Bank Select inputs controls its relevant bank (1 or 2).
Bank 1 contains coins 1 to 8.
Bank 2 contains coins 9 to 16.

The Bank Select inputs are connected in parallel with the DIL switches on the PCB (see section 17 Bank Select Switches). The normal state, floating /High, is **Selected** (Bank Enabled).
If the Bank Select DIL switch is set to the ON position **De-selected** (Bank Inhibited) then changing the state of the Bank Select input will have no effect.
If the Bank Select pin on the parallel connector is Low, **De-selected** (Bank Inhibited) then changing the state of the Bank Select DIL switch will have no effect.

When a Bank Select input is Low[3], then the corresponding bank of coins are de-selected (i.e. inhibited).
When a Bank Select input is High[4], then the corresponding bank of coins are selected (i.e. enabled).
The 8 inhibit inputs only act on the coins in the bank/s that are enabled.

Examples.

When both Bank Select inputs are High then both banks of coins are **selected**. In this state the 8 inhibit lines act on all 16 coins, i.e.
Inhibit 1 controls coin 1 and coin 9.
Inhibit 2 controls coin 2 and coin 10 and so on up to
Inhibit 8 controls coin 8 and coin 16

When Bank Select 1 input is High and Bank Select 2 input is Low then coin Bank 1 is **selected** and coin Bank 2 is **de-selected**, i.e.
Inhibit 1 controls coin 1.
Inhibit 2 controls coin 2 and so on up to
Inhibit 8 controls coin 8.

When Bank Select 1 input is Low and Bank Select 2 input is High then coin Bank 1 is **de-selected** and coin Bank 2 is **selected**, i.e.
Inhibit 1 controls coin 9.
Inhibit 2 controls coin 10 and so on up to
Inhibit 8 controls coin 16.

Notes:

[3] Pulling the Bank Select Low is the same as setting the DIL switch UP (the ON position).
[4] Pulling the Bank Select High is the same as setting the DIL switch DOWN (the OFF position).

10.8 Inhibit Options

There are 5 special inhibit options available which are stored in EEPROM and allow different coin inhibits to be set up. These options must be specified at time of ordering and can only be set up using production software.

Option	Inhibit Control	Money Controls Product Compatibility
1	Inhibit 5 controls windows 5 & 6. Inhibit 6 controls windows 7 & 8.	C200 series, C420, SR5 Modes 3, 10 & 11
2	Inhibit 5 controls windows 5 & 7. Inhibit 6 controls windows 6 & 8.	C335
3	Standard Inhibit Mapping	C435, SR5 Mode 1
4	Inhibit 2 controls windows 2 & 8. Inhibit 6 controls window 7. Coin 6 always disabled	C435A, SR5 Mode 2, BACTA Dedicated
	Inhibit 2 controls windows 2, 4, 7 & 8.	C435A, SR5 Mode 2, BACTA Binary
5	Customer Selectable[1]	None

[1] Inhibit lines can be mapped as required, mapping table is stored in EEPROM.

Note: options 1 to 4, lower bank inhibits apply to the upper bank inhibits.

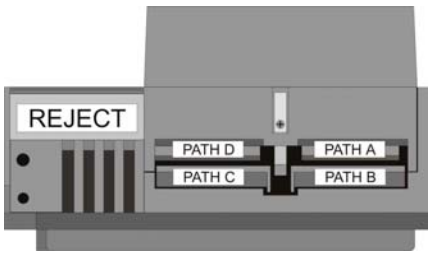
11. Sorting Coins

Due to the improvements incorporated in the SR5 series 4-way sorter, this sorter is not compatible with any of the sorters previously manufactured by MCL and vice versa.

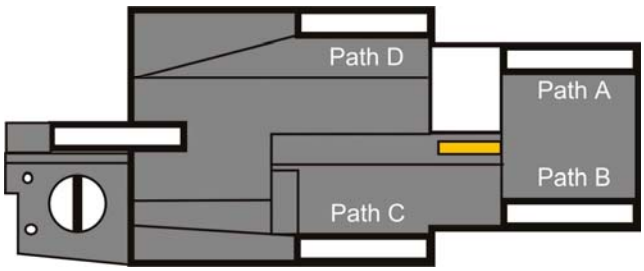
11.1 4-way Sorter

Normally the SR5i will be used to sort coins to one of 4 paths.
(The passive manifold, if fitted, is used to channel the coins into the BACTA industry standard footprint).
Sorting can be achieved either using the routing plug (see Sorting Modes – page 25) or having the paths pre-programmed into EEPROM. Switching between EEPROM and routing plug can be achieved using the rotary switch (see Routing Plug / EEPROM mode "E"– page 33)
When in serial (ccTalk) mode, EEPROM routing is used.

Figure 7: 4-way sorter paths



View from below sorter.

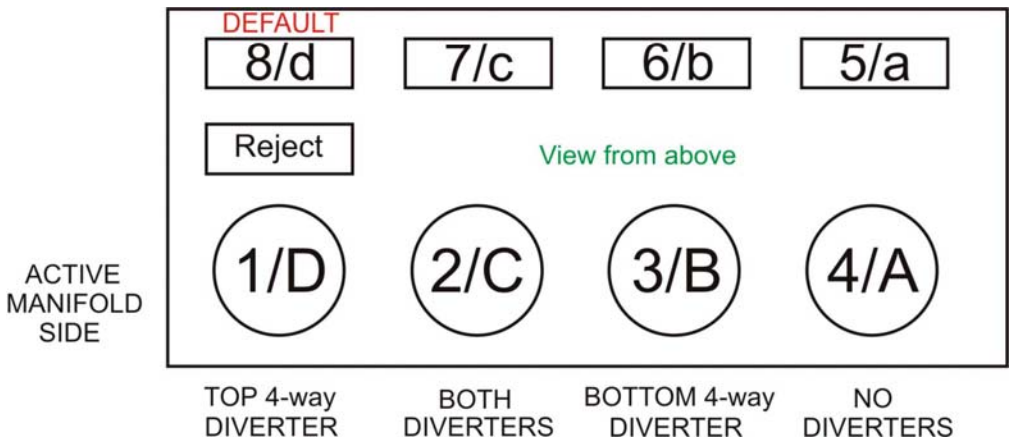


View from below passive manifold.

11.2 8-way Sorter (Active Manifold)

Other applications require sorting up to 8 different paths. This can be achieved using the active manifold in conjunction with the 4-way sorter. This method can only be used however, if the sorter paths are programmed in EEPROM.

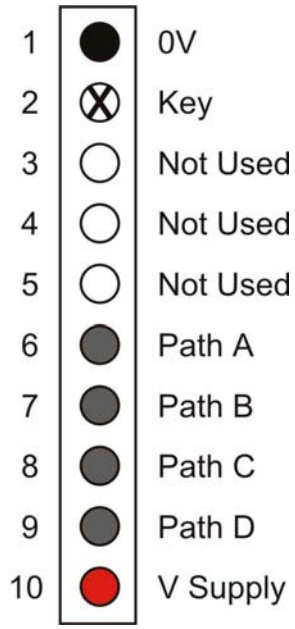
Figure 8: 8-way Active Manifold sorter paths

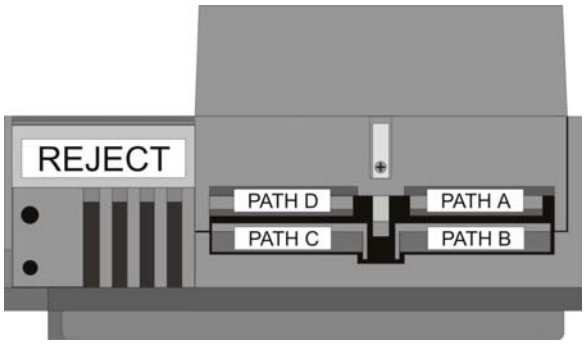


12. Sorter Overrides

12.1 4-Way Override

Figure 9: Sorter Overrides 4-way

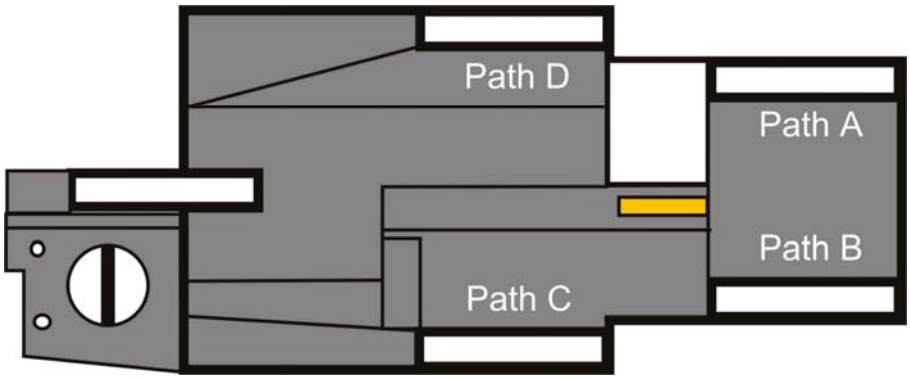




View from below sorter.

4-way sorting can be achieved either via the routing connector or pre-programmed in EEPROM.
Overrides 1 to 4 control paths A-D (as shown) irrespective of method used.
Taking the relevant input Low indicates to the acceptor that the route is overridden. The coin will then travel down the next programmed/routing connector path or be accepted to the **DEFAULT 'A'** path.

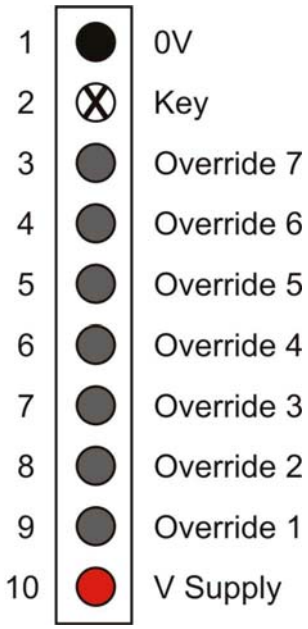
Note: Path A can be overridden as long as there is another path for that coin to divert to which has not already been overridden.



View from below passive manifold.

12.2 8-Way Override

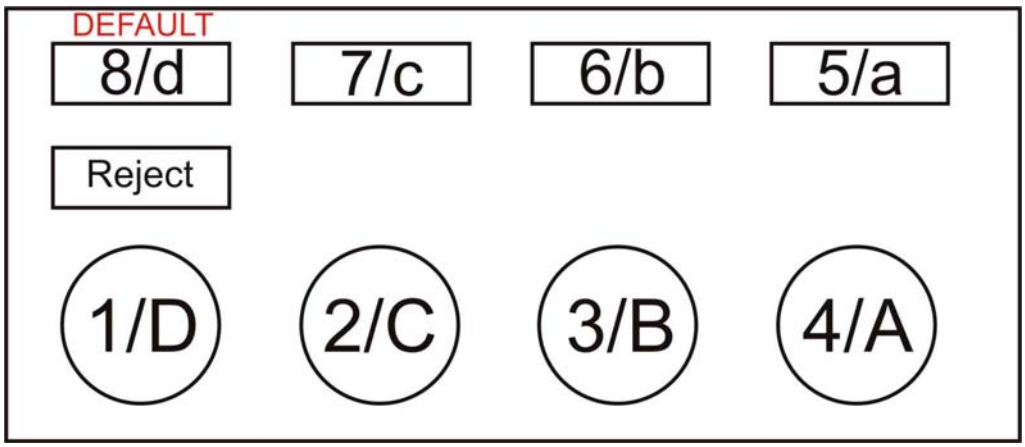
Figure 10: Sorter Overrides 8-way



In order to use 8-way sorting, the paths **MUST** be programmed in EEPROM.

Of the 8 possible routes for an accepted coin, only routes 1 to 7 have a sorter override input. Taking the relevant input **Low** indicates to the acceptor that the route is overridden. The coin will then travel down the next programmed route or be accepted through the **DEFAULT** path.

View from above



13. Sorting Modes

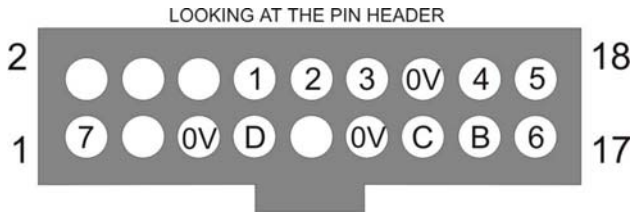
13.1 Routing Plug (4 way sorting only)

The routing connector is an 18-way 0.1" pitch DIL header.
Shown below are the coin positions and the sorter paths.

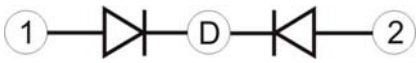
Note: The default path is A and coin 8 ALWAYS goes to the default.

Note: For coins 9 to 16 the paths are the same as coins 1 to 8.

Figure 11: Routing Plug Connections

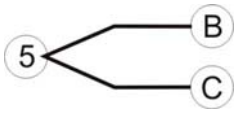


13.2 Using the routing plug

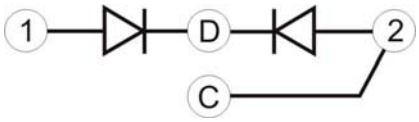


In this example both coins 1 and 2 are diverted to path D. (Any number of coins can be connected like this as long as there is a protection diode - 1N4148 - inserted between the coin position and the path as shown - Cathode to path connection.

Note: The sequence of sorting using the routing plug is D – C – B – A.



In this example coin 5 will divert to path C then to path B (see above note).
If path B, override to path C is required, path C must first be overridden - coins will sort down path B. When path B is full, the override can be removed from C - coins will sort to path C.



Here, coins 1 and 2 will sort to path D.
If path D is then overridden, coin 1 will sort to DEFAULT (A) and coin 2 will sort to path C.
If path C is then overridden coin 2 will also sort to the DEFAULT (A).

13.3 EEPROM mode (4-way / 8-way sorting)

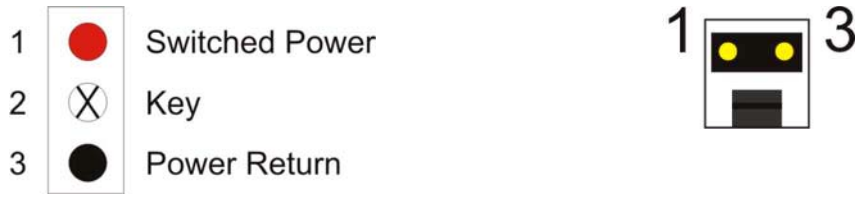
This mode allows any coin to be sorted to a maximum of 4 paths + the relevant default path.

e.g. 4-way could be coin 2 to path C, then D, B, default A. See Figure 7.

e.g. 8-way could be coin 6 to path 1, then 4, 3, 7, default 8. See Figure 8.

14. Active Manifold Interface

Figure 12: Active Manifold connector



This two pin connector is switched to operate the divertor flap within the active manifold when required as part of 8 way coin sorting.

15. RS232 Interface

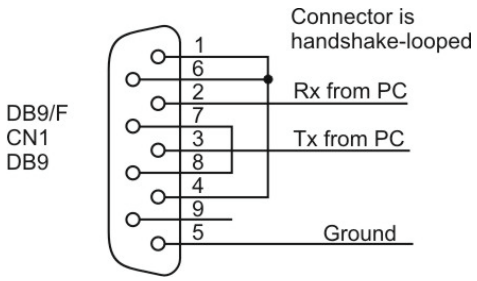
- Cost option
- Industry standard 9 way D-type vertical pcb mounting socket (Female)

Table 8: RS232 Signal Connections

PIN	SIGNAL NAME	FUNCTION	Input (I) / Output(O) / Power(P)
1	DCD	Received line signal detector (Data Carrier Detect)	I
2	Rx Serial	RS232 received data input	I
3	Tx Serial	RS232 transmit data output	O
4	DTR	Data Terminal Ready	O
5	Gnd	Signal ground	P
6	DSR	Data set Ready	I
7	RTS	Request To Send	O
8	CTS	Clear To Send	O
9	RI	Ring Indicator	Not used

15.1 Recommended PC connection wiring details:

Figure 13: 'D' Type Recommended Connections



15.2 Signal descriptions

- Data is transmitted and received on pins 3 and 2 respectively.
- Data set ready **(DSR)** is an indication from the PC Host that it is active.
- Data Terminal Ready **(DTR)** indicates to the PC Host that it is active.
- Data Carrier Detect **(DCD)** indicates that carrier for the transmit data is active.
- Request to Send **(RTS)** and Clear to Send (**CTS)** signals are constantly on throughout the communication session.
- The Ring Indicator **(RI)** signal is only used for synchronous communication.

16. Flash Programming Interface

16.1 Details of PCB connector:

5x2 way 2mm pitch straight pin header:

16.2 Details of mating connector plug:

Supplier – Harwin or equivalent:

Item 1 M22-3020500 5+5 DIL crimp housing
Item 2 M22-3050022 2mm crimp contact

Table 9: Flash Programming Interface – Signal Details

Pin	Signal Name	Function	Input (I) / Output(O) / Power(P)
1	Tx D1	Transmit Flash data – 5V TTL/CMOS	O
2	Gnd	Connection to SR5i board ground (0V)	P/O
3	Rx D1	Receive Flash data – 5V TTL/CMOS	I
4	Vcc	Connection to SR5i board +ve supply (+5V)	P/O
5	SCLK	Serial Clock – active Low	I
6	CNVSS	Programming voltage input – link to pin 4	I
7	Key	No connection. Used for polarising key	No connection
8	BUSY	Busy output – no connection required	O
9	CE	Chip Enable – active Low	I
10	HOLD/EPM	Hold/EPM – active Low	I

16.3 Plug wiring details for Flash programming SR5i processor

Table 10: Flash Programming – Connections Required

Pin	Signal	Connections for Flash Program mode
1	Tx D1	Transmit Flash data – 5V TTL/CMOS
2,5,9,10	0V / Gnd	External 0V / Ground connection
3	Rx D1	Receive Flash data – 5V TTL/CMOS
4.6		Link on header plug
7,8		No connection

3 external connections are required for on-board flash programming.

Programming of the on-board processor flash memory requires a cable link to a separate RS232 / 5V TTL/CMOS interface box connected to a PC COM port (COM1 or COM2).

Rotary switch must be set to Position 0.

Use Money Controls FlashProgrammer s/w utility to erase, download and verify the SR5I flash memory.

17. Bank Select Switches

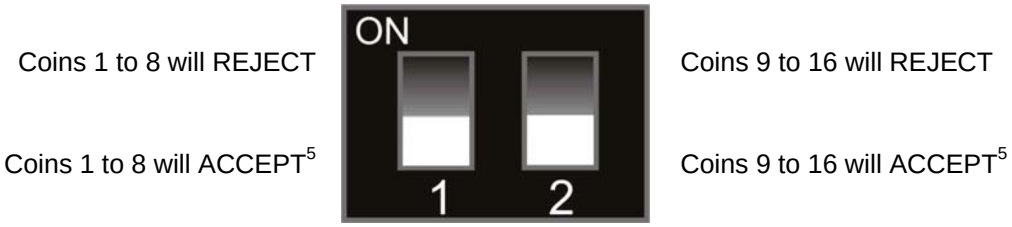
There are two bank select switches (one per bank of 8 coins).
These switches operate in parallel with the Bank Select inputs described on page 20 - "Bank Select Parallel Inputs".

Closing the switch (ON position) is the equivalent of taking the relevant Bank Select input, on the main parallel connector, Low .

If either the switch is closed or the Bank select input is Low, then the bank is de-selected (inhibited).

The Bank Select switch must be in the OFF position (down) AND the corresponding Bank Select input must be High for the bank to be selected (accept coins).

Figure 14: Bank Select switches

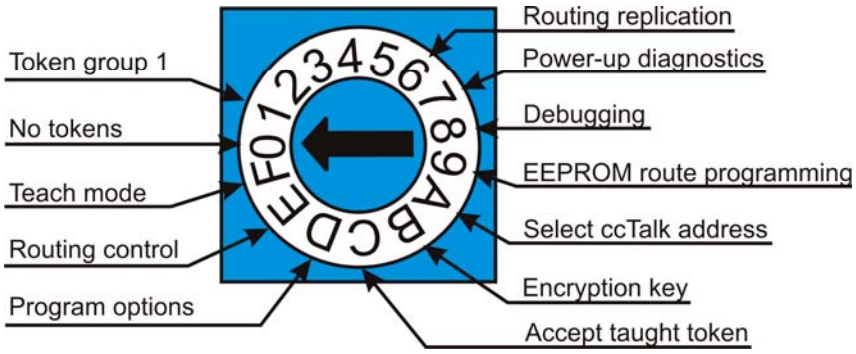


[5] ONLY if the Bank Select input is either not connected or pulled High.

18. Rotary Switch Options.

There are a number of options which can be selected via the hexadecimal rotary switch.
One function of the rotary switch is to select and program tokens and also carry out basic changes to the SR5i (as discussed below):

Figure 15: Rotary switch



18.1 Token Group Selection

Table 11: Rotary Switch Functions

Rotary Switch	Function	Bank Select 1	Bank Select 2
0	Special	Flash Programming Mode	
0	Token disabled	x	x
1 - 5	Select token 1 to 5	x	x
6	Routing Replication	x	x
7	Power-up diagnostics	Up = Enable diagnostics Dn = Disable diagnostics	x
8	Debugging	Up = Pulse solenoids Dn = No action	x
9	EEPROM route programming	Up = Reset to default Dn = No action	Up = Swallow plug Dn = No action
A	Modify ccTalk address Choose 2, 11, 12, 13	Up = 1 Dn = 0	Up = 1 Dn = 0
B	Encryption key	Up = Reset to factory Dn = No action	Up = Clear maintenance LED Dn = No action
C	Select teach token	x	x
D	Operating mode	Up = DCE rundown Dn = Industry standard	Up = Alarms off Dn = Alarms on
E	Routing control	Up = Routing Plug Dn = EEPROM	x
F	Teach new token	x	x

Note: NEVER leave the acceptor with the rotary switch in positions D, E or F.

18.2 Token Selection "Rotary switch positions 0 to 5 & C"

Positions 1 to 5 and C select the token to accept. Position 0 disables all tokens. The switch position is read at power-up or reset, but may be changed at any time by pressing the push button for at least 1 second.

18.3 Routing replication "Rotary switch position 6"

Position 6 allows a ccTalk 1:1 ribbon cable to connect a SR5i to another 5 inch ccTalk validator and copy the EEPROM sorter path configuration. Power should be applied through the parallel connector on SR5i and then only the ccTalk cable used to connect the two products. All 4 routes for all 16 coins are replicated.

18.4 Power-up Diagnostics "Rotary switch position 7"

Position 7 controls whether SR5i checks the sensor and thermistor readings at power-up for an out-of-range error. If a fault condition is detected then no coins can be accepted.

18.5 Debugging "Rotary switch position 8"

Position 8 allows the solenoid test sequence to be enabled - pulsed solenoid duty cycle is 500ms on, 500ms off.

If the sorter is enabled on the SR5i then the software cycles through a solenoid test sequence…

[Accept Gate] → [Lower Sorter Flap] → [Upper Sorter Flap] → [Manifold Flap] →

If the sorter is disabled the only the accept gate solenoid is pulsed.

[Accept Gate] → [Accept Gate] → [Accept Gate] → [Accept Gate] →

18.6 EEPROM route programming "Rotary switch position 9"

Position 9 allows the sorter routing to be programmed to the default state or set by an external routing plug.

Reset to default: Enables all the sorter routes in EEPROM to be changed to the default sorter route (usually 5).

Swallow plug: Allows a routing plug to be copied or 'swallowed' to EEPROM. Once this is done, the routing plug can be removed and the coins will be routed in an identical manner. The legacy routing plug allows any of 7 coins to be routed to 3 paths (in the order D then C then B). This function also programs the default sorter path for coin 8 and copies the paths from the lower bank to the upper bank (coins 1..8 to 9..16).

If both switches are up then the plug swallowing has priority.

The sorter must be enabled (factory option) for these functions to work.

18.7 Address Selection "Rotary switch position A"

Position A allows the ccTalk address to be changed for applications which require more than one coin acceptor on the same bus.

BS1	BS2	Address
Down	Down	2
Up	Down	11
Down	Up	12
Up	Up	13

Addresses 3 to 10 are reserved for serial hoppers.

It is strongly recommended that all single coin acceptor applications use ccTalk address 2 which is the factory default.

18.8 Encryption Key Recovery "Rotary switch position B"

Position B allows the encryption key to be changed back to the factory value (as shown on the product label) if it has been changed / stored with ccTalk headers 137 / 136 and then 'lost'. This function is only of interest if the SR5i has been ordered with encryption enabled

18.9 Alarm and Rundown settings "D"

For Alarm details see section 8. "Alarms".

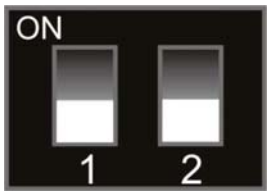
To set these options to those required, ensure that the SR5i is powered up through the main parallel connector. Changes cannot be made in serial mode.

Note: Make a note of the rotary switch position and the bank select switch positions.

Turn the rotary switch to position D.

Set the Bank Select switches, to the desired position.

CCL Rundown



Alarms OFF

Other Rundown or NO Rundown

Alarms ON

When the desired switch positions are selected press and hold the program button, (situated underneath the rotary switch), the LED will change from Green to Yellow, release the program button; the LED will pulse Red and change back to Green.

Note: If the LED stays Green then Alarm and Rundown settings "D" is not available.

Return the rotary switch and the Bank Select switches to their original positions. Press the program button, the LED will change to Red, release the program button; the LED will change back to Green.

Note: NEVER leave the acceptor with the rotary switch in positions D, E or F.

18.10 Routing Plug / EEPROM mode “E”

The SR5i allows you to change from EEPROM mode (factory programmed sorting configurations) to routing plug mode and from routing plug mode to EEPROM mode.

To set this option, ensure that the SR5i is powered up through the main parallel connector.

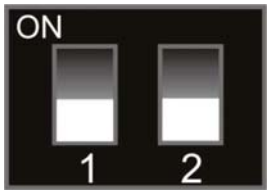
IMPORTANT:

Changes cannot be made in serial mode.

Note: Make a note of the rotary switch position and the bank select switch positions.

Turn the rotary switch to position E.

Set Bank Select switch 1, to the desired position.



Routing Plug Mode		Not Used
EEPROM Mode		Not Used

When the desired switch positions are selected press and hold the program button, (situated underneath the rotary switch), the LED will change from Green to Yellow, release the program button; the LED will change back to Green.

Note: If the LED stays Green then Routing Plug / EEPROM mode “E” is not available.

Return the rotary switch and the Bank Select switches to their original positions. Press the program button, the LED will change to Red, release the program button; the LED will change back to Green.

Note: If the SR5i is powered up in serial (ccTalk) mode – sorter routing is always taken from EEPROM settings.

Note: NEVER leave the acceptor with the rotary switch in positions D, E or F.

18.11 Teach and Run™ Token "F"

Position F allows a token, which is not currently in one of the pre-programmed groups, to be programmed on site.

To **Teach and Run™** a token, ensure that the SR5i is powered up through the main parallel connector.

IMPORTANT:

(**Teach and Run™** Token "F" is not available in serial mode).

Turn the rotary switch to position F.

Press and hold the program button, (situated underneath the rotary switch), the LED will change from Green to Red, release the program button; the LED will flash Yellow and Red.

Note: If the LED stays Green then Teach and Run™ Token "F" is not available.

Insert several of the coin type to be taught, typically 8 coins, until the LED flashes Green. If the SR5i encounters a problem during Teach and Run™ the LED will flash Red.

Press the program button, the LED will stop flashing.

The SR5i automatically selects the newly programmed token after Teach and Run™.

Turn the rotary switch to position C, to accept the newly programmed token, press the program button, the LED will turn Red. Release the program button, the LED will return to Green and the new token will be accepted.

If an error occurs during this procedure then the LED will change to flashing Red. Press the program button, the LED will change to Green. The token that was previously programmed will still accept.

To stop programming before the LED changes to flashing Green, press the reject lever, the LED will change to flashing Red. Press the program button, the LED will change to Green. The token that was previously programmed will still accept.

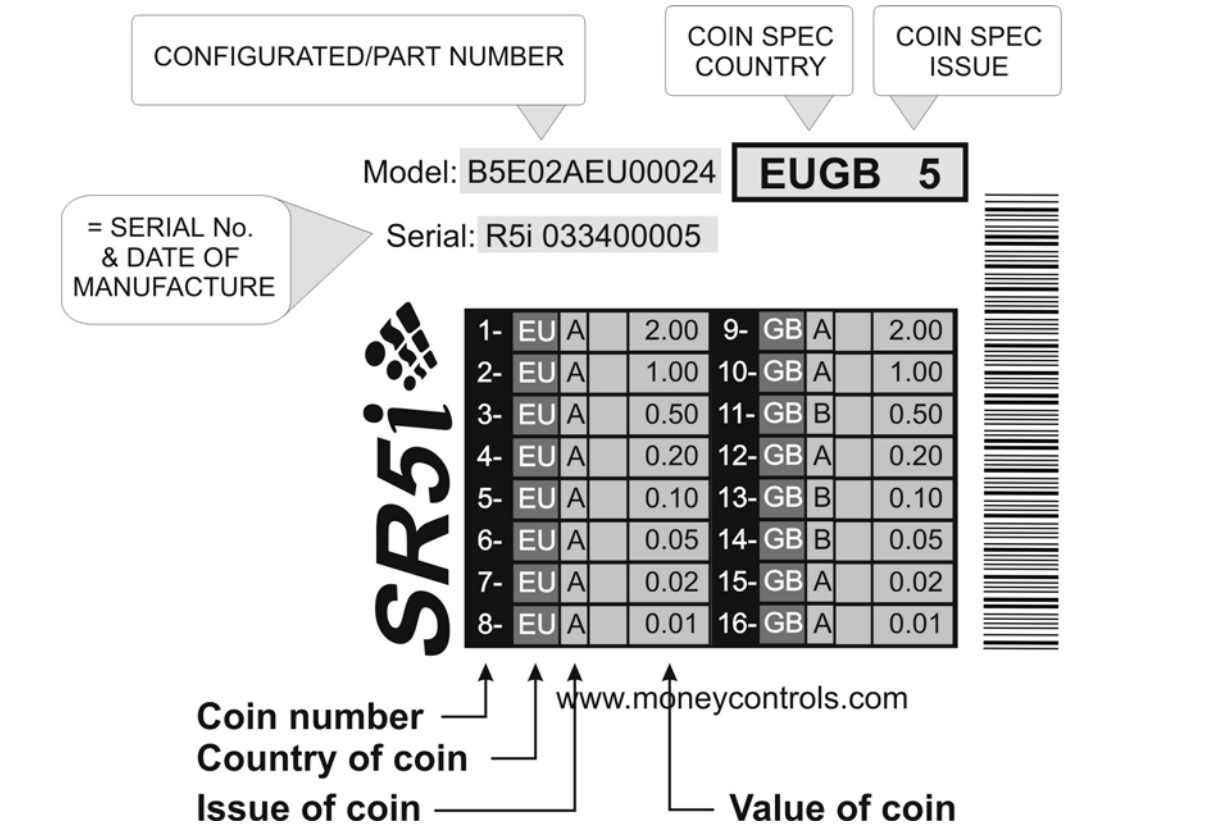
Note: NEVER leave the acceptor with the rotary switch in positions D, E or F.

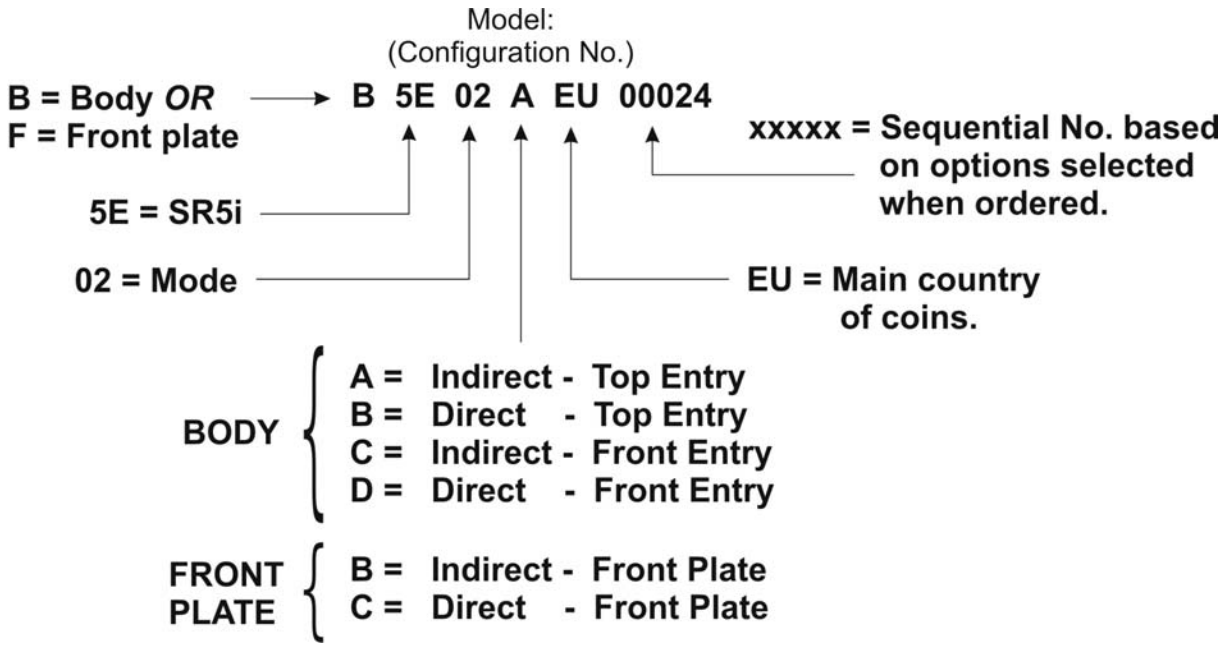
18.12 Teach and Run™ Coins

Teach and Run™ is only available in serial mode (via ccTalk) – allowing the programming of all 16 coin positions.

19. Label Details

Figure 16: SR5i Label Details





20. ccTalk Protocol

Warning:

While in SERIAL mode, the PARALLEL connectors are DISABLED.

20.1 Serial Interface

The serial interface is used to program coin data and customer options. It can also be used instead of the parallel interface to communicate with the machine.

Note: The serial and parallel interfaces cannot be used together in the machine.

Protocol: **ccTalk** BACTA compliant implementation.

For further details on this section please refer to the current **ccTalk** generic standard.

Connector type: 10 Way DIL (connector 5 on Figure 2).

Pin 1 - DATA
Pin 2 - 0V [Not used]
Pin 3 - Not used
Pin 4 - 0V [Not used]
Pin 5 - /RESET
Pin 6 - Not used
Pin 7 - +12 to +24 Volts [Power]
Pin 8 - 0 Volts [Power]
Pin 9 - /Serial Mode
Pin 10 - Reserved

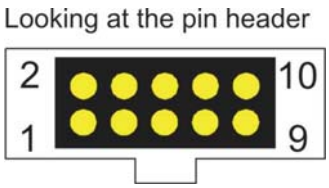


*Figure 17: **ccTalk** pin header*

Pin 9 is used to signal to the mech. that the serial interface is to be used rather than the parallel interface. For serial mode, pin 9 = Low **- at POWER-UP**.

Pin 5 is an optional hardware-reset line to the mech. and other peripherals on the bus.

Note: Pins 2 and 4 are connected to 0 Volts.

21. ccTalk Serial Messages

*Table 12: **ccTalk** Serial Commands*

Header	Function	Header	Function
254	Simple poll	214	Write data block
253	Address poll	213	Request option flags
252	Address clash	212	Request coin position
251	Address change	210	Modify sorter paths
250	Address random	209	Request sorter paths
249	Request polling priority	202	Teach mode control
248	Request status	201	Request teach status
247	Request variable set	199	Configuration to EEPROM
246	Request manufacturer id	197	Calculate ROM checksum
245	Request equipment category id	196	Request creation date
244	Request product code	195	Request last modification date
243	Request database version	194	Request reject counter
242	Request serial number	193	Request fraud counter
241	Request software revision	192	Request build code
240	Test solenoids	189	Modify default sorter path
238	Test output lines	188	Request default sorter path
237	Read input lines	185	Modify coin id
236	Read opto states	184	Request coin id
233	Latch output lines	183	Upload window data
232	Perform self-test	182	Download calibration information
231	Modify inhibit status	181	Modify security setting
230	Request inhibit status	180	Request security setting
229	Read buffered credit or error codes	179	Modify bank select
228	Modify master inhibit status	177	Handheld function
227	Request master inhibit status	176	Request alarm counter
226	Request insertion counter	173	Request thermistor reading
225	Request accept counter	170	Request base year
222	Modify sorter override status	169	Request address mode
221	Request sorter override status	162	Modify inhibit & override registers
220	One shot credit		
219	Enter new PIN number	4	Request comms revision
218	Enter PIN number	3	Clear comms status variables
216	Request data storage availability	2	Request comms status variables
215	Read data block	1	Reset device

For further details on this section please refer to the current **ccTalk** generic standard or contact Money Controls Technical Services Department.

21.1 ccTalk Error Codes

*Table 13: **ccTalk** Error Codes*

Code	Error
1	Reject coin
2	Inhibited coin
3	Multiple window (ambiguous coin type)
6	Accept sensor timeout
8	2nd close coin error (coin insertion rate too high)
14	Accept sensor blocked
15	Sorter opto blocked
17	Coin going backwards
23	Credit sensor reached too early
24	Reject coin (repeated sequential trip)
25	Reject slug
35	Number of coin meter pulses overloaded
36	Games overloaded
254	Coin return mechanism activated (flight deck open)

21.2 ccTalk Fault Codes

Table 14: Fault Codes

Code	Fault
1	EEPROM checksum corrupted
2	Fault on inductive coils
3	Fault on credit sensor
4	Fault on piezo sensor
8	Fault on sorter exit sensors
22	Fault on thermistor
34	Temperature outside operating limits

21.3 ccTalk Status Codes

Table 15: Status Codes

Code	Status
1	Coin return mechanism activated (flight deck open)

22. ccTalk Interface Circuits

22.1 Circuit 1 – ccTalk Standard Interface

This circuit uses an open-collector transistor to drive the data line and a diode protected straight-through receiver.

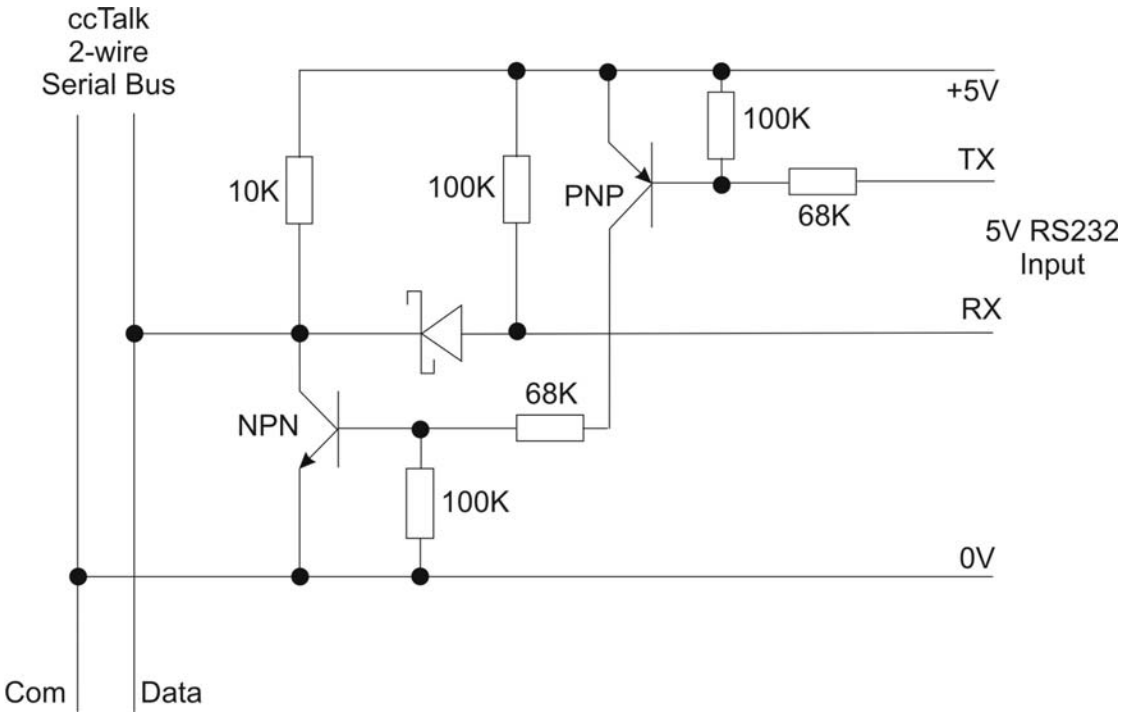


*Figure 18: Circuit 1, **ccTalk** Standard Interface*

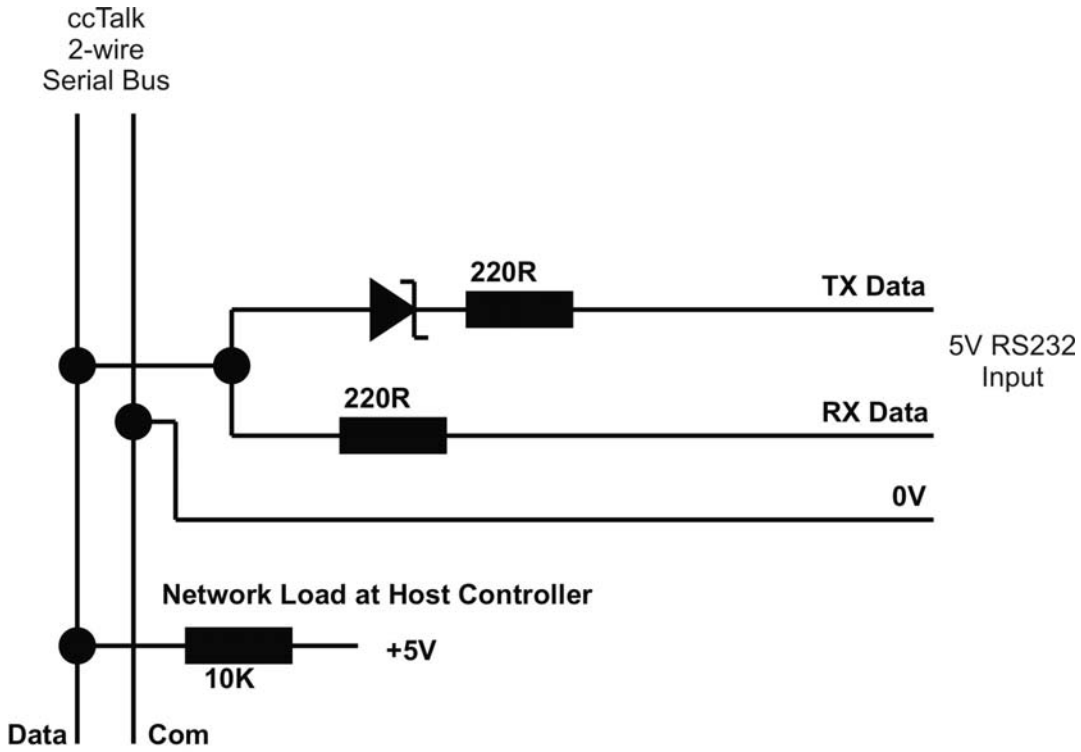
Typical Components

Diode	BAT54	Schottky Diode, low forward voltage drop.
NPN	BC846B	High gain, medium signal, NPN transistor.
PNP	BCW68	High gain, medium signal, PNP transistor.

22.2 Circuit 2 – ccTalk Low Cost Interface

Assuming that the transmitting device is capable of sinking a reasonable amount of current, a direct diode interface can be used rather than a full transistor interface. Although cheaper to implement, this circuit does not have the drive capability or the robustness of other designs.

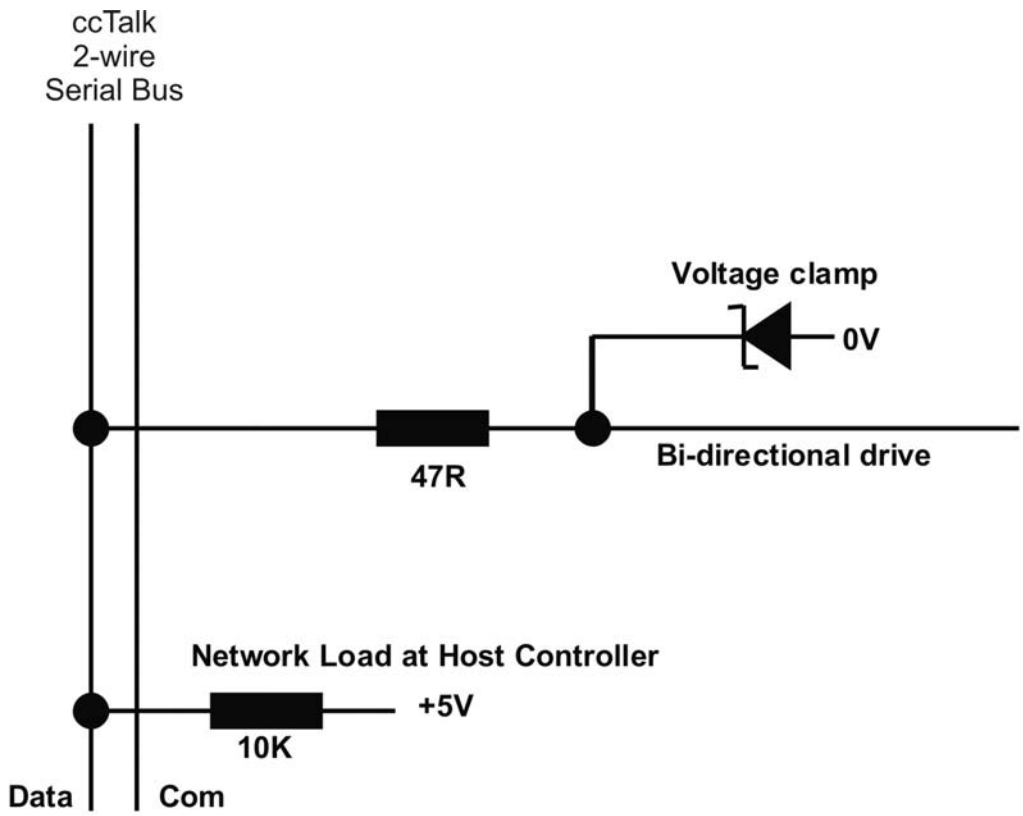
*Figure 19: Circuit 2, **ccTalk** Low Cost Interface*



22.3 Circuit 3 – ccTalk Direct Interface

A very low cost solution is to interface a single pin on a microcontroller directly onto the **ccTalk** data line. The pin can be switched between active-low for transmitting and high-impedance tri-state for receiving.

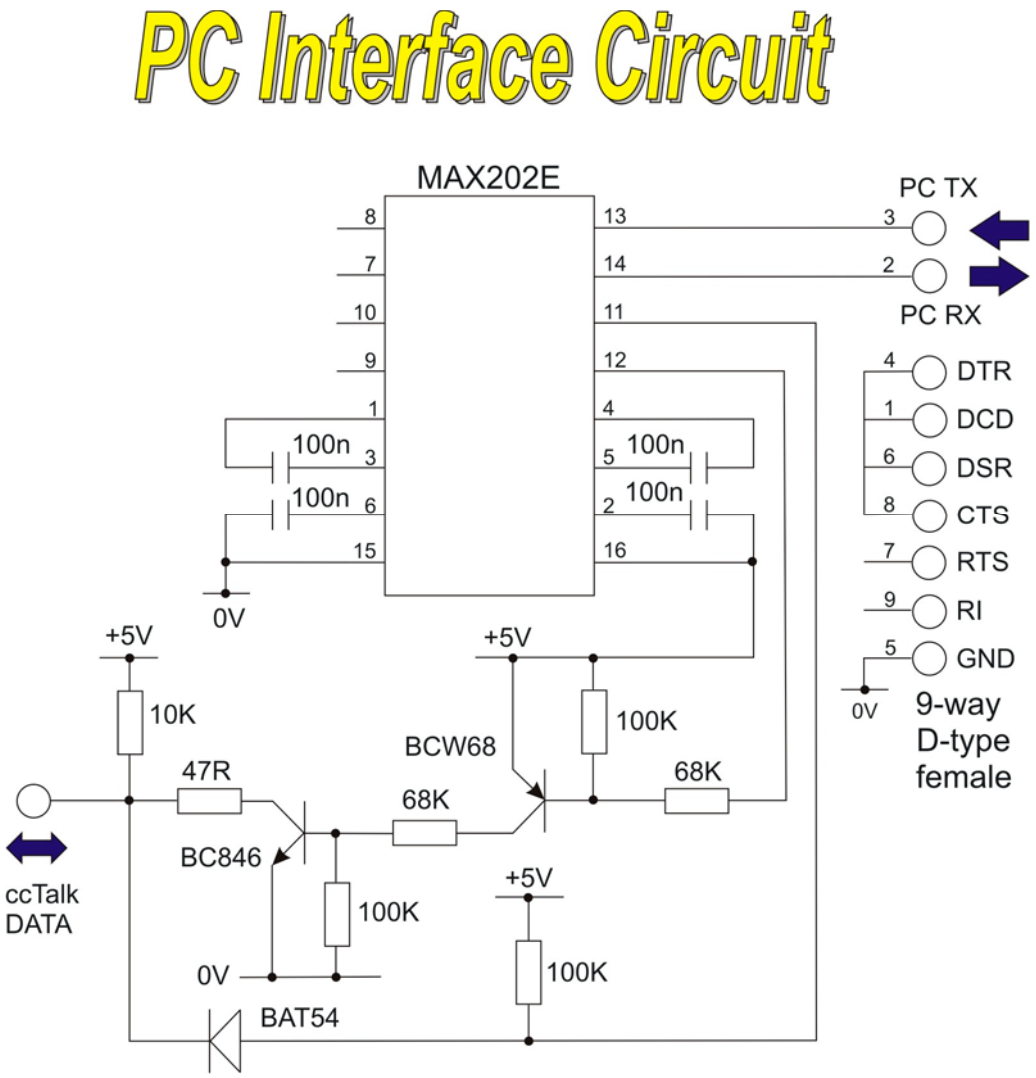
*Figure 20: Circuit 3, **ccTalk** Direct Interface*



22.4 Circuit 4 – ccTalk PC Interface

The circuit below shows how to connect the 9-pin serial port of a PC to the **ccTalk** data bus. The only integrated circuit required is a Maxim level-shifter which operates off a single +5V supply. Any small-signal diodes and transistors can be used.

*Figure 21: Circuit 4, **ccTalk** PC Interface*



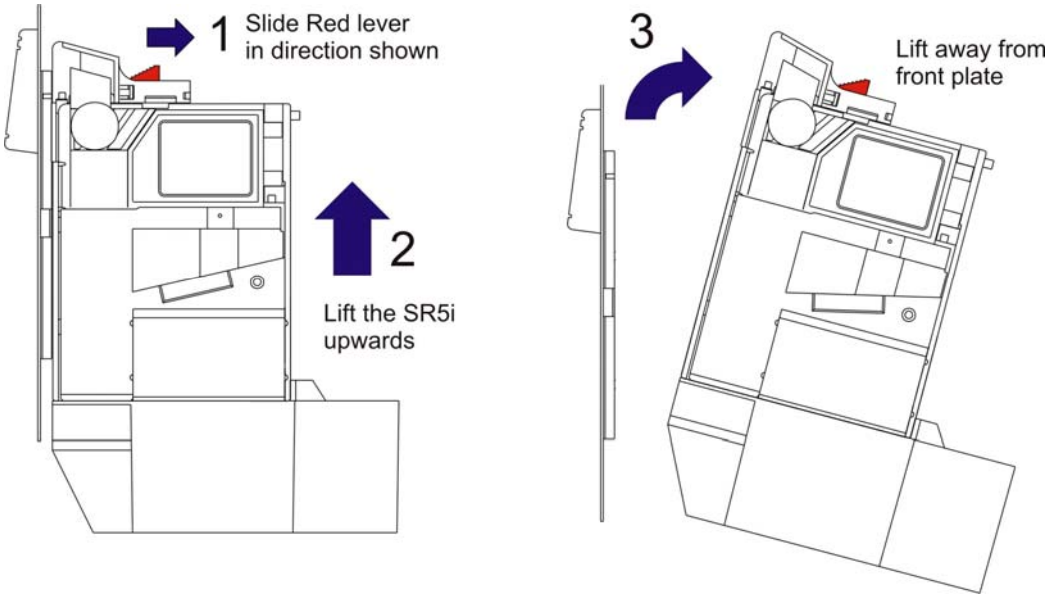
23. Servicing

Please refer to Figure 29 for parts details.

23.1 Front Entry - Removal and Refitting

To remove the body from the frontplate, first unplug any interface connectors from the SR5i.
Pull back catch (1) and lift the body upwards (2). When the stop position is reached the body can be withdrawn away from the frontplate (3).
When re-assembling, line up the keyhole slots in the body with the retainers on the frontplate. Push the body forward and downwards.
When in position, catch (1) will click into the locking slot.
Re-connect all the interface connectors.

Figure 22: Front Entry Removal Diagram



23.2 Top Entry - Removal and Refitting

Release the locking catches and carefully lift out the acceptor from the back channel.
Once the machines harness becomes accessible, remove all the interface connectors.

Refitting the acceptor is the reverse of removal.

23.3 Cleaning

The coin rundown area should be cleaned regularly to ensure accurate discrimination of coins and tokens. Only a damp cloth should be used.

Under NO circumstances should any solvent, abrasive or foam type cleaner be used.

Access to the coin rundown is gained by opening the reject gate.

23.4 Accept Gate

Please refer to Figure 29.
To detach the accept gate, first undo screw (9) and remove the rundown cover. Carefully slide the gate spring (12) towards the rear of the SR5i and remove. Pull the gate forward and downward to remove.

Re-fitting is the reverse of removal.
Take extreme care when re-fitting the accept gate spring.

23.5 Sorter

Please refer to Figure 29.
Removal and Re-fitting.
Undo screw (9) and remove the rundown cover. The sorter can be unplugged and withdrawn.

When re-assembling, ensure the sorter flaps are correctly fitted and not trapped.

23.6 Rear Cover

No User serviceable parts.

Access to all switches is achievable without removing the cover. Therefore the cover should only be removed by approved service centres.

24. Fault Finding

The following information is presented for customers' guidance in rectifying a fault but does not cover all possible causes.
All acceptors with electronic faults should be returned to Money Controls Ltd. or to an approved service centre for repair.

Symptom	Investigate	Possible Cause
Acceptor does not work (all coins reject).	Connector.	Poor contact. Loose wire.
	Power supply.	Not switched on. Incorrect voltage. Inadequate current. Rise time too slow.
	Inhibit inputs.	Acceptor inhibited.
	Accept gate.	Gate not free or dislocated.
	Accept channel.	Obstructed.
	Reject gate.	Not fully closed.
	LED on rear cover is RED.	EEPROM checksum error[6]. SR Sensor faulty[7,8]. Credit sensor faulty[7,8]. Credit sensor blocked[7]. Sorter faulty[7,8]. Sorter blocked[7].
	LED on rear cover is YELLOW.	Remove the power and re-apply. LED should be green.
Poor acceptance of true coins.	Power supply	Voltage less than 10V. (NB voltage drops when solenoid/s are activated).
	Accept gate.	Gate not free or dislocated.
	Connector.	Loose.
	Coin rundown.	Dirty.
	Bank select switches.	Both switches are DOWN and both banks are programmed with the same coins.
Coins stick or jam in acceptor.	Rundown. Accept channel. Accept gate. Reject gate.	Dirty or mechanical damage.
One of the true coin types always rejects.	Interface.	Damaged interface cable.
	Inhibit status.	Coin inhibited.
	Label.	Coin not programmed.
Coins in wrong cash box.	Sorter.	Dirty, damaged or obstructed.
		Broken wire.
		Sorter flap dislocated.
	Main unit.	Incorrect sorter paths programmed.
		Faulty/wrong routing plug.
		No routing plug fitted.
		Wrong routing mode.
		Incorrect overrides selected.
No accept signal.	Connector.	Loose or broken wire.
	Accept channel.	Dirty or obstructed. (acceptor time-out)

[6] This condition requires the SR5i to be reprogrammed.
[7] These faults will only be seen if 'Power-up Diagnostics' is ON.
[8] These faults require to SR5i to be returned for repair.

25. Mechanical Specification

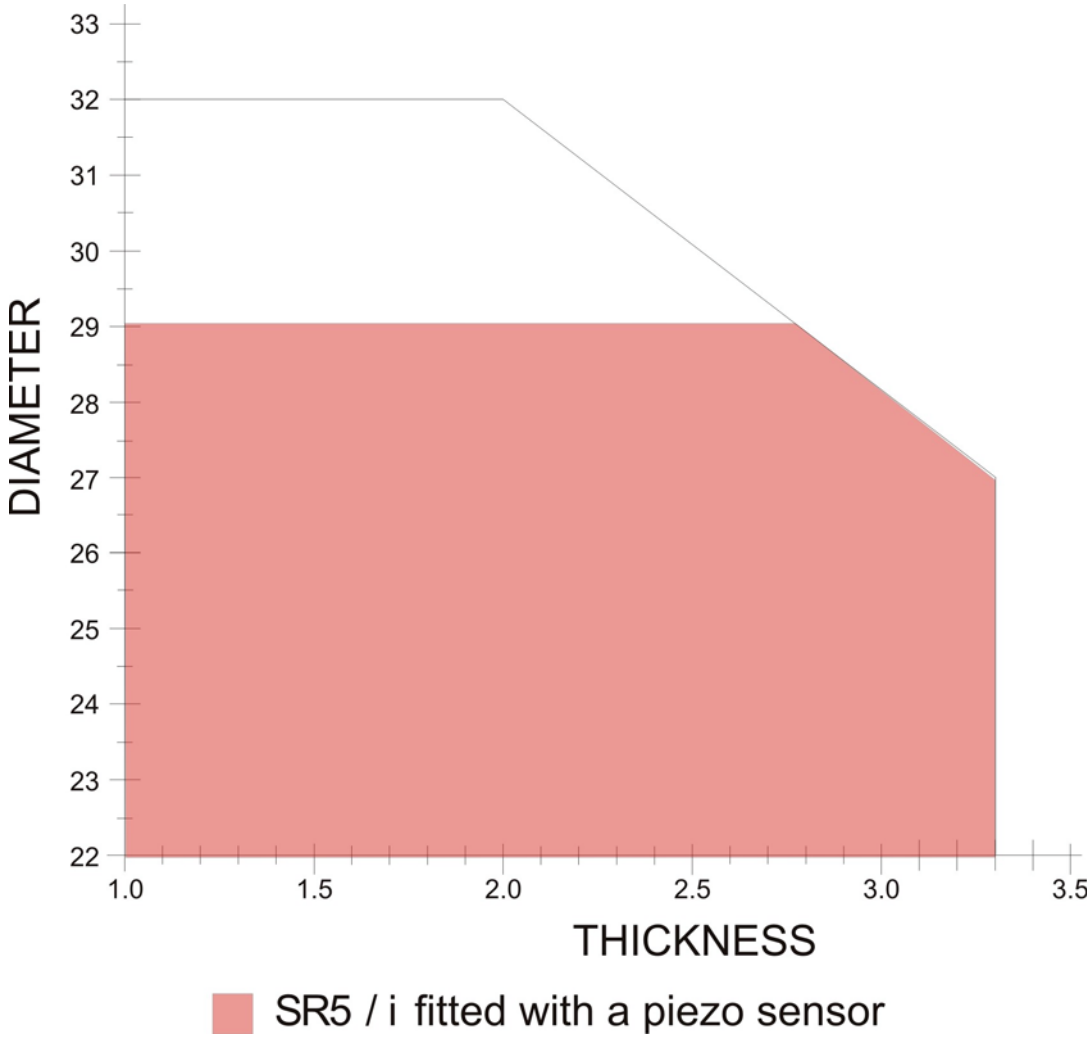
25.1 Position

The SR5i should be mounted within +/-2 degrees of the vertical in any plane. It is intended for use in stationary environments.

25.2 Coin/Token Sizes

The accepted range of coin sizes are shown below:
This Graph is only intended as a guide. If a coin is required that is close to the limits shown, please check with Money Controls Technical Services department first.

Figure 23: SR5i Accepted Coin Dimensions Graph



25.3 Specified EMC Performance

25.31 EMISSIONS

This product is compliant with EMC test specification EN55022; 1998

25.32 IMMUNITY

This product is compliant with EMC test specification EN55014-2; 1997

25.33 SHOCK / VIBRATION IMMUNITY

This product is compliant with BS 2011 part 2.1. [IEC 68-2-27]

25.4 Environmental specification

Table 16: Environmental Ranges

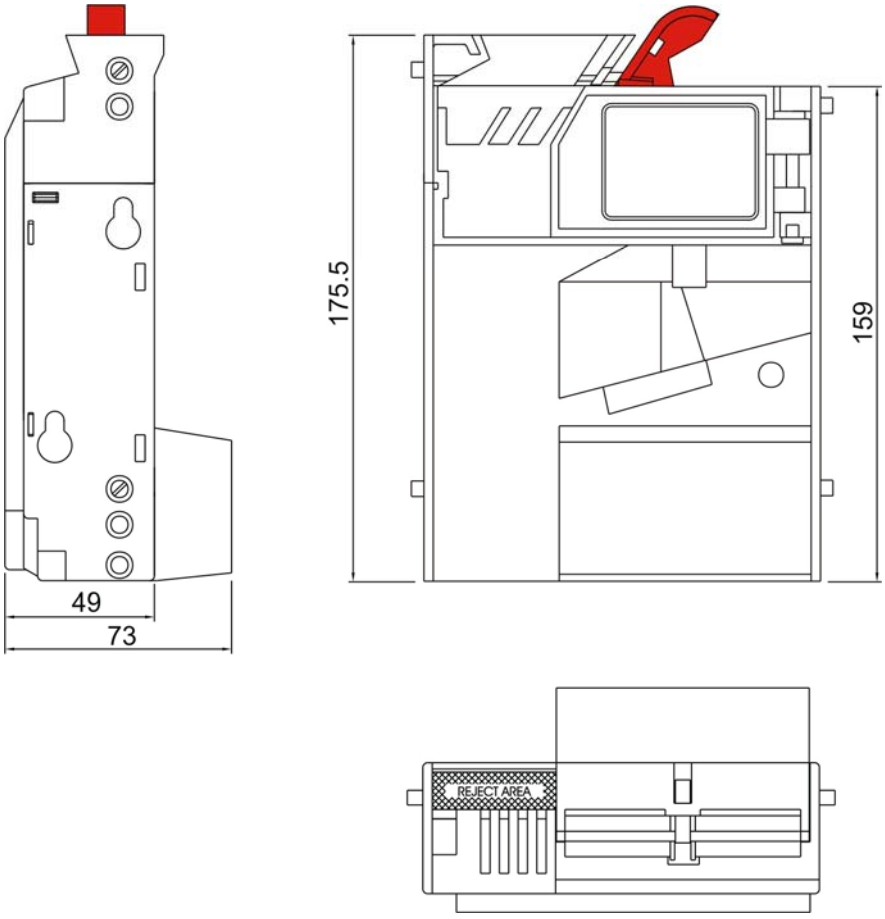
Operating temperature range:	0°C to 55°C 10% to 75% RH non-condensing
Storage temperature range:	-20°C to 70°C 5% to 95% RH non-condensing
(Recovery time by the acceptor after a temperature step change is 1 hour per 20°C. Maximum operating rate of change 20°C per hour.)	

25.5 Material Flammability Rating

The major plastic part of the SR5i (the body) is rated as	UL94-V0
The other parts are rated as	UL94-HB
The 8-way manifold is rated as	UL94-HB

25.6 Top Entry dimensions

Figure 24: SR5i Top Entry with Sorter Dimensions



25.7 Bezel Dimensions

Figure 25: Oval Bezel Dimensions

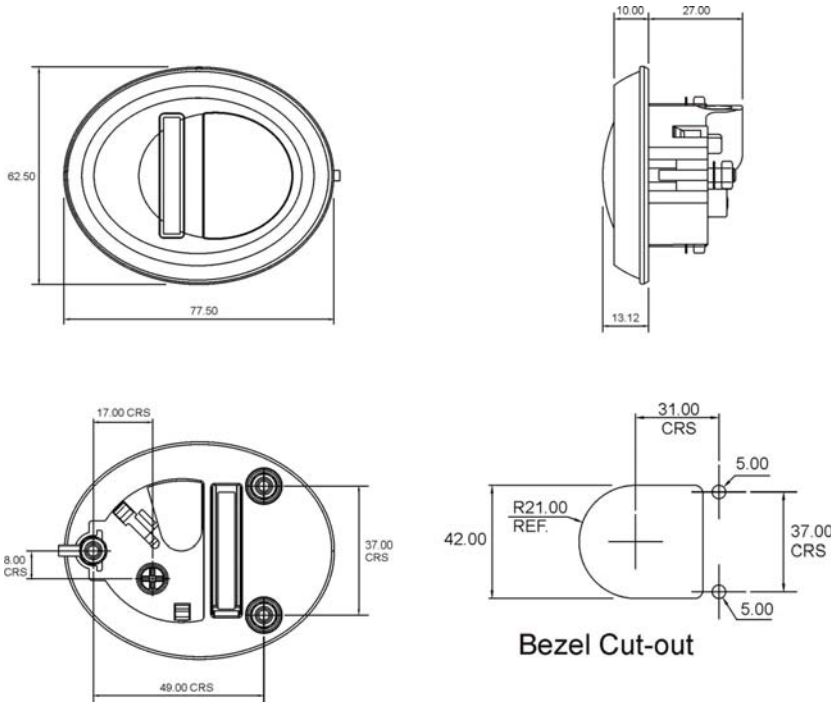
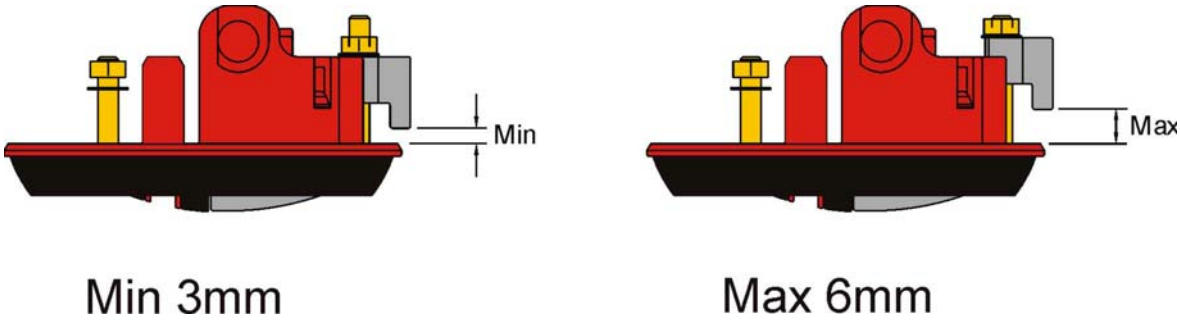
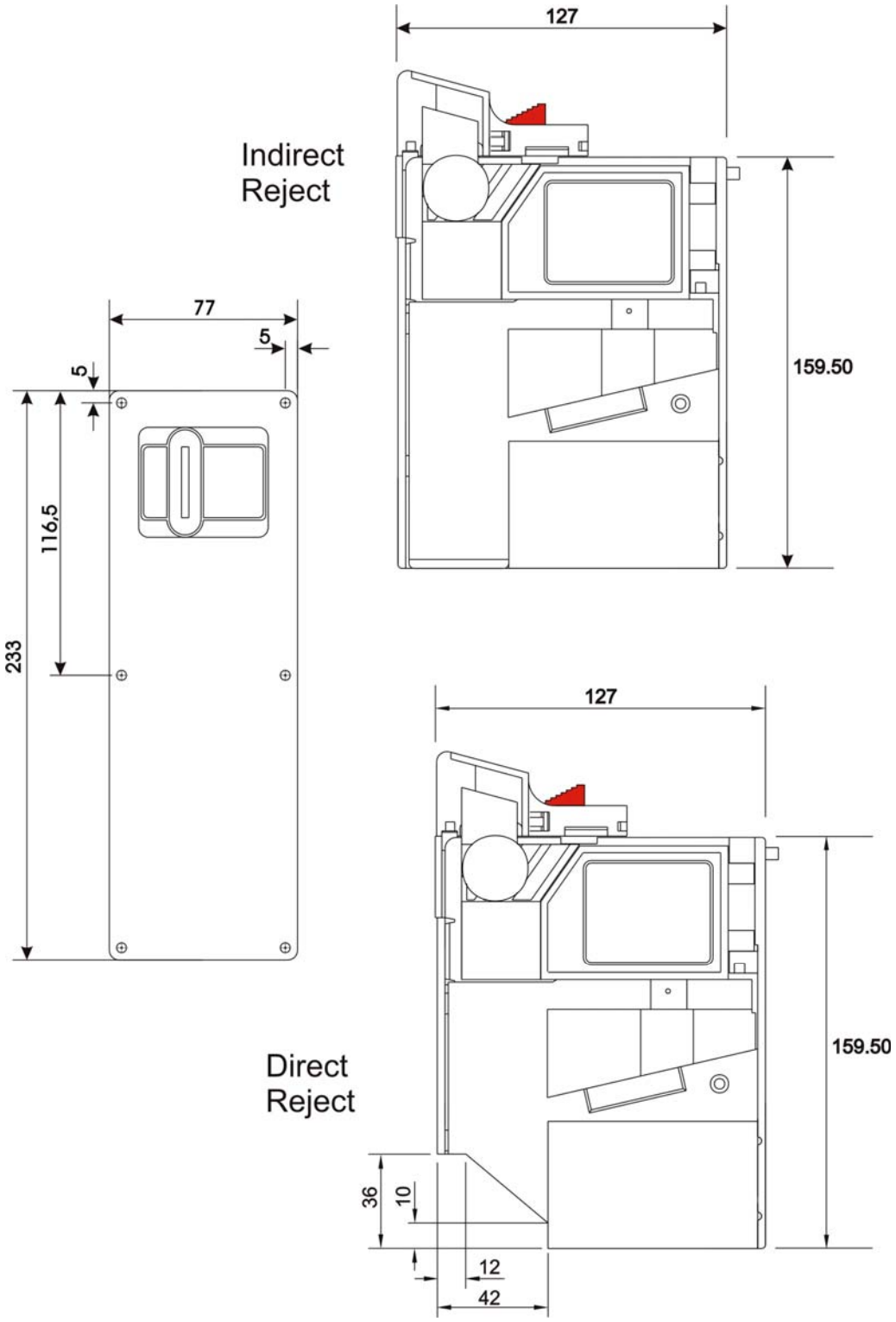


Figure 26: Panel Fixing Dimensions



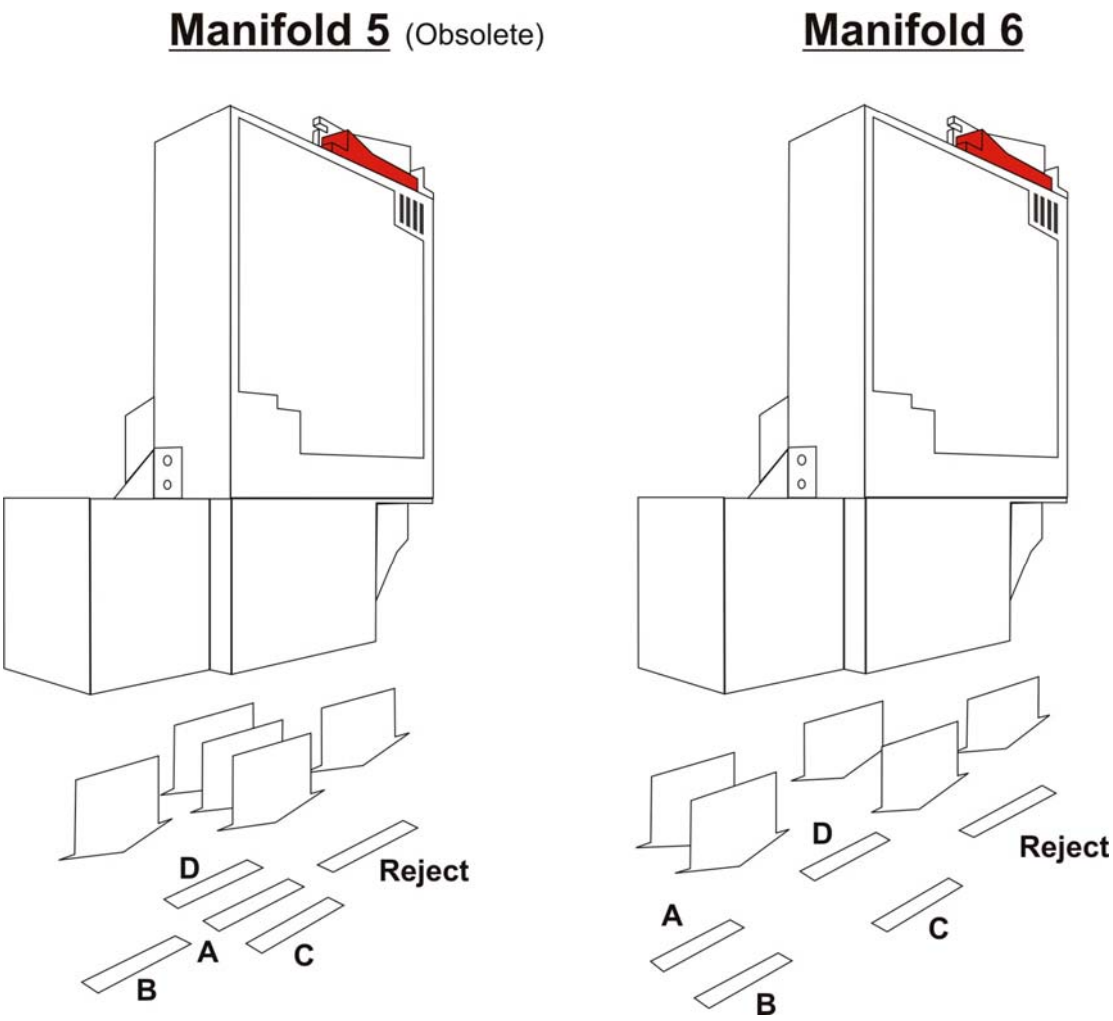
25.8 Front Entry Dimensions

Figure 27: SR5i Front Entry Dimensions



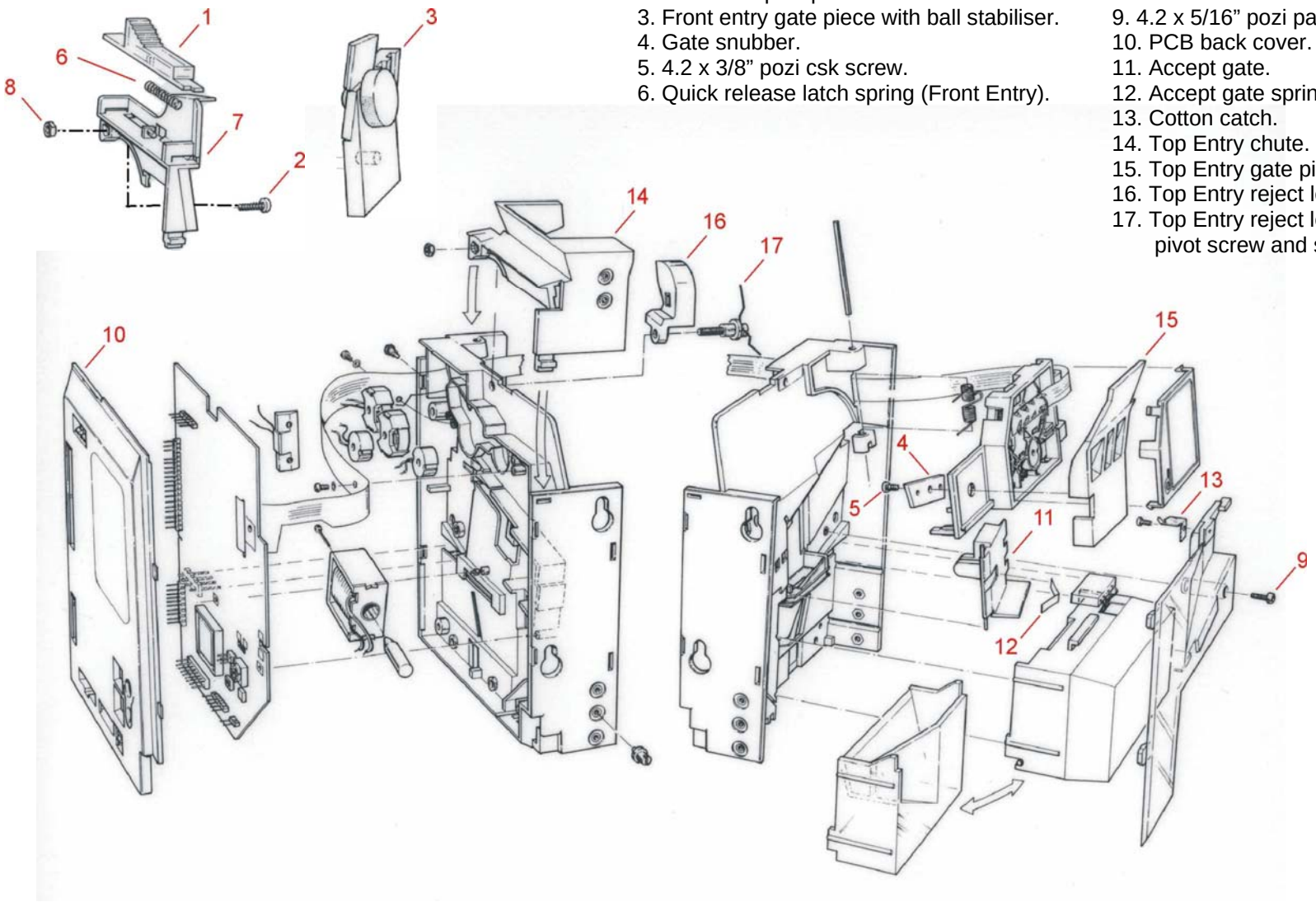
25.9 Manifold Coin Exit Paths

Figure 28: SR5i Manifold Coin Exit Paths



Note:- C235, C255, C335 and SR5 Mode 5 have the same sorter paths (Red + Black). C435 and all the other SR5's fitted with a sorter are as above (Black only). Manifold 5 is an OBSOLETE product and is only here for reference.

Figure 29: Top Entry / Front Entry Exploded View



1. Quick Release latch (Front Entry).
2. M4.0 x 16 pozi pan head screw.
3. Front entry gate piece with ball stabiliser.
4. Gate snubber.
5. 4.2 x 3/8” pozi csk screw.
6. Quick release latch spring (Front Entry).
7. Front Entry piece.
8. M4.0 full nut.
9. 4.2 x 5/16” pozi pan head.
10. PCB back cover.
11. Accept gate.
12. Accept gate spring.
13. Cotton catch.
14. Top Entry chute.
15. Top Entry gate piece.
16. Top Entry reject lever.
17. Top Entry reject lever pivot screw and spring

This manual is intended only to assist the reader in the use of this product and therefore Money Controls shall not be liable for any loss or damage whatsoever arising form the use of any information or particulars in, or any incorrect use of the product. Money Controls reserve the right to change product specifications on any item without prior notice.