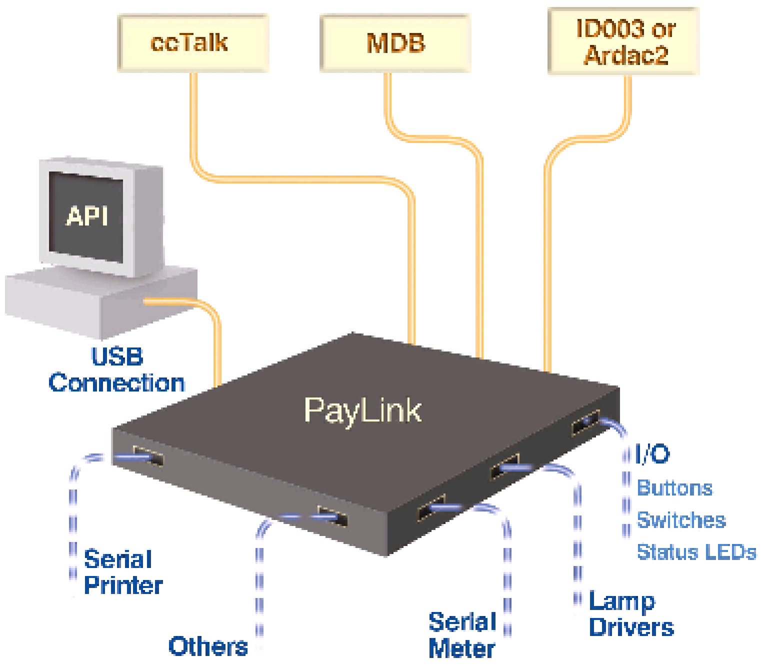
Money Controls

PayLink Technical Manual



Contents

Figures

Tables

1. Diary of Changes

Issue 1.0……………………………………………………………………………..…August 2005

- 1st Issue

Issue 1.1……………………………………………………………………………November 2005

- Changed the value for cctalk hopper address 10, from 500 to 1
- Corrected a mistake with the pinout for RS232 printer interface
- Change ‘red and black’ to ‘orange and black’ for 24V
- Included information on hotswapping
- Above mentioned changes in line with firmware release 4.1.9.6

Issue 1.2…………………………………………………………………………..December 2005

- Corrected a mistake with the cctalk connector pinout information.

Issue 1.3………………………………………………………………………….……May 2006

- Added hopper level sense support
- Added MDB changer support
- Added hopper power fail support
- Corrected mistakes in Figure 14 and Figure 15
- Added SCH3 Combi Support
- Removed all connector details – referecne now to release drawings.
- Added driver and dll revisions.
- Added additional functions available in AESWDriver and Firmware updater.
- Above mentioned changes in line with firmware release 4-1-10-4

Issue 1.4…………………………………………………………………………..November 2006

- Changes to reflect 4-1-10-6 release of software
- Updated the hopper Address vs Value table

Issue 1.5…………………………………………………………………………August 2008

- Changes to reflect 4-1-10-9 release of software
- Added PayLink Lite reference

2. Overview

2.1 Introduction

PayLink is a simple, compact system that offers trouble free interfacing between a PC and money handling Equipment. **PayLink** allows the rapid integration of a variety of payment peripherals into new machine platforms, without the need for bespoke software.

Designed for use in a wide range of applications

- **Gaming**
- **Amusement**
- **Transportation**
- **Vending**

Interfaces/protocols supported

- **ccTalk**
- **ID003**
- **MDB (Master & Slave)**
- **Ardac 2**
- **RS232 serial**

Products supported

- **SR3**
- **Condor Plus / Condor Premier**
- **SR5**
- **SR5i**
- **Ardac Elite**
- **Lumina/MC7200**
- **Serial Compact Hopper MK2 (SCH2)**
- **SCH3 Combi**
- **Serial Universal Hopper (SUH)**
- **Ardac 5**
- **Serial ticket printer (GEN2)**
- **MDB Changer (Coin Co - Vortex/Quantum Pro/Guardian)**

I/O supported

- **16 Outputs (8 High Power – 8 Low Power)**
- **16 Inputs**
- **Serial electronic meter**

PayLink Lite, allows the connection of a range of payment peripherals (but with fewer hoppers than PayLink) driven using the ccTalk industry-standard protocol.

Designed for use in a wide range of applications

- **Gaming**
- **Amusement**
- **Transportation**
- **Vending**

Interfaces/protocols supported

- **ccTalk**

Products supported

- **SR3**
- **Condor Plus / Condor Premier**
- **SR5**
- **SR5i**
- **Ardac Elite**
- **Lumina/MC7200**
- **Serial Compact Hopper MK2 (SCH2)**
- **SCH3 Combi**
- **Serial Universal Hopper (SUH)**

I/O supported

- **2 Inputs**

2.2 Contents

PayLink or **PayLink Lite** does not come with any cables or software. In order to obtain the software CD (drivers, API) please contact your local Money Controls Technical Services Dept.

The verison of software currently available and released is as follows.

PayLink Firmware	**4.1.10.9**
AESWDriver.exe	**1.1.3.3**
Aesimhei.dll	**1.4.0.2**
FTD2XX.dll	**3.1.8.1**
Demo.exe	**1.1.0.5**
MilanDiag.exe	**1.0.3.6**

To obtain a copy of these drivers please contact

Technical Services link: http://www.moneycontrols.com/support/technical_support.asp

PayLink part number: **APCUSBXX00001**

PayLink Lite part number: **APCUSBXX00003**

However, Money Controls can provide a development kit, which consists of example cables and a software CD, but this is only available as a 1 off order. Please contact your local Customer Services Dept to place an order.

Customer Services link: http://www.moneycontrols.com/support/customer_support.asp

PayLink development kit part number: **APCUSBXX00002**

Money Controls recommend purchasing a development kit, in order to aid the integration process in the host machine.
The contents of the **PayLink** Development Kit are as follows:

- **PayLink**
- 1 X cctalk multidrop cable
- 2 X SR5/Lumina cable
- 1 x Ardac Elite ccTalk Cable
- 1 X SR3/Condor Plus cable
- 1 X SCH2 cable – set to address 4
- 1 X SUH cable – set to address 3
- 1 X Serial ticket printer cable
- 1 X Serial meter cable
- 1 X Paylink power cable
- 4 X 20-way headers – for use with inputs/outputs
- 1 X USB Type A – Type B cable
- 1 X Ardac 5 Power cable
- 1 X RJ45-RS232 adapter
- 1 X RJ45 cable
- 1 X MDB cable

PayLink Lite development kit part number: **APCUSBXX00004**

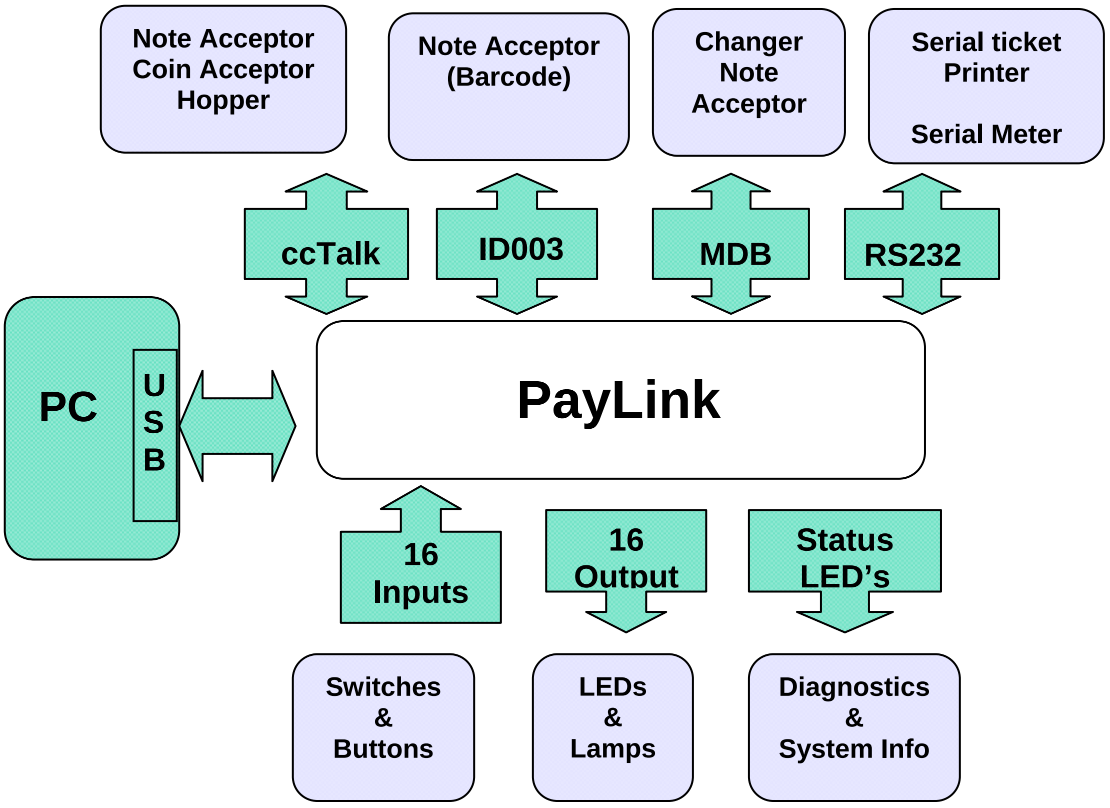
Money Controls recommend purchasing a development kit, in order to aid the integration process in the host machine.
The contents of the **PayLink Lite** Development Kit are as follows:

- **PayLink Lite**
- 1 X cctalk multidrop cable
- 2 X SR5/Lumina cable
- 1 x Ardac Elite ccTalk Cable
- 1 X SR3/Condor Plus cable
- 1 X SCH2 cable – set to address 4
- 1 X SUH cable – set to address 3
- 1 X Paylink power cable
- 1 X USB Type A – Type B cable
- 1 X 2 way Switch Input loom

3. Specification

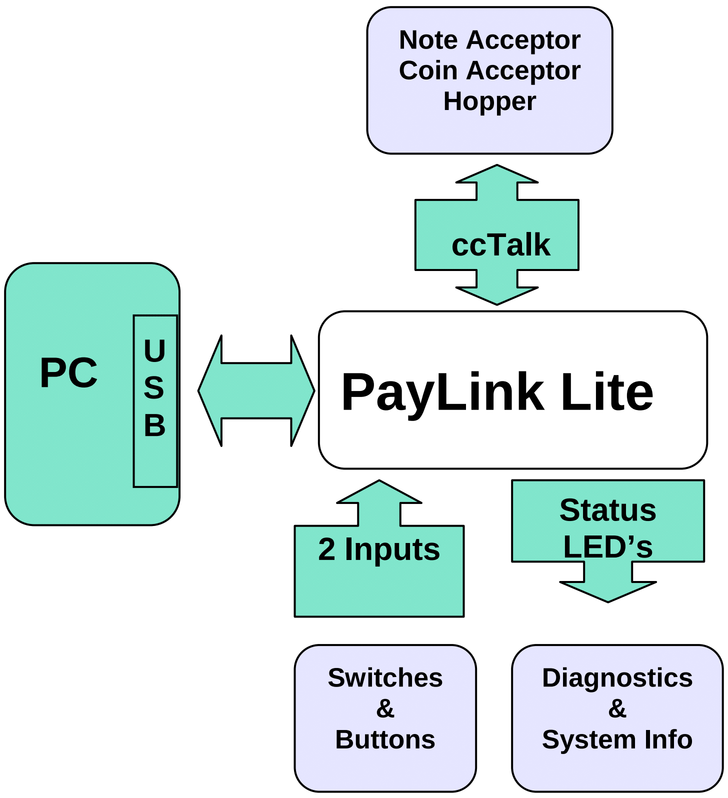
3.1 PayLink Functional block diagram

Figure 1: Functional block diagram



3.2 PayLink Lite Functional block diagram

Figure 2: Functional block diagram



3.3 Connector Overview

Below is an overview of each connector on **PayLink.**

Figure 3: PayLink Connector overview with examples

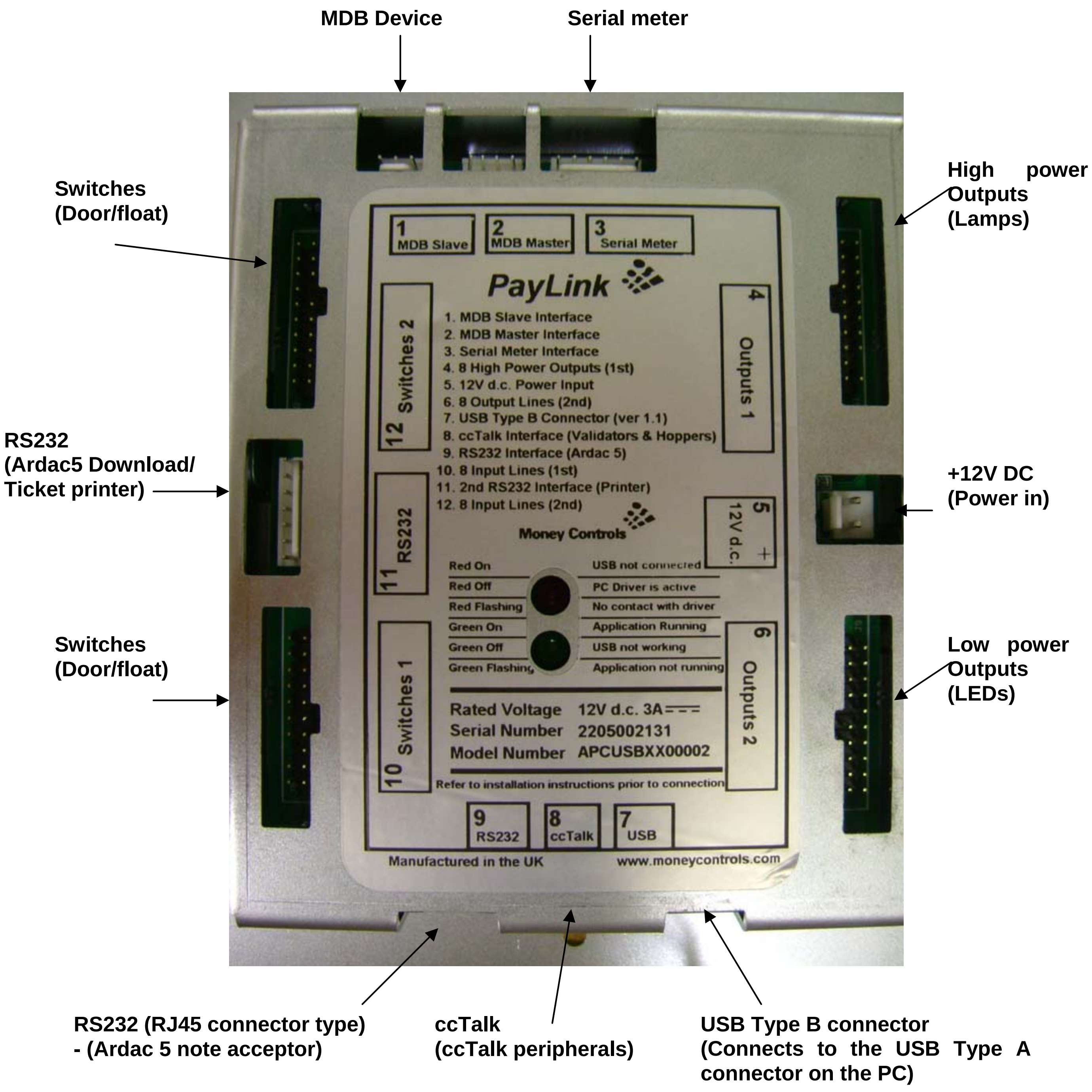
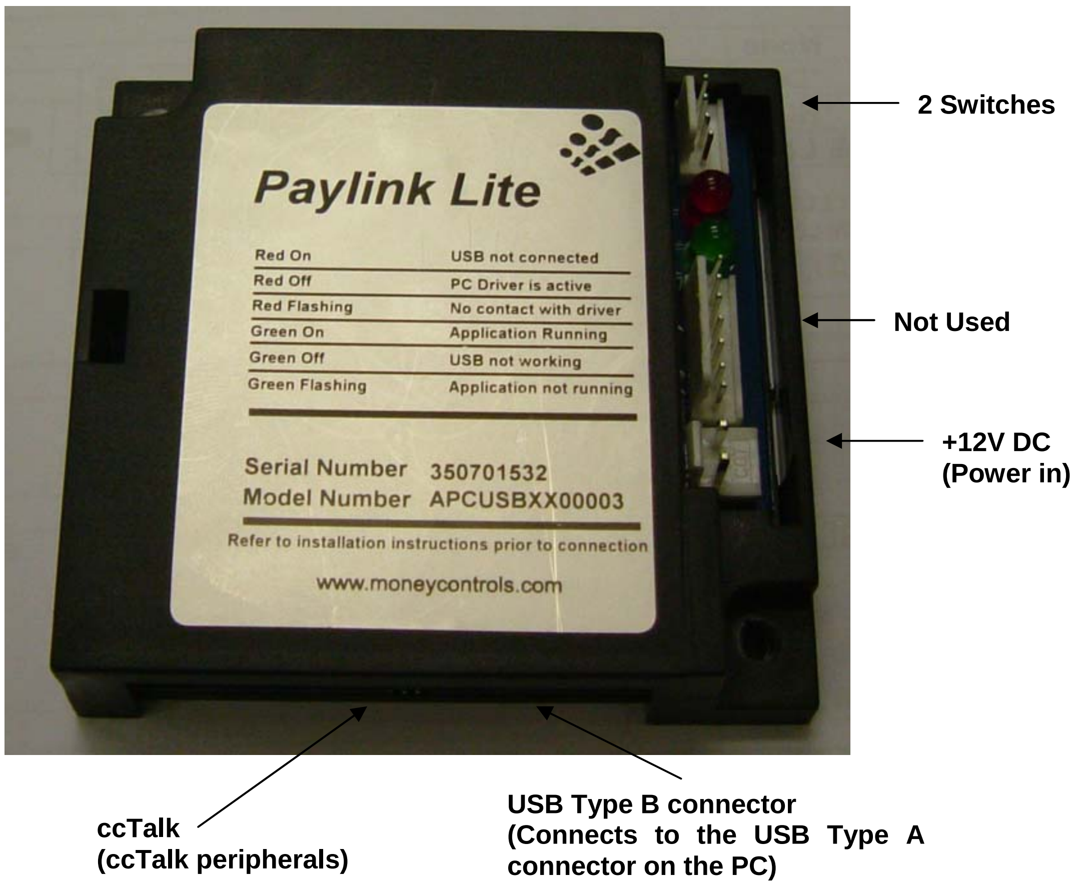


Figure 4: PayLink Lite Connector overview with examples


Paylink Lite
Red On USB not connected
Red Off PC Driver is active
Red Flashing No contact with driver
Green On Application Running
Green Off USB not working
Green Flashing Application not running
Serial Number 350701532
Model Number APCUSBXX00003
Refer to installation instructions prior to connection
www.moneycontrols.com
2 Switches
Not Used
+12V DC (Power in)
ccTalk (ccTalk peripherals)
USB Type B connector (Connects to the USB Type A connector on the PC)

3.4 Mechanical Dimensions

Figure 5: PayLink mechanical dimensions

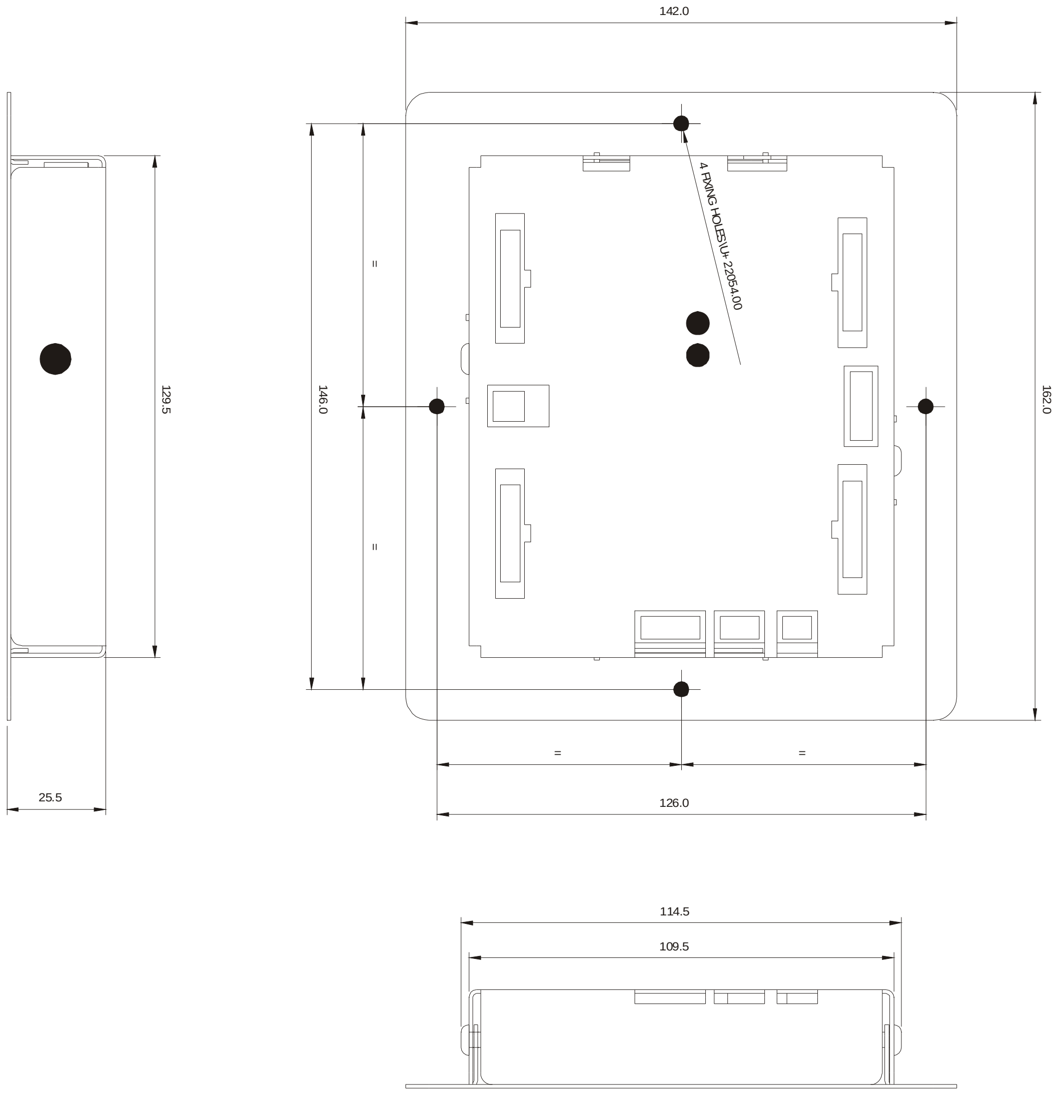
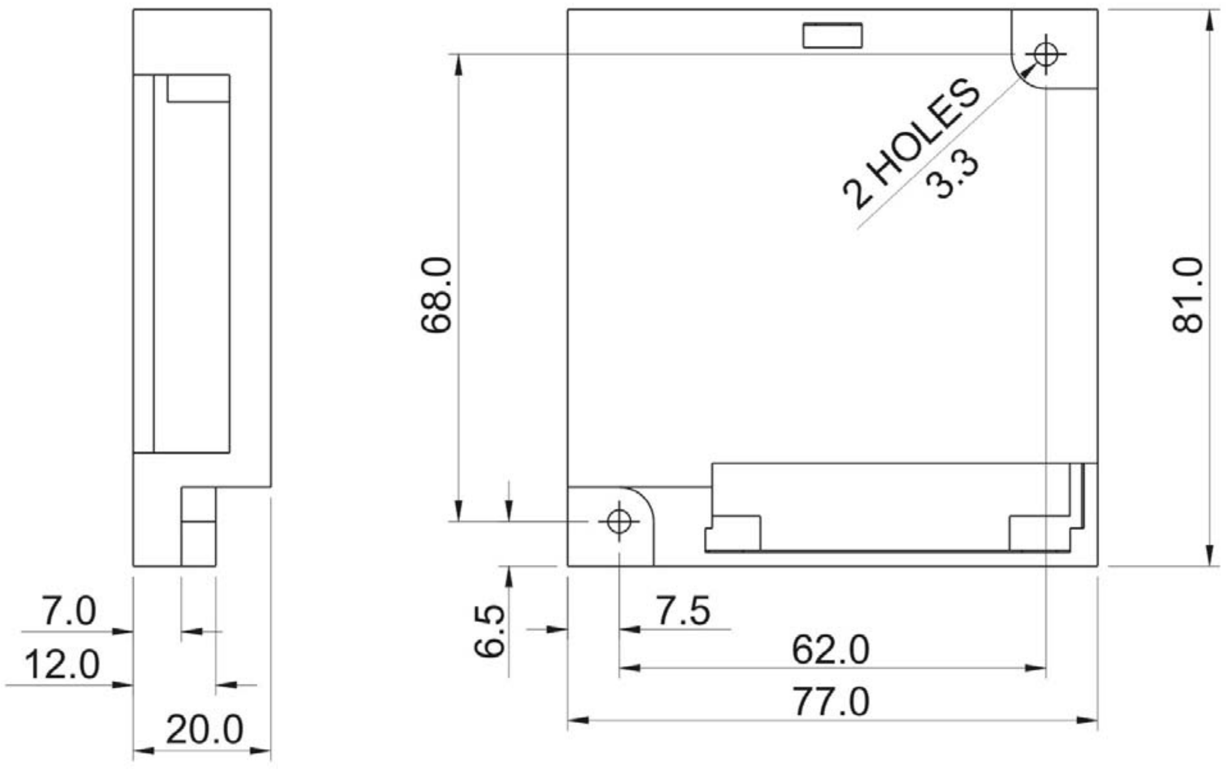


Figure 6: PayLink Lite mechanical dimensions



3.5 Electrical Specification

Table 1: Electrical Specification (PayLink)

Environmental	
Operating temperature range	0°C to 55°C
Storage temperature range	-20°C to 70°C
Humidity range	Up to 75% RH non-condensing
Electrical - General	
Voltage range	+10.8Vdc to +13.2Vdc (nominal +12Vdc)
Outputs (fuse protected) +12Vdc	2.5A continuous, 5A peak for 200ms
Outputs (fuse protected) +24Vdc	2.5A continuous, 5A peak for 200ms
Electrical – I/O Ports	
16 inputs	Switch inputs 3V3 CMOS thresholds with 3V3 pull-ups, 5mA max.
8 high power outputs	Open drain up to 300mA, max output 36V. (Inductive or resistive)
8 low power outputs	Open drain up to 30mA, max output 12V (resistive only)
Communications Interface	USB Type B interface, V1.1 and above
Protocols support	ccTalk, Ardac 2, ID003, MDB, RS232

Table 2: Electrical Specification (PayLink Lite)

Environmental	
Operating temperature range	0°C to 55°C
Storage temperature range	-20°C to 70°C
Humidity range	Up to 75% RH non-condensing
Electrical - General	
Voltage range	USB Powered
Outputs (fuse protected) +12Vdc	2.5A continuous, 5A peak for 200ms
Outputs (fuse protected) +24Vdc	2.5A continuous, 5A peak for 200ms
Electrical – I/O Ports	
2 inputs	Switch inputs 3V3 CMOS thresholds with 3V3 pull-ups, 5mA max.
Communications Interface	USB Type B interface, V1.1 and above
Protocols support	ccTalk

4. Installation

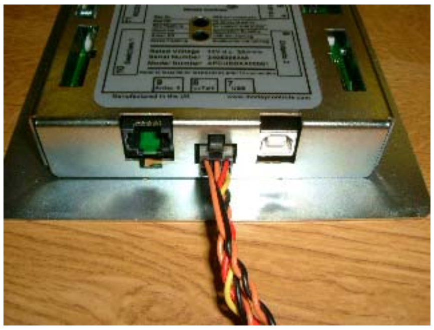
4.1 Hardware installation

PayLink connects to the PC via the USB Type A – Type B cable, during the installation process; the LED indicates the current status of **PayLink**.

Table 3: Status LED table

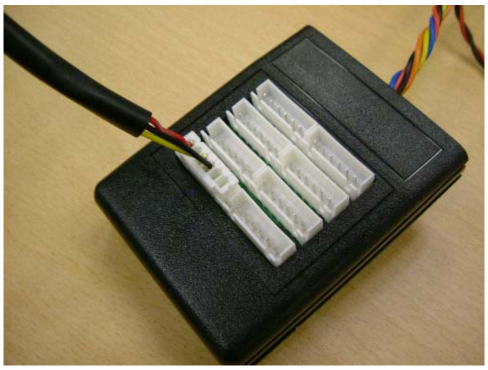
RED on	USB not connected (electrical)
RED off	PC driver is active
RED flashing	No contact with PC driver program
GREEN off	USB not working
GREEN flashing	Application not running
GREEN on	Application running & Peripherals Enabled

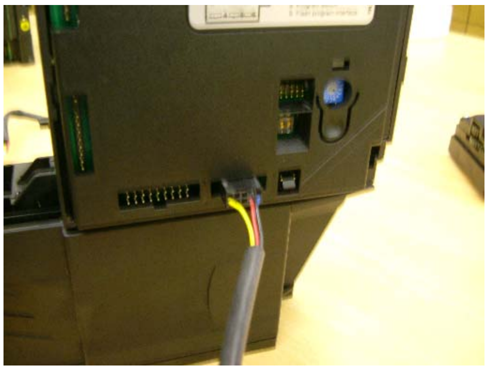
Connect the ccTalk multi drop cable to **PayLink**



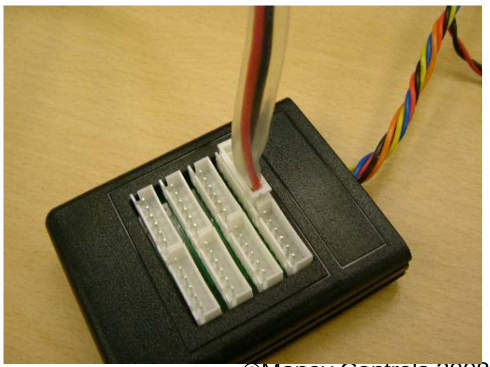
Please note: Only one ccTalk coin/note acceptor is supported.

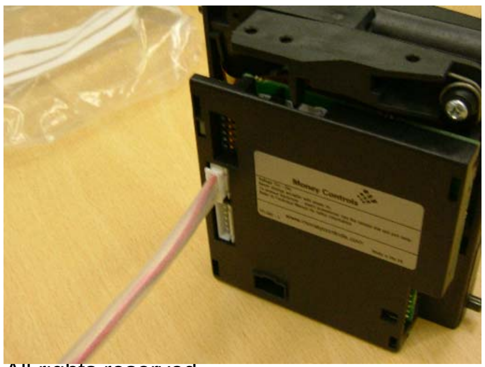
Connect the SR5 cable to the ccTalk multidrop cable and SR5.



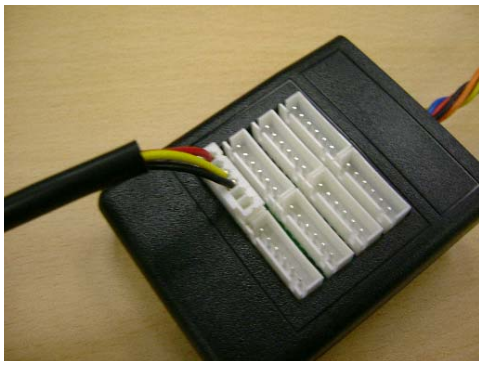
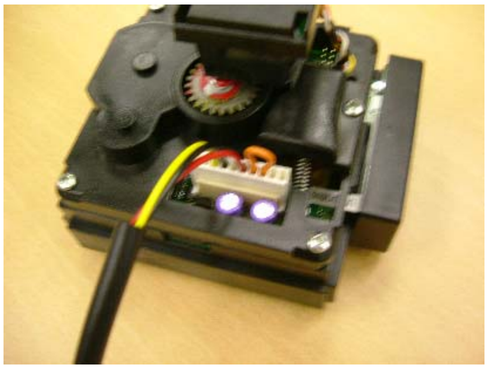


Connect the SR3/Condor Plus cable to the ccTalk multidrop cable and SR3/Condor Plus.

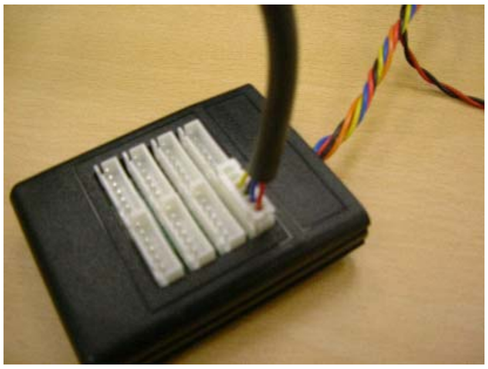
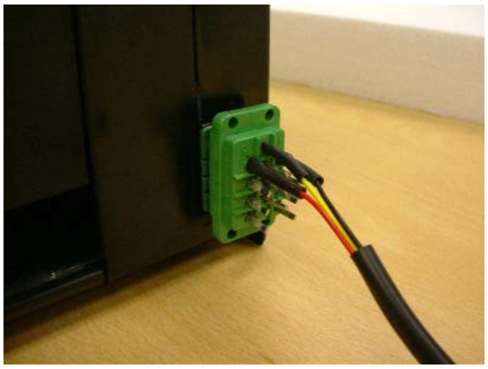




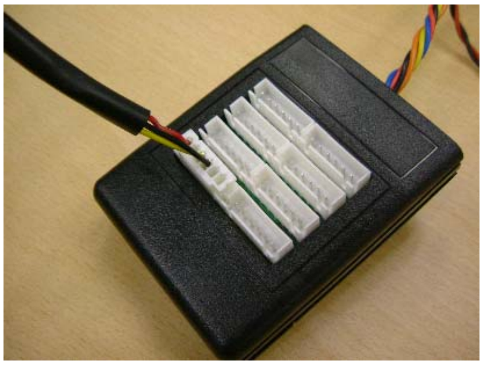
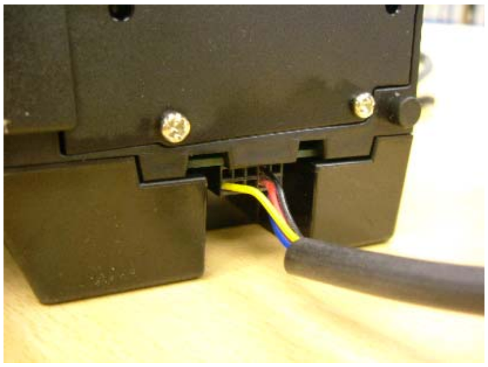
Connect the SCH2 cable to the ccTalk multidrop cable and SCH2.

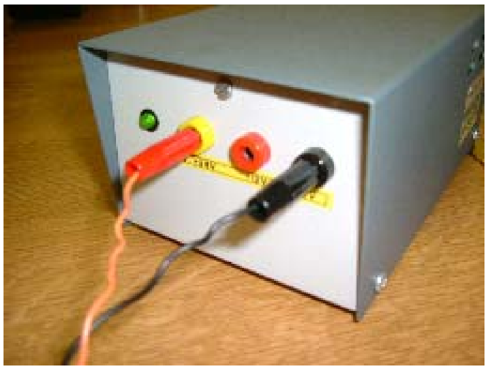
Connect the SUH cable to the ccTalk multidrop cable and SUH.

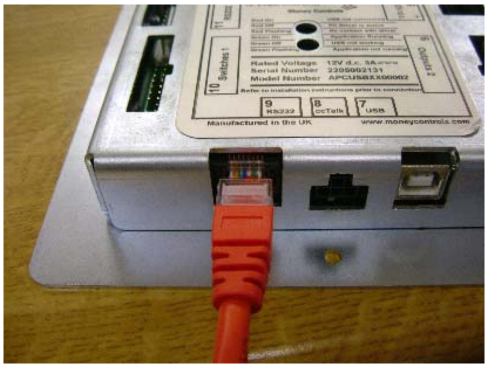
Connect the Lumina cable to the ccTalk multidrop cable and Lumina.

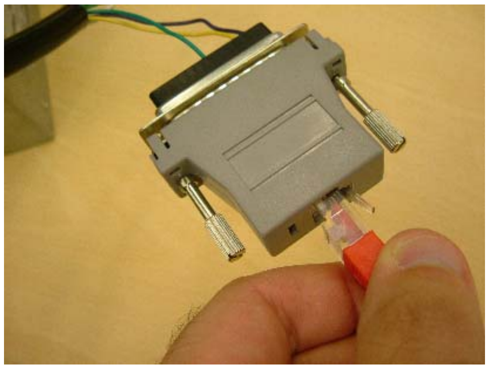



Connect the ccTalk multidrop cable (orange and black) to a +24V dc power supply

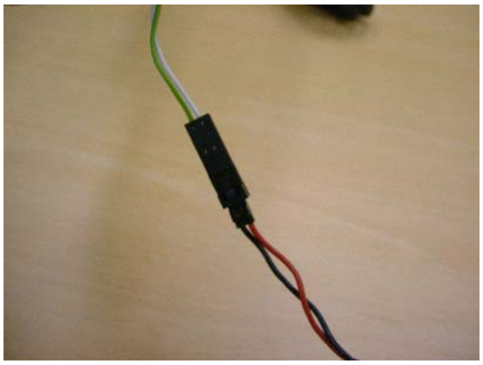


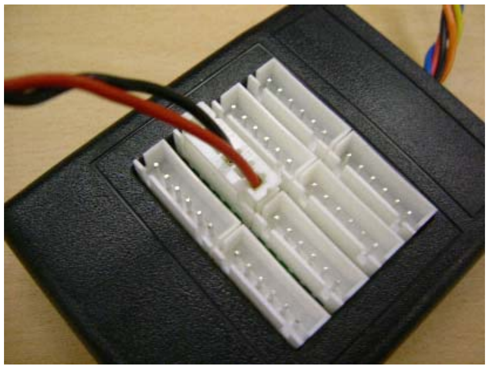
Connect the RJ45 cable to the **PayLink** and Ardac 5 (via the RJ45-RS232 adapter).



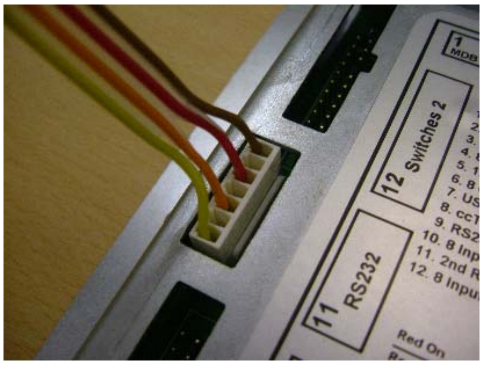


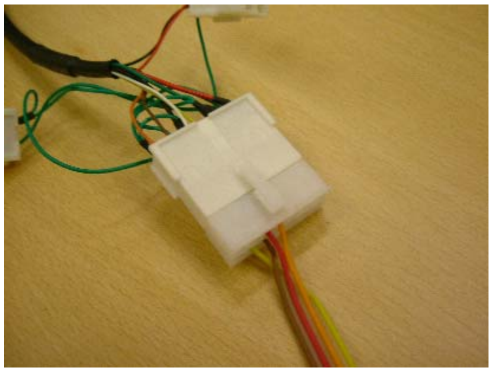
Connect the Ardac 5 power cable to the Ardac 5 and to the multi drop cable.



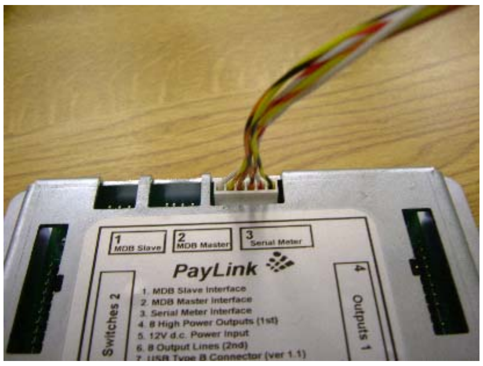


Connect the Serial ticket printer cable to **PayLink** and Serial ticket printer.

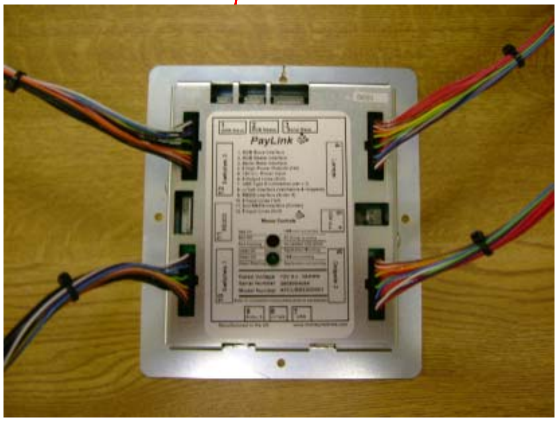




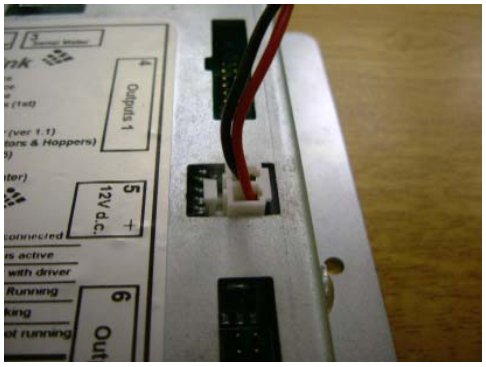
Connect the Serial meter cable to **PayLink** and Serial Meter.

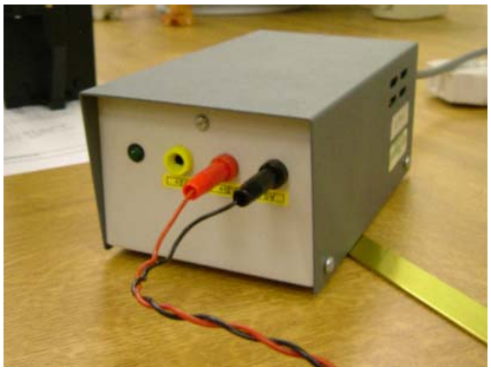


Connect the 4 X 20-way headers to the I/O connectors. *Note: Each 20 way header has a different 'key way' to correspond with the missing pin on the 20-way connectors. The ends of the cables are left open to use as desired.*



Connect **PayLink** to the 2-pin power cable and to a +12V dc power supply. The status LED will show **RED ON**.



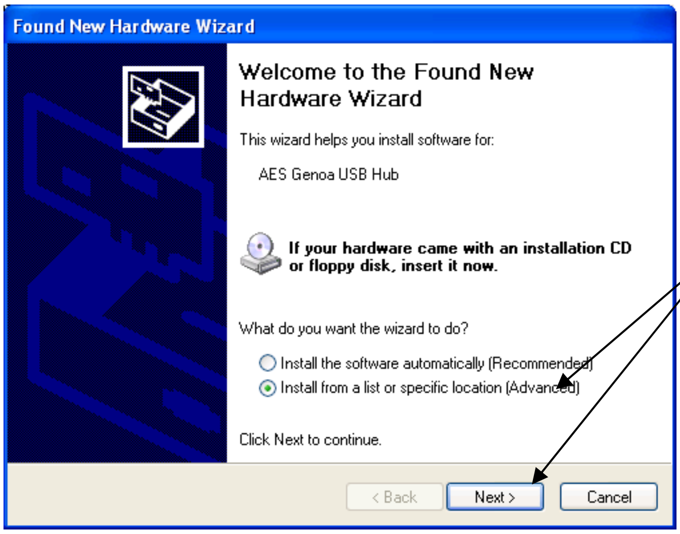


Connect the USB cable to **PayLink** and to the PC.

Windows will indicate that a new USB device has been detected and will prompt for the drivers. The following screen will be shown (this begins the software installation).

4.2 Software Installation

Note: These instructions are for Windows XP only. Please contact Money Controls for information on installing the software under different operating systems.



Found New Hardware Wizard

Welcome to the Found New Hardware Wizard

This wizard helps you install software for:

AES Genoa USB Hub

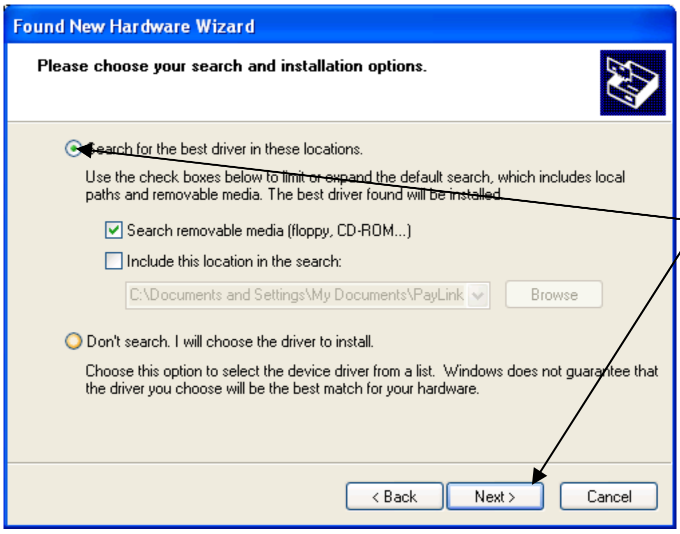
If your hardware came with an installation CD or floppy disk, insert it now.

What do you want the wizard to do?

- Install the software automatically (Recommended)
- [✓ Install from a list or specific location (Advanced)]

Click Next to continue.

Choose **Install from a specific location**, then click **Next**



Found New Hardware Wizard

Please choose your search and installation options.

[✓ Search for the best driver in these locations.]

Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.

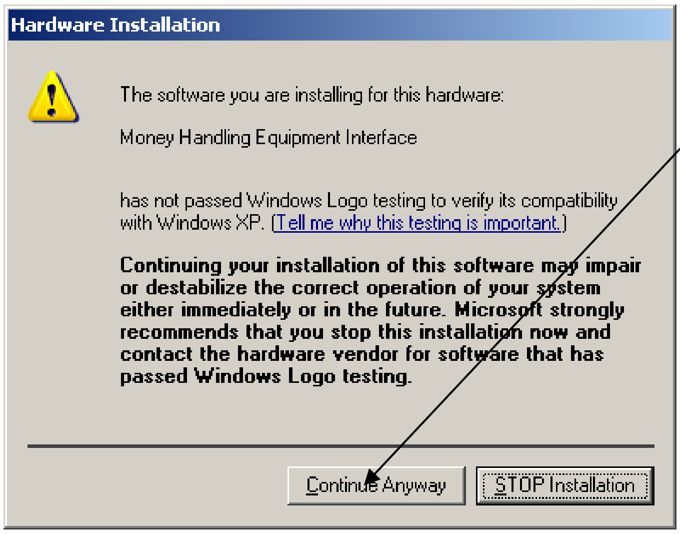
- [✓] Search removable media (floppy, CD-ROM...)
- [ ] Include this location in the search:

C:\Documents and Settings\My Documents\PayLink

Don't search. I will choose the driver to install.

Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.

Choose **Search for the best driver in these locations** then click **Next**



Hardware Installation

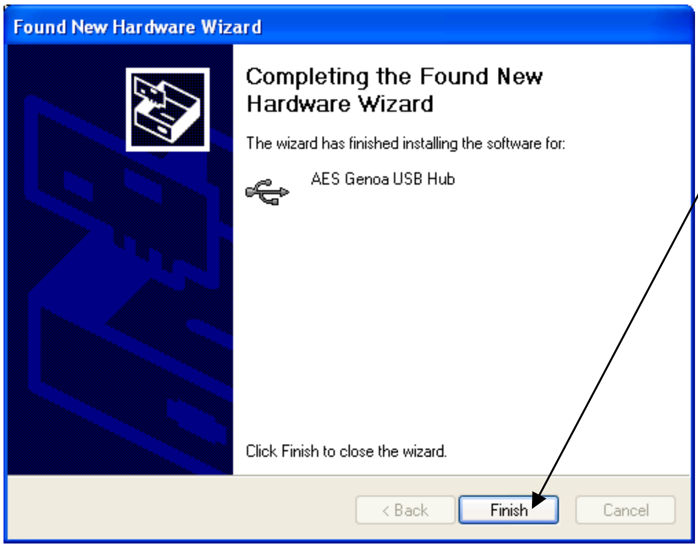
The software you are installing for this hardware:

Money Handling Equipment Interface

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.

If this screen appears, click **Continue Anyway**


Found New Hardware Wizard
Completing the Found New Hardware Wizard
< Back
Finish
Cancel

The wizard has finished installing the software for:

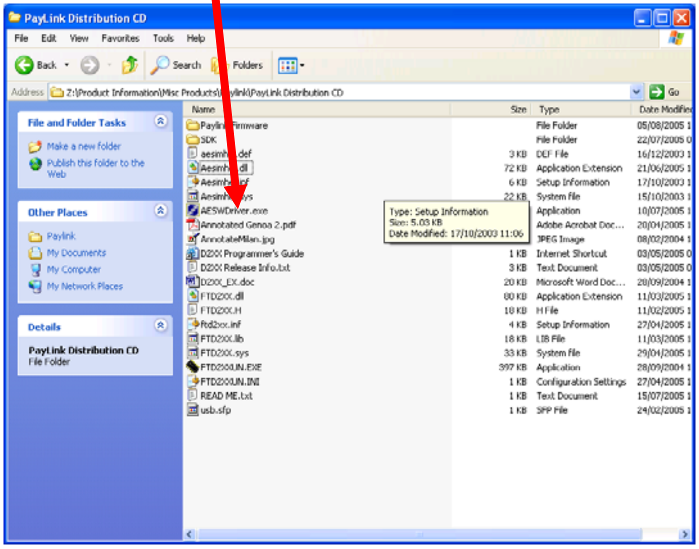
AES Genoa USB Hub

Click Finish to close the wizard.

Click **Finish** to complete the software installation for **PayLink**.

To complete the software installation. Take the following step:

In the PayLink Distribution CD there is a file called *Aesimhei.dll* – copy this to C:\Windows\System32\



Address Z:\Product Information\Misc Products\Paylink\PayLink Distribution CD

PayLink Distribution CD
File Folder

Name	Size	Type	Date Modified
Paylin Firmware		File Folder	05/08/2005 1
SDK		File Folder	22/07/2005 0
aesimh .def	3 KB	DEF File	16/12/2003 1
Aesimh .dll	72 KB	Application Extension	21/06/2005 1
Aesimh .inf	6 KB	Setup Information	17/10/2003 1
Aesimh ys	22 KB	System file	15/10/2003 1
AESWDriver.exe		Application	10/07/2005 1
Annotated Genoa 2.pdf		Adobe Acrobat Doc...	20/04/2005 1
AnnotateMilan.jpg		JPEG Image	08/02/2004 1
D2XX Programmer's Guide	1 KB	Internet Shortcut	03/05/2005 0
D2XX Release Info.txt	3 KB	Text Document	03/05/2005 0
D2XX_EX.doc	20 KB	Microsoft Word Doc...	20/09/2004 1
FTD2XX.dll	80 KB	Application Extension	11/03/2005 1
FTD2XX.H	18 KB	H File	11/02/2005 1
ftd2xx.inf	4 KB	Setup Information	27/04/2005 1
FTD2XX.lib	18 KB	LIB File	11/03/2005 1
FTD2XX.sys	33 KB	System file	29/04/2005 1
FTD2XXUN.EXE	397 KB	Application	28/09/2004 1
FTD2XXUN.INI	1 KB	Configuration Settings	27/04/2005 1
READ ME.txt	1 KB	Text Document	15/07/2005 1
usb.sfp	1 KB	SFP File	24/02/2005 1

Type: Setup Information
Size: 5.03 KB
Date Modified: 17/10/2003 11:06

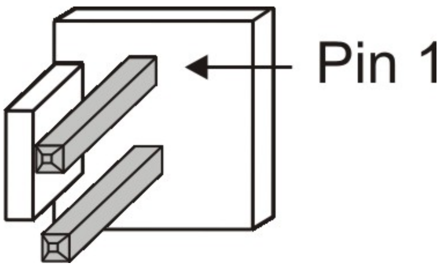
Please note: If this step is not performed, the **PayLink** applications will not function correctly.

Note: At this point, in order to test PayLink. Refer to Section 7 Using PayLink

5. Interface

5.1 Power interface

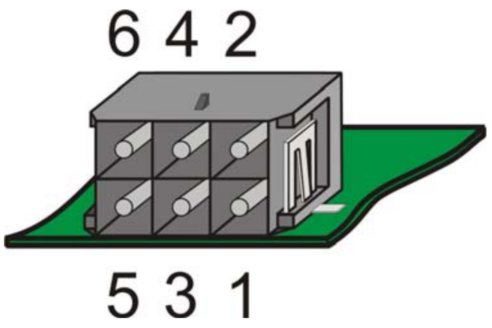
Figure 7: PayLink power interface



Pin	Function
1	GND
2	+12V dc

5.2 ccTalk interface

Figure 8: PayLink ccTalk interface

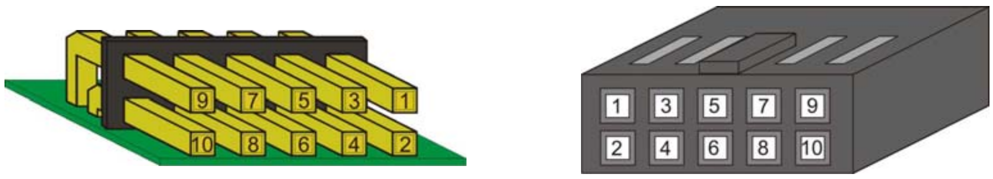


Pin	Function	Pin	Function
1	ccTalk data line	4	+24V Out
2	+12V Out	5	0V In
3	Serial Select / 0V	6	+24V In

IMPORTANT INFORMATION

- **+12V Out is the supply which is provided to PayLink on the 2 pin connector via a polyfuse for protection.**
- **+24V In must be provided by the host machine (in the PayLink development kit, this is shown by orange and black power cables) and is passed through a polyfuse for protection, this becomes +24V Out.**
- **Under no circumstances can any more than 2.5A drawn through the card.**
- **Under no circumstances should PayLink be ‘hot swapped’**

Figure 9: Lumina / SR5 ccTalk interface



Pin	Description	Pin	Description	
1	ccTalk data line		Lumina	SR5
2,3,4,5,6	Not Used			
7	12V	9	Not Used	ccTalk select line
8	0V	10	Not Used	

Figure 10: SR3/Condor Plus ccTalk interface

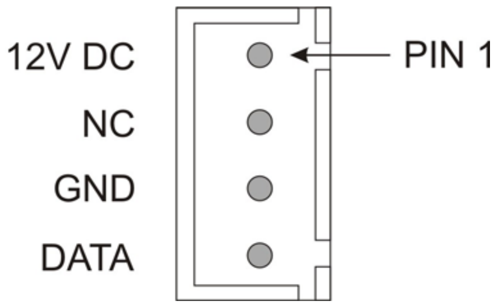
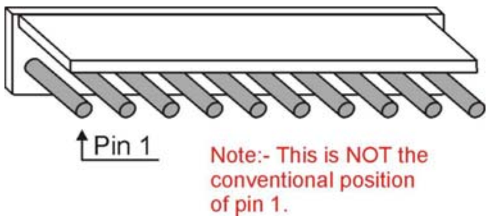


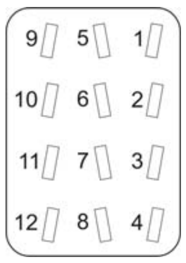
Figure 11: SCH2 ccTalk interface

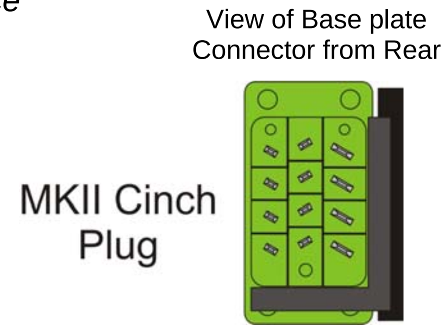


Pin	Function	Pin	Function
1	Address select 3 - MSB	6,7	0V
2	Address select 2	8	ccTalk data line
3	Address select 1 - LSB	9	N/C
4,5	+Vs	10	/RESET

The address selection process is covered in Section 6.3.

Figure 12: SUH ccTalk interface



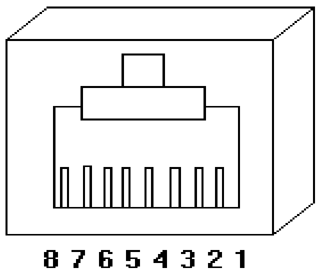


Pin	Function	Pin	Function
1	0V	8	Address Select 2
2,3	N.C.	9	+Vs
4	Address Select 1 - LSB	10,11	N.C.
5	ccTalk data line	12	Address Select 3 - MSB
6,7	N.C.		

The address selection process is covered in section 6.3

5.3 ID003/Ardac 2 interface

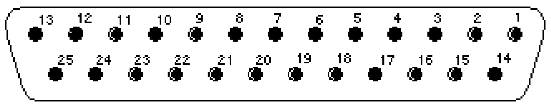
Figure 13: PayLink - ID003/Ardac 2 interface



Pin (PayLink)	Function
3	Rx (Green/White)
4	TX (Blue)
2	GND (Orange)

Figure 14: Ardac 5 - ID003/Ardac 2 interface

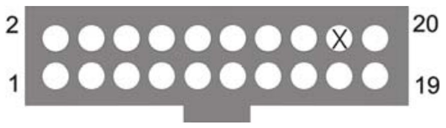
Pin (Ardac5)	Function
2	Rx (Violet)
3	TX (Yellow)
7	GND (Green)



Ardac 5 25 Way D-type (Female) Connector
Important: This view is from the mating side

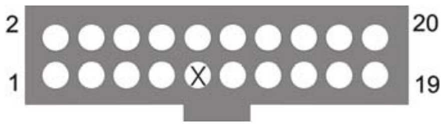
5.4 PayLink Auxiliary input/output interface

Figure 15: Connector 4 – High power outputs



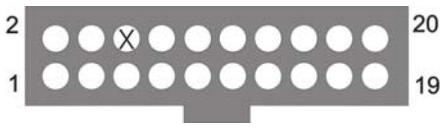
+12V	+12V	N/C	+12V	+12V	+12V	+12V	+12V	Key	+12V
0	1	2	3	N/C	4	N/C	5	6	7

Figure 16: Connector 6 – Low power outputs



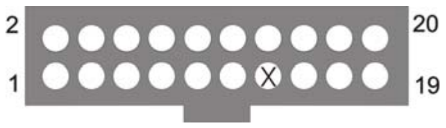
+12V	+12V	N/C	+12V	+12V	+12V	+12V	+12V	N/C	+12V
8	9	10	11	Key	12	N/C	13	14	15

Figure 17: Connector 10 – Switches / Inputs



0V	0V	Key	0V	0V	0V	0V	0V	N/C	0V
0	1	2	3	N/C	4	N/C	5	6	7

Figure 18: Connector 12 – Switches / Inputs



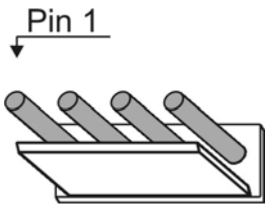
0V	0V	N/C	0V	0V	0V	0V	0V	N/C	0V
8	9	10	11	N/C	12	Key	13	14	15

Table 4: I/O Interface

Pin	Conn 4	Conn 6	Conn 10	Conn 12
1	Output 0	Output 8	Input 0	Input 8
2	+12V	+12V	0V	0V
3	Output 1	Output 9	Input 1	Input 9
4	+12V	+12V	0V	0V
5	Output 2	Output 10	Input 2	Input 10
6	N/C	N/C	KEYWAY	N/C
7	Output 3	Output 11	Input 3	Input 11
8	+12V	+12V	0V	0V
9	N/C	KEYWAY	N/C	N/C
10	+12V	+12V	0V	0V
11	Output 4	Output 12	Input 4	Input 12
12	+12V	+12V	0V	0V
13	N/C	N/C	N/C	KEYWAY
14	+12V	+12V	0V	0V
15	Output 5	Output 13	Input 5	Input 13
16	+12V	+12V	0V	0V
17	Output 6	Output 14	Input 6	Input 14
18	KEYWAY	N/C	N/C	N/C
19	Output 7	Output 15	Input 7	Input 15
20	+12V	+12V	0V	0V

5.5 PayLink Lite input interface

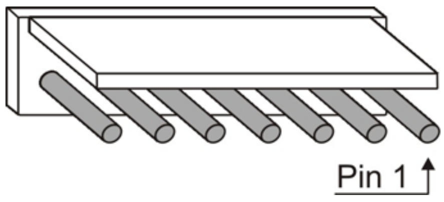
Figure 19: PayLink Lite Switch Inputs

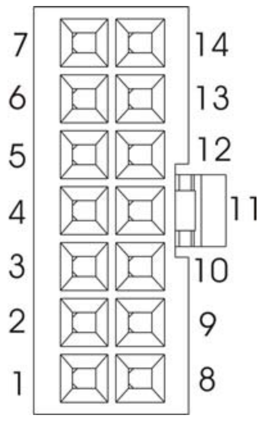


Pin - PayLink	Function
1	GND
2	Switch 1
3	GND
4	Switch 2

5.6 Serial printer interface

Figure 20: PayLink – RS232 Serial Printer Interface

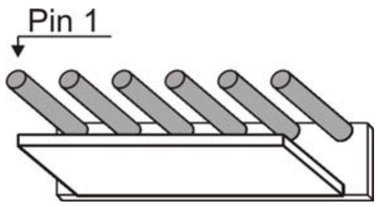




Pin - PayLink	Function	Pin – Serial Printer
1	+24V DC	6
3	TX (from PayLink)	11
5	RX (to PayLink)	12
7	GND	5

5.7 Serial meter interface

Figure 21: PayLink serial meter interface

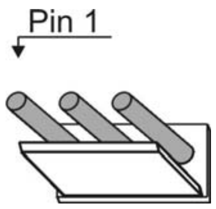


This is a 1 to 1 connection between **PayLink** and the Serial meter.

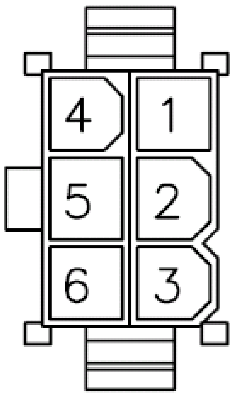
Pin (Meter)	Function	Pin (Meter)	Function
1	SPI Data Output	4	SEC Reset
2	SPI Clock Input	5	+12V Supply
3	SPI Data Input	6	0V Supply

5.8 MDB Device interface

Figure 22: MDB Slave interface



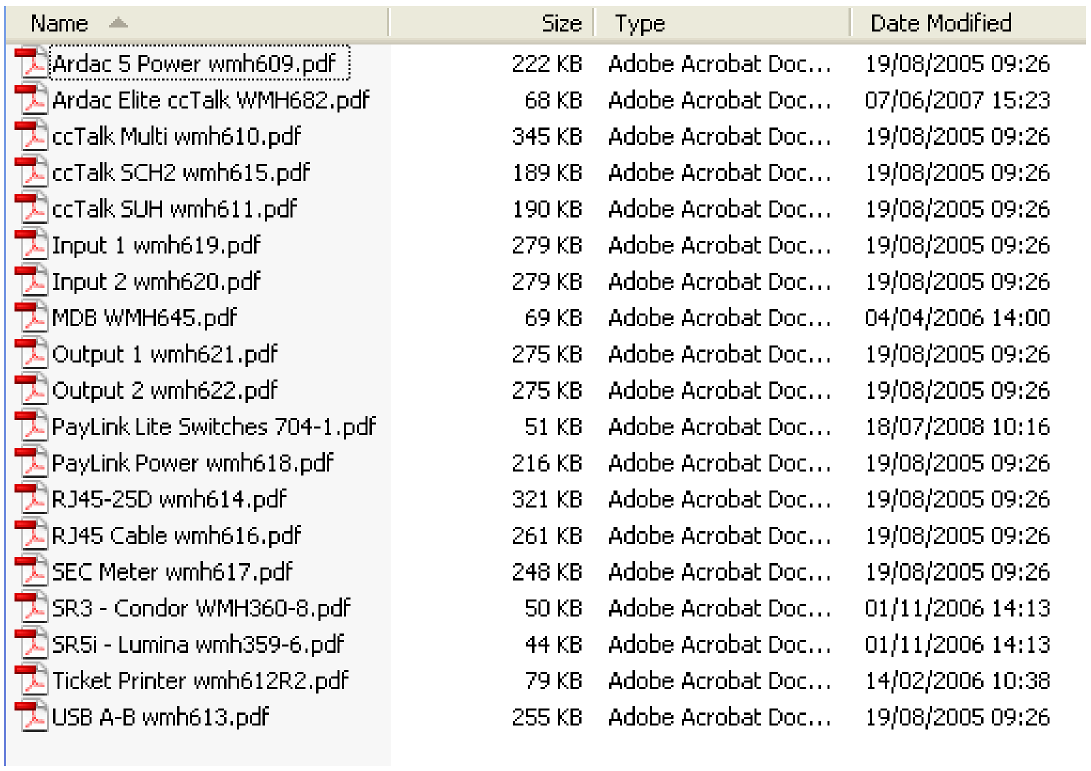
Pin (PayLink)	Function	Pin (MDB)
1	Rx (to PayLink)	5
2	TX (from PayLink)	4
3	Signal GND	6
	0V DC	2
	+V DC	1



Note: The *MDB Master interface* is currently not supported and can be used for special projects only. Please contact Money Controls if you would like further information.

5.9 Connector details

Full drawings and connector details are provided within the \PayLink Looms section of the CD.



Name	Size	Type	Date Modified
Ardac 5 Power wmh609.pdf	222 KB	Adobe Acrobat Doc...	19/08/2005 09:26
Ardac Elite ccTalk WMH682.pdf	68 KB	Adobe Acrobat Doc...	07/06/2007 15:23
ccTalk Multi wmh610.pdf	345 KB	Adobe Acrobat Doc...	19/08/2005 09:26
ccTalk SCH2 wmh615.pdf	189 KB	Adobe Acrobat Doc...	19/08/2005 09:26
ccTalk SUH wmh611.pdf	190 KB	Adobe Acrobat Doc...	19/08/2005 09:26
Input 1 wmh619.pdf	279 KB	Adobe Acrobat Doc...	19/08/2005 09:26
Input 2 wmh620.pdf	279 KB	Adobe Acrobat Doc...	19/08/2005 09:26
MDB WMH645.pdf	69 KB	Adobe Acrobat Doc...	04/04/2006 14:00
Output 1 wmh621.pdf	275 KB	Adobe Acrobat Doc...	19/08/2005 09:26
Output 2 wmh622.pdf	275 KB	Adobe Acrobat Doc...	19/08/2005 09:26
PayLink Lite Switches 704-1.pdf	51 KB	Adobe Acrobat Doc...	18/07/2008 10:16
PayLink Power wmh618.pdf	216 KB	Adobe Acrobat Doc...	19/08/2005 09:26
RJ45-25D wmh614.pdf	321 KB	Adobe Acrobat Doc...	19/08/2005 09:26
RJ45 Cable wmh616.pdf	261 KB	Adobe Acrobat Doc...	19/08/2005 09:26
SEC Meter wmh617.pdf	248 KB	Adobe Acrobat Doc...	19/08/2005 09:26
SR3 - Condor WMH360-8.pdf	50 KB	Adobe Acrobat Doc...	01/11/2006 14:13
SR5i - Lumina wmh359-6.pdf	44 KB	Adobe Acrobat Doc...	01/11/2006 14:13
Ticket Printer wmh612R2.pdf	79 KB	Adobe Acrobat Doc...	14/02/2006 10:38
USB A-B wmh613.pdf	255 KB	Adobe Acrobat Doc...	19/08/2005 09:26

6. Peripheral Features/Support

6.1 SR3/Condor Plus/SR5/SR5i

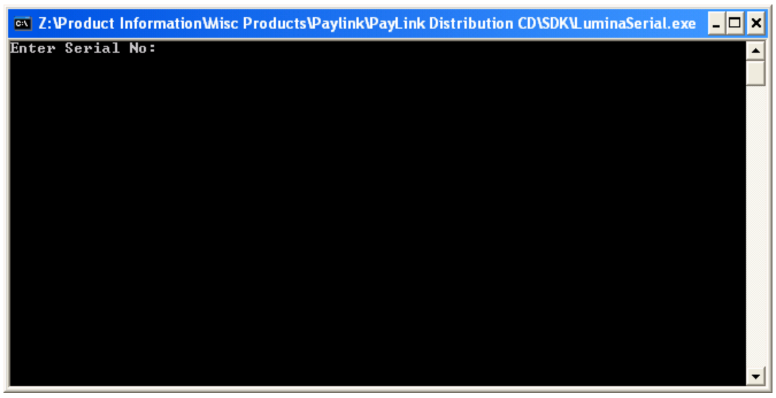
- At present, only one coin acceptor, at address 2, is supported.
- A complex system of routing is provided, which supports the diversion of coins.
- Both individual coins and the entire unit can be easily inhibited.
- The automatic retrieval from the unit of the value of each coin is supported.

6.2 Lumina

- At present, only one note acceptor, at address 40, is supported.
- **PayLink** fully supports the ccTalk encryption scheme needed to communicate with Lumina.
- Both individual notes and the entire unit can be easily inhibited.
- The automatic retrieval from the unit of the value of each note is supported.
- The default Lumina 6-digit security code is 123456. To use a Lumina with a different security code an application is provided. Luminaserial.exe is found in the following directory

PayLink\SDK

Run LuminaSerial.exe – the following screen will be shown:


Z:\Product Information\Misc Products\Paylink\PayLink Distribution CD\SDK\LuminaSerial.exe

```
Enter Serial No:
```

Enter the Lumina 6-digit security code (found on a label on the top of Lumina) and click **Enter**. This will close the application. **PayLink** will now work with the code specified. To change to a different code, run LuminaSerial.exe again to change the code.

6.3 ccTalk hoppers

- Currently, 8 Hoppers, at addresses 3 to 10, are supported and the pre-set values are linked to the cctalk address (shown below).
- 6 are supported on PayLink Lite (2 when a Coin or Bill acceptor are connected)
- The below hoppers values have been implemented from PayLink firmware version 4-1-9-6 and above.
- The hopper addresses is selected by hardwiring the connector.

Table 5: Hopper address Wiring & Coin Values

X = Connect to +Vs (Pins 4 or 5)			ccTalk Address	Coin Value
Address select 3 (Pin 1)	**Address select 2 (Pin 2)**	**Address select 1 (Pin 3)**		
			3	100
		X	4	50
	X		5	25
	X	X	6	20
X			7	10
X		X	8	5
X	X		9	200
X	X	X	10	1

- It is recommend to use only use 24V hoppers.
- 12V SCH2 hoppers can be used, but you must not power via **PayLink**, as the current consumption will be too high. Under no circumstances can any more than 2.5A drawn through the card.
- Hopper level sense is supported in PayLink firmware version 3-1-10-1 and above. See section 7.2 Demo.exe & 11.22 DispenserBlock for information.
- Hopper 'power fail' is supported in PayLink firmware version 3-1-10-1 and above. See section 11.15 Hopper Power Fail support. (1.10.x) for information.

6.4 Ardac 5

- Paylink supports either ID003 or Ardac 2 protocol but not both. In order to convert from Ardac 2 protocol to the ID003 protocol (and vice versa), the necessary firmware needs to be programmed into Paylink. Refer to section 7.4 Upgrading PayLink firmware for information on how to do this.
- Must be powered at 24V as the current consumption at 12V will be too high. Under no circumstances can any more than 2.5A drawn through the card.
- Both individual notes and the entire unit can be easily inhibited.
- The automatic retrieval from the unit of the value of each note is supported.

6.5 Serial ticket printer

- The printer needs to be preloaded with a template.
- Currently only supports Futurelogic GEN2 ticket printer. Please contact Money Controls Technical Services for details.

6.6 MDB Device

- The MDB hardware has always existed on the PayLink PCB. However, the PayLink firmware only supports an MDB Device from version 3-1-10-1 and above.

6.7 Inputs

- 16 Individual external switches are supported by the unit, and are easily accessible by the user's application.
- Provision is made for the user's application to easily use switches in two modes:

1. Key Press - Where a button may be pressed several times and it is important to know how many times
2. State - Where the switch changes over a long time frame and all the application needs to know is where the switch is at any instant.

6.8 Outputs

- 8 Individual external LED's are supported by the unit, and are easily accessible by the user's application.
- 8 high power (lamp) outputs are supported by the unit, and are easily accessible by the user's application.

6.9 Serial meter

- One external meter with an SPI interface corresponding to that defined by Starpoint is supported.
- The **PayLink** board fully supports all 31 of the Starpoint's counters.
- Provision is made to allow the user's application to easily support the BACTA standard for displaying counter values, as well as to implement any other scheme.
- The **PayLink** board continually checks that the meter is operation.

7. Using PayLink

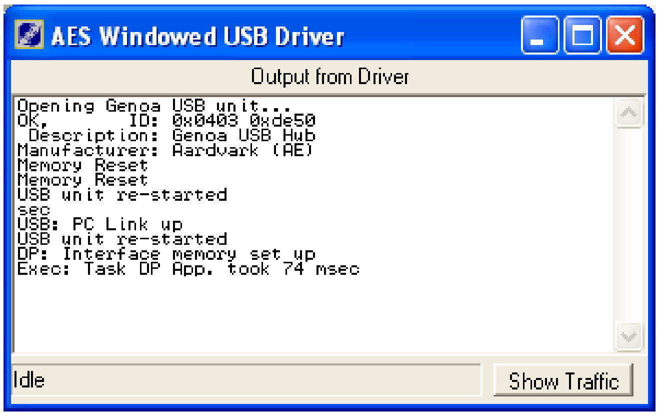
This section shows how to run and use various programs, all of which are provided on the **PayLink** distribution CD.

- **AESWDriver.exe** (the PayLink driver)
- **MilanDiag.exe** (diagnostics program)
- **Demo.exe** (API example)
- **Firmware.exe** upgrade program

7.1 AESWDriver.exe

AESWDriver.exe is found in the **PayLink** directory. When the application is run, the following screen will be shown.

You can output to a log file by adding a parameter to AESWDriver start line. This will generate a time stamped log that will show driver and PayLink events. There will be no GUI when this is performed.



```
Opening Genoa USB unit...
OK,        ID: 0x0403 0xde50
 Description: Genoa USB Hub
Manufacturer: Aardvark (AE)
Memory Reset
Memory Reset
USB unit re-started
sec
USB: PC Link up
USB unit re-started
DP: Interface memory set up
Exec: Task DP App. took 74 msec
```

The contents of this screen should be similar to the one shown above. The status LED on **PayLink** will now **Flash GREEN** to indicate that the driver is working correctly.

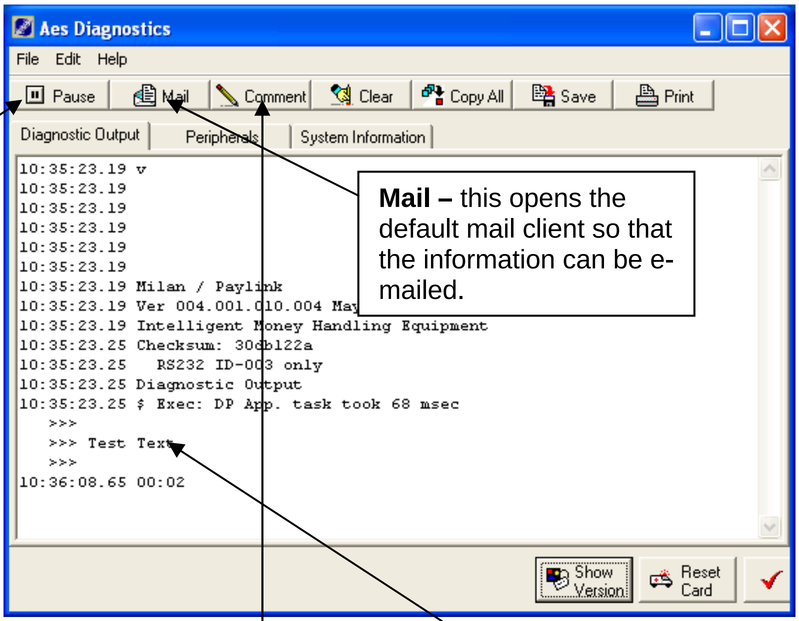
Refer to Table 3: Status LED table for information.

This driver **MUST** be run before running the demo software.

7.2 MilanDiag.exe

This is a Diagnostics program, which shows various information about **PayLink**, such as the peripherals, which are connected and the version number of PayLink firmware. Diag.exe is found in the following directory: **PayLink\SDK\** When the application is run, the following screen will be shown:

Pause – This pauses the application.



```
10:35:23.19 v
10:35:23.19
10:35:23.19
10:35:23.19
10:35:23.19
10:35:23.19
10:35:23.19 Milan / Paylink
10:35:23.19 Ver 004.001.010.004 May
10:35:23.19 Intelligent Money Handling Equipment
10:35:23.25 Checksum: 30db122a
10:35:23.25   RS232 ID-003 only
10:35:23.25 Diagnostic Output
10:35:23.25 $ Exec: DP App. task took 68 msec
   >>>
   >>> Test Text
   >>>
10:36:08.65 00:02
```

Mail – this opens the default mail client so that the information can be e-mailed.

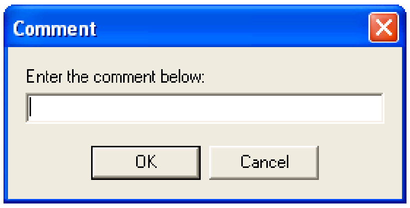
Clear – clears the screen.

Copy all – this copies the shown text to clipboard.

Save – This saves the text in a log file.

Print – This prints the current text.

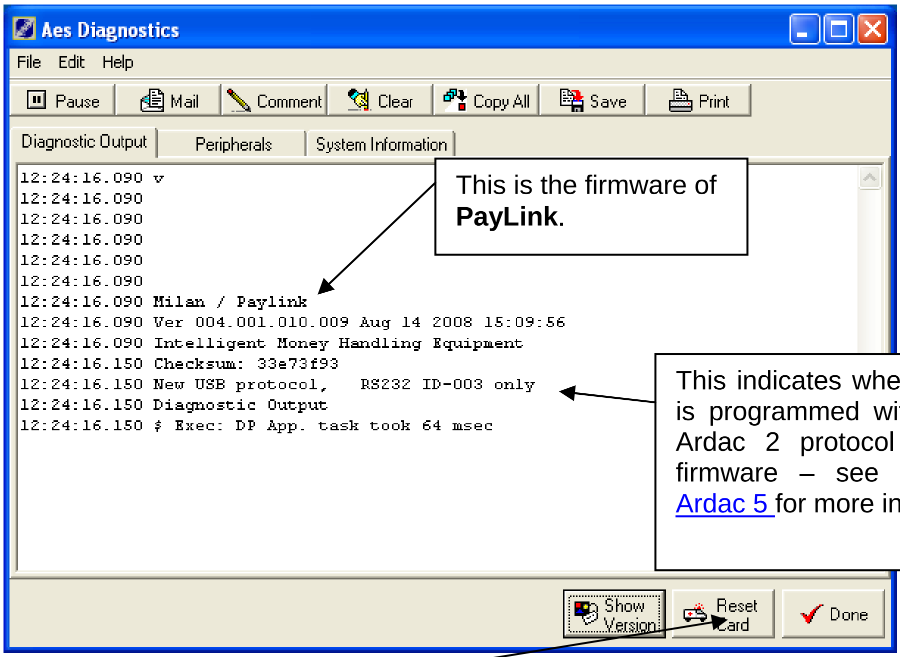
Clicking the **Comment** button, allows a comment to be added, the following screen will appear.



Enter the comment below:

A comment will then appear in the diagnostics window.

Clicking on the **Show Version** button will show the following screen.

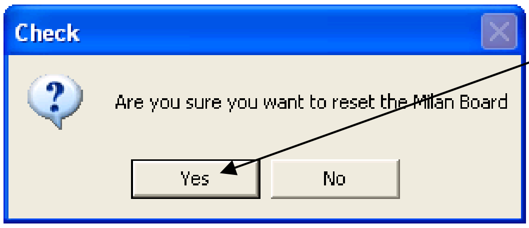

Aes Diagnostics
File Edit Help
Pause Mail Comment Clear Copy All Save Print
Diagnostic Output Peripherals System Information
Show Version Reset Card Done

```
12:24:16.090 v
12:24:16.090
12:24:16.090
12:24:16.090
12:24:16.090
12:24:16.090
12:24:16.090 Milan / Paylink
12:24:16.090 Ver 004.001.010.009 Aug 14 2008 15:09:56
12:24:16.090 Intelligent Money Handling Equipment
12:24:16.150 Checksum: 33e73f93
12:24:16.150 New USB protocol,   RS232 ID-003 only
12:24:16.150 Diagnostic Output
12:24:16.150 $ Exec: DP App. task took 64 msec
```

This is the firmware of **PayLink**.

This indicates whether Paylink is programmed with ID003 or Ardac 2 protocol compatible firmware – see section 6.8 Ardac 5 for more info.

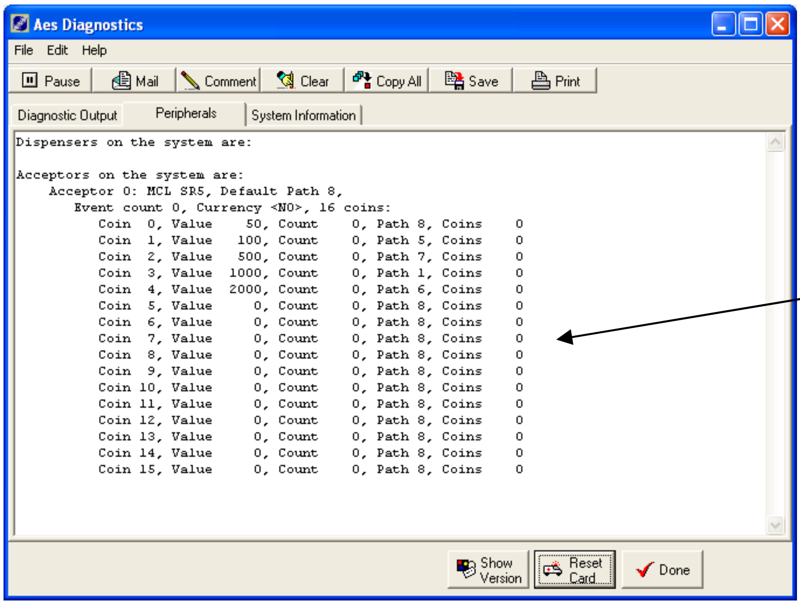
Click on the **Reset Card** button will show the following screen.



Are you sure you want to reset the Milan Board

Choose **Yes** to reset **PayLink**.

Click on the **Peripherals** tab to see which peripherals are connected.

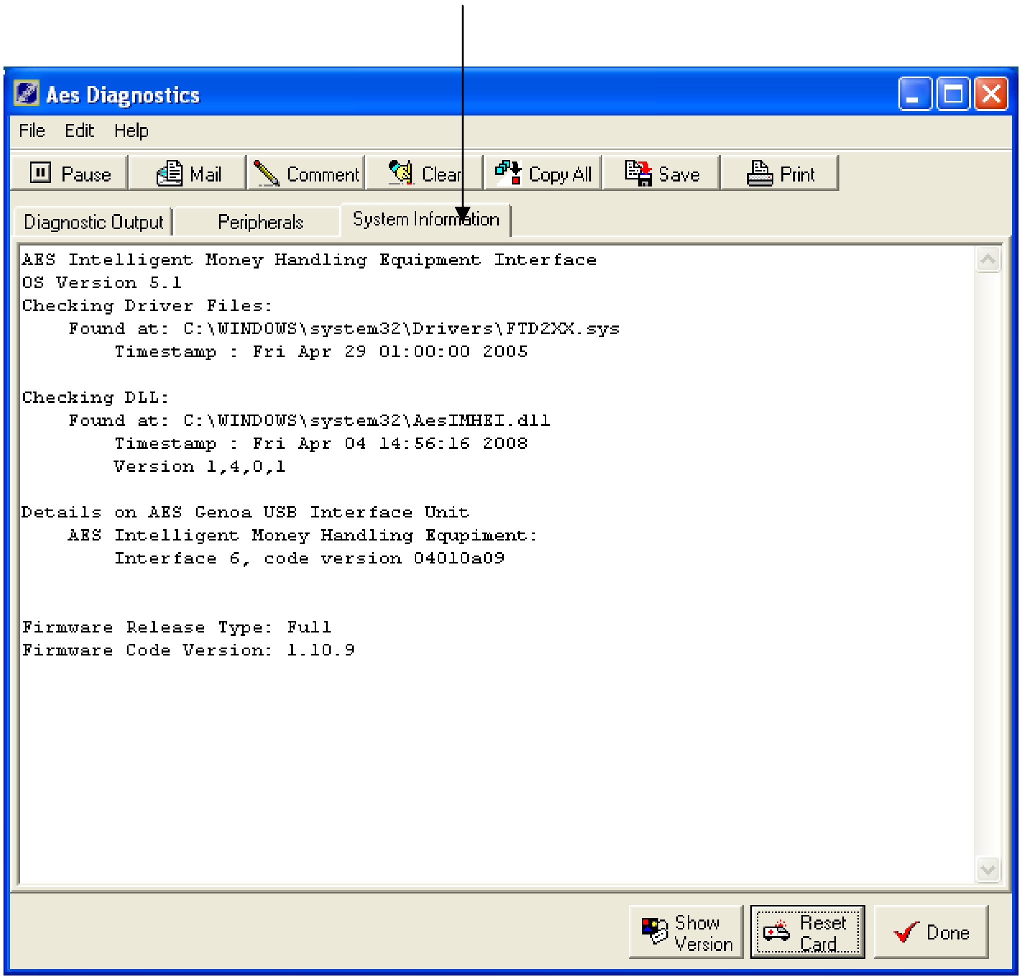

Aes Diagnostics
File Edit Help
Pause Mail Comment Clear Copy All Save Print
Diagnostic Output Peripherals System Information
Show Version Reset Card Done

```
Dispensers on the system are:

Acceptors on the system are:
    Acceptor 0: MCL SR5, Default Path 8,
       Event count 0, Currency <NO>, 16 coins:
          Coin  0, Value    50, Count    0, Path 8, Coins    0
          Coin  1, Value   100, Count    0, Path 5, Coins    0
          Coin  2, Value   500, Count    0, Path 7, Coins    0
          Coin  3, Value  1000, Count    0, Path 1, Coins    0
          Coin  4, Value  2000, Count    0, Path 6, Coins    0
          Coin  5, Value     0, Count    0, Path 8, Coins    0
          Coin  6, Value     0, Count    0, Path 8, Coins    0
          Coin  7, Value     0, Count    0, Path 8, Coins    0
          Coin  8, Value     0, Count    0, Path 8, Coins    0
          Coin  9, Value     0, Count    0, Path 8, Coins    0
          Coin 10, Value     0, Count    0, Path 8, Coins    0
          Coin 11, Value     0, Count    0, Path 8, Coins    0
          Coin 12, Value     0, Count    0, Path 8, Coins    0
          Coin 13, Value     0, Count    0, Path 8, Coins    0
          Coin 14, Value     0, Count    0, Path 8, Coins    0
          Coin 15, Value     0, Count    0, Path 8, Coins    0
```

This example shows an SR5 coin acceptor, and information about the coin paths and values etc.

Click on the **System Information** tab to display various system information about **PayLink**.



```
AES Intelligent Money Handling Equipment Interface
OS Version 5.1
Checking Driver Files:
    Found at: C:\WINDOWS\system32\Drivers\FTD2XX.sys
        Timestamp : Fri Apr 29 01:00:00 2005

Checking DLL:
    Found at: C:\WINDOWS\system32\AesIMHEI.dll
        Timestamp : Fri Apr 04 14:56:16 2008
        Version 1,4,0,1

Details on AES Genoa USB Interface Unit
    AES Intelligent Money Handling Equipment:
        Interface 6, code version 04010a09


Firmware Release Type: Full
Firmware Code Version: 1.10.9
```

Click **Done** to close the Diagnostics application.

7.3 Demo.exe

This is an API example, which also doubles up as a quick and easy way to test/demo **PayLink** before the software writing can begin. The application is called Demo.exe and is in the following location: **PayLink\SDK\**

Click **Acceptors** to show the current connected Coin/Note acceptors

Click **Dispensers** to show the current connected Hoppers

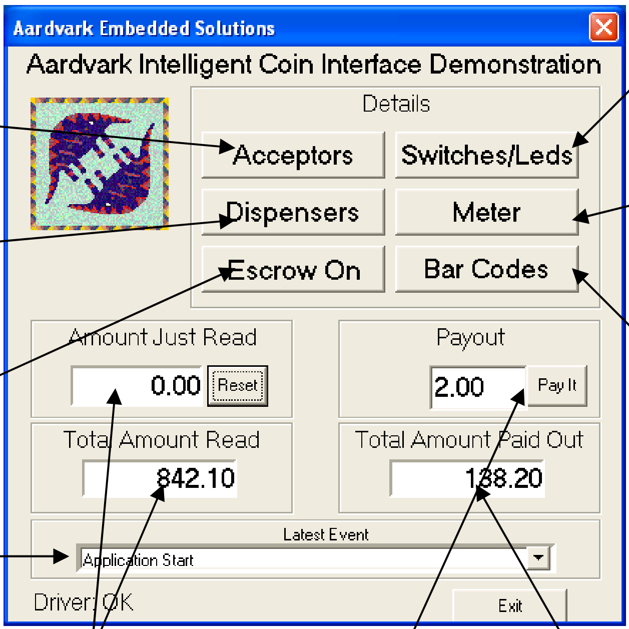
Click **Escrow** for the Escrow control

The **Latest Event** notifies the application of events that are not to do with money. Faults, misreads etc.

Click **Switches/LEDs** to control the Inputs/outputs

Click **Meter** to show the current connected Serial Meter

Click **Barcodes** to control the barcode features (Ardac 5/Serial ticket printer)



Amount Just Read	0.00
Payout	2.00
Total Amount Read	842.10
Total Amount Paid Out	138.20
Latest Event	Application Start
Driver:	OK

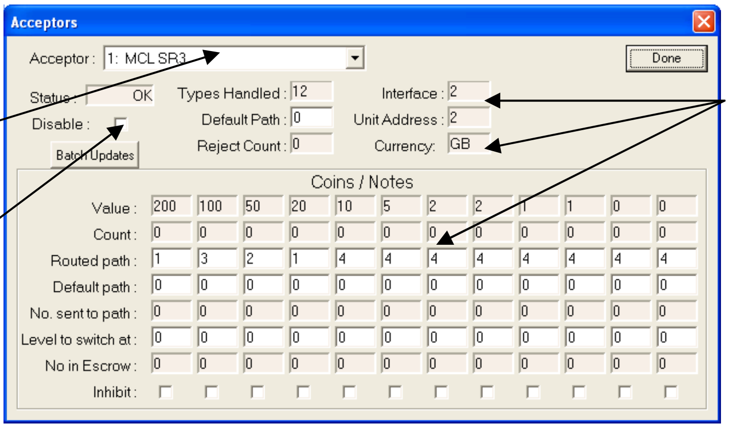
Coins and notes entered into the peripherals will be displayed in the **Amount Just Read** box. The **Total Amount Read** box is the amount read over the lifetime of the PayLink

The **Payout** box shows the value to be paid out. Click the **Pay It** button to pay out the desired value. **Paylink** will decide how to pay out the value depending on which value hoppers are connected. The **Total Amount Paid Out** shows the amount paid over the lifetime of the PayLink

This drop down menu shows the acceptors connected

Click **Disable** to disable the acceptor selected

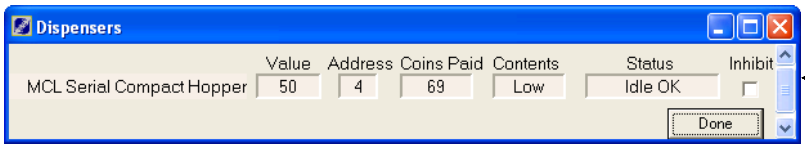
Various information about the selected acceptor such as currency, coins programmed etc



Acceptor :	1: MCL SR3
Status :	OK
Disable :	☐
Types Handled :	12
Default Path :	0
Reject Count :	0
Interface :	2
Unit Address :	2
Currency:	GB

Value :	200	100	50	20	10	5	2	2	1	1	0	0
Count :	0	0	0	0	0	0	0	0	0	0	0	0
Routed path :	1	3	2	1	4	4	4	4	4	4	4	4
Default path :	0	0	0	0	0	0	0	0	0	0	0	0
No. sent to path :	0	0	0	0	0	0	0	0	0	0	0	0
Level to switch at :	0	0	0	0	0	0	0	0	0	0	0	0
No in Escrow :	0	0	0	0	0	0	0	0	0	0	0	0
Inhibit :	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

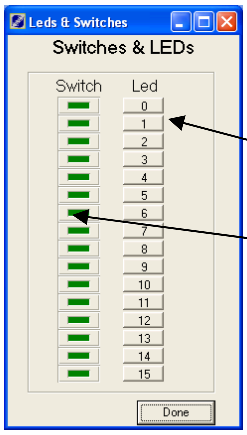
Click **Done** to return to the front screen.



Dispensers

	Value	Address	Coins Paid	Contents	Status	Inhibit
MCL Serial Compact Hopper	50	4	69	Low	Idle OK	☐

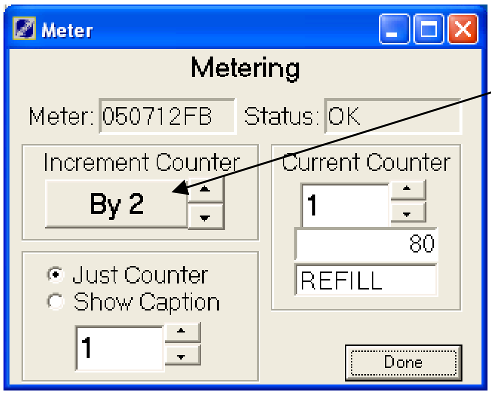
Click on the **Dispensers** button and this screen will be shown. Various information about the connected **Dispensers** is shown.



Click on the Switches/LEDs button to see the following screen.

Click on the Led buttons to drive the LED output.

The switch box will light when the switch inputs are activated.



Meter

Metering

Meter: 050712FB Status: OK

Increment Counter: By 2

Current Counter: 1

80

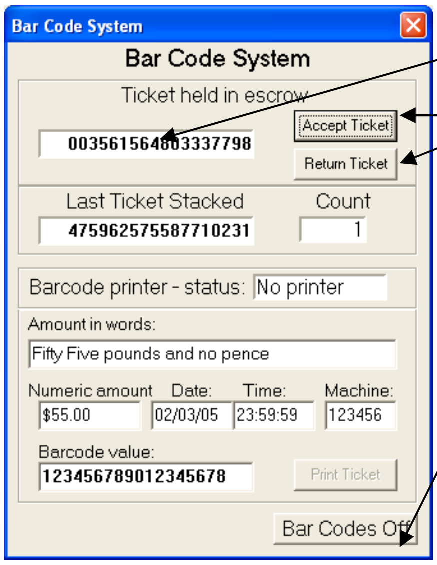
REFILL

(● Just Counter) ○ Show Caption

1

Click on the **Meter** button to show this screen. The counter can be incremented using the **Increment Counter** button.

Click on the **Barcodes** button to show the following screen.



Bar Code System

Bar Code System

Ticket held in escrow

0035615648803337798

Last Ticket Stacked: 4759625755877710231 Count: 1

Barcode printer - status: No printer

Amount in words: Fifty Five pounds and no pence

Numeric amount: $55.00 Date: 02/03/05 Time: 23:59:59 Machine: 123456

Barcode value: 123456789012345678

When a barcode is inserted, the number will be shown here. Click **Accept ticket** or **Return ticket** to proceed.

The barcodes screen can be exited using the **Bar Codes Off** button

7.4 Upgrading PayLink firmware

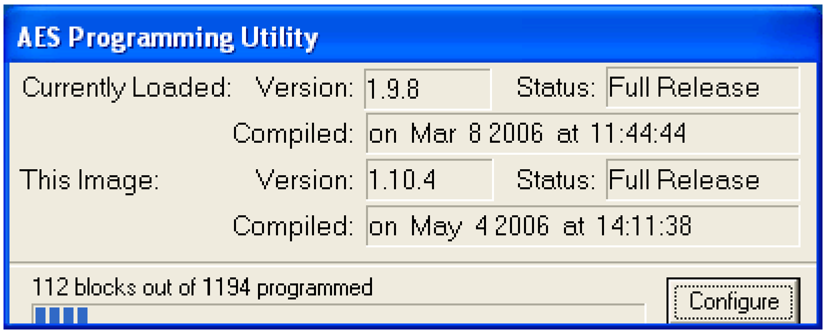
PayLink has an on board flash device, which can be reprogrammed using a small application through the USB link. The application is found in the following directory **PayLink\PayLink Firmware**

The following parameters can be added to the file name to provide enhanced functionality.

/Force - will automatically re-program the PayLink even if the images match.

/Check - will cause the loader to exit without showing a window if the PayLink firmware matches, and has no errors.

/Nogui - will never display anything on the screen and will report progress to stdout or a console window if either is available.

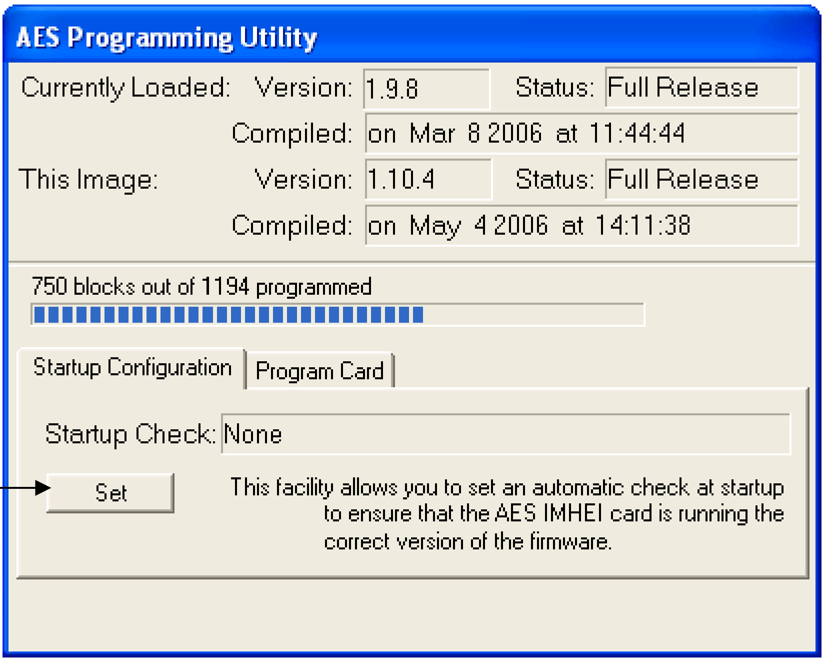

AES Programming Utility

Currently Loaded: Version: 1.9.8 Status: Full Release
Compiled: on Mar 8 2006 at 11:44:44
This Image: Version: 1.10.4 Status: Full Release
Compiled: on May 4 2006 at 14:11:38

112 blocks out of 1194 programmed

Once complete, the **AES Programming Utility** will self terminate.

While running a "Configure" button is accessible. This can be used to access advanced features.


AES Programming Utility

Currently Loaded: Version: 1.9.8 Status: Full Release
Compiled: on Mar 8 2006 at 11:44:44
This Image: Version: 1.10.4 Status: Full Release
Compiled: on May 4 2006 at 14:11:38

750 blocks out of 1194 programmed

Startup Check: None

This facility allows you to set an automatic check at startup to ensure that the AES IMHEI card is running the correct version of the firmware.

"Startup Configuration" provides the ability to "Set" and "Clear" an entry in the Windows registry that will silently run this copy of the programming utility at system Startup.

8. User Manual Revision History

Version	Date	Author	Description
0.0 - Draft	5th Feb 03	D. Bush A. Graham	Initial description document.
0.1 - Draft	16th Feb 03	D. Bush	Detail corrections (Bug Fixes)
0.2 - Draft	28th Feb 03	D. Bush	Changes to Coin Path handling
0.3 - Draft	10th Apr 03	D. Bush	Minor change to SystemStatus
0.4 - Draft	30th Apr 03	D Bush	Further Changes to Coin Path Handling
1.0	14th Oct 03	D Bush	Addition of Meters Various clarifications
1.1	24th Nov 03	D Bush	New Meter Functions Changes to details on dispensers
1.2	3rd Dec 03	D Bush	New E2Prom Functions
1.3	2nd Apr 04	D. Bush	Various Bug Fixes - new constants
1.4	9th Aug 05	D Bush.	Sections added on: • Escrow functions. • Event Queue • Barcode functions
1.5	8th Mar 06	D Bush	Document structure revised Added a number of Usage Details sections 1.10.x Functions detailed
1.6	13th Nov 06	A Tainsh	Rewritten the Coin Routing description
1.7	11th Sep 07	D Bush	Added description of multiple unit support.

9. Introduction

9.1 Purpose of Document

This document describes the software interface to the AES Intelligent Money Handling Equipment Interface (IMHEI) as seen by a software engineer writing in either the C or C++ programming languages on the PC.

9.2 Intended Audience

The intended audience of this document is the software engineers who will be writing software on the PC that will communicate with the IMHEI card itself or will read the monetary information or diagnostic information provided by the card.

9.3 Document Layout

The document itself is split into a number of sections. Within each section, there are three sections.

- **Operational Overview.**
  Where the way in which this area is intended to work is explained.
- **Function Definitions.**
  Where you will find exact details on each function call.
- **Usage Details.**
  This gives details on exactly how the IMHEI system operates.

The first two sections are intended to reflect different levels of complexity at which an initial game programmer may wish to use the interface.

1. Getting Started

   These are the minimum set of "vanilla" functions that may be used to get a working *demonstration* program running.

   Using these calls alone; the software engineer can write a working program and get a feel for the ease with which he can now communicate with the Money Handling Equipment attached to his game.

2. Full Game System

   These build on the set of functions provided within the "Getting Started" section. They add functionality that can determine the *status* of the peripherals attached to the interface card.

   By these status analysis functions, the game programmer could determine (say) the exact reason that an attempted payout failed and then notify either and engineer or a cash collector.

3. Utility Functions

These miscellaneous functions are concerned with the administration of the game system.

4. Note Reader Escrow

   Here you will find functions that enable the escrow feature provided by note acceptors to be easily used.

5. Meters / Counters

   This section is concerned with the support of the SEC meter, a small external unit that allow audit numbers to be maintained

6. E2Prom

   The IMHEI units incorporate E^2Prom storage for internal configuration storage. Some of this is made available to the PC programmer.

7. Barcode Reading

   Here you will find functions that enable the barcoded ticket features provided by some note acceptors to be easily used.

8. Barcode Printing

   These functions are used by the IMHEI units to support a “Ticket Printer” which will produce barcoded tickets.

9. Engineering Support

   These functions provide full-blown diagnostics and reconfiguration facilities.

10. Getting Started

10.1 Installation

The Genoa / PayLink unit is a standard USB 1.1 peripheral. Installation of the OS driver is as with any USB peripheral, when the unit is detected the user is prompted to insert the installation CD. This CD will install the low level drivers, which may be removed using the standard “Add or Remove Programs” facility for the “AES Genoa USB Drivers” entry.

In addition, two other steps need to be undertaken, at present manually:

- The interface AESIMHEI.DLL needs to be copied from the installation CD to Windows\System32
- The High Level driver program needs to be copied from the installation CD to a convenient folder, and an entry made in the Startup folder to run this at system boot.

The IMHEI card is a standard PCI interface card which has the normal Windows Plug ’n’ Play automatic installation facilities.

When an interface card is detected in a PC the user is prompted to insert the installation CD. This CD will configure the system to use the card and copy into the system directories the two elements of the interface:

- The device driver: AESIMHEI.SYS
- The interface: AESIMHEI.DLL.

These provide all the software necessary to allow the user’s program to access the money handling equipment.

10.2 Operation

The Milan unit contains an embedded processor that is responsible for all communication with the peripherals.

It handles the *event* based protocols, and uses the results to update a set of *state* tables.

The underlying concept behind the state tables is that the all activity causes counters to be incremented. The application programmer reads out the totals at the time the application starts, and then compares these with the current totals. Peripheral activity will cause these totals to increment, subtracting the old, saved value from the current value enables the application to determine the value inserted by the customer.

Using state tables on the PC in this way allows the programmer to be unconcerned with hardware response times. Although the *state* tables have to be periodically examined to see if anything has changed, there is never any requirement that this is done quickly, and the programmer does not have to be concerned that the OS may suspend his program for significant periods. Regardless of how long the program spends between examinations, the system will function perfectly and no money insertion or payout will be missed.

The following function calls are provided to implement a minimum system. Using the functions described within this section, one can provide a fully working system, with credit and payout capability, as well as a number of indicators and switches.

10.3 OpenMHE

10.31,1 Synopsis

This call is made by the PC application software to open the “Money Handling Equipment” Interface.

```
long OpenMHE (void);
```

10.31,2 Parameters

None

10.31,3 Return Value

If the Open call succeeds then the value zero is returned.

In the event of a failure one of the following standard windows error codes will be returned, either as a direct echo of a Windows API call failure, or to indicate internally detected failures that closely correspond to the quoted meanings.

Error Number	Suggested string for English decoding	Microsoft Mnemonic	Retry
13	The DLL, application or device are at incompatible revision levels.	ERROR_INVALID_DATA	No
20	The system cannot find the device specified.	ERROR_BAD_UNIT	No
21	The device is not ready.	ERROR_NOT_READY	Yes
31	Driver program not running. ***or*** No PCI card in system.	ERROR_GEN_FAILURE	Yes
170	The USB link is in use.	ERROR_BUSY	Yes
1167	The device is not connected.	ERROR_DEVICE_NOT_CONNECTED	Yes

10.31,4 Remarks

1. With a USB system, there is a noticeable time for the USB communications to start. This may cause error returns labelled “Yes” under Retry in the above table. This indicates that the call to **OpenMHE** should be retried periodically until it has failed for at least 5 consecutive seconds before deciding that the interface is actually inoperative.

2. Whereas an Open service normally requires a description of the item to be opened (and returns a reference to that Item) there is only one IMHE Interface unit in a system. Hence any “Open” call must refer to that single item.

3. Even following this call, all the money handling equipment will be *disabled* and rejecting all currency inserted until the successful execution of a call to **EnableInterface**.

10.4 OpenSpecificMHE

10.41,1 Synopsis

This call is made by the PC application software to open or to switch to one of the multiple “Money Handling Equipment” Interfaces installed on the PC.
Details on how a system works with multiple PayLinks are given in a later section.

```
long OpenSpecificMHE (char SerialNo[8]);
```

10.41,2 Parameters

None

10.41,3 Return Value

If the Open call succeeds then the value zero is returned.
In the event of a failure the same standard windows error codes are returned as for **OpenMHE.**

10.41,4 Remarks

1. Every PayLink requires a unique instance of the USB driver program to be running. If there is no driver for the PayLink whose Serial Number is quoted, then the function returns 31 (ERROR_GEN_FAILURE).

2. As the default serial number for PayLink unit is “AE000001”, the **OpenMHE** call is equivalent to the call **OpenSpecficMHE("AE000001")**

3. This call may be issued repeatedly with no ill effects. Each call will serve to swap all the other calls in this document to the specified unit.

10.5 EnableInterface

10.51,1 Synopsis

The **EnableInterface** call is used to allow “turn on” the IMHE. This would be called when a game is initialised and ready. Until this call is made, no acceptors will accept credit.

```
void EnableInterface (void) ;
```

10.51,2 Parameters

None

10.51,3 Return Value

None

10.51,4 Remarks

1. Normally the application will initialise the saved values of all the information it is monitoring before this call.
2. This must be called following the call to **OpenMHE** before any coins / notes will be registered.

10.6 DisableInterface

10.61,1 Synopsis

The **DisableInterface** call is used to prevent users from entering any more coins or notes.

```
void DisableInterface (void) ;
```

10.61,2 Parameters

None

10.61,3 Return Value

None

10.61,4 Remarks

1. There is no guarantee that a coin or note can not be successfully read after this call has been made, a successful read may be in progress.

10.7 CurrentValue

10.71,1 Synopsis

Determine the current monetary value that has been accepted

The **CurrentValue** call is used to determine the total value of all coins and notes read by the money handling equipment connected to the interface.

```
long CurrentValue (void) ;
```

10.71,2 Parameters

None

10.71,3 Return Value

The current value, in the lowest denomination of the currency (i.e. cents / pence etc.) of all coins and notes read.

10.71,4 Remarks

1. The value returned by this call is never reset, but increments for the life of the interface card. Since this is a long (32 bit) integer, the card can accept £21,474,836.47 of credit before it runs into any rollover problems. This value is expected to exceed the life of the game.

2. It is the responsibility of the application to keep track of value that has been used up and to monitor for new coin / note insertions by increases in the returned value.

3. Note that this value should be read following the call to **OpenMHE** and before the call to **EnableInterface** to establish a starting point before any coins or notes are read.

10.8 PayOut

10.81,1 Synopsis

The **PayOut** call is used by the PC application to instruct the interface to pay out coins (or notes).

```
void PayOut (long Value) ;
```

10.81,2 Parameters

Value

This is the value, in the lowest denomination of the currency (i.e. cents / pence etc.) of the coins and notes to be paid out.

10.81,3 Return Value

None

10.81,4 Remarks

1. This function operates in value, not coins. It is the responsibility of the interface to decode this and to choose how many coins (or notes) to pay out, and from which device to pay them.

10.9 PayStatus

10.91,1 Synopsis

The PayStatus call provides the current status of the payout process.

```
long LastPayStatus (void) ;
```

10.91,2 Parameters

None

10.91,3 Return Values.

Value	Meaning	Mnemonic
0	The interface is in the process of paying out	PAY_ONGOING
1	The payout process is up to date	PAY_FINISHED
-1	The dispenser is empty	PAY_EMPTY
-2	The dispenser is jammed	PAY_JAMMED
-3	Dispenser non functional	PAY_US
-4	Dispenser shut down due to fraud attempt	PAY_FRAUD
-5	The dispenser is blocked	PAY_FAILED_BLOCKED
-6	No Dispenser matches amount to be paid	PAY_NO_HOPPER
-7	The dispenser is inhibited	PAY_INHIBITED
-8	The internal self checks failed	PAY_SECURITY_FAIL

10.91,4 Remarks

1. Following a call to **PayOut**, the programmer should poll this to check the progress of the operation.
2. If one out of multiple hoppers has a problem, the PCI card will do the best it can. If it can not pay out the entire amount, the status will reflect the last attempt.

10.10 CurrentPaid

10.101,1 Synopsis

The CurrentPaid call is available to keep track of the total money paid out because of calls to the PayOut function.

```
long CurrentPaid (void) ;
```

10.101,2 Parameters

None

10.101,3 Return Value

The current value, in the lowest denomination of the currency (i.e. cents / pence etc.) of all coins and notes ever paid out.

10.101,4 Remarks

1. This value that is returned by this function is updated in real time, as the money handling equipment succeeds in dispensing coins.

2. The value that is returned by this call is never reset, but increments for the life of the interface card. It is the responsibility of the application to keep track of starting values and to monitor for new coin / note successful payments by increases in the returned value.

3. Note that this value can be read following the call to **OpenMHE** and before the call to **EnableInterface** to establish a starting point before any coins or notes are paid out.

10.11 IndicatorOn / IndicatorOff

10.111,1 Synopsis

The IndicatorOn / IndicatorOff calls are used by the PC application to control LED's and indicator lamps connected to the interface.

```
void IndicatorOn  (long IndicatorNumber) ;
void IndicatorOff (long IndicatorNumber) ;
```

10.111,2 Parameters

IndicatorNumber

This is the number of the Lamp that is being controlled.

Return Value

None

10.111,3 Remarks

1. Although the interface is described in terms of lamps, any equipment at all may in fact be controlled by these calls, depending only on what is physically connected to the interface card.

10.12 SwitchOpens / SwitchCloses

10.121,1 Synopsis

The calls to **SwitchOpens** and **SwitchCloses** are made by the PC application to read the state of switches connected to the interface card.

```
long SwitchOpens  (long SwitchNumber) ;
long SwitchCloses (long SwitchNumber) ;
```

10.121,2 Parameters

SwitchNumber

This is the number of the switch that is being controlled. In principle the API can support 64 switches, though note that not all of these may be support by any particular hardware unit.

10.121,3 Return Value

The number of times that the specified switch has been observed to open or to close, respectively.

10.121,4 Remarks

1. The convention is that at initialisation time all switches are open, a switch that starts off closed will therefore return a value of 1 to a SwitchCloses call immediately following the OpenMHE call.

2. The expression (SwitchCloses(n) == SwitchOpens(n)) will always return 0 if the switch is currently closed and 1 if the switch is currently open.

3. Repeat pressing / tapping of a switch by a user will be detected by an increment in the value returned by SwitchCloses or SwtichOpens.

4. The user only needs to monitor changes in one of the two functions (in the same way as most windowing interfaces only need to provide functions for button up or button down events)

5. The inputs are debounced. The unit reads all 16 inputs every 2 milliseconds. If we detect a change, we then require the next two reads to give exactly the same pattern before reporting the change. This means that a simple "electronic" input change will be reported between 4 and 6 milliseconds of it occurring.

10.13 Getting Started Code Examples

The following code fragments are intended to provide clear examples of how the calls to the IMHEI are designed to be used:

Each function will provide the central processing for a small command line demonstration program.

10.131 CURRENCY ACCEPT

```
void AcceptCurrencyExample(int NoOfChanges)
    {
    long LastCurrencyValue ;
    long NewCurrencyValue  ;

    long OpenStatus = OpenMHE() ;

    if (OpenStatus != 0)
        {
        printf("IMHEI open failed - %ld\n", OpenStatus) ;
        }
    else
        {
        // Then the open call was successful
        // Currency acceptance is currently disabled
        LastCurrencyValue = CurrentValue() ;

        printf("Initial currency accepted = %ld pence\n",
                                            LastCurrencyValue) ;
        EnableInterface() ;

        printf("Processing %d change events\n", NoOfChanges) ;
        while (NoOfChanges > 0)
            {
            Sleep(100) ;

            NewCurrencyValue = CurrentValue() ;
            if (NewCurrencyValue != LastCurrencyValue)
                {
                // More money has arrived (we do not care where from)
                printf("The user has just inserted %ld pence\n",
                            NewCurrencyValue - LastCurrencyValue) ;
                LastCurrencyValue = NewCurrencyValue ;
                --NoOfChanges ;
                }
            }
        }
    }
```

10.132 CURRENCY PAYOUT

```
void PayCoins(int NoOfCoins)
    {
    long OpenStatus = OpenMHE() ;

    if (OpenStatus != 0)
        {
        printf("IMHEI open failed - %ld\n", OpenStatus) ;
        }
    else
        {
        // Then the open call was successful
        // The interface is currently disabled
        EnableInterface() ;

        PayOut(NoOfCoins * 100) ;
        while (LastPayStatus() == 0)
           {}
        if (LastPayStatus() < 0)
           {
           printf("Error %d when paying %d coins\n",
                                        LastPayStatus(), NoOfCoins) ;
           }
        else
           {
           printf("%d coins paid out\n", NoOfCoins) ;
           }
        }
    }
```

10.133 INDICATOR EXAMPLE

```
void LEDs(void)
   {
   long OpenStatus = OpenMHE() ;
   char Loop ;

   if (!OpenStatus)
      {
      EnableInterface() ;

      for (Loop = 0 ; Loop < 8 ; ++Loop)
         {
         IndicatorOn(Loop) ;
         Sleep(1000) ;
         }

      for (Loop = 0 ; Loop < 8 ; ++Loop)
         {
         IndicatorOff(Loop) ;
         Sleep(1000) ;
         }

      DisableInterface() ;
      }
   }
```

10.134 SWITCH EXAMPLE

```
void LEDs(void)
   {
   long OpenStatus = OpenMHE() ;
   char Loop ;

   if (!OpenStatus)
      {
      EnableInterface() ;

      for (Loop = 0 ; Loop < 8 ; ++Loop)
         {
         printf(“Switch %d is currently %s\n”, Loop,
                  SwitchCloses(Loop) == SwitchOpens(Loop) ?
                  “Open” : “Closed”) ;

         printf(“It has closed %d times!\n”, SwitchCloses(Loop)) ;
         }

      DisableInterface() ;
      }
   }
```

11. Full Game System

11.1 Background

When implementing a full game implementation, tighter control over the behaviour and response of the individual acceptors and hoppers is frequently necessary, for such purposes as routing coins to hoppers and cashboxes and emptying hoppers. Some more details on these operations are given at the end of this section.

The data retrieval functionality is achieved by reading the control blocks for the acceptors (with **ReadAcceptorDetails**) and possibly hoppers (with **ReadDispenserDetails**) at initialisation time and then continually checking the current contents of these against saved copies. To aid in this process the **CurrentUpdates** function guarantees that; if it returns an unchanged value then none of the control blocks will have changed.

Most of the control functionality is achieved by reading a data structure from the API, modifying it as appropriate or necessary and writing it back. Four functions are involved**: ReadAcceptorDetails, ReadDispenserDetails, WriteAcceptorDetails & WriteDispenserDetails**.

All these functions identify the individual units by a serial number, in the range 0…N-1. The programmer should not assume that any particular unit is present at any particular number, the numbers are assigned dynamically and are liable to change from run to run.

To find the particular unit of interest, the programmer should scan number from 0 up, looking for a match on the structure members.

For an acceptor, this will usually involve the **`Unit`** field. Although this is defined as single 32 bit number, it is created by concatenating four 8 bit values. The program will usually only be interested in distinguishing the coin and note acceptors, which are distinguished by values in the top 8 bits. For this purpose two 'C' macros are defined, **IS_COIN_ACCEPTOR**(**`Unit`**) and **IS_NOTE_ACCEPTOR**(**`Unit`**), see below, which can easily be translated into other languages.

For a dispenser, this will normally involve the **`Value`** as that shows the coin value assumed by Milan interface, which is the most important distinguishing feature of a dispenser.

11.2 'C' Program Structures and Constants

This is currently an extract of the 'C' header file, the comments should serve to define the various fields, we hope to enhance the format of this section of the document in the near future.

For people unfamiliar with 'C', a data item prefixed with **long** is a 32 bit integer, a data item prefixed with **char** is an 8 bit integer.

11.21 ACCEPTORBLOCK

11.21,1 Constants for AcceptorBlock

```
enum AcceptorConstants
    {
    ACCEPTOR_DEAD      = 0x00000001,    /* No response to communications for this device */
    ACCEPTOR_DISABLED  = 0X00000004,    /* Disabled by Interface */
    ACCEPTOR_INHIBIT   = 0X00000008,    /* Specific by Application */
    ACCEPTOR_FRAUD     = 0x00000010,    /* Reported from device */
    ACCEPTOR_BUSY      = 0x00000020,    /* Reported from device */
    ACCEPTOR_FAULT     = 0x00000040,    /* Reported from device */

    MAX_ACCEPTOR_COINS = 256            /* Maximum coins or notes */
                                        /* handled by any device */
    } ;
```

11.21,2 Structures for AcceptorBlocks

```
typedef struct
    {
    long        Value ;               // Value of this coin
    long        Inhibit ;             // Set by PC: this coin is inhibited
    long        Count ;               // Total number read "ever"
    long        Path ;                // Set by PC: this coin's chosen output path
    long        PathCount ;           // Number "ever" sent down the chosen Path
    long        PathSwitchLevel ;     // Set by PC: PathCount level to switch coin to default
                                                   path
    char        DefaultPath ;         // Set by PC: Default path for this specific coin
    char        FutureExpansion ;     // Set by PC: for future use
    char        HeldInEscrow ;        // count of this note / coin in escrow (usually max 1)
    char        FutureExpansion2 ;    // for future use
    char*        CoinName ;              // A string, usually as returned from the acceptor,
                                                   describing this coin
    } AcceptorCoin ;



typedef struct
    {
    long           Unit ;             // Specification of this unit
    long           Status ;           // AcceptorStatuses - zero if device OK
    long           NoOfCoins ;        // The number of different coins handled
    long           InterfaceNumber ;  // The bus / connection
    long           UnitAddress ;      // For addressable units
    long           DefaultPath ;
    long           EventCount ;       // Count of events (e.g. rejects) for this acceptor
    char              Currency[4] ;         // Main currency code reported by an intelligent
                                                   acceptor
    AcceptorCoin   Coin[MAX_ACCEPTOR_COINS] ;  // (only NoOfCoins are set up)
    long           SerialNumber ;     // Reported serial number  (0 if N/A)
    char*           Description ;       // Device specific string for type / revision / coin
                                                   set
    } AcceptorBlock ;
```

11.22 DISPENSERBLOCK

11.22,1 Constants for DispenserBlock

```
enum DispenserConstants
    {
    MAX_DISPENSERS         = 16           // Maximum handled

                // Coin Count Status Values
    DISPENSER_COIN_NONE     = 0,          // No dispenser coin reporting
    DISPENSER_COIN_LOW      = 1,          // Less than the low sensor level
    DISPENSER_COIN_MID      = 2,          // Above low sensor but below high
    DISPENSER_COIN_HIGH     = 3,          // High sensor level reported

    DISPENSER_ACCURATE      = -1,         // Coin Count reported by Dispenser
    DISPENSER_ACCURATE_FULL = -2,         // The Dispenser is full

    DISPENSER_REASSIGN_VALUE     =  100,        //  The  Value  has  just  been  updated  by  the
                                                    application
    DISPENSER_VALUE_REASSIGNED = 101       // The updated Value has just been accepted by the
                                                    IMHEI
    } ;
```

11.22,2 Structure for DispenserBlock

```
typedef struct
    {
    long        Unit ;                   // Specification of this unit
    long        Status ;                 // Individual Dispenser status
                                         // This takes the same values as PayStatus()
    long        InterfaceNumber ;        // The bus / connection
    long        UnitAddress ;            // For addressable units
    long        Value ;                  // The value of the coins in this dispensor
    long        Count ;                  // Number dispensed according to the hopper records
    long        Inhibit ;                // Set to 1 to inhibit Dispenser
    long        Currency ;               // The currency code reported by
                                         // an intelligent dispenser
    long        CoinCount ;              // The number of coins in the dispenser
    long        CoinCountStatus ;        // Flags Relating to Coin Count (See above)
    long        SerialNumber ;           // Reported serial number (0 if N/A)
    char*       Description ;            // Device specific string for type / revision
    } DispenserBlock ;
```

11.23 DEVICE IDENTITY CONSTANTS

These constants are ORed together to form the coded device identity that can be extracted from the interface.

11.23,1 Example

As an example, a Money Controls Serial Compact Hopper 2 will have the following device code DP_MCL_SCH2, made up from:

• A device specifc code	ORed with
• DP_COIN_PAYOUT_DEVICE	ORed with
• DP_CCTALK_INTERFACE	ORed with
• DP_MANU_MONEY_CONTROLS	

This is a device code of **0x01020101**

```
enum GenericDevices
    {
    DP_GENERIC_MASK               =  0xff000000,

    DP_COIN_ACCEPT_DEVICE         =  0x02000000,
    DP_NOTE_ACCEPT_DEVICE         =  0x12000000,
    DP_CARD_ACCEPT_DEVICE         =  0x22000000,

    DP_COIN_PAYOUT_DEVICE         =  0x01000000,
    DP_NOTE_PAYOUT_DEVICE         =  0x11000000,
    DP_CARD_PAYOUT_DEVICE         =  0x21000000
    } ;

#define IS_ACCEPTOR(code)       (code & 0x02000000)
#define IS_COIN_ACCEPTOR(code)  ((code & DP_GENERIC_MASK) == DP_COIN_ACCEPT_DEVICE)
#define IS_NOTE_ACCEPTOR(code)  ((code & DP_GENERIC_MASK) == DP_NOTE_ACCEPT_DEVICE)
#define IS_PAYOUT(code)         (code & 0x01000000)


enum InterfaceNumbers
    {     // These describe the interface via which this device is connected:
    DP_INTERFACE_MASK             =  0x00ff0000,
    DP_INTERFACE_UNIT             =  0x00000000,
    DP_ONBOARD_PARALLEL_INTERFACE =  0x00010000,
    DP_CCTALK_INTERFACE           =  0x00020000,
    DP_SSP_INTERFACE              =  0x00030000,
    DP_HII_INTERFACE              =  0x00040000,
    DP_ARDAC_INTERFACE            =  0x00050000,
    DP_JCM_INTERFACE              =  0x00060000,
    DP_GPT_INTERFACE              =  0x00070000,
    DP_MDB_INTERFACE              =  0x00080000,
    DP_MDB_LEVEL_3_INTERFACE      =  0x00080000,
    DP_MDB_LEVEL_2_INTERFACE      =  0x00090000,
    // Some Generic Identities
    DP_ID003_NOTE                 =  0 | DP_JCM_INTERFACE
                                       | DP_NOTE_ACCEPT_DEVICE,
    DP_MDB_LEVEL_2                =  0 | DP_MDB_LEVEL_2_INTERFACE
                                       | DP_COIN_ACCEPT_DEVICE,
    DP_MDB_LEVEL_3                =  0 | DP_MDB_LEVEL_3_INTERFACE
                                       | DP_COIN_ACCEPT_DEVICE,
    DP_MDB_LEVEL_2_TUBE           =  0 | DP_MDB_LEVEL_2_INTERFACE
                                       | DP_COIN_PAYOUT_DEVICE,
    DP_MDB_TYPE_3_PAYOUT          =  0 | DP_MDB_LEVEL_3_INTERFACE
                                       | DP_COIN_PAYOUT_DEVICE,
    DP_MDB_BILL                   =  0 | DP_MDB_INTERFACE
                                       | DP_NOTE_ACCEPT_DEVICE,
    DP_CC_GHOST_HOPPER          =  255 | DP_CCTALK_INTERFACE        // Used by Value hopperz
                                       | DP_COIN_PAYOUT_DEVICE,
    } ;
#define GET_INTERFACE(code) ((code >> 16) & 0xff)
```

```
enum ManufacturerIdentities
    {                            // These describe the manufacturer of the device.
    DP_MANUFACTURER_MASK           =  0x0000ff00,
    DP_MANU_UNKNOWN                =  0x00000000,
    DP_MANU_MONEY_CONTROLS         =  0x00000100,
    DP_MANU_INNOVATIVE_TECH        =  0x00000200,
    DP_MANU_MARS_ELECTRONICS       =  0x00000300,
    DP_MANU_AZKOYEN                =  0x00000400,
    DP_MANU_NRI                    =  0x00000500,
    DP_MANU_ICT                    =  0x00000600,
    DP_MANU_JCM                    =  0x00000700,
    DP_MANU_GPT                    =  0x00000800,
    DP_MANU_COINCO                 =  0x00000900,
    DP_MANU_ASAHI_SEIKO            =  0x00000A00,
    DP_MANU_ASTROSYSTEMS           =  0x00000B00,
    } ;


enum ManufacturerSpecificDeviceTypes
    {                            // These device types are manufacturer-dependent,
            //       so that each manufacturer can have up to 255 known devices.
    DP_SPECIFIC_DEVICE_MASK         =  0x000000ff,

                                                     // Money Controls Devices
    DP_MCL_SCH2                    =  1 | DP_MANU_MONEY_CONTROLS
                                        | DP_CCTALK_INTERFACE
                                        | DP_COIN_PAYOUT_DEVICE,
```

Please see the latest AESIMHEI.H file in the SDK for an up to date list of these.

```
                                                    // Asahi Seiko Devices
    DP_AS_WH2                      =  0 | DP_MANU_ASAHI_SEIKO
                                        | DP_CCTALK_INTERFACE
                                        | DP_COIN_PAYOUT_DEVICE,
    } ;
```

11.3 CurrentUpdates (1.10.4)

11.31,1 Synopsis

Detect updates to the data presented to the API by the firmware.

The fact that the value returned by **CurrentUpdates** has changed, prompts the application to re-examine all the variable data in which it is interested.

`long CurrentUpdates (void) ;`

11.31,2 Parameters

None

11.31,3 Return Value

Technically **CurrentUpdates** returns the number of times that the API data has been updated since the PC system initialised. In practice, only *changes* in this value are significant.

11.31,4 Remarks

1. It is possible that the value could change without any visible data changing.
2. *This is only available with the DLL associated with firmware versions 1.10.8 and higher.*

11.4 ReadAcceptorDetails

11.41,1 Synopsis

The ReadAcceptorDetails call provides a snapshot of all the information possessed by the interface on a single unit of money handling equipment.

```
bool ReadAcceptorDetails ( long           Number,
                           AcceptorBlock* Snapshot) ;
```

11.41,2 Parameters

1. Number
   The serial number of the coin or note acceptor about which information is required.
2. Snapshot
   A pointer to a program buffer into which all the information about the specified acceptor will be copied.

11.41,3 Return Value

True if the specified input device exists, False if the end of the list is reached.

11.41,4 Remarks

The serial numbers of the acceptors are contiguous and run from zero upwards.

11.5 WriteAcceptorDetails

11.51,1 Synopsis

The **WriteAcceptorDetails** call updates all the changeable information to the interface for a single unit of money accepting equipment.

```
void WriteAcceptorDetails ( long           Number,
                            AcceptorBlock* Snapshot) ;
```

11.51,2 Parameters

1. Number
   The serial number of the coin or note acceptor being configured.
2. Snapshot
   A pointer to a program buffer containing the configuration data for the specified acceptor. See below for details.

11.51,3 Return Value

None.

11.51,4 Remarks

The serial numbers of the acceptors are contiguous and run from zero upwards.
A call to **ReadAcceptorDetails** followed by call to **WriteAcceptorDetails** for the same data will have no effect on the system.

11.6 ReadDispenserDetails

11.61,1 Synopsis

The **ReadDispenserDetails** call provides a snapshot of all the information possessed by the interface on a single unit of money dispensing equipment.

```
bool ReadDispenserDetails( long            Number,
                           DispenserBlock* Snapshot) ;
```

11.61,2 Parameters

1. Number
   The serial number of the coin or note dispenser about which information is required.
2. Snapshot
   A pointer to a program buffer, into which all the information about the specified dispenser will be copied.

11.61,3 Return Value

True if the specified input device exists, False if the end of the list is reached.

11.61,4 Remarks

The serial numbers of the dispensers are contiguous and run from zero upwards.

11.7 WriteDispenserDetails

11.71,1 Synopsis

The **WriteDispenserDetails** call updates all the changeable information to the interface for a single unit of money handling equipment.

```
void WriteDispenserDetails( long            Number,
                            DispenserBlock* Snapshot) ;
```

11.71,2 Parameters

1. Number
   The serial number of the coin or note dispenser being configured.
2. Snapshot
   A pointer to a program buffer containing the configuration data for the specified dispenser. See below for details.

11.71,3 Return Value

None.

11.71,4 Remarks

The serial numbers of the dispensers are contiguous and run from zero upwards. A call to **ReadDispenserDetails** followed by call to WriteDispenserDetails for the same data will have no effect on the system.

11.8 Dispenser Value Reassignment (1.10.7)

Releases of PayLink after 1.10.7 allow the value of the coin associated with a Dispenser to be re-assigned.
To do this:

- the dispenser to be updated should be found using **ReadDispenserDetails(),**
- the **`Dispenser.Value`** updated to the new value,
- the **`Dispenser.Status`** field changed to DISPENSER_REASSIGN_VALUE
- and **WriteDispenserDetails()** used to update the record to Paylink.
-

Paylink will acknowledge that the update has been processed by setting the **`Dispenser.Status`** field to DISPENSER_VALUE_REASSIGNED. *If this value is not seen in the **`Dispenser.Status`** field, then the value change has not be processed by Paylink*.

11.9 Token Handling (Coin Ids) (1.11.x)

As tokens do not have a known value, they appear as coins with value zero. The only way for a game to detect tokens is to use the **CurrentUpdates()** function to detect activity, and then to check for increases in the count of the token(s) to be accepted(**`Coin.Count`**).

The index for the coin that holds the count for a particular token can be obtained by searching the coin array belonging to the acceptor and comparing the coin name (**`Coin.CoinName`**) with that of the token.

11.10 Dual Currency Handling (Coin Ids) (1.11.x)

If an acceptor is being used to accept coins of more than one currency, the application can determine the currency of a specific coin by examining the first two characters of the name of the coin (**`Coin.CoinName`**). For supported acceptors, the firmware guarantees that a coin name will always contain a currency code as the first two characters of a coin name.

ccTalk	This contains up to eight characters as returned by the Request Coin Id (184) command.
ID-003	This contains a representation of the three bytes as return by the Get Currency Assignment (0x8A) command. The first two bytes are the hex value for country code, then a '/', then the base value as a decimal number, followed by a '^', then the count of extra zeros as a decimal number.
MDB	TBD
GPT	TBD
ARDAC	The Ardac protocol does not return any information about notes.

11.11 Read out of Acceptor Details (1.11.x)

Different protocols / manufacturers provide different details on acceptors. The **`Acceptor.Description`** field is generated as follows:

ccTalk	The replies to: • Request Currency Specification ID (91), • Request Currency Revision (145), • Request Software Revision (241) & • Request Product Code (244) commands, separated by '~' characters. Each individual field is truncated to 15 characters, and is omitted if there is no response to the command, although the '~' character is still inserted.
ID-003	The entire reply to the "Get Version Request" (0x88) command
MDB	TBD
GPT	TBD
ARDAC	TBD.

The **`Acceptor.SerialNumber`** field is generated as follows:

ccTalk	The binary reply to the ID Serial No (242) command.
ID-003	The "standard" ID-003 protocol does not allow for a serial number. A non-standard 0x8F query is issued and any response will be stored here.
MDB	TBD
GPT	TBD
ARDAC	TBD.

11.12 Read out of Dispenser Details (1.11.x)

Different protocols / manufacturers provide different details on acceptors. The Description (**`Dispenser.Description`**) field is generated as follows:

ccTalk	The replies to: • Request Software Revision (241) & • Request Product Code (244) commands, separated by '~' characters. Each individual field is truncated to 15 characters, and is omitted if there is no response to the command, although the '~' character is still inserted.
MDB	TBD

The **`Dispenser.SerialNumber`** field is generated as follows:

ccTalk	The binary reply to the ID Serial No (242) command.
MDB	TBD

11.13 Coin Routing.

Coins can be easily routed to fill a coin dispenser and one or more cash boxes.

There are 3 routing techniques:

- Route coins to a general cash box.
- Route specific coins to a specific cash box.
- Route specific coins to a dispenser until it is full then route it to a coin specific cash box.

There are 3 settings for each coin that are important:

• Coin.Path	The path to the coin specific hopper.
• Coin.DefaultPath	The path to the coin specific cash box.
• Coin.PathSwitchLevel	When Coin.PathCount reaches Coin.PathSwitchLevel coins are routed to the coin cash box.

11.131 ROUTE COINS TO A GENERAL CASH BOX

- Set all coin paths to the desired route.

e.g. General Cash box on route 4.

• Path	4 for all coins
• DefaultPath	0 for all coins
• PathSwitchLevel	0 for all coins

11.132 ROUTE SPECIFIC COINS TO A SPECIFIC CASH BOX.

- Set Coin.Path for each coin that is routed to a specific cash box.
- The other 2 coin settings are zero.

e.g. General Cash box on route 4, coins 1 and 2 have separate cash boxes on routes 5 and 6.

• Path	5 for coin 1, 6 for coin 2 and 4 for all other coins
• DefaultPath	0 for all coins
• PathSwitchLevel	0 for all coins

11.133 ROUTE COINS TO A DISPENSER UNTIL IT IS FULL THEN ROUTE IT TO A COIN CASH BOX.

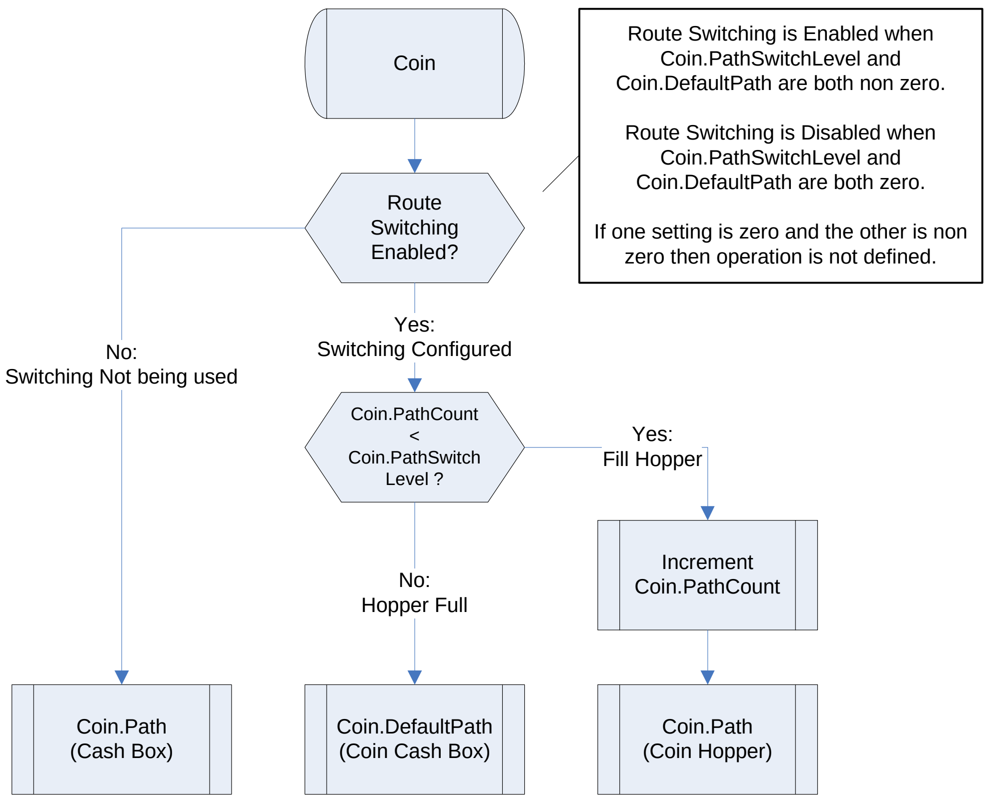
- Set Coin.Path to the dispenser route for each coin that is routed to a hopper.
- Set Coin.DefaultPath to the cash box route for each coin that is routed to a hopper. **This must be non zero.**
- Set Coin.PathSwitchLevel to the Coin.PathCount value at which the dispenser becomes full. **This must be non zero.**

e.g. General Cash box on route 4, coin 1 goes to a dispenser on route 1 and a cash box on route 2. Coin.PathCount is 100 and there is space for 300 more coins in the hopper.

• Path	1 for coin 1, 4 for all other coins
• DefaultPath	2 for coin 1, 0 for all other coins
• PathSwitchLevel	400 for coin 1, 0 for all other coins

When coins are routed to the dispenser (via the Coin.Path route) the variable Coin.PathCount is incremented. When PathCount reaches PathSwitchLevel, further coins are routed to the coin cash box. As the dispenser pays out coins the PathSwitchLevel should be increased by the corresponding amount. Further coins will then be routed to the dispenser again until the new switch level is reached.

11.134 PAYLINK ROUTING - FLOW DIAGRAM



Route Switching is Enabled when Coin.PathSwitchLevel and Coin.DefaultPath are both non zero.

Route Switching is Disabled when Coin.PathSwitchLevel and Coin.DefaultPath are both zero.

If one setting is zero and the other is non zero then operation is not defined.

Notes:

- **Setting route 0 should be avoided as it does not exist on an SR5 coin acceptor.**
- **The settings for PathSwitchLevel and PathCount are restored automatically by PayLink after a reset.**

11.14 MDB changer support. (1.10.x)

If an MDB changer is used, it will appear as an acceptor in very much the same way as any other acceptor. The coins that are routed to tubes can be distinguished as having a non zero Routed Path, although, obviously, any changes made to the routing will be ignored.

With the payout, the situation is slightly more complicated. The MDB changer protocol supports two different payout mechanisms, a basic one that is always present and an extended one, which is supported on some level 3 changers. The basic provides control over the individual payout tubes, but has no feedback as to whether the payout works. The extended one provides feedback as to the success of the payout, but does not allow any control over which tubes the payout is from.

The solution adopted is to always provide one dispenser for each tube, which is run using the basic mechanism and, if the extended mechanism is present, to provide an additional dispenser which is run using the extended mechanism. Where an extended mechanism dispenser is available, the individual tubes are pre-set to inhibited.

To perform a “normal” payout, you just issue a **PayOut()** request and call **PayStatus()** and **CurrentPaid()** to monitor the results. If you have a level 2 changer, **CurrentPaid()** will update almost instantaneously rather than at the end and will always show that all coins have been paid. If you have a level 3 changer, **CurrentPaid()** will update during the process, and you may get a PAY_EMPTY status from **PayStatus()**, with **CurrentPaid()** then reflecting the actual payout achieved.

The current levels of MDB tubes, *as reported by the coin-changer,* are returned in the field **`CoinCount`**. In addition, the field **`CoinCountStatus`** will contain the value DISPENSER_ACCURATE for a normal tube, and DISPENSER_ACCURATE_FULL if the changer is reporting the tube as full. Note that the levels reported by the changer do not necessarily update in a “sensible” fashion after a payout.

Should you wish to perform an operation on a specific tube (e.g. emptying it), you should inhibit the extended mechanism dispenser and enable the specific tube you wish to control.

As the manufacturer is shown in the acceptor detail block for the changer, the extended mechanism dispenser has the constant type **DP_MDB_TYPE_3_PAYOUT** while the individual tubes have the type **DP_MDB_LEVEL_2_TUBE** .

11.141 MDB TUBE LEVEL MONITORING.

Monitoring:

The main method for determining tube levels is via the Tube Status (0x02) MDB command. This is issued during startup and then every 25 seconds. The response to this is copied directly into the tube coin level, and one of the DISPENSER_ACCURATE or DISPENSER_ACCURATE_FULL level statuses set.

Coin Insertion:

When a coin insertion (event code 0x40) is reported as going to a tube, the changer also includes an updated value for the tube level. If this is non-zero then this is used to overwrite the coin level for the tube. When a coin insertion is reported as going to the cashbox for a coin that has an associated tube, PayLink immediately issues a Tube Status (0x02) MDB command to obtain an accurate on the levels. (Note that after a delay of up to 25 seconds this will be replaced by the value from a Tube Status command)

Manual Dispense:

When a manual dispense (event code 0x80) is reported then the reported tube level copied directly into the tube coin level. . (Note that after a delay of up to 25 seconds this will be replaced by the value from a Tube Status command if that is different)

Payout:

While a payout is in progress, no updates are made to the coin level. As soon as the payout completes, PayLink immediately issues a Tube Status (0x02) MDB command to obtain the changer's opinion of the new levels.

11.15 Dispenser Power Fail support. (1.10.x)

Some dispensers, especially some hoppers produced by MCL, are guaranteed to correctly count coins even if power is removed during a payout sequence. This facility is explicitly supported in the PayLink software. The **`Count`** field for these hoppers is set during initialisation to correspond to the "total coins paid since manufacture" value retrieved from the hopper, and is then updated as payouts occur. It is this field that allows for the correct counting of coins over a power failure.

At the end of every payout sequence, the PayLink stores, internally, the **`Count`** for each hopper. At initialisation as well as reporting the retrieved count, it is also compared with the saved value. This enables the **CurrentPaid()** function to continue to report the correct value, and also generates an **IMHEI_COIN_DISPENSER_UPDATE** *Event* (see below) to register this update.

11.16 Combi Hopper Support. (1.10.x)

This single unit dispenses two different coin values. It is therefore handled in a similar way to the MDB system. There is a primary dispenser, which is set up as a normal unit with a **`Unit`** field of DP_MCL_SCH3, and a **`Value`** field with the lower coin value in it. The **`Count`** in this dispenser is the count of the lower value coins dispensed. In addition, another dispenser is set up, with a matching **`Address`** field, a **`Unit`** field of DP_CC_GHOST_HOPPER, the **`Value`** of the higher coin and the **`Count`** of the higher value coins dispensed.

Note that, due to limitations of the unit, during a payout operation the **`Count`** of the main dispenser *only* is updated, as though all coins dispensed were of this value. At the end of the sequence, while **LastPayStatus()** is still returning PAY_ONGOING, the accurate count of both coins is retrieved and the two separate **`Count`** fields updates. The result of this is that, as the operation finishes, the **`Count`** for the lower value dispenser decrements.

11.17 Multiple PayLink Unit Support.

11.171 OVERVIEW

Although the PayLink system was designed on the basis of a single PayLink unit being connected to a PC, facilities are provided to support multiple PayLink units.

The only change that is visible to a programmer when multiple units are in use is that the **OpenSpecificMHE** is used to associate a specific one of the multiple PayLink unit interface areas with the program.

It is envisaged that in a system with multiple PayLink units a separate instance of the program will be running for each PayLink unit interface area and a supervisory level will start the different programs. This is not compulsory as **OpenSpecificMHE** can be called repeatedly with different parameters so as to switch between PayLink unit interface areas.

11.172 UNIT IDENTIFICATION

The USB interface chip on a PayLink unit provides a “Serial Number”. This is pre-set during manufacture to "AE000001" - but is not used or checked in a system that does not have multiple units.

When the **AESWDriver** program is run, the default is for it to search all USB devices that may be a PayLink, and connect to the first one it finds. When the /S=<SerialNo> switch is provided on the command line, this has two effects:
Firstly, it causes the driver program to create a named PayLink unit interface area, which can then be connected to by an **OpenSpecificMHE** call with a matching parameter.
Secondly it causes the driver program to search all USB devices that may be a PayLink until it finds one with a matching programmed serial number.

The serial number is *not* associated with the PayLink firmware, and any release of PayLink firmware may be used in a multiple PayLink system. The **PaylinkSerial** utility is available as a part of the released SDK, which takes as a parameter a serial number and programs it into the single PayLink unit currently connected to the system.

12. Utility Functions

12.1 CheckOperation (1.11.x)

12.11,1 Synopsis

This call allows an application to check that the PayLink and its connection to the PC are operational. It also allows the application to automatically close down currency acceptance in the event of any PC malfunction.

```
long CheckOperation(long Sequence,
                    long Timeout)
```

12.11,2 Parameters

1. Sequence
   A unique number for this call, freely chosen by the application.
2. Timeout
   A time in milliseconds before which another **CheckOperation()** call must be made, *with a different value in **Sequence,*** in order to continue the normal operation of Paylink. If zero, then this functionality is inactive from then on.

12.11,3 Return Value

The last **Sequence** value of which the PayLink unit has been notified, or -1 if the PayLink does not support this facility.

12.11,4 Remarks

1. In normal operation, PayLink can be expected to have updated the value to be returned by this within 100 milliseconds of the previous call. It is suggested that this call is made every 500 milliseconds or longer to allow for transient delays.
2. If the **Timeout** expires, PayLink will “silently” disable all the acceptors that are connected to it. The next call to **CheckOperation()** will “silently” re-enable them. This facility is not operation until the first call of **CheckOperation().**

12.2 NextEvent

12.21,1 Synopsis

This call provides access to all the detailed workings of the peripherals connected to the system. All Acceptor / Dispenser events such as errors, frauds and rejects (including pass / fail of internal self test) that are received will be queued (in a short queue) and can be retrieved with **NextEvent** calls.

```
int NextEvent(EventDetailBlock* EventDetail);
```

12.21,2 Parameters

3. EventDetail
   NULL, or the address of the single structure at which to store more details of the event given by the return value.

12.21,3 Return Value

The return code is 0 (IMHEI_NULL) if no event is available, otherwise it is the next event.

12.21,4 Remarks

3. In the case where one or more events are missed, the code IMHEI_OVERFLOW will replace the missed events.
4. If only basic information is required, then (as note, coin & Dispenser event codes do not overlap) the **EventDetail** parameter can often be set to NULL, as the device is implicit in the event.
5. The values for the **EventCode**s returned are in the separate header file **ImheiEvent.h** (see Appendix 1)
6. The **RawEvent** field for various drivers is as follows:

Driver Software	**Raw Code for Event**	**Raw Code for Fault**
ccTalk coin	Byte from “Read Buffered Credit” response.	1st byte of “Perform self test” response.
ccTalk note	Byte from “Read Buffered Bill Events” response.	1st byte of “Perform self test” response.
Ardac II note		
ID-003	Response to “Status Poll”	The byte following a **FAILURE** response
GPT note		
MDB Bill Acceptor		
MDB Changer		

12.3 AvailableValue

12.31,1 Synopsis

The **AvailableValue** call is available to keep track of how much money is available in the coin (or note) dispensers.

```
long AvailableValue (void) ;
```

12.31,2 Parameters

None

12.31,3 Return Value

The approximate minimum value, in the lowest denomination of the currency (i.e. cents / pence etc.) of all coins and notes that could be paid out.

12.31,4 Remarks

The accuracy of the value returned by this call is entirely dependent upon the accuracy of the information returned by the money dispensers.

At present, this facility is not implemented!

12.4 ValueNeeded

12.41,1 Synopsis

The **ValueNeeded** call provides an interface to an optional credit card acceptor unit.

It is not envisaged that this would be used within many systems, but may be used, for example, in vending applications.

```
void ValueNeeded (long Amount) ;
```

12.41,2 Parameters

Amount

The figure that **CurrentValue** is required to reach before the next event can happen.

12.41,3 Return Value

None

12.41,4 Remarks

1. This function does not necessarily have any affect on the system. If the MHE includes a credit card acceptor, or similar, then the MHE interface unit will arrange for the next use of that unit to bring **CurrentValue** up to latest figure supplied by this routine.

2. If **CurrentValue** is greater or equal to the last supplied figure then any such acceptors are disabled.

12.5 SetDeviceKey

12.51,1 Synopsis

The **SetDeviceKey** call is made by the PC application software to set such things as an encryption key.

```
void SetDeviceKey (long InterfaceNo,
                   long Address,
                   long Key);
```

12.51,2 Parameters

1. InterfaceNo
   The Interface on which the device is located
2. Address
   The address of the device whose key is being updated
3. Key
   The 32 bit key to be remembered for the device.

12.51,3 Return Value

None

12.51,4 Remarks

1. At present, this can only be used for a Lumina acceptor at address 40 on interface 2, the ccTalk interface. The key (as 6 hex digits) is used as the encryption key.

2. An example application for this is available within the SDK folder structure.

12.6 SerialNumber

12.61,1 Synopsis

The **SerialNumber** call provides access to the electronic serial number stored on the device.

```
long SerialNumber (void) ;
```

12.61,2 Parameters

None

12.61,3 Return Value

32 bit serial number.

12.61,4 Remarks

1. A serial number of -1 indicates that a serial number has not been set in the device.
2. A serial number of 0 indicates that the device firmware does not support serial numbers

12.7 FirmwareVersion

12.71,1 Synopsis

The **FirmwareVersion** call allows a control application to discover the exact description of the firmware running on the unit.

```
long FirmwareVersion (char* CompileDate,
                      char* CompileTime);
```

12.71,2 Parameters

1. CompileDate
   This is a pointer to a 16 byte area that receives a null terminated printable version of the date on which the firmware was installed.
2. CompileTime
   This is a pointer to a 16 byte area that receives a null terminated printable version of the time at which the firmware was installed.

12.71,3 Return Values

The firmware version, as a 32 bit integer. This is normally shown as 4 x 8 bit numbers separated by dots.

12.71,4 Remarks

Either or both of the character pointers may be null.

12.8 USBDriverStatus

12.81,1 Synopsis

The USBDriverStatus call allows an interested application to retrieve the status of the USBDriver program for PayLink system.

```
USBStatus DLL USBDriverStatus (void) ;
```

12.81,2 Parameters

None

12.81,3 Return Values

Mnemonic	Value	Meaning
NOT_USB	-1	Interface is to a PCI card
USB_IDLE	0	No driver or other program running
STANDARD_DRIVER	1	The driver program is running normally
FLASH_LOADER	2	The flash re-programming tool is using the link
MANUFACTURING_TEST	3	The manufacturing test tool is using the link
DRIVER_RESTART	4	The standard driver is in the process of exiting / restarting
USB_ERROR	5	The driver has received an error from the low level driver

12.81,4 Remarks

1. For PCI systems this is obviously meaningless and the system returns NOT_USB
2. Be aware that further error statuses may be added. Any response other than STANDARD_DRIVER should be regarded as indicating that the system is not currently functional.

12.9 USBDriverExit

12.91,1 Synopsis

The **USBDriverExit** call allows a control application to request that the USB driver program exits in a controlled manner.

```
void USBDriverExit (void) ;
```

12.91,2 Parameters

None

12.91,3 Return Values

None

12.91,4 Remarks

This sets the **USBDriverStatus** to DRIVER_RESTART. Driver programs with version 1.0.3.1 or greater will report their exit by changing the **USBDriverStatus** to USB_IDLE.

For PCI systems this is obviously meaningless and has no effect.

12.10 IMHEIConsistencyError

12.101,1 Synopsis

The **IMHEIConsistencyError** call allows an application to check that a transient (hardware) error has not caused corruption of the underlying data structures used to hold the current monetary situation. Although the use of state tables removes the vulnerability of the system to time problems, it increases its vulnerability to *expensive* hardware errors (which could falsely indicate very large money increments.)

```
char* DLL IMHEIConsistencyError(int CoinTime,
                                int NoteTime) ;
```

12.101,2 Parameters

None

1. CoinTime
   Default STANDARD_COIN_TIME = 500 msec.
   This is the minimum time in milliseconds that will elapse between successive coin insertions. It should be overridden by the application where a fast coin acceptor is in use.
2. NoteTime
   Default STANDARD_NOTE_TIME = 5000 msec.
   This is the minimum time in milliseconds that will elapse between successive note insertions. It should be overridden by the application where a fast note acceptor is in use.

12.101,3 Return Value

1. If all the data structures are both consistent and reasonable, the function returns NULL.
2. If there is any problem an English text message is returned describing the problem.

12.101,4 Remarks

1. A non-NULL return is a totally unrecoverable situation. It is expected that application will report the error, and then stop operation.
2. As well as calling this function periodically, it is recommended that it is called after the detection of a credit increase.

12.11 Auditing / Event Processing

This section elaborates further on the processing behind the events returned by the NextEvent() function.

There is no intention that these events would be used for the normal operation of the game. Rather, the intention is that they can be captured and presented in “management” reports.

(Obviously, the application can respond automatically to events such as fraud, by disabling everything for a while, but this doesn’t form part of the algorithms by which the application manages the peripherals.)

12.111 STRUCTURE FOR EVENTDETAILBLOCK

```
typedef struct
    {
    long   EventCode ;          // The code (the same as rturned by NextEvent)
    long   RawEvent ;           // The actual code returned by the peripheral
    long   DispenserEvent ;     // True if the device was a dispenser
                                   // False for an acceptor
    long   Index ;              // The ReadxxxBlock index of the generating device
    } EventDetailBlock ;
```

12.112 EVENT CODES FOR NEXTEVENT / EVENTDETAILBLOCK

Event codes have an internal structure, allowing cateogizations. The bottom 6 bits are the unique code for the event, serious fault related codes have bit 5 set. Above this are bits describing the type of unit affected.

```
// enums to allow this categoisation to be acheived
enum
    {
    EVENT_CODE_MASK       =   0x03f,
    UNIT_TYPE_MASK        =  ~0x03f,
    FAULT_BIT             =   0x020,
    COIN_DISPENSER_EVENT  =   0x040,
    NOTE_DISPENSER_EVENT  =   0x080,
    COIN_EVENT            =   0x0C0,
    NOTE_EVENT            =   0x100,
    } ;



// The common base codes
enum
    {
    EVENT_OK,           // Internal use only
    EVENT_BUSY,         // Internal use only

    REJECTED,
    INHIBITED,
    MISREAD,
    FRAUD,
    JAM,
    JAM_FIXED,
    RETURN,
    OUTPUT_PROBLEM,
    OUTPUT_FIXED,
    INTERNAL_PROBLEM,
    UNKNOWN,
    DISPENSE_UPDATE,

                        // Fault codes
    NOW_OK = 0,
    REPORTED_FAULT,
    UNIT_TIMEOUT,
    UNIT_RESET,
    SELF_TEST_REFUSED,
    } ;



// The actual Full Event Codes
enum
    {
    // General
    IMHEI_NULL                          =   0,
    IMHEI_INTERFACE_START               =   1,
    IMHEI_APPLICATION_START             =   2,
    IMHEI_APPLICATION_EXIT              =   3,

    IMHEI_OVERFLOW                      = 0x1f,


    // Coin Acceptors
    IMHEI_COIN_NOW_OK                   = COIN_EVENT | FAULT_BIT | NOW_OK,
    IMHEI_COIN_UNIT_REPORTED_FAULT      = COIN_EVENT | FAULT_BIT | REPORTED_FAULT,
    IMHEI_COIN_UNIT_TIMEOUT             = COIN_EVENT | FAULT_BIT | UNIT_TIMEOUT,
    IMHEI_COIN_UNIT_RESET               = COIN_EVENT | FAULT_BIT | UNIT_RESET,
    IMHEI_COIN_SELF_TEST_REFUSED        = COIN_EVENT | FAULT_BIT | SELF_TEST_REFUSED,


    IMHEI_COIN_REJECT_COIN              = COIN_EVENT | REJECTED,
    IMHEI_COIN_INHIBITED_COIN           = COIN_EVENT | INHIBITED,
    IMHEI_COIN_FRAUD_ATTEMPT            = COIN_EVENT | FRAUD,
    IMHEI_COIN_ACCEPTOR_JAM             = COIN_EVENT | JAM,
    IMHEI_COIN_COIN_RETURN              = COIN_EVENT | RETURN,
    IMHEI_COIN_SORTER_JAM               = COIN_EVENT | OUTPUT_PROBLEM,
    IMHEI_COIN_INTERNAL_PROBLEM         = COIN_EVENT | INTERNAL_PROBLEM,
    IMHEI_COIN_UNCLASSIFIED_EVENT       = COIN_EVENT | UNKNOWN,



    // Note Acceptors
    IMHEI_NOTE_NOW_OK                   = NOTE_EVENT | FAULT_BIT | NOW_OK,
    IMHEI_NOTE_UNIT_REPORTED_FAULT      = NOTE_EVENT | FAULT_BIT | REPORTED_FAULT,
    IMHEI_NOTE_UNIT_TIMEOUT             = NOTE_EVENT | FAULT_BIT | UNIT_TIMEOUT,
    IMHEI_NOTE_UNIT_RESET               = NOTE_EVENT | FAULT_BIT | UNIT_RESET,
    IMHEI_NOTE_SELF_TEST_REFUSED        = NOTE_EVENT | FAULT_BIT | SELF_TEST_REFUSED,

    IMHEI_NOTE_REJECT_NOTE              = NOTE_EVENT | REJECTED,
    IMHEI_NOTE_INHIBITED_NOTE           = NOTE_EVENT | INHIBITED,
    IMHEI_NOTE_NOTE_MISREAD             = NOTE_EVENT | MISREAD,
    IMHEI_NOTE_FRAUD_ATTEMPT            = NOTE_EVENT | FRAUD,
    IMHEI_NOTE_ACCEPTOR_JAM             = NOTE_EVENT | JAM,
    IMHEI_NOTE_ACCEPTOR_JAM_FIXED       = NOTE_EVENT | JAM_FIXED,
    IMHEI_NOTE_NOTE_RETURNED            = NOTE_EVENT | RETURN,
    IMHEI_NOTE_STACKER_PROBLEM          = NOTE_EVENT | OUTPUT_PROBLEM,
    IMHEI_NOTE_STACKER_FIXED            = NOTE_EVENT | OUTPUT_FIXED,
    IMHEI_NOTE_INTERNAL_ERROR           = NOTE_EVENT | INTERNAL_PROBLEM,
    IMHEI_NOTE_UNCLASSIFIED_EVENT       = NOTE_EVENT | UNKNOWN,

    // Coin Dispenser
    IMHEI_COIN_DISPENSER_NOW_OK            = COIN_DISPENSER_EVENT | FAULT_BIT | NOW_OK,
    IMHEI_COIN_DISPENSER_REPORTED_FAULT    = COIN_DISPENSER_EVENT | FAULT_BIT | REPORTED_FAULT,
    IMHEI_COIN_DISPENSER_TIMEOUT           = COIN_DISPENSER_EVENT | FAULT_BIT | UNIT_TIMEOUT,
    IMHEI_COIN_DISPENSER_RESET             = COIN_DISPENSER_EVENT | FAULT_BIT | UNIT_RESET,
    IMHEI_COIN_DISPENSER_SELF_TEST_REFUSED = COIN_DISPENSER_EVENT | FAULT_BIT | SELF_TEST_REFUSED,

    IMHEI_COIN_DISPENSER_FRAUD_ATTEMPT     = COIN_DISPENSER_EVENT | FRAUD,
    IMHEI_COIN_DISPENSER_UPDATE            = COIN_DISPENSER_EVENT | DISPENSE_UPDATE,
    } ;
```

12.113 CCTALK COIN PROCESSING

12.113,1 Fault Events

During start-up the ccTalk command “Do self Test” is sent to the acceptor. The response is queued as an event with the first byte of the response in **RawEvent** and an **EventCode** type of **IMHEI_COIN_NOW_OK** or **IMHEI_COIN_UNIT_REPORTED_FAULT.**

If the unit is reset (the sequence number is found to be zero) or repeated messages are ignored **IMHEI_COIN_UNIT_RESET** or **IMHEI_COIN_UNIT_TIMEOUT** event is queued. Whenever any of these faults have been reported, the handler will continually “poll” the acceptor with “Do Self Test” commands until a “non-faulty” response is returned.

12.113,2 Coin Events

When the acceptor reports an event other than an accepted coin, this is queued as a COIN_DISPENSER_EVENT event, with the actual event byte reported in **RawEvent.**

The handler classifies ccTalk events as:

Event Number	Meaning	Event Classification
1	Coin Rejected	REJECTED
2	Coin Inhibited	INHIBITED
3	Multiple window	REJECTED
4	Wake-up timeout	JAM
5	Validation timeout	JAM
6	Credit sensor timeout	JAM
7	Sorter opto timeout	OUTPUT_PROBLEM
8	2nd close coin error	REJECTED
9	Accept gate not ready	REJECTED
10	Credit sensor not ready	REJECTED
11	Sorter not ready	REJECTED
12	Reject coin not cleared	REJECTED
13	Validation sensor not ready	REJECTED
14	Credit sensor blocked	JAM
15	Sorter opto blocked	OUTPUT_PROBLEM
16	Credit sequence error	FRAUD
17	Coin going backwards	FRAUD
18	Coin too fast (over credit sensor)	FRAUD
19	Coin too slow (over credit sensor)	FRAUD
20	C.O.S. mechanism activated (coin-on-string)	FRAUD
21	DCE opto timeout	FRAUD
22	DCE opto not seen	FRAUD
23	Credit sensor reached too early	FRAUD
24	Reject coin (repeated sequential trip)	FRAUD
25	Reject slug	FRAUD
26	Reject sensor blocked	JAM
27	Games overload	INTERNAL_PROBLEM
28	Max. coin meter pulses exceeded	INTERNAL_PROBLEM
128-159	Inhibited Coin	INHIBITED
254	Flight Deck Open	RETURN

12.114 CCTALK NOTE PROCESSING

12.114,1 Fault Events

Shortly after start-up the ccTalk command "Do self Test" is sent to the acceptor. The response is queued as an event with the first byte of the response in **RawEvent** and an **EventCode** type of **IMHEI_NOTE_NOW_OK** or **IMHEI_NOTE_UNIT_REPORTED_FAULT.**

Some acceptors reply to this command with a NAK, these are reported as **IMHEI_NOTE_SELF_TEST_REFUSED.**

If the unit is reset (the sequence number is found to be zero) or repeated messages are ignored **IMHEI_NOTE_UNIT_RESET** or **IMHEI_NOTE_UNIT_TIMEOUT** event is queued.

Whenever any of these faults have been reported, the handler will continually "poll" the acceptor with "Do Self Test" commands until a "non-faulty" response is returned.

12.114,2 Note Events

When the acceptor reports an event other than an accepted note, this is queued as an NOTE_DISPENSER_EVENT event, with the actual event byte reported in **RawEvent.**

The handler classifies ccTalk events as:

Event Number	**Meaning**	**Event Classification**
0	Master inhibit active	INHIBITED
1	Bill returned from escrow	RETURN
2	Invalid bill (due to validation fail)	REJECTED
3	Invalid bill (due to transport problem)	REJECTED
4	Inhibited bill (on serial)	INHIBITED
5	Inhibited bill (on DIP switches)	INHIBITED
6	Bill jammed in transport (unsafe mode)	MISREAD
7	Bill jammed in stacker	OUTPUT_PROBLEM
8	Bill pulled backwards	FRAUD
9	Bill tamper	FRAUD
10	Stacker OK	OUTPUT_FIXED
11	Stacker removed	OUTPUT_PROBLEM
12	Stacker inserted	OUTPUT_FIXED
13	Stacker faulty	OUTPUT_PROBLEM
14	Stacker full	OUTPUT_PROBLEM
15	Stacker jammed	OUTPUT_PROBLEM
16	Bill jammed in transport (safe mode)	JAM
17	Opto fraud detected	FRAUD
18	String fraud detected	FRAUD
19	Anti-string mechanism faulty	INTERNAL_PROBLEM

12.115 CCTALK HOPPER PROCESSING

This is divided into two parts, the processing associate with reporting the ongoing ability of a functioning hopper to pay out coins, and that associated with checking that the hopper is operational.

Both of these require a “Test Hopper” command to be sent to the unit, but the reporting mechanism is different.

The ongoing ability to pay out is reported as the Status field in the dispenser block, the results of the regular check are reported as “self test” events.

Note: that when a Payout is issued the results of the “self Test” are ignored - the dispense coins command is dent to the hopper regardless.

On a regular basis the “Test Hopper” command is sent to the each hopper and the result evaluated. After start-up, and regularly thereafter, a **IMHEI_COIN_DISPENSER_NOW_OK** is reported if there are no errors.

The defined return from this command is a string of up to 4 bytes (depending upon the exact unit) with one (or theoretically more) bits set to indicate the problem.

The action of PayLink is to regard these bytes as containing 32 bits. The bits are classified by this section of PayLink as an Error, a Fraud attempt, a Payout result or “information only”. PayLink scans along these bits looking for the first Error or Fraud bit that is non-zero. Other bits are ignored.

The bit number of this first bit (i.e. a number between 0 to 31) is then returned in **RawEvent** and an **EventCode** of either **IMHEI_COIN_DISPENSER_FRAUD_ATTEMPT** or **IMHEI_COIN_DISPENSER_REPORTED_FAULT**

For reference, the bit numbers, and their classification are:

Bit Number	Meaning	Event Classification	Payout Result
0	Jammed	Information only	PAY_JAMMED
1	Empty	Information only	PAY_EMPTY
2	Reversed	Information only	
3	Idle fraud blocked	Fraud	PAY_FRAUD
4	Idle fraud short	Fraud	PAY_FRAUD
5	Payout blocked	Information only	PAY_FAILED_BLOCKED
6	Power up	Information only	
7	Disabled	Fault	
8	Fraud short	Fraud	PAY_FRAUD
9	Sngle coin mode	Fault	
10	Chksum a	Fault	
11	Chksum b	Fault	
12	Chksum c	Fault	
13	Chksum d	Fault	
14	Pwr fail during write	Fault	
15	Pin locked	Fault	
16	Powerdown during payout	Information only	
17	Unknown coin type paid	Fault	
18	Pin number incorrect	Fault	
19	Incorrect cipher key	Fault	
20	Unused	Information only	
21	Unused	Information only	
22	Unused	Information only	
23	Unused	Information only	
24	Unused	Information only	
25	Unused	Information only	
26	Unused	Information only	
27	Unused	Information only	
28	Unused	Information only	
29	Unused	Information only	
30	Use other hopper	Information only	PAY_NOT_EXACT
31	Opto fraud	Fraud	PAY_FRAUD

12.116 ID-003 NOTE PROCESSING

12.116,1 Fault Events

There is no specific self test command with ID-003, the acceptor reports faults in response to a poll. When the protocol handler completes its initialisation, the first idle response is reported as **IMHEI_NOTE_NOW_OK.**

When a **FAILURE** response to a status poll is received, this is reported as an **IMHEI_NOTE_UNIT_REPORTED_FAULT** event. A failure status is expected to be continually reported by the acceptor until it is cleared. When the acceptor again reports **IDLING**, then an **IMHEI_NOTE_NOW_OK** event is reported.

Other "non normal" responses to a status poll are reported as events as they are receive according to the table below.

In a similar way to the action for faults, **OUTPUT_FIXED** is reported when events that translate to **OUTPUT_PROBLEM** are cleared.

Status Value	**Name**	**Event Classification**
0x17	REJECTING	REJECTED
0x41	POWER_UP_WITH_BILL_IN_ACCEPTOR	REJECTED
0x42	POWER_UP_WITH_BILL_IN_STACKER	REJECTED
0x43	STACKER_FULL	OUTPUT_PROBLEM
0x44	STACKER_OPEN	OUTPUT_PROBLEM
0x45	JAM_IN_ACCEPTOR	JAM
0x46	JAM_IN_STACKER	OUTPUT_PROBLEM
0x47	PAUSE	UNKNOWN
0x48	CHEATED	FRAUD
0x49	FAILURE	- Fault Report
0x4A	COMMUNICATION_ERROR	INTERNAL_PROBLEM

13. Note Reader Escrow

13.1 EscrowEnable

13.11,1 Synopsis

Change the mode of operation of all escrow capable acceptors to hold inserted currency in escrow until a call of **EscrowAccept**.

The **EscrowEnable** call is used to start using the escrow system

```
void EscrowEnable (void) ;
```

13.11,2 Parameters

None

13.11,3 Return Value

None

13.2 EscrowDisable

13.21,1 Synopsis

Change the mode of operation of all escrow capable acceptors back to the default mode in which all currency is fully accepted on insertion

```
void EscrowDisable (void) ;
```

13.21,2 Parameters

None

13.21,3 Return Value

None

13.21,4 Remarks

1. If any currency is currently held in escrow when this call is made, it will be accepted without comment.

13.3 EscrowThroughput

13.31,1 Synopsis

Determine the cumulative monetary value that has been held in escrow since the system was reset.

The **EscrowThroughput** call is used to determine the cumulative total value of all coins and notes read by the money handling equipment that have ever been held in escrow.

```
long EscrowThroughput (void) ;
```

13.31,2 Parameters

None

13.31,3 Return Value

The current value, in the lowest denomination of the currency (i.e. cents / pence etc.) of all coins and notes ever held in Escrow.

13.31,4 Remarks

1. It is the responsibility of the application to keep track of value that has been accepted and to monitor for new coin / note insertions by increases in the returned value.

2. Note that this value should be read following the call to **OpenMHE** and before the call to **EnableInterface / EscrowEnable** to establish a starting point before any coins or notes are read.

3. If the acceptor auto-returns the coin / note then this will fall to its previous value. This can (potentially) occur *after* a call to **EscrowAccept**() or **EscrowReturn**() if the acceptor has already started its return sequence.

13.4 EscrowAccept

13.41,1 Synopsis

If the acceptor that was last reported as holding currency in escrow is still in that state, this call will cause it to accept that currency.

```
void EscrowAccept (void) ;
```

13.41,2 Parameters

None

13.41,3 Return Value

None

13.41,4 Remarks

1. If a second acceptor has (unreported) currency in escrow at the time this call is made, it will immediately cause the **EscrowThroughput** to be updated.
2. If no currency is currently held in escrow when this call is made, it will be silently ignored.

13.5 EscrowReturn

13.51,1 Synopsis

If the acceptor that was last reported as holding currency in escrow is still in that state, this call will cause it to return that currency.

```
void EscrowReturn (void) ;
```

13.51,2 Parameters

None

13.51,3 Return Value

None

13.51,4 Remarks

1. If a second acceptor has (unreported) currency in escrow at the time this call is made, it will immediately cause the **EscrowThroughput** to be updated.
2. If no currency is currently held in escrow when this call is made, it will be silently ignored.

13.6 Escrow system usage

Where an acceptor provides escrow facilities, the IMHEI card fully supports these: by enabling escrow mode. It reports the note that is currently held in escrow by an acceptor, and allows the game to either return or accept the escrow holding of the acceptor.

In most system only one escrow capable acceptor will be present, the IMHEI card will however support escrow on an unlimited number of acceptors. In order to allow for accurate information and control to pass between the game and the IMHEI firmware, the escrow holding reported is limited to a single acceptor at time. If two acceptors are holding escrow at the same time, the second will not be reported until the first has completed.

At start-up, the system does not report escrow details and all acceptors are run in “normal” mode where all currency is accepted. To use escrow the call **EscrowEnable** is issued. Following this the call **EscrowThroughput** will return the *total* value of all currency that has ever been held in escrow (in the same way as for **CurrentValue** except that the value is not preserved over resets). An increase in the value returned indicates that a note is now in escrow. The **HeldInEscrow** field within the **AcceptorCoin** structure will indicate the number of each note / coin that is currently being held.

The **EscrowAccept** call will cause the IMHEI card to complete the acceptance of the currency in question. When complete, this will be indicated by an increase in **CurrentValue**. An **EscrowReturn** call will cause the currency to be returned with no further indication to the game. Following either call, the **EscrowThroughput** value may increase immediately due to another acceptor having an escrow holding.

If the game wishes to stop using the escrow facilities, it may issue the **EscrowDisable** call. This will have the side effect of accepting any outstanding escrow holdings.

14. Meters / Counters

The IMHEI units will support the concept of external meters that are accessible from the outside of the PC system.

In keeping with the IMHEI concept, an interface is defined to an idealised meter. This will be implemented transparently by the card using the available hardware. Initially the IMHEI will support a ***Starpoint Electronic Counter***, although other hardware may be supported at a later date.

14.1 CounterIncrement

14.11,1 Synopsis

The **CounterIncrement** call is made by the PC application software to increment a specific counter value.

```
void CounterIncrement(long CounterNo,
                      long Increment);
```

14.11,2 Parameters

1. CounterNo
   This is the number of the counter to be incremented.

2. Increment
   This is the value to be added to the specified counter.

14.11,3 Return Value

None

14.11,4 Remarks

1. If the counter specified is higher than the highest supported, then the call is silently ignored.

14.2 CounterCaption

14.21,1 Synopsis

The **CounterCaption** call is used to associate a caption with the specified counter. This is related to the **CounterDisplay** call described below.

```
void CounterCaption(long  CounterNo,
                    char* Caption);
```

14.21,2 Parameters

1. CounterNo
   This is the number of the counter to be associated with the caption.
2. Caption
   This is an ASCII string that will be associated with the counter.

14.21,3 Return Value

None

14.21,4 Remarks

1. The meter hardware may have limited display capability. It is the system designer's responsibility to use captions that are within the meter hardware's capabilities.
2. If the counter specified is higher than the highest supported, then the call is silently ignored.
3. The specified caption is **not** stored in the meter, even if the meter offers this facility.

14.3 CounterRead

14.31,1 Synopsis

The **CounterRead** call is made by the PC application software to obtain a specific counter value as stored by the meter interface.

```
long CounterRead(long CounterNo);
```

14.31,2 Parameters

1. CounterNo
   This is the number of the counter to be incremented.

14.31,3 Return Value

The Value of the specified meter at system start-up.

14.31,4 Remarks

1. If the counter specified is higher than the highest supported, then the call returns -1

2. If the counter external hardware does not support counter read-out, then this will return the total of all increments since PC start-up.
3. If error conditions prevent the meter updating, this call will show the value it **should** be at, not its actual value. (The value is read only read from the meter at system start-up.)

14.4 ReadCounterCaption

14.41,1 Synopsis

The Read**CounterCaption** call is used to determine the caption for the specified counter

```
char* CounterCaption(long CounterNo);
```

14.41,2 Parameters

1. CounterNo
   This is the number of the counter to be incremented.

14.41,3 Return Value

None

14.41,4 Remarks

1. If the counter specified is higher than the highest supported, then the call returns an empty string (“”).
2. All captions stored in the meter are read out at system start-up and used to initialise the captions used by the interface.

14.5 CounterDisplay

14.51,1 Synopsis

The **CounterDisplay** call is used to control what is displayed on the meter.

```
void CounterDisplay (long DisplayCode) ;
```

14.51,2 Parameters

1. DisplayCode
   If positive, this specifies the counter that will be continuously display by the meter hardware.

   If negative, then the display will cycle between the caption (if set) for the specified counter for 1 second, followed by its value for 2 seconds.

14.51,3 Return Value

None

14.51,4 Remarks

1. This result of this call with a negative parameter is undefined if no counters have an associated caption.
2. Whenever the meter displayed is changed, the caption (if set) is always displayed for one second.

14.6 MeterStatus

14.61,1 Synopsis

The **MeterStatus** call is used determine whether working meter equipment is connected.

```
long MeterStatus (void);
```

14.61,2 Parameters

None

14.61,3 Return Value

One of the following:

Value	Meaning	Mnemonic
0	A Meter is present and working correctly	METER_OK
1	No Meter has ever been found	METER_MISSING
2	The Meter is no longer functioning	METER_DIED
3	The Meter is functioning, but is itself reporting internal problems	METER_FAILED

14.61,4 Remarks

None

14.7 MeterSerialNo

14.71,1 Synopsis

The **MeterSerialNo** call is used determine which item meter equipment is connected.

```
long MeterSerialNo ( void );
```

14.71,2 Parameters

None

14.71,3 Return Value

The 32-bit serial number retrieved from the meter equipment.

14.71,4 Remarks

1. Where the meter equipment is not present or does not have serial number capabilities, zero is returned.

15. E^{2}Prom

Included in the IMHEI card is E^{2}PROM memory, which is used by the embedded process to maintain counters etc. 256 bytes of this E^{2}PROM is available to users to store essential information if they wish to run their system with no other writeable storage.

In this section, routines are described to access this user storage and to allow for a user application to clear all the E^{2}PROM memory on the card, after testing and before delivery to an end user.

15.1 E2PromReset

15.11,1 Synopsis

The **E2PromReset** call is made by the PC application software to clear all the *internal* E^{2}PROM memory on the card. This is where the IMHEI system keeps the value in / value out counters, the configuration information, etc.

```
void E2PromReset(long LockE2Prom);
```

15.11,2 Parameters

1. LockE2Prom
   This is a Boolean flag. If zero, then the E2PROM may be reset again later.
   If non zero, then **all** future calls to this function will have no effect on the card.

15.11,3 Return Value

None

15.11,4 Remarks

An example application for this is available within the SDK folder structure.

15.2 E2PromWrite

15.21,1 Synopsis

The **E2PromWrite** call is made by the PC application software to write to all or part of the user E^{2}PROM on the card.

```
void E2PromWrite (void* UserBuffer,
                  long  BufferLength);
```

15.21,2 Parameters

1. UserBuffer
   This is the address of the user's buffer, from which **BufferLength** bytes of data are copied to the start of the user area.
2. BufferLength
   This is the count of the number bytes to be transferred. If this is greater than 256 the extra will be silently ignored.

15.21,3 Return Value

None

15.21,4 Remarks

1. This call schedules the write to the E^{2}PROM memory and returns immediately. There is no way of knowing when the E^{2}PROM has actually been updated but, barring hardware errors, it will be complete within one second of the call.

15.3 E2PromRead

15.31,1 Synopsis

The **E2PromRead** call is made by the PC application software to obtain all or part of the user E^{2}PROM from the card.

```
void E2PromRead (void* UserBuffer,
                 long  BufferLength);
```

15.31,2 Parameters

1. UserBuffer
   This is the address of the user's buffer, into which the current contents of the user E^{2}PROM area are copied.
2. BufferLength
   This is the count of the number bytes to be transferred. If this is greater than 256 the extra will be silently ignored.

15.31,3 Return Value

None

15.31,4 Remarks

1. Unwritten E^{2}Prom memory is initialised all one bits.
2. Writes performed by E2PromWrite will be reflected immediately in the data returned by this function, regardless of whether or not they have been committed to E^{2}Prom memory.

16. Bar Codes

Where an acceptor provides barcode facilities, the IMHEI card fully support this by enabling bar code acceptance and reporting the barcodes read.

Barcode reading is always handled using the Escrow position on the acceptor. The barcode is held in the acceptor pending a call from the application the either stack or return it.

In most systems, only one barcode capable acceptor will be present, the IMHEI card will however support barcodes on an unlimited number of acceptors. In order to allow for accurate information and control to pass between the game and the IMHEI firmware, the barcode reported is limited to a single acceptor at time. If two acceptors are holding barcoded tickets at the same time, the second will not be reported until the first has completed.

All the barcodes processed by the IMHEI system are in the format “Interleaved 2 of 5” and are 18 characters long. (Functions return a 19 character, NULL terminated, string.)

Barcodes read by the IMHEI can also be printed if a dedicated barcode printer is connected.

16.1 Barcode Reading

16.2 BarcodeEnable

16.21,1 Synopsis

Change the mode of operation of all Barcode capable acceptors to accept tickets with barcodes on them.

The **BarcodeEnable** call is used to start using the Barcode system

```
void BarcodeEnable (void) ;
```

16.21,2 Parameters

None

16.21,3 Return Value

None

16.3 BarcodeDisable

16.31,1 Synopsis

Change the mode of operation of all Barcode capable acceptors back to the default mode in which only currency is accepted.

```
void BarcodeDisable (void) ;
```

16.31,2 Parameters

None

16.31,3 Return Value

None

16.31,4 Remarks

1. If a Barcoded ticket is currently held when this call is made, it will be returned without comment.

16.4 BarcodeInEscrow

16.41,1 Synopsis

This is the regular “polling” call that the application should make into the DLL to obtain the current status of the barcode system. If a barcode is read by an acceptor, it will be held in escrow and this call will return true in notification of the fact.

```
bool BarcodeInEscrow (char BarcodeString[19]) ;
```

16.41,2 Parameters

1. BarcodeString
   A pointer to a buffer of at least 18 characters into which the last barcode read from any acceptor is placed. This will be all NULL if no barcoded ticket has been read since system start-up.

16.41,3 Return Value

The return value is true if there is a barcode ticket currently held in an Acceptor, false if there is not.

16.41,4 Remarks

1. There is no guarantee that at the time the call is made the acceptor has not irrevocably decided to auto-eject the ticket.

16.5 BarcodeStacked

16.51,1 Synopsis

Following a call to **BarcodeAccept** the system *may* complete the reading of a barcoded ticket. If it does, then the count returned by **BarcodeStacked** will increment. There is no guarantee that this will take place, so the application should continue to poll **BarcodeInEscrow**.

```
long BarcodeStacked (char BarcodeString[19]) ;
```

16.51,2 Parameters

2. BarcodeString
   A pointer to a buffer of at least 18 characters into which the last barcode read from any acceptor is placed. This will be all NULL if no barcoded ticket has been read since system start-up.

16.51,3 Return Value

The count of all the barcoded tickets that have been stacked since system start-up. An increase in this value indicates that the current ticket has been stacked - its contents will be in the **BarcodeString** buffer.

16.51,4 Remarks

2. It is the responsibility of the application to keep track of the number of tickets that have been accepted and to monitor for new insertions by increases in the returned value.

3. Note that this value should be read following the call to **OpenMHE** and before the call to **EnableInterface / BarcodeEnable** to establish a starting point before any new tickets are read.

16.6 BarcodeAccept

16.61,1 Synopsis

If the acceptor that was last reported as holding a Barcode ticket is still in that state, this call will cause it to accept that currency.

```
void BarcodeAccept (void) ;
```

16.61,2 Parameters

None

16.61,3 Return Value

None

16.61,4 Remarks

1. If a second acceptor has (unreported) currency in Barcode at the time this call is made, it will immediately cause the **BarcodeTicket** to be updated.
2. If no ticket is currently held when this call is made, it will be silently ignored.

16.7 BarcodeReturn

16.71,1 Synopsis

If the acceptor that was last reported as holding a Barcode ticket is still in that state, this call will cause it to return that currency.

```
void BarcodeReturn (void) ;
```

16.71,2 Parameters

None

16.71,3 Return Value

None

16.71,4 Remarks

1. If a second acceptor has (unreported) currency in Barcode at the time this call is made, it will immediately cause the **BarcodeTicket** to be updated.
2. If no ticket is currently held when this call is made, it will be silently ignored.

16.8 Barcode Printing

16.9 BarcodePrint

16.91,1 Synopsis

This call is used to print a barcoded ticket, if the IMHEI system supports a printer.

```
void BarcodePrint (TicketDescription* TicketContents) ;
```

16.91,2 Parameters

1. TicketContents.
   Pointer to a TicketDescription structure that holds pointers to the strings that the application is "filling in". NULL pointers will cause the relevant fields to default (usually to blanks).

```
typedef struct
  {
  long    TicketType ;                        // The "template" for the ticket
  char*   BarcodeData ;
  char*   AmountInWords ;
  char*   AmountAsNumber ;          // But still a string
  char*   MachineIdentity ;
  char*   DatePrinted ;
  char*   TimePrinted ;
  } TicketDescription ;
```

16.91,3 Return Value

None

16.91,4 Remarks

1. There are a number of fields that can be printed a barcode ticket.
   Rather than provide a function with a large number of possibly null parameters, we use a structure, which may have fields added to end.
   The user should ensure that all unused pointers are zero.
2. Before issuing this call the application should ensure that **BarcodePrintStatus** has returned a status of **PRINTER_IDLE**
3. The mechanics of the priniting mechanism rely on **BarcodePrintStatus** being called regularly after this call, in order to "stage" the data to the interface.

16.10 BarcodePrintStatus

16.101,1 Synopsis

This call is used to determine the status of the barcoded ticket printing system.

```
long BarcodePrintStatus (void) ;
```

16.101,2 Parameters

None

16.101,3 Return Value

Mnemonic	Value	Meaning
PRINTER_NONE	0	Printer completely non functional / not present
PRINTER_FAULT	0x80000000	There is a fault somewhere
PRINTER_IDLE	0x00000001	The printer is OK / Idle /Finished
PRINTER_BUSY	0x00000002	Printing is currently taking place
PRINTER_PLATEN_UP	0x00000004	
PRINTER_PAPER_OUT	0x00000008	
PRINTER_HEAD_FAULT	0x00000010	
PRINTER_VOLT_FAULT	0x00000040	
PRINTER_TEMP_FAULT	0x00000080	
PRINTER_INTERNAL_ERROR	0x00000100	
PRINTER_PAPER_IN_CHUTE	0x00000200	
PRINTER_OFFLINE	0x00000400	
PRINTER_MISSING_SUPPY_INDEX	0x00000800	
PRINTER_CUTTER_FAULT	0x00001000	
PRINTER_PAPER_JAM	0x00002000	
PRINTER_PAPER_LOW	0x00004000	
PRINTER_NOT_TOP_OF_FORM	0x00008000	
PRINTER_OPEN	0x00010000	
PRINTER_TOP_OF_FORM	0x00020000	
PRINTER_JUST_RESET	0x00040000	

16.101,4 Remarks

1. The mechanics of the priniting mechanism rely on this being called regularly after the **BarcodePrint** call, in order to "stage" the data to the interface, until **PRINTER_BUSY** is no longer returned.
2. Any reported fault that requires an operator action will cause the **PRINTER_FAULT** bit to be set.
3. A **PRINTER_NONE** status will be reported if the printer is powered off after having been working.

17. Engineering Support

It is not envisaged that games programmers will use these particular functions.

They are included here for completeness, but can be ignored if you are just interfacing game software to a collection of standard peripherals.

17.1 WriteInterfaceBlock

17.11,1 Synopsis

The **WriteInterfaceBlock** call sends a "raw" block to the specified interface.

There is no guarantee as to when, in relation to this, regular polling sequences will be sent, except that while the system is *disabled*, the interface card will not put any traffic onto the interface.

```
void WriteInterfaceBlock (long   Interface,
                          void*  Block,
                          long   Length) ;
```

17.11,2 Parameters

1. Interface

   The serial number of the interface that is being accessed.

2. Block

   A pointer to program buffer with a raw message for the interface.
   This must be a sequence of bytes, with any addresses and embedded lengths required by the peripheral device included. Overheads such as standard checksums will be added by the IMHEI.

3. Length

   The number of bytes in the message.

17.11,3 Return Value

None

17.11,4 Remarks

Using this function with some interfaces does not make sense, see status returns from **ReadInterfaceBlock**.

17.2 ReadInterfaceBlock.

17.21,1 Synopsis

The **ReadInterfaceBlock** call reads the “raw” response to a single **WriteInterfaceBlock**.

```
long ReadInterfaceBlock (long   Interface,
                         void*  Block,
                         long   Length) ;
```

17.21,2 Parameters

1. Interface
   The serial number of the interface being accessed

2. Block
   A pointer to the program buffer into which any response is read.

3. Length
   The space available in the program buffer.

17.21,3 Return Values

+ve return values indicate a message has been returned.

Other values are:

-5	INTERFACE_NO_DATA	The handshake has completed, but no data was returned.
-4	INTERFACE_TOO_LONG	Input command is too long
- 3	INTERFACE_NON_EXIST	Non command oriented interface (the corresponding **WriteInterfaceBlock** was ignored)
- 2	INTERFACE_OVERFLOW	Command buffer overflow (the corresponding **WriteInterfaceBlock** was ignored)
- 1	INTERFACE_TIMEOUT	Timeout on the interface - no response occurred (The interface will be reset if possible)
0	INTERFACE_BUSY	The response from the **WriteInterfaceBlock** has not yet been received
> 0		Normal successful response - the number of bytes received and placed into the buffer.

17.21,4 Remarks

1. Repeated calls to **WriteInterfaceBlock** without a successful response are <u>not</u> guaranteed not to overflow internal buffers.

2. The program is expected to “poll” the interface for a response, indicated by a non-zero return value.