

Welcome to your Freetronics **TwentyTen!**

freetronics

www.freetronics.com/twentyten

Getting Started with TwentyTen

The **TwentyTen** is 100% Arduino compatible, uses the ATmega328P Microcontroller and works with all Arduino shield designs and software. The **TwentyTen** can be powered automatically by the USB connection or powered separately by your project via the DC jack or header. Let's get started with the installation.

Installation

1. Download the latest Arduino IDE for your operating system from www.arduino.cc/en/Main/Software and install it to suit. You'll also find more step-by-step guides for installation here: www.arduino.cc/en/Guide/HomePage
2. Once the Arduino IDE is installed, we're ready to do the initial board and port setup. You won't need to do this again unless the serial port number changes such as when using a different USB port on your computer.
3. In the Arduino IDE, select **Tools > Board > "Arduino Duemilanove or Nano w/ ATmega328"**.
4. Before connecting your TwentyTen to the USB port, have a look at the list of ports in **Tools > Serial Port**. That's where your TwentyTen serial port is going to appear when you plug it in.
5. Connect your TwentyTen to the computer USB port. We supply an appropriate USB cable with the TwentyTen. After a short while if you look at **Tools > Serial Port** again you'll see a new port appear: that's the TwentyTen ready to be used. Select that port now with **Tools > Serial Port** so there is a tick mark next to it.
6. You're ready to go. The Arduino IDE now knows about your board and has a connection to it. Our TwentyTen boards ship with the "Blink" sketch preloaded so you should immediately see the blue power LED illuminate, and the red D13 LED will begin flashing on and off at 1 second intervals.



Compiling and uploading a sketch to the TwentyTen

"Sketch" is the Arduino term for a program. To test uploading a simple sketch to your **TwentyTen**:

1. Choose **File > Examples > Digital > Blink**. You'll see the code for Blink open in the IDE.
2. Select **Sketch > Verify/Compile**, you've now built (compiled) the program ready to be loaded.
3. Lastly, to load the program into the TwentyTen, select **File > Upload to I/O Board**. You'll see the red D13 LED flicker as the board is reset, and the green and yellow RX and TX LEDs will flash while the programming is being completed.
4. A few seconds later the RX and TX LEDs will go off, the board will reset, and the red D13 LED will begin flashing on and off at 1 second intervals. Congratulations! You've now compiled and uploaded your first sketch to the TwentyTen. Try experimenting with changing the delay values in the sketch and repeating the process to see the LED blink at different rates.

Online Resources

There's a wealth of information, sketches and libraries out on the internet for all things Arduino related. If there's a useful function, IC or shield there is likely to be some example code or a library to support it. And it's being added to almost daily as people like yourself create new solutions and share their projects and code to suit. The official Arduino website includes a wealth of information including tutorials, a language reference, projects, and examples.

- Official Arduino site** www.arduino.cc
Arduino discussion forum www.arduino.cc/cgi-bin/yabb2/YaBB.pl
Freetronics resources page www.freetronics.com/resources
Freeduino knowledgebase www.freeduino.org
IRC channel **Network: irc.freenode.net. Channel: #arduino**

A Google search for "arduino projects", "arduino code" or "arduino examples" is recommended too.

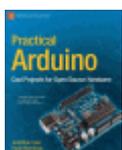
Arduino Books



Getting Started With Arduino by Massimo Banzi (O'Reilly)

A gentle introduction to using your Arduino for the first time: how to connect it up, load programs onto it, and do some basic experiments to give you a feel for how it works. Great introduction for the first-time Arduino user. 128 pages.

www.oreilly.com/pub/pr/2115

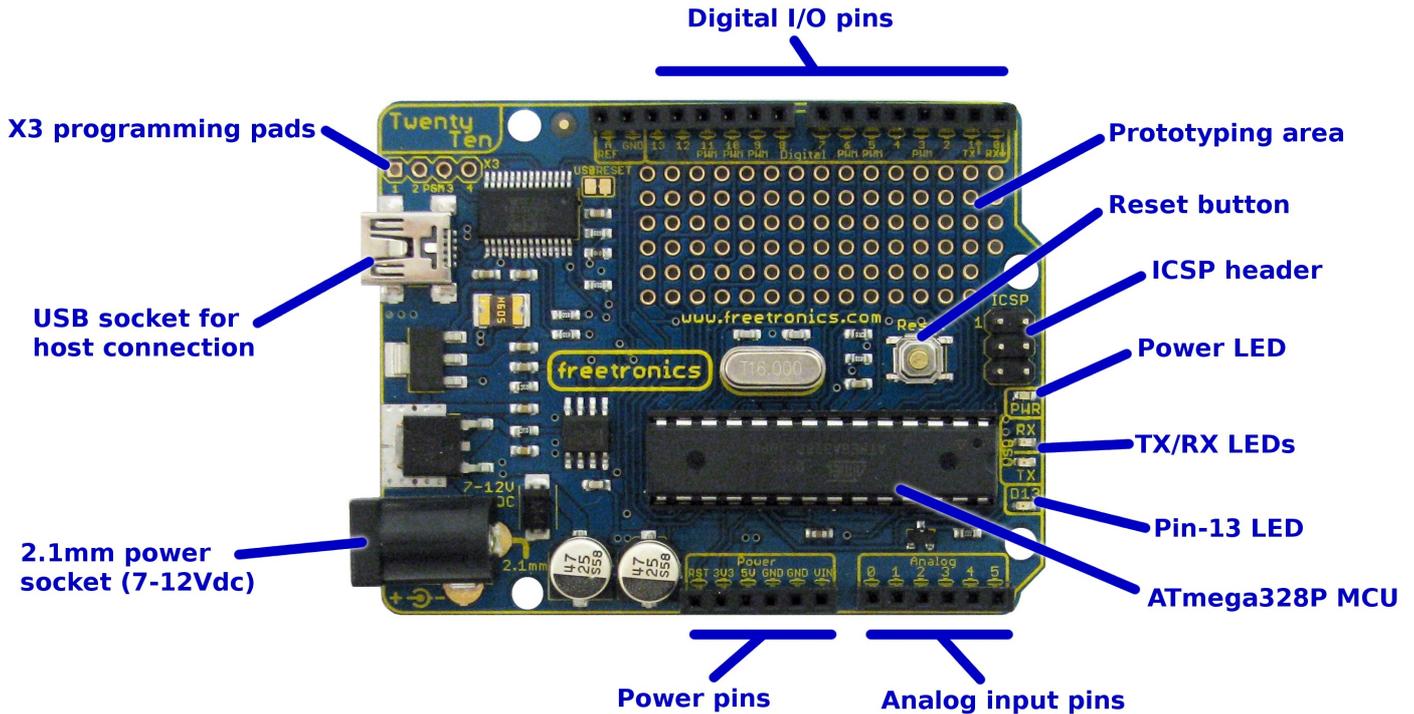


Practical Arduino by Jonathan Oxer and Hugh Blemings (Apress)

Taking you far beyond the basics, this book blends theory and practice by using example projects to illustrate some of the more advanced things you can do with Arduino and how to apply those same concepts to your own designs. After working through this book you'll be very confident designing and building your own Arduino creations. 445 pages.

www.practicalarduino.com

Your TwentyTen



The Freetronics TwentyTen is a microcontroller board which is 100% compatible with the popular Arduino Duemilanove reference design, while incorporating several updates and improvements.

It provides a balanced combination of general-purpose digital I/O pins, analog inputs, pulse-width modulated (PWM) outputs and communications support to allow it to directly control, read and communicate with sensors, drive servos and other external devices. Ethernet, WiFi, ZigBee, and hundreds of other expansion shields and devices are also available to operate with it.

All TwentyTen I/O pins and power rails are brought out to convenient headers, allowing you to either connect individual pins to a breadboard using standard jumper wires or to plug in "shield" daughter-boards for versatile expansion. General-purpose prototyping shields are also available which provide extensive space for you to create your own add-on circuits.

Microcontroller	
MCU Type	Atmel ATmega328P
Operating Voltage	5V
MCU Clock Speed	16 MHz
TwentyTen	
Input Voltage	7-12V DC recommended 6-20V DC maximum
Digital I/O pins	14 (6 provide PWM output)
Analog Input Pins	6 (analog input pins also support digital I/O, giving 20 digital I/O total if required)
Analog Resolution	10 bits, 0-1023 at 5V AREF is approx 0.00488V; 4.88mV per step
Current Per I/O Pin	40 mA maximum
Total Current For All I/O Pins	200mA maximum
Current For 3.3V Output	50mA maximum
Memory	
Flash Memory	32 KB Flash Memory, of which 2 KB is used by bootloader
SRAM, EEPROM	2 KB SRAM, 1 KB EEPROM
Communications	
Serial	1 x hardware USART, SPI (Serial Peripheral Interface), I2C
Other	Integrated USB programming and communication port. Many other one-wire, multi-wire, LCD and expansion devices supported by free code and libraries

About Freetronics

Freertronics is an Australian company created by Jonathan OXer and Marc Alexander to provide cheap and easy access to hardware, parts, and products related to Arduino projects and the *Practical Arduino* book. Learn more at www.freetronics.com. Follow us on Twitter at twitter.com/freetronics.