Arduino DCC++ DCC++EX DCC++EX WiFi

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Typical DCC

Cab

Sends input

NMRA
Decoder-equipped locomotive responds

DCC

Command station

Proprietary

Proprietary

NMRA
Digital signal

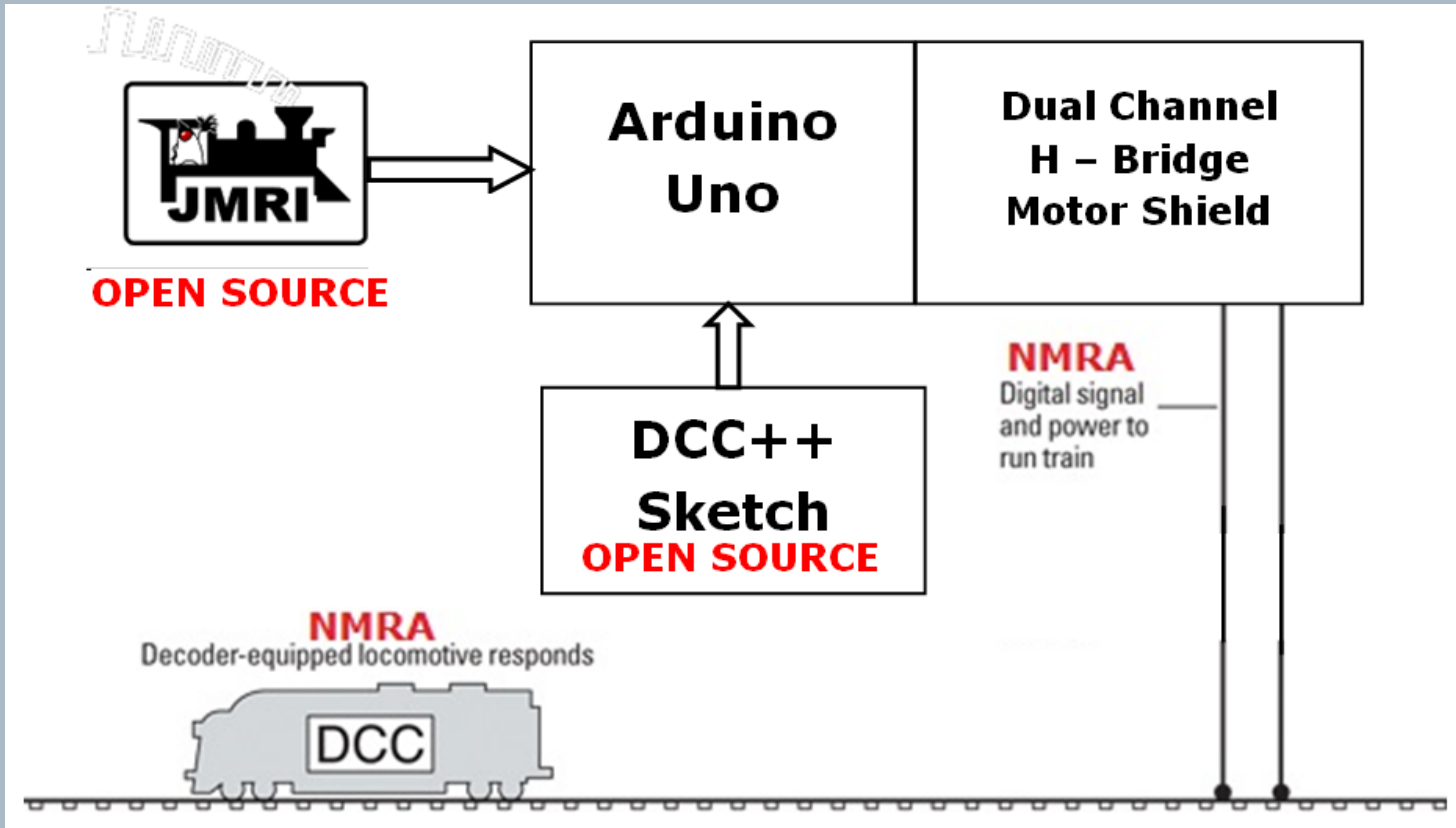Booster and power supply

NMRA
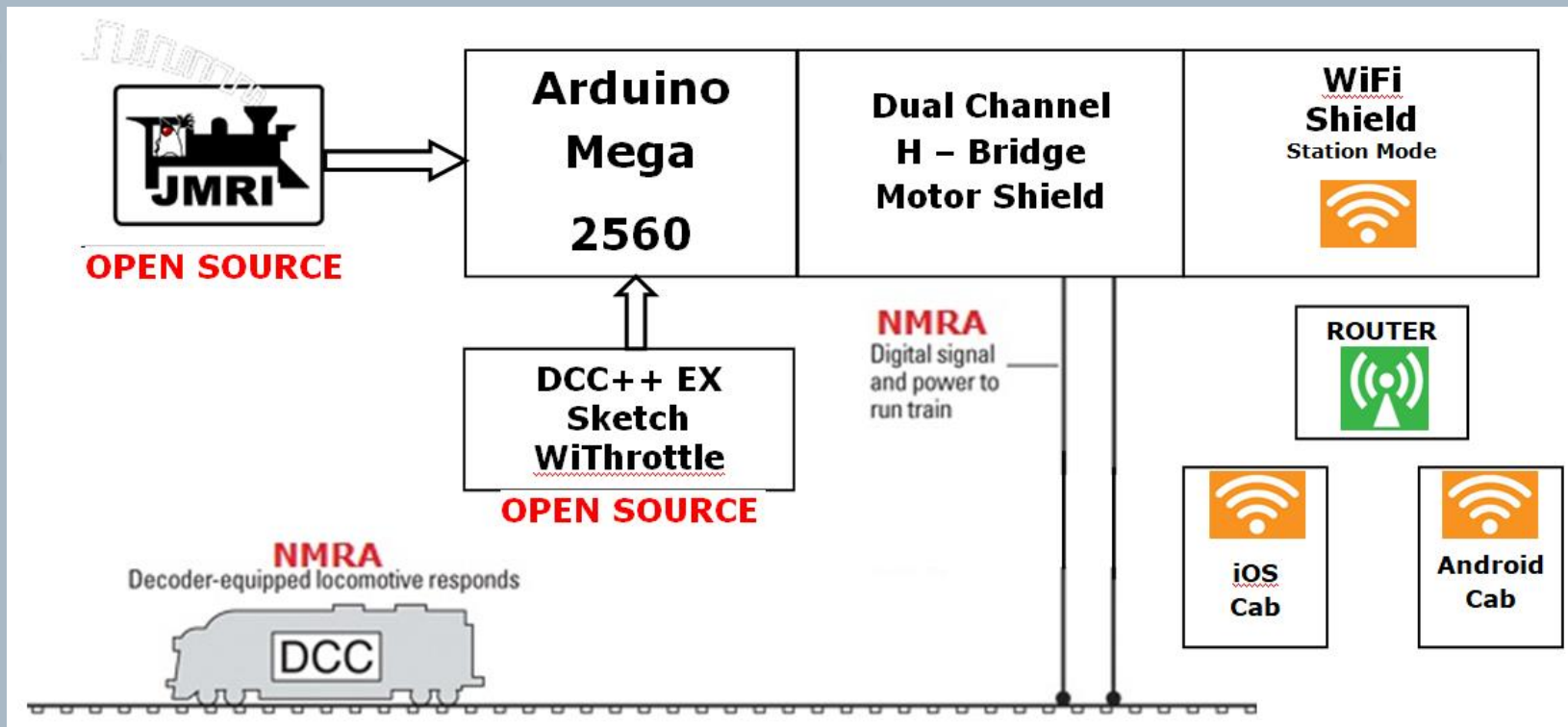Digital signal and power to run train

fppt.com
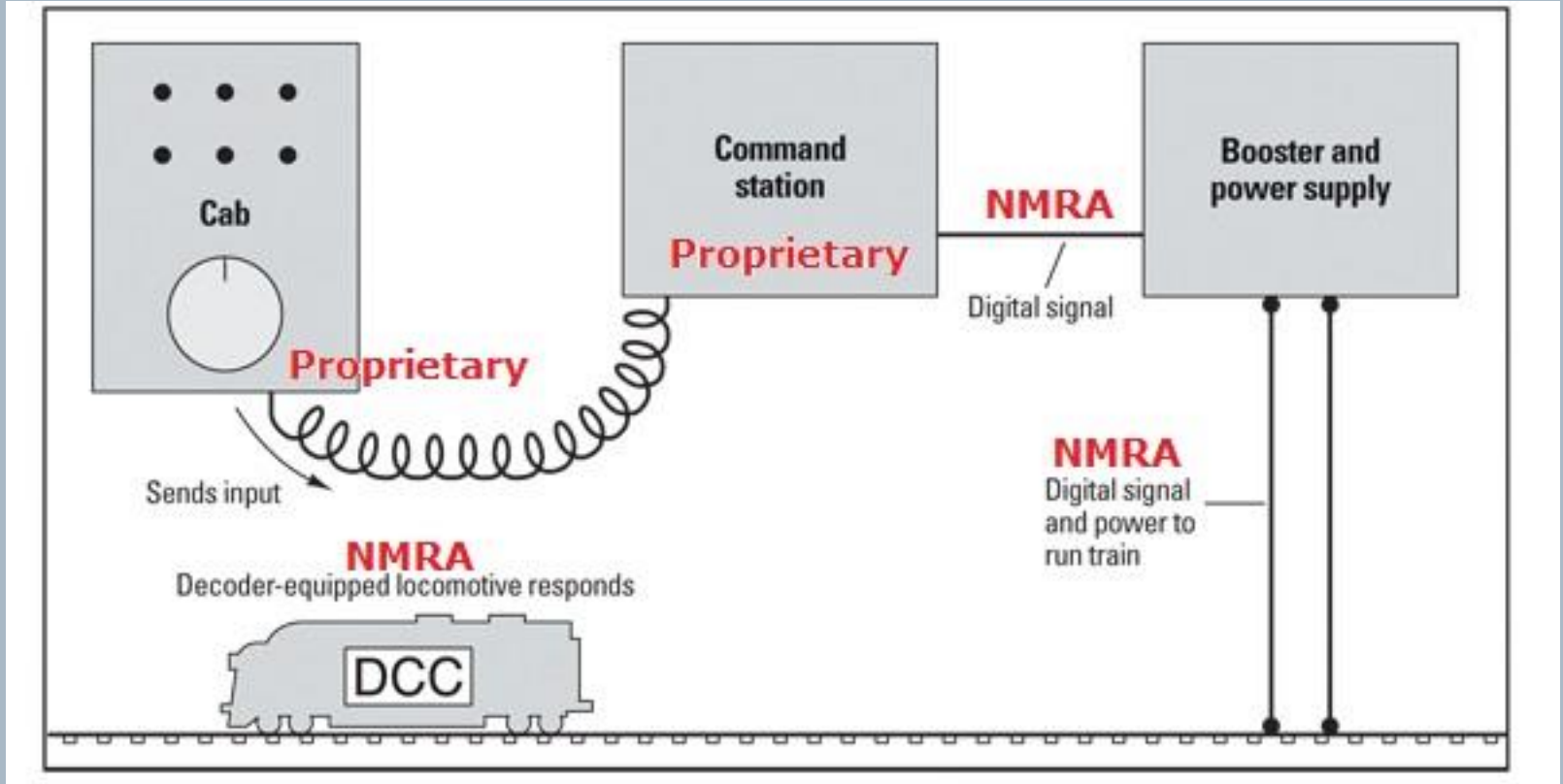
Major DCC Wired Protocols

- Digitrax – LocoNet
- Lenz – XpressNet
- North Coast Engineering (NCE) – Cab Bus
- EasyDCC – CabControl
- Model Rectifier Corporation (MRC) – Prodigy

(Many, many more)

Typical DCC++

JMRI
OPEN SOURCE

Arduino
Uno

Dual Channel
H – Bridge
Motor Shield

DCC++
Sketch
OPEN SOURCE

NMRA
Digital signal
and power to
run train

NMRA
Decoder-equipped locomotive responds

DCC

fppt.com

Typical DCC++EX

Throttles
for PC

https://dcc-ex.com/

https://www.jmri.org/

Smart Throttles

- Engine Driver - Android
- DCCpp Cab - Android
- Cab Engineer: DCC Throttle - Android
- DigiTrains Pro - Android
- RtDrive DCC++ - Android
- WiThrottle – iOS
- Lococontrol – iOS
- SRCP Client – iOS
- Train Driver - iOS

DXX++EX Features

- Fully compliant with NMRA DCC standards
- 2-byte and 4-byte locomotive addressing
- Simultaneous control of multiple locomotives
- 128-step speed control
- Control all cab functions F0-F28
- Activate/de-activate all accessory function addresses 0-2048
- Programming on the Programming Track
    - Write configuration variable bytes
    - Set/clear specific configuration variable bits
    - Read configuration variable bytes
- Programming on the Main Operations Track
    - Write configuration variable bytes
    - Set/clear specific configuration variable bits
- Control DCC turnouts and sensors
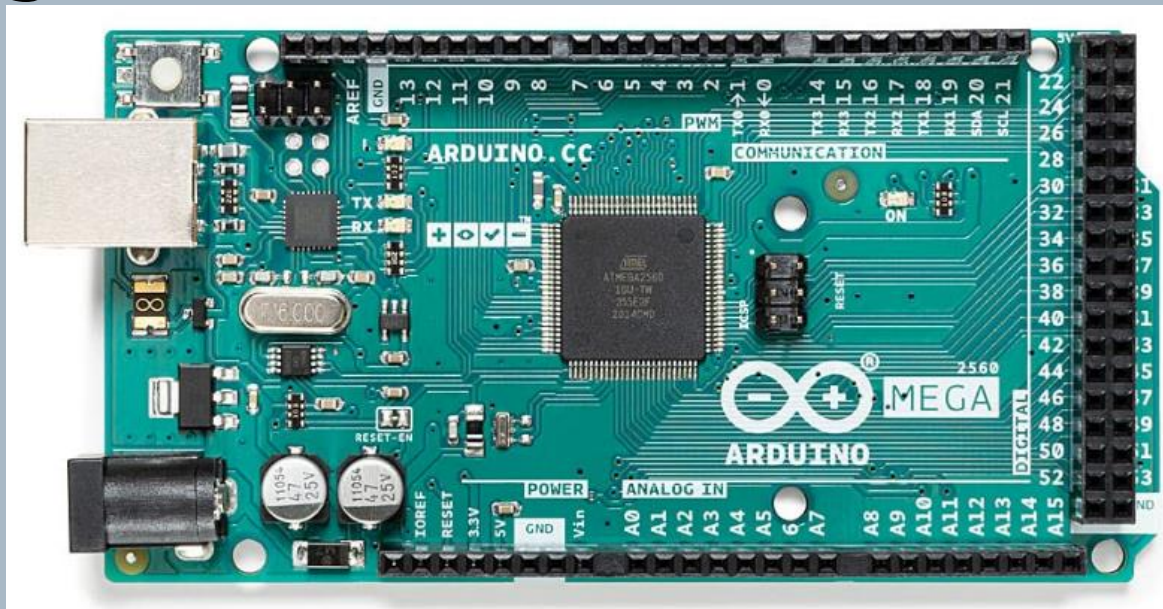- **Directly access and control Arduino IO pins for accessory functions and sensors**

fppt.com

Hardware DCC++

Arduino UNO R3 can do it but uses almost all memory
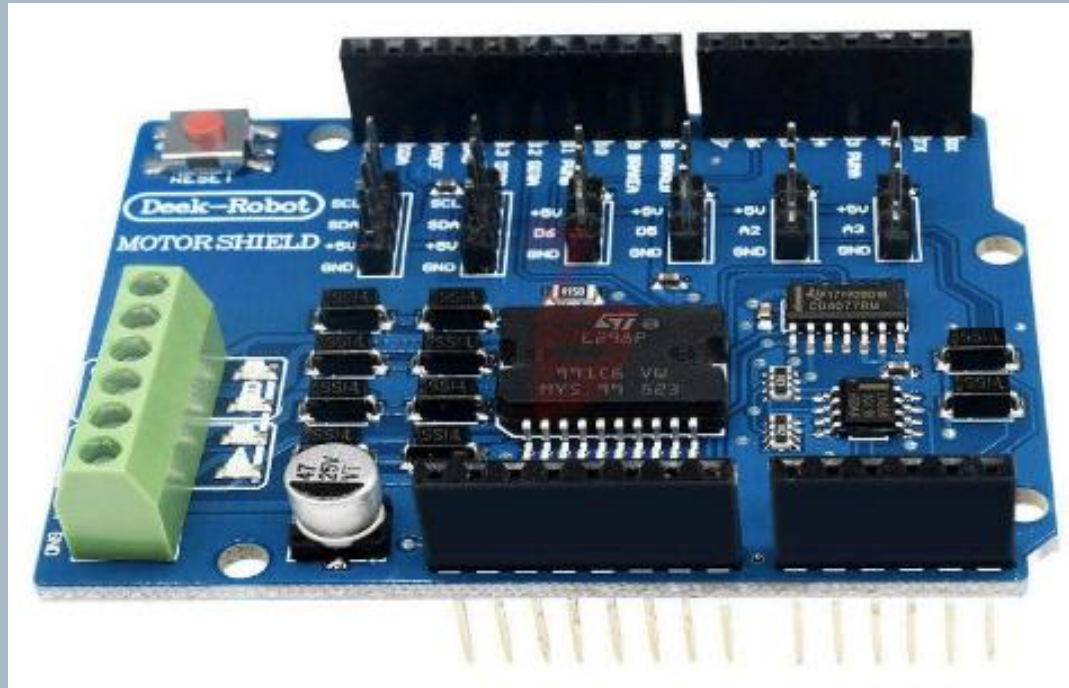
Hardware DCC++EX

Arduino Mega 2560 has plenty of memory, additional I/O pins and registers for WiFi - $20.00
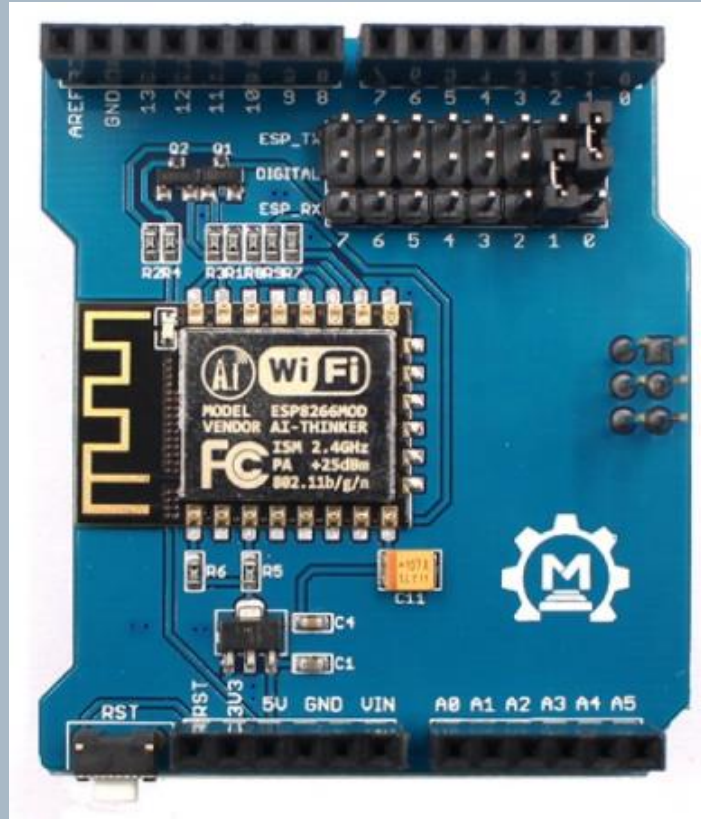
Hardware DCC++EX

Deek Robot L298P 2-channel, 2A

H-Bridge Motor Shield - $6

Hardware DCC++EX

Makerfabs ESP8266 WiFi Shield

$9

Hardware DCC++EX

Power Supplies

9VDC 1A Arduino Compatible Power Supply Adapter 110V AC 5.5 x 2.1mm Tip Positive Part#LJH -186
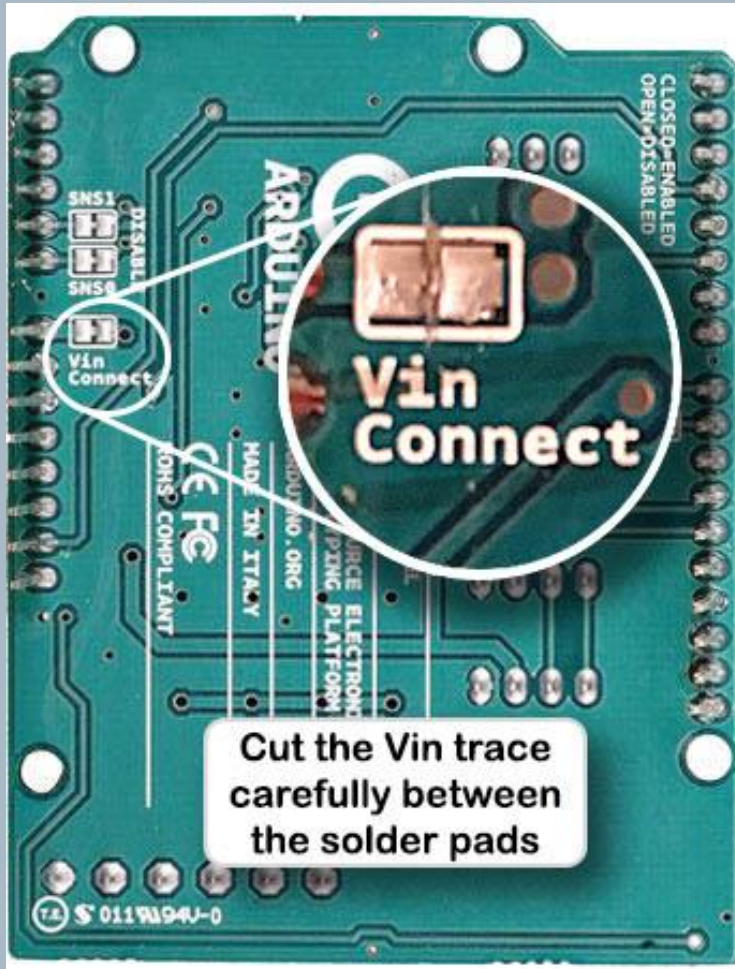
$7.50 for Arduino board

LEDMO 12V 5A 60W LED Power Supply Adapter AC 100-240V to DC 12V Transformers US Plug LED Driver for 12V LED Light and Small Household Electronics

$13 for Motor shield

fppt.com

WARNING

- Motor shield operates at 12-30VDC.

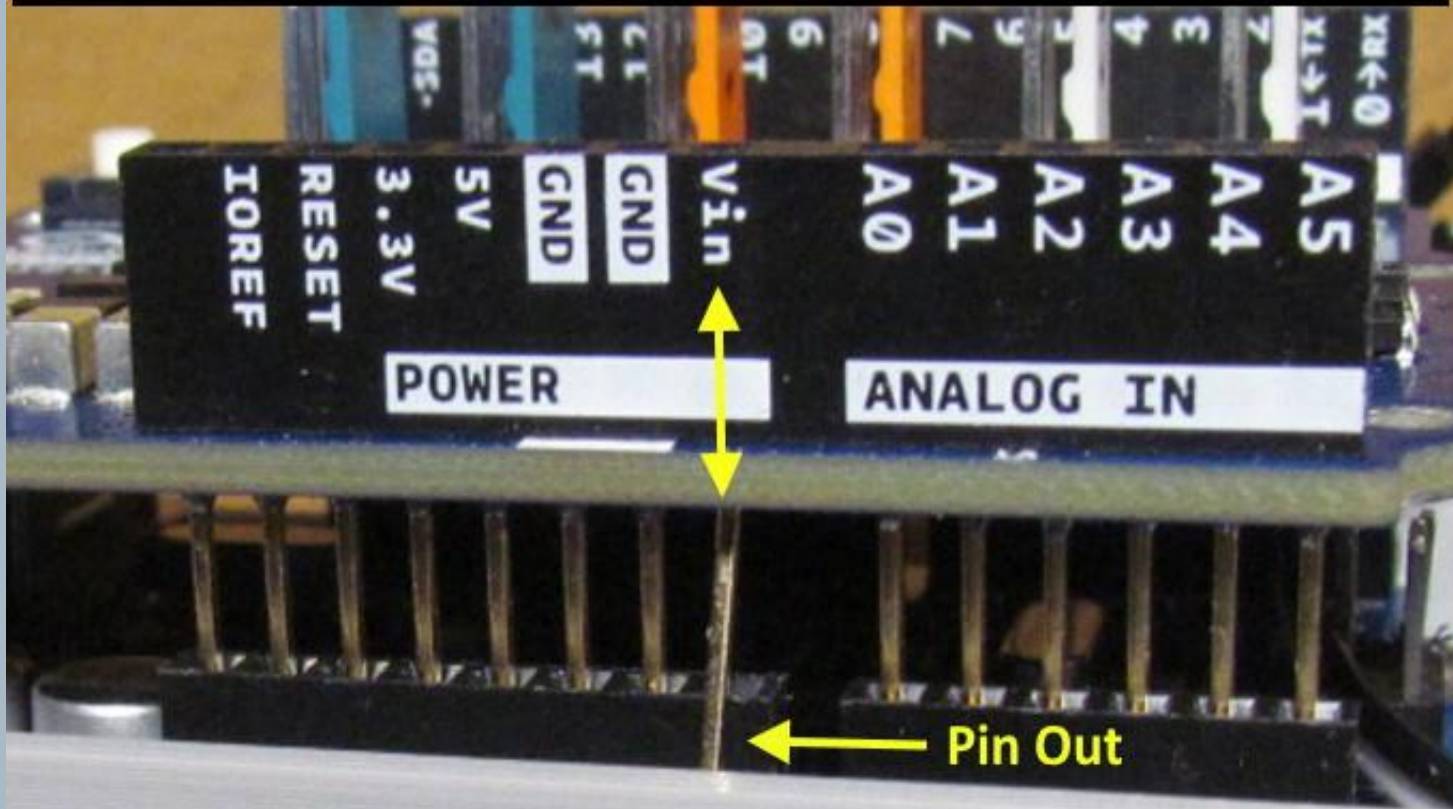- Arduino voltage is 7-12VDC

- Max WiFi shield is 5VDC

We **MUST** isolate Motor Shield voltage from feed through Vin pin

fppt.com

Cut the Motor Shield Vin connecting trace.

Or you can bend the Motor Shield Vin out of the way

Motor Shield-Top Board -------------- Arduino-Bottom Board

POWER

IOREF RESET 3.3V 5V GND GND Vin

ANALOG IN

A0 A1 A2 A3 A4 A5

Pin Out

Bend Vin Pin bent out so it doesn't go into bottom socket.

fppt.com

Put it all together

- **Arduino needs to communicate with the WiFi Throttle or USB connected Throttle fast enough to interrupt power for a short circuit.**

- Choose **115,200** baud for all comms and monitors

Mega ⬌ WiFi

- Arduino is Full Duplex – simultaneous asynchronous Tx and Rx per channel.

- WiFi shield comms is Half Duplex – Tx or Rx on a channel BUT it has eight channels. Use Tx and Rx from different channels.

Hardware Assembly

- Arduino Mega 2560 [9 VDC supply]

  +

- Motor Shield [12 VDC supply]

  +

- WiFi Shield
  - Connect WiFi Tx3 to Mega Rx1
  - Connect WiFi Rx1 to Mega Tx1

Assembly

Software

- https://dcc-ex.com/download/ex-commandstation.html#ex-installer
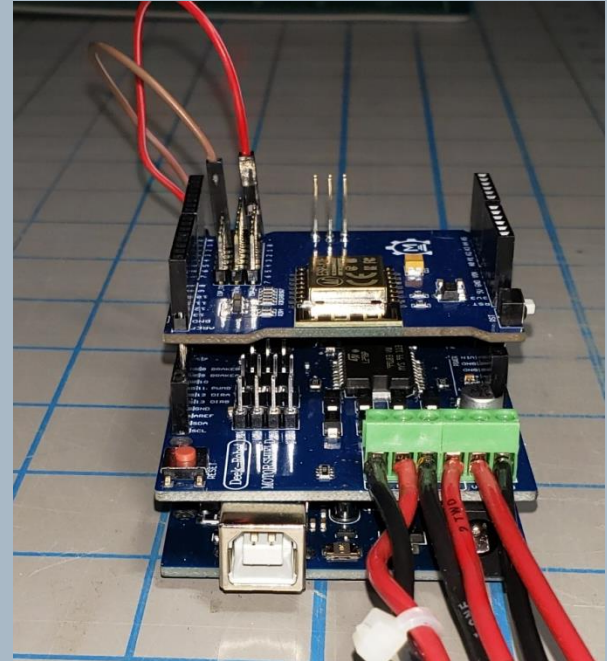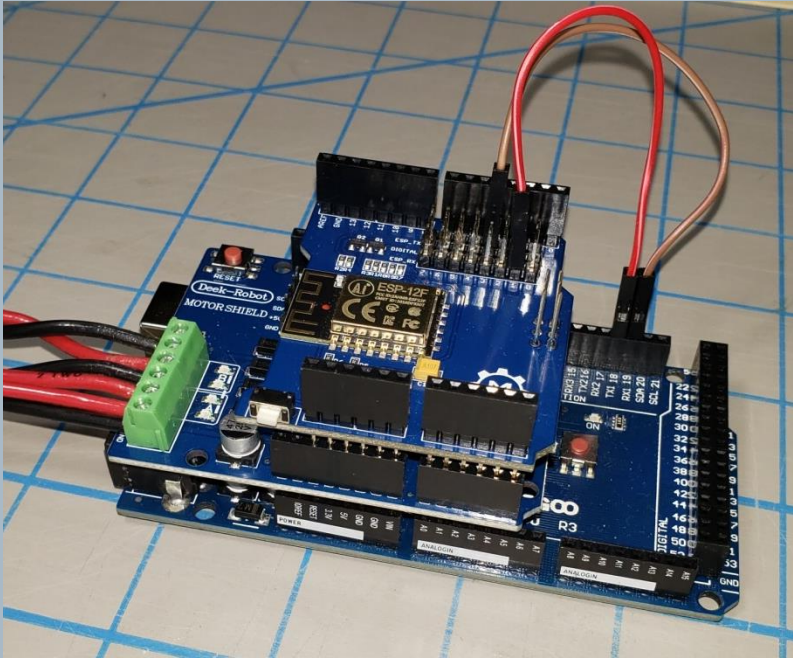
- Go to dcc-ex.com and read all about it.

Let's Give It a Try

Atlas Train Master Gold Lackawana #850 from 2003
QSI DCC + Sound Decoder.

Questions