

# AUTOBLIND v1.0 User Manual

Smart Blinds Controller with WiFi Connectivity

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## System Overview

AUTOBLIND v1.0 is a smart blinds controller that enables remote control of window blinds through WiFi connectivity. The system uses a stepper motor with precise positioning control, allowing for smooth and accurate blind movement with a capacity of up to 50 full revolutions.

### Key Features

- **50 Revolution Capacity:** Up to 204,800 steps of precise positioning
- **WiFi Connectivity:** Remote control via web interface or HTTP API
- **Web Interface:** User-friendly browser-based control panel
- **Position Memory:** Automatic position saving and restoration
- **Safety Features:** Watchdog timer protection against system lockups
- **Reverse Direction Support:** Configurable motor direction for different installations
- **EEPROM Storage:** Persistent settings storage that survives power cycles

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# Hardware Requirements

## Core Components

- **Microcontroller:** Wemos D1 Mini Pro (ESP8266-based)
- **Stepper Motor:** 28BYJ-48 (5V, unipolar stepper motor)
- **Motor Driver:** ULN2003 driver board
- **Power Supply:** 5V DC power adapter (minimum 1A recommended)

## Pin Connections

Wemos D1 Mini Pro Pin	ULN2003 Driver Pin	Description
D1	IN1	Motor control signal 1
D3	IN2	Motor control signal 2
D4	IN3	Motor control signal 3
D5	IN4	Motor control signal 4
5V	VCC	Power supply (5V)
GND	GND	Ground connection

## Motor Specifications

- **Type:** 28BYJ-48 Unipolar Stepper Motor
  - **Steps per Revolution:** 4,096 steps (in HALF4WIRE mode)
  - **Operating Voltage:** 5V DC
  - **Operating Mode:** HALF4WIRE for smooth operation
  - **Maximum Speed:** 500 steps/second (conservative setting)
  - **Acceleration:** 250 steps/second<sup>2</sup> (gentle acceleration)
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## **Initial Setup**

### **1. Hardware Assembly**

1. Connect the 28BYJ-48 stepper motor to the ULN2003 driver board
2. Wire the ULN2003 driver to the Wemos D1 Mini Pro according to the pin connections table
3. Connect the 5V power supply to both the Wemos D1 Mini Pro and ULN2003 driver
4. Ensure all ground connections are properly made

### **2. Software Installation**

1. Flash the AUTOBLIND v1.0 firmware to the Wemos D1 Mini Pro
2. On first boot, the system will automatically clear EEPROM for fresh installation
3. The system will perform a basic motor functionality test (200 steps)
4. If no WiFi credentials are stored, the system enters Access Point mode

### **3. First Boot Sequence**

The system will display the following information via serial console:

=====

**AUTOBLIND v1.0**

**Smart Blinds Controller**

**50 Revolution Capacity**

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**Max capacity: 50 revolutions (204800 steps)**

**Fresh programming detected - Clearing EEPROM**

**Motor configured with conservative settings**

**Testing motor - minimal test (200 steps)...**

**Safe motor test completed!**

**Starting Access Point mode**

**AP Name: AUTOBLIND-Setup**

**AP IP: 192.168.4.1**

**Web server started!**

=====

**AUTOBLIND v1.0 Ready!**

**Range: 0 to -204800 steps**

**Setup AP: 192.168.4.1**

=====

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## **WiFi Configuration**

### **Access Point Mode (Initial Setup)**

**When no WiFi credentials are configured, AUTOBLIND creates its own WiFi network:**

- **Network Name: AUTOBLIND-Setup**
- **Password: 12345678**
- **IP Address: 192.168.4.1**

### **Connecting to Setup Network**

1. **Connect your device to the "AUTOBLIND-Setup" WiFi network**
2. **Open a web browser and navigate to <http://192.168.4.1>**
3. **Click on "WiFi Settings" in the web interface**
4. **Enter your home WiFi network credentials**
5. **Click "Save & Connect" - the system will restart and connect to your network**

## WiFi Status Monitoring

- The system automatically retries WiFi connection every 30 seconds if disconnected
  - If connection fails, it maintains Access Point mode for configuration access
  - WiFi status is displayed in the web interface and serial console
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## Calibration

### Setting Movement Limits

Before normal operation, calibrate the upper and lower positions of your blinds:

1. Access Configuration Page: Navigate to **/config** in the web interface
2. Position the Blinds: Use manual controls to move blinds to desired upper position
3. Save Upper Position: Click "Save Current as UPPER"
4. Position for Lower: Move blinds to desired lower position
5. Save Lower Position: Click "Save Current as LOWER"

### Default Range

- Upper Position: 0 steps (typically fully up)
- Lower Position: -204,800 steps (50 full revolutions down)
- Current Position: Tracks actual motor position

### Motor Direction Configuration

If your installation requires opposite motor rotation:

1. Go to Configuration page
  2. Check "Reverse motor direction" checkbox
  3. Setting is automatically saved and applied to all movements
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## Operation

### Basic Controls

- UP: Moves blinds to saved upper position
- DOWN: Moves blinds to saved lower position

- **STOP:** Immediately stops motor movement

## Manual Positioning

- **Step Control:** Move in increments of 100 or 1,000 steps
- **Revolution Control:** Move in increments of 1 or 5 full turns
- **Absolute Position:** Move to specific step position
- **Revolution Position:** Move to specific revolution count

## Position Tracking

- Current position is continuously monitored and saved
  - Position is restored after power cycles
  - Movement status (moving/stopped) is tracked in real-time
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# Web Interface

## Main Page (/)

- Real-time status display showing position, WiFi, and system status
- Quick browser control URLs for automation
- Position displayed as percentage and absolute steps/revolutions
- WiFi connection status and IP address

## Configuration Page (/config)

- Motor direction reversal setting
- Basic UP/DOWN/STOP controls
- Manual step and revolution controls
- Position calibration tools
- Reset functions

## WiFi Settings Page (/wifi)

- Current WiFi connection status
- WiFi credential configuration
- Network reset functionality

## Status Information Display

- **Position Status:** Shows calibration status and current position as percentage

- WiFi Status: Connected/Setup mode with network details
  - System Status: Moving/Ready status and direction configuration
  - Auto-refresh: Status updates every 5 seconds automatically
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## HTTP API Reference

### Status Endpoint

GET `/api/status`

Returns JSON with complete system status:

```
{  
  "software": "AUTOBLIND v1.0",  
  "currentPosition": -50000,  
  "upperPosition": 0,  
  "lowerPosition": -204800,  
  "maxSteps": 204800,  
  "maxRevolutions": 50,  
  "stepsPerRevolution": 4096,  
  "isMoving": false,  
  "reverseDirection": false,  
  "wifiConnected": true,  
  "wifiSSID": "HomeNetwork",  
  "localIP": "192.168.1.100"  
}
```

### Movement Control

**POST /api/move**

Parameters (use one):

- **direction=up** or **direction=down** - Move to saved positions
- **steps=X** - Relative movement in steps (positive/negative)
- **position=X** - Absolute position in steps
- **revolutions=X** - Relative movement in revolutions (supports decimals)

## Position Management

**POST /api/set\_position?type=upper** - Save current position as upper limit  
**POST /api/set\_position?type=lower** - Save current position as lower limit

## Motor Direction

**POST /api/set\_reverse?reverse=true** - Enable reverse direction  
**POST /api/set\_reverse?reverse=false** - Disable reverse direction

## System Control

**POST /api/stop** - Stop motor immediately  
**POST /api/reset\_position** - Reset to full range (0 to -204,800 steps)

## WiFi Management

**POST /api/set\_wifi?ssid=NetworkName&password=NetworkPass** - Configure WiFi  
**POST /api/reset\_wifi** - Clear WiFi settings and restart in AP mode

## Browser Control URLs (GET)

For simple browser-based control or automation:

- **http://[IP]/api/move/direction=up** - Move up
- **http://[IP]/api/move/direction=down** - Move down
- **http://[IP]/api/stop** - Stop motor

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# Troubleshooting

## Common Issues



## **Motor Not Moving**

- Check power supply connections (5V, minimum 1A)
- Verify wiring between Wemos D1 Mini Pro and ULN2003 driver
- Ensure motor is properly connected to driver board
- Check serial console for error messages

## **WiFi Connection Problems**

- Verify network credentials are correct
- Check WiFi signal strength at installation location
- Ensure router supports 2.4GHz band (ESP8266 requirement)
- Try resetting WiFi settings and reconfiguring

## **Web Interface Not Accessible**

- Check WiFi connection status via serial console
- In AP mode, ensure connected to "AUTOBLIND-Setup" network
- Verify IP address in serial console output
- Try different web browser or clear browser cache

## **Position Tracking Issues**

- Recalibrate upper and lower positions
- Reset position tracking via configuration page
- Check for mechanical binding in blind mechanism
- Verify motor direction setting is correct

## **System Resets/Instability**

- Check power supply adequacy (5V, stable current)
- Ensure proper grounding of all components
- Watchdog timer protection may trigger on hardware issues
- Check serial console for detailed error information

## **Serial Console Debugging**

Connect to serial console (115200 baud) for detailed system information:

- Boot sequence and initialization status
  - WiFi connection attempts and results
  - Motor movement commands and status
  - Error messages and system warnings
  - Real-time position tracking information
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# Technical Specifications

## Performance Characteristics

- **Maximum Range:** 50 revolutions (204,800 steps)
- **Resolution:** 1 step = 0.088 degrees of rotation
- **Speed:** Up to 500 steps/second (conservative for stability)
- **Acceleration:** 250 steps/second<sup>2</sup> (smooth operation)
- **Position Accuracy:**  $\pm 1$  step ( $\pm 0.088$  degrees)

## Software Features

- **Watchdog Timer:** 100ms feeding interval for system stability
- **EEPROM Management:** Automatic settings persistence
- **WiFi Retry Logic:** 30-second reconnection attempts
- **Safe Motor Control:** Time-limited operations prevent lockups
- **Position Validation:** Automatic range limiting for safety

## Power Requirements

- **Operating Voltage:** 5V DC
- **Current Consumption:** 200mA idle, up to 800mA during movement
- **Recommended Power Supply:** 5V 1A minimum, 2A recommended

## Network Specifications

- **WiFi Standard:** 802.11 b/g/n (2.4GHz only)
  - **Security:** WPA/WPA2 supported
  - **IP Assignment:** DHCP client mode
  - **Access Point Mode:** 192.168.4.1/24 subnet
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# Safety Information

## Electrical Safety

- **Use only the specified 5V DC power supply**
- **Ensure proper grounding of all components**
- **Disconnect power before making wiring changes**
- **Protect against moisture and water ingress**

## Mechanical Safety

- Do not exceed the 50-revolution maximum range
- Ensure blind mechanism can handle motor torque
- Install appropriate mechanical stops if needed
- Monitor for binding or excessive resistance

## **System Safety**

- Watchdog timer provides protection against software lockups
- Position limits prevent over-travel
- Manual stop function available at all times
- Regular position saving prevents data loss

## **Installation Safety**

- Mount controller in accessible but protected location
- Ensure adequate ventilation around electronics
- Use appropriate cable management for safety
- Test all functions before final installation

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***This manual covers AUTOBLIND v1.0 software. Hardware implementation and installation should be performed by qualified individuals with appropriate electrical and mechanical skills.***