

# SECTION 4

## NV200 MANUAL SET

### MECHANICAL AND ELECTRICAL MANUAL

INTELLIGENCE IN VALIDATION

Innovative Technology assume no responsibility for errors, omissions, or damages resulting from the use of information contained within this manual.

**NV200 MANUAL SET – SECTION 4**

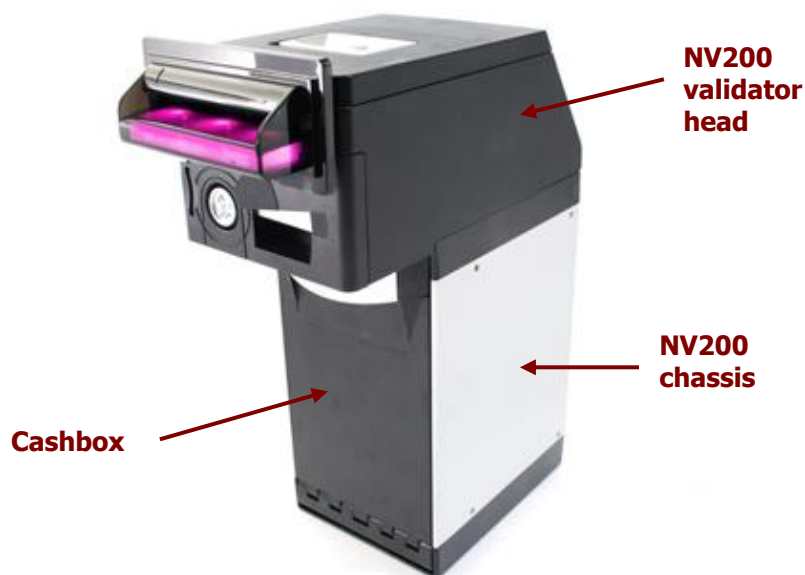
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## 4. MECHANICAL AND ELECTRICAL MANUAL

This section is one part of a complete manual set: Design Engineers who are designing a host machine cabinet, or looking to integrate the NV200 Validator into an existing cabinet would need to read this section. This section contains the all the mechanical and electrical information a designer needs to effectively integrate the NV200 Validator into a host machine.

### 4.1 Introduction

The NV200 validator is made up of three basic components: an NV200 validator head, NV200 chassis and a cashbox (as shown below).



The NV200 validator is a device that can accept, validate and store 500 or 1000 bank notes of mixed denominations, and works with any NV200 currency dataset created by Innovative Technology Ltd.



**NV200  
Rear View**



**NV200  
Front View**



**NV200  
Side View**

## 4.2 Assembly and Fitting Instructions

Installing the NV200 is a simple operation, described in the steps outlined here:

1. To remove the NV200 head unit, first unlock the NV200 cashbox and head release lock (if fitted)
2. Then, lift the silver head release catch located on the front of the NV200
3. Finally, slide the head unit forward and lift it off the chassis
4. Remove the NV200 cash box from the metal chassis
5. If installing into a host machine, the NV200 chassis is then mounted by using the tapped holes on either side of the chassis using 4 x M4 fixing screws and a suitable mounting bracket



### Information

Check fixing screw length before final installation to avoid damage to the cash box.

The length of the fixing screws fitted to either side of the chassis must be no longer than 6 mm plus the thickness of the mounting bracket.

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

The NV200 has the provision of fitting three locks for extra security. One lock can be added to the front of the NV200 that locks the validator head and cash box into position without the need of external brackets, and another two locks can be added to the cash box itself.



The cams required for the locks are supplied with the NV200 and can be found in the cash box. Details of how to fit the locks can be found on the drawings at the end of this section.

**WARNING!**

Do not attempt disassembly

Do not attempt to disassemble the NV200 validator head – trying to do this could cause personal injury and will damage the unit beyond repair.

### 4.3 Technical Specifications

The full technical specifications for the NV200 Validator can be found in Section 6, Appendix B of this manual set. A brief summary is given here:

DC Voltage	Minimum	Nominal	Maximum
Absolute limits	10.8 V	12 V	24 V **
Supply ripple voltage	0 V	0V	0.25 V @ 100 Hz
Supply Current			
Standby	400 mA		
Running	1.5 A		
Peak (motor stall)	3 A		

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

**WARNING!**

Use correct supply voltage

**\*\* NOTE:** Only the later models of NV200 are capable of using a supply voltage up to 24 V DC. Earlier versions have a maximum voltage of 13.2 V DC.

See Section 6, Appendix E of this manual set for information on how to identify if your validator supports 24V DC operation.

We recommend that your power supply is capable of supplying 12V DC at 4.3 A, or 24V DC at 2.1 A - TDK Lambda produces a range of suitable power supplies:

- For 12V operation, use TDK Lambda model SWS50-12. This power supply is available from a variety of suppliers including Farnell (stock code 1184645) and RS (stock code 466-5869).
- For 24V operation, use TDK Lambda model SWS50-24. This power supply is also available from a variety of suppliers including Farnell (stock code 1184646) and RS (stock code 466-5875).



## 4.4 Cable Specifications

The **minimum** specification for wire used in power cables for the NV200 validator is given here:

Minimum AWG	Nominal current rating	Peak current rating	Cable rating	Insulation rating
26	1.5 A	3 A	4 A	80 °C

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

## 4.5 Electrical Interfaces

The NV200 validator has two connectors that are used to allow interfacing and programming; these connectors are easily accessible at the back of the validator.



### Information

Power always required regardless of connection type.

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

The first connector is a 16 pin socket used to interface the NV200 to the host machine. The pin numbering of the socket is shown below, as well as an overview of the socket connections:



Pin	Description
6	Serial Data Out (Tx)
7	Serial Data In (Rx)
15	+ V
16	0V / Ground Connection

The USB connector is a standard Type 'B' USB socket, and can be used for interfacing to the host machine – in this case, power must be provided through the 16 way connector. The USB socket can also be used for programming the NV200 – a USB 2.0 compliant Type 'A' to 'B' lead can be used to do this. USB cables should be electrically shielded and less than 5 metres long.

The function of pins 1 to 9 can change depending on which machine interface is being used with the NV200. Typically, the validator will be using SSP, ccTalk or SIO interfaces. MDB, Parallel, Binary and Pulse interfaces are only supported with the use of an external interface, so there are no connection tables shown here.



The socket connections for the SSP and ccTalk interfaces are shown in the tables below, as is a summary of the interface units needed for other types of operation:

### NV 200 SSP Interface:

Pin	Name	Type	Description
1	TxD	Output	TTL TxD
2	TxD Opto Emitter	Output	Opto isolated TxD Emitter
3	RxD Opto +	Input	Opto RxD +
4	RxD Opto -	Input	Opto RxD -
5	RxD	Input	TTL RxD
6	TxD RS232	Output	RS232 TxD
7	RxD RS232	Input	RS232 RxD
8	Factory use only		<b>Do not connect</b>
9	TxD Opto Collector	Output	Opto Isolated TxD Collector
10	Factory use only		<b>Do not connect</b>
11			
12			
13			
14			
15	V In	Input	+V
16	GND	Input	GND

### NV200 ccTalk Interface:

Pin	Name	Type	Description
1	TxD	Output	TTL TxD – connect to pin 5
2	Factory use only		<b>Do not connect</b>
3			
4			
5	RxD	Input	TTL RxD – connect to pin 1
6	Factory use only		<b>Do not connect</b>
7			
8			
9			
10			
11			
12			
13			
14			
15	V In	Input	+V
16	GND	Input	GND



#### WARNING!

**Risk of unit damage**

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



### Multi Drop Bus (MDB) Interface:

MDB is a serial bus interface commonly used in electrically controlled vending machines. This is a 9600 Baud Master – Slave system where the NV200 validator is a slave to master controller.

To use the NV200 with MDB protocol, an **IF5** external interface is required. The IF5 regulates the power supply and opto-isolates the communication lines. The NV200 validator supports the MDB Protocol Version 1, Level 1.

### Parallel Interface:

To use the NV200 in Parallel mode, an **IF10** external interface is required. When operating in Parallel mode the NV200 will issue a 100ms active LOW pulse on the relevant vend line, and a maximum of 4 channels can be used.

### Binary Interface:

To use the NV200 in Binary mode, an **IF9** external interface is required. When operating in Binary mode the NV200 will issue a binary pattern on vend lines 1 to 4, and a maximum of 15 channels can be used.

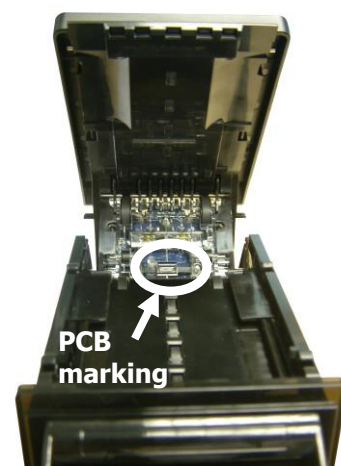
### Pulse Interface:

To use the NV200 in Pulse mode, an **IF15** external interface is required. When operating in Pulse mode the NV200 outputs a number of pulses on Vend 1. The number of pulses for each channel is different and set to default values within the dataset. The number of pulses and the pulse duration can be modified using the Bank Note Validator Currency Manager Software, and a maximum of 16 channels can be used.

Opto-isolation and RS232 communications is only available on validators with an issue number of 4 or greater. You can check the issue number on the validator as shown here:

Open the NV200 validator lid and check the marking on the PCB where shown in this picture – the marking needs to read **PB00266\_4**

If the issue number is less than 4 or not visible, contact ITL Support for connection options and information.





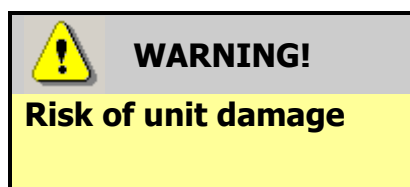
## 4.6 DIP Switches

The NV200 has a Dual Inline Package (DIP) switch bank that is used to set the various options for the unit. A summary of the switch options are shown below:



Switch	Option	Switch OFF (↓)	Switch ON (↑)	Default Setting
1	Disable Barcode	Read enabled	Read disabled	OFF
2	Channel 1 Inhibit	Channel enabled	Channel disabled	OFF
3	Channel 2 Inhibit	Channel enabled	Channel disabled	OFF
4	Channel 3 Inhibit	Channel enabled	Channel disabled	OFF
5	Channel 4 Inhibit	Channel enabled	Channel disabled	OFF
6	Channel 5 Inhibit	Channel enabled	Channel disabled	OFF
7	Channel 6 Inhibit	Channel enabled	Channel disabled	OFF
8	Programming Mode	*With power on, switch to ON then back to OFF to activate programming mode		OFF

\* When DIP switch 8 is turned on and off, the bezel LEDs will flash on and off quickly and then reset.



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

## 4.7 Basic Operation

The NV200 validator is a device that can accept, validate and store 500 or 1000 bank notes of mixed denominations, and works with any NV200 currency dataset created by Innovative Technology Ltd.

Validated bank notes are stored in the NV200's secure cashbox, and bank notes accepted by the validator are not visible once inside the unit and can only be taken out of the cashbox manually.

The operational colour of the bezel illumination can be set to a user definable colour by using the Bank Note Validator (BNV) Currency Manager Software. Each of the three colours of LED in the bezel can be set to a different brightness level (0-255) to achieve the desired colour.

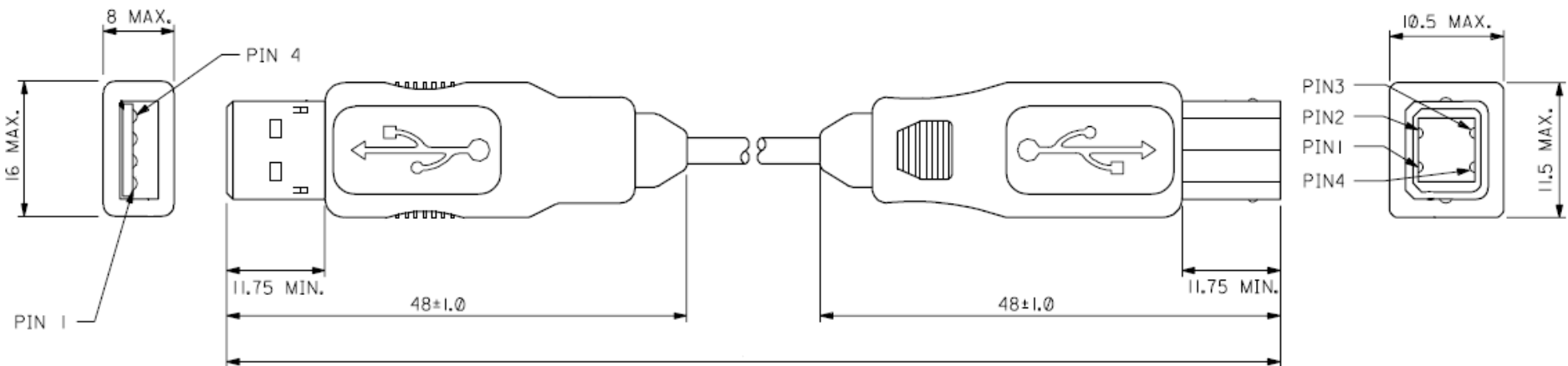
The NV200 Validator has inbuilt fault detection facilities. If there is a configuration or other error, the NV200 front bezel will flash in a particular sequence.

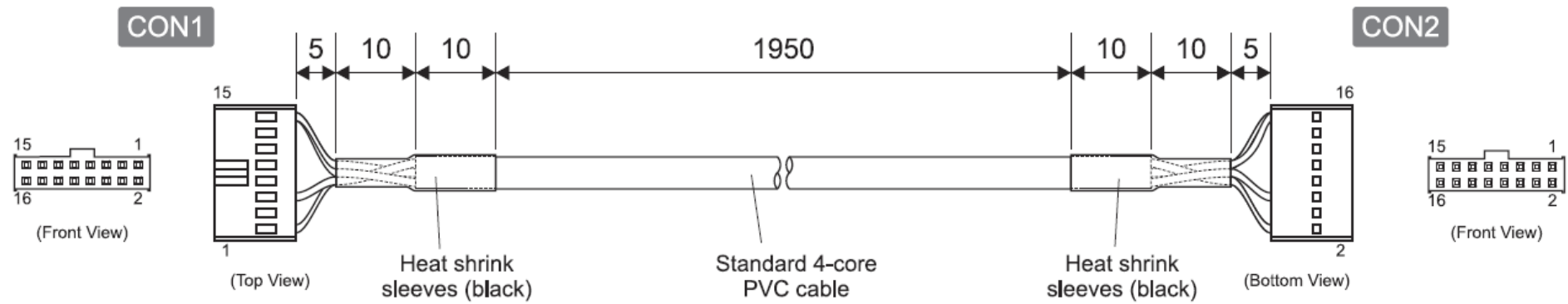


A summary of the Bezel Flash Codes for the NV200 is shown below:

<b>Flashes</b>		<b>Indicated Error</b>	<b>Comments</b>
<b>Red</b>	<b>Blue</b>		
<b>0</b>	<b>0</b>	None	
<b>1</b>	<b>1</b>	Note path open	Close note path
	<b>2</b>	Note path jam	Remove obstruction and follow the cleaning procedure in Subsection 4.9 of this manual
	<b>3</b>	Unit not initialised	Contact ITL technical support
<b>2</b>	<b>1</b>	Cashbox removed	Refit cashbox
	<b>2</b>	Cashbox jam	Remove trapped notes
<b>3</b>	<b>1</b>	Firmware checksum error	Download new firmware
	<b>2</b>	Interface checksum error	
	<b>3</b>	EEPROM checksum error	Download new firmware
	<b>4</b>	Dataset checksum error	
<b>4</b>	<b>1</b>	Power supply too low	Check power supply
	<b>2</b>	Power supply too high	
	<b>3</b>	Card format	Reprogram programming card
	<b>4</b>	Payout reset	Turn power on and off
<b>5</b>	<b>1</b>	Firmware mismatch	Reprogram unit

## 4.8 Spare Parts

ITL Part Number	Description	Details
CN00214	USB Cable	USB 2.0 Compliant Type A to Type B cable
 <p>Technical drawing of a USB 2.0 Compliant Type A to Type B cable. The drawing shows the cable with dimensions and pin labels. The Type A connector on the left has a width of 8 MAX. and a height of 16 MAX. The Type B connector on the right has a width of 10.5 MAX. and a height of 11.5 MAX. The cable length is 48 ± 1.0. The distance from the connector to the cable body is 11.75 MIN. The pin labels are PIN 1, PIN 4, PIN 3, PIN 2, PIN 1, and PIN 4.</p>		
<p><b>COMMENTS:</b></p> <p>Any commercially available USB 2.0 compliant Type A to Type B cable is suitable – these are available from many different sources. The cable should be electrically shielded and less than 5 metres long.</p>		

ITL Part Number	Description	Details
CN00292	IF10 – SSP to Binary interface cable	Provides connection between IF10 module and NV200
 <p>The diagram illustrates the IF10 – SSP to Binary interface cable (CN00292). It shows a top-down view of the cable assembly. The cable is 1950 units long. At each end, there is a 16-pin connector. The left connector is labeled CON1 and the right connector is labeled CON2. Both connectors have pins numbered 1 to 16. The cable is composed of a standard 4-core PVC cable with heat shrink sleeves (black) at each end. Dimensions are provided: 5 units for the connector housing, 10 units for the heat shrink sleeve, and 10 units for the cable length. The main cable length is 1950 units.</p>		
<p><b>Comments:</b> Please consult the tables on the next page for pin out and connector information.</p>		

**CN00292 Parts List**

Qty	Description	Supplier	Alternative
2	8 way 2 row 2.54mm pitch friction lock housing	Leotronics 2652-2161	Molex 90142-0016
8	Tin plated crimp socket 22-24 AWG	Leotronics 2653-2000	Molex 90119-0110
2	Black heat shrink sleeving	---	---
1	22 AWG stranded 4 core cable, PVC insulated	---	---

**CN00292 Connectivity**

CON1	CON2	Gauge	Colour	Comments
Pin				
1	1	24 AWG	Orange	
5	5	24 AWG	Brown	
15	15	24 AWG	Red	V IN
16	16	24 AWG	Black	GND
<b>Notes:</b> Pins 3, 4, 7, 8, 9, 10, 13 and 14 have no crimps fitted Pins 2, 6, 11 and 12 have crimps fitted but these are not connected.				

**WARNING!**

**Use correct wire gauges**

If you choose to make your own cables, you must make sure that the wire gauges are suitable for use with the validator. The minimum wire gauge for the CN00292 cable is **24 AWG**, with **22 AWG** being recommended.



ITL Part Number	Description	Details
<b>CN00414</b>	RS232 to NV200 interface cable	Provides 12V or 24V supply and RS232 communications to NV200
<p><b>Comments:</b> Please consult the tables on the next page for pin out and connector information.</p>		

**CN00414 Parts List**

Item	Qty	Description	Supplier	Alternative
A	1	9 way solder 'D' socket	Multicomp 5501-09SA-02-F1	Farnell 1084678
B	1	9 way 'D' socket shell	MH Connectors DPPK9-BLACK-K	RS 469-889
C	5	Tin plated crimp	Molex 90119-2110	Farnell 9733272
D	1	2 x 8 way 2.54mm pitch housing with key	Molex 90142-0016	Farnell 3291613
E	1	3 core 24 AWG stranded cable, AWM type 2464	---	---
F	1	Red 22 AWG stranded wire, PVC insulated, UL1007	---	---
G	1	Black 22 AWG stranded wire, PVC insulated, UL1007	---	---
H	1	Stackable red 4mm banana plug	Deltron 553-0500-01	Farnell 1101199
I	1	Stackable black 4mm banana plug	Deltron 553-0100-01	Farnell 1101106
---	10	Black heat shrink sleeving	---	---

**CN00414 Connectivity**

CON1	CON2	CON3	CON4	Gauge	Colour	Comments
<b>Pin</b>						
2	6	---	---	24 AWG	Brown	Rx (DTE - DCE)
5	16	---	---	24 AWG	Black	GND
3	7	---	---	24 AWG	Orange	Tx (DTE - DCE)
---	16	1	---	22 AWG	Black	GND
---	15	---	1	22 AWG	Red	V IN



**Notes:**

CON2 Pin 16 has two wires crimped together.

CON1 connects to host.

CON2 connects to validator.

T1 (CON4) connects to +V of power supply.

T2 (CON3) connects to 0V (GND) of power supply.

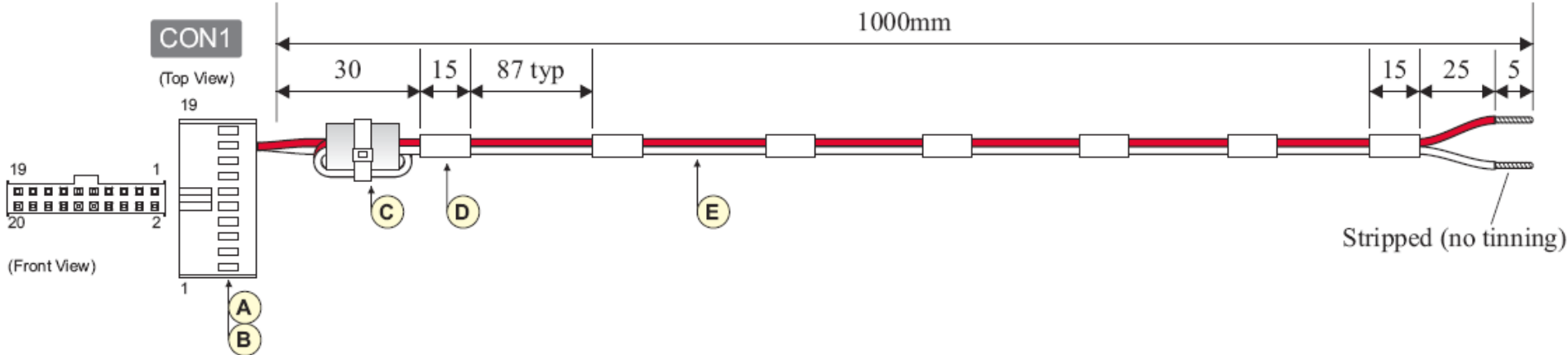
**WARNING!**

**Use correct wire  
gauges**

If you choose to make your own cables, you must make sure that the wire gauges are suitable for use with the validator. The minimum wire gauge for the CN00414 cable is **24 AWG**, with **22 AWG** being recommended.





ITL Part Number	Description	Details
CN00459	NV200 power cable	Provides 12V or 24V supply only to NV200
 <p><b>Comments:</b> Please consult the tables on the next page for pin out and connector information.</p>		

**CN00459 Parts List**

Item	Qty	Description	Supplier	Alternative
A	1	20 way 2 row 2.54mm pitch friction lock housing	Molex 90142-0020	Farnell 3291637
B	4	Gold plated crimp socket 22-24 AWG	Molex 90119-2110	Farnell 9733272
C	1	Type 'T' toroidal core, 16.5 x 8.2 x 16mm	Paddiford 10-13-165082160-0	RS 261-8928
D	10	Black heat shrink sleeving	---	---
E	2	22 AWG stranded wire, PVC insulated	---	---

**CN00459 Connectivity**

Connector	Pin	Gauge	Colour	Comments
CON1	17	22 AWG	Red	V IN
	18	22 AWG	Black	GND
<b>Notes:</b> CON1 Pins 3, 6, 15 and 16 have crimps fitted but these are not connected.				

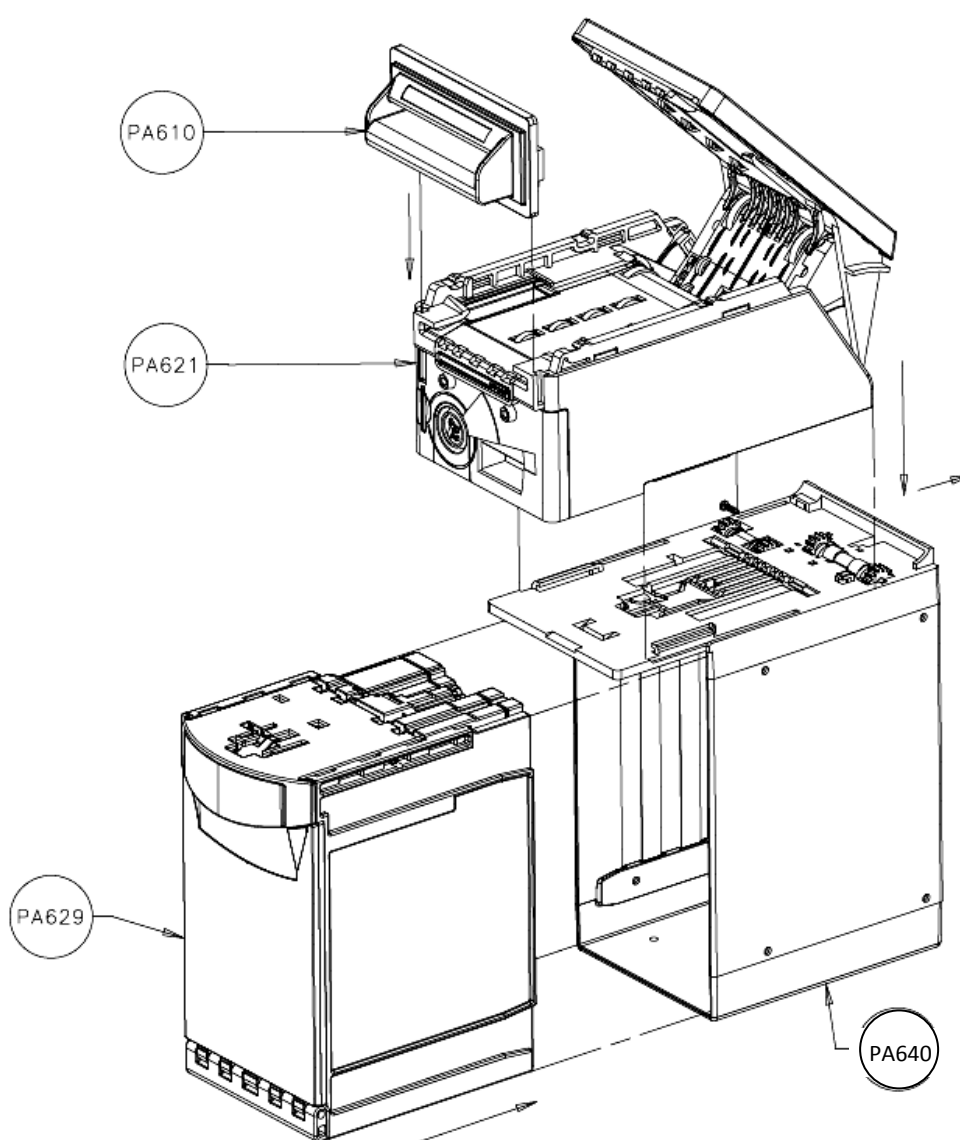
**WARNING!**

**Use correct wire gauges**

If you choose to make your own cables, you must make sure that the wire gauges are suitable for use with the validator. The minimum wire gauge for the CN00459 cable is **26 AWG**, with **22 AWG** being recommended.



ITL Part Number	Alternative Part Number	Description
<b>PA00610</b>	---	Bezel Assembly
<b>PA00621</b>	---	NV200 Validator Head Assembly
<b>PA00629</b>	---	Cashbox Final Assembly
<b>PA00640</b>	---	Chassis Assembly
<b>PA00650</b>	Camlock 28D181CPA	Lock Assembly (see subsection 4.9 of this manual for lock fitting instructions)



## 4.9 Guidance Notes

### Cleaning

**WARNING!**

**Do not attempt  
disassembly**

Do not attempt to disassemble the NV200 validator head – trying to do this could cause personal injury and will damage the unit beyond repair.

The NV200 Validator has been designed in a way to prevent damage and airborne contamination reaching the optical sensors; however, depending upon the environment the NV200 may require occasional cleaning.

**Caution!**

**Do not use solvent based  
cleaners on any part of the  
NV200 unit.**

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

You can clean the NV200 note path with the head unit still fitted to the chassis, although you may find it easier to remove the head from the chassis assembly.

To remove the NV200 head unit, first unlock the NV200 cashbox and head release lock (if fitted)

Then, lift the silver head release catch located on the front of the NV200

Finally, slide the head unit forward and lift it off the chassis

**WARNING!**

**Disconnect power BEFORE  
any cleaning operation**

You should disconnect the power BEFORE carrying out any cleaning operations to avoid the risk of causing damage to the validator.



After removing the head unit, to open the note path cover, pull the top cover release latch forward (towards the bezel) and lift the cover as shown here (it is recommended to also remove the front bezel to allow correct cleaning of the note path guides):



The note path is now visible and can be cleaned. Carefully wipe the surfaces with a soft lint free cloth that has been moistened with a water and mild detergent solution (e.g. household washing up liquid) - be very careful when cleaning around the sensor lenses and make sure they are clean and dry before closing the cover and restarting the unit.

**Caution!**

Do not use solvent based cleaners on any part of the NV200 unit.

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

**Caution!**

Do not use any lubricants.

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

**WARNING!**

Do not try to disassemble

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

## Re-Initialisation

The NV200 validator has an in-built self-calibration system that keeps the optical sensors in optimum operating condition. However if the NV200 is disassembled for any reason it also will need to be re-initialised - re-initialisation can only be carried out by ITL's technical support team.

## Bezel Removal and Replacement



### WARNING!

Ensure bezel is secured to validator

The front bezel should be secured to the validator head using screws if the NV200 is being installed and transported inside a host machine.



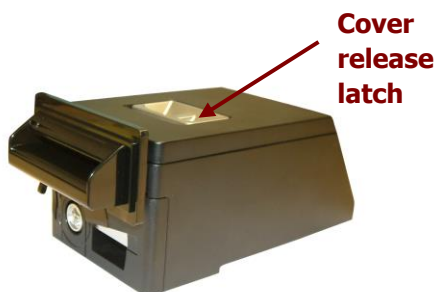
### Information

Check bezel fixing screw length before installation.

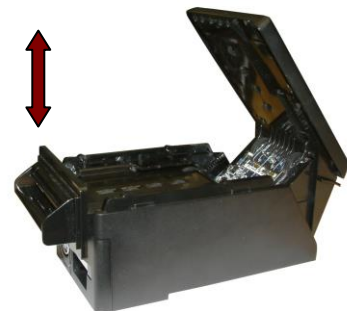
The length of the bezel fixing screws must be no more than 12 mm in length.

The bezel on the front of the NV200 validator has been designed to be removed and refitted very easily.

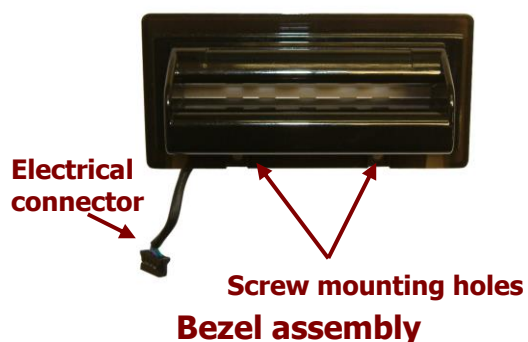
To remove or refit the bezel, access to the note path is required as described earlier in this section – the top cover must be open fully to allow access to the bezel mounting area.



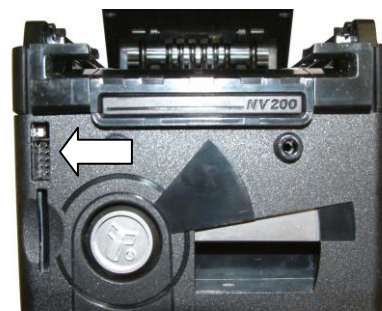
**Validator note path cover**



**Bezel removal and fitting**



**Bezel assembly**



**Bezel connector socket**

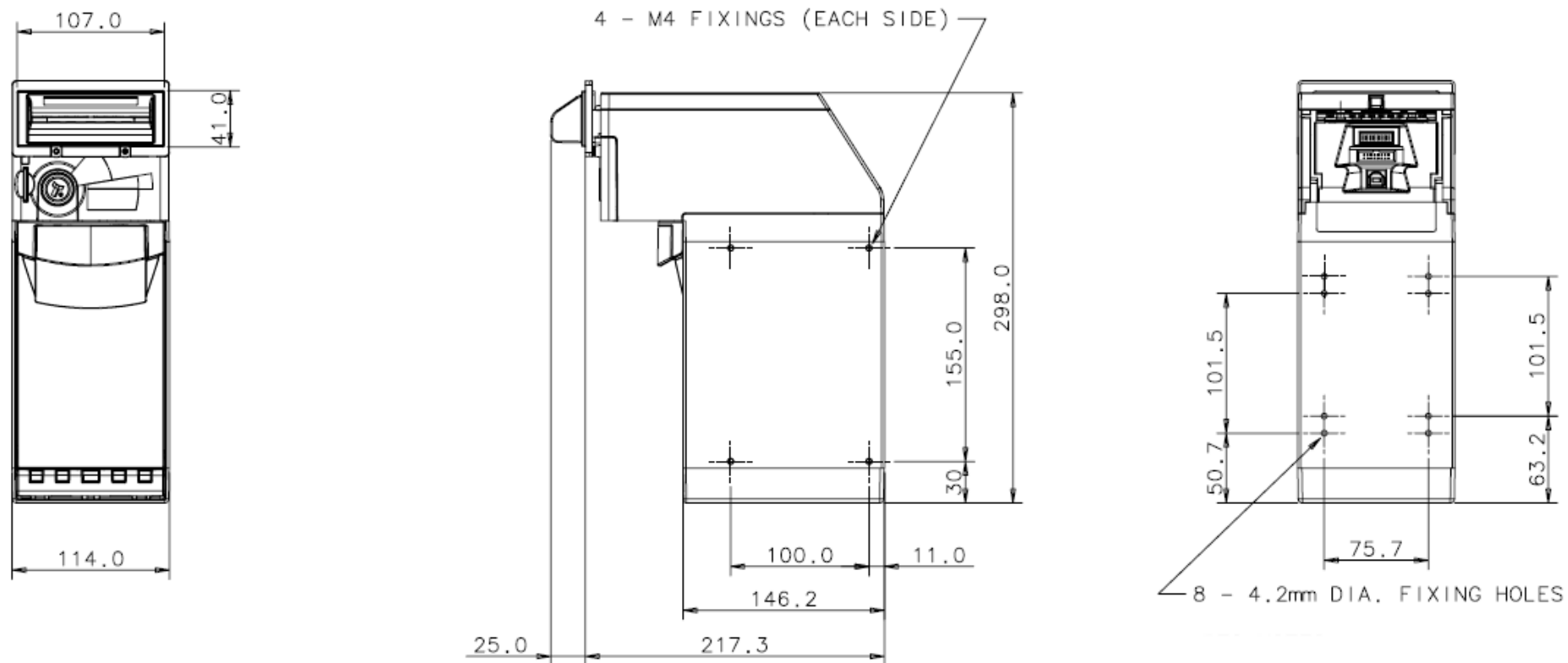


Removing the bezel: Lift the upper cover by pulling the top latch forward. If fitted, remove the two bezel securing screws and then slide the bezel assembly upwards. Finally unplug the cable from the socket on the front of the validator head.

Fitting the bezel: Lift the upper cover by pulling the latch forward. Connect the cable from the bezel assembly to the socket located on the front of the validator head and slide the assembly down into place and then close the note path upper cover. If required, the bezel can be secured in place with two M3 screws - these are fitted in the two holes at the bottom of the bezel.

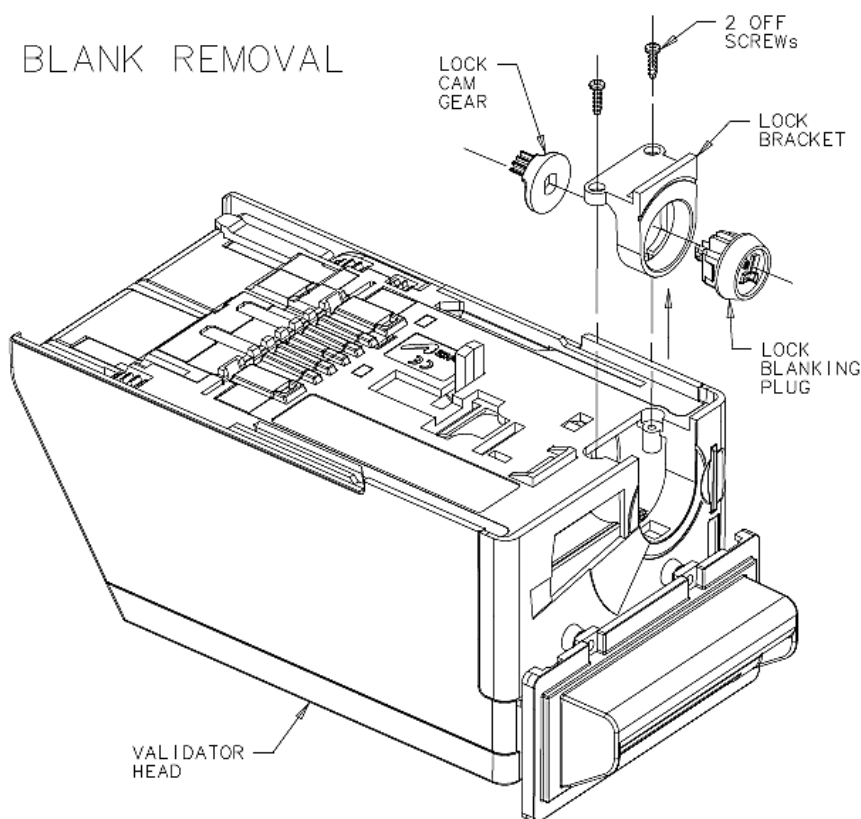
## 4.10 Drawings and Schematics

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

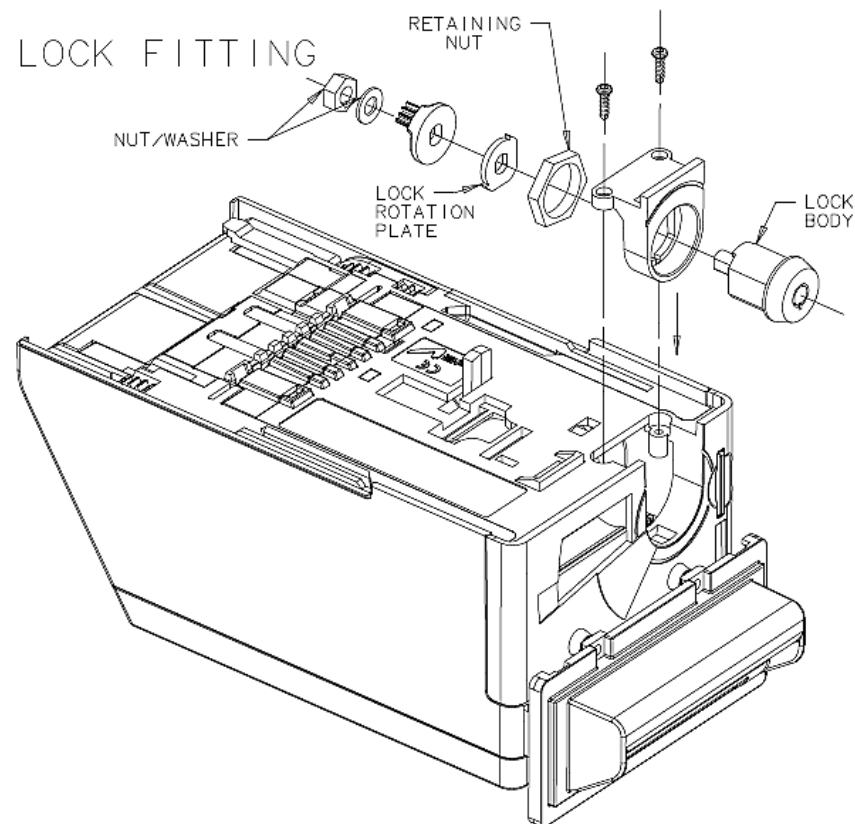




## NV200 Validator Lock Fitting:

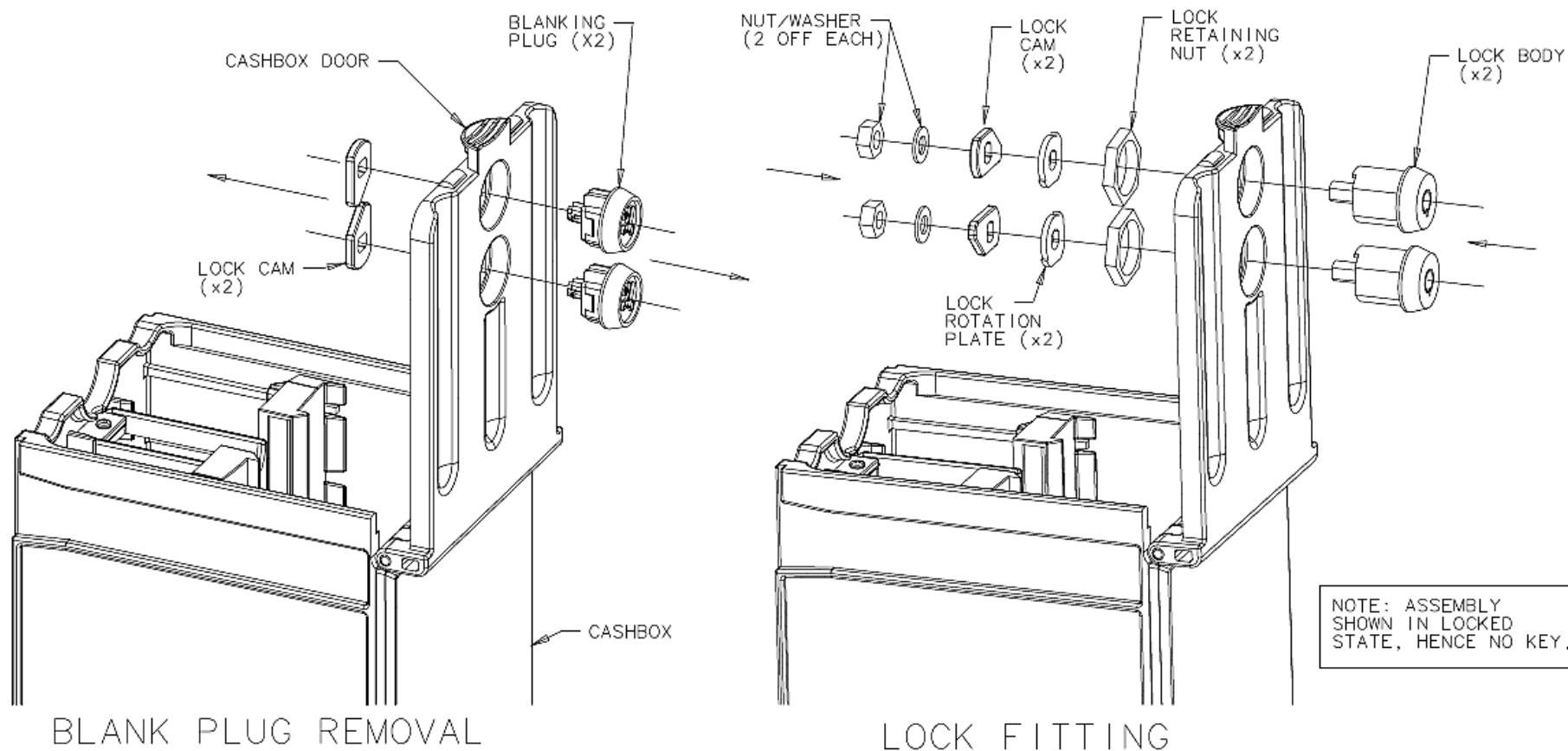


1. Unscrew the two screws (indicated) with a T8 Torx screwdriver
2. Remove the lock bracket from the validator head
3. Unclip the lock blanking plug and cam gear (keep these for use later)
4. Fit the lock into the bracket (as shown), and fix in place with the lock retaining nut



5. Place the lock rotation plate over the lock stub as shown
6. Place the lock gear cam on the lock stub and fasten with a washer and nut
7. Insert the lock key and rotate clockwise; place the assembly back into validator head and fit the screws. (finger tight)
8. When the validator is fitted to the chassis, turn the lock key anticlockwise and remove

## NV200 Cashbox Lock Fitting:



1. Open the cashbox door
2. Unclip the lock cams from the blanking plugs (keep these for use later)
3. Unclip the two blanking plugs from the cashbox door
4. Fit the two lock bodies into the door recesses as shown

5. Fix the locks in place with the two retaining nuts
6. Fit the lock rotation plates in place
7. Fit the lock cams to the lock stubs as shown
8. Secure the cams with the retaining washers and nuts

## MAIN HEADQUARTERS

Innovative Technology Ltd  
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