NV9 USB MANUAL SET

INTELLIGENCE IN VALIDATION

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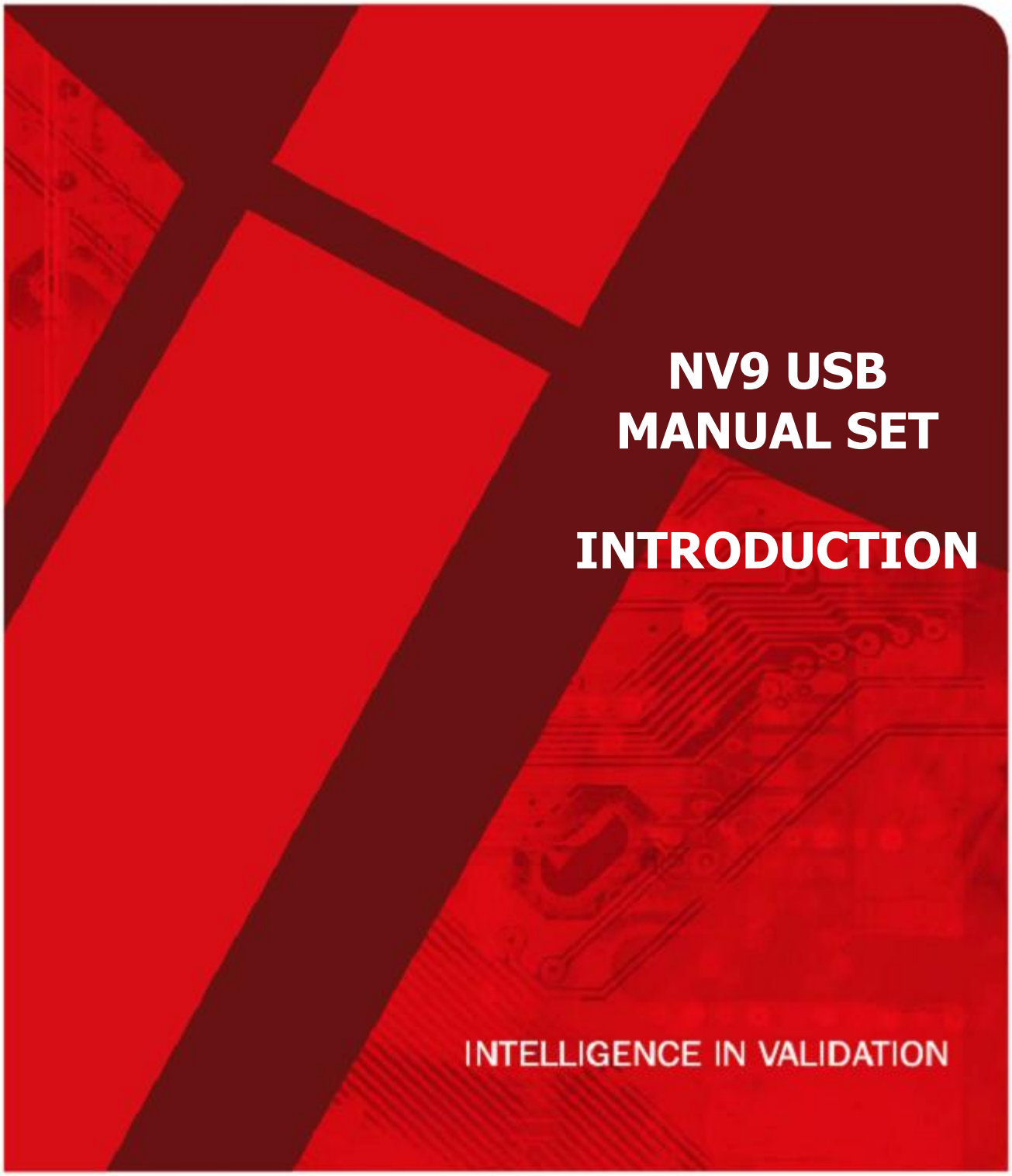

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MANUAL AMENDMENTS

Document Base Details

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NV9 USB MANUAL SET - INTRODUCTION

MAIN HEADQUARTERS

Innovative Technology Ltd
Derker Street – Oldham – England - OL1 4EQ
Tel: +44 161 626 9999 Fax: +44 161 620 2090
E-mail: support@innovative-technology.co.uk
Web site: www.innovative-technology.co.uk

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

BRAZIL
suporte@bellis-technology.com.br

CHINA
support@innovative-technology.co.uk

GERMANY
supportDE@innovative-technology.eu

SPAIN
supportES@innovative-technology.eu

UNITED KINGDOM
support@innovative-technology.co.uk

UNITED STATES OF AMERICA
supportusa@bellis-technology.com

REST OF THE WORLD
support@innovative-technology.co.uk

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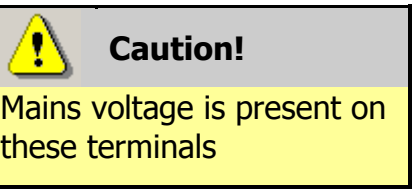
PRODUCT SAFETY INFORMATION

Throughout this manual set, we may draw your attention to key safety points that you should be aware of when using or maintaining the product.

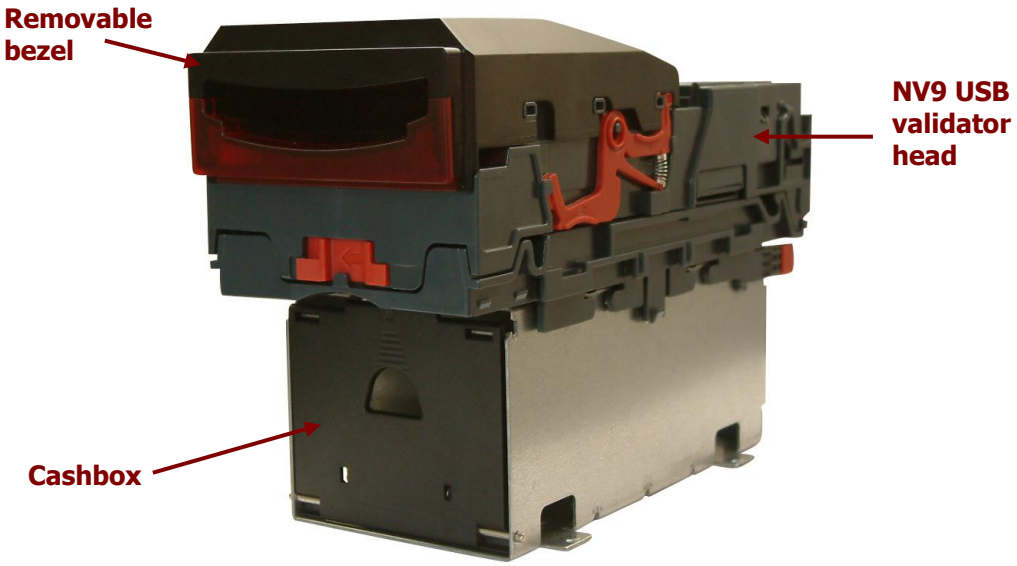
These safety points will be highlighted in a box, like this:



This manual set and the information it contains is only applicable to the model stated on the front cover, and must not be used with any other make or model.

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

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.

FEATURES

The NV9 USB validator has many innovative features, including:

- 300 or 600 note capacity cashboxes available
- Accepts up to 15 different note denominations (in serial control mode)
- Accepts, validates and stores multiple denominations of bank notes in less than 3 seconds
- Secure encrypted protocol available for communication

TYPICAL APPLICATIONS

The NV9 USB validator can be used in a variety of situations where high security and high volume bank note acceptance and validation are needed. Some typical applications are:

- AWP and SWP applications
- Self-Serve and Retail
- Kiosks
- Casinos
- Parking and Ticketing
- Vending

STRUCTURE OF THIS MANUAL SET

This manual set is made up of seven sections, each is supplied in a separate Portable Document Format (PDF) file, so you only need to download or print the section relevant to your requirements:

- Introduction
- Section 1 – Quick Start and Configuration Guide
- Section 2 – Field Service Manual
- Section 3 – ITL Software Support Guide
- Section 4 – Mechanical and Electrical Manual
- Section 5 – Software Implementation Guide
- Section 6 – Technical Appendices

WHICH SECTION IS RELEVANT TO ME?

- **Quick Start and Configuration Guide:**
  - Most users should use this section; typical users are software engineers looking at how to make it work, project engineers evaluating their first unit, or installation engineers installing the unit into a host machine.
  - This section contains the essential information that a user needs to quickly assemble and configure the NV9 USB validator ready for installation into the host machine.

- **Field Service Manual:**
  - Typically used by a field service engineer who is maintaining the product.
  - This section contains the essential information that the field service engineer needs to clean, maintain and fault find an NV9 USB validator that is installed in a host machine.

- **ITL Software Support Guide:**
  - Any user who wants to test the functionality of the unit, reprogram the firmware or dataset, or set up the encryption key, address or routing for the unit.
  - This section contains the information needed for a user to configure and program the NV9 USB validator, using a range of software tools.

- **Mechanical and Electrical Manual:**
  - Design engineers who are designing a host machine cabinet, or looking to integrate the NV9 USB validator into an existing cabinet.
  - This section contains the all the mechanical and electrical information a designer needs to effectively integrate the NV9 USB validator into a host machine.

- **Software Implementation Guide:**
  - Software engineers looking at how to implement the NV9 USB validator in their host machine, or design engineers looking at including the unit in their host machine.
  - The information in this section details the communications protocols, specific commands and interfaces used including eSSP and ccTalk.

- **Technical Appendices:**
  - These appendices have no specific audience, but users can find relevant and useful information here.
  - This section includes information on product approvals, technical specifications and ordering information.

SECTION 1

NV9 USB MANUAL SET

QUICK START AND CONFIGURATION GUIDE

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NV9 USB MANUAL SET – SECTION 1

1. QUICK START AND CONFIGURATION GUIDE

This section is one part of a complete manual set: most users should use this section of the manual - typical users are software engineers looking at how to make it work, project engineers evaluating their first unit, or installation engineers installing the unit into a host machine.

This section contains the essential information that a user needs to quickly assemble and configure the NV9 USB validator ready for installation into the host machine.

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).

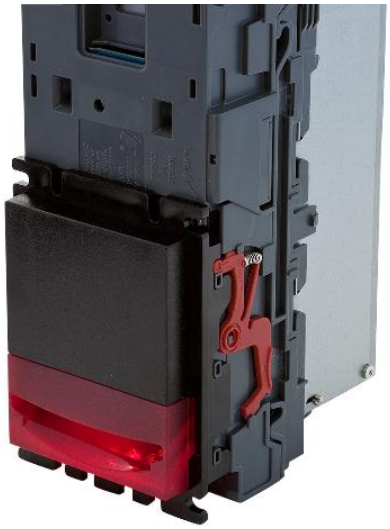
1.1 Assembly

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:

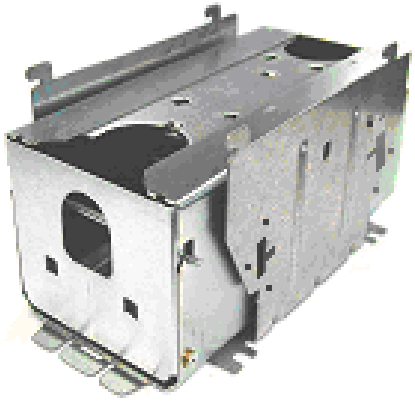
1. If the validator is fitted with a clip-on cashbox, then the validator will be mounted VERTICALLY

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) 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.

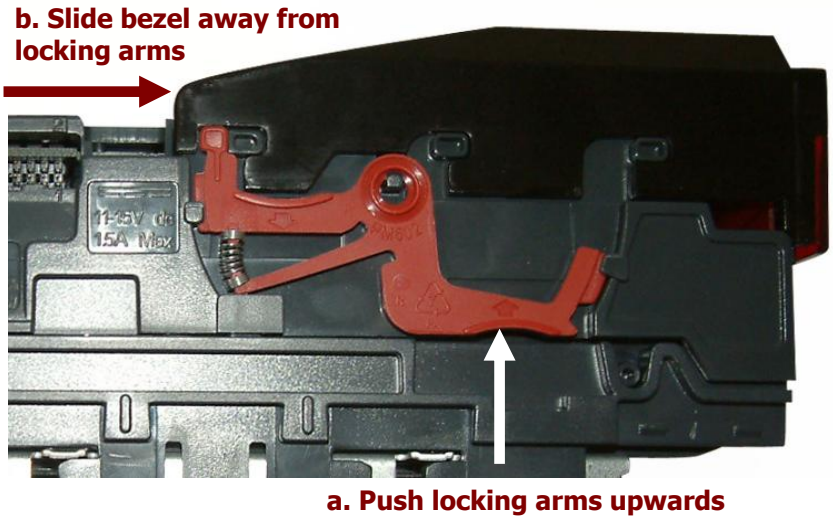
WARNING!

Do not attempt disassembly

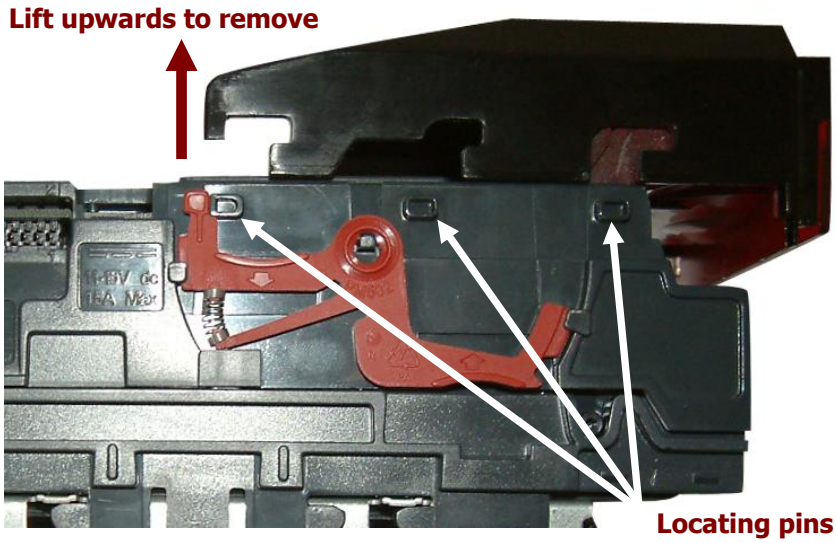
Do not attempt to disassemble the NV9 USB validator head – trying to do this could cause personal injury and will damage the unit beyond repair.

1.2 Bezel Removal and Refitting:

- 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



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



The bezel is refitted by pushing the bezel back onto the locating pins and sliding backwards until all six pins are engaged in the slots. The locking arms will then spring back and locate into the bezel.

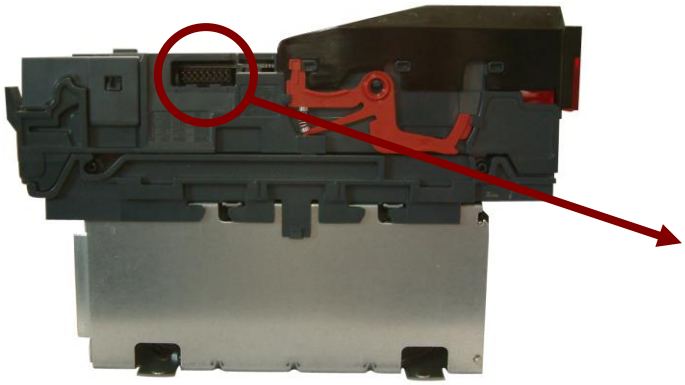
Caution!

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 unit damage.

1.3 Interfacing

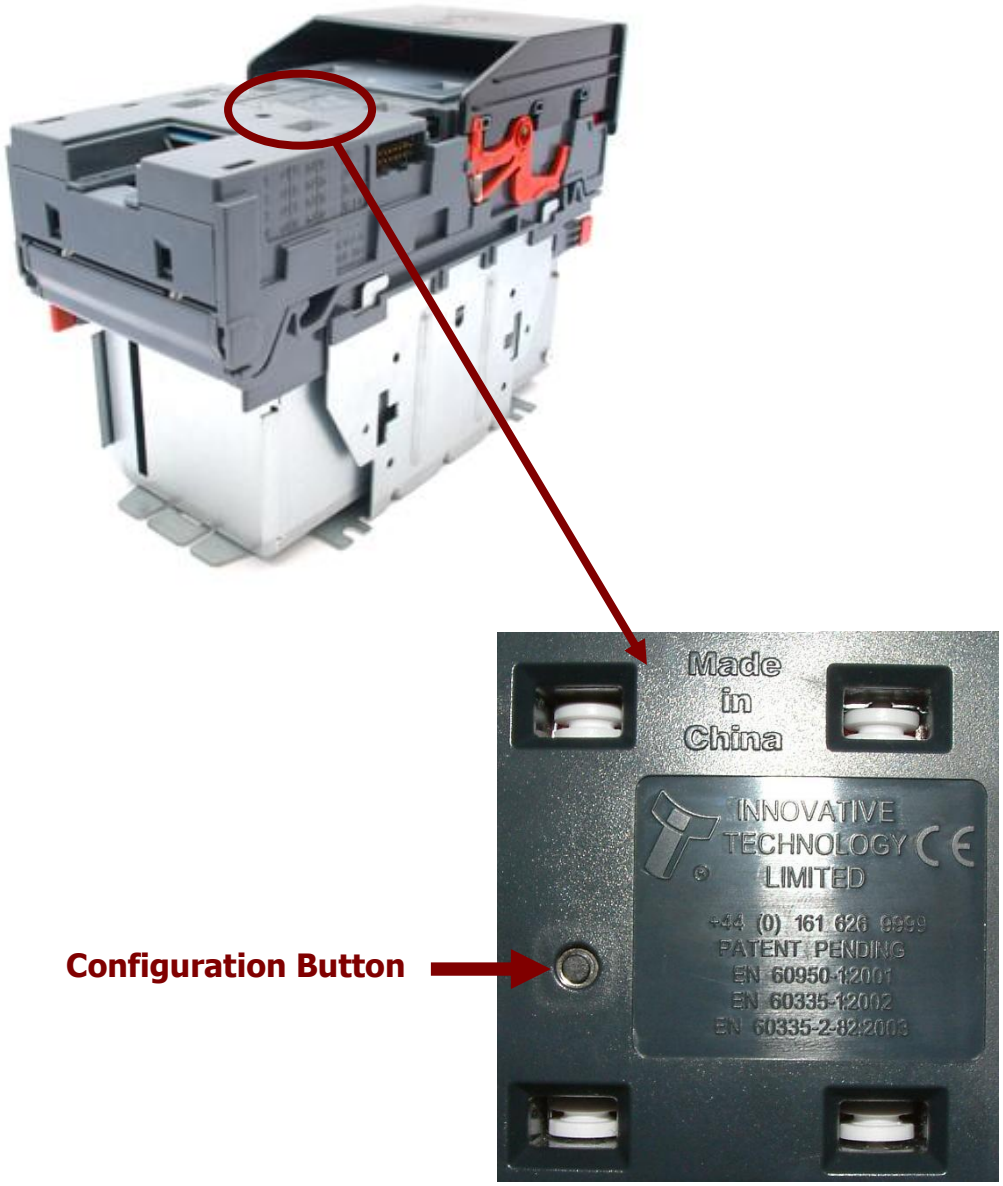
The connector needed to set up and interface the NV9 USB Validator is easily accessible on the side of the unit:



Interface Socket

1.4 Configuration

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:

WARNING!
Risk of unit damage

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
Press and hold (more than 2 seconds) until the bezel illuminates, then release	Powered ON	Sets validator to Programming mode (SSP)
Press once (less than 1 second)	Powered ON	Enables Configuration Card programming – press again to cancel this mode
Press twice (within half a second)	Powered ON	Shows current interface type (see flash count table below)
Press and hold as validator is powered up	Powered OFF / ON	Resets to factory settings

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 dataset and interface used are shown on the label fixed to the top of the validator head.

1.5 Connector and Pinouts

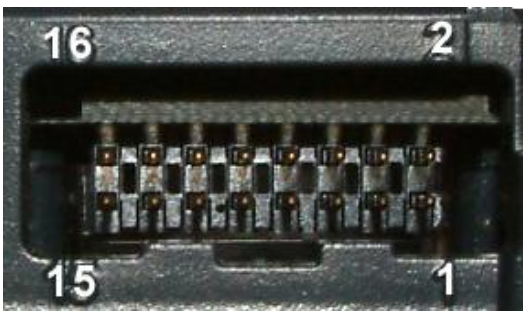
The NV9 USB Validator has a single connector that is used to allow interfacing and programming.

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 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:



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 fitted with a 16 way connector on one end (ITL Part Number CN392) should be used. The CN392 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 CN392 cable.

1.6 Programming

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

1.7 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	

WARNING!

Use suitable power supply

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).

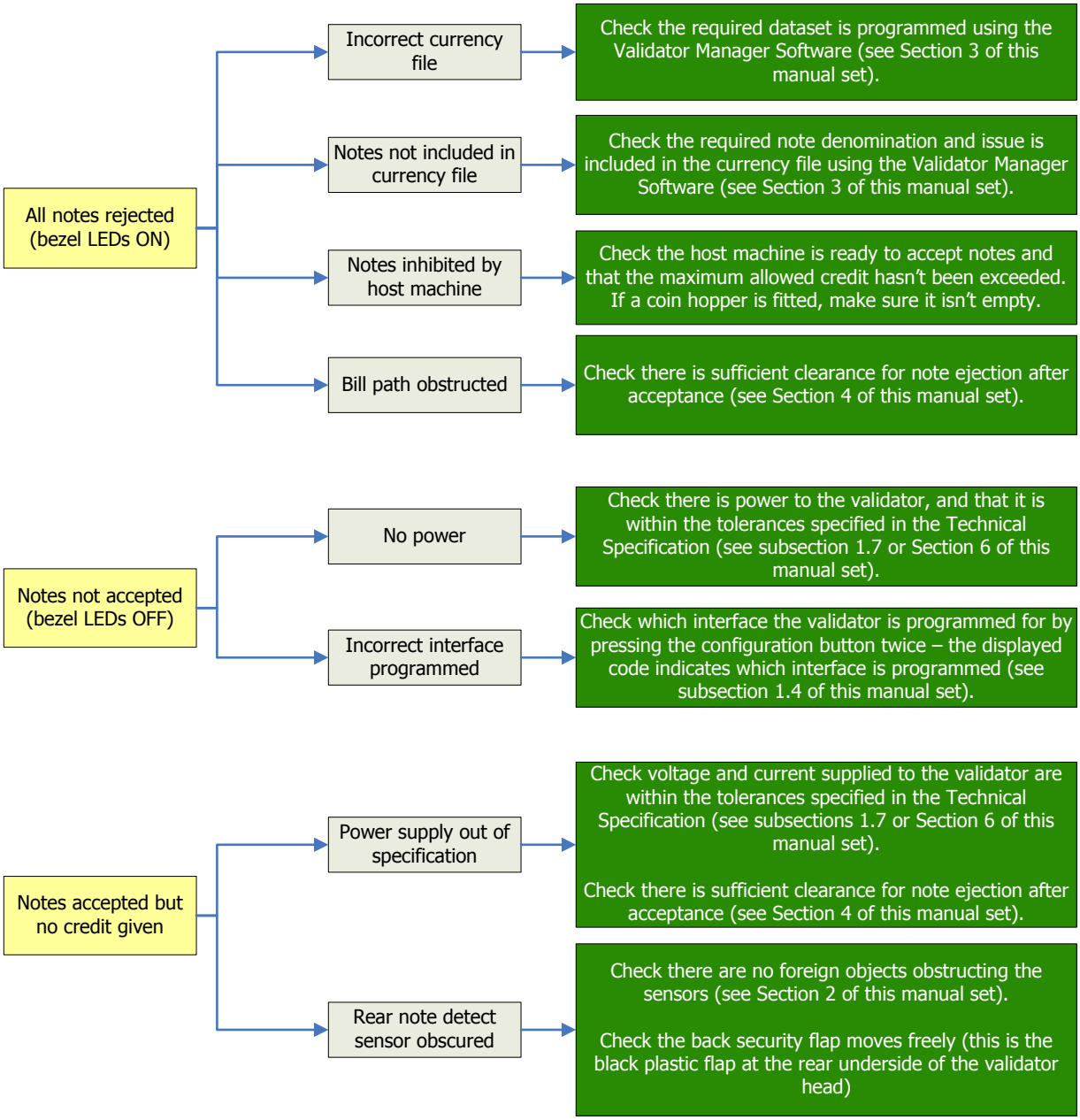
1.8 NV9 USB Bezel Flash Codes

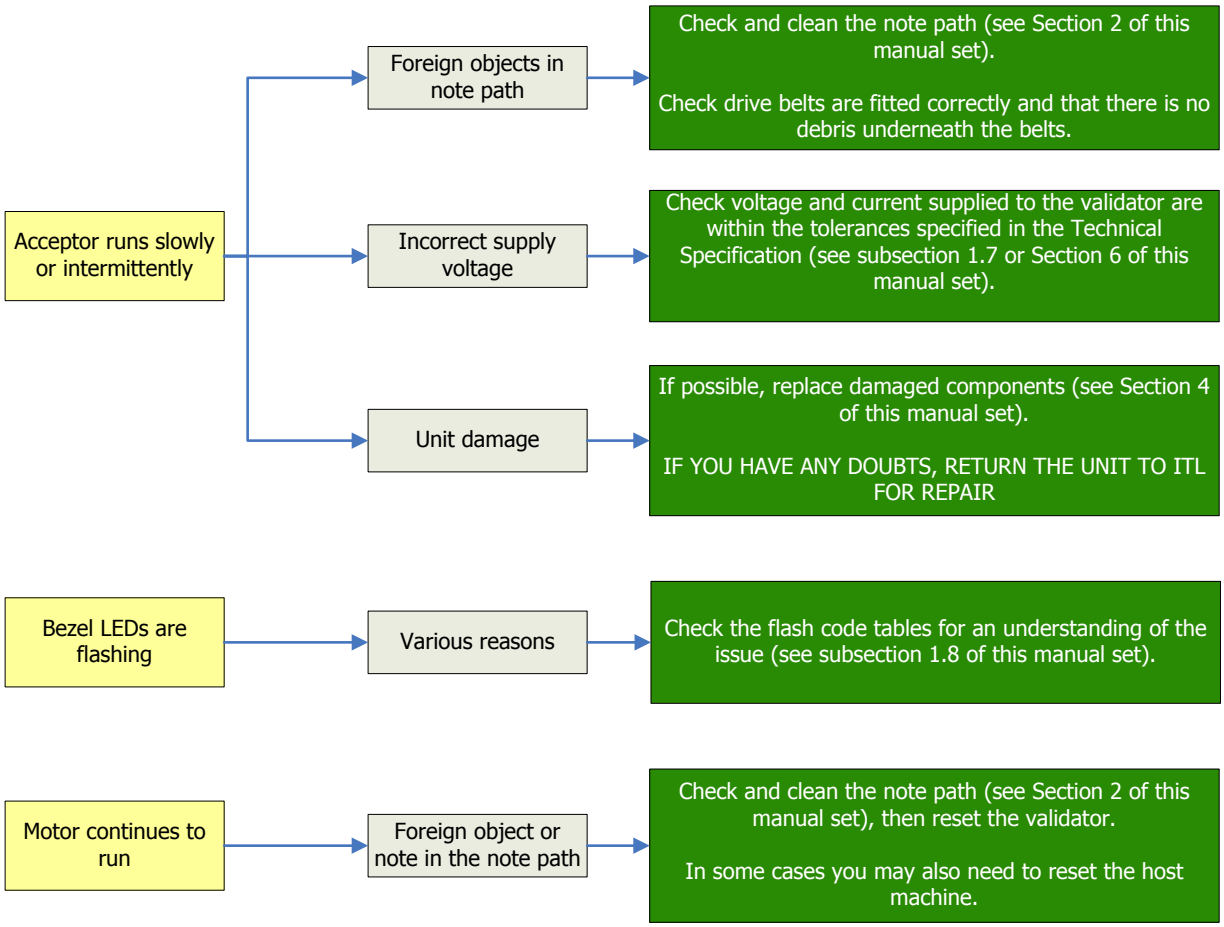
The NV9 USB Validator has inbuilt fault detection facilities. If there is a configuration or other error the NV9 USB front bezel will flash in a particular sequence; a summary of the Bezel Flash Codes for the NV9 USB is shown below:

Flashes		Indicated Error	Comments
Long	Short		
0	0	None	
1	2	Note path jam	Remove obstruction and follow the cleaning procedure in Section 2 of this manual set
	3	Unit not initialised	Contact ITL technical support
3	1	Firmware checksum error	Download new firmware
	2	Interface checksum error or unable to set programmed interface	
	3	EEPROM checksum error	
	4	Dataset checksum error	
4	1	Power supply too low	Check power supply
	2	Power supply too high	

1.9 Fault Finding

Please use this flow chart with the Flash Codes in the previous sub-section as an aid to help resolve any configuration or start up problems you might have after installing the NV9 USB validator





If you are unsure about the cause or how to resolve the problem, please contact ITL's technical support department. Support contact details can be found on the ITL website (www.innovative-technology.co.uk), or on the last page of this section.

1.10 Frequently Asked Questions

a. Why are there no DIP switches on the unit?

- The NV9 USB has no dipswitches. Configuring the unit is carried out using a configuration button mounted on top of the unit – see subsection 1.3 of this manual for more information.

b. In what orientation can I use the NV9 USB validator?

- The NV9 USB can be mounted horizontally or vertically, depending on the type of bezel and cashbox selected. See subsection 1.1 of this manual for more information on mounting the validator – check the ITL website to see the currently available range of cashboxes and bezels.

c. How do I check which interface has been set?

- You can check which interface has been selected by using the configuration button mounted on top of the unit – see subsection 1.3 of this manual for more information.

d. How do I change the interface type?

- You can change the interface type by using the configuration button mounted on top of the unit – see subsection 1.4 of this manual for more information.

e. Some or all notes are not accepted

- Check that no inhibits are set in the Validator Manager software (see Section 3 of this manual set). If the problem persists, contact ITL Support for further assistance.

MAIN HEADQUARTERS

Innovative Technology Ltd
Derker Street – Oldham – England - OL1 4EQ
Tel: +44 161 626 9999 Fax: +44 161 620 2090
E-mail: support@innovative-technology.co.uk
Web site: www.innovative-technology.co.uk

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

BRAZIL
suporte@bellis-technology.com.br

CHINA
support@innovative-technology.co.uk

GERMANY
supportDE@innovative-technology.eu

SPAIN
supportES@innovative-technology.eu

UNITED KINGDOM
support@innovative-technology.co.uk

UNITED STATES OF AMERICA
supportusa@bellis-technology.com

REST OF THE WORLD
support@innovative-technology.co.uk

SECTION 2

NV9 USB MANUAL SET

FIELD SERVICE MANUAL

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NV9 USB MANUAL SET – SECTION 2

2. FIELD SERVICE MANUAL

This section is one part of a complete manual set: typically, a field service engineer who is maintaining the product would use this section.

This section contains the essential information that the field engineer needs to clean, maintain and fault find an NV9 USB Validator that is installed in a host machine.

The NV9 USB Validator has been designed to minimise any problems or performance variations over time. This has been achieved by careful hardware and software design; this attention to the design means there is very little user maintenance required.

2.1 Cleaning

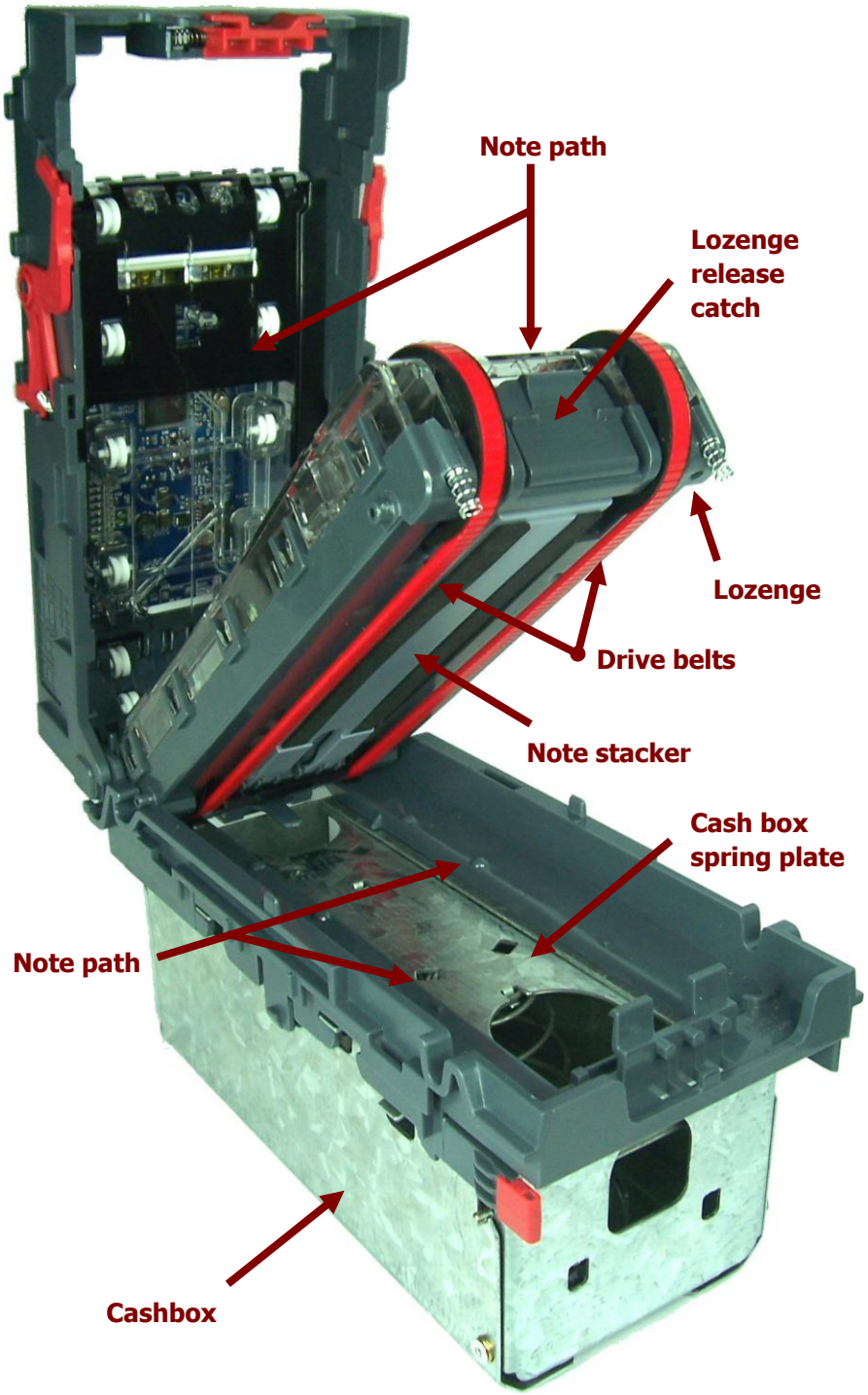
The NV9 USB Validator has been designed in a way to prevent damage and airborne contamination reaching the optical sensors; however, depending upon the environment the NV9 USB may require occasional cleaning or belt changing.

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.

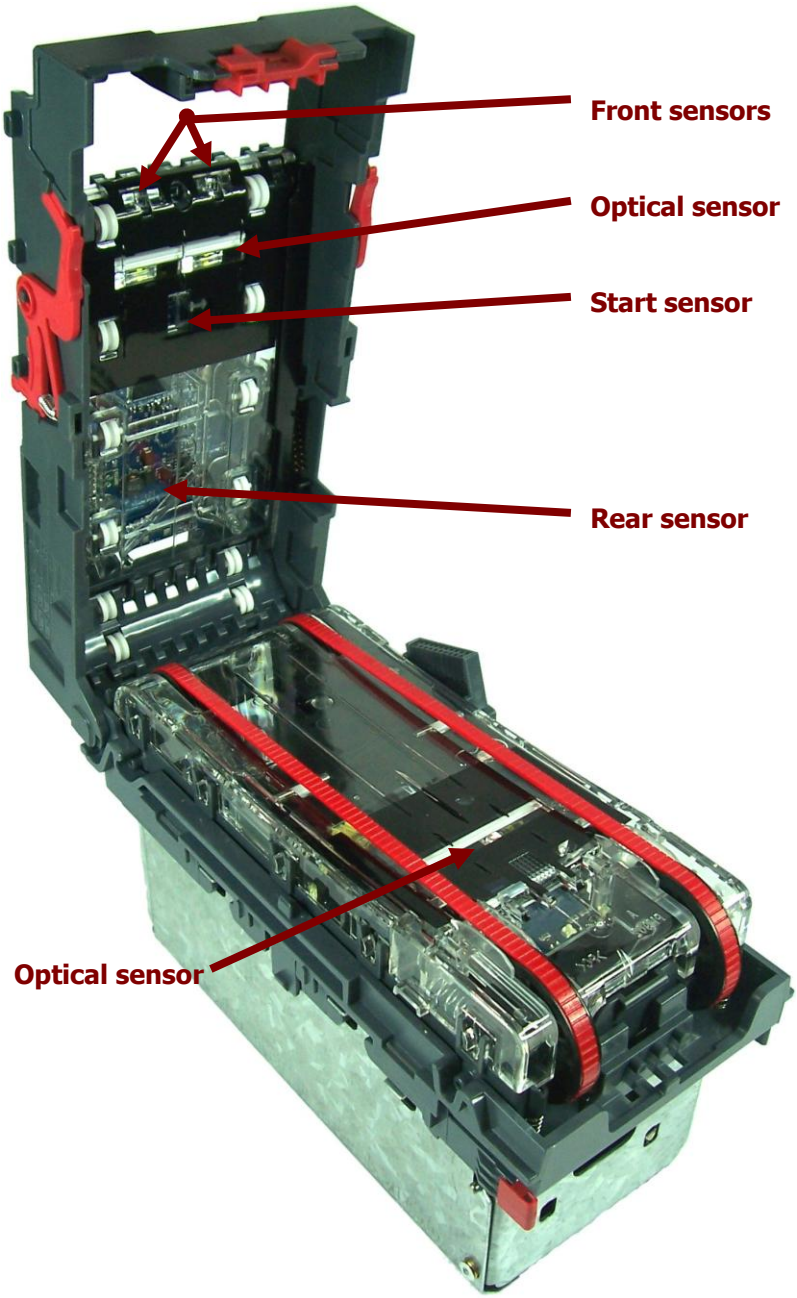
To clean the NV9 USB, open the note path by sliding the red release catch on the front of the validator to the left (as indicated in the picture) - this will allow access to the lozenge and note path



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!

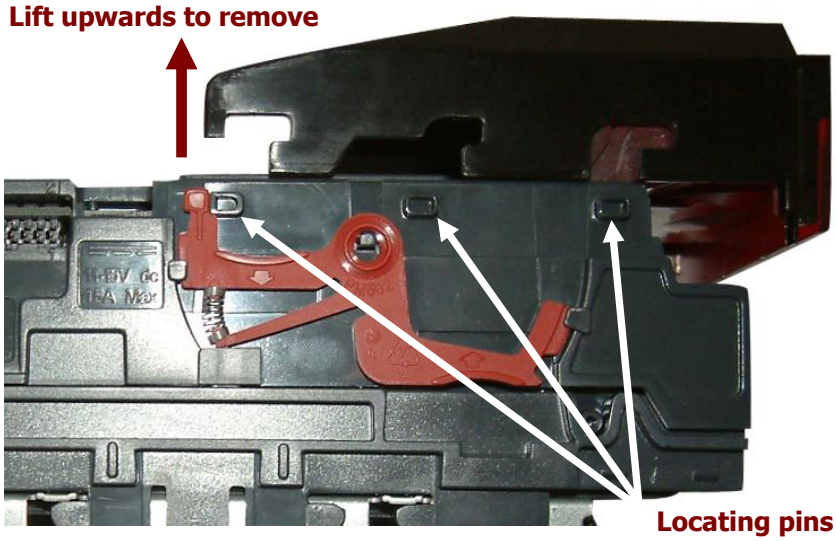
Be careful cleaning sensors.

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

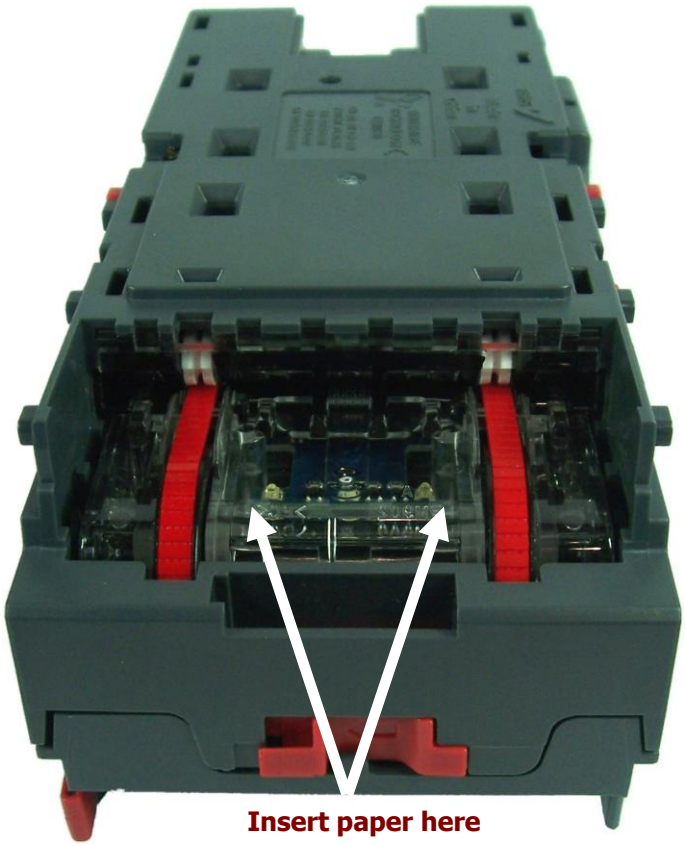
Cleaning the belts is a simple operation. Ensure the validator is enabled (i.e. bezel lights are illuminated), then remove the bezel:

- 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

- Lift the bezel off once the bezel has been slid fully across and is clear of the 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 is 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 backwards 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.

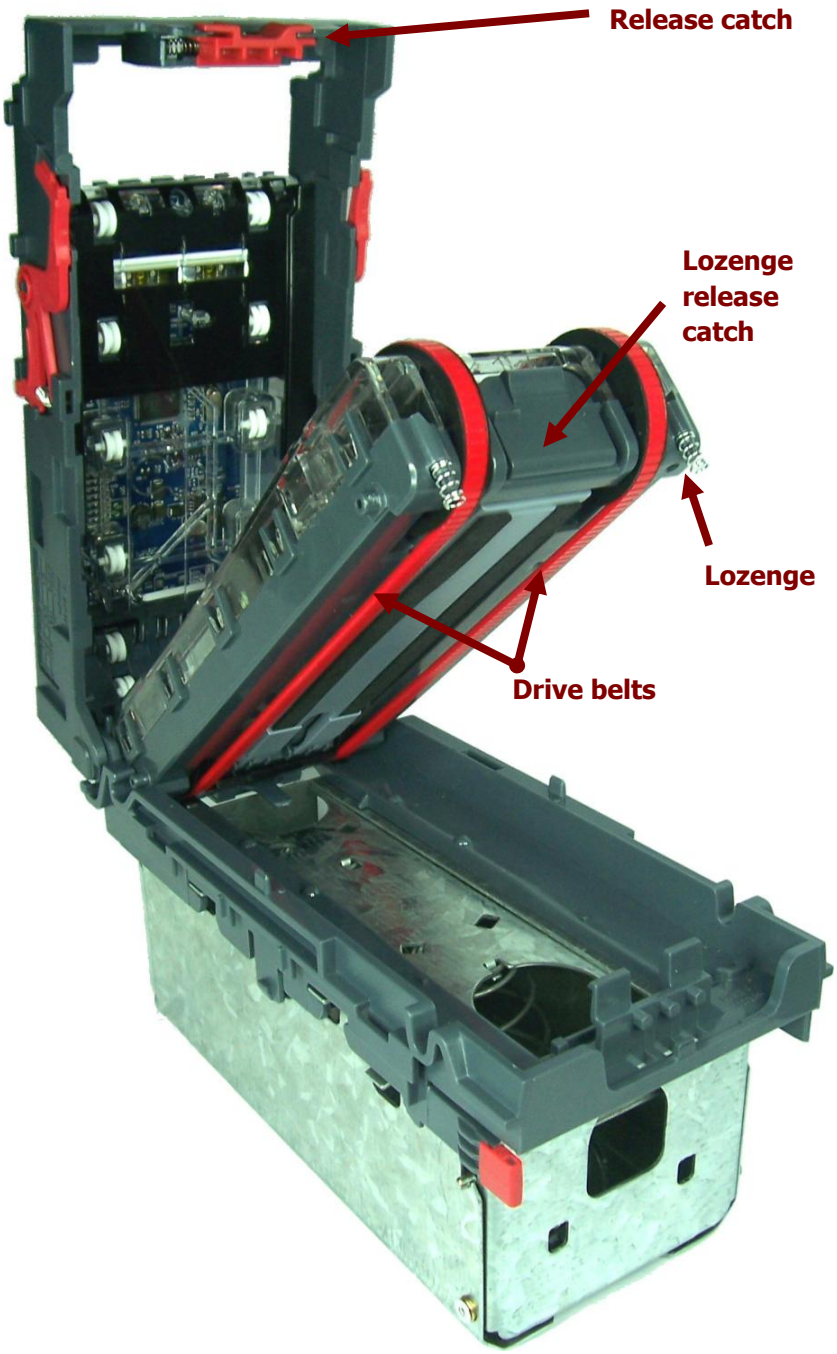
If the belts are worn or damaged, they should be replaced (ITL part number FD106). This is a simple procedure, and is carried out as follows:

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



2.2 Fault Finding - Flash Codes

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		
0	0	None	
1	2	Note path jam	Remove obstruction and follow the cleaning procedure in subsection 2.1 of this manual
	3	Unit not initialised	Contact ITL technical support
	4	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
3	1	Firmware checksum error	Download new firmware
	2	Interface checksum error or unable to set programmed interface	
	3	EEPROM checksum error	
	4	Dataset checksum error	
4	1	Power supply too low	Check power supply
	2	Power supply too high	

2.3 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	

WARNING!

Use suitable power supply

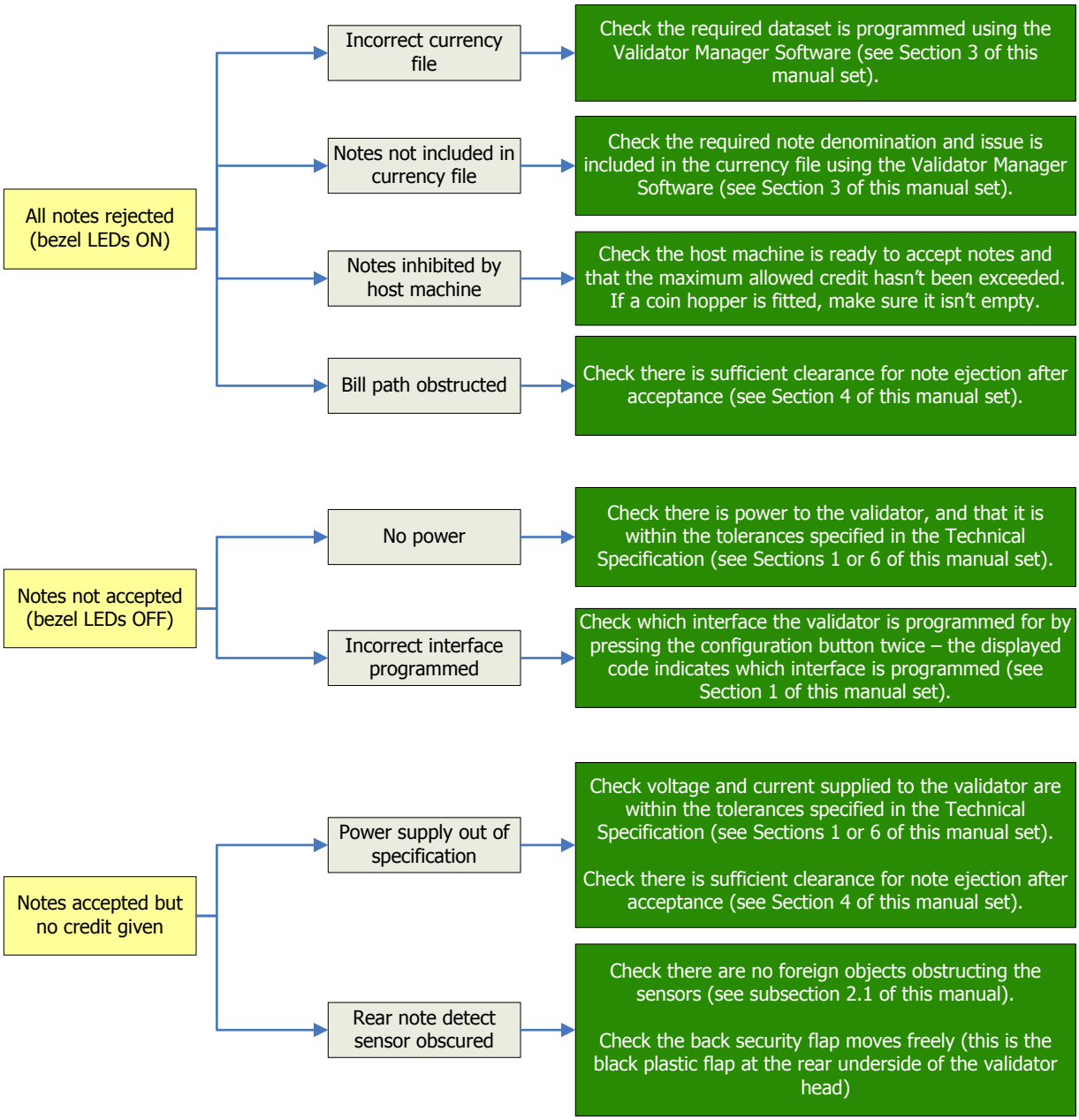
Ensure that the supply voltage to the NV9 USB is not lower than 10.8 V and that the power supply can provide sufficient current to avoid incorrect operation and excessive note rejects.

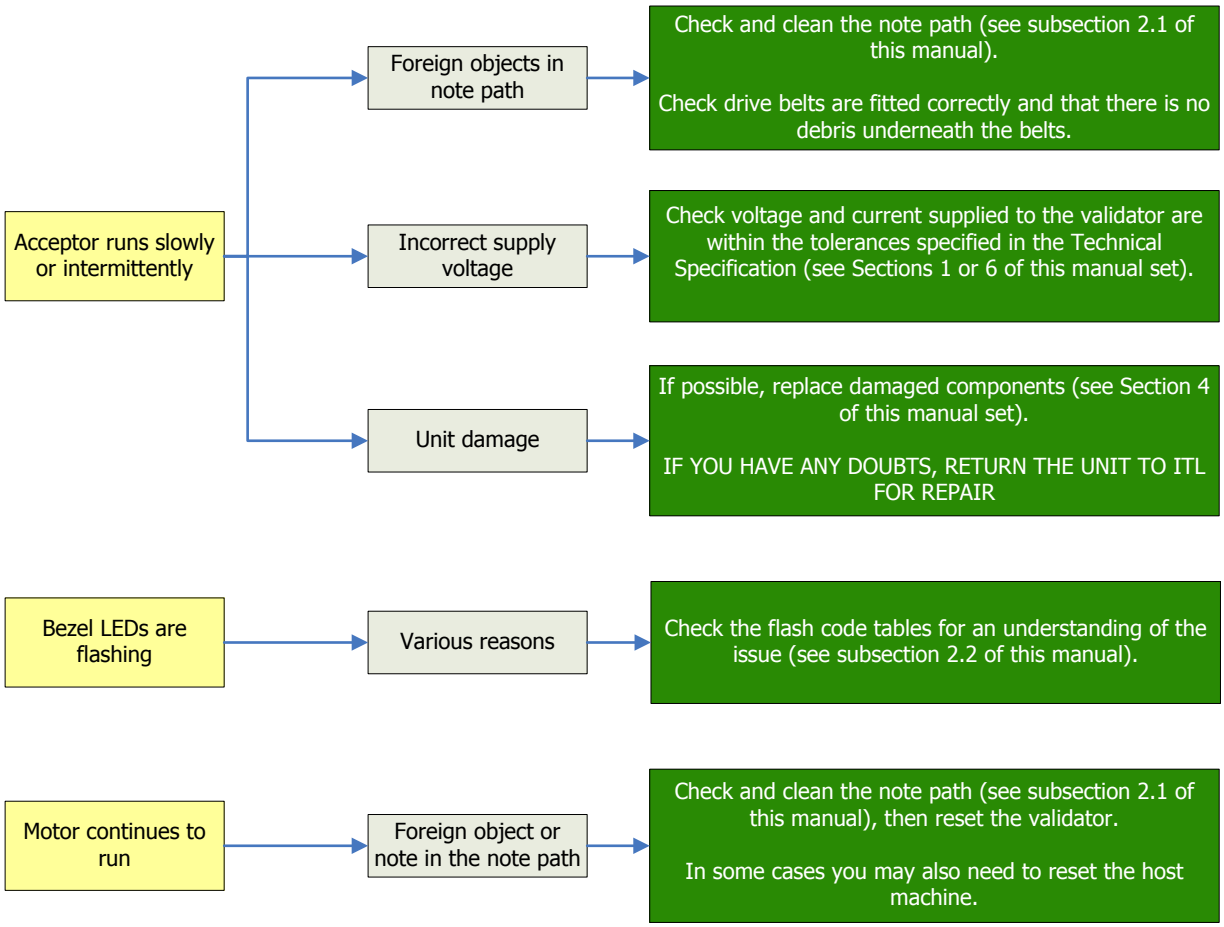
We recommend that your power supply is capable of supplying 12V DC at 3 A.

- 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).

2.4 Fault Finding Flow Chart

Please use this flow chart with the Flash Codes in subsection 2.2 as an aid to help resolve any configuration or start up problems you might have after installing the NV9 USB validator





If you are unsure about the cause or how to resolve the problem, please contact ITL's technical support department. Support contact details can be found on the ITL website (www.innovative-technology.co.uk), or on the last page of this section.

2.5 Frequently Asked Questions

a. Why are there no DIP switches on the unit?

- The NV9 USB has no dipswitches. Configuring the unit is carried out using a configuration button mounted on top of the unit – see Section 1, subsection 1.3 of this manual set for more information.

b. In what orientation can I use the NV9 USB validator?

- The NV9 USB can be mounted horizontally or vertically, depending on the type of bezel and cashbox selected. See Section 1, subsection 1.1 of this manual for more information on mounting the validator – check the ITL website to see the currently available range of cashboxes and bezels.

c. Some or all notes are not accepted

- Check that no inhibits are set in the Validator Manager software (see Section 3 of this manual set). If the problem persists, contact ITL Support for further assistance.

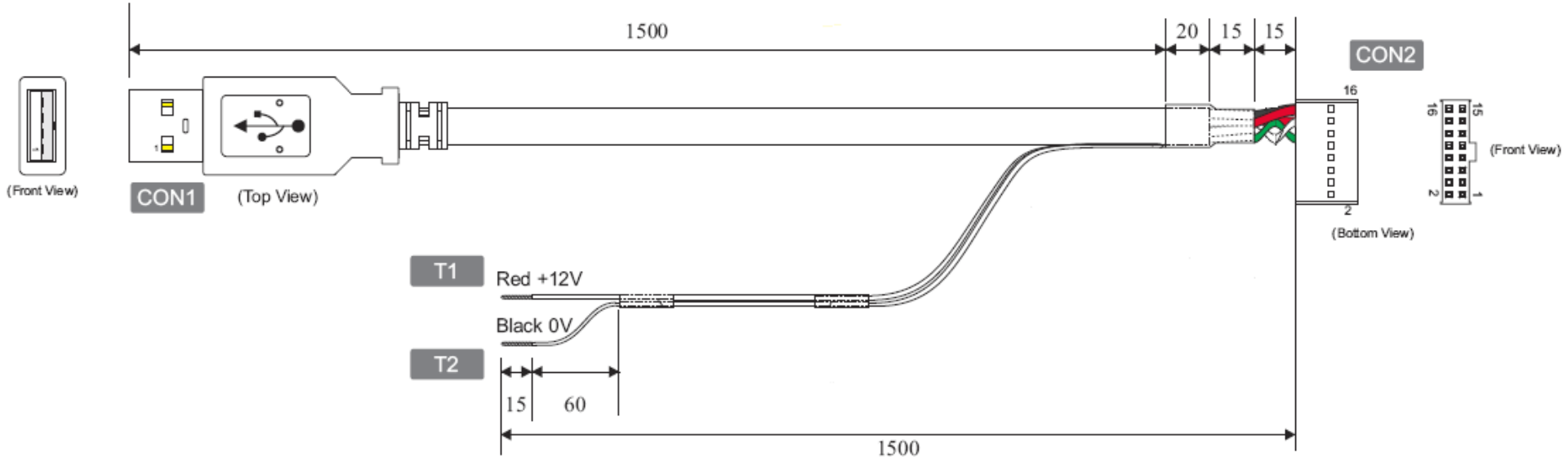
d. How do I clean the validator?

- Follow the instructions given in subsection 2.1 of this manual.

2.6 Spare Parts

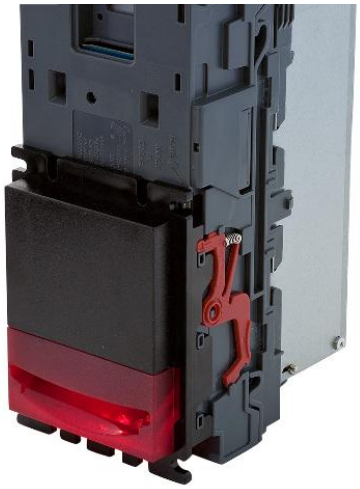
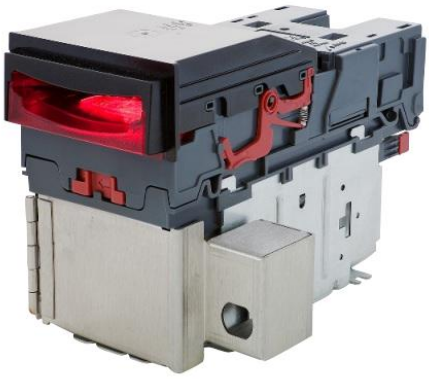
Full details of the interface cable connector pinouts, connector types / makes and other related information can be found in Section 4 of this manual set. The user can obtain the following parts for the NV9 USB validator:

ITL Part Number	Description	Details
CN392	Power and USB Communication Cable	USB 2.0 Compliant Type A to 16 way header cable



Bezels		
ITL Part Number	**Description**	
PA188	Vertical Upstack Bezel Assembly	
PA189	Horizontal Bezel Assembly	
PA190	Vertical Upstack Extended Snout Bezel Assembly	
PA191	Vertical Downstack Extended Snout Bezel Assembly	
PA256	66mm Vertical Upstack Bezel	No image available
PA268	69mm Fixed Width Horizontal Bezel	No image available
PA296	Vertical Up/Down Flat 66mm Bezel Assembly	No image available

PA896	Horizontal Bezel Assembly (NV11)	

Cashboxes		
PA185	Clip-on Cashbox Assembly (300C)	
PA186	Locking Cashbox Assembly (300L)	

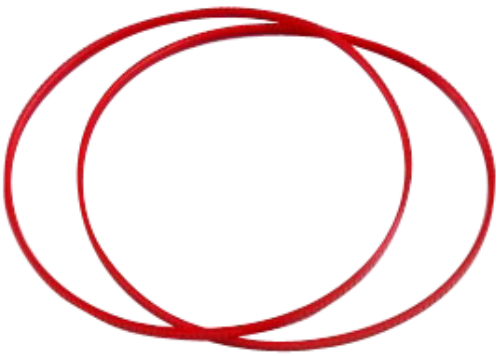
PA192	Slide-on Cashbox Assembly (300S)	
PA193	Clip-on Cashbox Assembly (600C)	
PA194	Slide-on Cashbox Assembly (600S)	

PA898	Standard Cashbox Assembly (NV11)	

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) for up to date information on the options available.

Drive Belts		
FD106	NV9 USB Red Drive Belt	

MAIN HEADQUARTERS

Innovative Technology Ltd
Derker Street – Oldham – England - OL1 4EQ
Tel: +44 161 626 9999 Fax: +44 161 620 2090
E-mail: support@innovative-technology.co.uk
Web site: www.innovative-technology.co.uk

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

BRAZIL
suporte@bellis-technology.com.br

CHINA
support@innovative-technology.co.uk

GERMANY
supportDE@innovative-technology.eu

SPAIN
supportES@innovative-technology.eu

UNITED KINGDOM
support@innovative-technology.co.uk

UNITED STATES OF AMERICA
supportusa@bellis-technology.com

REST OF THE WORLD
support@innovative-technology.co.uk

SECTION 3

NV9 USB MANUAL SET

ITL SOFTWARE SUPPORT GUIDE

INTELLIGENCE IN VALIDATION

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

NV9 USB MANUAL SET – SECTION 3

3. ITL SOFTWARE SUPPORT GUIDE

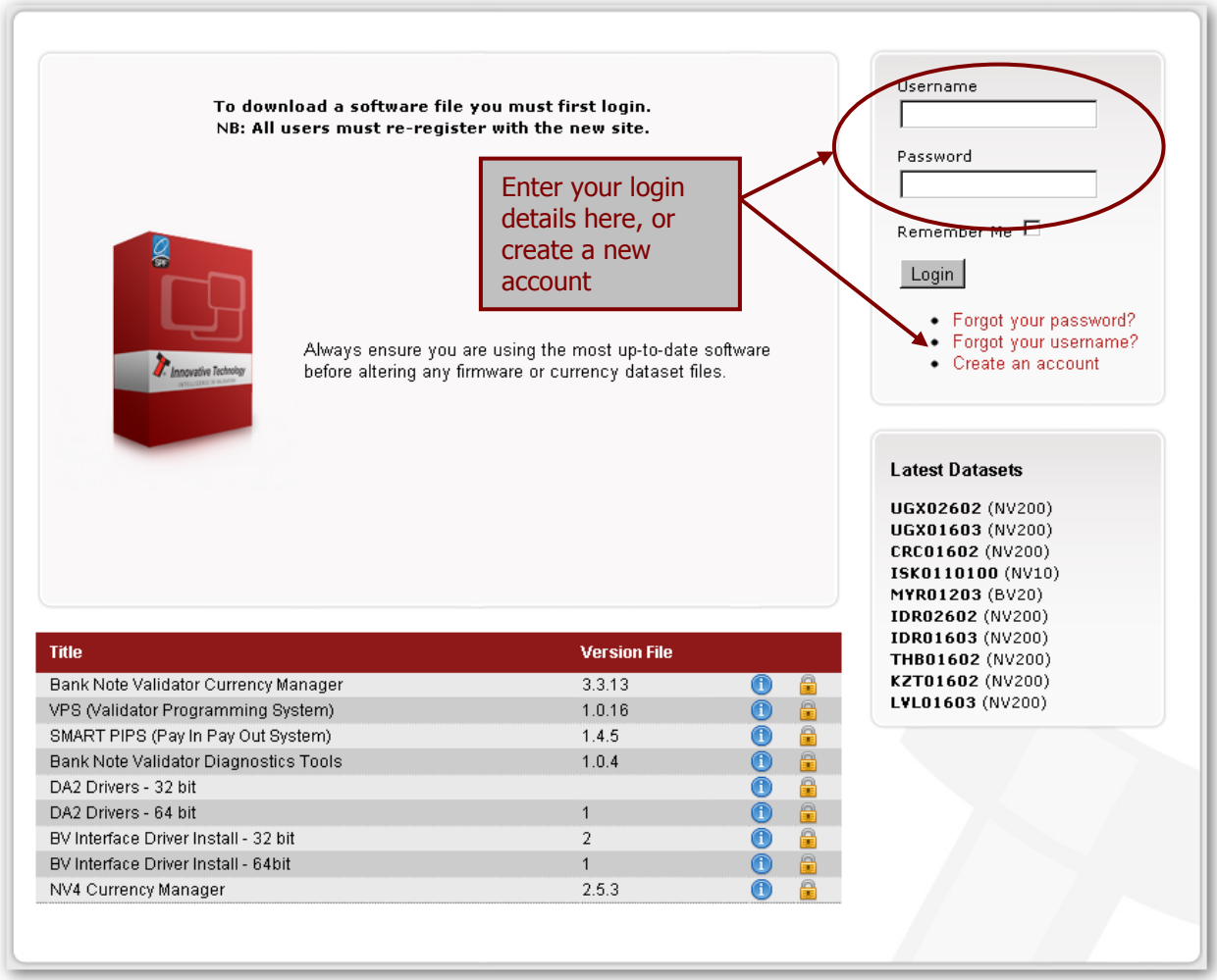
3.1 Validator Manager Software

Validator Manager (also called Bank Note Validator Currency Manager) is a software package developed by Innovative Technology Ltd to allow customers to carry out programming, setup and operational tasks on the NV9 USB bank note validator.

3.1.1 Preparing for Installation

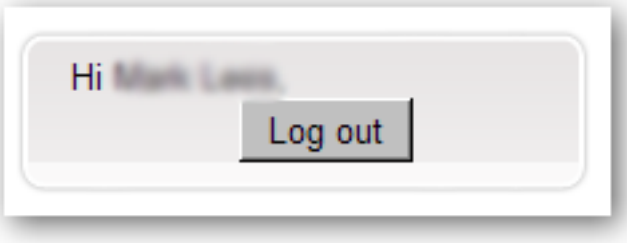
If you do not have the Validator Manager software on CD, you can easily download it from the Innovative Technology website. Visit www.innovative-technology.co.uk, and select 'Software Download' from the 'Support' tab:

Clicking this link will take you to the software download page. To download any files you must log in as a registered user – if you have not already registered this is a very quick process; just click the 'create an account' link and follow the on-screen instructions.



After logging in, the download screen will change slightly:

Your user name will be displayed in the top right hand corner of the screen



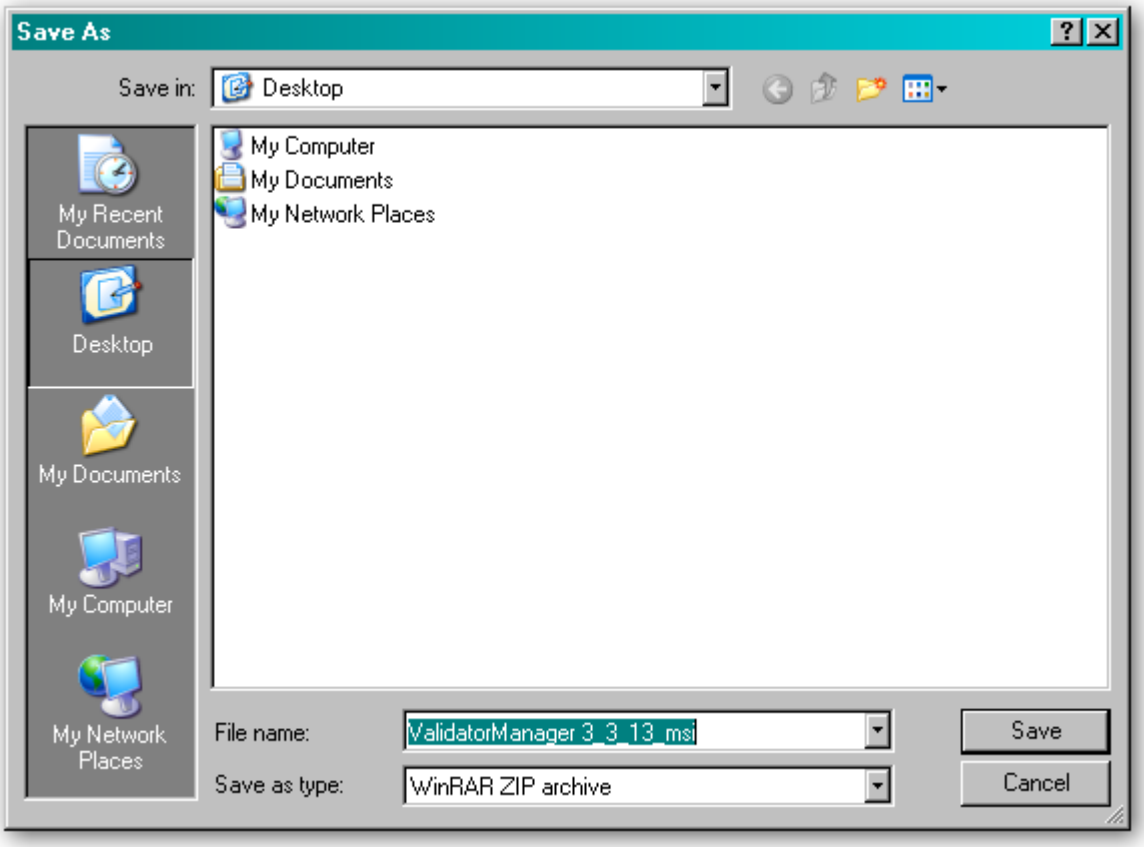
The padlock icon for each file will change from locked to unlocked. To download a file, just click on the padlock icon opposite the file name.

If you want to find more information about the file before you download it, you can click on the blue information icon.

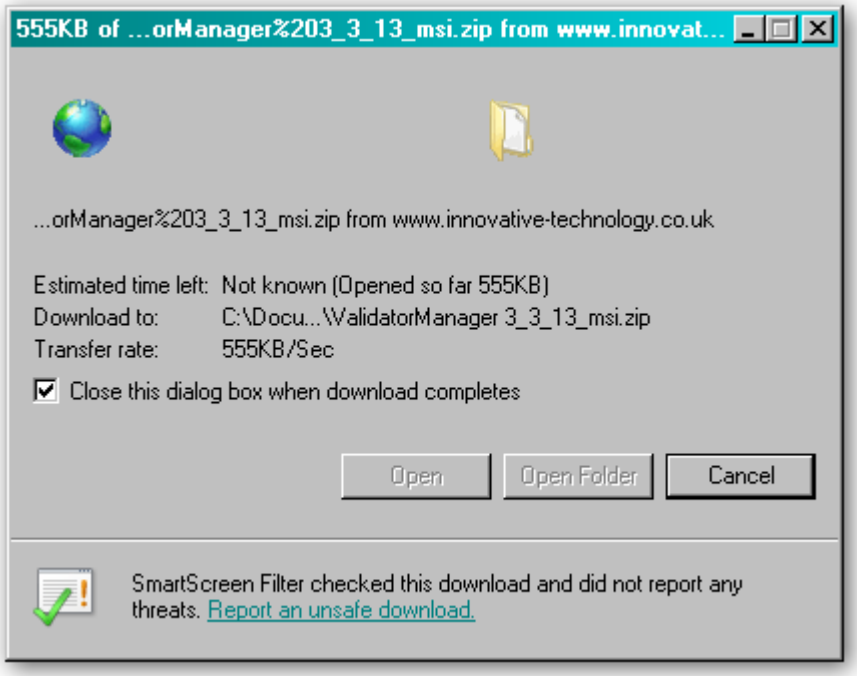
In this case, we want to download the Validator Manager software, so we click on the padlock icon opposite the 'Bank Note Validator Currency Manager' filename:

After clicking the link, a file download dialog box will appear – choose the option to **save** the file:

You can save the file anywhere that is convenient, as long as you can remember where it is when you want to install the software.

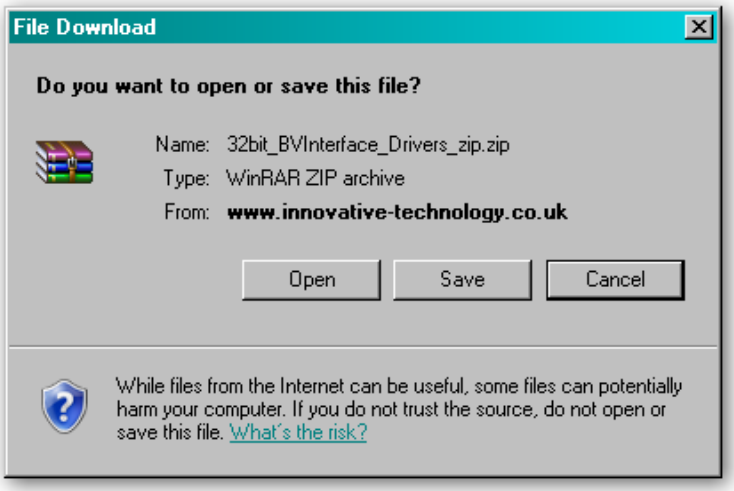


After choosing where to save the file, a file transfer dialog box will appear showing the progress of the file download:

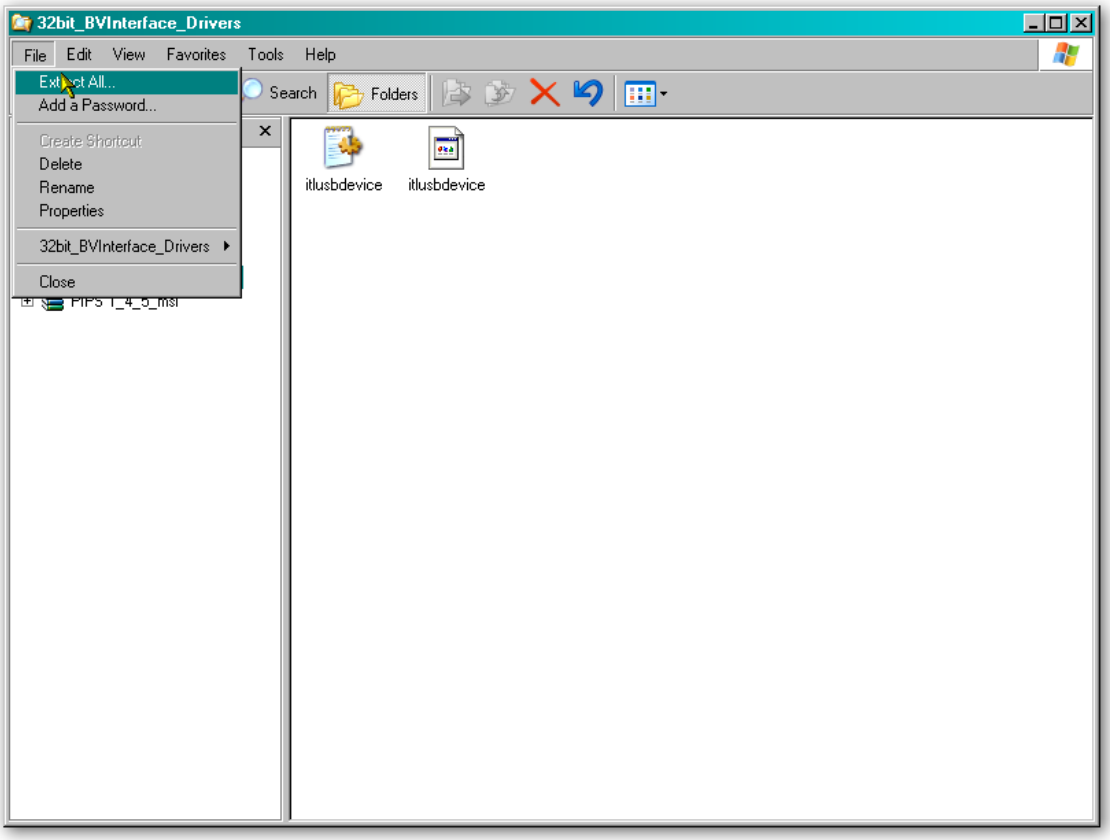


3.1.2 BV Interface Drivers

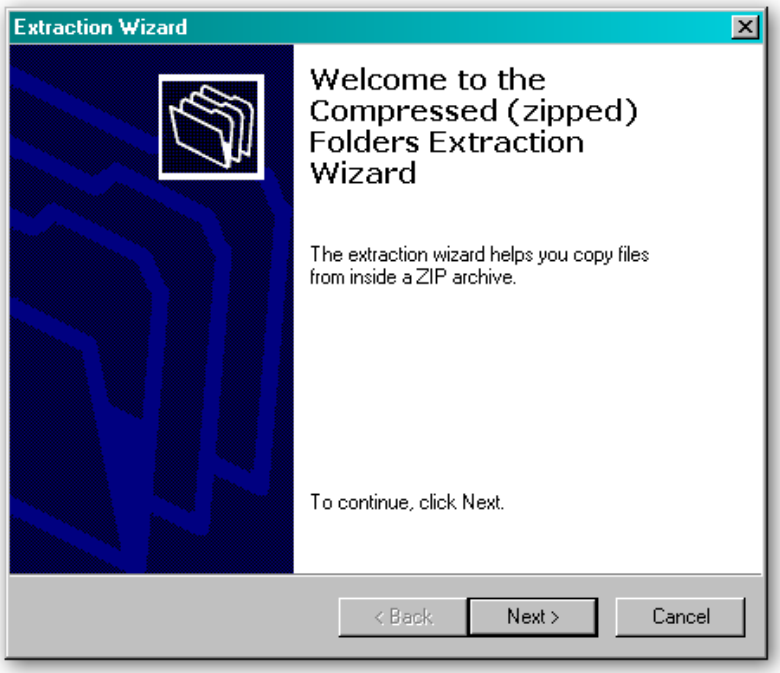
After downloading the Validator Manager software, you will also need to download the Banknote Validator (BV) Interface drivers – two versions are available (32 bit and 64 bit) so choose the correct type for your operating system. Again, remember where you saved the file.



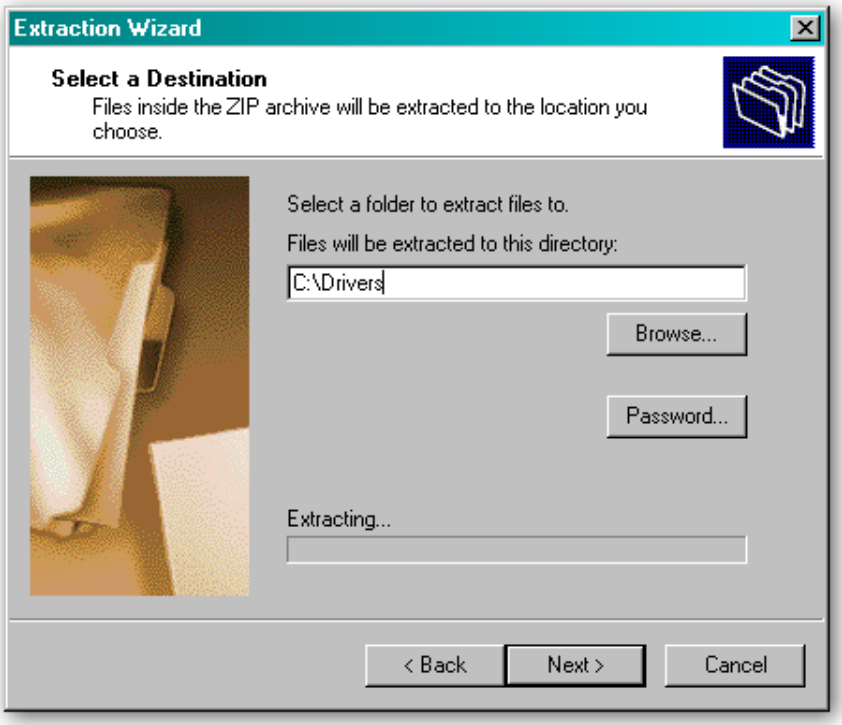
Both files are provided in a 'zipped' (compressed) form – you will need to extract the files from the zipped file before you can install the software or driver. Any version of Windows from Windows 98 onwards can open zipped files; or you may want to use a third party software tool such as Winzip or WinRAR.

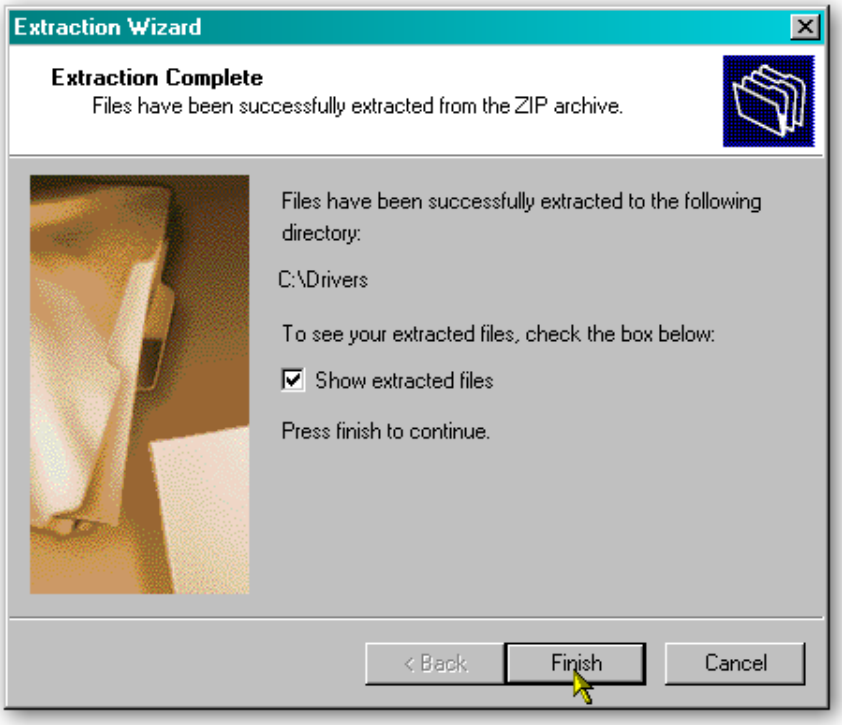


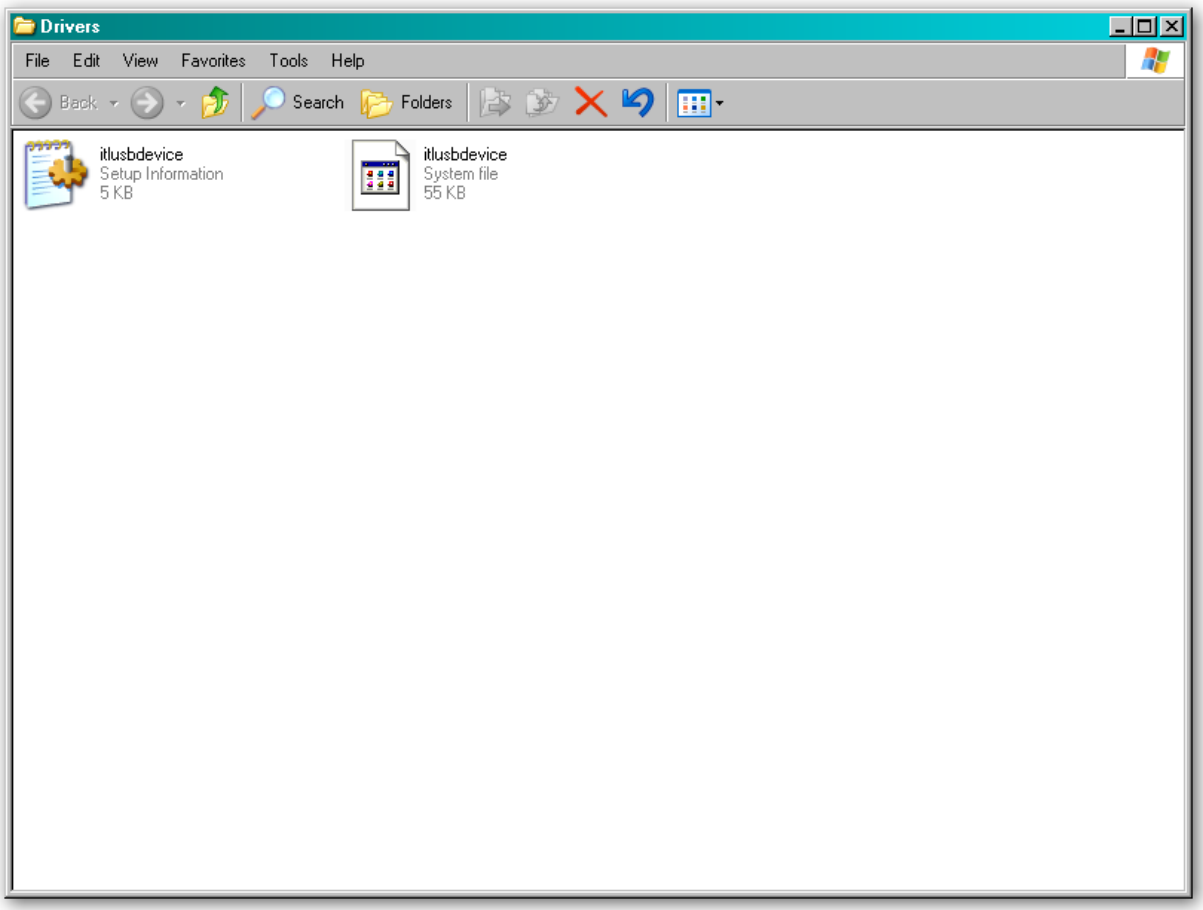
Extract the files to a convenient location – this might be an existing folder, or you may want to save them into a new folder.



In this example, the BV Interface driver files are being saved into a folder called 'Drivers' on the computers C: drive.







3.1.3 Installing the Drivers

There are several ways to communicate with the NV9 USB validator, which include using a direct connection from computer to validator with a CN392 validator to USB cable, or by using a special interface unit called a DA2. Use of the DA2 is not covered here – please refer to ITL Document number GA338-2 for more information. In this manual we will be using the USB connection method.

To use a USB connection with the NV9 USB, a USB cable with a 16 way connector on one end (ITL Part Number CN392) should be used. The CN392 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 red and black power leads on the CN392 cable.

The connector needed to set up and interface with the NV9 USB Validator is easily accessible on the side of the unit:

Interface Connector

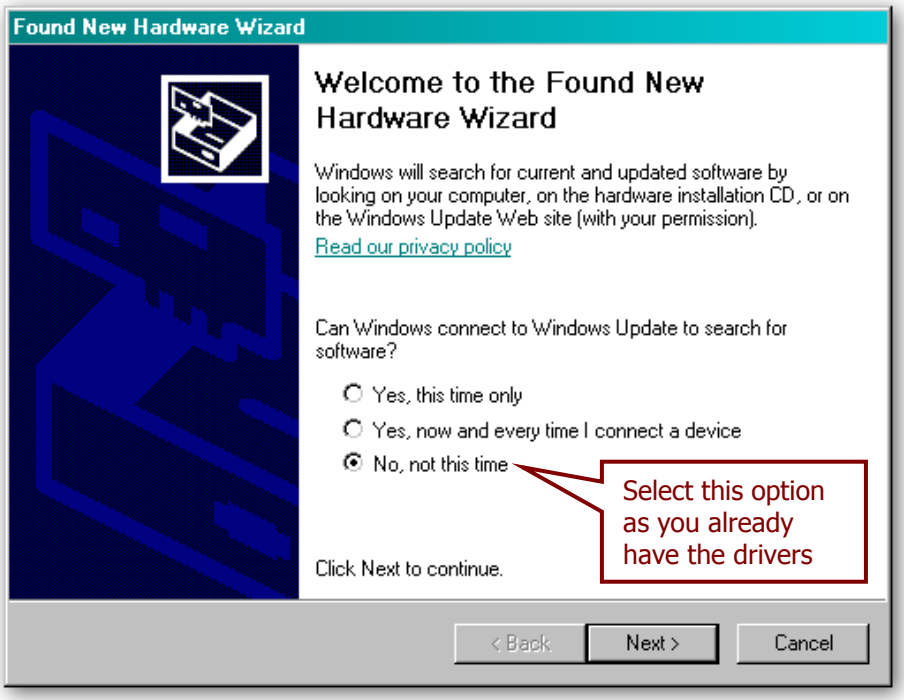
The NV9 USB validator must be powered up for the interface to be recognised by Windows. If the validator is not in the host machine, you will need to provide power to the 16 way interface connector first. The connection information and pin numbering is as follows:

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

Before connecting the USB cable to the computer, make sure that the CN392 cable is connected to the validator and that the unit is powered up. Once you have carried out these steps, plug the USB cable into the computer.

After connecting the USB cable, Windows should then detect the NV9 USB validator interface – a 'Found New Hardware' bubble or dialog box should appear.

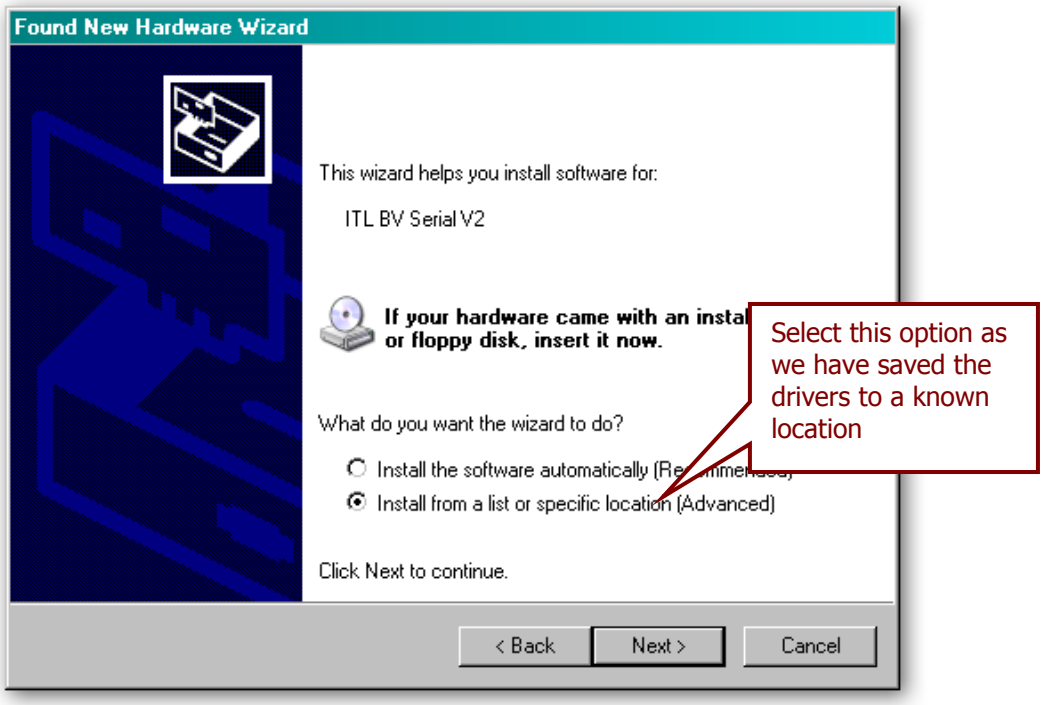
A 'Found New Hardware' wizard should then start to guide you through the installation process (this first screen is not always shown on some computers):



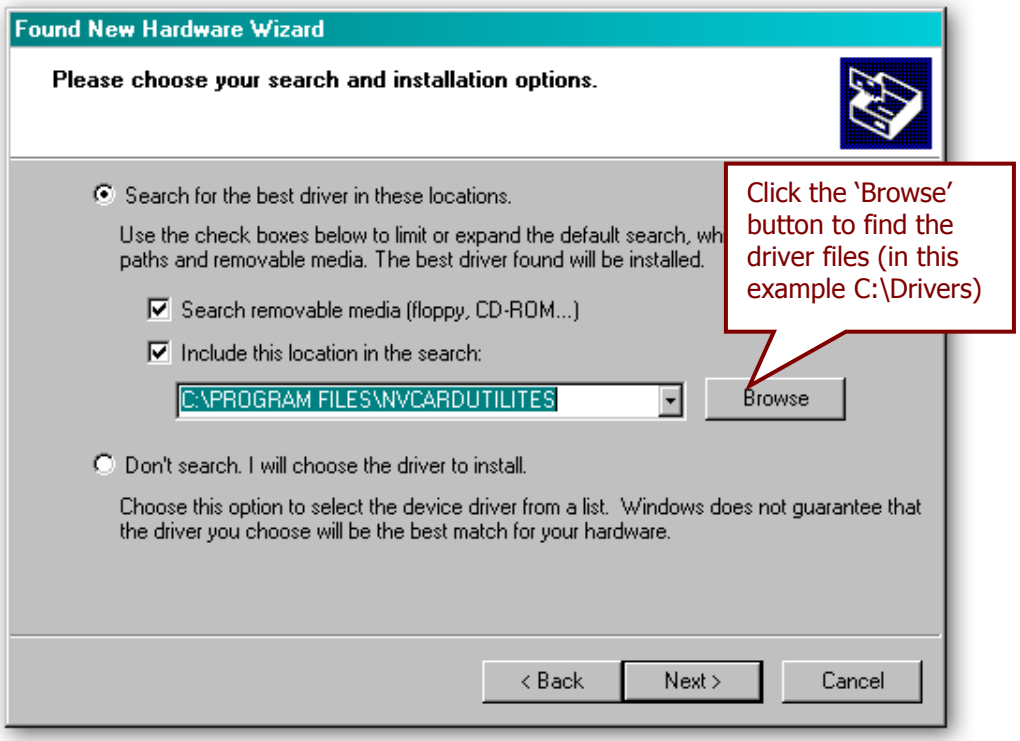
Information

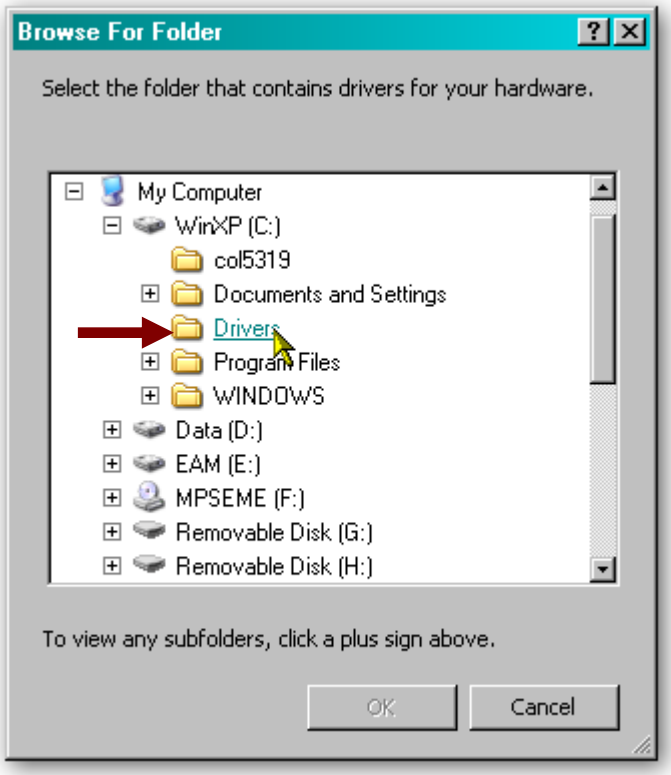
Only use V2 drivers

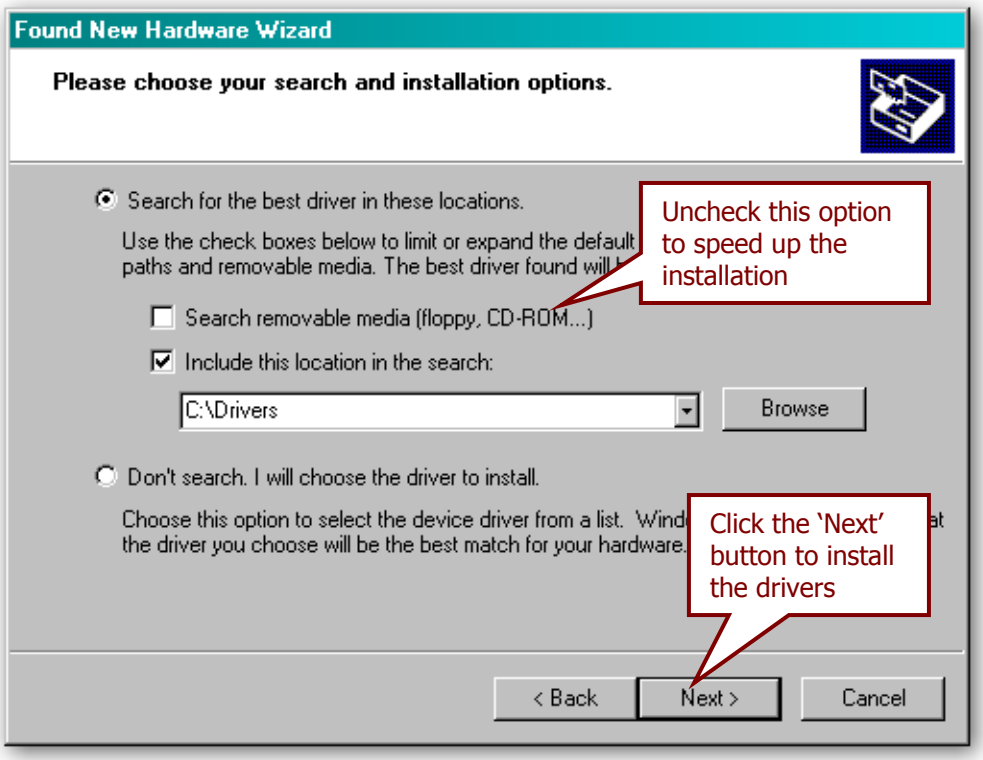
Please make sure that you are using the V2 drivers for the installation.



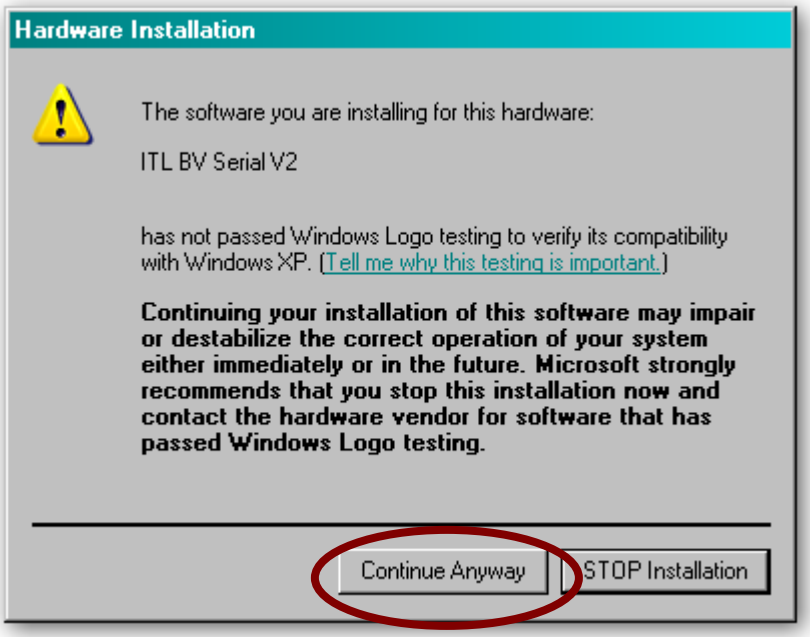
The next dialog box will ask you where to search for the drivers:

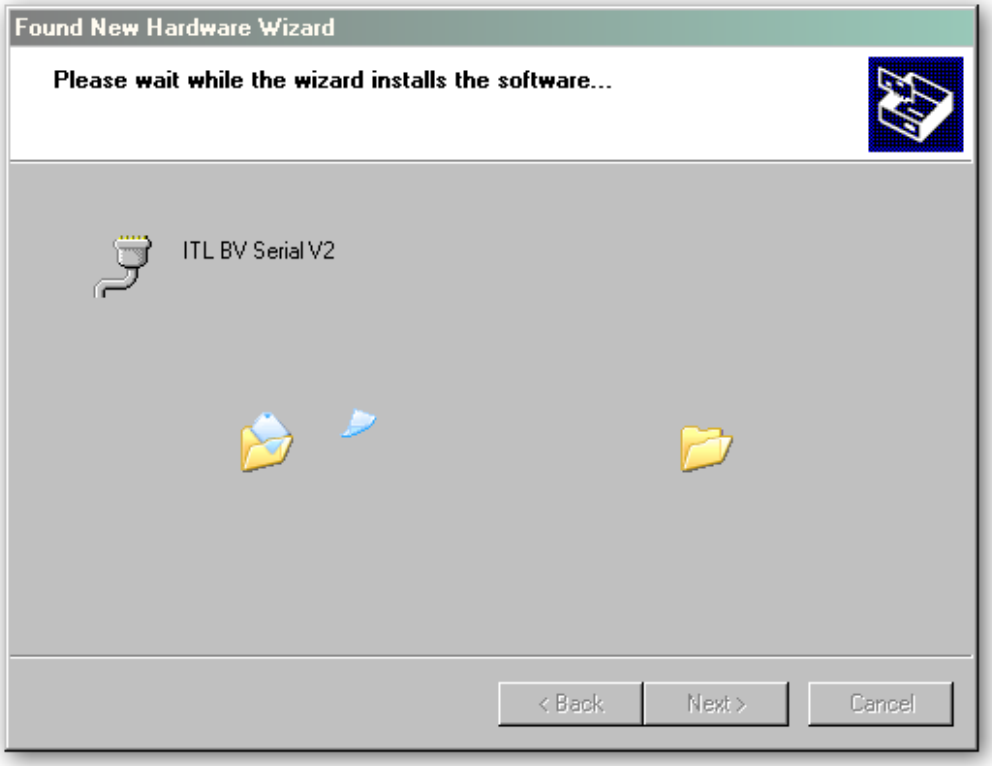


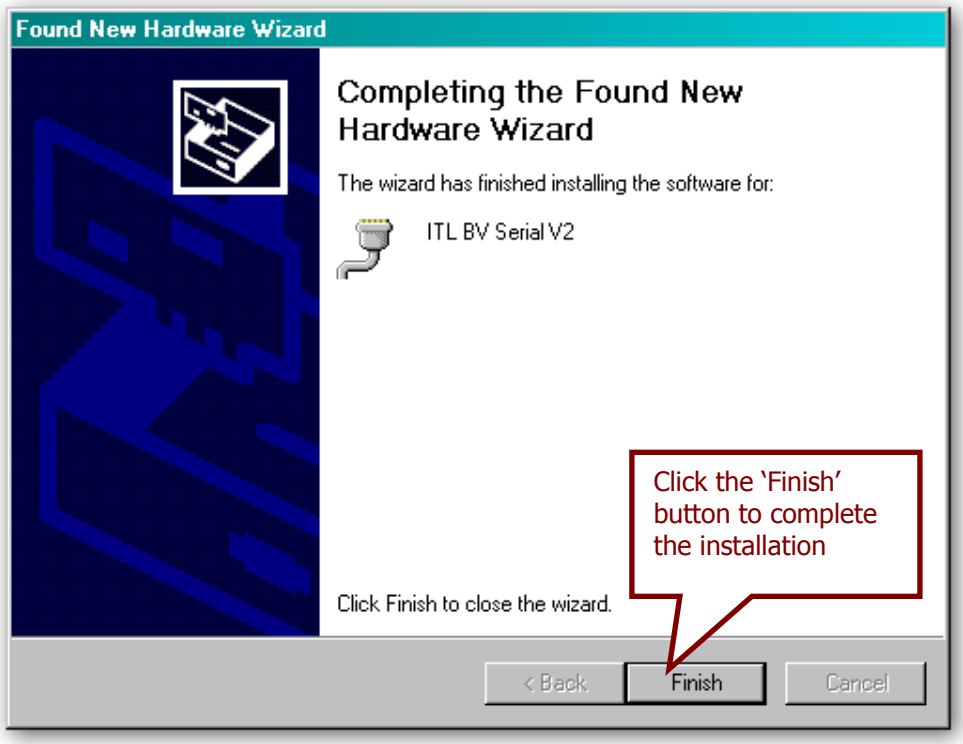




You may see a warning dialog saying that the drivers have not passed Windows logo testing – you can ignore this warning. Just click the 'Continue Anyway' button.

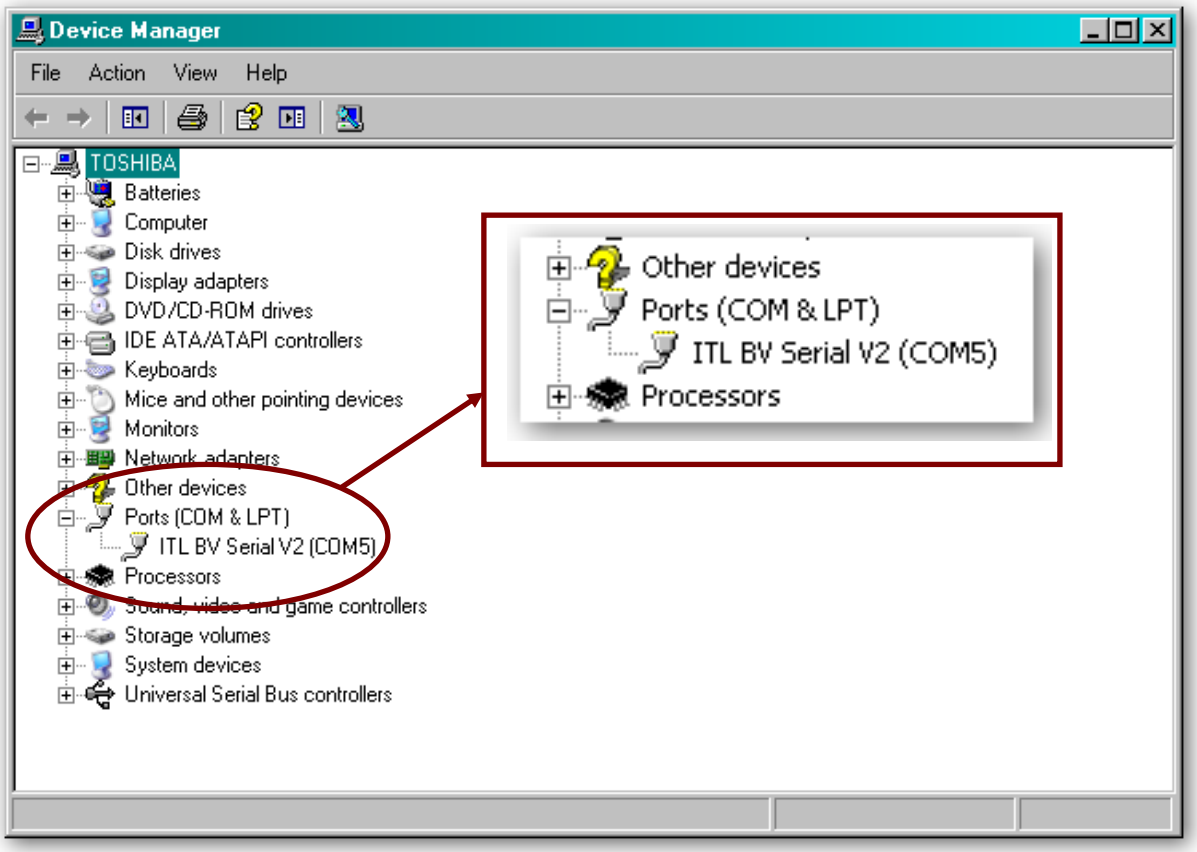






After completing the driver installation you can check that the communications port has been installed correctly.

Open Windows Device Manager, and click on the Plus symbol (+) next to the 'Ports' entry. This will expand the list of installed communications ports. You should see an entry for an '**ITL BV Serial V2'** port as shown here:

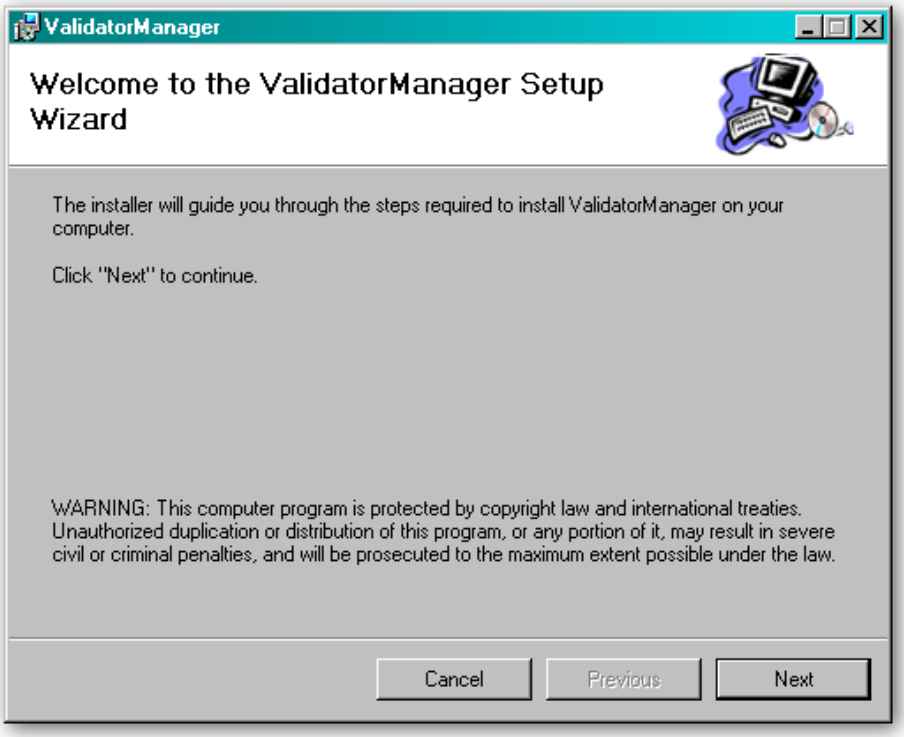


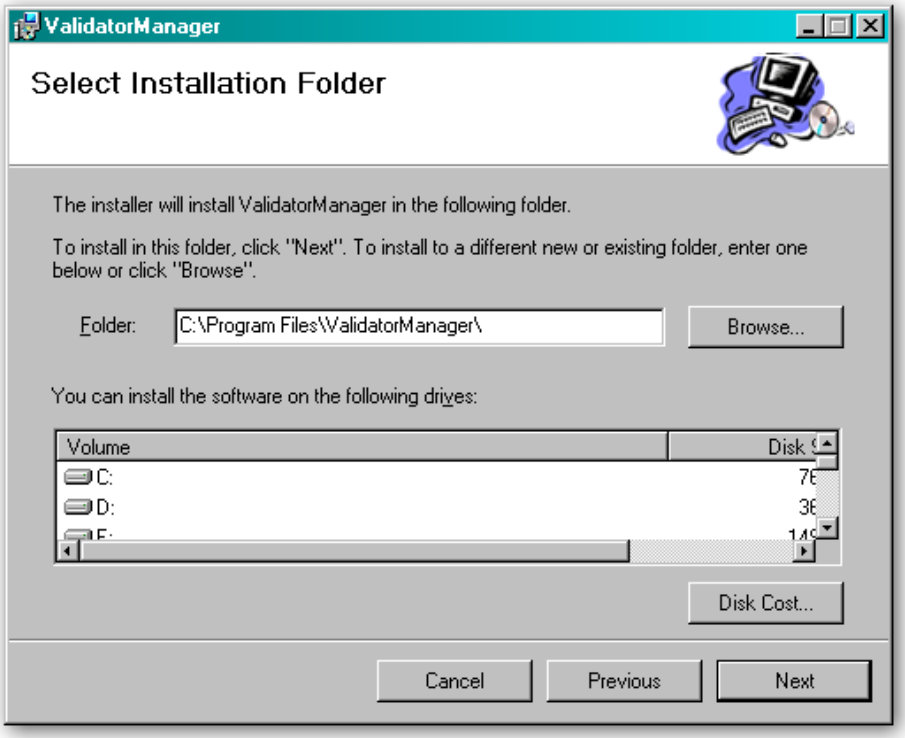
The actual communications port number (in our example COM5) may vary depending on your particular computer configuration.

Now the drivers have been correctly installed you can install the Validator Manager software – this is covered next.

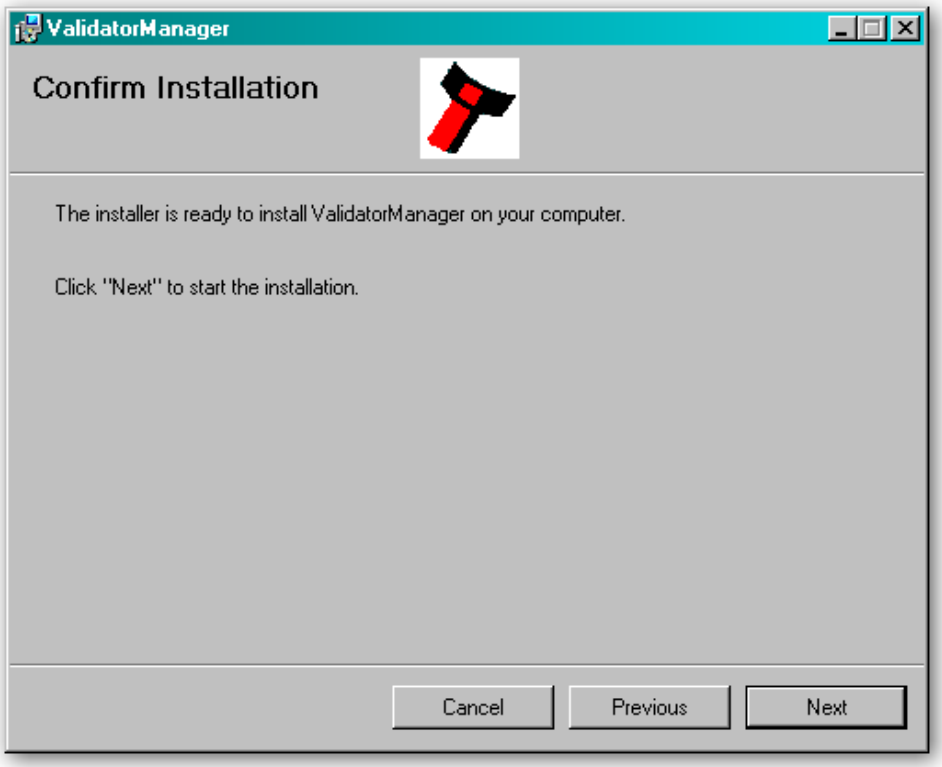
3.1.4 Installing the Validator Manager Software

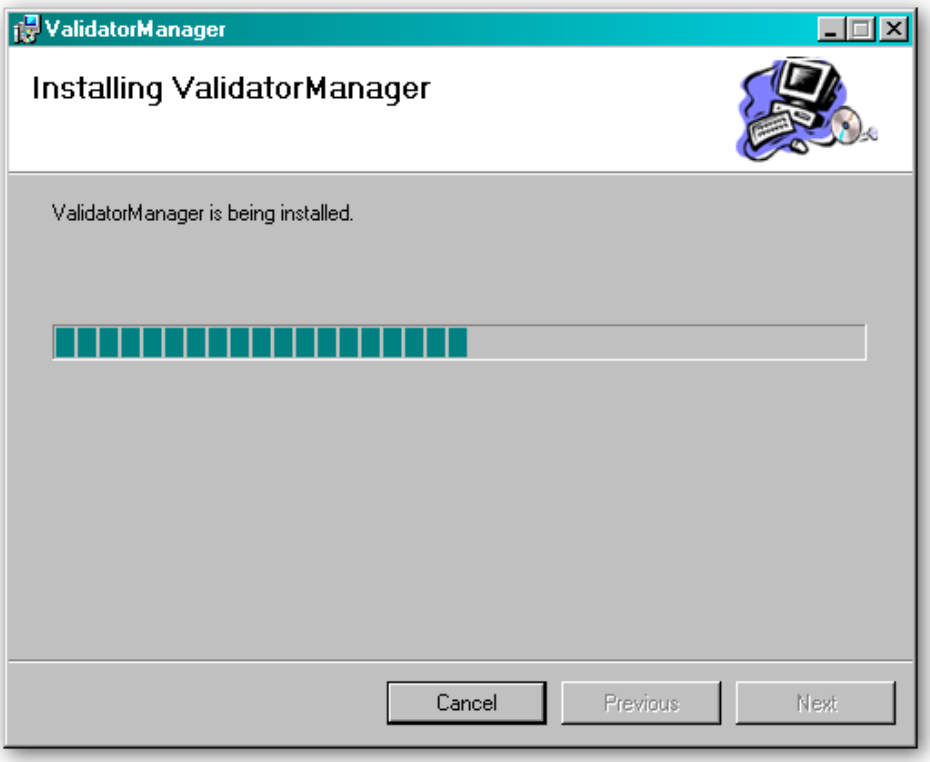
Installing the Validator Manager software is very straightforward. Find the Validator Manager zipped file you downloaded earlier, extract the installation file from the zipped file and double click the extracted file (it has an .msi extension) – this will start the installation process:

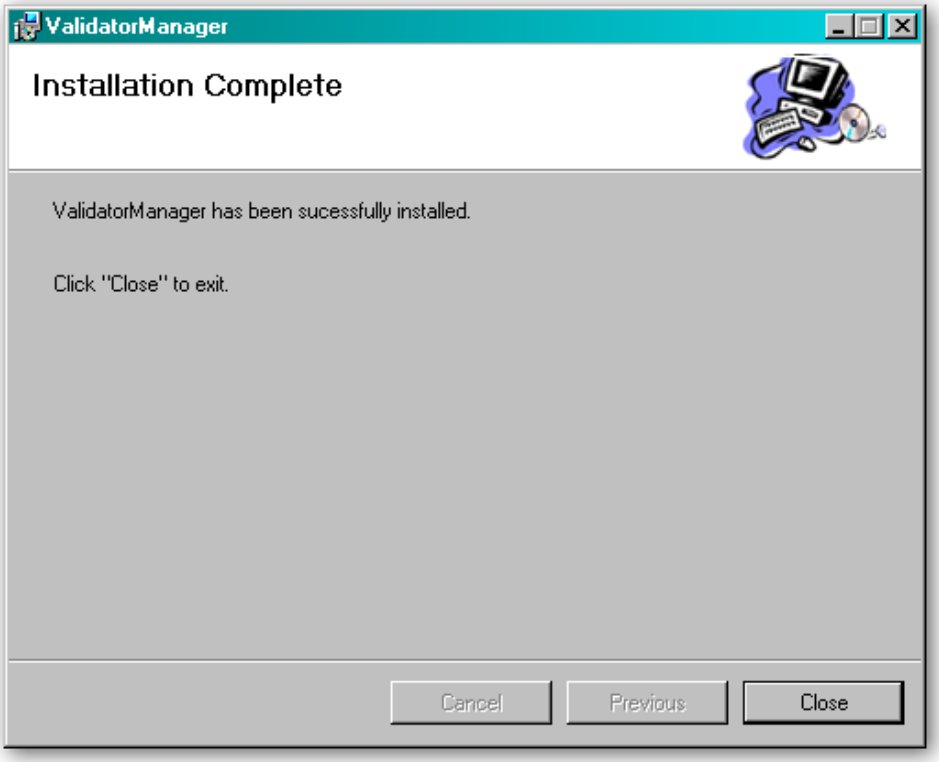




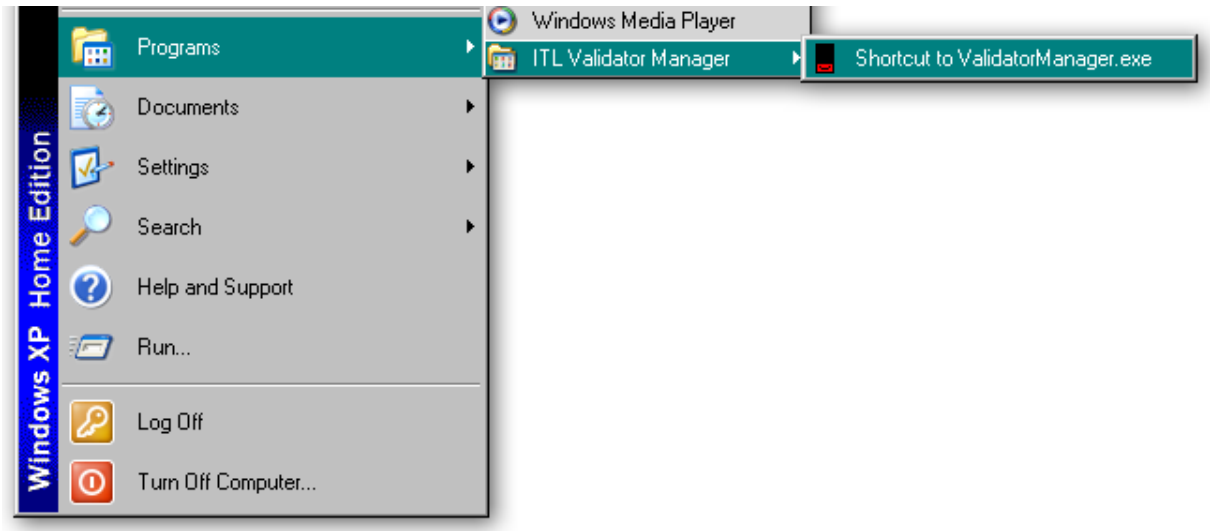
You can choose where you would like to install the software, or just accept the default location (as shown above). Clicking on the 'Next' button will then ask you to confirm the installation:







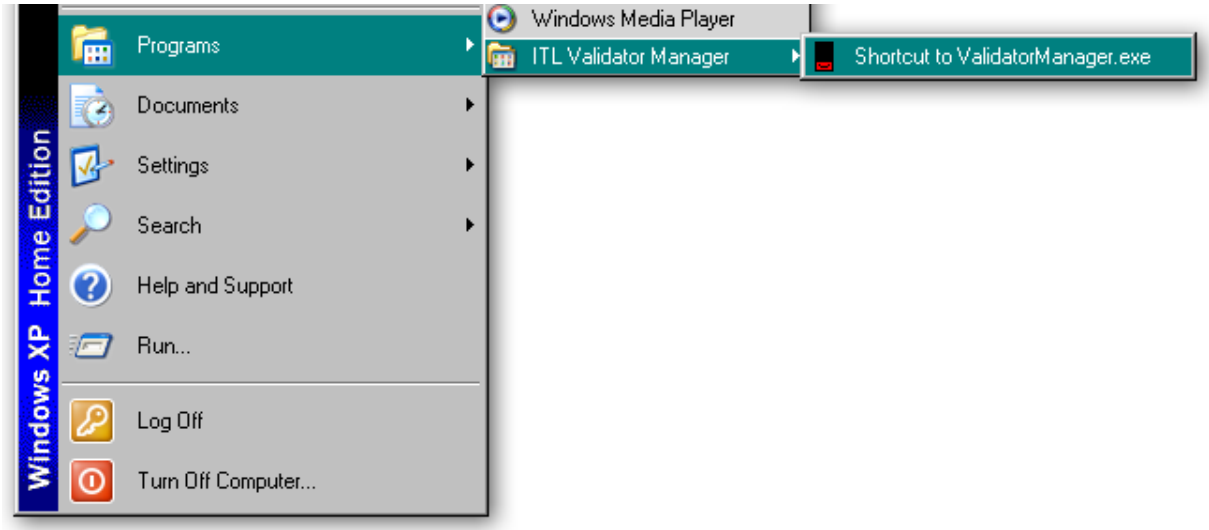
Once the installation is complete, you will have a new program group called 'ITL Validator Manager' in the Windows Start Menu, similar to the one shown here:



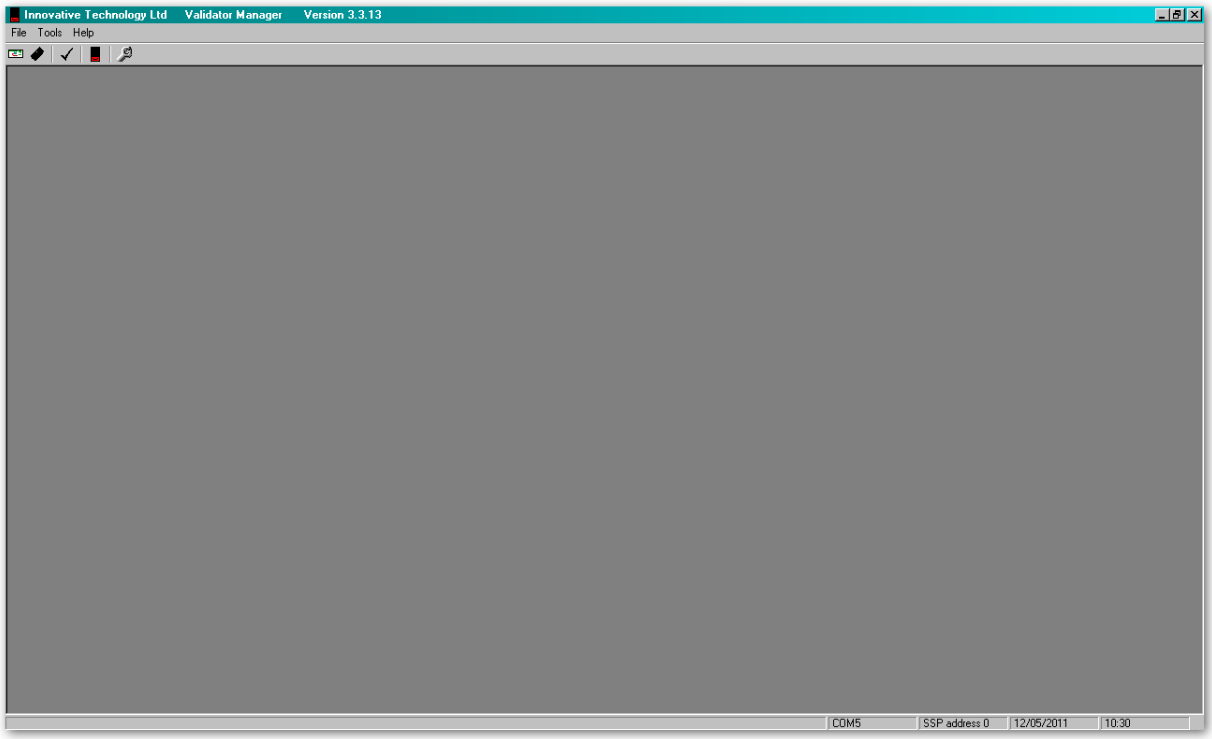
You can run the Validator Manager software by clicking the 'Shortcut to ValidatorManager.exe' menu entry; however, before you can use the Validator Manager software with an NV9 USB validator you will need to make sure that you have installed the BV interface drivers (as described earlier).

3.1.5 Starting the Validator Manager Software

The Validator Manager software is launched by clicking the 'Shortcut to ValidatorManager.exe' entry in the 'ITL Validator Manager' menu group.

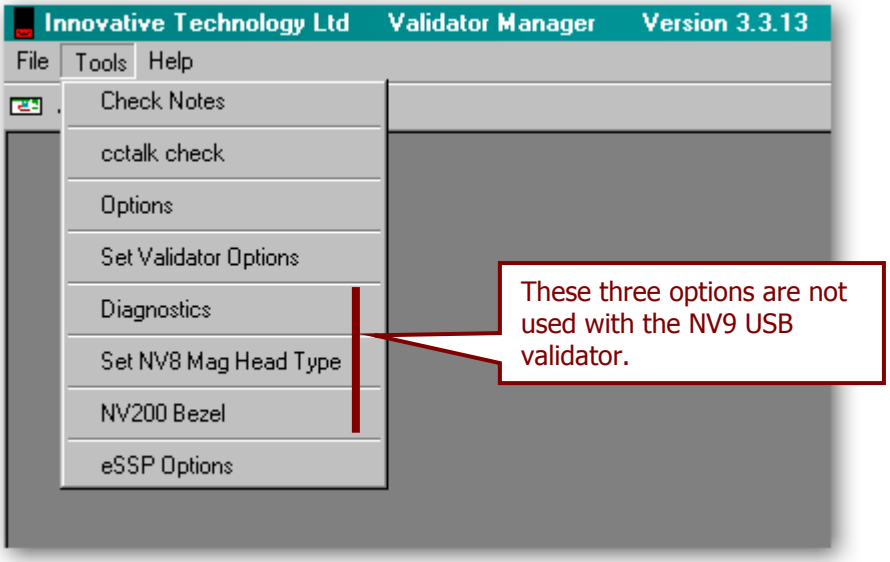


The initial program screen looks like this:



Make sure that the NV9 USB Validator is powered up and the USB cable is connected before going any further. All of the program options can be accessed from the menu bar at the top of the screen – some specific functions can also be accessed by clicking the relevant icon underneath the menu bar, and the function of each icon is indicated by a 'tooltip' indicator

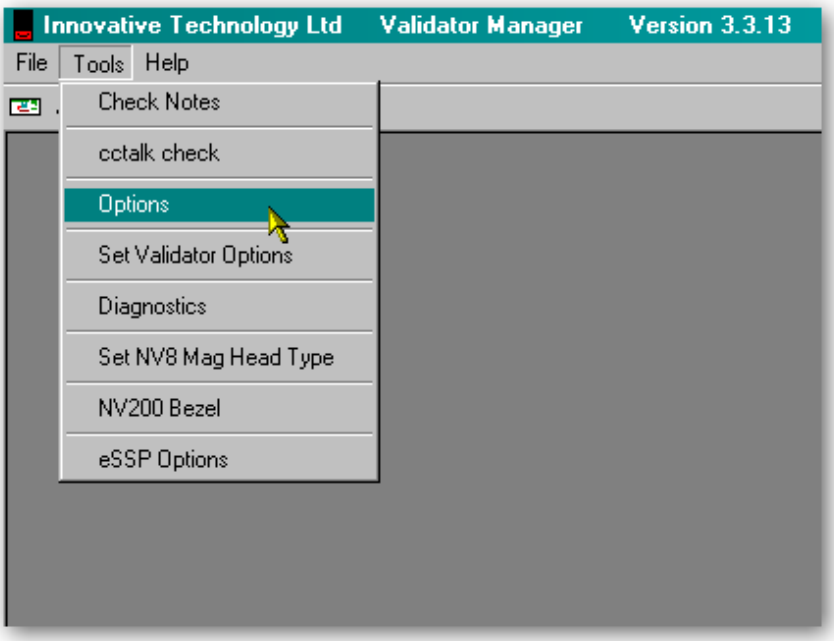
Please be aware that not all the program options are applicable to the NV9 USB, as the Validator Manager software is designed to work with a range of ITL Technology validators.



Full details of all the Validator Manager software functions are detailed in the program help file (accessible from the 'Help' menu).

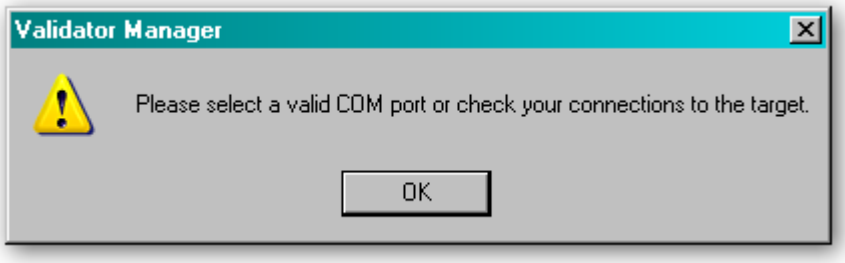
Options:

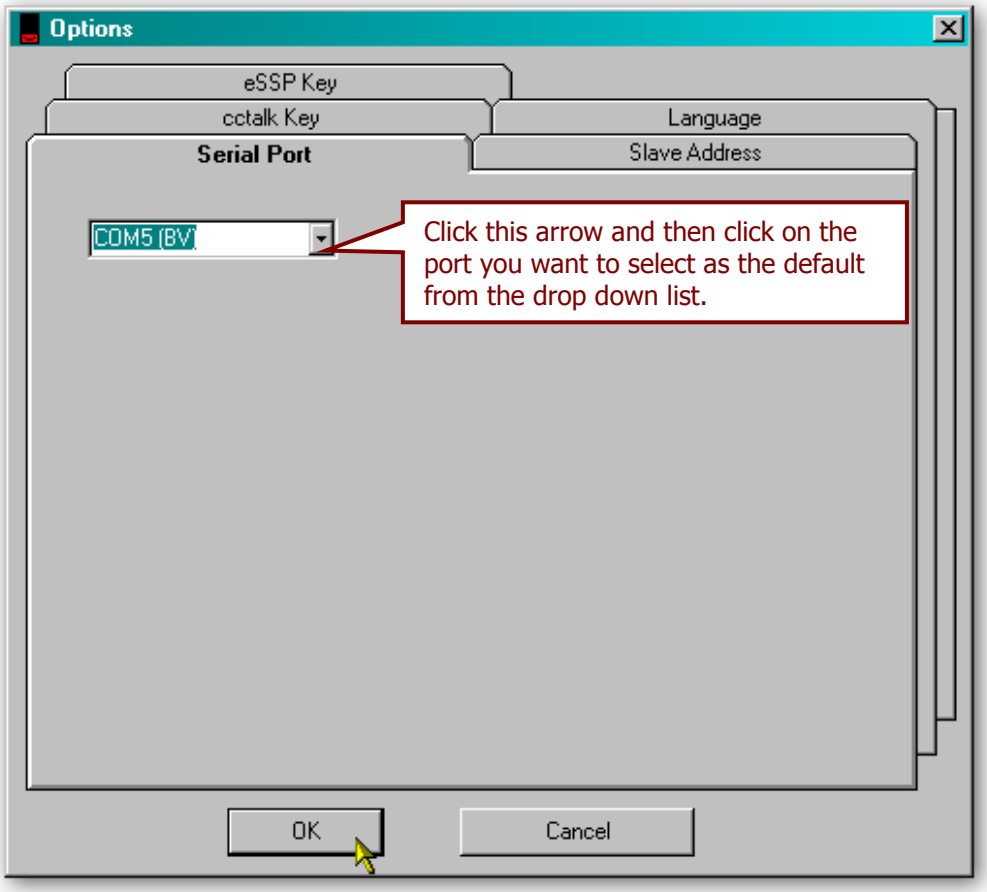
The general preferences for the Validator Manager software are accessible from the 'Tools' menu (as shown). Click the 'Options' entry to open a new dialog box:



Selecting the 'Serial Port' tab from the 'Options' dialog and defining which serial port to use to connect to the NV9 USB validator should be one of the first things you do after installing the software.

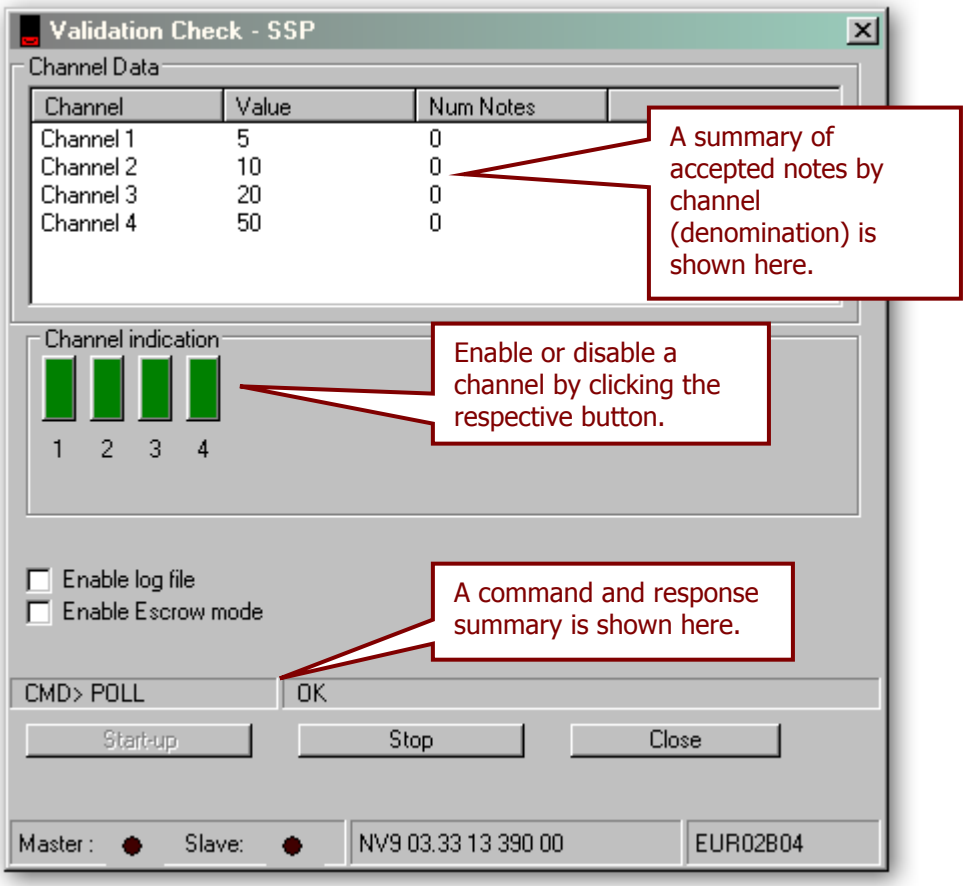
The Validator Manager will not work if the serial port is not set or is set incorrectly (if the serial port has not been set a dialog box will appear will appear when you run the program prompting you to enter or correct the port setting):





Select the correct serial port from the list and click the 'OK' button to confirm the setting.

Check Notes:

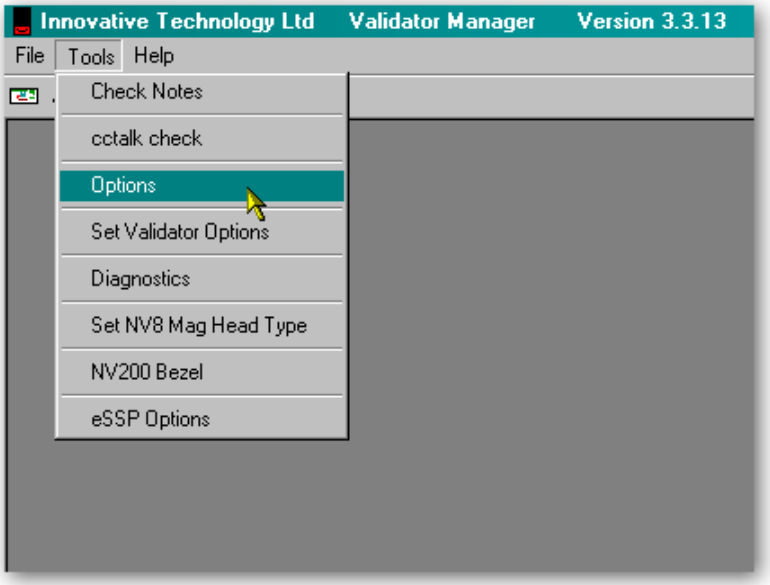


The 'Check Notes' menu item provides a way to check the validator will correctly accept bank notes. Clicking the 'Start-up' button will initialise the NV9 USB validator and allow acceptance of bank notes.

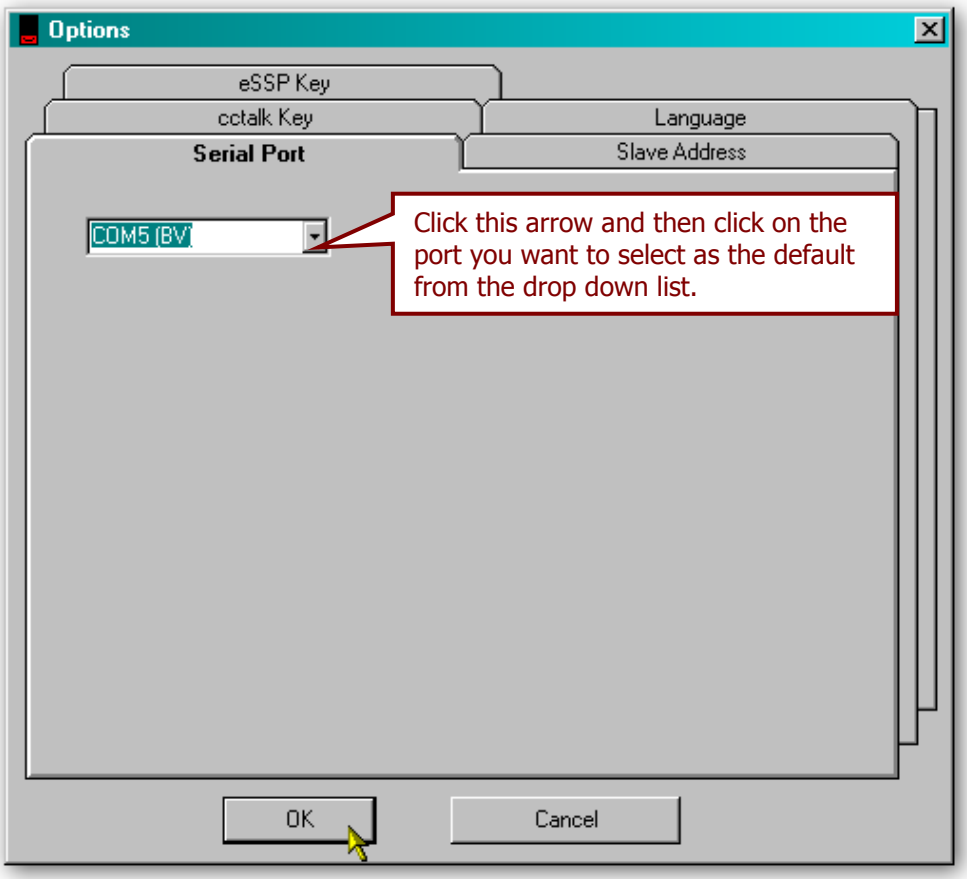
3.1.6 Preferences, Settings and Options

Options:

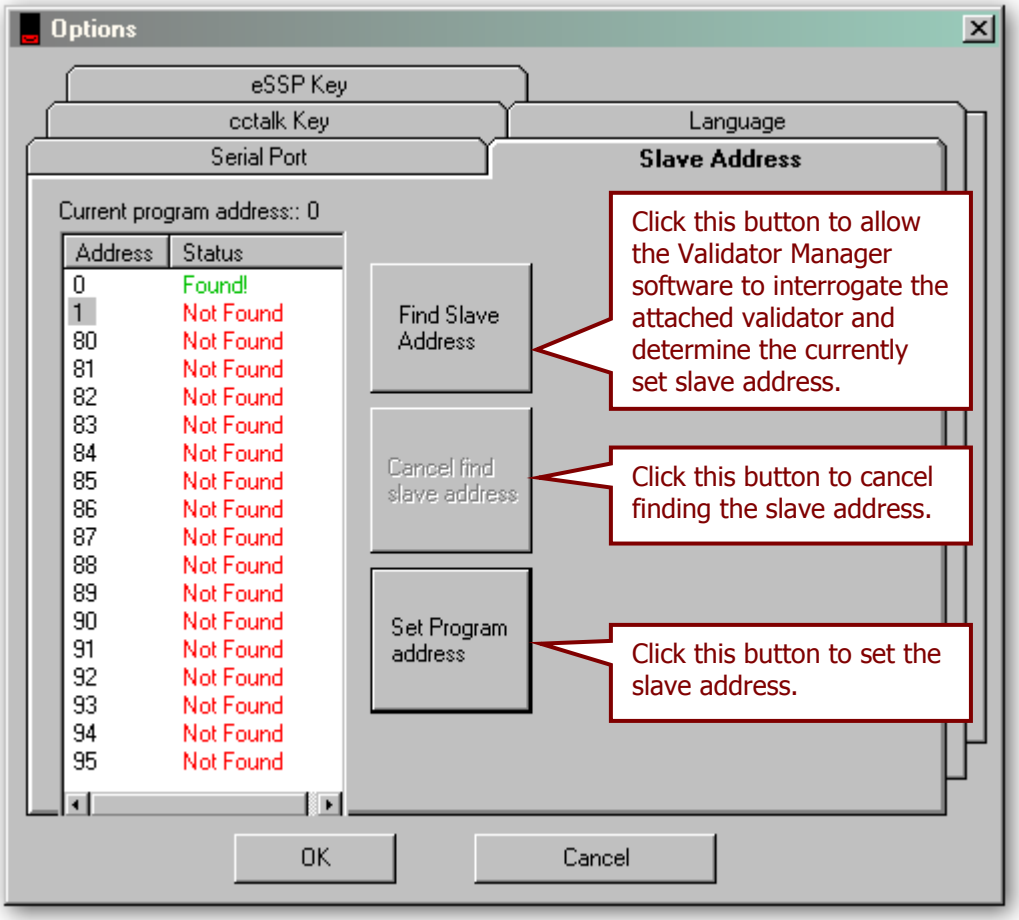
The general preferences for the Validator Manager software are accessible from the 'Tools' menu (as shown). Click the 'Options' entry to open a new dialog box:



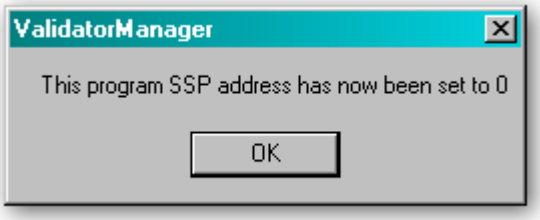
By selecting the 'Serial Port' tab from the 'Options' dialog you can define which serial port is being used to connect to the NV9 USB validator – click the 'OK' button to confirm the setting:



The Validator Manager software can detect the address used by the validator from the 'Slave Address' tab:



After clicking the 'Set Program Address' button, a dialog box will appear confirming the new setting - click the 'OK' button to confirm the change.

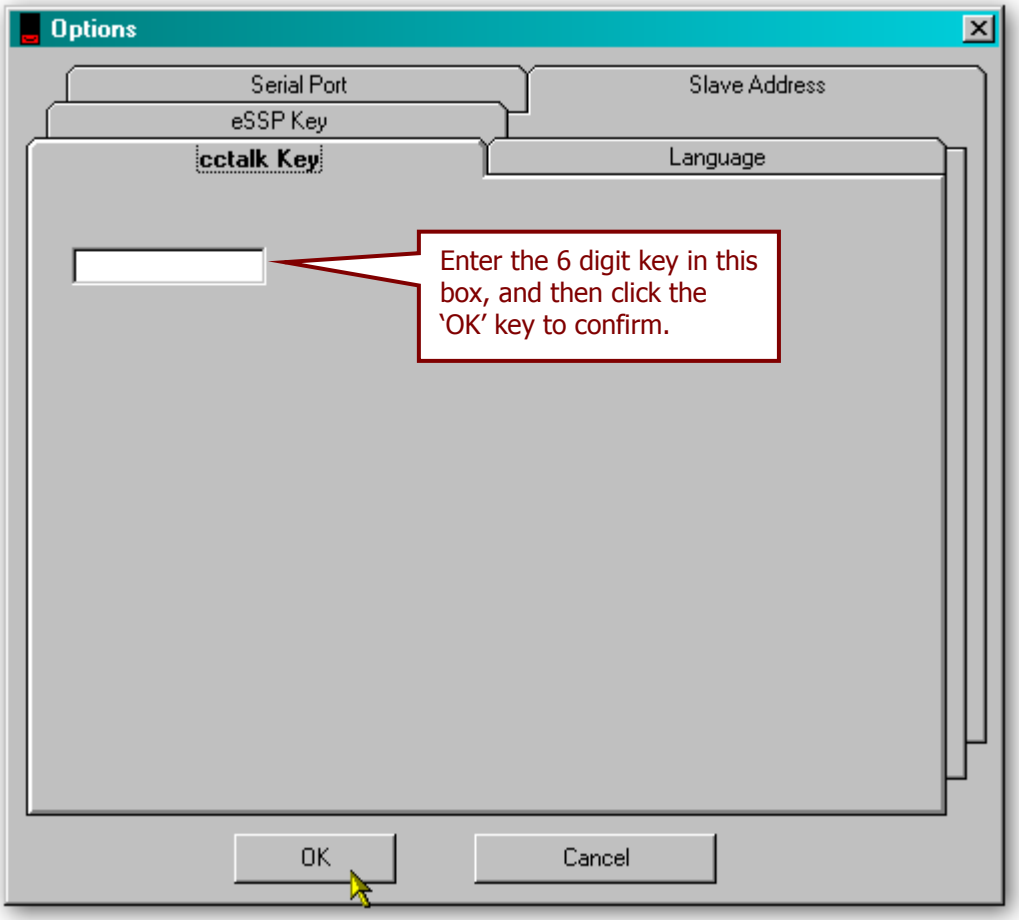


CAUTION!

Limited slave address ranges

The Validator Manager software will only communicate with the validator if the slave address is set to 0, 1 or in the range 80-99.

The 'ccTalk Key' tab allows the user to enter a six digit security key for use when the validator is set for ccTalk operation.



The ccTalk key is the **HOST** key, and is used for the ccTalk check – the validator must be configured to use the same key.

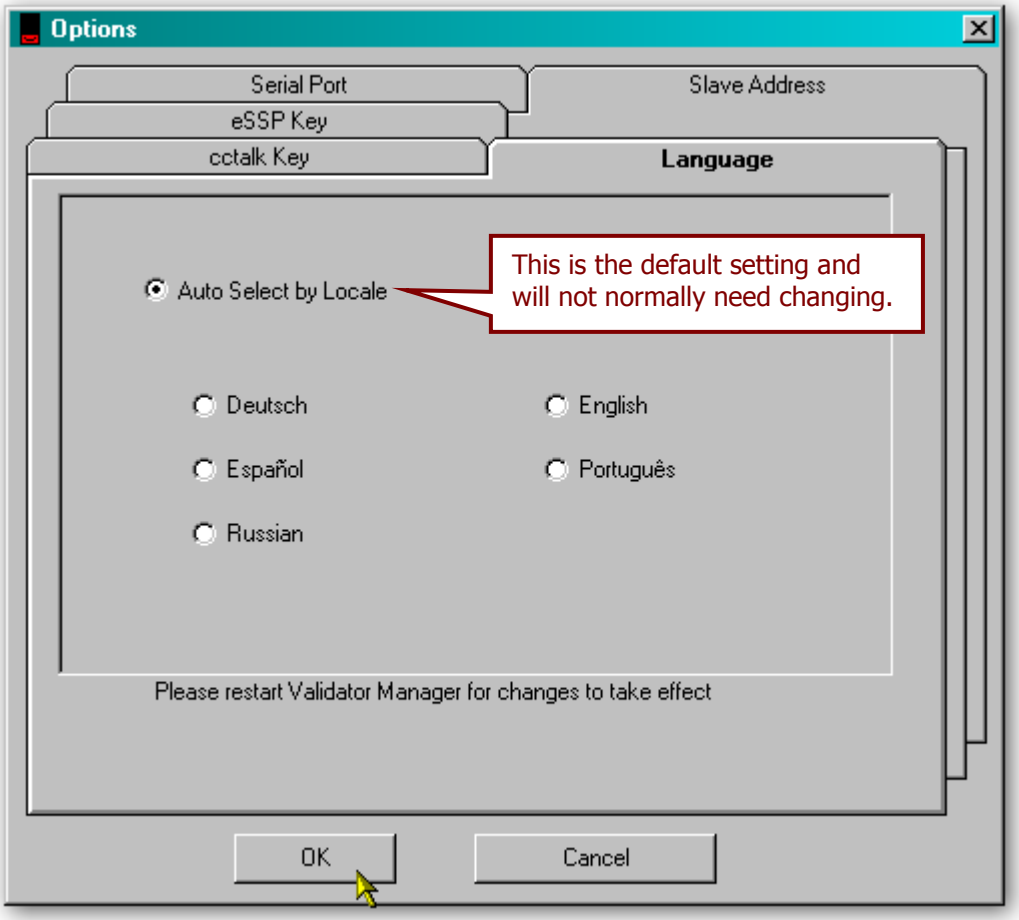
CAUTION!

Take care when changing ccTalk key

The user should make a note of the new key and after any change. The default setting for the ccTalk security key is 123456.

Select the 'Language' tab to change the preferred language for the software. You shouldn't normally need to change the language setting, as this is determined automatically based on the Windows locale settings. You can if you wish select one of five specific languages (German, English, Spanish, Portuguese or Russian) if needed, as shown below.

Click the 'OK' button to confirm the change – you will have to close and reopen the software to allow the language change to take effect.



The final tab on the 'Options' dialog is the 'eSSP Key' tab. By selecting this tab you can set a new security key to use when the validator is operating in SSP mode.

CAUTION!

Take care when changing eSSP key

Exercise care when changing the device eSSP key. The user must make a note of the new key and change the host key to match. If the key is not known then device must be returned to ITL for key reset.

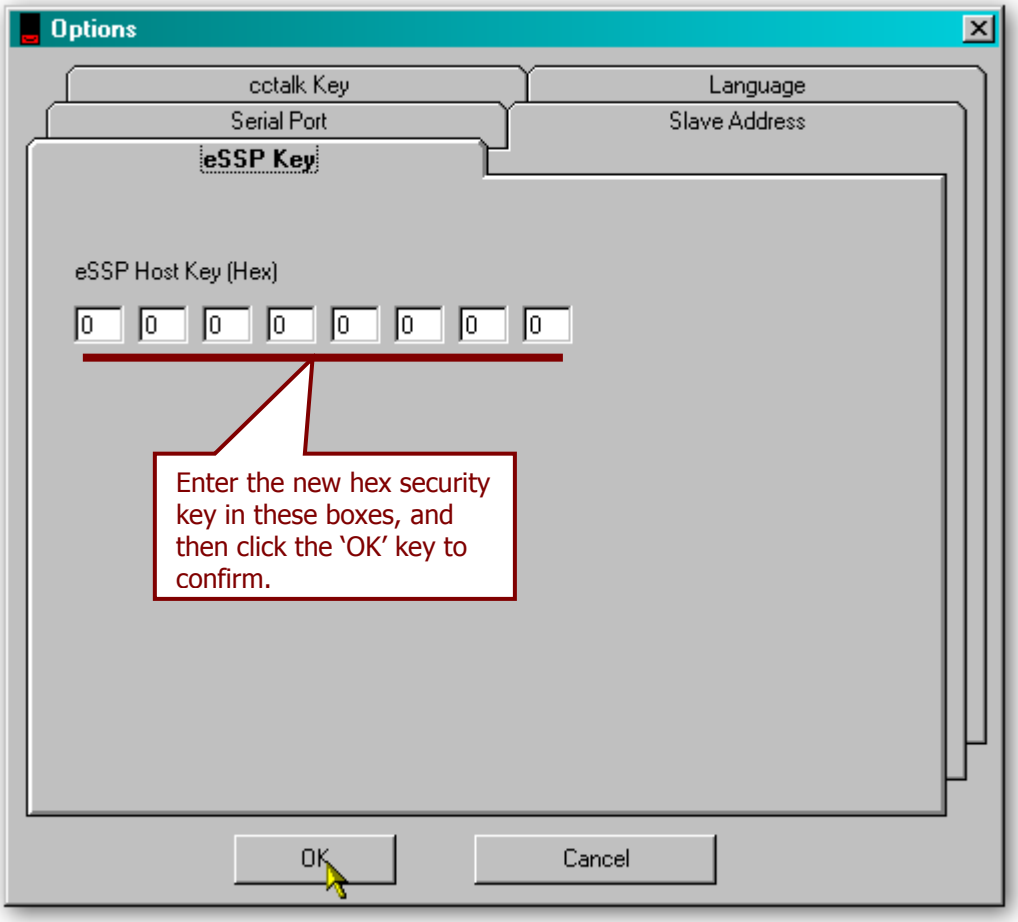
The eSSP key is made up a string of hexadecimal characters - each part of the key comprises two characters, giving a key with 16 characters in total.

As an example, your key may look like this:

65616d636f6e7375

This key would be entered eight groups of two characters per group, like this:

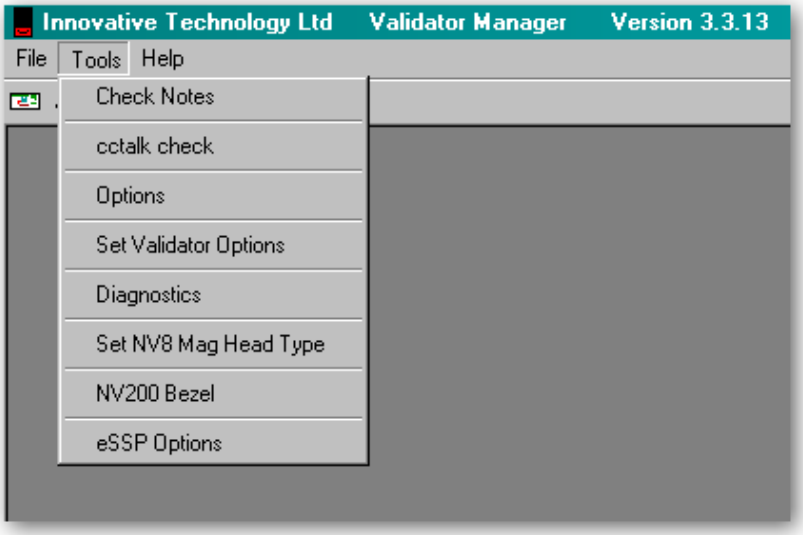
65 61 6d 63 6f 6e 73 75



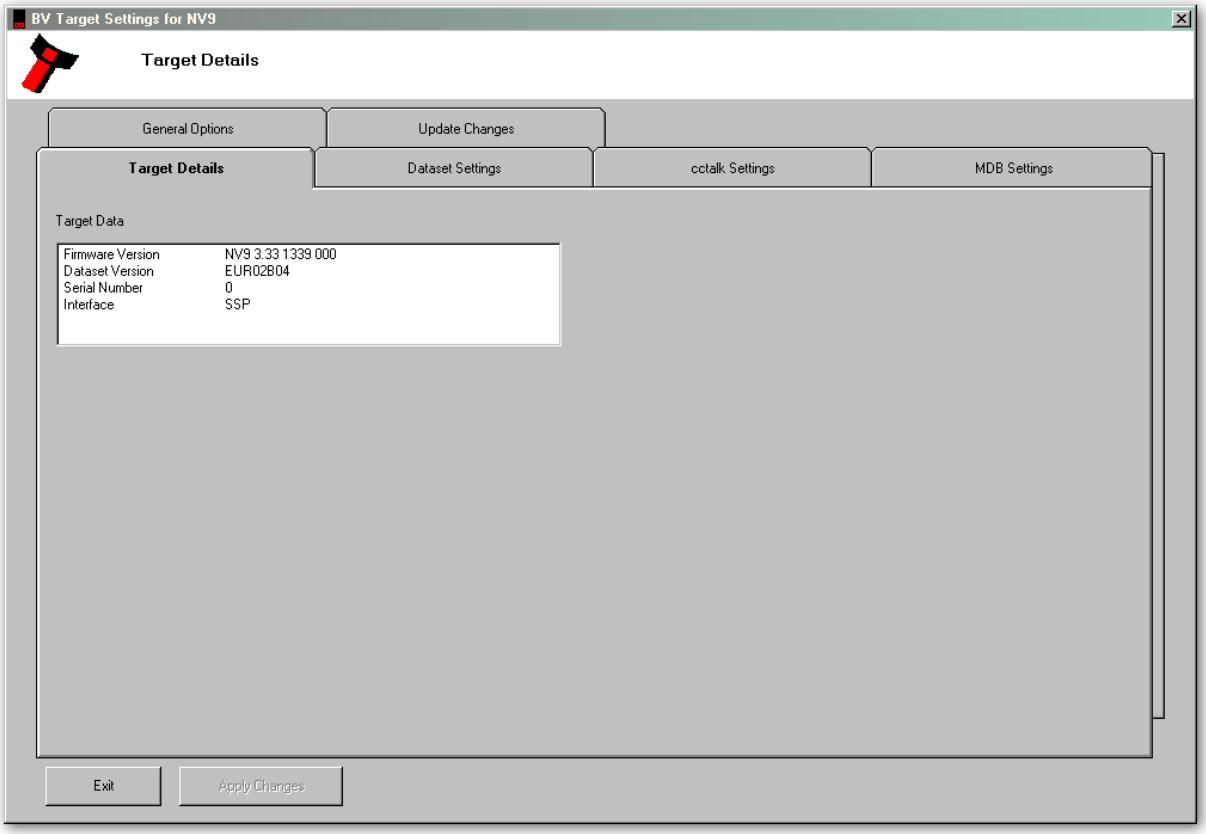
After entering the new key, press the 'OK' button to confirm the change.

Validator Options:

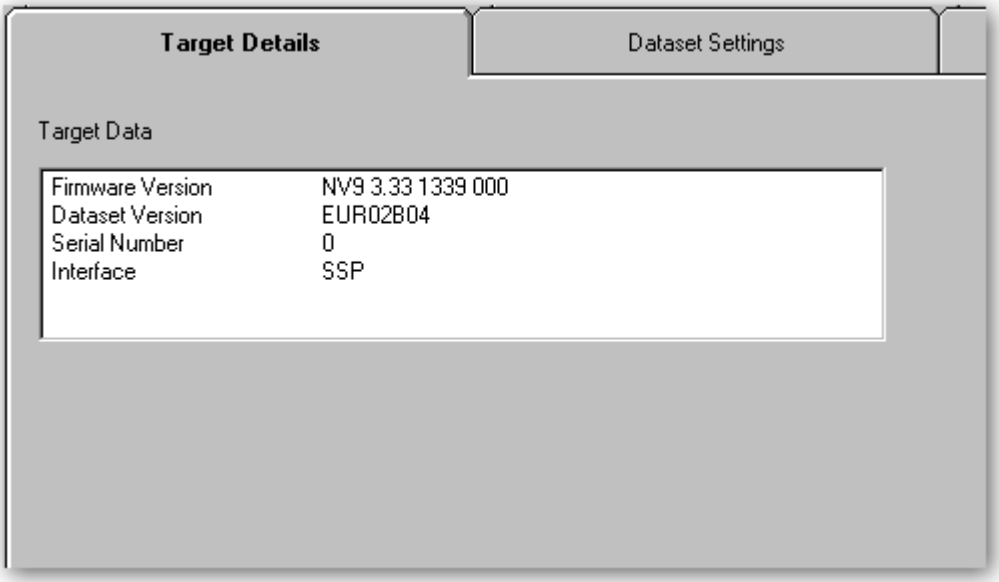
NV9 USB validator specific options are accessed from the 'Set Validator Options' item on the 'Tools' menu:



As with the 'Options' dialog, the 'Set Validator Options' dialog also has several tabs:

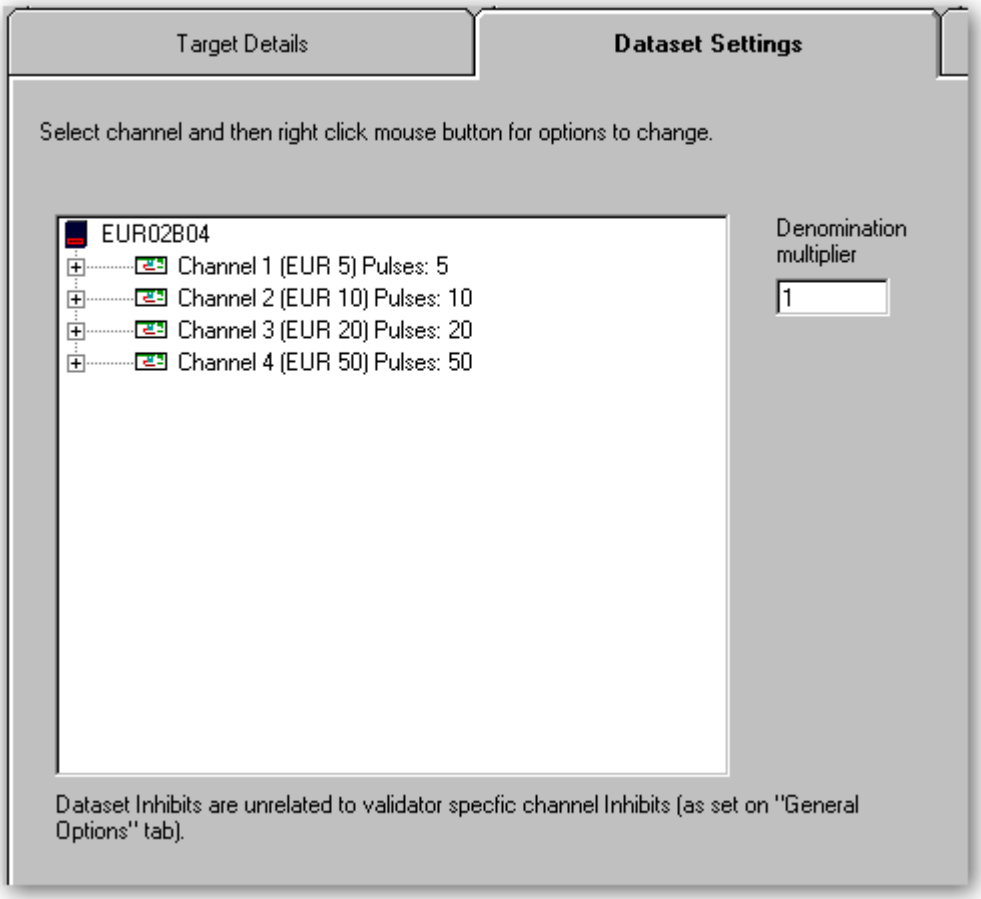


The first tab 'Target Details' allow you to see specific details about the validator, and provides a simple way of checking what version of firmware or dataset are currently installed:

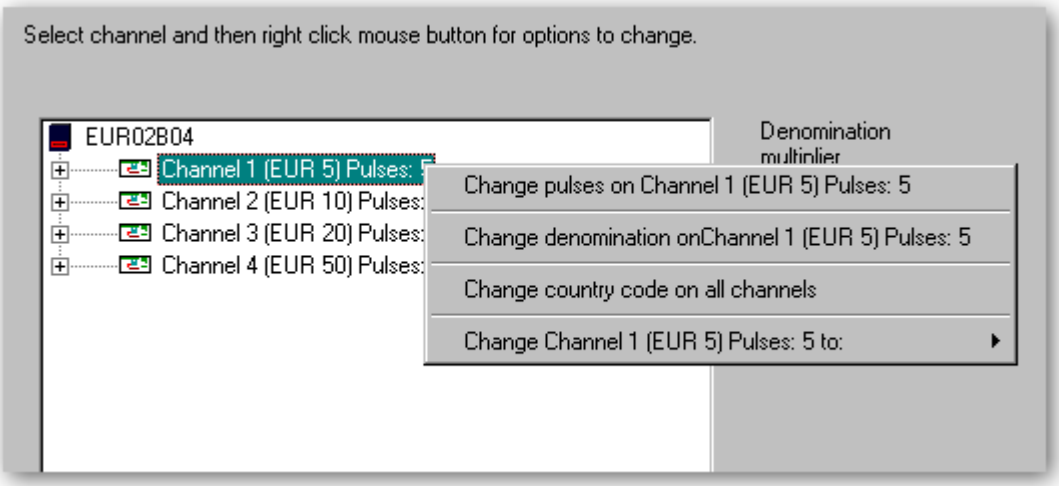


There are no user-changeable settings on this tab.

The second tab 'Dataset Settings' allows you to review and modify the settings of each installed channel:

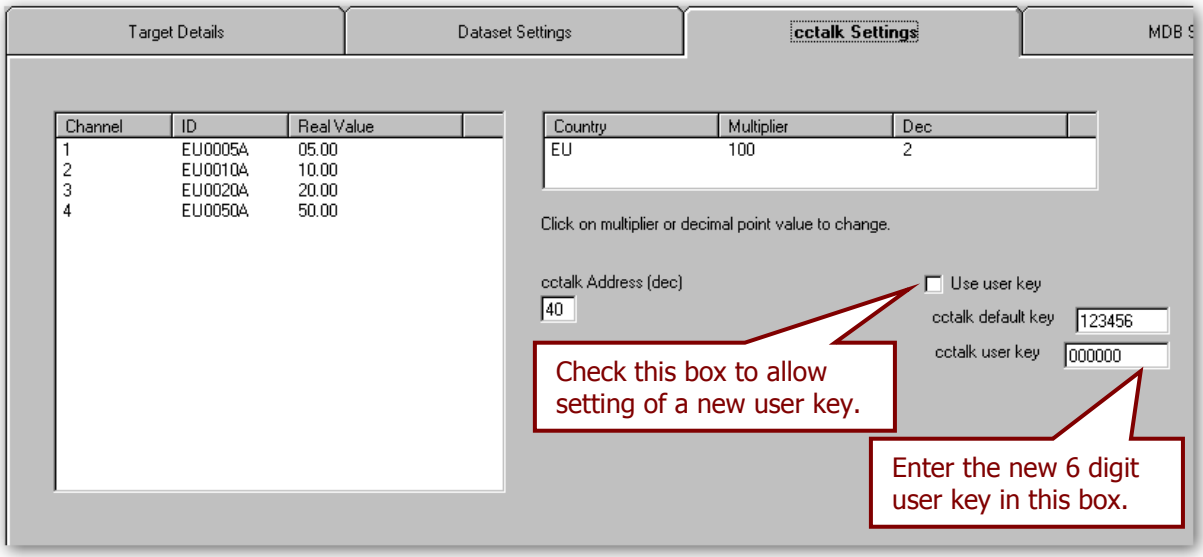


Right clicking on a channel will open a further dialog allowing you to make specific changes:



Consult the Validator Manager software help file for more information on how to change channel settings.

The third tab 'ccTalk Settings' allows you to review and modify the ccTalk settings and also change the security key settings:

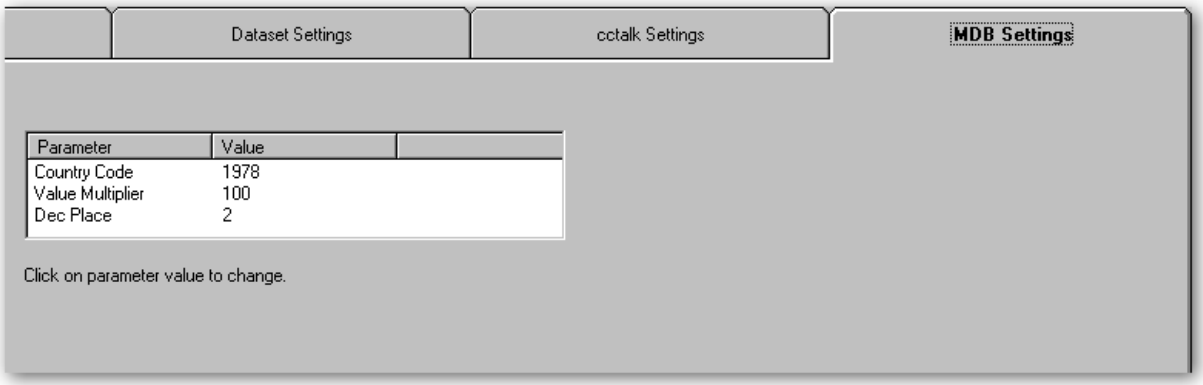


CAUTION!

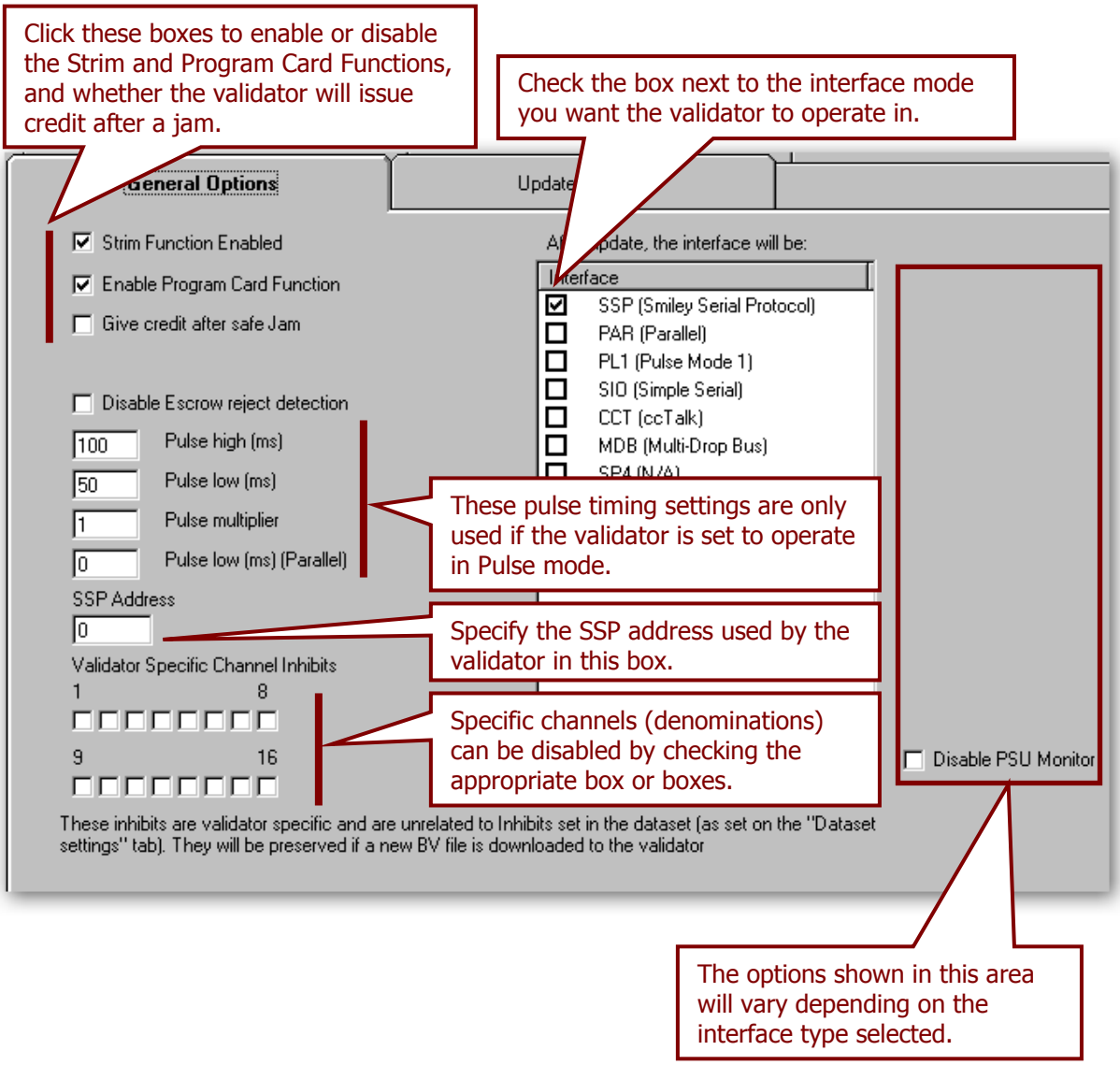
Take care when changing ccTalk key

The user should make a note of the new key and after any change. The default setting for the ccTalk security key is 123456.

The fourth tab 'MDB Settings' allows you to review and modify specific settings if the validator is being used with the MDB protocol:



The fifth tab 'General Options' allows you to review and modify a variety of validator specific settings, including interface mode:



WARNING!

Security risk

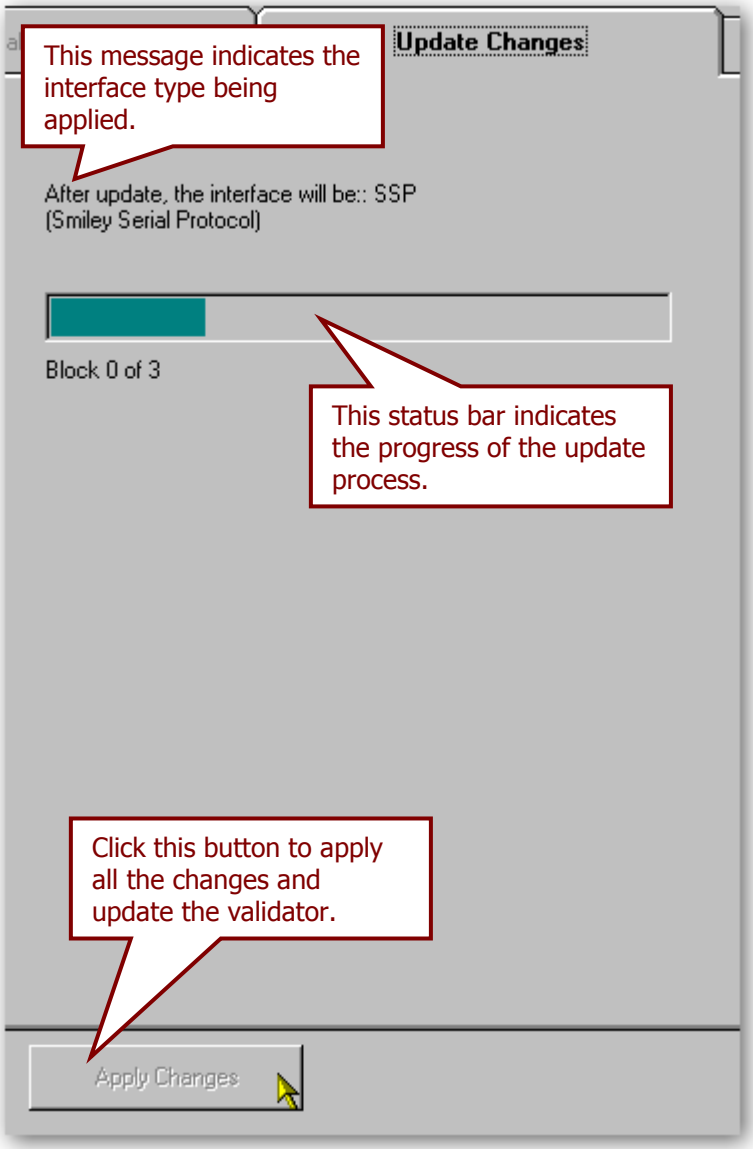
Disabling the Strim Function is not recommended because of the potential security risks.

Information

Limited SSP address ranges

The Validator Manager software will only communicate with the validator if the SSP address is set to 0, 1 or in the range 80-99.

The final tab, 'Update Changes' commits all the changes to the validator configuration and updates the validator accordingly:



Information

Always apply changes

Please make sure that you click the 'Apply Changes' button, otherwise none of your configuration changes will be applied or saved.

After applying the changes successfully, a dialog box will appear confirming the operation - click the 'OK' button to confirm this and close the dialog box. The validator will then be reset.

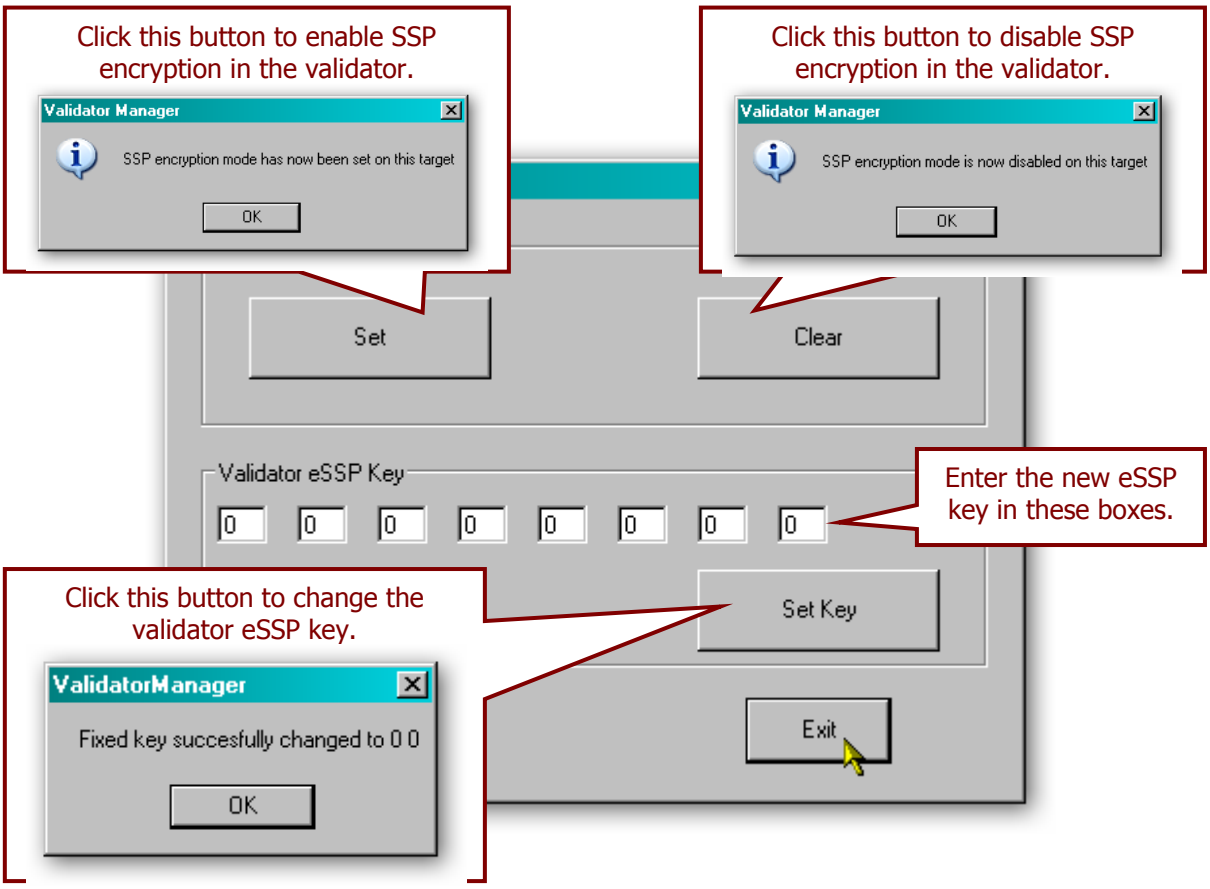
WARNING!

Do not power off or disconnect

Powering off the NV9 USB or disconnecting the USB cable when updating settings can cause the validator to stop working.

eSSP Options:

The 'eSSP Options' menu item allows the user to change the fixed part of the SSP key and other functions. Selecting this menu option will open a dialog box like this:



After carrying out any of the operations on this dialog, the validator will be reset. Click the 'Exit' button to close the dialog.

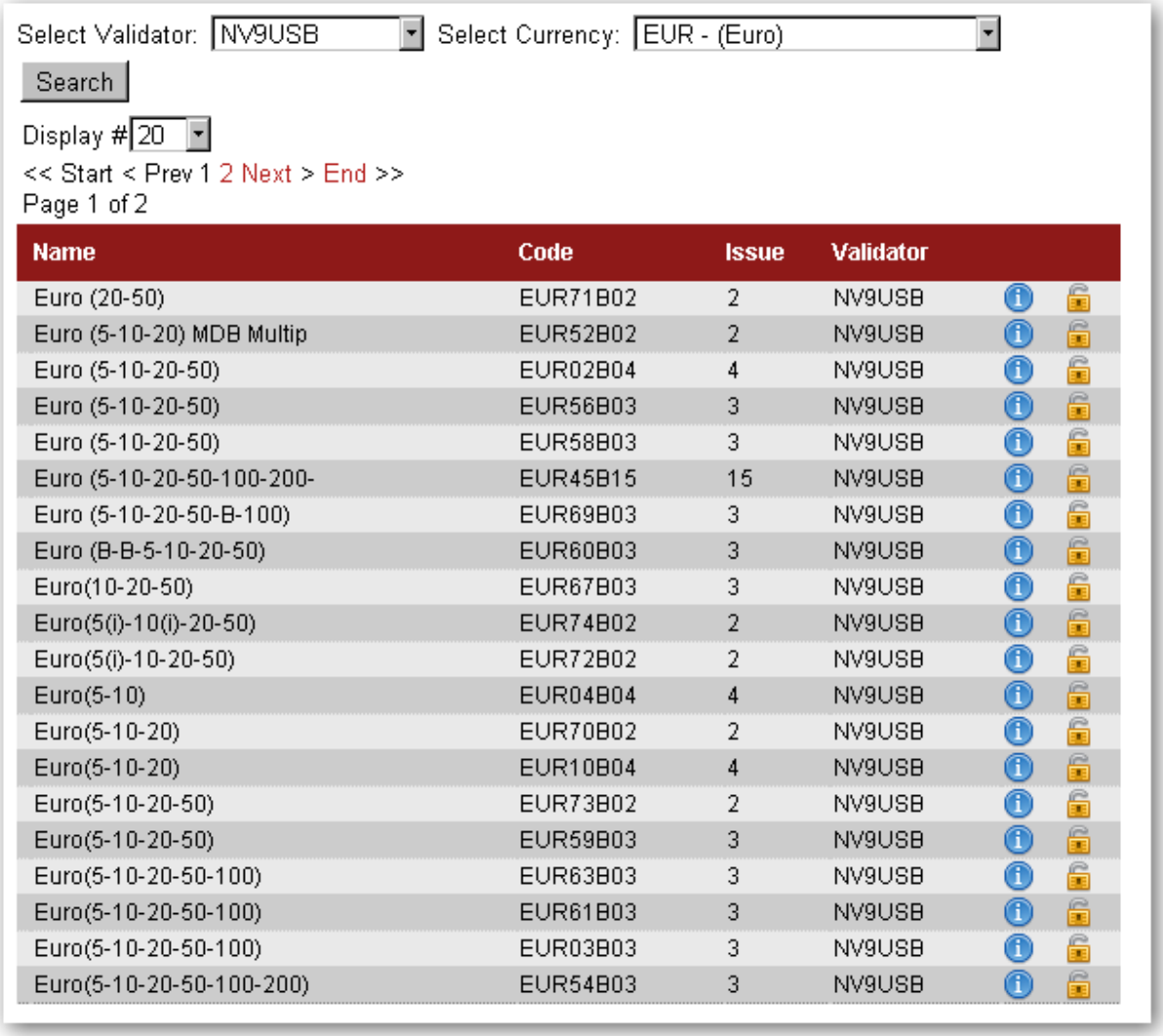
3.2 Updating Firmware and Datasets

CAUTION!

Do not power off

Powering off the NV9 USB when updating the firmware or dataset can cause the validator to stop working.

The NV9 USB validator firmware and dataset can be updated very easily using the Validator Manager software. The dataset files can be downloaded from the Innovative Technology Ltd website:



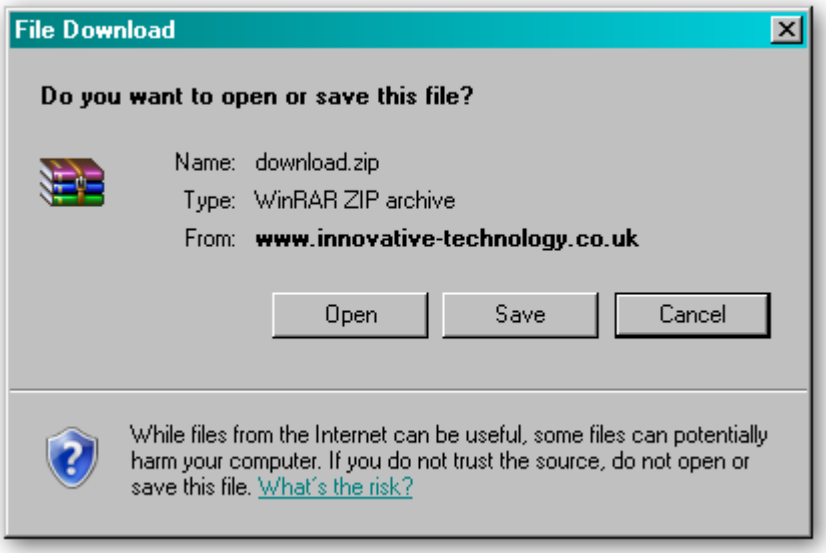
Name	Code	Issue	Validator
Euro (20-50)	EUR71B02	2	NV9USB
Euro (5-10-20) MDB Multip	EUR52B02	2	NV9USB
Euro (5-10-20-50)	EUR02B04	4	NV9USB
Euro (5-10-20-50)	EUR56B03	3	NV9USB
Euro (5-10-20-50)	EUR58B03	3	NV9USB
Euro (5-10-20-50-100-200-	EUR45B15	15	NV9USB
Euro (5-10-20-50-B-100)	EUR69B03	3	NV9USB
Euro (B-B-5-10-20-50)	EUR60B03	3	NV9USB
Euro(10-20-50)	EUR67B03	3	NV9USB
Euro(5(i)-10(i)-20-50)	EUR74B02	2	NV9USB
Euro(5(i)-10-20-50)	EUR72B02	2	NV9USB
Euro(5-10)	EUR04B04	4	NV9USB
Euro(5-10-20)	EUR70B02	2	NV9USB
Euro(5-10-20)	EUR10B04	4	NV9USB
Euro(5-10-20-50)	EUR73B02	2	NV9USB
Euro(5-10-20-50)	EUR59B03	3	NV9USB
Euro(5-10-20-50-100)	EUR63B03	3	NV9USB
Euro(5-10-20-50-100)	EUR61B03	3	NV9USB
Euro(5-10-20-50-100)	EUR03B03	3	NV9USB
Euro(5-10-20-50-100-200)	EUR54B03	3	NV9USB

Information

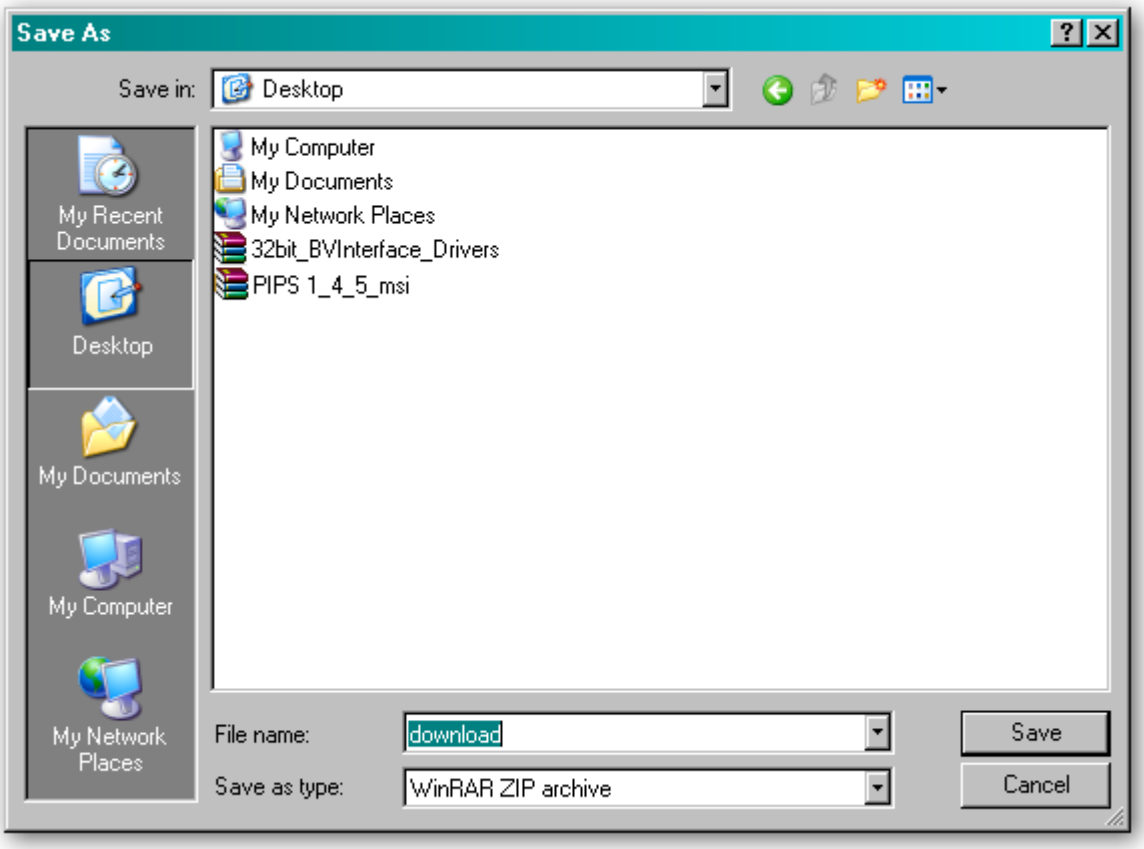
Combined data files

The firmware and dataset files for the NV9 USB validator are combined into a single file, so both will be updated when you carry out the update.

After selecting the dataset, a dialog will prompt you to save or open the file: select the **Save** option

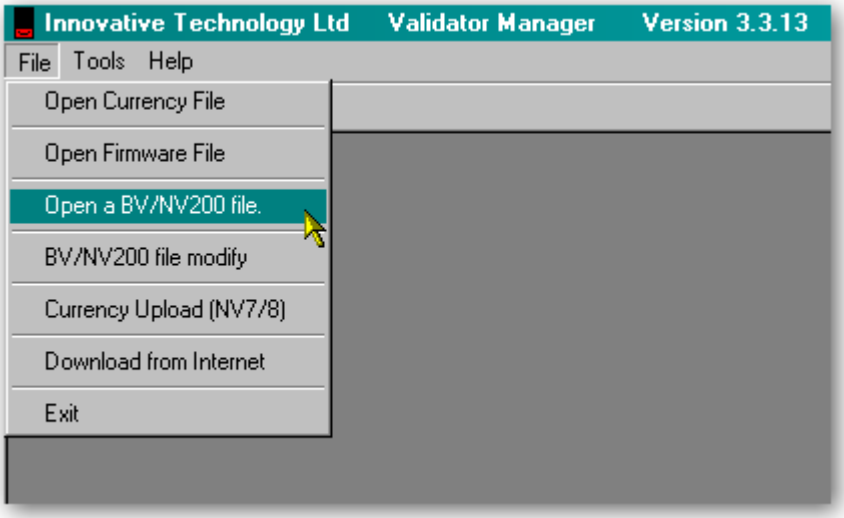


You can then choose where to save the file – choose a location that is convenient for you:

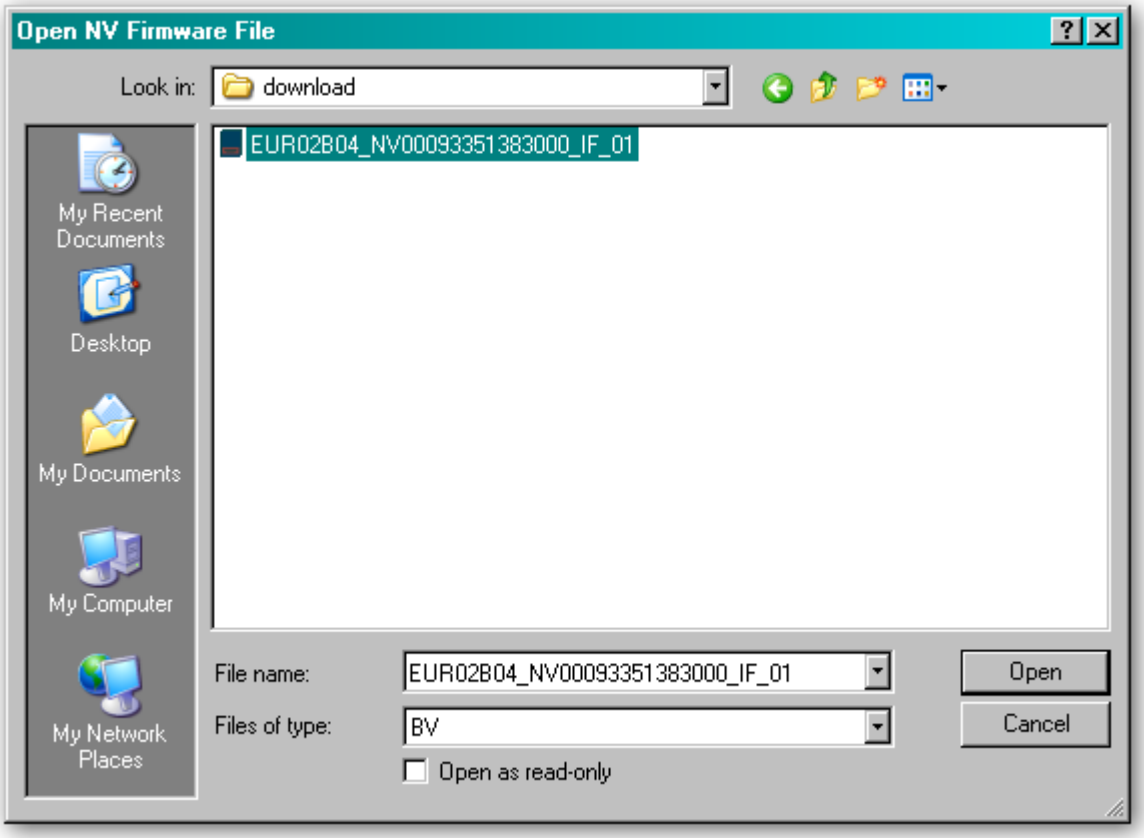


Once the dataset file is saved, unzip the file and you can then start the process to update the NV9 USB validator by connecting the USB cable and starting the Validator Manager software as described previously.

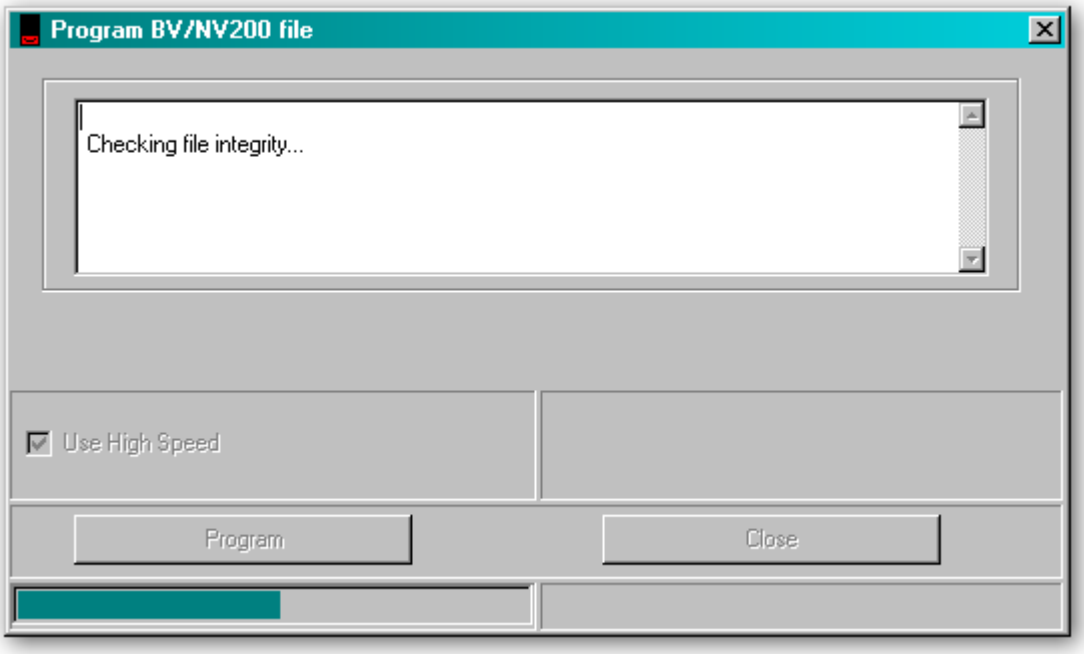
From the Validator Manager main screen, select the 'Open a BV/NV200 file' entry from the 'File' menu as shown here:



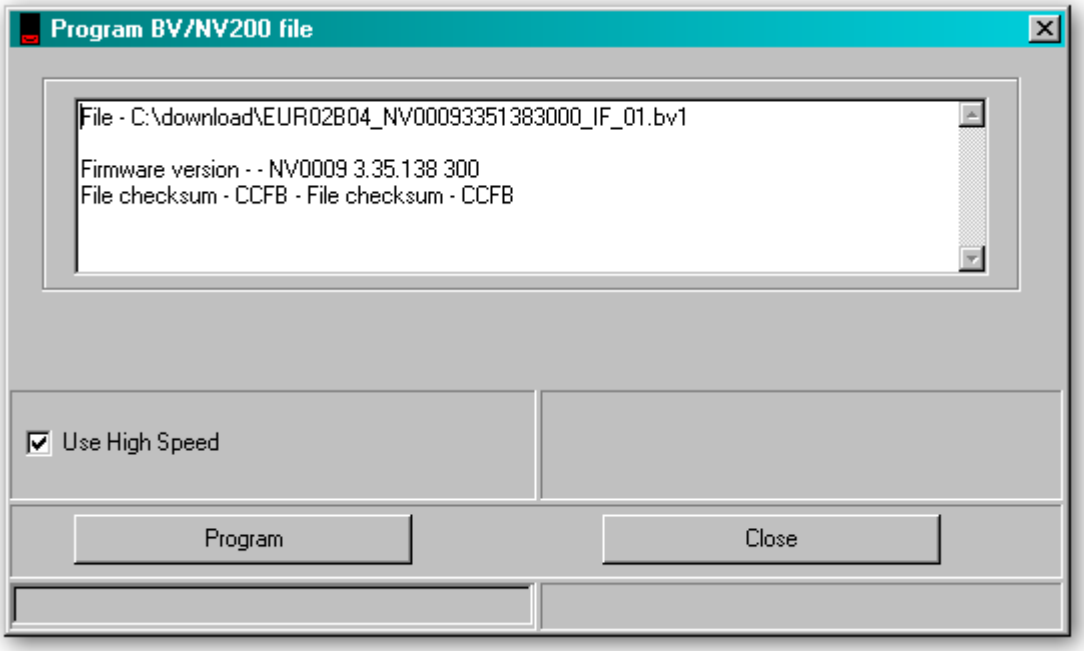
You will then be prompted to select the dataset file you downloaded and unzipped earlier – select the file and click the 'Open' button:



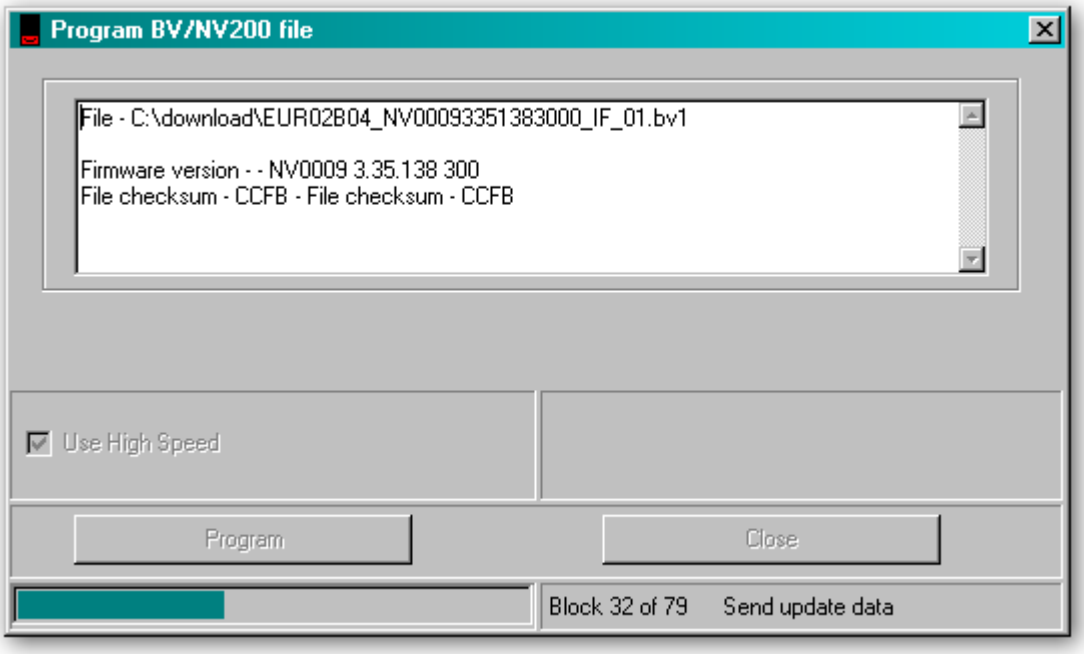
After clicking the 'Open' button, a new dialog box will appear. The status bar in the bottom left hand corner of the dialog box will show the progress in loading the dataset:



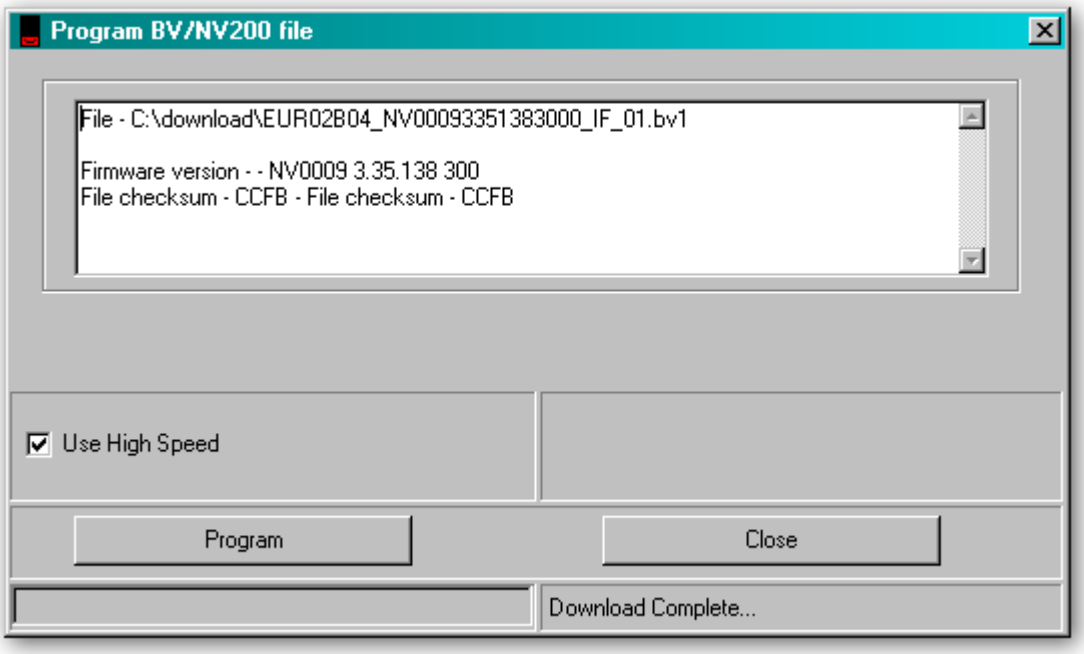
Once the dataset has been loaded, the file details will be shown in the status window, and the two buttons at the bottom of the dialog box will be active - **make sure that you do not disconnect the power to the NV9 USB or remove the USB cable until the programming operation has been completed**. Click the 'Program' button to start the update process:



During the update process, the progress of the update will be shown in the status bar at the bottom left of the dialog box, and the mouse cursor will change to an hourglass:



While the update process is being carried out, the NV9 USB bezel will flash when the update is completed. After the update, the NV9 USB will be reset, and the dialog box will then look like this:



After the reset is complete, the NV9 USB validator will then be ready for use with the new currency.

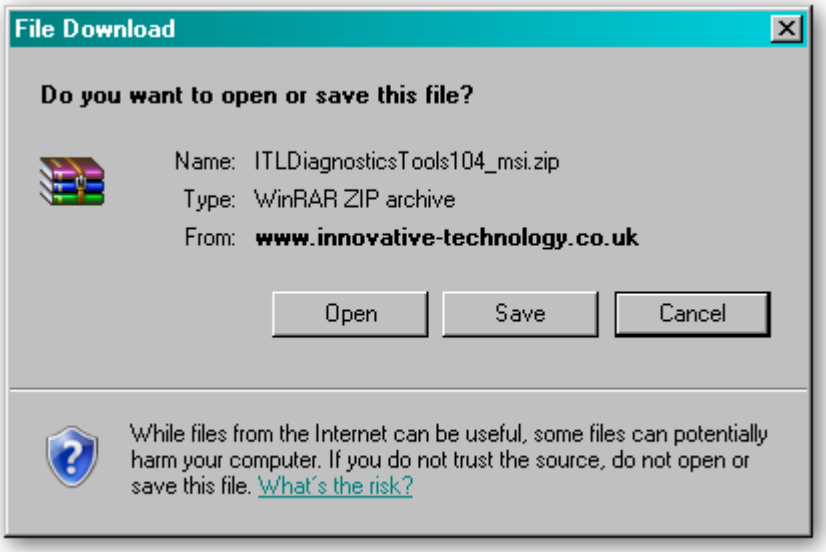
3.3 Tools

3.3.1 Diagnostics

There is a dedicated software diagnostics tool for use with the NV9 USB validator called 'Bank Note Validator Diagnostics Tools', and this software can be downloaded from the Innovative Technology Ltd website:

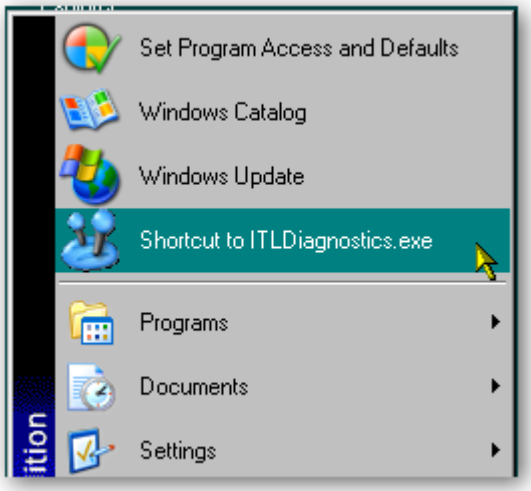
Title	Version File
Bank Note Validator Currency Manager	3.3.13
VPS (Validator Programming System)	1.0.16
SMART PIPS (Pay In Pay Out System)	1.4.5
Bank Note Validator Diagnostics Tools	1.0.4
DA2 Drivers - 32 bit	
DA2 Drivers - 64 bit	1
BV Interface Driver Install - 32 bit	2
BV Interface Driver Install - 64bit	1
NV4 Currency Manager	2.5.3

When the file download dialog box appears, click the 'Save' button and select a suitable location to save the file in:

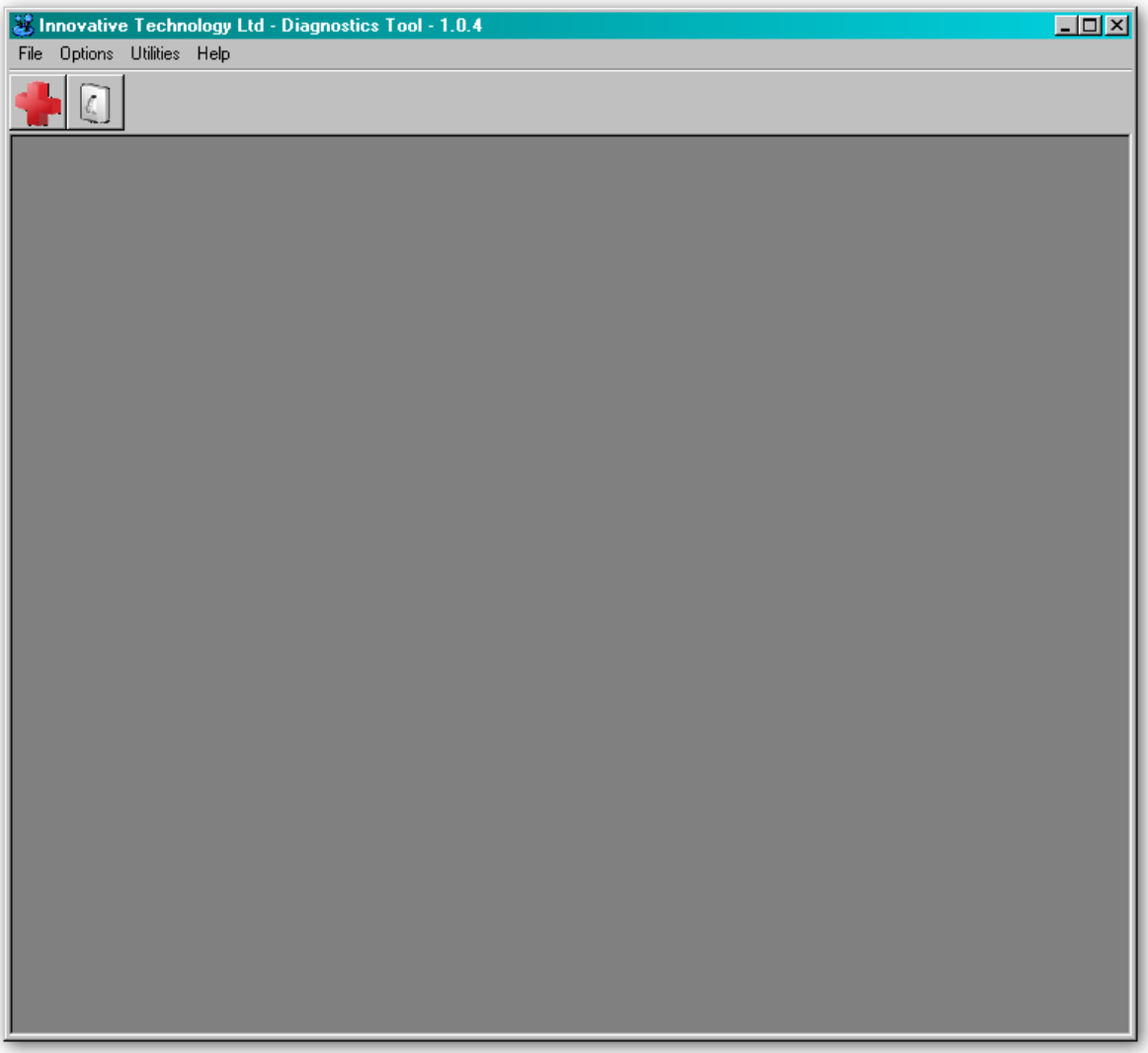


Installing the Diagnostics tools software is done in the same way as the Validator Manager software - Find the ITLDiagnosticsTools zipped file you just downloaded, extract the installation file from the zipped file and double click the extracted file (it has an .msi extension) – this will start the installation process.

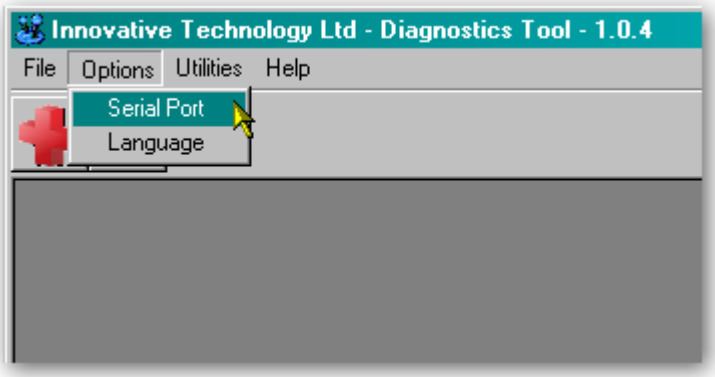
After installing the software, you can run the diagnostics software by selecting the 'Shortcut to ITL Diagnostics.exe' item near the top of the Windows Start menu. Make sure that the NV9 USB Validator is powered up and the USB cable is connected before starting the program.



The main screen of the diagnostics tools software looks like this:

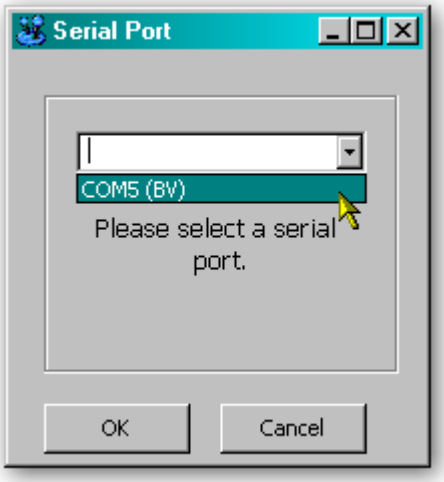


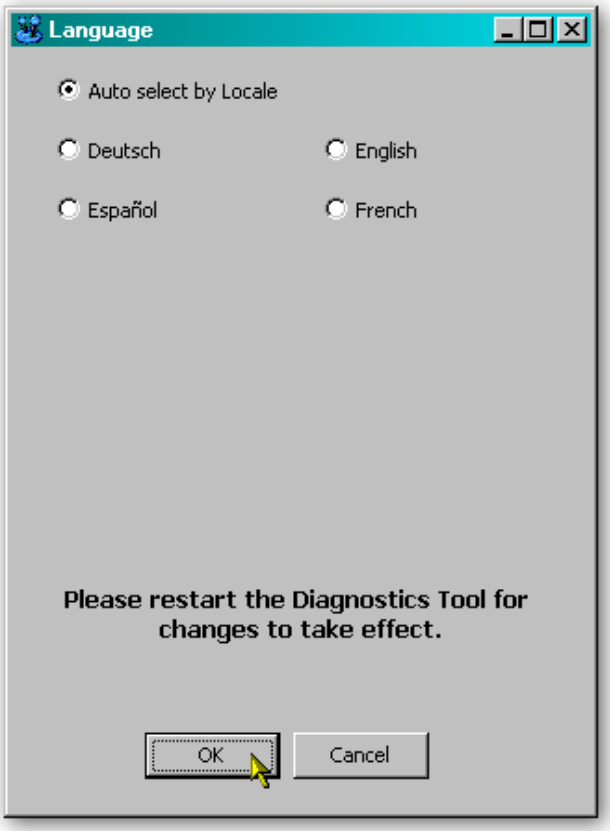
When running the software for the first time, you need to set a few options. These are accessed from the 'Options' menu:

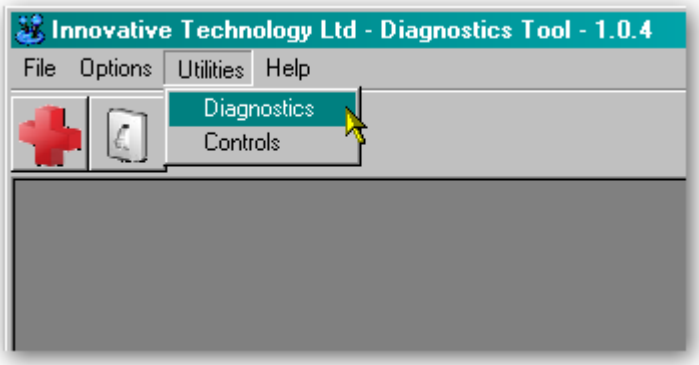


By selecting the 'Serial Port' item from the 'Options' menu you can define which serial port is being used to connect to the NV9 USB validator. After selecting this option, a new dialog box will open allowing you to choose the correct serial port.

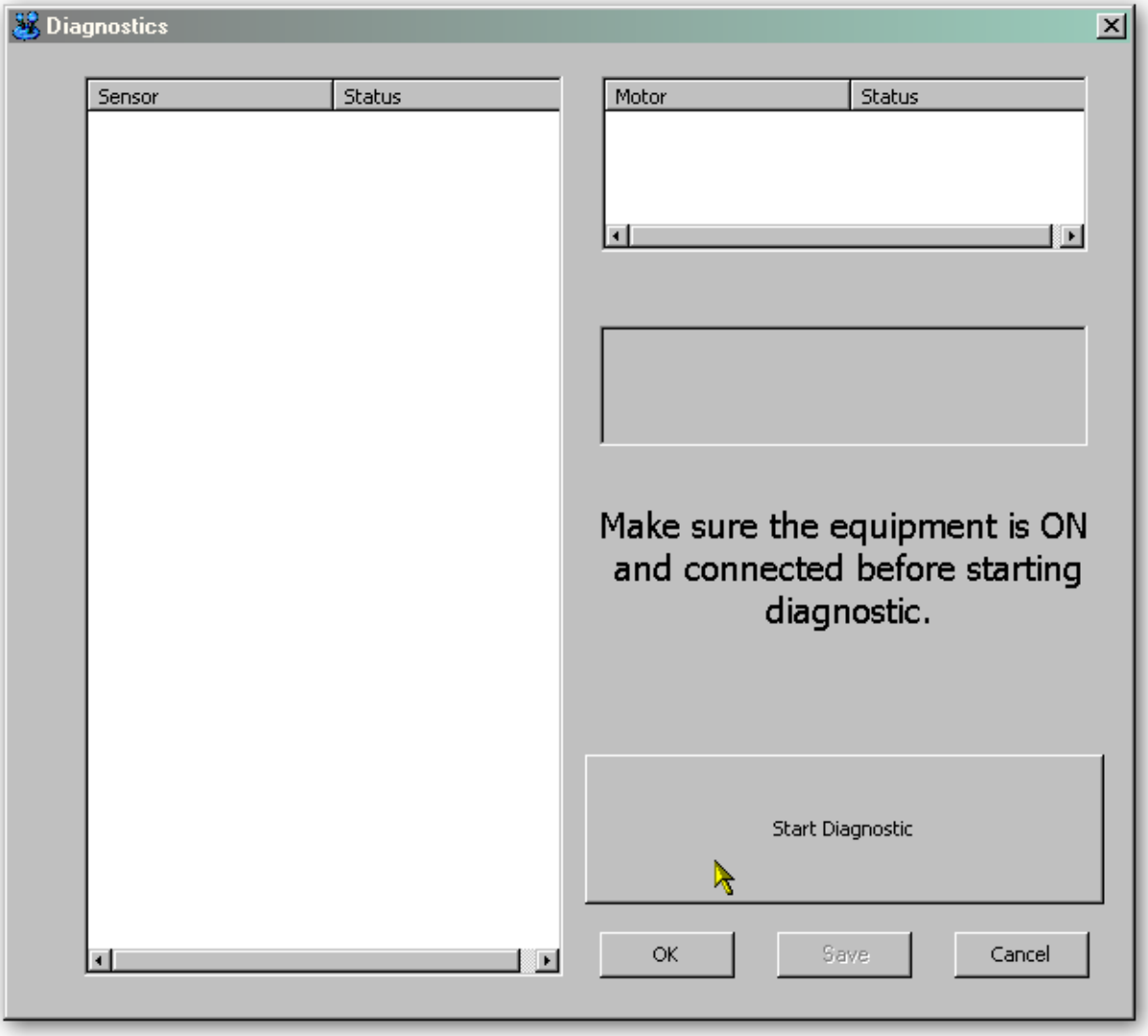
Select the required port from the dropdown list, and then click the 'OK' button to confirm your selection. This will close the dialog box and allow you to select another option from the menu. You shouldn't normally need to change the language setting, as this is determined by the Windows locale settings. You can if you wish select one of four specific languages if needed, as shown below:





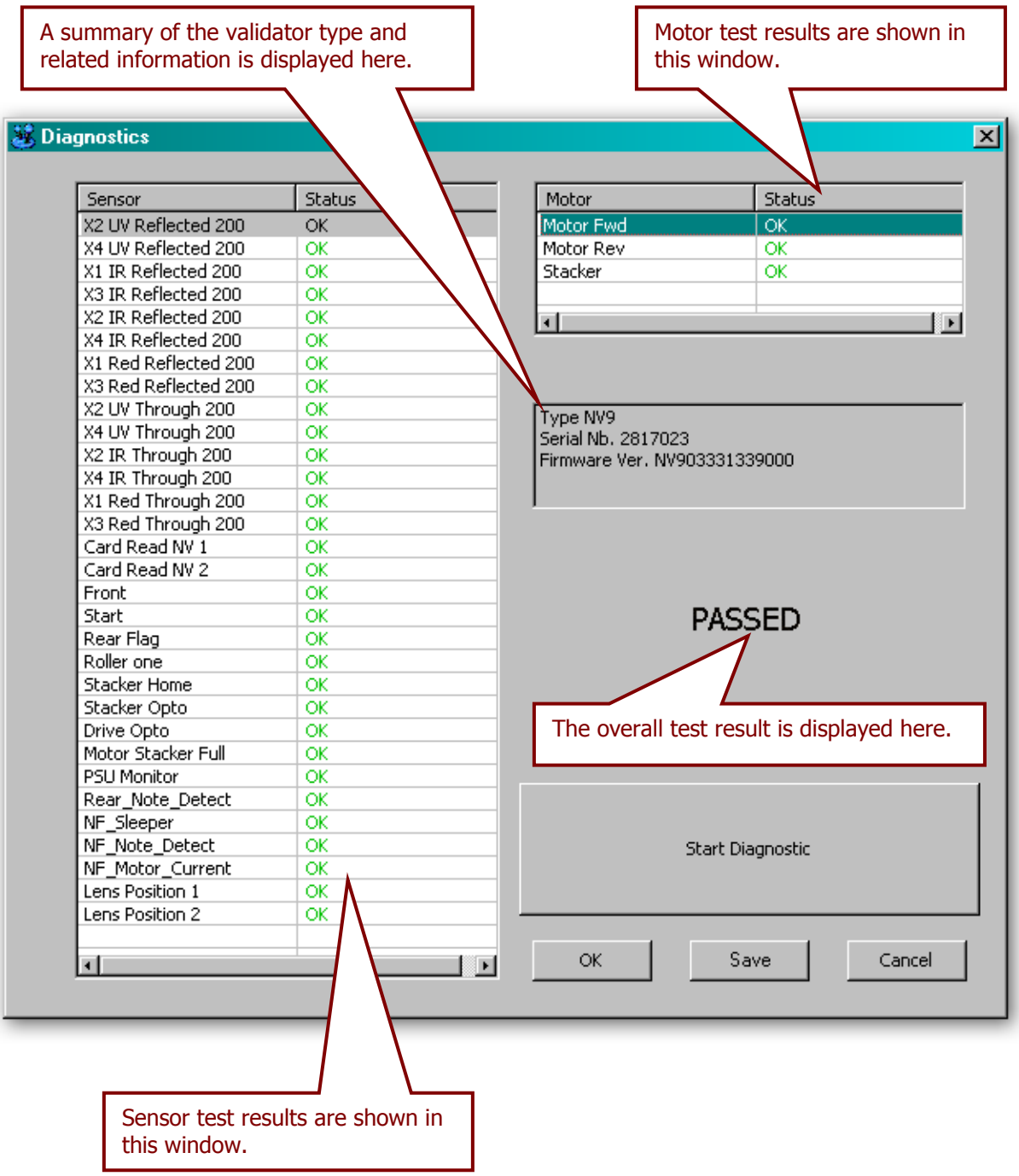


Select the 'Diagnostics' item from the 'Utilities' menu to start the diagnostics process (you can also start the diagnostics by clicking on the left hand icon below the menu bar) - this will open the Diagnostics screen:

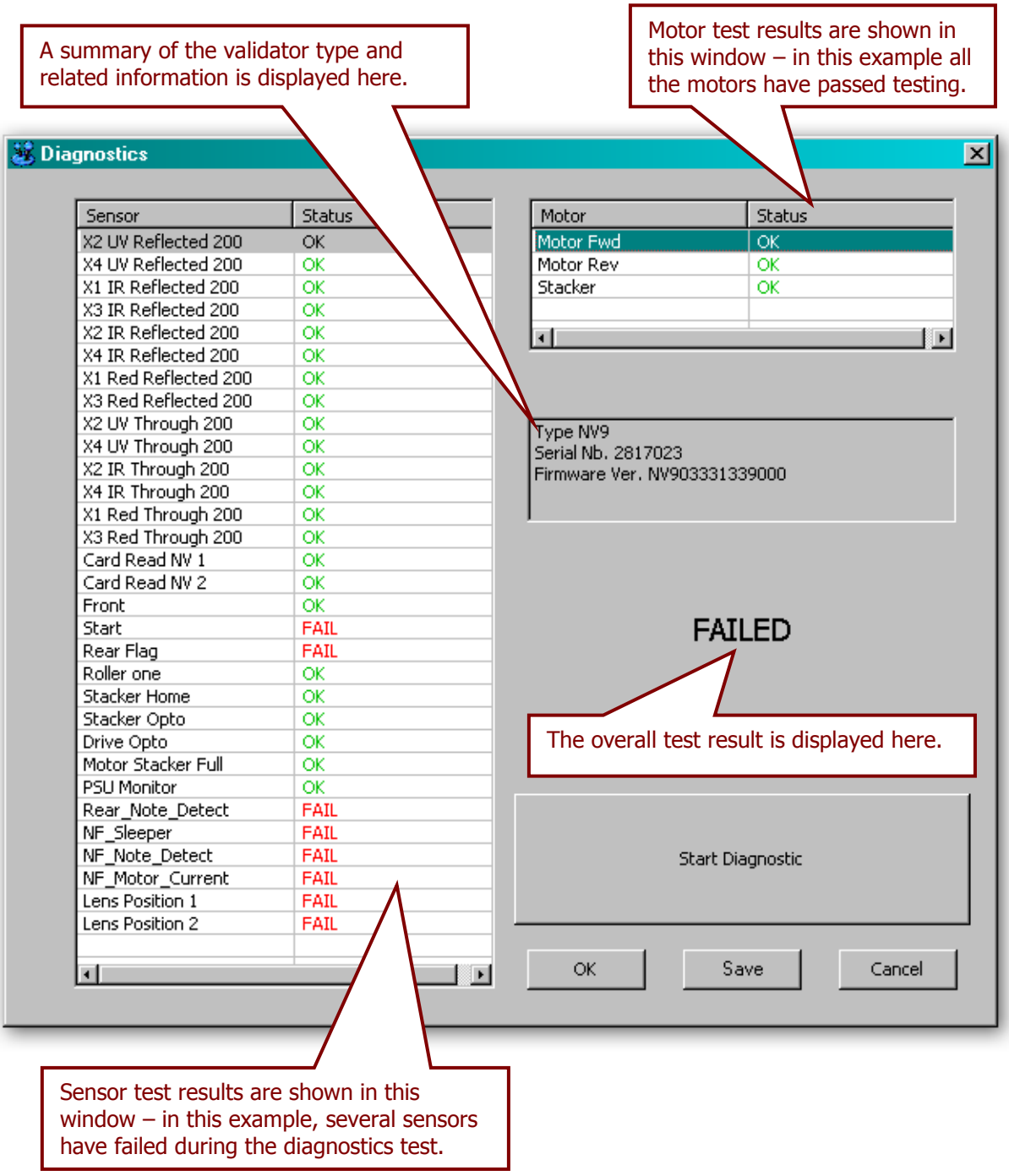


Click the 'Start Diagnostic' button to start the diagnostic process. The software will then prompt you to insert a special piece of green diagnostics paper (ITL part number LB149). Insert the paper in the same way you would with a bank note – at the end of the diagnostics test the paper will be ejected.

Diagnostics Pass:



Diagnostics Fail:



Further details on how to use the diagnostics tools and interpret the results can be found in the program help file.

3.3.2 Connections

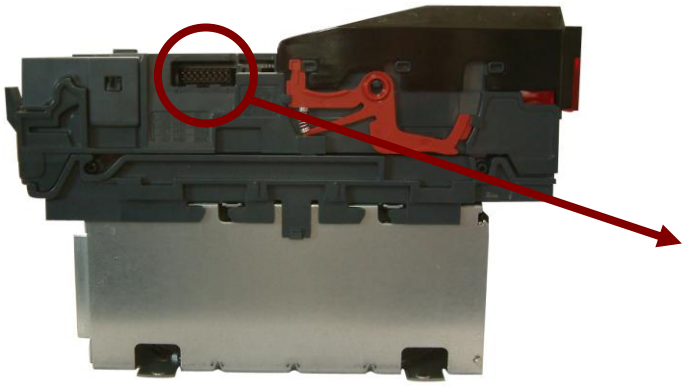
The NV9 USB Validator has a single connector that is used to allow interfacing and programming.

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 CN392) should be used. The CN392 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 CN392 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:

WARNING!

Risk of unit damage

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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data in (Rx)
6	Factory use only		**Do not connect**
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		**Do not connect**
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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data – must also be connected to pin 1
6	Factory use only		**Do not connect**
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		**Do not connect**
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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data
6	Factory use only		**Do not connect**
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		**Do not connect**
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		**Do not connect**
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		**Do not connect**
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		**Do not connect**
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.

3.4 Frequently Asked Questions

a. Why are there no DIP switches on the unit?

- The NV9 USB has no dipswitches. Configuring the unit is carried out using a configuration button mounted on top of the unit – see Section 1, subsection 1.3 of this manual set for more information.

b. Are 64 bit drivers available?

- Both 32 and 64 bit drivers can be downloaded from the 'Support' section of the ITL website – please make sure that you are using the correct type of driver for your Operating System.

c. Some or all notes are not accepted

- Check that no inhibits are set in the Validator Manager software (see subsection 3.1 of this manual). If the problem persists, contact ITL Support for further assistance.

MAIN HEADQUARTERS

Innovative Technology Ltd
Derker Street – Oldham – England - OL1 4EQ
Tel: +44 161 626 9999 Fax: +44 161 620 2090
E-mail: support@innovative-technology.co.uk
Web site: www.innovative-technology.co.uk

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

BRAZIL
suporte@bellis-technology.com.br

CHINA
support@innovative-technology.co.uk

GERMANY
supportDE@innovative-technology.eu

SPAIN
supportES@innovative-technology.eu

UNITED KINGDOM
support@innovative-technology.co.uk

UNITED STATES OF AMERICA
supportusa@bellis-technology.com

REST OF THE WORLD
support@innovative-technology.co.uk

SECTION 4

NV9 USB MANUAL SET

MECHANICAL AND ELECTRICAL MANUAL

INTELLIGENCE IN VALIDATION

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

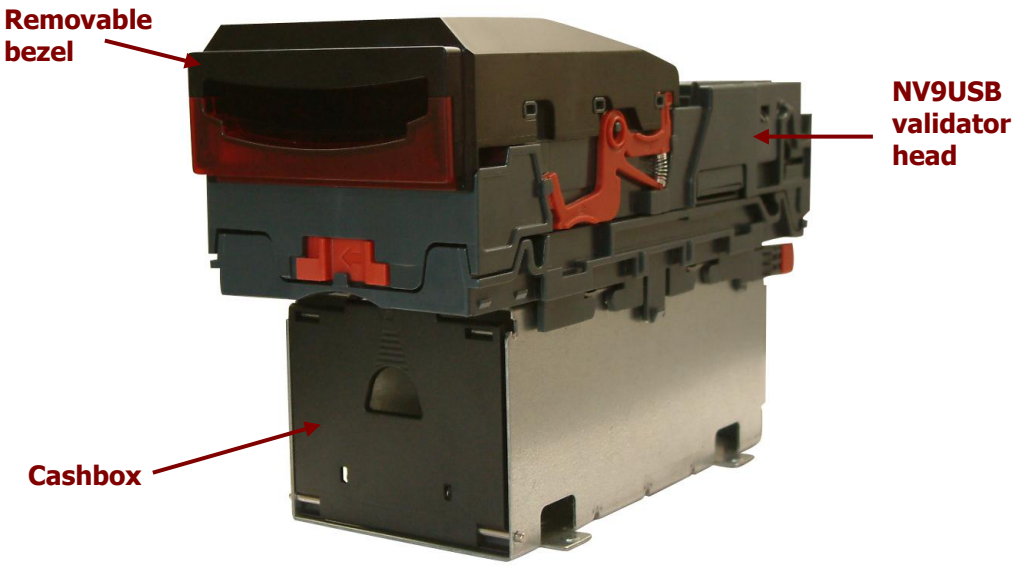
NV9 USB MANUAL SET – SECTION 4

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.

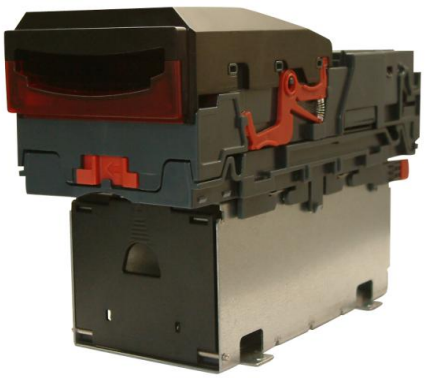
4.1 Introduction

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

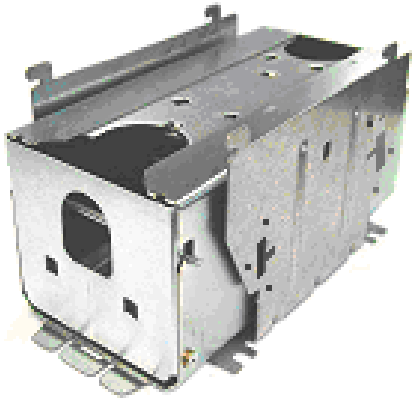
Installing the NV9 USB is a simple operation; the validator can be installed **vertically** or **horizontally**, depending on the type of cashbox fitted or orientation needed:

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



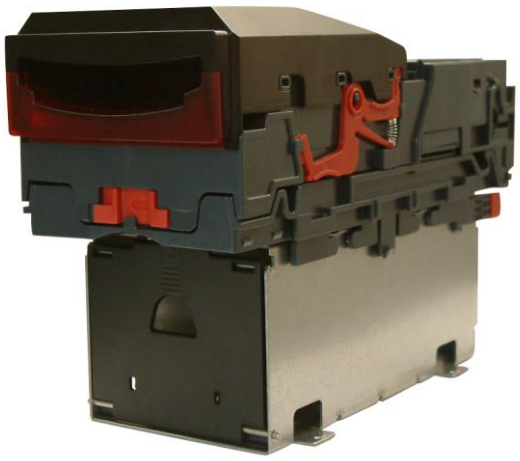
5. The validator will be fitted with a suitable horizontal or vertical bezel

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) 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	

WARNING!

Use suitable power supply

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

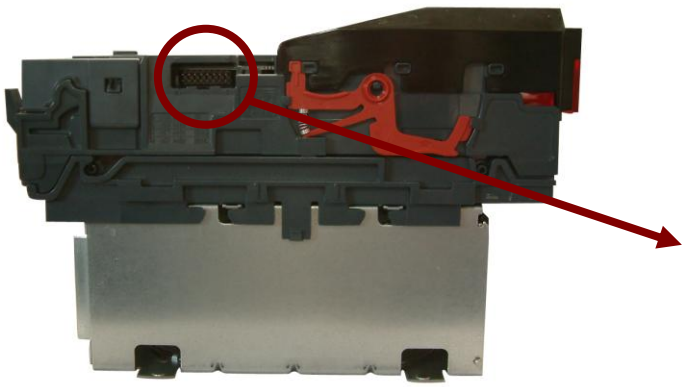
The NV9 USB Validator has a single connector that is used to allow interfacing and programming.

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 CN392) should be used. The CN392 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 CN392 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:

WARNING!

Risk of unit damage

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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data in (Rx)
6	Factory use only		**Do not connect**
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		**Do not connect**
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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data – must also be connected to pin 1
6	Factory use only		**Do not connect**
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		**Do not connect**
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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data
6	Factory use only		**Do not connect**
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		**Do not connect**
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		**Do not connect**
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		**Do not connect**
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.

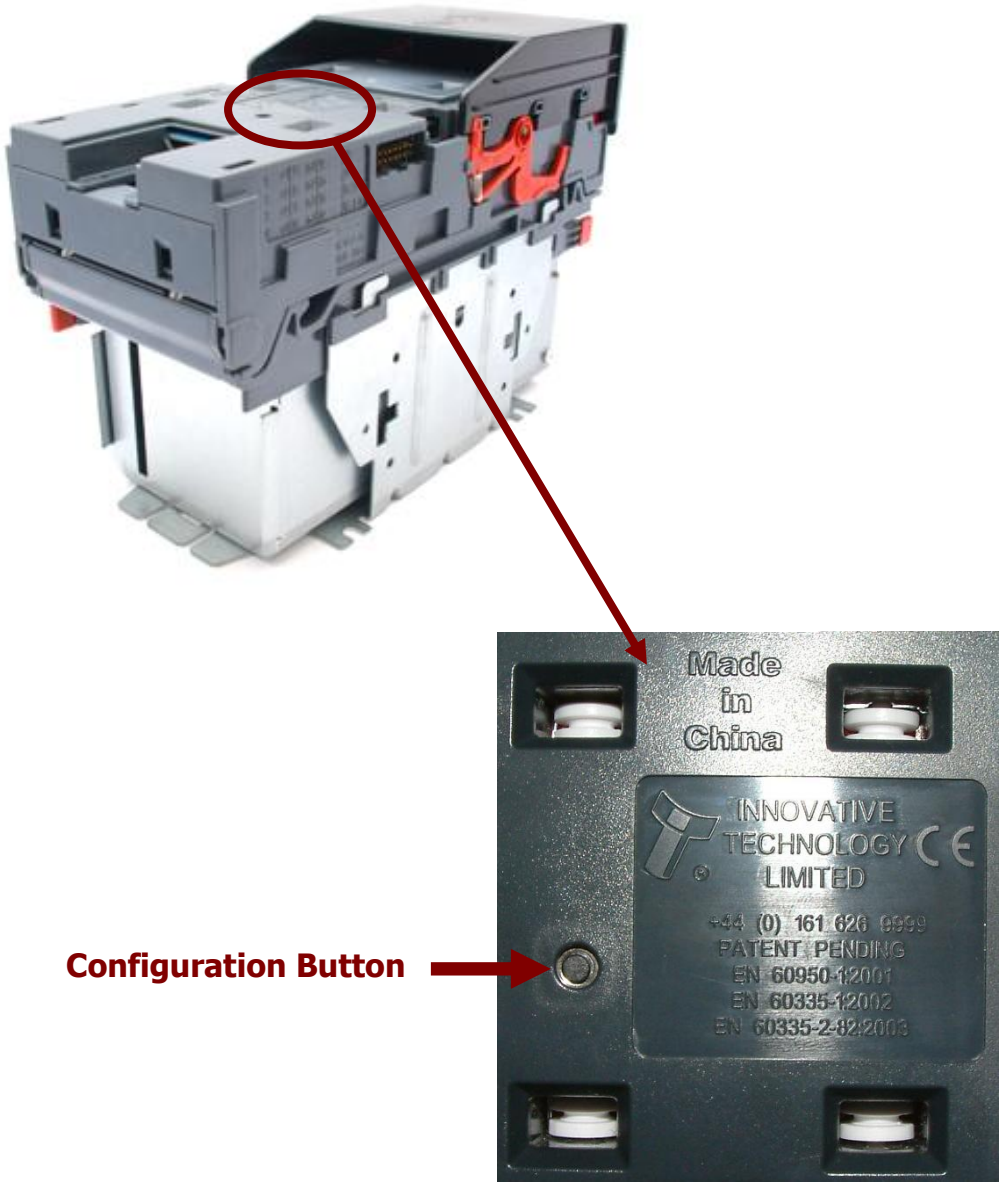
NV9 USB Parallel Interface:

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		**Do not connect**
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:

WARNING!
Risk of unit damage

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

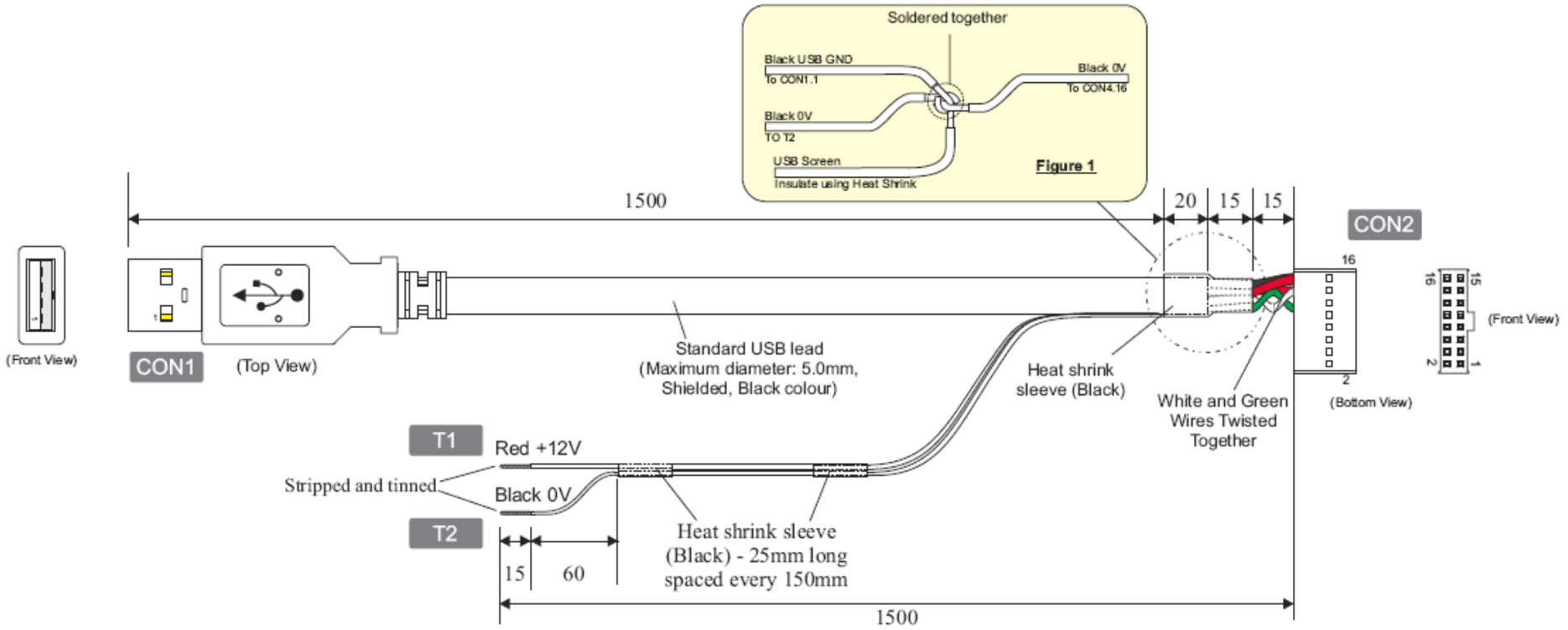
The NV9 USB Validator has inbuilt fault detection facilities. If there is a configuration or other error, the NV9 USB front bezel will flash in a particular sequence.

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

Flashes		Indicated Error	Comments
Long	Short		
0	0	None	
1	2	Note path jam	Remove obstruction and follow the cleaning procedure in Section 2 of this manual set
	3	Unit not initialised	Contact ITL technical support
	4	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
3	1	Firmware checksum error	Download new firmware
	2	Interface checksum error or unable to set programmed interface	
	3	EEPROM checksum error	
	4	Dataset checksum error	
4	1	Power supply too low	Check power supply
	2	Power supply too high	

4.9 Spare Parts

ITL Part Number	Description	Details
CN392	Power and USB Communication Cable	USB 2.0 Compliant Type A to 16 way header cable



Comments:

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

CN392 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	---	---

CN392 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
Notes: CON2 pins 1 - 4 have crimps fitted but these are not connected. CON2 pins 5 -10 and 14 have no crimps fitted				

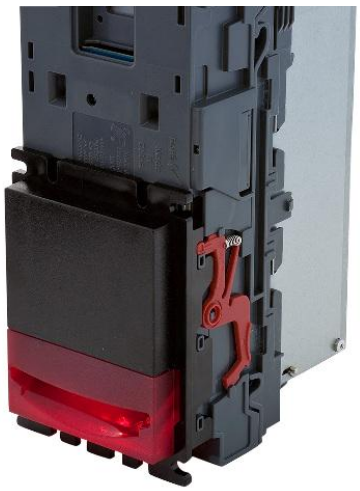
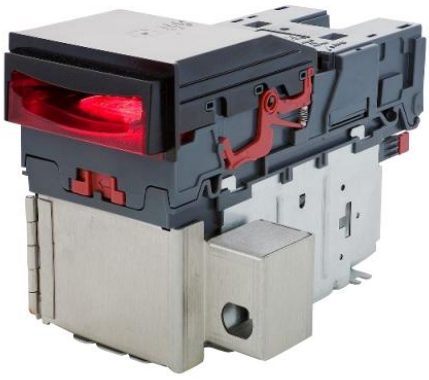
WARNING!

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.

Bezels		
ITL Part Number	**Description**	
PA188	Vertical Upstack Bezel Assembly	
PA189	Horizontal Bezel Assembly	
PA190	Vertical Upstack Extended Snout Bezel Assembly	
PA191	Vertical Downstack Extended Snout Bezel Assembly	
PA256	66mm Vertical Upstack Bezel	No image available
PA268	69mm Fixed Width Horizontal Bezel	No image available
PA296	Vertical Up/Down Flat 66mm Bezel Assembly	No image available

PA896	Horizontal Bezel Assembly (NV11)	

Cashboxes		
PA185	Clip-on Cashbox Assembly (300C)	
PA186	Locking Cashbox Assembly (300L)	

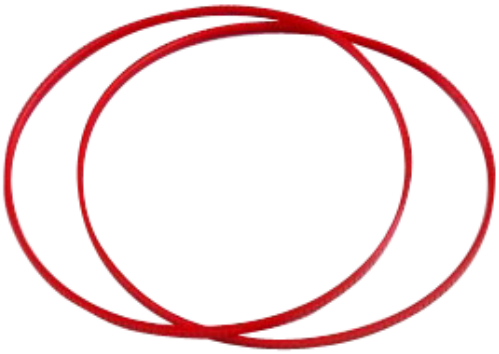
PA192	Slide-on Cashbox Assembly (300S)	
PA193	Clip-on Cashbox Assembly (600C)	
PA194	Slide-on Cashbox Assembly (600S)	

PA898	Standard Cashbox Assembly (NV11)	

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) for up to date information on the options available.

Drive Belts		
FD106	NV9 USB Red Drive Belt	

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.

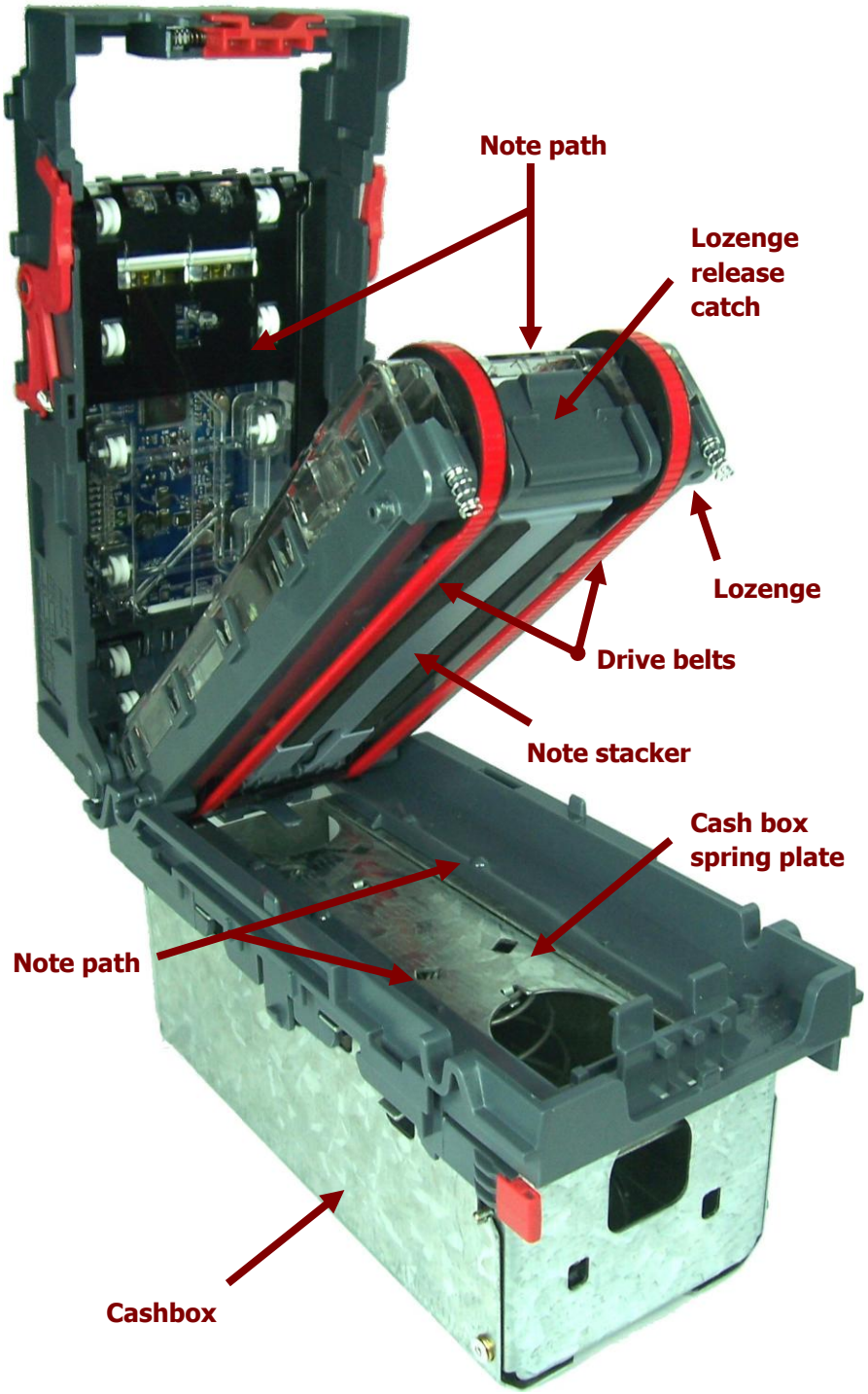
Do not use solvent based cleaners such as alcohol, petrol, methylated spirits, white spirit or PCB cleaner. Using these solvents can cause permanent damage to the unit; only use a mild detergent solution as directed below.

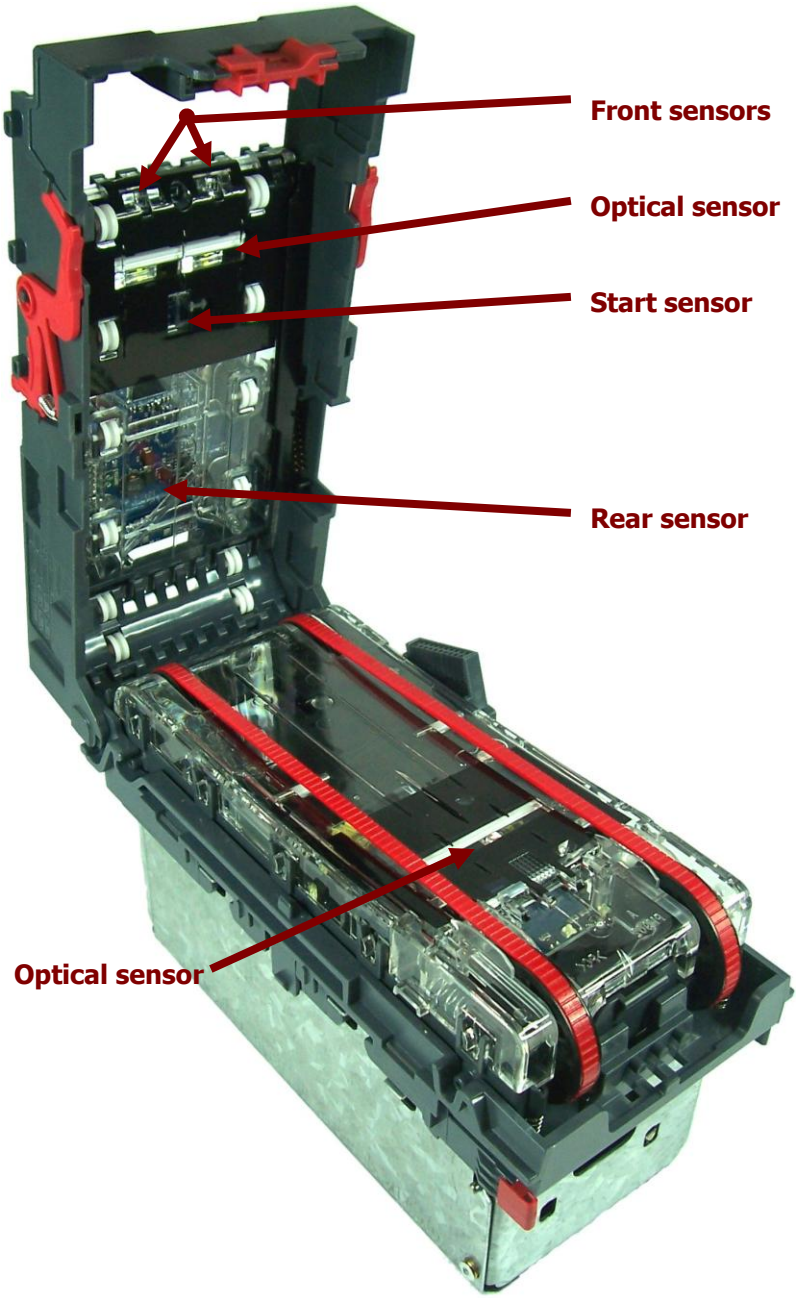
To clean the NV9 USB, open the note path by sliding the red release catch on the front of the validator to the left (as indicated in the picture) - this will allow access to the lozenge and note path

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.

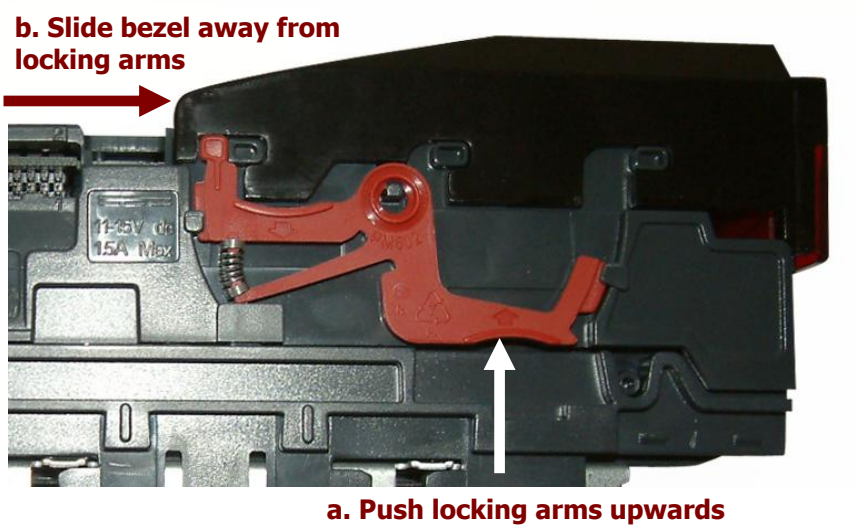
Caution!

Be careful cleaning sensors.

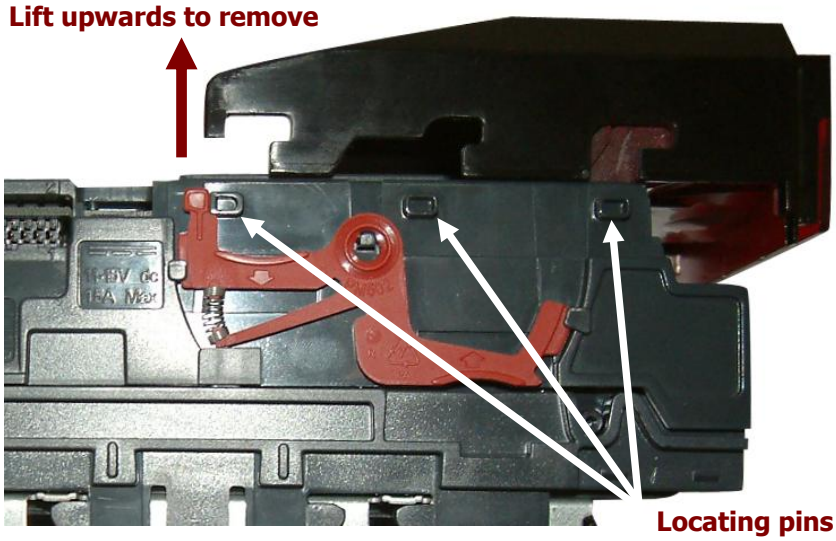
When cleaning the recessed front sensor, use a small soft brush or cotton bud – do not use anything sharp or abrasive.

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

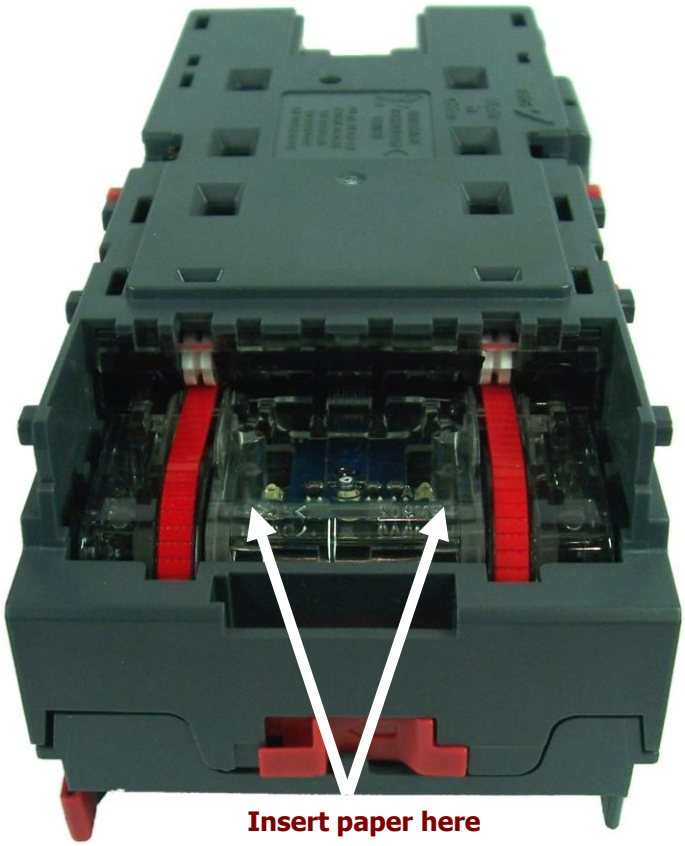
- The bezel is removed by pushing the red locking arms on both sides of the validator upwards, and sliding the bezel away from the locking arms



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

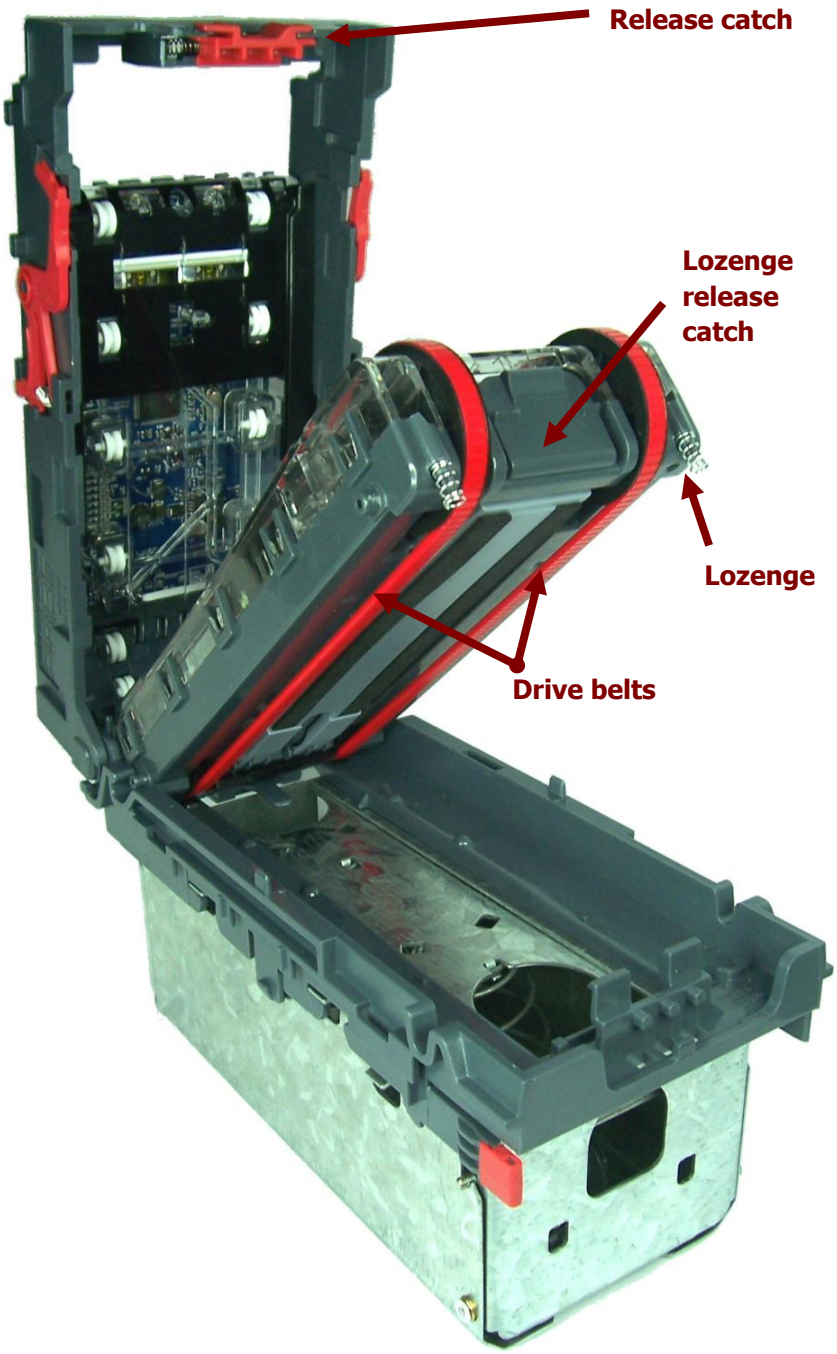
If the belts are worn or damaged, they should be replaced (ITL part number FD106). This is a simple procedure, and is carried out as follows:

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



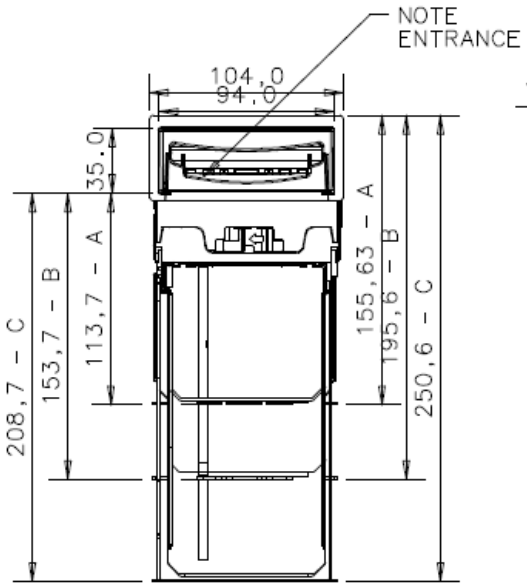
Re-Initialisation

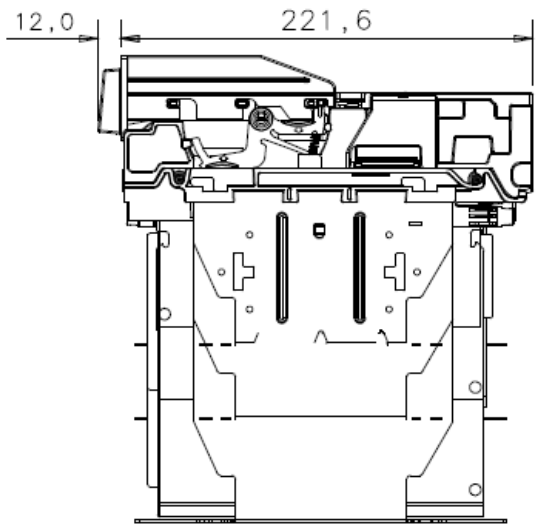
The NV9 USB validator has an in-built self-calibration system that keeps the optical sensors in optimum operating condition. However if the NV9 USB is disassembled for any reason it also will need to be re-initialised - re-initialisation can only be carried out by ITL's technical support team.

4.11 Drawings and Schematics

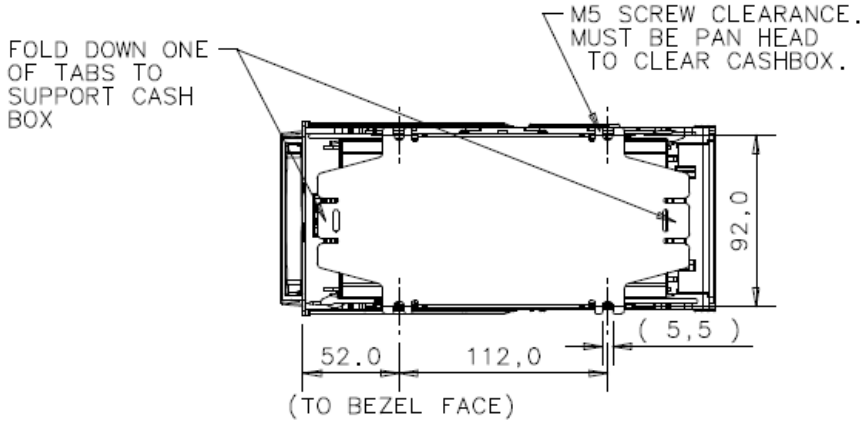
NOTE: If required, IGES 3D models are available on request from ITL technical support.

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



MAIN HEADQUARTERS

Innovative Technology Ltd
Derker Street – Oldham – England - OL1 4EQ
Tel: +44 161 626 9999 Fax: +44 161 620 2090
E-mail: support@innovative-technology.co.uk
Web site: www.innovative-technology.co.uk

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

BRAZIL
suporte@bellis-technology.com.br

CHINA
support@innovative-technology.co.uk

GERMANY
supportDE@innovative-technology.eu

SPAIN
supportES@innovative-technology.eu

UNITED KINGDOM
support@innovative-technology.co.uk

UNITED STATES OF AMERICA
supportusa@bellis-technology.com

REST OF THE WORLD
support@innovative-technology.co.uk

SECTION 5

NV9 USB MANUAL SET

SOFTWARE IMPLEMENTATION GUIDE

INTELLIGENCE IN VALIDATION

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

NV9 USB MANUAL SET – SECTION 5

5. SOFTWARE IMPLEMENTATION GUIDE

5.1 Communication Protocols

The NV9 USB validator can use several different communication protocols, including eSSP, SIO, ccTalk, MDB, Parallel, Binary and Pulse. Use of the MDB protocol requires the use of an external IF5 interface unit.

Smiley® Secure Protocol (SSP) is a secure serial interface specifically designed to address the problems experienced by cash systems in gaming machines. Problems such as acceptor swapping, reprogramming acceptors and line tapping are all addressed.

Encrypted Smiley® Secure Protocol (eSSP) is an enhancement of SSP. eSSP uses the same 16 bit CRC checksums on all packets as SSP, but also uses a Diffie-Hellman key exchange to allow the host machine and validator to jointly establish a shared secret key over an insecure communications channel. The encryption algorithm used is AES with a 128-bit key; this provides a very high level of security.

The recommended communication protocol for the NV9 USB validator is eSSP, as this provides the highest level of data transfer security. A ccTalk interface protocol is also available.

For detailed information and the full protocol specifications please read the following documents, which can be downloaded from the Innovative Technology Ltd website (www.innovative-technology.co.uk):

- SSP Interface Specification (ITL Document number GA138)
- ITL Bank Note Reader ccTalk Specification (ITL Document number GA966)

Summaries of the NV9 USB validator socket connections for the supported interfaces are shown below:

WARNING!

Risk of unit damage

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.

Information

Encryption of data strongly recommended

It is recommended that all transactions with the NV9 USB validator be encrypted to prevent commands being recorded and replayed by an external device. If this is not possible, then other (mechanical) measures should be used to prevent physical bus tapping.

NV9 USB SSP Interface:

Pin	Name	Type	Description
1	Vend 1	Output	Serial data out (Tx)
2	Factory use only		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data in (Rx)
6	Factory use only		**Do not connect**
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		Do not connect
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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data – must also be connected to pin 1
6	Factory use only		**Do not connect**
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		Do not connect
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		**Do not connect**
3			
4			
5	Inhibit 1	Input	Serial data
6	Factory use only		**Do not connect**
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		**Do not connect**
15	V In	Power	+V
16	GND	Ground	GND
When operating with this interface, the host machine does not echo messages back to the validator, and the NV9 USB does not operate in true RS232 mode (only TTL level).			

NV9 USB Pulse Interface:

Pin	Name	Type	Description
1	Vend 1	Output	Credit pulse stream output
2	Factory use only		**Do not connect**
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		**Do not connect**
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.

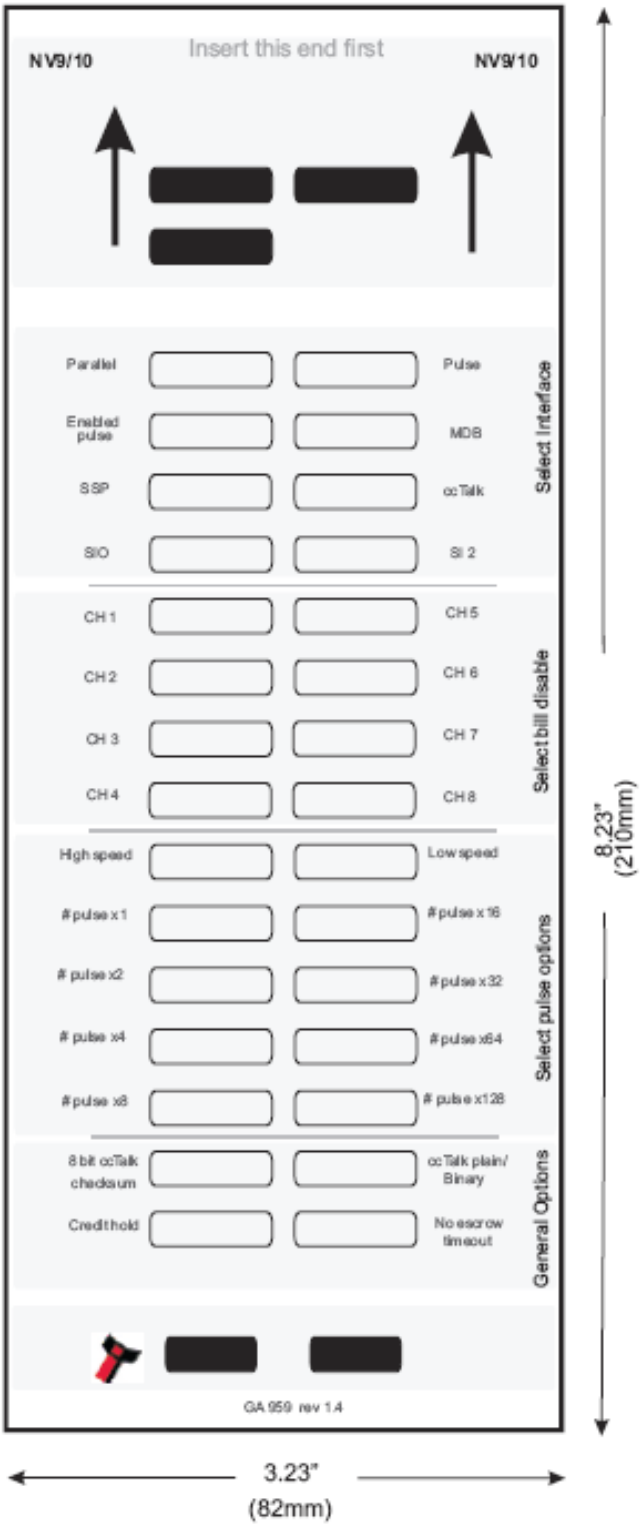
NV9 USB Parallel Interface:

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		**Do not connect**
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.

5.2 Configuration Card Programming

Please consult ITL technical document GA959 for further information on configuration card programming – the GA959 document includes a printable template for the configuration card and this can be downloaded from the Support section of the ITL website – **the sample shown here should not be used for programming as it is not to scale**.



Configuration Card - instructions for use:

1. Cut card around the outline - check the measurements are as printed. Make sure that 'Page scaling' is set to 'None' in your print options to ensure the correct size.

2. Fill in sections as required. Take care to fill in the sections correctly, keep inside the lines and fill boxes fully as shown here:

3. Power-up the validator and wait until it resets.

4. Press the configuration button once to enter programming mode (the bezel LEDs should flash at 1 second intervals).

5. Insert the card into the validator face up and in the direction indicated by the arrows.

6. The configuration card will be ejected and if the configuration was good the bezel LEDs will flash at a fast rate while programming takes place. After completion of programming the validator will reset.

Information

Check print settings.

Make sure that 'Page scaling' is set to 'None' in your print options to ensure the correct size when printing the configuration card.

If an error has occurred, the card will be rejected and the bezel LEDs will flash slowly a number of times to indicate the cause of the error:

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

WARNING!

Risk of unit damage

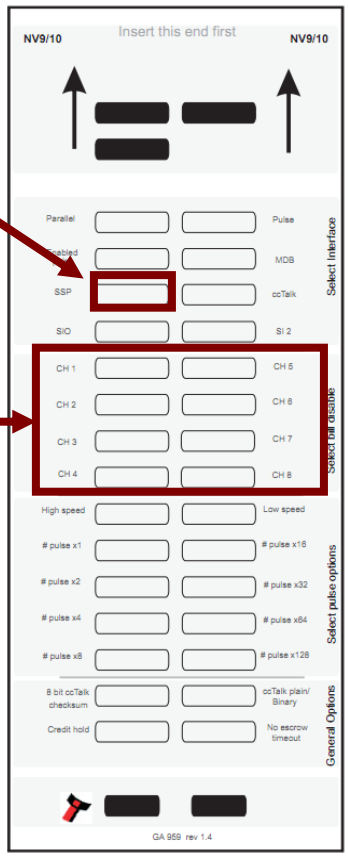
When in programming mode, do not turn off the power before the operation is complete as this will make the unit unusable.

There are different options available to use with the validator, depending on which interface is selected. Full details on programming the NV9 USB Validator using software can be found in Section 3 of this manual set (ITL Software Support Guide) – details of programming the various interfaces by use of configuration card are detailed on the next pages.

SSP configuration card options:

When using the configuration card to set SSP mode, the following options are available:

Note inhibits – fill in the boxes to inhibit notes



ccTalk configuration card options:

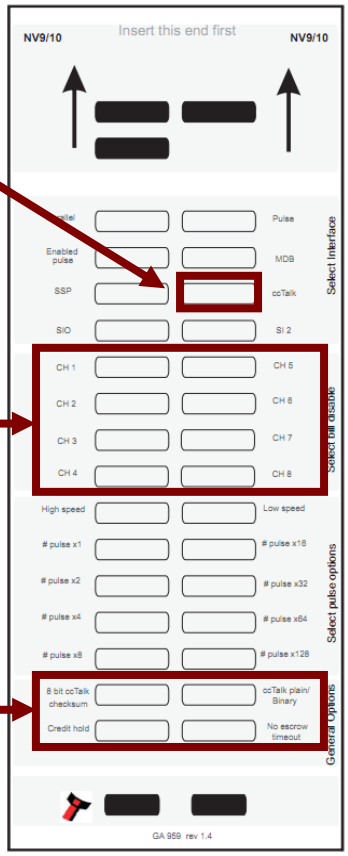
When using the configuration card to set ccTalk mode, the following options are available:

Note inhibits – fill in the boxes to inhibit notes

ccTalk plain – fill in this box to use un-encrypted ccTalk

ccTalk 8 bit checksum – if ccTalk plain is selected, leave this box blank for 16 bit CRC checksum. Fill in this box to use simple 8 bit checksum

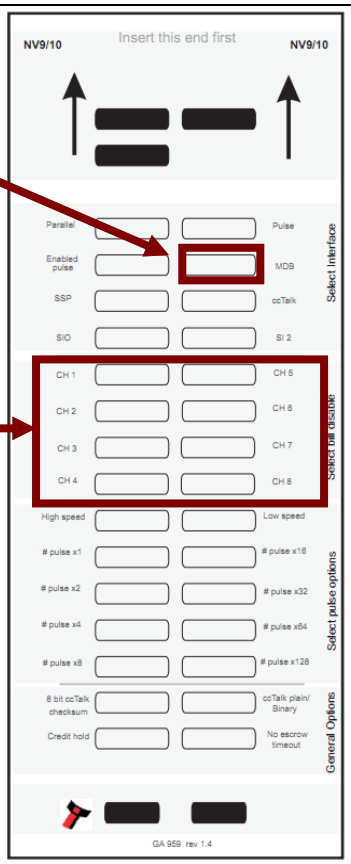
No escrow timeout – fill in this box to disable the escrow timeout



MDB configuration card options:

When using the configuration card to set MDB mode, the following options are available:

Note inhibits – fill in the boxes to inhibit notes



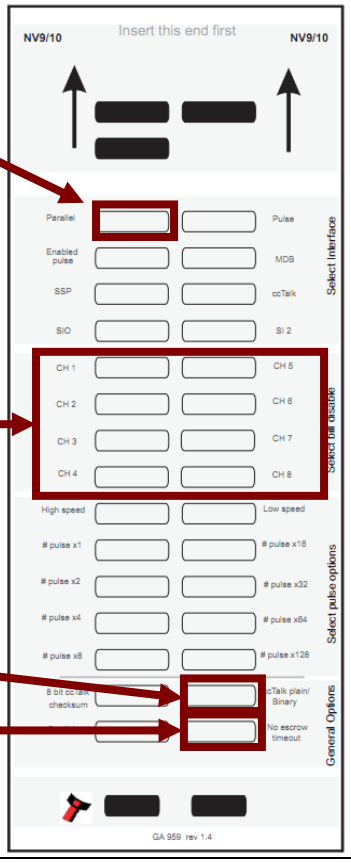
Parallel configuration card options:

When using the configuration card to set Parallel mode, the following options are available:

Note inhibits – fill in the boxes to inhibit notes

Binary – fill in this box to enable binary output mode

No escrow timeout – fill in this box to disable the escrow timeout



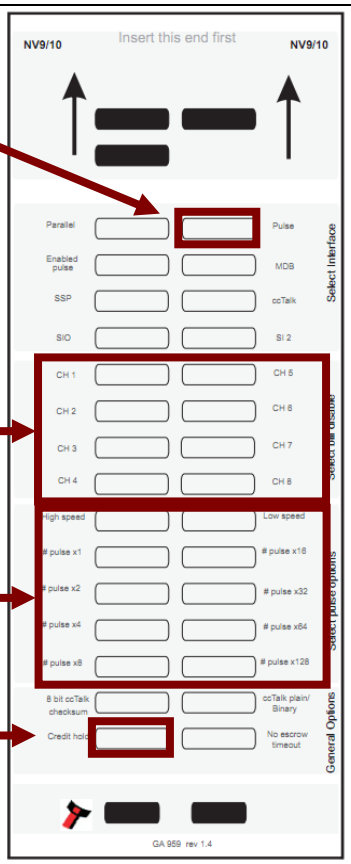
Pulse configuration card options:

When using the configuration card to set Pulse mode, the following options are available:

Note inhibits – fill in the boxes to inhibit notes

Pulse settings – set the required pulse widths and pulse multiplier

Credit hold – fill in this box to enable the credit hold function



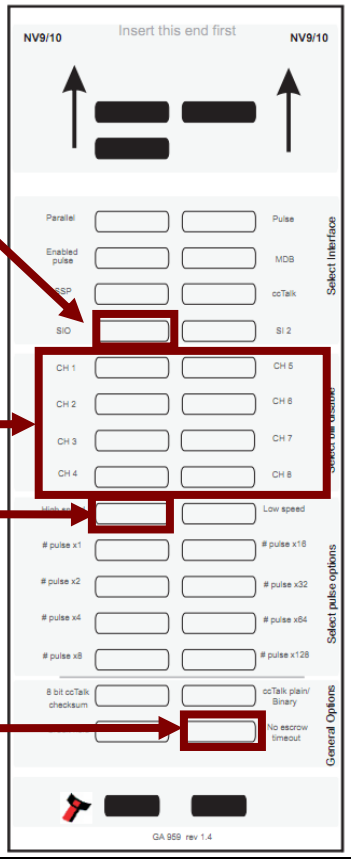
SIO configuration card options:

When using the configuration card to set SIO mode, the following options are available:

Note inhibits – fill in the boxes to inhibit notes

High speed – fill in this box to use high speed (9600 baud) data transfer rates output mode

No escrow timeout – fill in this box to disable the escrow timeout



5.3 SSP and eSSP

Smiley® Secure Protocol (SSP) is a secure serial interface specifically designed to address the problems experienced by cash systems in gaming machines. Problems such as acceptor swapping, reprogramming acceptors and line tapping are all addressed.

Encrypted Smiley® Secure Protocol (eSSP) is an enhancement of SSP. eSSP uses the same 16 bit CRC checksums on all packets as SSP, but also uses a Diffie-Hellman key exchange to allow the host machine and validator to jointly establish a shared secret key over an insecure communications channel. The encryption algorithm used is AES with a 128-bit key; this provides a very high level of security.

The encryption of the SSP protocol ensures superior protection and reliability of the data, which is transferred between validator and host machine. The encryption key is divided into two parts:

- The lower 64 bits are fixed and specified by the machine manufacturer allowing control of which devices are used in their machines.
- The higher 64 bits are securely negotiated by the slave and host at power up, ensuring each machine and each session are using different keys.

The interface uses a master-slave model; the host machine is the master and the peripherals (note acceptor, coin acceptor or coin hopper) are the slaves. Data transfer is over a multi-drop bus using clock asynchronous serial transmission with simple open collector drivers. Each SSP device of a particular type has a unique serial number; this serial number can be checked by the host on start up and receipt of a credit event to ensure that the device has not been changed.

Information

200 ms command spacing

When communicating with the NV9 USB validator, poll commands should be sent **at least** 200 ms apart.

SSP Commands and Responses

a. Commands

Action	Command Code (Hex)	Command Set
Reset	0x01	Generic
Host Protocol Version	0x06	
Poll	0x07	
Get Serial Number	0x0C	
Synchronisation command	0x11	
Disable	0x09	
Enable	0x0A	
Program Firmware / currency	0x0B (Programming Type)	
Set inhibits	0x02	Validator
Display On	0x03	
Display Off	0x04	
Set-up Request	0x05	
Reject	0x08	
Unit data	0x0D	
Channel Value data	0x0E	
Channel Security data	0x0F	
Channel Re-teach data	0x10	
Last Reject Code	0x17	
Hold	0x18	

Notes:

Action	Comments
Reset:	Single byte command, causes the slave to reset
Host Protocol Version:	Dual byte command, the first byte is the command; the second byte is the version of the protocol that is implemented on the host.
Poll:	Single byte command, no action taken except to report latest events.
Get Serial Number:	Single byte command, used to request the slave serial number. Returns 4-byte long integer.
Sync:	Single byte command, which will reset the validator to expect the next sequence ID to be 0.
Disable:	Single byte command, the peripheral will switch to its disabled state, it will not execute any more commands or perform any actions until enabled, any poll commands will report disabled.
Enable:	Single byte command, the peripheral will return to service.

b. Responses

Action	Command Code (Hex)	Command Set
OK	0xF0	Generic
Command not known	0xF2	
Wrong number of parameters	0xF3	
Parameter out of range	0xF4	
Command cannot be processed	0xF5, Error Code	
Software Error	0xF6	
FAIL	0xF8	
Key Not Set	0xFA	
Slave Reset	0xF1	Validator
Read, n	0xEF, Channel Number	
Credit, n	0xEE, Channel Number	
Rejecting	0xED	
Rejected	0xEC	
Stacking	0xCC	
Stacked	0xEB	
Safe Jam	0xEA	
Unsafe Jam	0xE9	
Disabled	0xE8	
Fraud Attempt, n	0xE6, Channel Number	
Stacker Full	0xE7	
Note cleared from front at reset	0xE1, Channel Number	

Action	Command Code (Hex)	Command Set
Note cleared into cash box at reset	0xE2, Channel Number	Validator
Note path open	0xE0	
Channel Disable	0xB5	

Notes:

Action	Comments
Command Not Known:	Returned when an invalid command is received by a peripheral.
Wrong Number Of Parameters:	A command was received by a peripheral, but an incorrect number of parameters were received.
Parameter Out Of Range:	One of the parameters sent with a command is out of range.
Command Cannot Be Processed:	A command sent could not be processed at that time – this will return a corresponding error code.
Software Error:	Reported for errors in the execution of software e.g. Divide by zero. This may also be reported if there is a problem resulting from a failed remote firmware upgrade, in this case the firmware upgrade should be redone
Key Not Set:	The slave is in encrypted communication mode but the encryption keys have not been negotiated
Jammed:	Five-byte response that indicates that the validator is jammed; this is reported until it is un-jammed or reset. It will also become disabled.

Example SSP Communications

Here is an example of the communication between host and slave. Both the typical commands from the host and responses from the validator are detailed.

Host	Slave	Comments
> SYNC	< OK	Synchronisation command
> SET_GENERATOR, *[64 bit prime number]*	< OK	Set the encryption key generator
> SET_MODULUS, *[64 bit prime number]*	< OK	Set the encryption key modulus
> REQUEST_KEY_EXCHANGE *[64 bit host intermediate key]*	< OK, *[64bit slave intermediate key]*	Host sends the host intermediate key, slave responds with the slave intermediate key. The encryption key is then calculated independently by both host and slave.
> GET_SERIAL	< OK < [*SERIAL NUMBER*]	NV9 USB Serial Number
> SETUP_REQUEST	< OK < [*SETUP INFORMATION*]	NV9 USB Setup
> SET_ROUTING, 01 14 00 00 00	< OK	Route notes of value 0020 to the NV9 USB Cashbox
> SET_INHIBIT > 07 > 00	< OK	Enable channels 1,2 and 3
> ENABLE	< OK	Enable NV9 USB
> POLL	< OK < DISABLED	
> POLL	< OK	
> POLL	< OK < NOTE READ < 00	NV9 USB currently reading a note
> POLL	< OK < NOTE READ < 03	Note has been recognised as channel 3 (£20)
> HOLD	< OK	Hold the note in escrow
> POLL	< OK < STACKING	Stack the note
> POLL	< OK < CREDIT < 03 < STACKING < STACKED	Credit given for channel 3 (£20), note stacked
> POLL	< OK	

Full support is available from ITL and local support offices for implementing eSSP - this support includes libraries and example applications. When requesting this information, please specify your preferred language(s) and operating system.

5.4 ccTalk

This section should be read in conjunction with the full ccTalk specification, which can be downloaded from the internet (www.cctalk.org).

ccTalk is a serial communications protocol in widespread use throughout the money transaction industry. Peripherals such as coin acceptors, note validators and hoppers found in a diverse range of automatic payment equipment use ccTalk to communicate with the host controller.

The protocol uses an asynchronous transfer of character frames in a similar manner to RS232. The main difference is that it uses a single two-way communication data line for half-duplex communication rather than separate transmit and receives lines. It operates at TTL voltages and is 'multi-drop' (peripherals can be connected to a common bus and are logically separated by a device address) - each peripheral on the ccTalk bus must have a unique address.

Each communication sequence (a command or request for information) consists of 2 message packets structured in one of the formats detailed below. The first packet will go from the master device to the slave device and then a reply will be sent from the slave device to the master device.

Commands can have 3 primary formats:

- 8 Bit Checksum – No Encryption
- 16 Bit CRC – No Encryption
- 16 Bit CRC – BNV Encryption

As it is possible to use the ccTalk protocol without encryption, suitable physical security should be employed to protect the ccTalk bus.

Information

200 ms command spacing

When communicating with the NV9 USB validator, Read Buffered Bill events (command 159) should be sent **at least** 200 ms apart.

ccTalk Command Summary

Command	Header	Parameters	Example
Reset Device	001	None	ACK
Request Comms Revision	004	None	X.Y
Read Barcode Data	129	None	ACK
Store Encryption Code	136	None	ACK
Switch Encryption Code	137	3 bytes Encryption key	ACK
Request Currency Revision	145	None or Country Code (2 digit)	'GBP02113'
Operate Bi-directional Motors	146	None	ACK
Stacker Cycle	147	None	ACK
Request Bill Operating Mode	152	None	3
Modify Bill Operating Table	153	Escrow & Stacker	ACK
Route Bill	154	0/1	ACK/254
Request Bill Position	155	Country Code (2 digit)	00000111 00000000
Request Country Scaling	156	Country Code (2 digit)	100
Request Bill ID	157	None	'GB0010A'
Read Buffered Bill Events	159	None	10000000000
Request Address Mode	169	None	1
Request Base Year	170	None	2006
Request Build Code	192	None	161209
Request Last Mod Date	195	None	00
Calculate ROM Checksum	197	None	4 byte checksum
Request Option Flags	213	None	3 (stacker & escrow)
Request Data Storage Av.	216	None	00000
Enter Pin	218	Pin1, Pin2, Pin3, Pin4	ACK
Enter New Pin	219	Pin1, Pin2, Pin3, Pin4	ACK
Request Accept Count	225	None	3
Request Insertion Count	226	None	7
Request Master Inhibit	227	None	1

Command	Header	Parameters	Example
Set Master Inhibit	228	Bit Mask	ACK
Request Inhibits	230	None	Inhibit Low, Inhibit High
Set Inhibits	231	Channels	ACK
Perform Self Check	232	None	0
Request Software Version	241	None	XX.YY
Request Serial Number	242	None	3 byte serial number
Request Product Code	244	None	'NV9 USB'
Request Equipment Category	245	None	'Bill Validator'
Request manufacturer ID	246	None	'ITL'
Request Polling Priority	249	None	200
Simple Poll	254	None	ACK

Monetary Values

Values are represented as 32 bit unsigned integers (4 bytes) and in the lowest value of currency. For example:

€50.00 would be 0x00001388

When sending or receiving a value the least significant byte is sent first. So in this example [0x88] [0x13] [0x00] [0x00] will be sent.

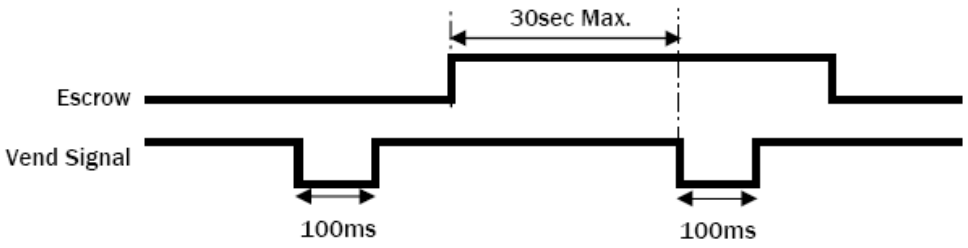
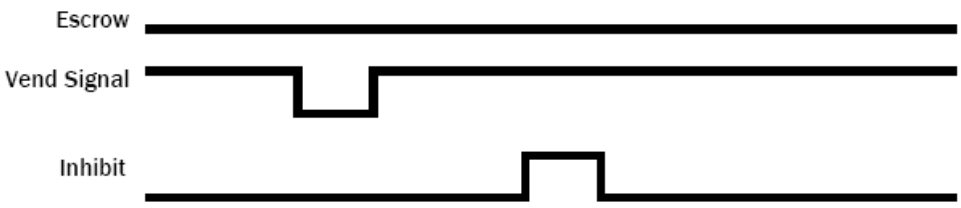
Each type of note is identified by its value and represented using the standard format outlined above. As an example, the values for Euro notes are:

Note (€)	Hex value	Data to Send
5.00	0x000001F4	[0xF4] [0x01] [0x00] [0x00]
10.00	0x000003E8	[0xE8] [0x03] [0x00] [0x00]
20.00	0x000007D0	[0xD0] [0x07] [0x00] [0x00]
50.00	0x00001388	[0x88] [0x13] [0x00] [0x00]
100.00	0x00002710	[0x10] [0x27] [0x00] [0x00]
200.00	0x00004E20	[0x20] [0x4E] [0x00] [0x00]
500.00	0x0000C350	[0x50] [0xC3] [0x00] [0x00]

5.5 Escrow Control

The NV9 USB has a single note escrow facility (pin 10) used in Parallel, Pulse and Binary modes. This allows the Validator to hold onto the note once accepted, and only stack the note into the cash box when the host machine confirms that the vend operation has been completed.

If no confirmation of vend is received then the note will be returned to the customer after 30 seconds (see the escrow timing diagrams below):

	Do not wait more than 30 seconds for the 2nd vend confirmation signal
	Inhibit rejection can be at any time during the 30 second decision period after completion of the vend

If the host machine itself aborts the transaction by setting the corresponding inhibit input high, the note is returned immediately.

The sequence of operations is as follows:

- Pin 10 is held low awaiting note insertion
- Note inserted. Validator issues a 100 ms pulse on the appropriate channel
- The host machine initiates the vend process
- The host machine sets pin 10 high to indicate that it wants the note. If this is not done within 30 seconds the Validator will return the note
- The Validator issues a 100 ms pulse on the appropriate channel after pin 10 going high to indicate final acceptance of the note. If the signal has not been received within 30 seconds it indicates the customer has forcibly retrieved the note and the vend will be aborted
- The vend process is completed
- The host machine sets pin 10 low ready for the next vend operation

The host machine can force the return of the note to the customer by setting the inhibit line high at any time before the end of the 30 second time-out. For channels above 4 setting all inhibits high will cause a note reject.

In the event of a note being forcibly removed from the mouth of the NV9 USB during the 30 second interval, the NV9 USB will go out of service for 45 seconds.

5.6 SSP Escrow Function

To hold a note in the escrow position when using SSP, the POLL command should be replaced with the HOLD (0x18) command after NOTE READ > 0 for as long as the note is to be held in escrow.

A POLL (0x07) command will then accept the note; the REJECT (0x08) command will return the note to the customer

5.7 Credit Hold Function

This function is only available if the validator is set to operate in Pulse mode.

If the credit hold function is enabled (either by configuration card or BNV Currency Manager Program), the validator will take the note as normal but then wait until the escrow line is toggled low/high. It will then give out the number of pulses per note denomination as set when programmed. After the pulses have been generated, the validator will then wait for another low/high toggle until the full value of credit pulses are given.

As an example, with a setting of 4 pulses per banknote, a 5 euro note will give 4 pulses, 5 times. A typical use of this option would be for a pool table with a game price of €1. You could insert a €5 note and press a button that toggles the escrow line and releases the pool balls; this would then allow you to play the first game. The validator holds onto the remaining credits until the game has finished and the button is pressed again allowing the next game to begin, this continues until all the credits have been used.

The busy line remains low throughout the whole process and the validator remains inhibited until all pulses are given.

5.8 Connection Options

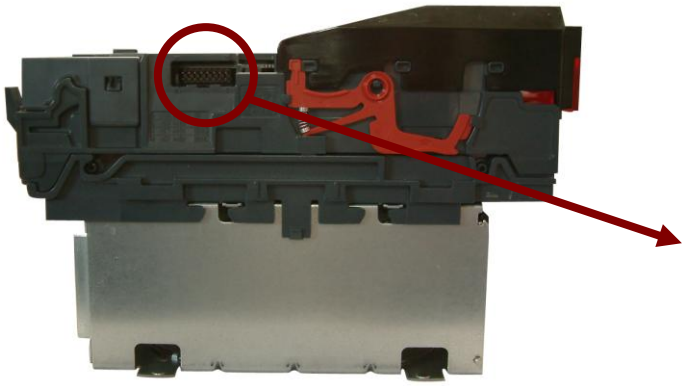
The NV9 USB Validator has a single connector that is used to allow interfacing and programming.

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 CN392) should be used. The CN392 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 CN392 cable - further details of the cable needed to interface and program the NV9 USB validator can be found in Section 4 of this manual set (subsection 4.9).

MAIN HEADQUARTERS

Innovative Technology Ltd
Derker Street – Oldham – England - OL1 4EQ
Tel: +44 161 626 9999 Fax: +44 161 620 2090
E-mail: support@innovative-technology.co.uk
Web site: www.innovative-technology.co.uk

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

BRAZIL
suporte@bellis-technology.com.br

CHINA
support@innovative-technology.co.uk

GERMANY
supportDE@innovative-technology.eu

SPAIN
supportES@innovative-technology.eu

UNITED KINGDOM
support@innovative-technology.co.uk

UNITED STATES OF AMERICA
supportusa@bellis-technology.com

REST OF THE WORLD
support@innovative-technology.co.uk

SECTION 6

NV9 USB MANUAL SET

TECHNICAL APPENDICES

INTELLIGENCE IN VALIDATION

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
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NV9 USB MANUAL SET – SECTION 6

6. TECHNICAL APPENDICES

APPENDIX A – PRODUCT APPROVALS

CE Marking

The NV9 USB unit described in this manual set has been designed to comply with the relevant sections of the following Harmonised European Standards:

- EN60950-1:2001
- EN60335-1:2002
- EN60335-2-82:2003

The unit complies with all the applicable essential requirements of the Standards.

RoHS

The following products, identified by the part numbers listed in the table below, are compliant with the European Union Directive 2002/95/EC of the Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment.

Product	Description	Lead free date
NV9 USB	Bank Note Acceptor Assembly	All NV9 USB

We hereby declare that lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (Cr4-6), polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), are not intentionally added to our products in amounts exceeding the maximum concentration values as defined by RoHS regulations (except where the application of any of those substances comes within the scope of the RoHS regulations exempted applications).

All compliant products are clearly marked on the product and/or packaging.

All the information provided in this statement of compliance is accurate to the best of our knowledge, as of the date of this publication being issued.

WEEE

The European Union's directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) was adopted by the European Council and Parliament in 2003 with a view to improving the collection and recycling of Waste Electrical and Electronic Equipment throughout the EU, and to reduce the level of non-recycled waste. The directive was implemented into law by many EU member states during 2005 and 2006.

Products and packaging that display the symbol (shown left) indicates that this product must NOT be disposed of with other waste. Instead it is the user's responsibility to dispose of their Waste Electrical and Electronic Equipment by handing it over to an approved reprocessor, or by returning it to the original equipment manufacturer for reprocessing.

APPENDIX B – TECHNICAL SPECIFICATIONS

The information contained here does not form part of a contract and is subject to change without notice. Innovative Technology Ltd operates a policy of continual product development; as such specifications may change from time to time.

Environment:

	Minimum	Maximum
Temperature	+3 °C	+50 °C
Humidity	5 %	95 % non condensing

Power Requirements:

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

WARNING!
Use suitable power supply

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).

Logic Levels:

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

General Specifications:

Note Sizes	Minimum	Maximum
Width	60 mm	85 mm
Length	115 mm	170 mm

Capacity	
Storage	300 or 600 notes

Weight	
NV9 USB	1.7 kg

Interface Protocol	
	eSSP; SIO; ccTalk; Parallel; Pulse; Binary ** MDB

Information

External interface required.

** NOTE: Using the NV9 USB with the MDB protocol is only possible by the use of an external **IF5** interface unit:

APPENDIX C – GLOSSARY OF TERMS

Term	Meaning
A	Ampere
AC	Alternating Current
ACK	Acknowledge
AES	Advanced Encryption Standard
ASSY	Assembly
AV	Average
AWG	American Wire Gauge
AWP	Amusement With Prizes
BNV	Bank Note Validator
ccTalk	Coin Controls Talk
COMMS	Communications
CRC	Cyclic Redundancy Check
DC	Direct Current
DIA	Diameter
DIP	Dual Inline Package
ECB	Electronic Code Book
EEPROM	Electrically Erasable Programmable Read Only Memory
eSSP	Encrypted Smiley® Secure Protocol
FAQ	Frequently Asked Questions
GA	General Assembly
GND	Ground
Hz	Hertz
IF	Interface

Term	Meaning
ITL	Innovative Technology Ltd
LED	Light Emitting Diode
mA	milliampere
max	maximum
MDB	Multi Drop Bus
min	minimum
mm	millimetre
ms	millisecond
MOD	Modified (or Modification)
NV	Note Validator
PCB	Printed Circuit Board
PDF	Portable Document Format
PiPS	Pay-in Pay-out System
PROM	Programmable Read Only Memory
PSU	Power Supply Unit
QTY	Quantity
RAM	Random Access Memory
ROM	Read Only Memory
Rx	Receive
RoHS	Restriction of the use of certain Hazardous Substances
SIO	Serial Input Output
SSP	Smiley® Secure Protocol
SWG	Standard Wire Gauge
SWP	Skill With Prizes
SYNC	Synchronize

Term	Meaning
TTL	Transistor Transistor Logic
Tx	Transmit
USB	Universal Serial Bus
V	Volt
V_In	Voltage In
WEEE	Waste Electrical and Electronic Equipment

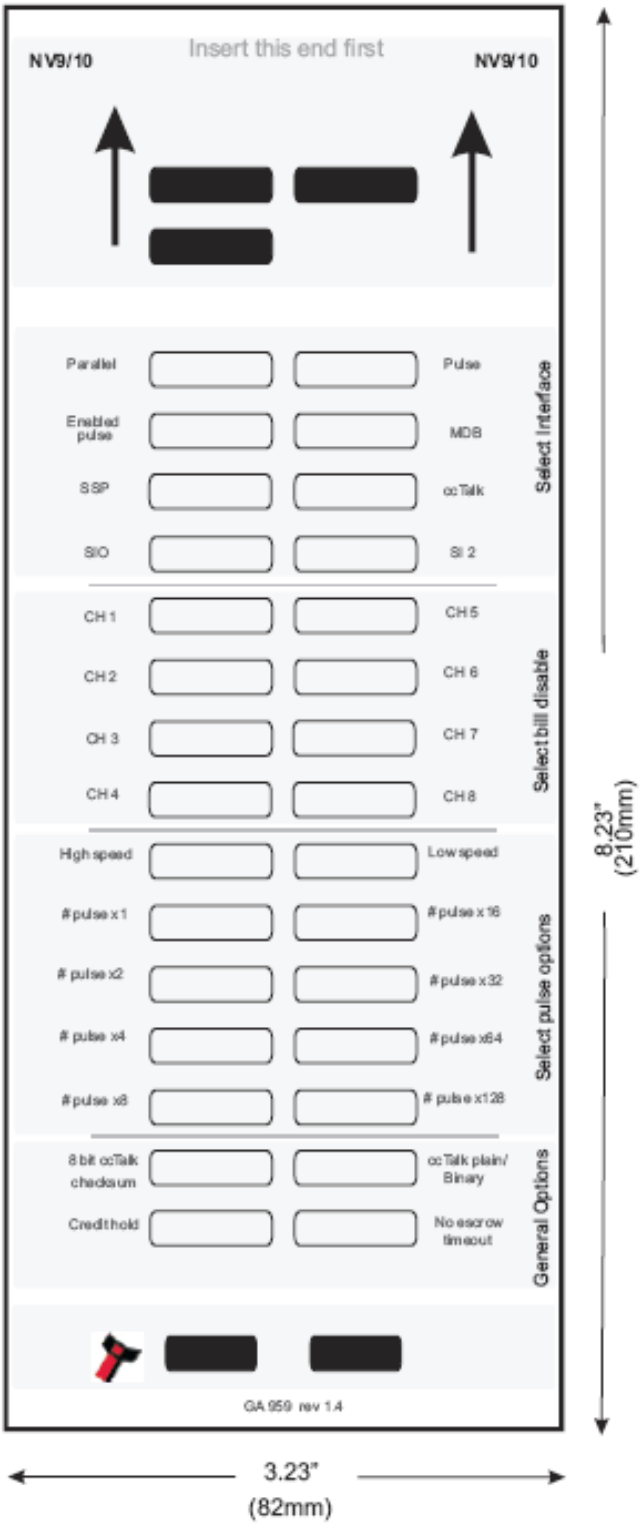
APPENDIX D – ORDERING INFORMATION

The following information is required to order an NV9 USB validator:

Product	NV9 USB	Consists of NV9 USB validator, bezel and cash box
Dataset	Country code and variant	Alternatively supply details of the currency and note types you wish to use
Bezel Size	66 - 85 mm	Please check the NV9 USB product page on the ITL website for details of the bezels available
Cash Box	300 or 600 note capacity	Please check the NV9 USB product page on the ITL website for details of the range of available cashboxes
Interface	eSSP; SIO; ccTalk; MDB; Parallel; Pulse; Binary	Using the NV9 USB with any of the following protocols will require an external interface unit: **MDB**

APPENDIX E – CONFIGURATION CARD

Please consult ITL technical document GA959 for further information on configuration card programming – the GA959 document includes a printable template for the configuration card and this can be downloaded from the Support section of the ITL website – **the sample shown here should not be used for programming as it is not to scale**.



Configuration Card - instructions for use:

1. Cut card around the outline - check the measurements are as printed. Make sure that 'Page scaling' is set to 'None' in your print options to ensure the correct size.

2. Fill in sections as required. Take care to fill in the sections correctly, keep inside the lines and fill boxes fully as shown here:

3. Power-up the validator and wait until it resets.

4. Press the configuration button once to enter programming mode (the bezel LEDs should flash at 1 second intervals).

5. Insert the card into the validator face up and in the direction indicated by the arrows.

6. The configuration card will be ejected and if the configuration was good the bezel LEDs will flash at a fast rate while programming takes place. After completion of programming the validator will reset.

Information

Check print settings.

Make sure that 'Page scaling' is set to 'None' in your print options to ensure the correct size when printing the configuration card.

If an error has occurred, the card will be rejected and the bezel LEDs will flash slowly a number of times to indicate the cause of the error:

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

WARNING!

Risk of unit damage

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

MAIN HEADQUARTERS

Innovative Technology Ltd
Derker Street – Oldham – England - OL1 4EQ
Tel: +44 161 626 9999 Fax: +44 161 620 2090
E-mail: support@innovative-technology.co.uk
Web site: www.innovative-technology.co.uk

Innovative Technology
INTELLIGENCE IN VALIDATION

Bellis Technology
INTELLIGENCE IN VALIDATION

BRAZIL
suporte@bellis-technology.com.br

CHINA
support@innovative-technology.co.uk

GERMANY
supportDE@innovative-technology.eu

SPAIN
supportES@innovative-technology.eu

UNITED KINGDOM
support@innovative-technology.co.uk

UNITED STATES OF AMERICA
supportusa@bellis-technology.com

REST OF THE WORLD
support@innovative-technology.co.uk