WSPR BEACON

Size:50*20*63 (not include connector)
RF connectors: SMA
Feed line: 50 Ohm coaxial cable
GPS antenna type: active, external
Maximum output power: ~23 dBm
Supply voltage: 5V, USB-C, fuse-protected

WSPR Beacon Configuration Manual

Overview

This WSPR (Weak Signal Propagation Reporter) beacon firmware allows amateur radio operators to transmit WSPR signals on designated frequencies. The device supports GPS-based time synchronization and location tracking, with configuration stored in EEPROM for persistence.

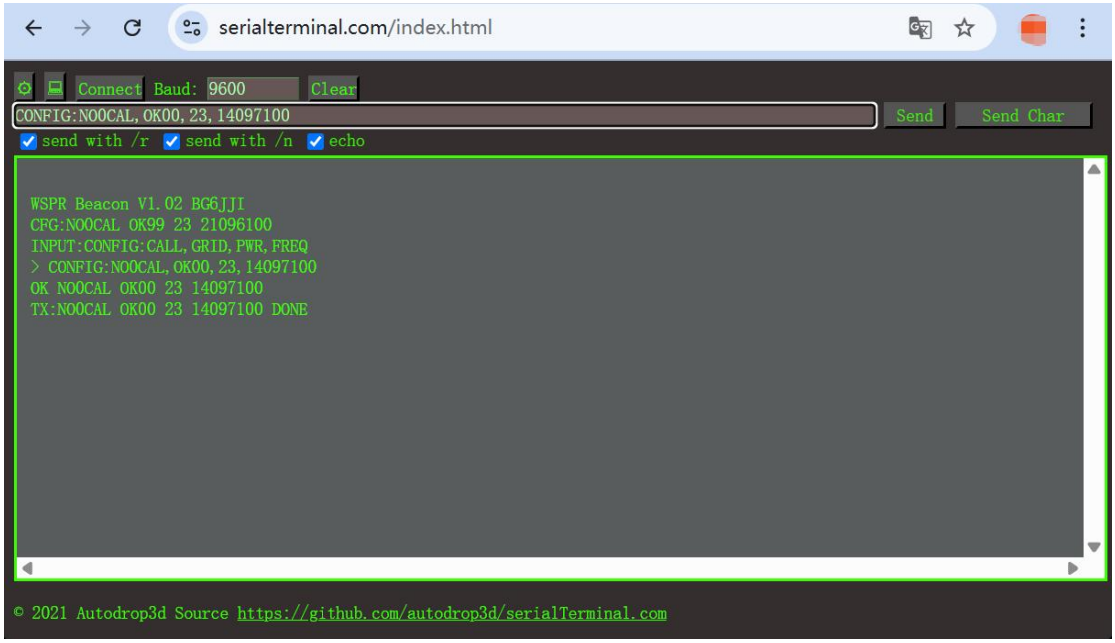
Pin Connections

TX_LED_PIN: 8 (Transmission indicator)
POWER_ON_LED_PIN: 10 (Power indicator)
GPS_RX_PIN: 4 (GPS module RX)
GPS_TX_PIN: 3 (GPS module TX)
GPS_STATUS_LED_PIN: 9 (GPS lock indicator)

Configuration Steps

1. Initial Setup

Connect hardware components as per pin definitions
Upload firmware to Arduino (This device has firmware installed)
Power on the device
Open serial monitor at 9600 baud (https://www.serialterminal.com/index.html)



2. Default Configuration

On first boot, the device uses default settings:
Callsign: BG6JJI
Grid Locator: Auto-detected from GPS
Power: 23 dBm
Frequency: 14.0971 MHz (20m band)

3. Custom Configuration

To configure custom settings, send the following command via serial:
CONFIG:CALLSIGN,GRID,POWER,FREQUENCY
Parameters:
- `CALLSIGN`: Your amateur radio callsign (max 6 characters)
- `GRID`: Maidenhead grid locator (4 characters, e.g., "CN99")
- `POWER`: Transmission power in dBm (this device is designed for 23 dBm)

- `FREQUENCY`: Center frequency in Hz

Note about power: While the configuration accepts power values from 0-60 dBm, this particular hardware implementation is optimized for 23 dBm output. Using other power values may not produce the expected output power due to hardware limitations.

Examples:

CONFIG:BG6JJI,CN99,23,14097100 # 20m band
CONFIG:KA1ABC,FN42,27,7040100 # 40m band
CONFIG:N0CALL,DM33,30,10140200 # 30m band
CONFIG:N0CALL, ,30,10140200 # 30m band and use GPS.
^^^^Note that there are 4 spaces here.

4. Configuration Response

After sending configuration command, you'll receive one of these responses:
Success: OK BG6JJI CN99 23 14097100
Error: ERR (invalid format or parameters)

5. GPS Operation

The GPS LED (pin 9) indicates GPS lock status:
Solid ON: GPS synchronized successfully
OFF: No GPS signal or invalid data
When use GPS Locator is enabled (grid starts with space), the device automatically calculates grid locator from GPS coordinates
GPS time synchronization occurs automatically every transmission cycle

6. Transmission Schedule

Transmits WSPR messages every even minute (00, 02, 04, ..., 58)
Each transmission takes approximately 110 seconds
Transmission indicator LED (pin 8) illuminates during transmission
Serial output shows: TX:BG6JJI CN99 23 14097100 DONE

7. Supported Frequencies

Common WSPR frequencies (configure as needed):

1.8381 MHz (160m)
3.5701 MHz (80m)
7.0401 MHz (40m)
10.1402 MHz (30m)
14.0971 MHz (20m)
18.1061 MHz (17m)
21.0961 MHz (15m)
24.9261 MHz (12m)
28.1261 MHz (10m)
50.2945 MHz (6m)

8. Important Notes

Configuration is automatically saved to EEPROM and persists after power cycle
GPS must have clear sky view for initial synchronization
Ensure frequency selection complies with your license privileges
Transmission power should be set according to local regulations
The device automatically adds ±100 Hz frequency randomization for each transmission

9. Troubleshooting

No GPS lock: Check antenna connection and sky visibility
Configuration errors: Verify parameter format and limits
No transmission: Check Si5351 module connections and power
EEPROM issues: Device will use defaults if EEPROM corrupted
Firmware Information
Version: 1.02
Author: BG6JJI 2025-10-22
Protocol: WSPR (Weak Signal Propagation Reporter)
Regulatory Compliance
Ensure all transmissions comply with your local amateur radio regulations regarding frequency bands, power limits, and station identification requirements.

Device Operation Status

Normal Operation Indicators

LED Status:

POWER LED (Green, Pin 10): Constantly ON - Device powered on
GPS LED (Green, Pin 9): ON when GPS synchronized, OFF when no signal
TX LED (Red, Pin 8): Blinks during transmission

Serial Monitor Output:

WSPR Beacon V1.02 BG6JJI
CFG:BG6JJI CN99 23 14097100
INPUT:CONFIG:CALL,GRID,PWR,FREQ
Transmission Cycle:
Every even minute (00, 02, 04, ..., 58)
Transmission duration: ~110 seconds
Output example: TX:BG6JJI CN99 23 14097100 DONE

GPS Synchronization:

Automatic time sync before each transmission
Grid locator updates from GPS (if enabled)
GPS status LED indicates lock status

Configuration Confirmation:

After successful configuration:
OK BG6JJI CN99 23 14097100
Error Indicators
GPS Failure:
GPS LED remains OFF
Device reboots after multiple sync failures
Red TX LED blinks 3 times before reboot

Configuration Error:
Serial output: ERR
Previous configuration remains active

Transmission Issues:

Verify antenna connection
Ensure adequate power supply

Maintenance

Keep GPS antenna with clear sky view
Monitor serial output for status updates
Configuration persists through power cycles
Regular verification of transmission reports on WSPRnet