

NV10 USB OPERATIONS MANUAL

INTELLIGENCE IN VALIDATION



A.u.S. Spielgeräte GesmbH
Scheydgasse 48 A-1210 Wien
Tel. +43-1-271 66 00 Fax.+43-1-271 66 00 75
E-mail: verkauf@aus.at
<http://www.aus.at>
Öffnungszeiten: Mo-Fr. 9-18 Uhr

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1 INTRODUCTION

NV10 USB VALIDATOR - THE LATEST GENERATION OF SMILEY BANK NOTE VALIDATORS

This manual describes the operation of the NV10 USB Bank Note Validator as fitted with Firmware Version 4.00 or greater.

This document is intended for those who will:

- Install the NV10 USB equipment.
- Maintain the NV10 USB equipment.

Although information is included which will allow a degree of fault diagnosis and repair, it is recommended that for all but simple mechanical repairs, the unit must be returned to an approved service centre for repair.

For more concise information, addressed primarily to maintenance, please refer for the concise manual in our website.

CAUTIONS

- This product must be fitted with a 3 A (ampere) fuse before use.
- The NV10 USB validator is pin for pin compatible with NV7/8/9/10, but not pin for pin compatible with the NV2/3/4/4x or 5 series products.
- Never exceed the recommended environmental and electrical limits.
- Do not attempt to lubricate the mechanisms as this may affect the note transport.
- Do not polish the lens as this may alter the optical characteristics.
- If the NV10 USB validator is disassembled the unit must be re-calibrated and re-initialised, following re-assembly.

WARNING

- Only suitably trained personnel should carry out any work on this equipment in accordance with all current local, national and international health and safety regulations.
- We recommend that you study this manual as there are many new features permitting new uses and more secure applications.
- If you do not understand any part of this manual please contact the factory, contact details are below, for assistance. In this way we may continue to improve our product.
- The NV10 USB Validator has been designed to minimise any performance variation over time. Much of this is achieved by careful Hardware and Software design.
- Innovative Technology Ltd has a policy of continual product improvement. As a result the products supplied may vary from the specification described here.

This manual can be printed in A4 or letter sizes, without losing the scale.

This is especially important in the Appendix D – Configuration Cards.



A.u.S. Spielgeräte GesmbH
Scheydgasse 48 A-1210 Wien
Tel. +43-1-271 66 00 Fax.+43-1-271 66 00 75
E-mail: verkauf@aus.at
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2 ENVIRONMENT AND POWER REQUIREMENTS

ENVIRONMENT

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

Table 1 – Environmental Requirements

CAUTION:

Depending upon the environment in which it is used the NV10 USB may at some time require re-calibration. Please refer to Chapter 6 for details of the re-calibration process.

POWER REQUIREMENTS

Electrical Supply	Minimum	Maximum
Supply Voltage (V DC) Absolute Limits	+11.5V	+14.2V
MDB IF5 Version Supply Voltage	+18V	+48V DC or 34V AC
MDB Hardware version	+18V	+48V DC
Supply Ripple Voltage	0 V	0.25 V @ 100 Hz
Supply Currents:		
Sleep (Low Power Mode)		2mA
Standby		0.35 A
Validating		1 A
Peak Motor Stall		1.5 A

Table 2 – Power Requirements

Interface Logic Levels	Logic Low	Logic High
Inputs	0 V to + 0.5 V	+3.7 V + 12 V
Outputs with 2K2Ω pull up	0.6 V	Pull up voltage of host interface
Maximum Current Sink	50mA per output	

Table 3 – Interface Logic Levels

CAUTION

- If the input voltage falls below 11.5 V the NV10 USB may not operate correctly (will reject notes). The front bezel lights will flash to indicate incorrect conditions.
- It is recommended that the power supply used can supply at least 2.5 amperes.

3 GENERAL DESCRIPTION

The NV10 USB Bank Note Validator is a compact unit (see Figure 1), suitable for most money machines. It will accept up to 15 different denominations of notes in the serial control mode.

The NV10 USB is designed for easy installation in most machines. To see the general dimensions of the NV10 USB, refer to Appendix B - NV10 USB Mechanical Installation.

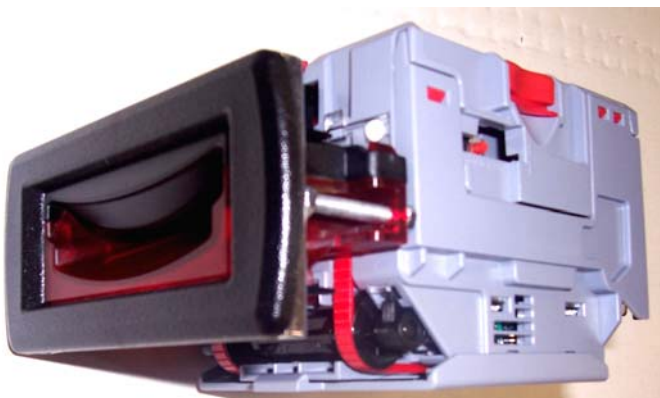


Figure 1 - The NV10 USB validator

Currency/ Firmware

The currency and firmware files have been combined in the new NV10 USB to simplify the downloading of files. The NV10 USB Validator leaves the factory preset to at least one currency so that it is ready for immediate installation. If the currency data set needs to change this may be done using the PC based Validator Management Software. New currencies and applications are being tested all the time, please refer to our web site or contact the factory for information concerning specific currencies if they are not already included on our approved list.

The NV10 USB has been designed for easy installation in most machines. The “Smiley mouth” allows insertion of notes with one hand and simplifies the note handling mechanism.

Interface

Interfacing the validator is very simple, with the choice of the following protocols:

SSP	CCTALK	MDB	SIO	eSSP
PARALLEL	PULSE	BINARY	NIS	

Table 4 - Available Interfaces / Protocols

For detailed information about the different interfaces see Chapter 4.3.

Low power option

The NV10 USB has a low power option to reduce the power consumption when idle. To learn more about the low power option, please refer to the Chapter 5.

PC System Specification

The ITL Validator Software has been tested and verified using Windows 2000/XP/Vista™ on a Pentium™ based PC System (© Microsoft and Intel). Full functionality cannot be guaranteed on lower specification systems.



4 MECHANICAL INSTALLATION

The NV10 validator is supplied with the Universal Bezel-PA231 (see figure 10).

CHANGING OR REMOVING THE BEZELS

- Push the red Bezel Release Catch in the centre and top of the NV10.
- The bezel can then be unhooked from the 4 locating points on the NV10.
- To refit, hook the bezel onto the bottom 2 locating points and then lift to fit onto the top 2 locating points on the NV10.
- The bezel will click home into NV10 when fitted correctly.

4.1 BEZEL LEDs

The Bezel LED's are used to indicate a variety of status signals as described below.

Number of LONG flashes	Number of SHORT flashes			
	1	2	3	4
1	Note Path Open	Note Path Jam	Unit Not Initialized	
2	Cash Box removed	Cash Box Jam		
3	Firmware Checksum	Interface checksum	EEPROM Checksum	Dataset Checksum
4	PSU too Low	PSU too High		

Table 5 – Bezel LED status codes

4.2 HARDWARE

4.2.1 PORTS AND BUTTONS

The NV10 USB interface connector is located on the left side of the unit; it has 16 pins (see Figure 2), refer to Table 6 for the pin allocation. Two are used for the 0V and +12V power supply and there are five outputs and five inputs, the remaining four pins are reserved for factory use and should not be connected. An example mating connector is Molex type Part No: 39-51-2160.

It is possible to use the special hardware versions of NV10 USB in machines operating at 110 volts or in machines operating at MDB.

The NV10 USB also has a Configuration Button located on the right hand side of the unit. The USB cable CN392 fits into the 16 way connector, this can be used to program the NV10 USB and for communications when used in SSP and SIO modes. When used for programming, no external power supply is required. When used for the communications, power must be applied to the NV10 USB cable CN392 via the 16 pin interface connector before connecting the USB cable.

4.2.2 INTERFACE CONNECTOR PIN DETAILS

The connector pin details are described below (see table 5); they use an IDC 16-pin 0.1" pitch header with 2 rows of 8 pins.

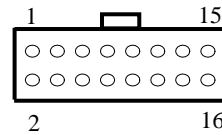


Figure 2 – Pin detail

Pin	Name	Description
1	Vend 1	Open collector outputs. Function changes depending on machine interface protocol (see individual interface descriptions for details.) Also the Pulse Steam output. Also the Serial Output pin in SSP Serial Mode and other serial modes.
2	Vend 2	Open collector outputs. Function changes depending on machine interface protocol (see individual interface descriptions for details).
3	Vend 3	
4	Vend 4	
5	Inhibit 1	Inhibit channel 1 by holding this pin HIGH. To Enable a channel the inhibit must be held LOW. Also the serial Input pin in SSP Serial Mode, and other serial modes.
6	Inhibit 2	Inhibit channel 2 by holding this pin HIGH
7	Inhibit 3	Inhibit channel 3 by holding this pin HIGH
8	Inhibit 4	Inhibit channel 4 by holding this pin HIGH
9	Busy	NV10 USB is validating and stacking output. Active low while the NV10 USB is reading, transporting or stacking a note
10	Escrow	Operate Escrow function by holding LOW (see Appendix B – Escrow Control for full details).
11	USB	Data Plus
12	USB	Data Minus
13	USB	-V- Bus
14	Factory use only	Do Not Connect
15	+Vin	Nominal 12V DC supply
16	0V	0V supply

Table 6 – 16 Pin Connector Details



4.2.3 CONFIGURATION BUTTON FUNCTIONS

The functions available via the Configuration Function Button are detailed in Table 7.

Configuration Button	Power Status	Function
Press and Hold (>2 secs)	Powered ON	Sets NV10 USB to Programming Mode (SSP)
Press Once (<1 sec)	Powered ON	Enables Configuration Card Programming
Press Twice (within half a second)	Powered ON	Current Setting Indicator
Press and hold as power is applied	Powered OFF/ON	Resets ccTalk key to Default setting

Table 7 – Configuration Button Functions

NV10 USB Programming Mode

Press and Hold the Configuration Button for at least 2 seconds whilst the NV10 USB is powered up. The Bezel LED will flash rapidly to indicate that SSP is being loaded. Once this process has finished the NV10 USB will reset. The NV10 USB will now be in Programming Mode (SSP) and allow connection to a PC via a DA1 or DA2 adapter or connection to a DA3.

Note: This mode can only be cancelled by re-programming with a Configuration Card or via the Validator Manager Program. Please ensure you are aware of all the NV10 USB programmed settings before entering this mode. Failure to restore the original setting will stop the NV10 USB from operating in the Host machine.

Configuration Card Programming Mode

Press the Configuration Button once whilst the NV10 USB is powered up. If done correctly the Bezel LED will flash every 1 second. This will allow the insertion of a Configuration Card to change the Firmware Protocol in the NV10 USB. (See chapter 4.4 Using NV10 USB Configuration Cards for full details). This mode can be cancelled by again pressing the Configuration Button once.

Current Setting Indicator Mode

Press the Configuration Button twice within half a second whilst the NV10 USB is powered up. The NV10 USB Bezel LED will then perform a series of flashes to indicate the current settings within the validator. (See Program Check Procedure, Appendix D - Configuration Cards)

Encryption Key Reset Function (ccTalk®)

Note: This function will only be possible if the NV10 USB is programmed to ccTalk® mode. It is not possible to reset the key from SSP mode. Press and hold the Configuration Button whilst the NV10 USB powered is off. Apply the power and keep the button pressed for several seconds. The ccTalk Encryption key will now be restored to the default setting.



4.3 PROTOCOLS

ITL strongly recommends the use of an encrypted Serial protocol (Preferably eSSP) to achieve the highest security.

4.3.1 eSSP - ENCRYPTED SMILEY® SECURE PROTOCOL

We have now developed encrypted SSP for the NV10 USB banknote validator as it is our opinion that encrypted SSP is now necessary in this advanced technological age. The encryption of SSP protocol will ensure superior protection and reliability of the data, which is transferred between validator and host machine. The encryption key is 128 bits long, and is divided into two parts. The lower 64 bits are fixed and specified by the machine manufacturer, allowing the manufacturer to control 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. This encryption algorithm is approved by the US military for its advanced security.

We have new hardware interfaces available to enable eSSP banknote validators to be used in machines without the need of updating the machine software. The interface is mounted close to the control board, and converts the connection to the banknote validator to serial eSSP, giving maximum security along the length of the cable.

4.3.2 SMILEY® SECURE PROTOCOL - SSP

NOTE: Please refer to the Smiley® Secure Protocol (SSP) Specification (ITL Drawing GA138) on the web site for full details of the SSP protocol. To use SSP mode, the SSP interface must be programmed into the validator via the Configuration Cards (See Appendix D - Configuration Cards) or via the ITL BNV Currency Manager Program, or by pressing and holding the Configuration Button for more than 2 seconds.

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. This interface is recommended for all new designs. 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.

The integrity of data transfers is ensured through the use of 16 bit CRC checksums on all packets. Each SSP device of a particular type has a unique serial number; this number is used to validate each device in the direction of credit transfer before transactions can take place. Commands are currently provided for coin acceptors, note acceptors and coin hoppers. All current features of these devices are supported.

For detailed information and full protocol specification please refer to SSP Interface Specification ITL (GA138), this is available from the ITL website www.innovative-technology.co.uk.

To help in the software implementation of the SSP, ITL can provide DLL controls and Visual Basic applications on request. Please contact support@innovative-technology.co.uk for more information.

4.3.3 CCTALK® PROTOCOL – CCT

The NV10 USB supports the ccTalk serial protocol for easy interfacing with host machines that support this protocol. To use ccTalk® mode, the CCT interface must be programmed into the validator via the Configuration Cards (See Appendix D - Configuration Cards) or via the ITL BNV Currency Manager Program.

Pin out connections on NV10 USB for ccTalk are shown (see Figure 6) looking at the connection pins on the NV10 USB interface connector as defined in the ccTalk specification. It is recommended that all communications with the note validator must be encrypted using the encryption key, the default encryption key will be printed on the label of the NV10 USB. To reset the Encryption key to its default value see Chapter 4.2.3. **NOTE:** For detailed information and full protocol specification please refer to www.cctalk.org.

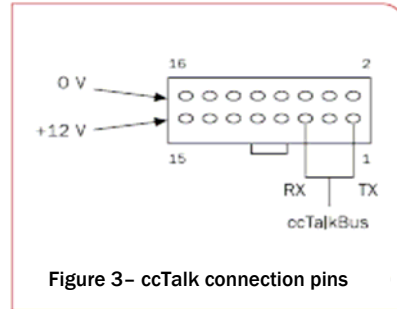


Figure 3- ccTalk connection pins

4.3.4 MULTI-DROP BUS/INTERNAL COMMUNICATIONS PROTOCOL (MDB/ICP)

To use the MDB mode an MDB NV10 USB or an IF5 interface box can be used. The MDB interface must be programmed into the validator via the Configuration Cards (See Appendix D - Configuration Cards) or via the ITL BNV Currency Manager program.

Note:

- An IF5 cannot be used with an MDB NV10 USB.
 - A standard NV10 USB can only be used in MDB with the addition of an IF5 interface.
 - Please refer to the Multi-Drop Bus specification for the suggested current drive circuits available.
 - The NV10 USB supports the MDB protocol version 1, level 1.
 - For detailed information and full protocol specification please refer to www.vending.org
- MDB defines a serial bus interface used in electrically controlled vending machines (see Figure 7).

This is a 9600 Baud Master-Slave system where the NV10 USB Banknote Validator is a slave to a master controller. A master has the capability of communicating with 32 peripherals or slaves. The master is defined as the Vending Machine Controller (VMC). The NV10 USB banknote Validators have a unique address – 00110XXX binary (30H).

The VMC polls the bus to detect presence of the NV10 USB Validator or get information on the current status of the validator.

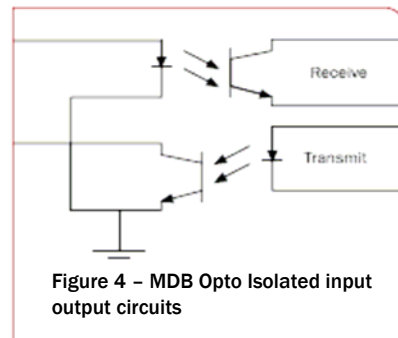


Figure 4 - MDB Opto Isolated input output circuits

The validators will respond when asked for activity with an acknowledgment, a negative acknowledgment or a specific reply, depending on its current status. Bus crashes are avoided as the Validators respond to being polled only by the VMC.

The international country code must be set for the country in which the Validators will be operating. This is either the international telephone code for that country, or the country code taken from ISO4217. The code is represented as two bytes. The initial digit signifies the source of the code. 0 signifies the telephone code is used, 1 signifies ISO4217 has been used.



For the USA the country code is 00 01, or 18 40
 For Great Britain the code is 00 44, or 18 26.

The scaling factor must also be specified for each Validator. All accepted note values must be evenly divisible by this number.

- This number would be set to 100 (Hex 64) for the Euro or Great Britain.
- The number would be set to 1000 (Hex 03E8) for Colombia.

The number of decimal places must also be programmed for each Validator

- The number would be set to 2 for Euro or USA
- The number would be set to 3 for Colombia

Adopting the numbers above.

- £5 would be displayed as 5.00
- £10 would be displayed as 10.00
- \$1 would be displayed as 1.00
- 1K Colombia would be displayed as 1.000

4.3.5 SERIAL INPUT/OUTPUT – SIO

Existing Smiley® NV4 - NV10 users may already be using the serial input/output facility in conjunction with the parallel inputs. The NV10 USB Validator also supports this system. However this interface is not recommended for new designs, the Smiley® Secure Protocol SSP interface is recommended.

CAUTION

- The NV10 USB does not support the simple serial data out only mode as available on NV4 and earlier models NV2 and NV3. It only supports the serial data input/output mode.
- The host machine does not echo messages back to the validator.
- The NV10 USB does not operate in true RS232 mode. (Only TTL level).

To use Serial Input/Output mode, the SIO interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager Program.

There are 4 different combinations of SIO available:

SIO 300 Baud

SIO 300 Baud (Disabled at Start up) - A software enable must be sent to enable the validator.

SIO 9600 Baud

SIO 9600 Baud (Disabled at Start up) - A software enable must be sent to enable the validator.

The data is formatted as follows for 300 Baud:

1 start bit - 8 data bits - 2 stop bits

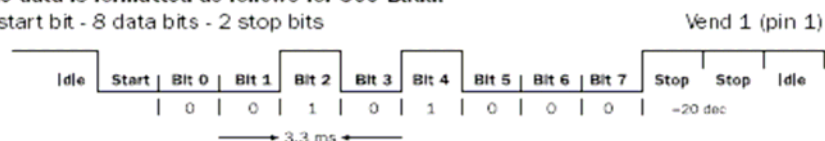


Figure 5 – Typical serial output: Transmission of the value 20 (decimal), note not recognized

The data is formatted as follows for 9600 Baud:

1 start bit - 8 data bits - 1 stop bits

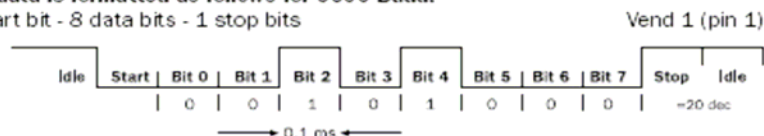


Figure 6 – Typical serial output: Transmission of the value 20 (decimal), note not recognized



The NV10 USB will receive and transmit the following event codes.

Recognised Receive Codes to NV10 USB		Transmitted codes from NV10 USB	
MESSAGE	DECIMAL VALUE	MESSAGE	DECIMAL VALUE
Inhibit C1	131	Note Accept on C1	1
Inhibit C2	132	Note Accept on C2	2
Inhibit C3	133	Note Accept on C3	3
Inhibit C4	134	Note Accept on C4	4
Inhibit C5	135	Note Accept on C5	5
Inhibit C6	136	Note Accept on C6	6
Inhibit C7	137	Note Accept on C7	7
Inhibit C8	138	Note Accept on C8	8
Inhibit C9	139	Note Accept on C9	9
Inhibit C10	140	Note Accept on C10	10
Inhibit C11	141	Note Accept on C11	11
Inhibit C12	142	Note Accept on C12	12
Inhibit C13	143	Note Accept on C13	13
Inhibit C14	144	Note Accept on C14	14
Inhibit C15	145	Note Accept on C15	15
Inhibit C16	146	Note Accept on C16	16
Un-inhibit C1	151	Note Not Recognised	20
Un-inhibit C2	152	Mechanism running slow	30
Un-inhibit C3	153	Strimming attempted	40
Un-inhibit C4	154	Channel 5 Note Rejected (fraud channel)	50
Un-inhibit C5	155	STACKER Full or Jammed	60
Un-inhibit C6	156	Abort During Escrow	70
Un-inhibit C7	157	Note may have been taken to clear jam	80
Un-inhibit C8	158	Validator Busy	120
Un-inhibit C9	159	Validator Not Busy	121
Un-inhibit C10	160	Command Error	255
Un-inhibit C11	161		
Un-inhibit C12	162		
Un-inhibit C13	163		
Un-inhibit C14	164		
Un-inhibit C15	165		
Un-inhibit C16	166		
Enable serial escrow mode	170		
Disable serial escrow mode	171		
Accept escrow	172		
Reject escrow	173		
Status	182		
Enable all	184		
Disable all	185		
Disable escrow timeout	190		
Enable escrow timeout	191		
Request firmware	192		
Request dataset	193		

Table 8 - Receive and Transmit Codes



Event	Validator	Decimal Value	Host
Note entered into validator	Validator Busy	120→	
Note accepted channel 2	Validator Ready	121→	
	Accept on channel 2	2→	
Note entered into validator	Validator Busy	120→	
Note not recognised	Validator Ready	121→	
	Note not recognised	20→	
Validator has returned note	Validator Ready	121→	
Software Inhibit Channel 4	Inhibit C4	←134	Inhibit C4
	Channel 4 inhibited	134→	
Software Enable Channel 4	Uninhibit C4	←154	Uninhibit C4
	Channel 4 inhibited	154→	
Status Report		←182	Status Request
	Status Requested	182→	
3 byte status message	Inhibit status Channels 1-8	Byte 1→	
	Inhibit status Channels 9-16	Byte 2→	
	Escrow On (=1) / Off (=0)	Byte 3→	
Turn on Escrow Mode		← 170	Enable Escrow Mode
	Escrow Mode Enabled	170→	
Note accept in Escrow Mode			
Note entered into validator	Validator Busy	120→	
Note Accepted Channel 2	Validator Ready	121→	
	Accept on Channel 2	2→	
		←172	Accept Note in Escrow
	Accept Escrow	172→	
	Accept on Channel 2	2→	

Example transactions are shown below.

Table 9 – Example Protocols

4.3.6 PARALLEL INPUT AND OUTPUT

To use Parallel Output for 4-note/channel acceptance the Parallel interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager Program.

Vend Signals: (Pins 1 to 4). The four channels have their own individual outputs. If a note is recognised then the relevant Vend line is set low for a period of 100 ± 3 ms. Pulses outside these limits should be rejected as a precaution against false triggering.

Busy Output: (Pin 9). This is a general-purpose busy signal. It is active low while the NV10 USB is in operation.



Escrow Control: (Pin 10) Hold this pin Low to enable the single note escrow function. (See Appendix E – Escrow Control). If the host machine aborts the transaction by setting the corresponding inhibit input high, the note is returned immediately.

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. Setting high all the inhibits causes a note reject.

In the event of a note being forcibly removed from the mouth of the NV10 USB during the 30-second interval, the NV10 USB will go out of service for 45 seconds.

Inhibit Operation: (Pins 5 – 8) Channels 1 to 4 have their own inhibit input to allow the host machine to refuse specified notes. To inhibit a channel, the relevant inhibit input must be held high. To enable a channel, the corresponding inhibit must be latched low so that notes may be accepted.

If all four inhibits are high simultaneously then the NV10 USB will be disabled. In this state the bezel LED will not illuminate and if a note is inserted the motor will run in reverse preventing the insertion of the note.

All four inhibits may be connected together to create a 'global' inhibit. In this way the NV10 USB may be brought in and out of operation by the host machine. It is possible to operate the NV10 USB in Low power mode with the Parallel interface. For further details please see Chapter 5.

4.3.7 PULSE STREAM OUTPUT

To use pulse stream output for acceptance of up to 16 note/channel acceptance, The Pulse interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager Program.

Vend Signal: (Pins 1) When a note is recognised vend 1 will pulse a pre set number of times, the number of pulses can be set via the ITL BNV Currency Manager Program (and set to default values with supplied dataset). The pulse width can be set either with the ITL BNV Currency Manager Program or via the Configuration Cards (See Appendix D - Configuration Cards)

Busy Output: (Pin 9). This is a general-purpose busy signal. It is active low while the NV10 USB is in operation.

Escrow Control: (Pin 10). No escrow function in this mode

Inhibit Operation: (Pins 5 – 8) Channels 1 to 4 have their own inhibit input to allow the host machine to refuse specified values of notes. To inhibit a channel, the relevant inhibit input must be held high. To enable a channel, the corresponding inhibit must be latched low so that notes may be accepted.

If all four inhibits are high simultaneously then the NV10 USB will be disabled. In this state The bezel will not illuminate and if a note is inserted the motor will run in reverse preventing the insertion of the note.

Note: Channels higher than four cannot be individually inhibited, but will be globally inhibited if inhibits 1 to 4 are inhibited.

It is possible to operate the NV10 USB in Low power mode with the Pulse interface. For further details please see Chapter 5.

Credit Hold Function:

If this function is enabled in pulse mode by Configuration card or ITL BNV Currency Manager Program, the validator will take the note as normal but then wait until the escrow line is toggled low/high before. It will then give out the number of pulses per dollar as set on the programming card. After the pulses have been given, the validator will then wait for another low/high toggle until the full value of credit pulses are given.

For example with a setting of 2 pulses per dollar, a five dollar bill will give 2 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.

4.3.8 BINARY OUTPUT – BIN

To use Binary mode the Binary interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager Program.

In the event that the machine needs more than 4 notes to be recognised, but the host machine cannot take advantage of the serial communication methods then the NV10 USB can be set to give a binary pattern output on the four parallel output pins. If the NV10 USB is set to binary mode it will issue the vend signals as a binary pattern on the parallel outputs for 100 ± 3 ms. In this way a maximum of 15 different notes can be accepted and 4 notes individually inhibited.

Vend Signals: (Pins 1 to 4). The four channels have their own individual outputs. If a note is recognised the binary representation of the channel number will be pulled low for 100 ± 3 ms. Pulses outside these limits will be rejected as a precaution against false triggering due to noise.

Busy Output: (Pin 9). This is a general-purpose busy signal. It is active low while the NV10 USB is in operation.

Escrow Control: (pin 10). Hold this pin Low to enable the single note escrow function. (See Appendix E – ESCROW Control).

If the host machine aborts the transaction by setting the corresponding inhibit input high on pin 10, the note is returned immediately.

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. Setting all the inhibits high causes a note reject.

In the event of a note being forcibly removed from the mouth of the NV10 USB during the 30-second interval, the NV10 USB will go out of service for 45 seconds.

Inhibit Operation: (Pins 5 – 8) Channels 1 to 4 have their own individual inhibit input to allow the host machine to refuse specified values of notes. To inhibit a channel, the relevant inhibit input must be held high. To enable a channel the corresponding inhibit must be latched low so that notes may be accepted.

If all four inhibits are high simultaneously then the NV10 USB will be disabled. In this state the bezel will not illuminate and if a note is inserted the motor will run in reverse preventing the insertion of the note.

Note: Channels higher than four cannot be individually inhibited, but will be globally inhibited if inhibits 1 to 4 are inhibited. It is possible to operate the NV10 USB in Low power mode with the Binary interface. For further details please see the next chapter.

4.3.9 OTHER INTERFACES AVAILABLE BY REQUEST FROM ITL

Any queries regarding interfaces not mentioned in this manual should be made to support@aus.at

4.4 USING NV10 USB CONFIGURATION CARDS

The Configuration Cards offer the following functions:

- Select required Communication Interface (SSP, ccTalk, Parallel etc).
- Adjust the channel and pulse configuration on a pre-programmed NV10 USB to your own requirements.

Programming the NV10 USB with the configuration cards is enabled via the 'Configuration Button' on the right hand side of the NV10 USB (see Chapter 4.2.3). (For details on how to complete the configuration cards please see Appendix D – Configuration Cards)

Instructions

- 1) Press the Configuration button once whilst the validator is powered up.
- 2) The bezel LEDs will now flash with a steady heartbeat until a Configuration Card is entered.
- 3) Once the Configuration Card has been entered the validator reads the card and immediately returns it.
- 4) The LEDs then flash rapidly whilst the interface is being changed. If the LEDs flash a number of times slowly, it is an indication of an error (For details of the Error Flash Codes please see Appendix D – Configuration Cards).
- 5) When the changes are complete the validator resets.

If a configuration card is not entered, this function can be cancelled by pressing the button again once.

It is now possible to check the programmed settings of the NV10 USB by pressing the Configuration button twice within half a second. (For details see Appendix D – Configuration Cards)

5 MECHANICAL

5.1.1 CHANGING OR REMOVING THE BEZELS

- Push the red Bezel Release Catch in the centre and top of the NV10.
- The bezel can then be unhooked from the 4 locating points on the NV10.
- To refit, hook the bezel onto the bottom 2 locating points and then lift to fit onto the top 2 locating points on the NV10.
- The bezel will click home into the NV10 USB when fitted correctly

5.1.2 FITTING THE BEZEL INTO A MACHINE

CAUTIONS:

- ENSURE THERE IS A CLEARANCE AROUND THE INITIAL EXIT (SEE DRG GA334 IN APPENDIX A) SO THERE IS NO OBSTRUCTION TO THE BANKNOTES AS THEY ARE BEING READ BY THE NV10.
- A SUITABLE CASH BOX IS NEEDED SO THAT THE NOTES SECURELY STORE AWAY FROM THE NOTE EXIT (SEE APPENDIX C), TO PREVENT NOTES ACCUMULATING AT THE NOTE EXIT.

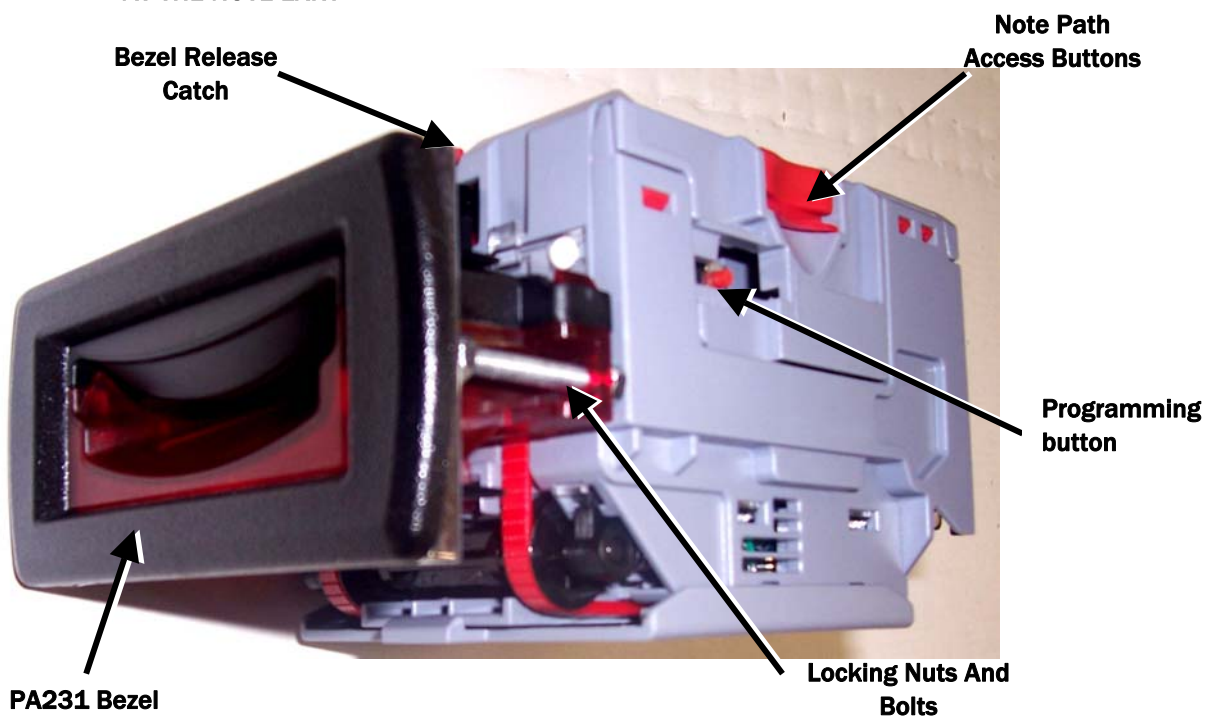


Figure 7 - Bezel and NV10 Installation

- Remove the 4 nuts, 2 metal clamps, star washers and 2 bolts from each side of the bezel as above (see figure 10).
- Place PA231 through the aperture in the door of the machine from the front.
- Fit the two metal clamps and star washers and tighten the nuts onto the bolts (recommended torque 25cN per metre).
- Fit the main bezel assembly onto the bolts with the black part to the top. Fit the star washers and tighten the nuts onto the bolts (recommended torque 25cN per metre).

5.1.3 CASH BOX INTERFACE

It is important that there is sufficient space for the "initial exit" and "final exit" of notes from the NV10 note path, before entry into the cash box/chute without any obstructions (see Appendix C). For help on installing the NV10 into a new design please contact: support@aus.at

5.1.4 ROUTINE MAINTENANCE

The NV10 Validator has been designed to minimise any performance variation over time. Much of this is achieved by careful hardware and software design. However, depending upon the environment the NV10 may at some time require cleaning, belt changing or note path clearing.

5.1.5 CLEANING

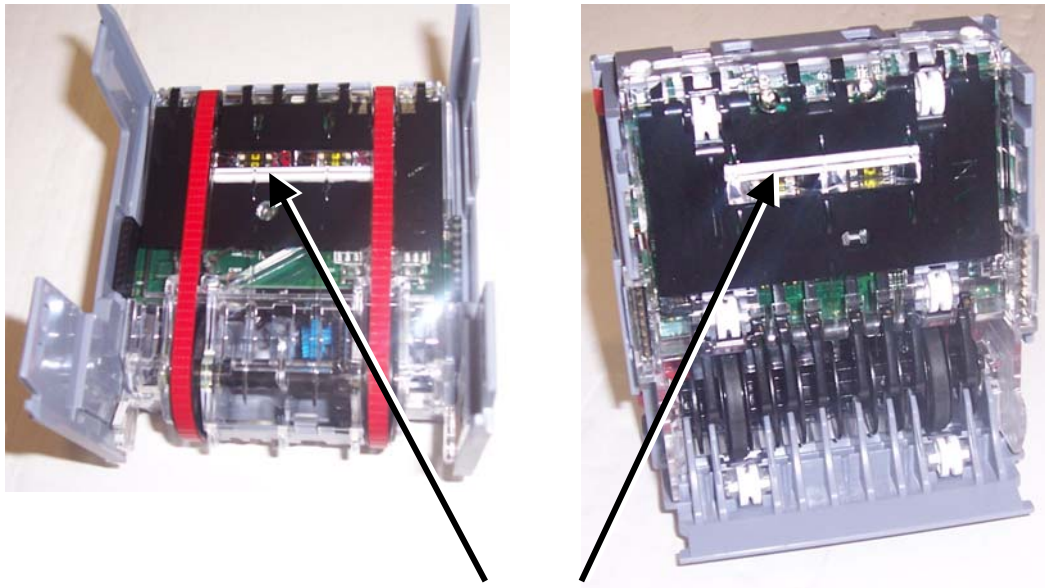
CAUTION: DO NOT USE SOLVENT BASED CLEANERS SUCH AS ALCOHOL, PETROL, METHYLATED SPIRITS, WHITE SPIRIT or PCB CLEANER. THIS WILL RESULT IN PERMANENT DAMAGE TO THE VALIDATOR, ONLY USE A MILD DETERGENT.

Remove the NV10 from its bezel. Push the 2 red Note Path Access Buttons on the sides of the NV10 downwards and then inwards towards the body of the NV10 (see figure 9) and lift to expose the note paths, place them on a clean dry surface. The note path will now be exposed for cleaning, (see figure 11).

Carefully wipe the surfaces with a soft lint free cloth that has been dampened with a water and mild detergent solution (i.e. household washing up liquid). Take particular care around all the sensor lenses (see figure 11), ensuring they are clean and dry. Clean any metal debris that may be attached to the magnetic sensor.

If a lens has become badly scratched do not attempt to polish it. Contact ITL for further advise, as there may be damage to the optical properties of the lens.

CAUTION: WHEN CLEANING THE "RECESSED" FRONT SENSOR, USE A SMALL SOFT BRUSH OR COTTON WOOL BUD.

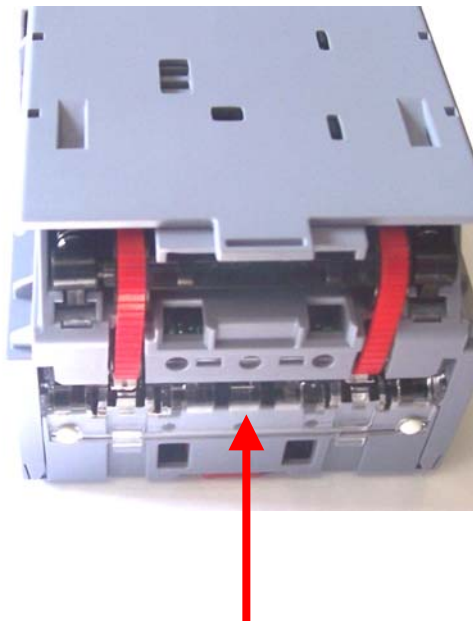


Optical Sensors

Figure 8 - NV10 Sensors

Belt Cleaning

1. Ensure the validator is enabled (i.e. Bezel lights are illuminated)
2. Remove Bezel.
3. 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.
4. Use a lint free cloth dampened with water containing a mild detergent such as dish detergent and hold it against each drive belt as it turns.
5. Repeat steps 3 and 4 until all dust and debris has been removed from both belts.
6. Repeat step 3 using a DRY lint free cloth to remove any excess moisture.



Insert Paper

5.1.6 BELT CHANGING

- With the NV10 note paths exposed (see figure 11) place the unit on a clean dry surface.
- Remove the lower cover plate by lifting up the retention catch and carefully sliding it back (see figure 12).
- Push the 2 belt tension springs inwards then slide each belt off the drive unit body, smallest wheels first.
- Replace the belts by fitting them over the drive unit body legs, smallest wheels first.
- Place the lower cover plate into the locating slots (2 each side) pushing forward and down, the plate will "click" confirming correct insertion.
- Connect the upper and lower note path back together.

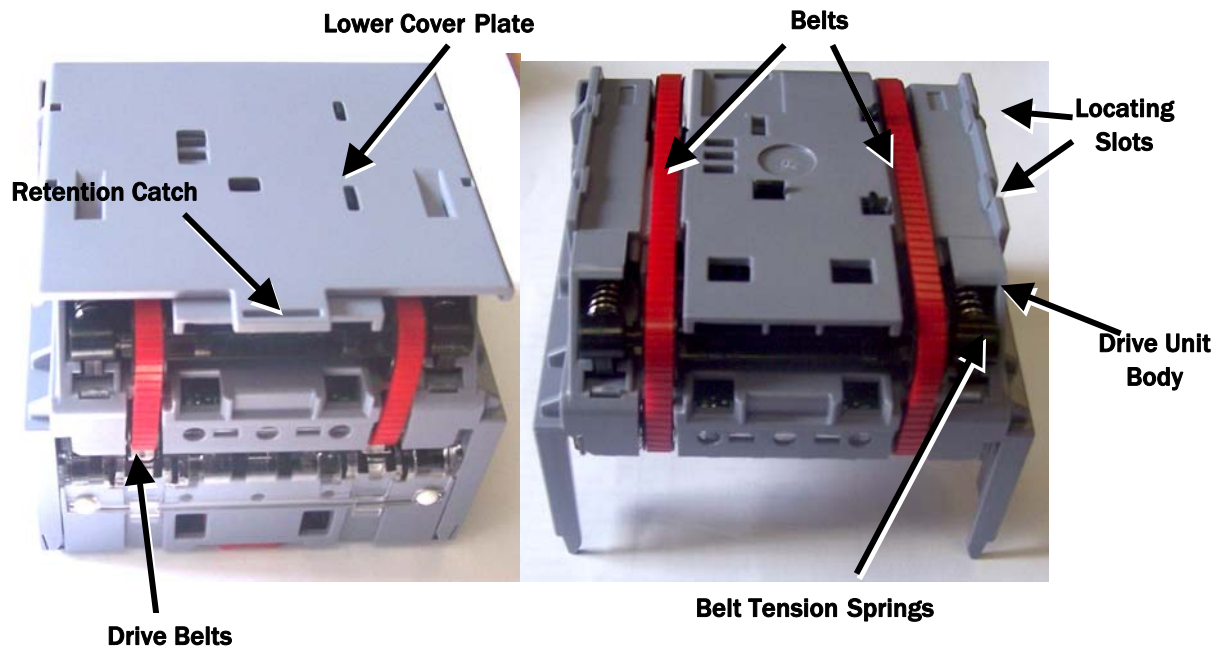


Figure 9 - NV10 Belt Access

5.2:FAULT FINDING ANALYSIS

PROBLEM	CHECK	SOLUTION
Validator will not accept notes	<p>Is the Bezel lit? Are any "STATUS" lights lit?</p> <p>Is the problem with all notes or just one denomination</p> <p>Is the Top to Bottom cable connected properly?</p>	<p>Check the Power Supply specification Check the LED Status codes (Chapter 4.2). Check correct interface is programmed in using VALIDATOR MANAGER software.</p> <p>Check the inhibit lines (pins 5 -8) from Host machine to Validator.</p> <p>Test cable for continuity and refit.</p>
Validator runs slowly and/or intermittently	<p>Check note paths for foreign objects Check note path for damage Check Voltage level of supply Check drive belts are fitted correctly Ensure that there is no grease on the drive belts</p>	<p>Clean the note path.</p> <p>Replace damaged parts</p> <p>Ensure PSU meets the required specification Refit belts</p> <p>Replace belts</p>
Notes are accepted but no credit received	<p>Is the PSU within specification? Has the correct interface been selected?</p>	<p>Check Power Supply specification</p>
Validator rejects genuine notes	<p>Is the correct currency file programmed?</p> <p>Is the required note contained in the Currency file? Are sensors ok</p>	<p>Check correct Currency is programmed in using Validator Manager software Contact Support with "Issue Date" and "Note Denomination" for details</p> <p>Run Diagnostics in Validator Manager</p>



6 RE-CALIBRATION

The NV10 USB has an in-built self-calibration system that maintains the optical sensors at their best operating point.

However if the NV10 USB is disassembled for any reason it will need to be re-calibrated. Re-calibration may only be performed under license from ITL, contact support@aus.at for further details.

This can be performed in conjunction with the diagnostics software option in the ITL BNV Currency Manager Program and help menus supplied with this program.

7 DIAGNOSTICS

Symptom	Possible Cause	Corrective Action
All notes are rejected (Bezel LED's are on)	Incorrect currency file programmed	Check that the required dataset is programmed into the validator using the validator manager software.
	Notes are not included in the currency file	Check that the required note denomination and issue is included in the currency file using the validator manager software.
	Notes are inhibited by the host machine	Ensure the machine is ready to accept notes. If a coin hopper is in the machine, ensure it is not empty. Ensure the maximum allowed credit on the host machine has not been exceeded.
	Bill path obstructed	Check for necessary clearance for note ejection after acceptance.
	Reader module is not fully inserted	Ensure the reader module is fully inserted into the main body of the validator.
Notes are not taken in (no bezel LED's)	No Power	Ensure the correct specification of power is applied to the validator.
	Incorrect interface is programmed	Check which interface is programmed into the validator by double clicking the configuration button. The displayed code indicates which interface is programmed as described in Appendix D – Configuration Cards)
	Reader module is not fully inserted	Ensure that the validator reader module is fully clipped in to the validator housing.
Notes accepted but no credit given	Incorrect interface is programmed	Check which interface is programmed into the validator by double clicking the configuration button. The displayed code indicates which interface is programmed as described in document number GA713.
	Power supply outside specification	Ensure correct supply and sufficient current. Also check for necessary clearance for note ejection after acceptance.
	Rear note detect sensor obscured	Ensure no foreign objects are obstructing the sensors.
Acceptor runs slowly or intermittently	Foreign objects in the bill path	Clean the bill path
	Incorrect voltage level of supply	Ensure correct supply and sufficient current
	Damage in the unit	Replace necessary components
Bezel LED's are flashing	See chapter 4.1 for details of LED status signals	
Motor continues to run	Foreign object or note is stuck in the note path	Ensure the note path is clear and reset the validator. It may also be necessary to reset the host machine.



8 SUPPORT

The following support tools are available for use with the NV10 USB Bank Note Validator:

- Configuration Cards.
- ITL Bank Note Validator Currency Manager Software.
- Validator Programming System (DA3)
- Downloads from the website: www.aus.at
- E-mail Support via support@aus.at

Configuration Cards

For full details of the use and function of the Configuration Cards please see Appendix D

- Configuration Cards.

ITL Bank Note Validator Currency Manager

Notes:

- The Validator must be set to Programming Mode (SSP) when connected to a computer or DA3 and then returned to the original Settings when complete (See Chapter 4.2.3).
- ITL BNV Currency Manager 3.2.0 or Higher must be used to access the NV10 USB functions.
- Datasets can only be downloaded to a NV10 USB with the correct bezel width for the currency. For example a USD dataset can only be downloaded to a 66 mm NV10 USB. A Euro dataset can only be downloaded to a 72 mm NV10 USB.

The ITL BNV Currency Manager software offers the following functions:

- Program the Validator by downloading pre-prepared currency data via the DA1 or DA2 kit.
- Check the firmware version and currency set already loaded on a NV10 USB unit.
- Adjust the channel and pulse configuration on a pre-programmed NV10 USB to your own requirements.
- Download a new version of firmware onto the NV10 USB.
- Use diagnostic functions to check Validators operation.

The software will run on an IBM compatible Personal Computer with Pentium™ processor or equivalent (see the General Description chapter for operating system requirements).

The NV10 USB can be connected directly via the USB port, or with either a DA1 kit fitted to the serial port or DA2 kit fitted to the USB port. (See Appendix F – Interface Tools DA1 – DA2)

Validator Programming System (DA3)

The DA3 is a programming system designed to enable the programming of ITL Bank Note Validators in the field without the use of a PC.

Once the DA3 has been programmed the user can:

- Reprogram the validator to accept a different currency using the BNV Override Download function.
- Test the functionality of the validator away from the Host machine.

For full DA3 operation and functionality details please refer to the DA3 User Manual (Document number GA339)

Note: When using the DA3 BNV Match Download function, any pulses and channel allocations programmed into the NV10 USB will not be retained. The user must ensure that the required dataset options are set and saved before programming the DA3.

When programming a NV10 USB using the DA3 BNV Override Download function, the firmware interface will not be changed. If a different interface is required, the user must use a configuration card to select the required interface.

Internet Website Support

The Innovative Technology Ltd website provides the means to download new and updated currency sets and new versions of firmware for the NV10 USB. You can obtain these along with technical bulletins by visiting www.aus.at

E-mail Support

If the data you require is not available over the Internet supports an e-mail system to help customers with unusual requirements. The address is: support@aus.at

APPENDIX A – HOW TO ORDER A NV10 USB VALIDATOR

To order a validator, please print and fill the order form, presented in the next page, and send it to our nearest office. You may send it by fax or email. To find our contact information, please go to our website or refer to the introduction chapter in this document. If you do not know which office to send the order form, just send it to our main head quarter:

A.u.S.Spielgeräte GmbH	Scheydgasse 48 – 1210 Wien - Austria Tel: +43 (0)1 2176600 Fax: +43 (0)1 271 66 00 E-mail: info@aus.at Web site: www.aus.at
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If you have any questions about the information required for the order form, please see chapter 3 General Description. If you still have any questions, or you want to know more about other products and possibilities, do not hesitate to contact your nearest dealer. We offer a wide range of products and accessories such as alternative validators, programming kits, interfaces, connecting cables, bezels and other elements. Please contact your nearest office for more information.

NV10 USB	Date:
-----------------	-------

Customer Details

Company	Phone Number:
Contact Person	Country:
Issue No.	Customer Part No:

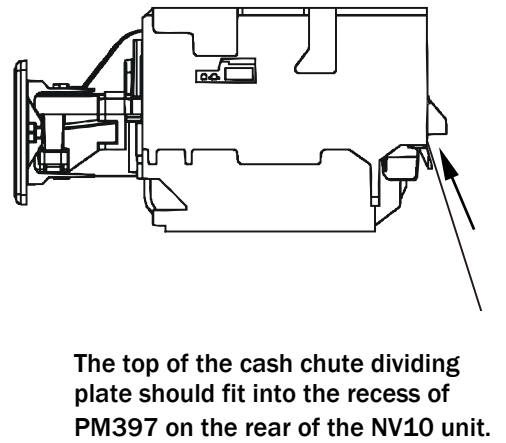
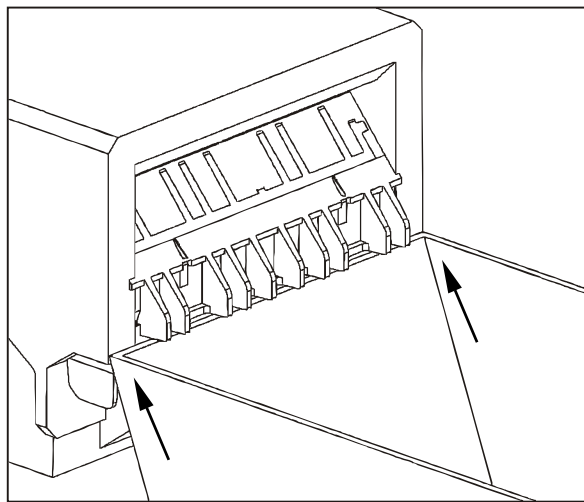
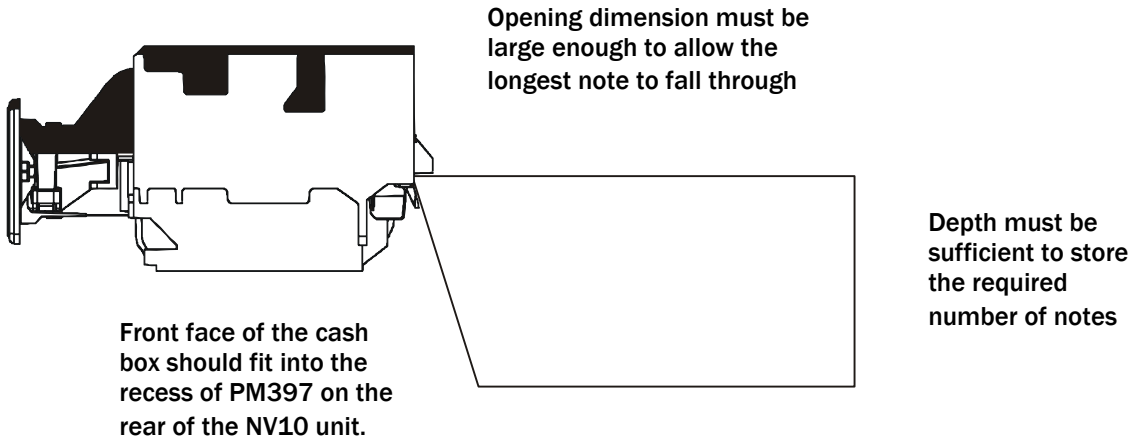
	NV10 USB		
Product			
Dataset			
Firmware Version			
Firmware Interface			
ccTalk Encryption Key			

APPROVED

Customer:	
-----------	--



APPENDIX C - CASH BOX ADVICE



APPENDIX D – CONFIGURATION CARDS

The following pages contain the information corresponding to the document number GA713. To print the cards, ensure that the page scaling is set to 'none'. Always ensure that the card has printed with the correct dimensions before use.

BV CONFIGURATION OPTION PROGRAMMING

Instructions for use

1) Select correct width card for bezel. Cut card around outline – check measurements as printed. Check print options 'Page scaling' is set to 'none' when printing a pdf file to ensure correct size.

2) Fill in sections as required. Take care to fill in the selections correctly, keep inside the lines and fill boxes fully as example below.



3) Power up NV10 USB and allow it to reset.

4) Click 'function' button on BV to access Configuration Mode, BV bezel LEDs should be flashing at 1 second intervals.

5) Enter card into BV in direction indicated by arrows.

6) Card will be returned and if configuration was good the bezel LEDs will flash rapidly while programming takes place. take care to ensure the power is not removed at this stage, the bv may suffer permanent damage!! The BV will then reset.

7) If an error occurs 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. (see table below)

8) important check that the configuration requested has been set in the NV10 USB before use.

Flash	Error
2	Invalid card read – card entered wrong way round, card mis-read or card wrong version
3	No interface selection was detected on card
4	Multiple interface selections detected
5	Invalid interface selected – the selected interface is not available for this NV
6	Selected interface not compatible with NV version
7	Pulse configuration error. Selected pulse options invalid.
8	ccTalk configuration error. Selected cctalk options invalid (ccTalk 8 bit chk not allowed without ccTalk Plain)
9	Low power mode not available on this NV version



Program check procedure

To check settings on a programmed unit:

1. Power on unit
2. Click program set button on unit twice (like double click on mouse)
3. Monitor bezel led and check flash codes

	Flash count	Pulse high	Pulse low	Pulse per dollar	High speed	Disabled	ccTalk plain	Low power	Binary	Credit hold
SSP	1									
Pulse	2	ms/10	ms/10	value						3 flash
MDB	3									
IF30	4									
IF31	5									
ccTalk	6						1 flash	2 flash		
SIO	7				1 flash	2 flash				
Parallel	8								1 flash	
spare	9									
NIS	10									
IF32	11				1 flash					
spare	12									
spare	13									
spare	14									

For example

A pulse interface with 50ms high, 100ms low, 2 pulse per dollar will flash 2,5,10,2

A SSP interface will only ever flash once

A ccTalk interface with 16 bit checksum, no encryption will flash 6,1

A ccTalk interface with 8 bit checksum, no encryption will flash 6,1,2

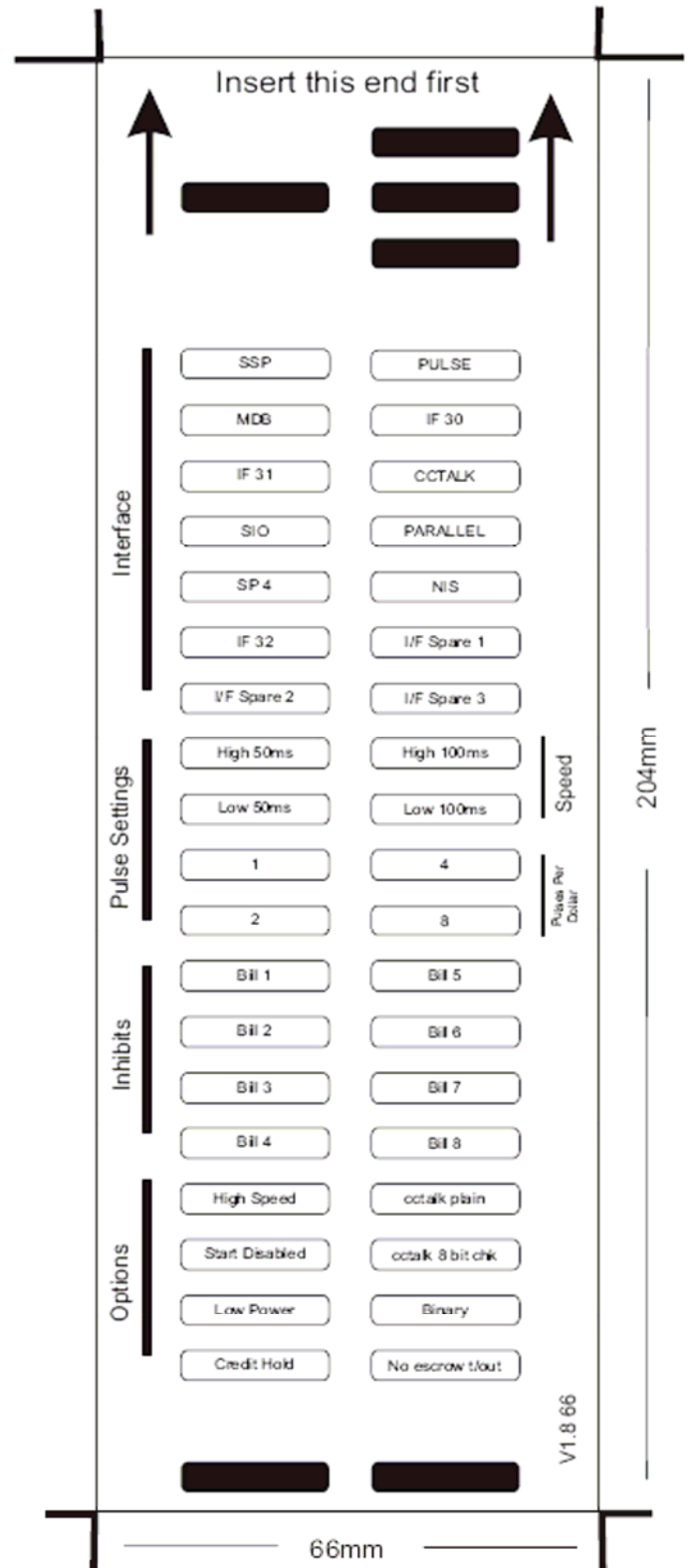
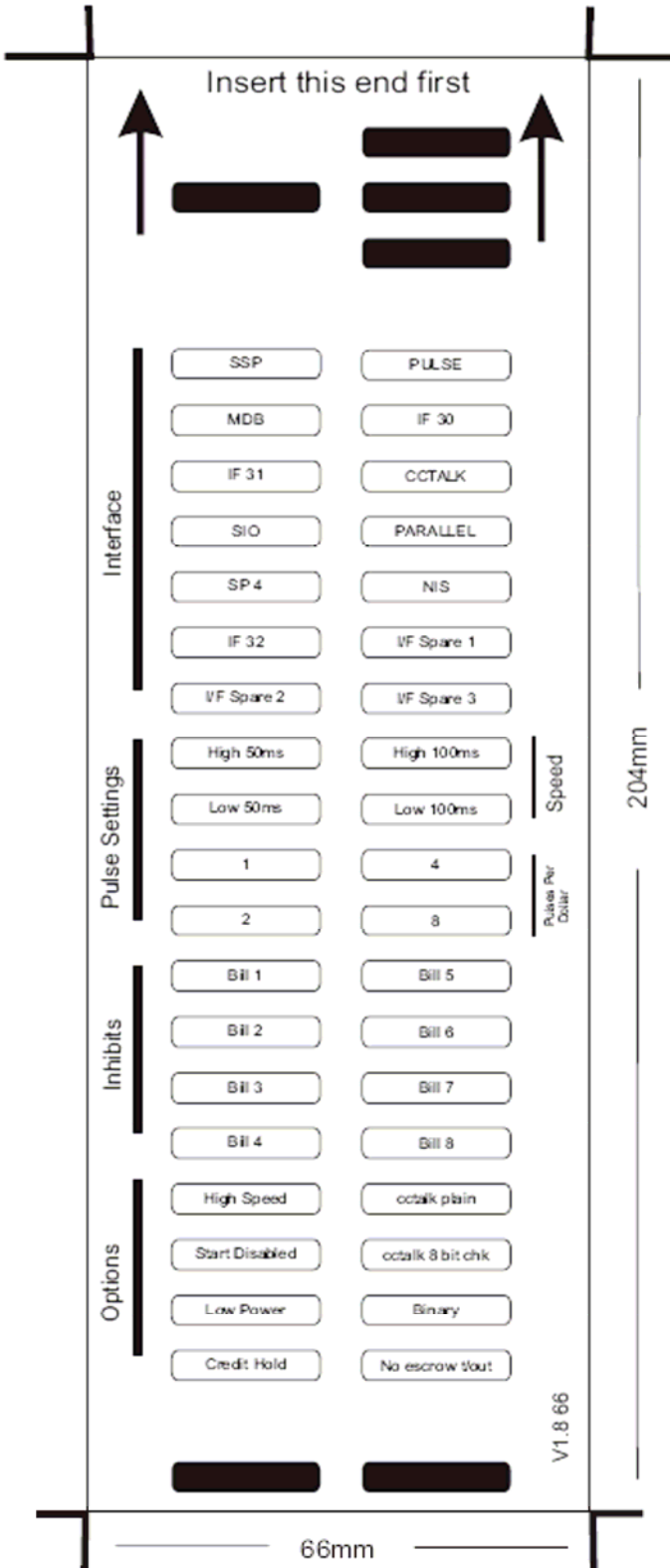
A Binary interface will flash 8,1



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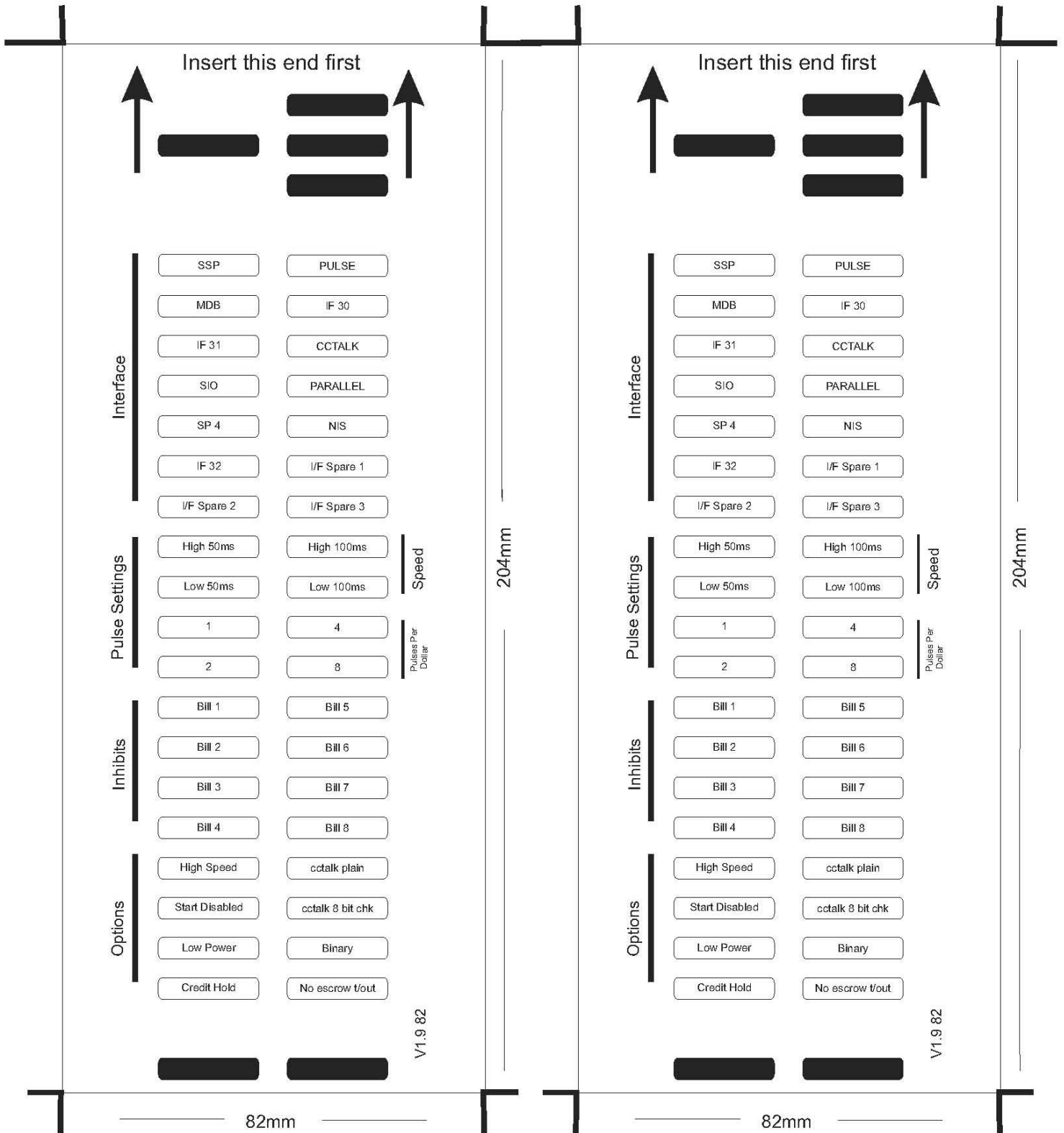
66mm Bezel



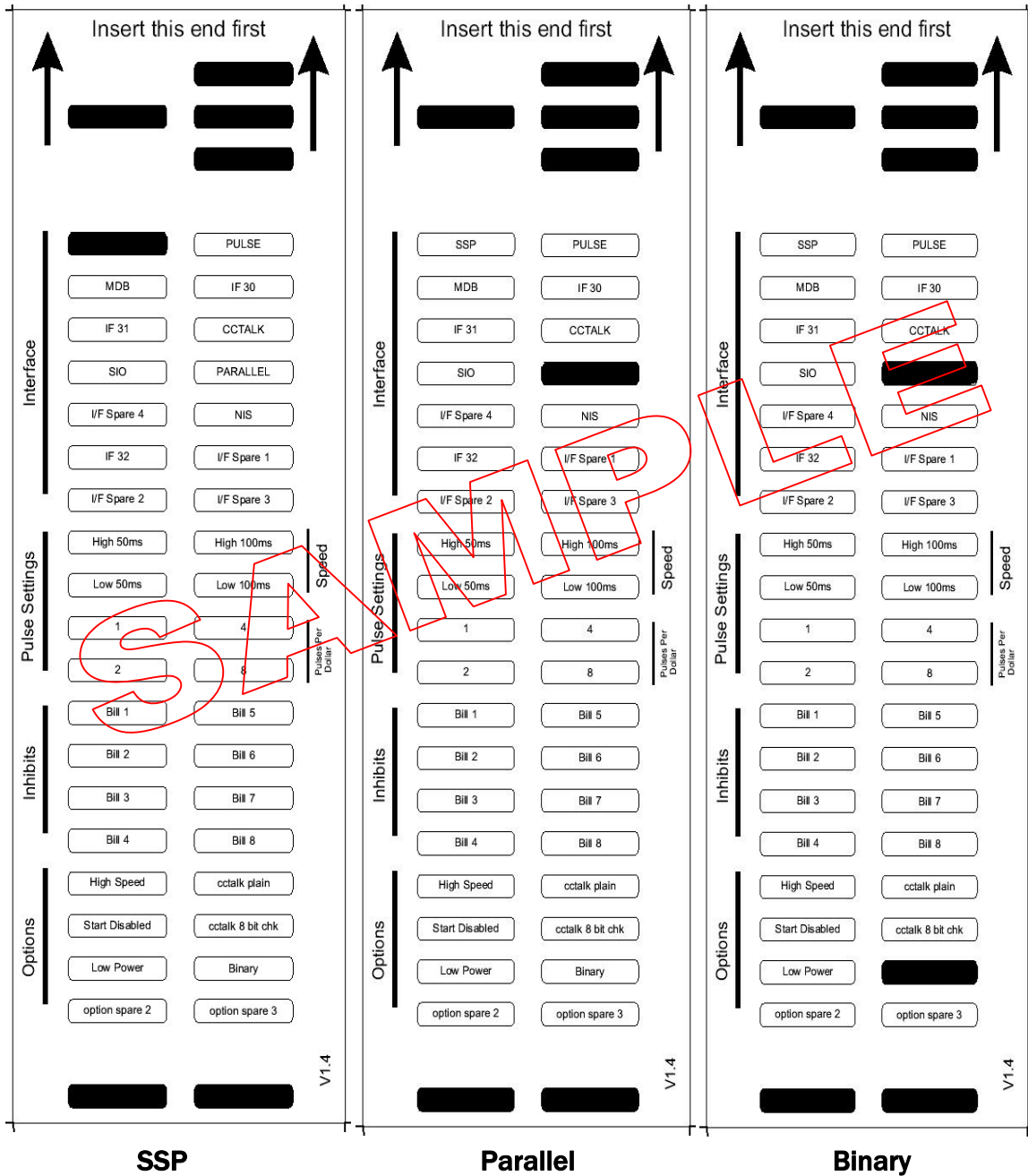
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82mm Bezel



Below are some typical examples of completed Configuration Cards.
 Note: These Configuration Cards are samples and should not be copied for programming use.
 Please see document GA713 for useable cards.



Note: These Configuration Cards are samples and should not be copied for programming use. Please see document GA713 for useable cards.

Insert this end first

Section	Option 1	Option 2
Interface	SSP	PULSE
	MDB	IF 30
	IF 31	[Black]
	SIO	PARALLEL
	I/F Spare 4	NIS
	IF 32	I/F Spare 1
	I/F Spare 2	I/F Spare 3
Pulse Settings	High 50ms	High 100ms
	Low 50ms	Low 100ms
	1	4
	2	8
Inhibits	Bill 1	Bill 5
	Bill 2	Bill 6
	Bill 3	Bill 7
	Bill 4	Bill 8
	High Speed	cctalk plain
	Start Disabled	cctalk 8 bit chk
	Low Power	Binary
	option spare 2	option spare 3

V1.4

Encrypted ccTalk

**Unencrypted ccTalk
with 16-bit Checksum**

**Pulse - Pulse width
50/100 mS
4 Pulses per Dollar**



Note: These Configuration Cards are samples and should not be copied for programming use. Please see document GA713 for useable cards.

Insert this end first

Interface

Pulse Settings

Inhibits

Options

V1.4

SIO 300-Baud

Insert this end first

Interface

Pulse Settings

Inhibits

Options

V1.4

SIO 300-Baud Starts Disabled

Insert this end first

Interface

Pulse Settings

Inhibits

Options

V1.4

SIO 9600-Baud

Insert this end first

Interface

Pulse Settings

Inhibits

Options

V1.4

SIO 9600-Baud Starts Disabled



9.5 APPENDIX E – ESCROW CONTROL

The NV10 USB has a single note escrow facility (pin 10) used in Parallel and Binary modes. This allows the Validator to hold onto the note once accepted, and then only stack the note into a cash box when the host machine confirms that the Vend operation has been completed. If no confirmation of the Vend is received then the note will be returned to the customer after 30 seconds, (see Figure 11).

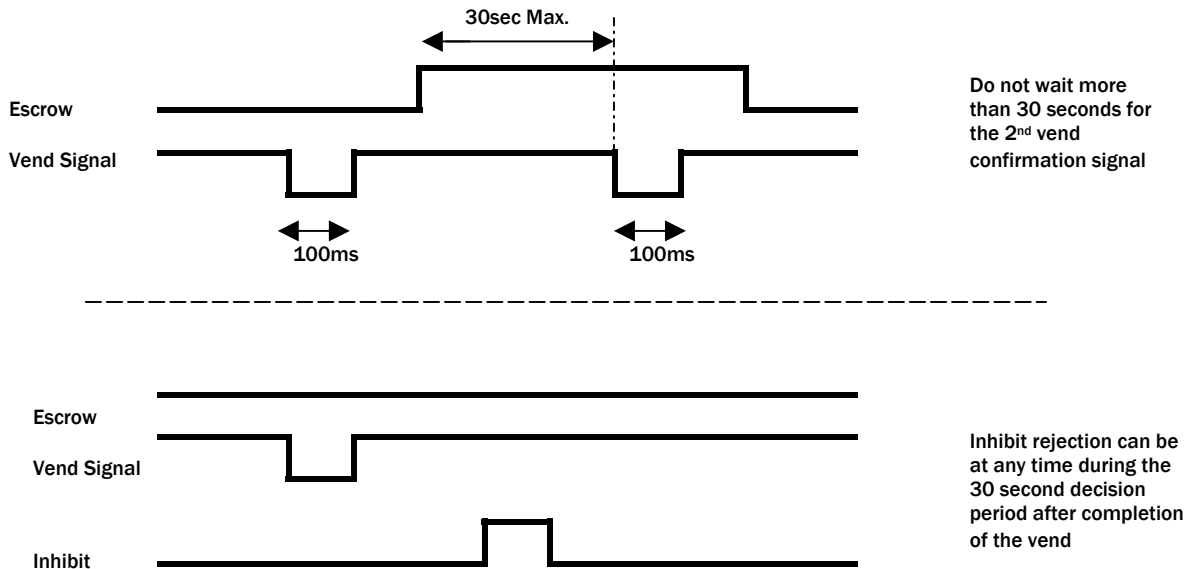


Figure 10 - Escrow Timing Diagram for Parallel Vends

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 held low awaiting note insertion.
- Note inserted. Validator issues a 100 ms pulse on the appropriate channel.
- The host machine initiates 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 in expectation of the next vend.

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 the inhibits high will cause a note reject.

In the event of a note being forcibly removed from the mouth of the NV10 USB during the 30 second interval, the NV10 USB will go out of service for 45 seconds.



9.6 APPENDIX F – INTERFACE TOOLS DA1 – DA2

The DA1/2 Kits are designed for the following:

- Connecting of ITL Note Validators to a PC for the upgrade and user option setting of Currency and Firmware files.
- Testing note acceptance of Note Validators independent of the host machine to confirm that the validator is working. The DA1 and DA2 Kits comprise the following components:

DA1	DA2
DA1 adapter board	DA2 adapter board
DA1 to NV7-NV10 and BV cable	USB type A to Type B cable
DA1 to NV4 cable	DA2 to NV7-10 and BV cable
Power cable	Power cable
ITL support CD-ROM	ITL support CD-ROM

Table 10 – DA1 and DA2

Connecting a DA1 to a validator and PC

For the PC system specification and set up refer to chapter 3.

Connect the DA1 to the validator as shown below (see Figure 12), using the 16-way to 5-way connector. The supplied 3.5 mm jack plug and 2 banana plugs are used to supply power to the DA1 when using a variable Bench power supply (Connect the +12 volts to the red banana plug and GND (0 V) to the black plug). Alternatively a Portable DC Power Adapter supplying 12 V and 1.5 A minimum can be used.

Plug the 9-way D-type connector into the serial port of the PC and note of the number of the port, as this will be needed later for configuring the software. Once the connections have been made install the appropriate software for the validator you are using.

NOTE: The Validator must be in Programming mode when connected to a computer and then returned to the Original Settings when the download is complete.

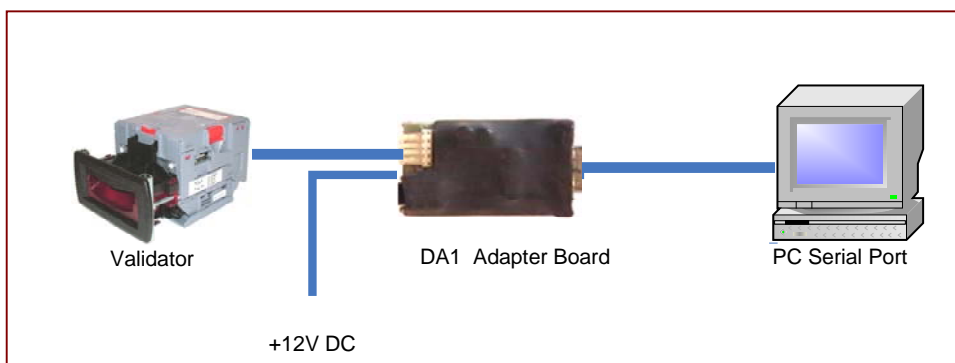


Figure 11 - Connecting DA1 to NV10 USB and PC for upgrading Validator programs

Connecting a DA2 to a validator and PC

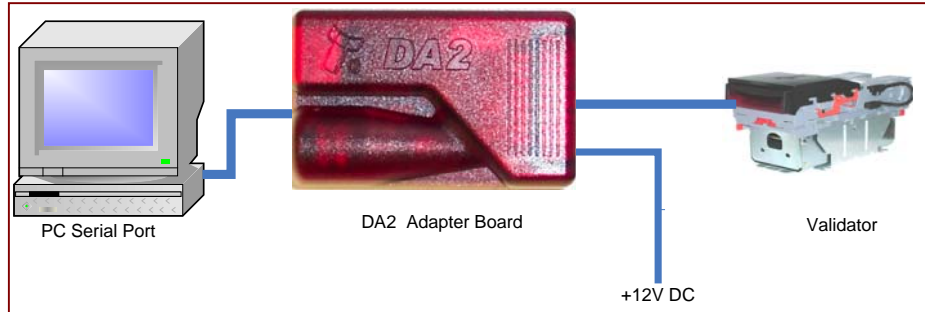
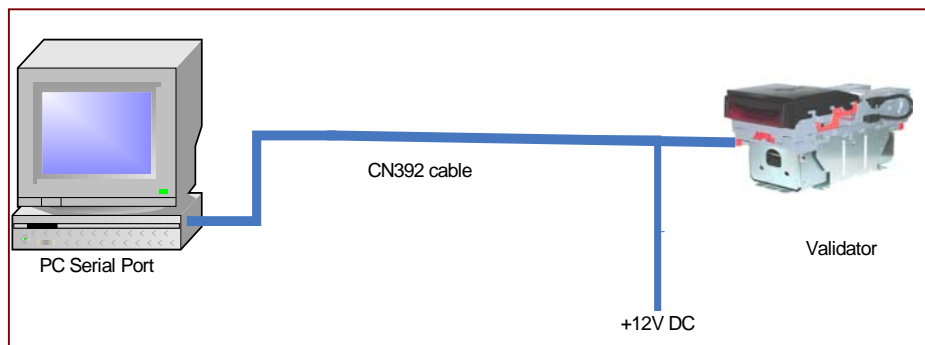


Figure 12 - Connecting DA2 to a NV10 USB and PC for upgrading Validator Programs

Connecting Host to validator using USB



Software Installation

DA1 - To install the ITL BNV Download Manager Software insert the CDROM into the correct PC drive. The CD should automatically run and an installation menu will appear. Double click the ITL BNV Download Manager and follow the on-screen instructions. You can also install the Currency files, Firmware files and the Technical Manuals for each specific product as well as other generic documentation.

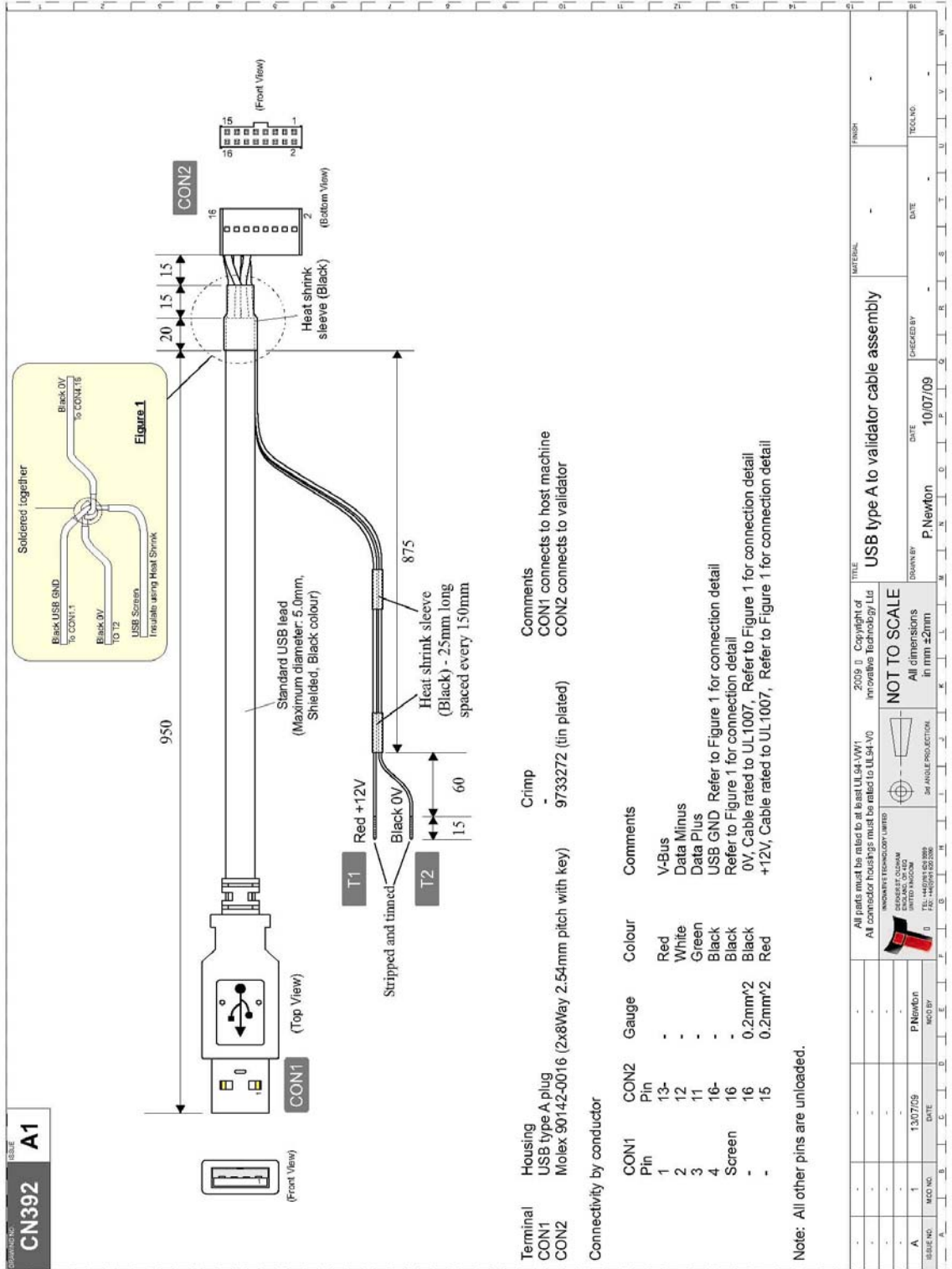
The Quick Start Guide for the DA1 is Document number GA151.

DA2 - To install the ITL BNV Download Manager Software insert the CDROM into the correct PC drive. The CD should automatically run and an installation menu will appear. Double click DA2 installation guide (GA338) and follow the instructions relating to your specific Operating System. Note: All files contained on the CD are available from our Website: www.aus.at

USB - To install the ITL BNV Download Manager Software insert the CDROM into the correct PC drive. The CD should automatically run and an installation menu will appear. Double click USB Installation guide and follow the instructions relating to your specific Operating System. Note: All files contained on the CD are available from our Website: www.aus.at

Please contact support@aus.at if you require further assistance.

9.7 APPENDIX G - USB TO VALIDATOR CABLE ASSEMBLY



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