

# PRECISION GLUE SPRAYER

## Installation, Operation, and Maintenance Manual

System Model: RDS-AWAKEN Series

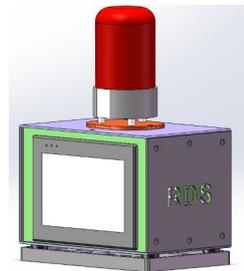
Controller Version: Xilinx FPGA High-Speed Architecture

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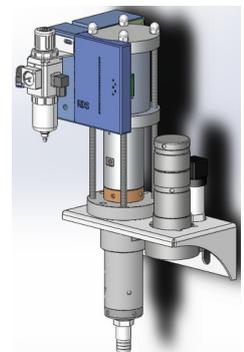
### Controller & System Highlights

- Core: High-Performance Xilinx FPGA Architecture
- Exclusive: Native Belt Friction Tester via Existing Encoder
- Processing: True Parallel Execution & Ultra-Low Latency
- Integration: RS-485 Modbus PLC Compatible



### Pump & Fluid Highlights

- Control: Dynamic Pressure-Speed Follower
- Safety: Automated Empty-Barrel Dry-Run Protection
- Reliability: Low Air Pressure Alarm & Auto-Stop to Prevent Defects
- Capacity: Handles Viscosities up to 4000mPas



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Please read this manual carefully before installing or operating the equipment to ensure safe and accurate production.

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# Precision Glue Sprayer User Manual

## 1. Equipment Description

### 1.1 Usage and Applications

This machine is manufactured by Advanced Algorithm Intelligent Electronic Pty Ltd. Designed for automated glue spraying on assembly lines, it caters extensively to the printing and packaging industry, furniture industry, automotive industry, and similar manufacturing sectors. The system is capable of driving cold glue and hot glue using thread, dot, or mixed modes. It also drives double-sided taping machines.

### 1.2 System Specifications & Parameters

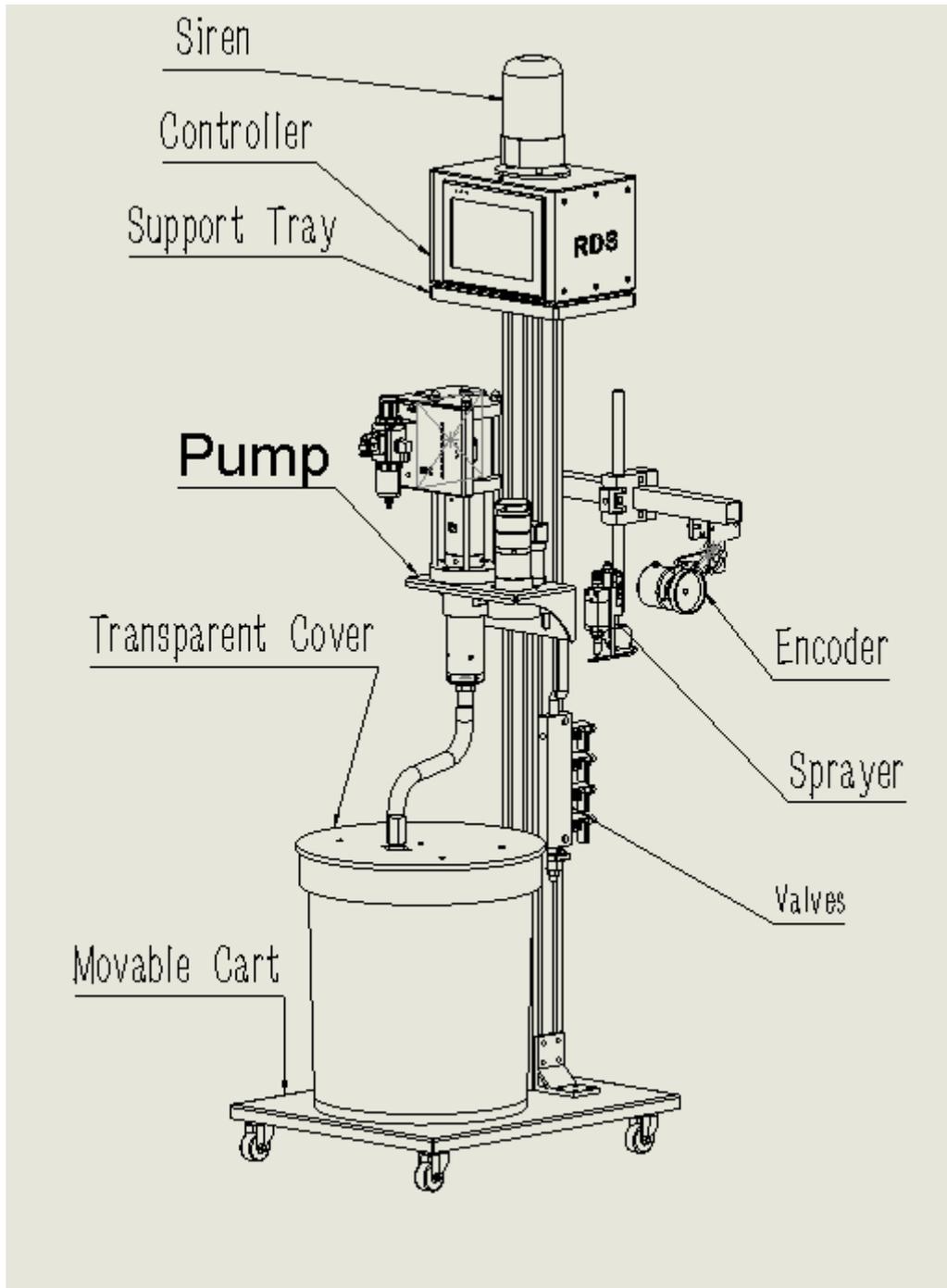
- **Controller:** Dot Max Speed: 180m/min | Thread Max Speed: 300m/min | Sections Programmable: 11.
- **Pump (RD-ZDB-2):** Compression Rate: 5:1 | Inlet Air Requirements: 2-8 bar | Max glue viscosity: 4000mPas.
- **Sprayer Gun (RD-QA-02):** Operating cycle: 0.02 ms | Piston lifespan: 5,000,000,000 cycles.

### 1.3 New Generation Upgrades

- **Advanced Control:** The main board is now powered by a high-performance Xilinx FPGA chip. This architecture delivers true parallel processing and ultra-low latency, ensuring pinpoint glue timing even at maximum production speeds.
- **Universal Mounting:** The redesigned encoder assembly features a highly adaptable clamping mechanism. It is engineered to securely mount onto a wide variety of machine frames and conveyors, completely eliminating the need for custom milling or drilling during installation.
- **Automated Safeguards:** The system now includes intelligent dry-run and low-pressure protection. If the system detects an empty glue barrel or a drop in inlet air pressure, the controller instantly halts the pump and triggers the siren. This prevents severe mechanical wear on the piston and eliminates production defects caused by missed glue cycles.
- **Integration:** Standard RS-485 communication ports allow seamless integration with central PLCs.

- **Quality Control:** Native integration with the Belt Friction Tester application to detect conveyor wear and compensate for belt slippage.

## 2. Knowing the Machine



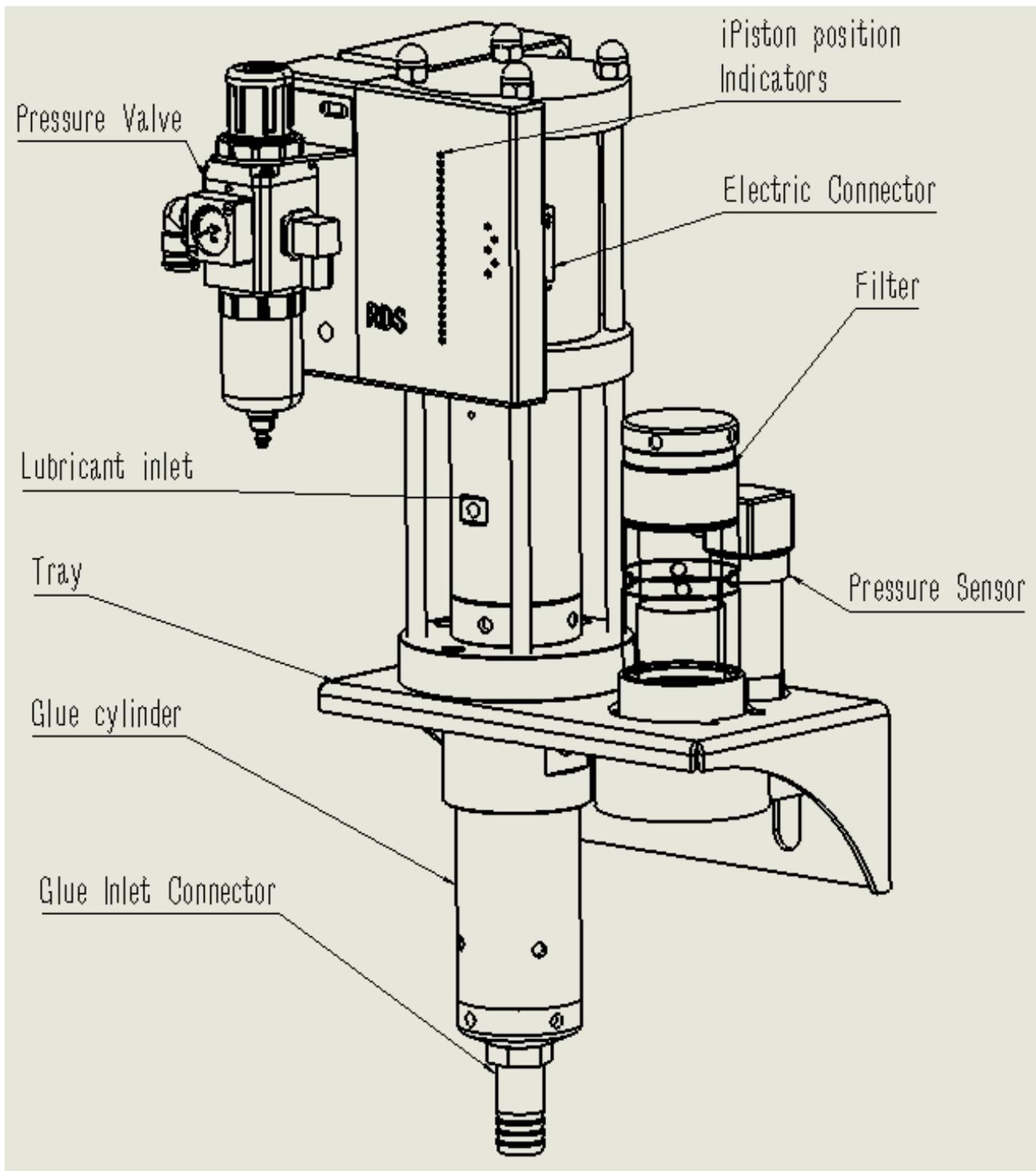
### 2.1 Main Components Overview

The Precision Glue Sprayer is built on a vertical, mobile chassis designed for easy integration into existing production lines.

- **Siren:** A tower indicator light with an audible alarm mounted atop the controller, providing real-time alerts for operational status and critical safety faults, such as low air pressure or an empty glue barrel.
- **Controller:** The central command unit housing the high-speed Xilinx FPGA main board and the main color touch screen interface, used to program, monitor, and adjust all machine operations.
- **Pump:** A 5:1 compression fluid displacement unit mounted above the main bucket. It drives the glue to the valves and features built-in sensors for dynamic pressure tracking and empty-barrel dry-run protection.
- **Movable Cart:** A wheeled base plate that provides mobility for the entire system across the factory floor.
- **Transparent Cover:** Seals the main glue bucket while allowing operators to easily monitor fluid levels at a glance.
- **Valves:** A multi-channel pneumatic valve manifold mounted on the lower central extrusion, controlling the distribution to the spray guns.
- **Encoder:** A tracking wheel mechanism mounted on an adjustable horizontal arm to measure the real-time speed of the conveyor belt or workpiece.
- **Sprayer:** The high-speed precision nozzle assembly, positioned alongside the encoder to apply the glue directly to the target.

## 2.2 Upgraded Circuit Boards

The redesigned main circuit board is built around a robust Xilinx FPGA architecture. Unlike traditional sequential microcontrollers, the Xilinx FPGA allows the system to process high-frequency encoder signals and execute multi-channel valve commands simultaneously without any processing bottlenecks.

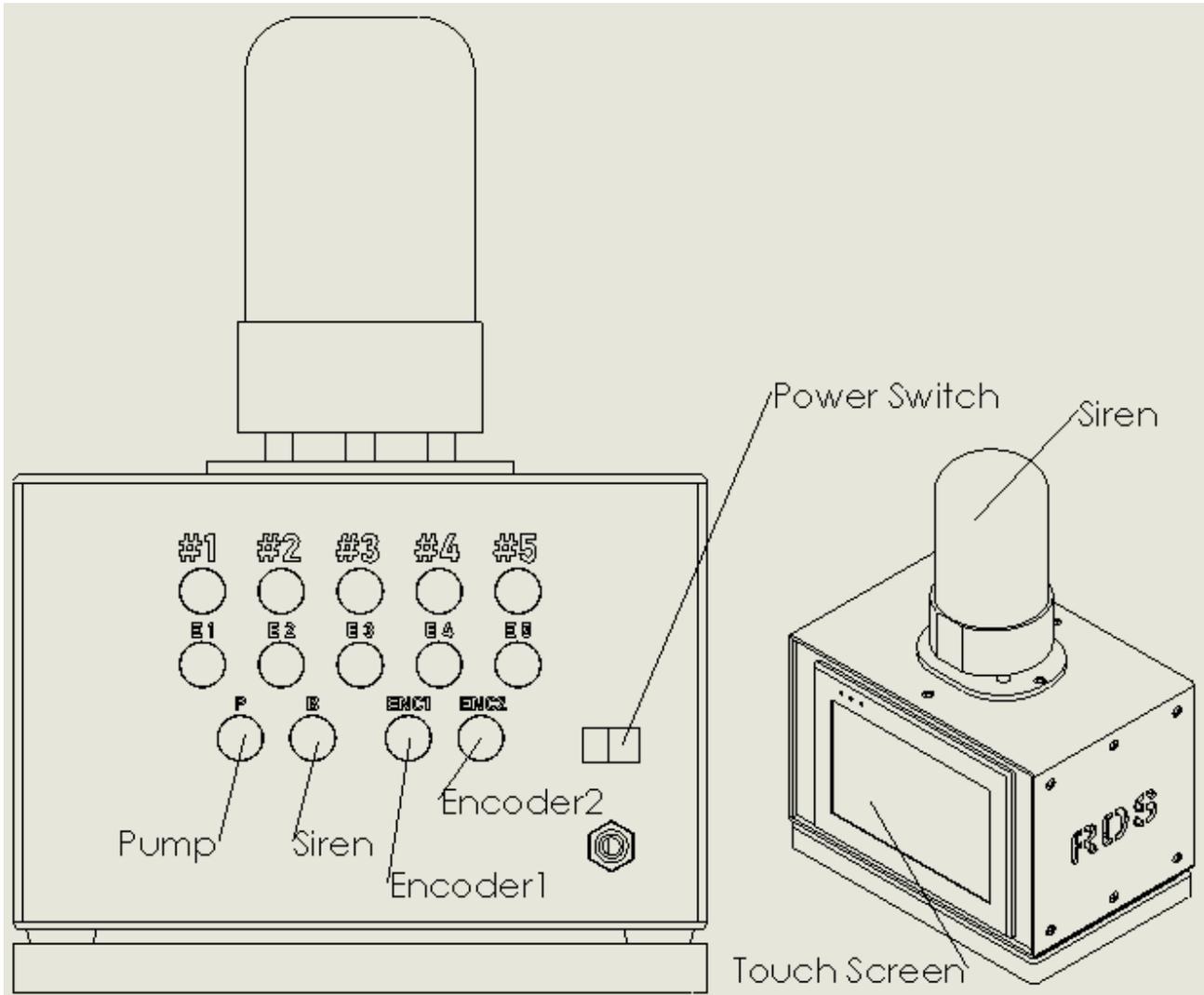


### 2.3 Pump Assembly Components

The central fluid displacement pump is a highly integrated unit:

- **Pressure Valve:** Regulates the incoming compressed air that drives the pump. Includes a gauge and moisture trap.
- **Piston Position Indicators:** A vertical array of indicator lights providing visual feedback on the real-time stroke position.
- **Lubricant Inlet:** A dedicated access port for adding maintenance oil to the internal cylinder mechanisms without disassembly.

- **Filter:** Traps impurities and prevents blockages before the glue reaches the high-speed spray nozzles.
- **Pressure Sensor:** Continuously monitors internal fluid pressure and feeds data back to the controller to execute the pressure-speed follower curve.



## 2.4 Controller Unit Interfaces

The controller unit houses the Xilinx FPGA main board:

- **Touch Screen:** The main color display interface used for all system programming, monitoring, and parameter adjustments.
- **Siren:** A tower indicator light to provide visual and audible alerts regarding operational status.
- **Rear Panel Ports:** Includes dedicated ports for Sprayer Guns (#1-#5), Detectors (E1-E5), Encoders (ENC1, ENC2), the Pump (P), and the Siren (B).

## 2.5 Universal Encoder Assembly

The encoder unit features a highly adaptable clamping mechanism designed to universally fit and secure onto different machine frames and conveyors.

- **Encoder Unit:** A differential, anti-interference 1000-line encoder ensures stable, high-resolution speed tracking even in electrically noisy industrial environments.
- **Tracking Wheel:** Features an anti-static polyurethane wheel to prevent static buildup while maintaining consistent traction against the belt.
- **Mounting Plates:** Utilizes a dual-plate system (Fasten Plate and Holding Plate) equipped with tightening and bonding threads to firmly clamp the assembly to the host machine.
- **Adaptability:** Features reserved threading holes specifically designed to accommodate different machine profiles and custom mounting setups.
- **Articulation & Adjustment:** Includes a ball bearing holder for smooth pivoting, a curved angle adjustment slot to set the precise wheel approach angle, and a position limiter to restrict over-travel and protect the sensor arm.

## 3. Installation & Setup

### 3.1 Physical Mounting & Custom Assembly Clamps

Utilize the provided clamps according to the installation video.

Ensure the gap between the nozzle and the product remains within 5-10mm.

### 3.2 Encoder & Belt Friction Tester Installation

- Loosen the tighten threads on the Fasten Plate and Holding Plate to open the clamp.
- Position the clamp over the target machine frame or rail, utilizing the reserved threads if a custom mounting profile is required. Securely tighten the bonding threads.
- Adjust the angle adjustment slot so the anti-static polyurethane wheel touches the belt closely, bending the belt gently to ensure zero slippage. Lock the angle in place.
- Verify the position limiter is set to prevent the encoder arm from dropping into the conveyor mechanics if the belt is removed.
- To ensure accurate spray placement, configure the Belt Friction Tester to analyze the conveyor condition.

### 3.3 Sprayer Nozzle Configuration

Use the glue adjusting knob to control the flow. Turn the knob clockwise to lower it, and anti-clockwise to lift it.

### 3.4 Pump & Air Source

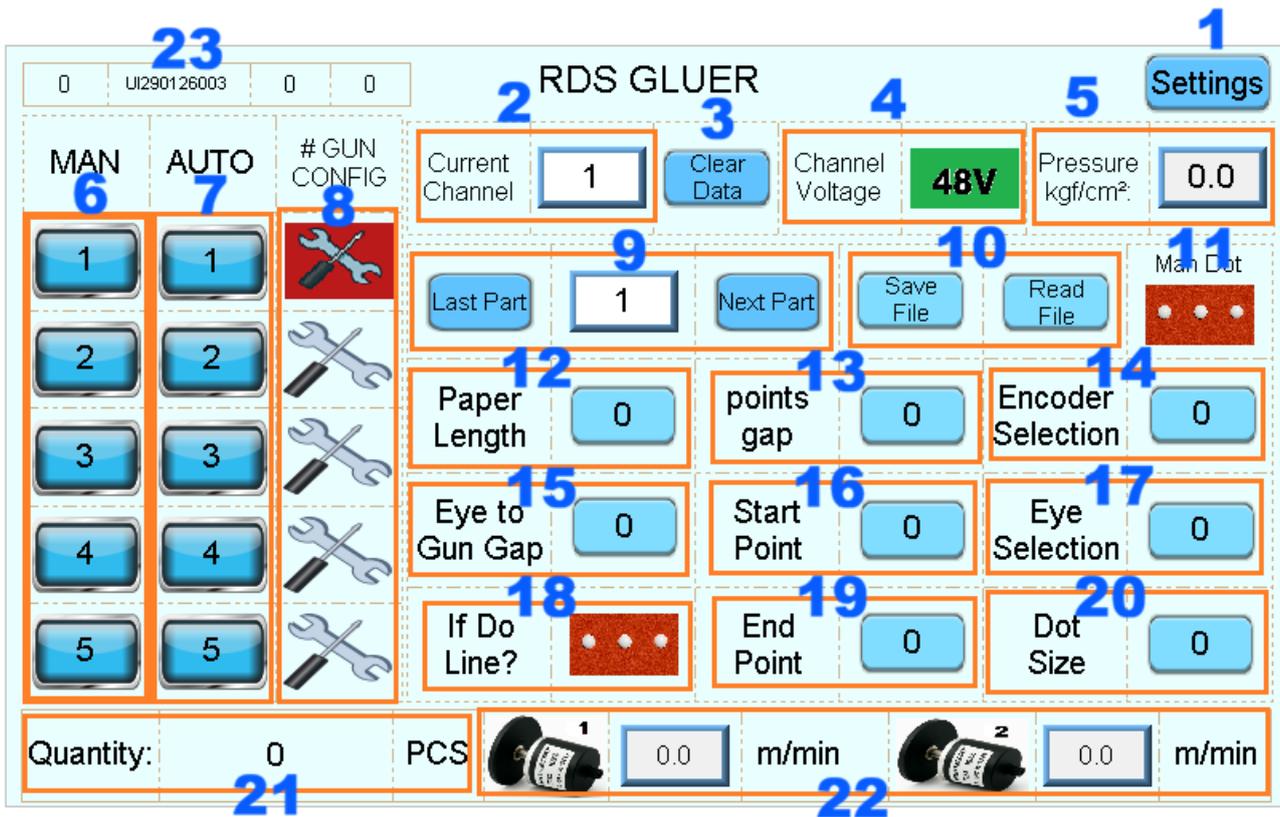
Connect the air source and adjust the inlet air pressure to 5 kg/cm<sup>2</sup> .

### 3.5 RS-485 Communication Protocol

The Precision Glue Sprayer features a dedicated RS-485 communication port on the main board, enabling reliable, long-distance serial communication with central PLCs.

- **Wiring:** Pin 1 (A/D+), Pin 2 (B/D-), Pin 3 (GND), Pin 4 (Shield).
- **Default Parameters:** 115200 bps, 8 Data Bits, 1 Stop Bit, No Parity, Modbus RTU, Slave Address 0x01.

## 4. Programming & User Interface



#### 4.1 Main Menu Interface Guide

- 1. Settings:** Enters the advanced system settings and pump control menus.
- 2. Current Channel:** Displays the currently selected gun channel being programmed.
- 3. Clear Data:** Erases all programmed parameter data for the currently selected channel.
- 4-5. Channel Voltage & Pressure:** Real-time displays of the operating voltage and fluid pressure.
- 6-7. MAN / AUTO (1-5):** Manual activation and Automatic run switches for guns 1 through 5.

**8. # GUN CONFIG (1-5):** Selects which gun's parameters you are currently viewing and editing.

**9. Part Navigation (Last/Next Part):** Navigate between different programmed gluing sections.

**10. Save / Read File:** Save the current gluing program parameters or load a previous one.

**11. Man Dot:** Toggles manual spray output between a continuous thread and individual dots.

**12-20. Parameter Matrix:** Inputs for Paper Length, Points Gap, Encoder Selection, Eye to Gun Gap, Start Point, Eye Selection, End Point, and Dot Size. The **If Do Line?** button toggles between dot and line spray modes.

**21-22. Status Bar:** Tracks the total Quantity (PCS) and displays real-time Encoder Speeds (m/min).

**23. Code version:** Firmware, UI and software version No. are shown.

#### **4.2 System Settings & Pump Control**

- **Accessing:** Press the **Settings** button (Index 1). Default access code: 123456.
- **Pressure Speed Follower:** The FPGA dynamically adjusts the pump pressure based on the real-time encoder speed to ensure consistent gluing.
- **Point Spraying Drive:** Tunes the physical size of the glue dots as line speed fluctuates by setting Maximum and Minimum amplitude parameters.
- **Starting Point Compensation:** Allows the operator to set a larger drive amplitude for the first initial dots in a sequence to overcome fluid inertia.

Belt Friction Test Return

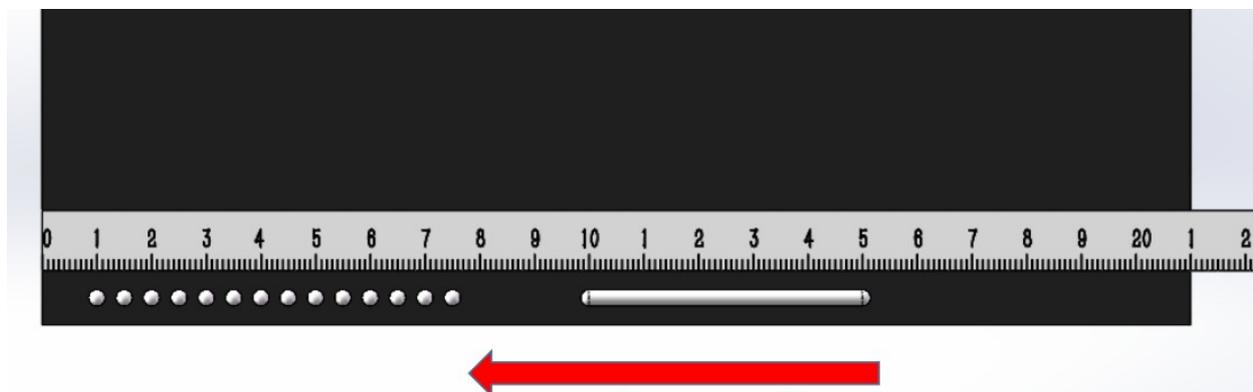
Unit: mm	Channel 1	Channel 2	Channel 3	Channel 4	Channel 5
<b>1</b> Detected MAX	0.0	0.0	0.0	0.0	0.0
<b>2</b> Detected MIN	0.0	0.0	0.0	0.0	0.0
<b>3</b> Pulse 1 Min	0.0	1st step: Turn the belt at STEADY speed		Step 4: Feed working pieces as many as possible at SAME speed	
<b>4</b> Pulse 1 Max	0.0				
<b>5</b> Pulse 2 Min	0.0	2nd step: Click button "Check Friction"		Step 5: Observe the channel indicator at SAME speed	
<b>6</b> Pulse 2 Max	0.0				
<b>7</b>  1 0.0  2 0.0		<b>8</b> Status Bit  Error Bit 		<b>9</b> 	

Note: This method is used to verify the consistency of digital measurement results for the workpiece. please measure up your work piece length precisely in mm:

### 4.3 Belt Friction Tester

The Belt Friction Tester confirms the consistency of the digital measurement results for the workpiece.

- 1) Set the conveyor belt to run at a steady, consistent production speed.
- 2) Click the "Check Friction" toggle switch (Index 9).
- 3) Continuously feed workpieces into the conveyor system.
- 4) Observe the **Detected MAX** (Index 1) and **Detected MIN** (Index 2) values. If the difference is very small (e.g., < 1%), friction is optimal. If there is a large discrepancy, the workpiece is slipping on the belt.



### 4.4 Example Programming Workflow

Based on above diagram, to program a 210mm product with a dot section (10mm to 75mm, 5mm gap) and a line section (100mm to 150mm):

- 1) **Select Gun:** Press the corresponding # **GUN CONFIG** wrench icon (Index 8).
- 2) **Clear Memory:** Click **Clear Data** (Index 3).
- 3) **Set Part 1:** Ensure part navigation is set to "1" (Index 9). Input **Paper Length** as 210 and **Eye to Gun Gap** as 45.
- 4) **Configure Part 1 (Dots):** Toggle **If Do Line?** (Index 20) to dot mode. Input **points gap** as 5, **Start Point** as 10, and **End Point** as 75.
- 5) **Set Part 2:** Click **Next Part** (Index 9) to change to part 2.
- 6) **Configure Part 2 (Line):** Toggle **If Do Line?** (Index 20) to line mode. Input **Start Point** as 100 and **End Point** as 150.
- 7) **Save:** Click **Save File** (Index 11) to save the program.

## 5. Troubleshooting (FAQ)

### 5.1 Sprayer gun cannot spray manually

- **Check:** Ensure the 4-channel valve is open and the sprayer gun connector is plugged in properly.
- **Check:** Verify auto-run is switched off.

### 5.2 Gun works on manual spray but not on auto mode

- **Check:** Ensure the encoder wheel is touching the belt.
- **Check:** Verify the Belt Friction Tester is not returning a severe slip fault.
- **Check:** Ensure the detector is working properly.

### 5.3 Pump is not pumping glue

- **Check:** Ensure the air source is connected and the inlet air pressure is not under the limit. Adjust to 5 kg/cm<sup>2</sup>.

### 5.4 Pump abruptly stops and siren is sounding

- **Check:** Verify the fluid level in the main glue bucket through the Transparent Cover. The empty barrel protection system will automatically stop the pump and trigger the alarm if the glue is depleted to prevent severe wear on the piston. Refill the glue and restart the system.

## 6. Maintenance

### 6.1 Daily Maintenance

- Keep the equipment clean and make sure no glue is visible on the equipment surface.
- Check the water level of the inlet air pressure control valve water container; release the water if the level is over 1/3 (by switching off the air. Visit [www.rds-robotics.com](http://www.rds-robotics.com) to obtain more info).
- Place nozzle protection sleeves back on the nozzle if not using the sprayer gun.

## **6.2 Periodic Maintenance**

- Add 20ml of lubricant (motor oil can be used) every 6 months.
  - Clean the pump filter and the filter under the container every 3 months.
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