Super-cap Stay Alive

by

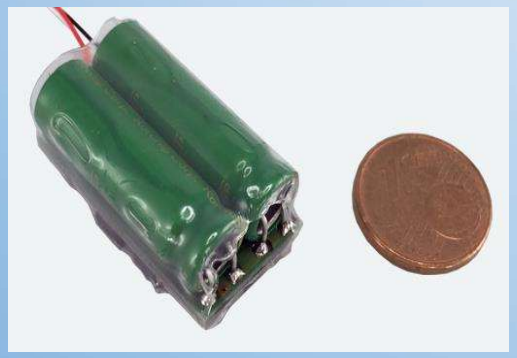
Jamie Robinson

What is “Stay-Alive”?

- With DC locomotives, a smooth mechanism and addition of a flywheel would typically move a loco through minor electrical interruptions
- DCC-equipped locomotives, especially when sound-equipped, are far more prone to electrical interruption with resultant jerking and performance changes depending on what type of decoder it is equipped with
- A stay-alive unit is a capacitor that stores a small amount of electricity to power the loco and maintain sound integrity for a brief interval

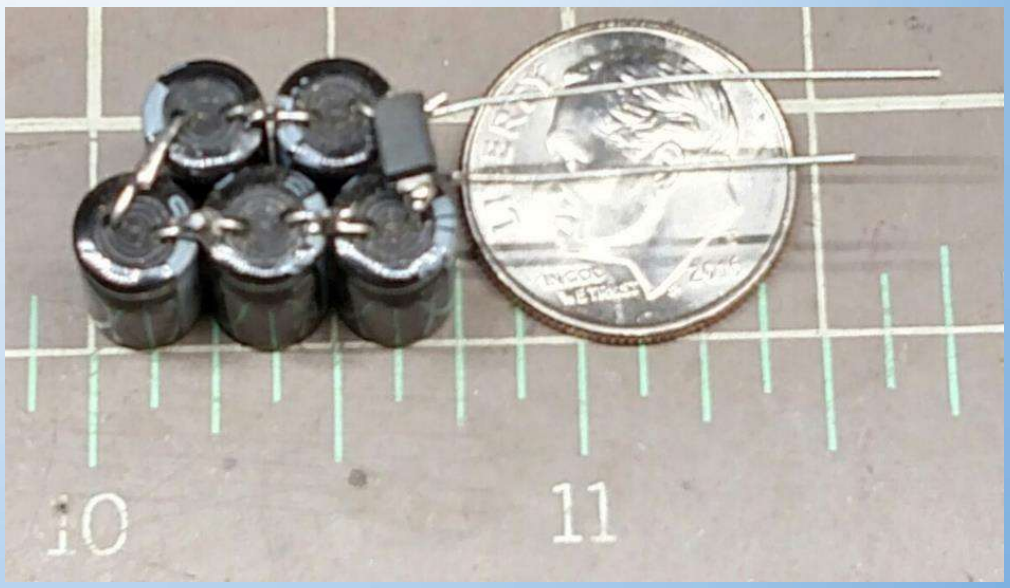
Stay-alive units are available from several manufacturers, for example:

ESU Loksound Power Pack



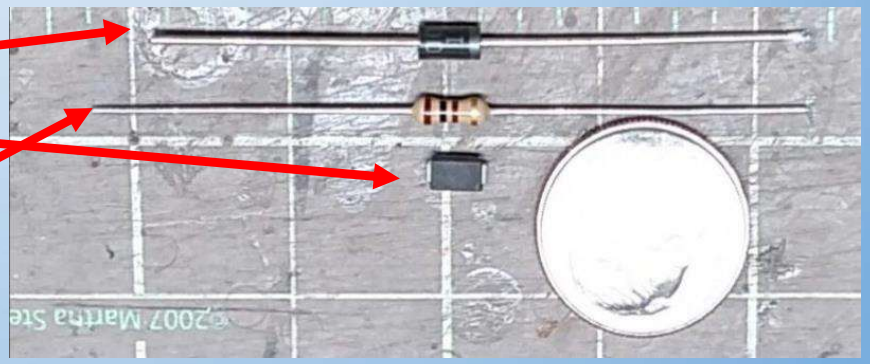
TCS Keep Alive

- Pre-packaged stay-alive units may not fit into your specific loco easily, and can be pricey…
- With the decreasing size of so-called “super” capacitors, it is now feasible to build small customized stay-alive units to fit almost any locomotive, and it’s very inexpensive!
- By purchasing the capacitors in lots of 100, cost per stay-alive unit is less than $5.00
- This presentation will demonstrate some of the possibilities

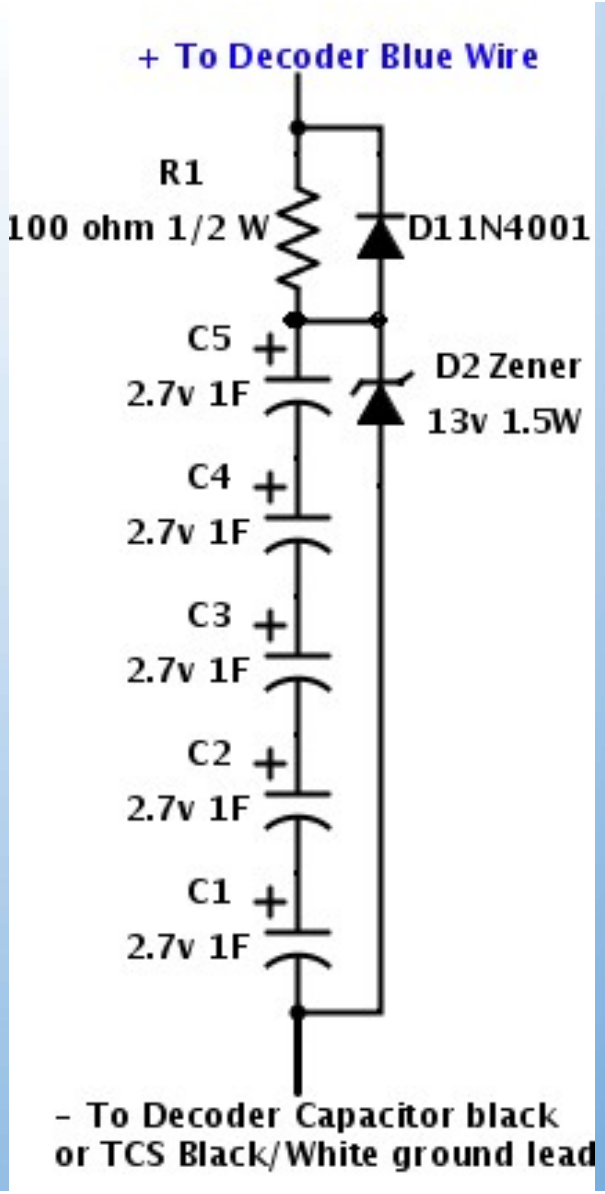


You will need the following components

- C1 - C5 2.7v 1F capacitors
- D1 1N4001 (or similar) diode
- D2 13v 1.5w Zener diode
- R1 100 ohm ¼ or ½ watt resistor

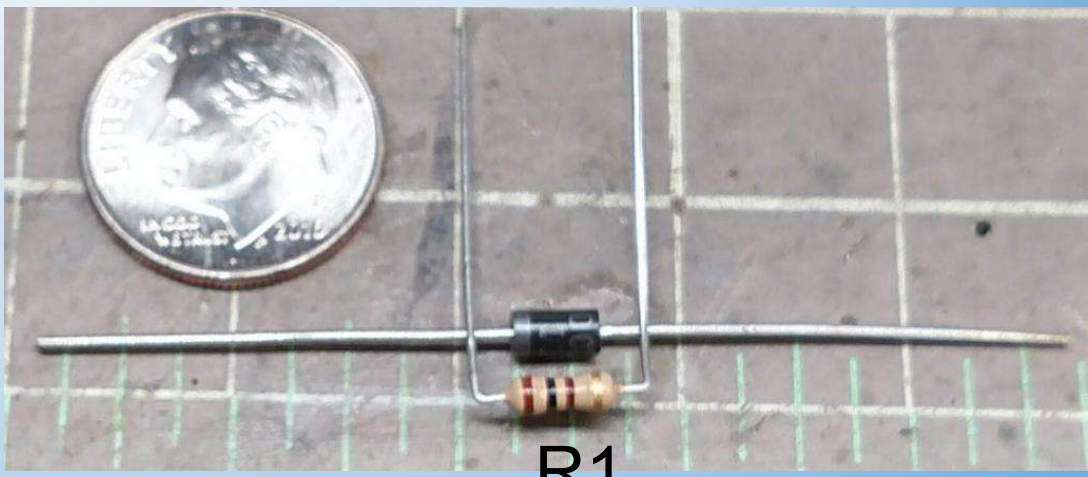


Here’s the circuit diagram



Limiting Inrush Current

- We use D1 and R1 to limit the rate of charge to prevent circuit breakers from tripping
- R1 is a 100 ohm ¼ (or ½) watt resistor



Limiting Inrush Current

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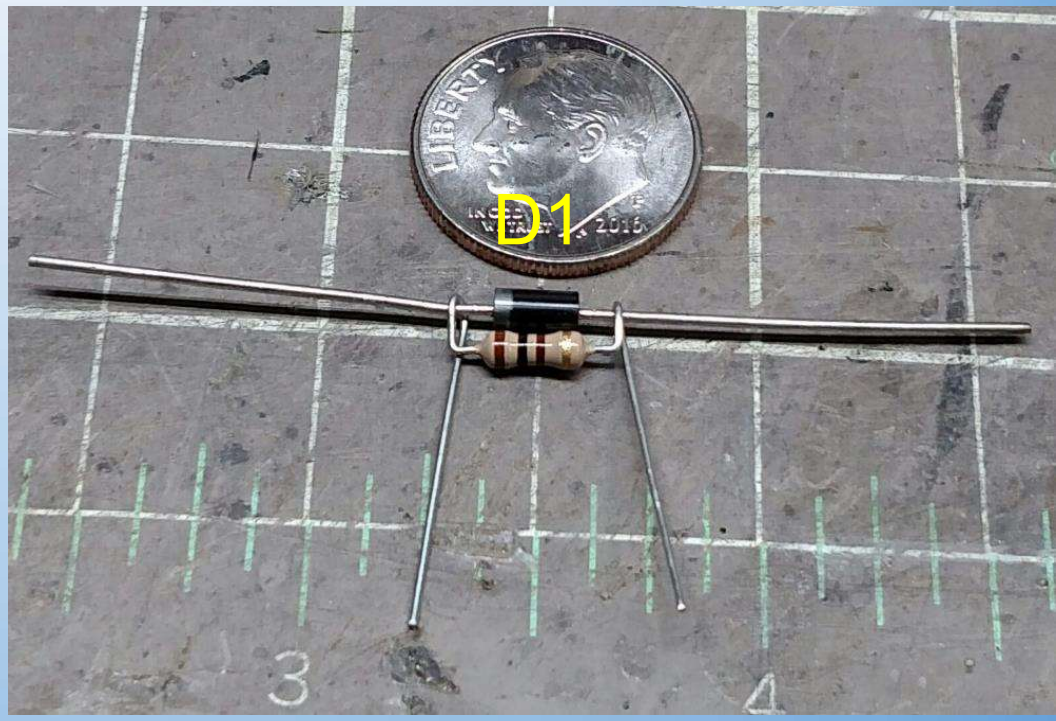
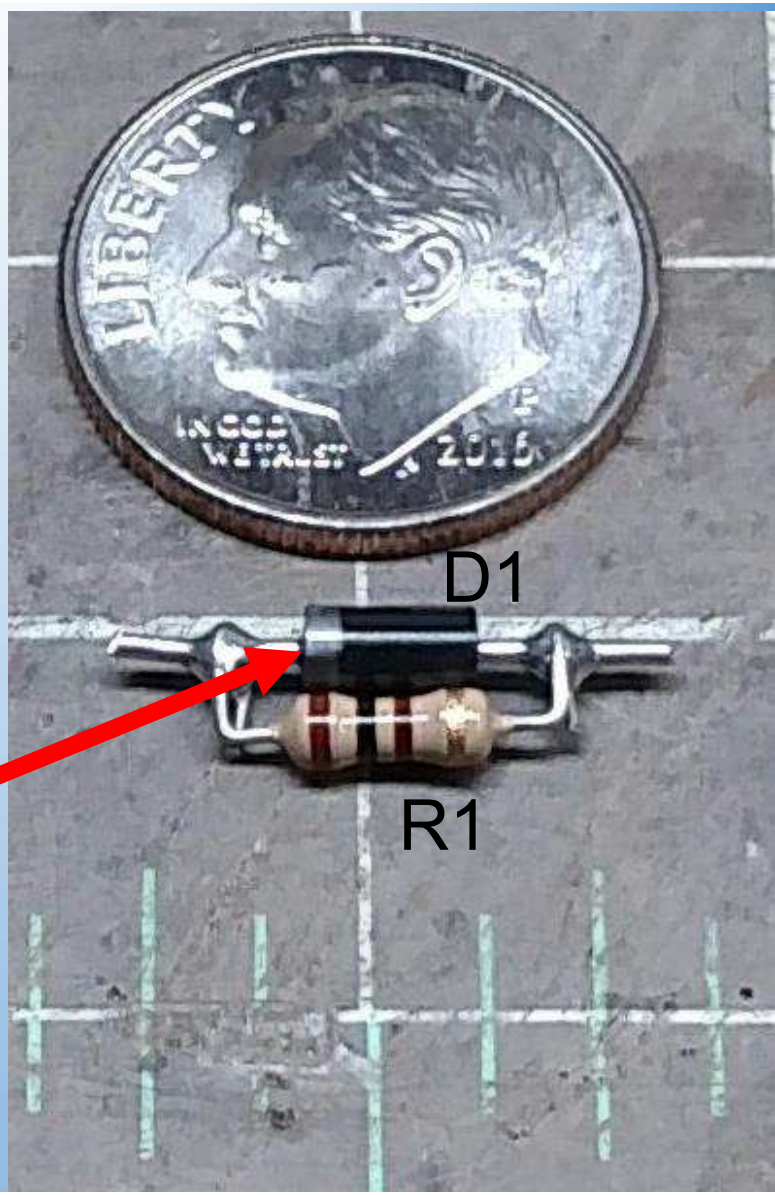
- Diode D1 prevents the flow of electricity in one direction



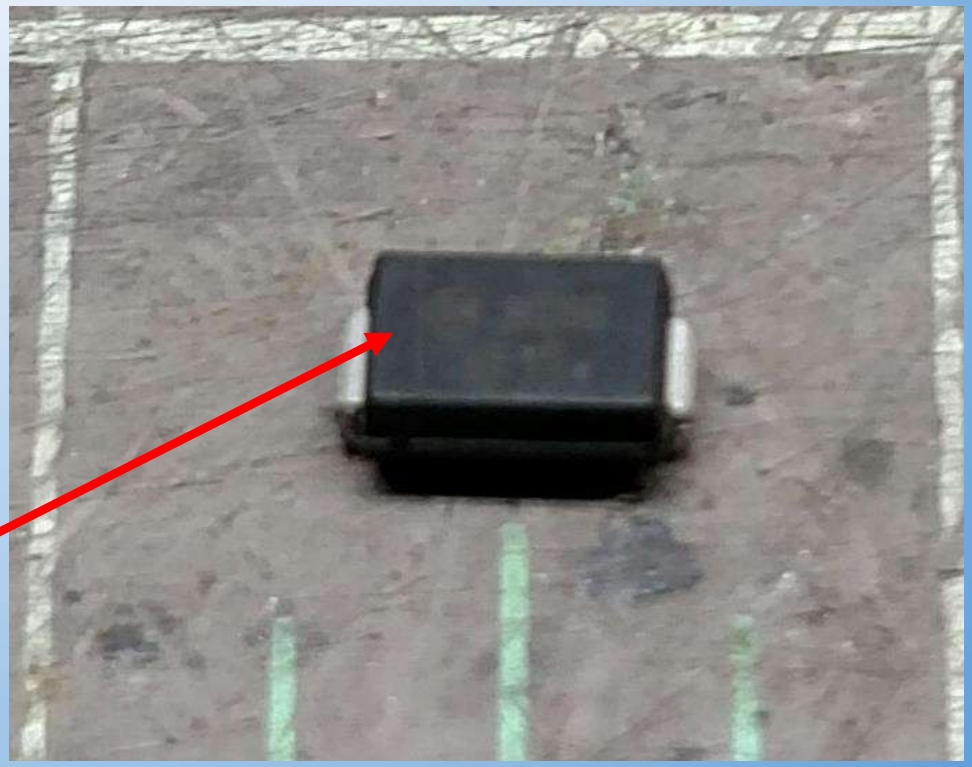
Limiting Inrush Current

- We use D1 and R1 to limit the rate of charge to prevent circuit breakers from tripping
- R1 is a 100 ohm ¼ (or ½) watt resistor
- Diode D1 prevents the flow of electricity in one direction
- D1 has a silver band on one end; that is the positive (+) end



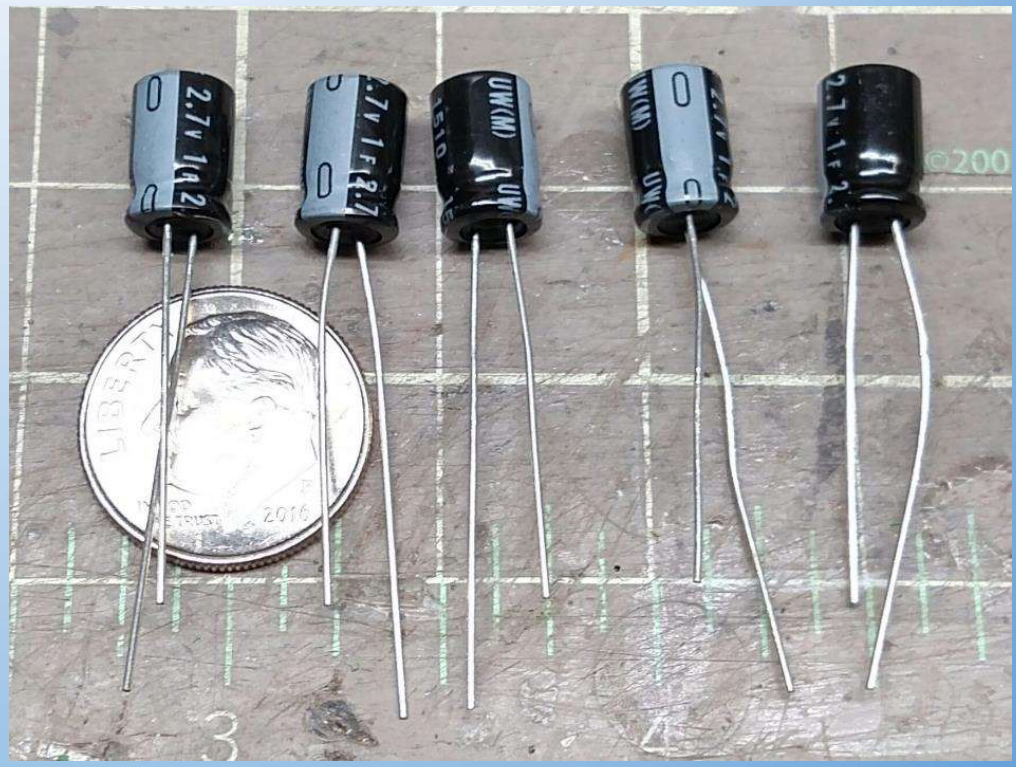
We use a Zener diode to limit maximum voltage to the capacitors

- D2 is a 13 volt 1.5 watt Zener diode
- It limits the capacitor voltage to 13 volts
- **This is extremely important** – capacitors can explode if exposed to excessive voltage
- This is the banded (+) end (it can be hard to see)



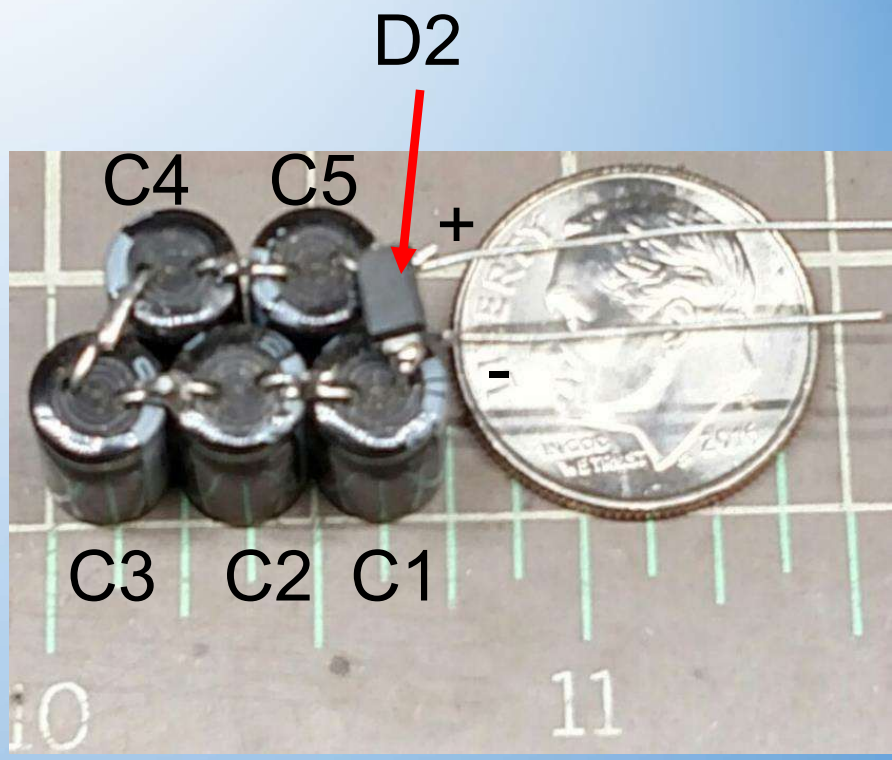
Capacitors

- C1 – C5 are 2.7 volt 1 Farad capacitors
- They store the electricity and act like small batteries
- Most capacitors are polarity-sensitive; the negative (-) lead is the short one and is marked on the case
- When capacitors are connected in series, their voltage is additive, so the max voltage is 2.7 x 5 = 13.5 volts
- Capacitance divides in series though, so total capacitance here is 1F / 5 = .2 F or 200,000 micro-farads



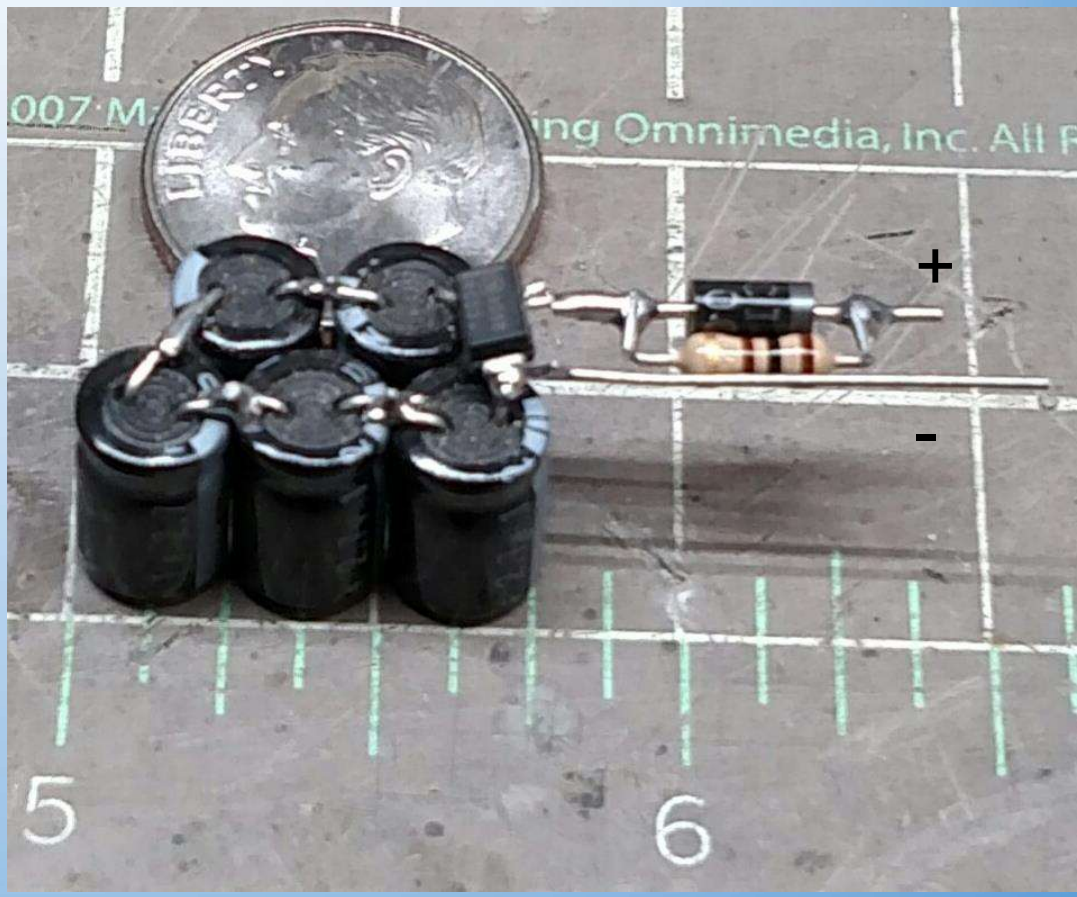
Wire it up

- Here's an easy configuration
- The 5 caps are soldered in series
- D2 is soldered across the + and - leads



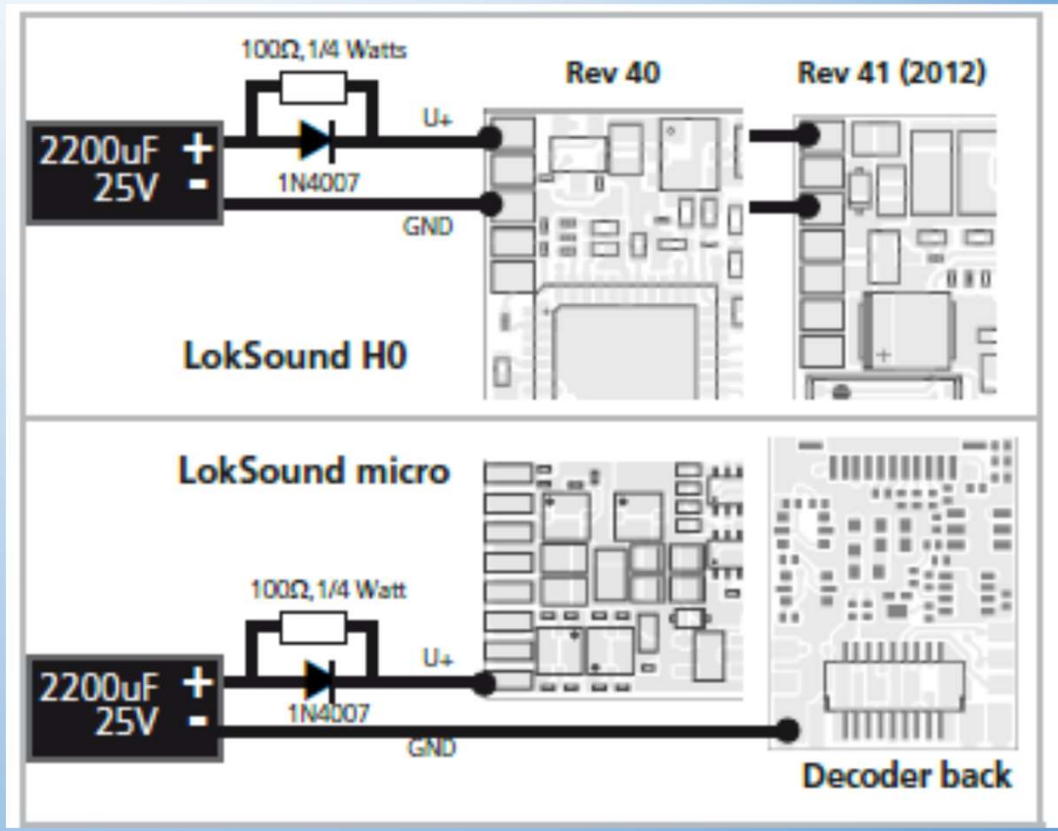
Add the Inrush Limiter

- We add the Inrush Limiter to the Positive lead, with the silver band of D1 pointed out
- Now we have two leads to be attached to the decoder
- The positive lead is attached to the decoder blue wire
- You may need to do some investigating to see where to attach the negative lead



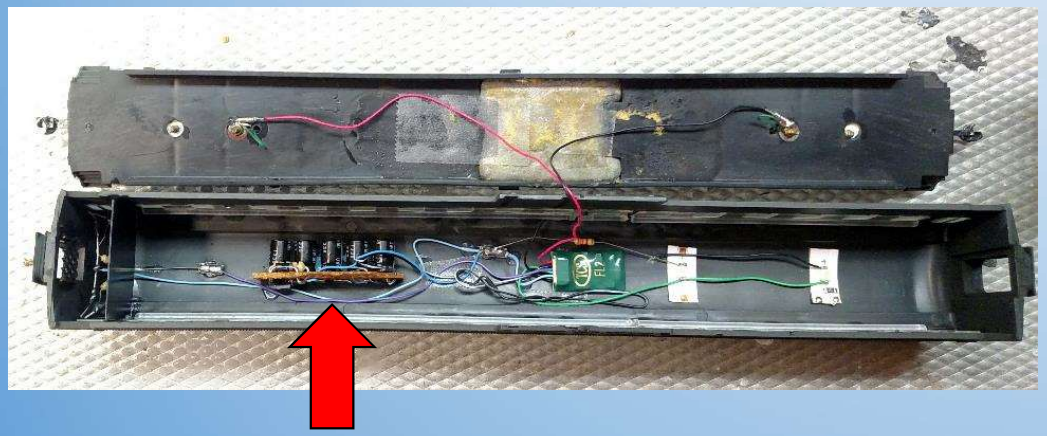
Hooking It Up

- On TCS decoders, attach the negative lead to the black and white “ground” lead
- On Tsunami decoders, attach it to the capacitor black lead
- On Loksound 4.0 decoders, attach it to the board as shown in the manual

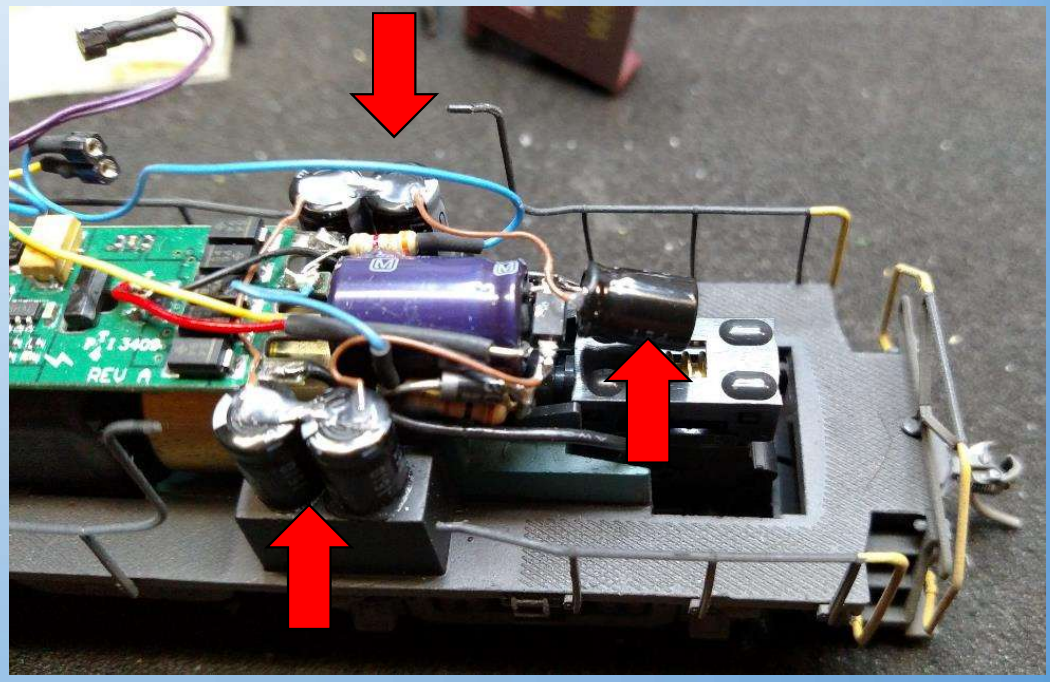


Sample Installations

In a coach on perf-board

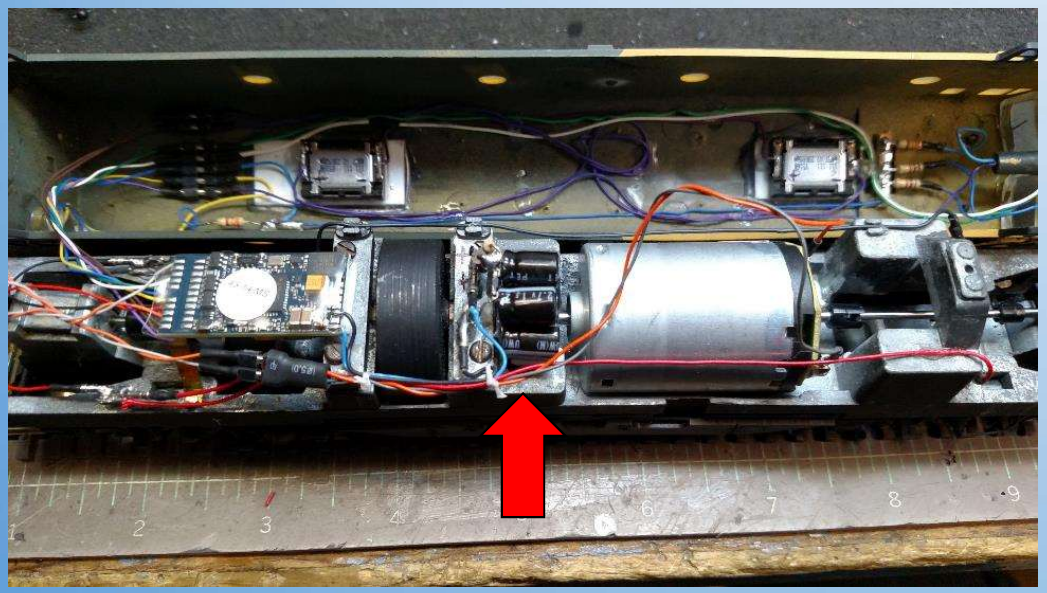


Atlas RS-1 – caps split up

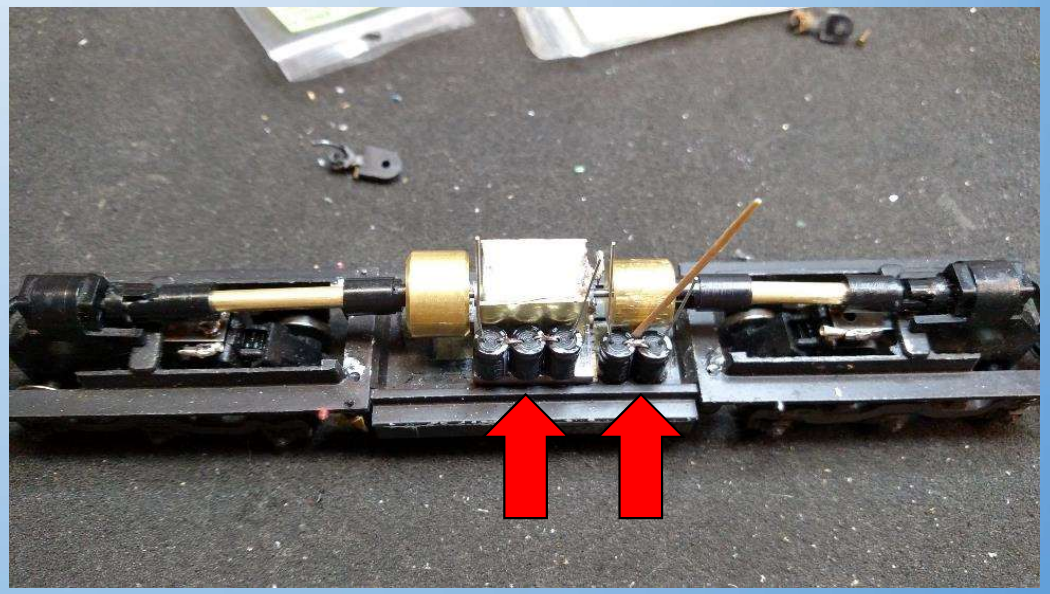


Sample Installations

Model Power E-8



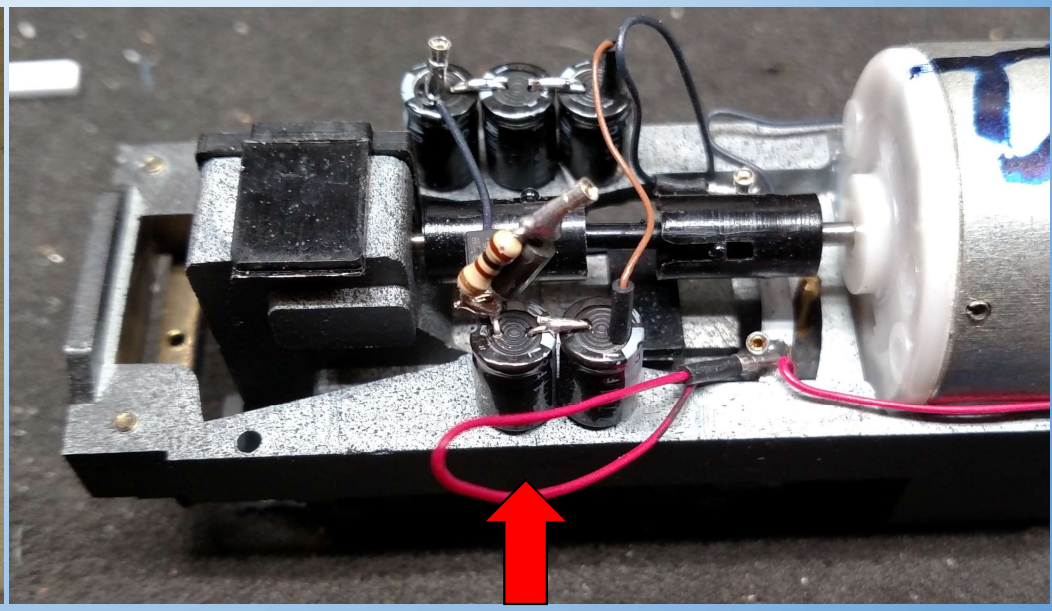
Athearn U-33C – caps split up



Sample Installations

Model Power FB-2

Model Power FA-2 – caps split up



Just Remember

- There's still no substitute for a smooth mechanism
- Don't be afraid to add pick-up wipers – don't rely on rotating equipment to provide good electrical contact
- Consider using dead blocks to protect lift-out or swing-out layout sections
- Once a loco is on stay-alive, you no longer have control – there's such a thing as too much!
- There's a handout with a parts list and supplier info, as well as some supporting web links
- Enjoy! Build a couple – they will help your sound units

Parts

- http://www.mouser.com/
- 647-JUWT1105MCD Super Capacitors (C1 – C5)
- 512-1N4001 Diode (D1)
- 863-1SMA5928BT3G Zener Diodes (D2)
- 279-CFR50J100R Resistor (R1)

Web Links

- http://www.members.optusnet.com.au/mainnorth/alive.htm
- http://wayback.archive.org/web/20120729061658/http:/www.members.optusnet.com.au/mainnorth/alive.htm