Innovative Technology

POWERING TRANSACTIONS AND INTERACTIONS

NV4000 Range User Manual

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Change History

Version	Date	Comment
1	23 Dec 2024	Initial Release

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NV4000 Range Product Information

Contents

General Description

The NV4000 is a highly secure and technologically advanced banknote validator and multiple denomination recycler built upon ITL's market leading NV200 Spectral technology. State of the art spectral sensors offer complete note image capture by scanning over 4.8 million data points to authenticate the validity of notes. The unit boasts 99%+ first time acceptance of new and street grade notes with a note to note processing time of 2 seconds.

The unit contains a number of security features including optical and mechanical anti-strimming technology that delivers outstanding fraud protection. The NV200 Spectral's cutting-edge note straightening mechanism, together with 4-way barcode acceptance bring the user exceptional note handling and increased ticket acceptance rates.

The NV4000 has 4 single denomination recycling drums as well as a 400 mixed denomination replenishment cassette that can either be used to refill the recycling drums or as a direct payment. With spray payout and note-to-note dispense times less than 2s the NV4000 provides market leading speed in class.

NOTE: The replenishment cassette performs discrimination on staff verified notes.

Key Features

- 100% note image capture - 4.8 million data points
- 99%+ first time acceptance of new & street grade notes
- Stained note detection
- 2 second note to note processing
- Modular design – 1 – 4 modules & additional replenishment cassette
- 280 note capacity + 400 note loader
- High level API provided to aid integration

Typical Applications

The NV200 Spectral validator can be used in a variety of situations where high security and high-volume bank note acceptance and validation are needed. Some typical applications are:

- Kiosks
- Casino redemption points
- Retail environment such as POS Systems

Component Overview

Single Note Feed

Cashbox Options

1000n Cashbox

Recycler Options

Module Options

NV200 Spectral Options

ITL Part Numbers	Description
PA02158	NV200 Spectral Head

NV200 Spectral Bezel Options

ITL Part Numbers	Description
PA00610	Standard Bezel (85mm)
PA00639	Metal Bezel
PA01038	Self-Aligning Bezel (White)
PA02053	Self-Aligning Bezel (Black)
PA04224	Coin Resistant Metal Bezel

Cashbox Options

Some national currencies differ in thickness and circulation practices. Depending on usage, this can impact cash box capacities by 10-15%. Consult with your ITL representative for more details.

ITL Part Number	Description
PA02739	500/1000 Note Cashbox Chassis
PA02931	1000 Note Cashbox Inner

Recycler Options

ITL Part Number	Description
PA03048	NV4000 Interface
PA03070	Recycler Assembly
PA00357	Conveyor Housing
PA03040	Conveyor

Module Options

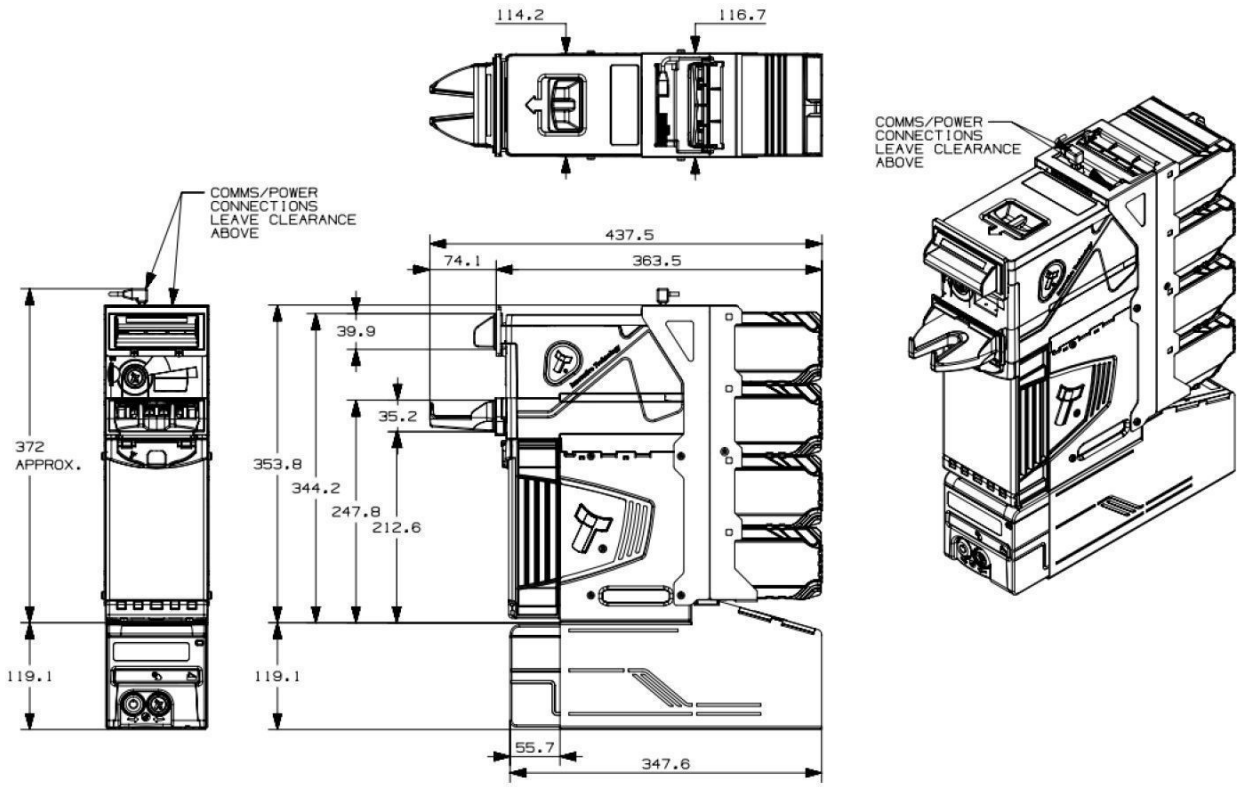
ITL Part Number	Description
PA03492	Replenishment Dock
PA03493	Replenishment Cassette Assembly

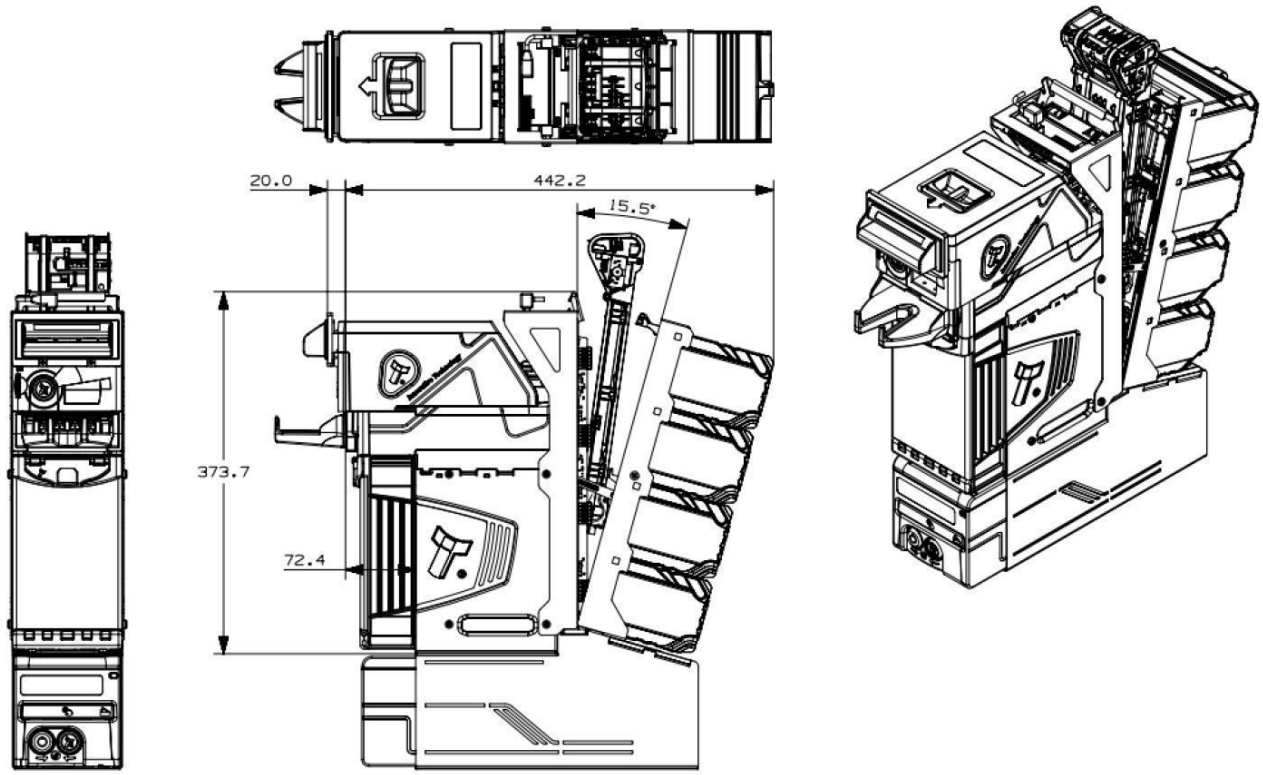
NV4000 Range Technical Data

Contents

Dimensions

The dimensions below are for the NV4000, 1000n cashbox with 4 recyclers and the replenishment cassette. Other cashbox / module options will change the dimensions. For dimensional drawings of other configurations contact support@innovative-technology.co.uk





Weight

The tables below show the weights for the individual components of the product.

For example, and NV200 Spectral with Standard Bezel and 500 Note Cashbox with Chassis would weigh 3.21Kg (1.20 Kg + 2.01 Kg)

Standard Unit - No Cashbox

Unit	Weight Empty	Weight Full
NV200 Spectral - Standard Bezel	1.20kg	N/A

Cashbox Options

Unit	Weight Empty	Weight Full
1000 Note Cashbox and Chassis	2.19kg	3.09kg

Module Options

Unit	Weight Empty	Weight Full
Recycler Module		
Conveyor		

Unit	Weight Empty	Weight Full
Interface		
Replenishment Cassette		

Environmental Requirements

Operation

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

Storage

Environment	Minimum	Maximum
Temperature	0°C	+60°C
Humidity	5%	95% Non-condensing

Transitioning from storage to operational temperatures should be done no faster than 2^{0}C per hour.

Power Requirements

Supply Voltages

Supply Voltage	Minimum	Nominal	Maximum
Supply Voltage (VDC)	+22.6VDC	+24VDC	+26.4VDC
Supply Ripple Voltage	0V	0V	0.25V @ 100 Hz

Supply Currents

The supply current required to run the NV200 Spectral will vary during the phases of operation, the maximum current the device can draw is 7A.

Power Supply Guidance

Check the power requirements of the host machine and other peripherals to dimension a suitable power environment for the machine setup.

The unit shall be supplied from a source specified as Electrical Energy Source Class 1 (ES1) to IEC/UL 62368-1, or specified as SELV according to IEC/UL 60950-1

TDK Lambda manufactures suitable power supplies. See table below for further details.

Power Supply Unit	Specification	RS Stock Code	Farnell Stock Code
TDK Lambda RWS-300B-24	+24VDC / 12.5A	813-9128	2419997

Interface Logic Levels

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

Reliability Data

Below is an explanation outlining the Mean Cycles Between Failure (MCBF) & Mean Cycles Between Interruption (MCBI) for the NV200 Spectral. Where a cycle is defined as a note/ticket either stacked, stored or paid-out. An example is if £20 is accepted and a £10 paid out that would be classed as 2 cycles.

The difference between MCBF and MCBI is that a failure is classed as an event which will require a service call – e.g. unit is seeing poor acceptance. Whereas an interruption is an event which store/site staff could rectify without a trained engineer present – e.g. clearing a note path jam.

The target MCBI / MCBF figures are listed below:

MCBI: 25,000
MCBF: 100,000

Media Requirements

The NV200 Spectral is capable of handling multiple denominations simultaneously, the media that can be accepted includes, but is not limited to:-

- Paper notes
- Polymer notes
- Windowed notes
- Barcoded tickets

Minimum and Maximum dimensions for IN via NV200 Spectral

	Minimum	Maximum
Length	110mm	165mm
Width	60mm	85mm

Minimum and Maximum dimensions for IN via Replenishment Cassette

	Minimum	Maximum
Length	110mm	165mm
Width	60mm	79mm

Minimum and Maximum dimensions for notes to Recyclers

	Minimum	Maximum
Length	110mm	165mm
Width	60mm	82mm

Note Quality Guidelines

When loading notes in through the validator or the replenishment cassette, ensure that notes are in good condition and are stacked neatly together to ensure optimum performance:

Do not load any of the following notes into the validator, this may cause poor performance or malfunction:

Damaged Notes

Taped Notes

Folded Notes

Torn Notes

Wet Notes

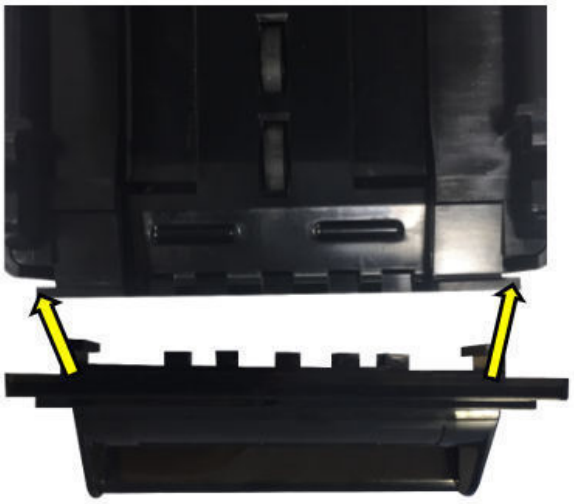
Inserting any of the notes above can cause jams or notes to be left unprocessed

NV4000 Range Mechanical Installation

Contents

Bezel Mounting

1	**Open Note Path** Pull the top latch in the direction shown to unlock the note path	
2	**Open Upper Note Path** When the note path has unlocked, lift the upper part to give clear access to the front	

3	**Attach Bezel Cable** Plug the bezel cable into the connection socket on the front. Ensure that the tab on the connector aligns with the notch on the socket	
4	**Insert Bezel** Slide the bezel down into the slots on the front of the bezel	
5	**Close Note Path** Push the upper note path back down until you hear it click firmly back into place	

Cashbox Removal & Opening

1	**NV200 Spectral** The image to the right shows the NV200 Spectral with 1000 note cashbox	

2	**Cashbox Handle** Pull the cashbox handle forward, this will unlatch the cashbox, allowing it to be slid forward from the chassis	

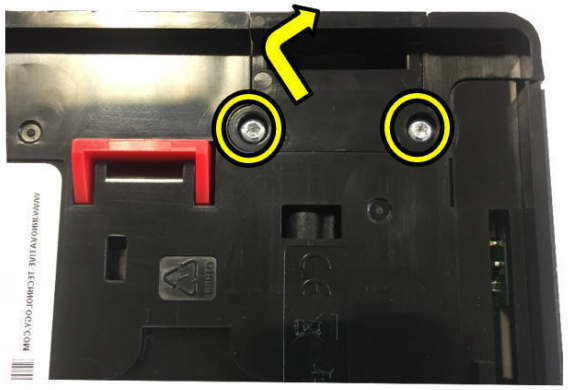
3	**Slide Cashbox Forward** Continue to pull the handle forward, sliding the cashbox completely free from the chassis	
4	**Turn Cashbox Over** To access the cash, turn the cashbox as the door is on the bottom	

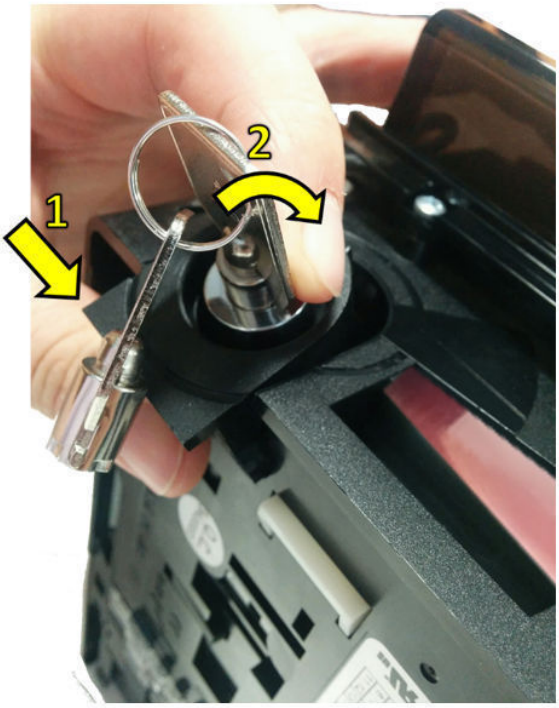
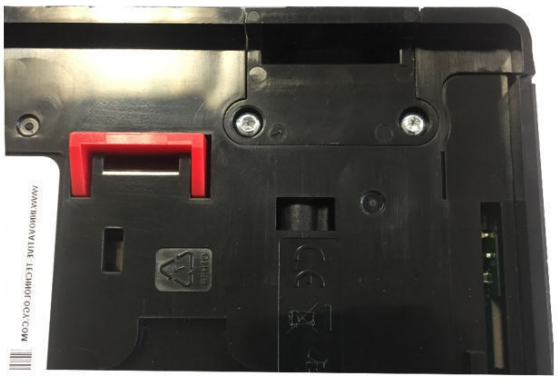
5	**Open Cashbox** Push the black door latch in and lift the door at the same time	

Lock Mounting

NV200 Spectral

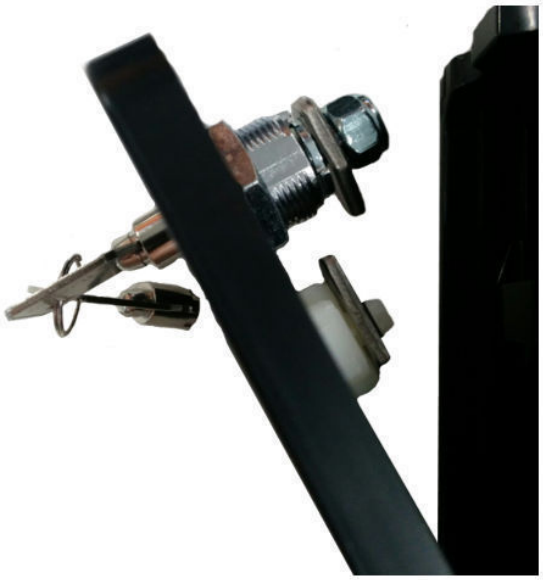
1	**Lock Location** The Lock can be fitted to the front of the NV200 Spectral replacing the red front insert (shown to the right) which ships by default	
2	**Remove head from chassis** Before the lock can be installed, remove the NV200 Spectral from the cashbox chassis. Lift the latch, slide the head forward and lift the head away from the chassis	

3	**Remove red insert** There are 2xT8 screws located on the underside of the NV200 Spectral, remove those and lift away the plastic insert	
4	**Remove Locking Cam** Press the plastic clip together and remove the locking cam	
5	**Remove Plastic Insert** To remove the plastic insert, from the lock mount, press the two clips on the side together and push through. Insert the cam lock in its place	

6	**Re-attach Locking Cam** Re-attach the locking cam onto the barrel of the lock and tighten	
7	**Fit Assembled Lock** To fit the assembled lock into the unit, place the bottom in first the push the top into position	
8	**Screw in place** Turn the unit upside down and screw in the 2xT8 screws previously removed	

Cashbox

1	**Cashbox Lock Location** The standard NV200 Spectral cashbox can be fitted with 2 locks for security. These are located on the bottom of the cashbox on the hinged door	
2	**Remove Blanking Plates and Fit Lock** Similarly, to fitting a lock on the front of the NV200 Spectral remove the locking cam and blanking plate which is there by default and replace with the desired lock	

3	**Finish Installation** With the lock in place add the washer and the locking cam Ensure when the keylock is turned the locking cam is inserted in the same position it was previously removed otherwise it can cause interference.	

Replenishment Cassette

1	Undo 2 screws inside of the replenishment cassette	
2	Remove the bottom panel	

Lock Specification

Locks for the NV200 Spectral are available from Innovative Technology Ltd.
ITL Part Number: PA00650

There is also a keyless lock assembly available, this comes as standard on the 1000 note cashbox.
ITL Part Number: PA02713

There are various lock manufacturers and distributors. Refer to NV4000 Range Appendix for lock specification.

Lock Cam

The following Lock Cams are included with the product.

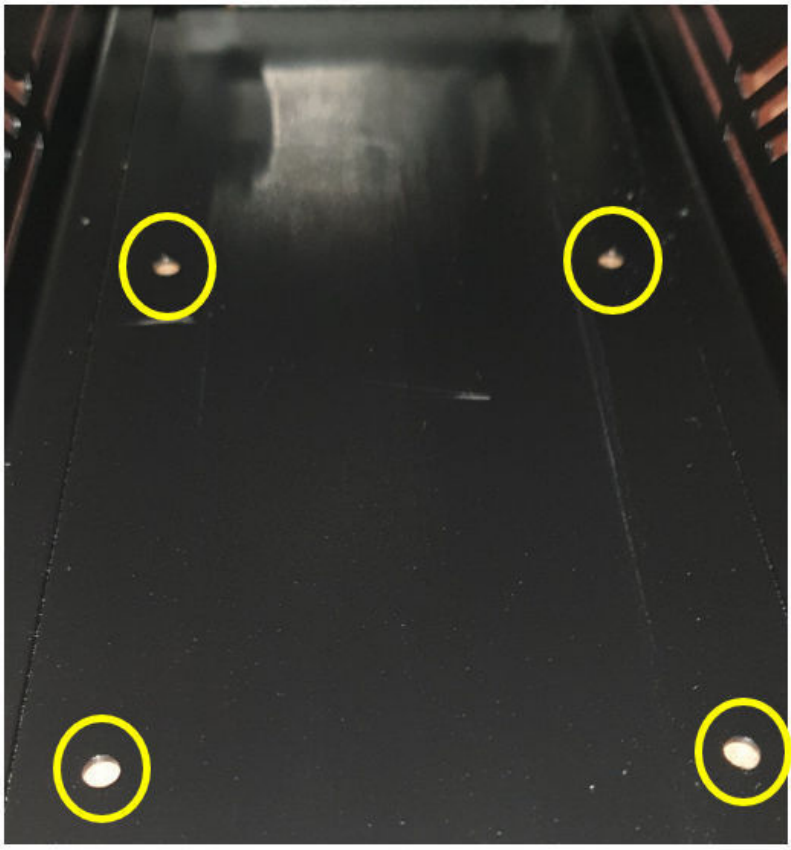
NV200 Spectral Lock Cam Part Number: PM00614

Cashbox Lock Cam Part Number: MC00247

Earth Bonding

It is very important that the NV200 Spectral is properly bonded to earth, using one of the earth tabs. Earthing on the standard chassis can be affixed to the lower screw mounting points at the side of the unit:

If you are using a replenishment cassette the 4 mounting holes on the bottom of the cassette can be used.



The resistance between the chassis and Earth should be less than 0.7Ω.

Lack of proper earth bonding causes failures!

Screw Specification

The scope of delivery does not include screws for machine mounting. See table below for screw specification reference.

Location	Thread Type	Screw Length
Bezel	M3	12mm
Cashbox	M4	6mm

Things to Consider

When mounting an NV4000 there are several things to consider including:

- Weight of a fully loaded unit as defined in Weights
- Accessibility – allow enough space to reach all connectors, switches and to allow access should clearing a jam be required. Details of which can be found in Dimensions
- Cable management – ensure no connectors are damaged/removed from everyday use.
- Visibility of the top bank of LED's help to identify an error with the device.

NV4000 Range Software Installation and Configuration

Contents

Introduction

The NV4000 leaves the factory programmed with the latest dataset and firmware files, unless specifically requested. However, it is important to ensure your device is kept up to date with the latest dataset and firmware. This section will give you a brief overview of the various update possibilities with the NV4000. For detailed instructions refer to the relevant manual package supplied with the software or contact support@innovative-technology.co.uk

Software Downloads

All software from Innovative Technology Ltd is free of charge and can be downloaded from the website once registered and logged in. If you are not registered, create an account via the Create an account form. A confirmation email will be sent to the registered email address once all contact details have been successfully submitted.

Drivers

The ITL drivers allow you to connect any of our validators to a compatible Windows device. If you are connecting via an IF17 then you will not need to follow this process as they are signed Microsoft Drivers and should install automatically. If this isn't the case or your computer is disconnected from the network, there is a standalone package included within the driver downloads.

Dataset/Firmware Programming

Validator Manager

General Description

Validator Manager is a utility which allows the user to reprogram any of ITL's validators, hoppers as well as coin and note recycler. Note that admin rights are required during installation. The validator must be in SSP for the Validator Manager to detect the device.

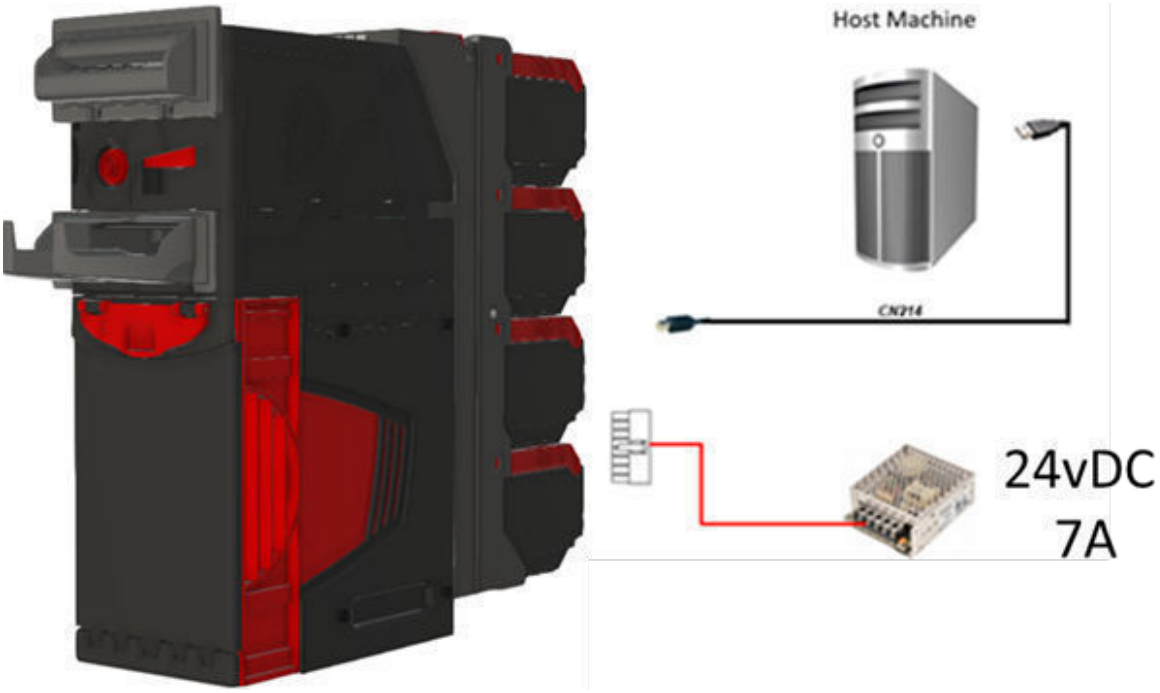
System Requirements

- Microsoft Windows 8.1 and above
- .Net Framework 4.5 and above
- 256mb ram
- 50mb hard disk free
- Connected NV200 Spectral with active com port

We have seen instances where one of the dll's (itdata1.dll) used in Validator Manager are flagged as a Trojan, this is a false positive and if this happens you will need to add a rule to your antivirus to allow the file to run.

Hardware Setup

The connection example below shows a direct USB connection between the NV200 Spectral and the host machine (PC). For other connection examples see NV4000 Setup Examples

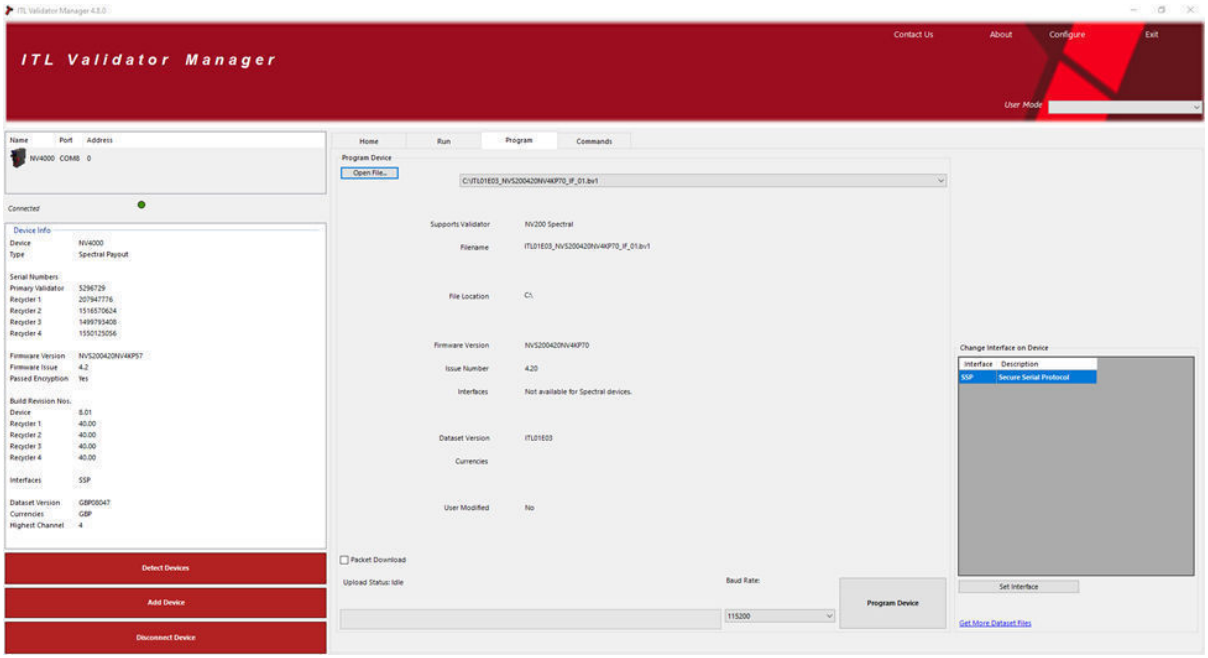


Programming the Device

Open Validator Manager and click detect devices. This will scan all active com ports for a unit, if the NV4000 fails to connect ensure the correct drivers are installed and the unit is in SSP.

By selecting the Program tab, you can reprogram the NV4000. To begin the upload, click open file, then browse to the file location (usually Downloads) before clicking OK.

Once the file has been selected its information will be populated and the Program device tab will become active. Finally, hit 'Program Device', the unit's bezel will now begin to flash signaling the update has begun. When completed the unit will restart and a pop-up box will appear saying Device Programming Complete.



Interrupting the download process can result in the unit entering a non-functional state, once the process has started it cannot be halted.

SD Card

General Description

The NV4000 can also be reprogrammed through the SD slot on the front of the unit. To do this the SD card must be correctly formatted and meet the hardware requirements defined below.

Hardware Requirements

The SD card must meet the following hardware requirements:

Minimum: 4GB – Class 10

Maximum: 32GB – Class 10

The following SD card has been tested and recommended for best performance: https://www.sandisk.co.uk/home/memory-cards/sd-cards/ultra-sd

Re-programming via SD Card

Follow the steps below to set up the SD card and perform the update:

1	Connect the SD card to your PC using an SD card reader
2	Ensure that the card is FAT-32 formatted and is blank
3	Create a folder on the SD card called nv200hs This must be lowercase
4	Inside the folder, place the dataset file that you want to load on to the validator. Datasets can be downloaded from the Innovative Technology website.
5	Ensure the NV200 Spectral is powered on and has booted up
6	Insert the SD card into the slot on the front. The bezel will now start flashing Do not unplug the validator during the update process
7	Wait until the bezel lights solid green. When it does, the SD card can be removed
8	After the SD card has been removed, the unit will reboot. This takes around 10 seconds. Once it has rebooted the unit will begin updating the NV4000 modules

Remote Updates

General Description

The unit can be updated through an SSP command which sets the validator into an update mode before downloading the firmware file. Details of how this process is implemented can be found in the SSP Implementation Guide. ITL also provide some example applications to assist in integrating this into host machine software.

This is a complex operation and failure to implement correctly may damage units.

NV4000 Range Protocols and Interfacing

Contents

Introduction

The NV4000 supports SSP which is a proprietary low level protocol developed by Innovative Technology. We provide a high level API that allows for easy integration into your host machine software. This has been developed on .Net Core to ensure cross platform support. Details of which can be obtained from support@innovative-technology.com

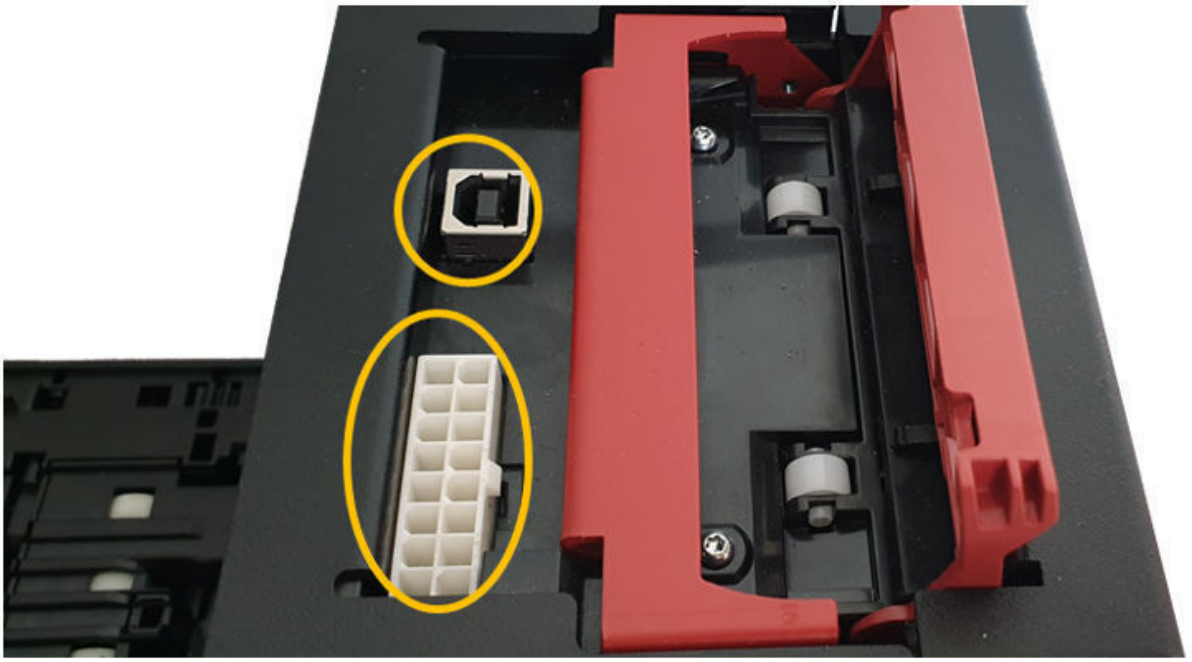
Interface Connectors

The NV4000 uses a 16-pin Molex 0039012165 connector for power and TTL, RS-232 & Opto-isolated interfacing. The connector is located on top of the NV4000 along with a USB B connector.

> Power is always required on pins 15(+V) and 16(0V) of the 16-way connector regardless of connection type.

Pinout

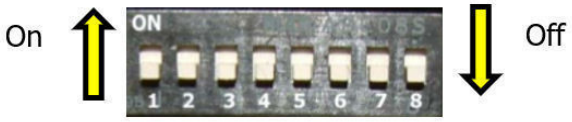
The USB connector is a standard Type ‘B’ USB socket which can be used for communication – a shielded USB 2.0 compliant Type ‘A’ to ‘B’ lead can be used to do this.



User Interfaces

NV200 Spectral Dip Switches

The NV200 Spectral 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 is 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	Protocol Select	Switches between the primary (selected) protocol and SSP (used for Programming). The switch needs to be toggled ON and OFF to alternate between the two. This will cause the unit to reset.		OFF

SSP and eSSP

General Description

Smiley® Secure Protocol (SSP) and Encrypted Smiley® Secure Protocol (eSSP) are field proven secure interfaces specifically designed by Innovative Technology Ltd. to address the problems by cash handling systems. Problems such as acceptor swapping, re-programming acceptors and line tapping are all addressed. This interface is recommended for all new designs. Innovative Technology Ltd. provides full SDK packages upon request including Interface Specification, Implementation Guide as well as source code examples for C++, C#.NET and Linux. Contact support@innovative-technology.co.uk for further information.

Pin Assignments

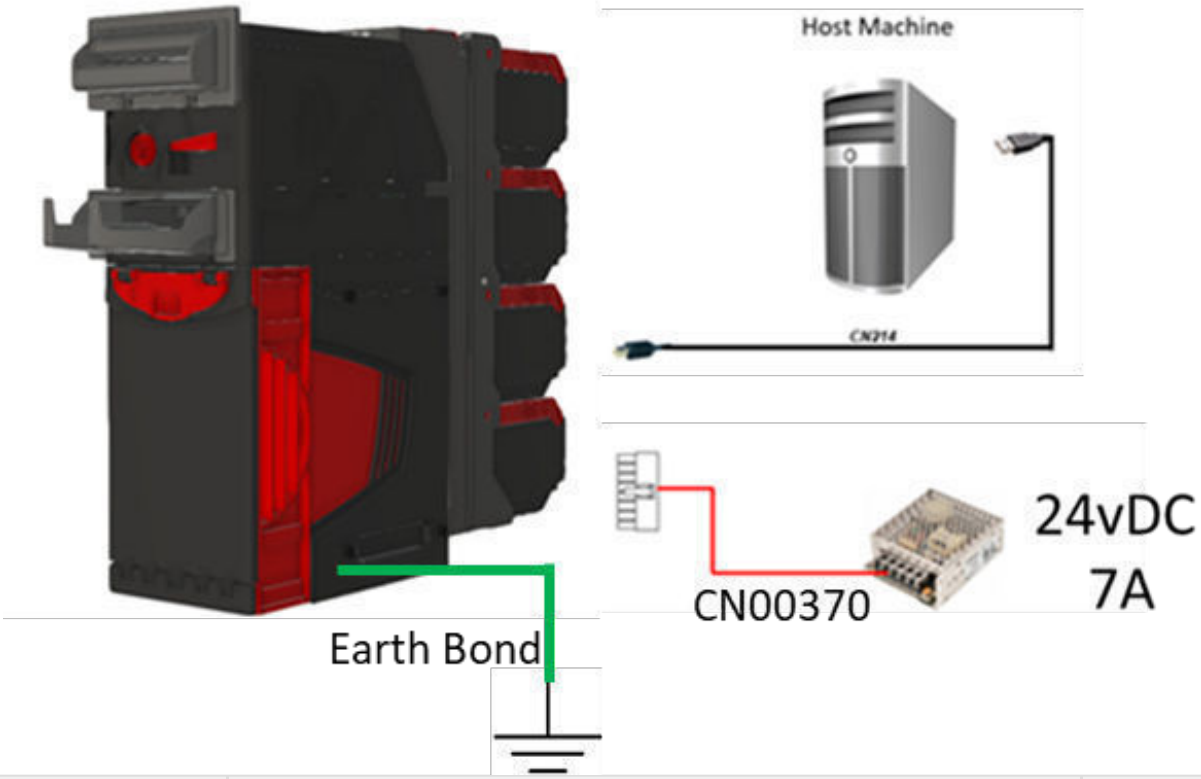
Pin	Name	Type	Description
1	TxD TTL	Output	Serial Data Out (Tx)
3	TxD RS232	Output	Serial Data Out (Tx)
5	RxD TTL	Input	Serial Data In (Rx)
11	RxD RS232	Input	Serial Data In (Rx)
15	+Vin	Power	24VDC Supply
16	0V	Power	0V Supply (GND)

+24VDC and 0V (GND) must always be connected, also when using USB connections.

Setup Examples

The drawings below highlight how to connect the NV200 Spectral to an SSP host machine using available cables and interfaces from Innovative Technology Ltd. For cable drawings refer to NV4000 Range Appendix

NV4000 USB Connection



Part	Description	Quantity
NV4000	NV4000 Bank Note Recycler	1
CN00370	Payout Power Only	1
CN00214	USB A to B Cable	1

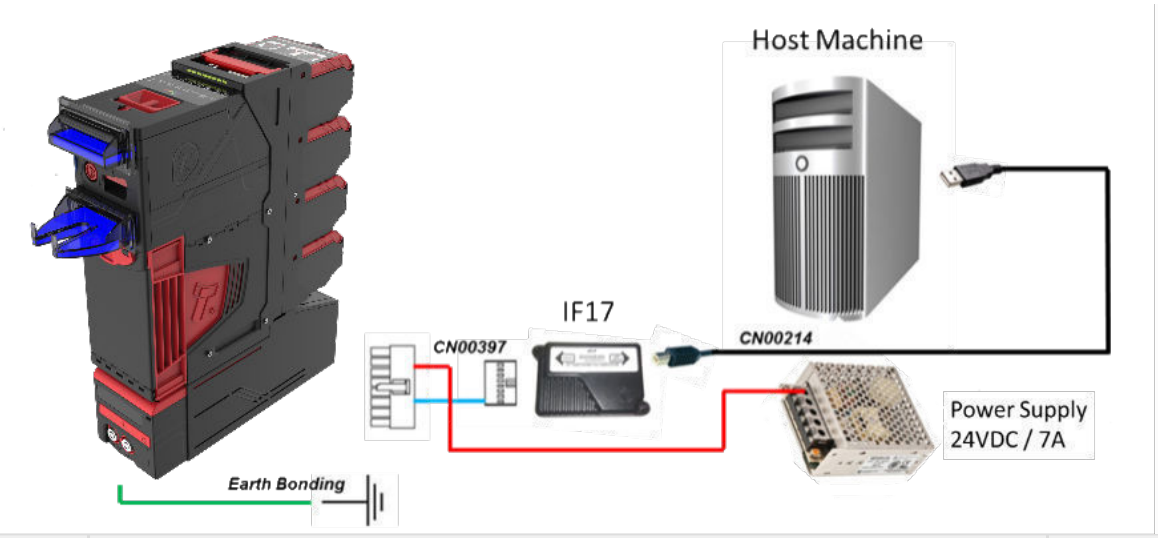
Power Requirements

This setup option requires a stable 24VDC / 7A power supply.

Check the power requirements of your host machine and other peripherals to dimension a proper power environment for your system setup.

It is very important that the cashbox chassis of the NV200 Spectral is bonded to earth, as lack of proper bonding can cause communication issues and failures. The earth bond on a NV200 Spectral should be made to the intended connection on the outer Cashbox. The resistance between the cashbox and the Earth pin on the mains plug should be less than 0.7Ω.

NV4000 TTL Connection



Part	Description	Quantity
NV4000	NV4000	1
IF17	USB Interface Converter	1
CN00397	SMART Payout to Host Cable	1
CN00214	USB A to B Cable Assembly	1

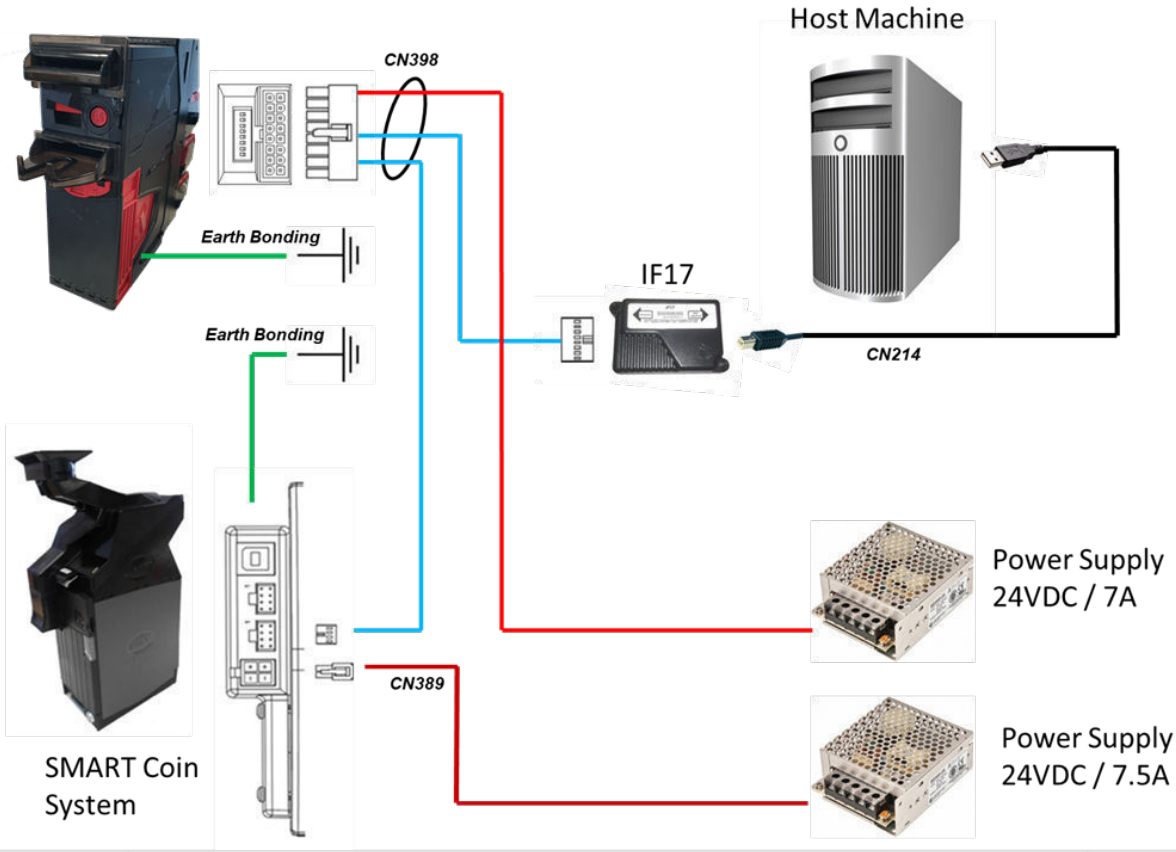
Power Requirements

This setup option requires a stable 24VDC / 7A power supply.

Check the power requirements of your host machine and other peripherals to dimension a proper power environment for your system setup.

It is very important that the cashbox chassis of the NV200 Spectral is bonded to earth, as lack of proper bonding can cause communication issues and failures. The earth bond on a NV200 Spectral should be made to the intended connection on the outer Cashbox. The resistance between the cashbox and the Earth pin on the mains plug should be less than 0.7Ω.

NV4000 And Smart Coin System



Part	Description	Quantity
NV4000	NV4000	1
SCS	Smart Coin System	1
IF17	USB Interface Converter	1
CN00389	SMART Hopper Power Cable	1
CN00398	Spectral Payout Duel SSP to Host Cable	1
CN00214	USB A to B Cable Assembly	1

Power Requirements

This setup option requires a stable 24VDC / 7A power supply for the NV4000 whilst the SCS requires 24V DC 7.5A according to the product specification.

Check the power requirements of your host machine and other peripherals to dimension a proper power environment for your system setup.

It is very important that all devices are bonded to earth, as lack of proper bonding can cause communication issues and failures. The earth bonds on a NV4000 should be made to the intended connection on the outer Cashbox. The resistance between the cashbox and the Earth pin on the mains plug should be less than 0.7Ω.

NV4000 Range Service Guide

Contents

Routine Maintenance

Introduction

The NV200 Spectral has been designed to minimise any problems or performance variations over time. This has been achieved by careful hardware and software design; this attention to the design means there is very little user maintenance required.

Recommended Cleaning Intervals

Innovative Technology Ltd recommends cleaning the optical lenses every month or as required. Dirt, dust or other residue leads to bad note acceptance and other performance degradation. Refer to the section below for detailed cleaning instructions.

Disconnect the power **BEFORE** carrying out any cleaning operations to avoid the risk of causing damage to the validator.

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.

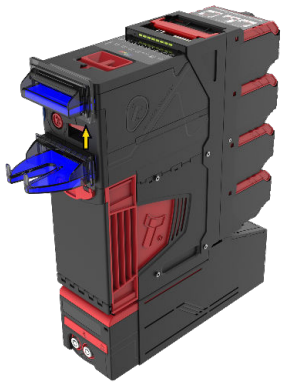
Do not attempt to disassemble the validator head.

Trying to do this could cause personal injury and will damage the unit beyond repair.

Cleaning the NV4000

Cleaning the Validator

The NV200 Spectral note path can be cleaned with the head still fitted to the chassis, although it may be easier to remove the head from the chassis assembly.

To remove the NV200 Spectral head unit, first lift the red head release catch located on the front of the NV200 Spectral. Then, slide the head unit forward and lift it off the chassis	

To open the note path cover, pull the top cover release latch forward (towards the bezel) and lift the cover as shown below (it is recommended to also remove the bezel to allow correct cleaning of the note path guides).

The note path is visible and can be cleaned. Carefully wipe the surfaces with a soft lint free cloth that has been dampened (NOT wet) 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 powering the unit.

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.

Bezel/Status LED Flash Codes

The NV200 Spectral Validator has inbuilt fault detection facilities. If there is a configuration or other error, the NV200 Spectral front bezel will flash in a particular sequence, and a summary of the Bezel Flash Codes for the NV200 Spectral is shown below:

Flashes		Indicated Status / Error	Recommended Action
Red	Blue		
1	1	Note Path Open	Close the lid of the NV200 Spectral validator it will click into place as it shuts.
	2	Note Path Jam	1. Power down the NV200 Spectral 2. Open the NV200 Spectral using the red catch on top and inspect the note path for any note debris 3. If there isn't any evidence of a note carefully remove the NV200 Spectral from the base using the red catch on the front. 4. A note could be just sticking out from the cashbox, remove power and the NV200 Spectral head. 5. If a note is visible remove the note. 6. Re-attach the head and power.
	3	Unit Not Initialised	The NV200 Spectral will need to be returned to your nearest repair centre for repair
2	1	Cashbox Removed	Insert the cashbox, on the NV4000 the interface checks the cashbox sensor so if the issue persists please re-dock the interface.
	2	Cashbox Jam	Follow the steps as advised in X
3	1	Firmware Checksum Error	There has been an issue with the attempted download, retry the download with the recovery section on validator manager, if this fails arrange for the unit to be returned to the nearest repair centre; details of which can be found on our website.

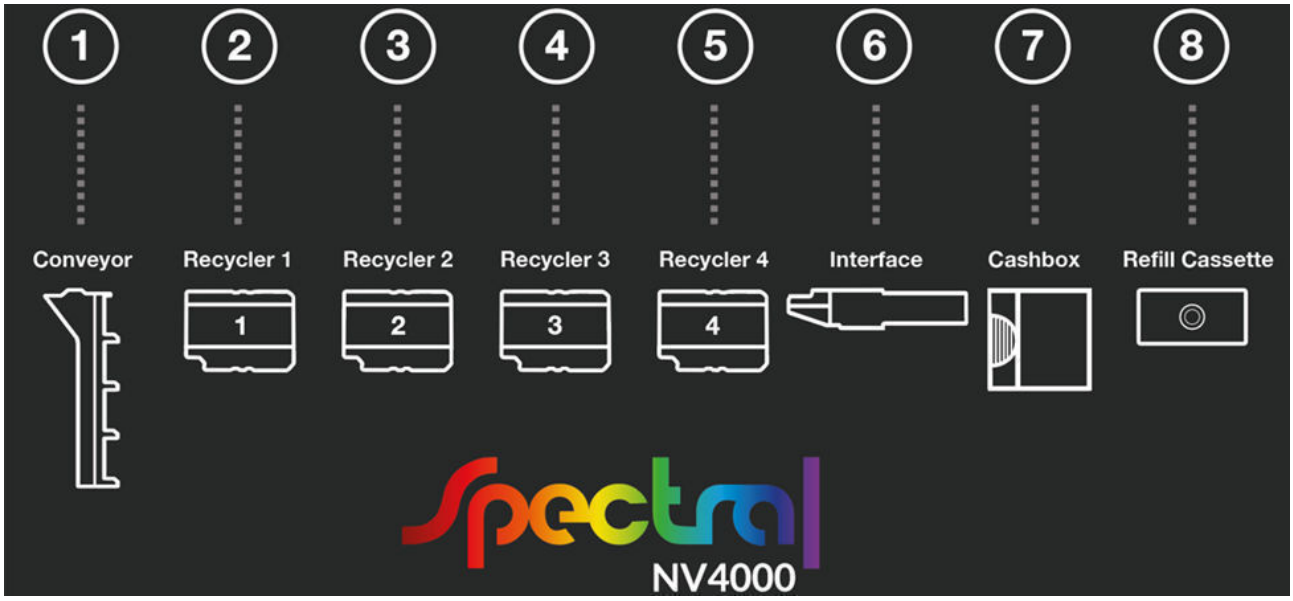
	2	Interface Checksum Error	The firmware loaded doesn't contain the primary interface from the previous firmware. Download with the IF file containing the correct protocol.
	3	EEPROM Checksum Error	There has been an issue with the attempted download, retry the download with the recovery section on validator manager, if this fails arrange for the unit to be returned to the nearest repair centre; details of which can be found on our website.
	4	Dataset Checksum Error	
4	1	Power Supply too Low	Check the voltage on your power supply is within the specified voltage range as outlined in Power Requirements If the voltage appears to be correct, check to ensure the power supply voltage doesn't vary by more than 10% under minimum current draw.
	2	Power Supply too High	Check the voltage on your power supply is within the specified voltage range as outlined in Power Requirements If the voltage appears to be correct, check to ensure the power supply voltage doesn't vary by more than 10% over maximum current draw.
	3	Card Format	The data card inserted is incorrect, format the card using the latest NVCardUtilities.
	4	Payout Reset	The Spectral Payout is in the process of resetting, wait for it to recover.
5	1	Firmware Mismatch	The Firmware on the device connected doesn't match the firmware on the NV200 Spectral. Ensure the Firmware supports the connected device.
	2	Payout Jam	The spectral payout has encountered an issue and a note has jammed, follow the steps as described in X
	4	Payout Jam recovery in progress	The spectral payout encountered a jam and is attempting to recover. 5 notes will be moved to the cashbox, from the payout. Once the unit has completed this it will go back in service.

NV4000 Module Flash Codes

Each additional module for the NV4000 has its own flash codes, outlined in the subsections below.

NV4000 Flash Codes

The NV4000 has a bank of 8 LED's to correspond with each peripheral, the label on the NV200 Spectral shows which LED relates to which device (as shown below):



If the peripheral is detected the LED illuminates, if it is off the device is not present.

The error flashes for the modules are as follows:

Conveyor Module

Green LED	Red LED	Orange LED	**Description of Error**
		Flashing	Device Starting Up
Solid			Device in Service
Flashing			Device in operation
	1	1	Conveyor Open
		2	Belt Missing
		3	Payout Failure
		4	Pay-in Failure
		5	Diverter Failure
		6	Waiting for Validator
	2	1	Belt failed to move
		2-4	Internal Error Codes
	3	1-6	Calibration Error
	4	1-6	Sensor Error

Recycler (1-4) Module

Green LED	Red LED	Orange LED	Description of Error
		Flashing	Device Starting Up
Solid			Device in Service
Flashing			Device in operation
	1	1	Pay-out Failure
		2	Pay-in Failure
		3	Empty Failure
		4	Accountancy Error
		5	Note Edge not Seen
		6	EEPROM Error
		7-8	Note Movement Error
	2	1-5	Tape Error
	3	1-2	Calibration Error

Interface

Green LED	Red LED	Orange LED	Description of Error
		Flashing	Device Starting Up
Solid			Device in Service
Flashing			Device in operation
	1	1	Diverter Failure
		2	LED failure
		3	Stacker position failure
		4	Stacker run timeout
		5	Note in the interface

Green LED	Red LED	Orange LED	Description of Error
		6	Stacker full
		7	Cashbox removed
	2	1-4	Motor error
	3	1-5	Calibration error

Replenishment Cassette

Green LED	Red LED	Orange LED	Description of Error
		Flashing	Device Starting Up
Solid			Device in Service
Flashing			Device in Operation
	1	1	Dock lid open
		2	Cassette Removed
		3	Dock Un-initialised
		4	Dock entry calibration error
		5	Dock exit calibration error
		6	Validation calibration error
		7	Dataset checksum error
		8	EEPROM checksum error
	2	1	Handle open
		2	Tray full
		3	Cassette initialisation error
		4	Cassette pay-in calibration
		5	Cassette reject calibration

Green LED	Red LED	Orange LED	Description of Error
	3	1	Dock Jam
		2	Cassette Jam
		3	Conveyor Jam

Recycler (1-4) Modules while Replenishing with Replenishment Cassette

Green LED	Red LED	Orange LED	Description of Error
		Flashing	Device Starting Up
Solid			Device in Service
Flashing			Device in operation
	1	1	Lid open
		2	Cassette removed
		3	Uninitialised
		4	Entry calibration
		5	Exit calibration
		6	Service hatch Open
	2	1	Handle open
		2	Tray not empty
		3	Initialisation error
		4	Pay in calibration
		5	Reject calibration
	3	1	Dock Jam
		2	Cassette Jam
		3	Conveyor Jam

Checking Power Connections

Check to ensure the power cables are correctly connected to the unit.

Checking the Supply Voltage

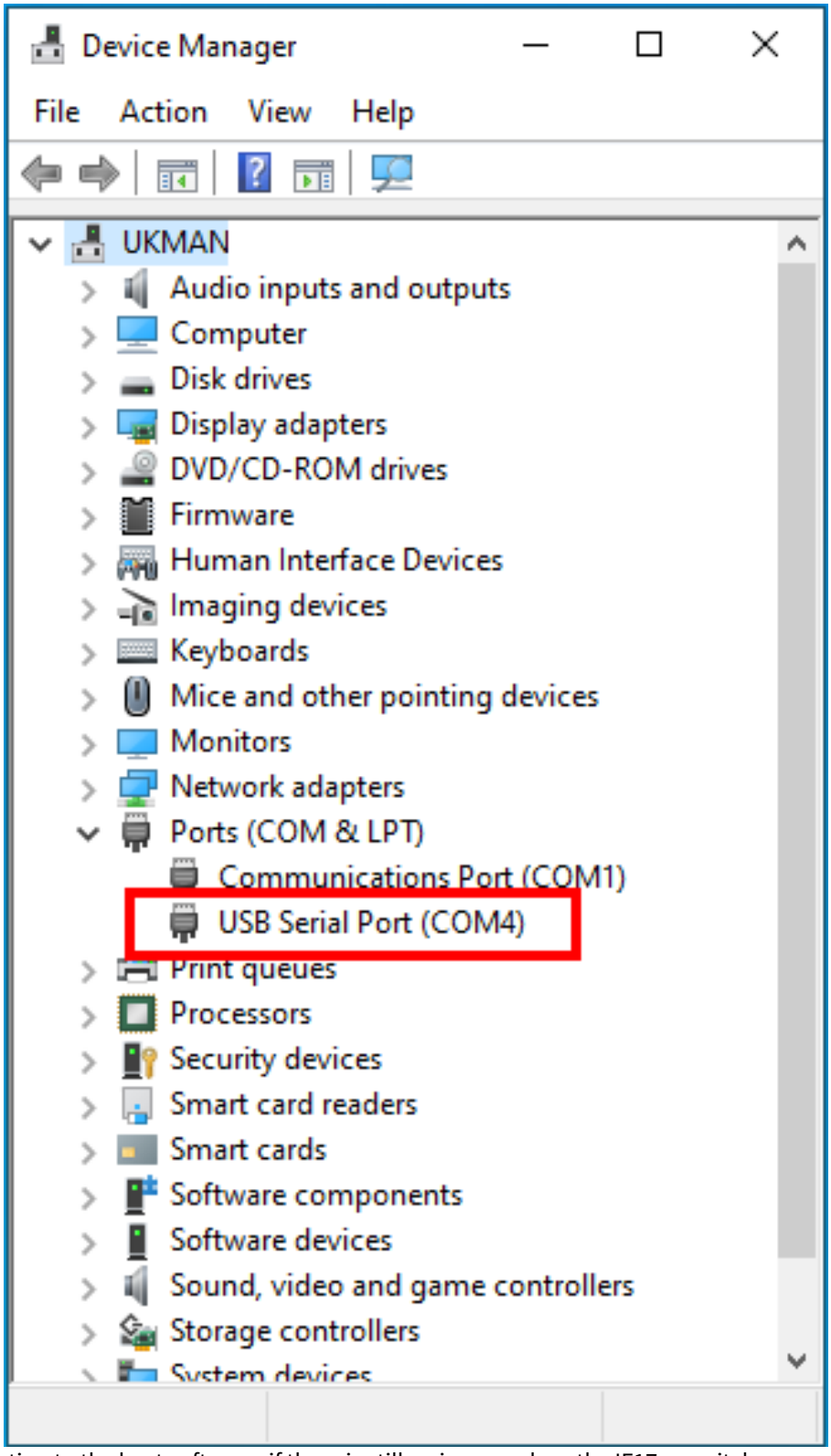
If the power supply seems to be powered and connections to the unit are in place, yet the unit isn't powered, check the voltage output from the power supply is sufficient and the polarity is correct. If this isn't the issue replace the cable as it may have been damaged. Should this not resolve the issue, contact your local repair centre, details of which can be found on our website.

Communication with the Host

If there is no communication with the host check the communication cable, typically this will be the IF17 and the port on the host system.

Ensure the cable is connected to the IF17 correctly, so the connectors are fully seated, and the USB cable is connected to the computer.

If the unit is connected, enter Windows Device Manager and check the active com ports, there should be a device labelled as USB Serial Port. If no com port is present replace the IF17 and a new device will register.



Check the connection to the host software, if there is still an issue replace the IF17 or switch com ports on the PC. If the unit is detected but there is a yellow triangle next to the serial port, then the drivers should be reinstalled.

For Linux use the dmesg console command as shown below:

```
File  Edit  View  Search  Terminal  Help
james@james-VirtualBox ~ $ dmesg | grep tty
[    0.000000] console [tty0] enabled
[   55.387744] usb 1-2: FTDI USB Serial Device converter now attached to ttyUSB0
james@james-VirtualBox ~ $
```

Obtaining Logs using SD Card

The NV200 Spectral has 128MB internal memory which is used to capture event and performance logs. To retrieve the logs from the internal memory, you can insert an SD card into the front slot. The SD card must be FAT-32 formatted and have an empty folder on there called **NV200HSL**. When this card is inserted the bezel will flash alternating colours, when it goes green the data transfer is complete and the SD card can be removed.

Alternatively, you can put an SD card in the slot that has two empty folders on it: **hsdata** and **valaudit**. This SD card will log all future events but does not extract logs currently stored on the internal memory. If this card is inserted all logs will be written to it instead of the internal memory.

See SD Card - Hardware Requirements for the hardware requirements for the SD Card.

Clearing a Jam in the NV4000

As explained earlier the LED's on top of the NV4000 will help guide you where there is an error with the device.

If the bezel is flashing 1R 2B indicating a note path jam, this indicates it's not made it's way into the recycling side of the device, so the note can be:

- Solely in the NV200 Spectral head
- In between the NV200 Spectral head and the interface
- Between the interface and the cashbox

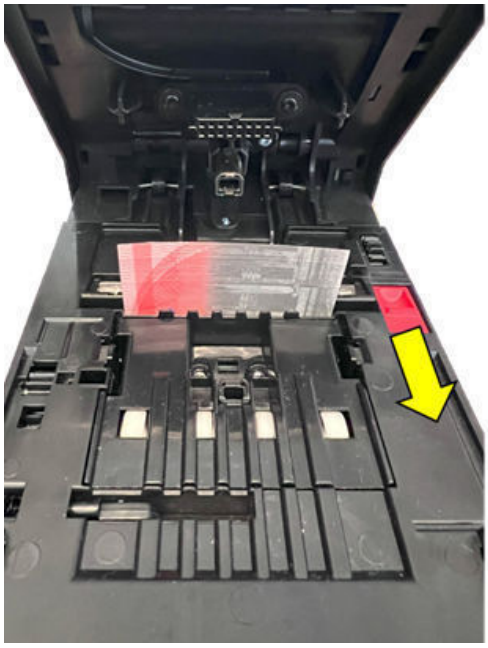
Warning if there is a note jammed caution should be used when removing devices to prevent further damage to the note

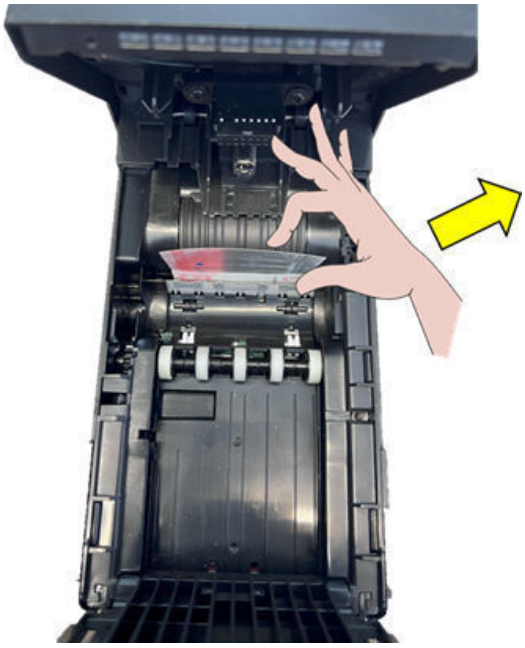
Note is in the note path

If the note is jammed in the note path it is possible to clear the jam by lifting the latch at the front and carefully pulling the device towards you, once free of the NV4000 pull the head release catch as shown below. Once the note path is clear you can then carefully pull the note out of the unit. Now shut the head re-dock the unit and it should reinitialise.

Note is visible once the head has been removed

If you can see the note in the interface, slide the red latch forward this then allows the door to hinge up and give you access to the note path. Now slowly pull the note out and check for any debris before closing the door and re-attaching the validator.





Note is visible once the interface has been removed

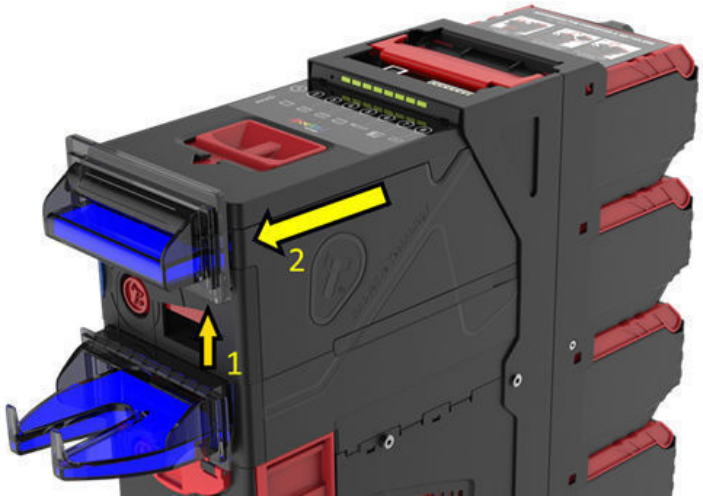
To clear this type of jam you will need to disconnect the power and then remove the NV200 Spectral head. Once you remove the head as explained in the picture below, check to see if the note is protruding from the cashbox. If it is, this means the note hasn't been driven down into the cashbox, this jam can be cleared by winding the drive gears on the left of the unit and slowly pulling the note out. Once the note has been removed, replace the NV200 Spectral head and reconnect the power.

Note isn’t visible once the NV200 Spectral has been removed

If the note isn’t visible then there is a jam in the cashbox, remove the cashbox by pulling the handle on the front of the cashbox and sliding it forward. Turn the keyless lock to release the barn door, you will now have access to the cashbox to manually remove the note. Usually the note will be resting on or underneath the stack of notes and may be folded or torn. Once the note has been identified slowly pull the note out of the unit. Replace cashbox and the unit should run through internal diagnostics and then be back in service.

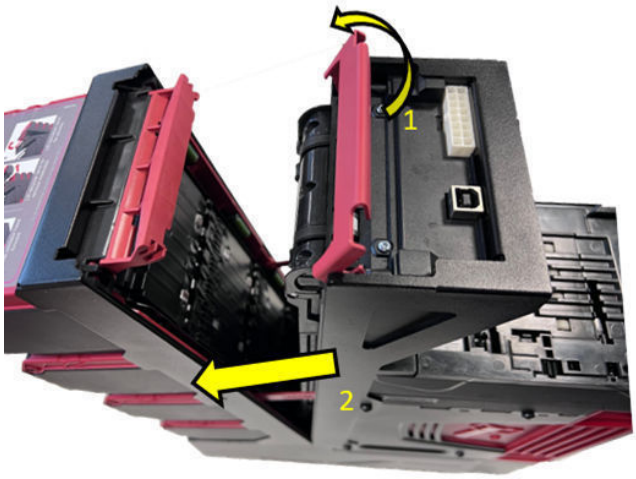
Clearing a Jam from the Recyclers and Conveyor

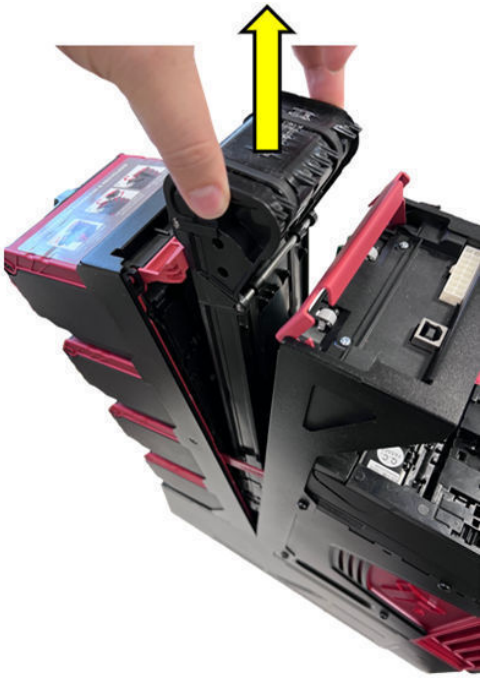
Before accessing the conveyor and the recyclers you need to remove the NV200 Spectral head by lifting the red latch (1), then sliding forward (2).



The red handles at the top can now be opened, the larger metal handle opens the conveyor and the smaller handle allows for the recyclers to be removed.

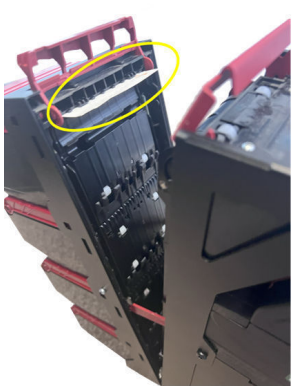
To remove the conveyor lift the metal handle (1), then the back of the NV4000 can open (2), this gives access to the conveyor which can be lifted out for cleaning or maintenance.

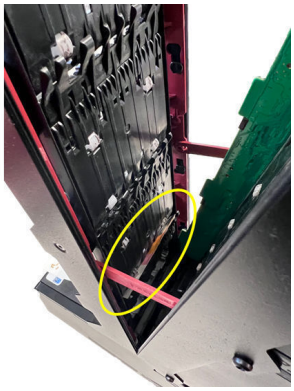




If the note has left the recyclers but not made it into the validator it will be visible when the conveyor has been removed.

If the note has jammed transferring between the recycler and the conveyor they will be in one of the positions below, depending on which recycler the note was leaving:





To clear the jam, with the second handle lifted, slowly remove the recycler and open the door and clear the note immediately visible, close the lid and re-assemble the device. When re-assembled run an empty on that recycler then re-float.

WARNING: If you fail to empty the recycler after a jam, further issues could occur.

Testing after an error has been cleared

Once an error has been cleared, ensure the device is tested by inserting bills and paying out notes/tickets where applicable. A recommended test is 10 notes in and 10 notes/tickets out, this will help limit the number of repeat calls for the same issue.

NV4000 Range Approvals

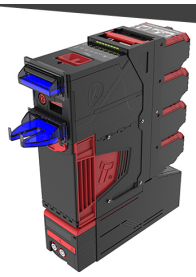
Contents

Central Bank Approvals

As part of continual product improvement central banks are regularly visited to gain product certification.

The NV200 Spectral has received independent validation from the European Central Bank (ECB), Bank of England (BoE) and several others.

NV4000 Range Product Compliance



EC Declaration of Conformity

The NV4000 is fully compliant with the Declaration of Conformity (CE Marking) and RoHS.

FCC Approval

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

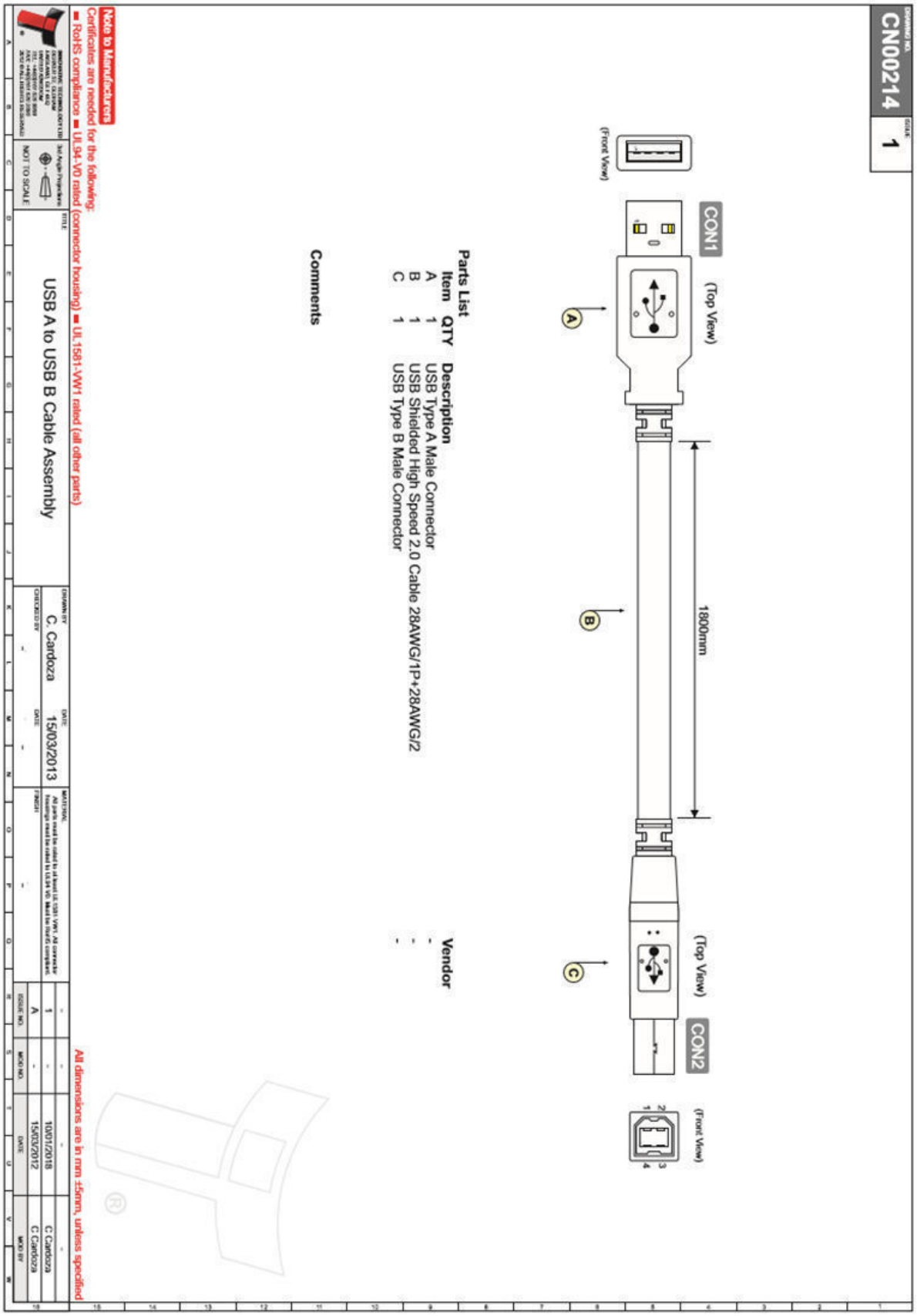
NV4000 Range Appendix

Contents

Cable Drawings

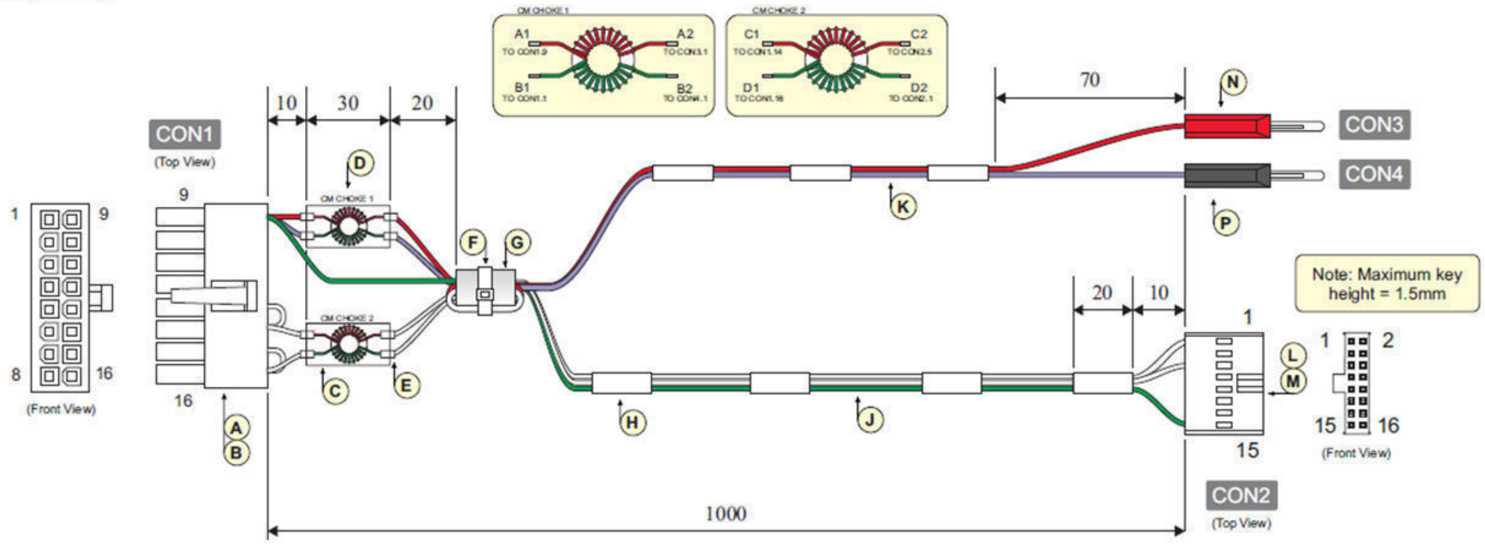
All parts can be purchased as part of the ITL development kit, details of which can be found on our website.

CN00214 - USB Type A to Type B Cable



CN00487 - SMART Payout Cable

DRAWING NO. **CN487** ISSUE **1**



Parts List

Item	QTY	Description	Vendor
A	1	39-01-2165 housing (2x8way 4.2mm pitch Mini-Fit Jr receptacle)	Molex
B	6	0039000209 (tin plated, female, brass) crimps (4A @ 22AWG, 2A@26AWG)	Molex
C	2	30mm black heat shrink sleeve (big diameter to fit over IN02012)	-
D	2	CM choke (ITL P/N IN02012)	-
E	8	Black heat shrink sleeve (small diameter to fit)	-
F	1	Cable tie to secure ferrite sleeve into place	-
G	1	Ferrite sleeve (2 turns)	See notes
H	7	20mm black heat shrink sleeve (spread along the assembly length)	-
J	7	Standard AWG 26 wire	-
K	4	Standard AWG 22 wire	-
L	1	90142-0016 housing (2x8way 2.54mm pitch receptacle)	Molex
M	3	90119-0120 (tin plated) crimps	Molex
N	1	Stackable red 4mm banana plug (553-0500-01)	Deltron
P	1	Stackable black 4mm banana plug (553-0100-01)	Deltron

Comments

CON1 connects to Smart Ticket
CON2 connects to Host
CON3 connects to V+ (24V)
CON4 connects to V- (GND)

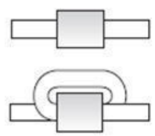
Connectivity

CON1 Pin	CHOKE1 Pin	CHOKE2 Pin	CON2 Pin	CON3 Pin	CON4 Pin	Gauge (AWG)	Colour	Comment
1	B1	-	-	-	-	22	Black	GND
-	B2	-	-	-	1	22	Black	GND
1	-	-	16	-	-	26	Black	GND
9	A1	-	-	-	-	22	Red	V_IN
-	A2	-	-	1	-	22	Red	V_IN
14	-	C1	-	-	-	26	Blue	SSP_RXD (Host to Validator)
-	-	C2	5	-	-	26	Blue	SSP_RXD (Host to Validator)
16	-	D1	-	-	-	26	White	SSP_TXD (Validator to Host)
-	-	D2	1	-	-	26	White	SSP_TXD (Validator to Host)
16, 7	-	-	-	-	-	26	White	Pins 16 and 7 are linked together
14, 5	-	-	-	-	-	26	Blue	Pins 14 and 5 are linked together

Notes

Ferrite sleeve needs to have >572Ω @ 100MHz.
Recommended parts:
a) Wurth 74270060 - 714Ω @ 100MHz (**two turns**)
b) Edgar FL8 RH10 x 20 x 6.35 - 724Ω @ 100MHz(**two turns**)

All cables go through the ferrite sleeve with two turns.



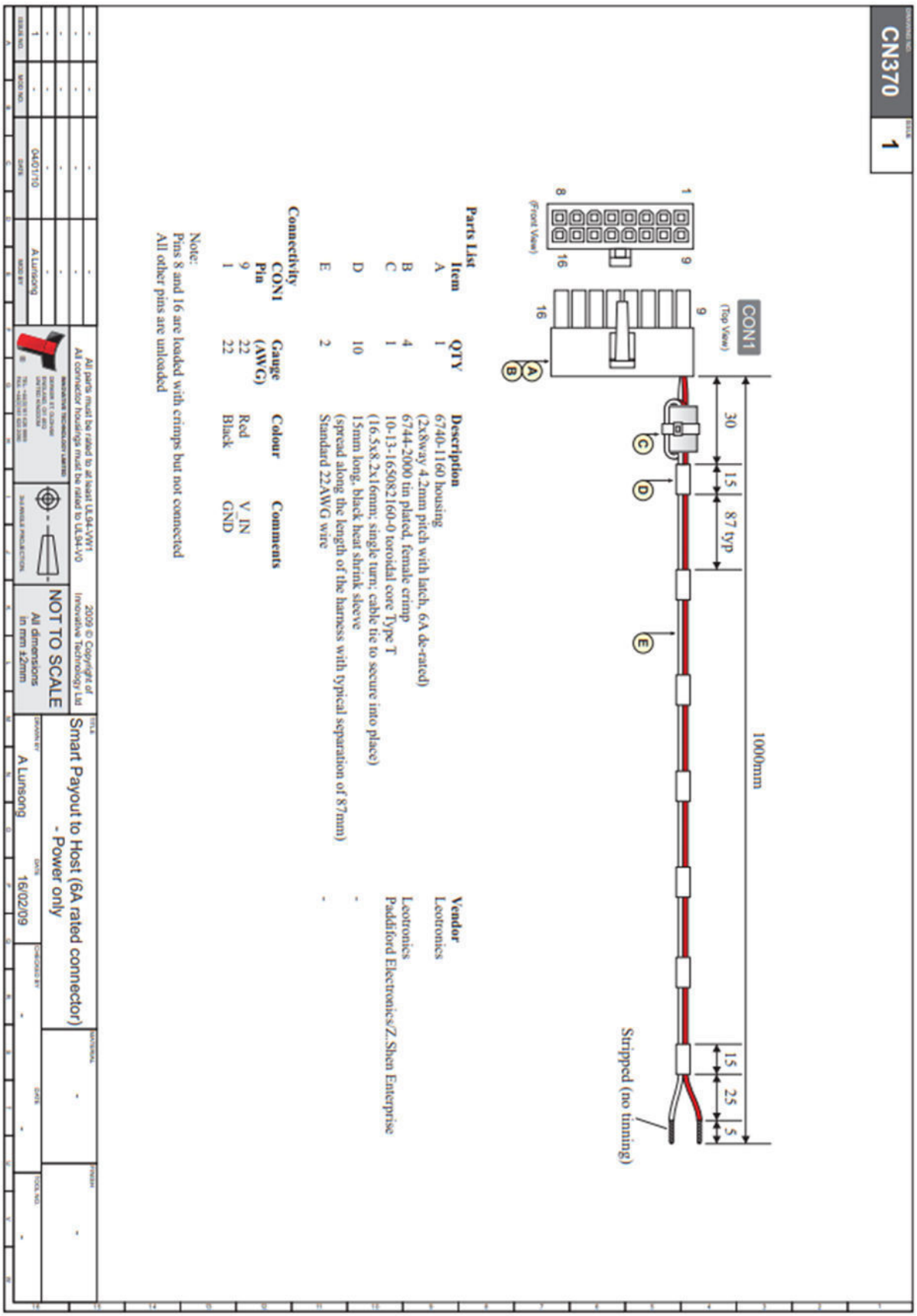
Note to Manufacturers
Certificates are needed for the following:
■ RoHS compliance ■ UL94-V0 rated (connector housing) ■ UL94-VW1 rated (all other parts)

All dimensions are in mm ±5mm, unless specified

INNOVATIVE TECHNOLOGY LTD, DERKER ST, OLDHAM, ENGLAND, OL1 4EQ, UNITED KINGDOM, TEL: +44(0)161 626 9999, FAX: +44(0)161 620 2090	3rd Angle Projections — NOT TO SCALE
TITLE	Smart Ticket to Host assembly (customer)
DRAWN BY	A Lunsong
DATE	31/01/2012
CHECKED BY	-
DATE	-
MATERIAL	All parts must be rated to at least UL94-VW1. All connector housings must be rated to UL94-V0. Must be RoHS compliant.
FINISH	-

ISSUE NO.	MOD NO.	DATE	MOD BY
-	-	-	-
-	-	-	-
1	-	23/08/2013	A Lunsong

CN00370 - SMART Payout Power Only



Parts List

Item	QTY	Description	Vendor
A	1	6740-1160 housing (2x8way 4.2mm pitch with latch, 6A de-rated)	Leotronics
B	4	6744-2000 tin plated, female crimp	Leotronics
C	1	10-13-1650S2160-0 toroidal core Type T (16.5x8.2x16mm; single turn; cable tie to secure into place)	Paddiford Electronics/Z.Shen Enterprise
D	10	15mm long, black heat shrink sleeve	-
E	2	(spread along the length of the harness with typical separation of 87mm) Standard 22AWG wire	-

Connectivity

CON1 Pin	Gauge (AWG)	Colour	Comments
9	22	Red	V_IN
1	22	Black	GND

Note:
Pins 8 and 16 are loaded with crimps but not connected
All other pins are unloaded

All parts must be rated to at least UL94-VW1
All connector housings must be rated to UL94-V0

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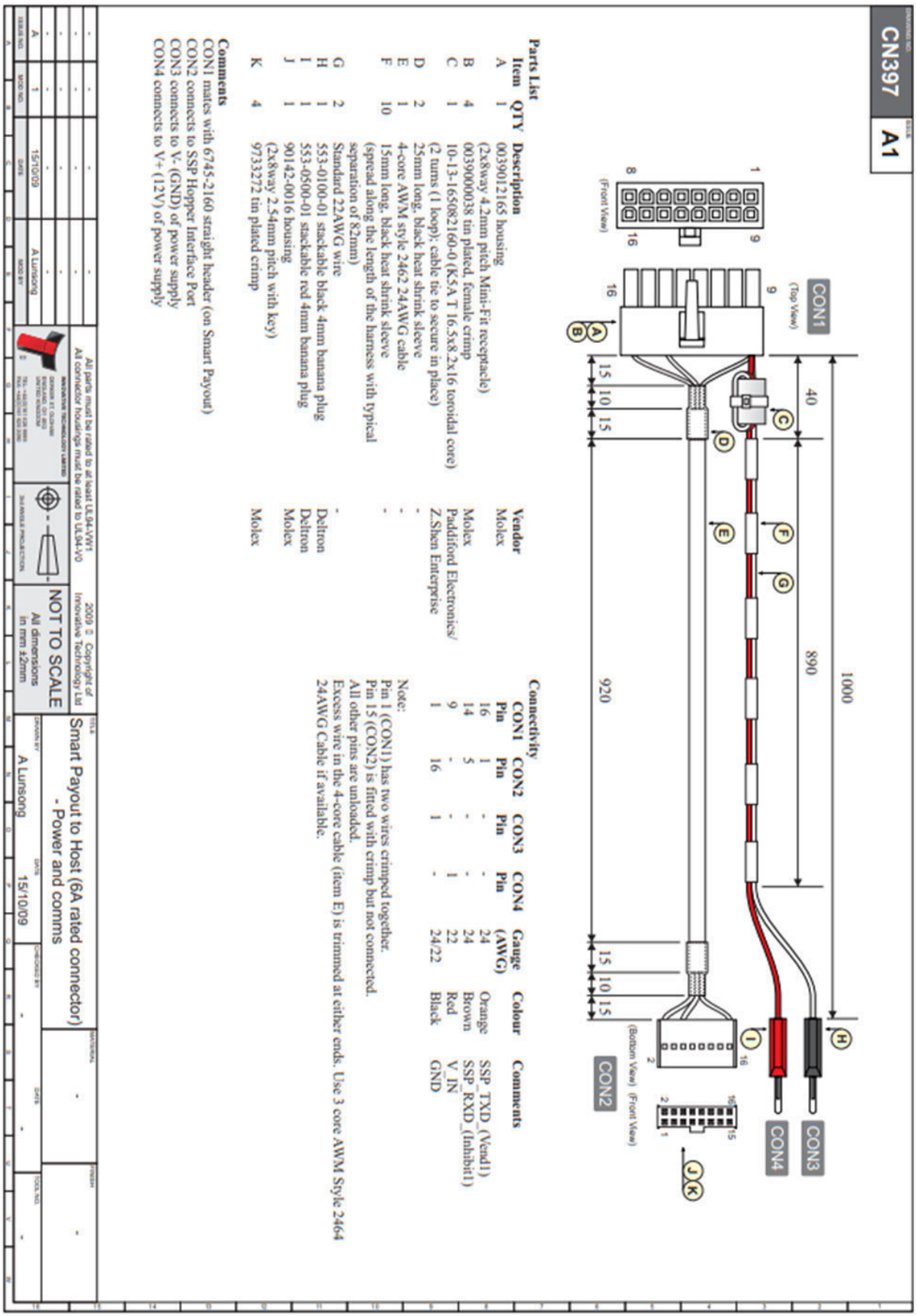
NOT TO SCALE
All dimensions in mm ±2mm

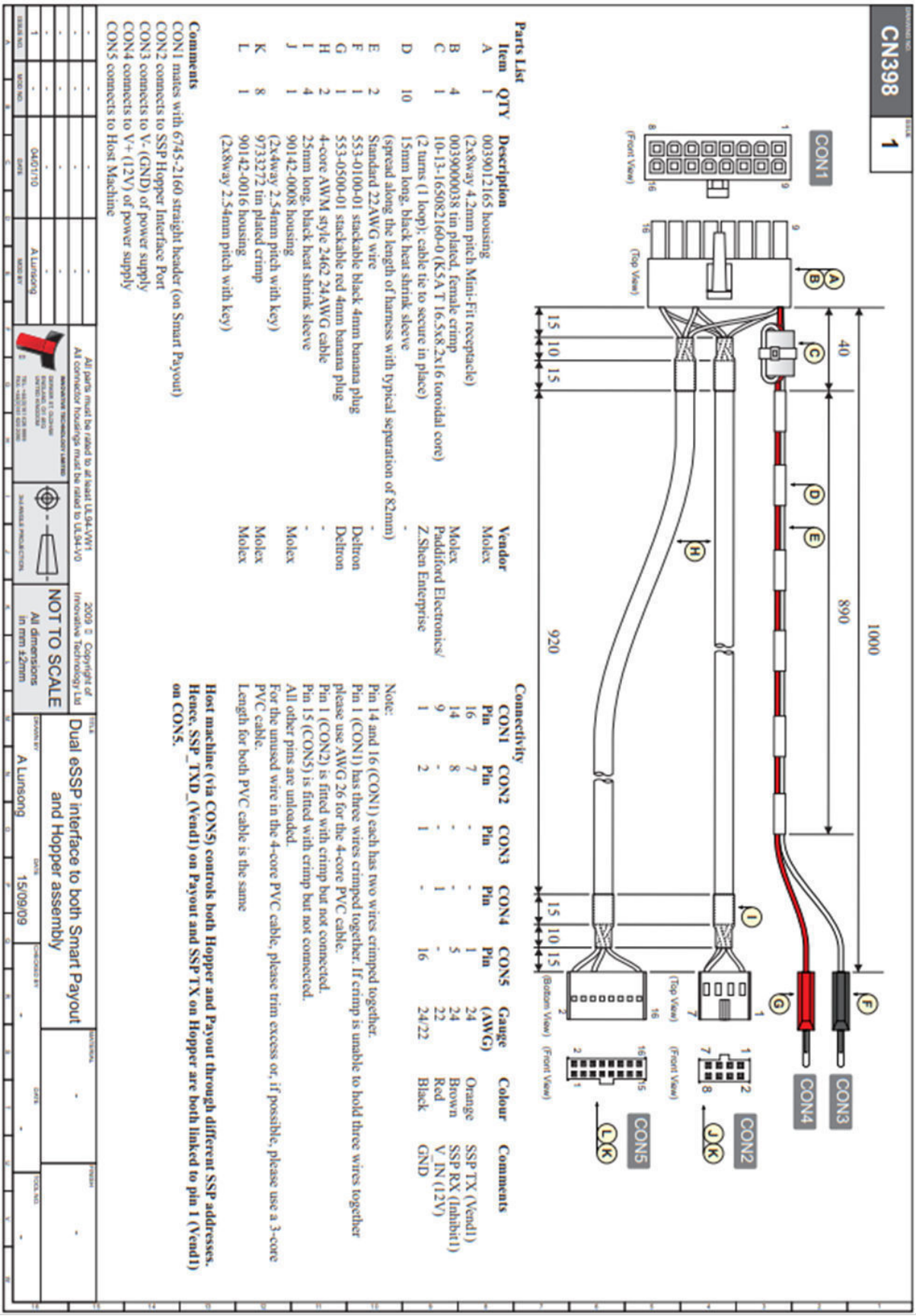
Smart Payout to Host (6A rated connector)
- Power only

A Lunsong | 04/01/10 | 16/02/09

CN00397 - Payout to Host Cable



CN00398 - Dual eSSP Interface for SMART Hopper & SMART Payout



Parts List

Item	QTY	Description	Vendor
A	1	0039012165 housing (2x8way 4.2mm pitch Mini-Fit receptacle)	Molex
B	4	0039000038 tin plated, female crimp	Molex
C	1	10-13-1650821600 (K5A T 16.5x8.2x16 toroidal core) (2 turns (1 loop); cable tie to secure in place)	Paddiford Electronics/ Z.Shen Enterprise
D	10	15mm long, black heat shrink sleeve (spread along the length of harness with typical separation of 82mm)	-
E	2	Standard 22AWG wire	-
F	1	553-0100-001 stackable black 4mm banana plug	Deltron
G	1	553-0500-01 stackable red 4mm banana plug	Deltron
H	2	4-core AWM style 2462 24AWG cable	-
I	4	25mm long, black heat shrink sleeve	-
J	1	90142-0008 housing (2x4way 2.54mm pitch with key)	Molex
K	8	9733272 tin plated crimp	Molex
L	1	90142-0016 housing (2x8way 2.54mm pitch with key)	Molex

Connectivity

	CON1 Pin	CON2 Pin	CON3 Pin	CON4 Pin	CON5 Pin	Gauge (AWG)	Colour	Comments
	16	7	-	1	24	Orange	SSP TX (Vend1)	
	14	8	-	5	24	Brown	SSP RX (Inhibit1)	
	9	-	-	-	22	Red	V_IN (12V)	
	1	2	1	-	16	24/22	Black	GND

Note:
Pin 14 and 16 (CON1) each has two wires crimped together.
Pin 1 (CON1) has three wires crimped together. If crimp is unable to hold three wires together please use AWG 26 for the 4-core PVC cable.
Pin 1 (CON2) is fitted with crimp but not connected.
Pin 15 (CON5) is fitted with crimp but not connected.
All other pins are unloaded.
For the unused wire in the 4-core PVC cable, please trim excess or, if possible, please use a 3-core PVC cable.
Length for both PVC cable is the same

Host machine (via CON5) controls both Hopper and Payout through different SSP addresses. Hence, SSP_TXD_(Vend1) on Payout and SSP TX on Hopper are both linked to pin 1 (Vend1) on CON5.

Comments
CON1 mates with 6745-2160 straight header (on Smart Payout)
CON2 connects to SSP Hopper Interface Port
CON3 connects to V- (GND) of power supply
CON4 connects to V+ (12V) of power supply
CON5 connects to Host Machine

All parts must be rated by at least UL94-VW1
All connector housings must be rated to UL94-V0

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NOT TO SCALE
All dimensions in mm ±2mm

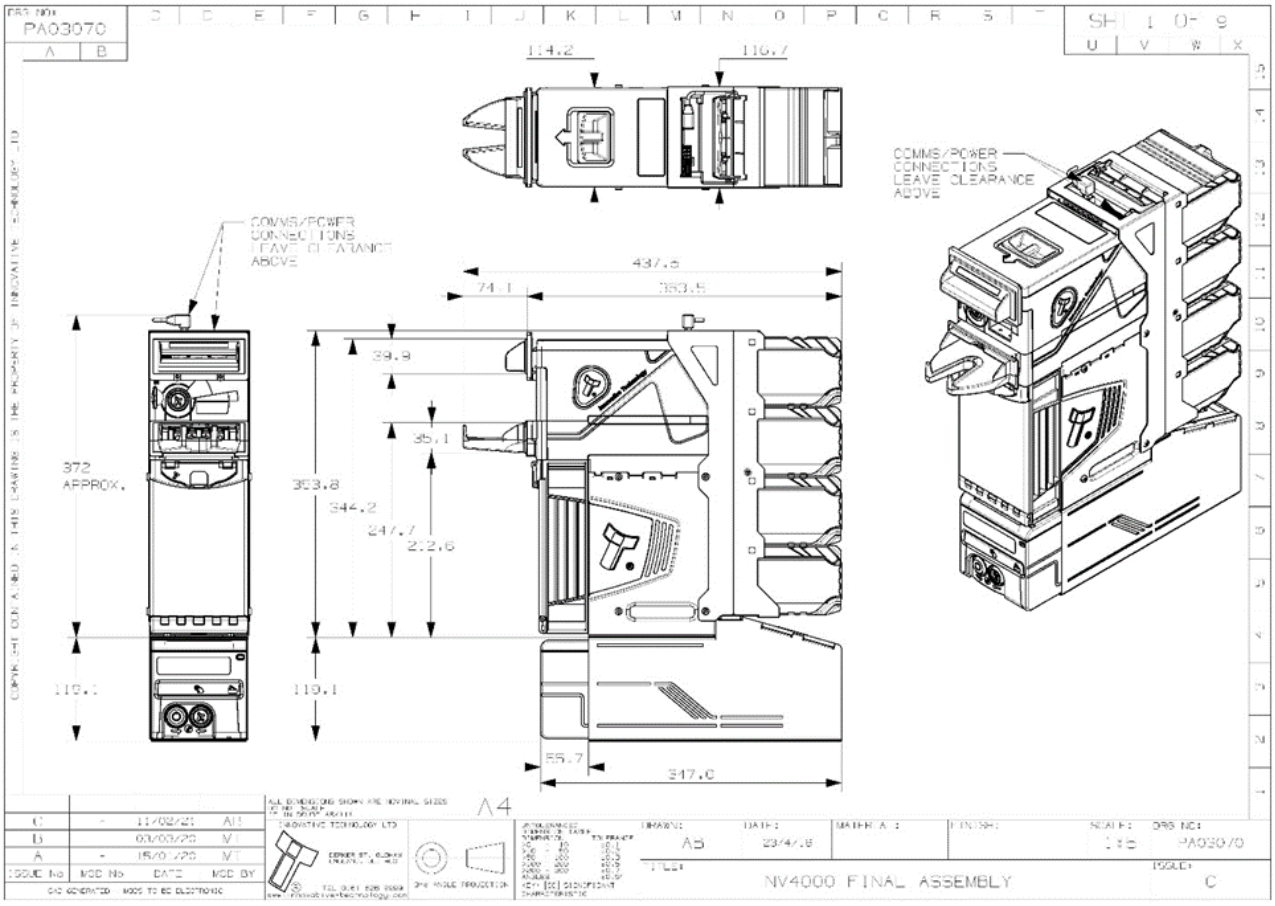
Dual eSSP interface to both Smart Payout and Hopper assembly

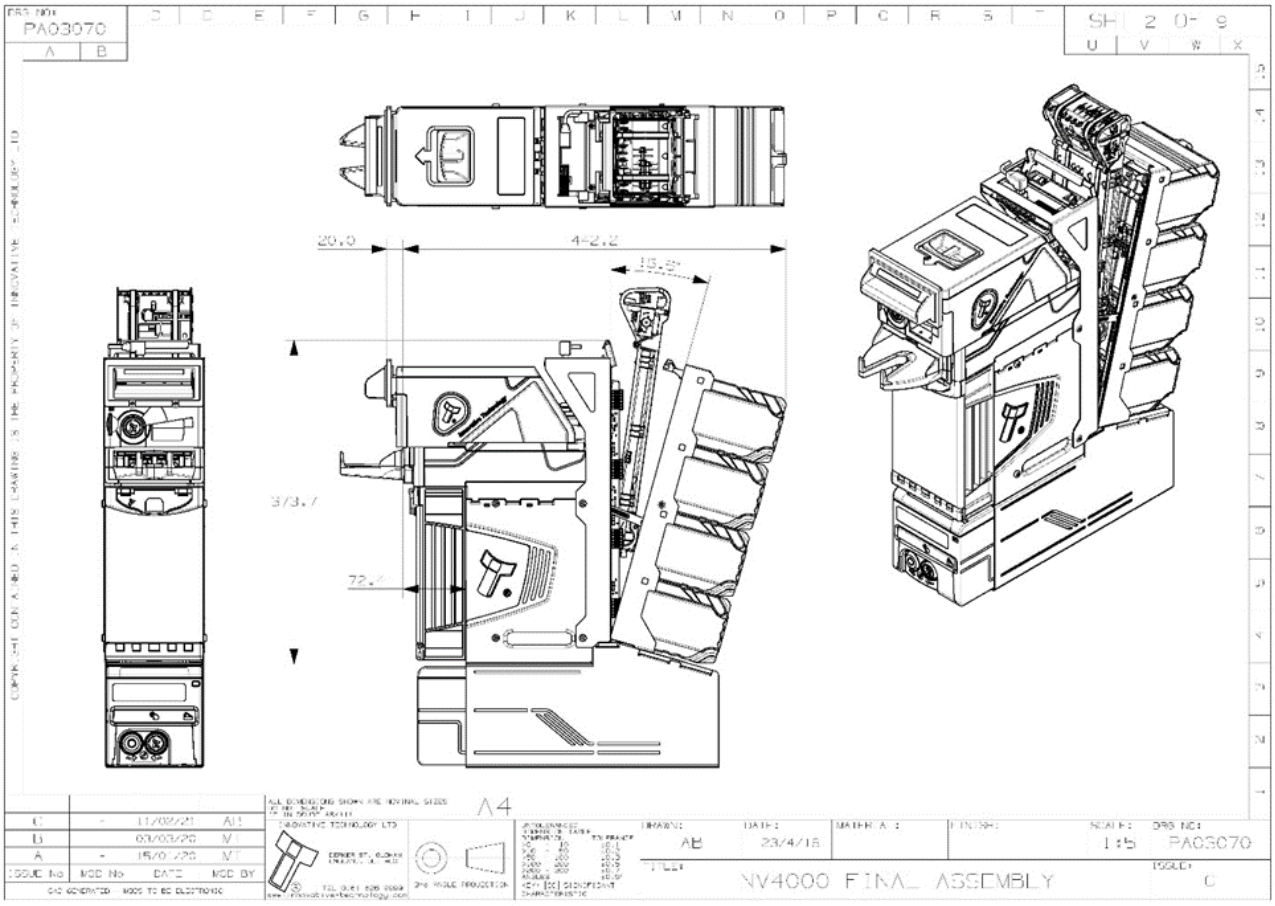
DRAWN BY: A Lunsong
DATE: 15/09/09
CHECKED BY:
DATE:
MATERIAL: -
FINISH: -
TOOL NO.: -

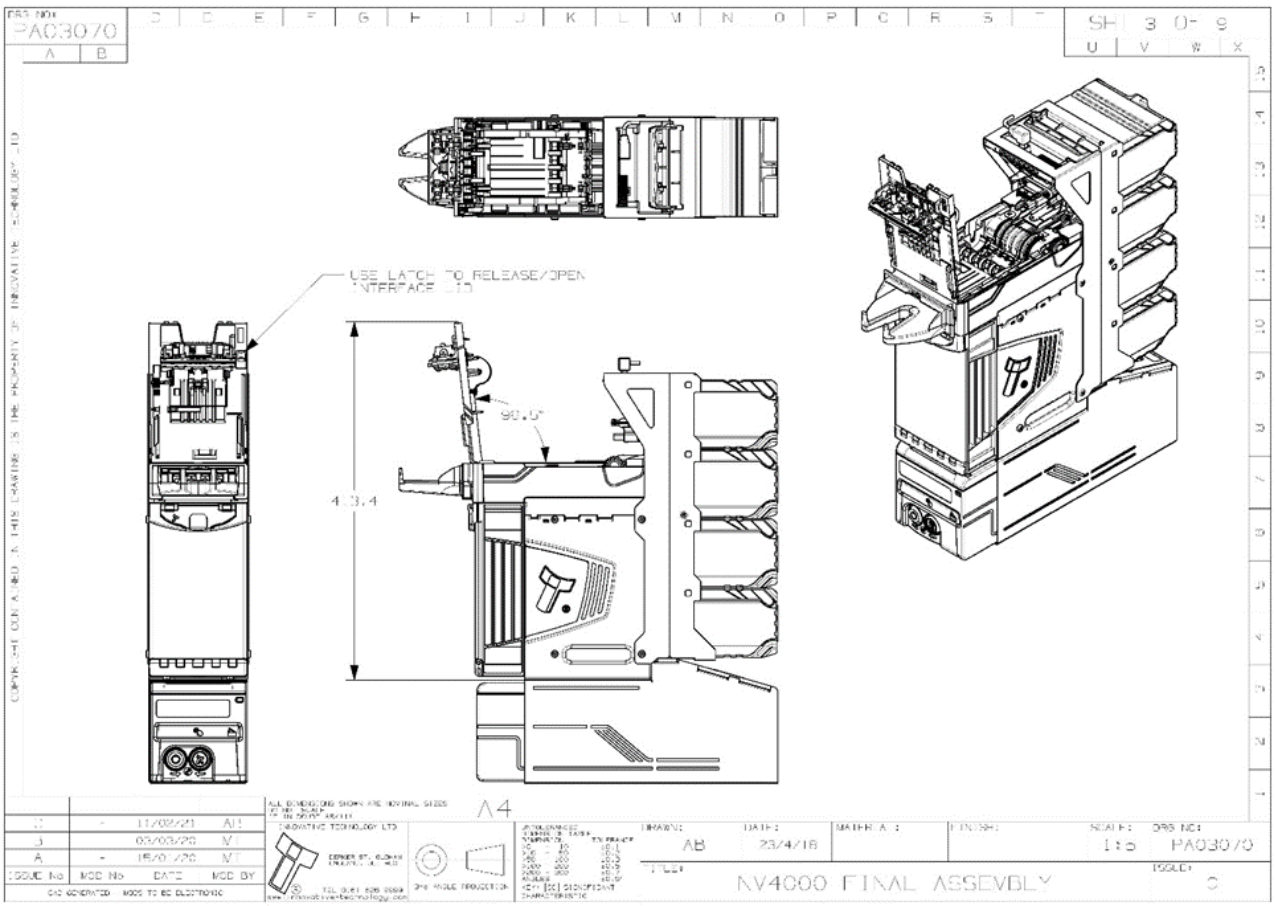
Connector Specifications

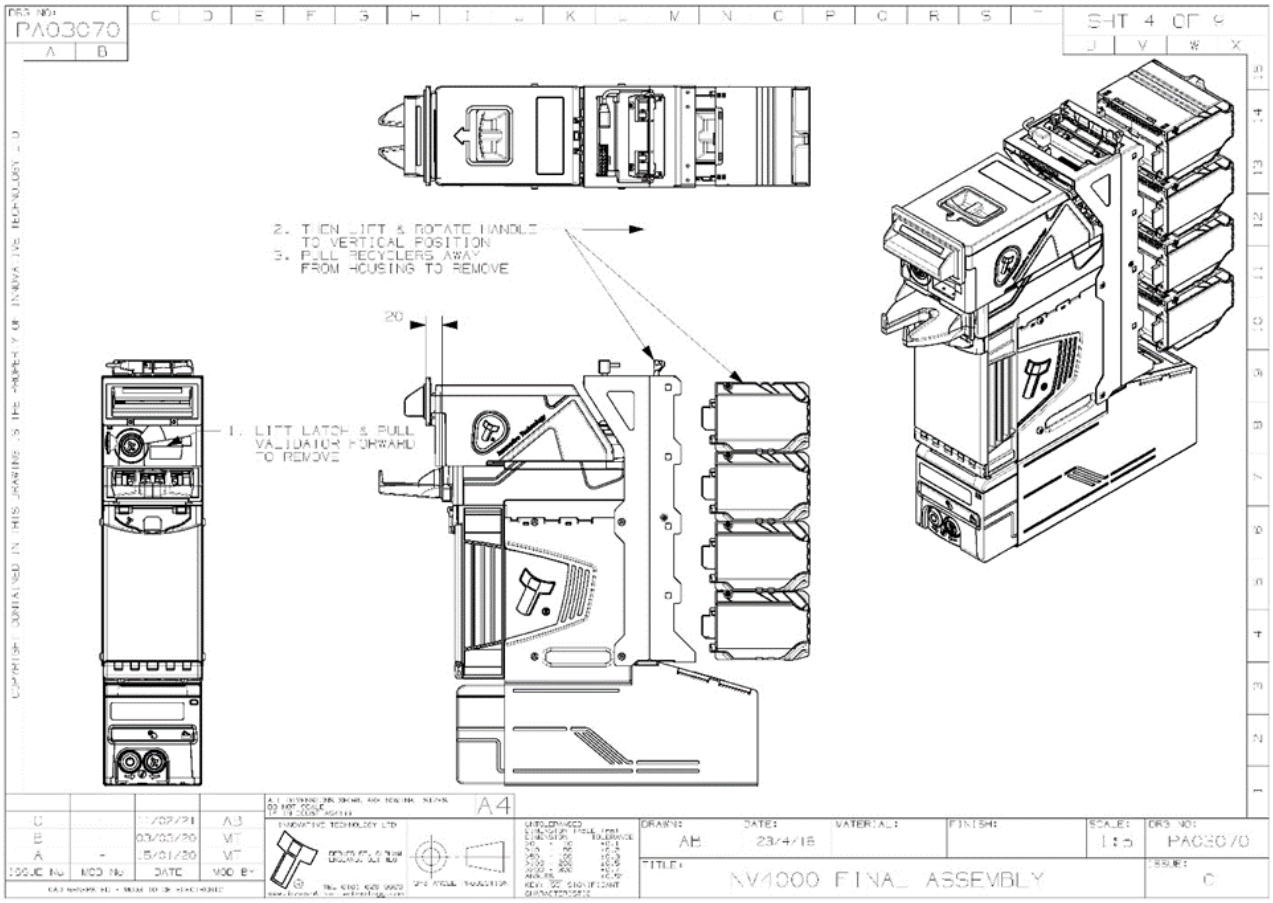
Type	Vendor	Part Number	Pins	Pitch	Polarising
Housing	Leotronics	2652-2161	2x8	2.54mm	With Key
Crimp	Leotronics	2653-2000			Female
Housing	Molex	90142-0016	2x8	2.54mm	With Key
Crimp	Molex	90119-2121			Female

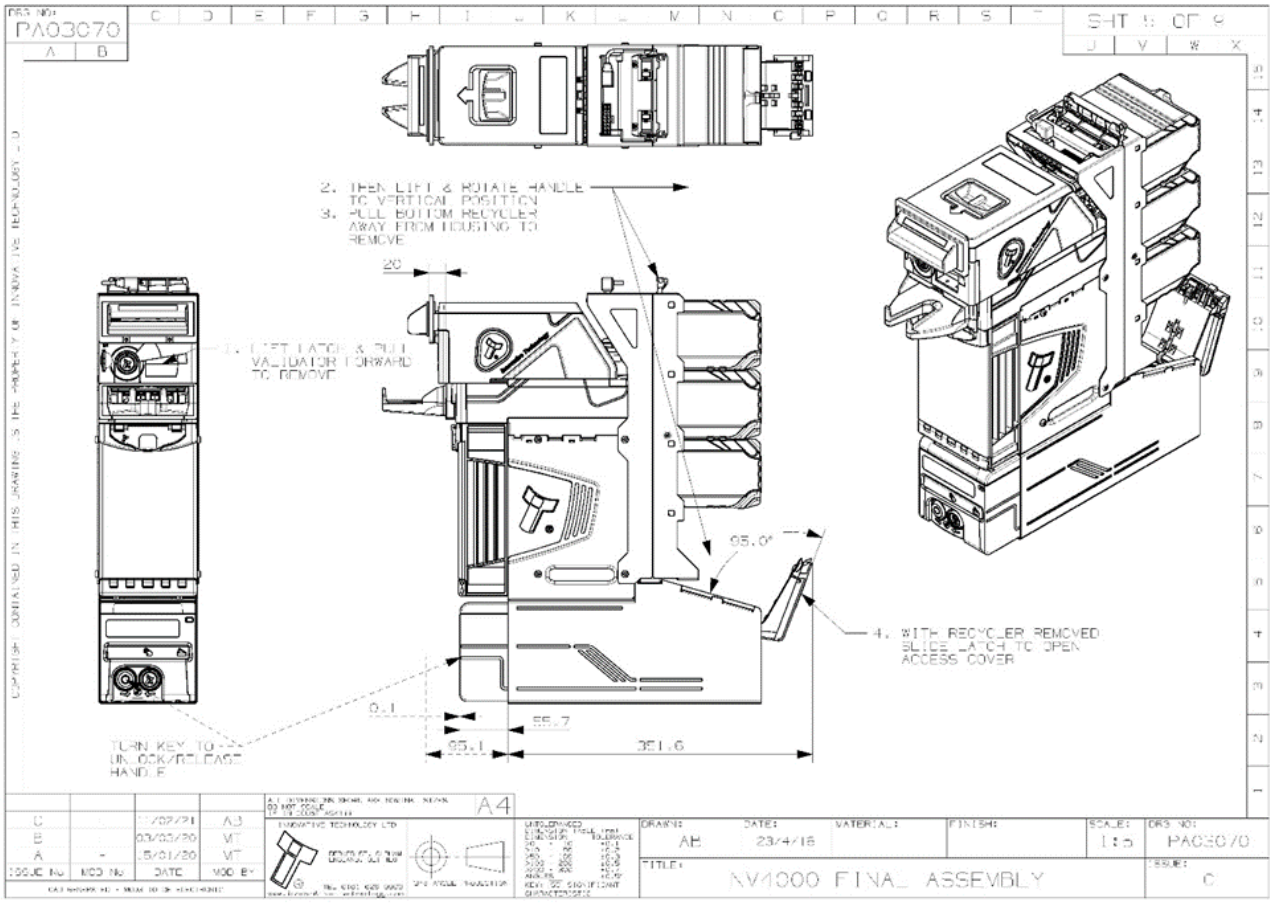
Dimensional Drawings

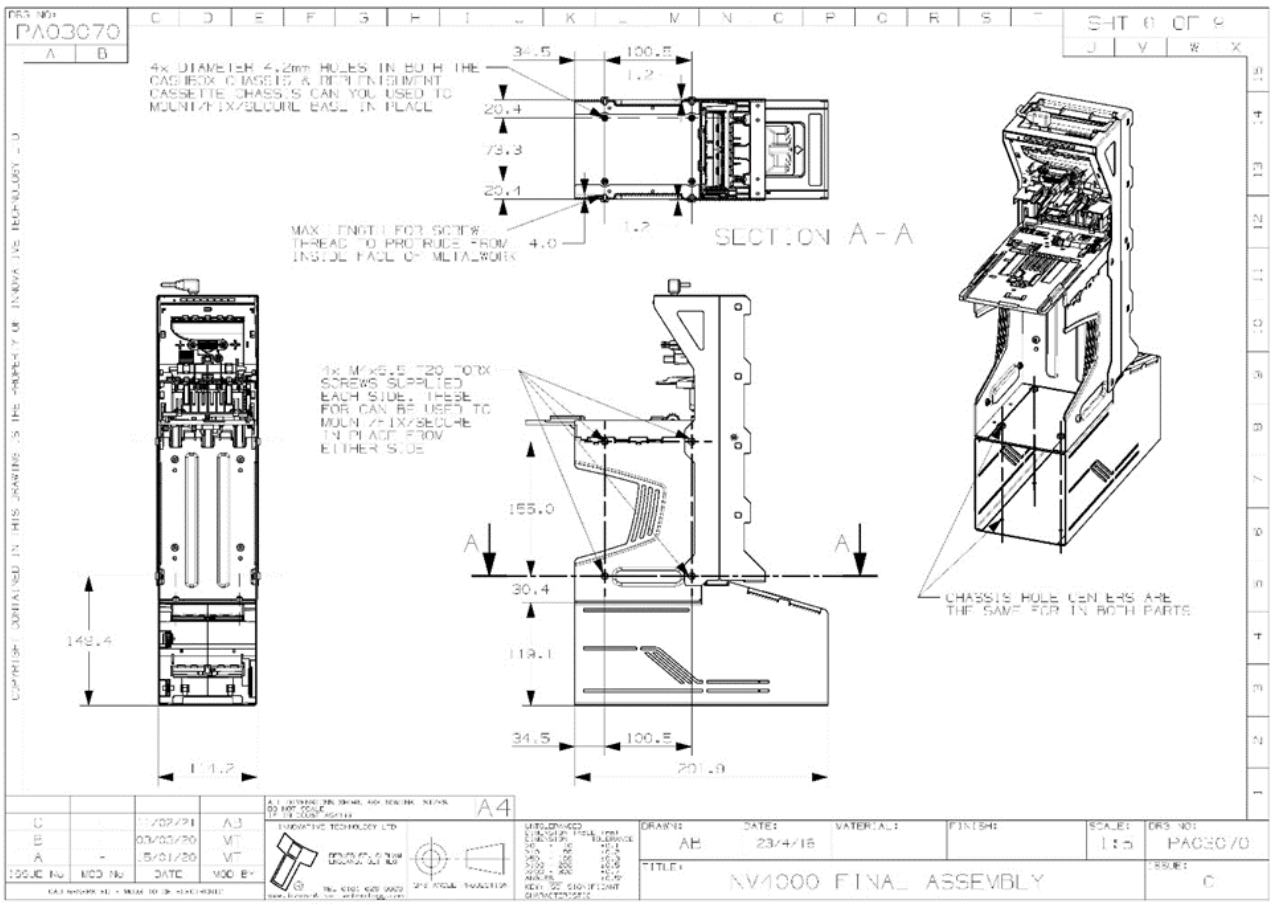



DRG NO:
PA03070
SH 2 OF 9
20.0
42.2
15.6
373.7
72.4
A4
AB
23/4/16
1:5
PA03070
NV4000 FINAL ASSEMBLY
C
11/02/21
03/03/20
15/07/20


DRG NO:
PA03070
SH 3 OF 9
USE LATCH TO RELEASE/OPEN
INTERFACE LID
90.0°
413.4
A4
AB
23/4/16
1:5
PA03070
NV4000 FINAL ASSEMBLY
C
11/02/21
03/03/20
15/07/20


DRS NO: PA03070
SHT 4 OF 9
2. THEN LIFT & ROTATE HANDLE TO VERTICAL POSITION
3. PULL RECYCLERS AWAY FROM HOUSING TO REMOVE
20
1. LIFT LATCH & PULL VALIDATOR FORWARD TO REMOVE
A4
DRAWN: AH
DATE: 23/4/18
SCALE: 1:5
DRS NO: PA03070
TITLE: NV4000 FINAL ASSEMBLY
ISSUE: C


DRS NO: PA03070
SHT 5 OF 9
2. THEN LIFT & ROTATE HANDLE TO VERTICAL POSITION
3. PULL BOTTOM RECYCLER AWAY FROM HOUSING TO REMOVE
20
1. LIFT LATCH & PULL VALIDATOR FORWARD TO REMOVE
95.0°
4. WITH RECYCLER REMOVED SLIDE LATCH TO OPEN ACCESS COVER
0.1
55.7
95.1
351.6
TURN KEY TO UNLOCK/RELEASE HANDLE
A4
DRAWN: AH
DATE: 23/4/18
SCALE: 1:5
DRS NO: PA03070
TITLE: NV4000 FINAL ASSEMBLY
ISSUE: C


DRS NO: PA03070
SHT 6 OF 9
4x DIAMETER 4.2mm HOLES IN BOTH THE CASHBOX CHASSIS & DEPLOYMENT CASSETTE CHASSIS CAN YOU USED TO MOUNT/FIX/SECURE BASE IN PLACE
38.5
100.5
1.2
20.4
73.3
25.4
4.0
1.2
SECTION A-A
4x M4x8.5 T20 TORX SCREWS SUPPLIED EACH SIDE. THESE FOR CAN BE USED TO MOUN T/FIX/SECURE IN PLACE FROM EITHER SIDE
155.0
A
A
30.4
119.1
34.5
100.5
201.0
149.4
111.2
CHASSIS HOLE CENTERS ARE THE SAME FOR IN BOTH PARTS
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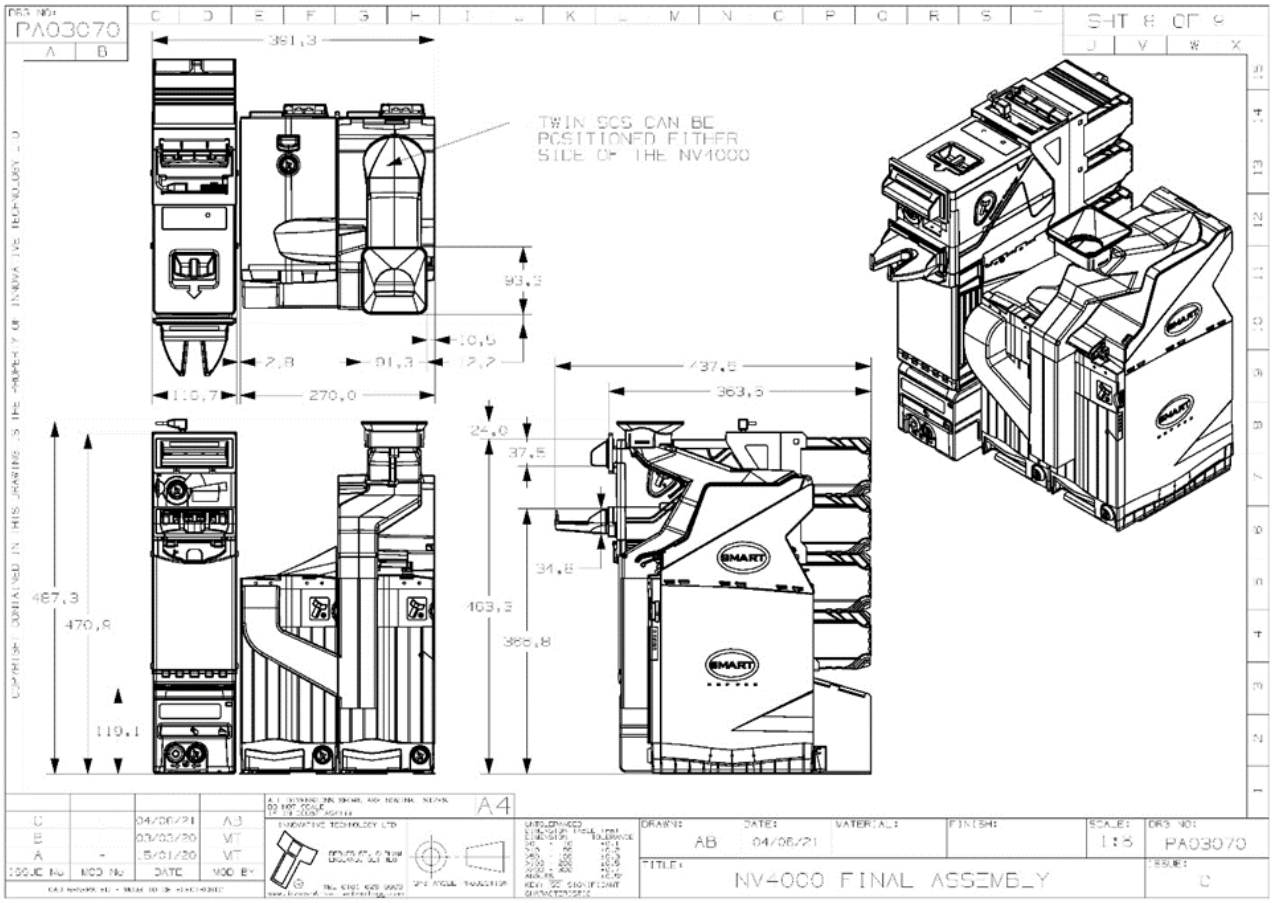
A4
INNOVATIVE TECHNOLOGY LTD
C 22/02/21 A3
B 03/03/20 MT
A - 15/01/20 MT
ISSUE NO MOD NO DATE MOD BY
DRAWN: AB
DATE: 23/4/18
MATERIALS:
FINISH:
SCALE: 1:5
DRS NO: PA03070
TITLE: NV4000 FINAL ASSEMBLY
ISSUE: C


DRS NO: PA03070
SHT 8 OF 9
381.3
TWIN SCS CAN BE POSITIONED EITHER SIDE OF THE NV4000
93.3
10.5
2.8
91.3
12.7
110.7
270.0
737.5
363.5
24.0
37.5
34.8
103.3
366.8
487.3
470.9
119.1
SMART
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A4
INNOVATIVE TECHNOLOGY LTD
C 04/06/21 A3
B 03/03/20 MT
A - 15/01/20 MT
ISSUE NO MOD NO DATE MOD BY
DRAWN: AB
DATE: 04/06/21
MATERIALS:
FINISH:
SCALE: 1:5
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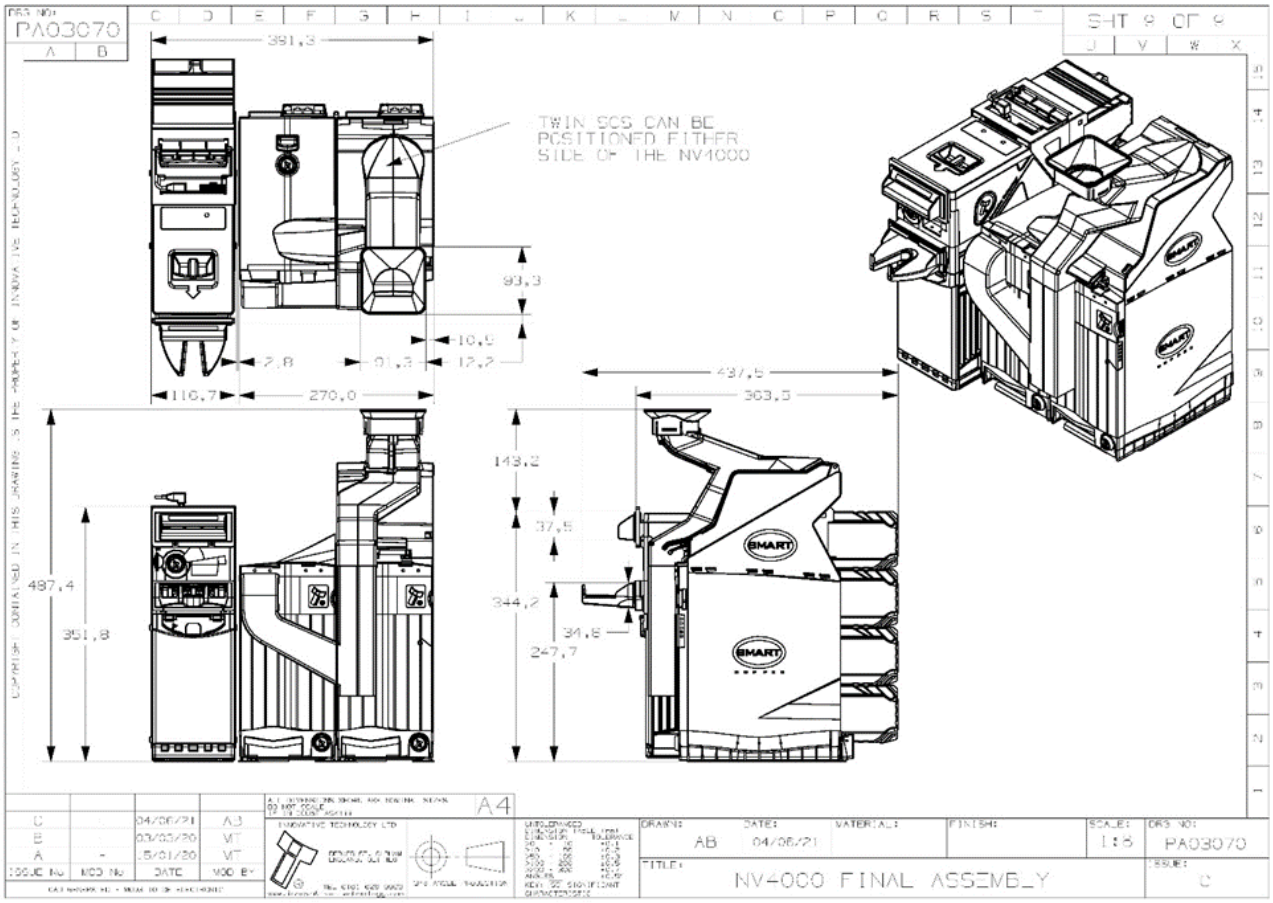
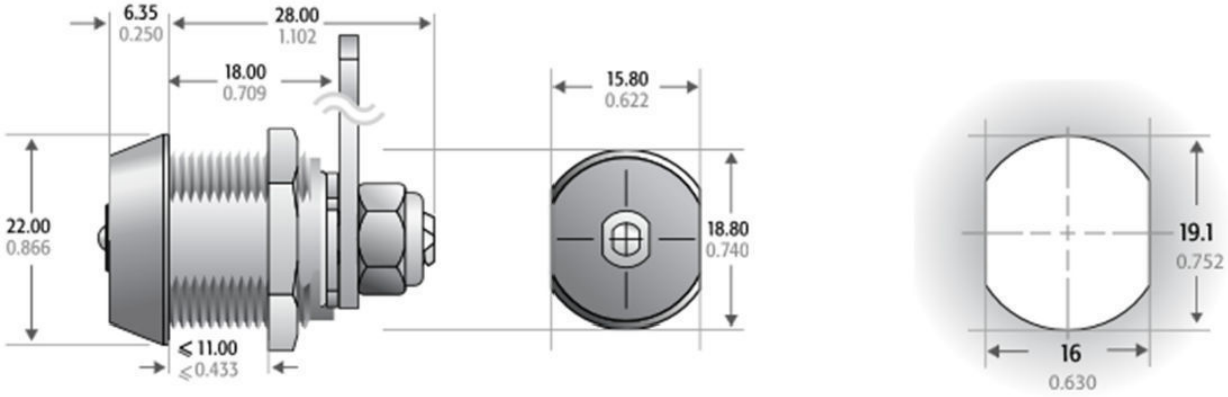
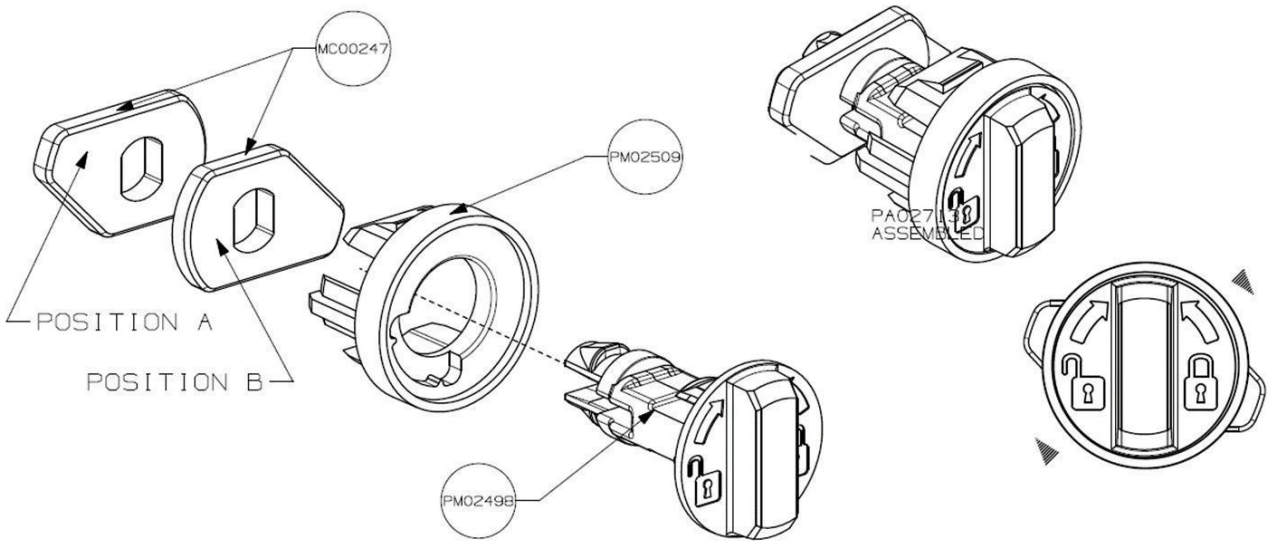
TITLE: NV4000 FINAL ASSEMBLY
ISSUE: C



Lock Specification



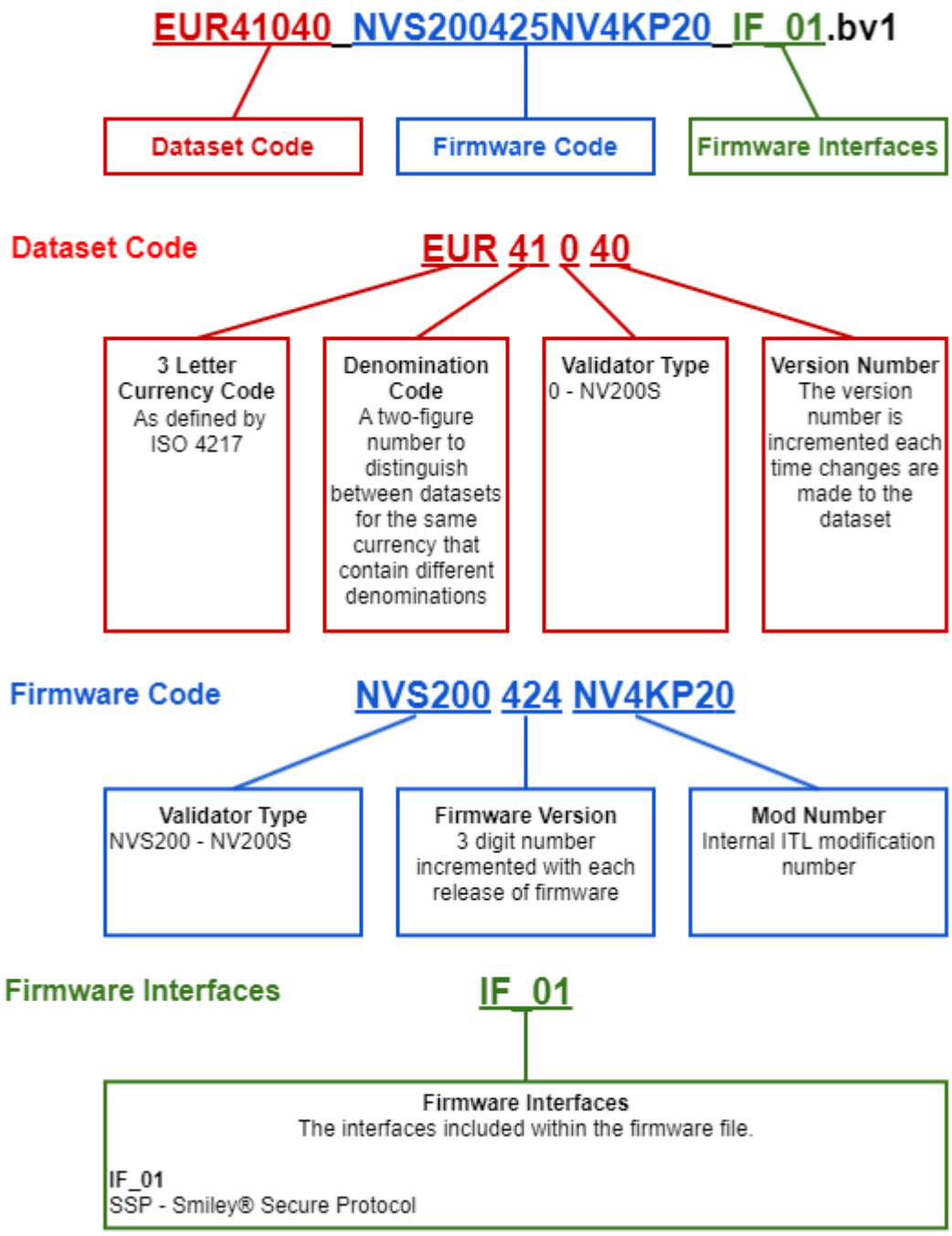
Keyless Locking Cam



Cashbox Handling Advice

The NV200 Spectral cashbox and TEBS cash bag has been designed to remain intact after an impact of 75cm onto a concrete floor. Dropping the cashbox multiple times can result in physical damage to the cashbox/bag.

File Naming Convention



Lock Inserts

The replenishment cassette can be fitted with a range of coloured inserts around the locks as shown in the picture below:

These are fitted in the same way as the lock, refer to Lock Mounting - Replenishment Cassette for instructions.

NV4000 Range Disclaimer and Safety Information

Contents

Disclaimer

Innovative Technology:

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Product Safety Information

Throughout this user manual, attention should be drawn to key safety points when using or maintaining the product.

These safety points will be highlighted in a box:

> This is an example text.

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

Danger!	**IR and UV Radiation**
 	• Possible skin or eye damage due to presence of IR and UV radiation internally. Disconnect power before servicing • Use PPE measures • Follow safety precautions given in IEC 62471