

®

NV4(/5) Bank Note Validator

The Next Generation Smiley® Bank Note Validator

Operations Manual

Introduction

This manual describes the operation of the NV4 Bank note Validator as fitted with Firmware Version 2.62.

It also describes the functionality of the new NV5 validator fitted with Firmware Version 3.02.

Please note that the NV4 Validator is pin for pin compatible with the NV2/3 Smiley® Validator at first glance. However it requires a higher peak operating current than the NV2/3.

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 for assistance. In this way we may continue to improve our product.

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Scope of Document

This document is intended for those whose will:

- a) Design the Validator into items of equipment.
- b) Build equipment using the Validator.
- c) Install equipment containing the Validator.
- d) Maintain equipment containing the Validator.

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 is returned to an approved service centre for repair.

CAUTION:

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 unit is re-taught pay particular attention to the instructions. Good teaching is essential to ensure satisfactory operation.

If the tops and bottoms of NV4 Validators are swapped the unit must be re-calibrated. In the unlikely event of a problem it is better to have the complete unit checked.

Innovative Technology Ltd has a policy of continual product improvement. As a result the products supplied may vary from the specification described here. If in doubt please contact Innovative Technology for details of any changes. Alternatively visit our web site at

NV4 Compared with the NV2/3 (Smiley®)

NV4 (☒ = new feature)	NV2 (Smiley®)
<p>☒ Normally five channels, expandable to 15 channels using binary outputs and up to sixteen channels using serial I/O</p> <p>☒ Total 63 faces, unrestricted use per channel Three user configurable security levels - each channel can have a separate level Manual Inhibit to disable notes ☒ Broad Band Optical Note reading - greater fraud discrimination + higher acceptance ☒ Total width note scanning - both sides</p> <p>Channel 5 reserved for teaching known frauds to be rejected.</p> <p>Note can be inserted using one hand only with patented “Smiley®” mouth ☒ Bezel is held securely to fascia by 4 screws and steel retaining plates. NV4 body is easily clipped and unclipped to bezel. ☒ Alternative Universal bezel allows NV4 to be fitted in a variety of different ways.</p> <p>☒ Note Exit flat for more stacking / note handling options.</p> <p>☒ Both horizontal and vertical stacker options are available from Innovative Technology Ltd.</p> <p>☒ Optical Anti Strimming - detailed view - available as an integral option on NV4 ☒ Patented Mechanical Anti Strimmer Included</p> <p>Four Parallel Outputs Pulse Stream Output (max. 250 pulses) - pulses and pulse period user programmable,</p> <p>☒ Binary Pattern Output ☒ RS232 TTL 300 Baud Input & Output, full control and status ☒ RS232 300 Baud Input & Output, full control and status ☒ New Smiley® Secure Protocol option for RS232 communications Four Parallel Inhibits Single note escrow Teach and Run (Lockable)</p>	<p>five channels, four to accept, one to reject</p> <p>Total 44 faces, split 10 faces per channel Three user configurable security levels- each channel can have a separate level Manual Inhibit to disable notes Narrow Band LED Note Reading</p> <p>Total width note scanning - top side, track reading bottom side</p> <p>Channel 5 reserved for teaching known frauds to be rejected.</p> <p>Note can be inserted using one hand only with patented “Smiley®” mouth NV2 is clipped into fascia</p> <p>Note Exit curved</p> <p>Only horizontal stacker available</p> <p>Optical Anti Strimming - broad view</p> <p>Separate Anti Strimmer</p> <p>Four Parallel Outputs Pulse Stream Output (max. 250 pulses) - pulses user programmable. NOTE must be factory enabled</p> <p>RS232 TTL 300 Baud Output Only</p> <p>Four Parallel Inhibits Single note escrow Teach and Run (Lockable)</p>

General Description

NV4 Validator - the next generation of Smiley® Bank Note validators

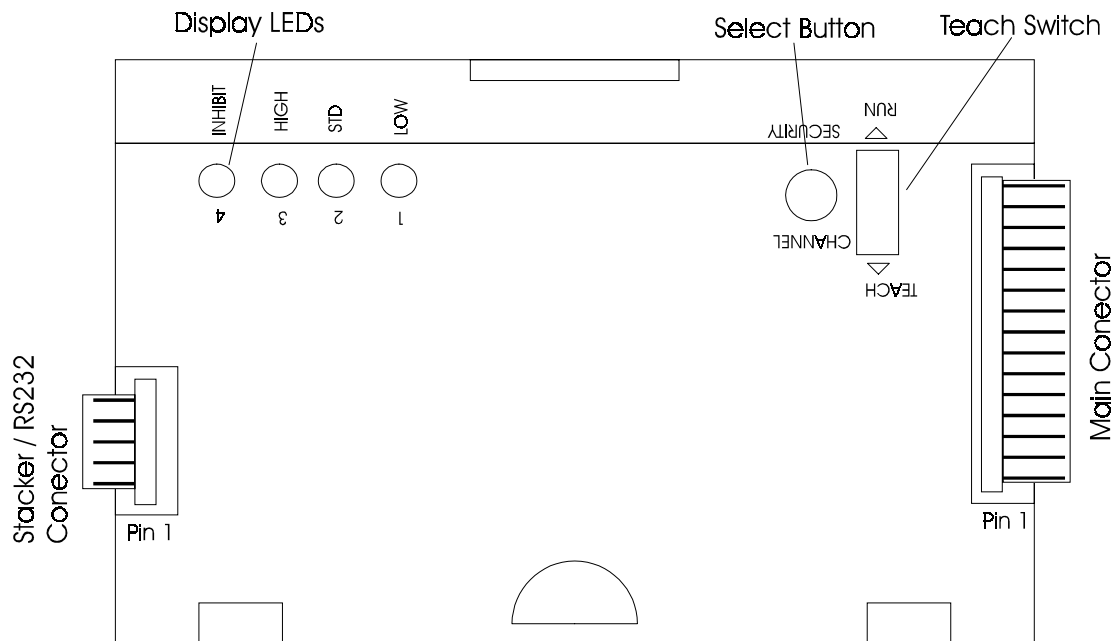


Figure 1 - Top View of NV4 Validator

The NV4 Bank Note Validator is a compact currency tester, suitable for most money machines. It will accept up to four different denominations of notes in the basic output mode, inserted in any orientation with most currencies, and will cope with different designs of banknote having the same value such as are found in the United Kingdom or Spain. It may also be re-configured to offer up to 15 different denominations so that multi currency validation may be done. Please note that this feature is only available using the pulse stream output, the RS232 serial interface or the binary output feature.

The NV4 Validator leaves the factory containing at least one currency data set so that it is ready for immediate installation. If it is desired to change the currency data set this may be done using either the NV4 to NV4 currency copy system or the PC based Currency Management software. The unit may also be programmed using the built in teach facility, without requiring any additional equipment, to cope with new issues of notes or different currencies. New currencies and applications are being tested all the time, so 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 Validator is of small size and has been designed for easy installation in most machines. The unique “smiling mouth” allows insertion of notes with one hand and simplifies the note handling mechanism. The NV4 however has a flat note exit permitting more note handling options

Interfacing the Validator is very simple, with the choice of parallel open collector outputs, pulse stream output, binary output or a 300bps serial input and output.

The principle of operation is that when a note is presented to the Validator the front optical sensors activates the motor and electronics. As the note is drawn through the Validator it is measured and examined with a broad range of wavelengths of light along its length. The lens assembly enables the Validator to examine the whole of the width of the note on both top and bottom faces, while at the same time making the validation process insensitive to marks commonly found on many banknotes in circulation.

The characteristics of the note are then analysed to see if they fall within the characteristics of any of the notes that the Validator has been taught to recognise, and if so, the note is accepted and the vend signal sent on the appropriate channel. Several techniques are implemented to detect forged notes and prevent the retrieval of notes already accepted. If any irregularities are encountered during the validation process, the note is immediately returned. In the unlikely event that a counterfeit note is found that the Validator will accept, then it may be taught to recognise that note and reject it in future using the channel 5 feature.

General Description

If the validation process matches the note to the data stored in its memory it will be passed through the Validator and into the host machine. The anti-strimming device consists of a mechanical roller that creates the “one way door” mechanical security. The note is reversed back over the top of the roller and out of the validator, following a path along which it is impossible to pull the note back using tape or wire.

Microprocessor technology is used to ensure high acceptance rates for genuine notes, and high sensitivity to forgeries. The unit is also designed so that there are no analogue controls, ensuring a long and stable operating life with no routine maintenance required.

NV5

This product has a simplified interface to the validator where no manual teaching of notes is possible and the rear anti trim roller operation is switchable. The units are supplied as standard with a short anti return-guard.

On receipt from the factory the anti return roller will be switched off.

Caution: *The rear roller is integral in the security of the validator against "fishing" type frauds and therefore this NV5 option should only be used in benign environments.*

The NV5 Firmware uses the prefix 3 to signify NV5 operation.

NV5 Functionality.

Anti return roller operation select & initialisation:

At power up if the select button is held down and the slide switch is in teach, the NV5 will enter Anti-trim roller function. The state of the roller may be toggled by clicking the select switch. To leave this mode slide teach switch to run. If the select switch is pushed during the time-out period, the NV5 calibrate flag is reset and when the NV5 starts up the panel bulb will flash indicating that the unit is ready to initialise.

Erasing of Faces:

In this version of NV5, the teaching and erasing of note faces within the validator are disabled.

Cloning:

It is possible to clone Issue 1 and 2 NV4's to become NV5's but it is not possible to reverse the operation.

Apart from the differences mentioned above the NV4 and NV5 functionality is the same. Therefore the rest of this manual applies to both products except where stated.

Display Information

The four red LED's on the top of the unit are used to provide a variety of status signals:

Firmware revision code

From software revision 2.50 onwards, when the validator is first switched on, the LED's are used to signal the 3 digit firmware revision number in sequence using a binary coding. A zero is shown by all 4 LED's lighting up. Each digit is shown in turn for about 0.5 sec. E.g. for version 2.51 the sequence is:

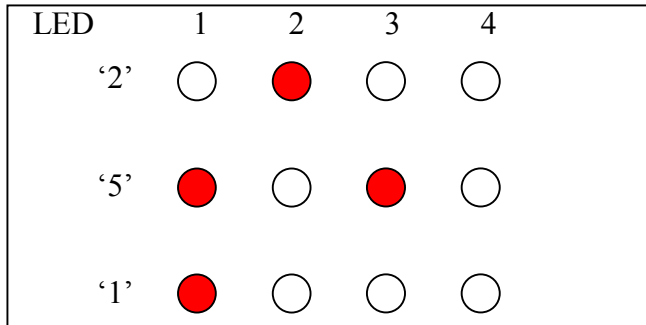


Figure 2 - LED's indicate firmware revision

a full list of number codes is shown in figure 4b

Heartbeat

In normal RUN operation, when the validator is ready to read a note, LED's 2 and 3 flash alternately ("Heartbeat") to signal a "healthy" status. see fig 3a. If the option to permanently add a stacker is set then if the stacker is removed, the LED's 1 & 4 flash alternately. see fig 3b.

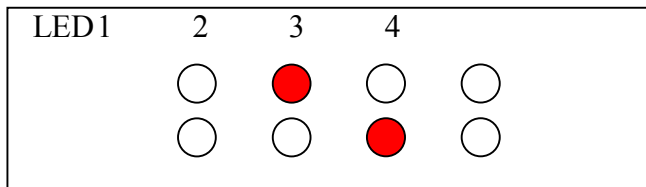


Figure 3a - LED's indicate healthy status

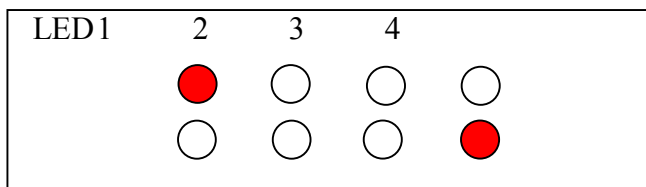


Figure 4b - LED's indicate stacker removed

Other combinations relate to specific functions and are described in later sections. If the validator is started with the Teach/Run switch set to TEACH, then after the revision number display it will go directly into teach mode - see later section.

Validation / reject codes (as from firmware version 2.6.2)

When a note is accepted, while the unit is in parallel or pulse mode, a code is presented on the LED's representing the channel in which it was accepted. If the "enable reject code" option is set then, during note validation the heartbeat will be suspended and should the note be rejected then a code is flashed twice representing the reason for rejection, prior to the heartbeat returning.

The codes flashed are as follows in fig 4a

Fig 4a – Reject codes

LED DISPLAY 4 3 2 1	Reject Cause
○ ○ ○ ●	Note rejected due to validation check 1
○ ○ ● ○	Note rejected due to validation check 2
○ ○ ● ●	Note rejected due to validation check 3
○ ● ○ ○	Note rejected due to validation check 4
○ ● ○ ●	Note rejected due to validation check 5
○ ● ● ○	Note inhibited by host machine
○ ● ● ●	Reserved 1
● ○ ○ ○	Rear Roller / Rear Flag Error
● ○ ○ ●	Note validated on more than 1 Channel
● ○ ● ○	Front Sensor detect
● ○ ● ●	Reserved 2
● ● ○ ○	Reserved 3
● ● ○ ●	Slow / Stalled Running
● ● ● ○	Reserved 4
● ● ● ●	Note validated as known fraud

Figure 5b – LED display indication for firmware version numbers

Number	LED DISPLAY			
	1	2	3	4
0	●	●	●	●
1	●	○	○	○
2	○	●	○	○
3	●	●	○	○
4	○	○	●	○
5	●	○	●	○
6	○	●	●	○
7	●	●	●	○
8	○	○	○	●
9	●	○	○	●
10	○	●	○	●
11	●	●	○	●
12	○	○	●	●
13	●	○	●	●
14	○	●	●	●

Environment and Power Requirements

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

Electrical Supply	Minimum	Maximum	
Supply Voltage (V dc) Absolute Limits	11V	15V	
MDB Supply Voltage	18V	42V	
NOTE: If input voltage falls below 10.5v the NV4 will shut down automatically			
Supply Ripple Voltage	0	0.25V @100Hz	
VCOM (Host logic high)	5V	30V	
Supply Currents			With Stacker HS1 or VS1
Standby		350mA	450mA
Validating		450mA	900mA
Peak (Motor start or stall)		1000mA	1800mA

Interfaces: Hardware Description

Interface Logic levels	Logic Low	Logic High
Inputs	0V < Low < 0.9V	+3.7V < High < (+VCOM+0.5V)
Outputs with 10KΩ pull up	0.4V	pull up voltage of host interface
Maximum Current Sink	50mA per output	

Note that the output low signal depends on the impedance of the pull up resistor on the host interface.

All outputs are open collector transistors.

All Inputs are held high to +VCOM via 10KΩ. The input structure is a CMOS gate with anti static protection fitted. Please ensure your signal LOW levels comply with the 74HC CMOS series specification for reliable operation.

15 Pin Connector

Pin	Name:	Description:
1	Vend 1 (binary bit 1)	Note accepted on Channel 1, Also the Pulse Stream output Also the serial output pin in Serial Mode Also the pulse stream output in Pulse Stream Mode
2	Vend 2 (binary bit 2)	Note accepted on Channel 2 pulse output
3	Vend 3 (binary bit 4)	Note accepted on Channel 3 pulse output
4	Vend 4 (binary bit 8)	Note accepted on Channel 4 pulse output
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 RS232 serial mode
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	Escrow	Operate Escrow function by holding LOW, refer to Escrow section for full details
10	Alarm	Problem indication Output
11	Supply Voltage	+11v to +15v DC
12	0V Supply	
13	+VCOM	Must be connected to the <u>host machine interface supply voltage</u> . See <u>Circuit Outlines</u>
14	Parallel /Serial Select	Hold this pin HIGH for Parallel Pulse output. Connect this pin LOW for Serial Outputs.
15	Factory Test Pin	FACTORY USE ONLY - DO NOT CONNECT

5 Pin Connector. For stacker use only. DO NOT power the NV4 validator through the 5 way connector

Pin	Name:	Description:
1	Supply Voltage	+11v to +15v DC
2	0V Supply	
3	Stacker Control	Used to control the stacker
4	Stacker Status RS232 Rx	When stacker is connected, monitors the stacker status. If no stacker is fitted, acts as the serial Input pin in RS232 serial mode
5	RS232 Tx	If no stacker is fitted, acts as the serial Output pin in RS232 serial mode

Connector Details:

15 Pin 0.1" pitch header, Molex 22-01-2155 (RS Components equivalent 479 - 175)

5 Pin 0.1" pitch header, Molex 22-01-2055 (RS Components equivalent 467 - 627)

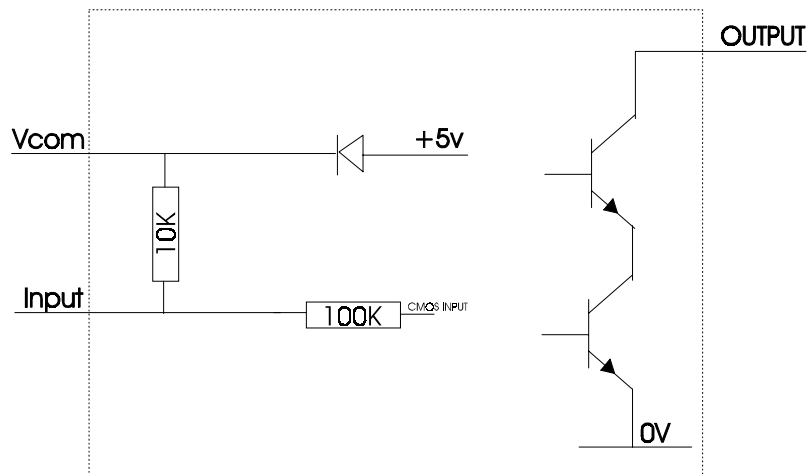


Figure 6 - Input / Output circuits

Interfaces: Protocols

1: parallel input and output:

To use parallel outputs pin 14 must be held high or left unconnected.

Vend Signals (Pins 1 to 4). The four channels have their own individual outputs. If a note is recognised then the relevant channel line is pulled low for 100 ± 3 milliseconds. It is recommended that pulses outside these limits are rejected as a precaution against false triggering due to noise.

Alarm Output: (Pin 10). This is a general purpose, problem indication line. If a problem occurs then this signal will go low for 100 milliseconds. The alarm signal will operate whenever one of the following conditions occurs:-

- 1) If the rear flag is raised when a note is not present.
- 2) If a note is being returned to the customer and somehow the note has become longer - i.e. strimming is being attempted.
- 3) If the Stacker is full or a note is jammed in the Validator.

Escrow Control:

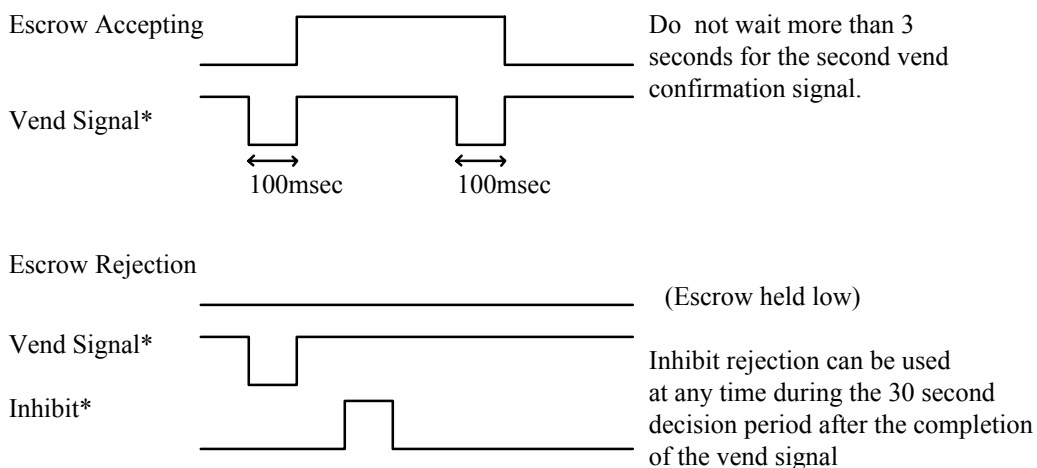
The NV4 has a single note escrow facility. This allows the Validator to hold onto the note once accepted, and then only pass the note out of the back of the Validator when the host machine confirms that the Vend operation has been completed. If no confirmation of the Vend is received then the note will be returned to the customer after 30 seconds. If the host machine itself aborts the transaction by raising the corresponding inhibit input high, the note is returned immediately. The sequence of operations is as follows:

1. Pin 9 held low awaiting note insertion.
2. Note inserted. Validator issues a 100ms pulse on the appropriate channel.
3. The host machine initiates vend process.
4. The host machine raises pin 9 high to indicate that it wants the note. If this is not done within 30 seconds the Validator will return the note.
5. The Validator issues a 100ms pulse on the appropriate channel within 3 seconds of pin 9 going high to indicate final acceptance of the note. (If the signal has not been received within 3 seconds it indicates the customer has forcibly retrieved the note and the vend should be aborted.)
6. The vend process is completed.
7. The host machine makes pin 9 low in expectation of the next vend.

The host can force the return of the note to the customer by raising the inhibit line high, at any time before the end of the 30 second time-out.

Please note that the inhibits will not work correctly unless +VCOM is connected to the host machine interface logic high supply voltage.

Escrow Timing Diagram for Parallel Vends:-



Inhibit Operation

Each channel (1 to 4) has its 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 NV4 will not read in any notes. In this mode, if a note is inserted the motor will run in reverse preventing the insertion of a note. All four inhibits may be connected together to create a 'global' inhibit. In this way the NV4 may be brought in and out of operation by the host machine.

It is also possible to inhibit channels directly on the Validator by selecting security level 4. This inhibit cannot be overridden by the host. See the section on Teaching / Security for an explanation of this inhibit facility.

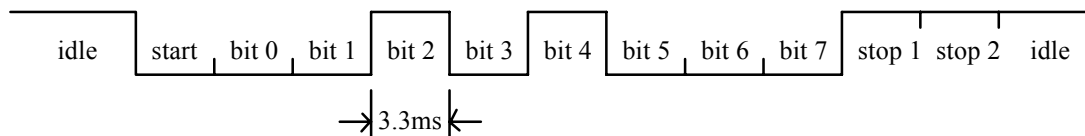
2: RS232TTL Input and Output

Existing Smiley® NV2 users may already be using the serial output facility in conjunction with the parallel inputs. This system is supported by the NV4 Validator and now has some further characters. However the NV4 now also supports serial input control as well. The NV4 also offers true RS232 input and output via the five pin Stacker connector.

Please contact the factory for details of firmware and currency programming protocols.

Typical Serial Output: Transmission of the value 20 (decimal), Note not recognised

Vend 1(Pin 1)



300 baud Serial Output Only Mode. Pin 14 connected to 0V only

Data format: 1 start bit
 8 data bits
 2 stop bits.
 300 baud.

Transmitted codes:

MESSAGE	DECIMAL VALUE
Accept on C1	1
Accept on C2	2
Accept on C3	3
Accept on C4	4
Accept on C5	5
Accept on C6	6
Accept on C7	7
Accept on C8	8
Accept on C9	9
Accept on C10	10
Accept on C11	11
Accept on C12	12
Accept on C13	13
Accept on C14	14
Accept on C15	15
Accept on C16	16
Note Not Recognised	20
Mechanism running slow	30
Strimming attempted	40
Channel 5 Note Rejected (fraud channel)	50
STACKER Full or Jammed	60
Abort During Escrow	70
Note may have been taken to clear jam	80

300 baud Serial input/output Mode.

This mode can be entered by selecting serial mode (pin 14 connected to 0V) and connecting the vend 4 output to the inhibit 4 input before the power is turned on.

The Validator echoes each valid command it receives. Note that the host does not have to echo messages back to the validator. The output codes indicated in '300 baud serial output mode' are supported with the following extensions.

Transmitted codes:

MESSAGE	DECIMAL VALUE
Validator Busy	120
Validator Not Busy	121
Command Error	255

Recognised Receive Codes:

MESSAGE	DECIMAL VALUE
Inhibit C1	131
Inhibit C2	132
Inhibit C3	133
Inhibit C4	134
Inhibit C5	135
Inhibit C6	136
Inhibit C7	137
Inhibit C8	138
MESSAGE	DECIMAL VALUE
Inhibit C9	139
Inhibit C10	140

Inhibit C11	141
Inhibit C12	142
Inhibit C13	143
Inhibit C14	144
Inhibit C15	145
Inhibit C16	146
Uninhibit C1	151
Uninhibit C2	152
Uninhibit C3	153
Uninhibit C4	154
Uninhibit C5	155
Uninhibit C6	156
Uninhibit C7	157
Uninhibit C8	158
Uninhibit C9	159
Uninhibit C10	160
Uninhibit C11	161
Uninhibit C12	162
Uninhibit C13	163
Uninhibit C14	164
Uninhibit C15	165
Uninhibit 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

Interfaces: Protocols

Example protocols are shown in the tables below:

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

3: Pulse Stream Output

For retrofitting to older coin based machines, the NV4 can be set to give a stream of pulses via the vend 1 output. Firstly the pulse stream system must be toggled on using the special menu functions (see later section on Special Menu). Then the number of pulses per channel may be programmed in using the teach process. This is done as follows:

1. Slide the teach run switch up to Teach, and select the desired channel by repeatedly pressing the select button. The LED's will indicate which channel is selected. Note that if a code lock is set, then the code must be entered first before the channel can be selected. (refer to page. 28) If a code lock is set, when the NV4 is switched to Teach, LED 1 will be lit. Otherwise none of the LED's will be lit.
2. Now slide the teach/run switch down to run. As soon as the light starts flashing push the slide switch back up to teach. If the pulse stream option has been toggled ON you may now enter the desired number of pulses for this channel. The channel number will be shown in reverse i.e. all LED's lit except for the chosen channel. If the Validator is not in Pulse Mode, it will return to the normal channel select stage of step 1.
3. Press the select button for the number of pulses required on that channel. Each time it is pressed the channel light will flash indicating recognition. You may enter a maximum of 250 pulses per channel.
4. When you have pressed the number of pulses required, slide the teach/run switch back to run. The channel light will now flash on and off, to play back your pulses so that you may determine if it is as desired.
5. If a note is now inserted and accepted, the vend 1 pin will output this number of pulses. The standard pulse timing is 100 milliseconds low, 200 milliseconds high. If you wish to change this, please follow the instruction given in the special functions menu instructions.

4: Binary Output

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 NV4 can be set to give a binary pattern output on the four parallel output pins. Refer to the special menu option setting to use this feature.

If the NV4 is set to 15 channel mode it will issue the vend signals as a binary pattern on the parallel outputs for 100 milliseconds. In this way a maximum of 15 different notes can be accepted and controlled.

5: SSP - Smiley® Serial Protocol.

SSP is a secure serial interface and the preferred method of connecting the NV4 to a host machine. SSP is supported from firmware version 2.50 (older validators can be upgraded to support SSP). SSP is an expandable open protocol that can be configured in a multi drop mode to allow many devices to be connected to the same serial interface on the host. Many of the frauds and communication problems associated with conventional parallel and serial interfaces are over come in SSP.

Teaching And Security

Validators are normally supplied ready taught from the factory. This section may be skipped unless the validators need to be re-taught with a new note or currency.

The NV4 Validator may be taught new currency or notes in three ways:

1. Use the NV4 /5 Currency Manager Software, which is supplied with a range of currencies. To use this system you will require a PC running Windows 95/98™, Pentium™ 75MHz or faster with a serial port, and a 12volt dc power supply to power the validator. (© Microsoft and Intel). A list of currently supported currencies is maintained on our web site, and new releases can be downloaded from there. Further details are available from Innovative Technology Ltd.
2. NV4 / 5 Master/Slave copying - a currency set can be transmitted from one NV4 onto another or an NV5. Note it is not possible to clone an NV4 from an NV5.
3. Manual teaching using a selection of real bank notes (NV4 Only). This method is not preferred and should only be used if the other alternatives are not available to you. Please be aware that some currencies have currency specific parameters associated with them. These may not be appropriate if the NV4 is re-taught manually. If an electronic method is used any special parameters will automatically be updated to suite the currency.

NV4 - NV4 Copy:

Overview

The facility exists for using an NV4 Bank Note Validator to copy its contents to another NV4 connected to it. The 'Master' validator will upgrade the slave's firmware if necessary and copy the currency data completely.

Requirements

NV4 whose board issue number (x.00) must be the same as the slave you wish to copy to. Typically issue 1 units can only be re-programmed by another issue 1 unit. The same applies for issue 2 units. The slave firmware issue can be the same or a lower level of firmware than the Master, but if it is a higher version of firmware in the Slave, it will not accept the data from the lower level Master unit.

Master to have firmware 2.20 or greater for series 2 NV4s or 1.52 or greater for series 1 NV4s.

NV4 copy cable assembly.

12V supply.

NV4 copy connector (optional)

NV4 Copy Cable

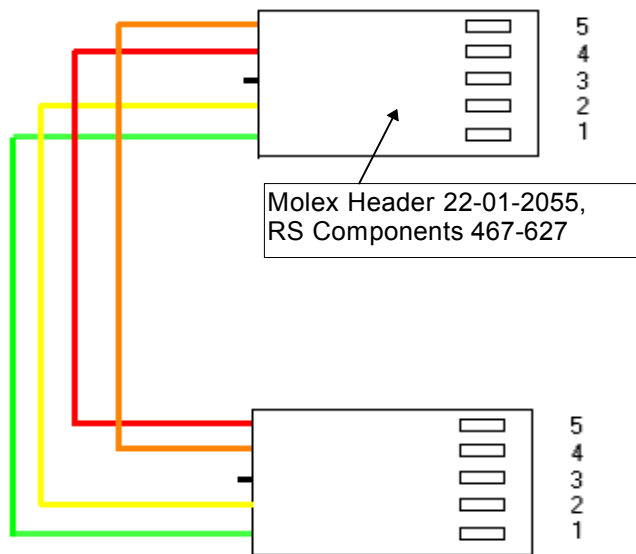


Figure 7 - Pin connections for NV4 Copy Connector

Start-up configuration

In order for the master validator to start in Copy Mode, the NV4 units should be set up as follows:

- The master and slave NV4s are set to 'TEACH'
- The Master and Slave NV4s are connected together using the NV4 copy cable as above.
- On the 15 pin connector on the Master NV4, pins 15 and 14 are held low and +12v input is connected to pin 11 and 0v to pin 12. (Do not apply the power until all the connections are made)

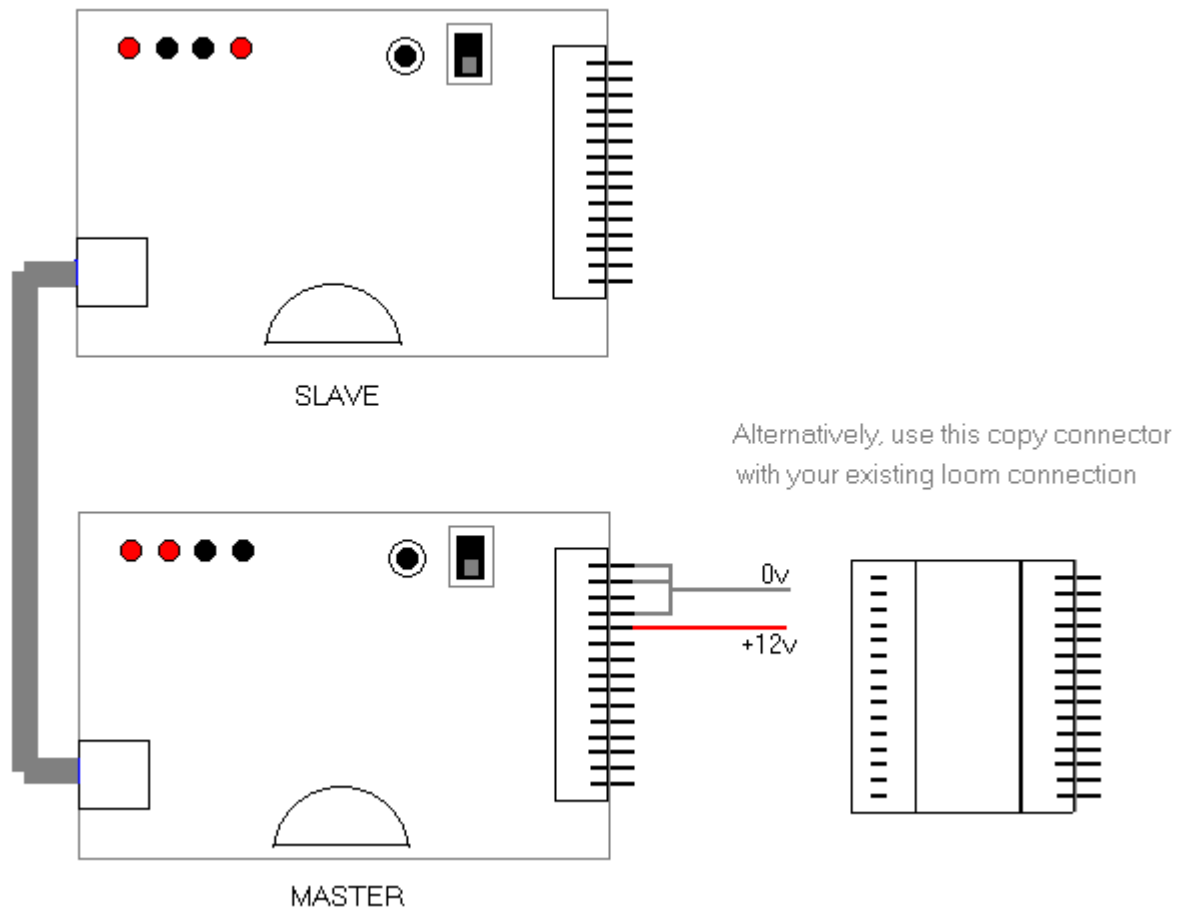


Figure 8 - Connecting Master and Slave NV4 units to copy a currency set

- If you are using the NV4 copy connector you can simply connect your existing 15 way plug to the master NV4 with this piece in-between.

Copying Procedure

LED1	2	3	4
Slave	●	○	○ ●
Master	○	○	● ●

Figure 9 - LED's indicate Ready to Copy

Apply the power and the NV4 units should now start-up with the led indicators as shown above (Master - LED's 3 & 4 , Slave - LED's 1 & 4). This indicates that the two validators are ready to start the copy process.

When the NV4 Units are started and are showing the correct indicator LED's, click the channel select button on the Master NV4 UNIT to initiate the copy process.

The Master NV4 UNIT will now look at the firmware version of the Slave and will upgrade the Firmware if it (the Master) has a higher version than the Slave.

If the Master is a different board issue number than the slave (a 1 to a 2 or vice versa) then

Led 3 on the Master will flash and no further operation can be allowed. In this case you require a Master that is the same board issue number as the Slave.

If the Master has a lower firmware issue number than the Slave, Led 2 will flash on the Master and again no further operation will be allowed.

If the Master cannot communicate with the Slave (due to a hardware or connection problem) then Led 4 will flash on the Master and the copy operation will stop.

LED	1	2	3	4
Firmware upgrade proceeding		●	○	○
Master firmware is lower issue	○		●	○
Master and slave are different board issues	○	○		●
Communications Error	○	○	○	●

Figure 10 - LED's firmware downloading or error condition

If the firmware versions are the same the copy process will now go directly to the currency copying mode.

Firmware Upgrade

If this process has been activated then Led 1 on the master will flash for a period then pause then flash again for a second period. This represents the transferring of the two blocks of Firmware data.

WARNING ! YOU MUST ENSURE THAT THIS PART OF THE COPY PROCESS IS NOT INTERRUPTED OR THE SLAVE NV4 UNIT MAY NO LONGER FUNCTION!

At the end of the firmware transfer, LED's 2 & 3 will be lit on the Master and on the Slave. The Slave will undergo a restart process. The Master will wait until the restart of the Slave has completed and then start the currency transfer.

LED1	2	3	4
Slave	●	○	●
Master	●	○	●

Figure 11 - LED's indicate currency downloading

Currency Transfer.

LED's 1 and 4 on both NV4 Units will flash on and off while the transfer is taking place, if an error occurs during this process, led 1 on the master will flash on its own and the process can be restarted to try again. At the end of the Currency transfer, LED's 3 & 4 will be illuminated on both validators to show that a successful transfer has taken place.

LED1	2	3	4
Slave	○	○	●
Master	○	○	●

Figure 12 - LED's indicate end of copy process

Manual Programming:

Manual programming can be used to teach a new note, such as a new issue, or to re-teach an existing note, or to teach a new fraud in the Emergency Channel. If you re-teach it is recommended that the old channel information is erased first, otherwise it will remain in the memory as a permitted face.

Code Lock

To prevent unauthorised access to the manual teach and manual menu functions, it is possible to set a 3 digit code lock. Refer to the section below on the Special Menu Features on how to set the Code Lock, and how to enter the Code Lock if required. (refer to page. 28) If a code lock is set, when the NV4 is switched to Teach, LED 1 will be lit. Otherwise none of the LED's will be lit.

LED	1	2	3	4
Code Lock set		●	○	○
No Code Lock set	○	○	○	○

Figure 13 - LED's indicate if Code Lock is set

Erasing a Channel

If the Validator has already been taught a new currency, re-teaching it will not make it forget the old. In this case it is important to delete the old information in each channel. To erase a channel, slide the Teach/Run switch to Teach. Select the channel to be erased by repeatedly pressing the select button. Now press and hold down the select button until the selected channel light goes off and comes back on. This will take approximately six seconds. If further channels need to be erased press the Red Select Button repeatedly until the correct channel is selected and then hold down the button as previously described. NOTE: It is not possible to reverse the erase process!

Teaching (Not NV5)

Before teaching the Validator examine the list of approved currencies on our website or in the appendix. Some currencies are only approved to be taught on particular faces for security reasons. Currencies not on the list have not been subject to the same (if any) levels of testing as the approved currencies. Users should take particular care to satisfy themselves on the security of operation once the Validator has been taught.

For teaching the Validator must be powered up, VCOM must be present, and the inhibit signals must be held low.

You will require at least twenty examples of the new note, and preferably thirty (some currencies may require more, particularly if there is more than one organisation printing the notes). Teach note selection is very important to obtain a good acceptance rate. As a guide your teach notes should contain at least five new notes, the rest should be 'typical' notes that are in circulation.

CAUTION!

Please be aware that the Smiley NV4 validator may have country specific parameters in operation that were set when the NV4 was manufactured or last programmed via a PC or the Master/Slave system. Manual teaching will not change these parameters. If you are manually teaching a completely new currency the end result may not be as satisfactory as PC downloading or using the cloning system. If in doubt please contact an approved service centre.

The following notes should not be used for teaching:-

- Do not use
- Very old or soiled notes for teaching.
 - Notes that have parts missing or large tears in them.
 - Notes that have been repaired with any kind of adhesive tape.
 - Notes with corners folded over.
 - Notes stained with tea or coffee.
 - Notes that have been stained by being washed with clothing e.g. jeans.

Sort the Teach notes so that they are all the same way up and the same way around. Do not mix different designs of the same denomination e.g. English and Scottish notes. They should be taught as separate faces in the same channel.

Remember that the quality of teaching notes will affect the accept rate of notes. A well taught unit will have a very high acceptance rate.

Selecting a Channel

Locate the slide switch marked TEACH/RUN

Locate the Push button marked SELECT CHANNEL/SELECT SECURITY

Locate the four channel LED's marked 1 to 4

The NV4 can be taught up to 15 different denomination notes, depending on the mode selected. Refer to the section below on the Special Menu Features on how to enable 15 channel teach mode.

Teaching Faces (not NV5)

1. Slide the Teach/Run switch up to the teach position. Enter Code Lock if necessary.
2. Repeatedly press the Select Channel button until the desired channel has been selected.
3. Feed in all the sample notes, in one orientation (face) only, one after another. Wait until one note has left the unit before trying to insert the next note. It is recommended you feed each note in the same orientation twice for better recognition. Insert the notes reasonably straight and central.
4. Do not deliberately insert notes that go up the sides of the note path or are badly twisted. Make sure that none of the teach notes have corners or edges folded over. This may unnecessarily distort the note definition and reduce the effectiveness of the NV4.
5. As each note is taught, the NV4 makes a crude check that the note looks similar to those taught before, in case one is fed the wrong way round. If it does not accept the note, it will flash all four LED's once as it feeds out the note. Occasionally the NV4 will not accept one of the first notes because it looks too different from the others e.g. the first old note. Put the note to the bottom of the pile and try again later. If the NV4 continues to reject all the old notes, it is best to teach these as a separate face.
6. When you have done this press the Select Button. The channel LED will blink once to confirm that the note data has been stored. If other faces of this note need to be recognised, change the orientation of the teach notes and insert the notes in the manner just described. Remember to press the select button at the end of each face taught.
7. When you have taught the desired faces of the note, slide the Teach/Run switch to the RUN position. The channel lights will now indicate the security setting for the channel you have just taught, and after five seconds the LED will flash four times indicating teaching is completed. If you need to change the security settings see the next section which explains the process.

Helpful tips for manual teaching:

While teach notes are being inserted the NV4 performs a very elementary test to look for operator errors. The NV4 checks the length of the notes and also does a crude test to see if subsequent notes are similar to the first teach note that was inserted. This is not fool-proof, and its effectiveness may depend upon the currency being taught.

If the Smiley® sees a note that it does not believe to be sufficiently similar it will flash all the channel lights momentarily and ignore the note for teaching purposes. If notes are inserted too quickly the channel lights will flash momentarily and the note data rejected.

For most currency sets this method will give good results. For some currencies you may notice that the four LED's flash frequently when teaching. This is because certain batches of notes may have very different characteristics, and in these cases it causes the Validator to reject them as not belonging to the same set as the first teach note. This can be for many reasons, but one common one is a change in characteristics as the notes ages. If this is seen to be happening when teaching an alternative method can be used that will improve acceptance rates.

Sort the notes into two sets, one with new and little used notes, the other with old and worn notes. Teach the sets into the same channel, but as different faces. This will result in twice as many faces being taught into a channel, but will give better acceptance rates due to the Validator not rejecting notes during teaching.

Note: The NV4 has the memory capacity to hold 63 faces, which is normally sufficient for most currencies. If the NV4 has reached capacity, it will flash the 4 LED's 5 times in warning and it will not be possible to teach any more faces unless you delete one or more channels.

Security Levels

The NV4 has three security level options. The security levels affect the severity of note testing and may be independently set for each of the channels. The higher the level of security the more closely the validation is examined. The security levels may be checked and changed if necessary whenever the Validator is switched from a selected channel in Teach mode to Run mode. When the switch is slid from Teach to Run one of the four Red LED's will light, indicating the current security level for the channel that has just been taught. The indications are:

- LED 1 Security level one (lowest security).
- LED 2 Security level two (recommended for most applications).
- LED 3 Security level three (highest security).
- LED 4 Inhibit. No notes will be accepted on this channel.

If the Select Button is pressed after the Validator has been switched from Teach mode into Run mode then the LED's will be seen to light in turn. Leave the light on that indicates the level you want applied. This must be done within 5 seconds of the unit being switched into run. The light selected will then flash four times to indicate the operation is complete. Note: Where a note dataset has mixed security levels within a channel, then no alteration to the security level is permitted. However it is possible to inhibit the channel. See below.

It is not necessary to re-teach the Validator to change the security levels. To do this, just place the validator into teach mode, select the channel required, switch to run and re-select the security level.

Multiple Security Levels

In some currency sets there are notes which, share the same channel but are set to different security levels (e.g. UK/Scottish - Bank of England £20 is on High Security, but Bank of Scotland £20 is on Standard security). If an attempt is made to alter the security settings, then 2 or more LED's will be lit, representing the different security levels used by notes on that channel. In there are multiple security settings, it is only possible to inhibit all notes on that channel or restore the previous security settings.

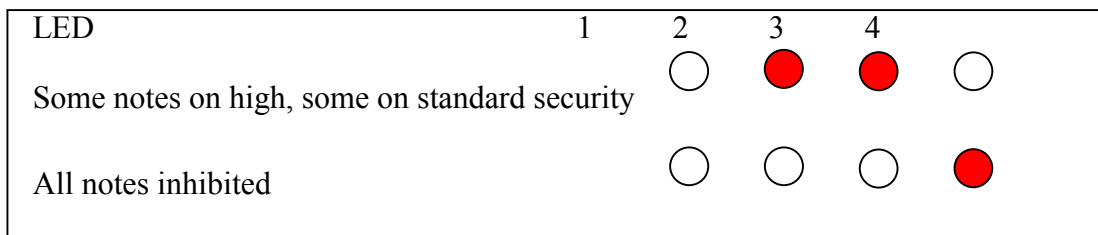


Figure 14 - Example of display with multiple security settings on a channel

Channel Five (Emergency Channel) Teaching (Not NV5)

Channel five is reserved for emergency use only. Channel five is used for teaching the Validator to recognise and reject any new fraud that the Validator has previously not been able to detect. Channel five is always checked first by the Validator to see if a presented note has a match there. This is a short term solution, and the factory should be informed of the circumstances as soon as possible.

The only operating difference with channel 5 is that the security levels work in reverse. The lower the security setting on channel 5 the more likely the NV4 is to recognise the note and reject it.

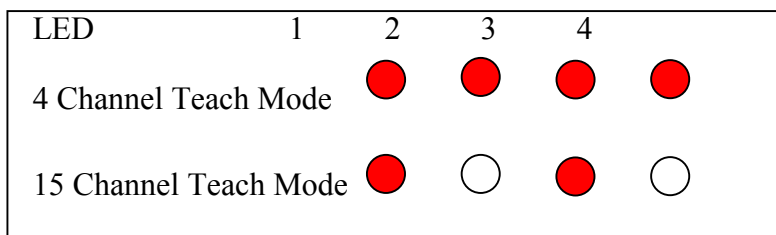


Figure 15 - Identifying Channel 5 from LED display

Special Menu Features

The NV4 Bank Note Validator has several new features that may be enabled/disabled by the operator using the teach/run switch and the select switch. It is possible to select and program into the Validator a 3 digit code lock that will prevent unauthorised operation of the manual teaching facility. It is also possible to select *parallel outputs*, *binary* or *pulse stream* outputs.

To call up the menu selection, first press and hold down the select button. Whilst you are holding it down slide the teach/run switch up to the teach position and then release the select switch. If a code lock is set, when the NV4 is switched to Teach, LED 1 will be lit. Otherwise none of the LED's will be lit. (Refer to Figure 13) The code lock must be entered, as described below, before a menu selection can be made.

If the select switch is now momentarily pressed the LED's will move from 1 to 2 etc.

LED	1	2	3	4
15 Channel Teach Mode	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pulse Stream Output	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Code Lock Programming	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Alternative Pulse Period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Strim Beam Security	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enable Reject Code	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Reserved for future use	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

Figure 16 - Special Menu options

1. Enabling Fifteen Channel Teach Mode

The NV4 validator is supplied in five channel teach mode. In this configuration, the teaching and credit interface operates in the normal 4 pulse parallel output mode as detailed in the interface protocol section of this technical manual. The ability to teach fifteen channels can be enabled by selecting option 1 in the special function menu as follows:

- 1 Power up the NV4 with the teach/run switch in the run position.
- 2 Hold down the select button and at the same time move the teach/run switch to the teach position. This action allows access to the special functions menu.
- 3 Select option one by pressing the select button until the LED 1 on the top of the validator is illuminated.
- 4 Move the teach/run switch back to the run position and then quickly back to the teach position.
- 5 LED 1 will then flash to indicate that the fifteen channel teach mode option has been enabled.
- 6 Finally, return the teach/run switch back to the run position.

Special Menu Features

When the unit is in this mode, the parallel vend outputs will be provided in a binary format as follows.

CHANNEL	LED 1 PIN 1	LED 2 PIN 2	LED 3 PIN 3	LED 4 PIN 4	
Vend 1	ON	OFF	OFF	OFF	● ○ ○ ○
Vend 2	OFF	ON	OFF	OFF	○ ● ○ ○
Vend 3	ON	ON	OFF	OFF	● ● ○ ○
Vend 4	OFF	OFF	ON	OFF	○ ○ ● ○
Vend 5	ON	OFF	ON	OFF	● ○ ● ○
Vend 6	OFF	ON	ON	OFF	○ ● ● ○
Vend 7	ON	ON	ON	OFF	● ● ● ○
Vend 8	OFF	OFF	OFF	ON	○ ○ ○ ●
Vend 9	ON	OFF	OFF	ON	● ○ ○ ●
Vend 10	OFF	ON	OFF	ON	○ ● ○ ●
Vend 11	ON	ON	OFF	ON	● ● ○ ●
Vend 12	OFF	OFF	ON	ON	○ ○ ● ●
Vend 13	ON	OFF	ON	ON	● ○ ● ●
Vend 14	OFF	ON	ON	ON	○ ● ● ●
Vend 15	ON	ON	ON	ON	● ● ● ●

Figure 17 - Binary display of channel no.'s

To disable the fifteen channel teach mode, repeat the above procedure points 1 - 6.

Selecting a Channel To Teach In Fifteen Channel Mode

- 1 Power up the NV4 with the teach/run switch in the run position.
- 2 Switch the teach/run switch to the teach position.
- 3 Select the desired channel you wish to teach by pressing the select button the appropriate number of times. The selected channel will be indicated by the 4 LED's in the same way as detailed in the binary format table.
- 4 The validator can now be taught as normal.

2. Pulse Stream Output Toggle:

Press the select button until LED 2 is chosen then slide the teach/run switch down to the run position and then back to the teach position. LED 2 will flash once. This will toggle the pulse stream output on or off. Return the teach/run switch back to the run position and wait two seconds.

3. Code Lock Programming:

Press the select button until LED 3 is chosen then slide the teach/run switch to the run position and then back to the teach position. You will then be allowed to program a three digit code lock, preventing unauthorised teaching of the Validator. If you do not have the code lock facility activated and do not wish to use it you may skip the code lock sections.

The code lock can be set as follows.

- 1 Press the select button repeatedly until the red LED's show the first digit of the three digit code. Note the digits are presented in binary, see below for an explanation.
- 2 Quickly slide the teach/run switch from the teach position to the to run position and then back to the teach position.
- 3 Press the select button repeatedly to select the second digit.
- 4 Quickly slide the switch from teach to run and back to teach.
- 5 Press the red select button to select the third and final digit.
- 6 Quickly slide switch from teach to run and back to teach. All red LED's should flash once.
- 7 Slide the switch to run. All red LED's should flash once.

The Validator is now code locked.

The code locking cannot be removed except by returning the Validator to an approved service centre or by using the "Reset Code Lock" facility in the NV4 Currency Manager program.

Note: Binary notation is the expressing of numbers as a pattern of "1" and "0". On the NV4 Validator the code numbers are in binary as shown by the red LED's and these are indicated as follows.

DIGIT	LED 1 PIN 1	LED 2 PIN 2	LED 3 PIN 3	LED 4 PIN 4	DISPLAY
1	ON	OFF	OFF	OFF	● ○ ○ ○
2	OFF	ON	OFF	OFF	○ ● ○ ○
3	ON	ON	OFF	OFF	● ● ○ ○
4	OFF	OFF	ON	OFF	○ ○ ● ○
5	ON	OFF	ON	OFF	● ○ ● ○
6	OFF	ON	ON	OFF	○ ● ● ○
7	ON	ON	ON	OFF	● ● ● ○
8	OFF	OFF	OFF	ON	○ ○ ○ ●
9	ON	OFF	OFF	ON	● ○ ○ ●

Figure 18 - Binary display of code lock digits

Code Lock Opening to Permit Manual Teaching and Access to Special Menu Functions

Where the code lock has been set, the manual teach and special menu functions can be accessed by entering the code as follows:

- 1 Select teach
- 2 Press the select button repeatedly until the first digit shows on the red LED's.
- 3 Quickly slide the switch from teach to run and back to teach.
- 4 Press the select button repeatedly until the second digit shows on the red LED's.
- 5 Quickly slide the switch from teach to run and back to teach.
- 6 Press the select button repeatedly until the third and final digit shows on the red LED's.

- 7 Quickly slide the switch from teach to run and back to teach. All red LED's will flash twice..

4. Programming An Alternative Pulse Period

Press the select button until LED 4 is chosen.

- 1 Move the teach/run switch from the teach position and then quickly back to the teach position.
- 2 Press the select button the appropriate number of times to provide the required pulse period. Please note, each time the select button is pressed the pulse period will be incremented by 10msecs.
- 3 Move the teach/run switch from teach to run and then quickly back to the teach position.
- 4 LED 4 will then flash back the number of times that the select button was pressed in point 5 above. Each flash will indicate a 10msecs time period.
- 5 Move the teach/run switch back to the run mode.

5. Programming Anti-strim beam security

(Note that the anti-strim beam is not a standard feature.)

Press the select button until LED's 1 and 2 are chosen.

- 1 Move the teach/run switch from the teach position and then quickly back to the teach position.
- 2 Pressing the select button will light the LED's in turn. The options are:

LED 1	Security level one (lowest security).
LED 2	Security level two (recommended for most applications).
LED 3	Security level three (highest security).
LED 4	Inhibit. The anti-strim beam is switched off.
3. Once the desired setting has been selected, slide the teach/run switch back to Run.

Mechanical Installation

The NV4 validator can be supplied with either the Conventional Bezel or the Universal bezel. Refer to drawings on pages 39 and 44 for more details.

Mounting Recommendation Details for the Conventional Bezel

In connection with the following instructions refer to Drawings GA105 for Fitting Details, GA106 for approximate dimensions required to fit the Validator, and GA107 for Cleaning & Removing the Validator.

1. The validator can be fitted to surfaces from 1mm - 8mm thick with the components supplied. Firstly cut an aperture 82mm Wide by 63mm High through the Mounting Plate.
2. Remove the "Bezel" (PM100 & PM101) from the Pre-Assembled Unit by pushing down the Large Red Button on top of the Validator, and levering back and lifting off the main part of the Unit.
3. Remove star washers, nuts (4 off) and bezel washer (2 off) from "Bezel". Place the "Bezel" (PM100 & PM101) through the aperture from the front (Showing Face) of the machine.
4. Holding the "Bezel" in position place the "Bezel Washer" (MC105 - 2 off) over the "Bezel" studs as shown in the centre view of drawing GA105. Place "Star Washer" (WS102) onto each of the remaining part of the studs followed by the "Nut" (WS103). Tighten the nuts, being careful not to over tighten as this will start to deform the "Bezel Washer".
5. Hook the rest of the unit into position as in the right hand view drawing GA105. Carefully check that it is secure and held firmly.
6. Connect the necessary Interfaces with Power turned off.

Mounting Recommendation Details for the Universal Bezel

In connection with the following instructions refer to Drawings GA127 and GA128 for Fitting Details, and GA126 for approximate dimensions required to fit the Validator.

1. Remove star washers and nuts (2 off) to remove Escutcheon panel from validator.
2. Press on the button on the top of the validator to hinge the Bezel forward, then unhook. Fix the Bezel to the mounting panel using 4 off No.4 self tapping screws. The panel cut-out is detailed in drawing GA127. If the validator is being mounted using the universal Bezel only, fit the validator back onto the Bezel.
3. If the escutcheon plate is being used, remove star washers and nuts (2 off) to remove the two escutcheon clamps. Fit the escutcheon plate to the front panel, then refit the clamps, and secure with star washers and nuts. The panel cut-out is detailed in drawing GA128.
4. If the escutcheon plate is being fitted to a separate hinged door or fascia panel, only tighten the nuts so that the clamps are lightly nipped. With the Bezel secured firmly in position, swing the door shut, allowing the bezel the guide the escutcheon plate into alignment. Open the panel and secure the nuts tightly.
5. If the validator is being secured directly by the escutcheon plate, then secure the escutcheon nuts tightly. Use the second pair of nuts and star washers to secure the Bezel to the two studs in the escutcheon plate. Then resecure the validator to the Bezel.

Further Considerations on Installation Position

Calibration and Routine Maintenance

1. To remove the Validator from its position on the “Bezel”, accessibility to the Red Release Button (Action 1 - GA107) on top of the validator is required. 20mm is required below the validator and 25mm to the back in order to remove it.
2. Additional space is required behind the Validator if the Path is cleaned while the Unit is still attached to the Bezel.
3. Access is needed for the Interface Connector which is fitted to the Left Hand Side of the Validator viewed from the back. If a stacker is fitted, then access is also needed for the Stacker Connector which is fitted to the Right Hand Side of the Validator viewed from the back.
4. Leave space below the validator for the note when it is in a pre-validated position. This space should be sufficient to accommodate the longest note that the validator will see plus 25mm.
5. Cashbox designs should comply with the details shown in Drawings GA123 for the NV4 and GA146 for the NV5.
6. **IMPORTANT:** If replacing an NV4 with an NV5, please refer to drawing GA146 for cashbox interchangeability problems.

Calibration and Routine Maintenance

The NV4 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 NV4 may at some time require cleaning or even re-calibration.

Cleaning:

Press down the red half circle on the top of the Validator to release it from the front bezel. The note path may now be exposed for cleaning. Wipe the surfaces with a soft lint free cloth that has been dampened with a water and detergent solution (such as a household washing up liquid) NEVER use a solvent based cleaner such as alcohol, petrol, methylated spirits, white spirit, or PCB cleaner. This will result in permanent damage to the validator. Take particular care with the lenses. If a lens has become badly scratched do not attempt to polish it as this may damage the optical properties. Near the front of the unit you will see two small slits in the upper path. these may be cleaned out with a soft toothpick. However, be careful not to push the toothpick inside the Validator. Cleaning instructions are also shown on the drawing GA107 which applies to both the NV4 and NV5.

Calibration:

The NV4 has an in-built calibration system. To re-calibrate an NV4 the unit must first be powered OFF and fitted to its front bezel. It must also be removed from any stacker it is fitted to. Now insert a piece of white paper into the curved entrance until it hits the drive wheels (letter quality, ideally 100 gram, white matt linen - approximately 150mm x 80mm. Do not use ordinary photo copier paper). The paper must occupy the entire curved entrance. Now hold down the select button and while you are holding it down turn on the power supply.

Release the button when the motor starts. The white paper will be drawn into the validator, and held for several seconds while the lenses are calibrated. It will then be pulled through the main body, then back over the rear roller, before eventually exiting over the top of the roller. Remove the white paper. After a short period the front bezel will be illuminated and the NV4 is now re-calibrated.

If the display bulb is flashing on and off continuously, the NV4 needs to be recalibrated. Insert the calibration paper as described above and press the select button momentarily. The Validator will then re-calibrate itself

For NV5 initialisation can be achieved by pressing the select switch as the Firmware revision code is being displayed on the four LEDs as the validator is powered up.

Fault Finding

Problem	Check:	Solution
Validator will not take notes:	Is the Bezel Illuminated?	Check power supply
	Is the jumper cable connected from the top to the bottom of the validator?	Test cable
	Is the Teach/Run switch in Run?	Slide Teach switch to RUN
Validator runs slowly or intermittently:	Make sure there are no foreign objects in the note path	Clean the note path
	Check voltage level of supply	Ensure correct supply and sufficient current.
	Check for damage	Replace Path components
	Ensure there is no grease on tyres	Replace tyres
Notes pass through the validator but do not give a vend signal	Is the unit in TEACH mode? - check the Teach/Run switch Is the power supply inside specification. Is the rear flag stuck up.	Make sure the validator is in run mode. Ensure correct supply and sufficient current. Make sure rear flag moves freely
Validator may be taught notes but will then not accept any note.	Check that +VCOM is connected to your interface supply voltage (+5v to +12v)	Test interface connections.
	Have sufficient notes been used to teach the NV4?	30 different notes are recommended, but some currencies may require more
	Check that the relevant inhibits are disabled (to enable a channel). The inhibit pin should be held logic low (0v).	Test interface
	Check that ESCROW is off.	Test Interface
Unit rejects genuine notes	Check that the unit has been taught this face.	Check Currency on label
	Check the channel security setting	Adjust security setting
Validator is difficult to teach.	Check all teach notes are in the same orientation.	Sort notes prior to teaching
	Check teach notes are not badly damaged or heavily stained	Change the teach notes for ones that are in better condition.

Support Tools

The following support tools are available for use with the NV4 Bank Note Validator:

1. PC Currency Manager Software.
2. PC Hardware Diagnostics Software.

1. PC Currency Programming Software.

The NV4 Currency Manager software offers the following functions:

- teach the NV4 Validator by downloading pre-prepared currency data via the serial communications link. The firmware will also be updated to the version compatible with the currency set to ensure maximum security.
- Check the firmware version and currency set already loaded on an NV4 unit
- Adjust the channel and pulse configuration on a pre-programmed NV4 to your own requirements
- download a new version of firmware onto the NV4
- upload the currency data in an NV4 and save to file
- reset the code lock

The software will run on an IBM compatible Personal Computer with Pentium™ processor or equivalent and requires a test box and security dongle (part number NP4KIT) which must be fitted to the PC parallel port. This program runs under the Windows 95/98™ operating system, and requires one free serial port to connect to the NV4. (© Microsoft and Intel).

2. PC Hardware Diagnostics Software.

In order to assist with the repair and testing of NV4, a diagnostic software package is available which allows the various functions of the validator to be individually operated remotely from a PC using a serial link.

The software will run on an IBM compatible Personal Computer with Pentium™ processor or equivalent. This program runs under the Windows 95/98™ operating system, and requires one free serial port to connect to the NV4 using the NP4 Test box and dongle (© Microsoft and Intel)

Parts List and Drawings

No	Part No	Description	No required
1	PM102	TOP COVER (NV4 Grey)	1
	PM102BK	TOP COVER (NV5 Black)	1
2	PM103	TOP PATH	1
3	PM104	BOTTOM PATH	1
4	PM105	BOTTOM COVER (NV4 Grey)	1
	PM105BK	BOTTOM COVER (NV5 Black)	1
5	PM106	DRIVE WHEEL	3
6	PM107	DAISY GEAR WHEEL	1
7	PM108	IDLER WHEEL	1
8	PM109	DAISY	1
9	PM217	FILTER HOLDER CLIP	2
10	PM112	BACK FLAG	1
11	PM218	BARREL WHEEL	1
12	PM114	LENS FILTER	2
13	PM115	CRADLE	1
14	PM116	DAISY WHEEL CARRIER	1
15	PM117	WHEEL CARRIER	1
16	PM118	FRONT CLIP	1
17	PM119	FLAT LENS	2
18	PM122	WORM	1
19	PM124	IDLER GEAR	1
20	PM126	DAISY GEAR	1
21	PM137	DRIVE GEAR	2
22	PM198	HELICAL GEAR	1
23	PM143	DRIVE TYRE	4
24	PM144	IDLER TYRE	4
25	PM146	STACKER DRIVE WHEEL	1
26	PM148	START SENSOR LIGHTPIPE	2
27	PM199	BULB RETAINER	1
28	PM151	LED LIGHTGUIDE	1
29	SP103	LEFT BARREL SPRING	1
30	SP105	RIGHT BARREL SPRING	1
31	SP107	BACKFLAG SPRING	1
32	SP108	CARRIER SPRING	2
33	MC106	DAISY SHAFT	1
34	MC107	DRIVE SHAFT	2
35	PB102	FRONT PCB	1
36	PB103	TOP PCB	1
37	PB104	BOTTOM PCB	1
38	PB105	PCB MOTHERBOARD	0.5
39	SC104	M2.5x5mm Pozi Pan Head	2
40	MC117	ANTI-RETURN GUARD for NV4	1
	MC136	ANTI-RETURN GUARD for NV5	1
41	PM216	FILTER HOLDER COVER	2
42	PM154	LEFT START SENSOR SPACER	1
43	PM155	RIGHT START SENSOR SPACER	1
44	WR106	SLEEVING	2

Parts List

45	PM191	LEFT STRIMMER COVER	1
46	PM192	RIGHT STRIMMER COVER	1
47	PM206	CURVE GUIDE LH	AS REQ
48	PM207	CURVE GUIDE RH	AS REQ

No	Part No	Description	No Required
Including Conventional Bezel:			
1	PM100	BEZEL	1
2	MC104	UPPER BEZEL STUD	2
3	MC109	LOWER BEZEL STUD	2
4	MC105	BEZEL WASHER	2
5	PM101	WINDOW	1
6	LB114	DISPLAY LABEL	1
7	WS102	M4 STAR WASHER	4
8	WS103	M4 HALF NUT	4
Including Universal Bezel:			
11	PM182	UNIVERSAL BEZEL	1
12	PM181	ESCUTCHEON PLATE	1
13	MC126	ESCUTCHEON STUD	2
14	MC124	ESCUTCHEON CLAMP	2
15	WS102	M4 STAR WASHER	4
16	WS103	M4 HALF NUT	4

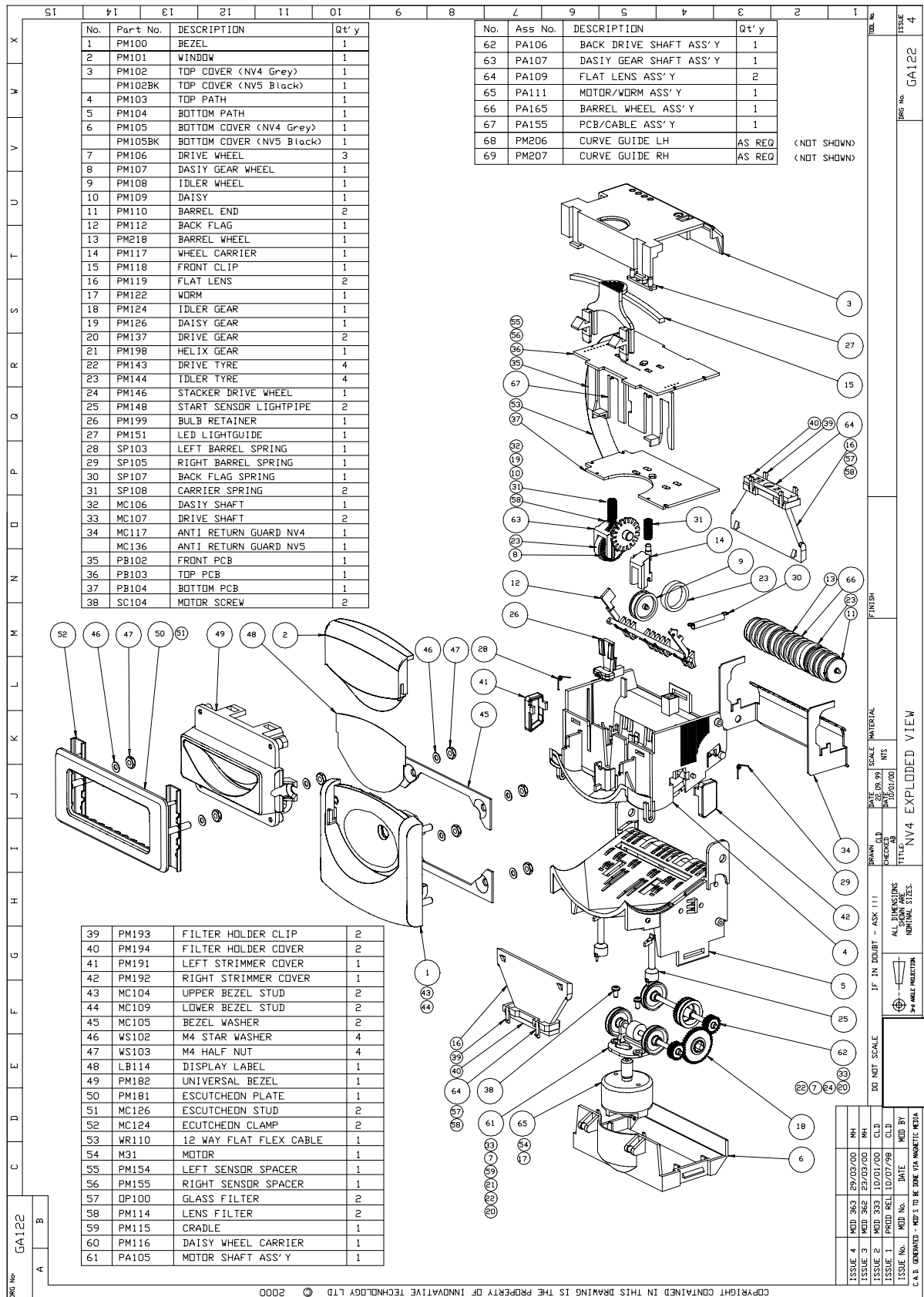


Figure 19 - NV4/5 Exploded View

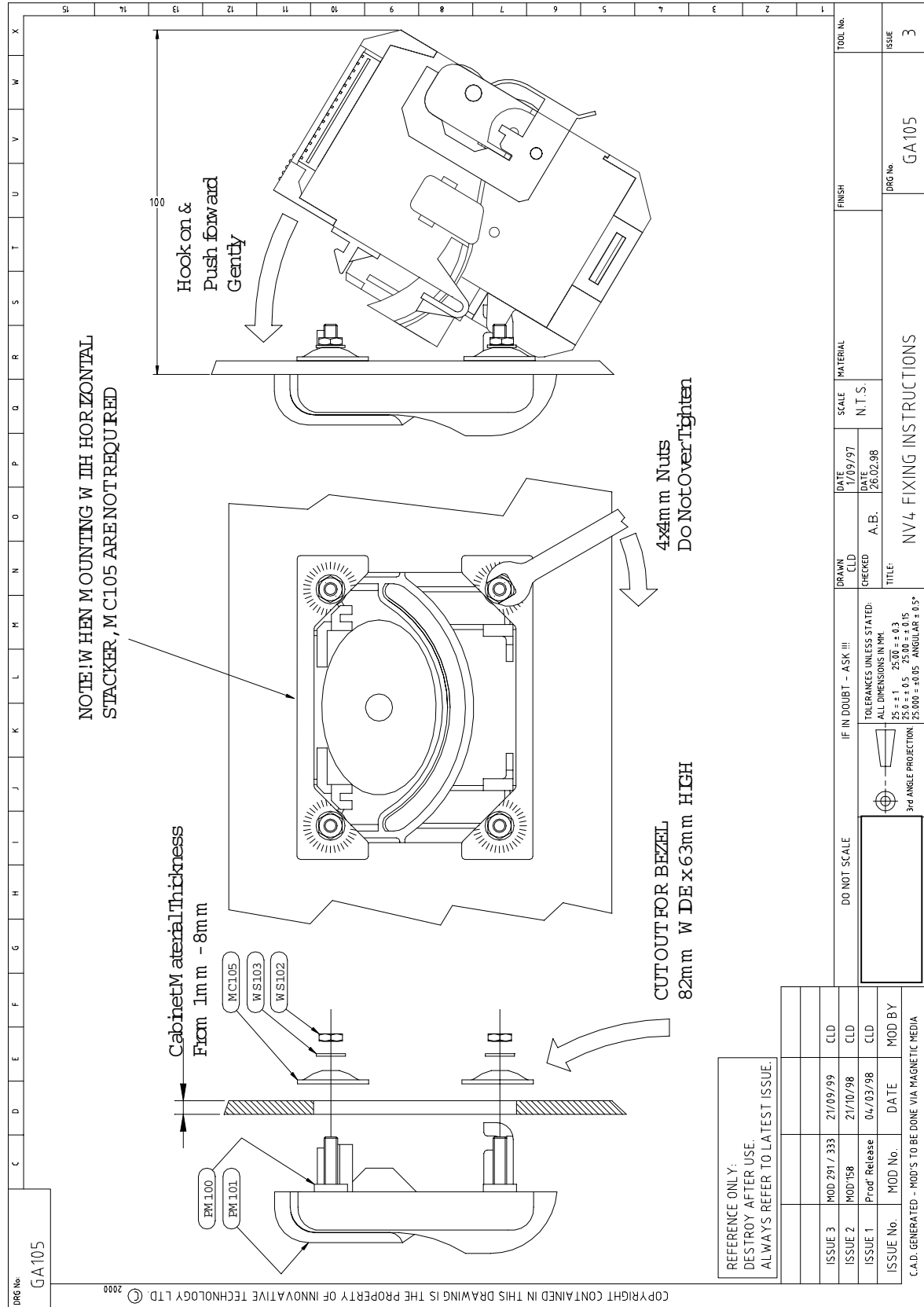


Figure 20 - NV4 Fixing Instructions with Conventional Bezel

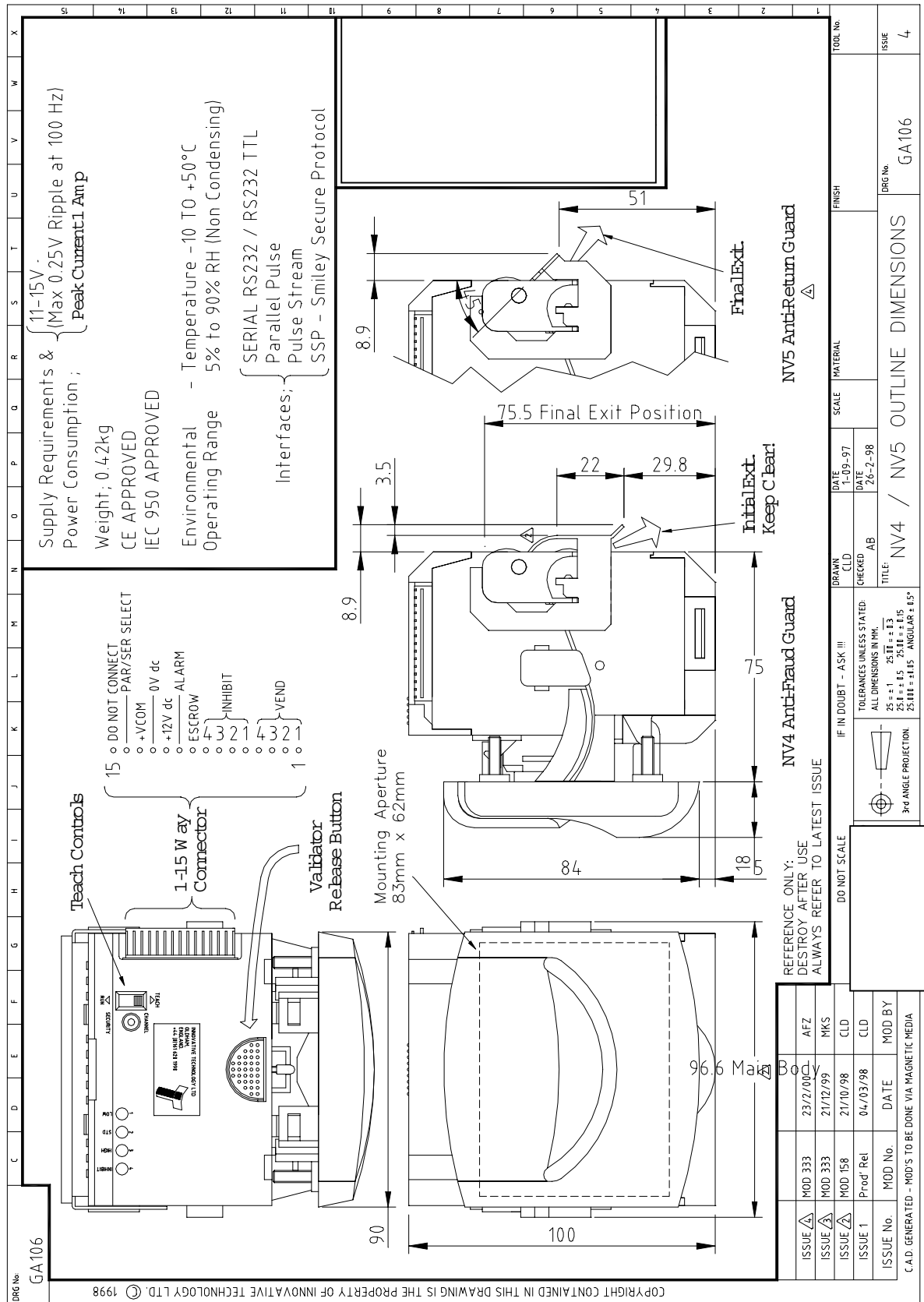


Figure 21 - NV4 / NV5 Outline Dimensions

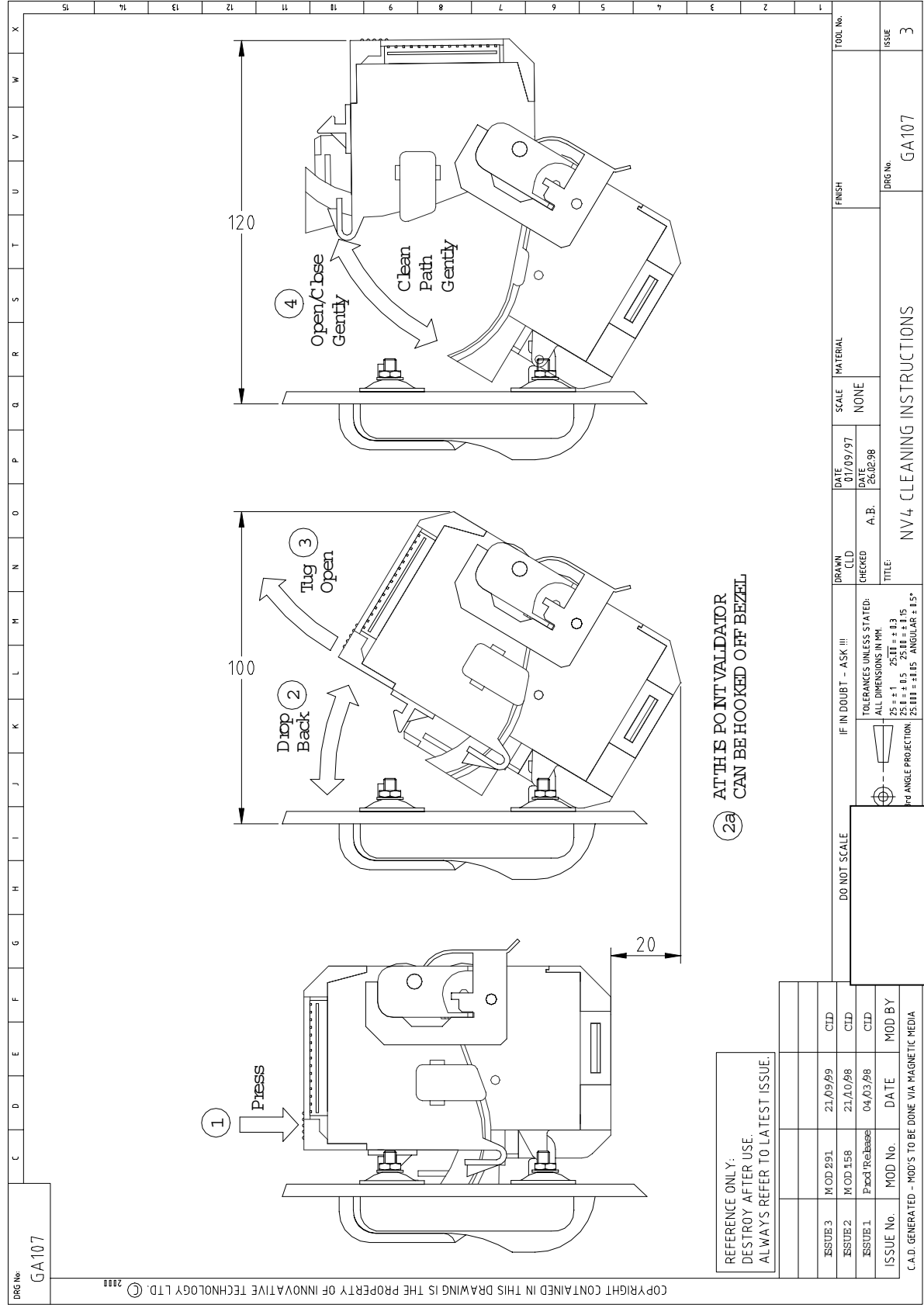


Figure 22 - NV4 Cleaning Instructions

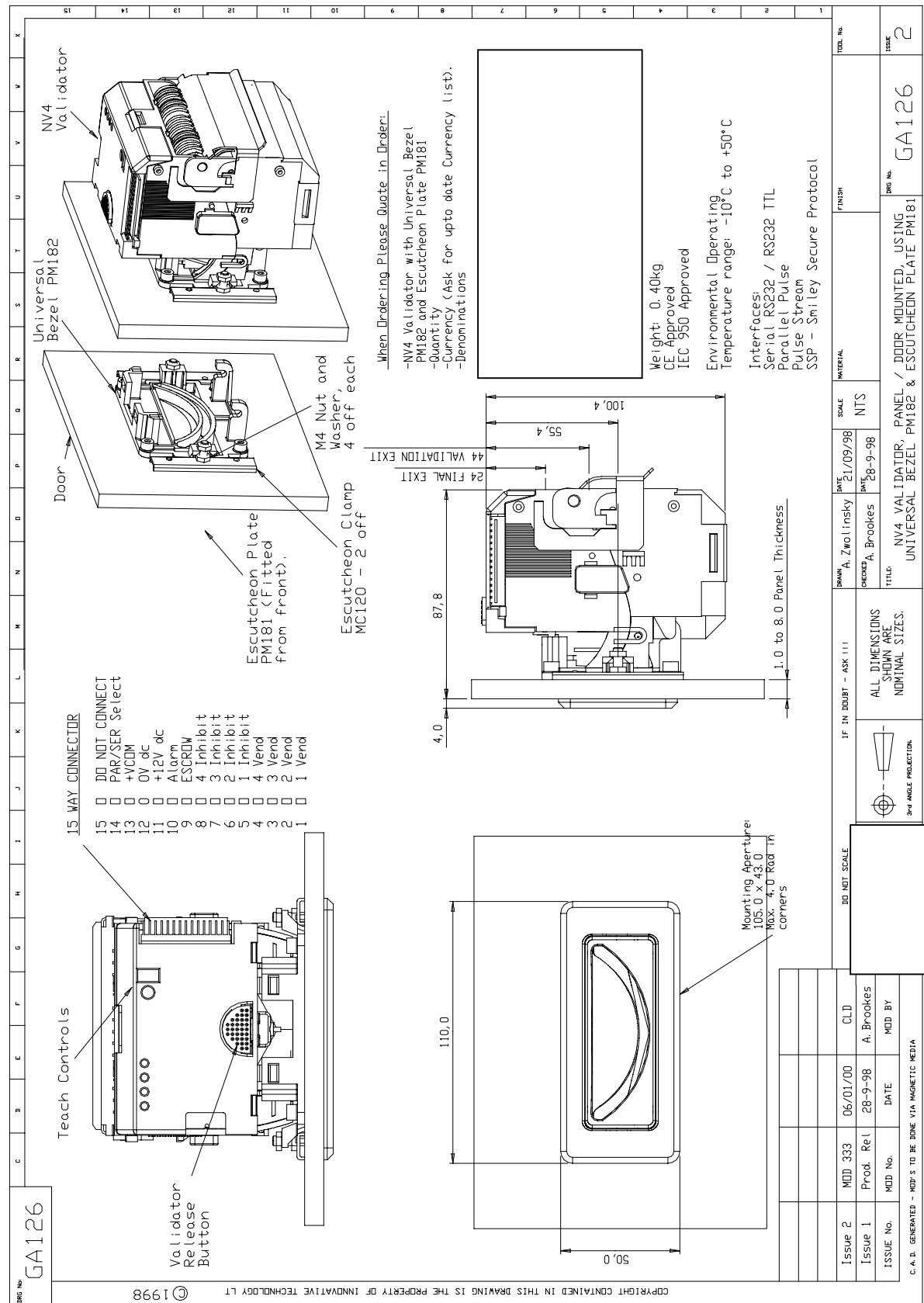


Figure 25 - NV4 Validator panel / door mounted using Universal Bezel and Escutcheon Plate

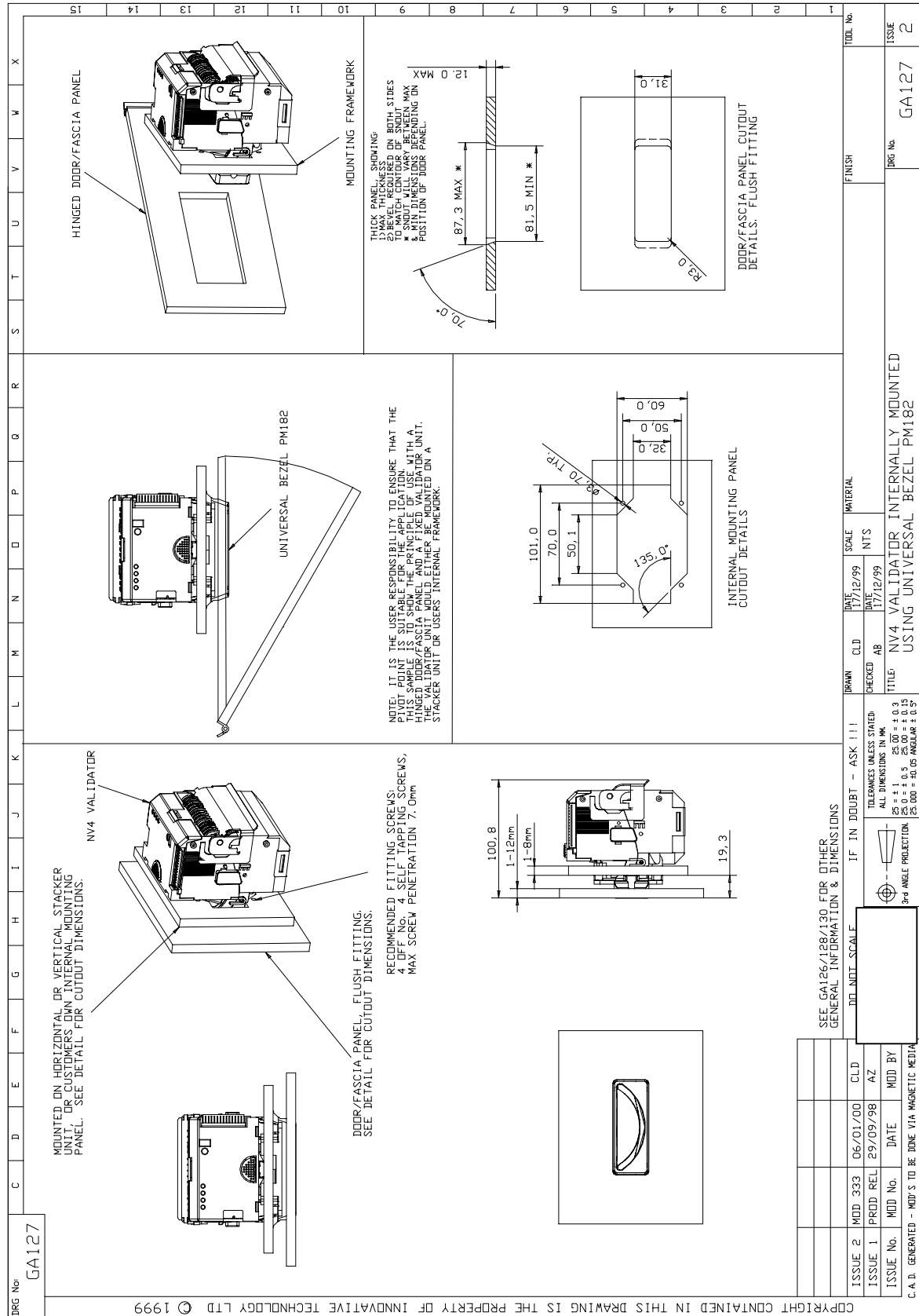


Figure 26 - NV4 Validator internally mounted using Universal Bezel

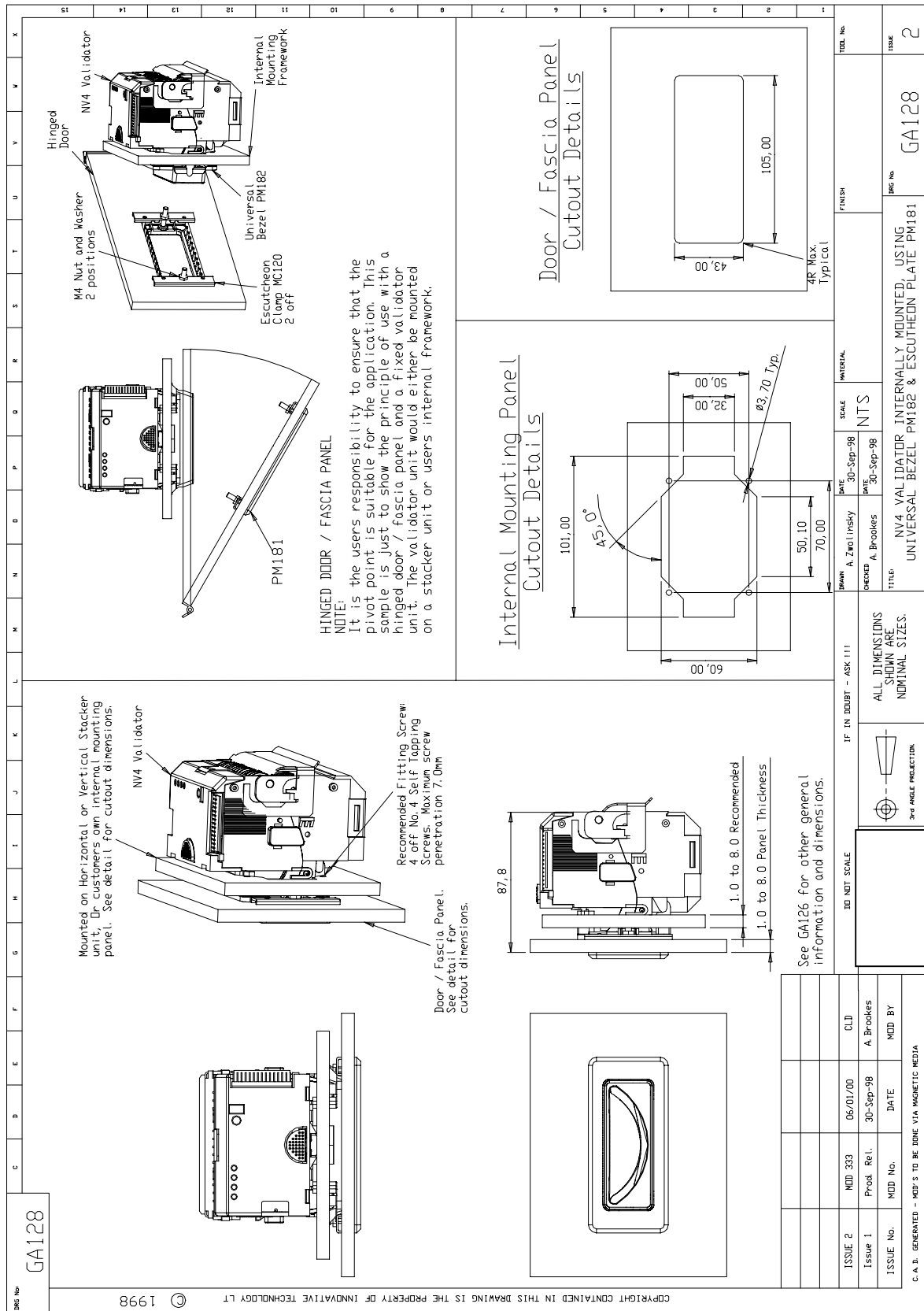


Figure 27 - NV4 Validator internally mounted using Universal Bezel and Escutcheon Plate

Revision History

Issue No.	Mod No.	Date	Done by
Issue 1	Sales Pre Release	7/11/97	PD
Issue 2	Production release	18/2/98	PD
Issue 3	MOD 160	11/09/98	AB
Issue 4	MOD 291	26/08/99	SL
Issue 5	MOD 333	22/02/00	JB / AZ
Issue 6	MOD 362	23/03/00	MH