Getting the Best from Soundtraxx's Steam Tsunami

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About me

- D&RGW & RGS summer 1951, HOn3
  - Since 1978
- Tsunami user since 2005
  - Factory trained 2012
- Small business in DCC & Sound installs
- Home layout: two-level HOn3 in converted single garage
- On30 layout with Tsunamis on the UK show circuit 2005 – 2013.

What we won't cover

- Installation.
  - But we do have some tips
- Diesels
  - Tho' quite a lot is applicable to Dismals.
  - We do mention Galloping Geese
- Complex lighting
  - Not commonly found on steam locos
- Stuff that's in common with all decoders
  - Speed tables, Consist settings, mostly
- Econami
  - I’m working on this for a future clinic
- Settings for DC operation
  - Why would you bother?

What we will cover

- Steam locomotives - mainly
  - “Purple” Tsunamis, mainly
  - Applicable to some OEM locos (Blackstone, Bachmann On30….)
- Keep-Alive Capacitors
- Speakers
  - choices, compromises
- Getting it running nicely
  - Including the brakes
- Setting up the Sound Properly
  - SoundCars
- Getting the DDE working

Some Assumptions

- You're familiar with DCC
  - Using it to run trains
  - Programming, and What a CV is and does
- You have, or will have, a decent DCC system
  - 8, 12 or more functions
  - Offers OPS mode
  - Has a Computer interface
    - Or you have a SPROG
- You are aware of DecoderPro
  - And preferably, use it

Keep-Alive

- Keep-alive capacitors
  - TSU1000: runs the processor only
    - Comes ready attached
  - TSU-750: runs everything
    - Do not miswire:
      - cap **will** explode and **probably** take decoder functions with it
    - You can add capacitance: add in PARALLEL
      - Note: extra caps can affect your booster's short recovery capability
- Keep-Alive should not be seen as an alternative to clean track, wheels and adequate pickups
    - You should **Fix These Issues First**

Keep-Alive: CurrentKeeper

- CurrentKeeper works well with TSU-750
  - Blue to blue, Black to Green/yellow
  - 36,000uf!
- Gives ~2 secs full operation
  - Bachmann On30 Shay, headlight on, volume @ max
- Get more
  - Marcus Amman's site
    - http://www.members.optusnet.com.au/mainnorth/alive.htm
  - Soundtraxx Currentkeeper documentation

Connectors: plugs and sockets

- TCS do nice small 2- and 6-pin
  - And some really small ones
- Also try: Mouser #: 575-501101 and 575-500101
  - Same as the TCS ones
  - Blocks of 50: cut off what you need
- Be sure to wire with **socket** on the “powered” side
  - Then it if it comes open, the decoder doesn't get blown
  - Use a foolproof arrangement (see next slide)

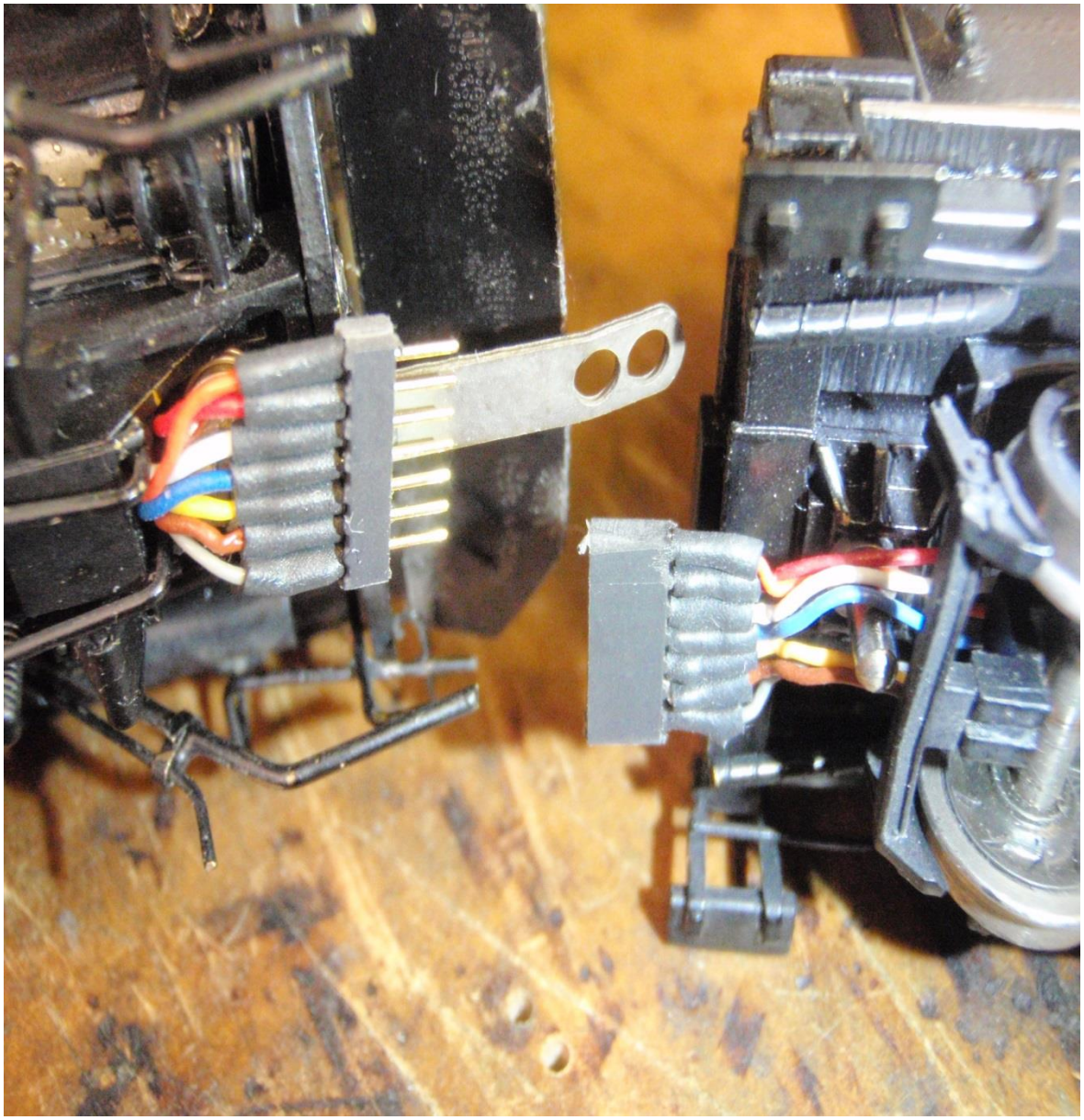
Foolproof plug/socket

- Decoder in tender
  - Socket on decoder
- Blue in centre
- White & yellow: lights
- Right rail and cam
- Motor on the outside

If connected the wrong way round:

- Won't run: no power
- Power connected to cam input: no issue here
- Cam may power decoder:
- If it does run…
  - Won't for long
  - Will go backwards
  - Lights won't work

But no harm done!



You can also spin the motor with clip leads on the outer two pins!

Lights: Always Use LEDs

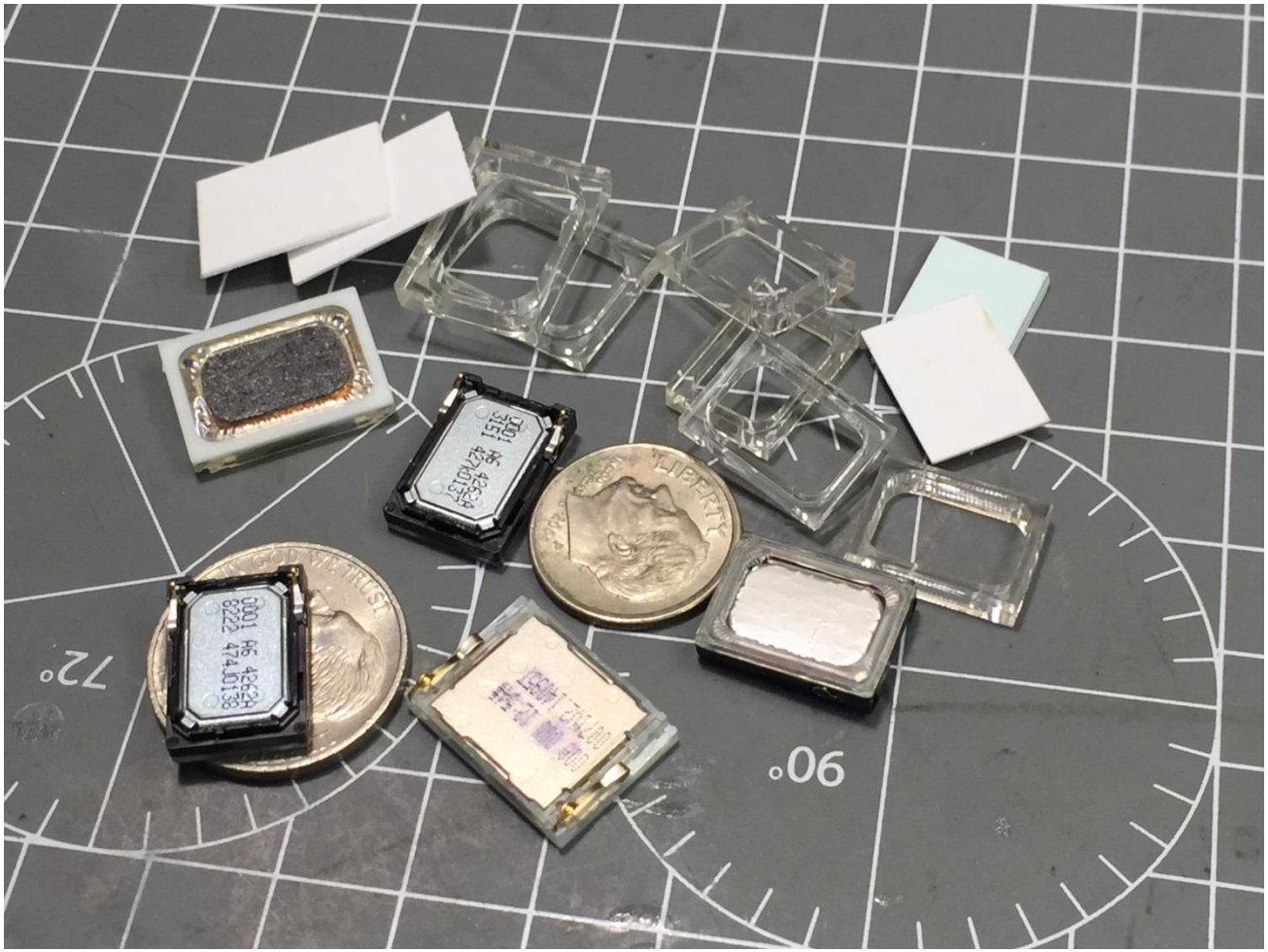
- No need to calculate accurate resistor values
  - Not much affected by track voltage, either
- 9K, 15K, 30K, even 50K resistors
  - More realistic intensity, particularly for steam
  - No heat issues
  - Longer life
- Plenty to choose from
  - Size, colour, etc
  - 0603 is ~ same size as 100W light bulb!
- The price is right, too
  - Try LEDBaron on eBay.

Speakers

- I used to say: Use the largest you can get in
  - But don't go mad and cut the loco up!
- But now: great sound from small speakers
  - “Sugar Cubes” work down to ~ 300 Hz, good sound pressure
  - Install in the smokebox – even in HOn3
- Just make sure it's decently baffled
  - Seal one side from the other
  - Space for speaker to “work”

Sugar Cube speakers

- Size is right
- Performance is right
- Price is right



Speakers

- Don’t pay too much attention to side-by-side comparisons
  - Or to bench tests
- The only thing that matters is what it sounds like to you, when it’s in the locomotive!
  - It will sound different than when it’s on the bench
  - Just clasp your hand round it to hear the difference

Speakers

- Understand the frequency response
  - A properly baffled “ordinary” speaker beats a poorly installed “hi-bass”
  - The frequency response of your ears matters at least as much as that of the speakers!
- A “sugarcube” in the smokebox may well beat a large speaker in the tender
  - Because the sound is better located
  - Sugar Cube speakers easily available (and cheap)
    - Talk to me afterwards about Mouser part numbers.
- We’ll come back to this later

Chuff Cams

- Use one if you possibly can
  - You'll never get the autochuff dead on at all speeds
  - Econami has an edge here
- GME cams
  - Split/slotted: easy install on brass locos
- Soundtraxx flat sheet
  - May be the only way for RTR locos
  - Work well when carefully installed
- Contactless Magnetic
  - Work well when adjusted nicely
  - Chuff will stop across a Kadee magnet!
  - Good ones available from EDM Models in UK

Programming

- Be methodical: don't change too much at once
  - Try just one CV at a time
- Use OPS mode to hear/see as you make changes
- Use DecoderPro to make it easier
  - And remember what you did

And If (When?) you do get it all wrong:

- **CV8=8 or CV30=2 resets to factory settings**
- **Start again.**

Programming

- Get it running properly first:
  - Address
  - Lights
  - BEMF settings & slow running
    - No momentum at this stage
  - Consist settings
    - If you use CV19 consists
- And only then start on the sound
  - Operational settings affect the sound

Tip #1

- If you plan to run on DC, then it matters which way round the motor is wired
  - NDOT bit in CV29 does not affect this
  - Orange to the same motor terminal as was wired to the right rail
- Program ack-pulse always spins the motor forwards *

  * with a Tsunami.

  - Check motor install by reading the address with the decoder connected to the motor
  - And watch which way the wheels turn
  - If they don't, work out why and fix it!

Tip #2

- Reset the decoder before you start
  - Anecdotal evidence
    - that some decoders are delivered with strange settings
    - Can't do any harm, and may do good
  - Reverts the address to 3, etc
    - Except Blackstone models – these go back to the cab number.
    - Some other OEM

Tip #3

- Set the address as you install, as part of testing the install
  - If you can...
    - it tells you if it's wired correctly – see Tip #1
  - Check all the lights work before reassembling the loco
  - Check no shorts to ground in light wiring
- Program the rest in OPS mode
  - Makes it much easier, and more fun.
  - And you won't need a program track booster
  - Use DecoderPro...

Tip #4

- Get the Soundtraxx Manuals
  - Some RTR locos come with a CD
  - From Soundtraxx web site
- Technical Reference manual
  - Describes each CV and the value ranges
  - Can be a bit hard going in places
- Steam Users Guide
  - Covers everything in this clinic!
- Other doco on Soundtraxx web site.

Tsunami Lights

- Dyno Lights:
  - Add Dyno light effect:
    - DecoderPro: On the lights panel
    - CV49/50/51/52 value 15
    - Is good with Diesels, too.
  - Turn on the dynamo sound
    - DecoderPro: Function mapping panel
    - CV33/34: add 64
    - CV39/40: add relevant values from Tech Ref (F5/6)
  - Dyno lights don’t light if the Dyno sound is not on!
- Firebox lights
  - Best is value 12 or 13 (12 is speed dependant)

Tsunami Lights

- Tip #6: TSU-750 independent lights
  - Use FX6 on DecoderPro to move yellow wire to FX6
    - then Remap to another key if desired
  - Remap F0 to non-directional
    - DecoderPro Function mapping
    - CV34=65.
  - Also works on TSU-1000

Starting and Stopping

- Tsunami slow speed control can be a bit poor
  - Motor-dependant: some are fine, others are not
  - Small, high-speed motors tend to be the worst
  - Coreless motors, too
- Test it out
  - Throttle on step 1, brakes on (brakes?... later)
  - Brakes off, and on
  - Is the start or stop too sudden?
- Maybe we need to look at the BEMF settings

BEMF: what is it?

- A generated back voltage from motor
  - The motor acting as a dynamo
  - All DC motors produce it, all the time
- Decoder makes use of it to:
  - Manage speed vs load & grade
  - Deal with small binds in the loco
    - Only with small ones, it isn't a silver bullet
- Hugely improves slow-speed performance

Back-EMF Control

- Standard PID loop: See Wikipedia for more
  - Derivative (Kd): Droop
    - Droop defines how far away from ideal the speed gets before the decoder does something about it.
    - Not directly externalised in the Tsunami
  - Proportional (Kp): How much throttle to apply
    - CV209 defines %age of calculated Kp to apply
  - Integral (Ki): How fast to apply throttle
    - CV210 defines %age of calculated Ki to apply

More Back-EMF CVs

- CV212: overall BEMF Intensity
  - Affects how much of the correction factor is applied
  - Values below 150 can result in a sluggish throttle response and generally poor running.
- CV213: Frequency of measurement
  - affects how often the motor checks BEMF
- CV214: Measurement window size
  - Soundtraxx doco suggests it's also the Kd gain modifier
- CV10
  - Enables BEMF to be trailed off at larger throttle openings.
  - Can deliver odd operational characteristics

Starting and Stopping: Back-EMF

- CVs 10, 209, 210, 212, 213, 214
- If it runs OK, don't touch these
- If it does jackrabbit starts:
  - See next few slides for alternative ideas
  - BEMF also affects overall operation
    - Provides “cruise control”, “speed stabilization”
- Changing BEMF affects Autochuff
  - Autochuff runs off throttle setting, not motor/loco speed

Setting Back-EMF

- Make sure the loco is warm
  - Cold locos react differently
  - Run for 2 – 5 minutes
- Make sure the track and wheels are clean
- Make sure the loco runs properly: no binds
  - BEMF will cure a lot, but not everything!
- Turn off momentum (CV3/4 = 0)
- Turn off start adjustment (CV2 =0)
  - Expect to leave it off; BEMF is a better substitute

Setting Back-EMF

- “Petrarca” method:
  - Set 209/210 to zero, Set throttle to step 1
  - Increase 210 till it just moves
  - Increase 209 till it's smooth
  - Reduce 210 by 1, increase 209 till smooth again
- “Kurpanek” method
  - Small reductions in CV213/214
  - 209/210 = 0, throttle on step 1
  - Increase 209 till it just moves (between 110 and 130?)
  - Increase 210 till it's smooth (between 6 and 12?)
- Two completely different methods
  - But they do both work, in the right situation

“Moignard” method

- CV212 = 255
- CV209/210 default (25/20)
  - CV210 < 20 impacts DDE quite badly
- CV213 = 4 - 10
- CV214 = 4 - 10 (don’t go less than this)
- Tells the decoder
  - check the motor more often,
  - take less time over each check
- So the motor has less time to slow down while being checked!

BEMF

- It won't cure a balky loco
  - Too much fiddling can easily make it worse
  - Inappropriate settings can have strange results
- “too much” BEMF can prevent DDE working its magic
  - For steam: diesels have no DDE
- “too much” is
  - large settings for both 209/210 (above 50 or so)
  - when 212 is less than 250
- Default settings often work well with DDE
  - Leave alone if you can

BEMF

- You can turn it off completely
  - CV212 = 0
- You will need to set CV2 for starting:
  - Warm loco
  - Throttle at step 1, adjust CV2 until it just starts
    - Expect value between 50 and 100 here
  - Then reduce by 2
- Affects:
  - DDE (possibly for the better!)
  - Non-cam chuff rates.
  - Poor running locos: makes them much worse!

Sound

- First set the basic Sound parameters
  - CVs112 to 116, or DP “Sound” page
- Then do these, in order
  - Individual and the master volumes
  - Equalizer
  - Reverb
  - Background probabilities
  - AutoSounds
  - DDE

Sound Parameters

- DecoderPro Sound panel, CVs 112 – 116
- Airpump:
  - Select one or more than one: count those on the loco
  - A Cross-Compound pump is one airpump.
- Articulateds:
  - Articulated settings only work on Autochuff.
    - Artics with cams get all the chuffs via cam(s)
    - Two four-points or one 8-point?
  - Compound Artics are “Normal”:
    - only the LP cylinders exhaust to atmosphere

Sound Parameters

- Select the whistle for the prototype
  - Or what you like best!
- Alternate whistle gives two whistles
  - Use F3 to toggle between them
    - So no whistle “toot”
  - Implements SP's airhorn on “Cab Forward” TSU.
- Playable whistle is crap
  - In my opinion
  - Requires recent Digitrax or NCE system to use
  - Negates standard whistle on that throttle

Sound Parameters

- Exhaust Control
  - This is the chuff rate
  - Set at step 5 or 10 **with engine warmed up**.
- Bell Ring rate
  - Above 8 or 9 gives double-ring. Neat (imho)
- Timeout CV113: I like a setting of around 200
  - Loco is quiet until addressed (saves your ears with 30 locos on layout!)
  - Loco goes quiet when speed = 0 and all functions are off, after n/4 (ish) seconds.

Galloping Geese

- Horn #7..... Branta Canadensis!
- Check CV116:
  - Value 7:
    - “notches” every 7 steps: that's 2nd gear at 7, 3rd at 14, top at 21.
    - Engine starts at throttle step 1
    - Use Emergency Stop to shut down engine.
  - Value 16
    - Entirely manually controlled with F9/F10 to change gear.
    - Fun occasionally; hard on a regular basis.

Effect Volumes

- Sound Levels on DecoderPro
  - Cvs 129 to 136: “Foreground” sounds
  - Cvs 137 to 151: “Background” sounds
- Set these as you feel best: adjust the various volumes against each other
  - As delivered, most are **FAR TOO LOUD**!
- Look at your loco and decide what you actually want and/or need:
  - No Fireman Fred on oilburners!
  - Does the loco have power reverse?

Tip #5

- It's your loco on your layout
- It's your ears
- But
  - Many people run WAY too loud
  - Consider the 6-foot rule (10 foot in O Scale)
  - Blend that to the location of your layout

Sound Levels

- Start with the master volume at around 70.
- Set the whistle to Max
  - It’s far and away the loudest thing on the loco
- Exhaust to around 30 - 70 (too high and the DDE won't work)
- Bell to 60/70ish
- Airpump and Injectors to 40 or so
- Rod Clank to 20
- Blower to 30, Blower Draft to 60 - 70
- Dynamo to 20 (less if it annoys you)
- Brake squeal to 40 or maybe less
- Pop valve to 100, steam release to 100

Sound Levels

- Test these out. Adjust to suit
  - You may need to wait before the pop valves go off.
  - Whistle should overpower all other sounds: adjust till it does
- Turn off Fireman Fred
  - especially on oilburners or stoker fitted locos
  - and anything else you don't like
    - does the loco have power reverse?
- Now set CV128 to something that makes sense for your environment
  - 25 to 40 for home use (the 6-foot rule)
  - 200+ for exhibitions/shows with lots of background noise

SoundCar

- Select the appropriate sounds
  - Disable the others
- Horns & bells quite loud
- Moving sounds less so
- Generator sound quite quiet too
- Set Speed scalar appropriate to vehicle length.
- Note too that SoundCar only has settable volumes
  - No EQ or reverb

Equalizer

- Low pitch
  - Steam and Diesel exhaust
  - Blowers, some Horns & Whistles
- Medium
  - Horns, Whistles
  - Airpumps, fans, compressors
- High
  - Bells, dynamos, turbos
- Use the equalizer to change the whole sound picture!
  - maximise the speaker you installed

Equalizer

- Adjust different frequencies from the amplifier
  - to match the speakers
  - and your ears
  - reduce outputs that the speaker can't handle, or you can't hear
  - emphasise those that it and you can
- Look at the speaker frequency response
  - Commonly 500hz to 12Khz
  - often very usable below and above the stated limits
- Understand what your ears can hear

Equalizer

- Look at the DP equalizer panel
  - CVs 153 to 160
- Check the Users Guide: good explanation there
  - but the CVs listed are wrong!
- Try the pre-set settings first
  - You'll probably not like any of the results
    - Except maybe 1 and 6
- Try a manual setup

Equalizer

- Assume frequency response of 500Hz to 12Khz (Soundtraxx 810113)

  1) Get the loco running at step 20 or so

  2) Set CV153=7 (User Adjustable on DP)

  3) CV154 = 0, CV155 = 75, CV156 = 175, CV157 = 175, CV158 = 200, CV159 = 200, CV160 = 175

  4) Adjust to taste.

  5) Optionally: go back to individual volumes and re-tweak

Don't just shove them all to 255; all that does is turn up the overall volume.

Reverb

- Reverb is not Echo!
  - You can easily overdo it.
- Try the various presets
  - My preference is additional reverb in Whistle/Horn

Reverb

- CV161 = 7: User adjustable
  - Or see DecoderPro
- CV162/3/4: Adjust the reverb
  - 162: how much output goes back in
  - 163: delay in feeding it back in
  - 164: gain loop: do not overdo this, or you can overload the speaker!
- 169/174: manually adjust what is reverb'd
  - DecoderPro doesn't cover CV174 (blower)

Reverb

- Tip #7: use reverb to simulate diesels with multiple prime-movers
  - Soundtraxx now have EMD E unit decoders...
  - And also a DD35/DD40 for Bachmann
- Use also to simulate two locos in a lashup, with one decoder

Automatic Effects

- DecoderPro ASC page
  - CVs 201 – 208: Probabilistic effects
- These affect how likely something is to happen when the loco is stationary
- Get rid of the effects that don't make sense:
  - Set Fireman Fred filling the tank OFF (zero)
    - You'd need to be sure you stopped at the tank every time, otherwise!
- Look at how steam locos actually work
  - And are used.

Probabilistic Effects

- My Suggestions (as ever, YMMV)
  - Set pop valve = 1 - 4
    - Depending on how good the prototype was at making steam
    - And how skilled your firemen are
  - Set blower = 200
    - should always use the blower when stationary
  - Set injectors = 150
    - It's likely that they will be used when stopped

Automatic Effects

- I don't use any of the automatic sounds
  - Steam blowdown on stopping is hateful
    - and not prototypical
  - Autowhistle and autobell become a nuisance
    - but you may like them
    - but you don't want the bell always sounding…
  - Grade Crossing can be useful
    - But note that the way you set up momentum and DDE may affect how it works
    - Econami has grade crossing on an F-key

Now bring it to life

- Set some momentum
  - Makes it behave properly
- Brakes!
  - Yes, proper brakes.
- DDE settings

Momentum

- CV3 and 4
  - Ensures that you don't have “train-set” starts and stops
    - Rarely need speed tables on a steam Tsunami
      - Have used on Geese: reverse trim slows down backing up
    - But you might
- CV3 = 25 to 50
  - Gives a prototypical start
  - Triggers the DDE
    - Fast open of throttle: DDE loudens the exhaust as the loco accelerates, and quietens it when it reaches the set speed

Momentum

- Set CV4 = lots (I go for 150-ish)
  - Close the throttle, and the DDE quietens the exhaust as the loco decelerates to the new throttle setting
    - This is why you don't set the Exhaust sound too loud
  - Coasts along. May go 10 feet from Speed 25/100 before stopping!
  - Help! Can't stop!!

Tip #8

- Know how to use your Emergency Stop.
- Digitrax:
  - set throttle to LOCAL Emergency Stop.
  - Else you'll shut down the whole layout!
- Local ES useful too for diesels/geese:
  - triggers prime mover shutdown sequence
    - When set to default of Automatic Notching

Brakes!

- Steam loco drifting nicely. How do I stop it?
- CV61 and F11 (F11 can be remapped)
  - DecoderPro Advanced page: CV61 is the brake intensity.
  - When brake pressed:
    - Values below 128 are added to CV4 value
    - **Values above 128 are Subtracted from CV4**
    - the loco then uses that temporary value
- DecoderPro presents these values differently
  - Use Subtract....

Brakes!

- My suggestion
  - CV61 = 255 (DP: Subtract, 127)
  - CV4 = 150
- When throttle closed, loco decelerates at CV4=150 rate. Coasting
- Press F11:
  - Temporary CV4 value: 150 – 127 = 23.
  - Loco now decelerates at simulated CV4=23.
  - From step 25/100, that's about 6 inches.

Brakes!

- Brake tricks
  - Which are just like the real thing....
- Coupling up
  - Stop short of train – say 1 inch.
  - Close throttle
  - Set brakes: F11 on
  - Open throttle to step 1
  - Brakes off
  - Brakes on as it couples.
  - Reverse loco, brakes still on, throttle still open.
  - Brakes off, pull couplers to check, brakes on. Close throttle.

Brakes!

- Helper Operations
  - I'm assuming here
    - you **need** the helper to move the train, and one loco can't do it on its own
    - Your locos are reasonably well speed matched
  - Run helper up to back of the train. Couple up, or leave uncoupled if you drop off on the fly.
    - Digitrax DT40x throttle helps here (two knobs)
  - Both locos: brakes on. Open throttle to appropriate setting (say 20).
  - Helper: brakes off.
  - As the slack bunches up, brakes off on the train loco.
  - When you get good at that, add the whistle signals!

SoundCar

- Set CV3 and 4 to same values as locos
  - Helps to have all locos with similar settings
- Set CV61 to same value as locos
- Then: SoundCar accelerates wheel sounds to match the loco speed
  - And reacts to loco brake applications too!

DDE

- DecoderPro DDE page, Cvs 177 to 188
  - Steam Only. No DDE for Dismals
- Throttle gain (CV 177)
  - Good values are 70 - 130
  - Decoder uses difference between throttle speed and actual speed - requires large CV3/4 values to work.
- Motor Load gain (CV 178)
  - Good values are 80 – 170
  - Decoder adjusts sound to the motor load
  - May be less effective if CV 212 is less than 200 or so
  - If too large, loco reacts to tiny load changes and you wonder what's happening.

DDE

- Attack/Delay time constants (CV179/180)
  - Affect how fast the sound responds to throttle or motor load changes.
  - Bigger the number, the faster the change. Leave at <10.
    - Values of 2 or 3 are often useful
- Exhaust and Rod Clank volume changes (CV 181-184)
  - Leave both Exhaust ones at 255 (12dB difference)
  - Leave Rod Clank Low at 255
  - Reduce Rod Clank High if you get too much rod clank for your liking – or the loco is freshly shopped.
  - Also alter Rod clank volume CV as required (it is often too loud)

DDE

- DDE filters (CV185-187)
  - Suggest leave these as default until you are fully happy with everything else
  - Then
    - CV185 (DDE Initial Frequency) adjusts the deepness of the initial chuff. Lower values = deeper chuff.
    - CV186 (DDE Gain) affects how the chuff is modified as speed rises and the cutoff is shortened. Too large a value can make high speed sound very strange
    - CV187 (Filter Control gain). Leave above 200. Sets “overall tonal shape” – too small a value makes it all sound very odd.

DDE and Load

- BEMF CV212 sets overall BEMF intensity
  - Default is 255
    - tends to give best BEMF control for slow speed and good starts and stops
  - Reducing CV212 may reduce the ability of the decoder to balance sound against load.
- We discussed BEMF settings earlier.
  - Too little CV210 can reduce DDE impact, in particular.
    - I find this needs to be 20-30.

DDE and Load

- Soundtraxx's Tsunami Users Guide shows how to adjust so that sound changes with load.
- It's a balancing act of
  - CVs 210, 212, 178, 185, 186 and 10
  - The motor and gearing in the loco
  - The speed you run it at
  - The grades and loads that you run it on and with
  - Your ears, and your perception of the sound.

DDE, Load and BEMF off

- CV212 = 0
- Only use on really smooth locos
- May get a significant improvement in DDE
- CV188 gives motor efficiency to DDE when BEMF is off (212=0).
  - Soundtraxx suggest leave at 102.
  - I say play with it, loco on a grade with a train
  - You may find a useful value between 40 and 60.

We're done

- Other clinics here in Portland
  - Jarrette Ireland: Saturday 4pm: Braking, Switching Running with Soundtraxx
  - Mat Thompson: Weds 8am, Fri 2:30: Configuring Tsunamis
  - You've already missed Greg Wright on Scale Sound.
- Come see and listen
  - My home layout (by appointment) – note that it's in the UK!
    - Grab a business card at the end
- Resources
  - Slides on my blog (www.mickmoignard.com) after the show
    - Look on the Downloads page
  - SoundTraxx web site (www.soundtraxx.com)
  - SoundTraxx yahoo group: membership recommended
    - (groups.yahoo.com/soundtraxx)
  - Marcus Amman's keep-alive site:
    - http://www.members.optusnet.com.au/mainnorth/alive.htm
  - Bruce Petrarca: http://www.mrdccu.com/
  - Detlef Kurpanek: http://www.trainweb.org/gnw/

Questions?

(if we have any time left)