

# FX450 Datasheet



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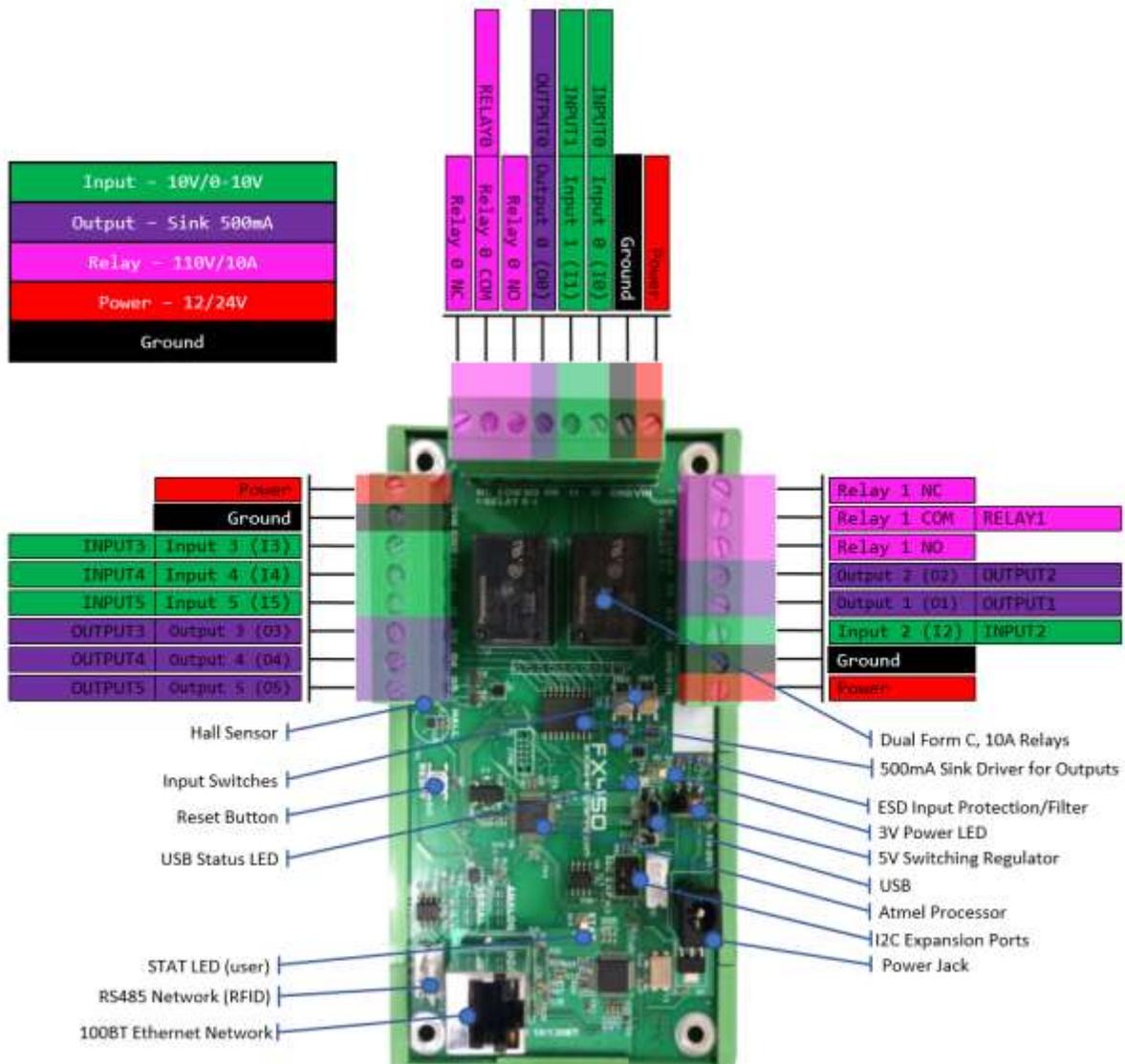
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## Overview

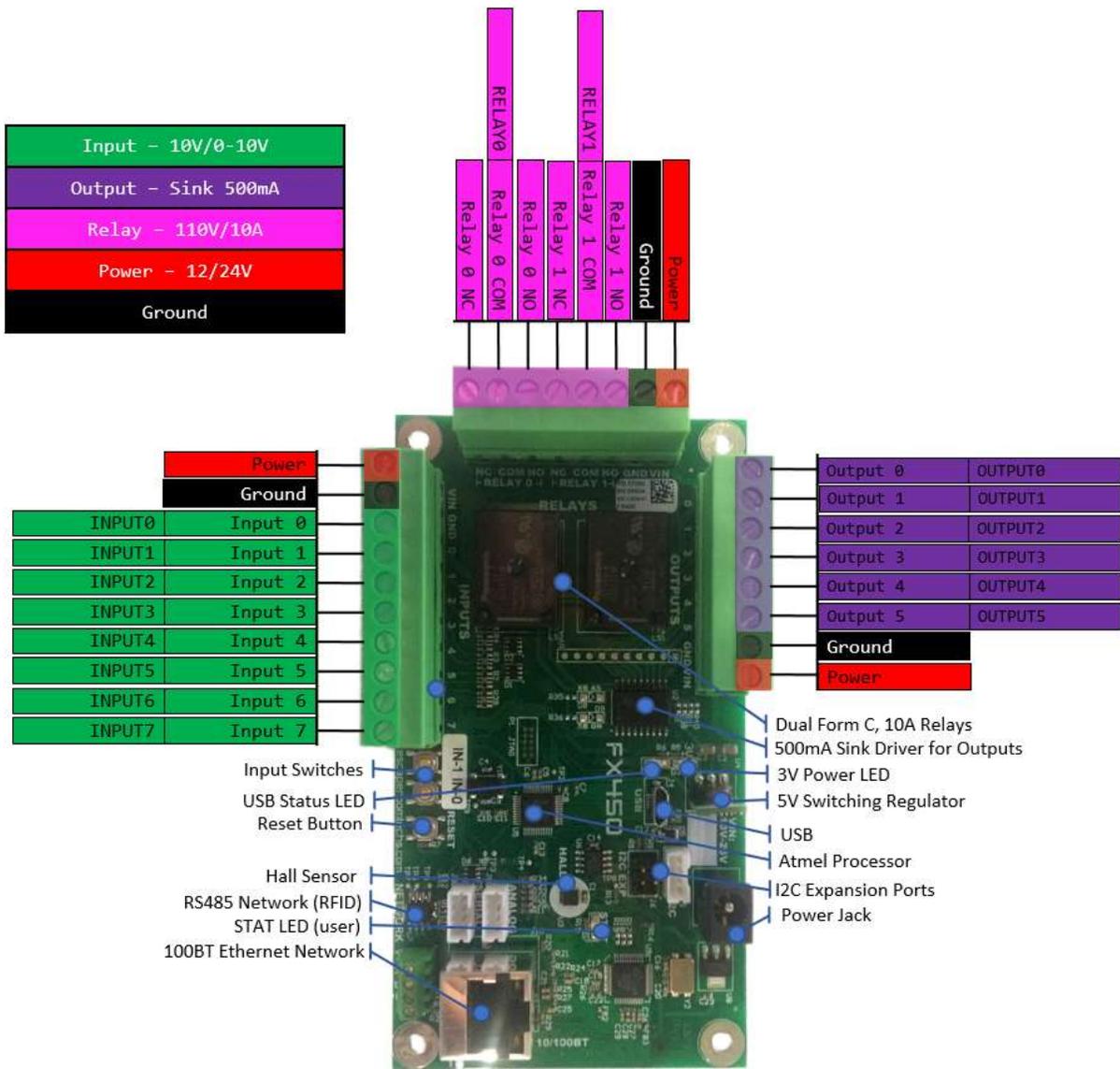
The FX450 is an Arduino compatible embedded controller designed for the Escape Room industry and other embedded control applications.

The controller integrates an Arduino compatible controller (ATSAMD21G18A) with industry standard I/O interfaces, 10/100 Ethernet Interface, and other peripherals like relays and hall sensors. All the I/O is designed to connect to real world buttons and eliminate or reduce external interfaces typically found in 'maker type' projects.

Rev 0



Rev 1



## Electrical Specifications

<b>Processor</b>	ATSAMD21G18A: 48MHz, 256KB Flash, 32KB SRAM
<b>Arduino Compatibility</b>	Adafruit Feather M0
<b>Ethernet</b>	Standard RJ-45 10/100 ethernet networking.
<b>Inputs</b>	6 Digital Inputs (Rev 0) 8 Digital Inputs (Rev 1) 0 – 10V Analog or 0 – 26V Digital ESD Protected 30KV HBM 2KOhm Pulldowns
<b>Outputs</b>	6 Digital Outputs 500mA max per output, 2500mA max all Optional pullup resistors for all outputs.
<b>Relays</b>	2 Relay Outputs, 120V, 10A Form C
<b>Hall Sensor</b>	Linear analog hall sensor. (Rev 0) 3D digital hall sensor (Rev 1)
<b>RS-485 (optional)</b>	A RS-485 port is available to provide a serial communication interface upon request.
<b>Expansion</b>	I <sup>2</sup> C expansion header for FX60 and other I <sup>2</sup> C peripherals.
<b>Input Voltage</b>	10 – 26V DC



## Initial Setup

Welcome! You have just received the Anidea Engineering FX450 Arduino Compatible Controller. To get started, there are a few key things to do:

1. Download and install the Arduino IDE <https://www.arduino.cc/en/main/software> if you don't have it installed already.
2. Navigate to **File -> Preferences**. Add this URL to the board manager URLs textbox:  
[https://anidea.github.io/aeifx/package\\_anidea\\_index.json](https://anidea.github.io/aeifx/package_anidea_index.json)



3. Load the board settings by selecting **Tools -> Board -> Boards Manager**. In the **Type** dropdown box choose **Contributed**. Click **Install** for the FX 400 package.



4. You must also install the Arduino SAMD package. In the **Type** dropdown box choose **Arduino**. Click **Install** for the Arduino SAMD package.



5. Go to **Tools -> Board** and select FX450 towards the bottom.
6. Plug in the micro USB connector to the FX450.
  - a. Drivers are required and may take time to load. If the drivers fail to install, you can manually install the drivers from [here](#).
7. The board will power itself from USB, however with higher current draws it is necessary to provide power to the board via the VIN and GND pins on header J1, J2, or J3.
8. Go to **Tools -> Port -> COMx** where x is the proper COM port the controller is on. This is typically the last port listed.
9. Start programming!
  - a. Download our game framework from <https://github.com/anidea/Anidea-FX-Framework>. It has multiple games for free and integration into Escape Room Manager, Clue Control, Houdini MC, and MQTT.
  - b. Or load your own code into the editor and happy programming! The board is designed to operate just like a normal Arduino board. The FX450.h file has useful defines for addressing your inputs and outputs. Note that the input and output logic may be reversed.

## Arduino Mapping

The inputs can be configured for digital or analog input.

In the 'setup()' portion of your program, configure the pinMode() for each pin. The use the digitalWrite(), digitalRead(), and analogRead() functions to get your use your signals. Please reference <https://www.arduino.cc/en/Reference/HomePage> for definitions of these functions.

Do not bother to use the pullups on the processor. All inputs are already pulled down on the board. Power must be supplied to them (over 10V) to turn the input on. The inputs are also ESD protected.

```
//FX450 Header
const int RELAY0 = 2;
const int RELAY1 = 3;

const int OUTPUT0 = 4;
const int OUTPUT1 = 5;
const int OUTPUT2 = 6;
const int OUTPUT3 = 7;
const int OUTPUT4 = 11;
const int OUTPUT5 = 12;

const int INPUT0 = A0;
const int INPUT1 = A1;
const int INPUT2 = A2;
const int INPUT3 = A3;
const int INPUT4 = A4;
const int INPUT5 = A5;

const int RS485_ENABLE = 1;
const int HALL = 8;
const int ANALOG_IN = 9;
const int WIZ_CS = 10;
const int LED = 13;
```

### Programming

Please check out our GitHub for sample programming games, projects, and frameworks.

<https://github.com/anidea>

### Escape Game Framework

There is a framework available that allows you to combine different games with different management software. There are several games included with the framework and instructions on how to create your own. Any game is compatible with any management software which currently includes Escape Room Manager, ClueControl, Houdini MC, and MQTT.

### Games

Some of the games that are included by default as options in the framework are listed below:

**Simple Game** – Basic game intended to show how a game is made using the framework.

**Input Sequence** – Solves upon a specific sequence of inputs being entered. The sequence is programmable on the board itself using a magnet.

**Sequence Detect (Simon Says)** – Shows the user a sequence of lights and solves when the user follows that sequence on the inputs. The sequence is programmable on the board itself using a magnet.

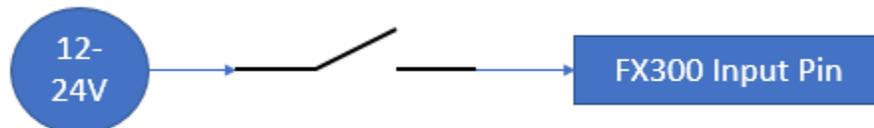
**Six Wire** – Solves when the six wires attached to the outputs are attached to the corresponding inputs. Will not solve if any of the wires are disconnected or connected to the wrong counterpart.

**Room** – This game is intended for using the controller to operate a whole room. It has two inputs that control the state of the game and two outputs to reflect it. It can operate four props by monitoring their inputs and turning on the outputs. The management software can then monitor these individually and reset or force solve them.

## Hardware

### Inputs

The inputs require voltage to be triggered. There are internal pull downs. Provide at least 10V to an input to trigger it. Max voltage is 26V. For an analog input, there is 2K of resistance to ground at the input. If you have a low impedance voltage source (like a powered device), you can connect it directly to the input and use the input as an analog input. If you have a higher impedance voltage source (as in a potentiometer), set the value accordingly. A 10K potentiometer should work well in many cases.



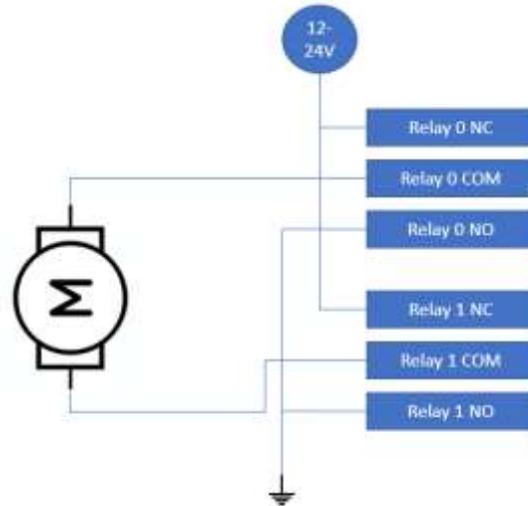
### Outputs

The digital outputs are designed to ground up to 500mA each. Connect lights and devices between the power source and the output pin. Each output pin has an optional through hole resistor at R30 to R35. This is useful for when you need both sides of an output to be driven, such as when scanning a grid of buttons or a patch game (in cases where there may not be a load present or you want to drive an input, which requires a voltage source, not a sink).



## Relays

There are two great uses for the relays. They can be used to drive AC outputs (please be careful and ask for help if you don't know what you are doing), solenoids, motors, or linear actuators. Here is an example of a bi-directional control of a motor or linear actuator.

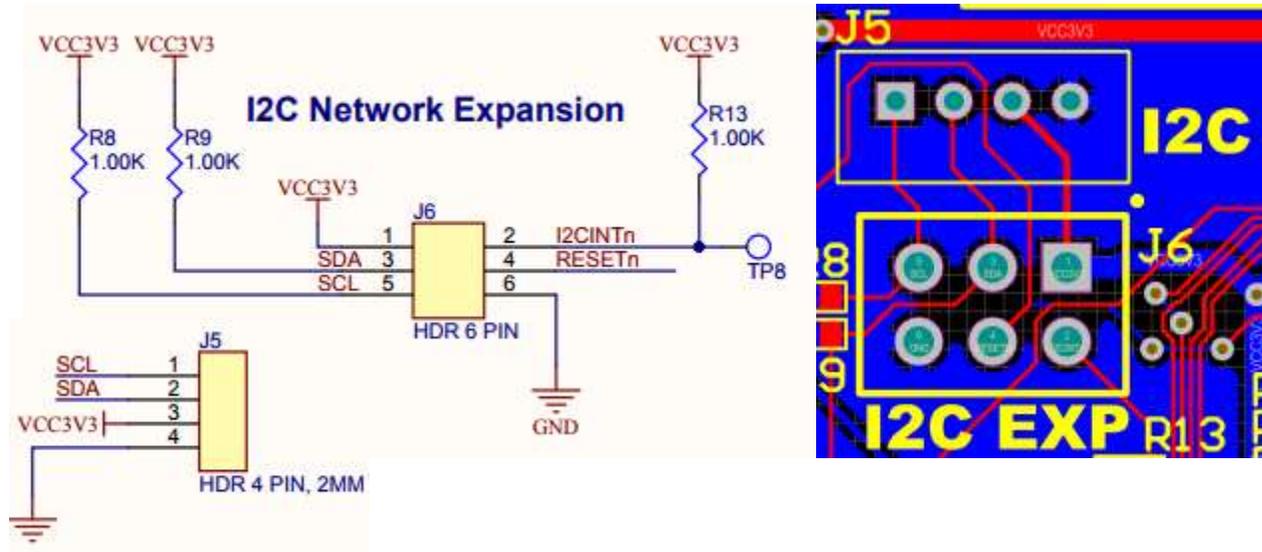


## Hall Sensor

A digital hall sensor is incorporated into the controller. It is on the I2C bus.e

## I2C Expansion

I2C expansion ports (J5 and J6) are available on the board. A 6 pin (2x3, .1" spaced header) ribbon cable can be used to connect the FX450 to expansion boards. An FX60 expansion board is available to add up to 32 digital inputs or outputs with relays and RS-232/485 serial ports.

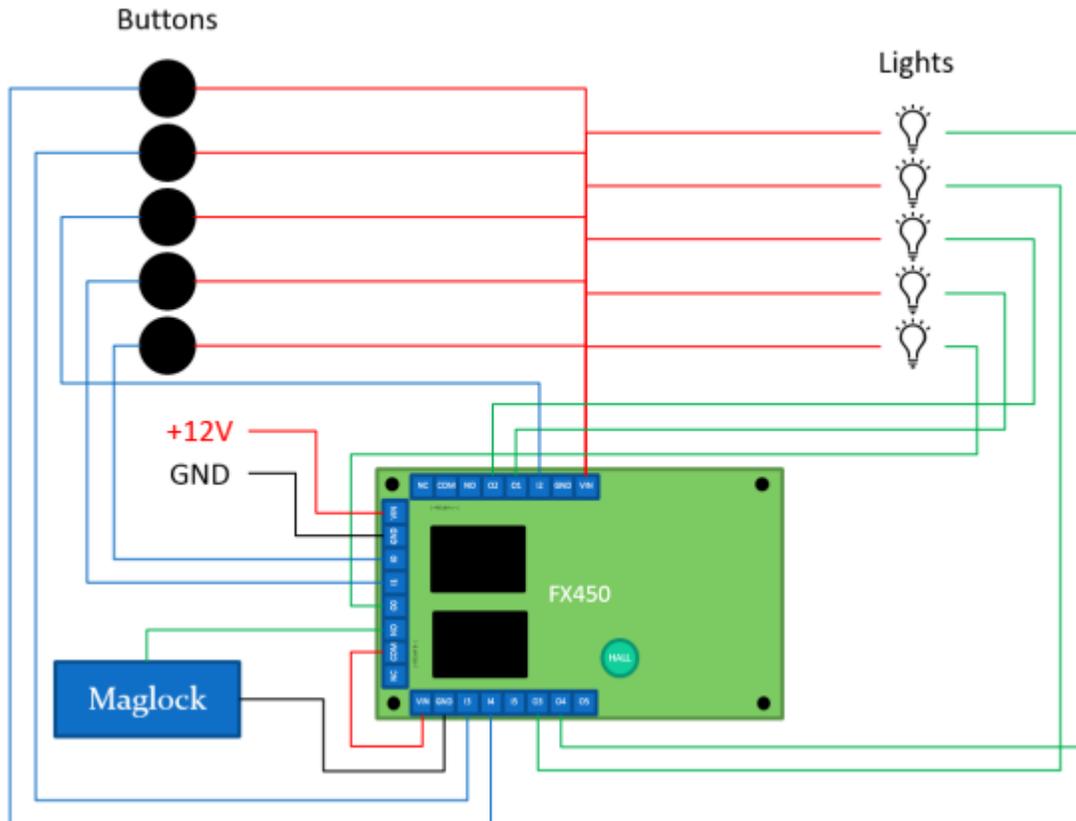


## Ethernet

The WIZ5500 chip is incorporated onto the FX450 board to provide 10/100 Base-T Ethernet capability. This chip utilizes the SPI port on the main processor. Be sure to use the Ethernet2 library in Arduino studio. This is the same chip provided on the Arduino Ethernet Shield.

### Sample Prop Wiring (Sequence Detect)

The beauty of the FX450 is you don't spend your time dealing with 5V signals and from a typical Arduino board. You get protected inputs and outputs capable of driving loads directly. Here is a sample prop wiring of our Sequence Detect game. To program the board to run this game download the framework from our GitHub page and uncomment the lines for the Sequence Game as well as for the management software you are using. The output here is wired through the relay to control a maglock.



## Contact

Web: [www.escaperoomtechs.com](http://www.escaperoomtechs.com)

Email: [support@escaperoomtechs.com](mailto:support@escaperoomtechs.com)

Phone: 561-708-0007

## References

Relay: Panasonic JS1-5V-F <http://www.digikey.com/products/en?keywords=255-2064-ND>

Terminal Blocks: Phoenix Contact / Onshore Tech

(Header OSTOQ085450): <https://www.digikey.com/product-detail/en/on-shore-technology-inc/OSTOQ085450/ED2849-ND/1588261>

(Terminals OSTTS08515B) <https://www.digikey.com/product-detail/en/on-shore-technology-inc/OSTTS08515B/ED2871-ND/1588651>

Regulator: SPX1117M3-L-3-3 <https://www.digikey.com/product-detail/en/exar-corporation/SPX1117M3-L-3-3-TR/1016-1848-1-ND/3586565>

Current Driver: ULN2803A <https://www.mouser.com/productdetail/texas-instruments/uln2803adwg4?q=sGAepiMZZMsleRsl8taJigEOeipnzW9X>

Hall Sensor: AH8500 <https://www.digikey.com/product-detail/en/diodes-incorporated/AH8500-FDC-7/AH8500-FDC-7DICT-ND/5027702>

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