BLUETAG

Hardware Debugging Tool Manual

Complete Guide to Firmware Flashing, Updates, and Usage

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1 Introduction

About Bluetag

Bluetag is a versatile hardware debugging tool based on RP2040/RP2350 microcontroller that provides multiple functionalities for embedded system development and debugging.

1.1 Key Features

- Detects JTAG & SWD debug pinout (JTAGulator function)
- Functions as a USB-to-Serial adapter
- Reads & writes flash ICs with Flashrom
- Supports OpenOCD with JTAG & SWD modes (BusPirate protocol)
- Acts as a CMSIS-DAP adapter (supports UART & SWD)
- 16 GPIO channels (GPIO0-GPIO15)
- Auto-baudrate detection at 115200 bps

2 Initial Firmware Flashing

Step-by-Step Firmware Installation

Follow these steps carefully to flash the Bluetag firmware for the first time.

2.1 Prerequisites

- RP2040 or RP2350 based development board
- USB cable
- Computer with USB port

2.2 Flashing Process

1. **Connect the Device**
   - Connect Pico USB to laptop or computer USB port
   - You will find an RPI-Drive appearing in your system
   - This indicates successful connection with the RP2040/RP2350
2. **Download Firmware**

- Primary source: https://github.com/madebygyanesh/internship
- Official repository: https://github.com/Aodrulez/blueTag
- Download the `.uf2` file from the releases section (right side corner)

3. **Flash the Firmware**
   - Copy the downloaded `.uf2` file
   - Paste, move, or drag and drop the file into the RPI-drive
   - The device will automatically reboot after flashing
4. **Verify Installation**
   - Check the LED near the BOOTSEL button
   - LED should be ON, indicating successful firmware installation

Important Notes

- Ensure stable USB connection during flashing
- Do not disconnect the device during the flashing process
- For RP2350 boards, use experimental builds: `blueTag-vX.X.X-RP2350-Experimental.uf2`

3 Firmware Updates

Updating Existing Firmware

Use this procedure to update Bluetag firmware to newer versions.

3.1 Update Process

1. **Enter Boot Mode**
   - Hold the BOOTSEL button while plugging the device into your computer
   - The device will automatically enter boot mode
   - Release the button once connected
2. **Follow Standard Flashing**
   - Download the latest firmware version
   - Follow the same steps as initial firmware flashing (Section 1)
   - Paste the new `.uf2` file to the RPI-drive

Tip

Always check the official repository for the latest firmware releases before updating.

4 Usage Guide

Operating Bluetag

Complete guide for using Bluetag after successful firmware installation.

4.1 Prerequisites

Safety Requirements

- Ensure firmware flashing is completed (mandatory)
- Verify voltage levels: Maximum 5.5V, Average 5V
- DIP pin switches must be OFF (used for other purposes)
- Connect GND pin to target's GND

4.2 Connection Setup

4.2.1 Hardware Connections

1. Connect Bluetag to laptop/computer via USB
2. Connect GPIO pins (CH0 - CH15) to target test points
3. Connect VREF and GND appropriately
4. Ensure DIP switches are in OFF position

4.2.2 Serial Communication Setup

Windows Systems:

1. Open Device Manager
2. Navigate to Ports section
3. Note the COM port assigned to Bluetag
4. Use terminal software like PuTTY or similar

```
dmesg | tail -n 20
# Look for "Bluetag generic device"
# Note the device path (usually /dev/ttyACM0)
```

Listing 1: Finding Bluetag Device in Linux

```
screen /dev/ttyACM0 115200
```

Listing 2: Connecting via Screen Command

4.3 Communication Parameters

Linux Systems:

Parameter	Value
Baudrate	115200 (auto-detection supported)
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	None

4.4 Interface Access

1. After establishing serial connection, you'll see a blank screen
2. Press any key to access the Bluetag interface
3. The UI provides detailed guidance for all commands and hardware modes

4.5 Hardware Boot Modes

Boot Mode Selection

To boot directly into a hardware mode:

- Connect the relevant hardware boot mode selection GPIO to GND
- Reset or reconnect Bluetag to your computer
- Only one boot mode can be active at a time
- Mode remains active as long as GPIO is connected to GND

5 Technical Specifications

5.1 GPIO Configuration

- **Channels:** 16 (GPIO0-GPIO15)
- **Voltage Level:** 3.3V (most RP2040 boards)
- **Maximum Input:** 5.5V
- **Recommended:** 5V average

5.2 Performance Optimization

JTAGulator Function Optimization

For fastest execution when using JTAGulator function:

- Connect channels sequentially (0 to 15)
- Algorithm verifies channels in order
- Sequential connection minimizes execution time

6 Troubleshooting

6.1 Common Issues

1. **Device Not Recognized**
   - Check USB cable connection
   - Try different USB port
   - Ensure BOOTSEL button is pressed during connection for flashing
2. **Firmware Flashing Failed**
   - Verify RPI-drive appears in system
   - Use different USB cable
   - Try on different computer
3. **Serial Communication Issues**
   - Verify correct COM port/device path
   - Check baudrate settings (115200)
   - Ensure no other applications are using the port

7 Additional Resources

7.1 Official Documentation

For comprehensive technical details and latest updates:

- Official Repository: https://github.com/Aodrulez/blueTag
- Development Repository: https://github.com/madebygyanesh/internship

7.2 Support Contacts

- Hardware Design: madeby.gyanesh@gmail.com (AIAKRP)
- Technical Guidance: Midhya Mathew (KJSCE) - midhya@somaiya.edu

This manual provides comprehensive guidance for Bluetag usage. For technical support and updates, refer to the official repositories and contact information provided.