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YouChoos Individual Model Locomotives

# YouChoos *DCC Sound*

immersive Drive

# 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: PENDO-TEMPLATE-0886**

## YouChoos Sounds
## EMU Class 390 Pendolino

DCC Address: 3



Included in this package:

| | |
|---|---|
| PART NUMBER | YouChoos Sounds - EMU Class 390 Pendolino YC-PENDO |
| DECODER | MS series - template |
| SPEAKER | N/A - template |

**Functions:**

| FKey | Category | Action |
|---|---|---|
| F0fwd: | LIGHT | FOfwd Forward lights |
| F0rev: | LIGHT | F0rev Reverse lights |
| F1: | SOUND | Running Sounds |
| F2: | ACTIVE BRAKE | Active Brake |
| F3: | SOUND | Horn |
| F4: | SOUND | Horn 2 |
| F5: | SOUND | Power Up |
| F6: | LIGHT | FA1 |
| F7: | SOUND | Buzzer |
| F8: | SOUND | Release |
| F9: | SOUND | Guard's Whistle |
| F10: | SOUND | Cab Noises |
| F11: | SOUND | Compressor |
| F12: | LIGHT | FA2 |
| F13: | SOUND | Announcement |
| F14: | SOUND | Doors |
| F15: | SOUND | Beeps |
| F16: | SOUND | Doors and Beeps |
| F17: | SOUND | Compressor Clicks |
| F18: | SOUND | Horn 12 |
| F19: | SOUND | Mute |
| F20: | SHUNT + HALF SPEED | Shunting Mode / Half Speed |
| F21: | SOUND | Horn 4 |
| F22: | SOUND | Horn 3 |
| F23: | SOUND | Compressor 2 |
| F24: | SOUND | High Speed Pass By |
| F25: | SOUND | Wheel Flange |
| F26: | SPEEDLOCK | SpeedLock |
| F27: | VOLUME | Volume Decrease |
| F28: | VOLUME | Volume Increase |

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 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, or by short-circuit via the speaker output. 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.

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# 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 |
|---|---|---|---|---|---|---|
| 12 | Horn | | F3 (CV#519) | | | |
| 13 | Horn 2 | | F4 (CV#522) | | | |
| 14 | Horn 3 | | F22 (CV#679) | | | |
| 15 | Horn 4 | | F21 (CV#676) | | | |
| 16 | Guard's Whistle | | F9 (CV#537) | | | |
| 17 | Compressor | Loops | F11 (CV#543) | | | |
| 18 | Compressor 2 | | F23 (CV#682) | | | |
| 19 | Release | | F8 (CV#534) | | | |
| 20 | Power Up | | F5 (CV#525) | | | |
| 21 | High Speed Pass By | | F24 (CV#685) | | | |
| 22 | Wheel Flange | Loops | F25 (CV#688) | | | |
| 23 | Wheel Flange 2 | Loops | | | | |
| 24 | Doors and Beeps | | F16 (CV#558) | | | |
| 25 | Announcement | | F13 (CV#549) | | | |
| 26 | Announcement 2 | | | | | |
| 27 | Doors | | F14 (CV#552) | | | |
| 28 | Compressor Clicks | | F17 (CV#561) | | | |
| 29 | Cab Noises | | F10 (CV#540) | | | |
| 30 | Buzzer | | F7 (CV#531) | | | |
| 31 | Beeps | | F15 (CV#555) | | | |
| 32 | Horn 5 | | | | | |
| 33 | Horn 6 | | | | | |
| 34 | Horn 7 | | | | | |
| 35 | Horn 8 | | | | | |
| 36 | Horn 9 | | | | | |
| 37 | Horn 10 | | | | | |
| 38 | Horn 11 | | | | | |
| 39 | Horn 12 | Loops | F18 (CV#564) | | | |

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) | FOfwd Forward lights |
| F0Rev | YELLOW | FKey0REV | Constant (simple ON/OFF) | F0rev Reverse lights |
| FA1 | GREEN | FKey6 | Constant (simple ON/OFF) | FA1 |
| FA2 | BROWN | FKey12 | 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) | |

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# PENDO-TEMPLATE-0886 - YouChoos Sounds - EMU Class 390 Pendolino

## 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 | 100 |
| 5 | Maximum speed | 1 |
| 6 | Middle speed | 1 |
| 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 | 195 |
| 17 | Extended address (byte 1) | 0 |
| 18 | Extended address (byte 2) | 0 |
| 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 | 10 |
| 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 | 0 |
| 38 | Function mapping F4 | 0 |
| 39 | Function mapping F5 | 0 |
| 40 | Function mapping F6 | 4 |
| 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 | 8 |
| 49 | Signal controlled acceleration | 0 |
| 50 | Signal controlled deceleration | 0 |
| 51 | Signal dependent speed limits | 20 |
| 52 | Signal dependent speed limits | 40 |
| 53 | Signal dependent speed limits | 70 |
| 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 | 0 |
| 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 | -3 |
| 106 | User CV | -118 |
| 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 | 0 |
| 126 | Special effects F0REV | 0 |
| 127 | Special effects FuncOutput1 | 0 |
| 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. | 0 |
| 138 | Definition of smoke generator characteristic, connected to FO 1 – 6. | 0 |
| 139 | Definition of smoke generator characteristic, connected to FO 1 – 6. | 0 |
| 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 |
| | method | |
| 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 | 20 |
| 156 | FKey for deactivating momentum | 20 |
| 157 | FKey for MAN function | 0 |
| 158 | Various special bits - sound | 0 |
| 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 | 49 |
| 171 | Servo 3 - Right stop | 205 |
| 172 | Servo 3 - Centre position | 127 |
| 173 | Servo 3 - Rotating speed | 10 |
| 174 | Servo 4 - Left stop | 49 |
| 175 | Servo 4 - Right stop | 205 |
| 176 | Servo 4 - Centre position | 127 |
| 177 | Servo 4 - Rotating speed | 10 |
| 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 |
| 195 | Special effects FuncOutput9 | 0 |
| 196 | Special effects FuncOutput10 | 0 |
| 197 | Special effects FuncOutput11 | 0 |
| 198 | Special effects FuncOutput12 | 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 | 101 |
| 266 | Total volume | 75 |
| 267 | Chuff sound fre-quency with „virtual cam sensor" | 90 |
| 268 | Switching to real cam sensor | 0 |
| 269 | Lead-chuff accentuated | 0 |
| 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 | 175 |
| 276 | Engine (chuff) sound volume at high speed and no-load | 150 |
| 277 | Degree of volume change under load for driving (chuff) sound. | 25 |
| 278 | Load change threshold | 1 |
| 279 | Reaction time to load change | 1 |
| 280 | Load influence (DIESEL) | 10 |
| 281 | Acceleration threshold for full load sound | 1 |
| 282 | Duration of acceleration sound | 50 |
| 283 | Engine sound volume at full acceleration | 255 |
| 284 | Threshold for deceleration sound | 1 |
| 285 | Duration of reduced volume on deceleration | 50 |
| 286 | Volume level during deceleration | 125 |
| 287 | Brake squeal threshold | 55 |
| 288 | Minimum driving time before brake squeal | 50 |
| 289 | Thyristor control - sound pitch for stepping effect - ELECTRIC | 1 |
| 290 | Thyristor control - sound pitch for medium - ELECTRIC | 20 |
| 291 | Thyristor control - sound pitch for max - ELECTRIC | 100 |
| 292 | Thyristor control - speed step for pitch increase (electric) | 10 |
| 293 | Thyristor - Volume at steady speed - ELECTRIC | 2 |
| 294 | Thyristor - Volume during acceleration - ELECTRIC | 255 |
| 295 | Thyristor - Volume during deceleration - ELECTRIC | 1 |
| 296 | Motor sound, highest volume - ELECTRIC | 255 |
| 297 | Motor sound, when sound becomes audible for ELECTRIC engines | 15 |
| 298 | Motor sound, starting point of full volume for ELECTRIC engines | 50 |
| 299 | Sound pitch dependent on speed - ELECTRIC | 100 |
| 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 | 2 |
| 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 | 119 |
| 314 | Mute fade in/out time | 0 |
| 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 | 115 |
| | Z4 | |
| 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 | 1 |
| 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 | 0 |
| 346 | Switch collection conditions | 3 |
| 347 | Switch-over key for solo driving | 0 |
| 348 | Switch-over parameters | 0 |
| 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 | 26 |
| 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 | 5 |
| 360 | Electric switchgear duration on coming to stop | 5 |
| 361 | Switch gear sound - Playback delay - ELECTRIC | 1 |
| 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) | 10 |
| 365 | Upshift rpm (diesel mechanical) | 10 |
| 366 | Maximum turbo sound volume for DIESEL engines | 125 |
| 367 | Turbo rpm dependency on speed (diesel) | 25 |
| 368 | Turbo rpm dependency on acceleration (diesel) | 5 |
| 369 | Minimum load for turbo | 5 |
| 370 | Frequency increase of turbo | 50 |

| | | |
|---|---|---|
| 371 | Frequency decrease of turbo | 100 |
| 372 | Electric motor sound - Volume dependent on speed - ELECTRIC | 255 |
| 373 | Electric motor sound - Volume dependent on braking - ELECTRIC | 50 |
| 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 | 30 |
| 382 | Electric brake - maximum speed | 255 |
| 383 | Electric brake - Pitch according to speed | 0 |
| 384 | Electric brake – Deceleration threshold | 40 |
| 385 | Electric brake – Hill descent | 0 |
| 386 | Electric brake – loops | 8 |
| 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 | 0 |
| 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 | 85 |
| 396 | FKey to reduce volume | 27 |
| 397 | FKey to increase volume | 28 |
| 398 | Automatice Coasting (diesels) | 25 |
| 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 | 0 |
| 517 | F2 volume adjust | 0 |
| 518 | F2 looping/short | 0 |
| 519 | F3 sound assignment | 12 |
| 520 | F3 volume adjust | 0 |
| 521 | F3 looping/short | 0 |
| 522 | F4 sound assignment | 13 |
| 523 | F4 volume adjust | 0 |
| 524 | F4 looping/short | 0 |
| 525 | F5 sound assignment | 20 |
| 526 | F5 volume adjust | 0 |
| 527 | F5 looping/short | 0 |
| 528 | F6 sound assignment | 0 |
| 529 | F6 volume adjust | 0 |
| 530 | F6 looping/short | 0 |
| 531 | F7 sound assignment | 30 |
| 532 | F7 volume adjust | 0 |
| 533 | F7 looping/short | 0 |
| 534 | F8 sound assignment | 19 |
| 535 | F8 volume adjust | 0 |
| 536 | F8 looping/short | 0 |
| 537 | F9 sound assignment | 16 |
| 538 | F9 volume adjust | 0 |
| 539 | F9 looping/short | 0 |
| 540 | F10 sound assignment | 29 |
| 541 | F10 volume adjust | 0 |
| 542 | F10 looping/short | 0 |
| 543 | F11 sound assignment | 17 |
| 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 | 25 |
| 550 | F13 volume adjust | 0 |
| 551 | F13 looping/short | 0 |
| 552 | F14 sound assignment | 27 |
| 553 | F14 volume adjust | 0 |
| 554 | F14 looping/short | 0 |
| 555 | F15 sound assignment | 31 |
| 556 | F15 volume adjust | 0 |
| 557 | F15 looping/short | 0 |
| 558 | F16 sound assignment | 24 |
| 559 | F16 volume adjust | 0 |
| 560 | F16 looping/short | 0 |
| 561 | F17 sound assignment | 28 |
| 562 | F17 volume adjust | 0 |
| 563 | F17 looping/short | 0 |
| 564 | F18 sound assignment | 39 |
| 565 | F18 volume adjust | 0 |
| 566 | F18 looping/short | 8 |
| 567 | F19 sound assignment | 0 |
| 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 | 0 |
| 574 | IDLE volume adjust | 0 |
| 575 | CHANGEDIR sound assignment | 0 |
| 576 | CHANGEDIR volume adjust | 0 |
| 577 | COMETOHALT sound assignment | 5 |
| 578 | COMETOHALT volume adjust | 0 |
| 579 | THYRISTOR sound assignment | 8 |
| 580 | THYRISTOR volume adjust | 0 |
| 581 | SETOFF sound assignment | 4 |
| 582 | SETOFF volume adjust | 0 |
| 583 | WATEROUTLET sound assignment | 0 |
| 584 | WATEROUTLET volume adjust | 0 |
| 585 | EMOTOR sound assignment | 6 |
| 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 | 7 |
| 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 | 15 |
| 677 | F21 volume adjust | 0 |
| 678 | F21 looping/short | 0 |
| 679 | F22 sound assignment | 14 |
| 680 | F22 volume adjust | 0 |
| 681 | F22 looping/short | 0 |
| 682 | F23 sound assignment | 18 |
| 683 | F23 volume adjust | 0 |
| 684 | F23 looping/short | 0 |
| 685 | F24 sound assignment | 21 |
| 686 | F24 volume adjust | 0 |
| 687 | F24 looping/short | 0 |
| 688 | F25 sound assignment | 22 |
| 689 | F25 volume adjust | 0 |
| 690 | F25 looping/short | 8 |
| 691 | F26 sound assignment | 0 |
| 692 | F26 volume adjust | 0 |
| 693 | F26 looping/short | 0 |
| 694 | F27 sound assignment | 0 |
| 695 | F27 volume adjust | 0 |
| 696 | F27 looping/short | 0 |
| 697 | F28 sound assignment | 0 |
| 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 | 0 |
| 745 | Z1 Random volume adjust | 91 |
| 746 | Z1 Random standstill / motion | 72 |
| 747 | Z2 Random sound assignment | 0 |
| 748 | Z2 Random volume adjust | 91 |
| 749 | Z2 Random standstill / motion | 72 |
| 750 | Z3 Random sound assignment | 0 |
| 751 | Z3 Random volume adjust | 91 |
| 752 | Z3 Random standstill / motion | 72 |
| 753 | Z4 Random sounds assignment | 0 |
| 754 | Z4 Random volume adjust | 91 |
| 755 | Z4 Random standstill / motion | 72 |
| 756 | Z5 Random sound assignment | 0 |
| 757 | Z5 Random volume adjust | 91 |
| 758 | Z5 Random standstill / motion | 72 |
| 759 | Z6 Random sound assignment | 0 |
| 760 | Z6 Random volume adjust | 91 |
| 761 | Z6 Random standstill / motion | 72 |
| 762 | Z7 Random sound assignment | 0 |
| 763 | Z7 Random volume adjust | 91 |
| 764 | Z7 Random standstill / motion | 72 |
| 765 | Z8 Random sound assignment | 0 |
| 766 | Z8 Random volume adjust | 91 |
| 767 | Z8 Random standstill / motion | 72 |
| 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 | 0 |
| 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