

ProBell[®] System Logic Controller

3A3955D

EN

For control of a ProBell Rotary Applicator System.

For professional use only.

Model 24Z223



Important Safety Instructions

Read all warnings and instructions in this manual and in your other ProBell system manuals. Save these instructions.

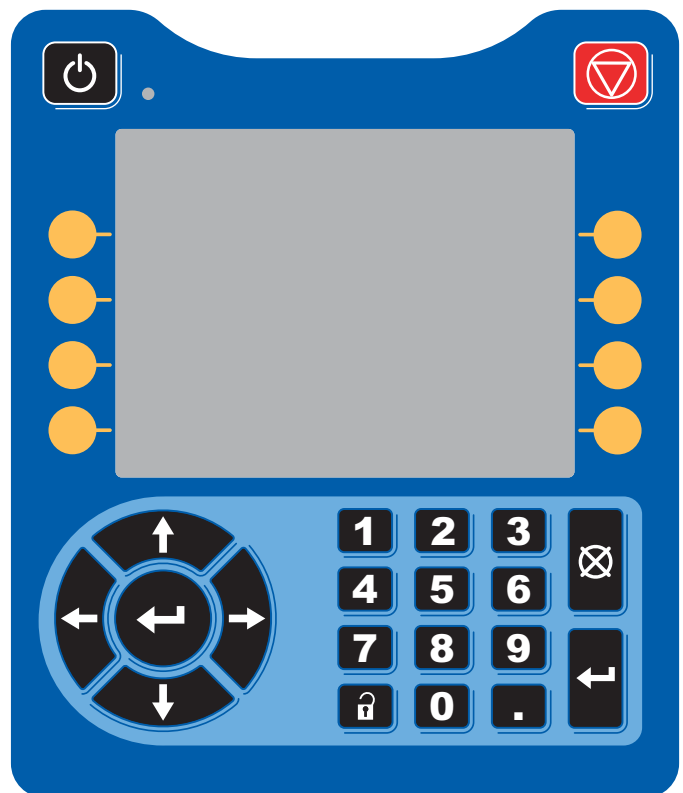


Table of Contents

Related Manuals	4	Digital Outputs	29
Component Identification	6	Analog Inputs	30
Install the Controller	7	Analog Outputs	30
Module Overview	8	Network Communication I/O Data Map	31
Power Supply	8	Applicator Network Outputs	31
Environmental Conditions	8	Applicator 1	31
Display	8	Output Register 00: Current Applicator Mode	31
Menu Bar	8	Output Register 01: Active Preset	31
Keys and Indicators	9	Output Register 02: Air Control Solenoid Status	32
Soft Key Icons	10	Output Register 03: Target Shaping Air One	32
Navigating the Screens	12	Output Register 04: Target Shaping Air Two	32
Screen Icons	12	Output Register 05: Target Turbine Speed .	33
Initial Setup	13	Output Register 06: Target Electrostatic Voltage	33
Multiple Gun Startup	13	Output Register 07: Target Electrostatic Current	33
Multiple Gun Shutdown	13	Output Register 08: Actual Shaping Air 1 ..	33
Setup Screens	13	Output Register 09: Actual Shaping Air 2 ..	33
System Screen	13	Output Register 10: Actual Turbine Speed .	33
Gun Screen 1	14	Output Register 11: Actual Electrostatic Voltage	33
Gun Screen 2	15	Output Register 12: Actual Electrostatic Current	33
Gun Screen 3	15	Output Register 13: Paint Trigger Status ..	33
Gun Screen 4	16	Output Register 14: Electrostatic Trigger Status	33
Gun Screen 5	16	Output Register 15: System Status	33
Preset Screens	17	Applicator 2	35
Maintenance Screen 1	17	Output Register 16: Current Applicator Mode	35
Maintenance Screen 2*	17	Output Register 17: Active Preset	36
Maintenance Screen 3*	18	Output Register 18: Air Control Solenoid Status	36
Maintenance Screen 4*	18	Output Register 19: Target Shaping Air One	(Inner)
Maintenance Screen 5*	18	Output Register 20: Target Shaping Air Two	(Outer)
Calibration Screen	19	Output Register 21: Target Turbine Speed .	37
Gateway Screens	19	Output Register 22: Target Electrostatic Voltage	37
PLC Diagnostic Screens	22	Output Register 23: Target Electrostatic Current	37
Advanced Screen 1	23	Output Register 24: Actual Shaping Air 1 ..	37
Advanced Screen 2	23	Output Register 25: Actual Shaping Air 2 ..	37
Advanced Screen 3	23	Output Register 26: Actual Turbine Speed .	37
Advanced Screen 4	23		
Operation	24		
Run Mode Screens	24		
Status Screen	24		
Spray Screen	25		
Error Log Screen	27		
Event Logs	27		
Network Communications and Discrete I/O	28		
Communication Gateway Module	28		
Discrete I/O	28		
Digital Inputs	28		





Output Register 27: Actual Electrostatic Voltage 37	System Log	56
Output Register 28: Actual Electrostatic Current 37	System Configuration Settings File	56
Output Register 29: Paint Trigger Status . . 37	Custom Language File	56
Output Register 30: Electrostatic Trigger Status 37	Create Custom Language Strings	57
Output Register 32: System Status	Download Procedure	57
Applicator Network Inputs	Upload Procedure	57
Applicator 1	Maintenance	59
Input Register 00: System Mode Command	Replace Battery	59
Input Register 01: Goto Preset	Upgrade Software	59
Input Register 02: Air Control Solenoids . . .	Cleaning	60
Input Register 03: Dynamic Shaping Air 1 Set Point (Inner)	Troubleshooting	61
Input Register 04: Dynamic Shaping Air 2 Set Point (Outer)	LED Diagnostic Information	61
Input Register 05: Dynamic Turbine Speed Set Point	Troubleshooting	61
Input Register 06: Dynamic Electrostatic Voltage Set Point	Error Codes	62
Input Register 07: Dynamic Electrostatic Current Set Point	To Clear Error and Restart	62
Input Register 08: Clear Active Alarm	Communication Errors	62
Input Register 09: Paint Trigger	Electrostatic Controller Failure Errors	63
Input Register 10: Electrostatic Trigger . . .	Electrostatic Controller Errors	65
Applicator 2	Electrostatic Controller Arc Detection Errors . . .	66
Input Register 11: System Mode Command	Electrostatic Controller CAN Bus Errors	67
Input Register 12: Goto Preset	Interlock Errors	67
Input Register 13: Air Control Solenoids . . .	Speed Controller Errors	67
Input Register 14: Dynamic Shaping Air 1 Set Point (Inner)	Electronic Shaping Air Errors	68
Input Register 15: Dynamic Shaping Air 2 Set Point (Outer)	Solenoid Errors	69
Input Register 16: Dynamic Turbine Speed Set Point	Bearing Air Pressure Errors	70
Input Register 17: Dynamic Electrostatic Voltage Set Point	System Logic Controller Errors	71
Input Register 18: Dynamic Electrostatic Current Set Point	Records and Advisories	71
Input Register 19: Clear Active Alarm	Maintenance Advisories	73
Input Register 20: Paint Trigger	Appendix A: Integration with Allen Bradley PLC	74
Input Register 21: Electrostatic Trigger . . .	Graco Standard Warranty	76
INPUT REGISTERS 22 – 25: DCS Command Structure	Graco Information	76
Network Communication - Dynamic Command Structure (DCS)		
USB Data		
USB Logs		
Event Log		

Related Manuals

Manual	Description
334452	ProBell® Rotary Applicator
334626	ProBell® Rotary Applicator, Hollow Wrist
3A3657	ProBell® Electrostatic Controller
3A3953	ProBell® Speed Controller
3A3954	ProBell® Air Controller
3A4384	ProBell® System CGM Installation
3A4232	ProBell® Cart Systems
3A4346	ProBell® Hose Bundles Kit
3A4738	ProBell® Reflective Speed Sensor Kit
3A4799	ProBell® Air Filters Kit
3A1244	GCA Software Token Kits

Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

 <h1 style="margin: 0;">WARNING</h1>	
	<p>ELECTRIC SHOCK HAZARD</p> <p>This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.</p> <ul style="list-style-type: none"> • Turn off and disconnect power at main switch before disconnecting any cables and before servicing or installing equipment. • Connect only to grounded power source. • All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.
	<p>EQUIPMENT MISUSE HAZARD</p> <p>Misuse can cause death or serious injury.</p> <ul style="list-style-type: none"> • Do not operate the unit when fatigued or under the influence of drugs or alcohol. • Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See Technical Data in all equipment manuals. • Use fluids and solvents that are compatible with equipment wetted parts. See Technical Data in all equipment manuals. Read fluid and solvent manufacturer’s warnings. For complete information about your material, request Safety Data Sheet (SDS) from distributor or retailer. • Turn off all equipment and follow the Pressure Relief Procedure when equipment is not in use. • Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer’s replacement parts only. • Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards. • Make sure all equipment is rated and approved for the environment in which you are using it. • Use equipment only for its intended purpose. Call your distributor for information. • Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces. • Do not kink or over bend hoses or use hoses to pull equipment. • Keep children and animals away from work area. • Comply with all applicable safety regulations.
	<p>PERSONAL PROTECTIVE EQUIPMENT</p> <p>Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. Protective equipment includes but is not limited to:</p> <ul style="list-style-type: none"> • Protective eyewear, and hearing protection. • Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Component Identification

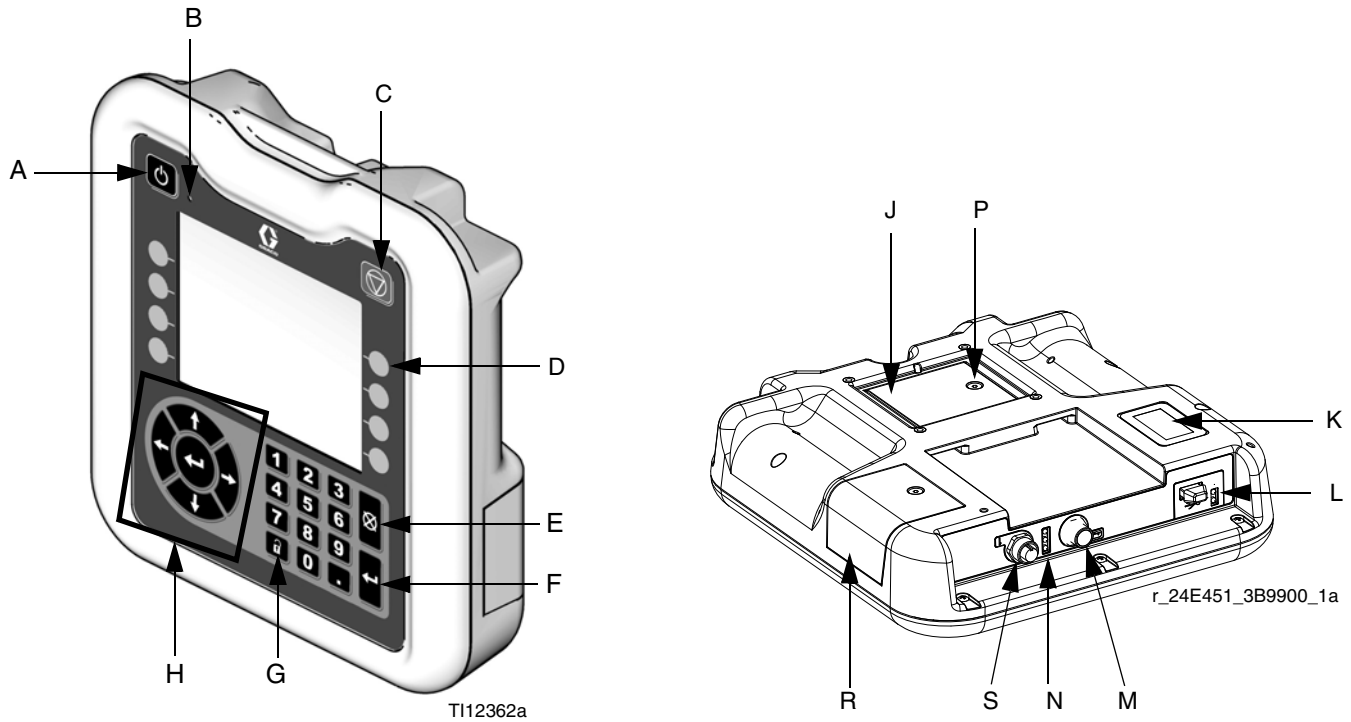


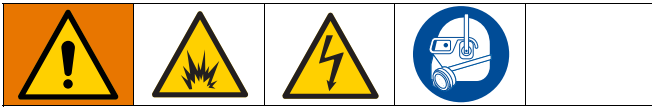
FIG. 1: Component Identification - Front

Key:

Ref.	Function
A	Startup/Shutdown Button Turns the system on and off.
B	System Status Indicator LED Displays the system status.
C	Stop Button Stops all system processes. Is not a safety or emergency stop.
D	Soft Keys Press to select the specific screen or operation shown on the display directly next to each key. See Soft Key Icons , page 10.
E	Cancel Button Cancels a selection or number entry within the active field.
F	Enter Button Acknowledges changing a value or making a selection.
G	Lock/Setup Toggles between run and setup screens. If setup screens are password protected, button toggles between run and password entry screens.

Ref.	Function
H	Navigation Buttons Navigate within a screen or to a new screen.
K	Model Number Tag
L	USB Module Interface USB port and USB indicator LEDs
M	CAN Connector Power connection
N	Module Status LEDs See LED Diagnostic Information , page 61, for signal definitions.
P	Battery Cover
R	Token Access Cover
S	Digital I/O Port for Light Tower

Install the Controller



Installing and servicing this equipment requires access to parts that may cause electric shock or other serious injury if work is not performed properly.

- Do not install or service this equipment unless you are trained and qualified.
- Do not install equipment approved only for a non-hazardous location in a hazardous location.
- Comply with all applicable local, state, and national fire, electrical, and other safety regulations.

Wall mounting: If the system does not have a speed controller, the logic controller can be mounted on a wall, using bracket kit 15V350 in a non-hazardous location.

Speed controller mounting: Mount the ProBell System Logic Controller on the front of the ProBell Speed Controller. Both controllers must be mounted in the non-hazardous location.

1. The bracket ships from the factory already installed on the speed controller.
2. Press the Logic Controller into the bracket until it locks in place.
3. Connect a CAN/Power cable from one of the CAN ports on the Speed Controller, Air Controller, or Electrostatic Controller to the CAN port on the Logic Controller.

Module Overview

The ProBell System Logic Controller controls and monitors one or two ProBell Rotary Applicator systems through the user interface or through communication with a PLC.

Power Supply

The ProBell System Logic Controller requires a Class 2 power supply. Refer to manual (3A4232), *ProBell Cart Systems* for system level power supply guidelines.

Environmental Conditions

Refer to manual (3A4232) *ProBell Cart Systems* for guidelines regarding environmental conditions for the ProBell System Logic Controller.

Display

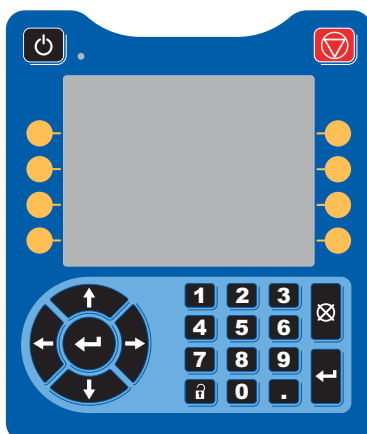
The System Logic Controller display shows graphical and text information related to setup and spray operations.

For details on the display and individual screens, see **Initial Setup, page 13**, or **System Screen, page 13**.

Keys are used to input numerical data, enter setup screens, navigate within a screen, scroll through screens, and select setup values.

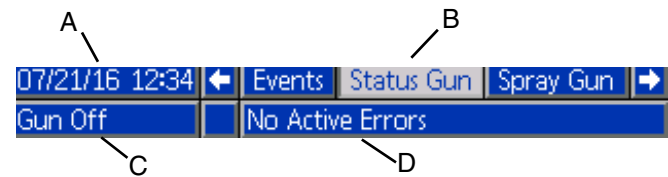
NOTICE

To prevent damage to the softkey buttons, do not press the buttons with sharp objects such as pens, plastic cards, or fingernails.



Menu Bar

The menu bar appears at the top of each screen.



Date and Time (A)

The date and time are always displayed in one of the following formats. The time is always displayed as a 24-hour clock. See **PLC Diagnostic Screens, page 22**, to set.

- DD/MM/YY HH:MM
- MM/DD/YY HH:MM
- YY/MM/DD HH:MM

Arrows

The left and right arrows indicate screen navigation.

Screen Menu (B)

The screen menu indicates the currently active screen, which is highlighted. It also indicates the associated screens that are available by scrolling left and right (i.e., Events/SprayGun).

System Mode (C)

The current system mode is displayed at the left of the menu bar. There are five modes: Gun Off, Startup, Idle, Spray, and Purge.

Error Status (D)



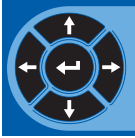
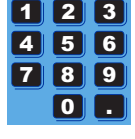



If there is an active system error, one of the following icons is displayed in the middle of the menu bar. There are three possibilities: Advisory, Deviation, or Alarm. If there is no icon, the system has no information or no error has occurred.

Icon	Function	Description
	Advisory	Informational
	Deviation	Important, no system shutdown.
	Alarm	Very important, system shutdown.

Keys and Indicators

NOTICE

To prevent damage to the softkey buttons, do not press the buttons with sharp objects such as pens, plastic cards, or fingernails.

Key	Function
Power 	When the system is in Gun Off mode, press to activate the applicator. When the system is active, press to deactivate the applicator and enter Gun Off mode.
Stop 	Press to stop the system immediately and deactivate electrostatics, turbine air, and shaping air.
Navigation 	<p>Left/Right Arrows: Use to move from screen to screen.</p> <p>Up/Down Arrows: Use to move among the fields on a screen, to move through the items on a drop down menu, or to move among multiple screens within a function.</p>
Numeric Keypad 	Use to input values.
Cancel 	Use to cancel a data entry field. The cancel button cannot be used to acknowledge events (see Enter).
Setup 	Press to enter or exit Setup mode.
Enter 	Press to choose a field to update, to make a selection, to save a selection or value, to enter a screen, or to acknowledge an event.

Soft Key Icons

Press a soft key to select the specific screen or operation shown on the display directly next to each key.



Blue icons show that a button is not available.











Gray icons with a green outline show that a button is available and is Active, or Selected.













Blue icons with a gray outline show that a button is available, but not Active, or not Selected.

NOTICE

To prevent damage to the softkey buttons, do not press the buttons with sharp objects such as pens, plastic cards, or fingernails.

Key	Function
Enter Screen 	Press to enter a screen for editing. Editable data on the screen is highlighted. Use up/down arrows to move among the data fields.
Exit Screen 	Press to exit a screen after editing.
Gun On* 	Press to turn on the applicator. This soft key has the same function as the Power key, but it appears on the Spray screen only when in Gun Off mode. The icon does not appear if manual override is disabled.
Gun Off* 	Press to turn off the applicator (only 2 applicators)
Idle* 	Press to put the system into Idle mode.
Purge* 	Press to put the system into Purge mode.
Spray* 	Press to put the system into Spray mode.
Cup Wash* 	Press to activate/deactivate the cup wash solenoid using the solvent valve when the applicator is in Purge mode.


Key	Function
Dump Valve* 	Press to activate/deactivate the dump valve solenoid when the applicator is in Purge or Idle mode.
Electrostatics* 	Press to activate/deactivate the electrostatics when the applicator is in Spray mode.
Paint Trigger 	Press to activate/deactivate the paint trigger (fluid flow) solenoid when the applicator is in Idle, Spray or Purge mode. This icon appears only if manual override is enabled and the paint trigger is defined as Local, in Gun Setup.
Shaping Air (Inner)* 	Press to activate/deactivate the inner shaping air solenoid when the applicator is in Idle or Spray mode.
Shaping Air (Outer)* 	Press to activate/deactivate the outer shaping air solenoid when the applicator is in Idle or Spray mode.
Solvent 	Press to activate/deactivate the solvent auxiliary valve(s) when the applicator is in Purge mode. This icon appears only if manual override is enabled and if at least one auxiliary solenoid is configured for Solvent.
Calibrate Inner Shaping Air* 	Press to calibrate the inner shaping air feedback voltage from the pressure transducer when the applicator is in Gun Off mode.
Calibrate Outer Shaping Air* 	Press to calibrate the outer shaping air feedback voltage from the pressure transducer when the applicator is in Gun Off mode.
Reset Valve Count* 	Press and hold for five (5) seconds to reset a valve counter.
Calibrate Turbine Air* 	Press to calibrate the turbine air voltage from the pressure transducer when the applicator is in Gun Off mode.


* Icon appears only if manual override is enabled. See **System Screen, page 13**.


Navigating the Screens


The System Logic Controller has two sets of screens:

- The Run screens control spraying operations and display system status and data.
- The Setup screens control system parameters and advanced features.

Press  on any Run screen to enter the Setup screens. If the system has a password lock, the Password screen displays. If the system is not locked (password is set to 0000), the System screen displays.

Press  on any Setup screen to return to the Status screen.








Press  to access the fields and make changes.

Press  to exit edit mode.

Use the other soft keys to select the function adjacent to them.


Screen Icons

Symbols are used to simplify global communication. The following descriptions explain what each icon represents.

Icon	Function
	Active preset
	Rotational speed or pressure if speed control is bypassed
	Inner shaping air state
	Outer shaping air state
	Date indicator
	Time indicator
	Alarm/Event indicator

Initial Setup

At power up, the Graco logo displays for approximately 5 seconds, followed by the **Status Screen, page 24**.

Press  on the Status screen to enter the Setup screens for initial setup or to make setup changes.




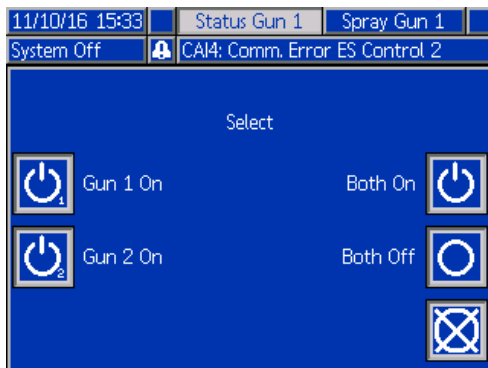
Loading Screen

07/17/17 07:51		Events	Status Gun	Spray Gun		
Gun Off		No Active Errors				
0	0	0	25 kRPM	--	--	
Target	10 psi	10 psi	25 kRPM	--	--	
Actual	0 psi	0 psi	0 kRPM	--	--	
Gun State	Gun Off	Inner Air	<input type="radio"/>			
		Outer Air	<input type="radio"/>			
		Paint	<input type="radio"/>			
		Dump	<input type="radio"/>			
		Cup Wash	<input type="radio"/>			
		Auxiliary	10 20 30			

Status screen


Multiple Gun Startup

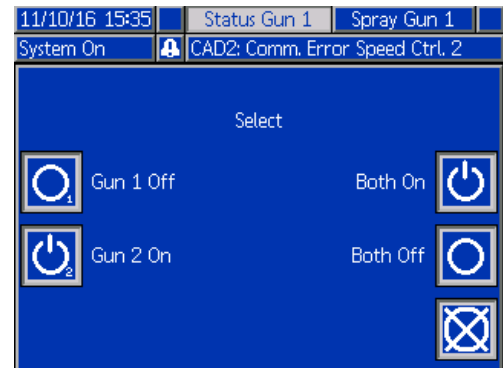
If the system is powered down, press  to display the following pop-up screen.



Select either applicator or both, to power on.

Multiple Gun Shutdown

Press  on the display module to turn off power to the applicators. The following pop-up screen is displayed.



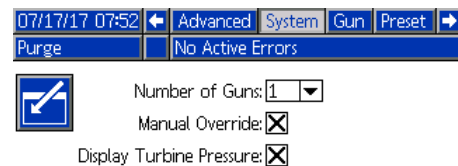
Select either applicator or both, to power off.

Setup Screens

The Setup mode is used to set up a password (if desired) and to set parameters for applicator operation. See **Module Overview, page 8**, for information on how to make selections, enter data, and icon descriptions.

System Screen

Use this screen to set basic system parameters.



Number of Guns: Set the number of guns in the system. Range=1 or 2; Default=1 gun.

Manual Override: Check this box to give users system control at the System Logic Controller. Leave the box unchecked if all system settings are controlled through a PC, PLC, or other networked device.

Display Turbine Pressure: Check this box to give users a view of the turbine pressure reading on the Spray Screen when the system is controlled to a set speed.

Gun Screen 1

Use this screen to set basic gun parameters.



Gun Type: Select the type of gun used in the system. Applicator type selection pre-configures the system controllers.

- ProBell (Default): Air Control, Speed Control, ES Control
- AirPro Auto: Air Control
- G40 Auto: Air Control
- AirPro EFX: Air control
- Pro Xpc Auto: Air Control, ES Control


Default Preset: Use the number keypad to set what is active on system power up. Range=0-98; Default=0.

Offsets: Check this box to enable users to change the preset targets by a limited amount.

NOTE: Units of measure are:


- Psi +/- 9 units of pressure
- Bar +/- 0.62 units of pressure
- MPa +/- 0.062 units of pressure
- Speed +/- 9 kRPM
- Voltage +/- 20 kV
- Current +/- 9 μ A

Paint Trigger: Select the method by which the gun receives the signal to trigger paint:

- Disabled - The paint trigger is controlled by other equipment in the system.
- Local (Default) - The paint trigger is activated by pressing the Activate Paint Trigger softkey  on the System Logic Controller. This appears only if manual override is enabled.

- Network - The Logic Controller triggers the paint in response to a signal received via a PC, PLC, or other networked device.
- Discrete - The Logic Controller triggers the paint in response to a signal received via a direct, hard-wired connection.
- Input Only - The Logic Controller is notified via a direct, hard-wired connection that another device has triggered the paint.

ES Enable: Select the method by which the gun receives the signal to activate electrostatics.

- Disabled - The electrostatics are activated by other equipment in the system
- Local (Default) - The electrostatics are activated by pressing the electrostatic softkey  on the System Logic Controller. This appears only if manual override is enabled.
- Network - The Logic Controller activates the electrostatics in response to a signal received via a PC, PLC, or other networked device.
- Discrete - The Logic Controller activates the electrostatics in response to a signal received via a direct, hard-wired connection to the electrostatic controller.

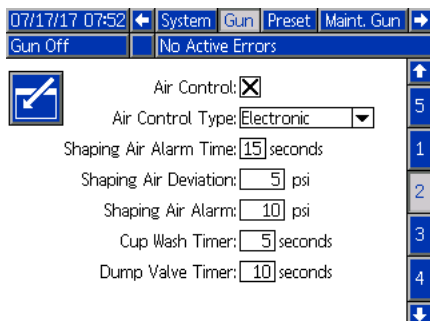
Idle Timer: Use the number keypad to set the amount of time the applicator remains in Spray mode with the paint trigger inactive before the system returns automatically to Idle mode. Range=0-999 minutes; Default=0 minutes (Disable).

NOTE: The Idle Time field is disabled if air controller is disabled. See **Gun Screen 2, page 15**.

Idle Speed: Use the number keypad to set the desired speed at which the bell cup rotates when the gun is in Idle mode. Select a speed lower than the desired spray speed. Range=10-30 kRPM; Default=15 kRPM

Gun Screen 2

Use this screen to enable or disable air control by the System Logic Controller and to set parameters if enabled.



Air Control: Check this box if the system uses either of the ProBell Air Controllers.

Air Control Type: Select the type of ProBell Air Controller used in the system.

- **Electronic (Default):** Uses voltage to pressure regulators in order to control shaping air.
- **Manual:** Use manual pressure regulators to control shaping air.

Shaping Air Alarm Time: Electronic air control only. Use the number keypad to set the length of time that the shaping air pressure (inner or outer) can be outside of the range before triggering a deviation or alarm. Range=0-60 seconds; Default=0 seconds (Disabled).

Shaping Air Deviation: Electronic air control only. This field is active if the Shaping Air Alarm Time is enabled (not 0). Set this field to the amount of pressure above or below the target that triggers a deviation (does not turn off the equipment). Range=1-99 psi; Default=5.

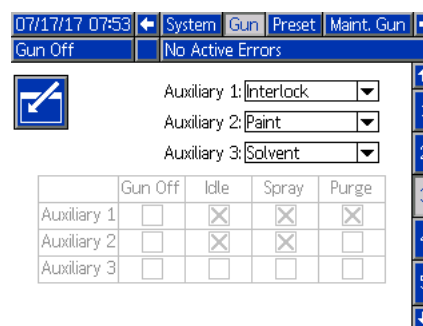
Shaping Air Alarm: Electronic air control only. This field is active if the Shaping Air Alarm Time is enabled (not 0). Set this field to the amount of pressure above or below the target that triggers an alarm (turns off the equipment). Range=1-99 psi; Default=10.

Cup Wash Timer: Use the number keypad to set the time in seconds for the cup wash. The cup wash begins when triggered and stops automatically after the timer expires. It can be stopped by the user or through a PLC before the timer runs out. Range=0-999 seconds; Default=0 seconds (Disabled)

Dump Valve Timer: Use the number keypad to set the time in seconds for the dump valve to remain open. The dump valve opens when triggered and closes automatically after the timer expires. It can be closed manually before the timer runs out. Range=0-999 seconds; Default=0 seconds (Disabled)

Gun Screen 3

Use this screen to set up the auxiliary solenoids in the air controller. An X indicates the operation modes in which each solenoid is active, based on the menu selection. For example, when interlock is selected for Auxiliary 1, the solenoid is active when in Idle, Spray, and Purge modes.



Disabled: The auxiliary solenoid is never turned on.

Interlock: The auxiliary solenoid is automatically activated in Idle, Spray, and Purge operation modes. For example, this option could be used to stop fluid flow if the system generates an alarm, or could signal a networked device that the system is not ready for fluid.

Paint: The auxiliary solenoid is automatically activated in Idle and Spray operation modes. For example, this option could be used to open a paint valve in a color stack.

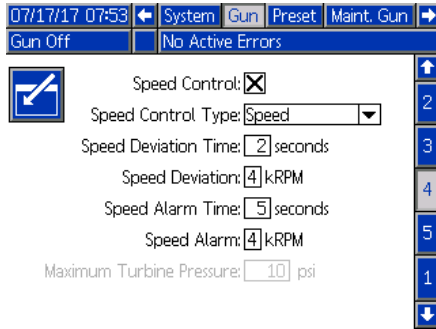
Solvent: The auxiliary solenoid can be activated via softkey in Purge operation mode, which appears only if manual override is enabled. For example, this option could be used to open a solvent valve in a color stack.

Custom: The user can select the operation modes in which the auxiliary solenoid is turned on. For example, this option could be used in reverse logic, to signal the PLC that the gun is off.

PLC: A networked device has control of all auxiliary output. Auxiliary output is turned off in Gun Off mode.

Gun Screen 4

Use this screen to enable or disable turbine speed control by the System Logic Controller and to set parameters.



Speed Control: Check this box if the system uses the ProBell Speed Controller.

Speed Control Type: Select the type of speed control.

- Speed - Uses feedback from the bell to make adjustments to the turbine speed.
- Bypass - Controls the turbine with pressure, without feedback.

NOTICE

In Bypass mode, with no feedback to the controller, take care to monitor turbine speed. Operating in excess of the maximum turbine speed will damage the turbine.

Speed Deviation Time: Use the number keypad to set the length of time that the turbine speed can be faster or slower than the target before triggering a deviation (does not turn off the equipment). Range=0-60 seconds; Default=0 seconds (Disabled)

Speed Deviation: This field is active if the Speed Deviation Time is enabled (not 0). Set the number of rotations above or below the target that triggers a deviation error (does not turn off the equipment). Range=1-5 kRPM; Default=1

Speed Alarm Time: Set the length of time that the turbine speed can be faster or slower than the target before triggering an alarm (turns off the equipment). Range=0-60 seconds; Default=0 seconds (Disabled)

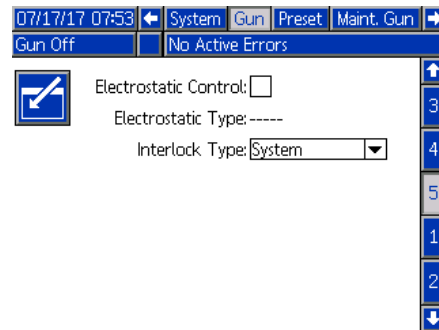
Speed Alarm: This field is active if the Speed Alarm Time is enabled (not 0). Set the number of rotations above or below the target that triggers an alarm (turns off the equipment). Range=1-5 kRPM; Default=2.

NOTE: The system automatically turns off if the speed exceeds 65,000 rpm.

Turbine Maximum Pressure: This field is active only if Bypass is selected for Speed Control Type. Use the number keypad to set the maximum pressure to the turbine. Range=7-80 psi; Default=10 psi.

Gun Screen 5

Use this screen to enable or disable electrostatics control by the System Logic Controller.



Electrostatic Control: Check this box to make all electrostatic settings and changes on the System Logic Controller screens, rather than on the Electrostatic Controller screens.

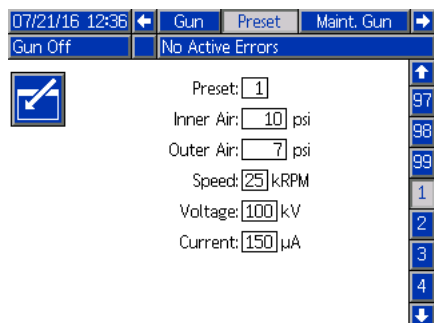
Electrostatic Type: This is a display only field that shows whether if the electrostatic controller is solvent-borne or waterborne.

Interlock Type: Select the type of electrostatic interlocks.



- System – Use the interlocks on the electrostatic controller to interlock all system operation. The system will not start without satisfying the electrostatic controller interlocks. If the electrostatic controller interlocks are removed, the system will shut down.
- Electrostatic – Use the interlocks on the electrostatic controller to interlock electrostatic operation only. The system will start without satisfying the electrostatic controller interlocks. The system will shut down if electrostatics are enabled without satisfying the electrostatic controller interlocks, or if the electrostatic controller interlocks are removed while electrostatics are enabled.

Preset Screens

Use the Preset screens to configure spray parameters for Presets 0 through 98. See the Applicator manual for instructions on adjusting the spray pattern.



Preset: Select the desired Preset in either of two ways.

- 1.) Press  to enter the screen, then enter the desired preset number using the number keypad.
- 2.) Use the up/down arrows to scroll to the desired Preset, then press .


Inner Air: This field is available only if **Air Control** is enabled and **Air Control Type** is set to Electronic on **Gun Screen 2, page 15**. Use the number keypad to set the desired pressure for the inner shaping air. Range=7-99 psi; Default=10 psi

Outer Air: This field is available only if **Air Control** is enabled and **Air Control Type** is set to Electronic on **Gun Screen 2, page 15**. Use the number keypad to set the desired pressure for the outer shaping air. Range=7-99 psi; Default=10 psi

Speed: This field is available only if **Speed Control** is enabled on **Gun Screen 4, page 16**. Use the number keypad to set the desired turbine rotation speed in Speed Control mode or desired turbine pressure in Bypass mode. Range=10-60 kRPM; Default=25 kRPM.

Voltage: This field is available only if **Electrostatic Control** is enabled on **Gun Screen 5, page 16**. Use the number keypad to set the desired spraying voltage in kilovolts (kV).

For Solventborne models: Range=0, 10-100 kV; Default=100 kV.

*To trigger a solenoid in Maintenance mode, the applicator must be in Gun Off mode. Press  to enter the screen. Select the desired solenoid and press enter to open. An X appears in the corresponding box. All open solenoids close when the screen is exited.

For Waterborne Models: Range=0 or 10-60 kV; Default=60 kV.

Current: This field is available only if **Electrostatic Control** is enabled on **Gun Screen 5, page 16**. Use the number keypad to set the desired spraying current in micro-amperes (μA). Range=0-150 μA; Default=150 μA

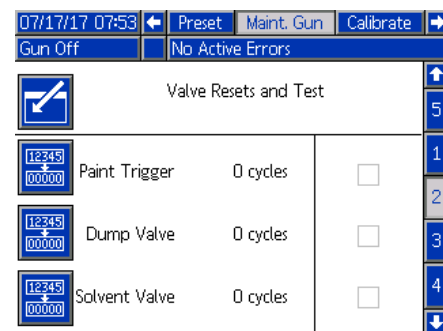
Maintenance Screen 1

Use this screen to set up the valve maintenance reminders. When the number of valve cycles exceeds this number, the corresponding maintenance advisory appears. A setting of 0 disables all maintenance advisories.

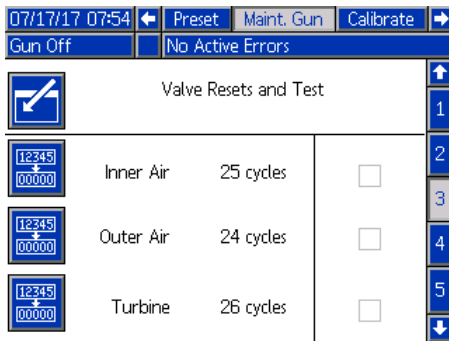


Maintenance Screen 2*

Use this screen to view and reset cycle counters for the Paint Trigger, Dump Valve, and Solvent Valve solenoids (in an air controller). To reset the cycle count, press and hold the corresponding soft key for five seconds. When in Gun Off mode, these solenoids can also be triggered to verify functionality. This screen is only enabled if the system has Air Control enabled. (**Gun Screen 2, page 15**).



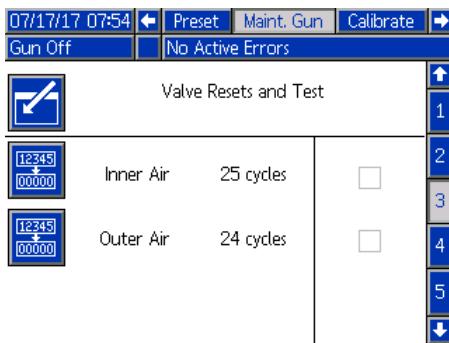
Maintenance Screen 3*



Use this screen to view and reset cycle counters for the Inner Shaping Air and Outer Shaping Air solenoids (in an air controller). To reset the cycle count, press and hold the corresponding soft key for five seconds. When in Gun Off mode, these solenoids also can be triggered to verify functionality.

This screen is only enabled if the system has Air Control enabled (**Gun Screen 2, page 15**). For an electronic air control, Inner Air is set to 15 psi, and Outer Air is set to 20 psi for this test.

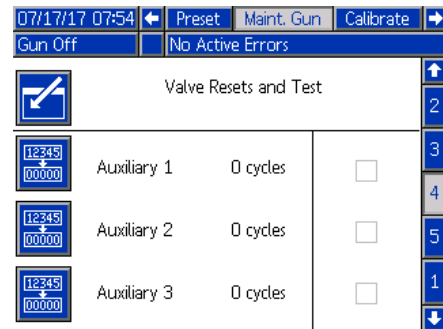
NOTE: When the system is set up to use a manual air control (See Gun Setup, **Gun Screen 2, page 15** Air Control Type Field) a field called Turbine appears to track turbine air solenoid cycles and allow enable/disable of solenoid for verifying functionality.1



Maintenance Screen 4*

Use this screen to view and reset cycle counters for the Auxiliary solenoids (in an air controller). To reset the cycle count, press and hold the corresponding soft key for five seconds. When in Gun Off mode, these solenoids also can be triggered to verify functionality.

This screen is only enabled if the system has Air Control enabled (**Gun Screen 2, page 15**).



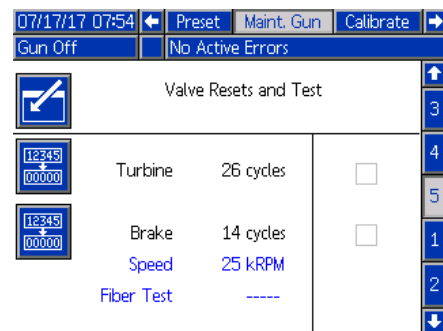
Maintenance Screen 5*

Use this screen to view and reset cycle counters for the Turbine Air and Braking Air solenoids (in the Speed Controller). To reset the cycle count, press and hold the corresponding soft key for five seconds. When in Gun Off mode, these solenoids can also be triggered to verify functionality.

The current turbine speed is displayed at the bottom of the screen. If the turbine speed is greater than 30k RPM, the system automatically disables the turbine and brake solenoid.

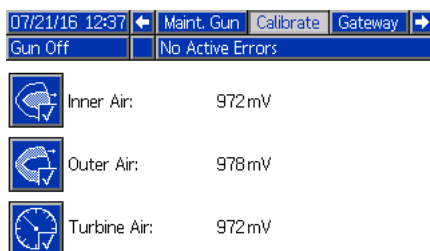
Use the Fiber Test field to determine the strength of the fiber optic signal. This field is updated when the ProBell coasts down to 0kRPM. The system displays PASS or FAIL based on the last speed. If FAIL appears, perform maintenance on fiber optic speed detection. See ProBell Speed Controller manual 3A3953 for more information.

This screen is only enabled if the system has Speed Control enabled (**Gun Screen 4, page 16**). Turbine pressure is set to 7 psi.



Calibration Screen

Use this screen to calibrate the pressure readings for the inner and outer shaping air and the turbine air.



1. Place the system in Gun Off mode.
2. The system must not be under pressure. If needed, follow the **Pressure Relief Procedure** in the Pro-Bell Rotary Applicator manual.
3. To calibrate, press each softkey (Calibrate Inner Air, Calibrate Outer Air, and Calibrate Turbine Air). If Air Control (**Gun Screen 2, page 15**) is disabled, no Inner Air or Outer Air softkey displays. If Speed Control (**Gun Screen 4, page 16**) is disabled, no Calibrate Turbine Air softkey displays.
4. The value on the screen updates if the calibration is successful.

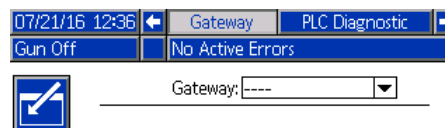
NOTE: Calibration is performed at the factory and should only be required when replacing an air regulator or voltage to pressure regulator, or after updating software.

Gateway Screens

Configuration of the system determines the Gateway screens that display. The System Logic Controller automatically detects which Graco Gateway is connected to the system, and displays the Gateway screens accordingly. Graco Gateways available include:

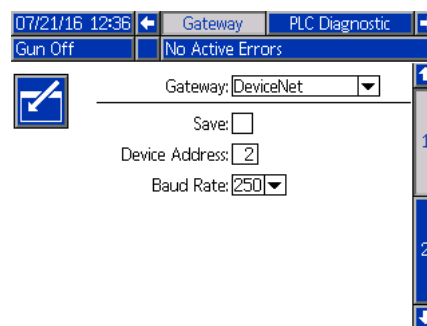
- DeviceNet
- EtherNet I/P
- Modbus TCP
- PROFINET

If the system has no gateway installed, the following screen displays when the Gateway tab is selected.



DeviceNet Gateway Screen 1

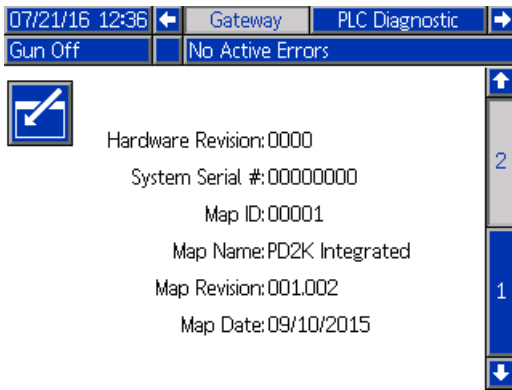
Use this screen to enter and save DeviceNet configuration information.



- Enter the address used to identify the device on the DeviceNet network (0-63).
- Select the desired baud rate from the dropdown menu.
 - 125 kbps
 - 250 kbps
 - 500 kbps
- Check the Save box to write the settings to the Gateway. **Wait** displays on the screen to indicate changes are being applied.

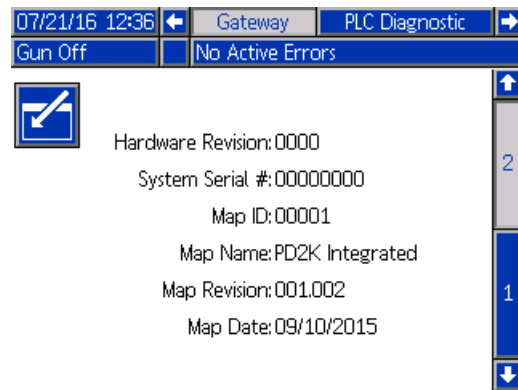
DeviceNet Gateway Screen 2

This screen displays the hardware revision number, system serial number, map ID, map name, map revision number, and map install date.



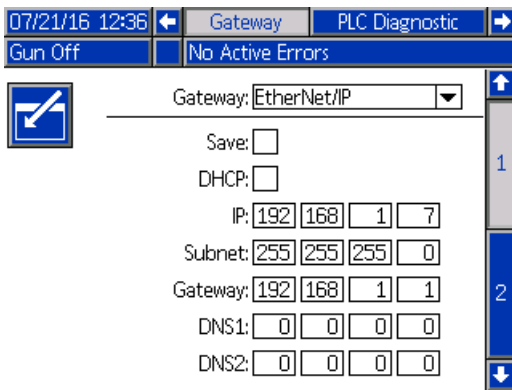
EtherNet/IP Gateway Screen 2

This screen displays the hardware revision number, system serial number, map ID, map name, map revision number, and map install date.



EtherNet/IP Gateway Screen 1

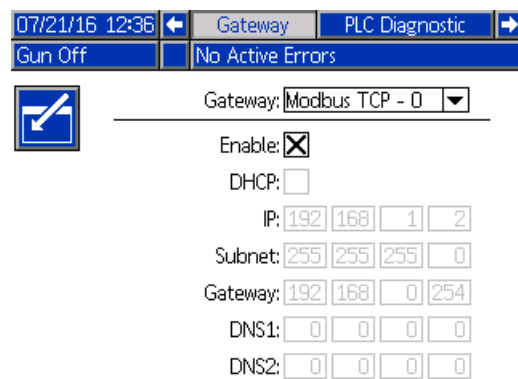
Use this screen to enter and save EtherNet/IP configuration information.



- Enter the DHCP address, the IP address, the subnet mask, the Gateway address, DNS 1, and DNS 2.
- Check the Save box to write the settings to the Gateway.

Modbus TCP Gateway Screen

Use this screen to enter and save Modbus TCP configuration information.



- Make sure the Enable box is unchecked.
- Enter the DHCP address, the IP address, the subnet mask, the Gateway address, DNS 1, and DNS 2.
- Check the Enable box to write the settings to the Gateway.

PROFINET Gateway Screen 1

Use this screen to enter and save PROFINET configuration information.

- Enter the DHCP address, the IP address, the sub-net mask, the Gateway address, DNS 1, and DNS 2.
- Check the Save box to write the settings to the Gateway.

PROFINET Gateway Screen 2

This screen displays the device address, install date, function tag, and system description.

PROFINET Gateway Screen 3

This screen displays the hardware revision number, system serial number, map ID, map name, map revision number, and map install date.

PLC Diagnostic Screens

Use the PLC Diagnostic screens to verify PLC communications. These screens provide a real-time status of all network inputs and outputs.

PLC Diagnostic Screens 1-4

These screens show all ProBell network outputs with their associated register ID, address, current value, and any relevant state information.

08/29/17 09:36 PLC Diagnostic Advanced			
Gun Off No Active Errors			
Network Outputs			
ID	Address	Value	
0	40100	1	Gun Off
1	40102	0	-
2	40104	0	-
3	40106	10	-
4	40108	10	-
5	40110	25	-
6	40112	10	-
7	40114	0	-

PLC Diagnostic Screen 9

This screen encapsulates all the registers used in the Dynamic Command Structure. Arguments and command registers are shown on the left. Acknowledge and Return registers are shown on the right. When a valid DCS command is sent, the Return registers display the appropriate data on the right side of the screen. This data can be used to test and verify DCS commands with the PLC.

08/29/17 09:36 PLC Diagnostic Advanced					
Gun Off No Active Errors					
DCS					
ID	Address	Value	ID	Address	Value
22	40800	4294967295	32	40900	4294967295
23	40802	4294967295	33	40902	4294967295
24	40804	4294967295	34	40904	4294967295
25	40806	4294967295	35	40906	4294967295

PLC Diagnostic Screens 5-8

These screens show all ProBell network inputs with their associated register ID, address, current value, and any relevant state information.

NOTE: If a network input has not been written, it shows a value of 4294967295 (0xFFFFFFFF) and the state as invalid.

08/29/17 09:50 PLC Diagnostic Advanced			
Gun Off No Active Errors			
Network Inputs			
ID	Address	Value	
0	40400	4294967295	Invalid
1	40402	4294967295	Invalid
2	40404	4294967295	Invalid
3	40406	4294967295	Invalid
4	40408	4294967295	Invalid
5	40410	4294967295	Invalid
6	40412	4294967295	Invalid
7	40414	4294967295	Invalid

Advanced Screen 1

Use this screen to set user preferences.

09/26/17 18:41 | Advanced | System | No Active Errors

Language: English

Date Format: mm/dd/yy

Date: 07 / 21 / 16

Time: 12 : 38

Password: 0000

Screen Saver: 5 minute(s)

Silent Mode:

Language: Select the desired language.

Date Format: Select the desired date format.

Date: Enter today's date using the number keypad.

Time: Enter the correct local time using the number keypad. Be aware that the time does not update automatically for local adjustments, such as daylight savings time.

Password: Use the number keypad to set a password, if desired, for entry into the Setup screens. Set the password to 0000 (which is the default) to disable password protection.

Screen Saver: Use the number keypad to set the amount of time that the screen remains backlit if no button is pressed.

Silent Mode: Check this box so the System Logic Controller does not beep every time a button is pressed or when events are active.

Advanced Screen 2

Use this screen to select the pressure units for the shaping air pressures and speed bypass mode.

09/26/17 18:41 | Advanced | System | No Active Errors

Units

Pressure: psi

Advanced Screen 3

Use this screen if the system is set up to send or receive data via USB. See **Troubleshooting, page 61**, for information about using this feature.

09/26/17 18:41 | Advanced | System | No Active Errors

Enable USB Downloads/Uploads:

Download Depth: Last 32 days

Log 90% Full Advisory Enabled:

Enable USB Downloads/Uploads: Check this box to enable USB download and upload of system information. The Download Depth field becomes editable.

Download Depth: Enter the number of days for data retrieval. For example, to retrieve data for the previous week, enter 7.

Log 90% Full Advisory Enabled: This selection is enabled by default. When enabled, the system issues an advisory when the memory log has reached 90% of capacity. Perform a download to avoid loss of data.


Advanced Screen 4

This screen displays the software part numbers and versions for the system components. Refer to this screen when updating software or when contacting a Graco distributor for technical assistance. This screen is not editable.

Module	Software Part #	Software Version
Advanced Display	17D005	0.10.001
USB Configuration	17D406	0.06.005
Air Control - 0	17B270	0.09.007
Air Control - 1	17B270	0.09.007
Speed Control - 0	17B269	0.10.015
Speed Control - 1	17B269	0.10.012
Electrostatic Control - 0	17J278	1.56.001
Gateway MBTCP - 0	16V799	1.01.001
Gateway CGM	16X255	2.06.004

Operation

Run Mode Screens

If the system is on a Setup screen, press  to go to the Run screens.

If the system has already been setup, whenever the Logic Controller is turned on to paint, the Graco logo screen shows first (see **Initial Setup, page 13**), followed by the Run Status screen.

Status Screen

The Status screen is a Run mode screen that displays important operation parameters.

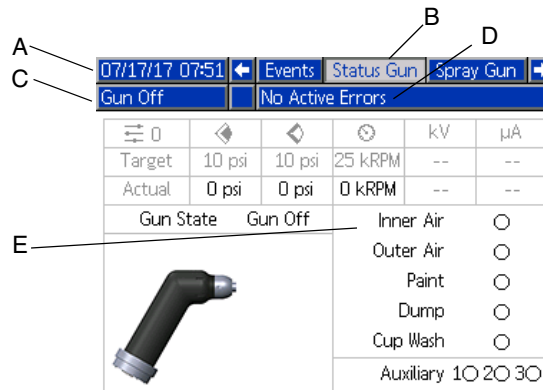










Table 1: Status Screen Key

Item	Description	Details
A	Date and Time	See PLC Diagnostic Screens, page 22 , to set.
B	Screen Menu	Run Screens. Use the left and right arrow keys to scroll through the different Run Screens: <ul style="list-style-type: none"> • Status • Spray (See Spray Screen, page 25.) • Errors (See Error Log Screen, page 27.) • Events (See Event Logs, page 27.)
C	System Mode	System Status. Displays the current mode of operation: <ul style="list-style-type: none"> • Gun Off • Startup • Idle • Spray • Purge
D	Error Status	Displays any active error code.
E	Solenoid Status	Solenoid Status. Circle is green if solenoid is active.
	Active Preset	See Gun Screen 4, page 15 , to set parameters.
	Inner Shaping Air Set-point	Displays the target and the actual pressure for the inner shaping air in selected pressure units. See Advanced Screen 2, page 23 , to set pressure units. Dashes (--) indicate that this feature is not available. A green circle indicates that the inner shaping air is on.
	Outer Shaping Air Set-point	Displays the target and the actual pressure for the outer shaping air in selected pressure units. See Advanced Screen 2, page 23 , to set pressure units. Dashes (--) indicate that this feature is not available. A green circle indicates that the outer shaping air is on.
	Rotational Speed	Displays the rotational speed target and the actual rotational speed in thousands of rotations per minute (kRPM). Displays pressure if Speed Control Type is set to Bypass on Gun Screen 4, page 16 .

Item	Description	Details
kV	Electrostatic Voltage	Displays the electrostatic spraying voltage target and the actual spraying voltage in kilovolts (kV).
μA	Electrostatic Current	Displays the electrostatic spraying current setpoint and actual in micro-amps (μA).

Spray Screen


From the Status screen (or any Run mode screen), use the left/right arrow keys to navigate to the Spray screen.

Press  to enter the screen. The soft key options on the left side of the screen correspond to the operation modes: Idle , Spray , and Purge . Soft keys only appear in Manual Override.

The Spray Screen can show the Turbine Pressure reading when controlling to a set speed. This is enabled on the **System Screen, page 13**. An example of this feature is shown in **Gun Off Mode**. It is not shown for the other operation modes.

NOTE: The content available on the spray screen varies depending on the operation mode.

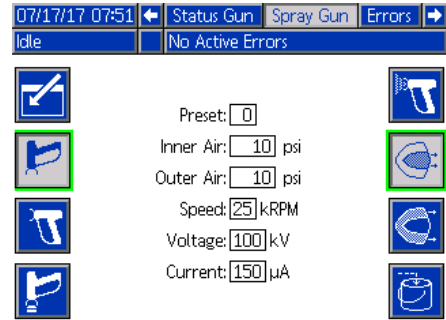
Gun Off Mode

This screen displays when the Spray Gun screen is displayed and the gun is off. Press  to turn on the applicator.









Idle Mode

When the applicator is turned on, the system brings the applicator up to the idle speed set on **Gun Screen 1, page 14**. The system automatically switches to Idle mode when idle speed is reached. In Idle mode, the Inner Shaping Air automatically turns on to help keep the cup and air cap clean. The screen displays the parameters set for the active preset.



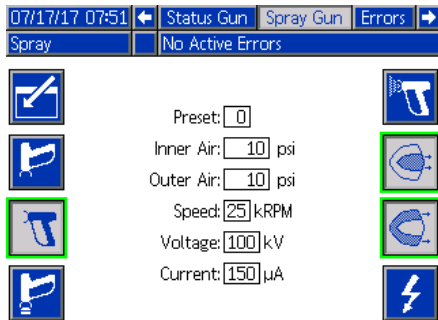
NOTE: In Preset 0, the inner shaping air, outer shaping air, speed, voltage, and current can be changed from the Spray Gun screen. In Presets 1-98, parameters are set up in advance on the **Preset Screens, page 17**.

In the Preset field, enter one of the presets that have been set up and enabled on the **Preset Screens, page 17**. Press  to select Spray mode, or  to select Purge mode.


- Activate Paint Trigger  is available only if Local is selected for the Paint Trigger on **Gun Screen 1, page 14**.
- Activate Shaping Air (Inner) 
- Activate Shaping Air (outer) 
- Activate Dump Valve 

Spray Mode




Select this mode to spray. When Spray mode is selected, both Inner and Outer Shaping Air automatically turn on to help keep the bell clean. In Spray mode, the bell accelerates to Preset speed.



NOTE: In Preset 0, the Inner Shaping Air, Outer Shaping Air, Speed, Voltage, and Current can be changed from the Spray Gun screen. In Presets 1-98, parameters are set up in advance on the **Preset Screens, page 17**.

When Spray  is selected, additional soft key options are available.

If Air Control is enabled on **Gun Screen 2, page 15**:

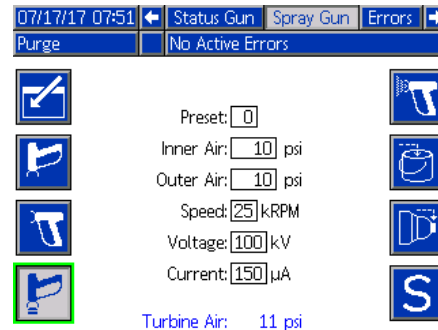
- Activate Paint Trigger  - This selection is available only if Local is selected for the Paint Trigger on **Gun Screen 1, page 14**.
- Activate Shaping Air (Inner) 
- Activate Shaping Air (outer) 

If **Electrostatic Control** is enabled on **Gun Screen 5, page 16**:


- Activate Electrostatics  - This selection is available only if Local is selected for the ES Enable on **Gun Screen 1, page 14**.

Purge Mode


Select this mode for color change or to clean the gun. In Purge mode, the electrostatics are disabled, Inner Shaping Air is active. Operators cannot turn on electrostatics in Purge mode. Purge mode uses the spray parameters of the active preset.






NOTE: In Preset 0, the Inner Shaping Air, Outer Shaping Air, Speed, Voltage, and Current can be changed from the Spray Gun screen. In Presets 1-98, parameters are set up in advance on the **Preset Screens, page 17**.


When Purge  is selected, additional soft key options are available:


If Air Control is enabled on **Gun Screen 2, page 15**:

- Activate Paint Trigger  - This selection is available only if Local is selected for the Paint Trigger on **Gun Screen 1, page 14**.

NOTE: The Paint Trigger softkey  is not available until the electrostatics discharged timer has expired.

- Activate Dump Valve 
- Activate Cup Wash Valve  - This selection is not available until the electrostatics discharged timer has expired.

NOTE: The Cup Wash Valve softkey  is not available until the electrostatics discharged timer has expired.

- Activate Solvent Valve  - This selection is available only if one of the Auxiliary Solenoids is configured for Solvent on **Gun Screen 3, page 15**.

Error Log Screen

The system logs up to 200 errors (20 pages). For each error, the screen displays the date, time, error code, and a brief description. Use the UP and DOWN arrow keys to toggle among the Error screens.

07/21/16 12:35				←	Spray Gun	Errors	Events	→
Gun Off		No Active Errors						
07/21/16	12:35	K1D1-A	Speed Ctrl. Low Gun 1					18
07/21/16	12:35	K2D1-D	Speed Ctrl. Low Gun 1					19
07/20/16	09:00	H421-A	ES CAN Error Gun 1					20
07/20/16	07:38	CAD1-A	Comm. Error Speed Control 1					1
07/20/16	07:37	K1D1-A	Speed Ctrl. Low Gun 1					2
07/20/16	07:37	K1D1-A	Speed Ctrl. Low Gun 1					3
07/20/16	07:37	K1D1-A	Speed Ctrl. Low Gun 1					4
07/20/16	07:37	K2D1-D	Speed Ctrl. Low Gun 1					↓
07/20/16	07:37	K2D1-D	Speed Ctrl. Low Gun 1					
07/20/16	07:34	H421-A	ES CAN Error Gun 1					

Event Logs

The system logs up to 200 events (20 pages). For each event, the screen displays the date, time, event code, and a brief description. Use the UP and DOWN arrow keys to toggle among the Event screens.

07/21/16 12:35				←	Errors	Events	Status Gun	→
Gun Off		No Active Errors						
07/21/16	12:34	EQU0-V	USB Idle					18
07/21/16	12:34	EQU1-R	Sys. Settings Downloaded					19
07/21/16	12:33	EQU3-R	Custom Lang. Downloaded					20
07/21/16	12:33	EQU5-R	Logs Downloaded					1
07/21/16	12:33	EAUX-V	USB Busy					2
07/20/16	09:05	EB00-R	Stop Button Pressed					3
07/20/16	09:05	EL00-R	System Power On					4
07/20/16	09:05	EM00-R	System Power Off					↓
07/20/16	09:00	EL00-R	System Power On					
07/20/16	09:00	EM00-R	System Power Off					

Network Communications and Discrete I/O

The ProBell uses Network Communications and has optional Discrete I/O features to drive the system remotely.

Some automation control elements of the ProBell can be driven by a local softkey, network communications, or discrete inputs. These options need to be configured at the System Logic Controller (see **Gun Screen 1, page 14**). The paint trigger can be set to: 'Local', 'Network', 'Discrete', or 'Input Only'. ES enable can be set to: 'Local', 'Network', or 'Discrete'.

Paint Trigger – A means of signaling the System Logic Controller to activate the paint trigger.

ES Enable – A means of signaling the System Logic Controller to activate electrostatics.

NOTE: The Manual Override check box enables a user to operate the system before the automation (PLC) is available. Manual Override can be used to run all functions of the system if a proper gun trigger signal is provided. It is not intended to be the main mode of control. Disable Manual Override during normal operation to avoid driving the system in a way that conflicts with the automation sequence.

Communication Gateway Module

Install a Communication Gateway Module (CGM) to provide a control link between the ProBell system and a selected field bus. This linkage provides the means for remote monitoring and control by external automation systems.

The ProBell system supports Modbus TCP, EtherNet/IP, DeviceNet, and PROFINET. One gateway can support two ProBells. The system requires a ProBell System CGM installation kit and a gateway. See the tables below.

ProBell System CGM Installation Kit Part Number	Field bus	Manual
24Z574	All	3A4384

Communication Gateway Module Part Number	Field bus	Manual
CGMDN0	DeviceNet	312864
DGMEMP0	EtherNet/IP	312864
DGMPP0	PROFINET	312864
24W462	Modbus TCP	334183

Discrete I/O

The ProBell system does not supply power for Discrete I/O. Possible Discrete I/O connections are listed by module.

NOTE: Speed and Air controllers provide optocouplers to isolate discrete I/O signals. The electrostatic controller requires external power to operate Discrete I/O interface.

Digital Inputs

- Speed Controller

Interlock Input: This normally open contact turns the applicator off when activated. If the ProBell speed controller reads the input as CLOSED it interrupts system operation and puts the gun into Gun Off mode. If the input is read as OPEN, the system operates normally. Install kit 24Z226 in the speed controller to use the Optional Interlock Input.

- Air Controller

Interlock Input: This normally open contact turns the applicator off when activated. If the ProBell air controller reads the input as CLOSED it interrupts system operation and puts the gun into Gun Off mode. If the input is read as OPEN, the system operates normally. Install kit 24Z226 in the air controller to use the Optional Interlock Input.

Paint Trigger: This normally open (maintained) contact provides a signal to the system to indicate whether or not to trigger spray device or spray device is triggered (Input Only). If the input is OPEN the system deactivates paint trigger solenoid. The input must be maintained CLOSED to activate the paint trigger solenoid.

NOTE: The Paint Trigger discrete input must be enabled via **Gun Screen 1, page 14** on the System Logic Controller. If it is set to 'Local' or 'Network', the discrete input is ignored and the spray device trigger signal is handled via the network communications, or manually.

- Electrostatic Controller

Electrostatic Trigger: Use to activate electrostatics.

0: Electrostatics not active.
1: Activate electrostatics. All other conditions for activating the electrostatics must be met.

Safe Position Interlock: The SAFE POSITION interlock and all other interlock inputs must be satisfied before electrostatics can be activated. See the *ProBell Electrostatic Controller* manual 3A3657 for details.

0: Interlock not satisfied: If electrostatics are off, electrostatics are not available. If electrostatics are on, no change to electrostatics.
1: Interlock satisfied; electrostatics activation is not locked by this input.

NOTE: Switching from 1 to 0 does not deactivate electrostatics. Symbol A10 on the display screen shows that this signal is satisfied. See *Screen Areas* in the *ProBell Electrostatic Controller* manual 3A3657 for more information.

24 VDC Interlock: The 24 VDC Interlock and all other interlock inputs must be satisfied before electrostatics can be enabled. See the *ProBell Electrostatic Controller* manual 3A3657 for details.

0: Interlock not satisfied; electrostatics not available.
1: Interlock satisfied; electrostatics activation is not locked by this input. Symbol A9 on the display screen shows that this signal is satisfied. See *Screen Areas* in the *ProBell Electrostatic Controller* manual 3A3657 for more information.

Digital Outputs

- Speed Controller

System Status Output: Used to indicate that the turbine is active and currently spinning.

0: Turbine is not active and not spinning.
1: Turbine is active and currently spinning.

- Air Controller - None
- Electrostatic Controller

NOTE: The voltage level for a digital output depends on the type of output selected on *Setup Screen 5 (Digital Output Type Select)* in the *ProBell Electrostatic Controller* manual 3A3657 for more information.

Safe-to-Move Output: Indicates whether the applicator can be moved out of SAFE POSITION to begin paint application. This output is tied to the arc detection blanking time setting on Setup screen 9 of the electrostatic controller. The blanking timer begins counting down when electrostatics are activated. When the timer has reached zero, the Safe-to-Move Output is switched from 0 to 1.

0: Applicator must not be moved out of SAFE POSITION because arc detection is blanked and electrostatics are active.
1: Applicator allowed to be moved out of SAFE POSITION because arc detection is active or electrostatics are not active. See *Safe Position Mode* in the *ProBell Electrostatic Controller* manual 3A3657 for more information.

NOTE: The voltage level for a digital output depends on the type of output selected on *Setup Screen 5 (Digital Output Type Select)* in the *ProBell Electrostatic Controller* manual 3A3657 for more information.

Error Output: Used to signal detection of an electrostatic error condition.

0: No electrostatic error condition detected.
1: An electrostatic error condition has been detected and reported.

NOTE: Reset by Error Reset input or by local confirmation.

Electrostatic Discharge Output: Use to indicate when electrostatics have been fully discharged. Set the electrostatic discharge time setting on Setup screen 10 (Configuration C2). The discharge timer begins counting down when electrostatics have been deactivated. When the timer reaches zero, the Electrostatic Discharge Output is switched from low (0) to high (1).

- 0: Electrostatic voltage not discharged.
- 1: Electrostatic voltage discharge time has elapsed.

Analog Inputs

- Speed Controller - None
- Air Controller - None
- Electrostatic Controller - Analog Inputs are not available when in CAN mode.

Analog Outputs

- Speed Controller - None
- Air Controller - None
- Electrostatic Controller

Actual Spraying Voltage Output: Use to indicate the actual spraying voltage (0– max kV*). This function is available when 24 VDC is applied to pin 16. The voltage or current signal present on this pin is proportional to the spraying voltage of the electrostatic power supply. The larger the value on this pin, the greater the output voltage at the gun.

0 – max kV* (gun output) → 0 – 10V or 4 – 20 mA (pin output)

* max kV = 100 kV (solventborne) or 60 kV (waterborne)

The type of output is selected on *Setup Screen 4 (Analog Output Type Select)* in the *ProBell Electrostatic Controller* manual 3A3657 for more information.

Actual Spraying Current Output: Use to indicate the actual spraying current (0 – 150 μ A). This function is available when 24 VDC is applied to pin 16. The voltage or current signal present on this pin is proportional to the spraying current of the electrostatic power supply. The larger the value on this pin, the greater the output current at the gun.

0 – 150 μ A (gun output) → 0 – 10V or 4 – 20 mA (pin output)

The type of output is selected on *Setup Screen 4 (Analog Output Type Select)* in the *ProBell Electrostatic Controller* manual 3A3657 for more information.

Network Communication I/O Data Map

Applicator Network Outputs

The Applicator Network Outputs are read only and should be treated as inputs to the PLC or other networking device. These registers provide various system and component status measurements, and set point values.

Applicator 1

Output Register 00: Current Applicator Mode

The Current Gun 1 Mode register contains a number that indicates the current operation mode of applicator 1.

Number	Operation Mode	Description
1	Gun Off	Gun is currently powered down and the gun is not in operation. Only Auxiliary solenoids configured to be enabled in Gun Off state are enabled. Gun Screen 3, page 15.
2	Gun Off Alarm	Gun has an active alarm.
3	Startup	Air is applied to turbine but system is not up to idle speed yet.
4	Idle	Gun is in Idle mode — Inner Air is automatically activated. <ul style="list-style-type: none"> • Paint Trigger can be activated. • Inner Air can be activated. • Outer Air can be activated. • Dump Valve can be activated. • Electrostatics are not available.
5	Spray	Gun is in Spray mode — Inner Air and Outer Air are automatically activated. <ul style="list-style-type: none"> • Gun Trigger can be activated. • Inner Air can be activated. • Outer Air can be activated. • Electrostatics can be activated.
6	Purge	Gun is in Purge mode — Inner Air is automatically activated. <ul style="list-style-type: none"> • Paint Trigger can be activated. • Inner Air can be activated. • Outer Air can be activated. • Electrostatics are not available.

Output Register 01: Active Preset

The Active Preset register contains the number of the active preset (0 – 98) for applicator 1.

NOTE: Preset 0 is referred to as the Dynamic preset. When preset zero is active all values can be changed independently.

Preset is associated with the following parameters:

- Inner Air
- Outer Air
- Voltage
- Current

Output Register 02: Air Control Solenoid Status

The Air Control Solenoid Status register contains the current status of the Dump Valve, Cup Wash, Shaping Air 1, Shaping Air 2, Auxiliary 1, Auxiliary 2, and Auxiliary 3 solenoids. These status bits are indicated in binary format.

Bit	Air Control Solenoid Current Status
Bit 0	Paint Trigger
Bit 1	Dump
Bit 2	Cup Wash
Bit 3	Shaping Air 1
Bit 4	Shaping Air 2
Bit 5	Auxiliary 1
Bit 6	Auxiliary 2
Bit 7	Auxiliary 3

- **Dump** – Indicates status of dump valve. For conventional and electrostatic guns this value should be ignored.

The value is 0 if the input is OPEN (dump valve closed or not active).

The value is 1 if the input is CLOSED (dump valve open or active).

- **Cup Wash** – Indicates status of the cup wash valve. For conventional and electrostatic guns this value should be ignored.

The value is 0 if the input is OPEN (cup wash valve closed or not active).

The value is 1 if the input is CLOSED (cup wash valve open or active).

- **Shaping Air 1 (Inner Air)** – Indicates status of the shaping air 1 solenoid. For a rotary atomizer this is for the inner shaping air. For conventional and electrostatic guns this is for the atomizing air.

The value is 0 if the input is OPEN (shaping air 1 solenoid closed or not active).

The value is 1 if the input is CLOSED (shaping air 1 solenoid open or active).

- **Shaping Air 2 (Outer Air)** - Indicates status of the shaping air 1 solenoid. For a rotary atomizer this is for the outer shaping air. For conventional and electrostatic guns this is for the fan air.

The value is 0 if the input is OPEN (shaping air 1 solenoid closed or not active).

The value is 1 if the input is CLOSED (shaping air 1 solenoid open or active).

- **Auxiliary 1** - Indicates status of the auxiliary 1 solenoid. This solenoid can be configured for multiple purposes. See **Gun Screen 3, page 15**, for options.

The value is 0 if the input is OPEN (auxiliary 1 solenoid closed or not active).

The value is 1 if the input is CLOSED (auxiliary 1 solenoid open or active).

- **Auxiliary 2** - Indicates status of the auxiliary 2 solenoid. This solenoid can be configured for multiple purposes. See **Gun Screen 3, page 15**, for options.

The value is 0 if the input is OPEN (auxiliary 2 solenoid closed or not active).

The value is 1 if the input is CLOSED (auxiliary 2 solenoid open or active).

- **Auxiliary 3** - Indicates status of the auxiliary 3 solenoid. This solenoid can be configured for multiple purposes. See **Gun Screen 3, page 15**, for options.

The value is 0 if the input is OPEN (auxiliary 3 solenoid closed or not active).

The value is 1 if the input is CLOSED (auxiliary 3 solenoid open or active).

Output Register 03: Target Shaping Air One

The Target Shaping Air 1 register contains the current gun shaping air 1 set point. The target is adjusted by the offset value when offsets are enabled. This register represents the inner air for a rotary atomizer or atomizing air for conventional and electrostatic guns. Value ranges from 7 – 99 psi.

Output Register 04: Target Shaping Air Two

The Target Shaping Air 2 register contains the current set point for shaping air 2. The target is adjusted by the offset value when offsets are enabled. This register represents the outer air for a rotary atomizer or fan air for conventional and electrostatic guns. Value ranges from 7– 99 psi.

Output Register 05: Target Turbine Speed

The Target Turbine Speed register contains the current set point for turbine speed. The target is adjusted by the offset value when offsets are enabled. This register is only used for rotary atomizer applicators. Value ranges from 10 – 60 kRPM.

Output Register 06: Target Electrostatic Voltage

The Target Electrostatic Voltage register contains the set point for electrostatic voltage. The target is adjusted by the offset value when offsets are enabled. This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0, 10 – 100 kV for solventborne and 60 kV for waterborne.

Output Register 07: Target Electrostatic Current

The Target Electrostatic Current register contains the set point for electrostatic current. The target is adjusted by the offset value when offsets are enabled. This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0 – 150 μ A.

Output Register 08: Actual Shaping Air 1

The Actual Shaping Air 1 register contains the actual shaping air 1 in PSI at the outlet of the air controller V2P. This register represents the inner air for a rotary atomizer or atomizing air for conventional and electrostatic guns. Value ranges from 0 - 99 psi.

Output Register 09: Actual Shaping Air 2

The Actual Shaping Air 2 register contains the actual shaping air 2 in PSI at the outlet of the air controller V2P. This register represents the outer air for a rotary atomizer or fan air for conventional and electrostatic guns. Value ranges from 0 - 99 psi.

Output Register 10: Actual Turbine Speed

The Actual Turbine Speed register contains the actual turbine speed in 1000 revolutions per minute (kRPM). This register is only used for rotary atomizer applicators. Value ranges from 0 – 60 kRPM.

Output Register 11: Actual Electrostatic Voltage

The Actual Electrostatic Voltage register contains the actual electrostatic voltage in kilovolts (kV). This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0 – 100 kV for solventborne and 60 kV for waterborne.

Output Register 12: Actual Electrostatic Current

The Actual Electrostatic Current register contains the actual electrostatic current in microamps (μ A). This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0 – 150 μ A.

Output Register 13: Paint Trigger Status

The Paint Trigger Status register contains the status of the paint trigger valve.

The value is 0 if the input is OPEN (paint not triggered or valve not active).

The value is 1 if the input is CLOSED (paint triggered or valve active).

Output Register 14: Electrostatic Trigger Status

The Electrostatic Trigger Status register contains the status of the electrostatic trigger.

The value is 0 if the input is OPEN (Electrostatics Off or not active).

The value is 1 if the input is CLOSED (Electrostatics On or active).

Output Register 15: System Status

The System Status register contains the system status. See table below for description of the register bitfield.

Bit 0	Speed Control Interlock
Bit 1	Air Control Interlock
Bit 2	ES System Interlock
Bit 3	ES 24 VDC Interlock
Bit 4	ES Safe to Move Interlock
Bit 5	Speed Control Alarm
Bit 6	Air Control Alarm
Bit 7	ES Control Alarm

Bit 8	Turbine At Speed
Bit 9	ES Discharge Expired
Bit 10	Turbine RPM Feedback Error
Bit 11	Turbine RPM Low Deviation
Bit 12	Turbine RPM Low Alarm
Bit 13	Turbine RPM High Deviation
Bit 14	Turbine RPM High Alarm
Bit 15	Turbine RPM Unstable

Bit 16	Shaping Air 1 Low Deviation
Bit 17	Shaping Air 1 Low Alarm
Bit 18	Shaping Air 1 High Deviation
Bit 19	Shaping Air 1 High Alarm
Bit 20	Shaping Air 2 Low Deviation
Bit 21	Shaping Air 2 Low Alarm
Bit 22	Shaping Air 2 High Deviation
Bit 23	Shaping Air 2 High Alarm

Bit 24	Arc Static Limit
Bit 25	Arc Dynamic Limit
Bit 26	Pressure Switch Inactive
Bit 27	N/A
Bit 28	N/A
Bit 29	N/A
Bit 30	N/A
Bit 31	N/A

- Bit 0 – Speed Control Interlock: Error Code “EBP1”
- Bit 1 – Air Control Interlock: Error Code “EBD1”
- Bit 2 – ES System Interlock: Error Code “V801”
- Bit 3 – ES 24 VDC Interlock: Error Code “V811”
- Bit 4 – ES Safe to Move Interlock: Error Code “V821”
- Bit 5 – Speed Control Alarm bit is active when any of the following error codes are present:

EBP1	K5D1	EBP1
K1D1	K6D1	WJ11
K2D1	K7P1	WJ21
K3D1	K8D1	
K4D1	K9P1	

- Bit 6 – Air Control Alarm bit is active when any of the following error codes are present:

EBD1	P321	P621	WJ81
P111	P411	WJ31	WJ91
P121	P421	WJ41	WJA1
P211	P511	WJ51	WJB1
P221	P521	WJ61	
P311	P611	WJ71	

- Bit 7 – ES Control Alarm bit is active when any of the following error codes are present:

H111	H211	H801	H951
H121	H241	H811	9021
H131	H251	H821	9031
H911	H261	H841	9041
H151	H271	H851	9051
H161	H401	H861	9991
H171	H411	H871	V801
H181	H421	H901	V811
H191	H431	H921	V821
H201	H441	H941	

- Bit 8 – Turbine At Speed: Actual turbine speed is within 1 kRPM of target.
- Bit 9 – ES Discharge Expired: Use to indicate when electrostatics have been fully discharged. Set the electrostatic discharge time setting on Setup screen 10 (Configuration C2). The discharge timer begins counting down when electrostatics have been deactivated. When the timer reaches zero, the Electrostatic Discharge Output is switched from low (0) to high (1).
 0: Electrostatic voltage not discharged
 1: Electrostatic voltage discharge time has elapsed.
- Bit 10 – Turbine RPM Feedback: Error Code “K8D1”
- Bit 11 – Turbine RPM Low Deviation: Error Code “K2D1”
- Bit 12 – Turbine RPM Low Alarm: Error Code “K1D1”
- Bit 13 – Turbine RPM High Deviation: Error Code “K3D1”
- Bit 14 – Turbine RPM High Alarm: Error Code “K4D1”
- Bit 15 – Turbine RPM Unstable: Error Code “K6D1”
- Bit 16 – Shaping Air 1 Low Deviation: Error Code “P211”
- Bit 17 – Shaping Air 1 Low Alarm: Error Code “P111”

- | | |
|--|--|
| Bit 18 – Shaping Air 1 High Deviation: Error Code “P311” | Bit 22 – Shaping Air 2 High Deviation: Error Code “P321” |
| Bit 19 – Shaping Air 1 High Alarm: Error Code “P411” | Bit 23 – Shaping Air 2 High Alarm: Error Code “P421” |
| Bit 20 – Shaping Air 2 Low Deviation: Error Code “P221” | Bit 24 – Arc Static Limit: Error Code “H151” |
| Bit 21 – Shaping Air 2 Low Alarm: Error Code “P121” | Bit 25 – Arc Dynamic Limit: Error Code “H161” |
| | Bit 26 – Pressure Switch Inactive: Error Code “K9P1” |

Applicator 2

Output Register 16: Current Applicator Mode

The Current Applicator Mode register contains a number that indicates the current operation mode

Number	Operation Mode	Description
1	Gun Off	Gun is currently powered down and the gun is not in operation. Only Auxiliary solenoids configured to be enabled in Gun Off state are enabled. Gun Screen 3, page 15.
2	Gun Off Alarm	Gun has an active alarm.
3	Startup	Air is applied to turbine but system is not up to idle speed yet.
4	Idle	Gun is in Idle mode — Inner Air is automatically activated. <ul style="list-style-type: none"> • Paint Trigger can be activated. • Inner Air can be activated. • Outer Air can be activated. • Dump Valve can be activated. • Electrostatics are not available.
5	Spray	Gun is in Spray mode — Inner Air and Outer Air are automatically activated. <ul style="list-style-type: none"> • Gun Trigger can be activated. • Inner Air can be activated. • Outer Air can be activated. • Electrostatics can be activated.
6	Purge	Gun is in Purge mode — Inner Air is automatically activated. <ul style="list-style-type: none"> • Paint Trigger can be activated. • Inner Air can be activated. • Outer Air can be activated. • Electrostatics are not available.

Output Register 17: Active Preset

The Active Preset register contains the number of the active preset (0 – 98) for applicator 1.

Preset is associated with the following parameters:

- Inner
- Outer
- Voltage
- Current

NOTE: Preset 0 is referred to as the Dynamic preset. When preset zero is active all values can be changed independently.

Output Register 18: Air Control Solenoid Status

The Air Control Solenoid Status register contains the current status of the Dump Valve, Cup Wash, Shaping Air 1, Shaping Air 2, Auxiliary 1, Auxiliary 2, and Auxiliary 3 solenoids. These status bits are indicated in binary format.

Bit 0	Paint Trigger
Bit 1	Dump
Bit 2	Cup Wash
Bit 3	Shaping Air 1
Bit 4	Shaping Air 2
Bit 5	Auxiliary 1
Bit 6	Auxiliary 2
Bit 7	Auxiliary 3

- Dump – Indicates status of dump valve. For conventional and electrostatic guns this value should be ignored.

The value is 0 if the input is OPEN (dump valve closed or not active).

The value is 1 if the input is CLOSED (dump valve open or active).

- Cup Wash – Indicates status of the cup wash valve. For conventional and electrostatic guns this value should be ignored.

The value is 0 if the input is OPEN (cup wash valve closed or not active).

The value is 1 if the input is CLOSED (cup wash valve open or active).

- Shaping Air 1 (Inner Air) – Indicates status of the shaping air 1 solenoid. For a rotary atomizer this is for the inner shaping air. For conventional and electrostatic guns this is for the atomizing air.

The value is 0 if the input is OPEN (shaping air 1 solenoid closed or not active).

The value is 1 if the input is CLOSED (shaping air 1 solenoid open or active).

- Shaping Air 2 (Outer Air) - Indicates status of the shaping air 2 solenoid. For a rotary atomizer this is for the outer shaping air. For conventional and electrostatic guns this is for the fan air.

The value is 0 if the input is OPEN (shaping air 2 solenoid closed or not active).

The value is 1 if the input is CLOSED (shaping air 2 solenoid open or active).

- Auxiliary 1 - Indicates status of the auxiliary 1 solenoid. This solenoid can be configured for multiple purposes. See **Gun Screen 3, page 15**, for options.

The value is 0 if the input is OPEN (auxiliary 1 solenoid closed or not active).

The value is 1 if the input is CLOSED (auxiliary 1 solenoid open or active).

- Auxiliary 2 - Indicates status of the auxiliary 2 solenoid. This solenoid can be configured for multiple purposes. See **Gun Screen 3, page 15**, for options.

The value is 0 if the input is OPEN (auxiliary 2 solenoid closed or not active).

The value is 1 if the input is CLOSED (auxiliary 2 solenoid open or active).

- Auxiliary 3 - Indicates status of the auxiliary 3 solenoid. This solenoid can be configured for multiple purposes. See **Gun Screen 3, page 15**, for options.

The value is 0 if the input is OPEN (auxiliary 3 solenoid closed or not active).

The value is 1 if the input is CLOSED (auxiliary 3 solenoid open or active).

Output Register 19: Target Shaping Air One (Inner)

The Target Shaping Air 1 register contains the current gun shaping air 1 set point. The target is adjusted by the offset value when offsets are enabled. This register represents the inner air for a rotary atomizer or atomizing air for conventional and electrostatic guns. Value ranges from 7– 99 psi.

Output Register 20: Target Shaping Air Two (Outer)

The Target Shaping Air 2 register contains the current set point for shaping air 2. The target is adjusted by the offset value when offsets are enabled. This register represents the outer air for a rotary atomizer or fan air for conventional and electrostatic guns. Value ranges from 7 – 99 psi.

Output Register 21: Target Turbine Speed

The Target Turbine Speed register contains the current set point for turbine speed. The target is adjusted by the offset value when offsets are enabled. This register is only used for rotary atomizer applicators. Value ranges from 10 – 60 kRPM.

Output Register 22: Target Electrostatic Voltage

The Target Electrostatic Voltage register contains the set point for electrostatic voltage. The target is adjusted by the offset value when offsets are enabled. This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0, 10 – 100 kV for solventborne and 10-60 kV for waterborne.

Output Register 23: Target Electrostatic Current

The Target Electrostatic Current register contains the set point for electrostatic current. The target is adjusted by the offset value when offsets are enabled. This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0 – 150 μ A.

Output Register 24: Actual Shaping Air 1

The Actual Shaping Air 1 register contains the actual shaping air 1 in PSI at the outlet of the V2P. This register represents the inner air for a rotary atomizer or atomizing air for conventional and electrostatic guns. Value ranges from 0 - 99 psi.

Output Register 25: Actual Shaping Air 2

The Actual Shaping Air 2 register contains the actual shaping air 2 in PSI at the outlet of the V2P. This register represents the outer air for a rotary atomizer or fan air for conventional and electrostatic guns. Value ranges from 0 - 99 psi.

Output Register 26: Actual Turbine Speed

The Actual Turbine Speed register contains the actual turbine speed in 1000 revolutions per minute (kRPM). This register is only used for rotary atomizer applicators. Value ranges from 0 – 60 kRPM.

Output Register 27: Actual Electrostatic Voltage

The Actual Electrostatic Voltage register contains the actual electrostatic voltage in kilovolts (kV). This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0, 10 – 100 kV for solventborne and 10-60 kV for waterborne.

Output Register 28: Actual Electrostatic Current

The Actual Electrostatic Current register contains the actual electrostatic current in microamps (μ A). This register is only used for rotary atomizer and electrostatic applicators. Value ranges from 0 – 150 μ A.

Output Register 29: Paint Trigger Status

The Paint Trigger Status register contains the status of the paint trigger valve.

The value is 0 if the input is OPEN (paint not triggered or valve not active).

The value is 1 if the input is CLOSED (paint triggered or valve active).

Output Register 30: Electrostatic Trigger Status

The Electrostatic Trigger Status register contains the status of the electrostatic trigger.

The value is 0 if the input is OPEN (Electrostatic Off or not active).

The value is 1 if the input is CLOSED (Electrostatic On or active).

Output Register 32: System Status

The System Status register contains the system status. See table below for description of the register bitfield .

Bit 0	Speed Control Interlock
Bit 1	Air Control Interlock
Bit 2	ES System Interlock
Bit 3	ES 24 VDC Interlock
Bit 4	ES Safe to Move Interlock
Bit 5	Speed Control Alarm
Bit 6	Air Control Alarm
Bit 7	ES Control Alarm

Bit 8	Turbine At Speed
Bit 9	ES Discharge Expired
Bit 10	Turbine RPM Feedback Error
Bit 11	Turbine RPM Low Deviation
Bit 12	Turbine RPM Low Alarm
Bit 13	Turbine RPM High Deviation
Bit 14	Turbine RPM High Alarm
Bit 15	Turbine RPM Unstable

Bit 16	Shaping Air 1 Low Deviation
Bit 17	Shaping Air 1 Low Alarm
Bit 18	Shaping Air 1 High Deviation
Bit 19	Shaping Air 1 High Alarm
Bit 20	Shaping Air 2 Low Deviation
Bit 21	Shaping Air 2 Low Alarm
Bit 22	Shaping Air 2 High Deviation
Bit 23	Shaping Air 2 High Alarm

Bit 24	Arc Static Limit
Bit 25	Arc Dynamic Limit
Bit 26	Pressure Switch Inactive
Bit 27	N/A
Bit 28	N/A
Bit 29	N/A
Bit 30	N/A
Bit 31	N/A

- Bit 0 – Speed Control Interlock: Error Code “EBP2”
- Bit 1 – Air Control Interlock: Error Code “EBD2”
- Bit 2 – ES System Interlock: Error Code “V802”

- Bit 3 – ES 24 VDC Interlock: Error Code “V812”
- Bit 4 – ES Safe to Move Interlock: Error Code “V822”
- Bit 5 – Speed Control Alarm bit is active when any of the following error codes are present:

EBP2	K5D2	EBP2
K1D2	K6D2	WJ12
K2D2	K7P2	WJ22
K3D2	K8D2	
K4D2	K9P2	

- Bit 6 – Air Control Alarm bit is active when any of the following error codes are present:

EBD2	P322	P622	WJ82
P112	P412	WJ32	WJ92
P122	P422	WJ42	WJA2
P212	P512	WJ52	WJB2
P222	P522	WJ62	
P312	P612	WJ72	

- Bit 7 – ES Control Alarm it is active when any of the following error codes are present:

H111	H211	H801	H951
H121	H241	H811	9021
H131	H251	H821	9031
H911	H261	H841	9041
H151	H271	H851	9051
H161	H401	H861	9991
H171	H411	H871	V801
H181	H421	H901	V811
H191	H431	H921	V821
H201	H841	H941	

- Bit 8 – Turbine At Speed: Actual turbine speed is within 1 kRPM of target.
- Bit 9 – ES Discharge Expired: Used to indicate when electrostatics have been fully discharged. Set the electrostatic discharge time setting on Setup screen 10 (Configuration C2). The discharge timer begins counting down when electrostatics have been deactivated. When the timer reaches zero, the Electrostatic Discharge Output is switched from low (0) to high (1).
 - 0: Electrostatic voltage not discharged
 - 1: Electrostatic voltage discharge time has elapsed.

- Bit 10 – Turbine RPM Feedback Error
Error Code “K8D2”
- Bit 11 – Turbine RPM Low Deviation
Error Code “K2D2”
- Bit 12 – Turbine RPM Low Alarm
Error Code “K1D2”
- Bit 13 – Turbine RPM High Deviation
Error Code “K3D2”
- Bit 14 – Turbine RPM High Alarm
Error Code “K4D2”
- Bit 15 – Turbine RPM Unstable
Error Code “K6D2”
- Bit 16 – Shaping Air 1 Low Deviation
Error Code “P212”
- Bit 17 – Shaping Air 1 Low Alarm
Error Code “P112”
- Bit 18 – Shaping Air 1 High Deviation
Error Code “P312”
- Bit 19 – Shaping Air 1 High Alarm
Error Code “P412”
- Bit 20 – Shaping Air 2 Low Deviation
Error Code “P222”
- Bit 21 – Shaping Air 2 Low Alarm
Error Code “P122”
- Bit 22 – Shaping Air 2 High Deviation
Error Code “P322”
- Bit 23 – Shaping Air 2 High Alarm
Error Code “P422”
- Bit 24 – Arc Static Limit
Error Code “H152”
- Bit 25 – Arc Dynamic Limit
Error Code “H162”
- Bit 26 – Pressure Switch Inactive
Error Code “K9P2”

OUTPUT REGISTERS 32 – 35: DCS Command Structure

See Dynamic Command Description, page 49.

Network Output Data Map (Read Only)

Network Output ID	Modbus Register	Parameter Name	Data Type	Units	Range
0000	40100	Current Gun 1 Mode	uint32	NONE	0 = NOP 1 = Gun Off 2 = Gun Off Alarm 3 = Startup 4 = Idle 5 = Spray 6 = Purge
0001	40102	Gun 1 Active Preset	uint32	NONE	0-98
0002	40104	Gun 1 Air Control Solenoid Status	uint32	NONE	bit 0 = Gun Trigger bit 1 = Dump Valve bit 2 = Cup Wash bit 3 = Inner Shaping Air bit 4 = Outer Shaping Air bit 5 = Auxiliary 1 bit 6 = Auxiliary 2 bit 7 = Auxiliary 3 bit 8 = Turbine
0003	40106	Gun 1 Target Shaping Air One	uint32	PSI	7-99
0004	40108	Gun 1 Target Shaping Air Two	uint32	PSI	7-99
0005	40110	Gun 1 Target Speed	uint32	kRPM	10-60

0006	40112	Gun 1 Target Voltage	uint32	kV	0-100
0007	40114	Gun 1 Target Current	uint32	μA	0-150
0008	40116	Gun 1 Actual Shaping Air One	uint32	PSI	0-99
0009	40118	Gun 1 Actual Shaping Air Two	uint32	PSI	0-99
0010	40120	Gun 1 Actual Turbine Speed	uint32	kRPM	0-60
0011	40122	Gun 1 Actual Voltage	uint32	kV	0-100
0012	40124	Gun 1 Actual Current	uint32	μA	0-150
0013	40126	Gun 1 Trigger Status	uint32	NONE	0 = Gun trigger not active 1 = Gun trigger active
0014	40128	Gun 1 Electrostatic Trigger Status	uint32	NONE	0 = Electrostatics not active 1 = Electrostatics active
0015	40130	Gun 1 Status	uint32	NONE	bit 0 = Speed Control Interlock bit 1 = Air Control Interlock bit 2 = ES System Interlock bit 3 = ES 24 VDC Interlock bit 4 = ES Safe To Move Interlock bit 5 = Speed Control Alarm bit 6 = Air Control Alarm bit 7 = ES Control Alarm bit 8 = Turbine At Speed bit 9 = ES Discharge Expired bit 10 = Turbine RPM Feedback Error bit 11 = Turbine RPM Low Deviation bit 12 = Turbine RPM Low Alarm bit 13 = Turbine RPM High Deviation bit 14 = Turbine RPM High Alarm bit 15 = Turbine RPM Unstable bit 16 = Shaping Air 1 Low Deviation bit 17 = Shaping Air 1 Low Alarm bit 18 = Shaping Air 1 High Deviation bit 19 = Shaping Air 1 High Alarm bit 20 = Shaping Air 2 Low Deviation bit 21 = Shaping Air 2 Low Alarm bit 22 = Shaping Air 2 High Deviation bit 23 = Shaping Air 2 High Alarm bit 24 = Arc Static Limit bit 25 = Arc Dynamic Limit bit 26 = Pressure Switch Inactive

0016	40132	Current Gun 2 Mode	uint32	NONE	0 = NOP 1 = Gun Off 2 = Gun Off Alarm 3 = Startup 4 = Idle 5 = Spray 6 = Purge
0017	40134	Gun 2 Active Preset	uint32	NONE	0-98
0018	40136	Gun 2 Air Control Solenoid Status	uint32	NONE	bit 0 = Gun Trigger bit 1 = Dump Valve bit 2 = Cup Wash bit 3 = Inner Shaping Air bit 4 = Outer Shaping Air bit 5 = Auxiliary 1 bit 6 = Auxiliary 2 bit 7 = Auxiliary 3 bit 8 = Turbine
0019	40138	Gun 2 Target Shaping Air One	uint32	PSI	7-99
0020	40140	Gun 2 Target Shaping Air Two	uint32	PSI	7-99
0021	40142	Gun 2 Target Speed	uint32	kRPM	10-60
0022	40144	Gun 2 Target Voltage	uint32	kV	0-100
0023	40146	Gun 2 Target Current	uint32	μ A	150
0024	40148	Gun 2 Active Shaping Air One	uint32	PSI	0-60
0025	40150	Gun 2 Active Shaping Air Two	uint32	PSI	0-60
0026	40152	Gun 2 Active Speed	uint32	kRPM	0-50
0027	40154	Gun 2 Active Voltage	uint32	kV	0-100
0028	40156	Gun 2 Active Current	uint32	μ A	150
0029	40158	Gun 2 Trigger Status	uint32	NONE	0 = Gun trigger not active 1 = Gun trigger active
0030	40160	Gun 2 Electrostatic Trigger Status	uint32	NONE	0 = Electrostatics not active 1 = Electrostatics active

0031	40162	Gun 2 Status	uint32	NONE	bit 0 = Speed Control Interlock bit 1 = Air Control Interlock bit 2 = ES System Interlock bit 3 = ES 24 VDC Interlock bit 4 = ES Safe To Move Interlock bit 5 = Speed Control Alarm bit 6 = Air Control Alarm bit 7 = ES Control Alarm bit 8 = Turbine At Speed bit 9 = ES Discharge Expired bit 10 = Turbine RPM Feedback Error bit 11 = Turbine RPM Low Deviation bit 12 = Turbine RPM Low Alarm bit 13 = Turbine RPM High Deviation bit 14 = Turbine RPM High Alarm bit 15 = Turbine RPM Unstable bit 16 = Shaping Air 1 Low Deviation bit 17 = Shaping Air 1 Low Alarm bit 18 = Shaping Air 1 High Deviation bit 19 = Shaping Air 1 High Alarm bit 20 = Shaping Air 2 Low Deviation bit 21 = Shaping Air 2 Low Alarm bit 22 = Shaping Air 2 High Deviation bit 23 = Shaping Air 2 High Alarm bit 24 = Arc Static Limit bit 25 = Arc Dynamic Limit bit 26 = Pressure Switch Inactive
0032	40900	Command Acknowledge	uint32	NONE	0 = NOP 1 = BUSY 2 = ACK 3 = NAK 4 = ERR
0033	40902	Command Return 1	uint32	N/A	N/A
0034	40904	Command Return 2	uint32	N/A	N/A
0035	40906	Command Return 3	uint32	N/A	N/A

Applicator Network Inputs

The Applicator Network Inputs are Write-Read capable, but should be treated as outputs from a PLC or other networking device. These registers allow the user to control system operation and configure system settings remotely. Invalid values (i.e. out of bounds or not consistent with system configuration) are ignored by the Applicator. All values must be written as integers. Floating point numbers are not supported. Do not rely on these registers for read status, other than to confirm data that has been written and accepted.

NOTE: The applicator system does not refresh the values for these registers. At power up all input registers are initialized to invalid values.

Applicator 1

Input Register 00: System Mode Command

The Gun Mode Command register accepts a number that represents a command to the gun to initiate a particular operation. Some operation modes may be initiated only under certain conditions.

Number	Operation Mode	Description
0	NOP	The system takes no action.
1	Power	The gun powers up.
2	Remote Stop	The gun stops all current operations and turns off the gun.
3	Idle	The gun transitions into Idle mode (see Idle Mode, page 25).
4	Spray	The gun transitions into Spray mode (see Spray Mode, page 26).
5	Purge	The gun transitions into Purge mode (see Purge Mode, page 26).

Input Register 01: Goto Preset

The Goto Preset register is used to change the current spray parameters. A number between 0 and 98 can be written to this register. Preset values contain set points for Inner Air, Outer Air, Turbine Speed, Electrostatic Voltage, and Electrostatic Current. These values update automatically based on the preset value received. If the dynamic preset value of '0' is received, the system maintains the current spray parameters and the set points can then be changed independently (Reference Input Registers 03 - 07).

Input Register 02: Air Control Solenoids

The Air Control Solenoids register is used to activate the air control solenoids. These air control solenoid bits use binary format to control the register.

Bit 0	N/A
Bit 1	Dump
Bit 2	Cup Wash
Bit 3	Shaping Air 1
Bit 4	Shaping Air 2
Bit 5	Auxiliary 1
Bit 6	Auxiliary 2
Bit 7	Auxiliary 3

- Dump Valve – Activates the dump valve used for flushing paint through the rotary atomizer. For conventional and electrostatic guns this is ignored.
- Cup Wash Valve – Activates the cup wash valve used for cleaning the inner and outer portions of the cup with solvent. For conventional and electrostatic guns this is ignored.
- Shaping Air 1 (Inner Air) – Activates the shaping air 1. For a rotary atomizer this is for the inner shaping air. For conventional and electrostatic guns this is for the atomizing air.
- Shaping Air 2 (Outer Air) - Activates the shaping air 2. For a rotary atomizer this is for the outer shaping air. For conventional and electrostatic guns this is for the fan air.

- Auxiliary 1 - Activates the auxiliary 1 solenoid. Auxiliary solenoid must be configured as “PLC” on Setup **Gun Screen 3, page 15**.
- Auxiliary 2 - Activates the auxiliary 2 solenoid. Auxiliary solenoid must be configured as “PLC” on Setup **Gun Screen 3, page 15**.
- Auxiliary 3 - Activates the auxiliary 3 solenoid. Auxiliary solenoid must be configured as “PLC” on Setup **Gun Screen 3, page 15**.

Input Register 03: Dynamic Shaping Air 1 Set Point (Inner)

The Dynamic Shaping Air 1 Set Point register is used to set the shaping air 1 set point. A number between 7 and 99 PSI can be written to this register. It can be changed at any time, and the system immediately adjusts to the new set point.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 04: Dynamic Shaping Air 2 Set Point (Outer)

The Dynamic Shaping Air 2 Set Point register is used to set the shaping air 2 set point. A number between 7 and 99 PSI can be written to this register. It can be changed at any time, and the system immediately adjusts to the new set point.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 05: Dynamic Turbine Speed Set Point

The Dynamic Turbine Speed Set Point register is used to set the turbine speed set point. A number between 0 and 60 kRPM can be written to this register. The value is only accepted if the current preset is equal to 0 (Dynamic Preset).

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 06: Dynamic Electrostatic Voltage Set Point

The Dynamic Electrostatic Voltage Set Point register is used to update the target electrostatic voltage set point. It can be changed at any time, and the system immediately adjusts to the new set point. A number between 0 and 100 can be written to this register (values 1-9 default to 10). Units of this register are kV.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 07: Dynamic Electrostatic Current Set Point

The Dynamic Electrostatic Current Set Point register is used to update the target electrostatic current set point. It can be changed at any time, and the system immediately adjusts to the new set point. A number between 0 and 150 can be written to this register. Units of this register are μ A.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 08: Clear Active Alarm

The Clear Active Alarm register is used to acknowledge an alarm remotely so that the system may resume operation. Be sure that the alarm condition has been alleviated. Write a 1 to this register to acknowledge the latest active alarm. If more than one alarm is currently active only the most recent alarm is acknowledged. A repeated write should be performed to clear any remaining active alarms.

NOTE: This register is not polled by the applicator. An alarm is cleared only when a value of 1 is written to this register. It is recommended that the automation reset this register by writing a 0 to it at all other times to avoid inadvertently clearing an alarm.

Input Register 09: Paint Trigger

The Paint Trigger register is used to signal the ProBell system to activate the paint trigger valve.

- Write a value of ‘1’ to activate the paint valve.
- Write a value of ‘0’ to deactivate the paint valve.

Input Register 10: Electrostatic Trigger

The Electrostatic Trigger register is used to signal the ProBell system to activate electrostatics.

NOTE: Robot should be located in a safe position to enable electrostatics. Arc detection is not enabled until blanking time has elapsed.

- Write a value of '1' to activate electrostatics.
- Write a value of '0' to deactivate electrostatics.

NOTE: This register is used only if the Electrostatic Enable is set to 'Network' via **Gun Screen 1, page 14**, on the System Logic Controller. If it is set to 'Discrete' or 'Local' this register is ignored and gun trigger is handled via the discrete input or softkey entry.

Applicator 2

Input Register 11: System Mode Command

The Gun Mode Command register accepts a number that represents a command to the gun to initiate a particular operation. Some operation modes may be initiated only under certain conditions.

Number	Operation Mode	Description
0	NOP	The system takes no action
1	Power	The gun powers up.
2	Remote Stop	The gun stops all current operations and turns off the gun.
3	Idle	The gun transitions into Idle mode (see Idle Mode, page 25).
4	Spray	The gun transitions into Spray mode (see Spray Mode, page 26).
5	Purge	The gun transitions into Purge mode (see Purge Mode, page 26).

Input Register 12: Goto Preset

The Goto Preset register is used to change the current spray parameters. A number between 0 and 98 can be written to this register. Preset values contain set points for Inner Air, Outer Air, Turbine Speed, Electrostatic Voltage, and Electrostatic Current. These values update automatically based on the preset value received. If the dynamic preset value of '0' is received, the system maintains the current spray parameters and the set points can then be changed independently (Reference Input Registers 14 -18).

Input Register 13: Air Control Solenoids

The Air Control Solenoids register is used to activate the air control solenoids. These air control solenoid bits use binary format to control the register.

Bit 0	N/A
Bit 1	Dump
Bit 2	Cup Wash
Bit 3	Shaping Air 1
Bit 4	Shaping Air 2
Bit 5	Auxiliary 1
Bit 6	Auxiliary 2
Bit 7	Auxiliary 3

- Dump Valve – Activates the dump valve used for flushing paint through the rotary atomizer. For conventional and electrostatic guns this is ignored.
- Cup Wash Valve – Activates the cup wash valve used for cleaning the inner and outer portions of the cup with solvent. For conventional and electrostatic guns this is ignored.
- Shaping Air 1 (Inner Air) – Activates the shaping air 1. For a rotary atomizer this is for the inner shaping air. For conventional and electrostatic guns this is for the atomizing air.
- Shaping Air 2 (Outer Air) - Activates the shaping air 2. For a rotary atomizer this is for the outer shaping air. For conventional and electrostatic guns this is for the fan air.
- Auxiliary 1 - Activates the auxiliary 1 solenoid. Auxiliary solenoid must be configured as "PLC" on Setup **Gun Screen 3, page 15**.

- Auxiliary 2 - Activates the auxiliary 2 solenoid. Auxiliary solenoid must be configured as “PLC” on Setup Gun Screen 3, page 15.
- Auxiliary 3 - Activates the auxiliary 3 solenoid. Auxiliary solenoid must be configured as “PLC” on Setup Gun Screen 3, page 15.

Input Register 14: Dynamic Shaping Air 1 Set Point (Inner)

The Dynamic Shaping Air 1 Set Point register is used to set the shaping air 1 set point. A number between 7 and 99 PSI can be written to this register. It can be changed at any time, and the system immediately adjusts to the new set point.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 15: Dynamic Shaping Air 2 Set Point (Outer)

The Dynamic Shaping Air 2 Set Point register is used to set the shaping air 2 set point. A number between 7 and 99 PSI can be written to this register. It can be changed at any time, and the system immediately adjusts to the new set point.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 16: Dynamic Turbine Speed Set Point

The Dynamic Turbine Speed Set Point register is used to set the turbine speed set point. A number between 10 and 60 kRPM can be written to this register. The value is only accepted if the current preset is equal to 0 (Dynamic Preset).

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 17: Dynamic Electrostatic Voltage Set Point

The Dynamic Electrostatic Voltage Set Point register is used to update the target electrostatic voltage set point. It can be changed at any time, and the system immediately adjusts to the new set point. A number between 0 and 100 can be written to this register (values 1-9 default to 10). Units of this register are kV.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 18: Dynamic Electrostatic Current Set Point

The Dynamic Electrostatic Current Set Point register is used to update the target electrostatic current set point. It can be changed at any time, and the system immediately adjusts to the new set point. A number between 0 and 150 can be written to this register. Units of this register are μ A.

NOTE: Active preset has to be equal to the Dynamic Preset 0 for value to take effect.

Input Register 19: Clear Active Alarm

The Clear Active Alarm register is used to acknowledge an alarm remotely so that the system may resume operation. Be sure that the alarm condition has been alleviated. Write a 1 to this register to acknowledge the latest active alarm. If more than one alarm is currently active only the most recent alarm is acknowledged. A repeated write should be performed to clear any remaining active alarms.

NOTE: This register is not polled by the applicator. An alarm is cleared only when a value of ‘1’ is written to this register. It is recommended that the automation reset this register by writing a 0 to it at all other times to avoid inadvertently clearing an alarm.

Input Register 20: Paint Trigger

The Paint Trigger register is used to signal the ProBell system to activate the paint valve.

- Write a value of ‘1’ to activate the paint valve.
- Write a value of ‘0’ to deactivate the paint valve.

Input Register 21: Electrostatic Trigger

The Electrostatic Trigger register is used to signal the ProBell system to activate electrostatics.

NOTE: Robot should be located in a safe position to enable electrostatics. Arc detection is not enabled until blanking time is expired.

- Write a value of ‘1’ to activate electrostatics.
- Write a value of ‘0’ to deactivate electrostatics.

NOTE: This register is used only if the Electrostatic Enable is set to 'Network' via Gun Screen 1 on the System Logic Controller. If it is set to 'Discrete' or 'Local' this register is ignored and gun trigger is handled via the discrete input or softkey entry.

INPUT REGISTERS 22 – 25: DCS Command Structure

See **Dynamic Command Description**, page 49.

Network Input Data Map (Write/Read)

Network Input ID	Modbus Register	Parameter Name	Data Type	Units	Range
0000	40400	Gun 1 Command Mode	uint32	NONE	0 = NOP 1 = Power 2 = Stop 3 = Idle 4 = Spray 5 = Purge
0001	40402	Gun 1 Goto Preset Number	uint32	NONE	0, 1 - 98
0002	40404	Gun 1 Air Control Solenoids	uint32	NONE	bit 0 = Gun Trigger bit 1 = Dump Valve bit 2 = Cup Wash bit 3 = Inner Shaping Air bit 4 = Outer Shaping Air bit 5 = Auxiliary 1 bit 6 = Auxiliary 2 bit 7 = Auxiliary 3 bit 8 = Turbine
0003	40406	Gun 1 Dynamic Shaping Air One Setpoint	uint32	PSI	7-99
0004	40408	Gun 1 Dynamic Shaping Air Two Setpoint	uint32	PSI	7-99
0005	40410	Gun 1 Dynamic Speed Setpoint	uint32	kRPM	10-60
0006	40412	Gun 1 Dynamic Voltage Setpoint	uint32	kV	0, 10-100
0007	40414	Gun 1 Dynamic Current Setpoint	uint32	μA	0-150
0008	40416	Gun 1 Clear Active Alarm	uint32	NONE	1 = Clear Active Alarm
0009	40418	Gun 1 Paint Trigger	uint32	NONE	0 = Deactivate Paint Trigger 1 = Activate Paint Trigger
0010	40420	Gun 1 Electrostatic Trigger	uint32	NONE	0 = Deactivate Electrostatics 1 = Activate Electrostatics
0011	40422	Gun 2 Command Mode	uint32	NONE	0 = NOP 1 = Power 2 = Stop 3 = Idle 4 = Spray 5 = Purge
0012	40424	Gun 2 Goto Preset Number	uint32	NONE	0, 1 - 98

0013	40426	Gun 2 Air Control Solenoids	uint33	NONE	bit 0 = Gun Trigger bit 1 = Dump Valve bit 2 = Cup Wash bit 3 = Inner Shaping Air bit 4 = Outer Shaping Air bit 5 = Auxiliary 1 bit 6 = Auxiliary 2 bit 7 = Auxiliary 3 bit 8 = Turbine
0014	40428	Gun 2 Dynamic Shaping Air One Setpoint	uint32	PSI	7-99
0015	40430	Gun 2 Dynamic Shaping Air Two Setpoint	uint32	PSI	7-99
0016	40432	Gun 2 Dynamic Speed Setpoint	uint32	kRPM	10-60
0017	40434	Gun 2 Dynamic Voltage Setpoint	uint32	kV	0, 10-100
0018	40436	Gun 2 Dynamic Current Setpoint	uint32	μA	0-150
0019	40438	Gun 2 Clear Active Alarm	uint32	NONE	1= Clear Active Alarm
0020	40440	Gun 2 Paint Trigger	uint32	NONE	0 = Deactivate Paint Trigger 1 = Activate Paint Trigger
0021	40442	Gun 2 Electrostatic Trigger	uint32	NONE	0 = Deactivate Electrostatics 1 = Activate Electrostatics
0022	40800	Command Argument 1	uint32	NONE	N/A
0023	40802	Command Argument 2	uint32	NONE	N/A
0024	40804	Command Argument 3	uint32	NONE	N/A
0025	40806	Command	uint32	NONE	See Command Table

Network Communication - Dynamic Command Structure (DCS)

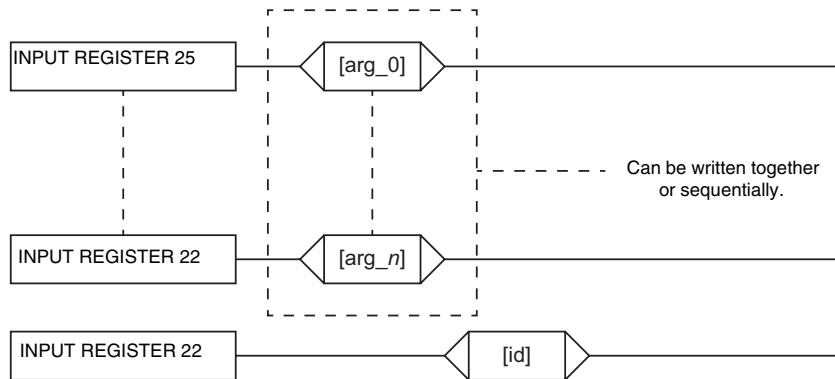
Dynamic Command Description

The Dynamic Command Structure (DCS) is used to access data that requires some form of argument(s) or consolidate data that requires multiple registers. The DCS uses a static set of network communication input and output registers (see **Network Output Data Map (Read Only)**, page 39 and **Network Input Data Map (Write/Read)**, page 48).

Use the following sequence for the DCS.

1. Write the appropriate command arguments to INPUT REGISTERS 22 – 24. These commands may be written sequentially or sent all at once.
2. Once all arguments have been passed, write the command ID to INPUT REGISTER 25.
3. The ProBell responds to a valid command by writing a 2 (Acknowledge) to OUTPUT REGISTER 32.
4. The ProBell writes appropriate return values to OUTPUT REGISTERS 33 – 35.

ProBell Inputs (PLC Outputs)



ProBell Outputs (PLC Inputs)

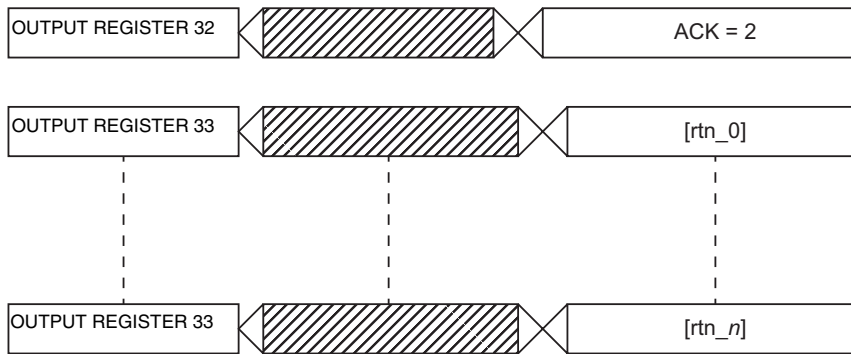


FIG. 2: Dynamic Command Structure Timing

List of DCS Commands

Table 6 Dynamic Commands with Command ID.

42	Read Turbine Speed
43	Read ES Voltage
44	Read ES Current

ID	Command
0	No Op
15	Read Alarm Info
16	Read Event Info
30	Write Shaping Air 1
31	Write Shaping Air 2
32	Write Turbine Speed
33	Write ES Voltage
34	Write ES Current
ID	Command
0	No Op
40	Read Shaping Air 1
41	Read Shaping Air 2

Read Alarm Info

The Read Alarm Info command allows remote access to any of the last 200 alarms logged by the ProBell system. The argument is the chronological index of the alarm log, where 0 is the most recent alarm and 199 is the 200th most recent. The date is returned as a four-byte packet with each byte holding a two-digit value for (from MSB to LSB) year, month, day, and day of the week (Monday = 01). The time is returned as a three-byte packet with each byte holding a two-digit value. Starting from the MSB, the first byte can be ignored, then hour, minute, and second. The alarm code is a four-character little endian ASCII string.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Read Alarm Info	Uint32	NONE	15	0-44
Argument 0	Alarm Index	Uint32	NONE	1	1-199
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Alarm Date	Uint32	[YY:MM:D D:DW]	0x0E060302 = [14:06:03:02]	N/A
Return 1	Alarm Time	Uint32	[xx:HH:MM - :SS]	0x080B0B = [08:11:11]	N/A
Return 2	Alarm Code [3:0]	Uint32	NONE	0x31304B44 = ['1', '0', 'K', 'D']	N/A

Read Event Info

The Read Event Info command allows remote access to any of the last 200 events logged by the ProBell system. The argument is the chronological index of the events log, where 0 is the most recent event and 199 is the 200th most recent. The date is returned as a four-byte packet with each byte holding a two-digit value for (from MSB to LSB) year, month, day, and day of the week (Monday = 01). The time is returned as a three-byte packet with each byte holding a two-digit value. Starting from the MSB, the first byte can be ignored, then hour, minute, and second. The event code is a four-character little endian ASCII string.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Read Event Info	Uint32	NONE	16	0-44
Argument 0	Alarm Index	Uint32	NONE	1	1-199
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Event Date	Uint32	[YY:MM:D D:DW]	0x0E060302 = [14:06:03:02]	N/A
Return 1	Event Time	Uint32	[xx:HH:MM - :SS]	0x080B0B = [08:11:11]	N/A
Return 2	Event Code [3:0]	Uint32	NONE	0x31304B44 = ['1', '0', 'K', 'D']	N/A

Write Shaping Air 1 (Inner)

The Write Shaping Air 1 command allows users to configure preset shaping air 1 set point remotely. The return registers echo the arguments received.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Write Shaping Air 1	Uint32	NONE	30	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Argument 2	Shaping Air 1 Set Point	Uint32	NONE	25	7-99

Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Shaping Air 1 Set Point	Uint32	NONE	25	7-99

Write Shaping Air 2 (Outer)

The Write Shaping Air 2 command allows users to configure preset shaping air 2 set point remotely. The return registers echo the arguments received.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Write Shaping Air 2	Uint32	NONE	31	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Argument 2	Fan Air Set Point	Uint32	NONE	22	7-99
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Fan Air Set Point	Uint32	NONE	22	7-99

Write Turbine Speed

The Write Turbine Speed command allows users to configure preset turbine speed set point remotely. The return registers echo the arguments received.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Write Turbine Speed	Uint32	NONE	32	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1

Argument 2	Turbine Speed Set Point	Uint32	NONE	25	10-60
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Turbine Speed Set Point	Uint32	NONE	25	10-60

Write Electrostatic Voltage

The Write Electrostatic Voltage command allows users to configure preset electrostatic voltage set point remotely. The return registers echo the arguments received.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Write ES Voltage	Uint32	NONE	33	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Argument 2	Electrostatic Voltage Set Point	Uint32	NONE	85	0, 10-100
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Electrostatic Voltage Set Point	Uint32	NONE	3	0-100

Write Electrostatic Current

The Write Electrostatic Current command allows users to configure preset electrostatic current set point remotely. The return registers echo the arguments received.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Write ES Current	Uint32	NONE	34	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Argument 2	Electrostatic Current Set Point	Uint32	NONE	150	0-150
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Electrostatic Current Set Point	Uint32	NONE	150	0-150

Read Shaping Air 1 (Inner)

The Read Shaping Air 1 command returns all configured preset parameters for a desired preset number. The number of the presets to be read is the only argument.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Read Shaping Air 1	Uint32	NONE	40	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Shaping Air 1 Set Point	Uint32	NONE	25	7-99

Read Shaping Air 2 (Outer)

The Read Shaping Air 2 command returns all configured preset parameters for a desired preset number. The number of the presets to be read is the only argument.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Read Shaping Air 2	Uint32	NONE	41	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Shaping Air 2 Set Point	Uint32	NONE	25	7-99

Read Turbine Speed

The Read Turbine Speed command returns all configured preset parameters for a desired preset number. The number of the presets to be read is the only argument.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Read Turbine Speed	Uint32	NONE	42	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4

Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Turbine Speed Set Point	Uint32	NONE	25	10-60

Read Electrostatic Voltage

The Read Electrostatic Voltage command returns all configured preset parameters for a desired preset number. The number of the presets to be read is the only argument.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Read Electrostatic Voltage	Uint32	NONE	43	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Electrostatic Voltage	Uint32	NONE	100	0, 10-100

Read Electrostatic Current

The Read Electrostatic Current command returns all configured preset parameters for a desired preset number. The number of the presets to be read is the only argument.

DCS Register	Parameter Description	Data Type	Units	Value	Range
DCS Command	Read Electrostatic Voltage	Uint32	NONE	44	0-44
Argument 0	Preset Number	Uint32	NONE	1	0-98
Argument 1	Gun Number	Uint32	NONE	0	0-1
Acknowledge	Command Acknowledged	Uint32	NONE	2 = ACK	0-4
Return 0	Preset Number	Uint32	NONE	1	0-98
Return 1	Gun Number	Uint32	NONE	0	0-1
Return 2	Electrostatic Current	Uint32	NONE	150	0-150

USB Data

If the system is configured with USB capability, be sure that **Enable USB Downloads/Uploads** is checked on **Advanced Screen 3, page 23**. All files downloaded from the USB are put in a DOWNLOAD folder on the drive. For example:
 "E:\GRACO\12345678\DOWNLOAD"

The 8-digit numeric folder name matches the 8-digit System Logic Controller serial number. When downloading from multiple System Logic Controllers, there is one sub-folder in the GRACO folder for each System Logic Controller.

USB Logs

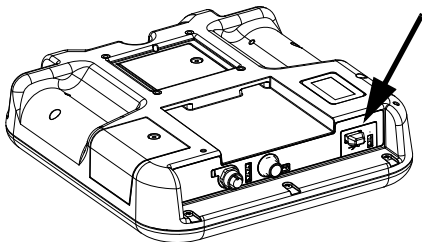


Fig. 3: : System Logic Controller USB Port

During operation, the ProBell stores system and performance related information to memory in the form of log files. ProBell maintains two types of log files: an event log and system logs. Follow the **Download Procedure, page 57**, to retrieve log files.

Event Log

The event log file name is 1-EVENT.CSV and is stored in the DOWNLOAD folder.

The event log maintains a record of the last 1,000 events. Each event record in the log file contains the date and time the event occurred, the event type, event code, and event description.

System Log

The system log file name is 2-SYSTEM.CSV and is stored in the DOWNLOAD folder.

The system log maintains a record of modules connected to the system. Each event record in the log file contains the date, time, software part number, and software version.

System Configuration Settings File

The system configuration settings file name is SETTINGS.TXT and is stored in the DOWNLOAD folder.

A system configuration settings file automatically downloads each time a USB flash drive is inserted. Use this file to back up system settings for future recovery or to easily replicate settings across multiple ProBell systems. Refer to the **Upload Procedure, page 57**, for instructions on how to use this file.

Retrieve the SETTINGS.TXT file after all system settings are set as desired. Store the file for future use as a backup in case the settings are changed and need to be quickly changed back to the desired setup.

NOTE: System settings may not be compatible between different versions of the ProBell software.

NOTE: Do not modify the contents of this file.

Custom Language File

The custom language file name is DISPTEXT.TXT and is stored in the DOWNLOAD folder.

A custom language file automatically downloads each time a USB flash drive is inserted. If desired, use this file to create a user-defined set of custom language strings to be displayed within the System Logic Controller.

The ProBell system is able to display the following Unicode characters. For characters outside of this set, the system displays the Unicode replacement character, which appears as a white question mark inside of a black diamond.

- U+0020 - U+007E (Basic Latin)
- U+00A1 - U+00FF (Latin-1 Supplement)
- U+0100 - U+017F (Latin Extended-A)
- U+0386 - U+03CE (Greek)
- U+0400 - U+045F (Cyrillic)

Create Custom Language Strings

The custom language file is a tab-delimited text file that contains two columns. The first column consists of a list of strings in the language selected at the time of download. The second column can be used to enter the custom language strings. If a custom language was previously installed, this column contains the custom strings, otherwise the second column is blank.

Modify the second column of the custom language file as needed and follow the **Upload Procedure, page 57**, to install the file.

The format of the custom language file is critical. The following rules must be followed in order for the installation process to succeed.

- The file name must be DISPTXT.TXT.
- The file format must be a tab-delimited text file using Unicode (UTF-16) character representation.
- The file must contain only two columns, with columns separated by a single tab character.
- Do not add or remove rows to the file.
- Do not change the order of the rows.
- Define a custom string for each row in the second column.

Download Procedure

1. Insert the USB flash drive into the USB Port. See FIG. 3: on page 56.
2. The menu bar and USB indicator lights indicate that the USB is downloading files. Wait for USB activity to complete. A pop-up is present until the transfer is complete if it is not acknowledged.
3. Remove the USB flash drive from the USB port (BL).
4. Insert the USB flash drive into the USB port of computer.
5. The USB flash drive window automatically opens. If it does not, open USB flash drive from within Windows[®] Explorer.
6. Open the Graco folder.
7. Open the system folder. If downloading data from more than one system, there is more than one folder. Each folder is labeled with the corresponding serial number of the System Logic Controller (The

serial number is on the back of the System Logic Controller.)

8. Open the DOWNLOAD folder.
9. Open the LOG FILES folder labeled with the highest number. The highest number indicates the most recent data download.
10. Open the log file. Log files open in Microsoft[®] Excel[®] by default as long as the program is installed. However, they can also be opened in any text editor or Microsoft Word.

NOTE: All USB logs are saved in Unicode (UTF-16) format. If opening the log file in Microsoft Word, select Unicode encoding.

Upload Procedure

Use this procedure to install a system configuration file and/or a custom language file.

1. If necessary, follow the **Download Procedure, page 57**, to automatically generate the proper folder structure on the USB flash drive.
2. Insert the USB flash drive into the USB port of computer.
3. The USB flash drive window automatically opens. If it does not, open the USB flash drive from within Windows Explorer.
4. Open the Graco folder.
5. Open the system folder. If working with more than one system, there is more than one folder within the Graco folder. Each folder is labeled with the corresponding serial number of the System Logic Controller. (The serial number is on the back of the module.)
6. If installing the system configuration settings file, place the SETTINGS.TXT file into UPLOAD folder.
7. If installing the custom language file, place the DISPTXT.TXT file into the UPLOAD folder.
8. Remove the USB flash drive from computer.
9. Install the USB flash drive into the ProBell system USB port.

10. The menu bar and USB indicator lights indicate that the USB is downloading files. Wait for USB activity to complete.

11. Remove the USB flash drive from the USB port.

NOTE: If the custom language file was installed, users can now select the new language from the Language drop-down menu in the Advanced Setup Screen 1.

Maintenance

Replace Battery

A lithium battery maintains the clock when the power is not connected.

To replace the battery:

1. Disconnect power to the System Logic Controller.
2. Remove the rear access panel.

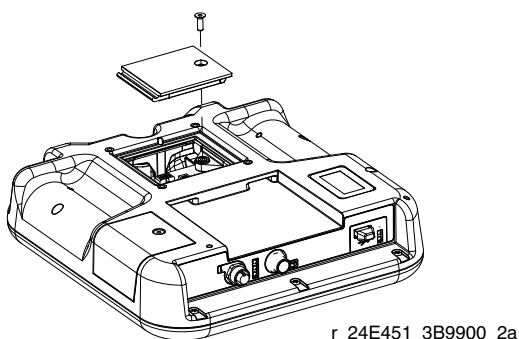


FIG. 4: Remove Battery Panel

3. Remove the old battery and replace with a new CR2032 battery.
4. Replace the rear access panel.

Upgrade Software

NOTE: Back up the custom language file (if installed) before upgrading the software. See **USB Data, page 56**, for more information.

To upgrade the system software, purchase Software Upgrade Token 17M465. Advanced Screen 4 displays the software part numbers and versions for the system components. The latest software version information is available at www.graco.com.

Module	Software Part Number
Advanced Display	17D005
USB Configuration	17D406
Air Control	17B270
Speed Control	17B269
Electrostatic Control	17J278
Gateway CGM	16X255

The software upgrade token does not upgrade the software on the ProBell Electrostatic Controller. To upgrade this software, use a MicroSD card and the files available for download at www.graco.com.

1. Turn off power to the system.
2. Remove the token access panel.

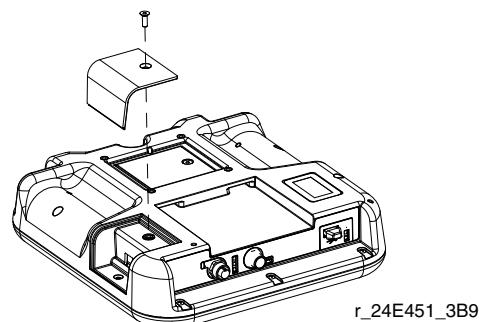


FIG. 5: Remove Access Panel

3. Insert and press the software token (T) firmly into slot.

NOTE: There is no preferred orientation of the token.

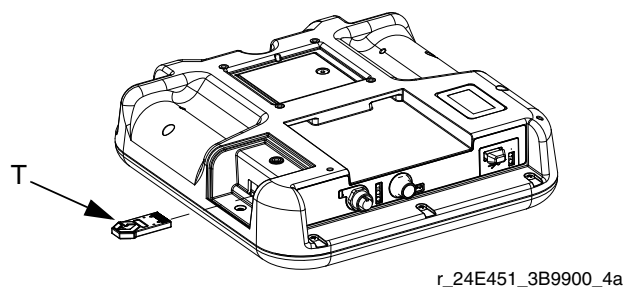


FIG. 6: Insert Token

4. Turn on power to the system. The red indicator light (L) flashes until the new software is completely loaded.
5. If prompted, match the Speed Controller software to the Speed Controller control module serial number and the Air Controller software to the Air Controller control module serial number.
6. After the red indicator light shuts off, turn off power to the system.

Maintenance

7. Remove the software token.
8. Replace the token access panel.

NOTE: Update all system software at the same time for system compatibility. See the *GCA Software Tokens Kit* manual 3A1244 for more details on all system software.

Cleaning

Use any alcohol-based household cleaner, such as glass cleaner, to clean the System Logic Controller.

Troubleshooting



LED Diagnostic Information

The following LED signals, diagnoses, and solutions apply to the System Logic Controller, the Control Module, and the Gateway module (if one is installed for PLC integration).

LED Status Signal	Diagnosis	Solution
Green on	The system is powered up.	---
Yellow	Internal communication is in progress.	---
Red solid	Hardware failure.	Replace module.
Red flashing fast	Software is uploading.	---
Red flashing slow	Token error	Remove token and upload the software token again.
Red flashes three times, pauses, then repeats	Invalid rotary switch position (FCM and CGM only)	Change the rotary switch position on the control module (inside the air or speed controller) to a valid position, then restart the system.

Troubleshooting

Problem	Cause	Solution
The System Logic Controller is not on.	Power is not on.	Turn power supply on.
	Loose or disconnected CAN cable.	Tighten or connect CAN cable.
The System Logic Controller has power but does not function.	Hardware failure.	Replace.
Red module status LED stays on constantly even after power cycle.	Hardware failure.	Replace.

Error Codes

System errors alert the operator of a problem in the system. When any error occurs:

- Error buzzer sounds (unless operating in silent mode).
- Error popup screen shows the active error code.
- The Status bar shows the active error code.

The error is saved in the error or event log.

There are four types of error: Alarm, Deviation, Advisory, and Record.

If an **Alarm** occurs, operation stops and an error is recorded in the system.

A **Deviation** records an error in the system but does not shut down the equipment. The deviation must be acknowledged by the user.

An **Advisory** records an event in the system and clears itself after 60 seconds.

A **Record** saves relevant system events in the background. This information can be reviewed on the Error Log Screen.

To Clear Error and Restart

When a deviation or alarm occurs, be sure to determine the error code before resetting it. Go to the **Error Log Screen, page 27** to view the last 200 errors, with date and time stamps.

If an alarm has occurred, correct the cause before resuming operation.

To acknowledge a deviation or clear an alarm, press



Communication Errors

Code	Type	Name	Description	Solution
CAP1 or CAP2	Alarm	Communication Error Air Control	The Logic Controller has lost communication with the air controller.	<ul style="list-style-type: none"> • Verify CAN connection on bottom of Air Controller. • Check status LEDs on FCM cube. • Cycle power.
CAD1 or CAD2	Alarm	Communication Error Speed Control	The Logic Controller has lost communication with the speed controller.	<ul style="list-style-type: none"> • Verify CAN connection on bottom of Speed Controller. • Check status LEDs on FCM cube. • Cycle power
CAI1 or CAI2	Alarm	Communication Error Electrostatic Control	The Logic Controller has lost communication with the electrostatic controller.	<ul style="list-style-type: none"> • Verify CAN connection on bottom of Electrostatics Controller. • Verify that the ES controller is configured to use CAN. See Setup Screen 2 in Manual 3A3657. • Verify that the power switch is in the ON position. • Cycle power.
CAGX, CAGO, or CAG1	Alarm	Communication Error Gateway	The system does not detect a CGM that was registered as being connected at power up.	<ul style="list-style-type: none"> • Verify CAN connection on bottom of Control Module. • Check the status LEDs on the Control Module. See LED Diagnostic Information, page 61.

Code	Type	Name	Description	Solution
CA00	Alarm	Communication Error Logic Controller	Logic Controller communication has been lost.	<ul style="list-style-type: none"> Verify CAN connection on the bottom of the System Logic Controller. Check the status LEDs on the System Logic Controller. See LED Diagnostic Information, page 61.
CDOX	Alarm	Duplicate Logic Control	The system sees two or more logic controllers.	
CDP1 or CDP2	Alarm	Duplicate Air Control	The Logic Controller sees two or more air controllers set to the same gun.	<ul style="list-style-type: none"> The air controller has the same CAN ID as another module. Adjust the selector switch on the control module. See Adjusting Selector Switch in manual 3A3954.
CDD1 or CDD2	Alarm	Duplicate Speed Control	The Logic Controller sees two or more speed controllers set to the same gun.	<ul style="list-style-type: none"> The speed controller has the same CAN ID as another module. Adjust the selector switch on the control module. See Adjusting Selector Switch in manual 3A3953.
CDI1 or CDI2	Alarm	Duplicate Electrostatic Control	The Logic Controller sees two or more Electrostatic Controllers set to the same gun.	<ul style="list-style-type: none"> Verify that the CAN ID is not the same as the CAN ID of a second Electrostatic Controller See Setup Screen 6 in the Electrostatic Controller Manual.
CDGX, CDG0, CDG1	Alarm	Duplicate Communications Gateway Module	The Logic Controller see two or more Gateway modules set to the same ID.	<ul style="list-style-type: none"> The system does not support two CGMs. Remove the second module from the system. Modbus TCP module has the same CAN ID as another module. Adjust the rotary switch.
WSCX, WSC1, WSC2	Alarm	Incorrect Air Control Configuration	The Air Control indicates a V2P feedback signal on a Manual Air Controller.	<ul style="list-style-type: none"> Verify the air control type is correct. See Gun Screen 2, page 15. Replace the control module if needed.

Electrostatic Controller Failure Errors

Code	ES Code	Type	Name	Description	Solution
H201 or H202	H20	Alarm	ES Controller Error	Onboard generated voltage is out of tolerance.	<ul style="list-style-type: none"> Verify all connections inside of controller are properly made. Verify power source is good. Replace 24 VDC board or power board if necessary.
H211 or H212	H21	Alarm	ES Controller Error	24V supply has dropped below 21V. Remark: No error code is displayed.	
H241 or H242	H24	Alarm	ES Controller Error	Magic number doesn't match the expected value.	<ul style="list-style-type: none"> Verify all connections inside of controller are properly made. Replace main board if necessary
H251 or H252	H25	Alarm	ES Controller Error	Writing to EEPROM takes longer than 10 minutes.	

Code	ES Code	Type	Name	Description	Solution
H261 or H262	H26	Alarm	ES Controller Error	Data to be written at power off hasn't been properly saved to the EEPROM.	<ul style="list-style-type: none"> Do not turn off controller so quickly after making setting changes. Verify all connections inside of controller are properly made. Replace main board if necessary.
H271 or H272	H27	Alarm	ES Controller Error	Verification of the data written to the EEPROM failed.	<ul style="list-style-type: none"> Verify all connections inside of controller are properly made. Replace main board if necessary.
H801 or H802	H80	Alarm	ES Controller Error	No response or timeout to a request. Error report on command execution. Response data mismatch.	<ul style="list-style-type: none"> Verify all connections inside of controller are properly made. Verify software version and upgrade if needed. Replace main board if necessary.
H811 or H812	H81	Alarm	ES Controller Error	The self-test performed by the safety controller detected an error.	
H821 or H822	H82	Alarm	ES Controller Error	Heartbeat message timeout.	
H831 or H832	H83	Alarm	24 VDC interlock missing	24 VDC interlock removed while electrostatics in operation	<ul style="list-style-type: none"> Verify DIO cable connections. Verify connected interlocked devices are functioning. Verify all connections inside of controller are properly made. Replace main board if necessary.
H841 or H842	H84	Alarm	ES Controller Error	The firmware requires an update.	<ul style="list-style-type: none"> Verify all connections inside of controller are properly made. Verify software version and upgrade if needed. Replace main board if necessary.
H851 or H852	H85	Alarm	ES Controller Error	Attempt to turn on the electrostatics while the applicator isn't in the safe position.	
H861 or H862	H86	Alarm	ES Controller Error	Attempt to turn on the electrostatics without valid arc detection parameters set.	
H871 or H872	H87	Alarm	ES Controller Error	Too many message transmission requests at the same time.	
H881 or H882	H88	Alarm	Digital output type not set	An attempt is made to turn on the electrostatics when the digital output type is not configured.	<ul style="list-style-type: none"> Verify all connections inside of controller are properly made. Verify software version and upgrade if needed. Replace main board if necessary.
H901 or H902	H90	Advisory	Gun Controller Communication Error	Internal controller failure.	
H921 or H922	H92	Advisory	Gun Controller Not Alive	Internal controller failure.	
H941 or H942	H94	Alarm	ES Controller Error	The firmware requires an update.	Verify the software version and update.

Code	ES Code	Type	Name	Description	Solution
H951 or H952	H95	Alarm	ES Controller Error	Mismatch between the type of cascade and the type of applicator	Contact Graco technical assistance.
9011 or 9012	H901	Alarm	Assertion failed	Violation of a mandatory precondition	<ul style="list-style-type: none"> • Verify that all connections inside of the controller are properly made. • Restart controller. • Verify software version and upgrade if needed. • Replace main board if necessary.
9021 or 9022	H902	Deviation	Out of Memory	Memory allocation failed.	
9031 or 9032	H903	Deviation	Watchdog timeout	Watchdog wasn't serviced when necessary.	
9041 or 9042	H904	Deviation	Stack Overflow	A stack overflow has been detected.	
9051 or 9052	H905	Deviation	Hard Fault Error	The CPU has detected a hard fault.	
9991 or 9992	H999	Deviation	Other Fatal Error	Unspecified fatal error.	

Electrostatic Controller Errors

Code	ES Code	Type	Name	Description	Solution
H111 or H112	H11	Alarm	ES Low Current	The controller does not detect a current from the applicator, or detects a current that is too low.	<ul style="list-style-type: none"> • Verify gun power cable connection and test continuity on the power cable. • Replace gun power cable or gun power supply if needed.
H121 or H122	H12	Alarm	Spraying current offset high	The controller has detected a high off-state current.	<ul style="list-style-type: none"> • Verify gun power cable connection and test continuity on the power cable. • Replace gun power cable or gun power supply if needed. • Verify all connections inside the controller. • Replace the main board if needed.
H131 or H132	H13	Alarm	ES DC Overvoltage	Gun voltage is too high.	<ul style="list-style-type: none"> • Verify gun power cable connection and test continuity on the power cable. • Replace gun power cable or gun power supply if needed.

Code	ES Code	Type	Name	Description	Solution
H141 or H142	H14	Alarm	Spraying current ground fault	The controller has detected a short between chassis and ground.	<ul style="list-style-type: none"> • Verify the gun power cable connection and test continuity on the power cable. • Replace the gun power cable or gun power supply if needed. • Verify all connections inside the controller. • Replace the main board if needed.
H911 or H912	H91	Advisory	Cascade Communication Error	Communication failure with cascade.	<ul style="list-style-type: none"> • Verify gun power cable connection and test continuity on the power cable. • Replace gun power cable or gun power supply if needed. •

Electrostatic Controller Arc Detection Errors

Code	ES Code	Type	Name	Description	Solution
H151 or H152	H15	Alarm	ES Arc Static Limit	The static arc detection threshold is exceeded. A grounded object came too close to the applicator.	<ul style="list-style-type: none"> • Verify closest distance to parts. • Verify paint conductivity. • Verify spraying parameters associated with static arc detection, see Run Screen 2 (Arc Limits) in ES Controller Manual.
H161 or H162	H16	Alarm	ES Arc Dynamic Limit	The dynamic arc detection threshold is exceeded. A grounded object approached the applicator at too high of a speed.	<ul style="list-style-type: none"> • Verify fastest approach to parts. • Verify paint conductivity. • Verify spraying parameters associated with dynamic arc detection, see Run Screen 2 (Arc Limits) in ES Controller Manual.
H171 or H172	H17	Alarm	ES Arc Both Limit	A grounded object came too close to the applicator at too high of a speed.	<ul style="list-style-type: none"> • Verify closest distances to parts. • Verify fastest approach to parts.
H181 or H182	H18	Alarm	ES Arc Unspecified	Arc detection has been triggered due to an unspecified reason.	<ul style="list-style-type: none"> • Verify paint conductivity. • Verify spraying parameters associated with arc detection, see Run Screen 2 (Arc Limits) in ES Controller Manual
H191 or H192	H19	Alarm	Arc Detection Drive Voltage	The power supply drive voltage rose too quickly.	

Electrostatic Controller CAN Bus Errors

Code	ES Code	Type	Name	Description	Solution
H401 or H402	H40	Advisory	ES CAN Error	The CAN controller went to bus off state due to permanent bus error.	<ul style="list-style-type: none"> Verify that parameter P02 on Setup Screen 2 is set to CAN mode and parameter P06 on Setup Screen 6 is correct. See Electrostatic Controller manual. Verify CAN cable connections. Verify that CAN devices are connected and functioning. Replace CAN board, if necessary.
H411 or H402	H41	Advisory		The CAN controller went to error passive state due to repeated bus errors.	
H421 or H422	H42	Advisory		Can messages are arriving too quickly.	
H431 or H432	H43	Advisory		Can messages arrive faster than they can be transferred to the receive queue.	
H441 or H442	H44	Advisory	ES CAN Heartbeat	The CAN remote enable heartbeat has stopped being transmitted.	

Interlock Errors

Code	Type	Name	Description	Solution
EBD1 or EBD2	Alarm	Interlock	Interlock input on air control 1 or 2 is active.	This normally open contact works like a soft emergency stop button. If the ProBell Air Controller or Speed Controller reads the input as CLOSED, it interrupts system operation and turns off. If the input is read as OPEN, the system operates normally.
EBP1 or EBP2	Alarm	Interlock	Interlock on speed control 1 or 2 is active.	
V801 or V802	Alarm	ES Interlock System	System power interlock is not satisfied.	See Table 1 in the ProBell Electrostatics manual for interlock requirements.
V811 or V812	Alarm	ES Interlock 24 VDC	24 VDC interlock is not satisfied.	
V821 or V822	Advisory	ES Interlock Safe	Safe position interlock is not satisfied.	

Speed Controller Errors

Code	Type	Name	Description	Solution
K1D1 or K1D2	Alarm	Speed Low Alarm	Actual turbine speed is lower than the alarm limit for longer than the alarm time (as set on Gun Screen 4).	<ul style="list-style-type: none"> Verify inlet air pressure and flow is sufficient. (Pressure greater than 70 psi) Check turbine air hose on Speed Controller is not pinched.
K2D1 or K2D2	Deviation	Speed Low Deviation	Actual turbine speed is lower than the deviation limit for longer than the deviation time (as set on Gun Screen 4).	

Code	Type	Name	Description	Solution
K3D1 or K3D2	Deviation	Speed High Deviation	Actual turbine speed is higher than the deviation limit for longer than the deviation time (as set on Gun Screen 4).	<ul style="list-style-type: none"> High fluid flow while turning paint trigger off. Verify that the voltage to pressure regulator in the Speed Controller is working properly. Verify brake solenoid is operating properly.
K4D1 or K4D2	Alarm	Speed High Alarm	Actual turbine speed is higher than the alarm limit for longer than the alarm time (as set on Gun Screen 4) or speed has exceeded 65 kRPM.	
K5D1 or K5D2	Alarm	Speed Controller Calibration	When calibrating turbine voltage to pressure feedback voltage, the control module detects a fault in the voltage.	<ul style="list-style-type: none"> Relieve the inlet air pressure on speed control enclosure. Retry Calibration. Verify cable connection between voltage to pressure regulator and connector 6 on speed control on FCM. Retry calibration. Replace cable 17K902. Replace voltage to pressure regulator.
K6D1 or K6D2	Alarm	Turbine V2P Feedback Error	System cannot detect feedback from turbine V2P.	
K7P1 or K7P2	Alarm	Speed Control Pressure Unknown	Manual air controls only. The system cannot determine the pressure switch state.	Verify the wiring on the pressure switch.
K8D1 or K8D2	Alarm	Speed Control Feedback	Turbine speed feedback was not detected	<ul style="list-style-type: none"> Verify Fiber Optic connection on speed control box. Verify Fiber Optic connection on applicator. Confirm ends of the fiber optic cable are in good shape.

Electronic Shaping Air Errors

NOTE: Air 1 is Inner Shaping Air for ProBell applicators, atomizing air for all other guns.

Air 2 is Outer Shaping Air for ProBell applicators, fan air for all other guns.

Code	Type	Name	Description	Solution
P111 or P112	Alarm	Pressure Low, Air 1 (Inner)	Actual air pressure 1 is lower than the alarm limit for longer than the alarm time (as set on Gun Screen 2).	Verify shaping air 1 (Inner) hose is not cut or split.
P121 or P122	Alarm	Pressure Low, Air 2 (Outer)	Actual air pressure 2 is lower than the alarm limit for longer than the alarm time (as set on Gun Screen 2).	Verify shaping air 2 (Outer) hose is not cut or split.
P211 or P212	Deviation	Pressure Low, Air 1 (Inner)	Actual air pressure 1 is lower than the deviation limit for longer than the deviation time (as set on Gun Screen 2).	Verify shaping air 1 (Inner) hose is not cut or split.

Code	Type	Name	Description	Solution
P221 or P222	Deviation	Pressure Low, Air 2 (Outer)	Actual air pressure 2 is lower than the deviation limit for longer than the deviation time (as set on Gun Screen 2).	Verify shaping air 2 (Outer) hose is not cut or split.
P311 or P312	Deviation	Pressure High, Air 1 (Inner)	Actual air pressure 1 is higher than the deviation limit for longer than the deviation time (as set on Gun Screen 2).	<ul style="list-style-type: none"> • Calibrate the voltage to pressure regulator (V2P). See Calibration Screen, page 19. • Verify the air tubing is connected properly. • Verify cable connections. • Replace the voltage to pressure regulator (V2P).
P321 or P322	Deviation	Pressure High, Air 2 (Outer)	Actual air pressure 2 is higher than the deviation limit for longer than the deviation time (as set on Gun Screen 2).	
P411 or P412	Alarm	Pressure High, Air 1 (Inner)	Actual air pressure 1 is higher than the alarm limit for longer than the alarm time (as set on Gun Screen 2).	
P421 or P422	Alarm	Pressure High, Air 2 (Outer)	Actual air pressure 2 is higher than the alarm limit for longer than the alarm time (as set on Gun Screen 2).	
P511 or P512	Alarm	Calibration Error, Air 1 (Inner)	The returned value of the calibration on Air 1 is out of range.	
P521 or P522	Alarm	Calibration Error, Air 2 (Outer)	The returned value of the calibration on Air 2 is out of range.	<ul style="list-style-type: none"> • Relieve inlet air pressure on air control enclosure. Retry Calibration • Verify cable connection between voltage to pressure regulator and connector 6 on air control on module. Retry calibration. • Replace cable 17K902. • Replace voltage to pressure regulator.
P611 or P612	Alarm	Air 1 sensor disconnected (Inner)	The returned value of the pressure sensor for Air 1 (Inner) is zero.	
P621 or P622	Alarm	Air 2 sensor disconnected (Outer)	The returned value of the pressure sensor for Air 2 (Outer) is zero.	

Solenoid Errors

Code	Type	Name	Description	Solution
WJ11 or WJ12	Alarm	Turbine Air Solenoid Removed	System does not detect the Turbine Air solenoid on the Speed Controller.	Verify wiring on terminals 1 and 2 in the Speed Controller.
WJ21 or WJ22	Alarm	Brake Solenoid Removed	System does not detect the Brake Air solenoid.	Verify wiring on terminals 3 and 4 in the Speed Controller.
WJ31 or WJ32	Alarm	Paint Trigger Removed	System does not detect the Gun Trigger solenoid.	<p>Electronic: Verify wiring on terminals 1 and 3 in the Air Controller.</p> <p>Manual: Verify wiring on terminals 1 and 2 in the Air Controller.</p>

Code	Type	Name	Description	Solution
WJ41 or WJ42	Alarm	Dump Solenoid Removed	System does not detect the Dump Trigger solenoid.	Electronic: Verify wiring on terminals 4 and 5 in the Air Controller. Manual: Verify wiring on terminal 5 and terminal 6 in the Air Controller.
WJ51 or WJ52	Alarm	Cup Wash Solenoid Removed	System does not detect the Cup Wash solenoid.	Electronic: Verify wiring on terminals 6 and 7 in the Air Controller. Manual: Verify wiring on terminals 7 and 8 in the Air Controller.
WJ61 or WJ62	Alarm	Air 1 (Inner) Solenoid Removed	System does not detect the Air 1 solenoid.	Electronic: Verify wiring on terminals 13 and 14 in the Air Controller. Manual: Verify wiring on terminals 17 and 18 in the Air Controller.
WJ71 or WJ72	Alarm	Air 2 (Outer) Solenoid Removed	System does not detect the Air 2 solenoid.	Electronic: Verify wiring on terminals 20 and 21 in the Air Controller. Manual: Verify wiring on terminals 20 and 21 in the Air Controller.
WJ81 or WJ82	Alarm	Turbine Air Solenoid Removed	System does not detect the Turbine Air solenoid on the manual Air Controller.	Verify wiring on terminals 3 and 4 in the Manual Air Controller.
WJ91 or WJ92	Alarm	Auxiliary 1 Solenoid Removed	System does not detect the Auxiliary 1 solenoid.	Electronic: Verify wiring on terminals 27 and 28 in the Air Controller. Manual: Verify wiring on terminals 23 and 24 in the Air Controller.
WJA1 or WJA2	Alarm	Auxiliary 2 Solenoid Removed	System does not detect the Auxiliary 2 solenoid.	Electronic: Verify wiring on terminals 29 and 30. Manual: Verify wiring on terminals 25 and 26.
WJB1 or WJB2	Alarm	Auxiliary 3 Solenoid Removed	System does not detect the Auxiliary 3 solenoid.	Electronic: Verify wiring on terminals 31 and 32 Manual: Verify wiring on terminals 27 and 28 in the Air Controller.

Bearing Air Pressure Errors

Code	Type	Name	Description	Solution
K9D1 or K9D2	Alarm	Bearing Air Pressure Switch Status Unknown	Pressure switch state cannot be determined.	Verify that inlet air pressure is greater than 70 psi, air flow is sufficient, and wiring on pressure switch is connected.
K9P1 or K9P2	Alarm	Bearing Air Removed	Speed Controller no longer detects bearing air.	
P7P1 or P7P2	Alarm	Air Control Pressure Switch Unknown	Pressure switch state cannot be determined on manual air controller.	Verify the wiring on the pressure switch.
P9P1 or P9P2	Alarm	Air Control Pressure Low	Air Controller no longer detects bearing air. (Manual air controller only.)	Verify that inlet air pressure and flow are sufficient.

System Logic Controller Errors

Code	Type	Name	Description	Solution
EVUX	Advisory	USB Disabled	User installed a USB device in the system logic controller USB port when USB downloads were disabled.	Go to Screen X and enable USB.
WNOX	Alarm	Key Token ErrorAdm	User installed incompatible key token.	Remove key token Repeat process with compatible keytoken.
WSUX	Advisory	USB Configuration Error	USB configuration file does not match expected; checked on startup.	Reinstall software.
WXUU	Advisory	USB Upload Error	User installed an incompatible USB device in the System Logic Controller USB port.	Repeat process with compatible USB device.
WXUD	Advisory	USB Download Error		
WX00	Alarm	Software Error	An unexpected software error has occurred.	Call Graco technical support.

Records and Advisories

Code	Type	Name	Description
System			
EB00	Record	Stop Button Pressed	Record of stop button press.
EC00	Record	Setup Value(s) changed	Record of changing setup variables
EL00	Record	System Power ON	Record of power cycle (ON).
ELD1 or ELD2	Record	Gun ON	Record of applicator power activation (ON).
EM00	Record	System Power OFF	Record of power cycle (OFF).
EMD1 or EMD2	Record	Gun OFF	Record of applicator power deactivation (OFF).
END1 or END2	Record	Calibration Gun	Record of Gun 1 or Gun 2 being calibrated.
ES00	Advisory	Factory Defaults	Record of system settings being reset to factory defaults.
Applicator			
EUD1 or EUD2	Advisory	Idle Timer Expired	Record of the system returning to Idle mode after expiration of the Idle Timer on Gun 1 or Gun 2.
USB			
EAUX	Advisory	USB Start (Drive Inserted)	USB drive is inserted, download is in progress.
EBUX	Record	USB Stop (Drive Removed)	USB drive was removed while downloading or uploading.
EQU0	Advisory	USB Idle	USB download completed, drive may be removed.
EQU1	Record	System Settings Downloaded	Settings were downloaded to USB drive.
EQU2	Record	System Settings Uploaded	Settings were uploaded to USB drive.
EQU3	Record	Custom Language Downloaded	Custom language was downloaded to USB drive.

Error Codes

Code	Type	Name	Description
EQU4	Record	Custom Language Uploaded	Custom language was uploaded to USB drive.
EQU5	Record	Logs Downloaded	Data logs were downloaded to USB drive.
EVUX	Advisory	USB Disabled	USB drive is inserted, download is disabled.

Maintenance Advisories

Code	Type	Name	Description	Solution
MD11	Advisory	Maintenance Valve Paint Gun 1	Gun 1 paint valve is due for maintenance	<ul style="list-style-type: none"> Perform required maintenance Clear advisory and clear valve count on corresponding Maintenance Screen
MD12	Advisory	Maintenance Valve Paint Gun 2	Gun 2 paint valve is due for maintenance	
MD21	Advisory	Maintenance Valve Dump Gun 1	Gun 1 dump valve is due for maintenance	
MD22	Advisory	Maintenance Valve Dump Gun 2	Gun 2 dump valve is due for maintenance	
MD31	Advisory	Maintenance Valve Cup Wash Gun 1	Gun 1 cup wash valve is due for maintenance	
MD32	Advisory	Maintenance Valve Cup Wash Gun 2	Gun 2 cup wash valve is due for maintenance	
MD41	Advisory	Maintenance Valve Air 1 Gun 1	Gun 1 air valve 1 is due for maintenance	
MD42	Advisory	Maintenance Valve Air 1 Gun 2	Gun 2 air valve 1 is due for maintenance	<ul style="list-style-type: none"> Perform required maintenance Clear advisory and clear valve count on corresponding Maintenance Screen
MD51	Advisory	Maintenance Valve Air 2 Gun 1	Gun 1 air valve 2 is due for maintenance	
MD52	Advisory	Maintenance Valve Air 2 Gun 2	Gun 2 air valve 2 is due for maintenance	
MD61	Advisory	Maintenance Valve Auxiliary 1 Gun 1	Gun 1 auxiliary 1 valve is due for maintenance	
MD62	Advisory	Maintenance Valve Auxiliary 1 Gun 2	Gun 2 auxiliary 1 valve is due for maintenance	
MD71	Advisory	Maintenance Valve Auxiliary 2 Gun 1	Gun 1 auxiliary 2 valve is due for maintenance	
MD72	Advisory	Maintenance Valve Auxiliary 2 Gun 2	Gun 2 auxiliary 2 valve is due for maintenance	
MD81	Advisory	Maintenance Valve Auxiliary 3 Gun 1	Gun 1 auxiliary 3 valve is due for maintenance	
MD82	Advisory	Maintenance Valve Auxiliary 3 Gun 2	Gun 2 auxiliary 3 valve is due for maintenance	
MD91	Advisory	Maintenance Valve Turbine Gun 1	Gun 1 turbine valve is due for maintenance	
MD92	Advisory	Maintenance Valve Turbine Gun 2	Gun 2 turbine valve is due for maintenance	
MDA1	Advisory	Maintenance Valve Brake Gun 1	Gun 1 brake valve is due for maintenance	
MDA2	Advisory	Maintenance Valve Brake Gun 2	Gun 2 brake valve is due for maintenance	
MMUX	Advisory	Maintenance USB Logs Full	USB maintenance logs are full.	

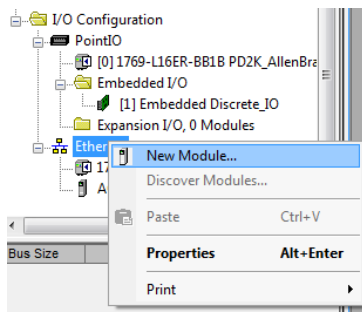
Appendix A: Integration with Allen Bradley PLC

This appendix outlines how to integrate a ProBell system with an Allen Bradley Studio 5000 Programmable Logic Controller (PLC).

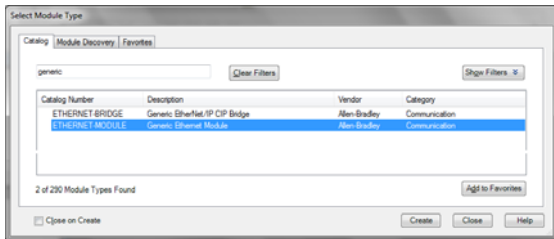
To integrate, the ProBell system must have the Ethernet/IP protocol for PLC CGM (Graco Part number CGMEPO) installed prior to performing this procedure.

In the PLC software, perform the following steps:

1. Add the new Ethernet module.

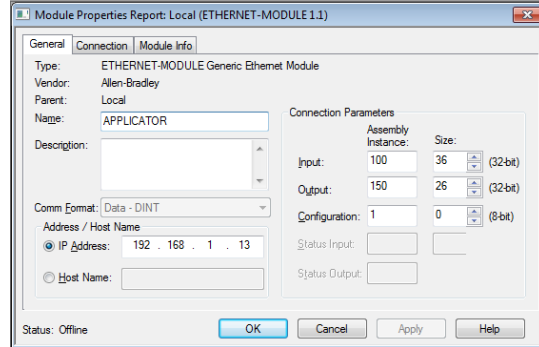


2. The Select Module Type screen opens.



- a. In the search field, type “generic”
- b. Select ETHERNET-MODULE Generic Ethernet Module. NOTE: Do not select the Close on Create checkbox.
- c. Click the Create button.

3. The New Module screen opens. Configure the module by defining the fields as follows:

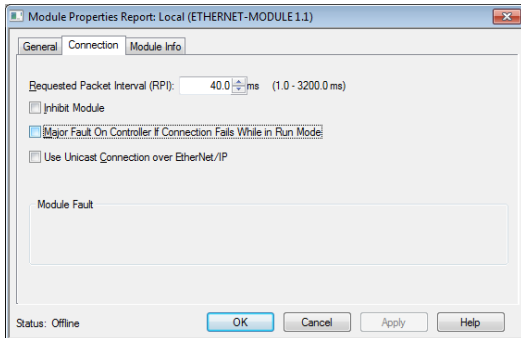


NOTE: The Open Module Properties checkbox must remain selected so that the configuration can be completed after completing this screen.

- a. Name (required): Enter a name for the module (select a name that has meaning for you when viewed on the Ethernet directory shown by the figure in step 1).
- b. Description (optional): Use any description desired.
- c. IP Address (required): Enter the static IP address of the Graco EtherNet/IP CGM installed in the ProMix PD2K.
- d. Input: Assembly Instance (required): Enter “100”, which is a device-specific parameter for the Graco EtherNet/IP CGM.
- e. Input: Size (required): Enter “36”, which is the number of 32-bit registers that are allocated for input variables in the Graco EtherNet/IP CGM.
- f. Output: Assembly Instance (required): Enter “150”, which is the device-specific parameter for the Graco EtherNet/IP CGM.
- g. Output: Size (required): Enter “26”, which is the number of 32-bit registers that are allocated for output variables in the Graco EtherNet/IP CGM.

- h. Configuration: Assembly Instance (required): Enter “1”.
- i. Configuration: Size (required): Enter “0”.
- j. Click the OK button. The Module Properties Report window is displayed.

4. On the Connection tab:



NOTE: An asterisk appears after the tab heading if unsaved changes are present. Click the Apply button to save changes without exiting this screen.

- a. Enter a Requested Packet Interval (RPI) value.

NOTE: Graco recommends a value of 30 ms or greater.
- b. If desired, select the available check boxes.

- c. Click the OK button to save all changes and exit this screen.

Connection Request Error — Invalid Input Application Path	This error, which also triggers an I/O Fault on the PLC, is caused by an invalid number being entered for the Input: Assembly Instance parameter. The correct value for this parameter is “100”.
Connection Request Error — Invalid Output Application Path	This error, which also triggers an I/O Fault on the PLC, is caused by an invalid number being entered for the Output: Assembly Instance parameter. The correct value for this parameter is “150”.
Connection Request Error — Invalid Input Size	This error, which also triggers an I/O Fault on the PLC, is caused by an invalid number being entered for the Input: Size parameter. The correct value for this parameter is “36”.
Connection Request Error — Invalid Output Size	This error, which also triggers an I/O Fault on the PLC, is caused by an invalid number being entered for the Output: Size parameter. The correct value for this parameter is “26”.
Module Configuration Rejected — Format Error	This error, which also triggers an I/O Fault on the PLC, is caused by an invalid number being entered for the Configuration: Size parameter. Because there are no configuration registers associated with the module, the correct value for this parameter is “0”.

Graco Standard Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS

The Parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés, à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

Graco Information

For the latest information about Graco products, visit www.graco.com.

TO PLACE AN ORDER, contact your Graco distributor or call to identify the nearest distributor.

Phone: 612-623-6921 **or Toll Free:** 1-800-328-0211 **Fax:** 612-378-3505

All written and visual data contained in this document reflects the latest product information available at the time of publication. Graco reserves the right to make changes at any time without notice.

Original instructions. This manual contains English. MM 3A3955

Graco Headquarters: Minneapolis

International Offices: Belgium, China, Japan, Korea

GRACO INC. AND SUBSIDIARIES • P.O. BOX 1441 • MINNEAPOLIS MN 55440-1441 • USA
Copyright 2016, Graco Inc. All Graco manufacturing locations are registered to ISO 9001.

www.graco.com

Revision D, April 2018