Arduino Intel Galileo

Getting Started:

To get started, simply connect the board to power with the 5V AC-to-DC adapter and then

connect to the computer with the micro-USB cable. By default they measure from ground to 5 volts.

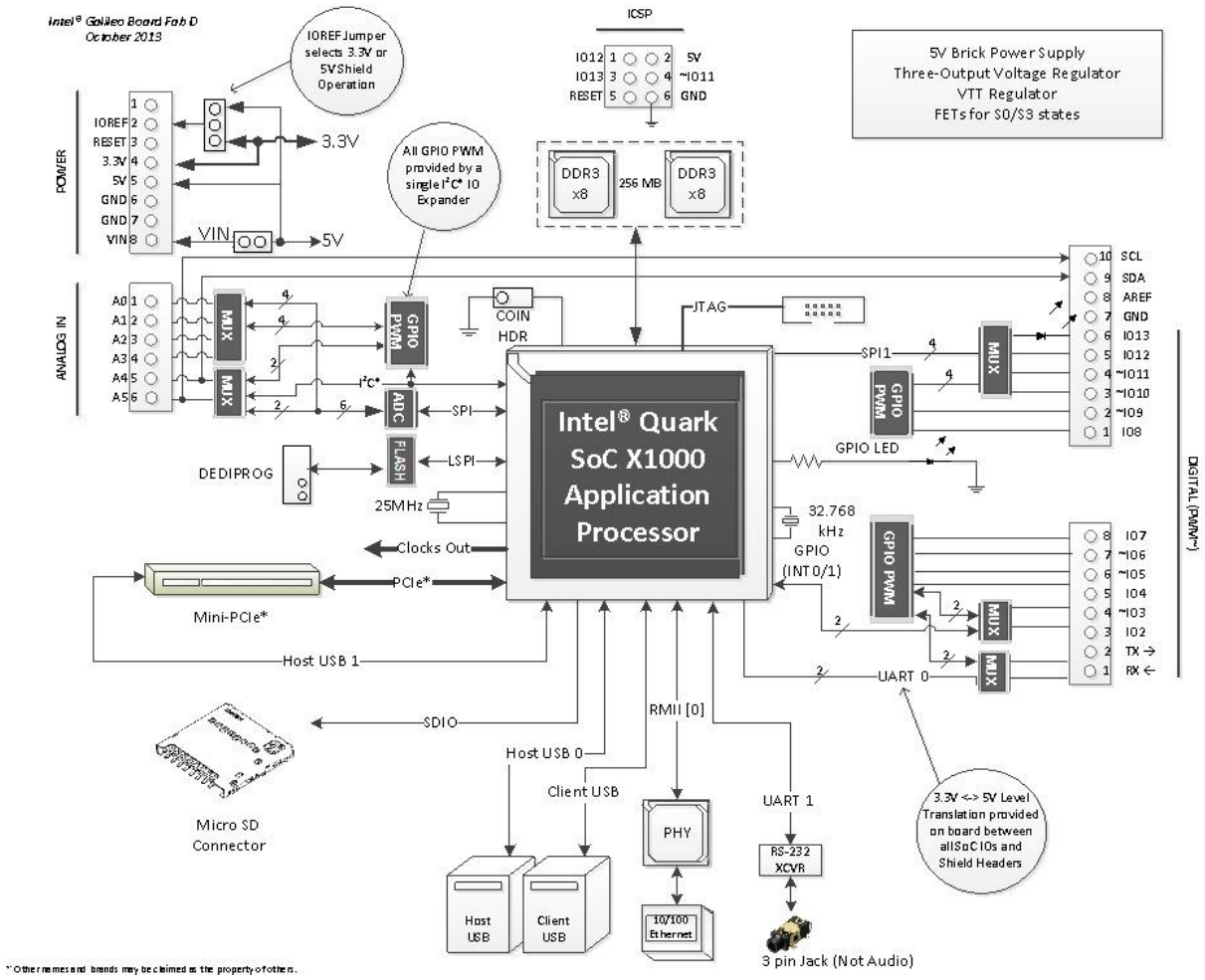
- I2C bus, TWI: SDA and SCL pins that are near to the AREF pin.
  - TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- SPI:
  - Defaults to 4MHz to support Arduino Uno shields. sing the board.

Arduino Shield Supported Features Galileo is compatible with Arduino UNO shields and is

designed to support 3.3V or 5V shields, following the Arduino Uno Revision 3, including:

- 14 digital input/output pins, of which 6 can be used as Pulse Width Modulation (PWM) outputs;
  - Each of the 14 digital pins on Galileo can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions.
  - They operate at 3.3 volts or 5 volts. Each pin can provide a maximum of 10 mA or receive a maximum of 25 mA and has an internal pull-up resistor (disconnected by default) of 5.6k to 10 kOhms.
- A0 – A5: 6 analog inputs, via an AD7298 A-to-D converter

- Each of the 6 analog inputs, labeled A0 through A5, provides 12 bits of resolution (i.e., 4096 different values). By default they measure from ground to 5 volts.
- I2C bus, TWI: SDA and SCL pins that are near to the AREF pin.
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- SPI:
- Defaults to 4MHz to support Arduino Uno shields. Programmable to 25 MHz.
- Note: While Galileo has a native SPI controller, it will act as a master and not as an SPI slave. Therefore, Galileo cannot be a SPI slave to another SPI master. It can act, however, as a slave device via the USB Client connector.
- UART (serial port): Programmable speed UART port (digital pins 0 (RX) and 1 (TX))
- ICSP (SPI): a 6 pin in-circuit serial programming (ICSP) header, located appropriately to plug into existing shields. These pins support SPI communication using the SPI library.
- VIN: The input voltage to the Galileo board when it's using an external power source (as opposed to 5 volts from the regulated power supply connected at the power jack). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- Warning: The voltage applied to this pin must be a regulated 5V supply otherwise it could damage the Galileo board or cause incorrect operation.
- 5V output pin: This pin outputs 5V from the external source or the USB connector. Maximum current draw to the shield is: 800 mA
- 3.3V output pin: A 3.3 volt supply generated by the on-board regulator. Maximum current draw to the shield is: 800 mA
- GND: Ground pins.
- IOREF: The IOREF pin on Galileo allows an attached shield with the proper configuration to adapt to the voltage provided by the board. The IOREF pin voltage is controlled by a jumper on the board, i.e., a selection jumper on the board is used to select between 3.3V and 5V shield operation.
- RESET button/pin: Bring this line LOW to reset the sketch. Typically used to add a reset button to shields that block the one on the board.
- AREF is unused on Galileo. Providing an external reference voltage for the analog inputs is not supported.
- For Galileo it is not possible to change the upper end of the analog input range using the AREF pin and theanalogReference() function.



Communication:

Galileo has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. Galileo provides UART TTL (5V/3.3V) serial communication, which is available on digital pin 0 (RX) and 1 (TX). In addition, a second UART provides RS-232 support and is connected via a 3.5mm jack. The USB Device ports allows for serial (CDC) communications over USB. This provides a serial connection to the Serial Monitor or other applications on your computer. It also enables Galileo to act as a USB mouse or keyboard to an attached computer. To use these features, see the Mouse and Keyboard library reference pages. The USB Host port allows Galileo act as a USB Host for connected peripherals such as mice, keyboards, and smartphones. To use these features, see the USBHost reference pages. Galileo is the first Arduino board to provide a mini PCI Express (mPCIe) slot. This slot allows full size and half size (with adapter) mPCIe modules to be connected to the board and also provides an additional USB Host port via the slot. Any standard mPCIe module can be connected and used to provide applications such as WiFi, Bluetooth or Cellular connectivity. Initially, the Galileo mPCIe slot provides support for the WiFi Library.

An Ethernet RJ45 Connector is provided to allow Galileo to connect to wired networks. When connecting to a network, you must provide an IP address and a MAC address. Full support of on-board Ethernet interface is fully supported and does not require the use of the SPI interface like existing Arduino shields. The onboardmicroSD card reader is accessible through the SD Library. The communication between Galileo and the SD card is provided by an integrated SD controller and does not require the use of the SPI interface like other Arduino boards. The Arduino software includes a Wire library to simplify use of the TWI/I2C bus.

Programming:

Galileo can be programmed with the Arduino software (download). When you are ready to upload the sketch to the board, program Galileo through the USB Client port by selecting "Intel Galileo" as your board in the Arduino IDE. Connect Galileo's port labelled USB Client (the one closest to the Ethernet) to your computer. Rather than requiring a physical press of the reset button before an upload, Galileo is designed to be reset by software running on a connected computer.

When the board boots up two scenarios are possible:

- If a sketch is present in persistent storage, it is executed.
- If no sketch present, the board waits for upload commands from the IDE.

If a sketch is executing, you can upload from the IDE without having to press the reset button on the board. The sketch is stopped; the IDE waits for the upload state, and then starts the newly uploaded sketch.
Pressing the reset button on the board restarts a sketch if it is executing and resets any attached shields.

Properties of Pins Configured as OUTPUT:

Pins configured as OUTPUT with pinMode() are said to be in a low-impedance state. On Galileo, when a pin is configured as OUTPUT, the functionality is provided via an I2C-based Cypress I/O expander datasheet). Digital pins 0 to 13 and Analog pins A0 to A5 can be configured as OUTPUT pins on Galileo.

The I/O expander's pins, when configured as OUTPUT, can source (provide positive current) up to 10 mA (milliamps) and can sink (provide negative current) up to 25 mA of current to other devices/circuits. The individual per pin current sourcing capability of 10 mA is subject to an overall limit of 80 mA combined between all OUTPUT pins. The per pin capability current sinking capability is subject to an overall limit of 200 mA. The following table provides a breakdown of the overall OUTPUT capabilities of the pins.

	Current Source (mA)	Current Sink (mA)
Per Pin Capability	10	25
Digital Pins 3,5,9,10,12, 13 Combined	40	100
Digital Pins 0,1,2,4,6,7,8,11 and Analog Pins A0,A1,A2,A3,A4, A5 Combined	40	100
Digital Pins 0-13 and Analog Pins A0-A5 Combined	80	200

Galileo Jumper Configuration:

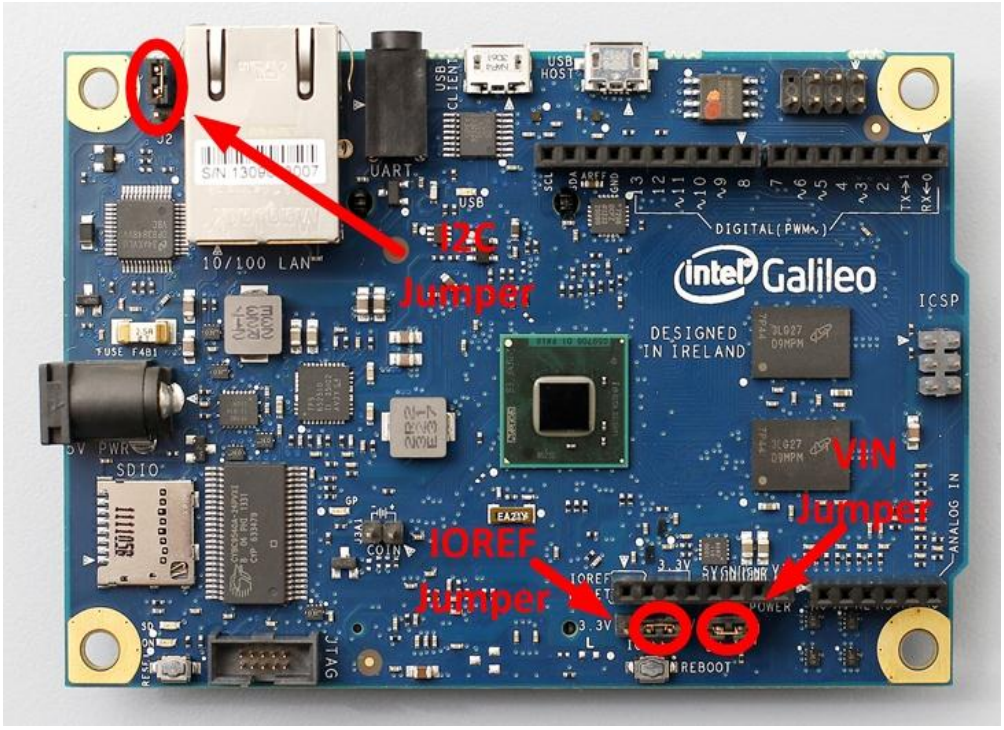
There are three jumpers on Galileo that are used to vary the configuration of the board. IOREF Jumper To allow Galileo support both 3.3V and 5V shields, the external operating voltage is controlled via a jumper. When the jumper is connected to 5V, Galileo is configured to be compatible with 5V shields and IOREF is set to 5V. When the jumper is connected 3.3V, Galileo is configured to be compatible with 3.3V shields and IOREF is set to

3.3V. The input range of the Analog pins is also controlled by the IOREF jumper and must not exceed the chosen operating voltage. However, the resolution of AnalogRead() remains at 5 V/1024 units for the default 10-bit resolution or, 0.0049V (4.9mV) per unit regardless of IOREF jumper setting.

Warning: The IOREF jumper should be used to match the board and shield operating voltages. Incorrectly setting the voltage could damage the board or the shield. I2C Address Jumper To prevent a clash between the I2C Slave address of the on board I/O expander and EEPROM with any external I2C Slave devices, jumper J2 can be used to vary the I2Caddress of the on-board devices. With J2 connected to pin 1 (marked with white triangle), the 7-bit I/O Expander address is 0100001 and the 7-bit EEPROM address is 1010001. Changing the jumper position changes the I/O Expander address to 0100000 and the EEPROM address to 1010000. VIN Jumper On Galileo, the VIN pin can be used to supply 5V from the regulated

power supply connected at the power jack to attached shields or devices. If there is a need to supply more than 5V to a shield using VIN then the VIN jumper should be removed from Galileo to break the connection between the on-board 5V supply and the VIN connection on the board header.

Warning: If the VIN jumper is not removed and more than 5V is connected to VIN, it may damage the board or lead to unreliable operation.



Automatic (Software) Reset:

Rather than requiring a physical press of the reset button before an upload, Galileo is designed in a way that allows it to be reset by software running on a connected computer. USB CDC-ACM control signals are used to transition Galileo from run-time to bootloader mode. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment.

Physical Characteristics:

Galileo is 4.2 inches long and 2.8 inches wide respectively, with the USB connectors, UART jack, Ethernet connector, and power jack extending beyond the former dimension. Four screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), is not an even multiple of the 100 mil spacing of the other pins.