BV20
OPERATIONS
MANUAL

INTELLIGENCE
IN VALIDATION

Contents

1 INTRODUCTION

BV20 VALIDATOR - THE NEXT GENERATION OF ITL BANK NOTE VALIDATORS

This manual describes the operation of the BV20 Bank Note Validator as fitted with Firmware Version 4.00 or greater.

This document is intended for those who will maintain the BV20 equipment.
Although information is included which will allow a degree of fault diagnosis and repair, it is recommended that for all but simple mechanical repairs, the unit must be returned to an approved service centre for repair.

CAUTIONS
• This product must be fitted with a 2 A (ampere) fuse before use.
• The BV20 validator is pin for pin compatible with NV7/8/9/10, but not pin for pin compatible with the NV2/3/4/4x or 5 series products.
• Due to different note cycle times there may be timing differences from the NV products.
• Never exceed the recommended environmental and electrical limits.
• Do not attempt to lubricate the mechanisms as this may affect the note transport.
• Do not polish the lens as this may alter the optical characteristics.
• If the BV20 validator is disassembled the unit must be re-calibrated and re-initialised, following re-assembly (See Chapter 6).

WARNING
• Only suitably trained personnel should carry out any work on this equipment in accordance with all current local, national and international health and safety regulations.

• We recommend that you study this manual as there are many new features permitting new uses and more secure applications.

• If you do not understand any part of this manual please contact the factory, contact details are below, for assistance. In this way we may continue to improve our product.

• The BV20 Validator has been designed to minimise any performance variation over time. Much of this is achieved by careful Hardware and Software design.

• Innovative Technology Ltd has a policy of continual product improvement. As a result the products supplied may vary from the specification described here.

MAIN HEADQUARTERS

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2 ENVIRONMENT AND POWER REQUIREMENTS

ENVIRONMENT

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

Table 1 – Environmental Requirements

CAUTIONS:
IF THE INPUT VOLTAGE FALLS BELOW 11.5V THE BV20 MAY NOT OPERATE CORRECTLY (WILL REJECT NOTES).
THE FRONT BEZEL LIGHTS WILL FLASH TO INDICATE INCORRECT CONDITIONS
IT IS RECOMMENDED THAT THE POWER SUPPLY USED CAN SUPPLY AT LEAST 1.7 AMPS

POWER REQUIREMENTS

Electrical Supply	Minimum	Maximum
Supply Voltage (V DC) Absolute Limits	12V $\pm$ 10%	
MDB IF5 Version Supply Voltage	18V	+48V DC or 34V AC
Supply Ripple Voltage	0 V	0.25 V @ 100 Hz
Supply Currents:		
Sleep (Low Power Mode)		1.2mA
Standby		150mA
Validating		540mA

Table 2 – Power Requirements

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

Table 3 – Interface Logic Levels

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3 GENERAL DESCRIPTION

The BV20 Bank Note System is a compact note-validating machine (see figure 1), suitable for most money machines. It will accept up to 16 different denominations of notes in the serial control mode. The BV20 Validator leaves the factory pre-set to at least one currency so that it is ready for immediate installation.
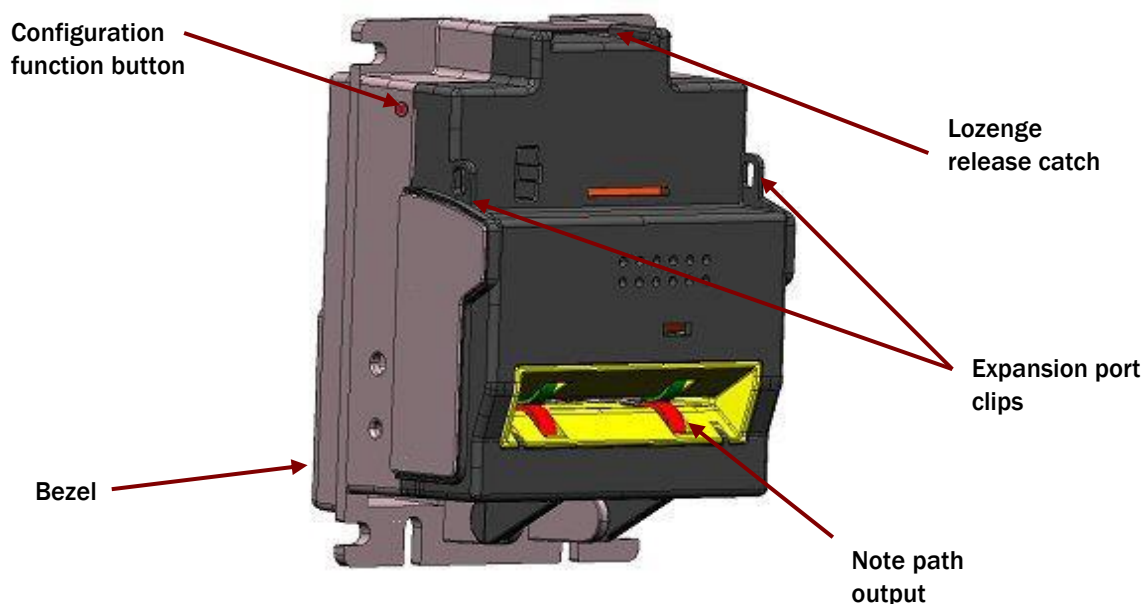
Configuration function button

Lozenge release catch

Expansion port clips

Bezel

Note path output

Figure 1 - The BV20 with vertical bezels

If it is required to change the currency data set this may be done using the PC based Validator Management software. New currencies and applications are being tested all the time, please refer to our web site, or contact the factory for information concerning specific currencies if they are not already included on our approved list. The BV20 is designed for easy installation in most machines. Interfacing the validator is very simple, with the choice of the following protocols:

SSP	PULSE	PARALLEL	BINARY
CCTALK	SIO	MDB	NIS
IF30	IF31	IF32	

Table 4 – Available Interfaces / Protocols

4 MACHINE INTERFACES – HARDWARE

The BV20 interface connector is located on the left side of the unit; it has 16 pins (see figure 2) refer to Table 5 for the pin allocation. Two are used for the 0V and +12V power supply and there are five outputs and five inputs, the remaining four pins are reserved for factory use and should not be connected. An example mating connector is Molex type Part No: 39-51-2160.

It is possible to connect the BV20 to machines operating at 110 Volts or to machines operating at MDB voltages by means of additional Hardware modules. The modules are attached to the BV20 by means of the External hardware clips and connected to the 16-pin connector. (See section 5.3) The BV20 also has a Configuration Button on the opposite side from the Connector (See Figure 3).
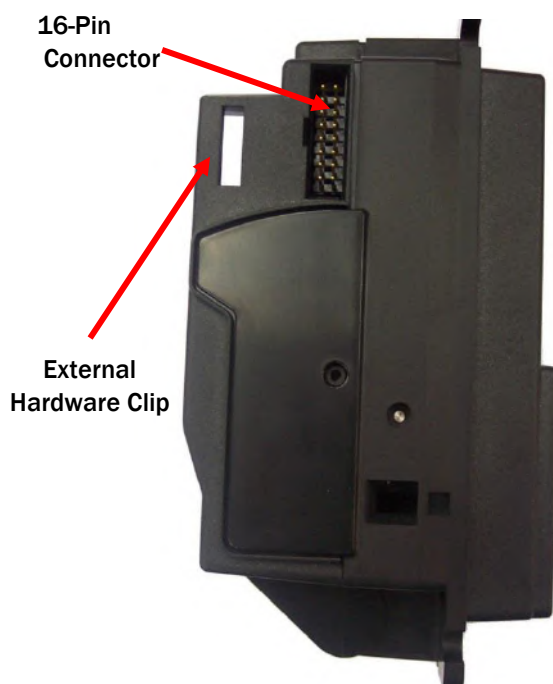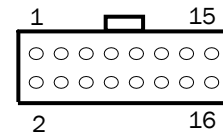
16-Pin Connector

External Hardware Clip

Figure 2 – **Interface Connector**

Configuration button

External Hardware Clip

Figure 3 – **Configuration Button**

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4.1 INTERFACE CONNECTOR PIN DETAILS

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

Pin	Name	Description
1	Vend 1	Open collector outputs. Function changes depending on machine interface protocol (see individual interface descriptions for details) Also the Pulse Stream output. Also the Serial Output pin in SSP Serial Mode and other serial modes
2	Vend 2	Open collector outputs. Function changes depending on machine interface protocol (see individual interface descriptions for details)
3	Vend 3	
4	Vend 4	
5	Inhibit 1	Inhibit channel 1 by holding this pin HIGH. To Enable a channel the inhibit must be held LOW Also the serial Input pin in SSP Serial Mode, and other serial modes
6	Inhibit 2	Inhibit channel 2 by holding this pin HIGH
7	Inhibit 3	Inhibit channel 3 by holding this pin HIGH
8	Inhibit 4	Inhibit channel 4 by holding this pin HIGH
9	Busy	BV20 is validating and stacking output. Active low while the BV20 is reading, transporting or stacking a note.
10	Escrow	Operate Escrow function by holding LOW (see Appendix B – Escrow Control for full details)
11	Factory use only	Do not connect
12	Factory use only	**Do not connect**
13	Factory use only	**Do not connect**
14	Factory use only	**Do not connect**
15	+Vin	Nominal 12V DC supply
16	0V	0V supply

Table 5 – **16 Pin Connector Details**

4.2 CONFIGURATION BUTTON FUNCTIONS

The functions available via the Configuration Function Button are detailed in Table 6

Configuration Button	Power Status	Function
Press and Hold (>2 secs)	Powered ON	Sets BV20 to Programming Mode (SSP)
Press Once (<1 sec)	Powered ON	Enables Configuration Card Programming
Press Twice (within half a second)	Powered ON	Current Setting Indicator
Press and hold	Powered OFF	Resets ccTalk key to Default setting

Table 6 – **Configuration Button Functions**

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BV20 Programming Mode

Press and Hold the Configuration Button for at least 2 seconds whilst the BV20 is powered up. The Bezel LED will flash rapidly to indicate that SSP is being loaded. Once this process has finished the BV20 will reset. The BV20 will now be in Programming Mode (SSP) and allow connection to a PC via a DA1 or DA2 adapter or connection to a DA3.

Note: This mode can only be cancelled by re-programming with a Configuration Card or via the Validator Manager program. Please ensure you are aware of all the BV20 programmed settings before entering this mode. Failure to restore the original setting will stop the BV20 from operating in the Host machine.

Configuration Card Programming Mode

Press the Configuration Button once whilst the BV20 is powered up. If done correctly the Bezel LED will flash every 1-second. This will allow the insertion of a Configuration Card to change the Firmware Protocol in the BV20. (See Chapter 6 - Using Configuration Cards for full details). This mode can be cancelled by again pressing the Configuration Button once.

Current Setting Indicator Mode

Press the Configuration Button twice within half a second whilst the BV20 is powered up. The BV20 Bezel LED will then perform a series of flashes to indicate the current settings within the validator. (See Program Check Procedure, in Appendix D)

Encryption Key Reset Function (ccTalk)

Note: This function will only be possible if the BV20 is programmed to ccTalk mode. It is not possible to reset the key from SSP mode.

Press and hold the Configuration Button whilst the BV20 is powered off. Apply the power and keep the button pressed for several seconds. The ccTalk Encryption Key will now be restored to the default setting.

4.3 ADDITIONAL HARDWARE MODULES

The BV20 currently supports the following additional hardware Modules for connection to machines with alternative power specifications.

MDB Voltage Regulator Module.

The MDB Voltage Regulator Module is for use in Vending machines operating at higher DC or AC voltage outputs. The module provides a regulated 12V DC supply to the validator and has Opto isolated inputs and outputs. For further details on the MDB protocol please see chapter 5.7

110V Voltage Regulator Module.

The 110V Voltage Regulator Module allows the BV20 to be used with machines that operate with a 110V AC supply.

The modules attach to the back of the BV20 and are held in place by the expansion port clips and a single fixing screw. For unit and cable dimensions please see diagrams below.
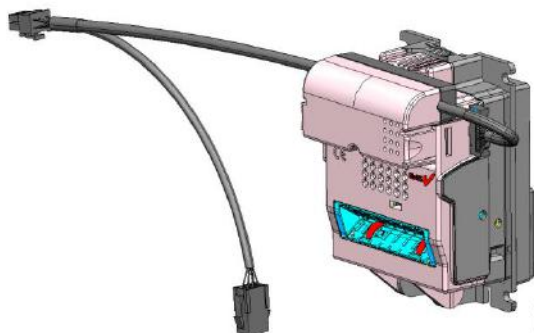

Figure 4 – **BV20 with MDB Voltage Regulator Module Fitted.**

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BV20 MECHANICAL INSTALLATION
Drawing Number GA791

In line with continued product development Innovativ
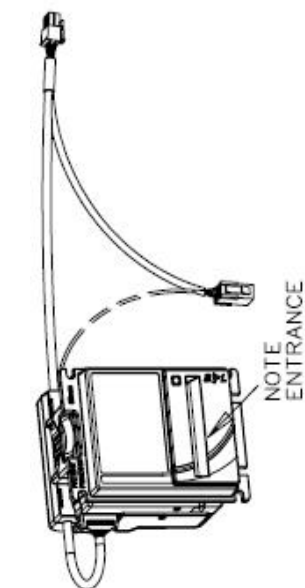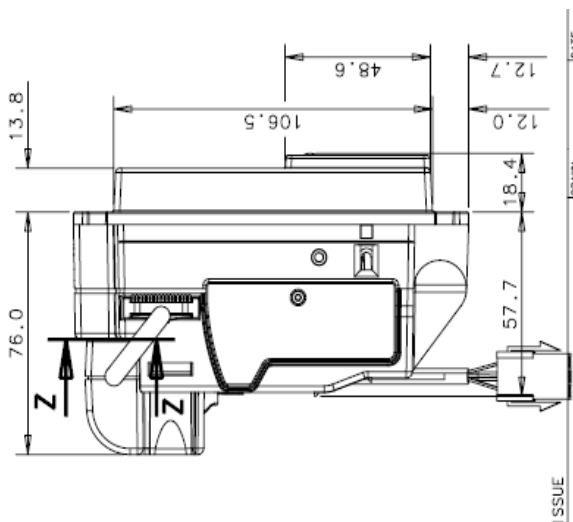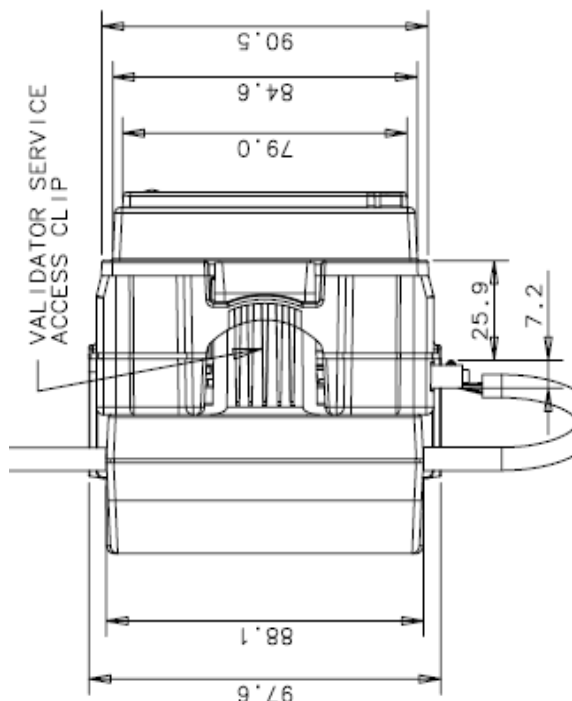specifications without prior notice.

ACCEPTS NOTES:

1. 66 mm x 160 mm LONG
2. 72 mm x 160 mm LONG

ENVIRONMENTAL OPERATING RANGE:
+3 ⁰C to +50 ⁰C at 5% to 95% RH
(NON – CONDENSING)

UNLADEN WEIGHT: 0.4 KG
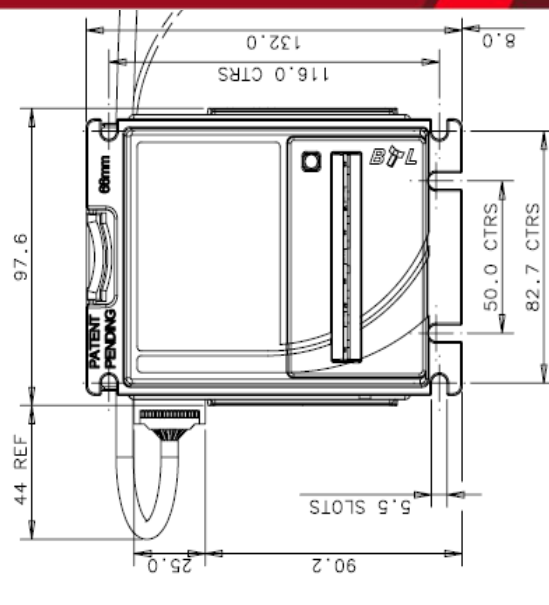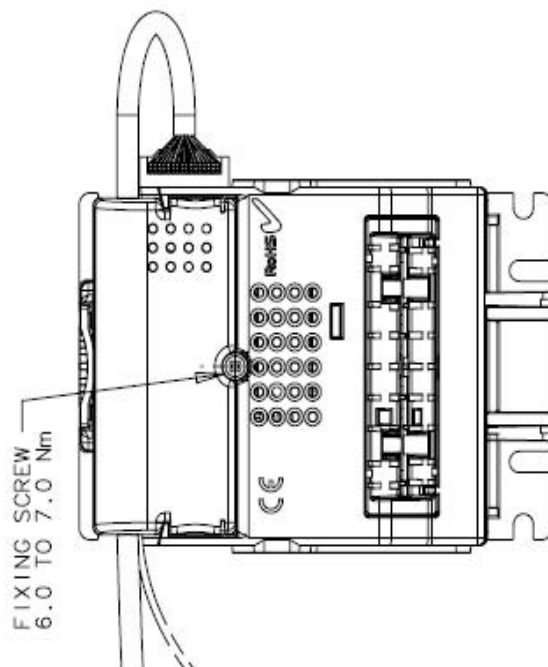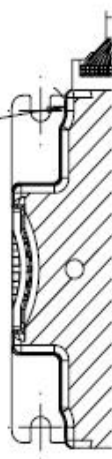
BV20 MDB PSU CABLE ASSEMBLY WITH EXTENDED LENGTH AND Y-SPLIT END (MDB PSU TO HOST MACHINE)
DRAWING NUMBER CN307

Terminal

	Housing
CON1	Leotronics 6740-1061 (2x3way 4.20mm pitch, receptacle)
CON2	Leotronics 2010-2051 (1x5way 2.00mm pitch, socket)
CON3	Leotronics 6740-2061 (2x3way 4.20mm pitch, plug)

	Crimp
	6744-2001 (tin plated)
	2033-2001 (tin plated)
	6743-2001 (tin plated)

Connectivity by conductor

CON1 Pin	CON2 Pin	CON3 Pin	Gauge (AWG)	Colour	Comments
1	5	1	24	Red	+Vin
2	4	2	24	Black	DC Power Return/GND
4	3	4	24	Yellow	Master Receive
5	2	5	24	Brown	Master Transmit
6	1	6	24	Orange	Comms Common

CON1 position 3 unloaded.
CON3 position 3 unloaded.

Stripped and tinned

The shorter length extensions/wires are Green, Black and White.

(See table below for further details)

Cable tie

Heat shrink sleeve (Black)

PVC tubing
(Thickness: 1mm)
(Diameter: 7mm)
(Black)

CON1 (Top View)

CON2

(Rear View)
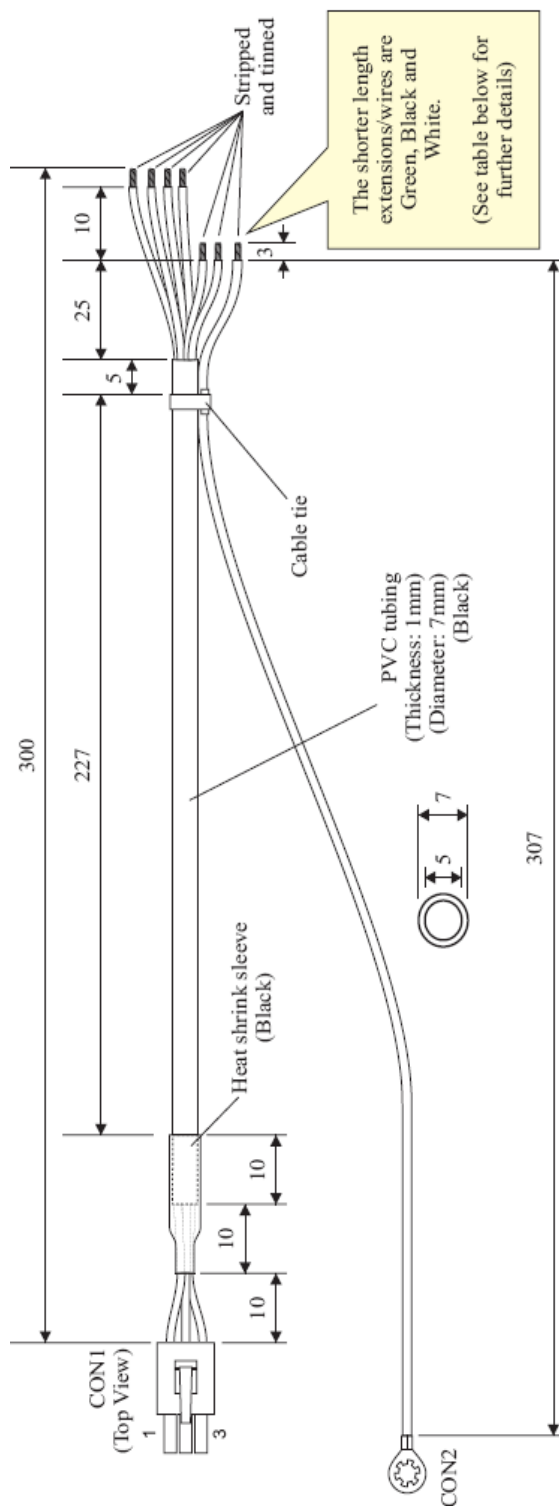
Terminal	Housing	Crimp
CON1	AMP 172169-1 (1x5way 2.00mm pitch, housing)	AMP 794137-1 (tin plated)
CON2	M5 ring terminal, sheared	-

Connectivity by conductor

CON1 Pin	CON2 Pin	Gauge (AWG)	Colour	Comments
2		22	Orange	
3		22	Red	
4		22	Black	Cut shorter at exposed end
6		22	White	Cut shorter at exposed end
7		22	Brown	
8		22	Blue	
	x	22	Green	Cut shorter at exposed end

CON1 position 1,5 & 9 unloaded.

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5 MACHINE INTERFACE PROTOCOLS

5.1 PARALLEL INPUT AND OUTPUT

To use Parallel Output for 4-note/channel acceptance, the parallel interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager program. In parallel mode the BV20 will issue a 100ms (±3%) active LOW pulse on the relevant vend line. A maximum of 4 channels can be used.

Connections:

```
  1              15
  ○○○○○○○○
  ○○○○○○○○
  2              16
```
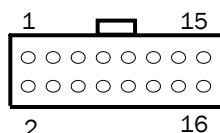
Pin	Name	Type	Description
1	Vend 1	Output	Channel 1 credit, 100ms (±3%) active LOW pulse.
2	Vend 2	Output	Channel 2 credit, 100ms (±3%) active LOW pulse.
3	Vend 3	Output	Channel 3 credit, 100ms (±3%) active LOW pulse.
4	Vend 4	Output	Channel 4 credit, 100ms (±3%) active LOW pulse.
5	Inhibit 1	Input	Inhibit channel 1 by holding this pin HIGH, hold LOW to enable.
6	Inhibit 2	Input	Inhibit channel 2 by holding this pin HIGH, hold LOW to enable.
7	Inhibit 3	Input	Inhibit channel 3 by holding this pin HIGH, hold LOW to enable.
8	Inhibit 4	Input	Inhibit channel 4 by holding this pin HIGH, hold LOW to enable.
9	Busy	Output	Active LOW when the BV20 is transporting, reading or stacking a note
10	Escrow	Input	Enable the escrow function by holding LOW (See Appendix B – Escrow Control)
11	Factory use only		Do not connect
12	Factory use only		Do not connect
13	Factory use only		Do not connect
14	Factory use only		Do not connect
15	+Vin	Power	Nominal 12V DC supply
16	0V	Ground	0V supply

Table 7 - Parallel and Binary Pin Description

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

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

If all four inhibits are high simultaneously then the BV20 will be disabled. In this state the bezel will not illuminate and if a note is inserted the motor will run in reverse preventing the insertion of the note. All four inhibits may be connected together to create a 'global' inhibit. In this way the BV20 may be brought in and out of operation by the host machine.

Busy Output: (Pin 9). This is a general-purpose busy signal. It is active low while the BV20 is in operation.

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Escrow Control: (Pin 10) Hold this pin low to enable the single note escrow function. (Appendix B – ESCROW CONTROL).

It is possible to operate the BV20 in low power mode with the Parallel interface. For further details please see Chapter 6.4.

5.2 PULSE STREAM OUTPUT

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

In Pulse mode the BV20 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 Validator Manager Software. A maximum of 16 channels can be used.

Connections:

```
   1          15
 ┌───────□───────┐
 │ ○○○○○○○○ │
 │ ○○○○○○○○ │
 └───────────────┘
   2          16
```
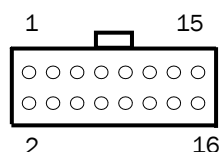
Pin	Name	Type	Description
1	Vend 1	Output	Credit pulse stream output.
2	Vend 2	Output	Not used
3	Vend 3	Output	Not used
4	Vend 4	Output	Not used
5	Inhibit 1	Input	Inhibit channel 1 by holding this pin HIGH, hold LOW to enable.
6	Inhibit 2	Input	Inhibit channel 2 by holding this pin HIGH, hold LOW to enable.
7	Inhibit 3	Input	Inhibit channel 3 by holding this pin HIGH, hold LOW to enable.
8	Inhibit 4	Input	Inhibit channel 4 by holding this pin HIGH, hold LOW to enable.
9	Busy	Output	Active LOW when the BV20 is transporting, reading or stacking a note
10	Escrow	Input	Enable the escrow function by holding LOW (See Appendix B – Escrow Control)
11	Factory use only		Do Not Connect
12	Factory use only		Do Not Connect
13	Factory use only		Do Not Connect
14	Factory use only		Do Not Connect
15	+Vin	Power	Nominal 12V DC supply
16	0V	Ground	0V supply

Table 8 – Pulse Mode Pin Description

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

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It is possible to operate the BV20 in low power mode with the Pulse interface. For further details please see Chapter 5.4

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

Eg. with a setting of 2 pulses per dollar, a five dollar bill will give 2 pulses, 5 times.
A typical use of this option would be for a Pool table with a game price of $1. You could insert a $5 note and press a button that toggles the escrow line and releases the pool balls; this would then allow you to play the first game. The Validator holds onto the remaining credits until the game has finished and the button is pressed again allowing the next game to begin, this continues until all the credits have been used.

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

NOTE:
From Firmware version BV 4.02 release, the pulse width setting function has been improved.

• The user will be able to set custom values for pulse low, pulse high and pulse per dollar multiplier in a dataset, which can then be downloaded into the BV20.
• Using the programming card, the user can set pulse mode, but retain the existing settings by not selecting the options for High pulse, Low pulse or Pulse per Dollar. In this way the user will retain any custom settings he has made. So for example, if the users BV are set to pulse low 5ms, pulse high 45ms with multiplier 3 - using the programming card with only pulse interface selected will retain these settings. Any one or all of the settings can be changed to the default values (Pulse high or low 100ms or 50ms and multiplier 1 to 4) by selecting the card options in the usual way. On previous firmware versions, the user was required to fill in all the pulse options on the card.

5.3 BINARY OUTPUT – BIN

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

In Binary mode, the BV20 will issue a binary pattern on vend lines 1 to 4 as shown in Table 9 – Binary Credit Outputs. A maximum of 15 channels can be used.

Vend 1	Vend 2	Vend 3	Vend 4	Credit Channel
LOW	HIGH	HIGH	HIGH	Channel 1
HIGH	LOW	HIGH	HIGH	Channel 2
LOW	LOW	HIGH	HIGH	Channel 3
HIGH	HIGH	LOW	HIGH	Channel 4
LOW	HIGH	LOW	HIGH	Channel 5
HIGH	LOW	LOW	HIGH	Channel 6
LOW	LOW	LOW	HIGH	Channel 7
HIGH	HIGH	HIGH	LOW	Channel 8
LOW	HIGH	HIGH	LOW	Channel 9
HIGH	LOW	HIGH	LOW	Channel 10
LOW	LOW	HIGH	LOW	Channel11
HIGH	HIGH	LOW	LOW	Channel 12
LOW	HIGH	LOW	LOW	Channel 13
HIGH	LOW	LOW	LOW	Channel 14
LOW	LOW	LOW	LOW	Channel 15

Table 9 – Binary Credit Outputs

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Connections:

Connections in Binary mode are the same as for Parallel mode.

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

It is possible to operate the BV20 in Low power mode with the Binary interface. For further details please see Chapter 5.4.

5.4 LOW POWER OPTION

Notes:

•Low Power Mode can ONLY be used with the above Parallel, Pulse and Binary protocols.
•Low power mode can only be enabled by correctly completing the configuration cards or via the ITL BNV Currency Manager Program.
•In Low Power Mode the front sensor is checked every 1 second which can lead to a delay in accepting the note when it is presented.
Configuration button functions are only available during power up before the BV20 goes into Low Power Mode.

Electrical Supply	Minimum	Maximum
Supply Voltage (V DC) Absolute Limits	12V ± 10%	
MDB IF5 Version Supply Voltage	+18V	+48V DC or 34V AC
Supply Ripple Voltage	0	0.25V @100 Hz
Supply Currents:		
Sleep (Low Power Mode)		1.2mA
Standby		150mA
Validating		540mA
Peak (Motor Stall)		1700mA

Low Power Mode can be used with all none serial communication protocols to reduce the power consumption of the BV20 when idle. When the BV20 is in this state the current consumption is reduced to approximately 1.2mA. The BV20 goes into low power mode approximately 4 seconds after the validator is powered up and remains in this state until a note is entered (Time A). Following a note insertion the BV20 returns to Low Power mode approximately 1 second after the Busy line goes High (After credit is given or note is rejected). (Time B)

Low Power mode uses 3 control lines: Vend – Pin 1, Inhibit – Pin 5 and Busy – Pin 9
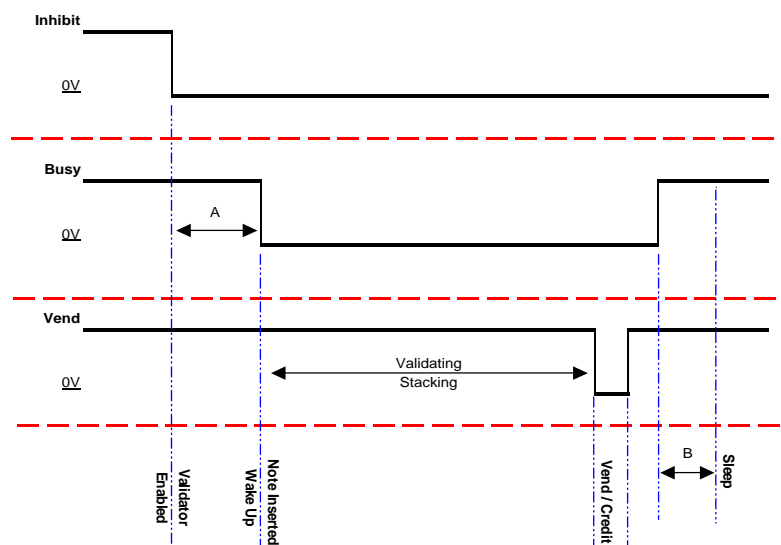

Figure 5 - Low Power Mode Timing Diagram

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TIMING DIAGRAM EXPLAINATION

When the Validator is enabled the Inhibit Line is Low and the Busy Line is High. This remains the same until a note is inserted (Time A).
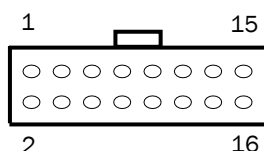
When a note is inserted under the front sensor the BV20 wakes up and the busy line goes low to indicate that the validator is in use. The busy line remains low during the validating and stacking process and once the note has been successfully validated and stacked the vend line goes low to issue the credit.
After the credit is issued the busy line goes high and approximately 1 second after the busy line goes high (Time B) the BV20 goes back into low power mode.

5.5 SERIAL INPUT/ OUTPUT – SIO

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

Serial Input/Output (SIO) is a simple serial protocol compatible with the same interface on NV4 to NV10. It is not recommended for use on new designs due to the possibility of noise effecting the communication. We recommend the use of a serial protocol with error checking such as SSP. The BV20 does not support the Simple Serial Data Out Only mode as available on the NV4 and earlier models.

Connections:

Pin	Name	Type	Description
1	Vend 1	Output	Serial Data Out (Tx)
2	Vend 2	Output	Not Used
3	Vend 3	Output	Not Used
4	Vend 4	Output	Not Used
5	Inhibit 1	Input	Serial Data In (Rx)
6	Inhibit 2	Input	Not Used
7	Inhibit 3	Input	Not Used
8	Inhibit 4	Input	Not Used
9	Busy	Output	Not Used
10	Escrow	Input	Not Used
11	Factory use only		Do not connect
12	Factory use only		Do not connect
13	Factory use only		Do not connect
14	Factory use only		Do not connect
15	+Vin	Power	Nominal 12V DC supply
16	0V	Ground	0V supply

Table 10 - SIO Mode Pin Description

The Baud rate of communications can be set at either 300 or 9600 using the Validator Manager Software. The data format according to the Baud rate used is shown in Table 11 - SIO Data Format.

Baud Rate	Start Bits	Data Bits	Stop Bits
300	1	8	2
9600	1	8	1

Table 11 - SIO Data Format

The BV20 will receive and transmit the following event codes.

Recognised Receive Codes to BV20		Transmitted Codes from BV20	
MESSAGE	DECIMAL VALUE	MESSAGE	DECIMAL VALUE
Inhibit C1	131	Note Accept on C1	1
Inhibit C2	132	Note Accept on C2	2
Inhibit C3	133	Note Accept on C3	3
Inhibit C4	134	Note Accept on C4	4
Inhibit C5	135	Note Accept on C5	5
Inhibit C6	136	Note Accept on C6	6
Inhibit C7	137	Note Accept on C7	7
Inhibit C8	138	Note Accept on C8	8
Inhibit C9	139	Note Accept on C9	9
Inhibit C10	140	Note Accept on C10	10
Inhibit C11	141	Note Accept on C11	11
Inhibit C12	142	Note Accept on C12	12
Inhibit C13	143	Note Accept on C13	13
Inhibit C14	144	Note Accept on C14	14
Inhibit C15	145	Note Accept on C15	15
Inhibit C16	146	Note Accept on C16	16
Un-inhibit C1	151	Note Not Recognised	20
Un-inhibit C2	152	Mechanism running slow	30
Un-inhibit C3	153	Strimming attempted	40
Un-inhibit C4	154	Note Rejected (fraud channel)	50
Un-inhibit C5	155	STACKER Full or Jammed	60
Un-inhibit C6	156	Abort During Escrow	70
Un-inhibit C7	157	Note may have been taken to clear jam	80
Un-inhibit C8	158	Validator Busy	120
Un-inhibit C9	159	Validator Not Busy	121
Un-inhibit C10	160	Command Error	255
Un-inhibit C11	161		
Un-inhibit C12	162		
Un-inhibit C13	163		
Un-inhibit C14	164		
Un-inhibit C15	165		
Un-inhibit C16	166		
Enable serial escrow mode	170		
Disable serial escrow mode	171		
Accept escrow	172		
Reject escrow	173		
Status	182		
Enable all	184		
Disable all	185		
Disable escrow timeout	190		
Enable escrow timeout	191		

Table 12 - Receive and Transmit Codes

Example transactions are shown below (see table 13):

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

Table 13 - Example Protocols

5.6 SMILEY® SECURE PROTOCOL – SSP

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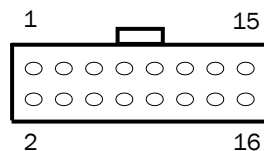
To use SSP mode the SSP Interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager Program, or by pressing and holding the Configuration Button for more than 2 seconds.

SSP is a secure serial interface specifically designed to address the problems experienced by cash handling systems in gaming machines. Problems such as acceptor swapping, reprogramming acceptors and line tapping are all addressed. This interface is recommended for all new designs.
The interface uses a master slave model, the host machine is the master and the peripherals (note acceptor, coin acceptor or coin hopper) are the slaves.

Data transfer is over a multi-drop bus using clock asynchronous serial transmission with simple open collector drivers. The integrity of data transfers is ensured through the use of 16 bit CRC checksums on all packets.

Connections:

Pin	Name	Type	Description
1	Vend 1	Output	Serial Data Out (Tx)
2	Vend 2	Output	Not Used
3	Vend 3	Output	Not Used
4	Vend 4	Output	Not Used
5	Inhibit 1	Input	Serial Data In (Rx)
6	Inhibit 2	Input	Not Used
7	Inhibit 3	Input	Not Used
8	Inhibit 4	Input	Not Used
9	Busy	Output	Not Used
10	Escrow	Input	Not Used
11	Factory use only		Do Not Connect
12	Factory use only		Do Not Connect
13	Factory use only		Do Not Connect
14	Factory use only		Do Not Connect
15	+Vin	Power	Nominal 12V DC supply
16	0V	Ground	0V supply

Table 14 - SSP Pin Description

Other Information:
Minimum time between polls: - 200ms
Default SSP address: - 0x00

For detailed information and full protocol specification please refer to SSP Interface Specification ITL (Drawing GA 138), this is available from the ITL website www.innovative-technology.co.uk.

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

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

To use the MDB mode an MDB Voltage Regulator Module should be fitted to the BV20 Expansion Port or alternatively an IF5 Interface Box can be used. The MDB Interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager Program.

Note:
• Please refer to the Multi-Drop Bus specification for the suggested current drive circuits available.
• The BV20 supports the MDB Protocol version 1, level 1.
• For detailed information and full protocol specification refer to www.vending.org
• MDB address: - 0x30

MDB defines a serial bus interface used in electrically controlled vending machines (see figure 6). This is a 9600 Baud Master-Slave system where the BV20 banknote validator is a slave to a master controller. A master has the capability of communicating with 32 peripherals or slaves. The master is defined as the Vending Machine Controller (VMC).
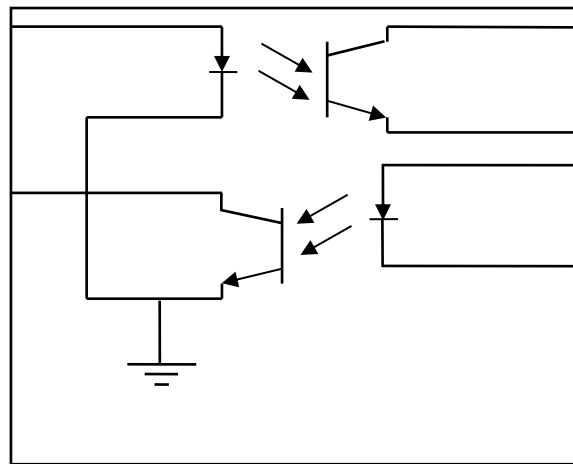

Figure 6 – MDB Opto Isolated Input / Output circuits BV20 MDB Slave

The BV20 Bank Note Validators have a unique address – 00110XXX binary (30H). The VMC polls the bus to detect presence of the BV20 Validator or get information on the current status of the validator.

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

The international country code must be set for the country in which the validators will be operating. This is either the international telephone code for that country, or the country code taken from ISO4217. The code is represented as two bytes. The initial digit signifies the source of the code. 0 signifies the telephone code is used, 1 signifies ISO4217 has been used.
For the USA the country code is 00 01, or 18 40
For Great Britain the code is 00 44, or 18 26.

The scaling factor must also be specified for each validator. All accepted note values must be evenly divisible by this number.
• This number would be set to 100 (Hex 64) for the Euro or Great Britain.
• The number would be set to 1000 (Hex 03E8) for Columbia.
• The number of decimal places must also be programmed for each validator
• The number would be set to 2 for Euro or USA
• The number would be set to 3 for Columbia

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Adopting the numbers above:

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

5.8 ccTALK PROTOCOL – ccTALK

The BV20 supports the ccTalk serial protocol for easy interfacing with host machines that support this protocol. To use ccTalk mode The CCT interface must be programmed into the validator via the Configuration Cards (See Appendix D – Configuration Cards) or via the ITL BNV Currency Manager Program.

Connections
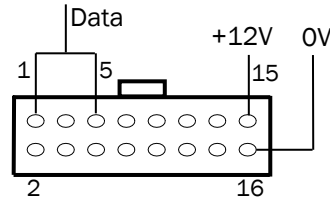
Pin	Name	Type	Description
1	Vend 1	Output	Serial Data. Must also be connected to Pin 5
2	Vend 2	Output	Not Used
3	Vend 3	Output	Not Used
4	Vend 4	Output	Not Used
5	Inhibit 1	Input	Serial Data. Must also be connected to Pin 1
6	Inhibit 2	Input	Not Used
7	Inhibit 3	Input	Not Used
8	Inhibit 4	Input	Not Used
9	Busy	Output	Not Used
10	Escrow	Input	Not Used
11	Factory use only		Do Not Connect
12	Factory use only		Do Not Connect
13	Factory use only		Do Not Connect
14	Factory use only		Do Not Connect
15	+Vin	Power	Nominal 12V DC supply
16	0V	Ground	0V supply

Table 15 - ccTalk Pin Description

Other Information:
For a list of supported commands please see Appendix F – Implemented ccTalk Commands. For detailed information and full protocol specification, please refer to www.cctalk.org
Default ccTalk address: - 0x28 (40 dec)
Encrypted ccTalk uses 16 bit CRC checksum. If the encryption is disabled, the user can select either simple 8 bit or 16 bit CRC checksums.

5.9 OTHER INTERFACES AVAILABLE

Other Interfaces are available on request from ITL. If the interface required is not detailed in this manual, contact support@innovative-technology.co.uk.

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6 USING BV20 CONFIGURATION CARDS

The Configuration Cards offer the following functions:
• Select required Communication Interface (SSP, ccTalk, Parallel etc).
• Adjust the channel and pulse configuration on a pre-programmed BV20 to your own requirements.

Programming the BV20 with the configuration cards is enabled via the 'Configuration Button' on the right hand side of the BV20 (see Chapter 4.2 Configuration Button Functions). (For details on how to complete the configuration cards please see Appendix D – Configuration Cards)

Note: Ensure you use the correct width configuration card for the bezel fitted.

1) Press the Configuration button once whilst the validator is powered up.

2) The Green bezel LED will now flash with a steady heartbeat until a Configuration Card is entered.

3) Once the Configuration Card has been entered the validator reads the card and immediately returns it.

4) The LED then flashes rapidly whilst the interface is being changed. If the LED flashes a number of times slowly, it is an indication of an error (For details of the Error Flash Codes please see page 1 of Appendix D – Configuration Cards)

5) When the changes are complete the validator resets.

If a configuration card is not entered, this function can be cancelled by pressing the button again once. It is now possible to check the programmed settings of the BV20 by pressing the Configuration button twice within half a second. (For details see page 2 of Appendix D – Configuration Cards).

7 MECHANICAL INSTALLATION

The BV20 validator is available with either a 66mm or 72mm Bezel. See drawing number GA790 for dimensions.

BV20 OUTLINE DIMENSIONS
DRAWING NUMBER GA790

In line with continued product development Innovative Technology Ltd reserves the right to change specifications without prior notice.

ACCEPTS NOTES:

1. 66 mm x 160 mm LONG	
2. 72 mm x 160 mm LONG	

SUPPLY AND POWER CONSUMPTION:

VOLTAGE: 12 $\pm$ 10%	
RIPPLE: 0.25 V at 100MHz	
SLEEP: 1.2mA	
STANDBY: 150mA	
VALIDATING: 540mA	
PEAK: 1700mA	

ENVIRONMENTAL OPERATING RANGE:

+3 ºC to +50 ºC at 5% to 95% RH (NON – CONDENSING)	
UNLADEN WEIGHT: 0.3KG	

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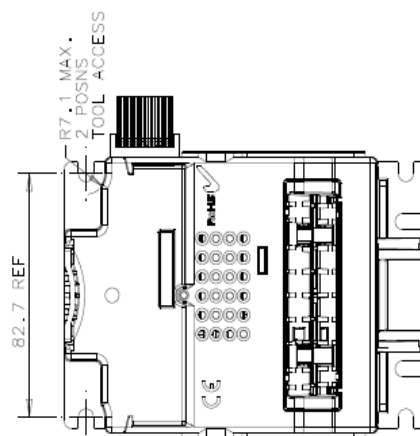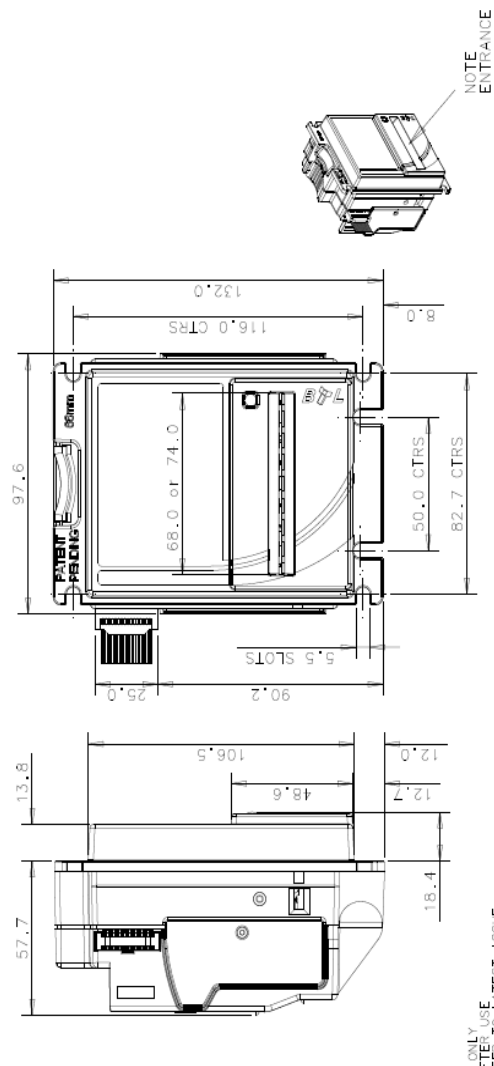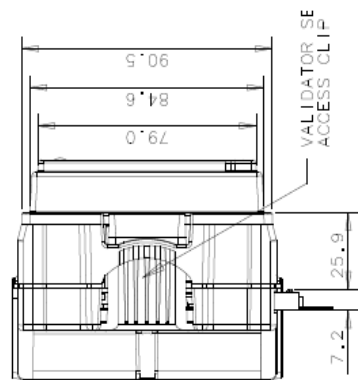
8 ROUTINE MAINTENANCE

The BV20 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 in which it is used the BV20 may at some time require re-calibration.

8.1 RE-CALIBRATION

The BV20 has an in-built self-calibration system that maintains the optical sensors at their best operating point. However if the BV20 is disassembled for any reason it will need to be re-calibrated. Re-calibration may only be performed under license from ITL, contact support@innovative-technology.co.uk for further details.

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

9 SUPPORT TOOLS

The following support tools are available for use with the BV20 Bank Note Validator:
• ITL Bank Note Validator Currency Manager Software.
• Configuration Cards.
• Validator Programming System (DA3).
• Downloads from the Innovative Technology Ltd website: www.innovative-technology.co.uk
• E-mail Support via support@innovative-technology.co.uk

9.1 CONFIGURATION CARDS

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

9.2 ITL BANKNOTE VALIDATOR CURRENCY MANAGER

NOTES:
• The validator must be set to Programming Mode (SSP) when connected to a computer or DA3 and then returned to the original settings when complete (See Chapter 4.2 Configuration Button Functions).
• ITL BNV Currency Manager 3.2.0 or Higher must be used to access the BV20 functions.
• Datasets can only be downloaded to a BV20 with the correct bezel width for the currency. For example a USD dataset can only be downloaded to a 66mm BV20. A Euro dataset can only be downloaded to a 72mm BV20.

The ITL BNV Currency Manager software offers the following functions:
• Program the Validator by downloading pre-prepared currency data via the DA1 or DA2 kit.
• Check the firmware version and currency set already loaded on a BV20 unit.
• Adjust the channel and pulse configuration on a pre-programmed BV20 to your own requirements.
• Download a new version of firmware onto the BV20.
• Use diagnostic functions to check Validators operation.

The software will run on an IBM compatible Personal Computer with Pentium™ Processor or equivalent (see Appendix E – PC System Specification) for operating system requirements and requires a DA1 kit fitted to the serial port or DA2 kit fitted to the USB port. (See Appendix C – Interface Tools DA1 – DA2).

9.3 VALIDATOR PROGRAMMING SYSTE, (DA3)

The DA3 is a programming system designed to enable the programming of ITL Bank Note Validators in the field without the use of a PC.
Once the DA3 has been programmed the user can:
• Update the existing software within a validator to the latest versions using the BNV Match Download Function.
• Reprogram the validator to accept a different currency using the BNV Override Download Function
• Test the functionality of the validator away from the Host Machine.
For full DA3 operation and functionality details please refer to the DA3 User Manual (Document number GA339).

Note: When using the DA3 BNV Match Download Function, any pulses and channel allocations programmed into the BV20 will not be retained. The user must ensure that the required dataset options are set and saved before programming the DA3.

When programming a BV20 using the DA3 BNV Override Download Function, the firmware interface is unchanged. A Configuration Card must be used after re-programming if a different interface is required.

9.4 INTERNET WEBSITE SUPPORT

The Innovative Technology Ltd website provides the means to download new and updated currency sets and new versions of firmware for the BV20. You can obtain these along with technical bulletins by visiting www.innovative-technology.co.uk.

9.5 EMAIL SUPPORT

If the data you require is not available over the Internet Innovative Technology supports an e-mail system to help customers with unusual requirements. The address is: support@innovative-technology.co.uk.

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10 APPENDIX

10.1 APPENDIX A – EXPLODED DIAGRAMS

Exploded diagrams part list:

No	Part No	Part description	Qty
1	PM771	BV20 Case	1
2	PM770	Bezel 72mm	1
2	PM781	Bezel 66mm	1
3	PA775	66mm Lens Assembly	1
3	PA776	72mm Lens Assembly	1
4	PM787	Light Pipe	1
5	PM775	Pressure Wheel	3
6	SP162	Axle Spring	3
7	PA771	Front Axle Assembly	1
8	PM774	Idle gear (16T – 0.8M)	1
9	SC113	No.4 20 x $^1/_4$" Pozi Flange BZP	1
10	PB243	Printed Circuit Board	1
11	PM773	Motor Cover	1
12	PA774	Motor Assembly	1
13	PA773	Drive Axle Assembly	1
14	PA781	Transfer Shaft Assembly (PM533, PM772, MC253)	1
15	LB155	Strim Sensor Label	1

BV20 EXPLODED ASSEMBLY
DRAWING NUMBER GA792

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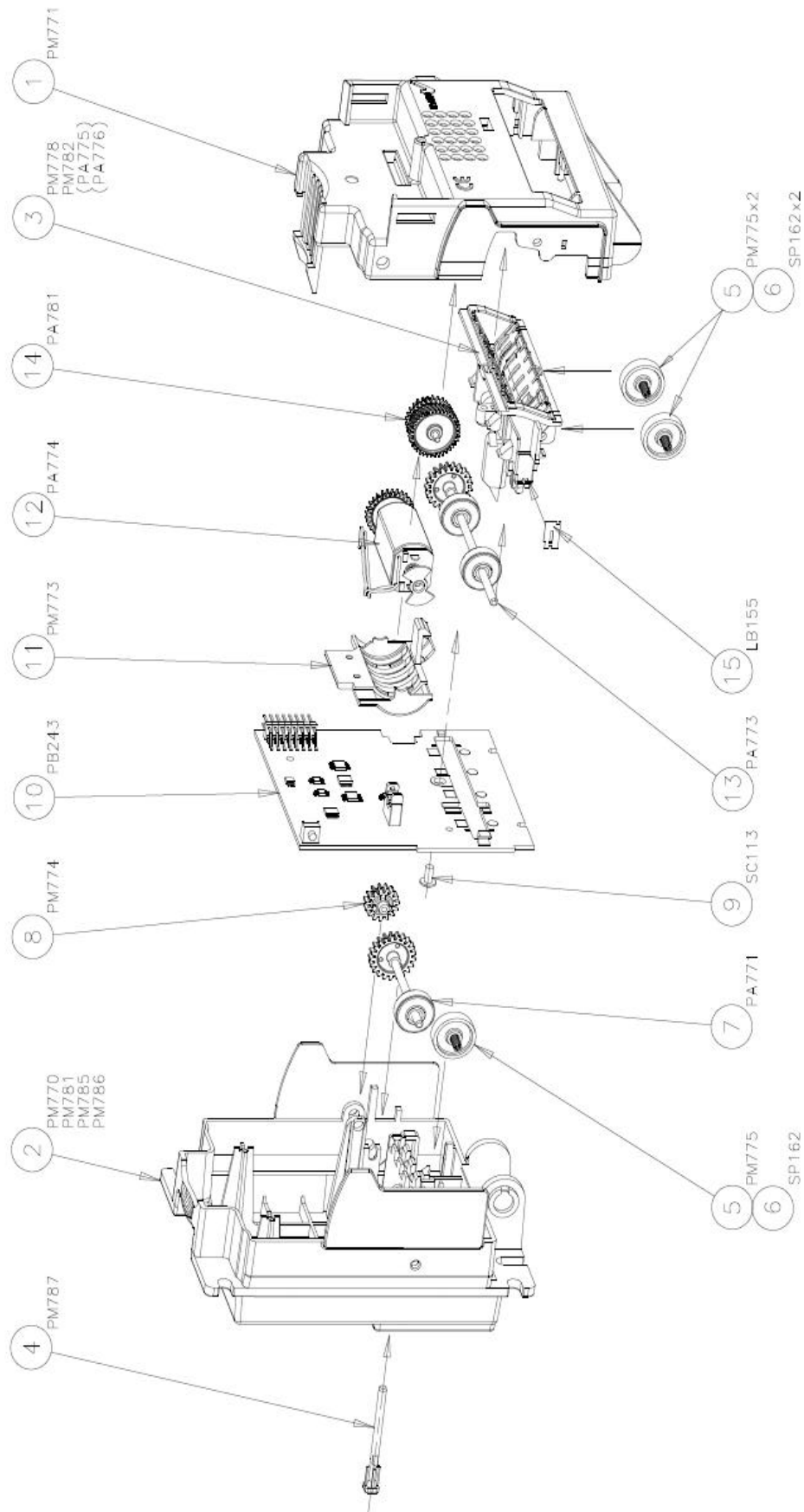
10.2 APPENDIX B – ESCROW CONTROL

The BV20 has a single note escrow facility (pin 10) used in Parallel and Binary modes. This allows the validator to hold onto the note once accepted, and then only stack the note in the cash box when the host machine confirms that the Vend operation has been completed. If no confirmation of the Vend is received then the note will be returned to the customer after 30 seconds, (see figure 7).
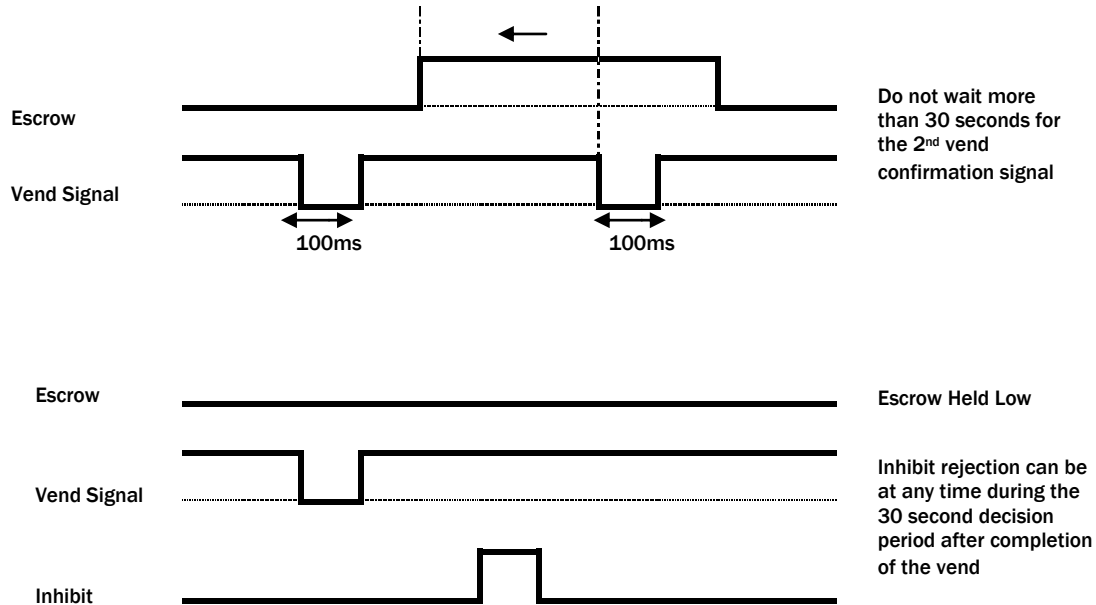

Figure 7 - Escrow Timing Diagram for Parallel Vends

If the host machine itself aborts the transaction by setting the corresponding inhibit input high, the note is returned immediately. The sequence of operations is as follows:
• Pin 10 held low awaiting note insertion.
• Note inserted. Validator issues a 100ms pulse on the appropriate channel.
• The host machine initiates vend process.
• The host machine sets pin 10 high to indicate that it wants the note. If this is not done within 30 seconds the Validator will return the note.
• The Validator issues a 100ms pulse on the appropriate channel after pin 10 going high to indicate final acceptance of the note. If the signal has not been received within 30 seconds it indicates the customer has forcibly retrieved the note and the vend must be aborted.
• The vend process is completed.
• The host machine sets pin 10 low in expectation of the next vend.

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

In the event of a note being forcibly removed from the mouth of the BV20 during the 30-second interval, the BV20 will go out of service for 45 seconds.

10.3 APPENDIX C – INTERFACE TOOLS DA1 – DA2

The DA1/2 Kits are designed for the following:
- Connecting of ITL Note Validators to a PC for the upgrade and user option setting of Currency and Firmware files.
- Testing note acceptance of Note Validators independent of the host machine to confirm that the validator is working.

The DA1 and DA2 Kits comprise the following components:

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

Connecting a DA1 to a validator and PC

For the PC system specification and set up refer To Appendix E – PC System Specification.

Connect the DA1 to the validator as shown below (see figure 8), using the 16-way to 5-way connector. The supplied 3.5mm jack plug and 2 banana plugs are used to supply power to the DA1 when using a variable Bench power supply (Connect the +12 volts to the red banana plug and GND (0V) to the black plug). Alternatively a Portable DC Power Adapter supplying 12V and 1.5A minimum can be used.

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

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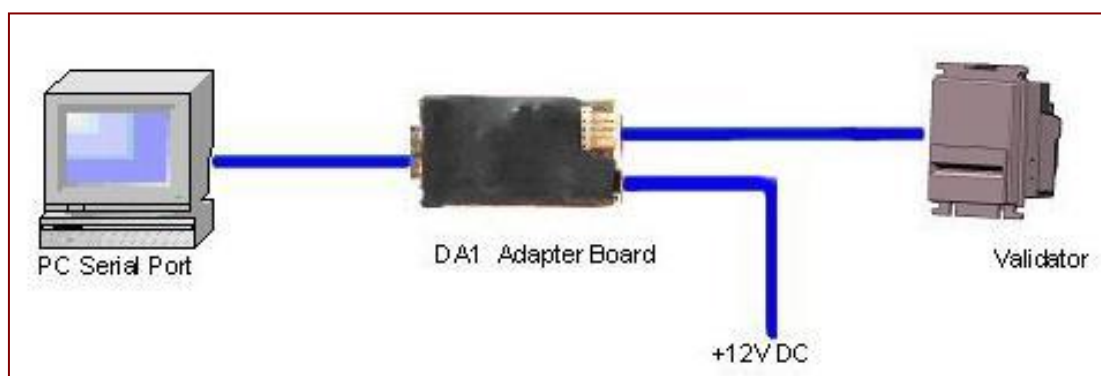

Figure 8 – Connecting DA1 to BV20 and PC for upgrading Validator programs
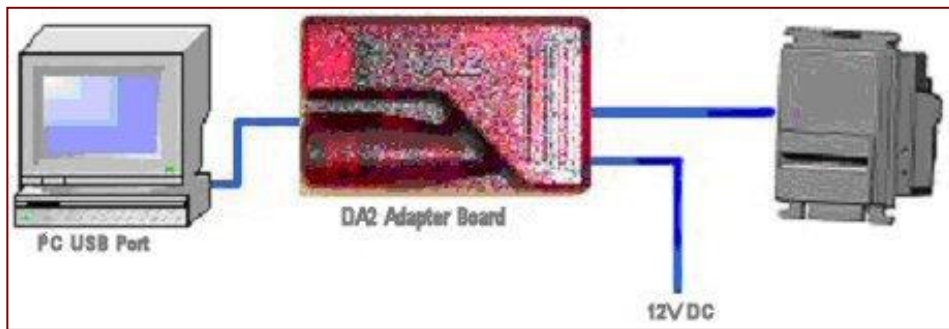
Connecting a DA2 to a validator and PC

Figure 9 – **Connecting a DA2 to a BV20 and PC for upgrading Validator Programs**

Software Installation

DA1 - To install the ITL BNV Download Manager Software insert the CDROM into the correct PC drive. The CD should automatically run and an installation menu will appear. Double click the ITL BNV Download Manager and follow the on-screen instructions. You can also install the Currency files, Firmware files and the Technical Manuals for each specific product as well as other generic documentation.
The Quick Start Guide for the DA1 is document number GA151.

DA2 - To install the ITL BNV Download Manager Software insert the CDROM into the correct PC drive. The CD should automatically run and an installation menu will appear. Double click DA2 installation guide (GA338) and follow the instructions relating to your specific Operating System.

NOTE: All files contained on the CD are available from the ITL website: www.innovative-technology.co.uk

Please contact support@innovative-technology.co.uk, if you require further assistance.

10.4 APPENDIX D – CONFIGURATION CARDS

Instructions for use

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

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

3) Power up BV20 and allow it to reset.

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

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

6) Card will be returned and if configuration was good the bezel LEDs will flash rapidly while programming takes place. TAKE CARE TO ENSURE THE POWER IS NOT REMOVED AT THIS STAGE, THE BV MAY SUFFER PERMANENT DAMAGE!! The BV will then reset.

If an error occurs has occurred the card will be rejected and the bezel LEDs will flash slowly a number of times to indicate the cause of the error. (see table below)

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

IMPORTANT CHECK THAT THE CONFIGURATION REQUESTED HAS BEEN SET IN THE BV20 BEFORE USE.

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Program check procedure

To check settings on a programmed unit:

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

	Flash count	Pulse High	Pulse Low	Pulse per dollar	High speed	Disabled	cctalk plain	cctalk 8 bit	low power	binary	Credit Hold	No escrow t/out
SSP	1											
Pulse	2	ms/10	ms/10	value							3 flash	
MDB	3											
IF 30	4											
IF 31	5											
cctalk	6						1 flash	2 flashes				3 flashes
SIO	7				1 flash	2 flashes						3 flashes
Parallel	8									1 flash		2 flashes
SP4	9	ms/10	ms/10	value							3 flash	
NIS	10											
IF 32	11				1 flash							
spare	12											
spare	13											
spare	14											

For example:

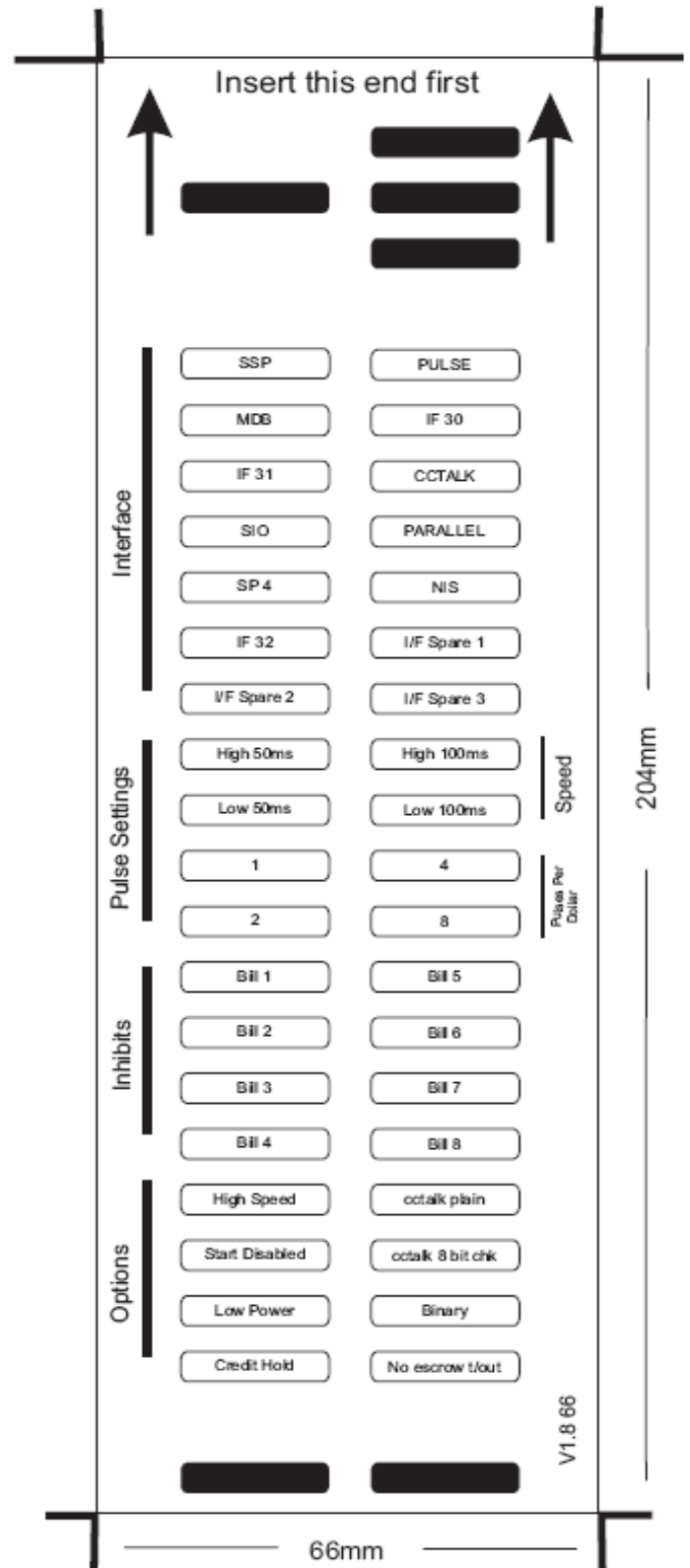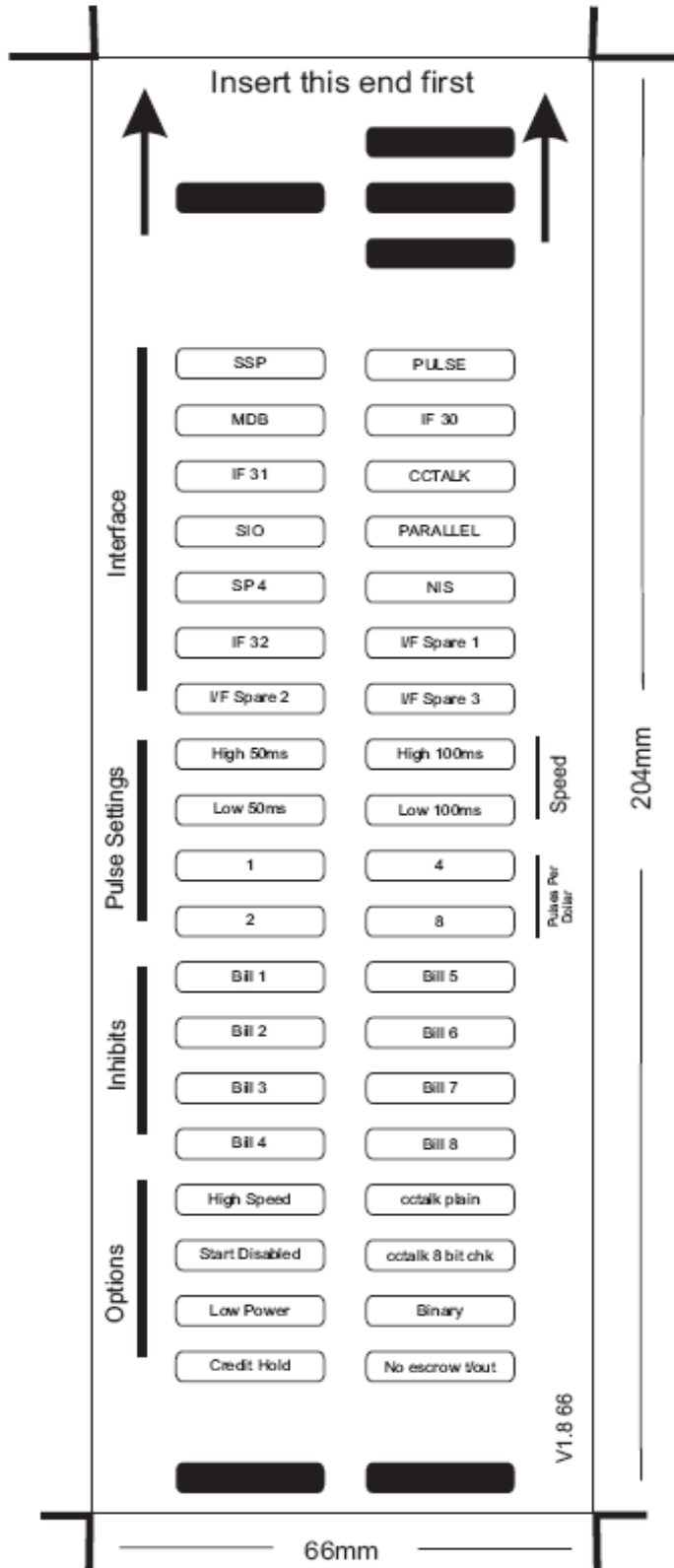A Pulse interface with 50ms high, 100ms low, 2 pulse per dollar will flash 2,5,10,2
A SSP interface will only ever flash once
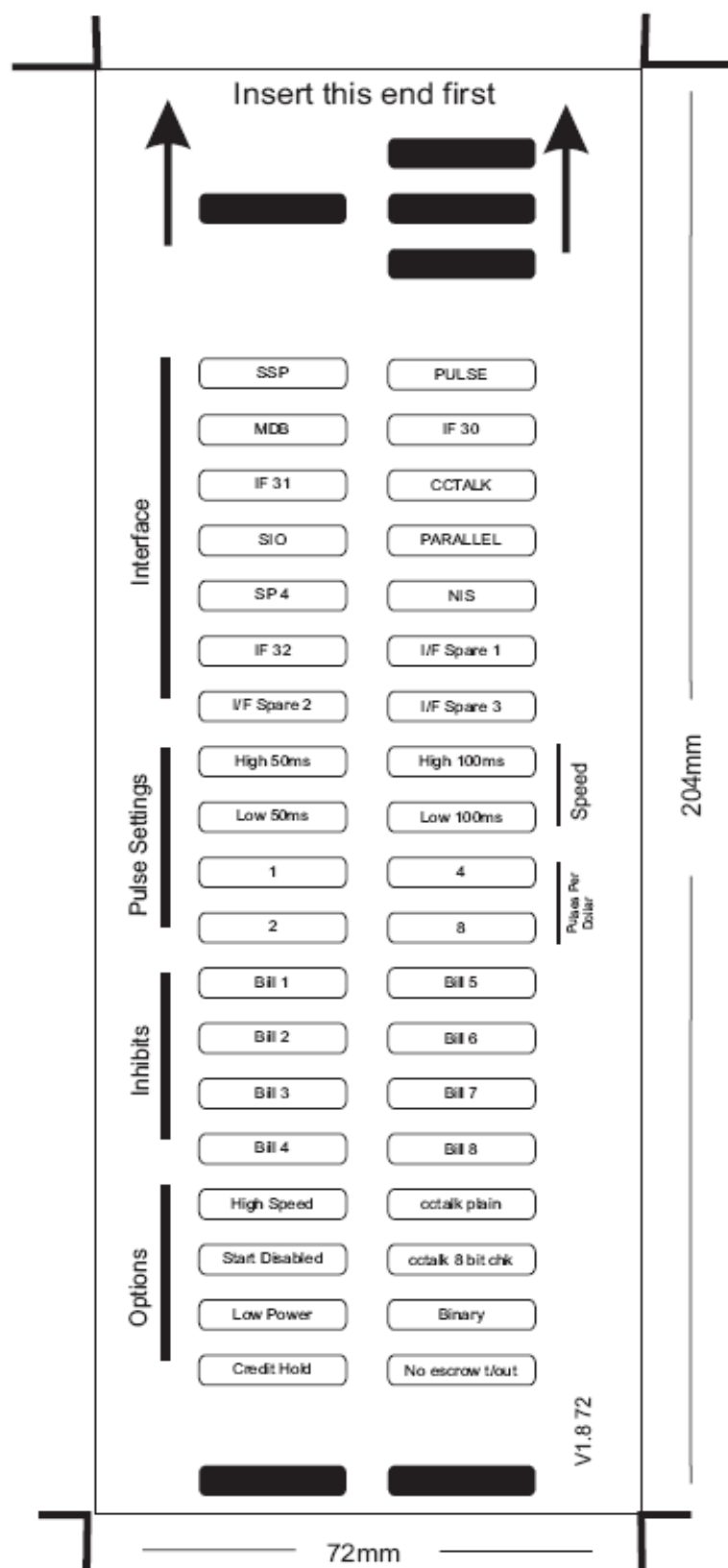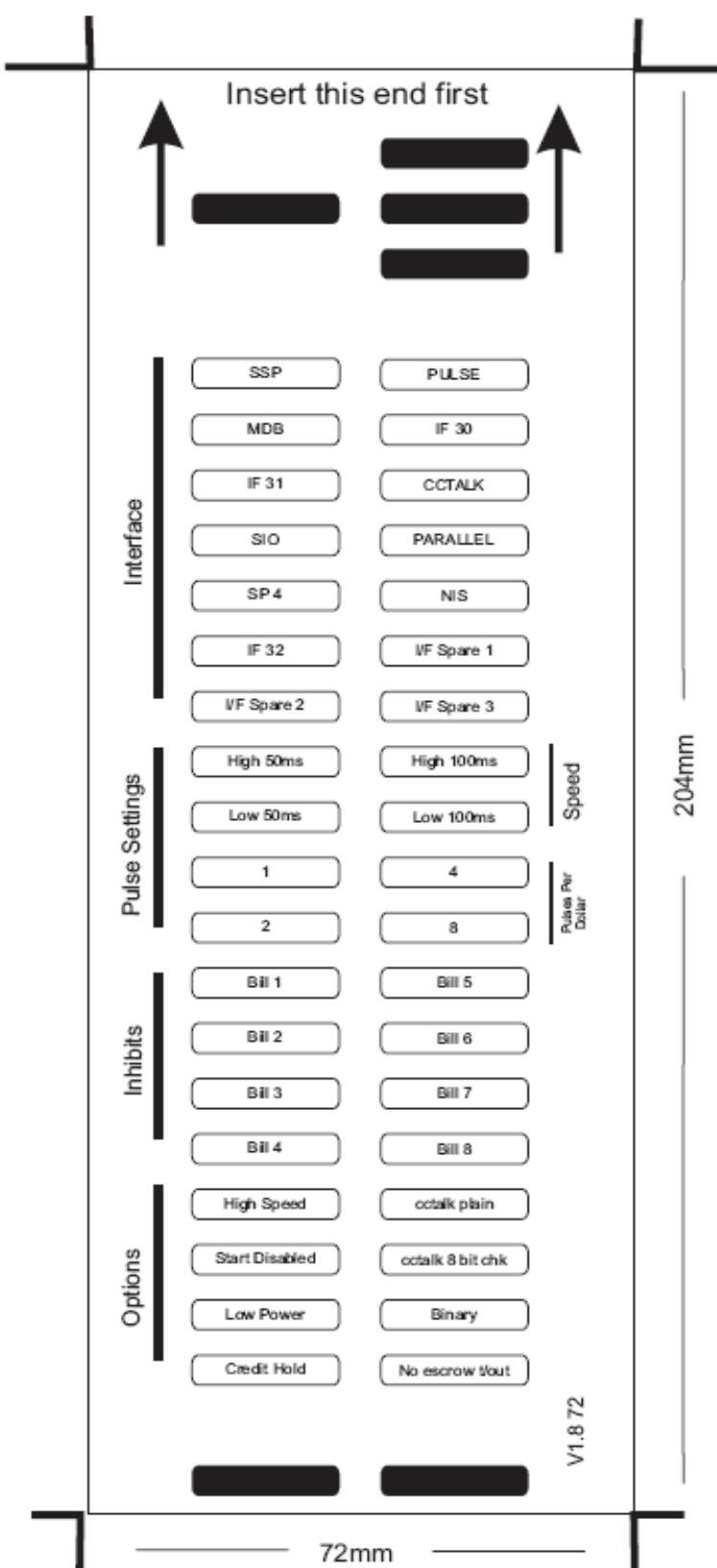A ccTalk interface with 16 bit checksum, no encryption will flash 6,1
A ccTalk interface with 8 bit checksum, no encryption will flash 6,1,2
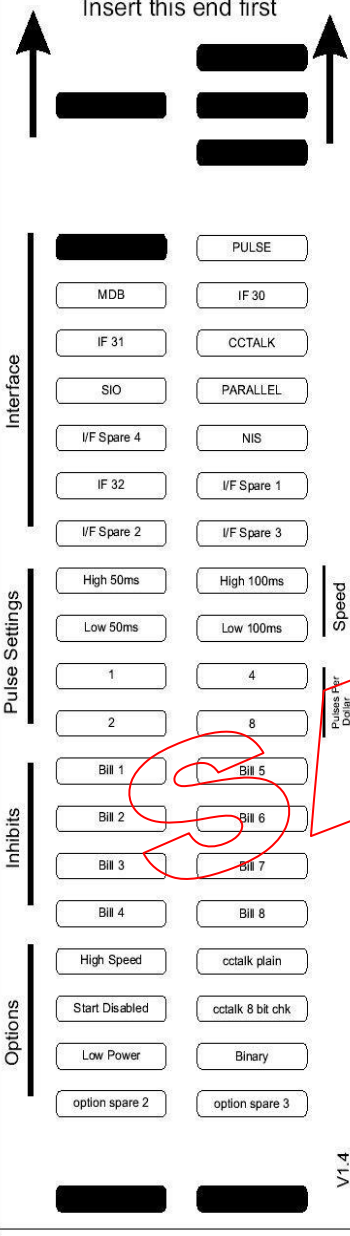A Binary interface will flash 8,1

66mm Bezel

Left configuration card

Insert this end first

Interface		
SSP	PULSE
MDB	IF 30
IF 31	CCTALK
SIO	PARALLEL
SP 4	NIS
IF 32	I/F Spare 1
I/F Spare 2	I/F Spare 3

Pulse Settings		
High 50ms	High 100ms	Speed
Low 50ms	Low 100ms	Speed
1	4	Pulses Per Dollar
2	8	Pulses Per Dollar

Inhibits		
Bill 1	Bill 5
Bill 2	Bill 6
Bill 3	Bill 7
Bill 4	Bill 8

Options		
High Speed	cctalk plain
Start Disabled	cctalk 8 bit chk
Low Power	Binary
Credit Hold	No escrow t/out

204mm

66mm

V1.8 66

Right configuration card

Insert this end first

Interface		
SSP	PULSE
MDB	IF 30
IF 31	CCTALK
SIO	PARALLEL
SP 4	NIS
IF 32	I/F Spare 1
I/F Spare 2	I/F Spare 3

Pulse Settings		
High 50ms	High 100ms	Speed
Low 50ms	Low 100ms	Speed
1	4	Pulses Per Dollar
2	8	Pulses Per Dollar

Inhibits		
Bill 1	Bill 5
Bill 2	Bill 6
Bill 3	Bill 7
Bill 4	Bill 8

Options		
High Speed	cctalk plain
Start Disabled	cctalk 8 bit chk
Low Power	Binary
Credit Hold	No escrow t/out

204mm

66mm

V1.8 66

34

72mm Bezel

Insert this end first		**Insert this end first**

Interface

SSP	PULSE
MDB	IF 30
IF 31	CCTALK
SIO	PARALLEL
SP 4	NIS
IF 32	I/F Spare 1
I/F Spare 2	I/F Spare 3

Pulse Settings

High 50ms	High 100ms	Speed
Low 50ms	Low 100ms	
1	4	Pulses Per Dollar
2	8	

Inhibits

Bill 1	Bill 5
Bill 2	Bill 6
Bill 3	Bill 7
Bill 4	Bill 8

Options

High Speed	cctalk plain
Start Disabled	cctalk 8 bit chk
Low Power	Binary
Credit Hold	No escrow t/out

V1.8 72

204mm

72mm

Interface

SSP	PULSE
MDB	IF 30
IF 31	CCTALK
SIO	PARALLEL
SP 4	NIS
IF 32	I/F Spare 1
I/F Spare 2	I/F Spare 3

Pulse Settings

High 50ms	High 100ms	Speed
Low 50ms	Low 100ms	
1	4	Pulses Per Dollar
2	8	

Inhibits

Bill 1	Bill 5
Bill 2	Bill 6
Bill 3	Bill 7
Bill 4	Bill 8

Options

High Speed	cctalk plain
Start Disabled	cctalk 8 bit chk
Low Power	Binary
Credit Hold	No escrow t/out

V1.8 72

204mm

72mm

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

SSP   Parallel   Binary

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

Encrypted ccTalk

Unencrypted ccTalk with 16-bit Checksum

Pulse – Pulse width 50/100 ms 4 Pulses per Dollar

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

SIO 300-Baud

SIO 300-Baud Starts Disabled

SIO 9600-Baud

SIO 9600-Baud Starts Disabled

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10.5 APPENDIX E – PC SYSTEM SPECIFICATIONS

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

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10.6 APPENDIX F – IMPLEMENTED CCTALK COMMANDS

Command	Header
SIMPLE_POLL	254
ADDRESS_POLL	253
ADDRESS_CLASH	252
ADDRESS_CHANGE	251
ADDRESS_RANDOM	250
REQUEST_POLLING_PRIORITY	249
REQUEST_MANF_ID	246
REQUEST_EQUIP_CAT_ID	245
REQUEST_PRODUCT_CODE	244
SERIAL_NUMBER	242
REQUEST_SOFTWARE_REVISION	241
READ_OPTO_STATES	236
PERFORM_SELF_CHECK	232
SET_INHIBITS	231
REQ_INHIBITS	230
SET_MASTER_INHIBIT	228
REQ_MASTER_INHIBIT	227
REQUEST_INS_COUNT	226
REQUEST_ACCEPT_COUNT	225
REQUEST_DATA_STORAGE_AVAIL	216
REQUEST_OPTION_FLAGS	213
CALCULATE_ROM_CHECKSUM	197
REQUEST_BUILD_CODE	192
REQUEST_BASE_YEAR	170
REQUEST_ADDRESS_MODE	169
READ_BUFFERED_BILL_EV	159
REQUEST_BILL_ID	157
REQUEST_COUNTRY_SCALING	156
REQUEST_BILL_POSITION	155
ROUTE_BILL	154
MODIFY_BILL_OPERATING_MODE	153
REQUEST_BILL_OPERATING_MODE	152
STACKER_CYCLE	147
OPERATE_BI_MOTORS	146
REQUEST_CURRENCY_REVISION	145
SWITCH_ENCRYPTION_CODE	137
STORE_ENCRYPTION_CODE	136
REQUEST_COMMS_REVISION	4
RESET_DEVICE	1

Table 16 – Implemented ccTalk commands

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REVISION HISTORY

INNNOVATIVE TECHNOLOGY LTD			
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DRAWING NO	**AUTHOR**	**DATE**	**FORMAT**
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