



Intel[®] Galileo Software

Package Version: 0.7.5 for Arduino IDE v1.5.3

Release Notes

16 October 2013



1 Introduction

This document describes extensions and deviations from the functionality described in the *Intel® Galileo Board Getting Started Guide*, available at: www.intel.com/support/go/galileo

This software release supports the following hardware and software:

- Intel® Galileo Customer Reference Board (CRB), Fab D with blue PCB
- Intel® Galileo software v0.7.5 for Arduino Integrated Development Environment (IDE) v1.5.3

Note: This release uses a special version of the Arduino IDE. The first thing you **must** do is download it from the Intel website below and update the SPI flash on the board.

Features in this release are described in [Section 1.4](#).

1.1 Downloading the Software Release

Download the latest Arduino IDE and firmware files here:

<https://communities.intel.com/community/makers/software/drivers>

This release contains multiple zip files, including:

- Operating system-specific IDE packages, contain automatic SPI flash update:
 - Intel_Galileo_Arduino_SW_1.5.3_on_Linux32bit_v0.7.5.tgz (72.2 MB)
 - Intel_Galileo_Arduino_SW_1.5.3_on_Linux64bit_v0.7.5.tgz (73.5 MB)
 - Intel_Galileo_Arduino_SW_1.5.3_on_MacOSX_v0.7.5.zip (54.3 MB)
 - Intel_Galileo_Arduino_SW_1.5.3_on_Windows_v0.7.5.zip (104 MB)
- (Optional) Files for updating SPI flash manually.
LITTLE_LINUX_IMAGE_FirmwareUpdate_Intel_Galileo_v0.7.5.7z (5.5 MB)
 - CapsuleApp.efi
 - sysimage_Intel_Galileo_v0.7.5.cap
- (Mandatory for WiFi) Files for booting board from SD card.
LINUX_IMAGE_FOR_SD_Intel_Galileo_v0.7.5.7z (36.7 MB)
- (Optional) Linux* BSP (Board Support Package) sources for Intel® Quark SoC-based systems.
 - Board_Support_Package_Sources_for_Intel_Quark_v0.7.5.7z (3.2 MB)
- (Optional) Linux* BSP (Board Support Package) full sources including Yocto for Intel® Quark SoC-based systems.
Board_Support_Package_Sources_for_Intel_Quark_v0.7.5+full_yocto_archive.tar.gz (1.4 GB)

If you are running the IDE software, see the *Intel® Galileo Board Getting Started Guide*. [<https://communities.intel.com/docs/DOC-21838>]



If you are working with the BSP sources, see the *Intel® Quark SoC X1000 BSP Build Guide*. [<https://communities.intel.com/docs/DOC-21882>]

1.2 Supported Operating Systems

The software release has been tested on the following operating systems.

| Operating System | Version |
|------------------|--|
| Windows* | Windows* 7 (32-bit & 64-bit) and Windows* 8 |
| Linux* | Ubuntu 12.04 (32-bit and 64-bit) |
| Mac OS* | Built on: Mac OS X version 10.8.5 Tested: Mac OS X 10.6.8, 10.7.5, and 10.9 developer preview |

1.3 Supported Libraries

The software release supports the following libraries:

- SPI
- EEPROM
- UART
- GPIO
- WiFi

1.4 Features in this Release

- Board firmware (*.cap file) installation using the IDE. See the *Getting Started Guide* for details.
- WiFi support (see [Section 1.4.1](#))
- Sketch persistence (SD only, see [Section 1.4.2](#))
- USB input device support (see [Section 1.4.3](#))
- Fast GPIO support
- I2C enhancements for PWM configuration
- Ethernet
- Linux SD additions

1.4.1 WiFi Support

Note: Integrated WiFi functionality (**not** WiFi shield) is supported in this release.

Validated on the Intel® Centrino® Wireless-N 135 adapter described at: <http://www.intel.com/content/www/us/en/wireless-products/centrino-wireless-n-135.html>



To use the Intel® Centrino® Wireless-N 135 adapter, run the Linux OS from mass storage (microSD) as described in the *Getting Started Guide, Booting your board from an SD card*.

You can use the existing WiFi library and sketches that are in the IDE. Details are available here: <http://arduino.cc/en/Reference/WiFi>

The library uses standard Linux wireless tools such as iwconfig, iwgetid, ifconfig, and wpa_passphrase.

WiFi has been tested with the Intel® Centrino® Wireless-N 135 adapter but may work on any Linux WiFi hardware used by the standard Linux tools referenced above.

Runs out of the box with this software release (Linux) and udhcpc client.

Not tested:

- WEP encryption
- Using Intel® Galileo as an Access Point (AP)
- Heavy traffic usage
- DNS
- Many other extended use scenarios

1.4.2 SD Library

Note: SD Library is supported on SD card only (**not** SD interfaces on shields) in this release.

All of the functions listed below from the Arduino library reference have been implemented.

```
class File
  File(FILE *f, char *name);
  File(void);
  ~File(void);
  virtual size_t write(uint8_t);
  virtual size_t write(const uint8_t *buf, size_t size);
  virtual int read();
  virtual int peek();
  virtual int available();
  virtual void flush();
  int read(void *buf, uint16_t nbyte);
  boolean seek(uint32_t pos);
  uint32_t position();
  uint32_t size();
  void close();
  operator bool();
  char * name();
  boolean isDirectory(void);
  File openNextFile();
  void rewindDirectory(void);

class SDClass
  boolean begin(uint8_t csPin = 0);
  File open(const char *filepath, uint8_t mode = FILE_READ);
  boolean exists(char *filepath);
  boolean mkdir(char *filepath);
```



```
boolean remove(char *filepath);
boolean rmdir(char *filepath);
```

Status of example sketches:

- Card Info – missing functionality from SDFile library which has not been implemented.
- Data logger – uses File.println() function which is inherited from SDFile and is not advertised on the Arduino website.
- Dump file – works correctly
- Read write – works correctly

1.4.3 USB Input Device Support

USB input devices are supported in this release. Any USB device with a button (including a keyboard) will generate events that can be captured.

Note: This release does not convert USB events to ASCII as is expected by the sketch software. This is because the Linux input sub-system returns absolute key positions instead of keyboard scancodes as is expected by the Arduino library.

1.5 Supported Shields

For a list of the shields that were tested, see the Intel® Galileo Shields List, which is posted here: <https://communities.intel.com/docs/DOC-21855>

1.6 Supported Sketches

The following Arduino-based sketches have been tested on at least one of the three supported OSes (Windows, Linux, Mac OS):

| Basic Arduino Examples | | |
|------------------------|-------------------------|--------------------------|
| AnalogInOutSerial | AnalogInput | AnalogReadSerial |
| Arrays | ASCIITable | BareMinimum |
| Blink | BlinkWithoutDelay | Button |
| Calibration | CharacterAnalysis | Debounce |
| DigitalInputPullup | DigitalReadSerial | Fade |
| Fading | ForLoopIteration | Graph |
| IfStatementConditional | PhysicalPixel | ReadAnalogVoltage |
| SerialCallResponse | SerialCallResponseASCII | SerialEvent |
| StateChangeDetection | StringAppendOperator | StringCaseChanges |
| StringLength | StringLengthTrim | StringStartsWithEndsWith |
| StringSubstring | StringToInt | StringToIntRGB |



| Basic Arduino Examples | | |
|---------------------------|-------------|-------------------|
| switchCase | switchCase2 | VirtualColorMixer |
| WhileStatementConditional | | |

| Sketches from Arduino Starter Kit | | |
|-----------------------------------|-----------------------|----------------------|
| p02_SpaceShipInterface | p03_LoveOMeter | p04_ColorMixingLamp, |
| p08_DigitalHourglass | p09_MotorizedPinwheel | p10_Zoetrope |
| p14_TweakTheArduinoLogo | p15_HackingButtons | |

| Arduino Library Sketches | | |
|--------------------------|---------------------|---------------------|
| Autoscroll | Blink | ConnectNoEncryption |
| ConnectWithWPA | Cursor | Display |
| DumpFile | EEPROM_clear | EEPROM_read |
| EEPROM_write | HelloWorld | listfiles |
| ScanNetworks | Scroll | SerialDisplay |
| setCursor | SimpleWebServerWiFi | TextDirection |
| WiFiWebClient | WiFiWebServer | |

1.7 Known Issues in the Release

| Issue # | Section | Description |
|---------|------------------------|--|
| 54396 | 1.7.1 | Windows 7 IDE - COM port stops working |
| 54857 | 1.7.2 | Unzipping packages with long file paths |
| 54863 | 1.7.3 | Timeout errors cause sketch download failure or firmware upgrade failure |
| 54935 | 1.7.4 | Using Serial.* without serial console will block sketch |
| 55278 | 1.7.5 | COM port disappears and IDE needs to be closed |
| 55303 | 1.7.6 | attachInterrupt HIGH/LOW triggering mode not supported |
| 55458 | 1.7.7 | I2C adapter fails with "controller timed out" error message |
| 55503 | 1.7.8 | When power is disconnected and reconnected "USB Device not detected" error occurs. |
| 55516 | 1.7.9 | Pins have pullups enabled at reset time |
| 55527 | 1.7.10 | Mac OS IDE zip file must be unzipped on Mac |
| 55564 | 1.7.10 | IO Expander address is hardcoded. |



| Issue # | Section | Description |
|---------|------------------------|---|
| 55603 | 1.7.12 | Workaround for servo library |
| 55631 | 1.7.13 | SPI LSB-first mode not supported |
| 55634 | 1.7.14 | UART doesn't support non printable characters |
| 55813 | 1.7.15 | SD Library cannot create new files |
| 56375 | 1.7.16 | Arduino app on Mac OS does not work when Mac auto renames app |
| n/a | 1.7.17 | Arduino IDE menus are greyed out on Mac after upgrade |

1.7.1 54396: Windows 7 IDE - COM port stops working

On Windows 7, you may see an error where the Galileo board's COM port stops working.

The IDE will display this error text (details are **highlighted**):

```
#mv the downloaded file to /sketch/sketch.elf
target_download_name="${host_file_name##*/}"
echo "Moving downloaded file to /sketch/sketch.elf on target"
Moving downloaded file to /sketch/sketch.elf on target
#$fixed_path/lsz.exe --escape -c "cp sketch /sketch/sketch.elf" <>
$TTY_PORT_ID 1>&0
$fixed_path/lsz.exe --escape -c "mv $target_download_name
/sketch/sketch.elf; chmod +x /sketch/sketch.elf" <> $TTY_PORT_ID 1>&0
C:\Users\enyquist\Downloads\arduino-
1.5.3\hardware\arduino\x86/tools\izmir/clupload_win.sh: line 39:
/dev/ttyS40: No such file or directory
```

Workaround: Reboot your Windows host PC. The USB serial port should then be present and the IDE will be able to upload sketches to the Galileo board again.

1.7.2 54857: Unzipping packages with long file paths

Extract the package into the C:\ directory due to a known issue unzipping packages with long file paths.

Use an unzip tool that supports an extended file path (for example, 7-zip from <http://www.7-zip.org/>).

1.7.3 54863: Timeout errors cause sketch download failure or firmware upgrade failure

Both issues described below are related to timeout errors:

- Sketch downloads to the board may fail after multiple sketches have been downloaded. If this happens, reset the board.
- If the firmware upgrade is stuck for more than 10 minutes or if you get any upgrade error, unplug the cables, and retry the firmware upgrade procedure again.



1.7.4 **54935: Using Serial.* without serial console will block sketch**

If a sketch uses Serial.* to output to the IDE via USB, the IDE serial console should be open. If the console is not open, then the sketch loop may block and the loop will stop. If using persistent sketches with no IDE connected, the same blocking behavior will occur.

Workaround: do not output to the IDE Serial Console port unless connected to the IDE with Serial Console monitor open.

1.7.5 **55278: COM port disappears and IDE needs to be closed**

USB CDC sometimes doesn't enumerate COM port on full board reset (power jack or REBOOT button).

Workaround: Close the IDE, reboot the board, and restart IDE.

1.7.6 **55303: attachInterrupt HIGH/LOW triggering mode not supported**

High and low level triggered interrupts are not available in this release, therefore, only edge-triggered interrupts can be used.

Workaround: Do not use level-triggered interrupts.

1.7.7 **55458: I2C adapter fails with "controller timed out" error message**

Very rarely, the I2C driver has been seen failing with the following error string:
`intel_cln_gip 0000:00:15.2: controller timed out`

Implication: When the error occurs, GPIOs are unusable.

Workaround: Cold reset the board by unplugging and replugging the power supply.

1.7.8 **55503: When power is disconnected and reconnected "USB Device not detected" error occurs**

On Windows and Linux, it has been reported that a device already enumerated will become not detected after the power is disconnected and reconnected.

This is planned to be fixed in a future release.



1.7.9 55516: Pins have pullups enabled at reset time

When the Intel® Galileo board is powered on, and before the sketch is executed, pins have pullups enabled by default.

Pins have a high logical state, and can drive a low amount of current. Although this is not generally a problem (an LED attached to a pin may get dimly lit), it can cause some devices to malfunction during the transient. For example, a PWM-driven servo may interpret the floating pin as a 100% duty cycle PWM.

Workaround: Minimize the 'offline' time. Connect a device to the pins immediately before executing the sketch.

1.7.10 55527: Mac OS IDE zip file must be unzipped on Mac

You must unzip the Mac OS IDE on your Mac's normal hard disk due to symbolic links within the IDE. Once the IDE is unzipped, you cannot run it from or transfer it to USB drives or any other media formatted for use in Windows computers.

It is safe to transfer the zip file on such devices, but once unzipped, the Arduino application must not be copied or transferred on non-Mac OS file systems or it may be corrupted.

Workaround: Download the zip file on your Mac's hard drive and then unzip it.

1.7.11 55564: I/O Expander address is hardcoded

The I2C address of the I/O expander is hardcoded to 0x20, regardless of the configuration set on the J2 header.

The address of the IO Expander cannot be changed to avoid address clash with another device on the bus.

Workaround: Modify the I2C address of the device clashing with the IO Expander.

1.7.12 55603: Workaround for servo library

Servo library is not currently supported. The workaround is to access the Pulse Width Modulator (PWM) directly as described below.

An example of a sketch is also below. The sketch configures the PWM at 125 Hz frequency which gives you a pulse width granularity of 31 usec. You are free to move the frequency up or down as you wish, keeping in mind that granularity will increase and decrease respectively.

Datasheet for the IO expander is at: <http://www.cypress.com/?docID=31413> page 13 is most relevant.

Mapping between Arduino pins and Cypress PWM ports:

- Pin3: GPORT0_BIT4_PWM7
- Pin5: GPORT0_BIT1_PWM5



- Pin6: GPORT1_BIT0_PWM6
- Pin9: GPORT0_BIT3_PWM1
- Pin10: GPORT0_BIT0_PWM7
- Pin11: GPORT1_BIT1_PWM4

Example Sketch

```
#include "Wire.h"

int PIN = 9;
void setup() {
  // put your setup code here, to run once:

  Wire.begin();
  pinMode(PIN, OUTPUT);
  analogWrite(PIN,1);

  // Set divider to get 125Hz freq.
  Wire.beginTransmission(0x20);
  Wire.write(0x2C);
  Wire.write(0x03);
  Wire.endTransmission();

  // Select programmable PWM CLK source
  Wire.beginTransmission(0x20);
  Wire.write(0x29);
  Wire.write(0x04);
  Wire.endTransmission();

  // Set period register
  Wire.beginTransmission(0x20);
  Wire.write(0x2a);
  Wire.write(0xff);
  Wire.endTransmission();

  // Set minimum duty cycle (31us @ 125Hz)
  Wire.beginTransmission(0x20);
  Wire.write(0x2b);
  Wire.write(0x01);
  Wire.endTransmission();
}
void loop() {
}
```

1.7.13 55631: SPI LSB-first mode not supported

SPI LSB-first mode is not supported, therefore, sketches using SPI in LSB-first mode will fail.

Workaround: switch to MSB-first mode if your device supports it.

1.7.14 55634: UART doesn't support non printable characters

`Serial.print()` does not support non-ASCII characters, therefore, sketches that use non-printable characters will malfunction.



1.7.15 55813: SD Library cannot create new files

The SD library should check if a valid file exists when passed a path to a file to be opened. As this check is not done, the library is not able to handle files that do not exist.

File.write() will crash when called on a File which was created with a new file. This might be true of other File methods.

Workaround. When opening a file with the SD library, it should already exist on the SD card until this bug has been fixed.

1.7.16 56375: Arduino application on Mac OS does not work when application is automatically renamed

If you already have the Arduino IDE installed on your Mac when you install the Galileo software, the Galileo IDE application will be renamed with a number and a space. The space causes the Galileo application to be unable to compile.

Workaround: check your Applications folder and be sure there is no space anywhere in the absolute path to the Galileo IDE application, including the name of the application itself.

1.7.17 N/A: Arduino IDE menus are greyed out on Mac after upgrade

After doing a firmware upgrade using a Mac, the menus in the Arduino IDE may be greyed out.

Workaround: restart the IDE.

1.8 Resolved Issues

1.8.1 54858: Driver installation in Windows gives a warning

The previous Release Notes version stated this item was Open; this was incorrect. This issue has been resolved.

During driver installation, you may see this error: **Windows cannot verify the publisher of this software**. This error will be fixed in a future release and can be ignored. Select **Install the driver anyway**.



Revision History

| Release Date | Document Revision | Description |
|-----------------|-------------------|---|
| 16 October 2013 | 004 | Updated download URL and other minor text corrections. |
| 10 October 2013 | 003 | Updated file names and sizes. Added Known Issue 1.7.16 . Removed list of supported shields (now a separate document). |
| 04 October 2013 | 002 | Updated Resolved Issues. |
| 02 October 2013 | 001 | First external release: Package Version: 0.7.5 for Arduino IDE v1.5.3 |

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