

# ZTC Controls Ltd. UK Tsunami Digital Sound Decoder.

## English UK Sound Supplement.

### Release 1.01

#### **INTRODUCTION.**

These new and advanced Sound Decoders from ZTC Controls Ltd. have been produced in partnership with Soundtraxx and Throttle Up! Corporation based in the US of A. All the sounds have been digitally recorded by our recording engineers and re-mastered in our sound studio in England. All the recordings were made using restored locomotives. These sounds have then been further processed and added to the digital hardware by engineers in America. These British Sound Decoders are therefore exclusive to ZTC Controls Ltd.

To minimise errors ZTC controls have not attempted to rewrite the Soundtraxx manual, which, in four parts is extremely detailed and comprehensive. Instead we have produced a Sound Supplement to the document, which will be known as the “UK Sound Supplement” and it details and relates to the points and changes that are specific to the UK version of this decoder.

We must stress that the following notes must always be read in conjunction with all aspects of the Tsunami Decoder manual, also on this Disc, in particular the section titled Steam Sound Users Guide, Step 7, which is titled “Sound Programming”

Where possible commonality of function with previous ZTC sound decoders has been maintained, so to those already operating ZTC sound will find a degree of familiarity. However due to the demand for increased functionality, fidelity and technical advances in DCC over recent years this has not always been possible. So please do not assume anything, but read this document before calling the ZTC helpdesk.

Our memory of sound, like colour differs dramatically between each and every person and as we get older the passage of time increases the problem. We all think we know the actual colour or sound of a particular locomotive but we all have a slightly different preference and perception from the actual. Its those rose tinted spectacles again!

To overcome this minor difficulty and to ensure that we can all make our model locomotive sound just “how we remember” it sounded, or more importantly want it to sound like today, a vast range of individual adjustments have been provided within the new Tsunami decoder.

Of course you can accept the decoder default values as they stand if you wish. The sound generated will be perfectly serviceable and acceptable to the majority of listeners. However to get the best out of your chosen sound decoder it is worth spending a few hours setting up all of the various parameters, to your particular and individual liking.

A simple tip to remove an unwanted sound from the overall spectrum is to turn its output volume level to zero.

Some controllers do not offer the full range of operator functions; to overcome this many of features such as cylinder blow down can be set to automatically operate under a defined set of conditions. This frees up a Function control that can be used by another feature. This approach requires the use of function mapping, details of which are provided. See step 5 of the Steam Sound User Guide.

To assist the operator a shortcut “Function Re-map” has also been provided. If you select CV30 and set it to 4 (the Default is 0) then F5 to F8 will be swapped with F9 to F12 in a single operation.

Depending on the age of your equipment and due to the slightly higher current consumption of these new sound decoders, some controllers may have difficulty in programming them. If this is the case then please contact ZTC Controls Ltd. Help Desk on 0870-241-8730 Extension 6. We can and do offer an upgrade solution for ZTC controllers. Those customers with other third party equipment will need to either purchase a Programming Booster or contact their supplying manufacturer.

## **SOUND FEATURES OF THE DECODER.**

The following is a list of all the features of the new UK decoders, which for clarity have been subdivided into four sections.

### Foreground Sounds.

- 1) Chuff synchronisation.
- 2) Cylinder Blow Down

### Background Sounds.

- 3) Boiler blowing off
- 4) Injectors.
- 5) Clack valve
- 6) Water tank being filled
- 7) Snifter valve
- 8) Fireman Pete coal shovelling
- 9) Firebox door
- 10) Dynamo / generator \*
- 11) Vacuum & Air Pumps\*

### Operator Sounds.

- 12) Coasting (reduced) Chuff
- 13) Coupler and Buffer Clank
- 14) Locomotive whistles.
- 15) Guards Whistle
- 16) Door slams
- 17) Break Squeal
- 18) Coupling Rod Clank

### Lighting Effects.

- 19) Ashpan Glow.
- 20) Firebox Flicker.
- 21) Head and Rear Light.

\*In some cases the decoder, as supplied has a default value, which is set to 0. This means that the light or sound output for this item is currently turned OFF. An example of this is the Dynamo. To use this feature you will need to turn the sound on according to the instructions in this manual.

## OPERATIONAL DESCRIPTION OF SOUNDS.

### Drive Controlled Foreground Effects.

#### 1) Chuff synchronisation.

Chuff synchronisation for two, three or more cylinder locomotives, can be achieved in two ways both are covered in detail in various sections of the manual the manual.

The first approach is referred to as Pseudo Sync where the decoder electronically measures the motor speed and at regular intervals a suitable “chuff” sound is generated. This works well on smaller models (especially where space does not permit a mechanical cam to be fitted) and providing the decoder is carefully set up at slow speeds (below 5 rpm of the driving wheels). Above 5 rpm the eye deceives the ear (or is it the other way around)? As the locomotive speeds up it will slowly drift out of synchronisation but it is almost impossible for the naked eye to observe the effect.

The second approach is referred to as Synchronised Chuffing. This requires that a small switch or cam is fitted to the locomotive wheel or axle every time the wheel moves through a defined angle (such as 90 degrees) then the cam makes contact or the switch closes sending a signal to the decoder to emits a suitable Chuff sound.

More details on both of these methods can be found in step 7 in the section titled “Exhaust Control”

#### 2) Cylinder Blow Down. Function 4

This feature can be operated in two ways either automatically every time the loco starts and stops (See step 7 of the Steam Sound Users Guide section titled “The Event Probability Generator”.

Alternatively when Functions have been selected on your controller pressing F4 the first time will cause the cylinder steam Cylinder Blow Down sound effect to start and pressing F4 a second time will cause the sound to cease.

### Random sound (Background) effects .

### 3) Boiler Blowing Off (Pressure Relief Valve)

This function automatically happens at random intervals, after a period of non running, as set up in the decoder. The Random pattern can also be adjusted to suit the operator's requirement. (See step 7 of the Steam Sound Users Guide section titled "The Event Probability Generator")

### 4) Injectors.

The injectors only operate when the locomotive is stationary and at random intervals. The randomness may be altered by changing the value of CV205.

Increasing the value increases the time interval between events. This function automatically happens at random intervals, after a period of non running, as set up in the decoder. The Random pattern can be adjusted to suit the operator's requirement. (See step 7 of the Steam Sound Users Guide section titled "The Event Probability Generator")

### 5) Clack valve

The Clack valve can only be heard to operate when the locomotive is stationary and at random intervals. Changing the value of CV203 will alter the randomness. The volume can be changing by altering CV151. The default values are 48 and 32 respectively.

Increasing the value increases the time interval between events. This function automatically happens at random intervals, after a period of non running, as set up in the decoder. The Random pattern can be adjusted to suit the operator's requirement. (See step 7 of the Steam Sound Users Guide section titled "The Event Probability Generator")

### 6) Water tanks being filled

The water tanks can only be heard to operate when the locomotive is stationary and at random intervals. The randomness may be altered by changing the value of CV205.

Increasing the value increases the time interval between events. This function automatically happens at random intervals, after a period of non running, as set up in the decoder. The Random pattern can be adjusted

to suit the operator's requirement. (See step 7 of the Steam Sound Users Guide section titled "The Event Probability Generator")

7) Snifter Valve.

CV 141 controls the volume of the snifter valve. The operation of the snifter valve is most noticeable when the locomotive is in the Coasting (reduced) Chuff mode. (Function 0)

8) Fireman Pete coal shovelling.

Fireman Pete has a range of sounds that he makes as he spends his day looking after your locomotive. Some of these are not generally used on all locomotives so their sound volume and occurrence time frame have been set to zero. Changing the respective CV values can however activate them.

CV149 the wrench volume, CV 150 oil can volume along with their respective probability registers CV203 and CV204 have all been set at default values equal to 0

The Pneumatic grease gun is not included in this decoder.

6) Firebox door

The firebox door opens and closes every time Fireman Pete throws a shovel full of coal on to the fire.

10) Dynamo / generator \*

The Dynamo sound will only become active when the headlight and /or back light outputs is turned ON. The Dynamo Default Volume is currently set to 0 and should be increased if the sound function is required.

11) Vacuum & Air Pump\* CV112 and CV132

Bit 0 and 1 of CV112 are used to select the air-pump options and are laid out in Table 1 below.

Bit 1	Bit 0	Functionality.
0	0	Vacuum & Air-Pump OFF
0	1	Westinghouse Air Pump ON
1	0	Single action Vacuum Pump (Default)
1	1	Double action Vacuum Pump.

The Westinghouse Air Pump Runs Continuously but slows down over a period of time to simulate a build up of pressure. To release the air pressure you may activate the brake squeal normally on Function 11.

The vacuum pumps are triggered to operate once or twice per driving wheel revolution.

The out volume of the Vacuum or Air pump may also be adjusted using CV 132

## 12) Coasting (reduced) Chuff. Function 0

This feature is unique to ZTC decoders and should not be confused with the Dynamic exhaust feature.

The facility permits a predetermined volume (level) for the “chuff” whenever the F0 function button is pressed. The feature can be toggled ON and OFF with each successive press of the F0 function (when functions are enabled).

By pressing F0 once the operator can now run the locomotive with a significantly reduced chuff volume with all the other sound features still remaining operational. Thus simulating a lightly loaded locomotive sliding quietly along or coming to a halt in a station. Pressing F0 a second times returns the decoder to normal operation.

When the manual mode is enabled F0 will raise and lower the exhaust chuff volume. When coasting Chuff is ON, there will also be a change in the exhaust tone to reflect a lightly loaded locomotive.

To enable manual coasting chuff set bit 2 in CV112 to 1 (This is also the default value). To adjust the volume level, first TURN OFF Function 0 (F0) and then adjust CV131 to set the normal exhaust chuff volume level. Now turn ON F0 and set the coasting chuff volume level by adjusting the value of CV181

It should be noted that CV181 does not set an absolute volume level. Instead it controls the relative volume level by setting the number of dB's that the exhaust chuff volume is reduced by from the original setting in CV131.

CV181 may be set to any value between 0 and 255. Setting CV118 to 0 is equivalent to a 0dB-volume reduction (i.e. No change). Setting CV181 to 255 will reduce the volume by  $-32\text{dB}$  (or the original volume multiplied by 0.0251 or 2.5% of the original volume level), which is the maximum reduction possible.

The default value for CV181 is 150. This corresponds to about  $-14\text{ dB}$  reduction in the original volume level. The original volume level should be multiplied by approximately 0.2 or 20%

13) Coupler and Buffer Clank. Function 7

This is operated by pressing F7. Each time the button is pressed the buffers make contact and the three-link coupling is completed.

14) Locomotive whistles. Function 2 and Function 3

A range of Locomotive whistles have been incorporated into the decoder and can be accessed via F2 and F3. Operating F2\* selects the long whistles and F3 selects the related short whistle.

The selection of which whistle is to be blown, is by setting one of the values available for CV115. It is important that the whistle selection is made first as the setting of the whistle type, also defines the other regional locomotive sounds, which are also related to the type specified.

If values for whistles marked with \*\* are selected, then no sound will play when F2 is turned ON and the operation of F3 will be blocked until F2 is turned OFF. This is because in actuality the decoder is playing a silent track when F2 is turned ON. Note that some slots are not yet allocated, but will be used for future expansion.



Table 1 LMS & LNER whistles installed in the ZTC 472

CV115	F2 (Long)	F3 (short)
0	LNER Fleet whistle	LNER Fleet whistle
1	**	LNER B12
2	LNER A4	LNER A4
3	LMS Black 5	LMS Black 5
4	LMS Britannia/BR Standard	LMS Britannia/BR Standard
5	Spare Slot for future expansion.	
6	Spare Slot for future expansion.	

Table 2 GWR Southern whistles installed in the ZTC 473

CV115	F2 (Long)	F3 (short)
0	TBA**	TBA**
1	TBA**	TBA**
2	TBA**	TBA**
3	TBA**	TBA**
4	TBA**	TBA**
5	TBA**	TBA**
6	TBA**	TBA**

Please note that CV 47 “The Playable Whistle” is not operable.

\*\*For technical reasons, not all the long whistles are available yet. When these issues become resolved ZTC will make these sounds available.

#### 15) Guards Whistle. Function 6.

The guard whistle can be operated manually or automatically when a locomotive starts to pull away from the station.

Manual operation is achieved by pressing F6 once each time the guards whistle is to operate.

The automatic Guard Whistle is triggered when the loco begins to move (i.e. The default is set so that it operates at speed step one in 28 speed step mode).

However as it spoils the illusion if the loco starts to chuff before the guard blows his whistle we can delay the start of the auto-chuff using CV199.

The default value is set to 7 which means that in 128 mode no chuffing will occur until the regulator advances to step 8 in 128 mode.

For 14 and 28 step modes CV199 should be set to the closest equivalent speed step as measured in the 128 mode using the following formula: -

$$\text{CV199} = \text{Speed step} \times 128 / (\text{speed step mode})$$

For example. In 14 step mode, speed step 1 is  $1 \times (128/14) = 9$

In 28 step mode, speed step 3 is  $3 \times (128/28) = 13$

When using the decoder in cam synchronised mode, the modeller should enable the 28-point speed table. Then programme the appropriate points with 0 to prevent the motor from prematurely moving.

Using Function 12 can also access this sound feature.

- 16) Door slams. Automatic Function.  
Setting a value in CV208 selects an option to hear any number of door slams followed by the Guard whistle.

A value of one or more will cause the decoder to produce more door slams. The number of door slams will depend on the number value set in CV 208. The range is 1 to 134 door slams, but the default value is 6

- 17) Break Squeal Function 11

Break squeal is available on this decoder and is implemented by pressing F11 once. If your controller does not support function above F8 then to operate this feature you will have to use function Mapping to move the sound to a lower function number.

- 18) Coupling-rod Clank Function 6

When the decoder is in manual mode F6 will raise and lower the volume of the Coupling-rod Clank. To enable manual Coupling-rod, you will need to set bit 3 of CV112 to 1 (This is also the default value).

To adjust the volume level first turn F6 ON and then use CV135 to set the boosted Coupling-rod clank level. Then turn OFF F6 and adjust the nominal volume level using CV183.

Note that this is the opposite procedure to setting the coasting chuff sound. As with CV181, CV183 does not set an absolute volume level, it controls the relative volume level by setting the number of dB's to reduce the coupling-rod clank volume as set by CV135.

CV183 may be set to any value between 0 and 255. Setting CV181 to a value of 0 is equivalent to 0dB volume reduction or no change. Setting CV181 to a value of 255 will reduce the volume by -32dB, which is the maximum reduction. The default value of CV183 is 200 corresponding to approximately to -25dB reduction in volume.

## Lighting Effects.

The main lighting effects available in the ZTC472 and ZTC473 are Firebox Flicker and Ash Pan Glow and are controlled by CV51 and CV52.

### 19) Ashpan Glow. Function 5

When the Functions have been selected on your controller pressing F5 the first time will cause the Ash pan light to come ON and pressing F5 a second time will cause the light to go out.

In addition a number of additional features can be added to this basic command such as the style of lighting by setting a specific number in CV52 as shown in Table 3

The operation of this feature is a Simple ON/OFF

Table 3                      Ash Pan Lighting Brilliance

CV52 Value set to 9 Brightness will be set to 12%  
CV52 Value set to 10 Brightness will be set to 25%  
CV52 Value set to 11 Brightness will be set to 50%  
CV52 Value set to 12 Brightness will be set to 100%

All of the above values are for an incandescent bulb. LED's can be used, but they are less effective however they do run cooler. If LED's are to be used then 128 needs to be added to the figures quoted above.

Control of the Ashpan light can if required be mapped to another function position. As outlined in Step 5 Titled "Function mapping" of the Steam Sound User Guide.

20) Firebox Flicker (lighting). Function 1

When the Functions have been selected on your controller pressing F1 the first time will cause the Firebox light to come ON and pressing F1 a second time will cause the light to go out.

If operation Firebox Flicker is selected to be operational only when fireman Pete does his shovelling then the light will only be operating when the firebox door is considered to be open and the loco stationary.

In addition a number of additional features can be added to this basic command such as the style of lighting by setting a specific number in CV51 as shown in Table 4

Table 4                      Firebox Lighting Effects

CV52	Value set to 00 Simple ON/OFF
CV52	Value set to 12 Speed Sensitive Flicker
CV52	Value set to 13 Constant Flicker
CV52	Value set to 14 Smart Flicker is selected.

This last feature now only becomes active when coal is being shovelled.

This feature can if required be mapped to another function position. As outlined in Step 5 Titled "Function mapping" of the Steam Sound User Guide.

21) Headlight & Back running light. Function 10

Both these lamps if fitted are controlled (by default) using the single function switch F10.

You should note that the headlight and back running light are not directional when assigned to operate with F10. If direction lighting is required then you will need to "function Map" this feature to operate using F0 only.

## Decoder (default) Function List.

Function 0 Coasting Chuff

Function 1 Smart Firebox light

Function 2 Long Whistle

Function 3 Short Whistle

Function 4 Steam Hiss

Function 5 Ashpan Lights

Function 6 Guard Whistle

Function 7 Buffer & Coupler

Function 8 Mute

Function 9 Water Stop

Function 10 Headlight & Back running Light, plus Dynamo

Function 11 Brake Squeal

Function 12 Guard Whistle (duplicate)

## ZTC 471 & ZTC 472 Sound Decoder CV List

All of the CV `s used in the ZTC 472 Sound Decoder are listed as follows with their default values.

Functional Description	CV Number	Default Value
Primary Address	1	3
Start Voltage	2	0
Acceleration Rate	3	0
Deceleration Rate	4	0
Manufactures Version	7	Version Identity
Manufactures Identity	8	132
PWM Period	9	180
Back EMF Cut Out	10	0
Packet Time-out Value	11	0
ANALOG MODE CVs		
Alternate Power Source	12	1
Analogue Mode Functions	13	0
SECURITY CVs		
CV Unlock Code	15	0
CV Lock ID	16	0
EXTENDED OPERATION CVs		
Extended Address MSB	17	192
EXT Address LSB	18	3
CONSIST Address	19	0
Consist Function Active	21	0
Consist FL Function. Active	22	0
Consist Acceleration	23	0
Consist Braking Rate	24	0
Speed Table Select	25	0
Configuration Byte 1	29	2
Error Information	30	0
FUNCTION MAPPING CVs		
FL (f) Output Location	33	16
FL(r) Output Location	34	16
F1 Output Location	35	4
F2 Output Location	36	1
F3 Output Location	37	2

## FUNCTION MAPPING CVs (continued)

Functional Description	CV Number	Default Value
F4 Output Location	38	64
F5 Output Location	39	1
F6 Output Location	40	32
F7 Output Location	41	16
F8 Output Location	42	32
F9 Output Location	43	64
F10 Output Location	44	3
F11 Output Location	45	128
F12 Output Location	46	32
Analogue Whistle Channel	47	0
<b>LIGHTING CONTROL CVs</b>		
FLf Light configuration.	49	15
FLr Light configuration	50	15
FX1 Firebox light	51	0
FX2 Ashpan light	52	256
Lighting Flash Rate	59	3
Grade Crossing Hold Time	60	4
<b>MISC. CONTROL</b>		
F11 Braking Rate	61	0
Transponder Control	82	0
<b>ANALOG MODE MOTOR CONTROL</b>		
Starting Voltage	63	20
Maximum Motor Voltage	64	180
<b>SPEED TABLE</b>		
Kick Start	65	0
Forward Trim	66	32
Speed Table	67	9
Speed Table 1	68	18
Speed Table 2	69	27
Speed Table 3	70	36
Speed Table 4	71	45
Speed Table 5	72	55
Speed Table 6	73	64

SPEED TABLE (continued)  
 Functional Description

CV Number Default Value

Speed Table 7	74	73
Speed Table 8	75	82
Speed Table 9	76	91
Speed Table 10	77	100
Speed Table 11	78	109
Speed Table 12	79	118
Speed Table 13	80	127
Speed Table 14	81	137
Speed Table 15	82	146
Speed Table 16	83	155
Speed Table 17	84	164
Speed Table 18	85	173
Speed Table 19	86	182
Speed Table 20	87	191
Speed Table 21	88	200
Speed Table 22	89	209
Speed Table 23	90	219
Speed Table 24	91	228
Speed Table 25	92	237
Speed Table 26	93	246
Speed Table 27	94	255
Reverse Trim	95	32

USER INFORMATION

User Identifier #1	105	Version ID 1
User Identifier #2	106	Version ID 2
Sound Configuration 1	112	14
Quiet Mode Control 2	113	0
Bell Ring Rate	114	1
Whistle Select	115	0
Exhaust Control	116	80
Not Applicable	117	0
Not Applicable	118	0
CV Bank Select	119	0



## USER INFORMATION (continued)

Functional Description	CV Number	Default Value
Processor Parameter	120	0
Processor Parameter 1	121	0
Processor Parameter 2	122	0
Processor Parameter 3	123	0
Processor Parameter 4	124	0
Processor Parameter 5	125	0
Processor Parameter 6	126	0
Processor Parameter 7	127	0
Master Volume Control	128	192
Channel 0 mixer level (whistle)	129	255
Channel 1 mixer level (bell)	130	128
Channel 2 mixer level (chuff)	131	192
Channel 3 mixer level (air and Vacuum -pump)	132	192
Channel 4 mixer level (dynamo)	133	0
Channel 5 mixer level (blower)	134	16
Channel 6 mixer level (rod clank)	135	64
Channel 7 mixer level (steam hiss)	128	136
Channel 8 mixer level (coupler)	137	128
Channel 9 mixer level	138	0
Channel 10 mixer level (brake squeal)	139	128
Channel 11 mixer level (brake release)	140	64
Channel 12 mixer level (snifter valve)	141	64
Channel 13 mixer level (power reverse)	142	64
Channel 14 mixer level (pop-off)	143	128
Channel 15 mixer level	144	0
Channel 16 mixer level (blower draft)	145	128
Channel 17 mixer level (water stop)	146	96
Channel 18 mixer level (injector)	147	64
Channel 19 mixer level (coal shovel)	148	64
Channel 20 mixer level (wrenches)	149	0
Channel 21 mixer level (oilcan)	150	0
Channel 22 mixer level (clack valve)	151	48
Channel 23 mixer level (firebox door slam)	152	64

## USER INFORMATION (continued)

Functional Description	CV Number	Default Value
Equaliser Control Regulator	153	0
62Hz Cut/Boost	154	32
125Hz Cut/Boost	155	32
250Hz Cut/Boost	156	32
500Hz Cut/Boost	157	32
1 kHz Cut/Boost	158	32
2 kHz Cut/Boost	159	32
4 kHz Cut/Boost	160	32
Reverb Control Register	161	0
Reverb Level	162	128
Reverb Delay Time	163	255
Reverb F.B. Gain Level	164	64
Unassigned	165	0
Unassigned	166	0
Unassigned	167	0
Unassigned	168	0
Reverb channel 0 mixer level	169	0
Reverb channel 1 mixer level	170	0
Reverb channel 2 mixer level	171	0
Reverb channel 3 mixer level	172	0
Reverb channel 4 mixer level	173	0
Reverb channel 5 mixer level	174	0
Reverb channel 6 mixer level	175	0
Reverb channel 7 mixer level	176	0
DDE Throttle Sensitivity	177	10
DDE Load Sensitivity	178	32
DE Attack Time Constant	179	10
DDE Decay Time Constant	180	10
DDE Exhaust Lower Volume Limit	181	150
DDE Exhaust Upper Volume Limit	162	255
DDE Rod Lower Volume Limit	183	200
DDE Rod Upper Volume Limit	184	255
DDE Filter Initial Frequency	185	42
DDE Filter Slope	186	64
DDE Filter Damping	187	255
DDE BEMF Tracking Constant	188	102
DDE BEMF Tracking Offset	189	0
Unassigned	190	0
Unassigned	191	0
Unassigned	192	0

USER INFORMATION (continued)

Functional Description	CV Number	Default Value
Bell On Voltage	193	15
Bell Off Voltage	194	19
Whistle Sensitivity	195	4
Brake Squeal Sensitivity	196	3
Analogue Auto Sound Enable 1	197	32
DCC Auto Sound Enable 1	198	32
Auto Chuff Start Speed Step	199	7
Unassigned	200	0
Task 0 Probability Level Fred	201	64
Task 1 Probability Level Wrench	202	0
Task 2 Probability Level Clack Valve	203	32
Task 3 Probability Level Oil-Can	204	0
Task 4 Probability Level Inject	205	64
Task 5 Probability Level Blower	206	64
Task 6 Probability Level Pop-Off	307	64
Door Slam Range	208	6
PID Kp Coefficient	209	25
PID Ki Coefficient	210	20
PID Kd Coefficient	211	0
BEMF Feedback Intensity	212	255
BEMF Sample Period	213	15
BEMF Sample Window Size	214	15
BEMF Gain Coefficient	215	0
Unassigned	216	0
Motor Control Register	217	2
Unassigned	218	0
Unassigned	219	0
Unassigned	220	0
Unassigned	221	0
Unassigned	222	0
Unassigned	223	0
PHANTOM_CV17	224	0

Function Mapping CVs are arranged as follows:

	WH	SHWH	FX5	FX6	DRFT	ROD	HL	BL	GWH	STM	CPLR	MOTE	WS	BELL	BRK
F0f					0				x	x	x	x	x	x	x
F0r					0				x	x	x	x	x	x	x
F1			0						x	x	x	x	x	x	x
F2	0								x	x	x	x	x	x	x
F3		0							x	x	x	x	x	x	x
F4	x	x	X							x		x	x	x	x
F5	x	x	X	0								x	x	x	x
F6	x	x	X			0						x	x	x	x
F7	x	x	X	x	x	x					0				x
F8	x	x	X	x	x	x						0			x
F9	x	x	X	x	x	x							0		x
F10	x	x	X	x	x	x	0	0							x
F11	x	x	X	x	x	x	X								0
F12	x	x	X	x	x	x	x		0						

X = not available

0 = default