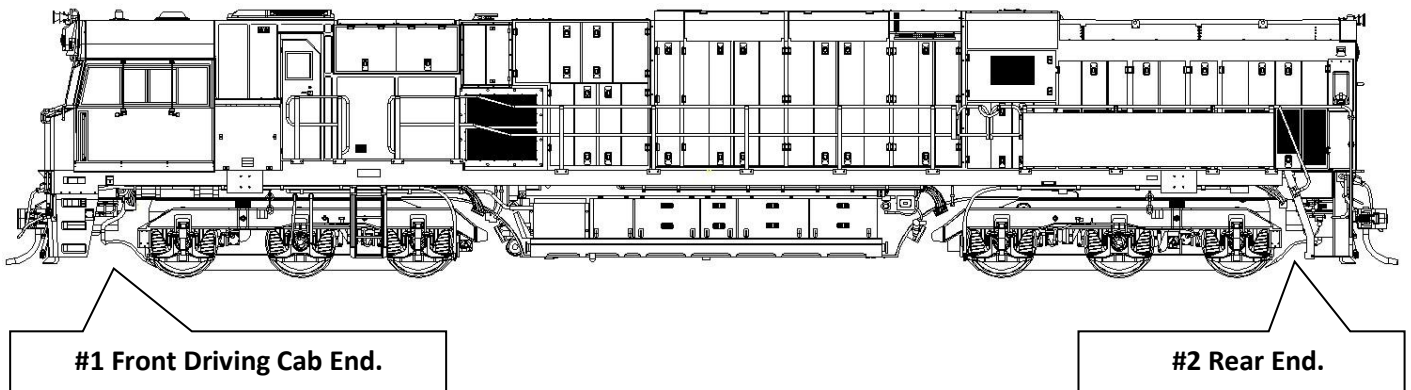# Auscision Models HO Scale
NR Class Locomotive Operating Information

Your Auscision Models NR Class locomotive's main printed circuit board and associated lighting has been designed to function as a **DC** and **DCC Sound Decoder Installed Model**. In these notes reference is made to the #1 end and the #2 end of the model. This diagram will assist in identifying which end is which.

#1 Front Driving Cab End.

#2 Rear End.

DC Model

The **DC** model is able to control the locomotives lighting via the micro switches on the bottom of the fuel tank. The lighting is directional. The switches are able to isolate, turn on/off:

1. The Locomotives Headlights and Fog / Ditch lights
2. The Locomotives Number Boards and White Marker Lights.
3. The Locomotives Red Marker Lights.

For the **DC model** the lighting connection on the main printed circuit board requires connection at the three plugs marked **'DC'**. The Headlights, Number Boards and Marker Lights connection is via the larger 14 pin wiring plug, and the Fog / Ditch Lighting connection on the applicable ends is via the smaller 3 pin plugs. (See image on page 3)

If you're going to operate your model on a DC system /controller then read no further. If you plan on fitting an after marker decoder or your model is a DCC factory decoder installed model then please read on.

DCC Ready Model - fitting an aftermarket decoder

The NR Class models main printed circuit board has been specifically designed to function through the 'NEM660 standard' 21pin connector and integrate with an **ESU Loksound V5 decoder**. Via the 21 pin connector this decoder functions with four individually powered auxiliary lighting outputs (Headlight front, Headlight rear, Aux 1 and Aux 2), and a further eight individual logic controlled outputs (Aux 3, 4, 5, 6, 7, 10, 11, 12) which the main circuit board has electronic components included for their operation. **Please Note** -There are also 2 permanently lit RED Chassis Fuel Gauge Indicator Lights which function regardless of DC or DCC operating system. These lights and the associated circuit components derive their power directly from the track supply and are separate from the decoder and its motor control outputs.

The **Factory DCC Decoder Installed Model** has the lighting connection via 3 separate plugs. One larger common 14 pin connection for the Headlights, Number Boards and Marker Lights, and two smaller plugs for Fog / Ditch Lighting on the applicable ends. These all connect to the plugs marked **'DCC'.** (See image on page 3)

When selecting an aftermarket decoder a few details may need to be considered first. As there are two standards of decoder 21pin connections available on the market, the **NEM660** version and the **NRMA** version, two lighting connection possibilities are available on the Main PCB. The lighting connection will be dependent on the brand and version of the aftermarket decoder being used. Generally speaking any aftermarket 21 pin decoder can be fitted.

For the majority of aftermarket decoders with a reduced number of auxiliary lighting outputs, the Models **Reversible Headlights and Fog/Ditch Lights** along with **Aux** 1 **(Front Number Boards, Front White Marker Lights, Rear Red Markers lights)** and **Aux 2 (Rear Number Boards, Rear White Marker Lights, Front Red Markers lights)** will function as long as the Lighting is connected to the **'DC'** PCB plug connections.

Alternatively refer to the link below for further decoder possibilities. This is an excellent source of information which addresses the 21pin NEM660/NMRA standards and their associated differences and functionality issues, along with a chart identifying which other brand decoders and versions that may also be suitable.

http://www.sbs4dcc.com/tutorialstipstricks/21mtcconnector.html

Fitting the decoder - Once the model's body is removed from the chassis, taking care with the body's wiring and lighting connection plugs, first remove the small 21pin DC adaptor PCB from the main PCB's 21 pin plug. Removal of the DC adaptor PCB also removes the components associated with motor noise suppression for DC function. Then, and paying close attention to the pin alignment, firmly push the decoder onto the 21 pin plug.

Note: When altering the Models Lighting plug connection between DC and DCC, inadvertently plugging the lighting into the wrong plug should pose no risk of damaging any circuitry, although care should be taken to ensure the lighting is connected to the correct plug for the decoder that has been selected.
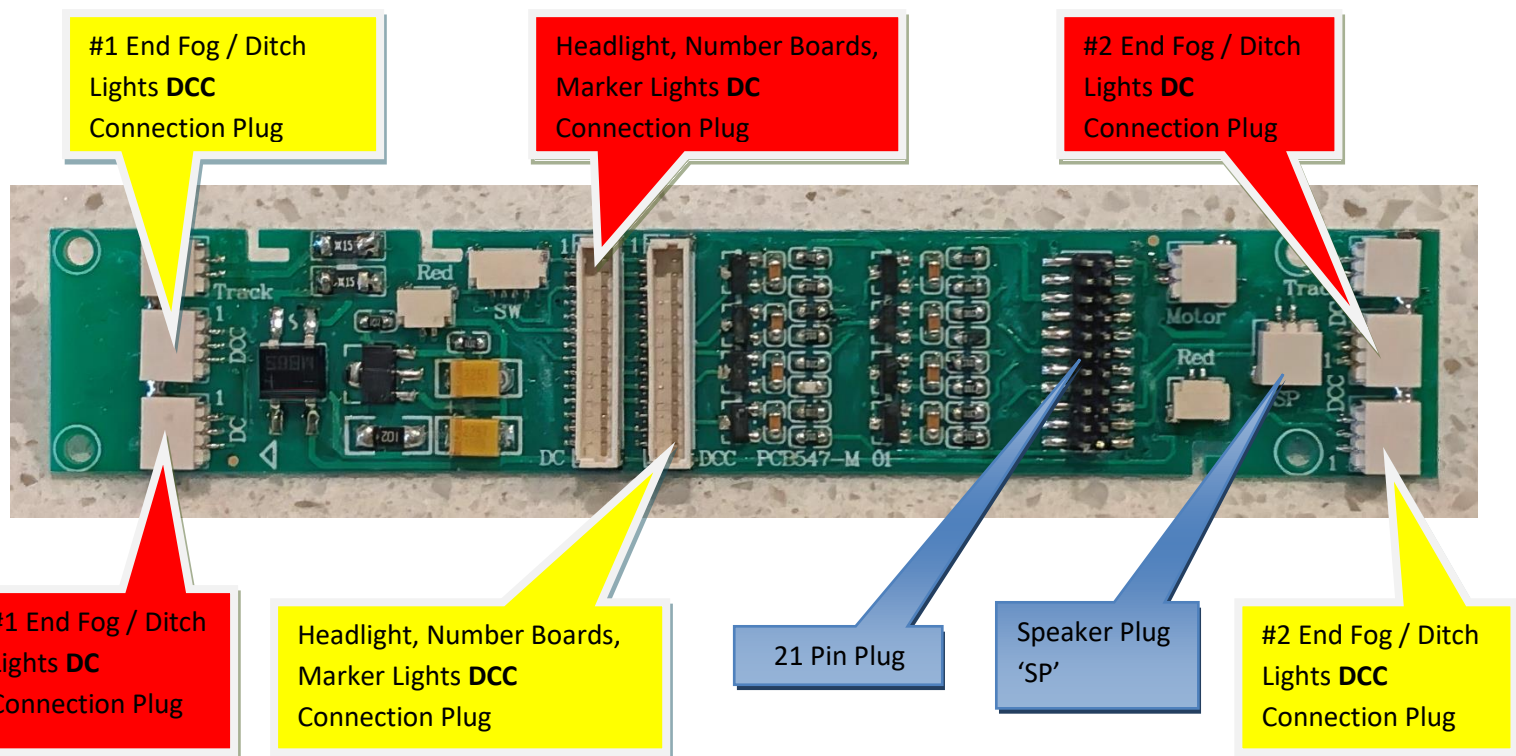
Speaker connection is via the supplied connector plug/wiring harness, fitted to the plug marked 'SP' (see image on page 3). Keep in mind matching the chosen speaker and decoder's amplifier impedance.

ESU Loksound V5 DCC Decoder Installed Model

Your **Factory installed DCC Sound NR Class Model** is fitted with an **ESU Loksound V5 Decoder**. All switches on the bottom of the fuel tank are to remain in the turned on position. The Decoder connects to the main printed circuit board via the 21pin connector. The models lighting connects via three plugs at the main PCB (see image on page 3):

- The Headlights, Number Boards and Marker Lights connect to the main PCB via the larger 14 pin connector to the plug marked **'DCC'**.
- The Fog/ Ditch lighting connects via the smaller plugs marked **'DCC'** for the appropriate ends.

NR Class Model Main PCB

#1 End Fog / Ditch Lights DCC Connection Plug

Headlight, Number Boards, Marker Lights DC Connection Plug

#2 End Fog / Ditch Lights DC Connection Plug

#1 End Fog / Ditch Lights DC Connection Plug

Headlight, Number Boards, Marker Lights DCC Connection Plug

21 Pin Plug

Speaker Plug 'SP'

#2 End Fog / Ditch Lights DCC Connection Plug

The decoders default settings have been adjusted to ensure your model operates smoothly straight out of the packaging. Please take a moment to read through the following information as it relates to the functionality and features along with further information as to individualising your model.

- In order to adjust the running qualities of your model for your personal preference, reference to suggested settings in the form of a quick start guide is available in the following notes. Alternatively for full decoder adjustment details refer to the ESU Loksound V5 Decoder Manual and Full Throttle Description available at the following links:

  http://www.esu.eu/en/downloads/instruction-manuals/digital-decoders/

  http://www.esu.eu/en/products/loksound/loksound-full-throttle-diesel-features/

  A description of the 95463-LS5H0DCC-Diesel-Auscision Models-Cv40-9IC-NR-Class and link to download the default file can be found here:

  http://projects.esu.eu/projectoverviews/6

- If required, adjustments and individual finetuning of your DCC model and decoder can be made primarily in two ways.

  1. The most simple and effective way is with an ESU Lokprogrammer interfaced with a Windows operating system PC.

The details of which can be found here:

Product Information... http://www.esu.eu/en/products/lokprogrammer/

Instructions................ http://www.esu.eu/en/downloads/instruction-manuals/lokprogrammer/

Updated Software...... http://www.esu.eu/en/downloads/software/lokprogrammer/

2. Alternatively adjustments can be made via your DCC operating system controller or with other PC based software such as JRMI. Refer to your operating system manual and the ESU V5 decoder manual.

Quick Start Guide

Care has been taken in order for your model to perform straight out of the packaging. In general it has been programmed to ESU Loksound's V5 Decoder default values. As modellers we all have different ideas and preferences as to how our models perform. Should you wish to further adjust how your model performs, the following is a quick start guide to some of the primary settings required to do so.

Excerpts from the ESU Loksound V5 and Lokprogrammer references are included in the description and are as follows. (Refer to the V5 Decoder Manual, the Lokprogrammer Manual or your DCC systems programming section for full programming details)

- The Default Locomotive Address for your NR Class Model is **3.**

  In order to change the locomotive address, refer to chapter 9.1, 9.2 'Address Settings' of the ESU V5 Decoder Manual. Individual DCC controller systems may also have a programme track output and function available for this purpose.

- Decoders operating within a **DC operating system** will function as per ESU's default DC settings. For further detail also refer to the DC notes contained within the 48 class operating information document.
  http://www.auscisionmodels.com.au/PDFs/Auscision%20HO%20Scale%2048-830%20class%20DCC%20Operating%20Information%20v4.pdf

Motor Auto Tune Procedure

Should you encounter any running performance issues the following Auto Motor Tune procedure may help resolve the problem.

This feature will automatically adjust the Motors Back-EMF in most cases. This is not meant to be a "cure all" solution. In most cases this will be all that is required, however there still may be the need to perform some manual adjustments.

In order to use this automatic adjustment you will first need to place your locomotive on a section of track paying attention to the set direction of travel.

Write a value of 0 to **CV54**. Activate function F1.

(Be sure to have plenty of clear space ahead of your locomotive. Allow 2 metres of available track)

Your locomotive will quickly take off at full speed and then stop while reading the motor responses. This will automatically set the motor values required in **CV51**, **52**, **53**, **54,** and **55**. Original file default values for these CV's will alter following this adjustment. Depending on the user's operating system /power supply from which the auto tune was performed, variations in the CV value's can occur.
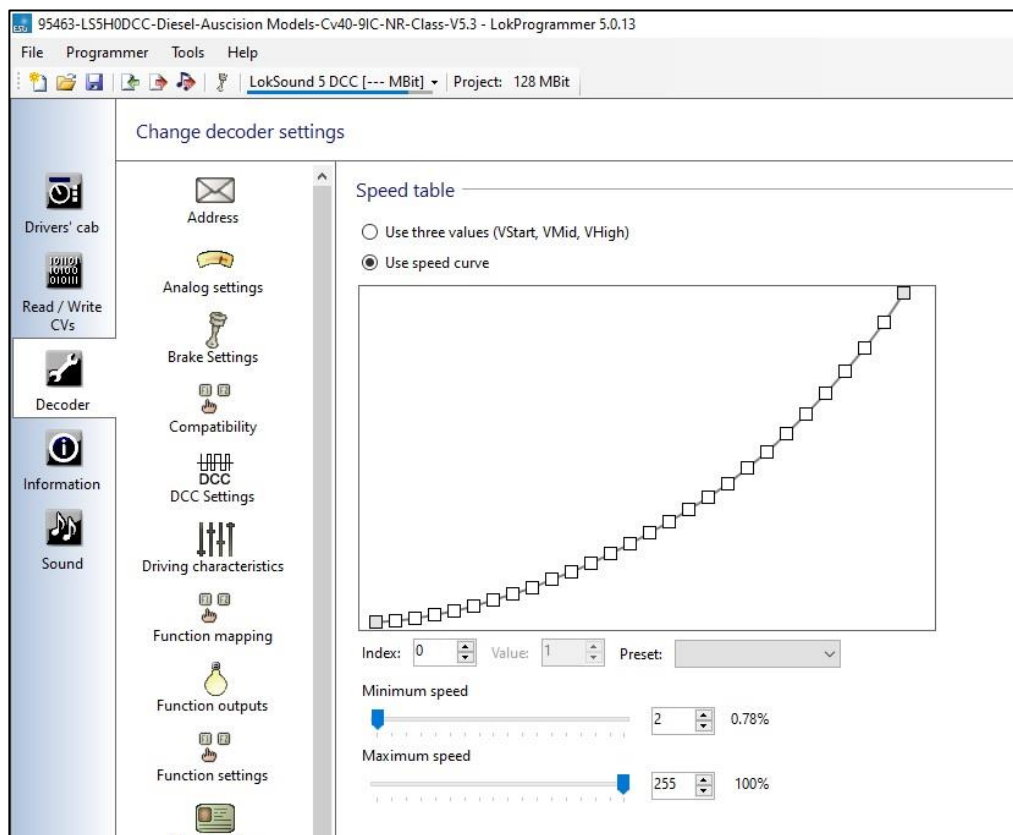
Following a motor auto tune the value in **CV53** (Regulation Reference Voltage) may need further manual adjustment. Typically using a 28 speed step controller, ensure your model has a gradual speed increase across all 28 steps. If a maximum speed is reached at a lower position with a flat response across the remaining steps then the value in CV53 will require adjusting to obtain the optimal setting. Values in the **CV53** range are as follows, 0 = 0v through to 255 = 25.5v.

For further detail refer Loksound V5 instruction manual, chapter 11 for full motor adjustment details.

Minimum and Maximum Speeds

As default, the decoder will automatically detect the user's controller speed step settings, with the controller using 14, 28 or 128 steps (28 being common).

- Default is the Exponential 1 28 step speed table as per the following graph utilising minimum and maximum speed settings.

- Defaults are **CV2** = 2 (minimum speed value) and **CV5** = 255 (maximum speed value).

- These two values define the compression of the curve while automatically adjusting the 28 individual speed steps in between that make up the curve. Alternatively and using Lokprogrammer there are several other speed preset tables available, as well as being able to adjust each of the 28 individual speed steps by changing the values at **CV67** through to **CV94** with values in the range between 1 and 255. Full details can be found in Chapter 10 'adaptive driving behaviour' of the Loksound V5 instruction manual.

Acceleration Momentum and Deceleration Momentum

The models acceleration momentum time and deceleration momentum time can be adjusted individually.

The time for accelerating from 0 to maximum speed is adjusted in **CV3** (default value = 20, which equates to 17.92 seconds) while deceleration is set in **CV4** (default value = 20, which equates to 17.92 seconds). Value Range is from 1 to 255 or from 0.9 to 228.48 seconds. (Approximately 0.89 seconds for each increment of value)

The times set in these CVs work speed dependant. Therefore, the acceleration distance and the brake distance are longer at higher speeds. In other words, the faster the locomotive moves, the longer the distance until it stops.

NR Class Sound Project Features

Engine Start and Shutdown, Idle Sequence, Air Compressor and Air Dryer Sounds

Engine Start

Function 8 will start the locomotive sound. The Cold Engine Start sequence will begin and the engine sound will run to a High Idle engine sound.

During the High Idle sound sequence the air compressor sound will start and run for a short period. From then on the compressor will periodically run as a Random Sound while ever the engine sound is functioning. As with the prototype and when the electric motor driven compressor is running, the compressor speed will generally follow the speed of the locomotives engine. Depending on the engine rpm sound, the compressor sound will speed up or slow down accordingly. The compressors random starting and stopping characteristics are adjustable if required. See the following Random Sounds information in the following text. The compressor sound is also able to be manually turned on if required using Function 17.

After the engine sound has been running for a short period in High Idle, the engine sound will drop to Normal Idle. At this time the random air dryer sounds begin to function. The prototype has a number of different air dryers and each makes a different discharge sound. These sounds will continually and randomly function whenever the locomotive sound is running. The Random nature of the Air Dryers activating is typical to that of the prototype.

After Normal Idle has been running for a short period without any locomotive movement the engine sound will drop to a Low Idle condition. A random variable Low Idle start delay has been incorporated into the logic at this point. When in consist with other locomotives, and just like the prototype they will drop back to Low Idle at different times. Without any locomotive movement the engine sound will continually run in the Low Idle condition, except for when the compressor starts, the engine sound will rise to the Normal Idle speed. Following the compressor stopping the engine idle will again drop back to Low Idle.

Note : Locomotive driving movement and the associated sound will function normally from any of the three idle sound conditions.

Engine Shut Down and Engine Restart

Engine shut down can occur from any of the three idle sound conditions.

A shutdown from the initial start-up High Idle condition, when restarted the sound will begin with the Cold Start Sequence.

Following a shutdown from the Normal Idle or Low Idle condition the air dryers will continue to function for a short period.

If the engine sound is restarted during the period the air dryers are still functioning it is considered a hot start and the engine sound will resume at the Normal Idle condition. The air dryers and air compressor sounds will continue to function randomly.

Following a shutdown whereby the air dryers have ended, an engine restart will begin with the Cold Engine start sequence again.

Prototype Engine RPM verse the Models Throttle / Speed Settings

The NR Class prototype is a General Electric Locomotive that has a 16 Cylinder 7FDL engine.
Unlike its earlier predecessors that utilised a change in engine rpm's for each increase/decrease of throttle notch, the NR Class locomotive shares engine rpm's across a number of throttle notch settings.

Therefore, with the models functionality, some throttle notch changes there is no change in engine rpm sound. Refer to the below graph for prototype information and the models equivalent engine sound with reference to the 28 speed step transition settings.

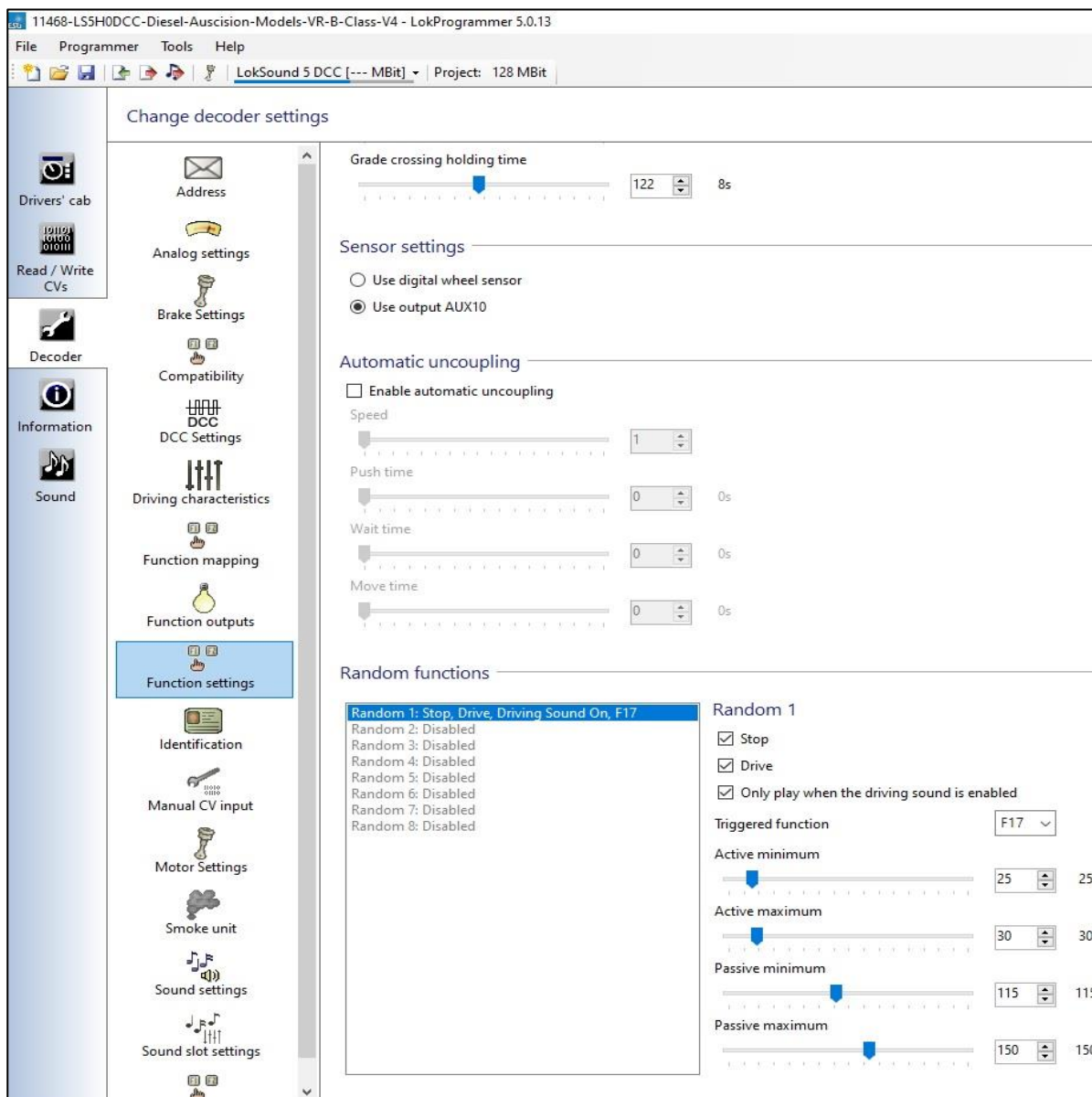| Engine RPM	28 Speed Step
High Idle 580rpm	0/28
Low Idle 330rpm	0/28
Idle 440rpm	0/28
1 Notch 440rpm	1/28
2 Notch 580rpm	3/28
3 Notch 880rpm	5/28
4 Notch 880rpm	7/28
5 Notch 990rpm	10/28
6 Notch 990rpm	12/28
7 Notch 990rpm	14/28
8 Notch 1050rpm	16/28

Random Sounds

The V5 decoder along with the updated Lokprogrammer software allows more flexibility to use and control random sounds. The following is an overview on how to activate and adjust these sounds using Lokprogrammer. With reference to the below screenshot the following settings can be adjusted to your personal preferences if required. The random compressor sound will be used as the example, although virtually any sound contained in the default file can be used. The V5 also has the flexibility of importing further sounds into the models default file from ESU's template sound files.

Refer to the default function table: Compressor being mapped to Function 17.

Under the **Decoder – Function Settings – Random functions** tab in Lokprogrammer, select position 'Random 1' and select triggered function **F17**, along with the **Stop, Drive** and **Only Play When Driving Sound Is Enabled** check box's being ticked. If the **'Drive'** check box is unticked the random compressor sound will only function when the locomotive is stationary. **Active Minimum** and **Active Maximum** is the variable length of time the random sound will occur, while **Passive Minimum** and **Passive Maximum** is the variable time frame in which the random sound will turn on and function. These values once selected will then require writing to the decoder in order for them to function.

For further information refer to Chapter 13 'Adjusting the Sound Effects' in the Loksound V5 instruction manual.

Fog / Ditch Lights

With the NR Class locomotive prototype, when the horn is blown it activates the Fog / Ditch lights to flash alternatively for a short set period. The flashing function will occur when the Fog / Ditch lights are turned on. The horn function will also automatically turn the lights on to flash from the turned off condition.

The models lighting has been set for these scenarios to occur. If any adjustment is required the following information to enable this is primarily in two parts.
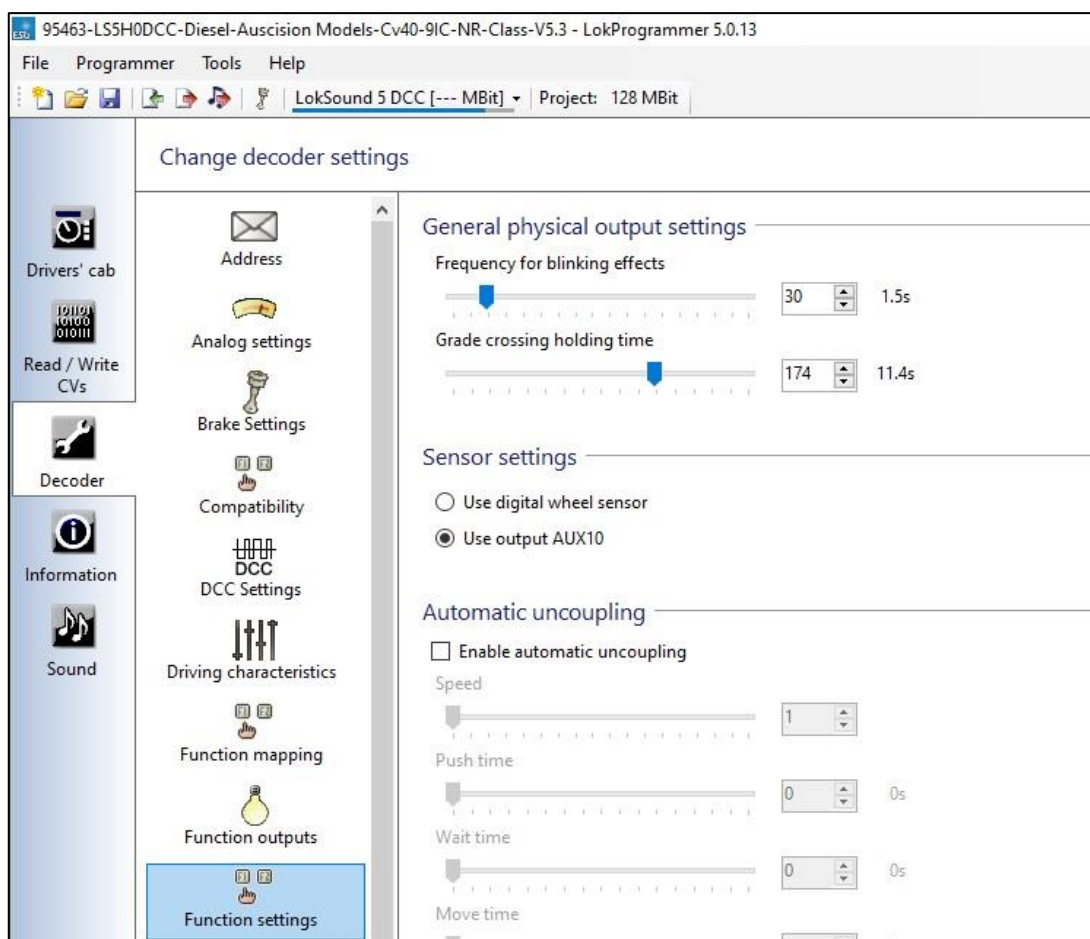
- **First** are the '*Flashing Rate'* and the '*Grade Crossing Hold Time'*.
  These settings, with the Fog /Ditch lights **turned on**, manage the rate at which the lights alternatively flash and the time period they will flash for.

- **Second** is the logic mapping and timer setting that allows the lights to automatically **turn on** from a **turned off** condition and remain on while ever the flashing '*Grade Crossing Hold Time'* is active.

Flashing Rate and Grade Crossing Holding Time

As per the following image the default flashing rate is set to 1.5 seconds with an 11.4 second flashing hold time. If required these rates can be adjusted with Lokprogrammer by using the sliders to adjust the preset values.

Alternatively the following CV's can be altered, with the changes requiring writing to the decoder.

- **CV112** controls the flashing rate. Default value is 30 for 1.5 seconds.
  A value between 1 and 255 is required. Each change in value equates to 0.05 seconds

- **CV132** controls the flashing hold time. Default value is 174 for 11.4 seconds.
  A value between 1 and 255 is required. Each change in value equates to 0.06 / 0.07 seconds
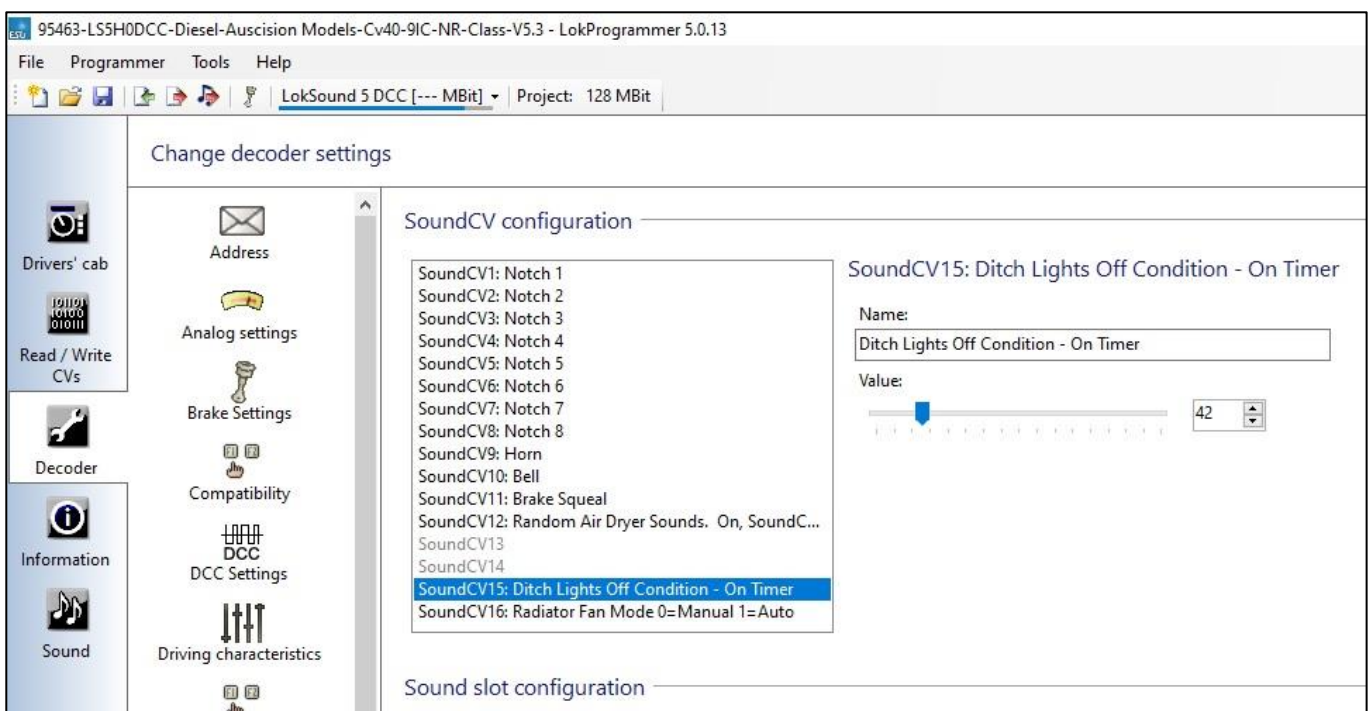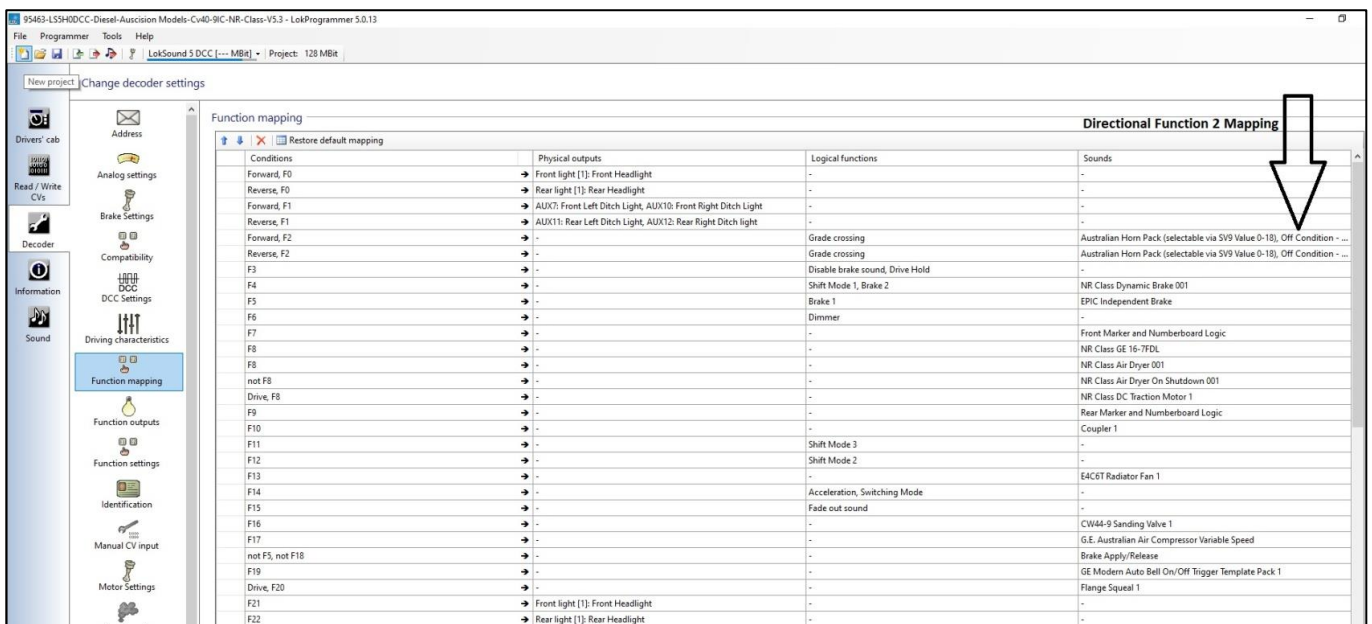
Ditch Lights Off Condition - On Timer, and Mapping

In order for the Ditch / Fog lights to function from a **turned off** condition, separate logic was created and also mapped into the (Function 2) Horn position. The logic is directional therefore the Function 2 Horn mapping requires a forward and a reverse setup. (See below image)

This logic has a timer that once activated when the horn is blown, enables the Fog / Ditch lights to remain **turned on** for the equivalent period of the '*Grade Crossing Hold Time*'. Each time the horn is used the timer resets to match the hold time. The timer adjustment is set via the Sound CV15 '*Ditch Lights Off Condition - On Timer*' under the Sound Slot Settings Tab (See the following image). The Default setting for Sound CV15 is a value of 42 or **CV169** = 42.

 If the '*Grade Crossing Hold Time*' is either increased or decreased to change the time period, then the '*Ditch Lights Off Condition - On Time*r' will also require adjusting to match.

Therefore the default setting of 11.4 seconds for the '*Grade Crossing Hold Time'* equals the Sound CV15 '*Ditch Lights Off Condition – On Timer*' value of 42. These settings are an approximate ratio of 1 : 3.7. Any alteration to these settings would need to maintain this ratio.

Function button 7 (Number 1 End Auxiliary Lighting Logic)
Function button 9 (Number 2 End Auxiliary Lighting Logic)

The lighting for each end of the locomotive has been divided into four separate lighting states.   By pressing the function key repetitively the following applies:

State 1.   All Lighting Off.

State 2.   Number Boards On. White Marker Lights On. (As in leading end mainline running)

State 3.   Number Boards On. Red Marker Lights On. (As with yard shunting. Both ends)

State 4.   Red Marker Lights On. (As in the trailing end of a light engine movement)

(State 4 is followed by State 1)

If required, the individual light brightness can be controlled / adjusted separately. Refer to the ESU V5 Decoder Manual, with reference to the auxiliary outputs 1 through 6.

Number 1 end Auxiliary Lighting

Aux 1 - Number Boards, Aux 3 - White Marker Lights, Aux 5 - Red Marker Lights

Number 2 end Auxiliary Lighting

Aux 2 - Number Boards, Aux 4 - White Marker Lights, Aux 6 - Red Marker Lights

PLEASE NOTE:

The following notes were relevant for the previously used Loksound Select Series Decoder as used in the Auscision 48 class model which had the following possible issue. The new Loksound V5 decoder utilises an extra 2 sound processing channels, (now 10 in total) and, following thorough testing, the problem appears to no longer exist in the V5. However if the issue should reoccur the following details can be followed in order to remedy the problem.

...

In order for the Function 7 and Function 9 auxiliary lighting feature to work, ESU Loksound had to create a lighting logic template. This template is NOT built into the decoders function logic, however utilises two of the ten available sound processing flow channels.

Therefore, under certain circumstances and especially when BOTH ends of the model's F7/F9 auxiliary lighting are turned on, then some of the secondary sounds may not function. (For example brake squeal when stopping) This is due to the non availability of spare sound channels at that particular moment in time, and is not a fault with your decoder.

If any activated secondary sound function (including the F7 and F9 lighting) appears erratic/frozen turn off the locomotive prime mover (F8). This will then allow the processes selected and queued the available space to function and complete. Once complete the prime mover (F8) can be turned back on as normal.

If this type of sound response becomes an operating issue, then to free up sound channels the auxiliary lighting has also been mapped to be individually controlled with the Logic Functions F21 through to F28. (See function table)

DCC Function Table

F0   **Directional Headlights**

F1   **Directional Fog / Ditch Lights**

F2   **Playable Air horn**

F3   **Drive Hold   (Full throttle feature)**

F4   **Dynamic Brake**

F5   **Locomotive Brake   (Full throttle feature)**

F6   **Headlight Dimmer Control**

F7   **Front #1End. Marker Light and Number Board Logic (See notes below)**

F8   **Prime Mover Locomotive Sound   (Start/Stop)**

F9   **Rear #2 End. Marker Light and Number Board logic   (See notes below)**

F10   **Manual Coupler sounds**

F11   **Coast   (Full throttle feature)**

F12   **Run 8   (Full throttle feature)**

F13   **Radiator Fan. SV16 Selectable. Fan Mode Auto = 0, Manual = 1 (Auto Mode, When Function Active Turns On At Speed Step 10/28. Sound Remains On Until Speed Step 0 and End Timer Completes)**

F14   **Acceleration / Shunting mode   (Turns off any momentum settings. Runs at half speed)**

F15   **Volume Fade Control   (set at 50% normal volume level - ideal for loud multiple unit consists)**

F16   **Manual Sanding Valve on/off**

F17   **Manual Compressor on/off**

F18   **Brake Set / Brake Release   (Default is on. Automatically plays Brake Valve Sound when moving off or stopping)**

F19   **Bell**

F20   **Flange Squeal (Sound will begin to function at Speed Step 4 and above)**

F21   **Headlight, #1 / Front End (not directional)**

F22   **Headlight, #2 / Rear End (not directional)**

F23   **Number Boards #1 / Front End**

F24   **Number Boards #2 / Rear End**

F25   **White Marker Lights #1 / Front End**

F26   **White Marker Lights #2 / Rear End**

F27   **Red Marker Lights #1 / Front End**

F28   **Red Marker Lights #2 / Rear End**

F29   **Manual Engine Sound Notching. Used in conjunction with F11 and F12**

F30

F31

Bell Function Button – NCE Controller

The Bell function button on an NCE controller, by default, is programmed to action the sound or function that is mapped to F1 on an ESU sound project.

Considering that the bell is not generally used on the Australian prototype, it is still included in the NR Class sound project however it is mapped to F19. However, Fog/Ditch Lights are common in Australia and, as such, have been mapped to function on the easily accessible F1 position. An outcome of this is that the Bell button, using the controllers default settings, will inadvertently control the models directional Fog/Ditch lights.

Should the user wish to have the bell sound function on the Bell button, then the bell sound will either require remapping to the F1 position and altering the fog/ditch lights to a different function position, or assigning the controllers bell button to function with another function position. Please note, only positions F0 to F9 are assignable on the NCE controller to function with the bell button, and the bell sound would still require the remapping within the sound project to align it with the desired position.

Should you wish to reassign functions please refer to the NCE controllers instructions under *'Cab Parameters and Assigning Bell to Function'* section.

Decoder Reset

If at any point your model's decoder becomes unresponsive, it may simply require a reset in order to regain normal function. You can reset the decoder to the current memory default settings at any time.

In most cases POM (Programming on the Main) will not work to reset a decoder. Please use a separate programming track.

To reset the decoder:

- **Refer to the ESU V5 Decoder manual for full details.**
- **Enter the value 8 into CV8.**
- **To complete the reset, power to the decoder must be interrupted.**

For ease of connection to the web links attached within this document, an online version of the NR class Operating Information can be found on the Auscision website at the below link:

http://www.auscisionmodels.com.au/NR%20Class%20Locomotive.htm

http://www.auscisionmodels.com.au/Indigenous%20NR%20Class%20Locomotive.htm