

ShackMate Antenna Switch (RCS-8/RCS-10) – Feature Summary

A professional-grade antenna switching solution for amateur radio operators using Icom equipment with CI-V capability.
Built on ESP32-S3 platform with modern web interface.

Core Features

Antenna Control & Management

- 8-Port Antenna Switching – Controls up to 8 antenna ports (RCS-10) or 5 ports (RCS-8)
- Per-Antenna Configuration – Each antenna has persistent storage for:
 - TYPE (Beam, Dipole, Loop, Vertical, etc.)
 - STYLE (Yagi, Log Periodic, Quad, etc.)
 - POL (Horizontal, Vertical, LHCP, RHCP, etc.)
 - MFG (Manufacturer selection)
 - Band Pattern (14 amateur radio bands: 160m–23cm)
 - Enable/Disable state
- Custom Antenna Names – User-configurable names for each antenna port
- Real-time Status Display – Shows selected antenna, TX/RX state, and antenna details

CI-V Integration

- Icom Radio Integration – Full CI-V protocol support for seamless radio control
- Automatic Antenna Selection – Radio can automatically switch antennas via CI-V commands
- RCS Type Detection – Supports both RCS-8 and RCS-10 switch models
- Device Number Configuration – Multiple switches can coexist (Device 1–4)
- Bidirectional Communication – Changes from radio or web interface sync automatically

Web Interface

- Professional Web UI – Modern, responsive interface accessible from any device
- Three Main Pages:
 - Info Page – Device status and network information
 - Config Page – Setup antenna names, RCS type, device settings
 - Switch Page – Real-time antenna selection and band control
- Real-time Synchronization – All connected clients stay in sync via WebSocket
- Mobile Friendly – Works on computers, tablets, and smartphones

Persistence & Storage

- ESP32 NVS Storage - All settings stored in device flash memory
- Cross-Session Persistence - Settings survive power cycles and firmware updates
- Shared Configuration - All users see the same antenna configurations
- Automatic Backup - Configuration automatically saved on changes

Interactive Controls

- Visual Antenna Selection - Click to select active antenna
- Band Pattern Control - Click LEDs to set which bands each antenna supports
- Tuner Control - Toggle tuner on/off per antenna
- Long-press Actions - Hold antenna buttons to enable/disable ports
- Dropdown Menus - Easy selection of antenna characteristics
- Dynamic Visibility - UI adapts to RCS-8 vs RCS-10 configuration

Hardware Platform

- M5Stack AtomS3 - Compact ESP32-S3 based controller
- WiFi Connectivity - Built-in WiFi with WiFiManager for easy setup
- WebSocket Server - Real-time communication on port 4000
- Status LED - RGB LED shows connection and operational status
- Physical Button - Hardware button for device interaction

Advanced Features

- Auto-save Configuration - Changes automatically saved without manual action
- Error Handling - Robust error handling and recovery
- Debug Console Functions - Browser console commands for troubleshooting
- Firmware Updates - OTA (Over-The-Air) update capability
- Network Discovery - mDNS support for easy device discovery
- Restore Defaults - Factory reset functionality

Connectivity & Protocols

- WebSocket Protocol - Real-time bidirectional communication
- HTTP Server - Serves web interface and handles configuration
- CI-V Serial - Direct connection to Icom radio CI-V bus
- WiFi Manager - Captive portal for initial WiFi setup
- JSON API - Structured data exchange for all operations

User Experience

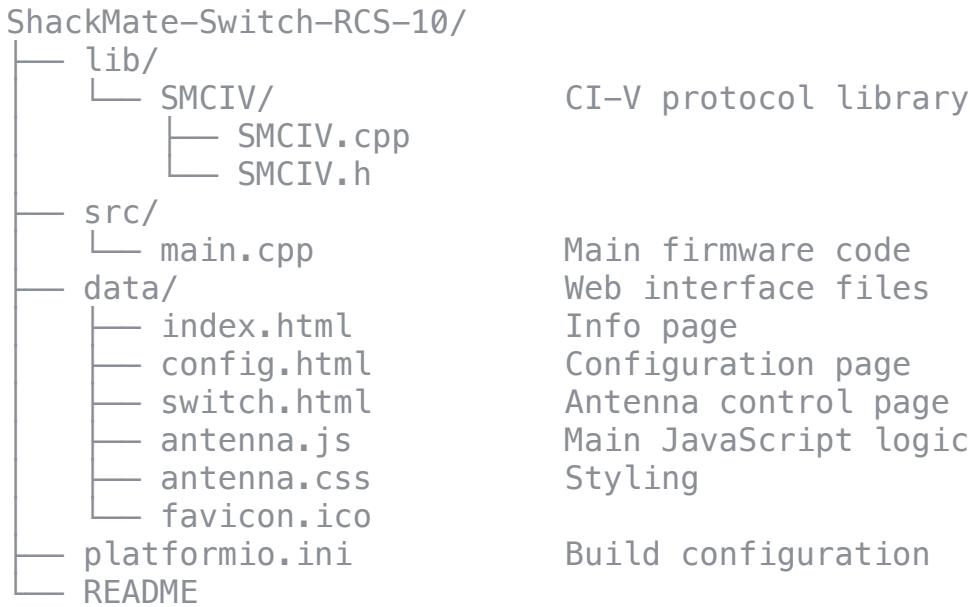
- Zero Configuration - Works out of the box with sensible defaults
- Intuitive Interface - Easy to understand and operate
- Visual Feedback - Clear indication of antenna states and selections
- Responsive Design - Adapts to different screen sizes
- Consistent State - All clients show identical information

- Professional Appearance - Clean, modern design suitable for shack use

Reliability Features

- Persistent Storage - Configuration survives power outages
- Automatic Reconnection - WebSocket auto-reconnects on connection loss
- State Synchronization - Prevents conflicts between multiple clients
- Input Validation - Prevents invalid configurations
- Graceful Degradation - Continues working even if some features fail

Project Structure



Getting Started

1. Hardware Setup - Connect M5Stack AtomS3 to RCS switch CI-V bus
2. First Boot - Device creates WiFi hotspot for initial configuration
3. WiFi Setup - Connect to hotspot and configure WiFi credentials
4. Web Access - Navigate to device IP address to access web interface
5. Configuration - Set RCS type, antenna names, and device settings
6. Operation - Use web interface or CI-V commands to control antennas

Technical Specifications

- Platform: ESP32-S3 (M5Stack AtomS3)
- Memory: 8MB Flash, 320KB RAM
- Connectivity: WiFi 802.11 b/g/n
- Interface: WebSocket (port 4000), HTTP (port 80)
- Protocol: Icom CI-V compatible
- Storage: NVS (Non-Volatile Storage) for persistence
- Framework: Arduino/ESP-IDF
- Web Tech: HTML5, CSS3, JavaScript, SVG graphics

Project: ShackMate Antenna Switch Control System
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Platform: PlatformIO + ESP32-S3
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