Integration Guide
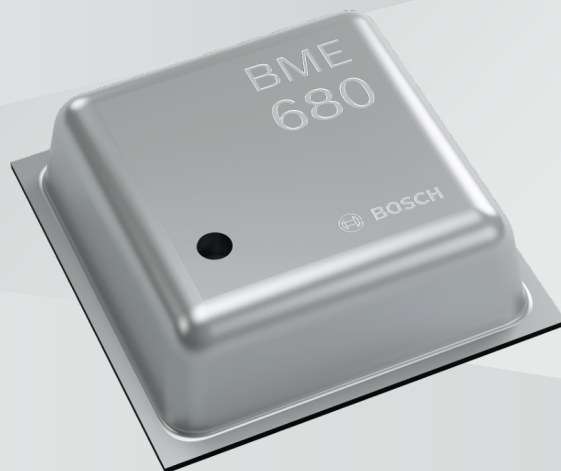## Bosch Software Environmental Cluster (BSEC)

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Contents

1 Instructions for using the BSEC Arduino Library in Arduino 1.8.5

Until the Arduino IDE natively supports pre-compiled libraries, the following steps/hacks will need to be followed to integrate the BSEC library into your project.

Installation and getting started

1. Install the latest Arduino IDE

As of this publication, the latest Arduino IDE 1.8.5 can be downloaded from this link

2. Install the BSEC and Bme680_Data library

Either download these libraries as zip and import BSEC.zip and Bme680_Data.zip into the Arduino IDE. Refer to this guide on how to import libraries.

3. Replace the arduino-builder

The `arduino-builder-PR219` now has the ability to select the appropriate pre-compiled library from the library folder.

Replace the arduino-builder executable from the Arduino installation folder with the appropriate file based on your OS from this link arduino-builder-219.zip.

4. Modify the platform.txt file

If you have already used the previous example code remove the linker flag `-libalgobsec` in the platform.txt file.

The arduino-builder passes the linker flags under `compiler.c.elf.extra_flags`. Most platform.txt files in the combine recipe place this previously unused variable in the start of the link recipe whereas it should be near the end along with the other pre-compiled libraries flags.

Examples

ESP8266 community forum's ESP8266 core   Original line 91, 92,

```
## Combine gc-sections, archives, and objects
recipe.c.combine.pattern="{compiler.path}{compiler.c.elf.cmd}" {compiler.c.elf.flags}
        {compiler.c.elf.extra_flags} -o "{build.path}/{build.project_name}.elf" -Wl,--start-group {object_files}
        "{build.path}/arduino.ar" {compiler.c.elf.libs} -Wl,--end-group  "-L{build.path}"
```

should become

```
## Combine gc-sections, archives, and objects
recipe.c.combine.pattern="{compiler.path}{compiler.c.elf.cmd}" {compiler.c.elf.flags}  -o
      "{build.path}/{build.project_name}.elf" -Wl,--start-group {object_files} "{build.path}/arduino.ar" {compiler.c.elf.libs}
      {compiler.c.elf.extra_flags} -Wl,--end-group  "-L{build.path}"
```

Arduino's SAMD core   Original line 95, 96,

```
## Combine gc-sections, archives, and objects
recipe.c.combine.pattern="{compiler.path}{compiler.c.elf.cmd}"  "-L{build.path}" {compiler.c.elf.flags}
      {compiler.c.elf.extra_flags} "-T{build.variant.path}/{build.ldscript}"
      "-Wl,-Map,{build.path}/{build.project_name}.map" --specs=nano.specs --specs=nosys.specs {compiler.ldflags} -o
      "{build.path}/{build.project_name}.elf" {object_files} -Wl,--start-group {compiler.arm.cmsis.ldflags} -lm "{build.path}/{archive_
      -Wl,--end-group
```

Should be,

```
## Combine gc-sections, archives, and objects
recipe.c.combine.pattern="{compiler.path}{compiler.c.elf.cmd}"  "-L{build.path}" {compiler.c.elf.flags}
      "-T{build.variant.path}/{build.ldscript}" "-Wl,-Map,{build.path}/{build.project_name}.map" --specs=nano.specs
      --specs=nosys.specs {compiler.ldflags} -o "{build.path}/{build.project_name}.elf" {object_files}
      -Wl,--start-group {compiler.arm.cmsis.ldflags} -lm {compiler.c.elf.extra_flags} "{build.path}/{archive_file}"
      -Wl,--end-group
```

5. Only for the ESP8266 - modify the linker script

This step needs to be done for BSEC example code as it has an interface with library and it need not be done for bme680 data logging example code.Due to the current size of the BSEC library, upon compilation, you will receive an error: `section '.text' will not fit in region 'iram1_0_seg'`. In order to solve this, you will need to modify the linker script and specifically define where the library should be placed in memory.

You will need to modify the file `eagle.app.v6.common.ld` typically found in `{YourESP8266PPackage↩ Directory}\tools\sdk\ld`.

With reference to the linker script here,

After line 117 `*libwps.a:(.literal.* .text.*)`, add `*libalgobsec.a:(.literal.* .text.*)`, which should look like,

```
  *libupgrade.a:(.literal.* .text.*)
  *libwpa.a:(.literal.* .text.*)
  *libwpa2.a:(.literal.* .text.*)
  *libwps.a:(.literal.* .text.*)
  *libalgobsec.a:(.literal.* .text.*)
  *(.irom0.literal .irom.literal .irom.text.literal .irom0.text .irom.text .irom.text.*)
  _irom0_text_end = ABSOLUTE(.);
  _flash_code_end = ABSOLUTE(.);
} >irom0_0_seg :irom0_0_phdr
```

6. Copy the binaries

If you have already used the previous example code remove the `libalgobsec.a` file from the core directory or any other location you might have copied it to and instead, copy the binaries from the zip file available via our website, to where the Arduino library is installed on your system. For Windows, this is typically under `Documents/Arduino/libraries/BSEC-Arduino-library-master`. The name of the library may differ depending how you installed it.

From the .zip (algo/bin/Normal_version/)	To (Documents/Arduino/libraries/BSEC-Arduino-library-master/src/)
avr/AVR8_megaAVR	atmega2560
gcc/Cortex_M0+	cortex-m0plus
gcc/Cortex_M3	cortex-m3
gcc/Cortex_M4F	cortex-m4
gcc/Cortex_M4F	cortex-m4 -mfpu=fpv4-sp-d16 -mfloat-abi=hard
esp32	esp32
esp8266	esp8266

7. Verify and upload the example code

Start or restart the Arduino IDE.

Open the example code found under `File>Examples>Bsec software library>Basic` for BSEC or open the example code found under `File>Examples>BME680 datalogging` for bme680 data logging.

Select your board and COM port. Upload the example. Open the Serial monitor. You should see an output on the terminal.

Note that not all supported cores have been tested. In such cases, the examples can be found under `File>Examples>INCOMPATIBLE>Bsec software library>Basic`

8. Tested board list

The current list of tested micro-controllers include,

Core MCU	Tested boards
atmega2560	Arduino MEGA 2560
cortex-m0plus	Arduino Zero
cortex-m3	Arduino Due
cortex-m4f	Adafruit BlueFruit NRF52 Feather, STM32 Nucleo F411RE
esp32	Sparkfun ESP32 Thing
esp8266	Adafruit Feather HUZZAH

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