

Using new technology such as smart phones and Raspberry Pi's can significantly drop the initial cost of entry into DCC Model Railroading without giving up high functionality. Specifically, we'll demonstrate and discuss Engine Driver, WiThrottle, Digitrax LnWi, MRC WiFi, RaspberryPi, PiSPROG, bluetooth remotes, and who knows what else.....

HIGH TECH FOR LOWERING COST OF DCC

About M. Steve Todd

- Current co-author of EngineDriver:
Android throttle for JMRI
- JMRI Developer
panel.js, web and withrottle server
- N-scale modular (*PiedmontNSouthern.org*)
- Secretary/webmaster Palmetto Div NMRA
- CIO of Mount Vernon
(one of last textile companies in USA)

Who are you?

- Use DCC?
- EngineDriver or WiThrottle apps?
- Use JMRI DecoderPro to program decoders?
- Use JMRI Panels? Created?
- Use JMRI Operations?
- Controlled turnouts or routes via ED or WiT?
- Used web features of ED or WiT apps?
- Own a RaspberryPi?

Outline

- Mass Market or Limited Market
- Smartphones or Vendor Throttles
 - 802.11 WiFi is mass market
- Tablets or Hard-wired Panels
- Servos or Tortoises
- Eliminate the fear factor
- EngineDriver demo with gamepad

Mass Market vs. Limited Market

- How many model railroaders?
 - 1/2 Million (maybe?)
- How many SmartPhone users?
 - 2 Billion and growing
- Spread all costs -- R&D, Manufacturing, Marketing, Distribution, Testing, etc.
- Use consumer gadgetry whenever possible

Smartphone Throttles

- Replace expensive hardware throttles with less-expensive (free?) phone devices
- More informative user interface. Lower learning curve for new (younger) operators.
- Uses consumer grade WiFi
- Use screen for setup, gamepad for control
- Older devices, or no-plan devices work fine
- Use at others' layouts without training





- \$200+
- Intimidating to new user
- Difficult to acquire
- User just wants to run train, blow horn
- Thanks for the handy directions, but.....

Throttles

- ⦿ Control engines - the starting point
- ⦿ What address is that loco?
- ⦿ Which function does what?
- ⦿ Which button do I press?
- ⦿ What turnout is that?
- ⦿ Use names and pictures instead of numbers
- ⦿ Routes
- ⦿ Panels

SmartPhone Throttles

- ◎ Android - Engine Driver
- ◎ iPhone – WiThrottle app
 - Both use the same server protocol - WiThrottle
- ◎ Engine Driver statistics
 - “Active” users at v2.22.69 > 8,000
 - 887 different device models
 - Dozens of countries

Where to get Throttle apps

- Engine Driver – search Google Play Store for “JMRI throttle”, or get link or load manually from ED web site *enginedriver.mstevetodd.com*
- WiThrottle app – search iTunes app store or visit WiThrottle.com

EngineDriver Select Loco from Roster

Engine Driver - Select Loco

Currently Selected Locos

Not Set Release CSX754 Release

Enter Locomotive Address to Acquire

Short

-OR- Select from Roster/Consist Entries

88(S)
2591+2608+4805

127(S)
6318+754

6318(L)
CSX6318 

754(L)
CSX754 

8969(L)
CSX8969

2591(L)
NS2591 

2608(L)
NS2608 

Throttle Name: Engine Driver 0650
WiThrottle: v2.0 Heartbeat: 8 secs

Engine Driver - Select Loco

Currently Selected Locos

Not Set Release Not Set Release

Enter Locomotive Address to Acquire

Short

-OR- Select from Roster/Consist Entries

CSX724 

Roster details for CSX9037

DCC Address: 9037
Road Name: CSX
Road Number: 9037
Owner: Steve Todd
Model: Kato
Comment: Speed matches to CSX734
Decoder Family: Brilliance Sound Decoders
Decoder Model: Synch Diesel Sound 1808 - N Scale
KATO SD80 - SD90/43MAC

734(S)
CSX734 

8969(L)
CSX8969 

9037(L)
CSX9037 

2591(L)
NS2591 

2608(L)
NS2608 

4805(L)
NS4805 

0(S)
CSX000 

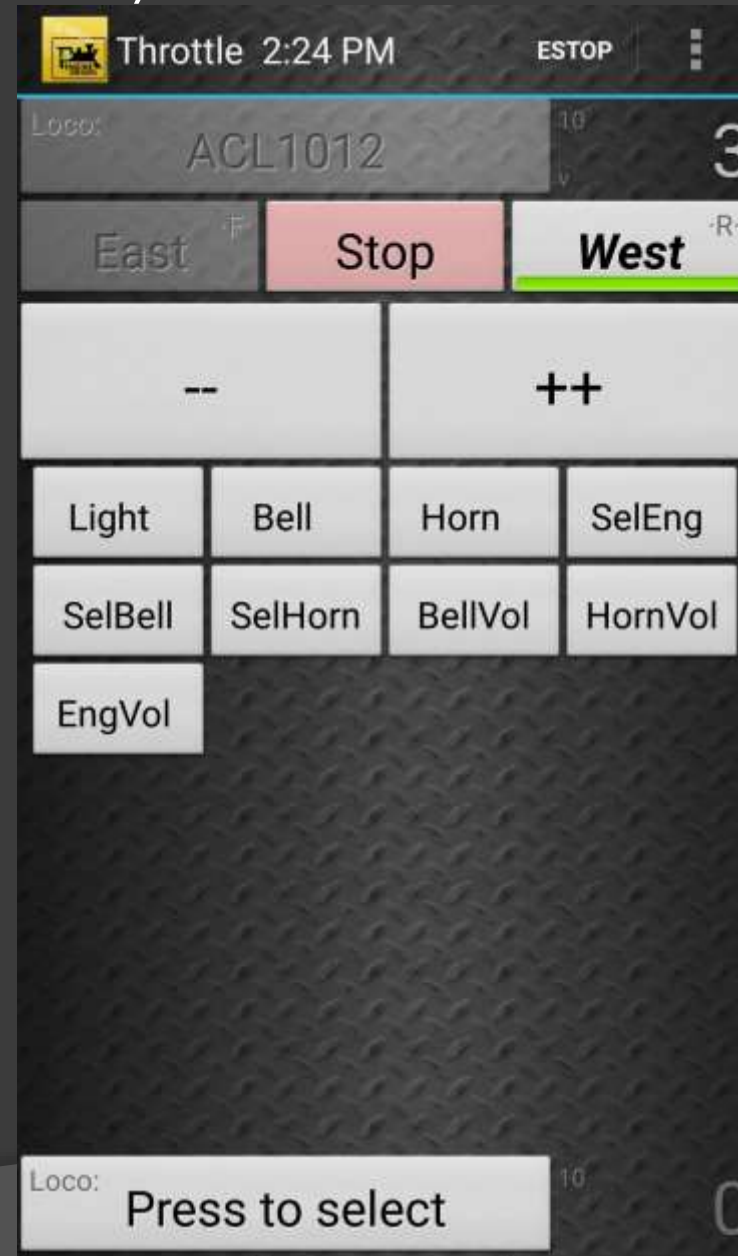
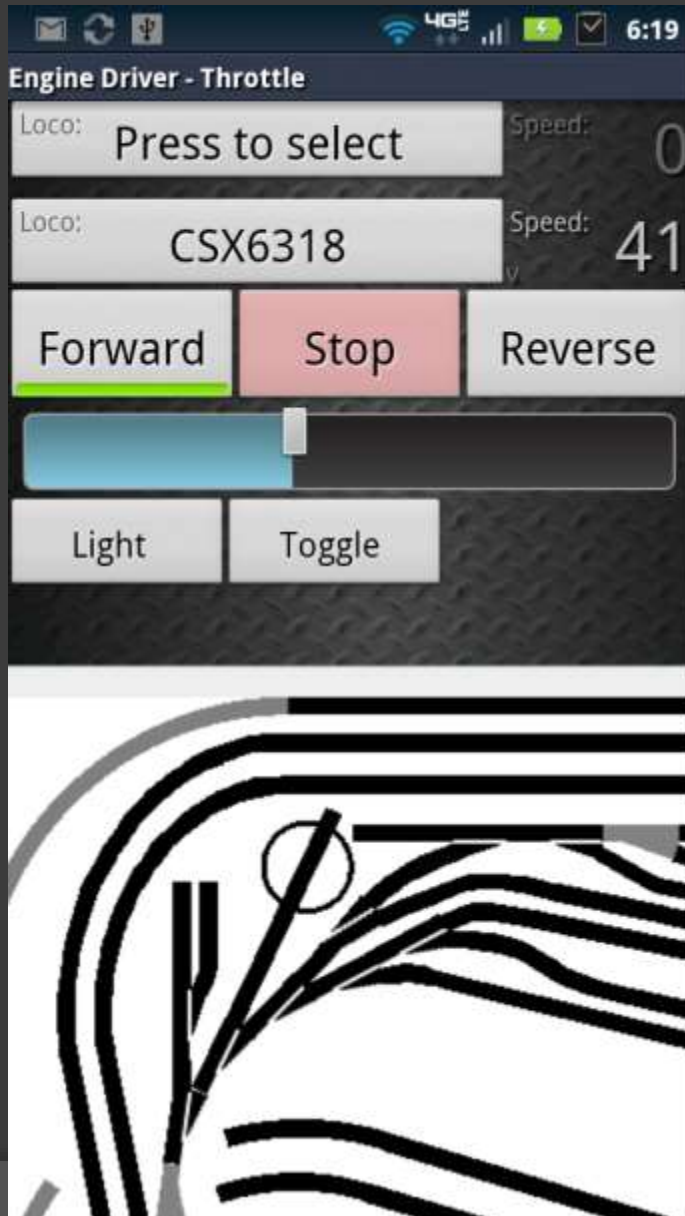
Throttle Name: Engine Driver 5341
WiThrottle: v2.0 Heartbeat: 18 secs
JMRI: 2.14-r19563

Default EngineDriver Throttle Screen




Note: roster id, text labels, on-the-fly consisting, two trains

EngineDriver w/Panel, No slider



EngineDriver Turnouts and Routes

 Turnouts - Engine Dri... ESTOP

Enter Turnout#

LT Turnout Throw Close Toggle

Filter by Location

ALL LOCATIONS

Turnouts (click state to toggle)

LT93	East Kaolin 2	Closed
LT92	East:Kaolin 1	Thrown
LT89	East:Main XOver 1	Closed
LT90	East:Main XOver 2	Thrown
LT65	East:Yard 1	Thrown
LT66	East:Yard 2	Thrown
LT67		

   4:00 PM

Engine Driver - Routes

Control Routes

Set

IR:AUTO:0007
West Yard 4 Inactive

IR:AUTO:0009
West Yard 3 Active



Throttle 7:26 PM

ESTOP

Loco:

ACL1012

10

0

East

Stop

West

--

++

Light

Bell

Horn

SelEng

SelBell

SelHorn

BellVol

HornVol

Train departs Port Arthur East with 3 cars, 197 feet, 308 tons

Pick up

☐ ATSF 10439 Boxcar 50 Tuscan L<oad> from #163 Siding

☐ CN 662703 Flatcar 52 Tuscan L<oad> from #153 Zane Mercantile



Move to Danville



Preferences - Engine Driver

Options for the Direction Buttons

Decrease Loco No. Height?

Use smaller buttons for the loco Number, speed and direction buttons.



Web View Preferences

Options for Web View appearance

Swipe Up-Down options

Preferences for swipe Up-Down on the Throttle Screen.

Show Loco Address instead of..

Show the loco DCC Address instead of the Loco Name on the Throttle page.



Use default function labels?

Display the default function labels instead of labels from roster entries.



Gamepad Preferences

Choose the Gamepad type and other options

Additional Selected Loco Indicator







Additional highlight of the Loco Select button based on the selection method. Requires Android Honeycomb or later.

Simple Throttle Landscape w/4



Use Roster Entries

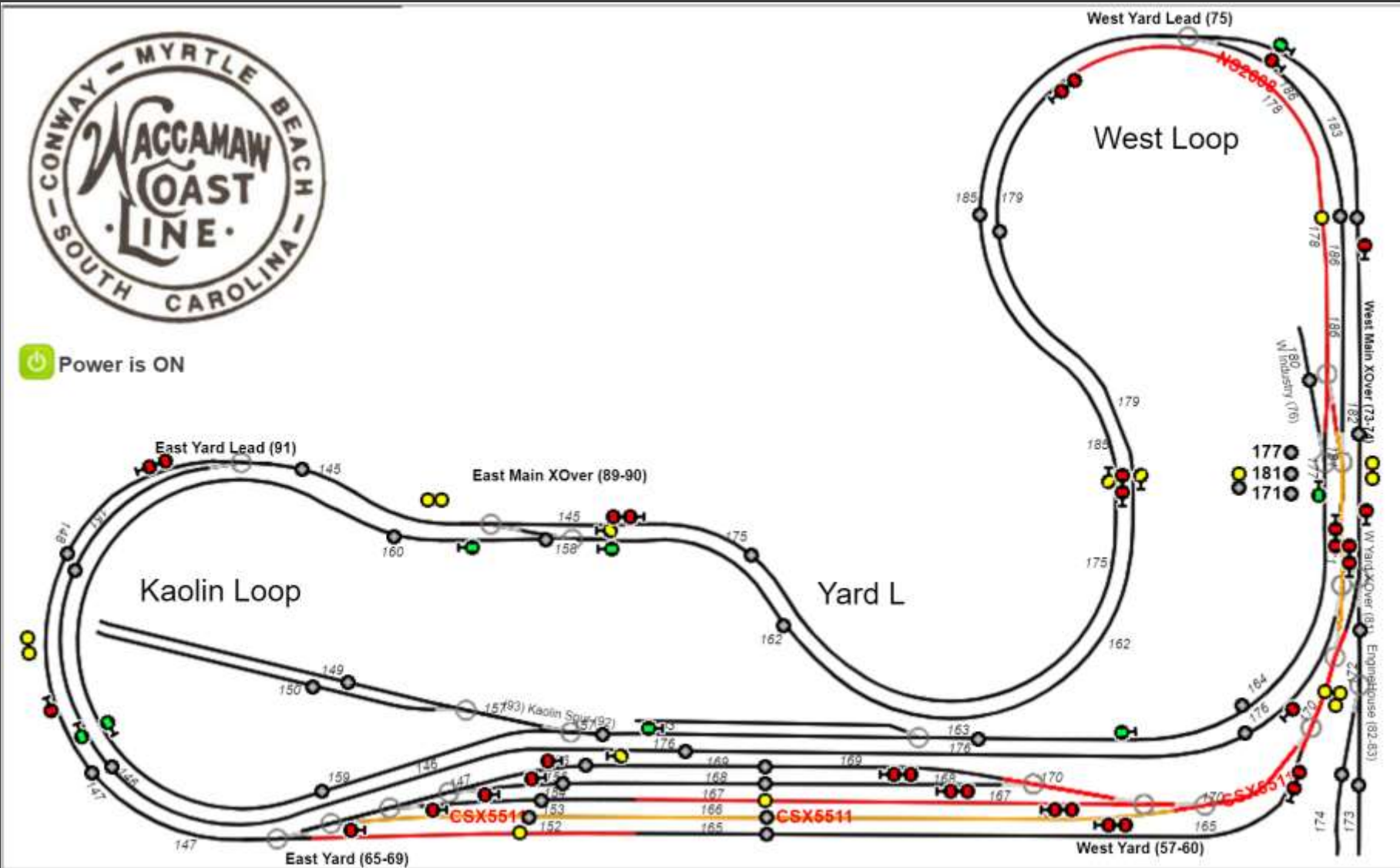
- ⦿ No more “What address is that loco?”
- ⦿ No more “Which function does what?”

Function Labels		Roster Media			
Use this tab to customize your JMRI t					
fn	label	lock	off	on	shunt
0	Light	<input checked="" type="checkbox"/>			<input type="radio"/>
1	Bell	<input checked="" type="checkbox"/>			<input type="radio"/>
2	Horn	<input type="checkbox"/>			<input type="radio"/>
3		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
4		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
5	BellVol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
6	HornVol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
7	EngVol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
8		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
9		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
10		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
11		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>
12	SelEng	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="radio"/>

[illegible]

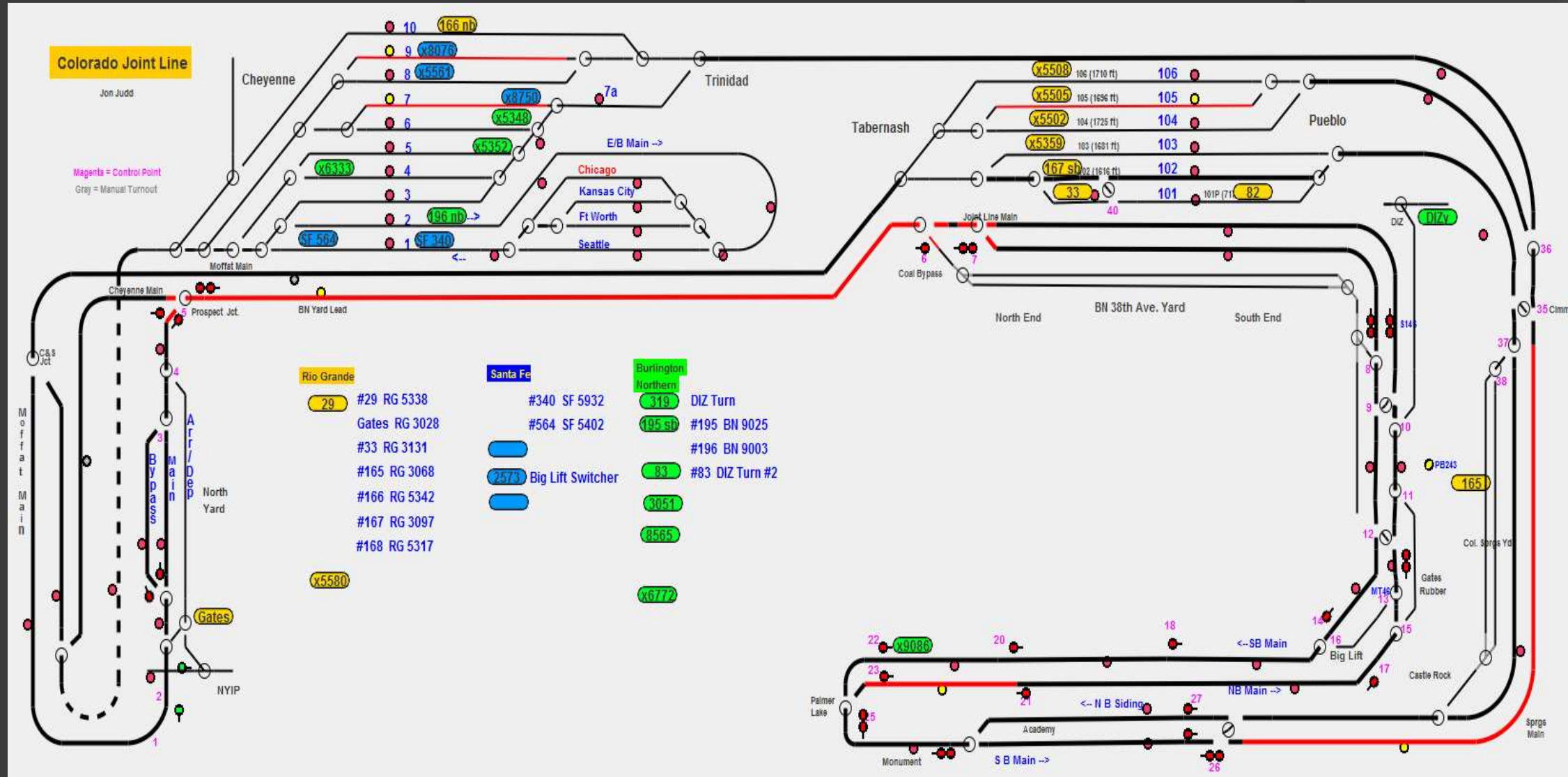
Software Panels

- Replace expensive physical panels with flexible software, saving time and money
- Rethink, redesign, redo much more easily
- Get signaling correct before installation
- Show on local tablets around layout
- Show on phones
- Maybe one big Dispatcher panel plus locals



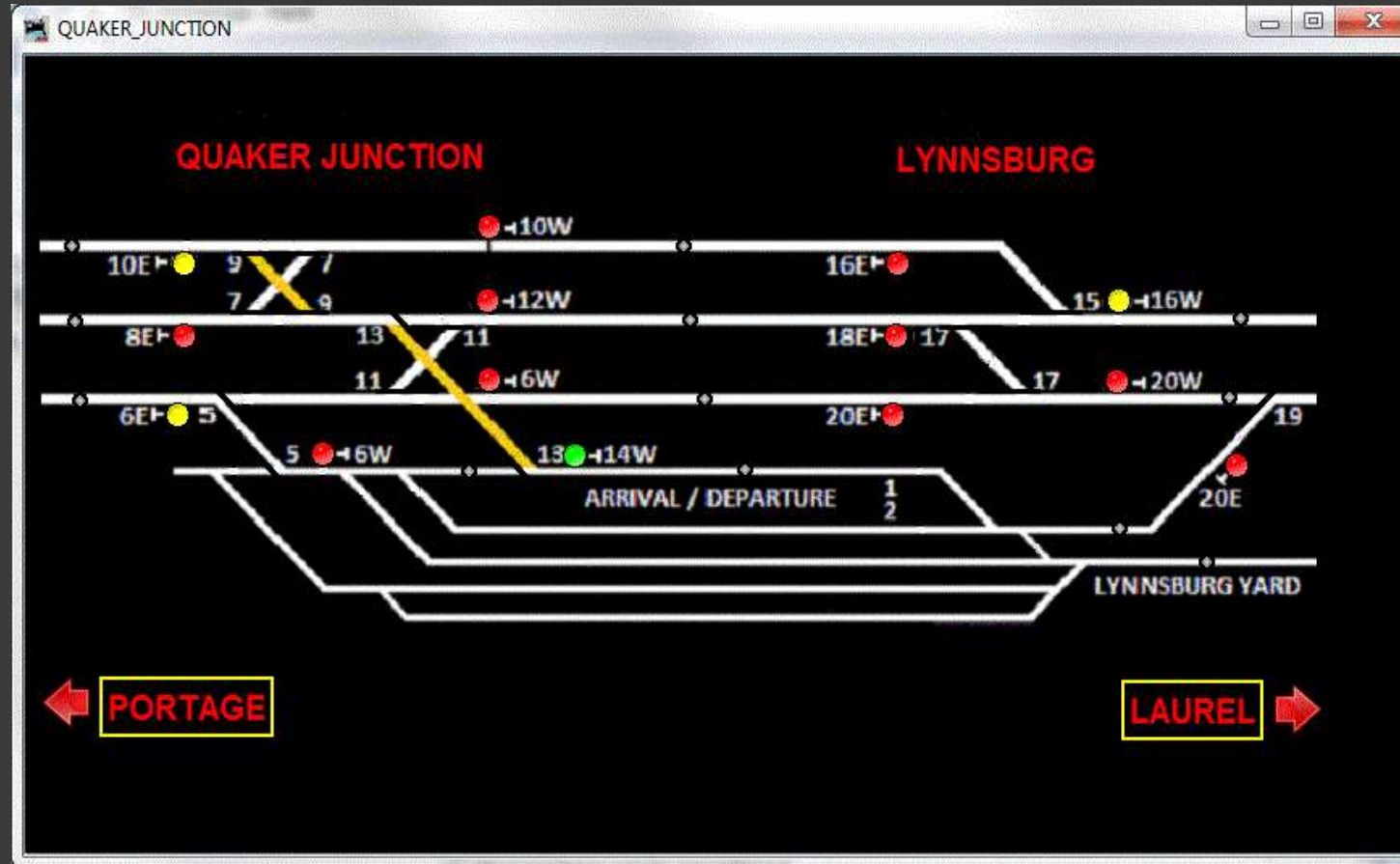
Virtual signalling, occupancy, train names. Fits nicely on pad.

Jon Judd's Colorado Joint Line



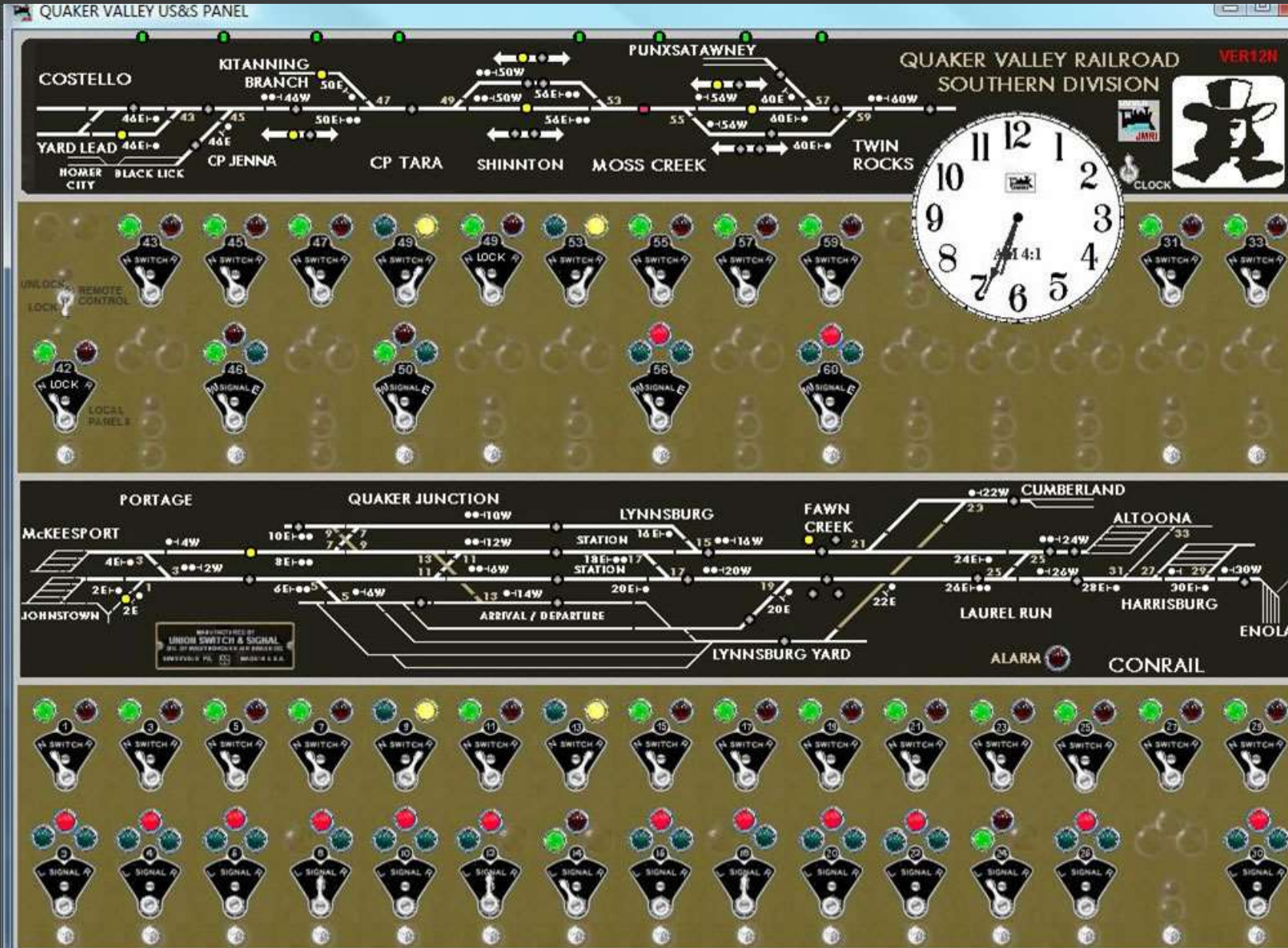
Signals, Occupancy detectors, Localcons, really needs a large monitor

Pad-Sized Panel with links



<http://quaker-valley.com/CTC/Tablet.html>

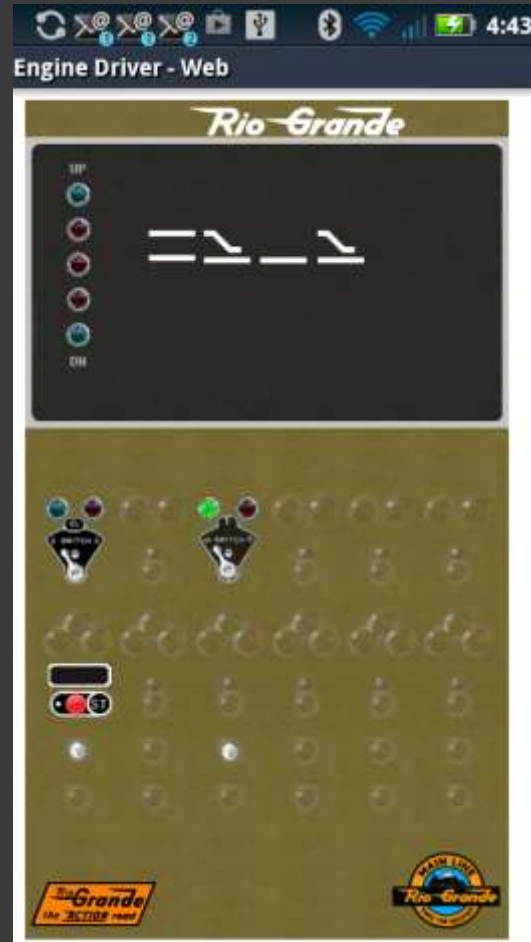
Large CTC Panels



Smartphone panels too! Robin's Elevator Control Panel on EngineDriver Web screen

CTC type panel

Fits nicely on
smartphone.



“Engineer view”



Signals are live, arrows open the “next” panel, uses Auto-Web

“Engineer view”



the “next” panel

Bluetooth “GamePad”

- Sold as “selfie remote” or x-box controller
- \$4 - \$12 online
- Controls speed & dir of your loco plus 5 funcs
- Paired with your smartphone
- Joystick plus buttons
- Each button can be mapped
- Use screen for acquisition



Servos vs. Tortoise

- ◉ Tam Valley Loconet servo controller
 - \$1-2 per servo (SG90)
- ◉ Tam Valley Loconet servo controllers
 - \$60 for 8 servos
- ◉ Tortoise switch machine \$16 each
- ◉ DS64 Loconet turnout controller
 - \$60 for 4 turnouts
- ◉ $(8 \times \$2) + \$60 = \$76$
- ◉ $(8 \times \$16) + (2 \times \$60) = \$248$



Servos vs. Tortoise

- Smaller size, more flexible installation
- Also handles buttons, LEDs, signals, much more
- Standard three-wire connections available on eBay
- QuadLN_S very configurable via JMRI

LED 13-24	Aspect 1-8	Aspect 9-16	Aspect 17-24	Aspect 25-32	Aspect 33-40	Aspect 41-48	
Group 2/8	Group 3/8	Group 4/8	Group 5/8	Group 6/8	Group 7/8	Group 8/8	Routes
Roster Entry	Basic	CVs	Quad-LN_S	Group 1/4	Group 2/4	Group 3/4	Group 4/4

Servo Start Address	89
Lock Start Address	89
Main IO Start Address	93
Aux IO Start Address	89

Route Delay	1 Sec	▼
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Expansion Port	<input type="radio"/> Relays 1-4
	<input type="radio"/> Signaling
	<input checked="" type="radio"/> Servos 5-8

Servo OFF When Stopped	<input checked="" type="checkbox"/>
Servo State Memory	<input checked="" type="checkbox"/>
Signal State Memory	<input type="checkbox"/>
Retry on DCC Busy	<input checked="" type="checkbox"/>
Output Off Switch Request	<input checked="" type="checkbox"/>
No Command Station	<input type="checkbox"/>
Input Invert	<input type="checkbox"/>
Blink indicates Unlock	<input type="checkbox"/>
Broadcast Local Actions	<input checked="" type="checkbox"/>

Manufacturer ID	59
Product ID	6
Hardware Version	1

QuadLN_S more config

LED 13-24	Aspect 1-8	Aspect 9-16	Aspect 17-24	Aspect 25-32	Aspect 33-40	Aspect 41-48	
Group 2/8	Group 3/8	Group 4/8	Group 5/8	Group 6/8	Group 7/8	Group 8/8	Routes
Roster Entry	Basic	CVs	Quad-LN_S	Group 1/4	Group 2/4	Group 3/4	Group 4/4
							LED 1-12
							Group 1/8

SERVO 1

Address LT89

Lock LT89

TRAVEL

Closed Position159

Thrown Position1245

Speed4

RapidStartThree-eighths travel

Directional SpeedDisabled

LOCK

ModeNone

MESSAGE

Output MsgExact feedback (sim)

CASCADE

TriggerNone

ActionFollow

Turnout1

AUX IO 1

Address LS89

INPUT

TypeGeneral

TriggerPositive Edge

DCC FreezeAlways live

SERVO 1 INDICATION

LED ModeBlink on Move or Lock

LED DriveNormal

SECONDARY MESSAGE

TypeSend this message

DeviceTurnout

ConditionNone

Number90

ACTION

Servo 1Toggle

Servo 2Toggle

Servo 3None

Servo 4None

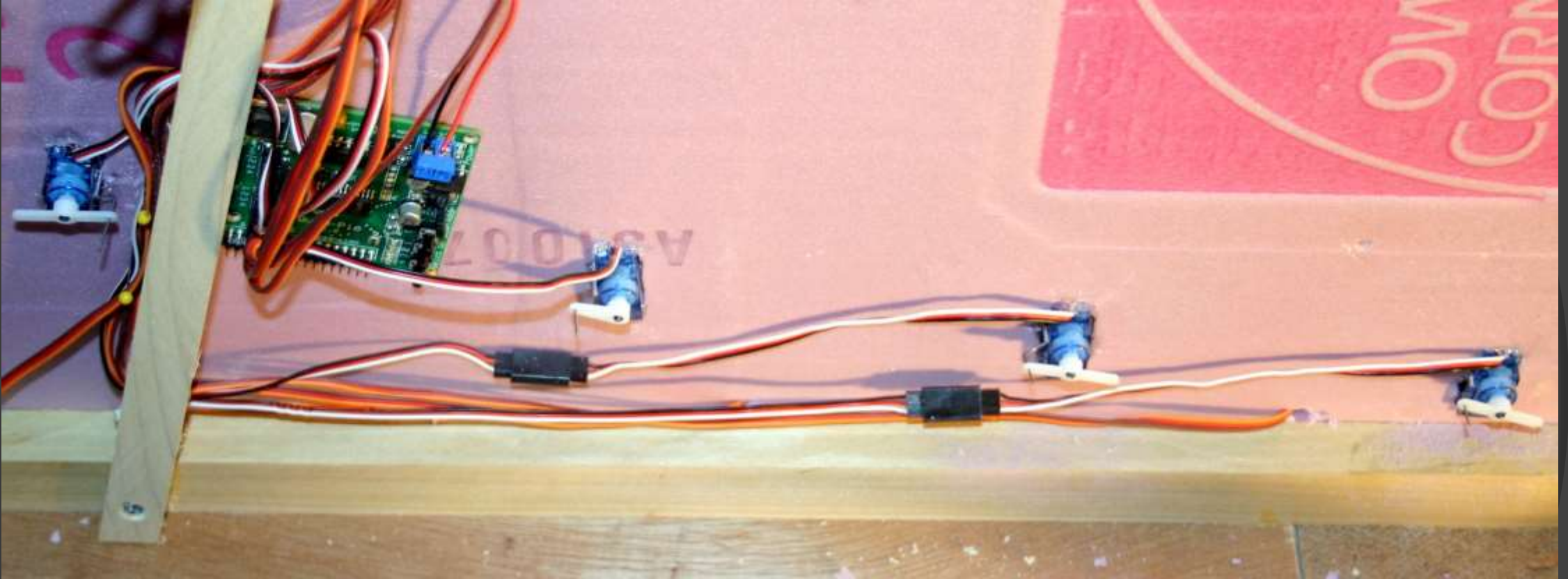
Servo 5None

Servo 6None

Servo 7None

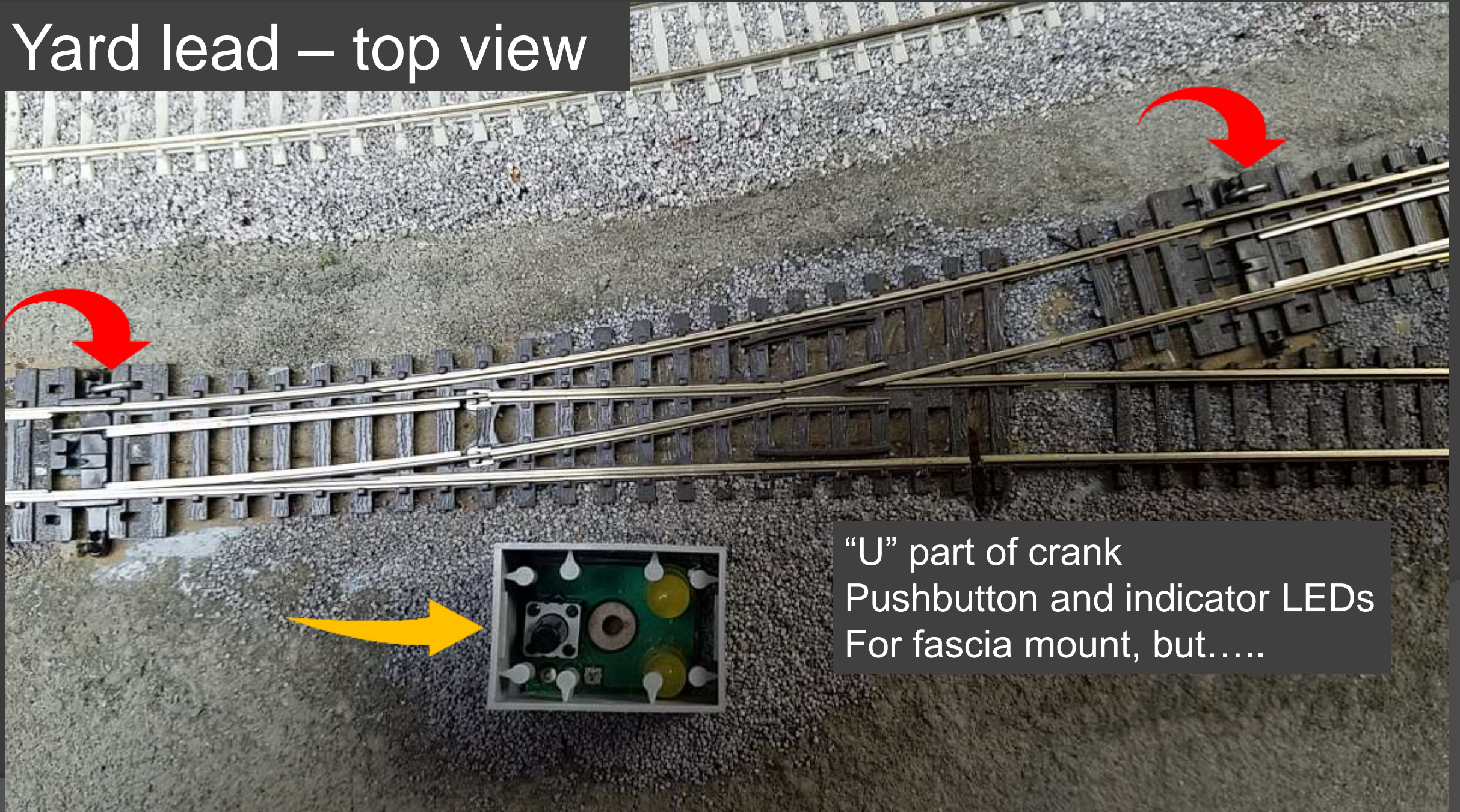
Servo 8Toggle

Servo installation – yard lead



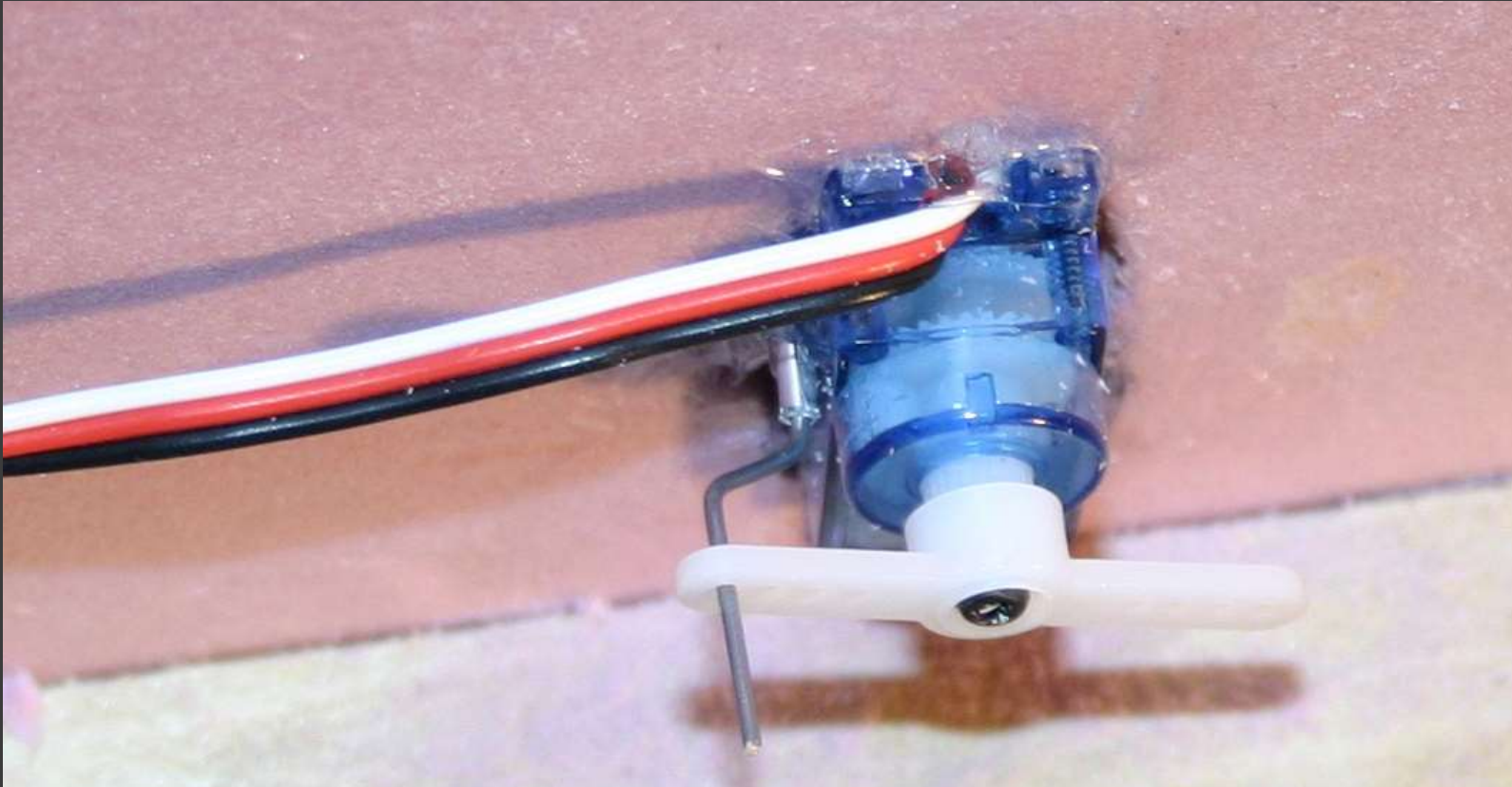
- Tam Valley's pre-Loconet controller board
- No soldering!
- Cut hole for body, bit of Alex caulk, plug it in

Yard lead – top view



“U” part of crank
Pushbutton and indicator LEDs
For fascia mount, but.....

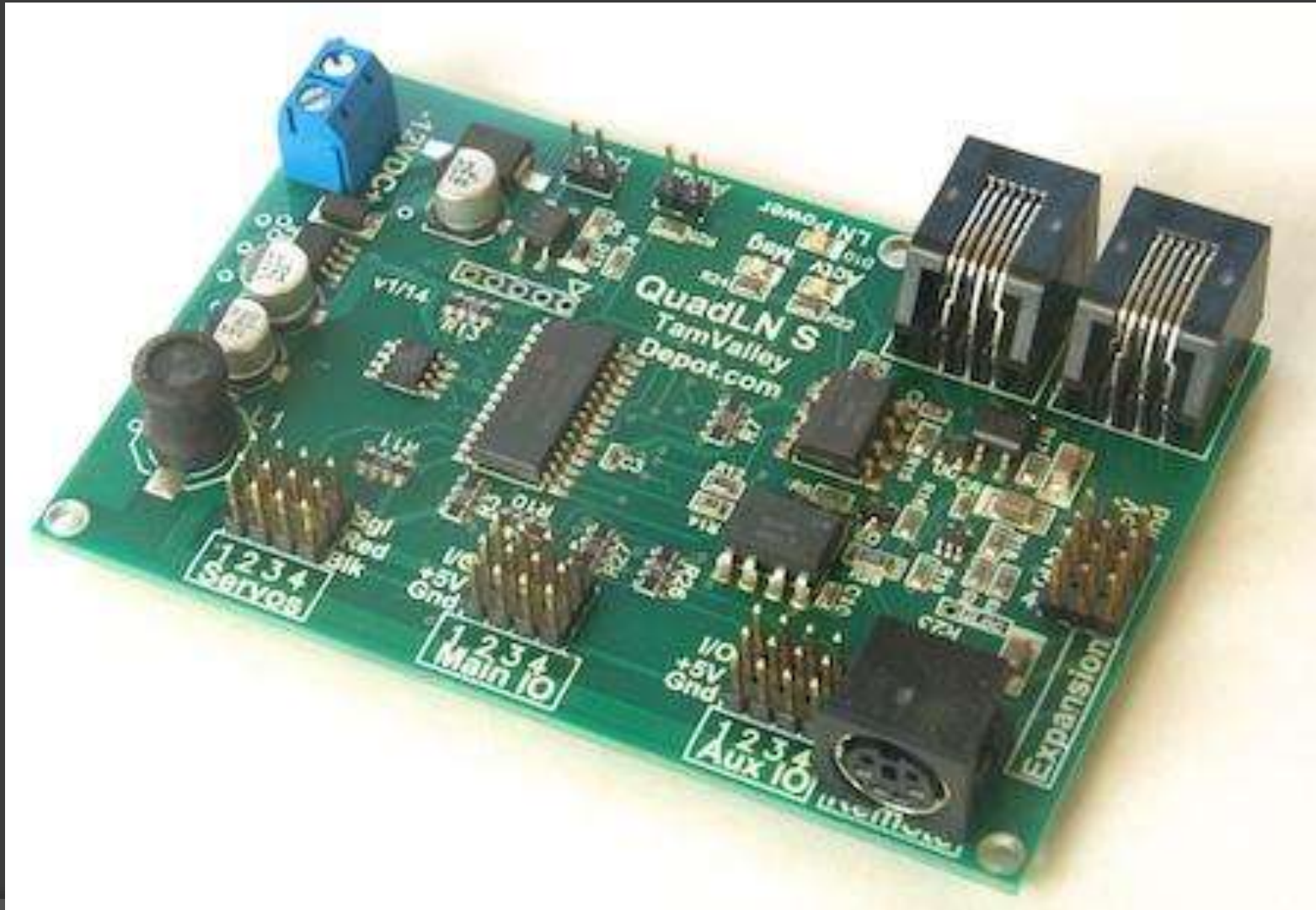
Servo installation - under



Make U in one end
Push piano wire down thru turnout and foam
Push tubing up around wire
Cut pocket in foam for body
Bend wire to form crank



Tam Valley Depot QuadLN_S



Eliminate the Fear Factor

- ⦿ Computers, networks, oh my!
- ⦿ MRC-WiFi (\$85)
- ⦿ Digitrax LnWi (\$61)
- ⦿ RaspberryPi w/WiFi + JMRI on a card (\$80)
 - Auto-identifies your hardware connection
 - Can include roster, turnout list, panels, automation

RaspberryPi Rpl-JMRI image

- Single-board computer
- SD card
- Power Supply
- USB connection
- WiFi network on a chip
- Power on, ready to go
- $\$35 + \$5 + \$11 + \$8 =$
- \$50 or so
- <http://mstevetodd.com/rpi>





CSX







Select Files to Upload...

-or- Drop files here

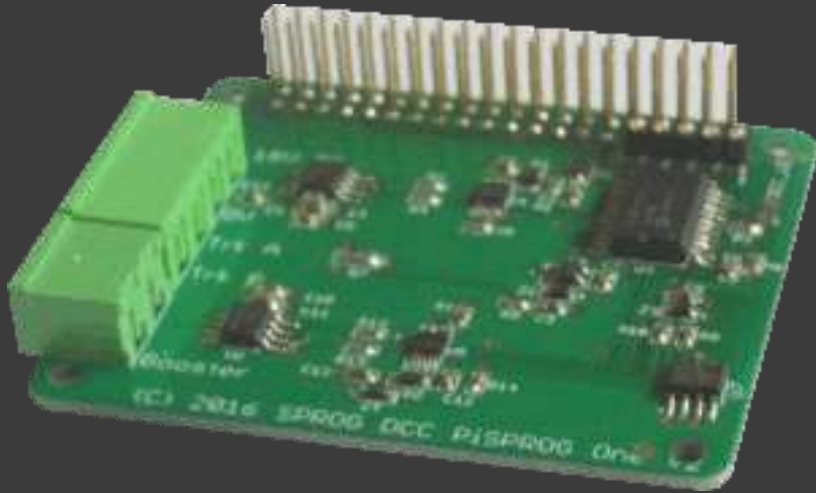
☐ Replace if exists?

Upload Roster Files

Results:

ID	Icon	Image	Road Name	Road Number	Manufacturer	Model	Owner	DCC Address	Max Speed	Decoder Model	Decoder Family	Decoder Comment	Comment
CSX5511 ▾			CSX	5511	GE B30-7	Atlas	Steve Todd	5511	100%	ATLS4	Silent Running w/ Torque Compensation	pre-installed, respond to functions at consist address = No	
CSX6318 ▾			CSX	6318	EMD GP40-2	Atlas Part #48682	Steve Todd	6318	100%	DN163	Series 3 with FX3, silent, readback	Digitrax DCC DN163A0 pre-installed, all consist function overrides set to No	
CSX8969 ▾			CSX	8969	EMD SD45-2	InterMountain	Steve Todd	8969	100%	IMD4	TCS X w/BEMF		InterMountain EMD SD45-2 "CSX" - in the CSX "Bright Future" Paint Scheme

Pi-SPROG One



- ⦿ “hat” for RaspberryPi
 - \$106 w/power supply
 - \$160 w/RPi and PS
- ⦿ Complete DCC system with wifi for \$160

Live Demo

- EngineDriver w/Bluetooth gamepad

- (use 2.23.84, connect, acquire, run, volume, dual, consist, preferences, turnout filter)

- Tactile feedback?

- Show slider, buttons, volume buttons, shake

- Show swipe-up to lock

- Show panel on iPad

EngineDriver Future?

- ⦿ Integrated PTT wifi radio
- ⦿ Onboard sounds
- ⦿ Find consumer device with notches
- ⦿ Speed-matching app
- ⦿ JMRI Ops web pages
- ⦿ Ops inventory app (using camera)
- ⦿ Integrate loco “location” with panel choice
- ⦿ More throttle layouts (e.g. Shunting)



- ⦿ ESU MCII wireless throttle
 - \$275
- ⦿ Engine Driver integrated
 - Connects to JMRI, LnWi, MRC-WiFi



ProtoThrottle.com

\$449 + \$99 DCC Receiver

Too much stuff?

How do you select loco?

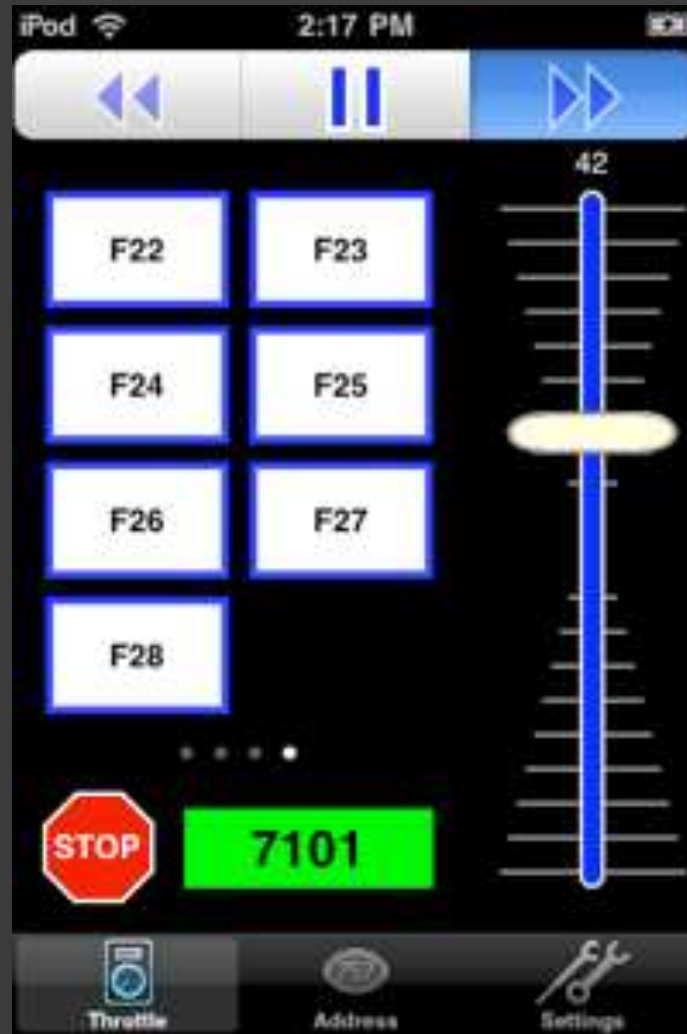
More Information

- Email mstevetodd@mstevetodd.com
- EngineDriver.MSteveTodd.com
- MSteveTodd.com/rpi
- WiThrottle.com
- JMRI.org
- groups.yahoo.com/group/jmriusers/

Networking Basics

- ED and WiT connect using existing WiFi, by IP address
- Discovery is *outgoing*, connection is *incoming*
- WiThrottle and Web Servers broadcast “an” address (*outgoing*) but accept “any” address (*incoming*)
- PC firewalls often block incoming connection, open specific port# needed
- Error message text is significant
- Network “sharing” needed for broadcast

WiThrottle App for iDevices



WiThrottle App for iDevices

