

Purpose and Scope

This chapter defines the User Interface (UI) architecture of the Welding Quality Control System.

The UI architecture supports:

- Real-time monitoring of welding process parameters
- Objective evaluation of weld quality (PASS / FAIL)
- Traceable presentation of production data
- Controlled system operation in industrial and kiosk environments

Design Principles

The UI architecture is developed based on the following principles:

- Process Transparency – All critical process data is visible in real time
- Error Prevention (Poka-Yoke) – QR generation and printing are restricted to PASS results only
- Traceability – Every weld cycle is associated with model, timestamp, and measured values
- Access Control – Configuration and shutdown actions are password-protected
- Deterministic Layout – Fixed layouts prevent operator confusion and misinterpretation
- Continuous Operation – Designed for 24x7 industrial use without manual intervention

Overall UI Layout Architecture

The system UI is organized into five permanent functional zones:

1. Application Header
2. Real-Time Process Visualization Area
3. Weld Result Evaluation Area
4. Latest Cycles Summary Area
5. System Footer

All zones remain consistently positioned across screens to ensure operator familiarity and audit consistency.



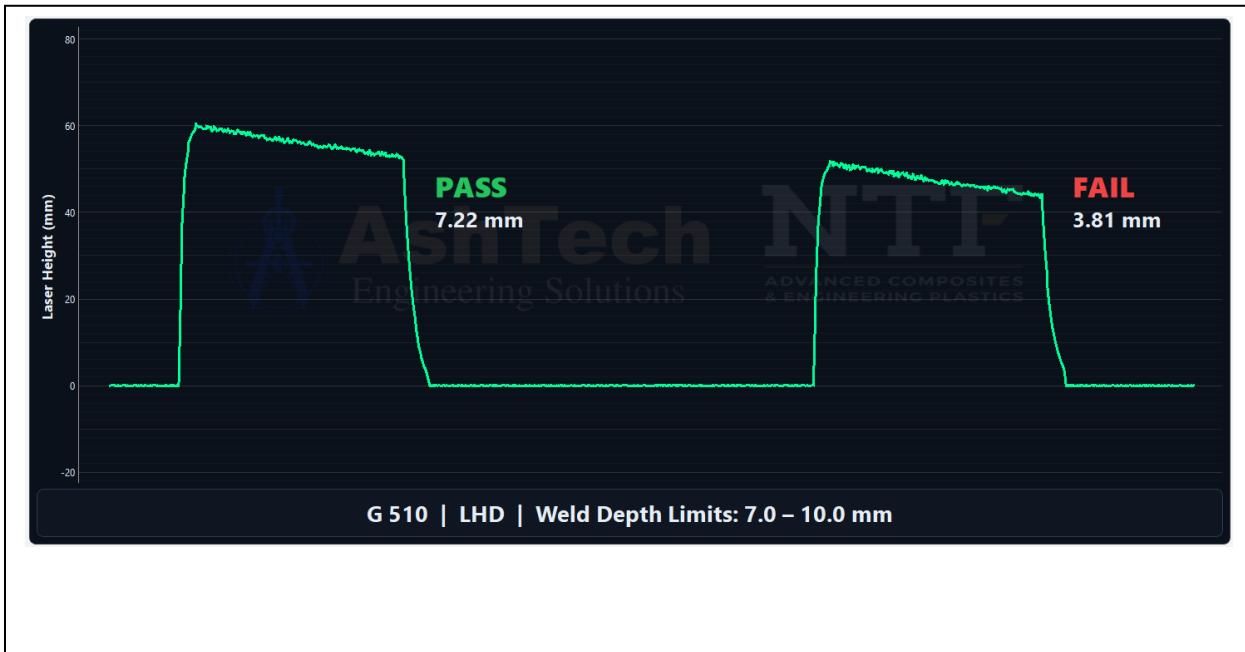
Application Header – System Identification & Control



The Application Header provides system identification, real-time clock reference, and controlled operator actions.

- Fixed-height industrial header (non-resizable)
- Company logo and system name
- Live date and time display (system clock)
- Icon-only action controls:
 - Print (QR label printing)
 - Settings (password-protected)
 - Shutdown (available only in kiosk mode)

Real-Time Process Visualization – Plot Panel



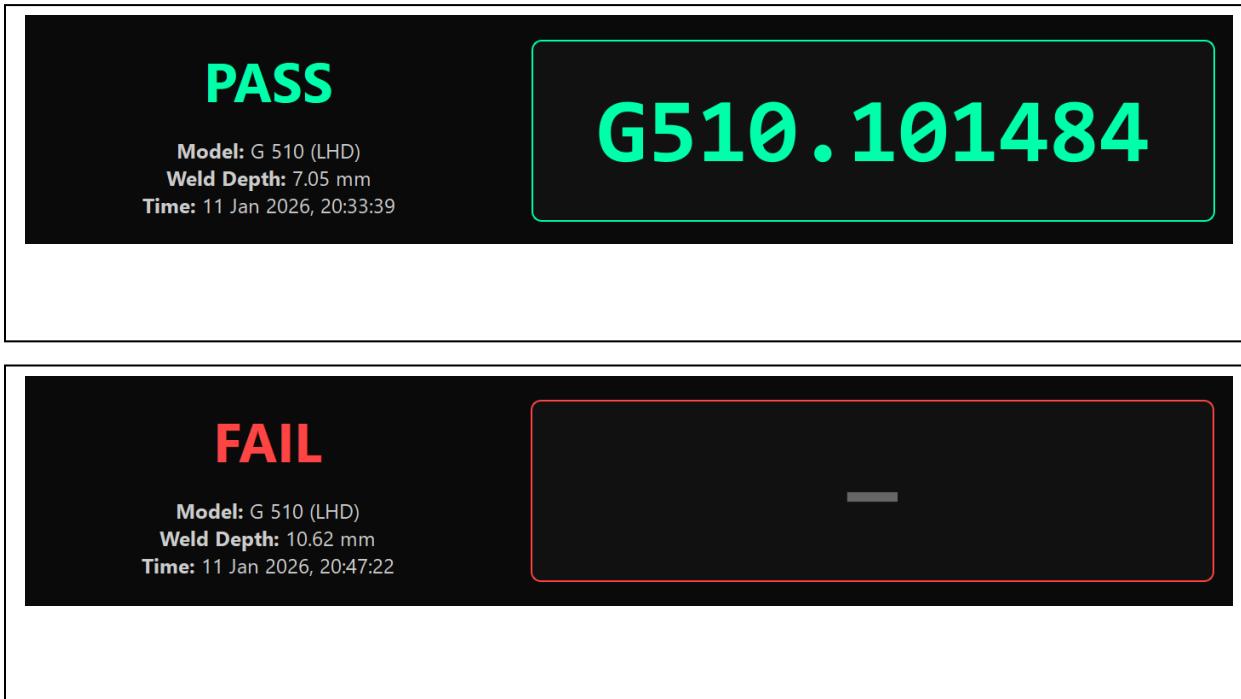
The Plot Panel provides continuous real-time visualization of laser welding signals.

Features:

- Live waveform of laser height versus time
- Fixed time window with automatic scaling
- Visual weld cycle annotations
- Clear PASS / FAIL indication with measured weld depth
- Display of model-specific acceptance limits

- Branding watermark for system identification

Weld Result Evaluation - Result Panel



The Result Panel presents the final quality decision for each weld cycle.

Features:

- Large PASS / FAIL display with color coding
- Weld depth measurement display
- Model name and model type
- Time-stamped cycle completion record
- QR code text display (PASS cycles only)
- Adaptive font sizing for variable-length QR data

Understanding Results Panel,

- **PASS**
 - Weld depth within configured limits
 - QR code generated automatically
 - Part allowed to move to next process
- **FAIL**
 - Weld depth outside limits
 - No QR code generated
 - Part must be segregate

Latest Cycles Summary - Cycles Panel

Latest Cycles	
G 510 (9.29 mm)	G510.101647
15 Jan 2026 19:00:57	
G 510 (7.88 mm)	G510.101646
15 Jan 2026 19:00:25	
G 510 (6.94 mm)	<i>No QR generated</i>
15 Jan 2026 18:59:45	
G 510 (10.72 mm)	<i>No QR generated</i>
15 Jan 2026 18:59:06	
G 510 (9.71 mm)	G510.101645
15 Jan 2026 18:58:24	
G 510 (7.80 mm)	G510.101644
15 Jan 2026 18:57:46	
G 510 (7.43 mm)	G510.101643
15 Jan 2026 18:57:06	
G 510 (10.72 mm)	<i>No QR generated</i>
15 Jan 2026 18:56:26	
G 510 (9.47 mm)	G510.101642
15 Jan 2026 18:55:43	

The Cycles Panel provides a compact historical view of recent production cycles.

Features:

- Displays latest completed cycles (newest first)
- PASS / FAIL clearly highlighted per cycle
- Model name, weld depth, and timestamp
- QR code displayed only for PASS cycles
- Fixed-height, non-scrollable layout for stability

System Footer - Status & Notification Panel

The Footer Panel provides continuous system health monitoring and notification feedback.

Features:

- Live status indication for:
 - PLC communication

- GSM modem
- USB printer
- SMS notification display with:
 - Recipient
 - Timestamp
 - Message content
 - Controlled scrolling for long messages
 - Automatic message timeout and clearance



Main Application Control & Workflow

System Behavior:

- Automatically loads the active welding model
- Continuously receives and displays laser data
- Updates all UI panels upon cycle completion
- Synchronizes plot, result, and cycle history
- Maintains layout consistency throughout operation

Kiosk Mode Controls:

- Full-screen operation
- Cursor auto-hide after inactivity
- No accidental window switching
- Controlled shutdown sequence with confirmation

Controlled Shutdown & Safety

- Shutdown Confirmation
- Password-protected access
- Explicit confirmation dialog
- Warning to ensure no active weld cycle
- Safe application termination

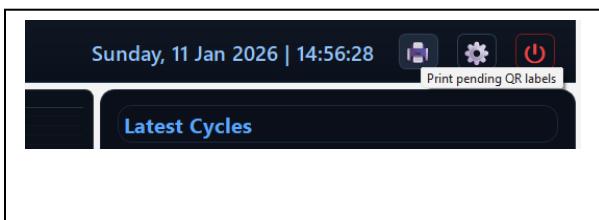
QR Label Printing (Operator)

Automatic Printing

1. PASS parts are queued automatically
2. Labels are printed without manual action

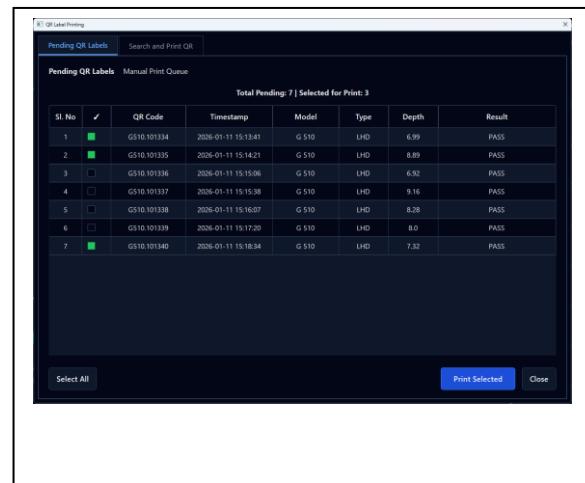
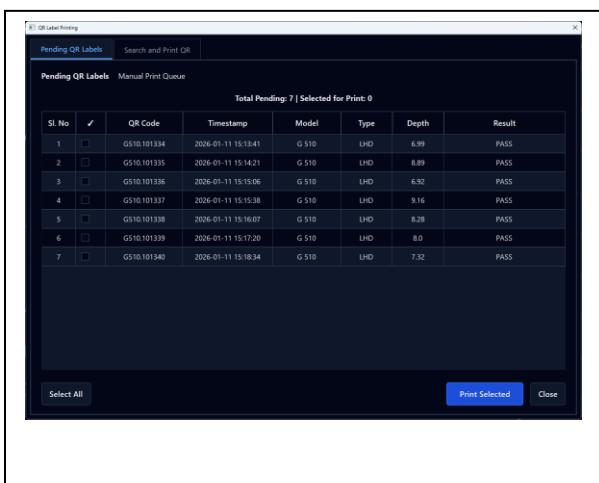


Manual Printing (Pending Queue)

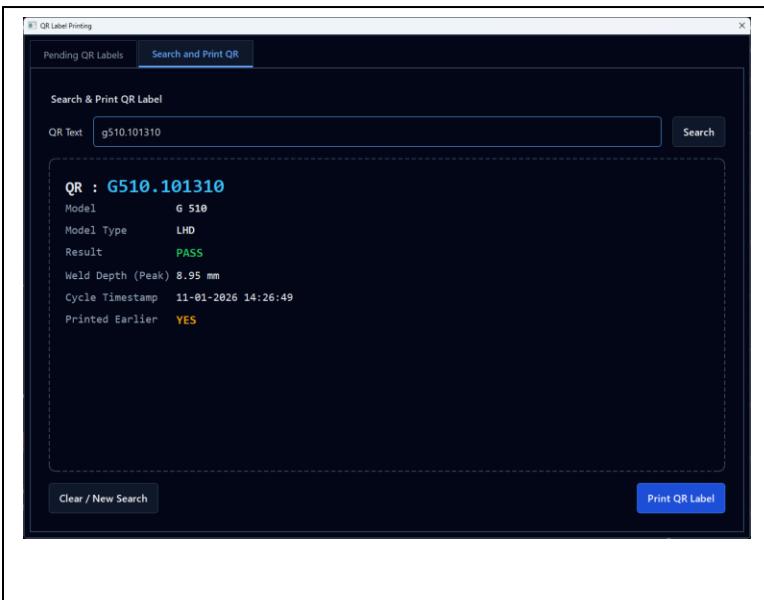
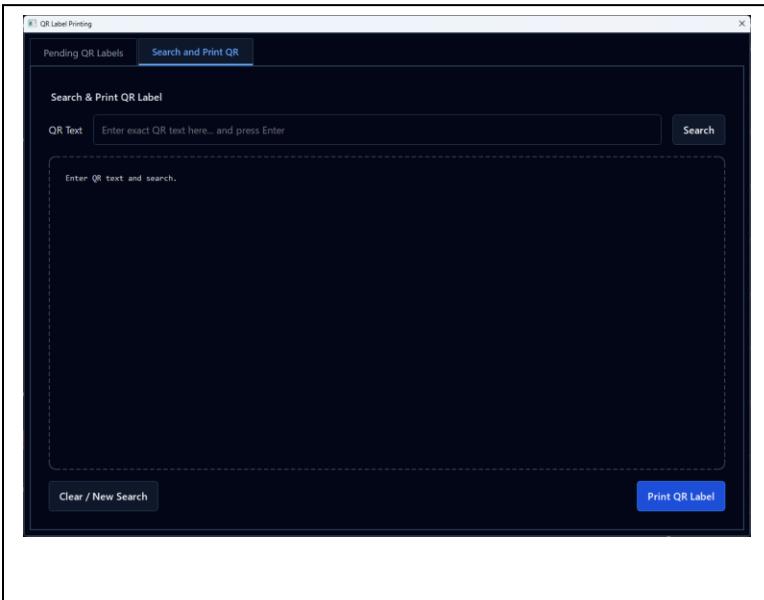


Open QR Printing

1. Select “Pending QR Labels”
2. Select required rows
3. Click Print Selected
4. Confirm print



Manual QR Search & Reprint



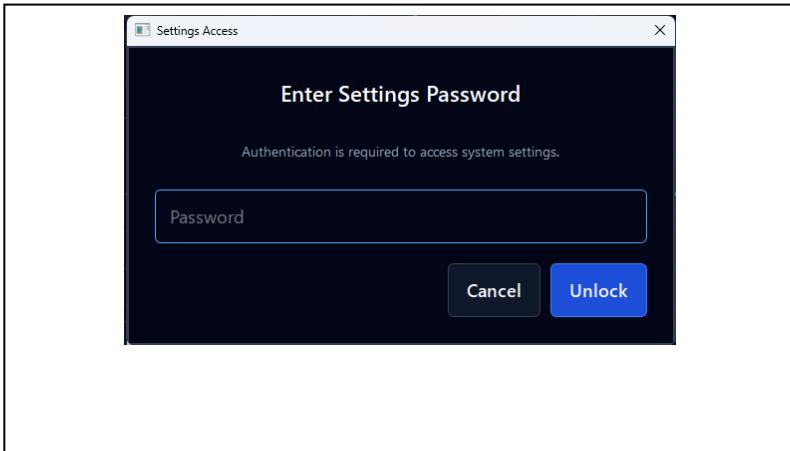
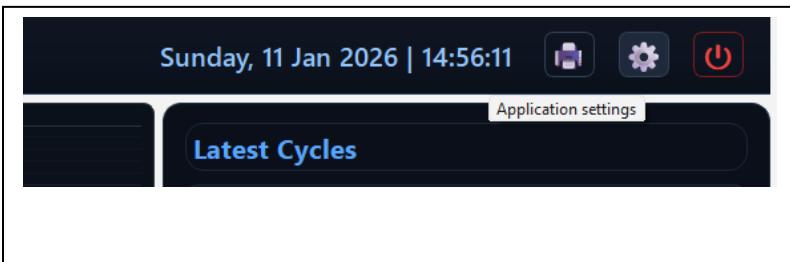
When to Use

1. QR label damaged
2. Printer failure during print
3. Audit or verification request

Steps

1. Open Search & Print QR
2. Enter exact QR text
3. Click Search
4. Verify preview details
5. Click Print QR Label

Operator Access & Security



Model Management

System Settings Configuration & Control Panel

Quality Control Models						
Model Name	Type	Tolerance (mm)	Status	Activate	Edit	Delete
G 507	RHD	6.00 – 10.00	INACTIVE	<button>Activate</button>	<button>Edit</button>	<button>Delete</button>
G 508	LHD	30.00 – 80.00	INACTIVE	<button>Activate</button>	<button>Edit</button>	<button>Delete</button>
G 509	RHD	40.00 – 68.00	INACTIVE	<button>Activate</button>	<button>Edit</button>	<button>Delete</button>
G 510	LHD	6.00 – 10.00	ACTIVE	<button>Activate</button>	<button>Edit</button>	<button>Delete</button>
G 511	RHD	45.00 – 60.00	INACTIVE	<button>Activate</button>	<button>Edit</button>	<button>Delete</button>

Buttons at the bottom: Apply, OK, Close.

Operator access is protected by a settings password.

Protected functions include:

1. Model management
2. QR configuration
3. Alert contact management
4. System shutdown

Each model represents a product with:

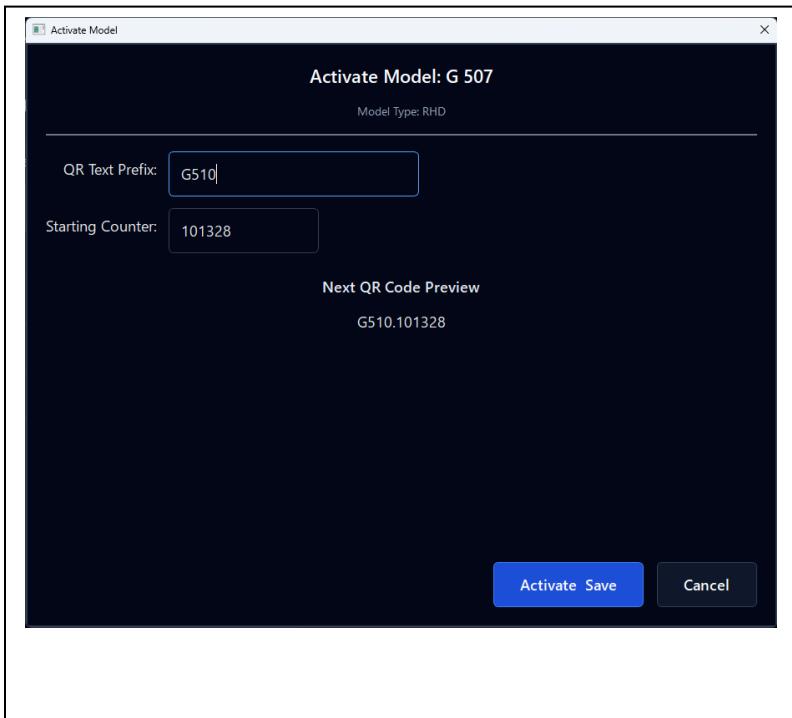
1. Welding tolerance limits
2. Model type (RHD / LHD)
3. QR behavior

Supervisor Actions

1. Add new models
2. Edit tolerance limits
3. Activate one model at a time
4. Delete inactive models only

- ✓ Only one model can be active
- ✓ Active model is clearly highlighted in green colour

Model Activation & QR Rules



Activate Model: G 507

Model Type: RHD

QR Text Prefix: G510

Starting Counter: 101328

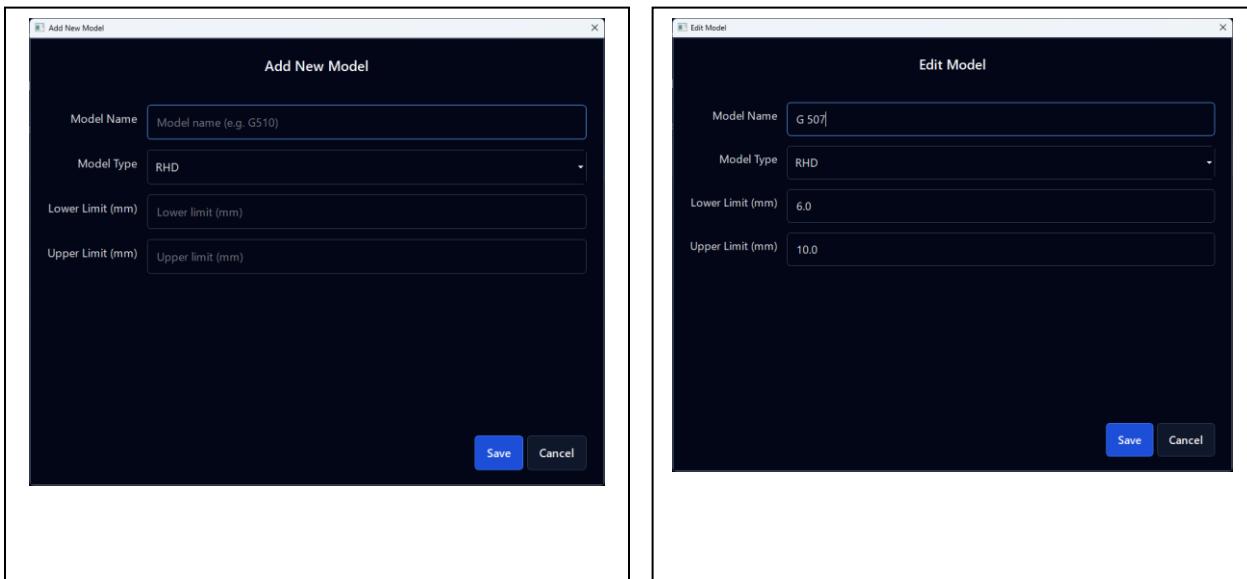
Next QR Code Preview
G510.101328

Activate Save Cancel

During Activation, Supervisor can:

1. Set QR prefix
 2. Set starting QR counter
 3. Preview next QR label
- ✓ Prevents duplicate QR codes
 - ✓ Ensures traceability consistency

Add and Edit Models



Add New Model

Model Name: G510

Model Type: RHD

Lower Limit (mm): 6.0

Upper Limit (mm): 10.0

Save Cancel

Edit Model

Model Name: G 507

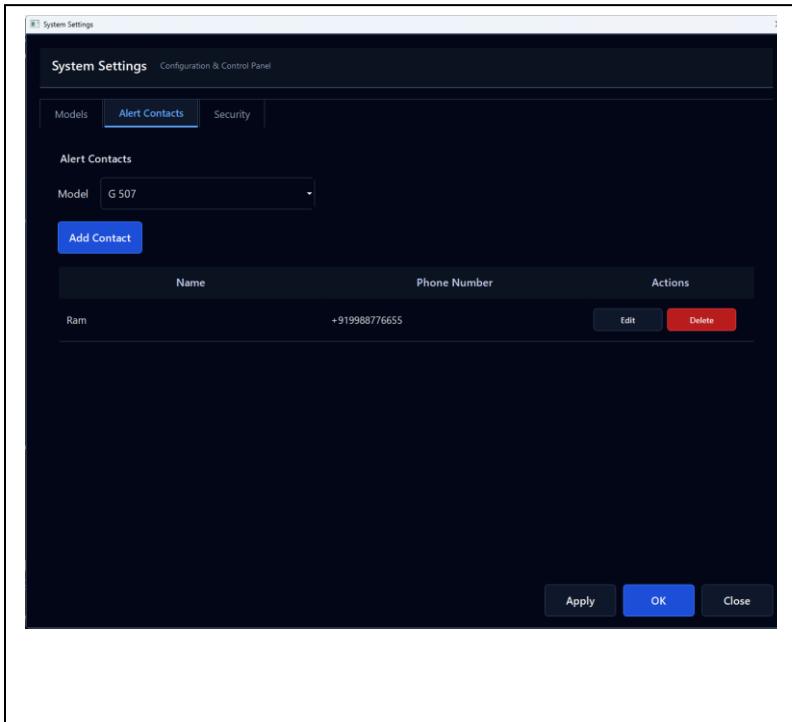
Model Type: RHD

Lower Limit (mm): 6.0

Upper Limit (mm): 10.0

Save Cancel

Alert Contact Management

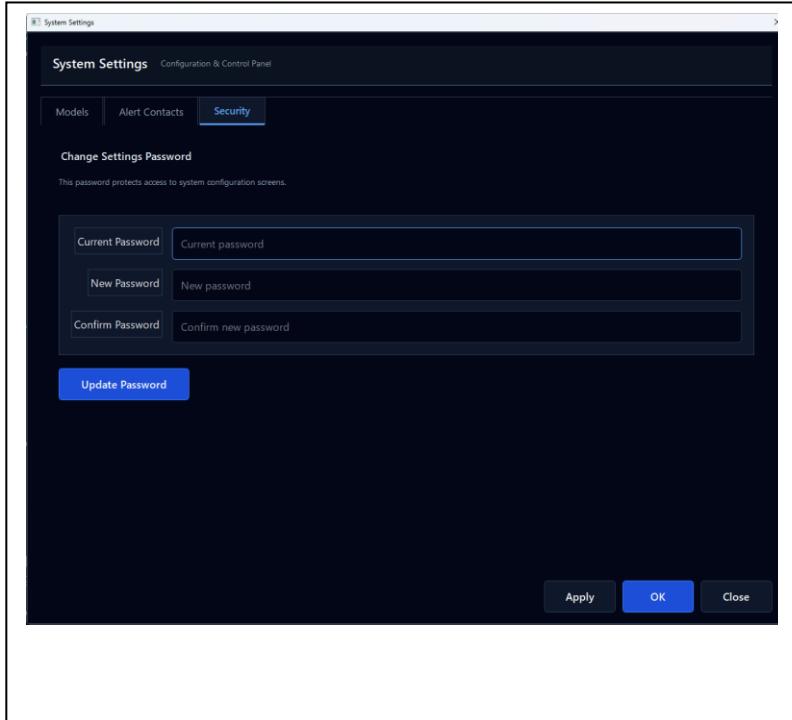


The screenshot shows the 'System Settings' application window with the title 'System Settings Configuration & Control Panel'. The 'Alert Contacts' tab is selected. A dropdown menu labeled 'Model' shows 'G 507'. Below it, a table lists a contact named 'Ram' with the phone number '+919988776655'. There are 'Edit' and 'Delete' buttons next to the contact entry. At the bottom are 'Apply', 'OK', and 'Close' buttons.

Define who receives SMS alerts for quality/system events.

1. Model-specific contacts
2. Add / Edit / Delete contacts
3. Phone number validation

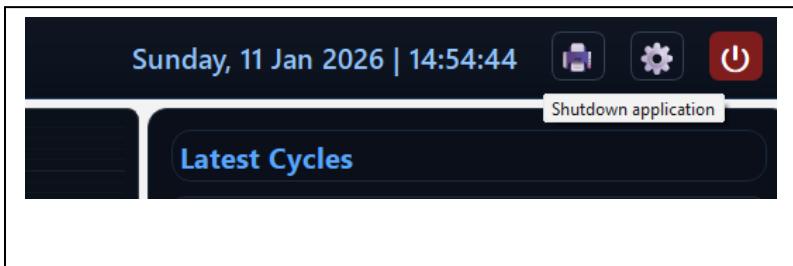
Password Management



The screenshot shows the 'System Settings' application window with the title 'System Settings Configuration & Control Panel'. The 'Security' tab is selected. A section titled 'Change Settings Password' contains instructions: 'This password protects access to system configuration screens.' Below are three input fields: 'Current Password' (placeholder 'Current password'), 'New Password' (placeholder 'New password'), and 'Confirm Password' (placeholder 'Confirm new password'). An 'Update Password' button is located below the fields. At the bottom are 'Apply', 'OK', and 'Close' buttons.

1. Maintain confidentiality
2. Change password periodically
3. Ensure only authorized access

Safe Shutdown Procedure



1. Authenticate with password
2. Confirm shutdown warning
3. Ensure no active cycle is running
4. Exit application safely

