

# **SECTION 4**

## **NV9 USB MANUAL SET**

### **MECHANICAL AND ELECTRICAL MANUAL**

INTELLIGENCE IN VALIDATION



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## NV9 USB MANUAL SET – SECTION 4

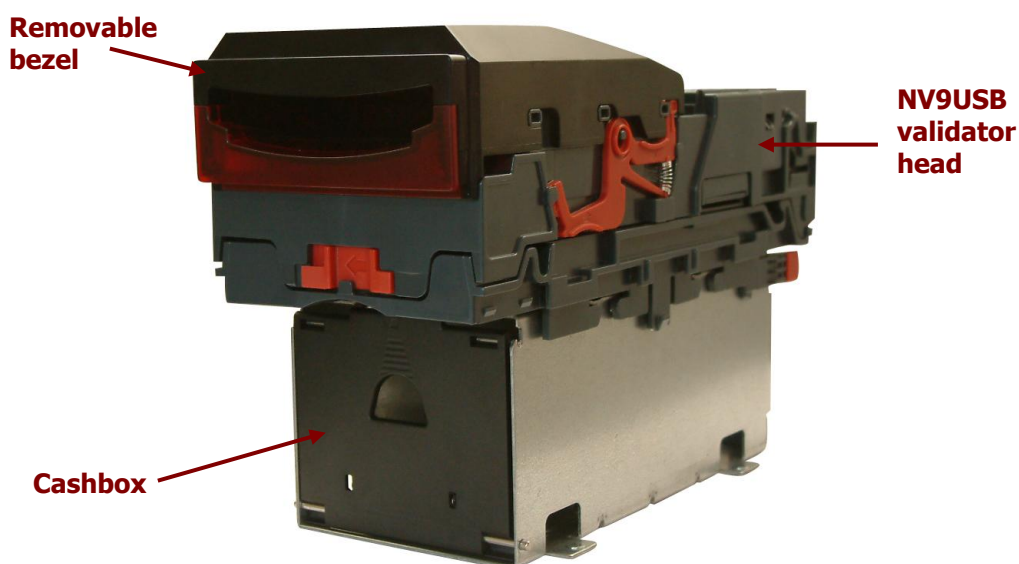
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## 4. MECHANICAL AND ELECTRICAL MANUAL

This section is one part of a complete manual set: Design Engineers who are designing a host machine cabinet, or looking to integrate the NV9 USB validator into an existing cabinet would need to read this section. This section contains the all the mechanical and electrical information a designer needs to effectively integrate the NV9 USB validator into a host machine.

### 4.1 Introduction

The NV9 USB validator is made up of three basic components: an NV9 USB validator head, removable bezel and a cashbox (as shown below):



The NV9 USB validator is a device that can accept, validate and store 300 or 600 bank notes of mixed denominations.



**NV9 USB  
Rear View**



**NV9 USB  
Side View**



**NV9 USB  
Front View**

**Information**

Validator compatibility.

The NV9 USB validator is pin for pin compatible with the NV7 / NV8 / NV9 / NV10 series of validators, but **NOT** with earlier versions of the product (NV2 – NV5).

The NV9 USB Validator leaves the factory preset to at least one currency and one firmware interface so that it is ready for immediate installation. The NV9 USB validator works with any NV9 USB currency dataset created by Innovative Technology Ltd - datasets can be downloaded from the Support section of the ITL website.

## 4.2 Assembly and Fitting Instructions

Installing the NV9 USB is a simple operation; the validator can be installed **vertically** or **horizontally**, depending on the type of cashbox fitted or orientation needed:

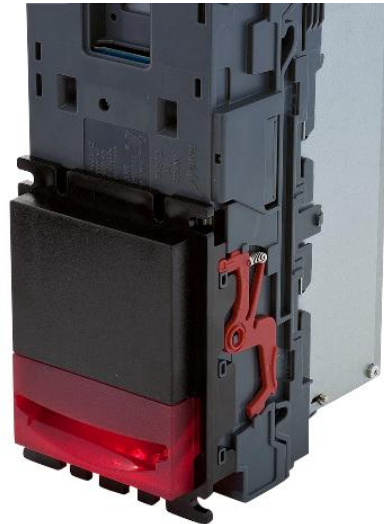
1. If the validator is fitted with a clip-on cashbox, then the validator will be mounted **VERTICALLY**



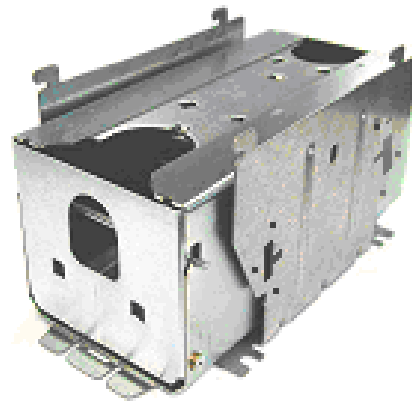
2. The validator is secured in the host machine using a suitable vertical bezel



3. The cashbox is attached to the validator by locating and sliding until the cashbox is clipped securely



4. If the validator is fitted with a slide-on cashbox, then the validator can be mounted HORIZONTALLY or VERTICALLY



5. The validator will be fitted with a suitable horizontal or vertical bezel



6. The cashbox housing is mounted in the host machine with the NV9 USB mounted on top. The cashbox is then slid into the housing until it is securely clipped.



7. If the validator is fitted with an NV11 standard cashbox, then the validator will be mounted HORIZONTALLY



8. The validator will be fitted with a suitable horizontal bezel



9. The cashbox is attached to the validator by locating and sliding until the cashbox is clipped securely





**Information**

Check website for options.

There are many variants of bezel and cashbox type available for the NV9 USB validator. Please check the ITL website ([www.innovative-technology.co.uk](http://www.innovative-technology.co.uk)) for up to date information on the options available.

The technical drawings which can be found at the end of this section show all the dimensional information needed to mount the unit.

**WARNING!**

Do not attempt disassembly

Do not attempt to disassemble the NV9 USB validator head – trying to do this could cause personal injury and will damage the unit beyond repair.

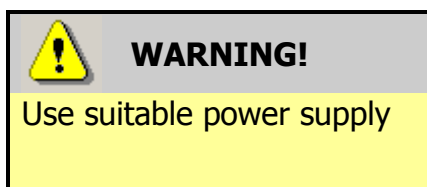


### 4.3 Technical Specifications

The full technical specifications for the NV9 USB Validator can be found in Section 6, Appendix B of this manual set. A brief summary is given here:

DC Voltage	Minimum	Nominal	Maximum
Absolute limits	10.8 V	12 V	13.2 V
Absolute limits (when fitted with IF5 interface)	18 V	---	48 V DC or 34 V AC
Supply ripple voltage	0 V	0V	0.25 V @ 100 Hz
Supply Current			
Standby	200 mA		
Running	1 A		
Peak (motor stall)	1.5 A		

Interface Logic Levels	Logic Low	Logic High
Inputs	0 V to +0.5 V	+3.7 V to +12 V
Outputs (2.2 kΩ pull-up)	+0.6 V	Pull-up voltage of host interface
Maximum current sink	50 mA per output	



Ensure that the supply voltage to the NV9 USB is not lower than 10.8 V and that the power supply can provide sufficient current to avoid incorrect operation and excessive note rejects.

We recommend that your power supply is capable of supplying 12V DC at 3 A.

- For 12V operation, use TDK Lambda model SWS50-12. This power supply is available from a variety of suppliers including Farnell (stock code 1184645) and RS (stock code 466-5869).

### 4.4 Cable Specifications

The **minimum** specification for wire used in power cables for the NV9 USB validator is given here:

Minimum AWG	Nominal current rating	Peak current rating	Cable rating	Insulation rating
30	1.0 A	1.5 A	2 A	80 °C

Do not use wire of an inferior specification, as this can cause operating problems with the validator.



## 4.5 Electrical Interfaces

The NV9 USB Validator has a single connector that is used to allow interfacing and programming.

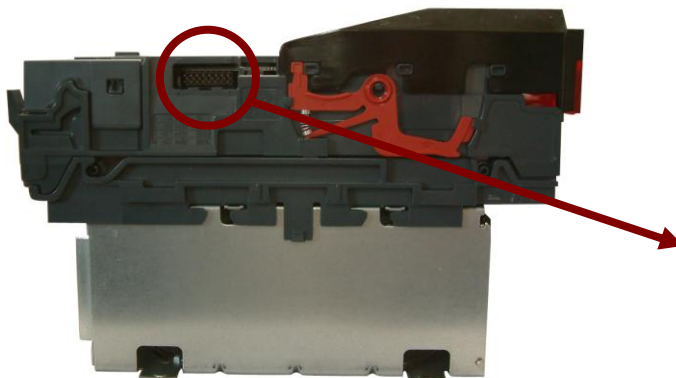


### Information

Power always required regardless of connection type.

Power is always required on pins 15 and 16 of the 16 way connector.

The connector is a 16 pin socket located on the side of the validator head. This connector is used to interface the NV9 USB to the host machine. The pin numbering of the socket is shown below, as well as an overview of the socket connections:



**Interface Socket**



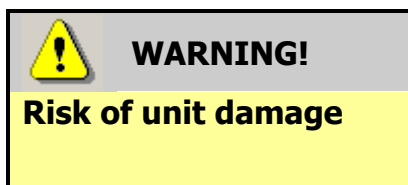
Pin	Description
1	Serial Data Out (Tx)
5	Serial Data In (Rx)
11	USB Data +
12	USB Data -
13	USB Power (+5V)
15	+ V
16	0V / Ground Connection

To use a USB connection with the NV9 USB, a USB cable with a 16 way connector on one end (ITL Part Number CN00392) should be used. The CN00392 cable fits into the 16 way connector and allows high speed programming and serial communications when used in SSP, ccTalk and SIO modes.



When using the USB connection, power must be supplied to the NV9 USB using the CN00392 cable.

The socket connections for the natively supported protocols are shown in the tables below, as is a summary of the interface units needed for other types of operation:



Do not make any connections to the interface socket pins marked '**Do not connect**' – making connections to these pins could cause severe damage to the unit.

### NV9 USB SSP Interface:

Pin	Name	Type	Description
1	Vend 1	Output	Serial data out (Tx)
2	Factory use only		<b>Do not connect</b>
3			
4			
5	Inhibit 1	Input	Serial data in (Rx)
6	Factory use only		<b>Do not connect</b>
7			
8			
9			
10			
11	USB D+	Data	USB Data +
12	USB D-	Data	USB Data -
13	USB Vcc	Power	USB +V (+5V)
14	Factory use only		<b>Do not connect</b>
15	V In	Power	+V
16	GND	Ground	GND

**NV9 USB ccTalk Interface:**

Pin	Name	Type	Description
1	Vend 1	Output	Serial data – must also be connected to pin 5
2	Factory use only		<b>Do not connect</b>
3			
4			
5	Inhibit 1	Input	Serial data – must also be connected to pin 1
6	Factory use only		<b>Do not connect</b>
7			
8			
9			
10			
11	USB D+	Data	USB Data +
12	USB D-	Data	USB Data -
13	USB Vcc	Power	USB +V (+5V)
14	Factory use only		<b>Do not connect</b>
15	V In	Power	+V
16	GND	Ground	GND

**NV9 USB SIO Interface:**

Pin	Name	Type	Description
1	Vend 1	Output	Serial data
2	Factory use only		<b>Do not connect</b>
3			
4			
5	Inhibit 1	Input	Serial data
6	Factory use only		<b>Do not connect</b>
7			
8			
9			
10			
11	USB D+	Data	USB Data +
12	USB D-	Data	USB Data -
13	USB Vcc	Power	USB +V (+5V)
14	Factory use only		<b>Do not connect</b>
15	V In	Power	+V
16	GND	Ground	GND



### NV9 USB Pulse Interface:

Pin	Name	Type	Description
1	Vend 1	Output	Credit pulse stream output
2	Factory use only		<b>Do not connect</b>
3			
4			
5	Inhibit 1	Input	Inhibit Channel 1 by holding this pin HIGH
6	Inhibit 2	Input	Inhibit Channel 2 by holding this pin HIGH
7	Inhibit 3	Input	Inhibit Channel 3 by holding this pin HIGH
8	Inhibit 4	Input	Inhibit Channel 4 by holding this pin HIGH
9	Busy	Output	Busy signal – output is pulled low when the validator is busy
10	Escrow	Input	Enable Escrow function by holding this pin LOW
11	Factory use only		<b>Do not connect</b>
12			
13			
14			
15	V In	Power	+V
16	GND	Ground	GND

When operating in Pulse mode the NV9 USB outputs a number of pulses on Vend 1. The number of pulses for each channel is different and set to default values within the dataset. The number of pulses and the pulse duration can be modified using the Bank Note Validator Currency Manager Software, and a maximum of 16 channels can be used.

### NV9 USB Multi Drop Bus (MDB) Interface:

MDB is a serial bus interface commonly used in electrically controlled vending machines. This is a 9600 Baud Master – Slave system where the NV9 USB validator is a slave to master controller.

To use the NV9 USB with MDB protocol, an **IF5** external interface is required. The IF5 regulates the power supply and opto-isolates the communication lines. The NV9 USB validator supports the MDB Protocol Version 1, Level 1.



**NV9 USB Parallel Interface:**

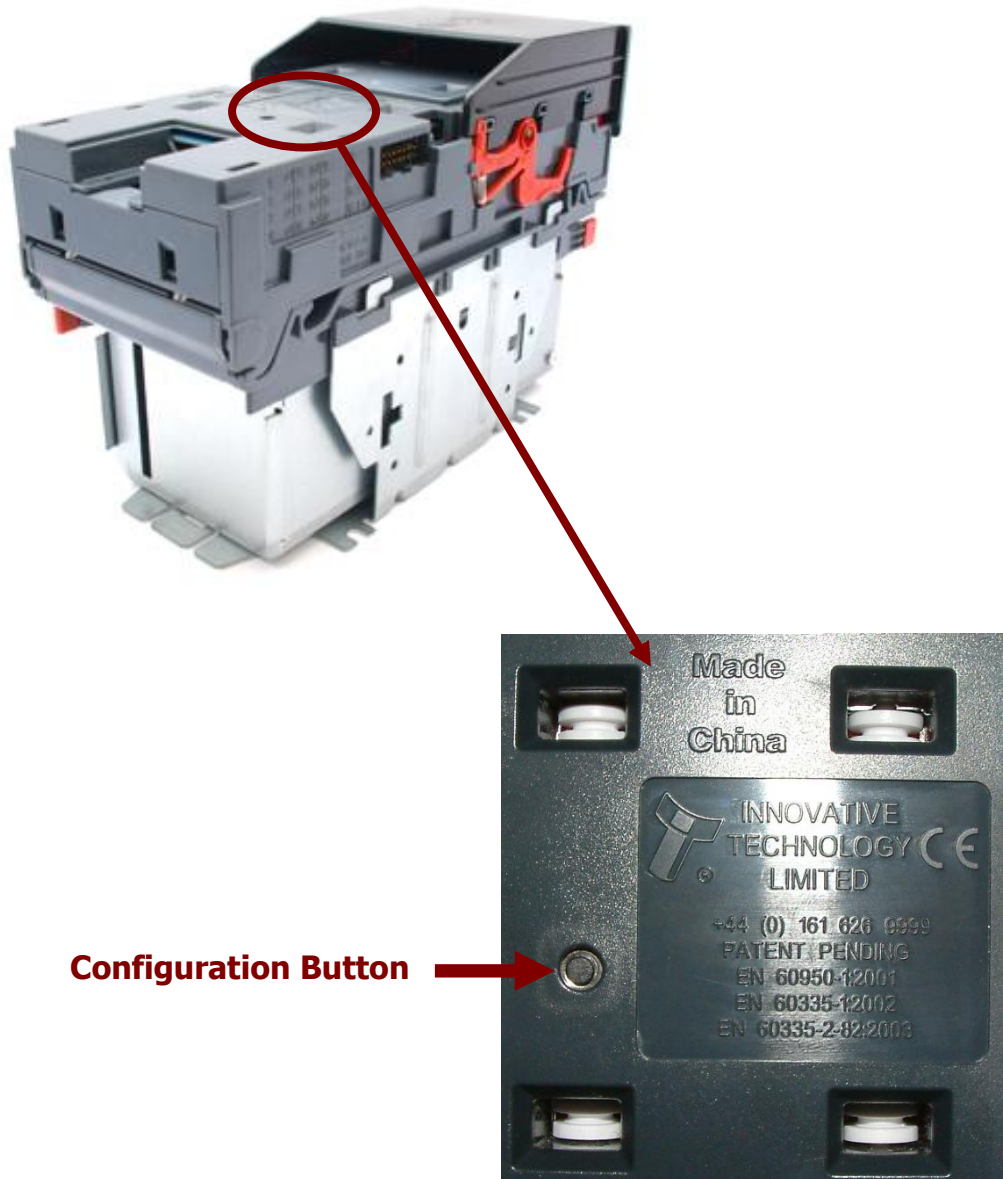
Pin	Name	Type	Description
1	Vend 1	Output	Channel 1 credit, 100ms active low pulse
2	Vend 2	Output	Channel 2 credit, 100ms active low pulse
3	Vend 3	Output	Channel 3 credit, 100ms active low pulse
4	Vend 4	Output	Channel 4 credit, 100ms active low pulse
5	Inhibit 1	Input	Inhibit Channel 1 by holding this pin HIGH
6	Inhibit 2	Input	Inhibit Channel 2 by holding this pin HIGH
7	Inhibit 3	Input	Inhibit Channel 3 by holding this pin HIGH
8	Inhibit 4	Input	Inhibit Channel 4 by holding this pin HIGH
9	Busy	Output	Busy signal – output is pulled low when the validator is busy
10	Escrow	Input	Enable Escrow function by holding this pin LOW
11	Factory use only		<b>Do not connect</b>
12			
13			
14			
15	V In	Power	+V
16	GND	Ground	GND

When operating in Parallel mode the NV9 USB will issue a 100ms active LOW pulse on the relevant vend line, and a maximum of 4 channels can be used. There is also the option to use a binary output where the NV9 USB will output a binary pattern on vend lines 1 – 4. Binary mode can be set as an option using a configuration card or with the Bank Note Validator Currency Manager Software.




## 4.6 Configuration Button

The NV9 USB does not use DIP switches to configure the unit – configuration and setting is carried out by using a Configuration Button mounted on top of the unit:



There are several functions available when using the Configuration Button, and these are listed in the next table:

	<b>WARNING!</b>
<b>Risk of unit damage</b>	

When in programming mode, do not turn off the power before the operation is complete as this will make the unit unusable.

Action	Power Status	Function	Confirmation
Press and hold (more than 2 seconds) until the bezel illuminates, then release	Powered ON	Sets validator to Programming mode (SSP)	Bezel will flash quickly and validator will restart
Press once (less than 1 second)	Powered ON	Enables Configuration Card programming – press again to cancel this mode	Bezel will flash on and off slowly while in this mode
Press twice (within half a second)	Powered ON	Shows current interface type	Bezel will flash – see the flash count table below
Press and hold as validator is powered up	Powered OFF / ON	Resets to default (factory) settings	---

**NV9 USB Programming Mode** - Press and hold the configuration button for approximately 2 seconds while the NV9 USB is powered up (until the bezel LED illuminates). The Bezel LED will flash rapidly as the button is released to indicate that SSP is being loaded. Once this process has finished the NV9 USB will reset. The NV9 USB will now be in Programming Mode (SSP) and allow connection to a PC via a CN392 cable, DA2 adapter or connection to a DA3.

Pressing and holding the button again will return the NV9 USB to its original interface.

**Configuration Card Programming Mode** - Press the configuration button once while the NV9 USB is powered up. If done correctly, the Bezel LED will flash every second. This indicates that the validator is ready for the insertion of a Configuration Card to change the Firmware Protocol in the NV9 USB. (See subsection 4.7 of this manual for more details).

This mode can be cancelled by pressing the configuration button once.

**Encryption Key Reset Function (ccTalk)** - This function will only be possible if the NV9 USB is programmed to operate in ccTalk mode, as it is not possible to reset the key from SSP mode.

Press and hold the configuration button while the NV9 USB powered is off. Apply the power and keep the button pressed for several seconds. Release the button and the ccTalk Encryption key will now be restored to the default setting.





**Current Setting Indicator Mode** - Quickly pressing the configuration button twice will cause the bezel LEDs to flash – the number of flashes indicates which interface is currently selected:

Flash Count	Interface
1	SSP
2	Pulse
3	MDB
6	ccTalk
7	SIO
8	Parallel

The NV9 USB Validator leaves the factory preset to at least one currency and one interface so that it is ready for immediate installation. The installed dataset and interface are detailed on the product label located on the top of the validator head.

## 4.7 Programming

Full details on programming the NV9 USB Validator using software can be found in Section 3 of this manual set (ITL Software Support Guide).

It is also possible to program the NV9 USB by the use of a configuration card. Summary information on configuration card programming can be found in Section 6, Appendix E of this manual set. More detailed information can be found in Section 5 of this manual set, or in ITL technical document GA959; the current version of this document can be downloaded from the Support section of the ITL website.



### Information

Validator specific.

The configuration card template contained in document GA959 is specific to the NV9 USB validator, and cannot be used for other products within the ITL range of validators.

If you use a configuration card to program the NV9 USB and there is an error, the card will be ejected and the bezel LEDs will flash slowly as shown in the table below:

Number of flashes	Indicated error
<b>2</b>	Invalid card read – card entered wrong way around, misread or wrong card version used
<b>3</b>	No interface selection was detected on the card
<b>4</b>	Multiple interface selections detected
<b>5</b>	Invalid interface detected – the selected interface is not available for this validator
<b>6</b>	Selected interface is not compatible with this validator version
<b>7</b>	Pulse configuration error – selected pulse options are invalid
<b>8</b>	ccTalk configuration error – the selected ccTalk options are invalid (ccTalk 8 bit chk not allowed without ccTalk plain)
<b>9</b>	Low power mode not available for this validator version



## 4.8 Basic Operation

The NV9 USB validator is a device that can accept, validate and store 300 or 600 bank notes of mixed denominations, and works with any NV9 USB currency dataset created by Innovative Technology Ltd.

Validated bank notes are stored in the NV9 USB's cashbox, and bank notes accepted by the validator are not visible once inside the unit and can only be taken out of the cashbox manually.

The NV9 USB Validator has inbuilt fault detection facilities. If there is a configuration or other error, the NV9 USB front bezel will flash in a particular sequence.

A summary of the Bezel Flash Codes for the NV9 USB is shown below:

Flashes		Indicated Error	Comments
Long	Short		
<b>0</b>	<b>0</b>	None	
<b>1</b>	<b>2</b>	Note path jam	Remove obstruction and follow the cleaning procedure in Section 2 of this manual set
	<b>3</b>	Unit not initialised	Contact ITL technical support
	<b>4</b>	Internal sensor unable to calibrate	Ensure note path is firmly closed, then cycle the power to the unit. If the problem persists contact ITL technical support
<b>3</b>	<b>1</b>	Firmware checksum error	Download new firmware
	<b>2</b>	Interface checksum error or unable to set programmed interface	
	<b>3</b>	EEPROM checksum error	
	<b>4</b>	Dataset checksum error	
<b>4</b>	<b>1</b>	Power supply too low	Check power supply
	<b>2</b>	Power supply too high	



## 4.9 Spare Parts

ITL Part Number	Description	Details
<b>CN00392</b>	Power and USB Communication Cable	USB 2.0 Compliant Type A to 16 way header cable

**Figure 1**

Soldered together

Black USB GND To CON1.1

Black 0V To CON4.16

Black 0V TO T2

USB Screen Insulate using Heat Shrink

Standard USB lead (Maximum diameter: 5.0mm, Shielded, Black colour)

Heat shrink sleeve (Black)

White and Green Wires Twisted Together

CON1 (Front View)

CON1 (Top View)

CON2 (Front View)

CON2 (Bottom View)

T1 Red +12V

T2 Black 0V

Stripped and tinned

Heat shrink sleeve (Black) - 25mm long spaced every 150mm

1500

15

60

1500

20

15

15

16

2

### Comments:

Please consult the tables on the next page for pin out and connector information.



**CN00392 Parts List**

Qty	Description	Supplier	Alternative
1	USB 2.0 lead with type A plug	Molex 88728-3400	RS 324-8362
2	8 way 2 row 2.54mm pitch friction lock housing	Molex 90142-0016	Leotronics 2652-2161
9	Gold plated crimp socket 22-24 AWG	Molex 90119-2110	Leotronics 2653-2000
2	Black heat shrink sleeving	---	---
2	26 AWG stranded single core cable, PVC insulated	---	---

**CN00392 Connectivity**

CON1	CON2	Gauge	Colour	Comments
Pin				
1	13		Red	USB +V (+5V)
2	12		White	USB Data – (twist together with Data +)
3	11		Green	USB Data + (twist together with Data -)
4	16		Black	USB GND - see figure 1 for connection detail
Screen	16		Black	See figure 1 for connection detail
---	16	26 AWG	Black	0V - see figure 1 for connection detail
---	15	26 AWG	Red	+12V - see figure 1 for connection detail
<b>Notes:</b> CON2 pins 1 - 4 have crimps fitted but these are not connected. CON2 pins 5 -10 and 14 have no crimps fitted				


**WARNING!**

**Use correct wire gauges**

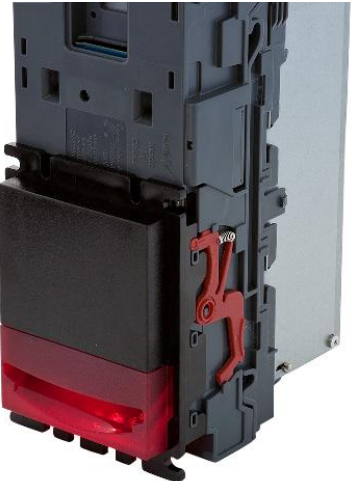
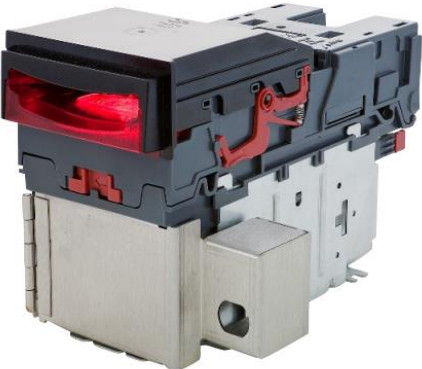
If you choose to make your own cables, you must make sure that the wire gauges are suitable for use with the validator. The minimum wire gauge for the CN392 cable is **30 AWG**, with **26 AWG** being recommended.






<b>Bezels</b>		
<b>ITL Part Number</b>	<b>Description</b>	
<b>PA00188</b>	Vertical Upstack Bezel Assembly	
<b>PA00189</b>	Horizontal Bezel Assembly	
<b>PA00190</b>	Vertical Upstack Extended Snout Bezel Assembly	
<b>PA00191</b>	Vertical Downstack Extended Snout Bezel Assembly	
<b>PA00256</b>	66mm Vertical Upstack Bezel	No image available
<b>PA00268</b>	69mm Fixed Width Horizontal Bezel	No image available
<b>PA00296</b>	Vertical Up/Down Flat 66mm Bezel Assembly	No image available

<b>PA00896</b>	Horizontal Bezel Assembly (NV11)	
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**Cashboxes**

<b>PA00185</b>	Clip-on Cashbox Assembly (300C)	
<b>PA00186</b>	Locking Cashbox Assembly (300L)	



<b>PA00192</b>	Slide-on Cashbox Assembly (300S)	
<b>PA00193</b>	Clip-on Cashbox Assembly (600C)	
<b>PA00194</b>	Slide-on Cashbox Assembly (600S)	

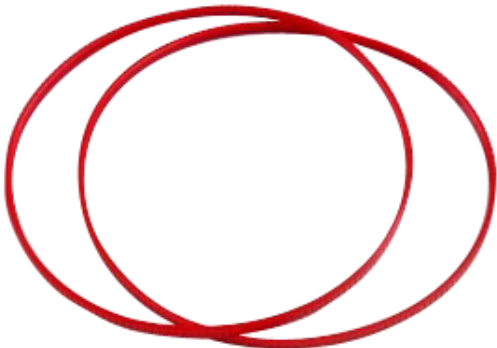
<b>PA00898</b>	Standard Cashbox Assembly (NV11)	
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**Information**

Check website for options.

There are many variants of bezel and cashbox type available for the NV9 USB validator. Please check the ITL website ([www.innovative-technology.co.uk](http://www.innovative-technology.co.uk)) for up to date information on the options available.

**Drive Belts**

<b>FD00106</b>	NV9 USB Red Drive Belt	
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## 4.10 Guidance Notes

### Cleaning

The NV9 USB Validator has been designed in a way to prevent damage and airborne contamination reaching the optical sensors; however, depending upon the environment the NV9 USB may require occasional cleaning or belt changing.

**Caution!**

Do not use solvent based cleaners on any part of the NV9 USB unit.

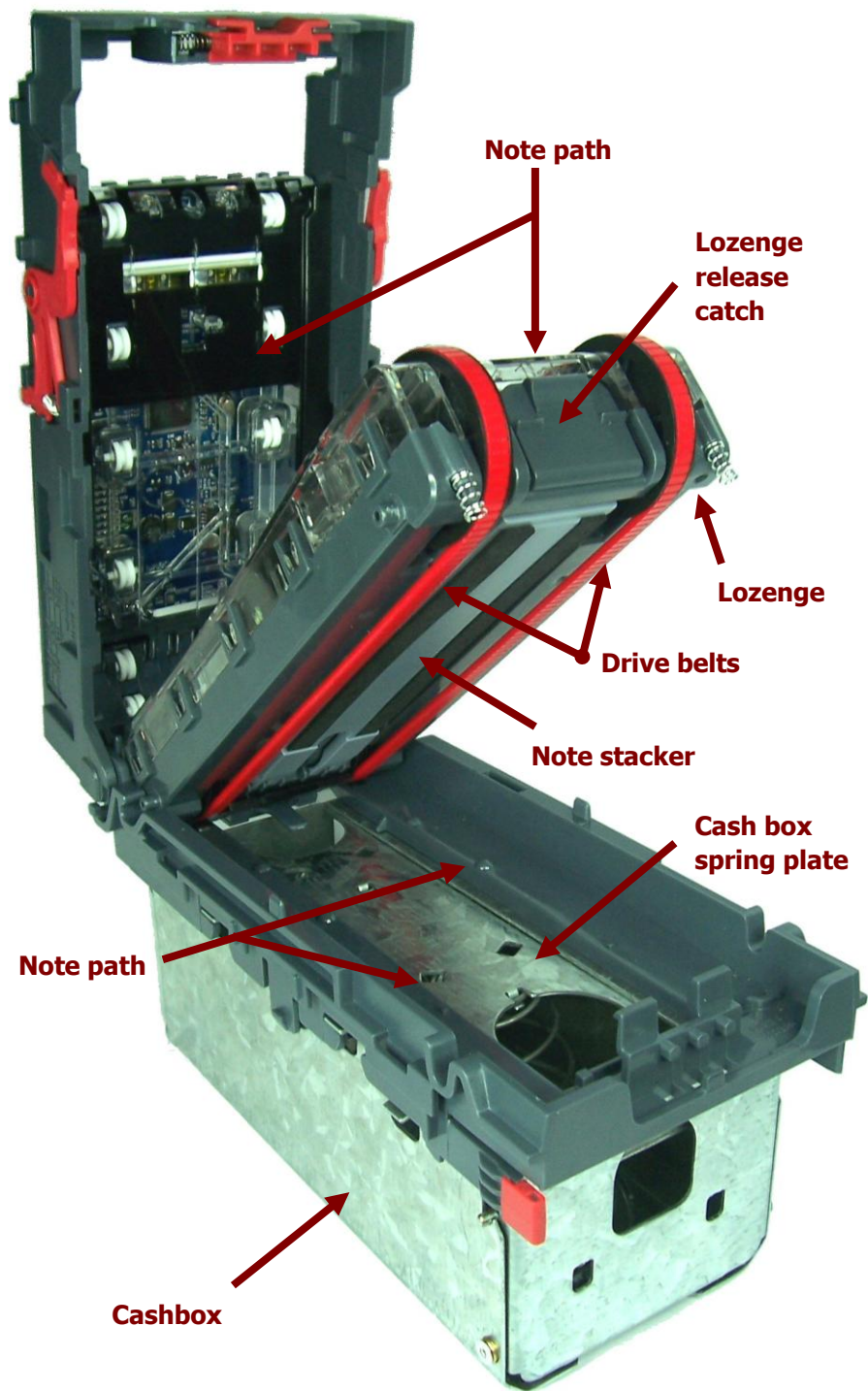
Do not use solvent based cleaners such as alcohol, petrol, methylated spirits, white spirit or PCB cleaner. Using these solvents can cause permanent damage to the unit; only use a mild detergent solution as directed below.

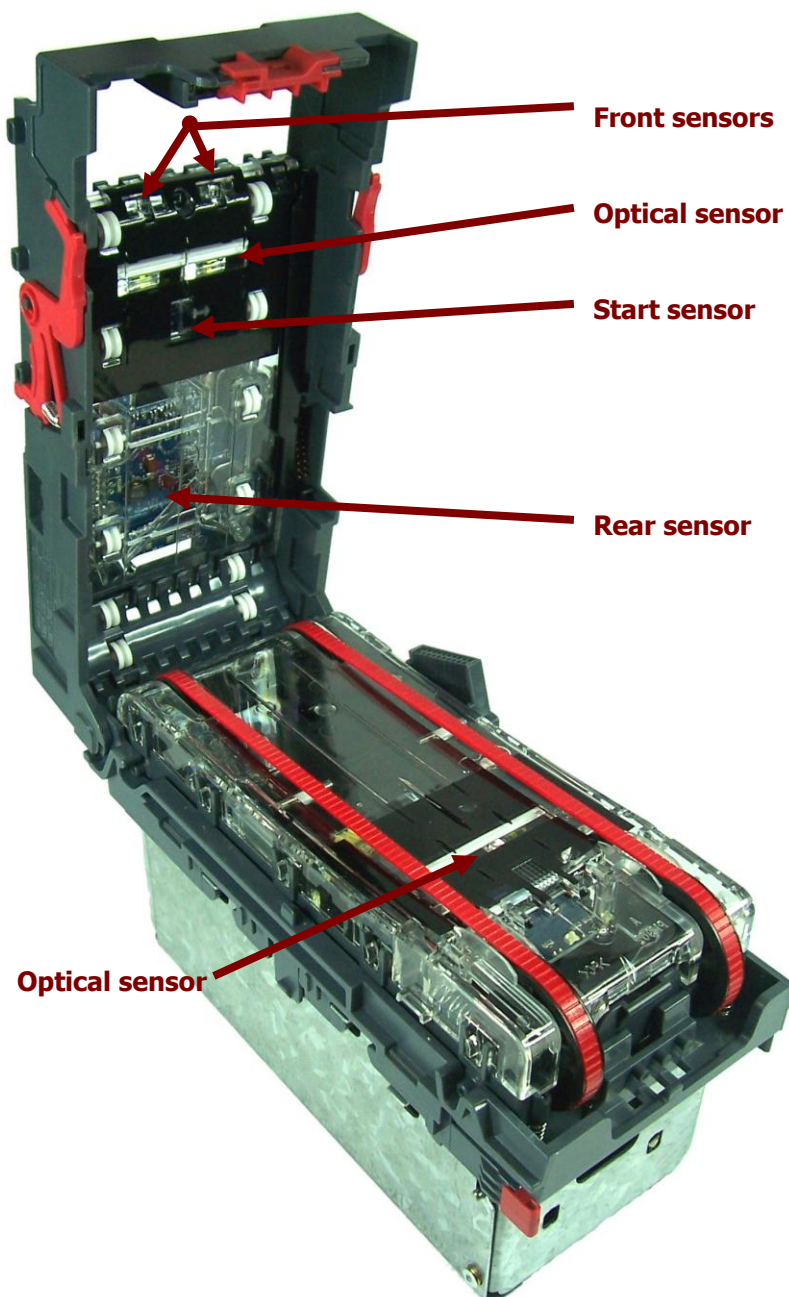
To clean the NV9 USB, open the note path by sliding the red release catch on the front of the validator to the left (as indicated in the picture) - this will allow access to the lozenge and note path

**WARNING!**

Disconnect power BEFORE any cleaning operation

Unless stated otherwise, you should disconnect the power BEFORE carrying out any cleaning operations to avoid the risk of causing damage to the validator.





Examine the note paths, lozenge and note stacker for any dirt or debris, and carefully clear and wipe the surfaces of the note paths and lozenge with a soft lint free cloth that has been dampened with a water and mild detergent solution (i.e. household washing up liquid.) - be very careful when cleaning around the sensor lenses and make sure they are clean and dry before closing the cover and restarting the unit. Do not try to polish the sensor lenses – if a lens is badly scratched, contact ITL technical support for advice.

Also check that the note stacker and cash box spring plate are not jammed.



**Caution!**

Be careful cleaning sensors.

When cleaning the recessed front sensor, use a small soft brush or cotton bud – do not use anything sharp or abrasive.

Cleaning the belts is a simple operation. Ensure the validator is enabled (i.e. bezel lights are illuminated), then remove the bezel:

- The bezel is removed by pushing the red locking arms on both sides of the validator upwards, and sliding the bezel away from the locking arms

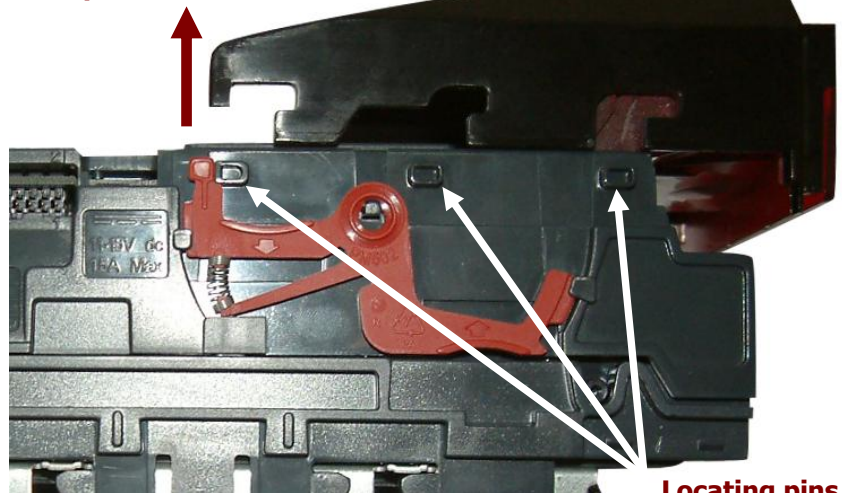
**b. Slide bezel away from locking arms**



**a. Push locking arms upwards**

- Lift the bezel off once the bezel has been slid fully across and is clear of the locating pins

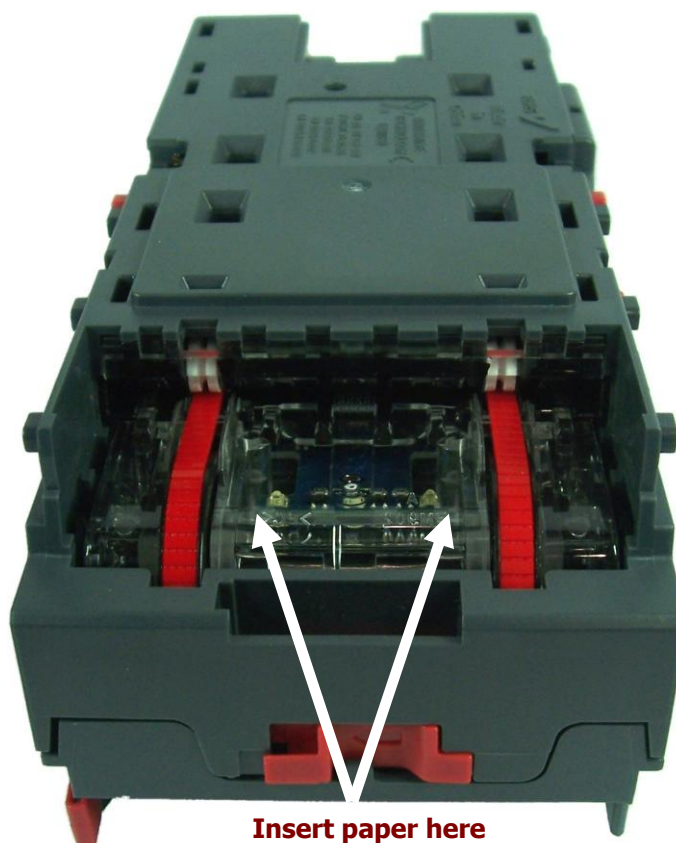
**Lift upwards to remove**



**Locating pins**



- Insert a piece of paper, which is narrower than the width between the two belts, in the centre of the note path to activate the drive motor
- Use a lint free cloth dampened with water and containing a mild detergent (such as dish detergent) and hold against each drive belt as it turns.



Repeat this procedure until all dust and debris has been removed from both belts. Finally, use a DRY lint free cloth to remove any excess moisture and refit the bezel. The bezel is refitted by pushing the bezel back onto the locating pins and sliding towards the locking arms until all six pins are engaged in the slots. The locking arms will then spring back and locate into the bezel.

**Caution!**

Check locking arms.

Always make sure that **BOTH** locking arms are fully located in the bezel – trying to operate the validator if they are not correctly located can cause transport issues or unit damage.

**Caution!**

Do not use any lubricants.

Do not lubricate any of the note transport mechanism, belts or any part of the note path, as this can affect the operation of the validator.



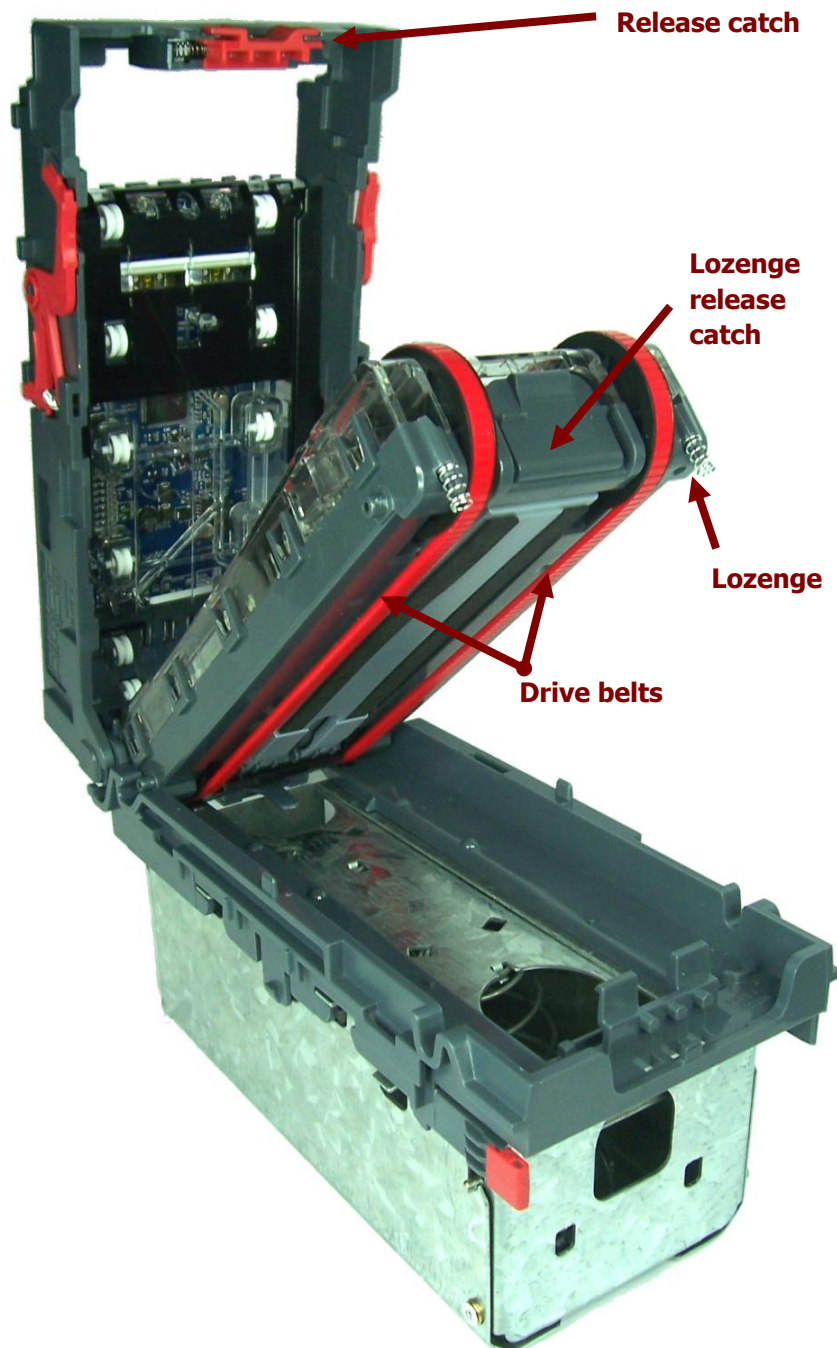
If the belts are worn or damaged, they should be replaced (ITL part number FD00106). This is a simple procedure, and is carried out as follows:

**WARNING!**

Do not try to disassemble

Do not attempt to disassemble the validator head – trying to do this could result in the validator needing reinitialisation, cause personal injury or could damage the unit beyond repair.

- Open the top of the unit using the release catch
- Release the lozenge by gently pressing the lozenge release catch
- Remove and place the lozenge on a clean dry surface
- Press in the large wheels to release the belt tension and then remove the belts, sliding them off the smallest wheels first
- Replace the belts by fitting them over the lozenge, largest wheels first
- Reassemble and close the unit



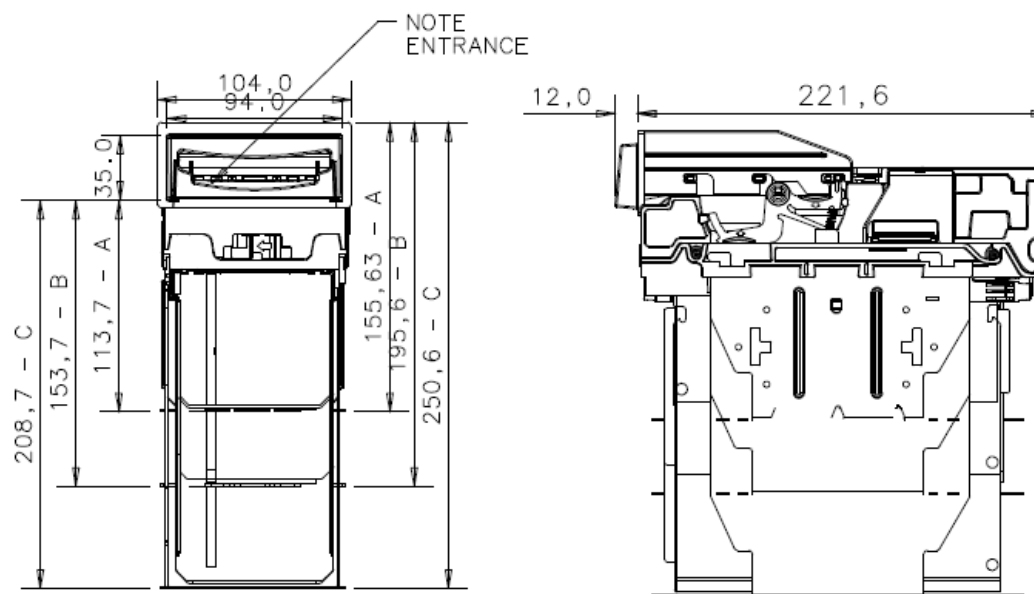
## Re-Initialisation

The NV9 USB validator has an in-built self-calibration system that keeps the optical sensors in optimum operating condition. However if the NV9 USB is disassembled for any reason it also will need to be re-initialised - re-initialisation can only be carried out by ITL's technical support team.

## 4.11 Drawings and Schematics

**NOTE:** If required, IGES 3D models are available on request from ITL technical support.

A	300 SLIDE-IN CASH BOX
B	600 SLIDE-IN CASH BOX
C	1000 SLIDE-IN CASH BOX



ACCEPTS NOTES UP TO 82mm x 160mm LONG

