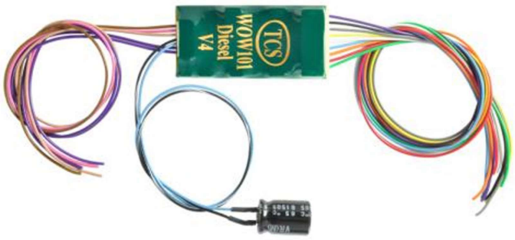
Is it Progress?

In the past, many layouts were built where the "driver" stood at one position and watched his train go around, and around, and around. Many of these were Club Layouts – no problem, at least the member gets to run his train.



In more recent years – say the last 20 years – we have had **Digital Command Control**. The big difference, with **Direct Current** - you drive the layout and with **DCC** you drive the train. To me this means you walk with the train to see signals, to see that the track is set right and high on the list is doing some switching. Yes, you can do this with DC but you would also have to do the other little jobs – switching turnouts, switching the power blocks, making sure nobody else is in the block.

DCC has come a long way.

With DCC there is also the full benefit of sound. Yes, you can make the DC steam loco chuff or diesel make a noise. With DCC you can have all the extra sounds – whistle, horn, brake squeal, generator for lights with plenty more. Early sound decoders did not have the benefit of technology – **BEMF** (I'll explain this later) and memory space. Decoders now have up to 8gb memory in a very small space – room for a lot of different sounds.

I install Sound Decoders for others. This in its self can be a challenge – some just want basic noise, others the exact sound of the prototype. For many years many people could not differentiate between 2 stroke and 4 stroke diesels.

Using the decoders.

Besides the sounds there is the way we operate our layouts – some just put the train on the track and run it around and around, Personally I am in to more prototypical operation. With this comes the more prototypical control of the loco. This is where some of the major brands of sound decoders are a blessing. Let's try a diesel first. Into the cab - the first thing is to start the prime mover. This will take a few seconds for the engine to run up to speed. Turn on the number board lights and possibly the marker/class lights then

a short blast on the horn, start the bell as we are ready to move away. Release the brake – you will hear the air release – then start moving the throttle. With some decoders you can set them so the loco will not move unless the prime mover is running.

Once up to the speed set on the throttle, the prime mover will notch down as we coast along. We get to the train we are about to pull. As we approach the first car, we close the throttle and the prime mover will drop to idle, we can then apply the brake. This will ease us to within 10 feet of the car – if we are slowing a little too quickly then release the brake and re-apply. Move up to the car at 5 mph and connect. Once connected we have to "pump up the air" in the train. The prototype can take up to an hour to do this, but that is too long for a modeller. On my layout it is a count of "3" for each car in the train.

What are Brakes?

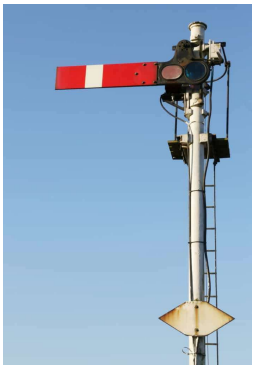
The next question – do the brakes actually work? Yes, they do on the better decoders. Actually, they do not apply the pads to the wheels but instead send signals to the motor that act the same way. At the same time, you get the "brake squeal and grind" that goes with the braking effect.

I use **TCS WOW** for Steam and **Tsunami** for the Diesels. Two different brands but with similar logic. The WOW has five levels of braking (F7) – they are 20%, press again and get 40% then 60% then 80% and 95%. Without similar figures pressing the brake once would "stand the loco on its nose" – some people like it that way. To release at any time just press (F6) or move the throttle either way. There are 5 CVs that can be set to replicate the braking effect.

In the **Tsunami** it is slightly different, (F7) still applies the brake and then press again to release it. Again, you can set a CV to the value you want for the brake. CV4 deceleration minus CV117 loco brake = actual braking. So 120 – 110 = 10 simple maths. The Tsunami also has the option of loco or train brake that can be set the same way – I set them the same. Other decoders are pot luck for braking – I have not tried them.

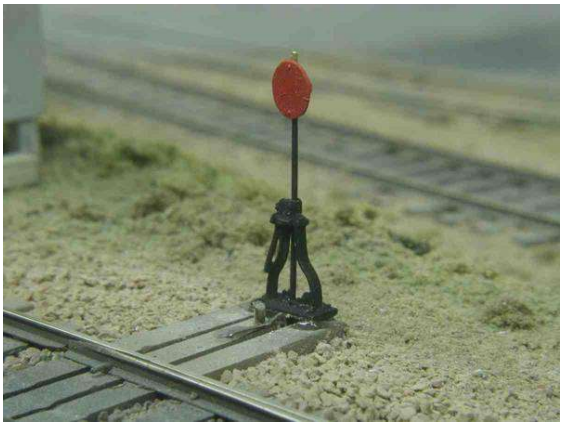
Out on the run.

We are now ready to leave the yard – turn on the bell and a short blast on the horn. Wind up the throttle and we start to move, as the locos feel the load, they will notch up further – thanks to **BEMF** (explained later). Once at a steady speed, they will notch down slightly. As the load changes due to turnouts or grade changes the prime mover will notch up and down due to the settings of **BEMF**.



There is a **RED** signal up ahead – this means the train must stop before the signal. There are many operators who do not know what red or green signals mean – never get in a car with them! Wind the throttle back to zero – the train will continue to coast but gradually loose speed. If you are still going a little too fast apply a bit of brake – release or apply as required. If the signal goes green as you approach it, then just wind the throttle back to where it was.

As you approach a yard or switching location, slow down and start the bell. The dispatcher should have the track set for you – BUT – there is always a but, if you have to set it, STOP the train before you reach it. The driver's assistant has to get down from the loco walk to the turnout control – switch stand or lever frame – and change the turnout. This takes a little time to do! So, wait for a count of 20 before you proceed. **MANY** operators forget to reset the turnout



after they have passed through it – if you get them to place a large coin in the jar each time – they will soon learn!

Once at the location you can check the **Switchlist** or **Car Cards** to see what work you have to do. **Switching/Shunting** is a complete subject on its own so I will go into that later. Once complete you are ready to leave the area. You now have to pump up the air in the brake system. As before, a count of 3 for each car. Get permission from the dispatcher to go back on the Mainline. Start the bell to signify you are about to move and a short blast on the horn – just for the hard of hearing! Remember to reset the turnout when you have left the yard.

I have covered the diesel ride above, the steam loco is very similar but you have a few extra options to consider, I will go into them later. Each layout has its own rules – so have the prototype railroads so what I have described are just the basics but can add a lot of fun to the hobby.

Setting up the diesel loco.

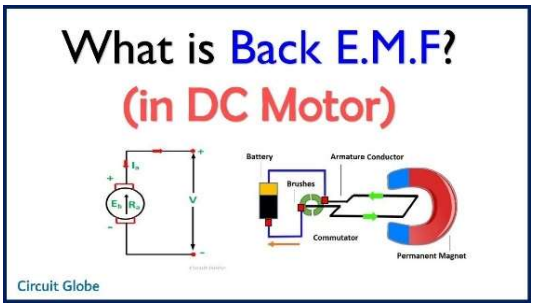
You would have to read your decoder manual for each brand, I do this in conjunction With **Decoder Pro** to get the best out of the loco. I use **Tsunami** decoders in the diesels and **TCS WOW** in the steam locos.

When doing the initial setup of the diesel, I set the address, momentum and speed. The first part of tuning is the **"start"** – setting the throttle to 128 speed steps I want the loco to start moving at step two (SS 2). Remember the prime mover does not speed up on notch one – that only connects the generator to the traction motors. Check the manual for the fine settings here.

The next part is the top speed, on my layout it is **30mph**. I have a speed trap on the mainline to assist here – makes it an easy task. Many people ask why such a slow speed? Well, by my observations when a driver is walking with his train, he may have to pass other operators and drivers at different points on the layout. For an operator over 55 years of age with a few extra pounds 30 mph is the perfect speed! For those who sit back and watch the train go by at 80mph that is their option.

Once the speed is set the next step is calibrating the **BEMF** (Back Electro Motive Force) – sounds technical but it is not. Read the relevant section of the manual twice and then try it.

What is Back Electro Motive Force?



I will try to keep this as simple and as basic as possible, it does apply to the mainstream sound decoders such as Tsunami 1, Tsunami 2, Econami and WOWs. Soundtraxx gave it the name of Dynamic Digital Exhaust and this seems to cover them all.

Each motor has "dead" spots when under power, at these spots the motor acts as a generator and generates a pulse – **B**ack **E**lectro **M**otive **F**orce. These pulses are seen by the processor and are used to control the motor speed.

When the throttle is set to a particular speed – the motor will turn at that speed – expected – **BUT**, if the decoder has momentum set correctly then there is a difference between the speed set and the actual speed

– the processor reads the **BEMF** to see this and increases the sound (the chuffs for a steam loco or the RPM for a diesel) until the motor gets to the set speed and then quietens down.

If the loco comes to a grade the motor will try to slow down but the processor sees the change in speed (by reading the BEMF) and adjusts the power to the motor accordingly – hence the chuff gets loader or the loco notches up. In both the Tsunami 2 and the WOW v4 this is part of the **High BEMF** calibration.

When the loco is going downhill, provided the rolling stock is free rolling, the motor will try to speed up. The processor sees this and reduces the power to the motor – this is controlled by the **Low BEMF** calibration. At the bottom of the grade the loco will have to work again until the motor is turning at the set speed – then the chuff or RPM will drop back.

Tsunami Diesel - USA

F0	Headlight – Backup Light
F1	Bell
F2	Horn
F3	Short Horn
F4	Dynamic Brakes
F5	Engine Start – RPM +
F6	Engine Stop – RPM -
F7	Brake Apply / Release
F8	Cab Chatter
F9	Grade Crossing Horn
F10	Auxiliary lights
F11	Fuel Loading
F12	Brake Select

Very slight changes in grade or curve radius will affect the **BEMF** and cause changes to the sound. To get the best response the momentum should be set realistically. I personally use 30 for acceleration and 120 for deceleration - using the brake for stopping.

Besides the Low & High settings there are other adjustments – rate at which the sound changes, how often it reads the **BEMF**, how big is the window through which it reads the pulses.

The above is as simple as I can explain it. There are many advanced algorithms in the decoder to give you the best results – we do not need to know the nitty gritty here just how to use it. We also have the dynamic brake; on a number of brands the dynamic brake actually works and can be set up like the normal brakes – to suite your layout. The dynamic brake application also makes the prime mover drop to idle or to some pre-set notch. The prime mover will notch back up when the brake is released

Now the Fun Bits

These "bits" add some fun to larger layouts. The names vary from brand to brand but the effects are much the same. OK, we are in a diesel cruising along at a mid-speed, we can drop the sound of the prime mover as we are not working hard – Notch Down =WOW, RPM minus =TSUNAMI. In the Loksound 5 DCC this is HOLD and in the QSI the same thing is Sound Of Power. With the two later decoders once in this mode you can increase or decrease the speed knob without changing the speed.

The above will also work the other way using Notch Up and its relatives. With the Tsunami and the WOW just a slight touch of the throttle will return things to normal; with the Loksound and QSI just turn the function off.

WOW Steam - USA

F0 = Headlight – Backup Light
F1 = Bell
F2 = Whistle
F3 = Short Whistle
F4 = Whistle Quill
F5 = Cylinder Cocks
F6 = Brake Release
F7 = Brake x 5 steps
F8 = Mute
F9 = Water Fill
F10 = Auxiliary Lights
F11 = Johnson Bar - UP
F12 = Johnson Bar – Down

A Little Blast Of Steam

Rules and regulations are the same for steam as they are for diesel. The fun is also just as good. On the diesel we have the throttle – on the steamer it is the regulator. Just open the regulator and the loco increases speed. We also have the Johnson Bar – consider this as the "gear lever" for the steamer. In Australian locos this is normally a wheel in front of the driver but in American locos it is a ratchet lever. While the loco is chuffing along nicely with the BEMF doing its job of changing the Kadence of the chuff, the Johnson Bar can add more to this – pull the bar backwards and the chuffs will drop off. This is done by pressing a function button, do this a few times- depending on the decoder. A touch of the throttle will bring it back to normal. Press another function button and the chuff will increase the Kadence giving a much heavy sound used when climbing hills.

OK, we have done the work in a yard and we need to move on, the steamer will need to take on some water to continue its journey. You pull up to the water stand or water tank and take on water – some decoders have the sound for this event, some, even have the sound of coal filling the tender. For this I use a count of 5 for each car.

With steamers they need a steam driven dynamo for the lights. A function will turn the dynamo on – two options here, the lights are on different functions and will not wind up unless the dynamo is running. The other option is to have the lights on the same function as the dynamo. One of the many personal choices when setting up the decoder.

The coloured panels show a list of functions for steam and diesel – both are for American locos. Those lists are printed on the front of the loco card that goes with the car cards.

Tsunami Diesel - Australia

F0	Headlight – Backup Light
F1	Auxiliary Lights
F2	Horn
F3	Short Horn
F4	Dynamic Brakes
F5	Engine Start – RPM +
F6	Engine Stop – RPM -
F7	Brake Apply / Release
F8	Mute
F9	
F10	Auxiliary lights
F11	Fuel Loading
F12	Brake Select

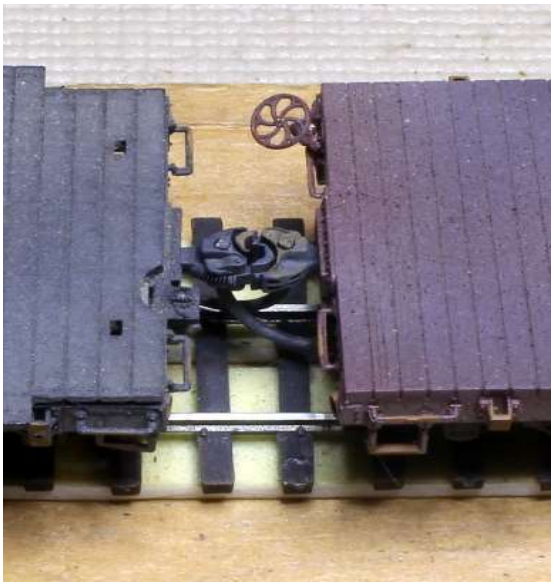
These two panels are for the Australian loco drivers – no bell, no cab chatter (needs some swearing) and no grade crossing whistle.

WOW Steam - Australia

F0 = Headlight – Backup Light
F1 = Auxiliary Lights
F2 = Whistle
F3 = Short Whistle
F4
F5 = Cylinder Cocks
F6 = Brake Release
F7 = Brake x 5 steps
F8 = Dynamo
F9 = Auxiliary Lights
F10 = Firebox Flicker
F11 = Johnson Bar - UP
F12 = Johnson Bar – Down

Once you have set up your locos to perform the way you want, spend plenty of time operating them – to get used to how they respond then you can think about setting up an operating system that is most suitable for your layout.

Uncoupling Kadees



Most modellers use **Kadee Couplers** on their locos and rolling stock, but they often have problems uncoupling the cars. The thing they often forget is to back up the loco and compress the coupling - THEN insert the tool to separate them.

Once the cars are together, place the uncoupling tool of your choice in the space formed between the couplings. If a “pointy stick” then click clockwise and drive away – leaving the uncoupled car behind.

My favourite is the dental brush (the blue one) just place it in the space and drive away – **NO** twisting required.

Operations on a Layout

Operation means different things to different modellers. After many years of exhibition layouts where trains go around and around and around.... I now like to use a local freight running between classification yards setting out and picking up cars at industries along the way.

To instil a form of reality to these operations I use **Car Cards** and **Waybills.** I print the car cards on 200gsm card stock and the waybills on normal 80gsm copy paper. This system has been around for many years in various forms, my system is only a slight variation.

First, I make the **car card**. This is folded up as shown to make a pocket for the waybill. The folded card is held together with a clear address label. They are easier to use than sticking tape, and, I have a few thousand of them doing nothing.

Because my hand writing is so bad (no, I'm not a doctor) I print the car cards and way bills on the printer. To get the right information in the right place, I use an Excel Spreadsheet to set up and then print the waybills.

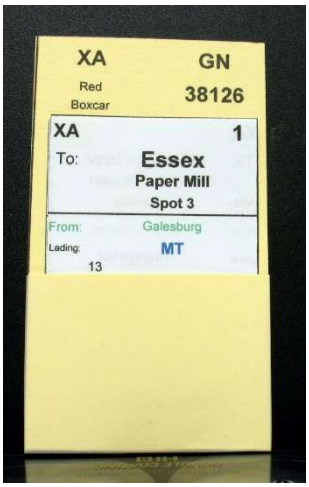
The **car cards** are the easiest part and they are also setup on a spreadsheet. All text the same way up, the reporting mark, AAR car type, car number, short description of the car, e.g. Brown Boxcar - in small print. The waybill spreadsheet takes a little more time to set up.

I put a car in its location at each industry along with its car card. I then go around the layout and add a suitable waybill to each car card. Peddler Freights are set up in the staging yards with 4 - 6 cars blocked for Shelby – the main yard.

The waybill has a section [VIA] in red, this shows the next yard destination for the car. Shelby is the yard for the division, the other "VIA" destinations are staging yards for the 'run through' trains. The cars dropped at Shelby are then sorted into "locals" for each of the industrial towns on the division.

The local has 5 cars and a caboose. The reasoning behind this is that it takes about an hour (real time) to travel to location, switch each of the industries, and return to the yard. Once at the yard, the loco has to return the caboose to the caboose track and then get its self to the loco yard for service and refuelling.

Any of the peddler freights can be diverted over the full system instead of going straight to the next staging yard. There are also "manifest freights" that just run from staging to staging, there are also a few passenger trains that run on the system.



As each car is set out, a car is removed from that exact location. This stops the industry or yard being swamped with cars. There are 86 industry "spots" on my layout. This means there can be 86 single car movements in a session, not counting run throughs or passenger trains. The cars returned to Shelby are placed in trains going to staging. If a peddler drops off 4 cars, it can take 4 cars to staging. This ensures that trains are not too long for staging. Limited space -limited staging.

Each train has a **Loco Card** and a **Car Card** for each car in the train. Each car card has a waybill in the pocket. The Loco Card has the details of the loco; type, Road Name, Number and capacity. The number is the address entered into the throttles. On the front there is a list of functions available for that loco. These lists were shown earlier – for both Australian and American Locos. The Car Card has the car type, reporting marks, number, description and “Return To” information. There is a pocket on the front for the waybill.

The Way Bill has two sides, both sides show the car type, Via (the next yard), destination and commodity carried. The destination will show the town, the industry and the location at that industry. The operator does not turn the way bill, that is done by the dispatcher between sessions. The reverse side shows the off line town, industry, and commodity just to add "reason" to the movement. The way bill is turned between session, we have yet to move all 86 cars in a session which lasts about 3 hours with sometimes a 30-minute break.

This is a simple operating system that I first used at the Sydney N Scale MRC back in 1975. Above you can see the cards set out ready for the cars to be moved to their new locations. There is no pressure or stress on the operator to perform in a set time. Most of my switching is off the mainline so that through trains are not held up.

The Fiddle Yard – Also known as - the Staging Yard

Nothing to do with the Emperor Nero – but out of sight storage yards. Quite often there is not enough staging area on any layout. Many people will ask what is a staging yard, why would you want one? Put simply NO layout is big enough to model a complete railroad. You might get away with a short narrow-gauge railway. The trains travel through the layout from one side to the other – where is the other?

The photo above shows the staging yard under Great Falls on my layout, there are three long tracks representing St Paul in the east and three more for representing Seattle in the west. Trains travel from east to west OR west to east over the layout dropping off cars at the yard at Shelby. The cars at Shelby are then classified and sent to the towns on the layout. There is a "formula" for the number of tracks you would need. Calculate the biggest number of trains you would need to store then add an extra track.

Like all formulas, this has been proven to be wrong – when you have the "most trains" calculated – DOUBLE IT – and you may have enough tracks. There are four such staging yards on my layout.

Railfanning and Night Operations = https://www.youtube.com/watch?v=oqKGpi10_EI&t=9s

Using A Consist = https://www.youtube.com/watch?v=f2j6_HDdRuw&t=635s