@rebwar_ai

🔗 Installing ARM & AVR Toolchains + avrdude & bossac (Windows, macOS, Linux)

This guide covers installing **ARM GCC**, **AVR GCC**,**avrdude** and **bossac** on all major operating systems. These tools will let you compile and upload code to the **ATmega2560** and **ATSAM3X8E** microcontrollers — without the Arduino IDE.

1️⃣ Install ARM GCC (arm-none-eabi-*)

We'll use the **GNU Arm Embedded Toolchain** from Arm's official site.

Official download page:
📎 https://developer.arm.com/downloads/-/gnu-rm

Windows

1. Download the latest `.zip` or `.exe` installer for Windows from the Arm page.
2. If using the `.exe`:
   - Run the installer
   - Choose **Add to PATH** if prompted.
3. If using the `.zip`:
   - Extract it to `C:\Program Files\ArmGCC` (or similar)
   - Add its `bin` folder to your **PATH**:
     - Press `Win + R`, type `sysdm.cpl`, press Enter.
     - Go to **Advanced** → **Environment Variables**.
     - Edit **PATH**, add the folder (e.g. `C:\Program Files\ArmGCC\bin`).
4. Open **Command Prompt** and verify:

```
arm-none-eabi-gcc --version
arm-none-eabi-as --version
arm-none-eabi-ld --version
arm-none-eabi-objcopy --version
```

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macOS

1. Download the **macOS tarball** (`.tar.bz2`) from the Arm page.
2. Open Terminal and run:

```
cd ~/Downloads
tar -xjf gcc-arm-none-eabi-*-mac.tar.bz2
sudo mv gcc-arm-none-eabi-* /opt/arm-gcc
```

3. Add to PATH (permanent):

```
echo 'export PATH=/opt/arm-gcc/bin:$PATH' >> ~/.zshrc
source ~/.zshrc
```

4. Verify:

```
arm-none-eabi-gcc --version
```

Linux (Ubuntu/Debian)

Option 1: Install via package manager (may be older version)

```
sudo apt update
sudo apt install gcc-arm-none-eabi binutils-arm-none-eabi
```

Option 2: Install latest from Arm

1. Download the Linux tarball from Arm.
2. Extract and move:

```
tar -xjf gcc-arm-none-eabi-*-linux.tar.bz2
sudo mv gcc-arm-none-eabi-* /opt/arm-gcc
echo 'export PATH=/opt/arm-gcc/bin:$PATH' >> ~/.bashrc
source ~/.bashrc
```

3. Verify:

```
arm-none-eabi-gcc --version
```

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2 Install avrdude (Uploader for AVR)

Official page:
🔗 https://www.nongnu.org/avrdude/

Windows

- Easiest method: Download prebuilt **WinAVR** or **avrdude** package from https://github.com/avrdudes/avrdude/releases
- Extract, place in `C:\Program Files\avrdude`, add `bin` folder to PATH.
- Verify:

```
avrdude -?
```

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macOS

```
brew install avrdude
avrdude -?
```

Linux (Ubuntu/Debian)

```
sudo apt update
sudo apt install avrdude
avrdude -?
```

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3 Install AVR GCC (avr-*)

We'll use **Zak Kemble's prebuilt AVR-GCC toolchain** (lightweight & cross-platform).

Download page:
🔗 https://github.com/ZakKemble/avr-gcc-build/releases

Windows

1. Download the latest `avr-gcc-*-win64.zip`.
2. Extract to `C:\Program Files\AVRGCC` (or similar).
3. Add the `bin` folder to your **PATH**.
4. Verify:

```
```

```
avr-gcc --version
avr-as --version
avr-ld --version
avr-objcopy --version
```

---

macOS

1. Download the macOS build from ZakKemble's releases.
2. Extract to `/opt/avr-gcc`.
3. Add to PATH:

```
echo 'export PATH=/opt/avr-gcc/bin:$PATH' >> ~/.zshrc
source ~/.zshrc
```

4. Verify with commands above.

Linux (Ubuntu/Debian)

Option 1: Install via package manager (may be older)

```
sudo apt update
sudo apt install gcc-avr binutils-avr avr-libc
```

Option 2: Latest build from ZakKemble

```
wget https://github.com/ZakKemble/avr-gcc-
build/releases/download/<version>/avr-gcc-<version>-linux64.tar.bz2
tar -xjf avr-gcc-*-linux64.tar.bz2
sudo mv avr-gcc-* /opt/avr-gcc
echo 'export PATH=/opt/avr-gcc/bin:$PATH' >> ~/.bashrc
source ~/.bashrc
```

Verify:

```
avr-gcc --version
```

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4 Install bossac (Uploader for SAM3X / Arduino Due)

`bossac` is used to upload compiled code to **ATSAM3X8E**-based boards (like the Arduino Due).

Official repo:
🔗 https://github.com/shumatech/BOSSA

Windows

1. Download the latest BOSSA installer or zip from:
   🔗 https://github.com/shumatech/BOSSA/releases
2. Extract or install it to `C:\Program Files\BOSSA`.
3. Add the `bin` folder to your **PATH**.
4. Verify:

```
bossac --help
```

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macOS

```
brew install bossa
bossac --help
```

Linux (Ubuntu/Debian)

```
sudo apt update
sudo apt install bossa-cli
bossac --help
```

If not available in your distro, build from source:

```
git clone https://github.com/shumatech/BOSSA.git
cd BOSSA
make
sudo make install
```

✅ Final Verification

At this point, running all of these should show version/help info (not “command not found”):

```
```

```
arm-none-eabi-gcc --version
arm-none-eabi-as --version
arm-none-eabi-ld --version
arm-none-eabi-objcopy --version

avr-gcc --version
avr-as --version
avr-ld --version
avr-objcopy --version

avrdude -?
bossac --help
```