PowderPilot™ HD
Controls Manual

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NORDSON Deutschland GmbH – ERKRATH – GERMANY

EC DECLARATION OF CONFORMITY
ACCORDING TO CE DIRECTIVE 2006/42/ EC ANNEX II A

DESCRIPTION	Controls for Powder-Systems Family/ Models: PowderPilot HD
APPLICABLE DIRECTIVES	CEE 2006/42 (Machinery) and following amendments CEE 2004/108 Electromagnetic Compatibility Directive CEE 2006/95 EEC Low Voltage Directive
STANDARDS USED TO VERIFY COMPLIANCE	EN 60204-1 VDE 0113-1
MARKING OF PRODUCT	CE

The equipment delivered is generally intended to be part of a powder coating system, and cannot be operated on its own.
In order to be in full compliance with the CE machinery directive and its amendments, the customer is obliged to respect the applicable regulations for his system upon incorporation of the equipment in the plant and before starting operation.

We hereby declare that the product specified conforms to the directives and standards described above and that it has been provided with a CE label. Provided the product is installed and operated in line with Nordson's manuals its operation is safe.

Kai Flockenhaus,
Manager - Procurement & Process,
ICS Europe Industrial Coating Systems Europe
Nordson Deutschland GmbH

Erkrath, 01st August 2014

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Section 1

Safety

Introduction

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to all persons operating or servicing equipment.

Qualified Personnel

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

Intended Use

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

Regulations and Approvals

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed. All phases of equipment installation must comply with all federal, state, and local codes.

Personal Safety

To prevent injury follow these instructions.

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing any moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Relieve (bleed off) hydraulic and pneumatic pressure before adjusting or servicing pressurized systems or components. Disconnect, lock out, and tag switches before servicing electrical equipment.
- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.

Fire Safety

To avoid a fire or explosion, follow these instructions.

- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Provide adequate ventilation to prevent dangerous concentrations of volatile materials or vapors. Refer to local codes or your material MSDS for guidance.
- Do not disconnect live electrical circuits while working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

Grounding

WARNING: Operating faulty electrostatic equipment is hazardous and can cause electrocution, fire, or explosion. Make resistance checks part of your periodic maintenance program. If you receive even a slight electrical shock or notice static sparking or arcing, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

Grounding inside and around the booth openings must comply with NFPA requirements for Class 2, Division 1 or 2 Hazardous Locations. Refer to NFPA 33, NFPA 70 (NEC articles 500, 502, and 516), and NFPA 77, latest conditions.

- All electrically conductive objects in the spray areas shall be electrically connected to ground with a resistance of not more than 1 megohm as measured with an instrument that applies at least 500 volts to the circuit being evaluated.
- Equipment to be grounded includes, but is not limited to, the floor of the spray area, operator platforms, hoppers, photoeye supports, and blow-off nozzles. Personnel working in the spray area must be grounded.
- There is a possible ignition potential from the charged human body. Personnel standing on a painted surface, such as an operator platform, or wearing non-conductive shoes, are not grounded. Personnel must wear shoes with conductive soles or use a ground strap to maintain a connection to ground when working with or around electrostatic equipment.
- Operators must maintain skin-to-handle contact between their hand and the gun handle to prevent shocks while operating manual electrostatic spray guns. If gloves must be worn, cut away the palm or fingers, wear electrically conductive gloves, or wear a grounding strap connected to the gun handle or other true earth ground.
- Shut off electrostatic power supplies and ground gun electrodes before making adjustments or cleaning powder spray guns.
- Connect all disconnected equipment, ground cables, and wires after servicing equipment.

Proper grounding of all conductive components of a powder coating system provides both shock and electrostatic discharge protection for both operators and sensitive electronic equipment. Many system components (booth, collector, color modules, control consoles, and conveyor) are connected both physically and electrically. It is important that the proper grounding methods and equipment are used when installing and operating the system.

PE (Protective Earth) Grounding

PE grounding is required on all conductive metal electrical enclosures in a system. PE grounding is provided by a ground conductor wire bonded to a true earth ground. PE grounding protects operators from electrical shock by providing a path to ground for electrical current if a conductor contacts an electrical enclosure or other conductive component. The ground conductor wire carries the electrical current directly to ground and short circuits the input voltage until a fuse or circuit breaker interrupts the circuit.

The green/yellow ground wires bundled with the AC input power cable are used only for PE grounding and their sole purpose is to protect personnel from a shock. These ground wires do not protect against electrostatic discharge.

Electrostatic Grounding

Electrostatic grounding protects electronic equipment from damage caused by electrostatic discharges (ESD). Some electronic components are so sensitive to ESD that a person can deliver a damaging static discharge without feeling even a mild shock.

Proper electrostatic grounding is mandatory in an electrostatic powder coating system. Powder spray guns generate electrostatic voltages up to 100,000 volts. It does not take long for ungrounded system components to build up an electrical charge strong enough to damage sensitive electronic components when discharged.

Electrostatic discharges occur at very high frequencies, around 100 megahertz. An ordinary ground conductor does not conduct such high frequencies well enough to prevent damage to electronic components. Special flat braided cables are provided with your Nordson powder coating equipment to protect against ESD.

Gun Current Path

Refer to Figure 1. All electrical circuits need a complete path for current to make its way back to the source (circle=circuit). Electrostatic spray guns emit current (ions) and therefore require a complete circuit. Some of the current emitted by the spray gun is attracted to the spray booth, but most is attracted to the grounded parts moving through the booth. The current attracted to the parts flows through the part hangers to the conveyor and to the building ground, back to the controller through a ground braid and back to the spray gun through the gun driver board. The current attracted to the booth is returned through the booth ground to the controller and back to the gun.

It is very important to provide a complete circuit for the gun current. A break in the circuit conductors (conveyor, booth, braided ground cables, controller) can cause voltage to build up on the conductors up to the maximum output of the spray gun voltage multiplier (up to 100 kV). The voltage will eventually discharge in a high frequency arc and cause damage to the controller electronics (gun driver board and power supply).

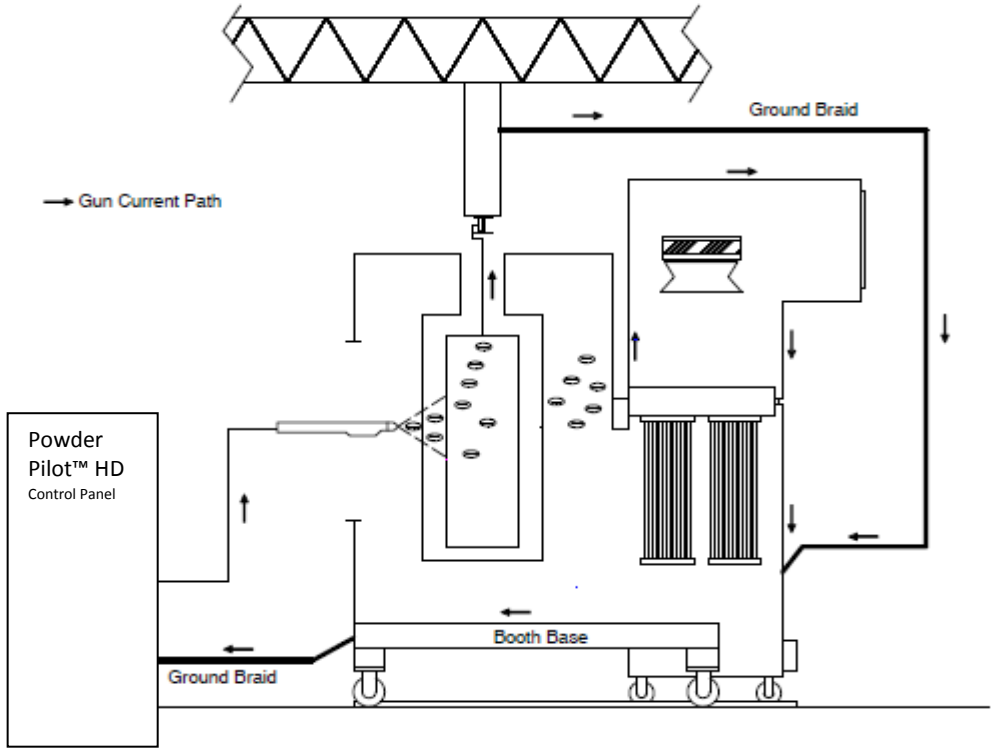


Figure Electrostatic Current Path

ESD Ground Procedures and Equipment

The best protection against ESD is to keep the ground braids as short as possible and connect them to a central point on the booth base as shown in the Star diagram. Under normal conditions making Star connections is not a problem, but in some systems, such as roll-on/roll-off booths, the ground braids required for a Star connection are too long to be effective against ESD. In this case, a Daisy Chain ground configuration is acceptable.

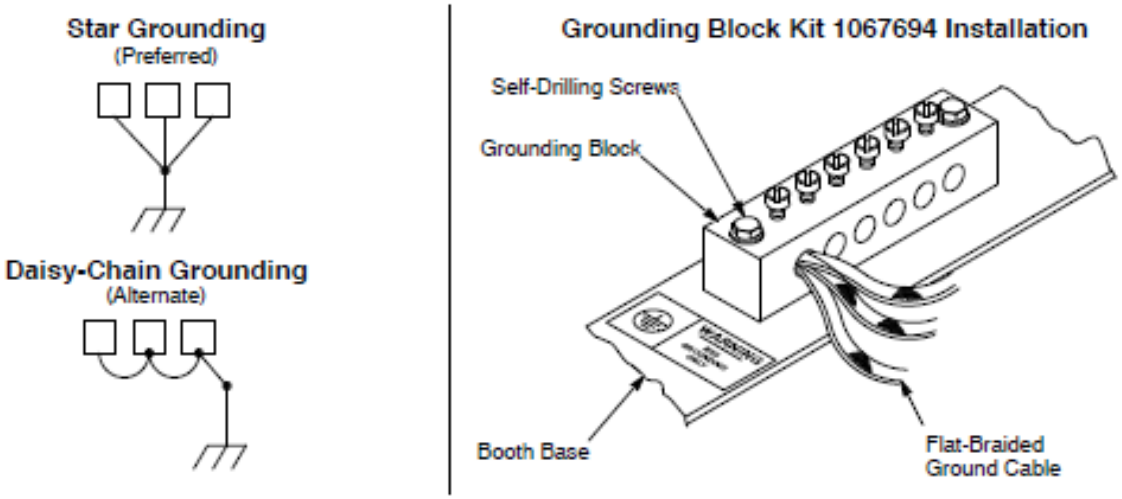


Figure 2 ESD Grounding Procedures and Equipment

Always use the special flat braided copper ESD ground cables furnished with all Nordson spray gun controllers to ground them. The ESD ground cables should always be attached to the welded booth base, not to a panel, enclosure, or other component bolted to the base. Keep the cables as short as possible. If using a grounding block kit, make sure the block is installed directly to the welded base with the included self-drilling screws.

An ESD grounding block kit is available for connecting the ground braids to the booth base. The kit contains two 6-position grounding blocks, fasteners, terminals, and 15 meters (50 feet) of braided ground cable. If additional kits are required, order:

1067694 Kit, ground bus bar, ESD, 6−position, with hardware

Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out electrical power. Close pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the equipment.

Disposal

Dispose of equipment and materials used in operation and servicing according to local codes.

Safety Labels

Table 1 contains the text of the safety labels on the Powder Pilot HD console. The safety labels are provided to help you operate and maintain your console safely. See Figure 3 for the location of the safety labels.

Item	Part	Description
1.	1034161	 **WARNING:** Disconnect power before servicing.

Section 2

Description

Product Information

The Nordson PowderPilot™ is an easy–to–use control system, with software and hardware specifically designed for automated powder coating systems.

The spray control system is based around a Siemens S7–315 PLC unit providing plant control, and a Siemens PC–677 providing Human-Machine-Interface.

The spray control system is based around a Siemens S7-300 Soft-PLC unit providing plant control via a Siemens S1200 PLC, and a Siemens PC-277D panel PC providing Human-Machine Interface

A touch sensitive screen is used for all interactions between the operator and the machine. In addition the control panel is fitted with an Emergency Stop push–button, a Reset push–button and a klaxon unit.

The 15” touch sensitive screen is used for all interactions between the operator and the machine In addition, the control panel is fitted with an Emergency Stop push-button, a Reset push-button and a light stack with klaxon unit.

This manual describes in detail, the operation required to control the plant via the operator interface.

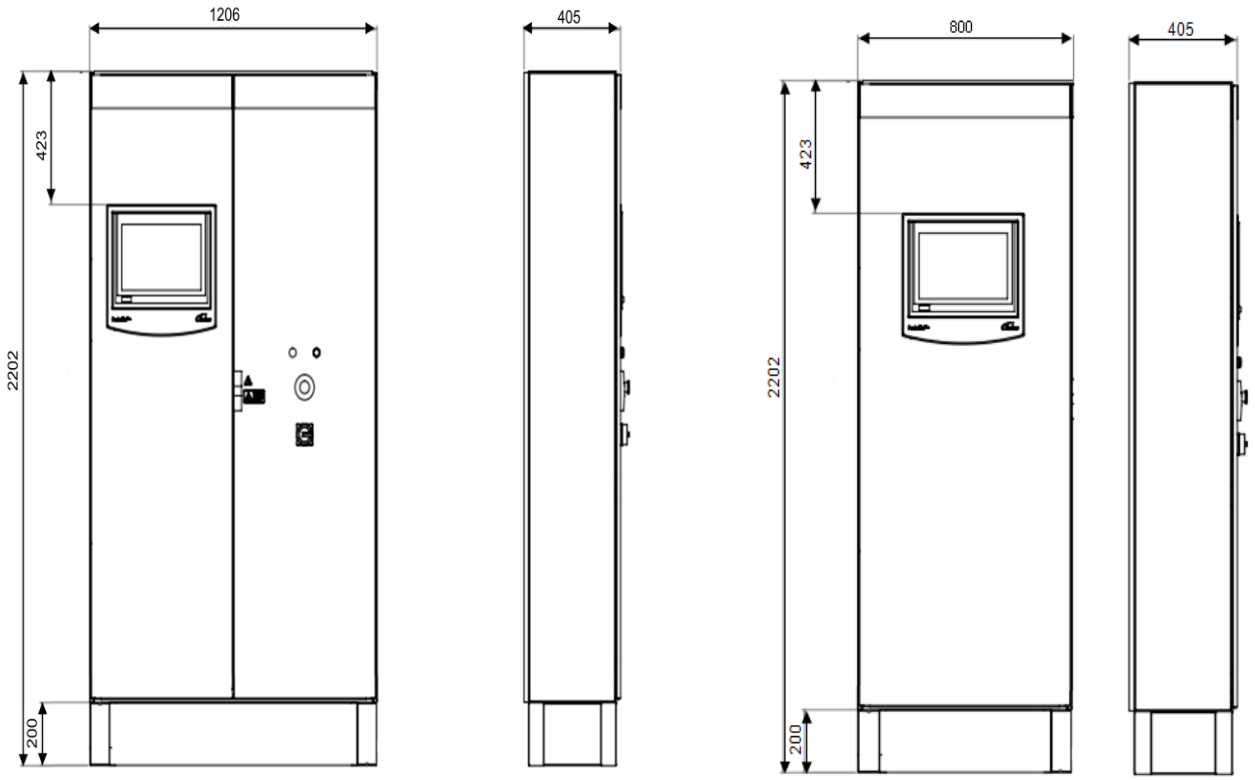
This manual describes the operation required to control the plant via the operator interface as well as operating the SpectrumHD GenII feed centre for fast and easy colour change.

NOTE: The Nordson PowderPilot™ is a bespoke control system and is always designed according to customer requirements.
Technical support is available from your local Nordson Representative.

Console dimensions

The PowderPilot™ HD is available with and without booth control section:

PowderPilot HD including booth control section



PowderPilot HD without booth control section

Specifications

Electrical supply	: 400 VAC /50Hz /3PH
Rated power	: 31 kVA
Panel environmental rating	: IP54

The cabinet must be operated outside hazardous areas or zones

Operating environment	
Temperature	: +15°C – +40°C
Humidity	: 5 – 95%, non condensing
Application	: 24 guns max.

Section 3

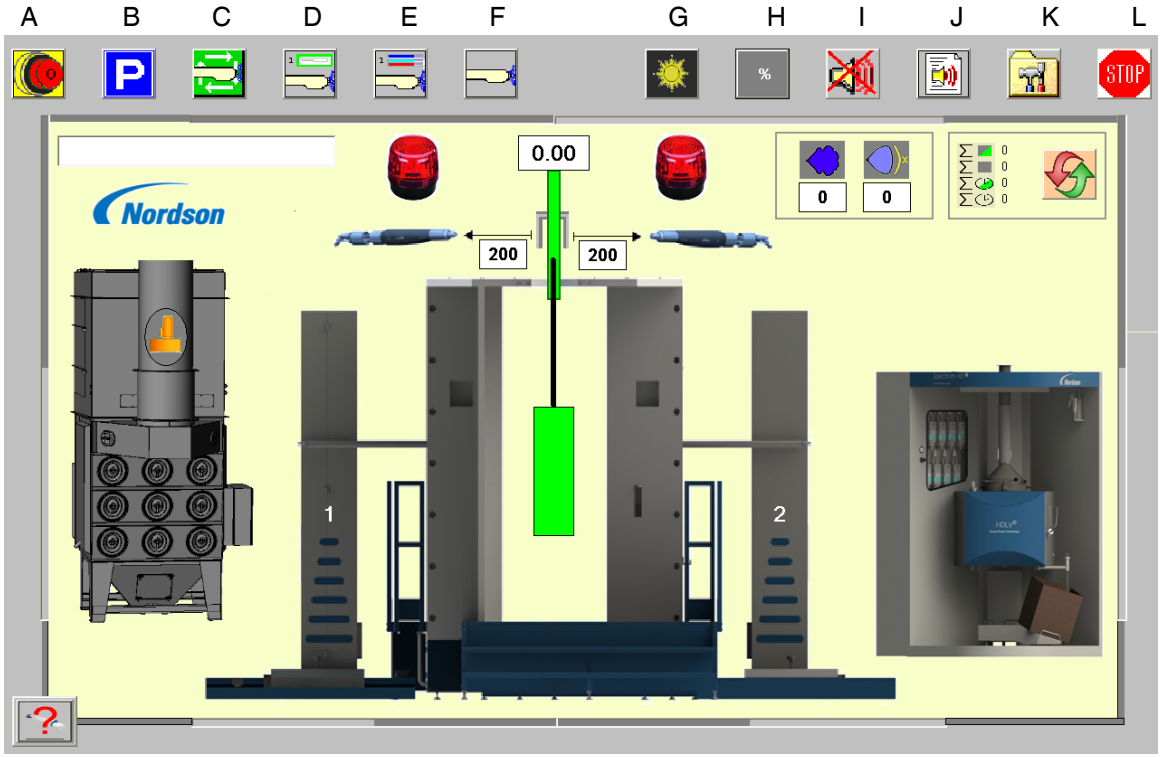
Booth Operation

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

Start-up sequence:

1. Ensure that the system is safe to start
2. Power-up the control panel via the isolator located on the front of the panel door
3. Power-up the after filter control panel via the isolator located on the front of the panel door
4. Ensure the emergency stop button is pulled out Also ensure the emergency stop button is pulled out on the after filter panel
5. Press the Control Reset push-button on the main control panel
6. Safety circuits will now energise and after a short delay, the main screen will be displayed on the operator panel

BOOTH CONTROL SCREEN



Buttons

A – *auto start / stop* **-** This button either starts or stops the booth and spray systems It places the booth in a production or standby mode Each press of this button toggles the mode When the booth is stopped, the oscillators and movers are automatically set to the park position Note:- The extract fan will run on for 30 seconds after the booth is stopped to remove any remaining air borne powder from the booth.

B - *park* – This button stops the oscillators and movers if running and moves them to their pre set park positions It will also stop the guns if they are spraying.

C – *guns auto / manual* – This button toggles the state of the gun control between auto and manual
In auto mode, the guns only trigger when product is in front of them and the conveyor is running
In manual mode, the guns will fire all of the time.

D – *guns triggered display* – This button displays a screen with an overview of which guns are triggered This screen is detailed in a later section of this manual

E – *gun feedback display* – This button displays the gun set point and actual feedback screen All set and running spray values for each gun are displayed here This screen is detailed in a later section of this manual

F – *gun spray control* – This button displays the gun spray control page From here, the guns flow, atomising pressures and KV can be adjusted as well as gaining access to the guns positional dimension control

Full details are described in a later section of this manual

G – *booth lights* – This button turns the booth lights on or off Each subsequent press of this button toggles the lights state between on and off

H – *gun pressure trim* – This button when pressed, reveals a pop up window to control the percentage offset that will be applied to the powder and pattern air set points

I – *mute* – Any fault that occurs with the system will enable an audible Klaxon alarm to attract the operators' attention to the fault Pressing this key silences the alarm The yellow light within the light stack will continue to illuminate until the fault is cleared

J – *alarm summary* – All faults are logged with a time & date at which they occurred

Pressing this button will display an alarm log showing a brief description of the fault and its current status If the status shows as K, then the alarm is active If the alarm is listed with a status of K(G), the alarm is cleared

Pressing the "  " in the top right hand corner of this screen will exit the log

K – *configuration* – This button jumps to the configuration screen The booth system parameters can be adjusted from here

Note:- This screen is only adjusted occasionally and by authorised personnel only Therefore, this screen has been password protected

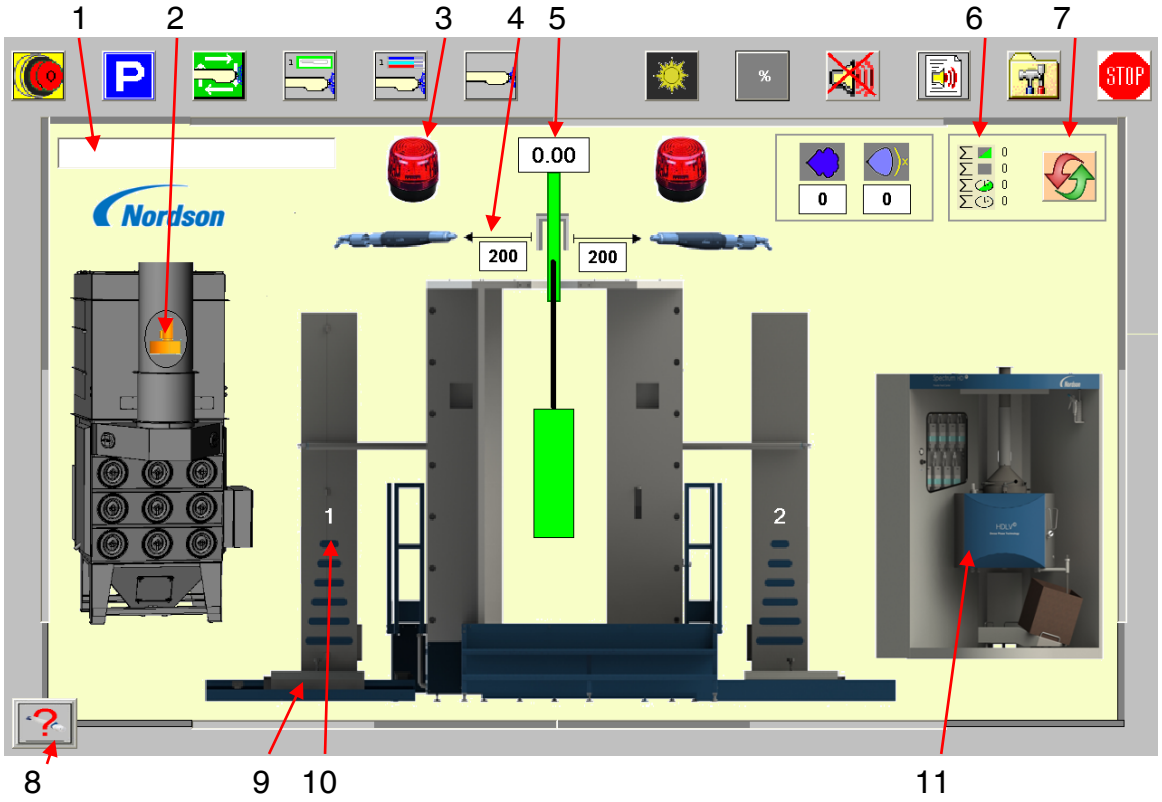
A subsequent section of this manual details the parameters available from this screen

L – *shut down* – touching this button will close all applications and shuts down the PC

Important: before switching off the system use this function to securely disable the soft-PLC and save all data stored in its memory.

Stay patient before switching off power.

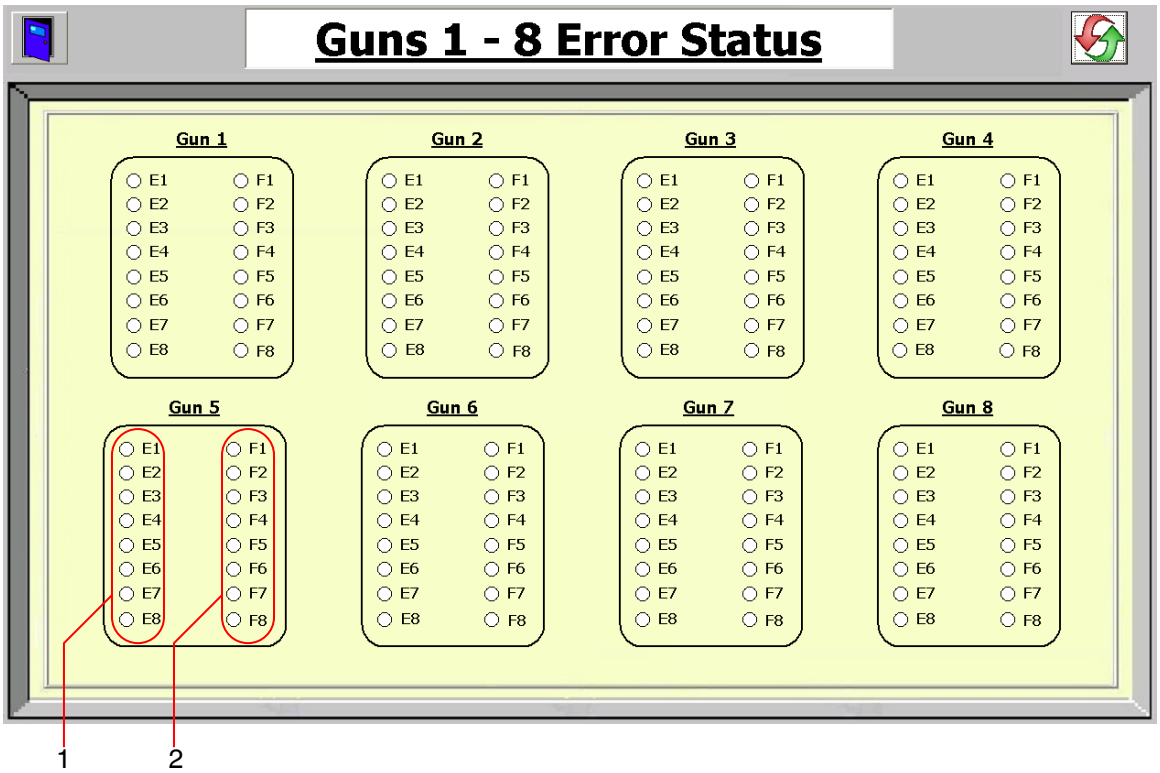
Screen elements



1 – *program control* – This data entry field has two functions It shows the program that is currently running in the system When pressed, it also allows the operator to create, delete, select or change programs. These procedures are described in detail in a subsequent section of this manual.
2 – *fan status* – This symbols' colour indicates the current state of the extract fan.
These are as follows:-
Grey - The fan is stopped
Green - The fan is running
Flashing Red - The fan is in fault
3 – *alarm symbols* – These symbols are flashing in case of any alarm occurs on the system The corresponding message can be seen in the alarm summary list (J).
4 – *gun to part distance* – This data entry sets the distance the gun will position itself away from the product regardless of the product size There is one entry for the mover on the left side of the booth and one for the mover on the right side.
5 – *conveyor status / speed* – This displays the condition of the conveyor When in static grey, the conveyor is stopped When flashing two tone green, the conveyor is running A component will also appear hanging from the conveyor when the booth has product within it The number displays the conveyor speed in metres / minute for indication purposes only .
6 – *production data* – These displays from top to bottom are:-
Shift product count – This is the total number of products sprayed since the last reset
Total product count – This is the total number of products sprayed since commission
Shift production hours – This is the total number of hours the system has sprayed for with the conveyor running since the last reset
Total production hours – This is the total number of hours the system has sprayed for with the conveyor running since commission

7 – *reset production data* – this button will reset the shift counters mentioned above
To reset the shift counters, touch the counters and the button will appear Pressing this button will reset them and the button will then automatically disappear again
8 – *gun fault status* – This button will display the gun fault screen where a more detailed fault code can be obtained for any gun

Exit screen **Reset errors**



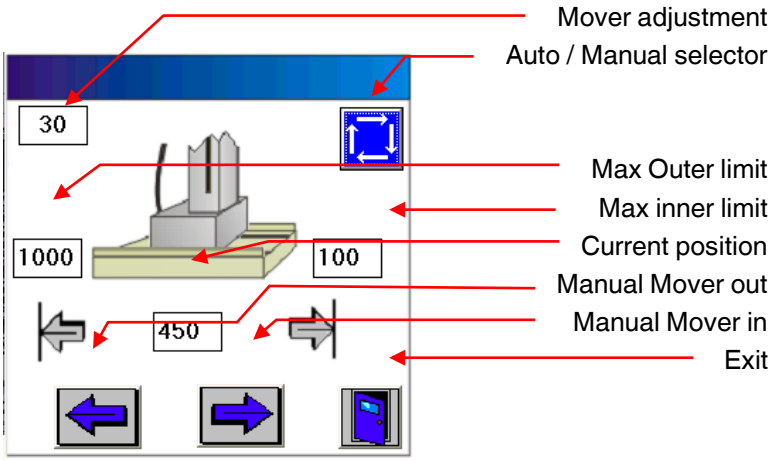
1 – *KV node errors for Gun 5* – fault occurred on KV side of gun number 5

2 – *Pump node errors* for Gun 5 – fault occurred on KV side of gun number 5
If any of these “LED-symbols” is drawn as red light, try to reset the fault by touching the reset button in the top right corner of the screen
If the problem persists, contact your Nordson representative for information on these codes

The fault codes indicated are explained as follows-

KV card faults-		Pump card faults-	
E1	uA has not reached alarm set point. This is used with Tribo guns where a low charge uA value is set for alarm	**F1**	Communication. The pump card has lost communication with the gateway
E2	Fold back. The gun is trying to draw more than 100uA	**F2**	No 24V. The 24V supply to the pump system has been lost
E3	Feedback. The uA feedback wire is broken in the gun cable	**F3**	General alarm. On for any other fault that cannot be detailed in this list
E4	Open circuit. The voltage multiplier is open circuit	**F4**	Reserved for future use.
E5	Short circuit. The voltage multiplier is short circuit	**F5**	Powder air is higher than set point
E6	Hardware. The KV card itself has a fault	**F6**	Pattern air is higher than set point
E7	General alarm. On for any other fault that cannot be detailed in this list	**F7**	Powder air is lower than set point
E8	No 24V. The 24V supply to the KV system has been lost	**F8**	Pattern air is lower than set point

9 – *mover control* – Pressing this area on the main screen displays the mover control page as shown below :-



Mover adjustment – This field displays the offset value that determines the actual distance of the guns from the conveyor centre line As an example, if the gun is actually 500mm from the conveyor centre line, but the screen displays only 440mm, adding 60 to the adjust value will correct the position display .
Note This value was set up during commissioning and should only be modified by authorised personnel. Therefore, this entry has been password protected

***Auto / manual selector* –** This button toggles between mover auto and manual control In auto mode, the mover profiles around any product that enters the booth maintaining a fixed distance from the work This value is set up on the main screen (See main screen elements **4**)
In manual mode (denoted by the symbol of a hand on a yellow background), the mover stays where it is and only moves in and out between the ultimate limits by the operator pressing either key D1 to move in or E1 to move out of the booth

CAUTION – The operator has total responsibility for the operation of the movers when in manual control Permanent gun damage may occur if running in manual and the guns have not been set correctly to spray the product entering the booth
***maximum outer limit* –** This value displays the maximum position that the mover can withdraw to in millimetres (This value is set in the configuration screen and is represented as the distance from the gun nozzle to the conveyor centre line)

***current mover position* –** This displays the current gun position in relation to the conveyor centre line

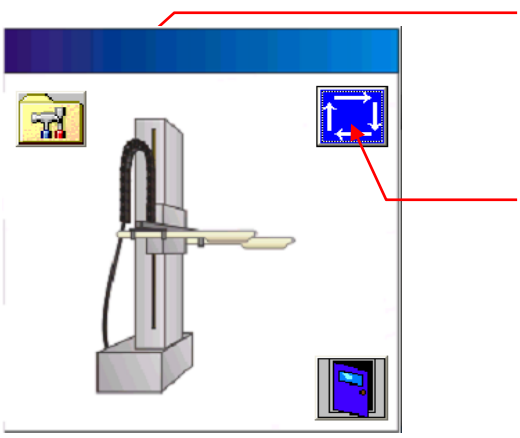
***maximum inner limit* –** This value displays the maximum position that the mover can move in to in millimetres (This value is set up in the configuration screen and is represented as the distance from the gun nozzle to the conveyor centre line)

***mover out* –** This button when pressed will drive the mover out as long as manual control is selected

***mover in* –** This button when pressed will drive the mover in as long as manual control is selected

exit – This button closes the mover control window

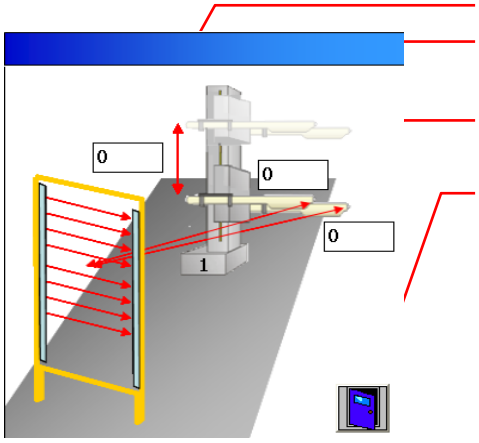
10 – *Oscillator control* - This button displays the Oscillator control page as shown below



Oscillator set up window
Calls a small window used to setup dimensions on the oscillator
– password required

Oscillator on /off switch
Starts or stops the Oscillator

Oscillator set up window



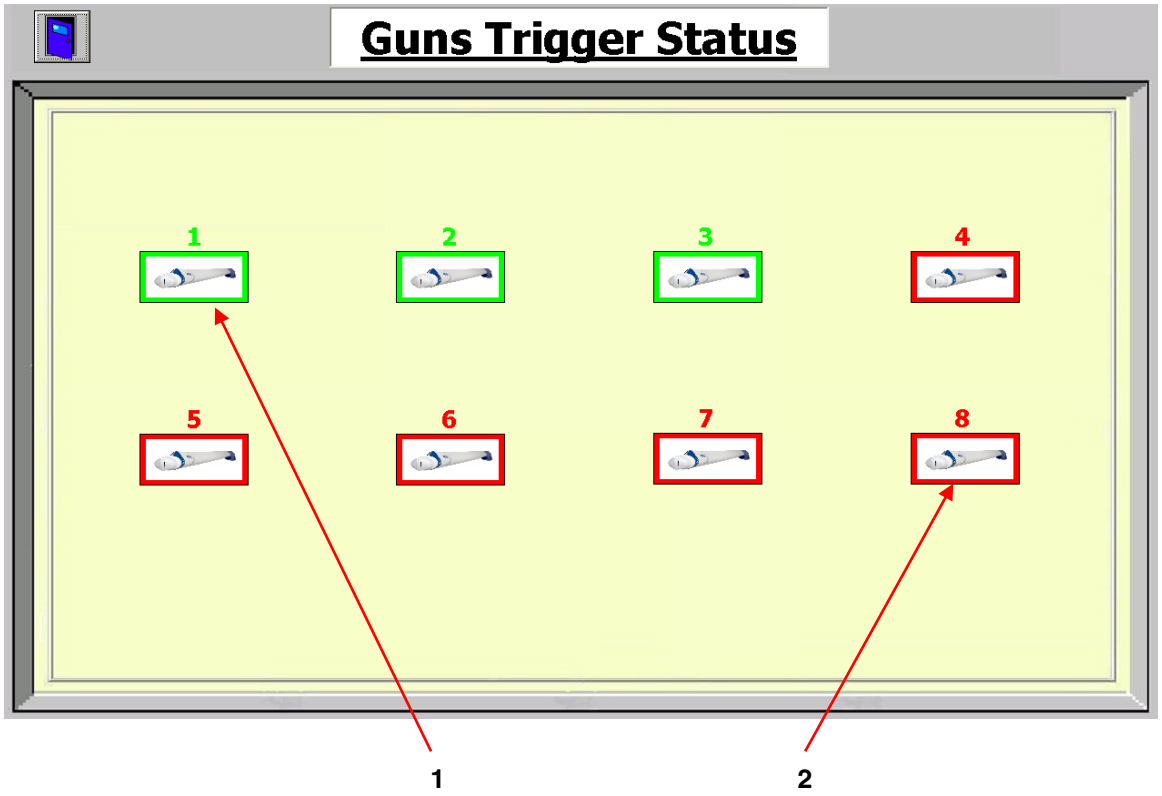
Oscillator stroke in mm
Distance from 1st gun on oscillator to the part recognition array
Distance of last gun on oscillator to the part recognition array
Exit

11 – *Spectrum HD feed centre control* **-** touching this area switches the screen to the feed centre control section as shown in a separate chapter of this manual

GUNS TRIGGERED STATUS SCREEN

By pressing the button keyed as D located on the main screen, the system will display the guns triggered status page as shown below:-

A – exit screen



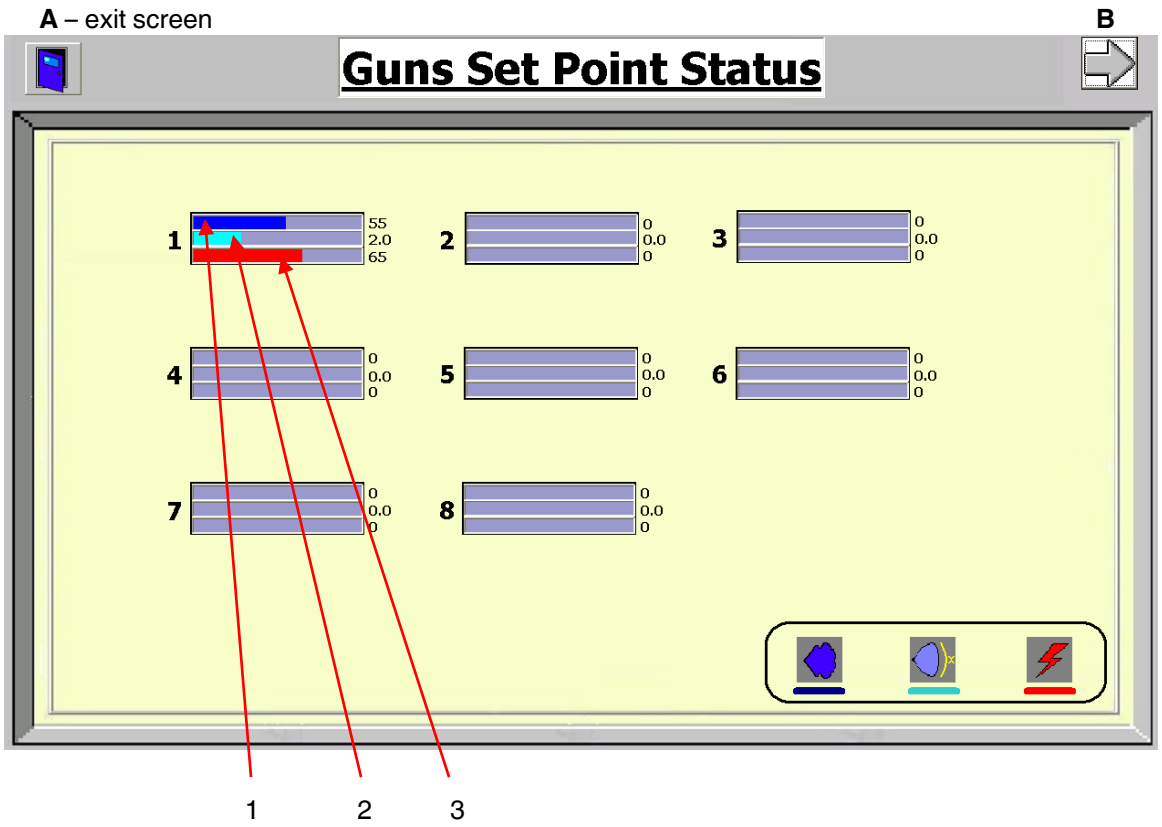
1 – *gun 1 triggered* – The green background denotes that this gun is triggered

2 – *gun 8 not triggered* – The red background denotes that this gun is not triggered

A – *exit* – This button exits the gun configuration screen and returns to the main screen

GUN SET POINT STATUS SCREEN

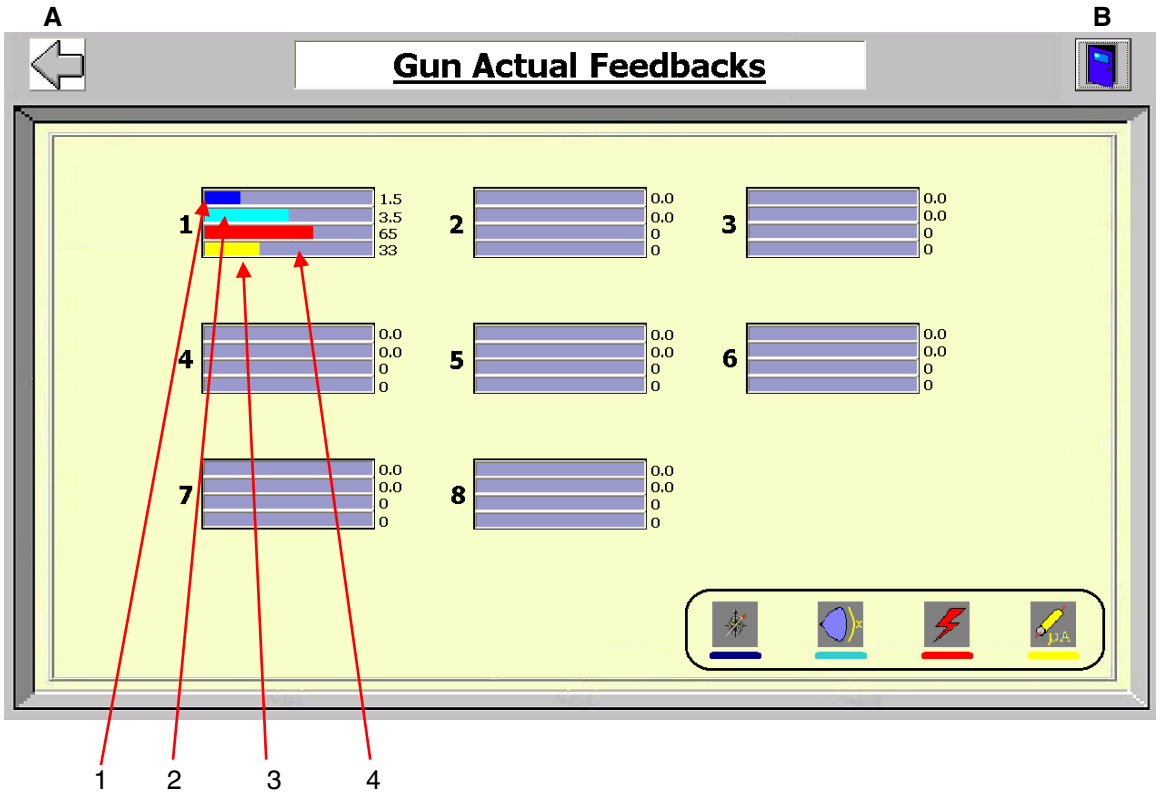
By pressing the button keyed as **E** located on the main screen, the system will display the guns triggered status page as shown below:-



A – *exit* – This button exits the gun configuration screen and returns to the main screen.
B – *gun feedbacks* – This button displays the actual gun feedback screen as described separately.

1 – *gun 1 powder set point* – This bar displays the current powder set point value applied to gun 1. Its units are displayed as a percentage value
2 – *gun 1 pattern air set point* – This bar displays the current pattern air set point value applied to gun 1. Its units are displayed in Standard Cubic Meters per hour (SCMH).
3 – *gun 1 KV set point* – This bar displays the current voltage set point value applied to gun 1. Its units are displayed in Kilo Volts.

GUN FEEDBACK SCREEN



A – *gun set point screen* – This button returns to the previous screen.
B – *exit* – This button exits to the booth control screen.

1 – *gun 1 assist air feedback* – This bar displays the actual assist air value being generated currently by gun 7. Its units are displayed in Standard Cubic Meters per hour (SCMH).

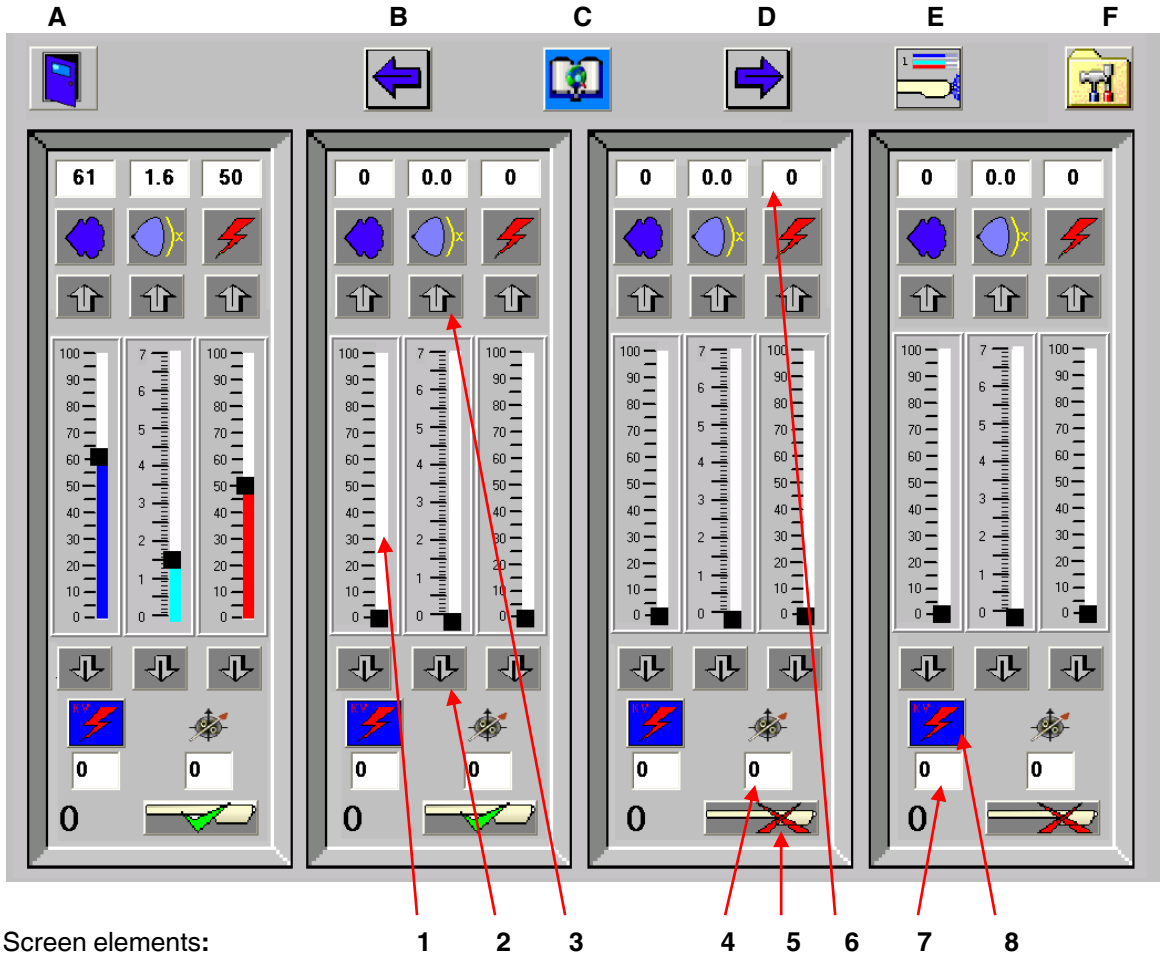
2 – *gun 1 pattern air feedback* – This bar displays the actual pattern air value being generated currently by gun 7. Its units are displayed in Standard Cubic Meters per hour (SCMH).

3 – *gun 1 uA feedback* – This bar displays the actual micro Amps value being generated currently by gun 7

4 – *gun 1 KV feedback* – This bar displays the actual KV value being generated currently by gun 7. Its units are displayed in Kilo Volts

GUN SPRAY CONTROL

By pressing the button keyed as **F** located on the main screen, the system will display the gun set point control page as shown below:-



Screen elements**:**

Buttons:

A – *exit* – This button exits the gun configuration screen and returns to the main screen

B – *previous guns* – This button displays the previous set of four guns for set point adjustment

C – group set point adjust – touching this button brings up a screen which allows the user to load set point to various groups of guns as described later on.

D – *next guns* – This button displays the next set of four guns for set point adjustment.

E – *gun feedback display* – This button displays the guns actual feedback screen. All running spray values for each gun are displayed here. This screen is detailed in a separate section of this manual

F – *gun properties* – This button displays the gun properties screen as described in a separate chapter of this manual.

Gun setpoint control screen elements:

1 – *powder output slider control* – This slider control sets the powder output for the gun entered as a percentage.
To set, touch the button and slide up or down to desired set point.

2 – *pattern air decrement control* – This button decreases the pattern air flow value by 01 SCMH each time it is pressed. This is used for fine tuning the flows.

3 – *pattern air increment control* – This button increases the pattern air flow value by 01 SCMH each time it is pressed. This is used for fine tuning the flows.

4 – *Assist air compensation* – This displays the assist air compensation value.

5 – *Gun trigger control* – This button determines whether the gun will fire or not If a red cross is displayed, the gun will never fire If a green tick is displayed, the gun will fire when product is in front of it.

6 – *flow / KV display* – This displays the current gun SCMH / KV setting. It also allows direct entry of the SCMH or KV by touching the number and typing it into the keypad that will appear

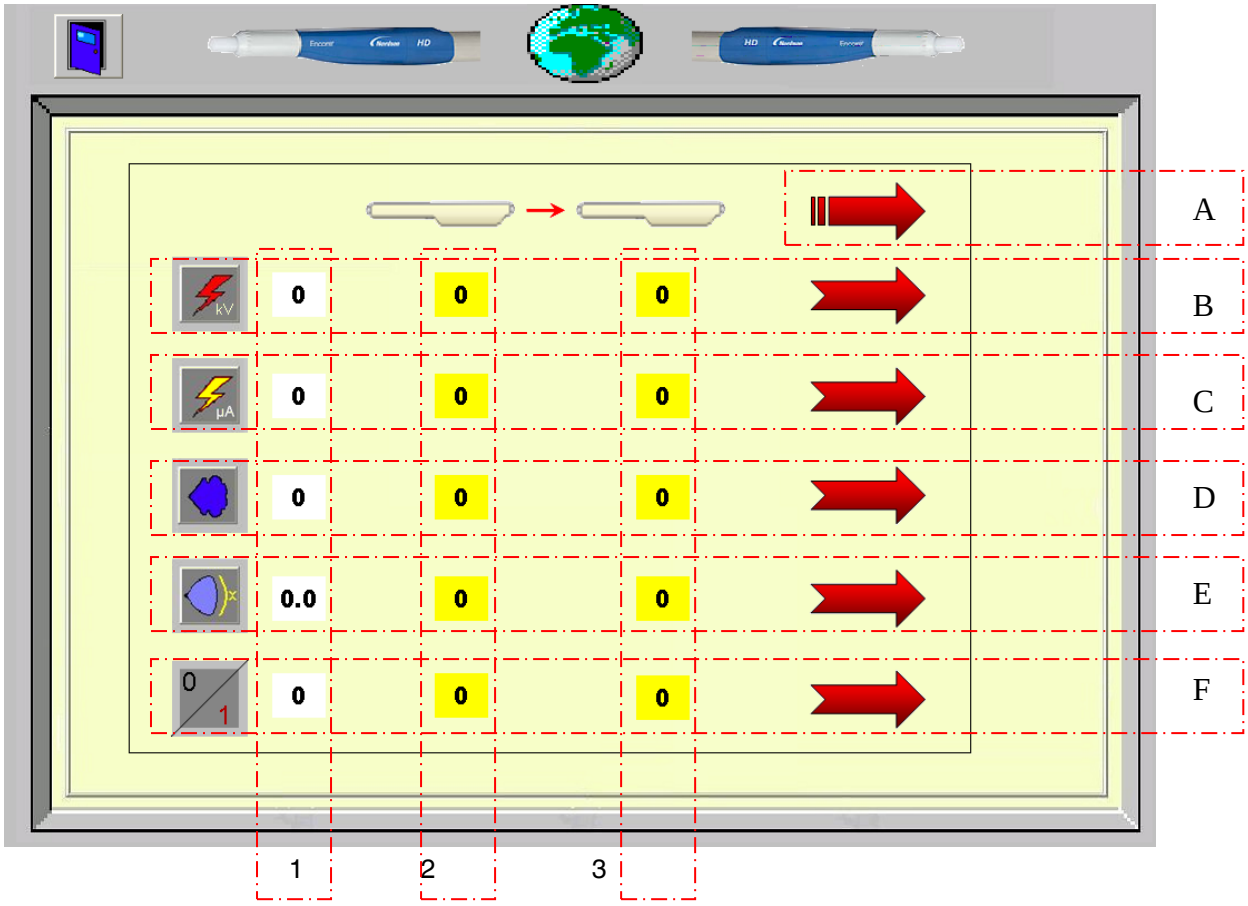
7 – *Micro amps reading / set point* – This displays the gun micro amp reading when in standard KV mode, and becomes the micro amp set point input when in AFC mode

8 – *KV / AFC mode selector* – This button selects either standard KV mode or AFC mode for the gun. When displaying a flash bolt on a blue background, the gun is in KV mode. When displaying a turquoise background, the gun is in AFC mode.

Group set point adjust

Pressing the button "**C**" on the gun spray control screen will show up the screen below:

Exit screen



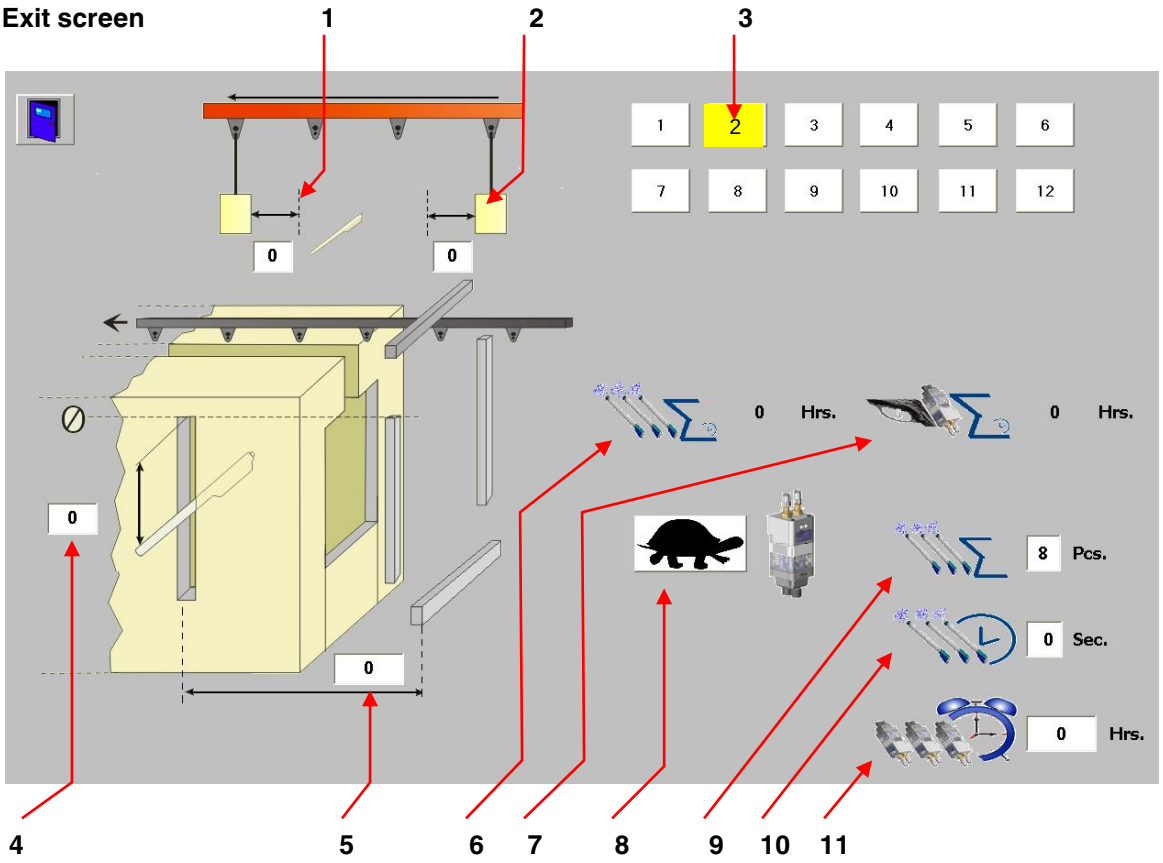
Through this screen the operator can define set points to be adjusted by using the following symbols:

1 – *set point values* – this fields are used to enter the value of a specific set point
2 – *first gun* – the number of the 1st gun in a series of guns to be selected
3 – *last gun* – the number of the last gun in a series of guns to be selected

A – *all set points* – touching this symbol will download all set points to the selected guns
B – *KV set point* – touching here will download KV set points to the selected guns
C – µA *set point* – touching here will download µA set points to the selected guns
D – Powder *output* – touching here will download Powder output set points to the selected guns
E – Pattern Air – touching here will download Pattern Air set points to the selected guns
F – Trigger enable – touching here will enable the selected guns to trigger

GUN CONFIGURATION

Pressing the button on  the gun spray control screen will show up the gun configuration screen below:



1 – *after spray* – This value shows how many millimetres after the product has left that the gun will switch off. Touch the value and a keypad will appear to adjust it.

2 – *before spray* – This value shows how many millimetres before the product arrives at the gun it will fire. Touch the value and a keypad will appear to adjust it.

3 – *gun parameter selection* – These buttons select the guns parameters to be displayed and adjusted. The gun currently selected, will flash yellow.

4 – *vertical distance* – This value shows the distance between the gun at the top of its stroke, and the top of the booth slot in millimetres. Touch the value and a keypad will appear to adjust it.

5 – *horizontal distance* – This value shows the distance between the gun and the beam array in millimetres Touch the value and a keypad will appear to adjust it.

6 – *total gun hours* – This displays the total hours that the gun has triggered for If the gun is replaced, this number can be reset by touching the display and entering zero into the keypad that will appear.

7 – *total pump hours* – This displays the total hours that the pump has triggered for If the pump is serviced, this number can be reset by touching the display and entering zero into the keypad that will appear.

8 – *fast pump mode selection* – touching this symbol will toggle the pump mode between fast  and  normal pinch valve frequency

Note: this is a global setting and will apply to all guns of the system

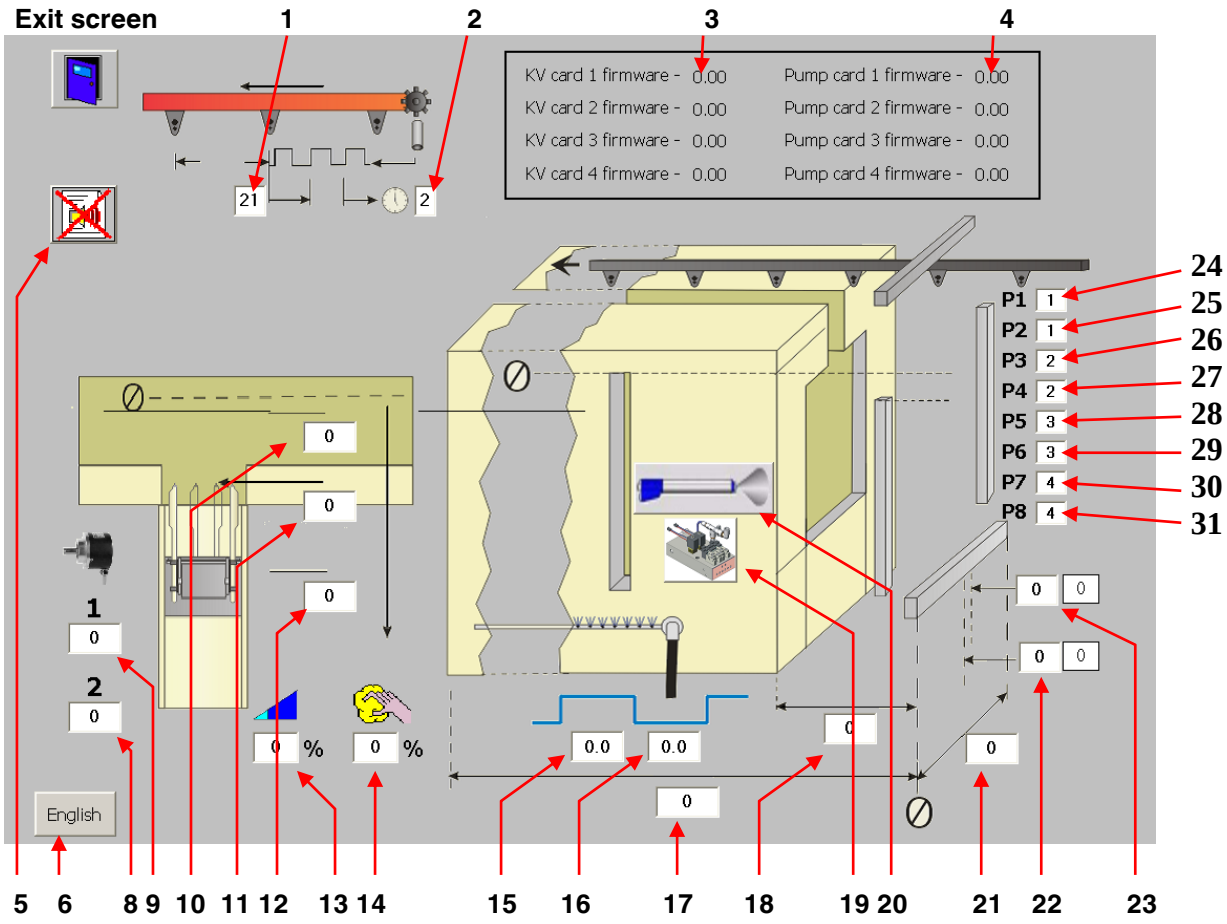
9 – *total guns* – This value shows the total number of guns on the system

10 – *gun prime time* – This value shows the time that the guns will fire for when the booth has been stood empty and the first product enters the booth. This value is entered in seconds.

11 – *Maintenance alarm time* – This value shows the time after which an alarm will be displayed for any pump that has run for longer than it. This value is entered in hours.

BOOTH CONFIGURATION

Pressing the button  on the main screen will evoke the screen below:



1 - *Conveyor index* - This is the number of millimetres the conveyor has travelled during one pulse from the conveyor encoder.

2 - *Conveyor timeout* – This is the number of seconds during which a pulse is not received from the encoder, that the conveyor is classed as stopped by the plc.

3 – *Firmware version of the KV cards* – this shows the firmware of KV cards at the time the system is started up.

4 – *Firmware version of the pump cards* – this shows the firmware of pump cards at the time the system is started up.

5 – *Clear alarm history* – touching this button will clear the alarm listing on the alarm summary display.

6 - *Language selection* – This button toggles the language between English and local language

8, 9 – *Mover encoder resolution* – enoder resolution of movers 1 and 2 are entered here in pulses per mm
10 - *Movers in* – This is the ultimate in position that the movers will be allowed to go to

11 - *Movers purge* – This is the purge and park position for the movers

12 - *Movers out* – This is the maximum out position that the movers will be allowed to go to

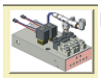
13 - *Automatic mover speed* – This is the speed at which the movers will traverse during normal production mode. The value is entered as a percentage.
14 - *Clean mover speed* – This is the speed at which the movers will travel out during the external gun blow off phase of the cleaning cycle The value is entered as a percentage.
15 - *airwash on time* – This is the time in seconds that the booth air wash will be on for

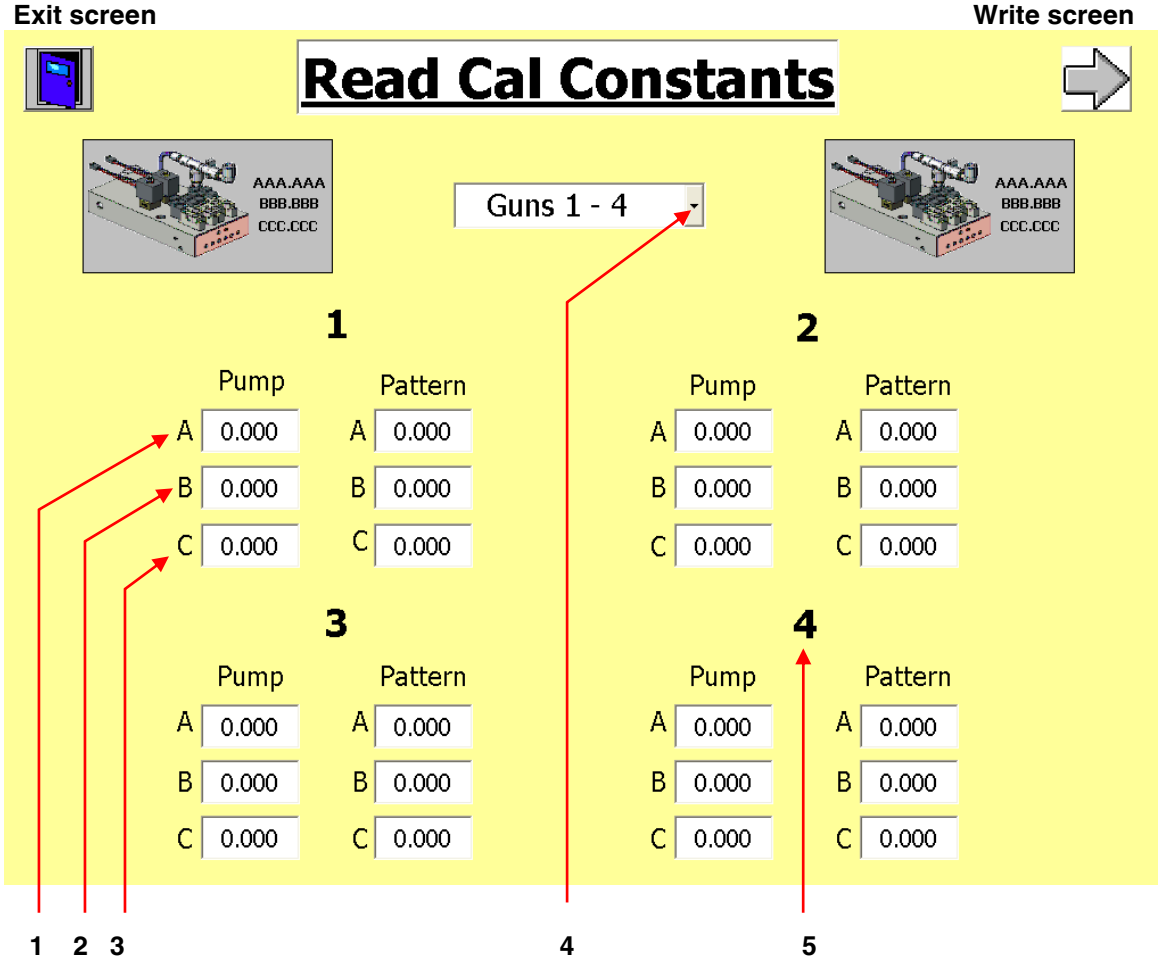
16 - *airwash off time* – This is the time in seconds that the booth air wash will be off for

17 - *Booth end from arrays* – This is the distance in millimetres from the beam arrays to the end of the booth.
18 - *Booth start to arrays* – This is the distance in millimetres from the beam arrays to the entrance of the booth.
19 – *Pump card calibration* – this symbol is used to bring up the pump card calibration window as described separately.
20 – *Purge timing configuration* – this symbol is used to display the set up window for the purge timings used by the Spectrum^{HD} for cleaning of guns and hopper. Details are described separately.
21 - *Horizontal array* – This is the length of the horizontal beam array.

22 - *Dampen near* – This is the width of the conveyor track left of the centre line.
Note : The display to the right of this entry is the actual left hand width in millimetres, of any product sensed in the beam array
23 - *Dampen far* – This is the width of the conveyor track right of the centre line.
Note: The display to the right of this entry is the actual right hand width in millimetres, of any product sensed in the beam array
24 – 31 – Gun PEC zone assignment – Guns 1 (P1) up to Gun 8 (P8) will be assigned to the 8 available digital beam array zones. As soon as a dedicated zone is covered in the array, the assigned gun will be triggered In the example above guns 1 + 2 are assigned to zone 1, guns 3 + 4 to zone 2 and so on.

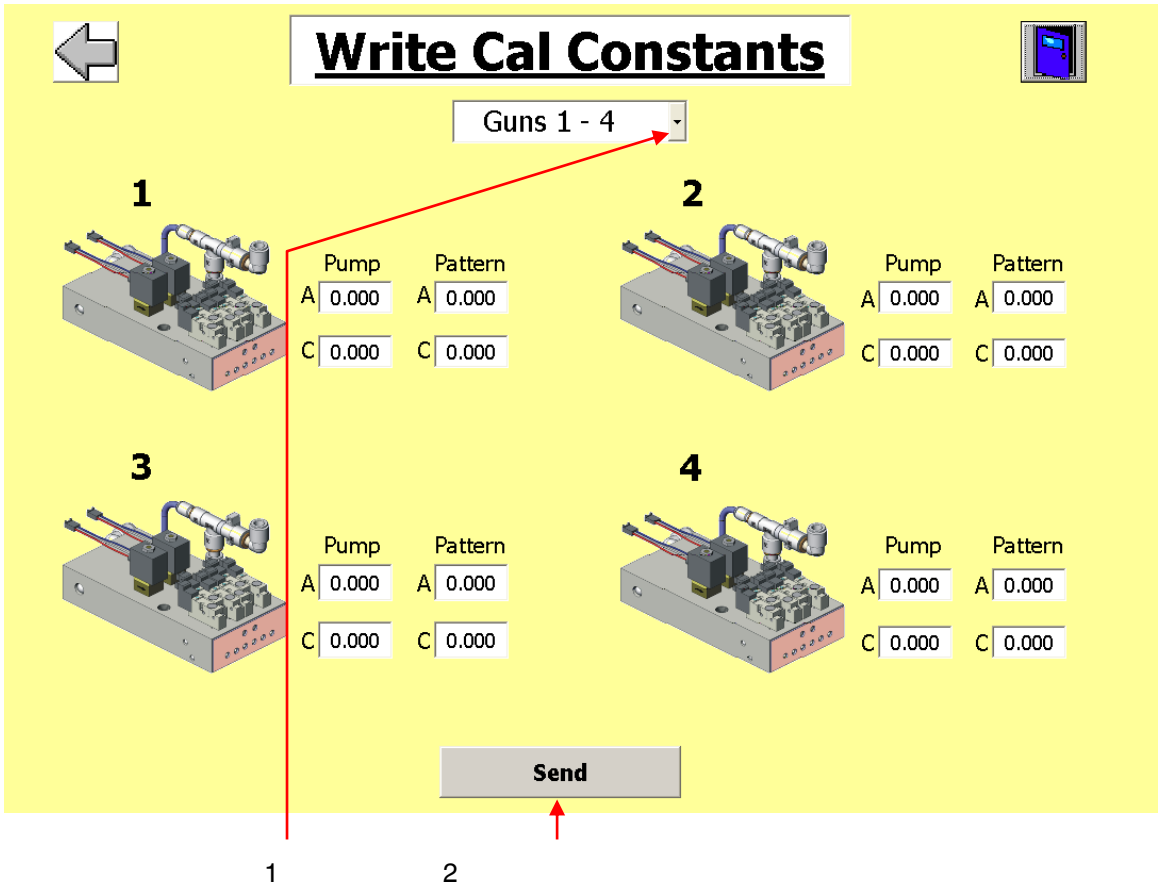
PUMP CONTROLLER CONFIGURATION

This screen appears after pressing the symbol on the booth configuration screen.
Pump controllers calibration values are displayed in groups of 4 gun on each page.
The user has to select the correct group  referring to the appropriate guns.



1 – *pump calibration value A* – enter the calibration value “A” written on the label sticking at the manifold for gun 1
2 – *pump calibration value B* – calibration value “B” is always 0
3 – *pump calibration value C* – enter the calibration value “C” written on the label sticking at the manifold for gun 1
4 – *Gun group* – the actual group of guns is selected by using the pull down menu here
5 – *Gun number* – calibration values for pump controller of gun number 4

Read screen **Exit screen**

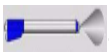


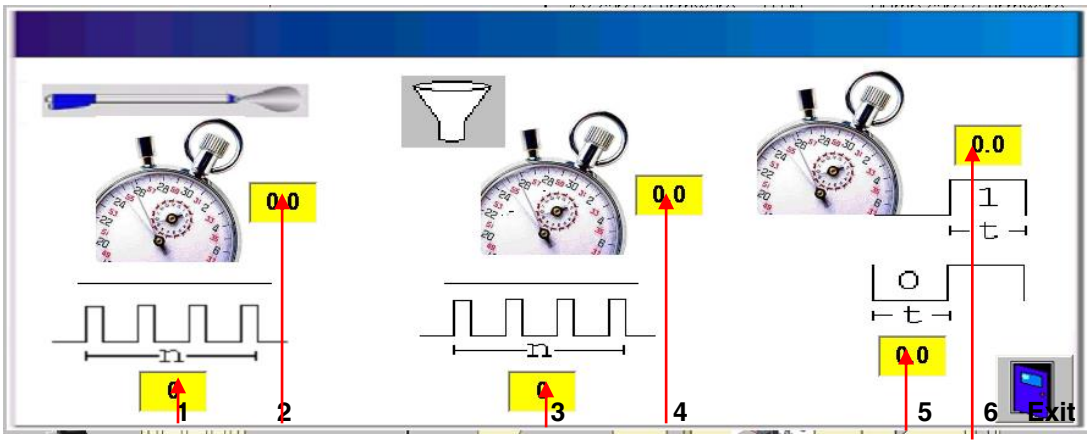
1 – *Gun group* – the actual group of guns is selected by using the pull down menu here.

2 – *send values to pump controllers* – calibration values are sent to all 4 pump controllers selected on this page controllers.

Note: changes are only required after hardware changes to the manifolds or controller cards

PURGE TIMING CONFIGURATION

Touching the  - button will bring up a window, allowing the user to set up different times used during cleaning of the system



1 – Gun pulses – specify the number of pulses for cleaning the gun here

2 – soft purge time guns – specify the time for soft gun purging here – in seconds

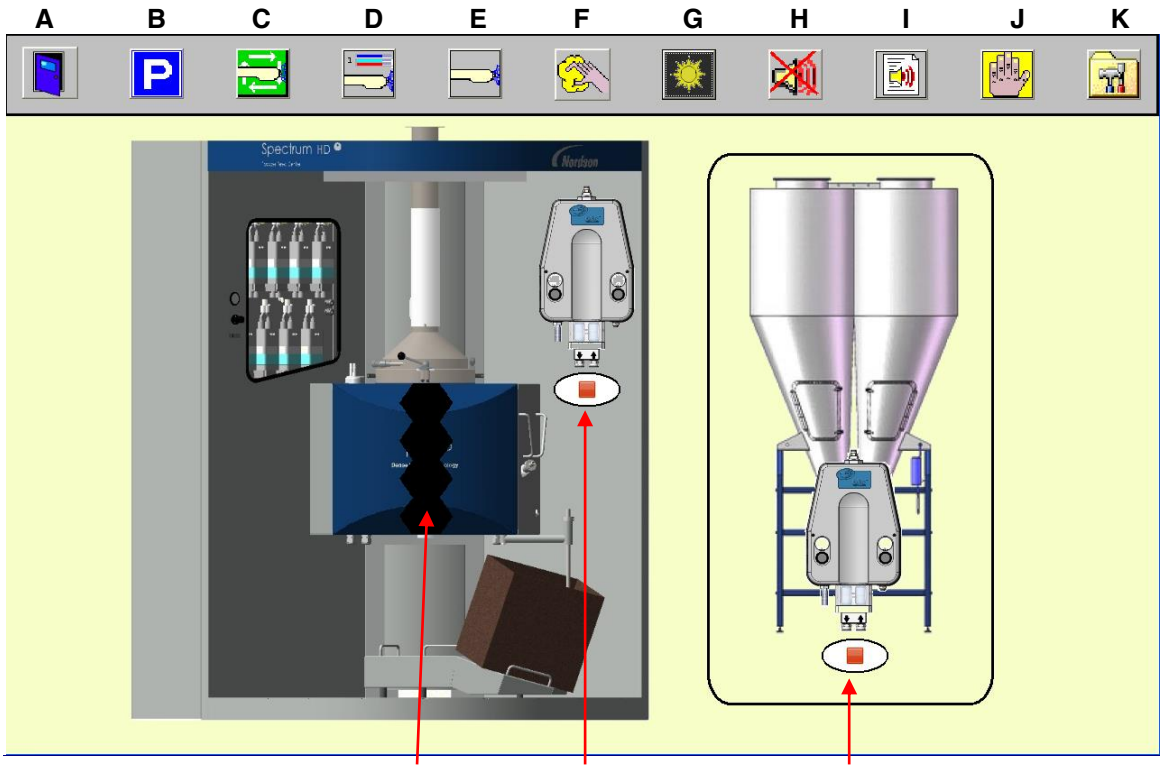
3 – hopper pulses – specify the number of pulses for cleaning hopper here

4 – soft purge time hopper – specify the time for soft hopper purging here – in seconds

5 – hard purge off time – specify the off time of the clean pulses here – in seconds

6 – hard purge on time – specify the on time of the clean pulses here – in seconds

Spectrum HD CONTROL SECTION



Screen elements:

Spectrum HD buttons

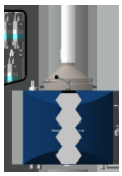
A – *Exit to booth control screen* – This button takes the operator back to the booth control screen

B, C, D, E, G,H I, – these are related to the same functions as on the main screen

F – Colour change – activating this button evokes the Colour change sequence, described in the section “colour change” of this manual.
J – Manual operation – this button brings the user to the manual operation screen, described later on in this manual.
K – SpectrumHD configuration – touching this button takes the operator to the configuration of the SpectrumHD feed centre as described in the section “configuring the SpectrumHD” of this manual.

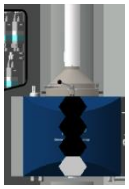
Spectrum HD screen elements

1 – Powder level monitor – the cut out in the hopper is shown in 4 steps representing the actual powder level inside:

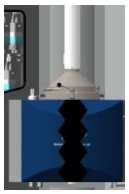


Powder level high, hopper full

Powder level medium, this is the working level which the system maintains using the virgin pump only. The recycle pump runs all time unless switched off or powder level is on high level.



Powder level low, this is the minimum level for the pumps to work properly When the powder level drops below this, an alarm is raised to inform the operator about this issue.



Hopper empty, no level probe actually detects powder This can happen right after a colour change or when the system has just been started up.
In all other situations this is an Error due to lack of powder .
Operator interaction is urgently required.

2 – Virgin HDLV-transfer pump – this shows the status of the virgin pump and allows the operator to start or stop the pump by touching the pump symbol.

Pump running

Pump stopped

3 – Reclaim HDLV-transfer pump – this shows the status of the reclaim pump as shown above and allows the operator to start or stop the pump by touching the pump symbol.

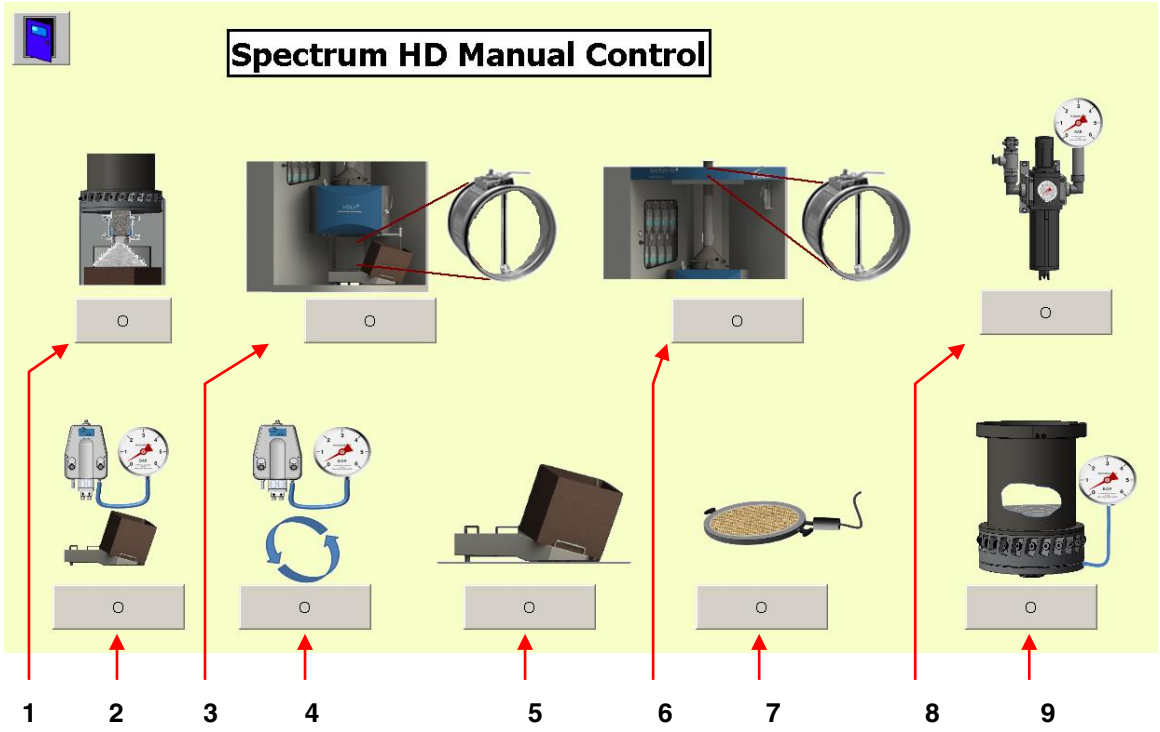
Spectrum HD MANUAL CONTROL SECTION

Pushing the button  on the Spectrum HD control screen will display controls for manual operation of various devices of the feed centre.

Note: the operator takes full responsibility of his actions on the system.

All automatic functions of the Spectrum^{HD} are inactive while on that screen.

Exit screen



1 – *Dump valve* – This button is used to open / close the dump valve in the bottom of the hopper.

2 – *Virgin HDLV transfer pump on/off* – This button is used to start or stop the virgin pump.

3 – *Main duct damper* – used to open or close the damper inside the main extraction duct behind the feed centre.

Note: when this duct is closed, the full extraction goes to the purge duct on top of the sieve.

4 – *Recycle HDLV transfer pump on/off* – This button is used to start or stop the reclaim pump located at the cyclone or a custom recycling system.

5 – *Vibrator motor on / off* – this button starts or stops the vibratory motor installed into the virgin powder box support.

6 – *Purge duct damper* – used to open or close the damper inside the purge duct on top of the sieve.

7 – *ultra-sonic sieve on/off* – this button starts or stops the ultra-sonic sieve.

8 – *main air solenoid* – this button opens or closes the main air solenoid in the supply line to the feed centre.

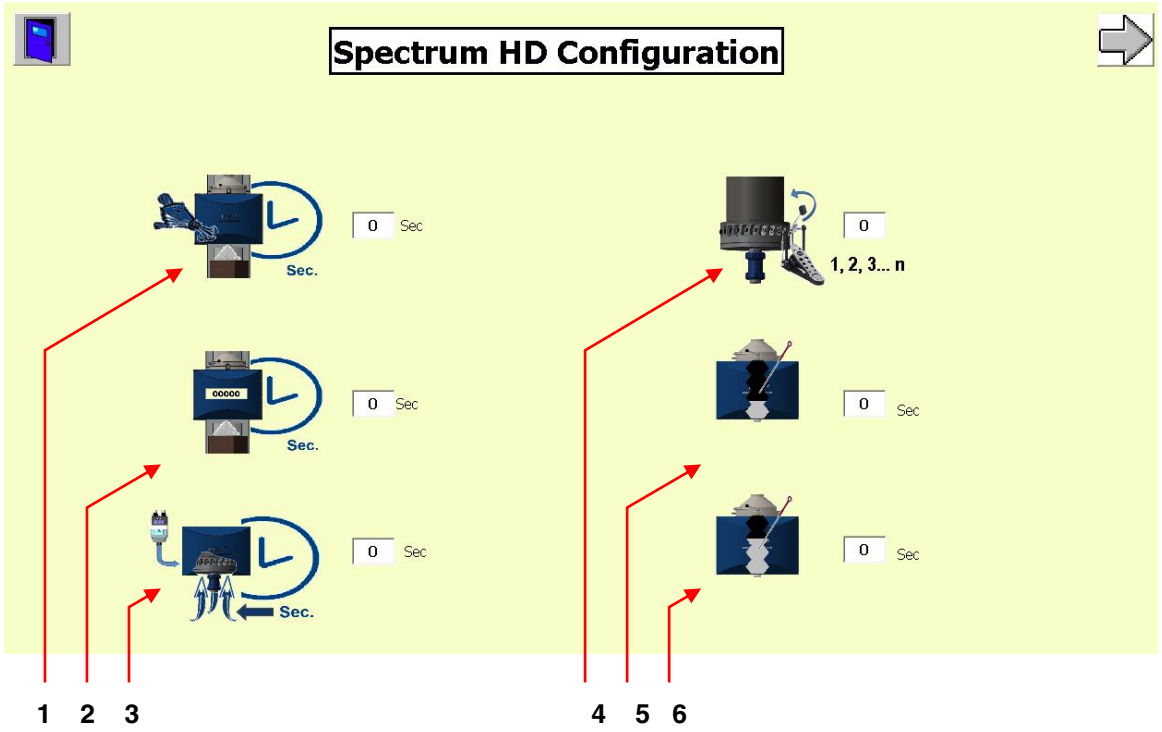
9 – *Hopper fluidisation on / off* – this button starts or stops fluidising the powder inside the hopper

Spectrum HD CONFIGURATION SECTION 1

Pushing the button  on the Spectrum HD control screen will display the configuration screens described below.

Note: configuration shall only be done by authorized and trained personnel!

Exit screen **Next screen**



1 – hopper empty assist air time out – Time to switch on the assist air after the low level probe gets free of powder when emptying the hopper.

2 – hopper empty time out – Count down time after the low level probe gets free of powder when emptying the hopper. After the countdown the OK button will be displayed to move on to the next step.

3 – purge to hopper dump valve delay – time to delay the opening of the dump valve while cleaning the hopper.

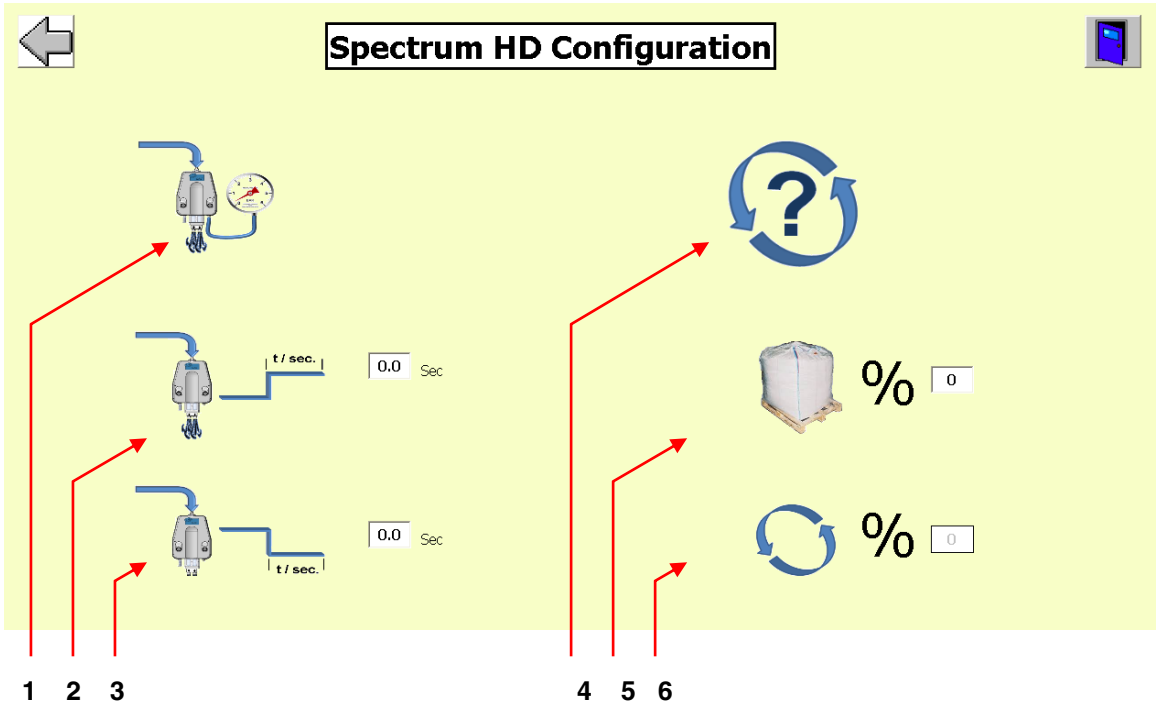
4 –hopper banger count – amount of beats to the hopper from the shaking device while emptying to the. box.

5 – level probe off delay – The time required for the mid level probe to be registered as off.

6 – level probe on delay – The time required for the mid level probe to be registered as on.

Spectrum HD CONFIGURATION SECTION 2

Previous screen **Exit screen**



1 – run pumps while purging – set the pumps to automatically run during a purge or don't run

2 – pump purge pulse on time – the on time of a cleaning pulse to the HDLV transfer pumps in seconds

3 – pump purge pulse off time – the off time of a cleaning pulse to the HDLV transfer pumps in seconds

4 – cyclone installed – recycle via a cyclone or a different method. When using a different recycling system, the values below (5 + 6) are used to set a virgin powder mix ratio to realise a consistent amount of fines within the powder.

5 – virgin powder mix ratio – The virgin ratio is set and the reclaim rate follows correspondingly. e.g. If a ratio is set for the virgin to be 50%, the reclaim ratio will be 50% as well and both pumps will be on all the time

If a ratio of 33% is set, the reclaim pump will be on all the time while the virgin pump switches off after 30 seconds. The time base for a pump to run will be 1 minute

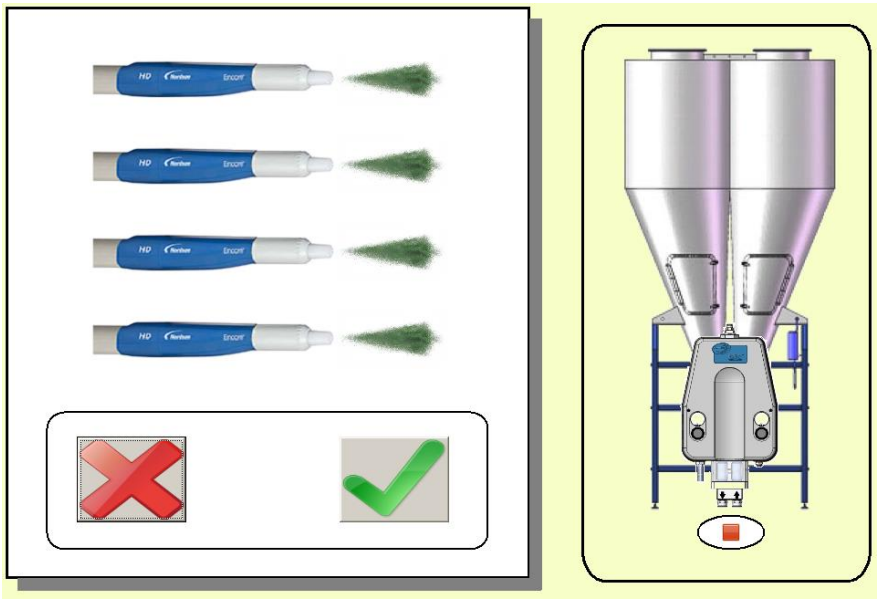
(30 sec Virgin + 60 sec Reclaim = 90 sec powder; where 30 sec is 1/3 rd of 90 sec)

6 – reclaim powder mix ratio – The reclaim ratio is set and the virgin rate follows correspondingly. This will only be effective if the virgin ratio is larger than the reclaim ration – see example above.

COLOUR CHANGE OPERATION

To start a colour change routine the operator pushes this button 

Step 1 – approve colour change:



On the screen above the operator can choose to carry on colour changing by touching this button  or to cancel the procedure  and go return to the Spectrum HD screen.

 this button can be used at any time during the colour change procedure to cancel the process and return to the main screen. Therefore it is not mentioned again following the steps of a color change.

Step 2 – place box underneath hopper:

The next screen asks the operator to move the powder box underneath the hopper to collect the powder still remaining inside the hopper.

After a box is placed under the hopper, the operator pushes this button  to release the powder out of the hopper and go to the next step.

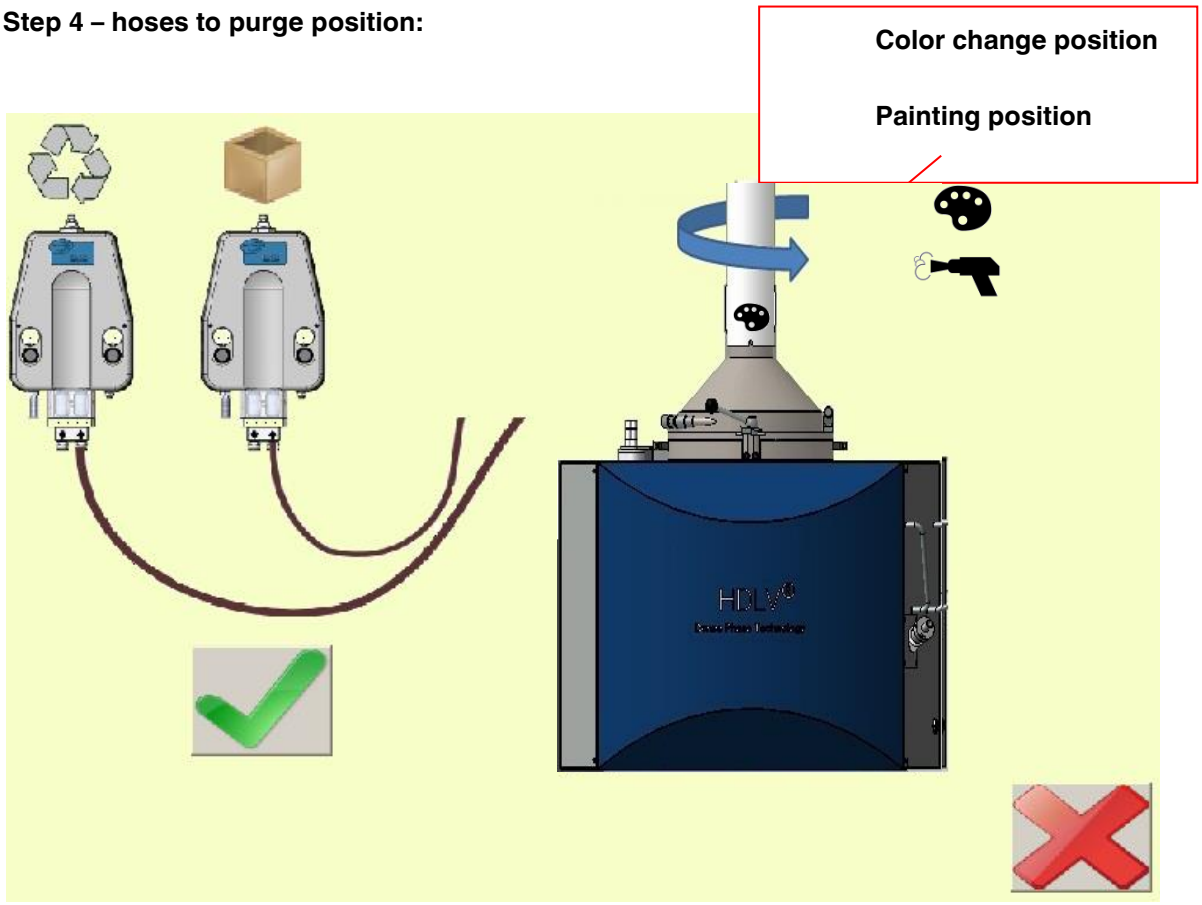
Step 3 – drain the hopper:

When this screen is shown, the dump valve on bottom of the hopper will be opened and powder is released into the box below it.

As soon as the low level probe is uncovered, a timer starts to count down for a time to be set up during configuration.

After it that the  - button appears on the screen to bring the operator to the next step.

Step 4 – hoses to purge position:

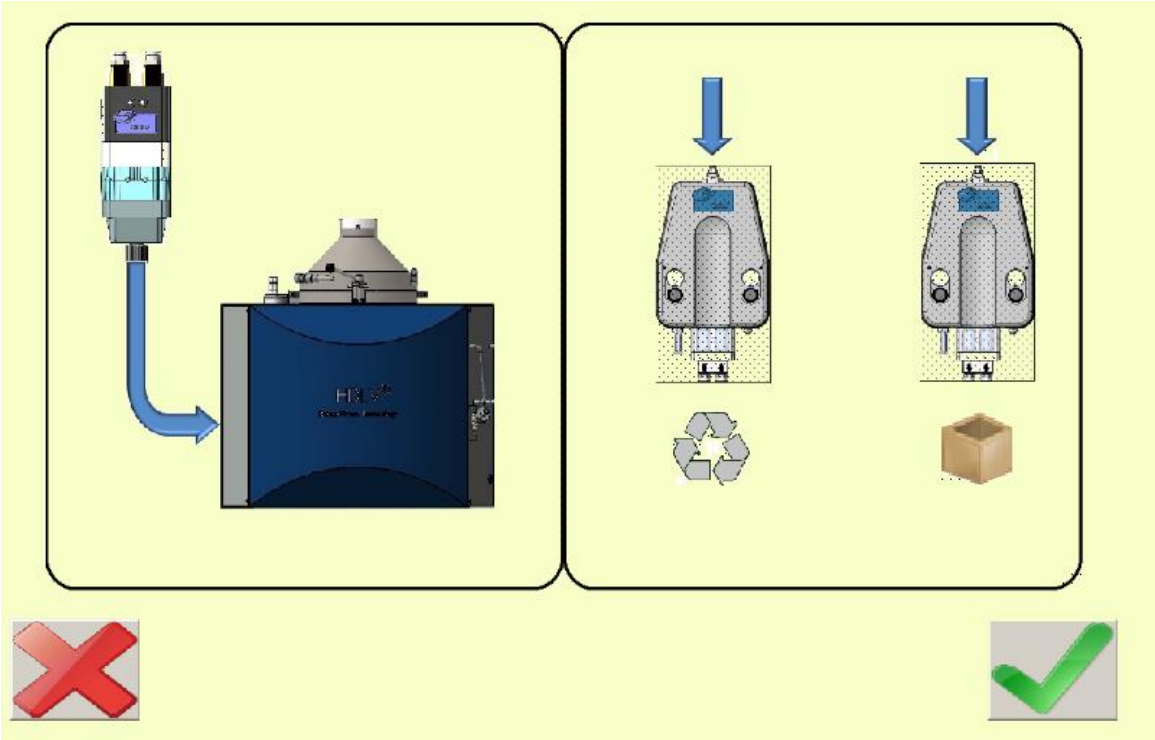


This screen is shown to remind the operator to turn the extraction pipe above the sieve to the cleaning position and move the pump hoses to the extraction sockets.
He will also need to close the sieve opening with the delivered plugs to avoid powder leaking out there during hopper purge.

When done, the  - button leads the operator to the next screen.

Step 4 – hopper purge:

During this step the hopper is cleaned from inside using the pumps and according to timings set up during configuration.



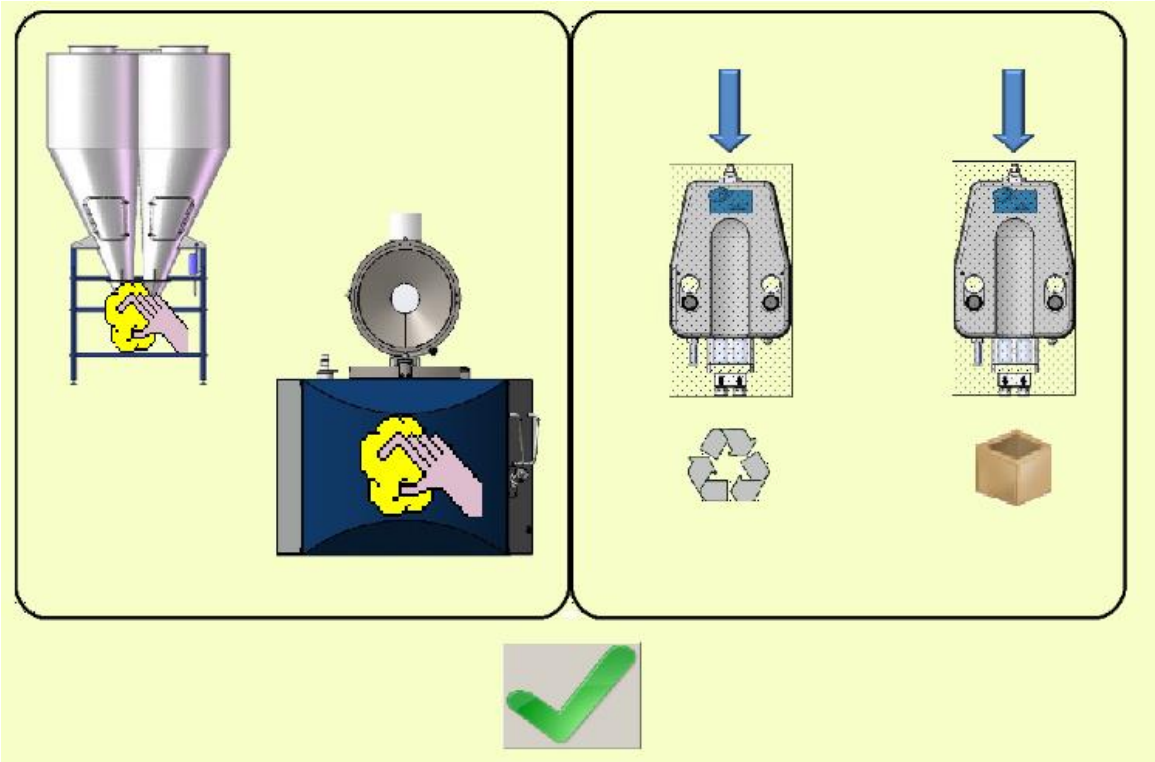
While cleaning the inside of the hopper, it should be avoided to open the cyclone hopper or anything else effecting the extraction. Otherwise the cleaning result will be compromised

The operator needs to start the cleaning of the HDLV transfer pumps by touching the pump symbols on the right. Active pump cleaning is visualized by the blue arrows above the pump symbols

After the configured amount of pulses through the hopper the  - button appears again to carry the user to the next screen.

Step 5 – manual cleaning:

This is the last step of the sequence;
the screen below reminds the operator to manually clean cyclone and hopper



Cleaning of the pumps can be activated or stopped by touching the pump symbols on the right side of the screen. This is visualized by the blue arrows again.
After cleaning, the hoses need to be placed back to their operating positions and the virgin pump can be used to refill the hopper with the new powder.

When done, the  - button will bring the operator back to the Spectrum HD control screen

Normal production can start again.

Section 4
Troubleshooting

In case of problems with the system or any equipment within the system call your local Nordson representative. Contacts can be found at the beginning of this manual.

Section 5
Repair

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

CAUTION: Do not turn off console power without first performing a program shutdown. Doing so could corrupt the Spectrum HD program and operating system on the program PC. Refer to *Program Shutdown* in the *Configuration* section of the Spectrum HD *Operator Interface* manual for the shutdown procedure.

WARNING: Hazardous voltages exist within the Spectrum HD console. Unless power must be on to test circuits, always shut off and lock out power before opening the console to make repairs. All repairs should be made by a qualified electrician. Failure to observe this warning could result in personal injury or death.
Repair consists of removing malfunctioning components and replacing them with new ones. There are no components inside the cabinet that can be repaired by the customer.
Refer to the wiring diagrams in Section 7 for connections.

WARNING: Whenever replacing a component that interfaces with the exterior of the cabinet, such as a gun harness receptacle, make sure that the dust-tight intergrity of the cabinet is intact by installing the correct gaskets and seals. Failure to maintain the dust-tight integrity of the cabinet could invalidate agency approvals and create a hazardous condition.

Gun Control Card Removal/Installation

WARNING: Shut off console power before removing and installing gun control cards. Failure to observe this warning could result in damage to the cards, and could result in personal injury or even death.

CAUTION: Do not turn off console power without first performing a program shutdown. Doing so could corrupt the Spectrum HD program and operating system on the program card. Refer to *Program Shutdown* in the *Configuration* section of the Spectrum HD *Operator Interface* manual for the shutdown procedure.

CAUTION: The gun control cards are electrostatic sensitive devices (ESD). To prevent damage to the cards when handling them, wear a grounding wrist strap connected to the Spectrum HD enclosure or other ground. Handle the cards only by their top and bottom edges.
See Figure 5-1. Gun control cards (2) are installed in the card cage from left to right. Each card controls two guns: the bottom receptacle on the card is the odd gun number; the top receptacle the even gun number. To remove a card, unplug the gun harnesses from the card receptacles (3 and 4), pull down the locking tab (5), then pull the card out of the card cage. To install a new card, slide the card into the slots in the card cage and seat the card's finger board firmly into the connector slot on the backplane (6). Push the locking tab up to lock the card into the card cage. Connect the gun harnesses to the card receptacles.

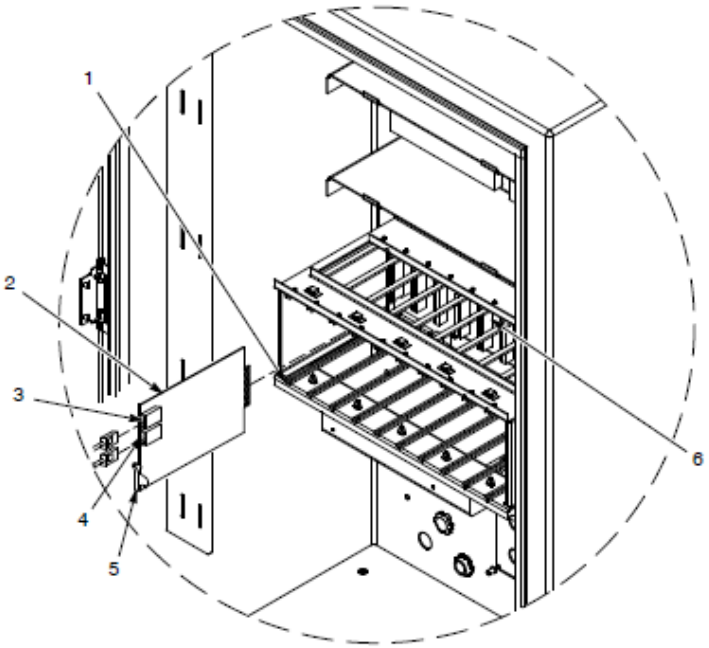


Figure 5-1 Gun Control Card Replacement

1. Card cage (slot 1)
2. Gun control card
3. Gun 2 receptacle
4. Gun 1 receptacle
5. Locking tab
6. Backplane

Section 6

Customer Specific Information

(Wiring & electrical diagrams)

Appendix

Please see **the separate PDF FILE** attached to this manual for more specific information about your individual system.

- Wiring diagram
- Electrical Parts list

Section 7
Parts

To order parts, call the Nordson Customer Service Center or your local Nordson representative.
http://www.nordson.com/en/global-directory

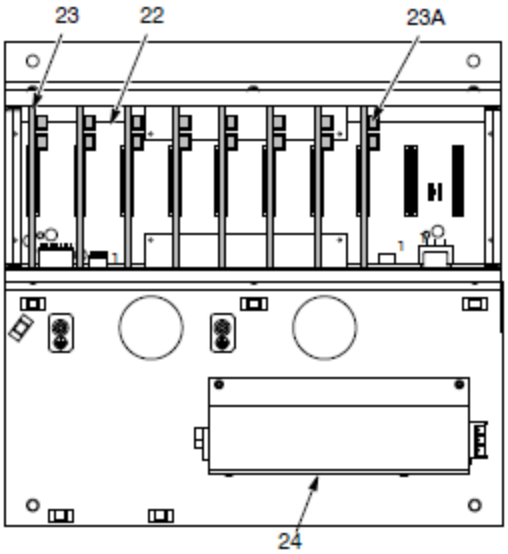
Console Parts

Item	Part	Description	Quantity	Note
22	1023939	PCA, backplane, iControl 2	2	
23	1023877	PCA, dual gun driver, iControl	AR	A
23A	1095361	JUMPER, gun ID, odd number	AR	B
24	1098442	POWER SUPPLY, 24V, 250 watt w/fan 2 C	2	C

NOTE A: One card controls the electrostatics for 2 automatic spray guns.
B: Use to prevent fault LED from lighting when odd number of guns are connected. Plug into gun card receptacle in place of receptacle harness for unused receptacle. One jumper is shipped with each console.
C: See Figure 6-5. When replacing obsolete power supplies (334817 or 334803), order kit 1107143 to update system to a single power supply. If replacing a new power supply (1098442), order 1098442 for a direct replacement.

AR: As Required

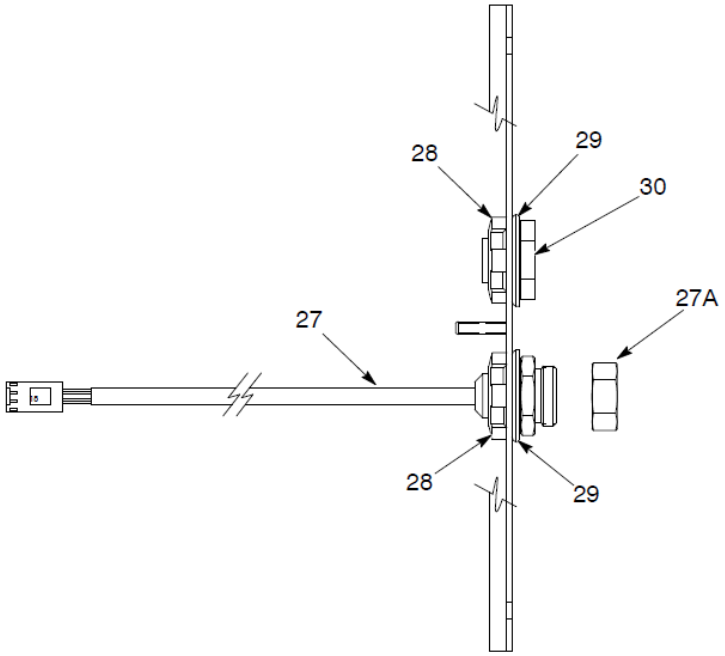
Continued…



Console Parts – cont.

Item	Part	Description	Quantity	Note
27	1031501	RECEPTACLE, 8-position, gun, 70 in	AR	A
27A	1023695	SEAL, bulkhead, 7/8–16 thread	AR	B
28	984526	NUT, lock, 1/2 in. conduit	AR	
29	939122	SEAL, conduit fitting, 1/2 in	AR	
30	334800	PLUG, 1/2 in	AR	

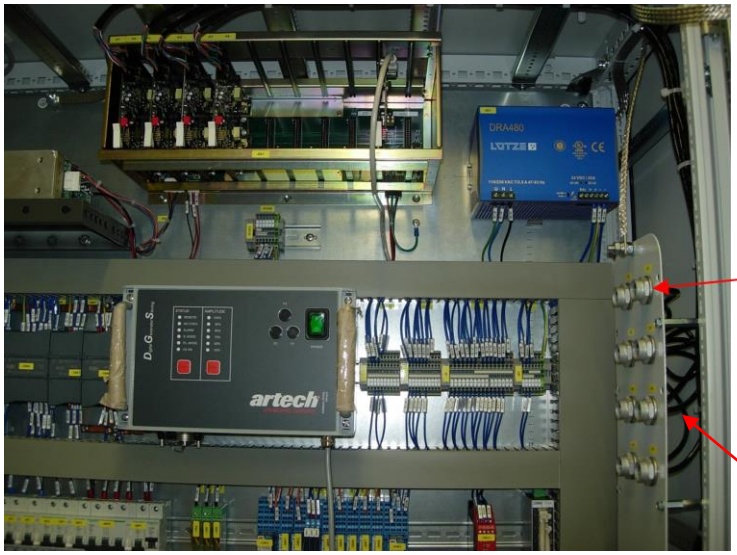
NOTE A: One receptacle is required for each automatic spray gun.
B: Use to cap unused receptacles. One seal is shipped with each console.
AR: As Required

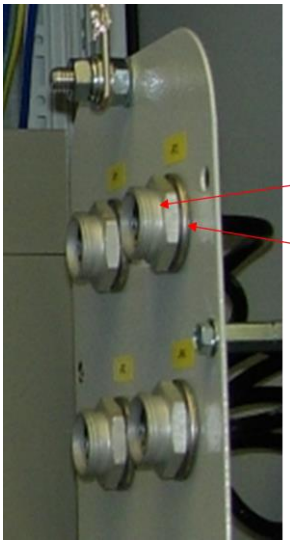


Console Parts – cont.

Item No.	Nordson Part No.	DESCRIPTION	Quantity
1	1031501	RECEPTACLE,8 POSITION,GUN,70 IN	1 per gun
2	939122	SEAL,CONDUIT FITTING,1/2	1 per gun
3	984526	NUT,LOCK,1/2 CONDUIT	1 per gun
4	1031485	HARNESS,NET,CPU,ICONTROL	1 per 16 guns
5	1107144	PCA, AUTO DUAL GUN DRIVER, ENCORE	1 per 2 guns
6	1027140	HARNESS,POWER,+5,+12,-12V,ICONTROL	1 per 16 guns
7	1042648	HARNESS,DIGITAL FLOW,NET,PWR,ICONTROL	1 per 16 guns
8	1033831	HARNESS,CONTROL UNIT POWER,ICONTROL	1 per 16 guns
9	1027138	HARNESS,POWER,24V,ICONTROL	1 per 16 guns
10	1042647	HARNESS,SIGNAL,INTERFACE,ICONTROL	1 per 16 guns
11	1027564	POWER SUPPLY,400W,+24V,+/-12V,+5V	1 per 16 guns
12	1098444	GUIDE,PCB CARD, CONDUCTIVE, 7 INCH	20 per 16 guns
13	334755	BRACKET,CARDFRAME,CTRL CAB	1 per 16 guns
14	1023939	PCA,BACKPLANE,ICONTROL	1 per 16 guns
15	334805	FILTER,LINE,RFI,POWER,10A	2 per 16 guns
16	185067	SUPPRESSOR,FERRITE,7MM DIA	2 per 16 guns
17	1103746	PCA,GATEWAY,GEN 3,ANYBUS	1 per PPHD

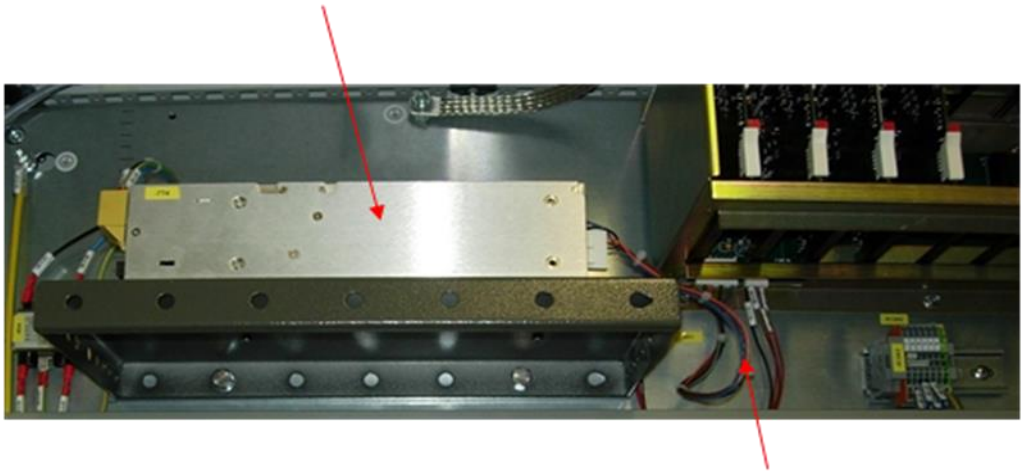
See illustrations on following pages to locate parts.





1	1031501	RECEPTACLE,8 POSITION,GUN,70 IN	1 per gun
2	939122	SEAL,CONDUIT FITTING,1/2	1 per gun
3	984526	NUT,LOCK,1/2 CONDUIT	1 per gun

11	1027564	POWER SUPPLY,400W,+24V,+/-12V,+5V	1 per 16 guns



6	1027140	HARNESS,POWER,+5,+12,-12V,ICONTROL	1 per 16 guns

5	1107144	PCA, AUTO DUAL GUN DRIVER, ENCORE	1 per 2 guns
12	1098444	GUIDE,PCB CARD, CONDUCTIVE, 7 INCH	20 per 16 guns
13	334755	BRACKET,CARDFRAME,CTRL CAB	1 per 16 guns
14	1023939	PCA,BACKPLANE,ICONTROL	1 per 16 guns
17	1103746	PCA,GATEWAY,GEN 3,ANYBUS	1 per PPHD