

Certificate & Quick Reference

Thank-you for purchasing a YouChoos sound decoder!

This certificate provides specific details of your decoder including your unique build number. Each sound decoder I load is individually catalogued and assigned a unique certificate, indicating the load date and an individual code...

Your decoder has unique number: B4-TEMPLATE-0825

YouChoos Sounds
LSWR Adams B4
DCC Address: 3



Included in this package:

PART NUMBER	YouChoos Sounds - LSWR Adams B4 YC-LSWRB4
DECODER	MS series - template
SPEAKER	N/A - template

Functions:

FKey	Category	Action
F0fwd:	LIGHT	F0fwd Forward lights
F0rev:	LIGHT	F0rev Reverse lights
F1:	SOUND	Running Sounds
F2:	SOUND	Whistle
F3:	LIGHT + SOUND	FA1 / Coal Shovelling
F4:	LIGHT	FA2
F5:	SOUND	Blower
F6:	SOUND	Whistle 2
F7:	QUICKSEL + SOLO	Quick-Select (Light) / Solo Driving
F8:	QUICKSEL#2	Quick-Select#2 (Heavy)
F9:	SOUND	Guard's Whistle
F10:	SOUND	Blower 2
F11:	SOUND	Cab Clanks
F12:	SHUNT + HALF SPEED	Shunting Mode / Half Speed
F13:	SOUND	Footplate Banter
F14:	SOUND	Wheel Flange
F15:	SOUND	Steam Brake
F16:	SOUND	Water Hatch
F17:	SOUND	Water Filling
F18:	SOUND	Whistle 4
F19:	SOUND	Buffer Up
F20:	VOLUME	Volume Decrease
F21:	VOLUME	Volume Increase
F22:	SOUND	Steam Release Wheezy
F23:	SOUND	Hand Brake
F24:	SOUND	Coal Loading
F25:	SOUND	Coupling Up
F26:	SOUND	Whistle 3
F27:	SOUND	Blower 3
F28:	SOUND	Open Valves

All functions are ON/OFF.

Feature Notes:

Active Braking – To slow down, choose the desired speed on the throttle, then use the Brake key to control the slow-down to that speed. If you prefer more traditional throttle-based braking, simply decrease the value in CV#4, or even simpler: leave ACTIVE BRAKE switched on all the time!

Shunt Mode – Momentum/Inertia is reduced to ¼ the normal effect and the throttle range is halved to simulate driving light-engine.

Quick Select – For steam, switches from standard chuff sounds to light-engine where chuffs are quieter. For hybrid locomotives, switches engine type – usually effective only at standstill. Some steam projects contain a 'QuickSelect#2' which normally gives heavier chuffs compared to the default. For diesel, sometimes provided for alternative cold start. **Solo** – usually defined on the same key as QuickSelect for light-engine on a steam loco – has various effects including reducing the effect of momentum.

SpeedLock – while the SpeedLock key is switched on, the throttle will control the engine sounds only, and leaves the physical speed of the motor unchanged.

NotchUp – for diesel/electric projects, the NotchUp key will raise the base engine level to notch 1 when standing idle. Switch off to return to idle. Has no effect while in motion. Allows you to manually rev the engine up.

Coast – for diesel/electric sounds, the Coast key brings the base engine level down to idle, regardless of the current speed. Switch off to return to speed-dependent engine level.

LowBeam – for some projects, a LowBeam key is provided which dims the forward-motion headlights.

Mute – Fades all sounds out to silent until unmuted, where sounds will be faded back to their previous level.

Volume Up/Down – Overall volume level will be decreased / increased gradually while VOLUP / VOLDOWN is switched on, eventually reaching silent or the maximum defined in the project (usually around 90%). Affects CV#266 master volume level. If you lose sound, check that you haven't simply reduced the volume to silent! Default is recommended around 65%.

Dynamic / Exponential Inertia – Linear throttle-to-speed response is not particularly realistic, so speed change is exponential as speed increases, simulating slow starts from standstill. Similarly, harder throttle requests will result in faster acceleration. This is all built-in to the project working automatically on your throttle requests.

Looping Sounds – Some sounds are looping and will continue repeating until that function is switched off.

Steam Chuff Rate – Use CV#267 to adjust the chuff rate to match wheel rotation.

Random Sounds – Some sounds may be configured to play at random intervals, usually at reduced volume.

IMPORTANT – WARRANTY INFORMATION!

Damage caused by mishandling, short-circuit, or undue force is NOT covered by warranty. Normally, a repair/replacement charge of approximately £30 + P&P will be levied in such cases. Decoders are delicate, so please handle with care. The most common cause of damage is caused by excessive force on wires, which may result in wires becoming detached, or worse, the entire solder pad coming off (particularly true for the smaller decoders). Also be careful that the coloured coating on the wires does not get pulled back exposing bare wire at the solder pads, thus increasing risk of short-circuit.

More Information on Your Sound Decoder



User Sound Assignments

The following table lists the sound effect files loaded onto your decoder, with their unique sample numbers which are used in CVs to assign a sound to a specific feature. Where a sound has no Function Key listed, this indicates that it is an additional sound included in your project which you can manually assign instead of another sound – for example, an alternative whistle/horn which you can swap in for one of the default ones. Please refer to the supplied CV Table document where you can see which CV is used to assign a sound to each Function Key (starts at CV#513).

Of course there are many more sound files that make up your project, such as engine sounds, braking, set-off etc., but these are not included here – only those that are available as user sounds, assignable to Function Keys.



Random Sounds

Zimo decoders include 8 random sound generators, Z1 to Z8, which are also indicated here along with the sample number assigned to them, and whether they are to be played randomly at standstill, in motion, or both.

Likewise, please refer to the CV Table document supplied with your YouChoos sound decoder to see which CVs are used in random sound definition (CVs#744 to 767 and CVs#315 to 338).

Effect Sound Sample Number	Name	Looping	Function Key(s)	Random Generator	Random at Standstill	Random in Motion
145	Whistle		F2 (CV#516)			
146	Whistle 2		F6 (CV#528)			
147	Whistle 3		F26 (CV#691)			
148	Hand Brake		F23 (CV#682)	Z1 (CV#744)	Yes	Yes
149	Coupling Up		F25 (CV#688)			
150	Blower	Loops	F5 (CV#525)	Z2 (CV#747)	Yes	Yes
151	Blower 2	Loops	F10 (CV#540)	Z3 (CV#750)	Yes	Yes
152	Blower 3	Loops	F27 (CV#694)	Z4 (CV#753)	Yes	Yes
153	Guard's Whistle		F9 (CV#537)			
154	Wheel Flange	Loops	F14 (CV#552)			
155	Steam Brake		F15 (CV#555)			
156	Cab Clanks		F11 (CV#543)	Z5 (CV#756)	Yes	
157	Coal Shovelling	Loops	F3 (CV#519)	Z6 (CV#759)	Yes	Yes
158	Coal Loading	Loops	F24 (CV#685)			
159	Buffer Up		F19 (CV#567)			
160	Footplate Banter		F13 (CV#549)			
161	Steam Release					
162	Steam Release Wheezy		F22 (CV#679)			
163	Water Filling	Loops	F17 (CV#561)	Z7 (CV#762)	Yes	
164	Water Hatch		F16 (CV#558)			
165	Whistle 4	Loops	F18 (CV#564)			
166	Clicks and Bangs	Loops				
167	Steam Release 2	Loops				
168	Hand Brake 2	Loops				
169	Open Valves		F28 (CV#697)	Z8 (CV#765)	Yes	

Remember, you can always reset to the project's original configuration if you make a mess, by sending CV#8=8, though note that the DCC Address of the decoder will also be reset (normally back to 3)!



Physical AUX Outputs

The table below states how the physical outputs (for lighting etc.) are configured in your decoder. Outputs that are assigned for FKey0-12 are achieved with Zimo Extended Function Mapping (where CV#61=97). For any outputs assigned to FKeys above FKey12, Swiss Mapping (also known as Zimo Advanced Mapping) is used instead (not shown in this table).

Physical Output	Wire Colour (if wired)	FKey	Effect / Direction	Notes
F0Fwd	WHITE	FKey0FWD	Constant (simple ON/OFF) - FWD only	F0fwd Forward lights
F0Rev	YELLOW	FKey0REV	Constant (simple ON/OFF) - REV only	F0rev Reverse lights
FA1	GREEN	FKey3	Random	FA1
FA2	BROWN	FKey4	Constant (simple ON/OFF)	FA2
FA3	-additional-		Constant (simple ON/OFF)	
FA4	-additional-		Constant (simple ON/OFF)	
FA5	-additional-		Constant (simple ON/OFF)	
FA6	-additional-		Constant (simple ON/OFF)	
FA7	-additional-		Constant (simple ON/OFF)	
FA8	-additional-		Constant (simple ON/OFF)	
FA9	-additional-		Constant (simple ON/OFF)	
FA10	-additional-		Constant (simple ON/OFF)	

Zimo Small DCC Decoders - YouChoos Common Tweaks

July 2023 Revision
For MS Range

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Zimo DCC decoders are some of the most advanced decoders available, and as such have many aspects that can be configured and tweaked according to your preferences and how you wish to use them. This flexibility of course comes with a certain complexity, so YouChoos have worked to produce this mini guide detailing some of the more common areas that you are likely to want to adjust in your Zimo decoder.

While the information here relates primarily to Zimo's sound decoders, much of the information also applies to Zimo's standard non-sound decoders and function decoders. More detailed information can be found in Zimo's own *Small Decoder Manual* available for download from their website (www.zimo.at).

Wiring Colours

All Zimo decoders follow the same wire colouring convention (note that purple and brown are reversed from the standards used by most other DCC manufacturers):

Red	Track right
Black	Track left
Orange	Motor right
Grey	Motor left
Blue	Common Positive
White	AUX1/F0Fwd Negative – normally for forward motion lights
Yellow	AUX2/F0Rev Negative – normally for reverse motion lights
Green	AUX3/FA1 Negative
Brown	AUX4/FA2 Negative
Purple x2	Speaker connection

Stay-Alive Capacitors

Some MS decoder types allow for direct connection of 16V capacitors, some unlimited and others up to a maximum of 1000uF – check the blue inlay that your decoder came in to find out.



For decoders that don't support direct connection of capacitors, it is always possible to connect a stay-alive via a connection circuit, such as YouChoos' LifeLink, Zimo SACC16 or a Zimo STACO kit. These kits also allow connection of larger than 1000uF for the smaller decoders. These kits connect to the decoder's common positive +VE and ground GND connections. See Zimo's documentation for more information.

Understanding and Calculating Binary Values

In order to successfully understand and program some CVs, you will need a basic understanding of binary. Each CV contains what is called a *byte* of information. This is computer-speak for 8 *bits* of information, each of which can be ON or OFF. A *bit* is therefore a *toggle*, ON or OFF. A 1 represents ON and a 0 represents OFF. If you have just 1 bit, then you can have a maximum of 2 values i.e. on and off. Adding more bits means you can have more combinations, for example, 2 bits gives you 4 possible combinations: OFF+OFF; OFF+ON; ON+OFF; ON+ON, or 0, 0; 0, 1; 1, 0; 1, 1. Read this as 0,1,2,3 since computers always start at 0 instead of 1.

By convention, bits are read with the least significant to the right i.e. "bit 0" is the right-most bit. A byte, as mentioned previously has 8 bits, so bits 0 to 7, giving a possible range of 0-255 ($2^8 - 1$ being the maximum value, 256 combinations). Use the table below for reference to see what value each bit can represent.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
128	64	32	16	8	4	2	1

An example: if bit 6 is ON and bit 1 is also ON, then this is 64+2, so the value represented is 66. Simple really!

Many of the CVs in your decoder use individual bits to control different aspects, so it is useful to understand binary in order to a) work out how the decoder is currently configured, and b) to understand how to modify the CVs to change the decoder's behaviour.

Hard Reset

A *HARD RESET* is performed by setting CV8=8. This resets all CVs to factory setting. By *factory*, we mean the last project loaded into the decoder (by YouChoos, or other vendor). This process will NOT wipe the sounds themselves! Occasionally you may have to send the RESET message a couple of times for it to actually work. This is particularly useful if you have lost track of the CV changes you have made and you want to go back, or the loco is not behaving as you hoped after some tuning! MS decoders may need to be placed on the main track for a few seconds after a reset request in order for it to be applied fully.

Speakers

The connected speaker must have an impedance of 8ohm and 1W. Alternatively, you can connect 2x 40hm speakers in series, which will give 80hm overall impedance (although power required will be the power rating of both speakers added together). Any other impedance will void warranty and may cause damage to the decoder and/or speaker. MX644 and MX645 are exceptions, which both support 4ohm speakers and up to 3W power (use 2x 80hm speakers in parallel for these decoders to get 40hm overall).



Analog/DC Operation

By switching CV29 Bit 2 (value 4) ON, DC/Analog operation is possible. This is normally done by default in sound decoders supplied by YouChoos. Control of the loco under DC is quite different from a model without a decoder, so you may have to re-learn how to use the throttle range! There is a useful video by YouChoos on YouTube showing the effects and how control differs from traditional DC operation.



Reading and Writing CVs

All Zimo decoders are capable of working with a DCC programming track as well as accepting new CVs values via *Programming-On-The-Main* (POM). Any feedback (reading CVs) will require a *load* to the decoder such as an attached motor, or lighting, as an electrical load is used to send back information to the DCC controller.

Addressing

Decoders will normally be supplied with their DCC 'address' set to a default of 3. If you have multiple locos fitted with DCC, then you will need to change this quite soon.



Most DCC controllers provide automatic facilities to change a decoder's address, but it may be useful to understand how this works under the covers. The full range of addresses goes from 1 up to 10239, although most DCC controllers are limited to 9999 (4 digits), and some are limited to just 2, or even a single digit!

If your chosen address falls in the range from 1 to 127, then this is known as a 'short' address, and is stored in CV1. With bit 5 (value 32) of CV29 switched OFF, the short address is active, and the decoder will respond to commands on the address stored in CV1.

For addresses between 128 and 10239, a formula is used to calculate and store the address in CVs 17 and 18. This is required because the largest number you can store in a single CV is restricted to 255. The long address is active when bit 5 of CV29 is switched on.

CV19 is used when you add your loco into a Consist. Refer to your DCC controller's manual for more information on Consisting (temporarily placing multiple locos together, such as double-heading).

Function Mapping

Control of decoder's auxiliary features, such as lighting and smoke, can be configured flexibly to different Function Keys. YouChoos sound decoders are normally shipped with Zimo's *advanced function mapping* enabled (CV61=97), which allows totally flexible mapping of AUX outputs (lighting etc.) to any FKey in the range F0 to F12 using CVs 33 to 46 (simple 8-bit-mask defining the outputs to activate for each FKey). With CV61=0, standard NMRA function mapping is assumed.



FKey assignment to other features, such as sounds, is defined with dedicated CVs. For example, CV516 defines which sound is played when FKey2 is pressed. The values you put in for sound assignments are unique ids that were defined when the sound project was created, so you will have to use your powers of deduction (or contact us) to find out which sounds have what values!

Numerous additional CVs define FKeys for other features, such as coasting key (CV374), manual electric brake key (CV380), master volume down/up keys (CV396 and CV397), shunting key (CV155), momentum deactivation (CV156), Quick Select (CV345), engine & random sounds on/off key (CV310), FKey sounds on/off key (CV311), mute key (CV313) etc.

Lighting

LEDs and bulbs may be powered and controlled by the AUX function outputs of the decoder. In general it is recommended to use LEDs, as these have very long lives and do not generally get hot.



LEDs should always have their positive terminal connected via a resistor to the decoder's common positive (blue), and their negative terminal to one of the AUX function outputs e.g. white, yellow, green, brown etc.

Configuration of what Function Key controls each AUX output is detailed in the section on Function Mapping.

A variety of lighting effects can be applied individually to each AUX output using CVs 125 to 132. Dimming can be achieved using CV60 to specify the level of dimming (0-100 percent brightness) and CV114 as a bit-mask to define which outputs the dimming is applied to.

Smoke Generators

As long as your smoke generator device draws less current than the AUX outputs for your decoder is capable of, you can connect it directly between the common positive (blue wire) of the decoder and one of the AUX function outputs (typically the brown wire is used for this purpose). No other components are required. Seuteh #22 and #27 units are suitable for direct connection in OO/HO scale in particular to any Zimo sound decoder.



A special effect can be used for smoke generators (see CVs 125 to 132) to achieve load or speed dependent smoke output, as well as a useful safety feature to automatically switch off the smoke unit after a predefined period (CV353).

Motor Control and Tuning

Zimo decoders offer very flexible tuning for motor control, supporting a wide variety of motor types, and it is normally possible to achieve excellent smooth, and slow running performance with any well maintained motor.



Speed Curves

CVs 2, 6 and 5 provide a simple method of defining the motor's speed curve from initial set-off to maximum speed. With CV 6 set to 0, the speed curve is linear, but with CV 6 set to something between 0 and 255, a rough 3-point curve is applied. This assumes that CV 29 bit 4 (value 16) is switched off.

With CV29 bit 4 switched on, the speed curve is taken from CVs 67 to 94, allowing you a much finer control of the motor output through the speed range.

Momentum / Inertia

One of the great features of DCC decoders is the ability to automatically apply gradual acceleration and deceleration, making the motion of the loco much more realistic than would be possible with an analog control. Zimo decoders are particularly good at applying these gradual effects, and the strength of the momentum effects can be easily configured using CV 3 (acceleration) and CV 4 (deceleration).

Motor Characteristics and Back EMF

Smooth running is achieved using a technique called Back EMF, whereby the decoder regularly samples current usage of the motor in order to work out if the requested speed is actually being maintained. It is a very sophisticated technique, and the frequency and strength of the feedback must closely match the characteristics of the motor in order for it to work effectively. Bad configuration will result in jerky motion, and noisy operation.

Zimo decoders will normally be shipped with Back EMF settings appropriate for the majority of modern motors, so there will be little tuning, if any required.

CV58 defines how much effect the feedback from BackEMF has (normally best to leave at max 255). CV56 defines how sampling of the motor is done, ranging from 00-99 where each digit defines a different aspect of the sampling. A 'middle' setting is the default (55), but if you find that your motor behaves poorly, try adjusting each digit individually to see the effects. Of course, if you have a poor motor to start with, then there may be very little you can do with BackEMF to improve it, so it is important to test the model on analog before installing a decoder!

Adjusting Sound

Overall Volume

Master volume (affects all sounds equally) is controlled with CV266 with a range from 0 to 100. Higher values are possible, but you risk damaging the decoder and/or speaker.



Individual Sound Volume

Most sounds can be individually tweaked in volume. Sounds applied to FKeys have their own CVs for this purpose, such as CV517 for FKey2's volume. Range is 1-255 (0 means the same as 255 i.e. max). Refer to the CV crib sheet as supplied with your YouChoos sound decoder. You will see numerous 'volume adjust' CVs in the range 574 to 602, which enable you to tune the volume of automatic sounds, such as brakes, idling, motor, set-off and come-to-halt.

Random Sounds

CVs in the range from 744 to 767 relate to the playback of sounds randomly. Many YouChoos sound decoders (steam in particular) will be shipped with some appropriate sounds that play at a reduced volume at random intervals. Details of how this is done is beyond the scope of this guide, but if you simply want to remove all random sounds then you can set all of these CVs to 0!

Chuff Rate

For steam sound decoders, one of the most common tweaks required is to tune the chuff rate. CV267 is used to do this. A lower value means faster chuffs. Further fine tuning is possible with other CVs (see the Zimo decoder manual for more information).

Engine Volume Relative to Other Sounds

If you feel that the automatic engine sounds are too loud compared to the FKey sounds, you can easily reduce it by changing CV#376. In conjunction, you may also wish to tune the set-off and come-to-halt sounds too (CV#582 and CV#578 respectively). This is primarily useful for diesel/electric projects.

However, engine volume in geared (diesel mechanical) projects (such as 1st gen DMUs, Class 03/04, or GWR Railcar etc.) behaves differently compared to normal diesels, so the above notes on CV changes won't have the desired effect. Instead, there are essentially 3 aspects to volume in geared projects...

First is the basic engine sounds, which are primarily affected by CV#283 and CV#286. Lower these to get to something you prefer.

We also make use of a feature called 'Thyristor', which of course is not a thyristor sound for diesel, but gives us an engine sound that plays with pitch dependent upon speed and the max volume that this can take comes from CV#294. This sound plays in a loop until the speed reaches the selected level, like an acceleration sound.

The 3rd aspect is a sound called 'eMotor', which is another way to get pitch-dependent engine sounds based on speed, and the max volume is specified with CV#296. CV#297 and CV#298 define at what point in the speed range the eMotor sound is played back.

So, a combination of these should allow you to adjust the engine sounds in a geared project. Once these are lowered, you can potentially use master volume CV#266 to increase the overall volume, thus bringing up the playable sounds like horns etc.

Speed, Load and Accel/Decel Effects on Sound

YouChoos tries hard to ship sound decoders with a sensible combination and balance for engine sounds, but everyone has different ideas of how a loco should sound, so you can fine tune many aspects. In particular, the volume of engine/chuffs can be adjusted according to rate of acceleration, deceleration, load as well as various time-based thresholds over which these aspects can change. CVs in the range of 268 to 288 are the primary ones used to do this, although there are many more. Refer to the CV crib sheet supplied with your YouChoos sound decoder, in conjunction with the Zimo Small Decoders manual for more detailed information.

Delayed Set-Off

When you open the throttle, a set-off or revving-up sound is usually played, but in reality you don't always want the motor to start spinning until this sound is finished, or at least part-way through playing. Many YouChoos sound decoders will be pre-configured with a suitable delay to the motor starting, but you can tune this to your own liking with CV273.

Final Braking Threshold

Depending upon your motor characteristics, you may also wish to tweak the threshold for the final braking sound (sometimes referred to as the 'come to halt' sound). This is done using CV287, which defines the speed step at which the brake sound starts to play. The lower the value, the closer the speed will have to be to stopping before the sound begins playing.

Further Reading

You have probably got the idea now that there is a lot you can play with in a Zimo sound decoder! This guide touches only a few of the more commonly tweaked areas, but you can find out a lot more detail in the Zimo Small Decoder manual, available for download from www.zimo.at. Here are some ideas of other areas of interest:

- Running in a consist (double-heading)
- Automatic braking, signal control and distance controlled stopping
- Uncoupler devices with automated uncoupling procedure
- Attaching a cam sensor for chuff synchronisation
- Railcom (feedback to your controller of what the loco is doing)
- Servo connection
- Input triggers – sensors to trigger effects and sounds
- Pantograph installation
- Swiss Mapping