Specialist in custom DCC installs... sound - lighting - smoke - crew - detailing - coach lighting & population

YouChoos – *Individual Locomotives*

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: BW-TEMPLATE-0826

YouChoos Sounds
LSWR Beattie Well Tank
DCC Address: 3



Included in this package:

PART NUMBER	YouChoos Sounds - LSWR Beattie Well Tank YC-WELL
DECODER	MS series - template
SPEAKER	N/A - template

Functions:

FKey	Category	Action
F0fwd:	LIGHT + SOUND	FOfwd Forward lights / Mute
F0rev:	LIGHT + SOUND	F0rev Reverse lights / Mute
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	Injector
F11:	SOUND	Westinghouse Pump
F12:	SHUNT + HALF SPEED	Shunting Mode / Half Speed
F13:	SOUND	Announcement
F14:	SOUND	Wheel Flange
F15:	SOUND	Coach Rattle
F16:	SOUND	Steam Hiss 3
F17:	SOUND	Water Filling
F18:	SOUND	Whistle 5
F19:	SOUND	Coupling Pull
F20:	VOLUME	Volume Decrease
F21:	VOLUME	Volume Increase
F22:	SOUND	Valves
F23:	SOUND	Whistle 4
F24:	SOUND	Injector 2
F25:	SOUND	Steam Hiss 2
F26:	SOUND	Whistle 3
F27:	SOUND	Blower 2
F28:	SOUND	Water Hatch

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	Whistle 4		F23 (CV#682)			
149	Blower		F5 (CV#525)			
150	Blower 2	Loops	F27 (CV#694)			
151	Injector		F10 (CV#540)	Z3 (CV#750)	Yes	Yes
152	Steam Hiss 2		F25 (CV#688)	Z4 (CV#753)	Yes	Yes
153	Valves	Loops	F22 (CV#679)	Z5 (CV#756)	Yes	
154	Steam Hiss 3		F16 (CV#558)	Z6 (CV#759)	Yes	Yes
155	Injector 2	Loops	F24 (CV#685)	Z7 (CV#762)	Yes	
156	Coupling Pull		F19 (CV#567)			
157	Water Filling	Loops	F17 (CV#561)			
158	Coal Shovelling	Loops	F3 (CV#519)			
159	Guard's Whistle		F9 (CV#537)			
160	Coach Rattle	Loops	F15 (CV#555)			
161	Announcement		F13 (CV#549)			
162	Westinghouse Pump	Loops	F11 (CV#543)			
163	Wheel Flange		F14 (CV#552)			
164	Whistle 5	Loops	F18 (CV#564)			
165	Blower 3	Loops		Z8 (CV#765)	Yes	
166	Water Hatch		F28 (CV#697)			
167	Water Filling 2	Loops				
168	Buffer Up					

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	FOfwd 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)	

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YouChoos
Model Railroad Creatives

BW-TEMPLATE-0826 - YouChoos Sounds - LSWR Beattie Well Tank

CV List MS series - template – Configuration Values at shipping time

CV	Description	Value
1	Short Address	3
2	Starting voltage	1
3	Rate of acceleration	20
4	Rate of deceleration	16
5	Maximum speed	0
6	Middle speed	0
7	Version Number (Part1)	38
8	Manufacturer Id / HARD RESET	145
9	Motor frequency	55
10	EMF Feedback cut-off	0
12	Operation Types - disable specific protocols	0
13	Analog mode active functions F1-F8	3
14	Analog functions and Inertia	130
17	Extended address (byte 1)	192
18	Extended address (byte 2)	3
19	Consist Address	0
21	Consist functions for F1 - F8	0
22	Consist functions F0 & F9-F12 + DC Inertia	0
23	Acceleration trimming	0
24	Deceleration trimming	0
27	Direction dependent stops (Lenz ABC)	0
28	RailCom Configuration	3
29	Configuration bits - decoder properties	6
33	Function mapping F0 forward	1
34	Funtion mapping F0 reverse	2
35	Function mapping F1	0
36	Function mapping F2	0
37	Function mapping F3	4
38	Function mapping F4	8
39	Function mapping F5	0
40	Function mapping F6	0
41	Function mapping F7	0
42	Function mapping F8	0
43	Function mapping F9	0
44	Function mapping F10	0
45	Function mapping F11	0
46	Function mapping F12	0
49	Signal controlled acceleration	0
50	Signal controlled deceleration	0
51	Signal dependent speed limits	0
52	Signal dependent speed limits	0
53	Signal dependent speed limits	0
54	Signal dependent speed limits	110
55	Signal dependent speed limits	180
56	Back-EMF control (P and I values)	55
57	Voltage reference	0
58	Back-EMF intensity	255
59	Signal dependent reaction time	5
60	Reduced function output voltage (Dimming)	50
61	Special ZIMO function mapping	97
62	Light effects modifications	50
63	Light effects modifications or Stop light OFF delay	62
64	Light effects modifications	0
65	Version Number (part2) sub-version	0
66	Directional speed trimming	0
67	Free speed curve	4
68	Free speed curve	7
69	Free speed curve	10
70	Free speed curve	13
71	Free speed curve	16
72	Free speed curve	20
73	Free speed curve	24
74	Free speed curve	28
75	Free speed curve	32
76	Free speed curve	36
77	Free speed curve	42
78	Free speed curve	48
79	Free speed curve	54
80	Free speed curve	60
81	Free speed curve	68
82	Free speed curve	76
83	Free speed curve	84
84	Free speed curve	92
85	Free speed curve	102
86	Free speed curve	112
87	Free speed curve	124
88	Free speed curve	136
89	Free speed curve	152
90	Free speed curve	168
91	Free speed curve	188
92	Free speed curve	208
93	Free speed curve	230
94	Free speed curve	252
95	Directional speed trimming	0
97	Fkey to switch between normal Address and Consist Address	0
105	User CV	-2
106	User CV	-103
109	Automatic unilateral light suppression	0
110	Automatic unilateral light suppression	0
112	Special ZIMO configuration bits	0
113	EMF reduction	0
114	Dimming mask	255
115	Uncoupler control (KROIS and ROCO couplers)	0
116	Automated uncoupling procedure	0
117	Flasher functions	0
118	Flashing mask	0
119	Low beam mask for F6	0
120	Low beam mask for F7	0
121	Exponential acceleration	11
122	Exponential deceleration	11
123	Adaptive acceleration and deceleration	22
124	Shunting key functions and SUSI	2
125	Special effects F0FWD	1
126	Special effects F0REV	2
127	Special effects FuncOutput1	8
128	Special effects FuncOutput2	0
129	Special effects FuncOutput3	0
130	Special effects FuncOutput4	0
131	Special effects FuncOutput5	0
132	Special effects FuncOutput6	0
133	FO4 as Cam sensor Or FO4 as fan of smoke generators of steam engines.	0
134	Asymmetrical threshold for stopping with asymmetrical DCC signa	106
135	Km/h – Speed regulation	0
136	km/h – Speed regulation	24
137	Definition of smoke generator characteristic, connected to FO 1 – 6.	70
138	Definition of smoke generator characteristic, connected to FO 1 – 6.	200
139	Definition of smoke generator characteristic, connected to FO 1 – 6.	255
140	Distance controlled stopping (constant stopping distance)	0
141	Distance controlled stopping - dist calc	20
142	Distance controlled stopping - hispeed correction	5
143	compensation using the HLU method	0
144	Programming and update lock - not in MS	0
145	Experimental - Alternative motor control	0
146	Compensation for gear back-lash	0
147	BackEMF I-value (Integral)	0
148	BackEMF D-Value (Differential)	0
149	BackEMF P-Value (Proportional)	0
150	Experimental CV?s for test purposes.	0
151	Motor brake and reduce motor BackEMF in Consist	0
152	Dim Mask 2	0
153	Stop time after DCC signal loss	0
154	Delay start special configuration	0
155	FKey for half-speed	12
156	FKey for deactivating momentum	12
157	FKey for MAN function	0
158	Various special bits - sound	16
159	Special effects FuncOutput7	0
160	Special Effects FuncOutput8	0
161	Servo outputs: Protocol	0
162	Servo 1 - Left stop	49
163	Servo 1 - Right stop	205
164	Servo 1 - Center position	127
165	Servo 1 - Rotating speed	10
166	Servo 2 - Left stop	49
167	Servo 2 - Right stop	205
168	Servo 2 - Center position	127
169	Servo 2 - Rotating speed	10
170	Servo 3 - Left stop	0
171	Servo 3 - Right stop	0
172	Servo 3 - Centre position	0
173	Servo 3 - Rotating speed	0
174	Servo 4 - Left stop	0
175	Servo 4 - Right stop	0
176	Servo 4 - Centre position	0
177	Servo 4 - Rotating speed	0
181	Servo 1 - FKey assignment	0
182	Servo 2 - FKey assignment	0
183	Servo 3 - FKey assignment	0
184	Servo 4 - FKey assignment	0
185	Special assignment for live steam engines	0
186	Pantograph 1 - FKey assignment	0
187	Pantograph 2 - FKey assignment	0
188	Pantograph 3 - FKey assignment	0
189	Pantograph 4 - FKey assignment	0
190	Brightening up times	0
191	Dimming down time	0
248	Bootloader version	0
249	Bootloader subversion	0
250	Decoder ID	0
251	Decoder ID	0
252	Decoder ID	0
253	Decoder ID	0
260	Load Code P1	0
261	Load Code P2	0
262	Load Code P3	0
263	Load Code P4	0
264	Variable low voltage (large scale)	0
265	Loco type selection	1
266	Total volume	64
267	Chuff sound fre-quency with „virtual cam sensor"	90
268	Switching to real cam sensor	0
269	Lead-chuff accentuated	25
270	Longer chuff length at very low speeds	0
271	Overlapping effect at high speed	16
272	Blow-off duration	50
273	Delayed start after blow-off	20
274	Blow-off schedule	30
275	Engine (chuff) sound volume at low speed	225
276	Engine (chuff) sound volume at high speed and no-load	240
277	Degree of volume change under load for driving (chuff) sound.	5
278	Load change threshold	0
279	Reaction time to load change	0
280	Load influence (DIESEL)	0
281	Acceleration threshold for full load sound	8
282	Duration of acceleration sound	30
283	Engine sound volume at full acceleration	255
284	Threshold for deceleration sound	1
285	Duration of reduced volume on deceleration	30
286	Volume level during deceleration	75
287	Brake squeal threshold	55
288	Minimum driving time before brake squeal	50
289	Thyristor control - sound pitch for stepping effect - ELECTRIC	0
290	Thyristor control - sound pitch for medium - ELECTRIC	0
291	Thyristor control - sound pitch for max - ELECTRIC	0
292	Thyristor control - speed step for pitch increase (electric)	0
293	Thyristor - Volume at steady speed - ELECTRIC	0
294	Thyristor - Volume during acceleration - ELECTRIC	0
295	Thyristor - Volume during deceleration - ELECTRIC	0
296	Motor sound, highest volume - ELECTRIC	0
297	Motor sound, when sound becomes audible for ELECTRIC engines	0
298	Motor sound, starting point of full volume for ELECTRIC engines	0
299	Sound pitch dependent on speed - ELECTRIC	0
300	Enter OpsMode	0
302	Start Calibration Mode/Sequence	0
307	Cornering squeals or reed configuration	0
308	Brake squeal FKey	0
309	Brake Key	0
310	On/off key for engine and random sound	1
311	On/off key for function sound	0
312	Blow-off key	0
313	Mute key	0
314	Mute fade in/out time	10
315	Minimum interval for random generator Z1	40
316	Maximum interval for random generator Z1	100
317	Playback length for random generator Z1	0
318	Minimum interval for random generator Z2	45
319	Maximum interval for random generator Z2	105
320	Playback length for random generator Z2	0
321	Minimum interval for random generator Z3	50
322	Maximum interval for random generator Z3	110
323	Playback length for random generator Z3	0
324	Minimum interval for random generator Z4	55
325	Maximum interval for random generator Z4	115
326	Playback length for random generator Z4	0
327	Minimum interval for random generator Z5	60
328	Maximum interval for random generator Z5	120
329	Playback length for random generator Z5	0
330	Minimum interval for random generator Z6	65
331	Maximum interval for random generator Z6	125
332	Playback length for random generator Z6	0
333	Minimum interval for random generator Z7	70
334	Maximum interval for random generator Z7	130
335	Playback length for random generator Z7	0
336	Minimum interval for random generator Z8	75
337	Maximum interval for random generator Z8	135
338	Playback length for random generator Z8	0
339	NotchUp Key	0
340	Notch level and extra Notch FKeys	0
341	Switch input 1 Playback time	0
342	Switch input 2 Playback time	0
343	Switch input 3 Playback time	0
344	Run-on time of motor sounds after stops (Cooling fan etc.)	0
345	Quick-select key for the sound of a MULTI-SYSTEM engine	7
346	Switch collection conditions	3
347	Switch-over key for solo driving	7
348	Switch-over parameters	19
349	Brake Time	10
350	Delay of switchgear sound after start up - ELECTRIC	0
351	Smoke fan speed at steady speed	0
352	Smoke fan speed at acceleration and motor start-up - DIESEL	0
353	Automatic shut-down of smoke generator	0
354	Steam chuff frequency at step 1	0
355	Exhaust fan speed at stand-still (steam and diesel)	0
356	Speedlock Key	0
357	Thyristor control - Lowering the volume at higher speeds - ELECTRIC	0
358	Thyristor control - Volume reduction curve at higher speeds - ELECTRIC	0
359	Duration of Electric switch gear sound on speed changes	0
360	Electric switchgear duration on coming to stop	0
361	Switch gear sound - Playback delay - ELECTRIC	0
362	Thyristor control - Switchover threshold for second thyristor sound - ELECTRIC	0
363	Switch gear sound - Dividing the speed into shift steps - ELECTRIC	0
364	Speed drop during upshifts (diesel with mechanical transmission)	0
365	Upshift rpm (diesel mechanical)	0
366	Maximum turbo sound volume for DIESEL engines	0
367	Turbo rpm dependency on speed (diesel)	0
368	Turbo rpm dependency on acceleration (diesel)	0
369	Minimum load for turbo	0
370	Frequency increase of turbo	0
371	Frequency decrease of turbo	0
372	Electric motor sound - Volume dependent on speed - ELECTRIC	0
373	Electric motor sound - Volume	0

	dependent on braking - ELECTRIC	
374	Coasting-Key (or Notching)	0
375	Coasting-Step (or Notching)	0
376	Driving sound	0
378	Likelihood of switchgear sparks during accel	0
379	Likelihood of switchgear sparks during decel	0
380	Manual electric brake key	0
381	Electric brake - minimum speed	0
382	Electric brake - maximum speed	0
383	Electric brake - Pitch according to speed	0
384	Electric brake – Deceleration threshold	0
385	Electric brake – Hill descent	0
386	Electric brake – loops	0
387	Influence of accel to diesel sound steps	64
388	Influence of decel to diesel sound steps	64
389	Limit accel influence over diesel sound steps	30
390	Momentum reduction when driving solo	75
391	Driving with idle sound, when driving solo	0
392	Switch input 4 Playback time	0
393	Zimo Config 5 - switch inputs	0
394	Switchgear flash with sound plus Blending	16
395	Max Volume via FKey volume adjust	65
396	FKey to reduce volume	20
397	FKey to increase volume	21
398	Automatice Coasting (diesels)	0
400	Input mapping for internal F0	0
401	Input mapping for internal F1	0
402	Input mapping for internal F2	0
403	Input mapping for internal F3	0
404	Input mapping for internal F4	0
405	Input mapping for internal F5	0
406	Input mapping for internal F6	0
407	Input mapping for internal F7	0
408	Input mapping for internal F8	0
409	Input mapping for internal F9	0
410	Input mapping for internal F10	0
411	Input mapping for internal F11	0
412	Input mapping for internal F12	0
413	Input mapping for internal F13	0
414	Input mapping for internal F14	0
415	Input mapping for internal F15	0
416	Input mapping for internal F16	0
417	Input mapping for internal F17	0
418	Input mapping for internal F18	0
419	Input mapping for internal F19	0
420	Input mapping for internal F20	0
421	Input mapping for internal F21	0
422	Input mapping for internal F22	0
423	Input mapping for internal F23	0
424	Input mapping for internal F24	0
425	Input mapping for internal F25	0
426	Input mapping for internal F26	0
427	Input mapping for internal F27	0
428	Input mapping for internal F28	0
430	Swiss Mapping Group 1 FKey	0
431	Swiss Mapping Group 1 MKey	0
432	Swiss Mapping Group 1 Forward 1st AUX	0
433	Swiss Mapping Group 1 Forward 2nd AUX	0
434	Swiss Mapping Group 1 Reverse 1st AUX	0
435	Swiss Mapping Group 1 Reverse 2nd AUX	0
436	SMG Group 2 FKey	0
437	SMG Group 2 MKey	0
438	SMG Group 2 Forward 1st AUX	0
439	SMG Group 2 Forward 2nd AUX	0
440	SMG Group 2 Reverse 1st AUX	0
441	SMG Group 2 Reverse 2nd AUX	0
442	SMG Group 3 FKey	0
443	SMG Group 3 MKey	0
444	SMG Group 3 Forward 1st AUX	0
445	SMG Group 3 Forward 2nd AUX	0
446	SMG Group 3 Reverse 1st AUX	0
447	SMG Group 3 Reverse 2nd AUX	0
448	SMG Group 4 FKey	0
449	SMG Group 4 MKey	0
450	SMG Group 4 Forward 1st AUX	0
451	SMG Group 4 Forward 2nd AUX	0
452	SMG Group 4 Reverse 1st AUX	0
453	SMG Group 4 Reverse 2nd AUX	0
454	SMG Group 5 FKey	0
455	SMG Group 5 MKey	0
456	SMG Group 5 Forward 1st AUX	0
457	SMG Group 5 Forward 2nd AUX	0
458	SMG Group 5 Reverse 1st AUX	0
459	SMG Group 5 Reverse 2nd AUX	0
460	SMG Group 6 FKey	0
461	SMG Group 6 MKey	0
462	SMG Group 6 Forward 1st AUX	0
463	SMG Group 6 Forward 2nd AUX	0
464	SMG Group 6 Reverse 1st AUX	0
465	SMG Group 6 Reverse 2nd AUX	0
466	SMG Group 7 FKey	0
467	SMG Group 7 MKey	0
468	SMG Group 7 Forward 1st AUX	0
469	SMG Group 7 Forward 2nd AUX	0
470	SMG Group 7 Reverse 1st AUX	0
471	SMG Group 7 Reverse 2nd AUX	0
472	SMG Group 8 FKey	0
473	SMG Group 8 MKey	0
474	SMG Group 8 Forward 1st AUX	0
475	SMG Group 8 Forward 2nd AUX	0
476	SMG Group 8 Reverse 1st AUX	0
477	SMG Group 8 Reverse 2nd AUX	0
478	SMG Group 9 FKey	0
479	SMG Group 9 MKey	0
480	SMG Group 9 Forward 1st AUX	0
481	SMG Group 9 Forward 2nd AUX	0
482	SMG Group 9 Reverse 1st AUX	0
483	SMG Group 9 Reverse 2nd AUX	0
484	SMG Group 10 FKey	0
485	SMG Group 10 MKey	0
486	SMG Group 10 Forward 1st AUX	0
487	SMG Group 10 Forward 2nd AUX	0
488	SMG Group 10 Reverse 1st AUX	0
489	SMG Group 10 Reverse 2nd AUX	0
490	SMG Group 11 FKey	0
491	SMG Group 11 MKey	0
492	SMG Group 11 Forward 1st AUX	0
493	SMG Group 11 Forward 2nd AUX	0
494	SMG Group 11 Reverse 1st AUX	0
495	SMG Group 11 Reverse 2nd AUX	0
496	SMG Group 12 FKey	0
497	SMG Group 12 MKey	0
498	SMG Group 12 Forward 1st AUX	0
499	SMG Group 12 Forward 2nd AUX	0
500	SMG Group 12 Reverse ast AUX	0
501	SMG Group 12 Reverse 2nd AUX	0
502	SMG Group 13 FKey	0
503	SMG Group 13 MKey	0
504	SMG Group 13 Forward 1st AUX	0
505	SMG Group 13 Forward 2nd AUX	0
506	SMG Group 13 Reverse 1st AUX	0
507	SMG Group 13 Reverse 2nd AUX	0
513	F1 sound assignment	0
514	F1 volume adjust	0
515	F1 looping/short	0
516	F2 sound assignment	145
517	F2 volume adjust	0
518	F2 looping/short	0
519	F3 sound assignment	158
520	F3 volume adjust	0
521	F3 looping/short	8
522	F4 sound assignment	0
523	F4 volume adjust	0
524	F4 looping/short	0
525	F5 sound assignment	149
526	F5 volume adjust	0
527	F5 looping/short	0
528	F6 sound assignment	146
529	F6 volume adjust	0
530	F6 looping/short	0
531	F7 sound assignment	0
532	F7 volume adjust	0
533	F7 looping/short	0
534	F8 sound assignment	0
535	F8 volume adjust	0
536	F8 looping/short	0
537	F9 sound assignment	159
538	F9 volume adjust	0
539	F9 looping/short	0
540	F10 sound assignment	151
541	F10 volume adjust	0
542	F10 looping/short	0
543	F11 sound assignment	162
544	F11 volume adjust	0
545	F11 looping/short	8
546	F12 sound assignment	0
547	F12 volume adjust	0
548	F12 looping/short	0
549	F13 sound assignment	161
550	F13 volume adjust	0
551	F13 looping/short	0
552	F14 sound assignment	163
553	F14 volume adjust	0
554	F14 looping/short	0
555	F15 sound assignment	160
556	F15 volume adjust	0
557	F15 looping/short	8
558	F16 sound assignment	154
559	F16 volume adjust	0
560	F16 looping/short	0
561	F17 sound assignment	157
562	F17 volume adjust	0
563	F17 looping/short	8
564	F18 sound assignment	164
565	F18 volume adjust	0
566	F18 looping/short	8
567	F19 sound assignment	156
568	F19 volume adjust	0
569	F19 looping/short	0
570	F0 sound assignment	0
571	F0 volume adjust	0
572	F0 looping/short	0
573	IDLE sound assignment	1
574	IDLE volume adjust	0
575	CHANGEDIR sound assignment	0
576	CHANGEDIR volume adjust	0
577	COMETOHALT sound assignment	3
578	COMETOHALT volume adjust	0
579	THYRISTOR sound assignment	0
580	THYRISTOR volume adjust	0
581	SETOFF sound assignment	2
582	SETOFF volume adjust	0
583	WATEROUTLET sound assignment	0
584	WATEROUTLET volume adjust	0
585	EMOTOR sound assignment	0
586	EMOTOR volume adjust	0
587	ROLLING sound assignment n/a	0
588	DRIVING SOUNDS volume adjustment	0
589	SWITCHVALVE sound assignment	0
590	SWITCHVALVE volume adjust	0
591	THYRISTOR2 sound assignment	0
592	THYRISTOR2 volume adjust	0
593	PANTOSTOP sound assignment	0
594	PANTOSTOP volume adjust	0
595	PANTODOWN sound assignment	0
596	PANTODOWN volume adjust	0
597	PANTODOWNSTOP sound assignment	0
598	PANTODOWNSTOP volume adjust	0
599	TURBO sound assignment	0
600	TURBO volume adjust	0
601	DYNAMIC BRAKES - sound assignment	0
602	DYNAMIC BRAKES volume adjustment	0
671	Reed input 4 sound assignment	0
672	Reed input 4 volume adjust	0
673	F20 sound assignment	0
674	F20 volume adjust	0
675	F20 looping/short	0
676	F21 sound assignment	0
677	F21 volume adjust	0
678	F21 looping/short	0
679	F22 sound assignment	153
680	F22 volume adjust	0
681	F22 looping/short	8
682	F23 sound assignment	148
683	F23 volume adjust	0
684	F23 looping/short	0
685	F24 sound assignment	155
686	F24 volume adjust	0
687	F24 looping/short	8
688	F25 sound assignment	152
689	F25 volume adjust	0
690	F25 looping/short	0
691	F26 sound assignment	147
692	F26 volume adjust	0
693	F26 looping/short	0
694	F27 sound assignment	150
695	F27 volume adjust	0
696	F27 looping/short	8
697	F28 sound assignment	166
698	F28 volume adjust	0
699	F28 looping/short	0
700	unused	0
726	Sound id for trigger 1	0
727	AUX output to activate with trigger 1	0
728	Sound id for trigger 2	0
729	AUX output to activate with trigger 2	0
730	Sound id for trigger 3	0
731	AUX output to activate with trigger 3	0
732	Sound id for trigger 4	0
733	AUX output to activate with trigger 4	0
734	Sound id for trigger 5	0
735	AUX output to activate with trigger 5	0
736	Sound id for trigger 6	0
737	AUX output to activate with trigger 6	0
738	Reed input 1 sound assignment	0
739	Reed input 1 volume adjust	0
740	Reed input 2 sound assignment	0
741	Reed input 2 volume adjust	0
742	Reed input 3 sound assignment	0
743	Reed input 3 volume adjust	0
744	Z1 Random sound assignment	173
745	Z1 Random volume adjust	91
746	Z1 Random standstill / motion	72
747	Z2 Random sound assignment	174
748	Z2 Random volume adjust	91
749	Z2 Random standstill / motion	72
750	Z3 Random sound assignment	151
751	Z3 Random volume adjust	91
752	Z3 Random standstill / motion	72
753	Z4 Random sounds assignment	152
754	Z4 Random volume adjust	91
755	Z4 Random standstill / motion	72
756	Z5 Random sound assignment	153
757	Z5 Random volume adjust	91
758	Z5 Random standstill / motion	8
759	Z6 Random sound assignment	154
760	Z6 Random volume adjust	91
761	Z6 Random standstill / motion	72
762	Z7 Random sound assignment	155
763	Z7 Random volume adjust	46
764	Z7 Random standstill / motion	8
765	Z8 Random sound assignment	165
766	Z8 Random volume adjust	91
767	Z8 Random standstill / motion	8
768	Steam set	0
769	unknown	1
770	unknown	127
771	unknown	127
772	unknown	127
773	unknown	127
774	unknown	1
775	unknown	42
776	unknown	26
783	PWM slow from auto-run	0
784	PWM fast from auto-run	0
800	SMG Group 14 FKey	0
801	SMG Group 14 MKey	0
802	SMG Group 14 Forward 1st AUX	0
803	SMG Group 14 Forward 2nd AUX	0
804	SMG Group 14 Reverse 1st AUX	0
805	SMG Group 14 Reverse 2nd AUX	0
806	SMG Group 15 FKey	0
807	SMG Group 15 MKey	0
808	SMG Group 15 Forward 1st AUX	0
809	SMG Group 15 Forward 2nd AUX	0
810	SMG Group 15 Reverse 1st AUX	0
811	SMG Group 15 Reverse 2nd AUX	0
812	SMG Group 16 FKey	0
813	SMG Group 16 MKey	0
814	SMG Group 16 Forward 1st AUX	0
815	SMG Group 16 Forward 2nd AUX	0
816	SMG Group 16 Reverse 1st AUX	0
817	SMG Group 16 Reverse 2nd AUX	0
818	SMG Group 17 FKey	0
819	SMG Group 17 MKey	0
820	SMG Group 17 Forward 1st AUX	0
821	SMG Group 17 Forward 2nd AUX	0
822	SMG Group 17 Reverse 1st AUX	0
823	SMG Group 17 Reverse 1nd AUX	0
835	Number of Additional Quick Select FKeys	2
836	Probability of switchgear sparks	0
837	Script processes	0

Zimo Small DCC Decoders - *YouChoos Common Tweaks*

September 2018 Revision
For MX645, MX644, MX648, MX646, MX649, MX658, MX659, MX695, MX696, MX699
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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



If adding a stay-alive capacitor, ensure its' voltage rating is at least as high as the DCC track voltage. Normally this is around 16V.

If possible, it is recommended that you use a capacitor between 25-35V. Any size will help, even as small as 100uF, but the bigger the better. Electrolytic, Tantalum and some SuperCap capacitors may be fitted directly to decoders with energy storage connections, or via a SPEIKOMP kit for decoders only supplying +VE and 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 vender). 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!

Speakers



The connected speaker must have an impedance of 8ohm and 1W. Alternatively, you can connect 2x 4Ohm speakers in series, which will give 8Ohm 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 8Ohm speakers in parallel for these decoders to get 4Ohm 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. Seuthe #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