



Introduction to **DCC-EX**

-- Martin Wade

Adopted from M Steve Todd's presentation
to ZoomTRAK, Jan 13, 2024

Goals

- 1) Provide Overview of DCC-EX as a DCC Command Station.
- 2) Demo a hardware build and software install.
- 3) Run DCC Command Station with Engine Driver

It's all easier than you think.



What is DCC-EX?

- DCC Command Station
- 5 amp Main channel plus 2nd Prog Channel
- DC options and can add more channels.

→ My words

Low-cost Hardware and free software (Open Source)

→ Their words

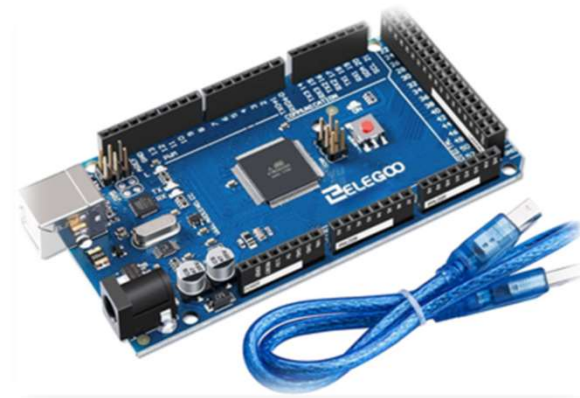
DCC-EX is a team of dedicated enthusiasts producing open source *DCC & DC solutions* for you to run your complete model railroad layout. Our easy to use, do-it-yourself, affordable products are based on off-the-shelf Arduino technology and are supported by numerous third-party hardware and apps like JMRI, Engine Driver, WiThrottle, Rocrail and more.



Arduino Mega

Arduino is an inexpensive open-source electronics platform

This is the Computer of the DCC Station



DCC EX Motor Shield

Motor Shield

plugs into Arduino

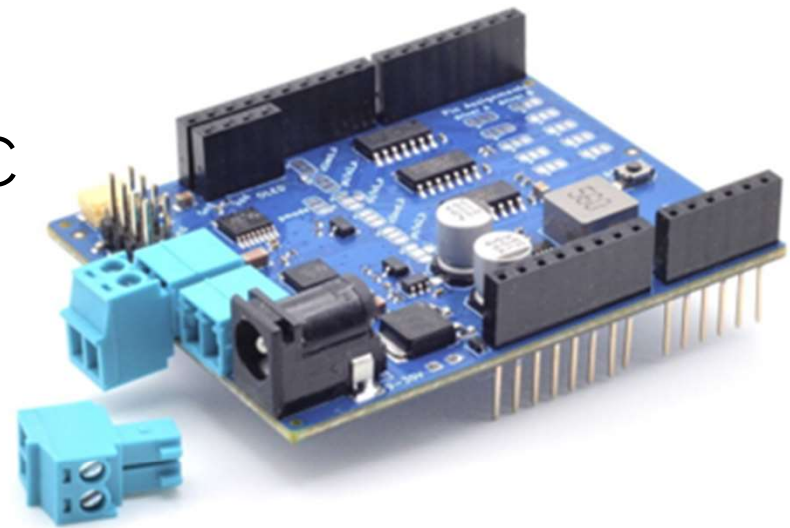
Creates DCC signal OR DC output

DCC EX Shield

Designed for Trains

No customization needed

5Amp per Channel + add Features



Wifi Shield

Wifi Shield

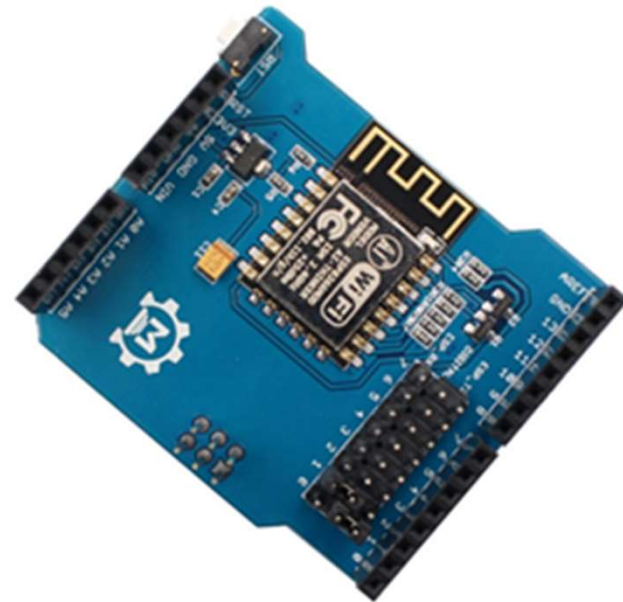
Connect to your network

Create its own Access Point

DCC EX Store

Preloaded with correct Firmware

Comes with 2 cables needed



Basic Steps to build one

- 1) Get some stuff from list on web page
- 2) Plug stuff together (no soldering!)
- 3) Download and install software
- 4) Connect to layout and power
- 5) Run trains from phone!



1) Get the stuff

Great Website!

- Open dcc-ex.com
 - Go to [Getting Started](#)
 - Click [Purchasing Parts](#)
- Links to vendor pages!

PRODUCTS

EX-CommandStation

Getting Started

Purchasing Parts

Initial Assembly

Adding WiFi

Install the Software

Choosing a Throttle (Controller)

Test Your Setup

Troubleshooting

ESP8266 (WiFi Boards) - AT Version

Solutions

Options

Controlling Accessories

Throttle

Shield8874

Spectator

Box

EX-COMMANDSTATION ADD-ONS

What you need to Acquire

Hardware

You will need to find or purchase:

1. a supported **Arduino board**

We recommend the [Elegoo Mega 2560](#)



Amazon

2. a supported **Motor Driver**

We recommend either our own [EX-MotorShield8874](#) or [Arduino Motor Shield Rev3](#)



DCC EX Store

3. a supported **WiFi shield**

We recommend the [EX-WiFi Shield 8266](#) (aka [Makerfab Shield](#)) or from [Makerfabs](#)



DCC EX Store

4. Two (2) Male to Female **Jumpers leads**

size based on Scale



Amazon

5. a 9-14v DC **power supply** for the motor shield

We recommend [12V 5Amp Power Supply for the Track](#)

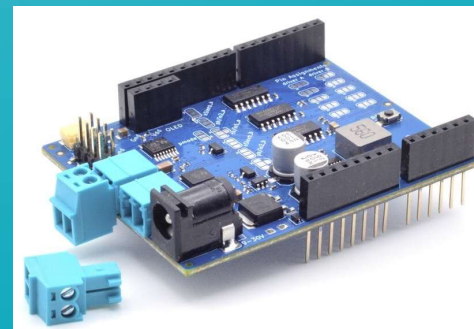
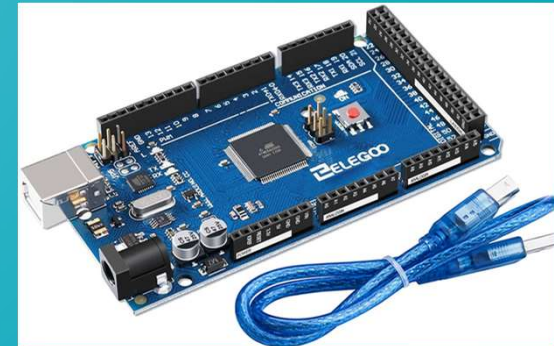
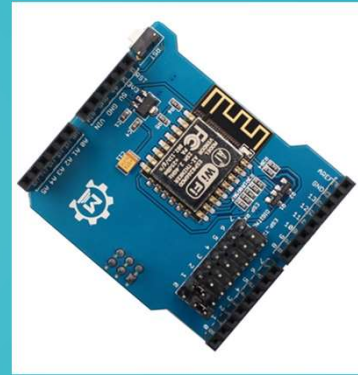
6. a 2.5mm x 5.5mm Female DC Plug to Screw Terminal (or **but recommended**) to connect the motor shield power s

Standard parts, DIY assembly

- Elegoo Mega 2560 = \$21
- DCC EX Motor Shield = \$40
- DCC EX Store WiFi Shield = \$14
- 15V 3A Power Supply = \$15
- LCD Display 20x4 = \$5

Total = \$95

NO ~~Note: WiFi Shield may need flashing to v1.7.4~~

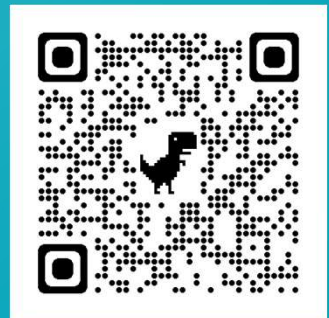


Amazon Parts



DCC-EX

 <p>\$17.99</p> <p>Add to Cart</p>	 <p>\$13.39</p> <p>16v 4.5a</p> <p>Add to Cart</p>	 <p>\$13.99</p> <p>14v 3a</p> <p>Add to Cart</p>	 <p>\$20.99</p> <p>Add to Cart</p>
 <p>\$15.29</p> <p>Add to Cart</p>	 <p>\$14.99</p> <p>Add to Cart</p>	 <p>\$15.99</p> <p>Add to Cart</p>	



https://www.amazon.com/hz/wishlist/ls/2YME45G7QT3UQ?ref_=wl_share

DCC EX Store Parts



DCC-EX



EX-MotorShield8874

\$39.98

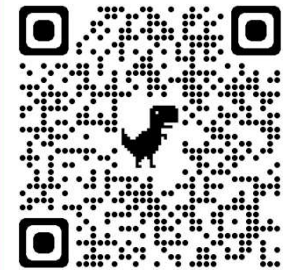


EX-WiFiShield 8266

\$13.95



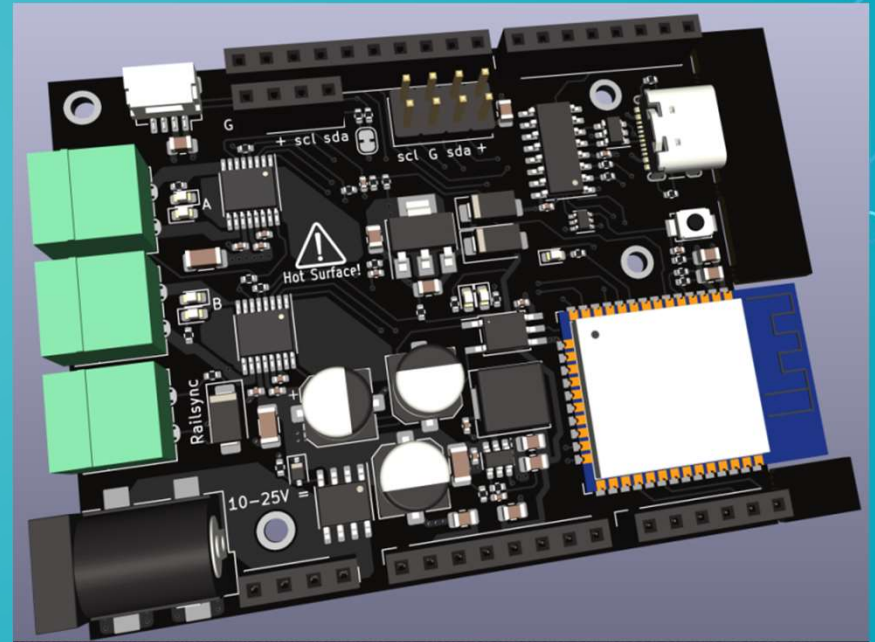
<https://store.dcc-ex.com/>



The Future!

- EX-CommandStation ESP32 = \$70
- 15V 3A Power Supply = \$13

Total = \$83



2) Plug stuff together

Assemble it

- Go to Initial Assembly
- Add Motor Shield
- Add Wifi Shield

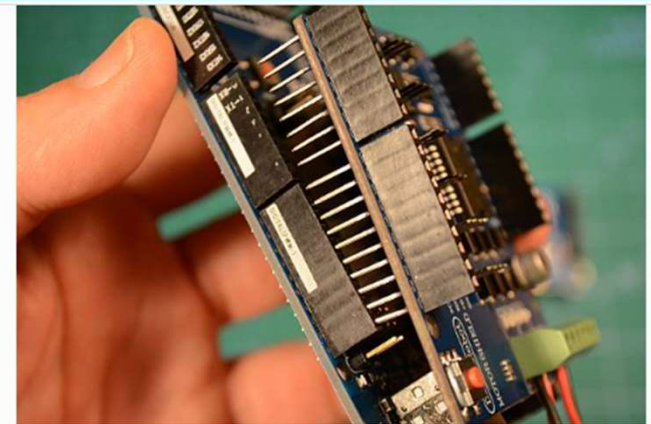
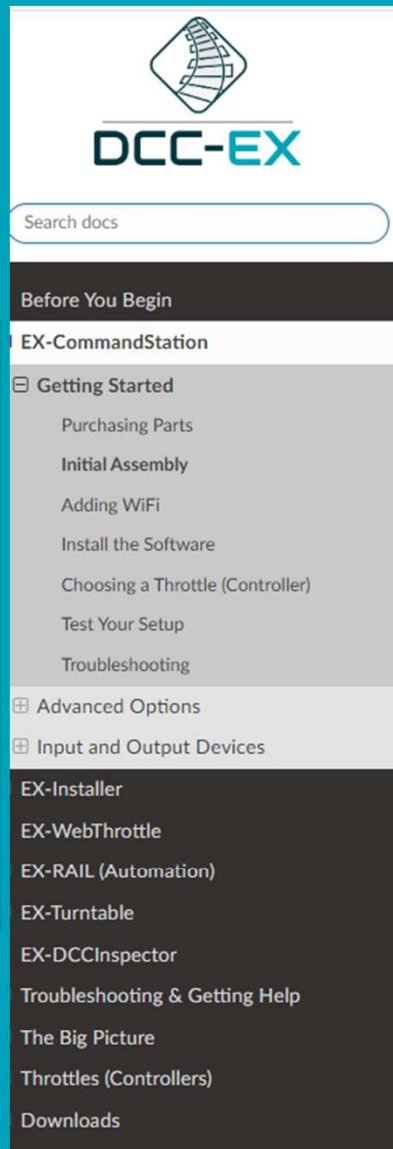


Figure 6 Line up left side first

- c. Just align them and start to push them in but don't push them all the way in.
Use your fingers to try to push the pins to get them to all go into the header.

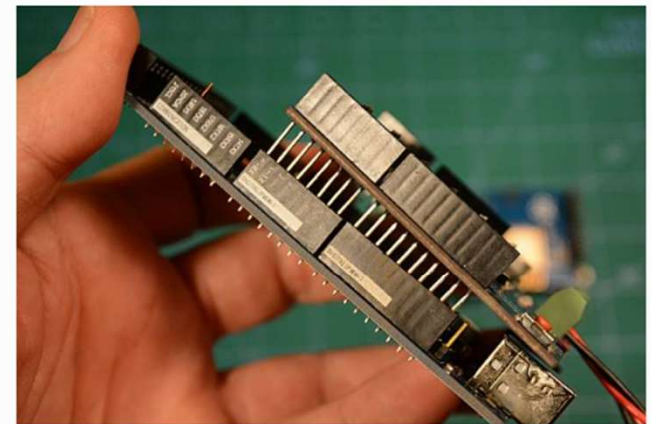


Figure 7 Get all the pins started

- d. Do the same on the other side.
Get all the pins aligned and start to press gently to get them into the header.

3) Install Software

Software

- Go to [Install the Software](#)
- Download and Run EX-Installer
- Load to Arduino

Requirements (for installing)

- a Windows, Linux or MacOS X Computer
- an **EX-CommandStation** (Arduino Mega/Uno + Motor shield and optional WiFi shield)
- a USB cable to connect your computer to the Microcontroller

1. Getting Ready

Instruction for Windows, Mac OS X, and Linux (including the Raspberry Pi)

Connect your **EX-CommandStation** hardware to your computer via USB.

Make sure your USB Cable is connected from your computer to the EX-CommandStation. Make sure no other program (like the Arduino IDE) are using the same USB port.

2. Download and Run EX-Installer

- Download the [EX-Installer](#) app.
- For Microsoft Windows:
 - Open the Windows *File Manager*
 - Find the folder in which the **EX-Installer-Win64.exe** or **EX-Installer-Win32.exe** was saved.
Generally this will default to downloading to the *downloads* folder but your browser may be configured differently.
 - Run **EX-Installer-Win64.exe** or **EX-Installer-Win32.exe** or **EX-Installer-Win32.exe**

USB Cable

Make sure your USB Cable is connected from your computer to the **EX-CommandStation**. Make sure no other programs (like the Arduino IDE) are using the same USB port.

Warning

Antivirus Software

You may need to turn off your antivirus software before you try to install. Sometimes our software gets blocked by antivirus apps. If you see any errors on the screen, this is usually the issue.



DCC-EX

Configure Software

EX-Installer

- Multi-page wizard
 - Note the tabs
 - Lots of options!
 - Device Monitor
 - Live demo
- (if time permits)*



DCC-EX

The screenshot shows the 'EX-Installer' application window. The title bar says 'EX-Installer'. The main window has a header with the 'DCC-EX EX-CommandStation' logo and the title 'Install EX-CommandStation'. Below the header, there is a paragraph: 'Select the appropriate options on this page to suit the hardware devices you are using with your EX-CommandStation device.' and another paragraph: 'If you are enabling WiFi or configuring TrackManager, enable the appropriate option and navigate to the appropriate tab to configure the relevant options.' There are three tabs: 'General', 'WiFi Options', and 'TrackManager Config'. The 'General' tab is active. It contains a list of toggle switches: 'I have a display', 'I have WiFi', 'I have ethernet', 'Configure TrackManager', 'Start with power on', 'Override current limit', 'Create myAutomation.h', and 'Advanced Config'. To the right of these toggles, there is a dropdown menu for 'Select your motor driver:' and a section for 'Select display type (if in use):' with four radio button options: 'LCD 16 columns x 2 rows' (selected), 'LCD 20 columns x 4 rows', 'OLED 128 x 32', and 'OLED 128 x 64'. At the bottom of the window, there are two buttons: 'Select version' and 'Compile and load'. Below these buttons is a progress bar showing the installation progress, with the word 'Idle' above it.

Hands on Demo

- ▶ Board Assembly
- ▶ Software Install
- ▶ Connection
- ▶ Web Throttle
- ▶ JMRI
- ▶ Engine Driver Demo
- ▶ DCC vs DC





Welcome to EX-Installer

EX-Installer simplifies the process of setting up the various software products created by the DCC-EX team.

As our products provide for a large number of different configurations and allow a number of optional features, we need to ask you some questions about what hardware you have and what options you want to enable.

Steps:

- We first need to install the Arduino Command Line Interface (CLI).
- You then need to select the type of Arduino you wish to install on.
- Next you will select which of our products you wish to install.
- From here you can choose some of the options for the software and apply additional configuration.
- Finally, you will load the software on to your Arduino.

The following pages you lead you through this process.

To continue, click the 'Manage Arduino CLI' button below and follow the instructions on each page.

(The button on the lower right on each page will move you to the next step. The button on the lower left of each page will allow you to go back and change your selections.)

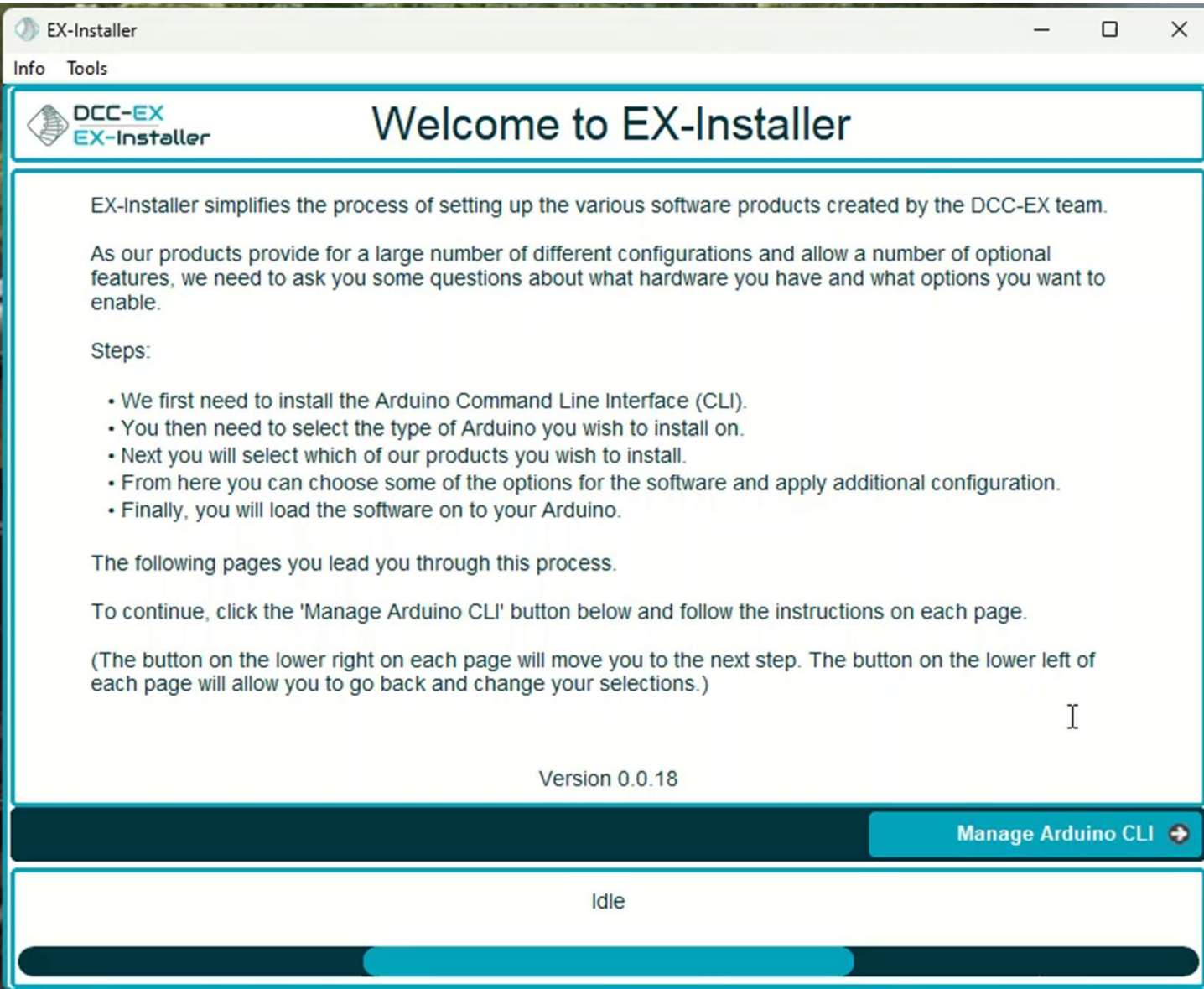
Version 0.0.18

Manage Arduino CLI ➔

Idle



DCC-EX



DCC-EX



Loco ID*

Loco ID / DCC Address



Serial (USB) ▾

Connect EX-CS



- 0 +

▲ ▼

☒ Track Power Off

Default ▾

Headlight	Bell	Horn	F3
F4	F5	F6	F7
F8	F9	F10	F11
F12	F13	F14	F15
F16	F17	F18	F19
F20	F21	F22	F23
F24	F25	F26	F27
F28			

☒ Debug Console

Direct Command (without < >)

Send

Clear

Copy



Connect JMRI DecoderPro

- Dedicated Programming Track
- Switch track between MAIN and PROG

Program <new loco> in Service Mode (Programming Track)

File Reset Window Help

Speed Table Function Map Lights Analog Controls Consist Advanced Sound Sound Levels CVs

Roster Entry Function Labels Roster Media Basic Motor Basic Speed Control

ID: <new loco>

Road Name:

Road Number:

Manufacturer:

Owner:

Model:

DCC Address:

Throttle Speed Limit (%): 100

Comment:

Decoder Family: NMRA standard CV definitions

Decoder Model: NMRA standard CV definitions

Decoder Comment:

Filename:

Date Modified:

Save to Roster Reset to defaults

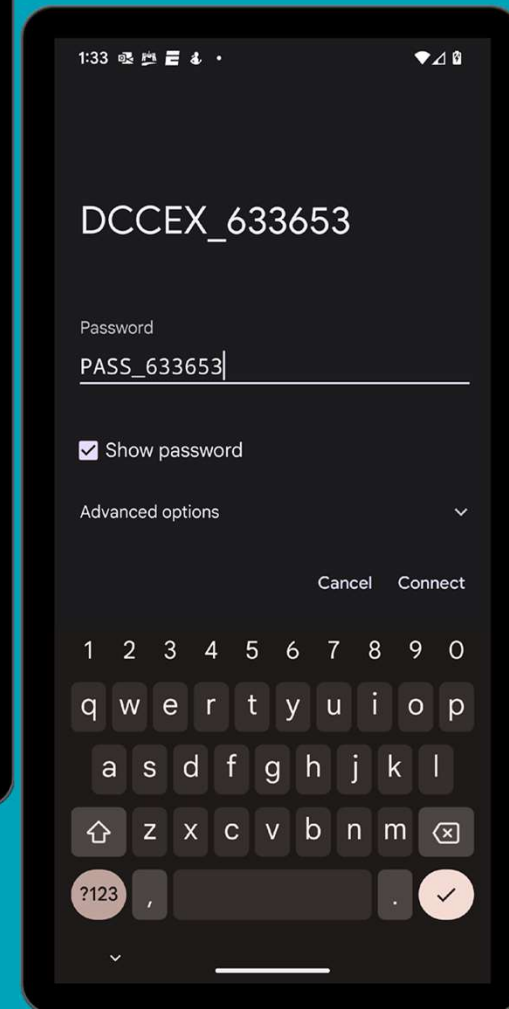
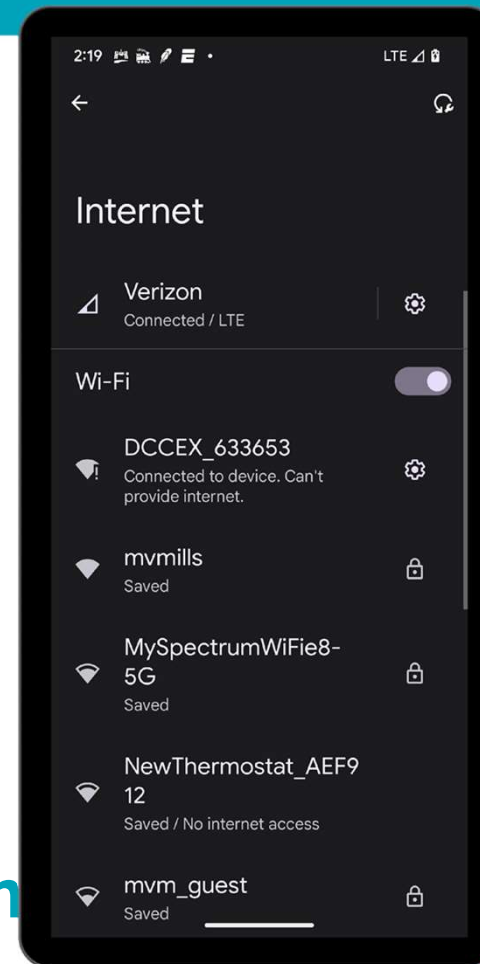
Read changes on all sheets Write changes on all sheets Read all sheets Write all sheets

Direct byte mode programming Set...

idle

Engine Driver

- Connect your phone to
 - Your Network OR
 - Access point network
DCCEX_nnnnnnn
PASS_nnnnnnn
- Open EngineDriver
 - Select DCCEX_nnnnnnn from
Discovered Servers
- Enter Loco address and Go!



EngineDriver DCC-EX Features

- Track/District Manager controls
- Service Mode CV Reads and Writes
- Operations Mode CV Writes

DCC-EX

Action Track/District Manager

A	DCC MAIN		Set
B	DC	1	

DCC-EX

Action Programming Track (Service mode)

DCC Address Read Write

CV Value Read Write

NMRA CVs <select>

DCC-EX Cmd (exclude '<' and '>') Send Prior Next

DCC-EX

Action Program on Main (Operation mode)

13:5 DCC Address

13:5 CV Value Write

NMRA CVs <select>

DCC-EX Cmd (exclude '<' and '>') Send Prior Next

Common CMDs <select>




DCC-EX

EX-ToolBox Features

- Current Status
- Servo Programmer
- Sensor Status
- Loco Status

Sensor Status				
31	911 1	Unknown	Watch	
30	910 1	Unknown		
29	909 1	Unknown		
28	908 1	Unknown		
27	907 1	Unknown		
26	906 1	Unknown		
25	905 1	Unknown		
24	24 1	InActive		
23	23 1	InActive		
22	22 1	Active		

Current Status

 **EX-Toolbox**

DCC-EX V-5.2.14 / MEGA / STANDARD_MOTOR_SHIELD G-devel-202311270714Z


Current Status

	Value	Highest	Max	
A	155	161	1497	<div><div></div></div>
B	2	8	1497	<div><div></div></div>

Start

Stop

Servo Programmer

 **EX-Toolbox**

DCC-EX V-5.2.9 / MEGA / STANDARD_MOTOR_SHIELD G-devel-202311232114Z

Servo Programmer

<select>

VPin

Throw (active) Mid Close (inactive)

100 409 307 207

Reset Swap + -

Profile Medium

SERVO_TURN Instant

DCC-EX Cr Fast

(exclude '<' and

Common Medium

Slow

Bounce

14:49:18.686 <-> <X>

14:49:17.588 <-> <X>



Questions???



DCC-EX



DCC-EX