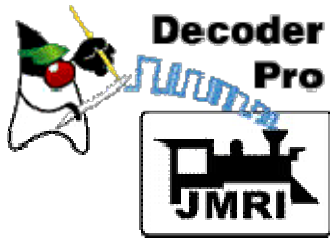


Tuning Your Decoder with Decoder Pro.



These days, sound decoders are so advanced that you can wear your pencil out recording all the settings you change, and in some cases there are so many things to enter that I do not even think about doing it without the computer.

I use a programme called [Decoder Pro](#) to programme and record all the decoders. It is easy to use, is regularly updated for new decoders and most of all it is free.

It means I do not have to remember or look up which CV to change or what each CV does. You just enter a number, or move a slider or just tick a box, the programme does the rest. Connecting the computer to your system can be very easy – **Decoder Pro** will connect to 38 different command systems.

The cable runs from your PC to your command station and that is all that should be needed. There are instructions on the web site for the initial set up of each system so I will not repeat them here. You can buy a unit that can be used for testing and programming your locos if you do not have your own system. Many of you may take your locos to a club or mate's place to run them but would like set up your own locos at home – a more favourable environment. This unit is called a [Sprog](#) and is available from the UK for about \$100.00. (There is also a Dealer in Glen Innes, NSW.) I use a Sprog 3 for all my programming N scale through to O scale.

<http://jmri.org/download/>

REMEMBER – set the loco up the way **YOU** want it, not for Claude at the club.

Start up Decoder and Programmer selection

You'll get a new window to configure the programmer with information about a specific type of decoder, or an existing locomotive. This will become your locomotive roster as you program your decoders.

DecoderPro: All Entries

File Edit Settings Actions SPROG Programmer EasyDCC via Serial Window Help

+ New Loco 🔍 Identify ? Help

Roster Groups	ID	DCC Address	Icon	Decoder Model
All Entries				
Don Tydd	CEFX1006	1006		AT100LC/KT100LC Diesel
Gerry Hopkins	GN 1012	1012		TSU-1000 DRGW K-Class Steam
Peter Jackson	BNSF 1016 bh	1016		WOW Diesel 101 SS2
Warren	NSW 1018 mw	1018		M1
	GN 1028	1028		TSU-1000 Lt Logging Steam
	GN 1056 gh t4	1056		T4X
	GN 1056 gh v4	1056		WOW Steam 101 SS4
	LMS 1072 gm	1072		ECO-200 UK Steam
	NSW 1100	1100		D13SR

To start working with a newly-installed decoder, click the adjacent "**New Loco**" button to open the list of decoders, then have the programmer read the decoder and attempt to identify it. (You could also explicitly tell the programmer the decoder type). While the programmer is talking to the decoder, status will be displayed in the bottom of the window; "Idle" or "OK" means that things are working. If it succeeds, it will select the decoder model in the selection box. Usually it will only be able to narrow the selection down to a

few choices. Check that the right model is selected in the "Decoder Installed" box, update the selection if desired.

The first screen lets you set up the **ID** for the file containing all the changes you make to the decoder. It also has the space to set up other data and notes for you own personal use.

Nothing technical here just straight forward information you can type in.

S	Sound Function	Volume Groups	Individual Volume 0	Individu
Basic Speed Control		Speed Table		
ID:	ANR 24 dg			
Road Name:				
Road Number:				
Manufacturer:				
Owner:				
Model:				
DCC Address:	24	DCC Short		
Throttle Speed Limit:	100 %			
Comment:				
Decoder Family:	WOW Diesel Sound Set 4			
Decoder Model:	WOW Diesel 101 SS4			
Decoder Comment:				
Date Modified:	10/05/2018 2:15:42 PM			
		Save to Roster	Reset to defaults	

The next screen is called **BASIC** and as the name implies, it has the basic detail information for identifying the loco such as the number on the side of the cab, direction, number of speed steps and whether it can run on DC as well.

The screenshot shows the BASIC configuration pane with the following settings:

- Short (one byte) address
- Long (two byte) address
- Active Address: 24
- Primary Address: 24
- Extended Address: 0
- Address Format: Short (one byte) address
- Normal direction of motion: forward
- Speed steps: 28/128
- Analog conversion mode: Off

This image shows the **number** on the cab and as it is only two digits it is referred to as Short Address.

Also shown here is the **direction** of travel, depending on the decoder you may have to change the way the lights operate but that is on another pane.

Speed Steps this is normally set to 28/128 the old option on decoders was 14 speed steps but many modern decoders do not have this option.

Analog Conversion Mode means the loco can run on DC as well as DCC. It is always advised to turn off the DC option for numerous technical reasons if you are only using DCC.

Click **“Write Changes”**. Once this pane is set up we can go on and set our preferred options for the loco.

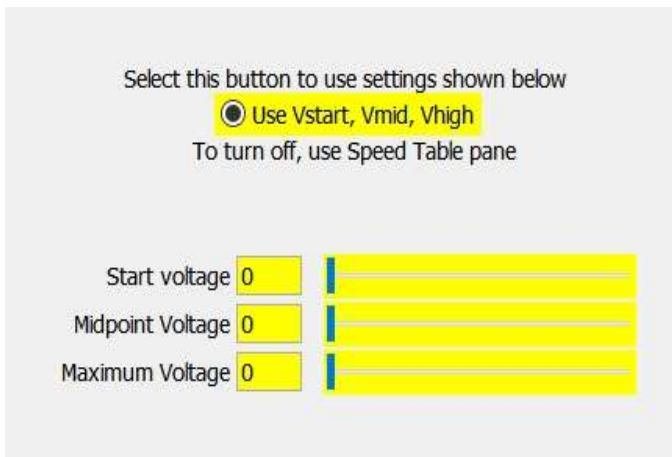
The screenshot shows the Motor Control configuration pane with the following settings:

- Accel 1 Rate: 1
- Decel 1 Rate: 1
- Dither Frequency: 3
- Dither Amplitude: 10
- BEMF Enable: Enabled
- BEMF Cut Out: 0
- Motor Button Control: Disabled
- Button Control Direction: Manual F2 for, F3 rev
- Power to button controlled motor: 255
- Enable BEMF Button Control: Disabled

The next pane is the **Motor Control** pane. Here you can set up the Acceleration and Deceleration rates. My advice for a starting point is to set Accel to 25 and Decel to 15.

This will work well for most decoders – ESU decoders would have these set - Accel to 100 and Decel to 60 for the same effect.

The rest of the setting on this pane can be left at default for now. The information here will vary depending on the Brand and whether it is non-sound or sound.



The next basic step is to set the top speed of your loco. This is a must if you intend to run locos together – it is called “**speed matching**” but more of that later.

As most decoders have **Back Electro Motive Force** the start voltage can be left at “0” for now.

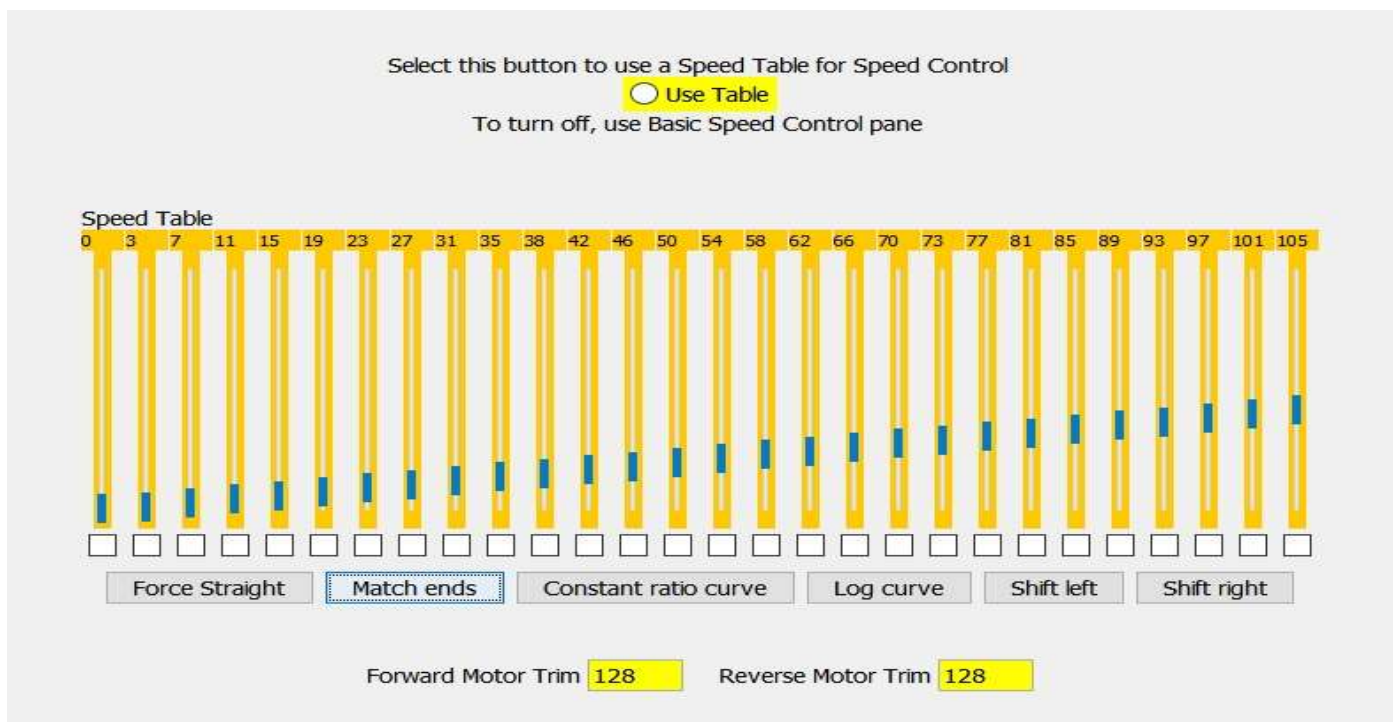
We must set the **Maximum Voltage** then the **Midpoint Voltage**. We do this by sliding pointer along the scale until the desired speed is obtained then set the Min Point to about half this.

An out of the box typical British 4-4-0 loco can run at 230mph – just a little too fast. As a rule of thumb, top speed would be set at 30mph for most locos. **Remember** – with DCC you walk with your train to observe signals, sound the bell, sound whistle/horn as required so 30mph is a good speed. This is a good speed when you walk around a layout that has other operators in aisles.

“With DCC you drive the train NOT the layout.”

The next pane in **Decoder Pro** is the **SPEED TABLE**. There are 28 speed steps and without Decoder Pro you can program all the steps individually with your command station.

Thanks to Decoder Pro you can do it all in a few easy steps. You can click on the first step and set its value then click on the last step (setting your top speed) and click match ends. The table sets itself up as shown here. Remember to click the circle at the top.



White Wire Effect 0	Constant bright light
White Wire Effect Group	Group 0
White Wire Timing	Function on running forward
Yellow Wire Effect 0	Constant bright light
Yellow Wire Effect Group	Group 0
Yellow Wire Timing	Function on running reverse
Green Wire Effect 0	Constant bright light
Green Wire Effect Group	Group 0
Green Wire Timing	Function on both directions
Purple Wire Effect 0	Constant bright light
Purple Wire Effect Group	Group 0
Purple Wire Timing	Function on both directions
Brown Wire Effect 0	Constant bright light
Brown Wire Effect Group	Group 0
Brown Wire Timing	Function on both directions
Pink Wire Effect 0	Constant bright light
Pink Wire Effect Group	Group 0
Pink Wire Timing	Function on both directions

The next “FUN” pane is the **Light Output** pane. Here you can see the 6 outputs on this decoder. The **EFFECT** can be set to one of many different effects – these do vary with many decoders. Just click on the down arrow at the end of the line and you will see all the effects available in that decoder.

You can also set the output to operate in either direction or in both directions. With a number of decoders there is a further option to control the brightness of each output – it saves having to “play” with different resistors in line with the light.

Headlight Dim When Stopped	Disabled
Opposite Headlight Dim	Disabled
Constant Dim 1 Brightness	16
Constant Dim 2 Brightness	5
Constant Dim 3 Brightness	5
Constant Dim 4 Brightness	5
Headlight Dim Brightness	0
Reverse Light Dim Brightness	0
Mars/Gyra Min Brightness	1
Mars/Gyra Mid Brightness	6

Lighting Outputs . . . What function does what.

Use this sheet to determine which functions will control which outputs

Description	Output wire or operation										
	1 White	2 Yellow	3 Green	4 Purple	5 Brown	6 Pink	Dim	Ditch	Motor	BEMF	Brake
Forward Headlight F0(f)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reverse Headlight F0(r)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Function 7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function 12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

On this pane we can select which function controls which output or outputs. A Function button can control a number of outputs such as **Rotary Beacon** as well as a **cab light** or **step lights**, each one on a different output.

You can also see here that there are other options available on this decoder. These often include Dim, Ditch Lights, Brakes and possibly turn the BEMF on or off.

You can have a lot of fun playing with this page.

Decoder Pro with Sound Decoders

To start working with a newly-installed sound decoder, click the adjacent "**New Loco**" button to open the list of decoders, then have the programmer read the decoder and attempt to identify it.

The first part is exactly the same as with non-sound decoders. With the newer decoders Decoder Pro reads a few extra CVs to get the correct sound file and firmware version. The **Tsunami 2** has a limited memory for the sound files so they are split into groups – Steam, Alco, GE, EMD, Baldwin and other. The WOW has a bit more memory – currently 8GB Micro SD Card – so all steam sounds are on one decoder and all diesels are on another decoder. The Loksound decoder has 32k of memory so only a single sound file is loaded.

DecoderPro: All Entries

File Edit Settings Actions SPROG Programmer EasyDCC via Serial Window Help

+ New Loco 🔍 Identify ? Help

Roster Groups	ID	DCC Address	Icon	Decoder Model
All Entries	CEFX1006	1006		AT100LC/KT100LC Diesel
Don Tydd	GN 1012	1012		TSU-1000 DRGW K-Class Steam
Gerry Hopkins	BNSF 1016 bh	1016		WOW Diesel 101 SS2
Peter Jackson	NSW 1018 mw	1018		M1
Warren	GN 1028	1028		TSU-1000 Lt Logging Steam
	GN 1056 gh t4	1056		T4X
	GN 1056 gh v4	1056		WOW Steam 101 SS4
	LMS 1072 gm	1072		ECO-200 UK Steam
	NSW 1100	1100		D13SR

(You could also explicitly tell the programmer the decoder type). While the programmer is talking to the decoder, status will be displayed in the bottom of the window. If it succeeds, it will select the decoder model in the selection box. Usually it will only be able to narrow the selection down to a few choices. Check that the right model is selected in the "Decoder Installed" box; update the selection if desired.

The Basic screen is the same as the one used for non-sound decoders. The next screen is the **Motor Control** screen and this often has a little more on it just in case you have a loco that is a little "lazy" to start. The **Basic Speed Control** is the same as before and is adjusted in the same way.

The **Function Pane** is something different and varies across brands.

In the **Tsunami 2** any function between “0 and “28” can be assigned to any of the sounds or outputs. Alongside any sound or light output there is a drop down box – just click here and assign a Function Button to it.

Use this sheet to determine which functions will control which outputs

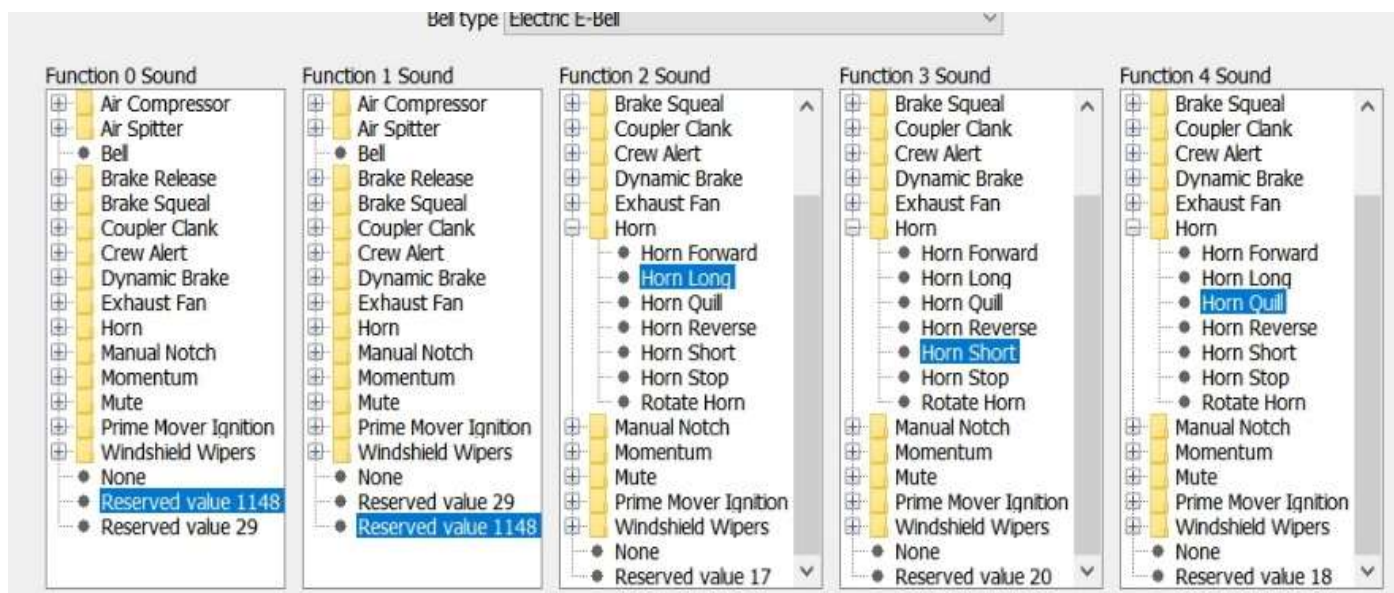
	Extended Function Mapping	Forward Driving	Reverse Driving	Forward Standing	Reverse Standing	Emergency Stop Button
Headlight	F0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Backup Light	F0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FX3 Effect	F1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FX4 Effect	F1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FX5 Effect	F9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FX6 Effect	F9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dimmer	F11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mute	F8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Independent/Train Brake	F7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Half Speed	F14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Momentum Override	F14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grade Crossing Signal	Disable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forward Whistle Signal	Disable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reverse Whistle Signal	Disable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stop Whistle Signal	Disable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Brake Select	F12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alternate Mixer	Disable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RPM+	F5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RPM-	F6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Airhorn	F2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bell	Disable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Read changes on sheet Write changes on sheet Read full sheet Write full sheet

The **Loksound** is different again and much of the sound allocation depends on the sound file that has been loaded. The Function mapping can be changed but this is best done with the Loksound Programmer.

↑	↓	Conditions (Motion, Direction, F keys, Sensors)	Physical Outputs (Wires)	Logical Functions	Sounds	Row	
○	1	Stopped,Forward	Change	-	Change	Change	1
○	2	Stopped,Reverse	Change	-	Change	Change	2
○	3	Moving,Forward	Change	-	Change	Change	3
○	4	Moving,Reverse	Change	-	Change	Change	4
○	5	Forward,F0,not F19	Change	Headlight[1]	Change	nd slot 11,Sound slot 13,Sound slot 14	Change
○	6	ie 3,not F26,not F27,not Wheel Sensor	Change	Aux 7,Aux 8,Aux 1[2]	Change	Sound slot 20	Change
○	7	F1	Change	-	Change	Sound slot 1,Sound slot 2	Change
○	8	F2	Change	-	Change	Sound slot 3	Change
○	9	F3	Change	-	Change	Sound slot 4	Change
○	10	F4	Change	-	Change	Sound slot 5	Change
○	11	F5	Change	-	Change	Sound slot 6	Change
○	12	F6	Change	Momentum off.Shuntion Mode	Change	-	Change

In the **TCS WOW** there are 28 Function Buttons and you can assign any one of 380 sounds to any button. This is opposite to the Tsunami 2.



When mapping sounds – use the functions you want and put them where you want.

All the three brands mentioned above have a further option to calibrate the **Back Electro Motive Force**. To get the best performance from your decoder follow the instructions in the maker’s manual as they are completely different to set up.

VOLUME is an individual choice – BUT – if you can hear the loco from more than 8 feet away – it is too loud.

So far I have only covered the basic Tuning of the Decoder – choice of sounds and their settings are an interesting session and would relate to your individual choice and your age. Next is a simple as possible explanation of BEMF just for your information.

BEMF and Sound.

I will try to keep this as simple and 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 – **Back Electro Motive Force**. 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) 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 adjust the power to the motor accordingly – hence the chuff gets loader. 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 will drop back.

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 25 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 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.

Model Railroading is Fun.

Gerry Hopkins MMR

Further reading

<http://nmra.org.au/Hints/Decoder%20Pro%20Clinic%202018.pdf>

<http://nmra.org.au/Hints/Decoder%20Hints/Decoders%20hints%20and%20tips.pdf>

<http://nmra.org.au/Hints/Program%20Track/Program%20Track.html>

http://nmra.org.au/Hints/Turnout_Tips/Turnout_Tips.html