REQUIREMENT REPORT

SEARCH CRITERIA

Author = Prescott,Jennifer-JPRESCO2 (jpresco2)
Status = RELEASED

Note: All records were not selected for the report

REQUIREMENTS SUMMARY

FSMS ID (SETK Legacy)	RQT Version	Requirement Title	Publish Date	Priority Level	Associated Detail ID(s)	Associated Verification Types
RQT-001502-012992 (IH-0010)	12	CHIME SOUND QUALITY	18-Jul-2016	Specification		00.00-L-470/3;1

REQUIREMENT

ID: RQT-001502-012992 **Rev:** 12 **Title:** CHIME SOUND QUALITY

Legacy ID: IH-0010 **Owner:** Prescott,Jennifer-JPRESCO2 (jpresco2) **Priority Level:** Specification

Release Status: Released **Rqmt Published Date:** 18-Jul-2016 **Obsolete Date:** **Superseded Date:**

Recipient CPSCs:

001502-NVH - Operational Sound Quality
001601-PQ - Crafted Quality
130100-Instrument Cluster Subsystem
130101-Driver Info Module (Inst Clust)
150000-In-Vehicle Entertainment System

Rqmt Sources(s) :

Source ID	Source Name	Source URL	Source Comments
Lincoln-Premium Content	Contains unique Lincoln Content	No URL	No Comments

Cascade To:

Cascade From:

Markets:
GLOBAL;

Vehicle Types:
GLOBAL:All

Comments:
-Updated section 3.1 to reflect current test method and acceptance criteria.
-Removed Chime 29 from specification

Requirement Description:

RQT-001502-012992 IH-0010

All chimes must meet the Vehicle level targets for all Chime Sounds as specified in the details of this specification. All chime waveforms shall be audibly evaluated in vehicle and approved prior to implementation.

SME sign-off on sound quality in vehicle is required.

1.1 PEAK LOUDNESS

The maximum value of time varying loudness, in SonesGD, as calculated using ISO-532B Sones (Zwicker), 4th Order Filter based.

1.2 VEHICLE LEVEL LOUDNESS

All chimes and warning sounds presented through the interior of the vehicle shall meet loudness requirements as specified in the Chime Parameters Table when measured at the driver position. At no time shall the chime Loudness Level exceed 25 sones for any Secondary Listener (except for Active Safety chimes). For Active Safety chimes, such as ACC (Active Cruise Control), FCW (Forward Collision Warning), etc., check with the NAE Active Safety group for their latest requirements.

Due to vehicle variation from one trim series to another, or body style to another, provision should be made to allow for unique calibration of chime loudness for each vehicle within a vehicle platform using the same instrument cluster software. For example, if a cluster with common software is used for multiple vehicles within different platform vehicle identifiers (i.e. D471, D385 or CD539, CD390), unique calibrations for loudness must be provided for each vehicle identifier. A single calibration will not suffice for all vehicles within a platform and multiple trim levels may be required to account for differences in speaker position or acoustic sensitivity or absorption.

1.3 LOUDNESS ADJUSTMENT

Chime Drive Level shall be adjustable under Software Control. Tuning of chime loudness must be available through software calibration parameters (such as through a Supplier DID), so that adjustment of the loudness level can be tuned throughout the development cycle prior to PEC. Calibration or software tuning parameters must be done through the vehicle diagnostic connector via CAN bus. No re-flashing of the module or removal of a component must be necessary. Development software that allows for tuning through the diagnostic connector can differ from final production software. However, final verification of the chime loudness must be performed on production intent software. This final verification of chime loudness must be done through the vehicle?s ICAN port, using CANSIM Canoe Panel, Canalyzer, or an alternative software package that is capable of sending CAN signals to the instrument cluster.

2.1 TOTAL HARMONIC DISTORTION

THD is the measure of harmonic content generation (distortion) expressed as a percentage of harmonics power to fundamental tone power when the system is driven with a sinusoidal waveform. The test must be performed at the maximum rated sound level output.

The harmonic sum is to be conducted over the first 20 harmonics.

THD shall be less than or equal to 10%.

$$T.H.D \equiv \frac{\sum_{n=1}^{20} P_{Fn}}{P_{F0}} \times 100 \leq 10\%$$

Where:

THD is the Total Harmonic Distortion,

P_0 is the fundamental frequency (the pure tone), and

P_1 to P_{20} are the harmonics of the fundamental frequency that are present in the waveform.

2.2 Decay Rate

This is the time constant expressing the rate at which the sound intensity decays. The time constant is referred to as Tau (τ).

$$A(t) = A_0 e^{-\left(\frac{t}{\tau}\right)}$$

Where:

A(t) is the amplitude of the waveform at any time t after the start (i.e. t > 0), and

A_0 is the initial value of the amplitude,

t is the time, in seconds, at any instant > 0, and

τ (is the decay rate) > 0.

Small values of τ (i.e. larger values of t/τ) result in sharper decay.

Refer to the following graph for an illustration of how τ affects the equation.

For a positive waveform with 50% duty cycle,

A(t) = Ao, for 0 < t < τ and

A(t) = 0 , for τ < t < 2 τ

2.3 ATTACK TIME DEFINITION

Let T1 be the instant in time at which an input signal to a circuit (or device) just exceeds the activation threshold level of the circuit (or device).

Let T2 be the instant in time at which the circuit (or device) reacts to the above input signal to produce an output according a specification.

Attack Time is the difference in time between the above mentioned instants, T1 and T2.

The "Attack Time" for all chime warning signals shall be less than or equal to .001 seconds (i.e., 1 ms), unless otherwise specified. However, Attack Time should not be shorter than 0.05 ms.

2.4 HARMONIC CONTENT

Magnitude - Fundamental drive frequency shall be dominant in the spectra of all waveforms. Harmonics are permitted, but must be lower in magnitude than the fundamental.

Even/odd harmonics - In order to promote richness of sound, both Even and Odd Harmonics of the Fundamental Drive Tone shall be present (typically achieved using a "saw tooth" rather than "square" drive waveform).
Monotonicity - Harmonic magnitude shall be monotonically decreasing with frequency to the 5th harmonic.

2.5 SIGNAL-TO-NOISE RATIO

Noise can couple from various sources into the drive circuit. This noise can be distracting to the customer, and must be restricted to a low level.
Electrical noise measured at the speaker terminals within the frequency range from 100 to 20000 Hz shall not be greater than -60 dB relative to the maximum signal level generated for peak chime output (RMS measurements). This test should be performed in-vehicle with a typical electrical load and engine running.

3.1 SOUND MEASUREMENT PROCEDURE

Test Method 00.00-L-470 is used for measurement procedure. Loudness requirements are as follows:

a. When measuring with a binaural head: Peak Loudness of right/left channel
b. When measuring with a microphone array: Average Loudness of all microphones
c. No individual microphone position can exceed 25 sones.

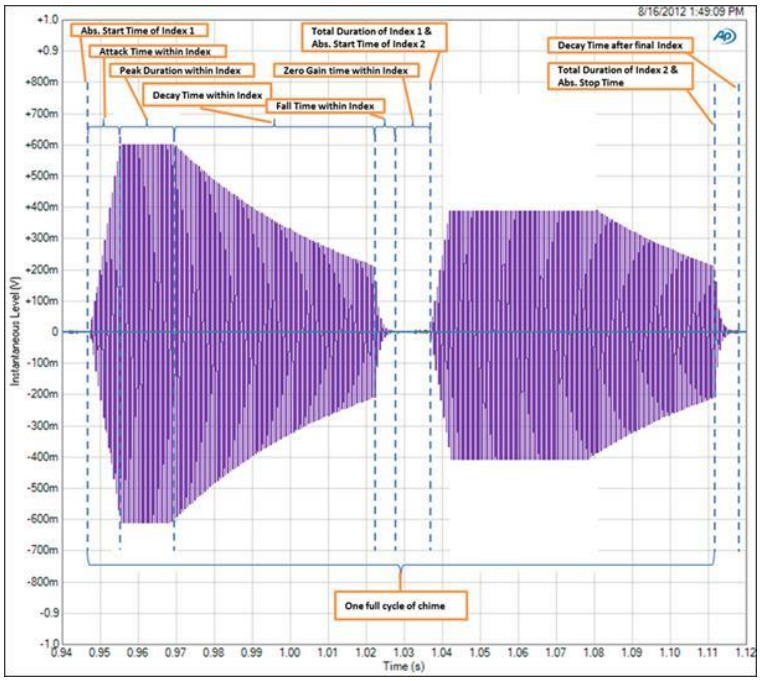
4.1 SPEED COMPENSATED TURN SIGNAL

The turn signal chime loudness will vary based on the speed of the vehicle. If speed compensated turn signal chime is not available in a cluster design, the loudness for tic and toc will be 5.5 +/- 0.5 sones.

Step Number	Loudness (Sones) +/- 0.5	Speed Threshold (kph) +/-1 kph
Loudness_Step_0	4.5	25
Loudness_Step_1	5	35
Loudness_Step_2	6	50
Loudness_Step_3	6.5	65
Loudness_Step_4	7.0	85
Loudness_Step_5	7.5	110

5.1 The supplier shall measure and report out the following characteristics of all chimes:

- Frequency
- Relative Amplitude (based off of magnitude plot)
- Absolute Peak Amplitude
- Absolute Between Chime Amplitude
- Absolute Start Time
- Attack Time within Index
- Peak Duration within Index
- Decay Time within Index
- Fall Time within Index
- Zero Gain Time between Indexes
- Total Duration of Index (sec)
- Abs. Stop Time
- Decay Time after final Index



`Front? and `All? Speakers Chime Waveform Requirements (Polyphonic Chimes):

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones
Chime_3	1.0 Second Chime	1	740 Hz	100%	500mv	0mv	0 ms	10 ms	0 ms	990 ms		0 ms	1000 ms	1000 ms	5 ms	13 +/- 2
Chime_4	0.5 Second Chime	1	740 Hz	100%	500mv	0mv	0 ms	5 ms	0 ms	495 ms		0 ms	500 ms	500 ms	5 ms	13 +/- 2
Chime_5	0.25 Sec Chime	1	740 Hz	100%	500mv	0mv	0 ms	5 ms	0 ms	245 ms		0 ms	250 ms	250 ms	5 ms	13 +/- 2
Chime_6	1 Sec Tone (1KHz Alert)	1	1.0 kHz	100%	500mv	200mv	0 ms	1 ms	499 ms	500 ms		0 ms	1000 ms	1000 ms	5 ms	13 +/- 2
Chime_7	0.1 Sec Chime	1	1.0 kHz	100%	500mv	0mv	0 ms	1 mv	99 ms	20 ms		0 ms	120 ms	120 ms	25 ms	13 +/- 2
Chime_8	Ford DNA Chime B (Soft Warning)	1	440 Hz	100%	500mv	140mv	0 ms	10 ms	10 ms	140 ms		0 ms	160 ms	160 ms		15 +/- 2
		2	660 Hz	100%	500mv	140mv	160 ms	10 ms	0 ms	140 ms		0 ms	150 ms	310 ms		
		3	550 Hz	100%	500mv	0mv	310 ms	10 ms	0 ms	580 ms		0 ms	590 ms	900 ms	5 ms	
Chime_9	Ford DNA Chime C (Hard Warning)	1	440 Hz	100%	500mv	140mv	0 ms	10 ms	10 ms	140 ms		0 ms	160 ms	160 ms		17 +/- 2
		2	550 Hz	100%	500mv	110mv	160 ms	10 ms	10 ms	170 ms		0 ms	190 ms	350 ms	5 ms	
Chime_10	Ford DNA Chime D (Non-Critical Alert) - Info	1	440 Hz	100%	500mv	140mv	0 ms	15 ms	5 ms	140 ms		0 ms	160 ms	160 ms		13 +/- 2
		2	660 Hz	100%	500mv	140mv	160 ms	10 ms	0 ms	140 ms		0 ms	150 ms	310 ms		
		3	550 Hz	100%	500mv	0mv	310 ms	10 ms	0 ms	1.280 s		0 ms	1290 ms	1600 ms	0 ms	
Chime_11	Ford DNA "B" shortened to 0.5 sec	1	440 Hz	100%	500mv	140mv	0 ms	10 ms	10 ms	130 ms		0 ms	150 ms	150 ms		15 +/- 2
		2	660 Hz	73%	365mv	0mv	150 ms	10 ms	0 ms	330 ms		10 ms	350 ms	500 ms	0 ms	13 +/- 2
Chime_12	Perimeter Warn. Chime A	1	1.0 kHz	100%	500mv	0mv	0 ms	1 ms	499 ms	50 ms		0 ms	550 ms	550 ms	0 ms	13 +/- 2
Chime_13	Perimeter Warn. Chime B	1	1.0 kHz	100%	500mv	0mv	0 ms	1 ms	329 ms	30 ms		0 ms	360 ms	360 ms	0 ms	13 +/- 2

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones
Chime_15	Cross-Traffic Alert (CTA)	1	600 Hz	100%	500mv	70mv	0 ms	10 ms	0 ms	115 ms		0 ms	125 ms	125 ms	5 ms	15 +/- 2
Chime_16	Forward Park Aid	1	900 Hz	100%	500mv	0mv	0 ms	10 ms	1 ms	64 ms		0 ms	75 ms	75 ms	5 ms	15 +/- 2
Chime_17	Reverse Park Aid	1	750 Hz	100%	500mv	0mv	0 ms	10 ms	1 ms	64 ms		0 ms	75 ms	75 ms	5 ms	15 +/- 2
Chime_18	Lincoln DNA Chime B (Soft Warning)	1	220 Hz	65%	325mv	150mv	0 ms	10 ms	0 ms	150 ms		0 ms	160 ms	160 ms		15 +/- 2
		2	330 Hz	100%	500mv	200mv	160 ms	10 ms	0 ms	200 ms		0 ms	210 ms	370 ms		
		3	440 Hz	100%	500mv	0mv	370 ms	10 ms	0 ms	240 ms		10 ms	530 ms	900 ms	5 ms	
Chime_19	Lincoln DNA Chime C (Hard Warning)	1	330 Hz	65%	325mv	150mv	0 ms	10 ms	0 ms	130 ms		0 ms	140 ms	140 ms		17 +/- 2
		2	440 Hz	100%	500mv	0mv	140 ms	10 ms	0 ms	240 ms		10 ms	260 ms	400.0 ms	0 ms	
Chime_20	Lincoln DNA Chime D (Non-Critical Alert)- Info	1	220 Hz	65%	325mv	160mv	0 ms	10 ms	0 ms	150 ms		0 ms	160 ms	160 ms		13 +/- 2
		2	330 Hz	100%	500mv	210mv	160 ms	10 ms	0 ms	200 ms		0 ms	210 ms	370 ms		
		3	440 Hz	100%	500mv	0mv	370 ms	10 ms	0 ms	240 ms		0 ms	1630 ms	2000 ms	0 ms	
Chime_21	Lincoln DNA "B" shortened	1	220 Hz	65%	325mv	150mv	0 ms	10 ms	0 ms	150 ms		0 ms	160 ms	160 ms		15 +/- 2
		2	330 Hz	100%	500mv	130mv	160 ms	10 ms	0 ms	220 ms		10 ms	240 ms	400 ms	0 ms	

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute between chime amplitude	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones
Chime_22	ACC-High, and FCW (1 cycle is 4 bursts repeated 3 times)	1	600 Hz	100%	500mv	0mv	0 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	110 ms		23 +/- 3
		2	600 Hz	100%	500mv	0mv	110 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	220 ms		
		3	600 Hz	100%	500mv	0mv	220 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	330 ms		
		4	600 Hz	100%	500mv	0mv	330 ms	0.6 ms	100 ms	0.6 ms		100 ms	200 ms	530 ms		
		5	600 Hz	100%	500mv	0mv	530 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	640 ms		
		6	600 Hz	100%	500mv	0mv	640 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	750 ms		
		7	600 Hz	100%	500mv	0mv	750 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	860 ms		
		8	600 Hz	100%	500mv	0mv	860 ms	0.6 ms	100 ms	0.6 ms		100 ms	200 ms	1060 ms		
		9	600 Hz	100%	500mv	0mv	1060 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	1170 ms		
		10	600 Hz	100%	500mv	0mv	1170 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	1280 ms		
		11	600 Hz	100%	500mv	0mv	1280 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	1390 ms		
		12	600 Hz	100%	500mv	0mv	1390 ms	0.6 ms	100 ms	0.6 ms		10 ms	110 ms	1500 ms	0 ms	
Chime_23	Lane Departure Warning (LDW)	1	400 Hz	100%	500mv	60mv	0 ms	5 ms	25 ms	70 ms		0 ms	100 ms	100 ms		15 +/- 2
		2	400 Hz	100%	500mv	60mv	100 ms	5 ms	35 ms	60 ms		0 ms	100 ms	200 ms		
		3	400 Hz	100%	500mv	0mv	200 ms	5 ms	35 ms	110 ms		50 ms	200 ms	400 ms		
		4	400 Hz	65%	325mv	40mv	400 ms	5 ms	25 ms	70 ms		0 ms	100 ms	500 ms		
		5	400 Hz	65%	325mv	40mv	500 ms	5 ms	35 ms	60 ms		0 ms	100 ms	600 ms		
		6	400 Hz	65%	325mv	0mv	600 ms	5 ms	35 ms	110 ms		50 ms	200 ms	800 ms		
		7	400 Hz	32%	160mv	20mv	800 ms	5 ms	25 ms	70 ms		0 ms	100 ms	900 ms		
		8	400 Hz	32%	160mv	20mv	900 ms	5 ms	35 ms	60 ms		0 ms	100 ms	1000 ms		
		9	400 Hz	32%	160mv	0mv	1000 ms	5 ms	35 ms	110 ms		50 ms	200 ms	1200 ms	0 ms	
Chime_24	Push Button	1	660 Hz	100%	500mv	40mv	0 ms	1 ms	0 ms	52 ms		0 ms	53 ms	53 ms	40 ms	7 +/- 1

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones
Chime_25	Beltminder A	1	740 Hz	100%	500mv	0mv	0 ms	10 ms	0 ms	990 ms		0 ms	1000 ms	1000 ms	5 ms	13 or 17(EuN CAP)
Chime_26	Beltminder B	1	740 Hz	100%	500mv	150mv	0 ms	10 ms	150 ms	240 ms		0 ms	400 ms	400 ms		13 or 17(EuN CAP)
		2	740 Hz	100%	500mv	0mv	400 ms	10 ms	0 ms	590 ms		0 ms	600 ms	1000 ms	5 ms	
Chime_27	RPA Continuous - Repetitions	1	750 Hz	100%	500mv	0mv	0 ms	1 ms	2849 ms	50 ms		100 ms	3000 ms	3000 ms	0 ms	15 +/- 2
Chime_27	RPA Continuous - Continuous	1	750 Hz	100%	500mv	0mv	0 ms	10 ms	n/a	10 ms		0 ms	n/a	n/a	n/a	
Chime_28	FPA Continuous - Repetitions	1	900 Hz	100%	500mv	0mv	0 ms	1 ms	2849 ms	50 ms		100 ms	3000 ms	3000 ms	0 ms	15 +/- 2
Chime_28	FPA Continuous - Continuous	1	900 Hz	100%	500mv	0mv	0 ms	10 ms	n/a	10 ms		0 ms	n/a	n/a	n/a	
Chime_29	Power Liftgate (POT)/Power Sliding Door	~~1~~														
		~~2~~														
		~~3~~														
Chime_30	300 ms Chime	1	880 Hz	100%	500mv	0mv	0 ms	10 ms	0 ms	300 ms		0 ms	310 ms	310 ms	0 ms	15 +/- 2
Chime_31	eLatch Chime Single Tone	1	523 Hz	100%	500mv	0mv	0 ms	5 ms	0 ms	725 ms		0 ms	730 ms	730 ms	0 ms	10 +/- 2
Chime_32	eLatch Chime Double Tone	1	523 Hz	100%	240mv	80mv	0 ms	5 ms	0 ms	395 ms		0 ms	400 ms	400 ms	0 ms	10 +/- 2
		2	523 Hz	83%	200mv	0mv	0 ms	5 ms	0 ms	720 ms		0 ms	725 ms	1125 ms	0 ms	

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones
Chime_33 (Dirana 2 / Hero)	eLatch Lock Chime (see note 1)	1	n/a	100%	500mv	0mv	0 ms	eLatch_Index 1_short.wav				248 ms	33 ms	281 ms	0 ms	4.5 +/- 0.5
		2	n/a	100%	500mv	0mv	281 ms	eLatch_Index 2_short.wav				0 ms	25 ms	306 ms	0 ms	4.5 +/- 0.5
Chime_34 (Dirana 2 / Hero)	eLatch UnLock Chime (see note 1)	1	n/a	100%	500mv	0mv	0 ms	eLatch_Index 2_short.wav				248 ms	25 ms	273 ms	0 ms	4.5 +/- 0.5
		2	n/a	100%	500mv	0mv	273 ms	eLatch_Index 1_short.wav				0 ms	33 ms	306 ms	0 ms	4.5 +/- 0.5
Chime_33 (Dirana 3)	eLatch Lock Chime (see note 1)	1	n/a	100%	500mv	0mv	0 ms	eLatch_Index 1.wav				248 ms	69 ms	317 ms	0 ms	4.5 +/- 0.5
		2	n/a	100%	500mv	0mv	317 ms	eLatch_Index 2.wav				0 ms	42 ms	359 ms	0 ms	4.5 +/- 0.5
Chime_34 (Dirana 3)	eLatch UnLock Chime (see note 1)	1	n/a	100%	500mv	0mv	0 ms	eLatch_Index 2.wav				248 ms	42 ms	290 ms	0 ms	4.5 +/- 0.5
		2	n/a	100%	500mv	0mv	290 ms	eLatch_Index 1.wav				0 ms	69 ms	359 ms	0 ms	4.5 +/- 0.5
Beep	Touch Screen or EFP initiated	1	660 Hz	100%	500mv	0mv	0 ms	1 ms	0 ms	59 ms		0 ms	60 ms	60 ms	40 ms	7 +/- 1

Cluster and Rear Speaker Chime Waveform Requirements (Simple Chimes)

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness	Wave-form
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones	
Chime_1	Turn Signal (Tic)	1	800	100%			0ms	1 ms					22 ms	22 ms	none	5.5 +/- 0.5 or speed comp	Square
		2	800	1%			22 ms	1 ms					260 ms	282 ms	none		
Chime_2	Turn Signal (Toc)	1	700	100%			0 ms	1 ms					22 ms	22 ms	none	5.5 +/- 0.5 or speed comp	Square
		2	700	1%			22ms	1 ms					260 ms	282 ms	none		
Chime_3	1.0 Second Chime	1	740 Hz	100%	500mv	30 mv	0 ms	10 ms	0 ms	990 ms		0 ms	1000 ms	1000 ms	50 ms	13 +/- 2	Sine
Chime_4	0.5 Second Chime	1	740 Hz	100%	500mv	0 mv	0 ms	5 ms	0 ms	495 ms		0 ms	500 ms	500 ms	50 ms	13 +/- 2	Sine
Chime_5	0.25 Sec Chime	1	740 Hz	100%	500mv	0 mv	0 ms	5 ms	0 ms	245 ms		0 ms	250 ms	250 ms	50 ms	13 +/- 2	Sine
Chime_6	1 Sec Tone (1KHz Alert)	1	1.0 kHz	100%	500mv	220 mv	0 ms	1 ms	499 ms	500 ms		0 ms	1000 ms	1000 ms	60 ms	13 +/- 2	Sine
Chime_7	0.1 Sec Chime	1	1.0 kHz	100%	500mv	60 mv	0 ms	1 ms	99 ms	20 ms		0 ms	120 ms	120 ms	50 ms	13 +/- 2	Sine
Chime_8	Ford DNA Chime B (Soft Warning)	1	440 Hz	100%	500mv	0 mv	0 ms	10 ms	0 ms	105 ms	40 ms	5 ms	160 ms	160 ms		15 +/- 2	Sine
		2	660 Hz	100%	500mv	0 mv	160 ms	10 ms	0 ms	95 ms	40 ms	5 ms	150 ms	310 ms			Sine
		3	550 Hz	100%	500mv	0 mv	310 ms	10 ms	0 ms	580 ms		0 ms	590 ms	900 ms	50 ms		Sine
Chime_9	Ford DNA Chime C (Hard Warning)	1	440 Hz	100%	500mv	0 mv	0 ms	10 ms	0 ms	105 ms	40 ms	5 ms	160 ms	160 ms		17 +/- 2	Sine
		2	550 Hz	100%	500mv	0 mv	160 ms	10 ms	0 ms	135 ms	40 ms	5 ms	190 ms	350 ms	0 ms		Sine
Chime_10	Ford DNA Chime D (Non-Critical Alert) - Info	1	440 Hz	100%	500mv	0 mv	0 ms	10 ms	0 ms	105 ms	40 ms	5 ms	160 ms	160 ms		13 +/- 2	Sine
		2	660 Hz	100%	500mv	0 mv	160 ms	10 ms	0 ms	95 ms	40 ms	5 ms	150 ms	310 ms			Sine
		3	550 Hz	100%	500mv	0 mv	310 ms	10 ms	0 ms	1280 ms		0 ms	1290 ms	1600 ms	0 ms		Sine

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness	Wave-form
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones	
Chime_11	Ford DNA "B" shortened to 0.5 sec	1	440 Hz	100%	500mv	0 mv	0 ms	10 ms	0 ms	95 ms	40 ms	5 ms	150 ms	150 ms		15 +/- 2	Sine
		2	660 Hz	73%	365mv	0 mv	156 ms	10 ms	0 ms	150 ms	40 ms	150 ms	350 ms	500 ms	0 ms	13 +/- 2	Sine
Chime_12	Perimeter Warn. Chime A	1	1.0 kHz	100%	500mv	0 mv	0 ms	1 ms	499 ms	50 ms		0 ms	550 ms	550 ms	25 ms	13 +/- 2	Sine
Chime_13	Perimeter Warn. Chime B	1	1.0 kHz	100%	500mv	0 mv	0 ms	1 ms	329 ms	30 ms		0 ms	360 ms	360 ms	30 ms	13 +/- 2	Sine
Chime_14	Perimeter Warn. Chime C	1	1.0 kHz	100%	500mv	0 mv	0 ms	1 ms	249 ms	25 ms		0 ms	275 ms	275 ms	50 ms	13 +/- 2	Sine
Chime_15	Cross-Traffic Alert (CTA)	1	600 hz	100%	500mv	70 mv	0 ms	10 ms	0 ms	115 ms		0 ms	125 ms	125 ms	50 ms	15 +/- 2	Sine
Chime_16	Forward Park Aid	1	900 Hz	100%	500mv	0 mv	0 ms	10 ms	1 ms	64 ms		0 ms	75 ms	75 ms	0 ms	15 +/- 2	Sine
Chime_17	Reverse Park Aid	1	750 Hz	100%	500mv	0 mv	0 ms	10 ms	1 ms	64 ms		0 ms	75 ms	75 ms	0 ms	15 +/- 2	Sine
Chime_18	Lincoln DNA Chime B (Soft Warning)	1	220 Hz	65%	325mv	0 mv	0 ms	10 ms	0 ms	105 ms	40 ms	5 ms	160 ms	160 ms		15 +/- 2	Sine
		2	330 Hz	100%	500mv	0 mv	160 ms	10 ms	0 ms	155 ms	40 ms	5 ms	210 ms	370 ms			Sine
		3	440 Hz	100%	500mv	75 mv	370 ms	10 ms	10 ms	250 ms		0 ms	530 ms	900 ms	1000 ms		Sine
Chime_19	Lincoln DNA Chime C (Hard Warning)	1	330 Hz	65%	325mv	0 mv	0 ms	10 ms	0 ms	85 ms	40 ms	5 ms	140 ms	140 ms		17 +/- 2	Sine
		2	440 Hz	100%	500mv	0 mv	140 ms	10 ms	0 ms	250 ms		0 ms	260 ms	400 ms	0 ms		Sine
Chime_20	Lincoln DNA Chime D (Non-Critical Alert)- Info	1	220 Hz	65%	325mv	0 mv	0 ms	10 ms	0 ms	105 ms	40 ms	5 ms	160 ms	160 ms		13 +/- 2	Sine
		2	330 Hz	100%	500mv	0 mv	160 ms	10 ms	0 ms	155 ms	40 ms	5 ms	210 ms	370 ms			Sine
		3	440 Hz	100%	500mv	0 mv	370 ms	10 ms	0 ms	250 ms		0 ms	1630 ms	2000 ms	0 ms		Sine
Chime_21	Lincoln DNA "B" shortened to 0.5 sec	1	220 Hz	65%	325mv	0 mv	0 ms	10 ms	0 ms	105 ms	40 ms	5 ms	160 ms	160 ms		15 +/- 2	Sine
		2	330 Hz	100%	500mv	40 mv	160 ms	10 ms	0 ms	230 ms		0 ms	240 ms	400 ms	110 ms		Sine

Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness	Wave-form
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones	
Chime_22	ACC-High, and FCW (1 cycle is 4 bursts repeated 3 times)	1	600 Hz	100%	500mv	0 mv	0 ms	1 ms	99 ms	5 ms		5 ms	110 ms	110 ms		23 +/- 3	Sine
		2	600 Hz	100%	500mv	0 mv	110 ms	1 ms	99 ms	5 ms		5 ms	110 ms	220 ms			Sine
		3	600 Hz	100%	500mv	0 mv	220 ms	1 ms	99 ms	5 ms		5 ms	110 ms	330 ms			Sine
		4	600 Hz	100%	500mv	0 mv	330 ms	1 ms	99 ms	5 ms		95 ms	200 ms	530 ms			Sine
		5	600 Hz	100%	500mv	0 mv	530 ms	1 ms	99 ms	5 ms		5 ms	110 ms	640 ms			Sine
		6	600 Hz	100%	500mv	0 mv	640 ms	1 ms	99 ms	5 ms		5 ms	110 ms	750 ms			Sine
		7	600 Hz	100%	500mv	0 mv	750 ms	1 ms	99 ms	5 ms		5 ms	110 ms	860 ms			Sine
		8	600 Hz	100%	500mv	0 mv	860 ms	1 ms	99 ms	5 ms		95 ms	200 ms	1060 ms			Sine
		9	600 Hz	100%	500mv	0 mv	1060 ms	1 ms	99 ms	5 ms		5 ms	110 ms	1170 ms			Sine
		10	600 Hz	100%	500mv	0 mv	1170 ms	1 ms	99 ms	5 ms		5 ms	110 ms	1280 ms			Sine
		11	600 Hz	100%	500mv	0 mv	1280 ms	1 ms	99 ms	5 ms		5 ms	110 ms	1390 ms			Sine
		12	600 Hz	100%	500mv	0 mv	1390 ms	1 ms	99 ms	5 ms		5 ms	110 ms	1500 ms	0 ms		Sine
Chime_23	Lane Departure Warning (LDW)	1	400 Hz	100%	500mv	0 mv	0 ms	10 ms	10 ms	80 ms		10 ms	110 ms	110 ms		15 +/- 2	Sine
		2	400 Hz	100%	500mv	0 mv	110 ms	10 ms	10 ms	80 ms		10 ms	110 ms	220 ms			Sine
		3	400 Hz	100%	500mv	0 mv	220 ms	10 ms	10 ms	80 ms		80 ms	180 ms	400 ms			Sine
		4	400 Hz	65%	325mv	0 mv	400 ms	10 ms	10 ms	80 ms		10 ms	110 ms	510 ms			Sine
		5	400 Hz	65%	325mv	0 mv	510 ms	10 ms	10 ms	80 ms		10 ms	110 ms	620 ms			Sine
		6	400 Hz	65%	325mv	0 mv	620 ms	10 ms	10 ms	80 ms		80 ms	180 ms	800 ms			Sine
		7	400 Hz	32%	160mv	0 mv	800 ms	10 ms	10 ms	80 ms		10 ms	110 ms	910 ms			Sine
		8	400 Hz	32%	160mv	0 mv	910 ms	10 ms	10 ms	80 ms		10 ms	110 ms	1020 ms			Sine
		9	400 Hz	32%	160mv	0 mv	1020 ms	10 ms	10 ms	80 ms		100 ms	180 ms	1200 ms	0 ms		Sine
Chime_24	Push Button	1	660 Hz	100%	500mv	0 mv	0 ms	1 ms	0 ms	59 ms		0 ms	60 ms	60 ms	40 ms	7 +/- 1	Sine

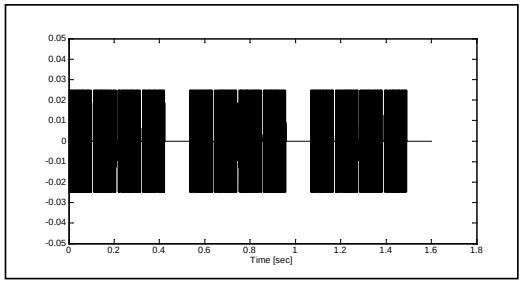
Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness	Wave-form
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones	
Chime_25	Beltminder A	1	740 Hz	100%	500mv	200 mv	0 ms	10 ms	0 ms	990 ms		0 ms	1000 ms	1000 ms	50 ms	13 or 17(EuNCAP) audio has 13 only. Check into this	Sine
Chime_26	Beltminder B	1	740 Hz	100%	500mv	240 mv	0 ms	5 ms	125 ms	230 ms		0 ms	360 ms	360 ms		13 or 17(EuNCAP)	Sine
		2	740 Hz	100%	500mv	240 mv	360 ms	5 ms	135 ms	430 ms		0 ms	570 ms	930 ms	370 ms		Sine
Chime_27	RPA Continuous - Repetitions	1	750 Hz	100%	500mv	0 mv	0 ms	10 ms	2830 ms	10 ms		150 ms	3000 ms	3000 ms	0 ms	15 +/- 2	Sine
Chime_27	RPA Continuous - Continuous	1	750 Hz	100%	500mv	0 mv	0 ms	10 ms	n/a	10 ms		0 ms	n/a	n/a	n/a		Sine
Chime_28	FPA Continuous - Repetitions	1	900 Hz	100%	500mv	0 mv	0 ms	10 ms	2830 ms	10 ms		150 ms	3000 ms	3000 ms	0 ms	15 +/- 2	Sine
Chime_28	FPA Continuous - Continuous	1	900 Hz	100%	500mv	0 mv	0 ms	10 ms	n/a	10 ms		0 ms	n/a	n/a	n/a		Sine
Chime_29	Power Liftgate (POT)/Power Sliding Door	1	440 Hz	100%	500mv	320 mv	0 ms	5 ms	5 ms	115 ms		0 ms	125 ms	125 ms		TBD ?	Sine
		2	440 Hz	100%	500mv	340 mv	125 ms	5 ms	5 ms	300 ms		0 ms	110 ms	310 ms	25 ms		Sine
Chime_30	300 ms Chime	1	880 Hz	100%	500mv	0 mv	0 ms	10 ms	0	300 ms		0 ms	310 ms	310 ms	25 ms	15 +/- 2	Sine
Chime_31	eLatch Chime Single Tone	1	523 Hz	100%	500mv	0mv	0 ms	5 ms	0 ms	725 ms		0 ms	730 ms	730 ms	0 ms	10 +/-2	Sine
Chime_32	eLatch Chime Double Tone	1	523 Hz	100%	240mv	80mv	0 ms	5 ms	0 ms	395 ms		0 ms	400 ms	400 ms	2 ms	10 +/-2	Sine
		2	523 Hz	83%	200mv	0mv	402 ms	5 ms	0 ms	720 ms		0 ms	725 ms	1127 ms			Sine

OBSOLETE – Use Chime 8 for Ford Power Liftgates and Chime 18 for Lincoln Power Liftgates

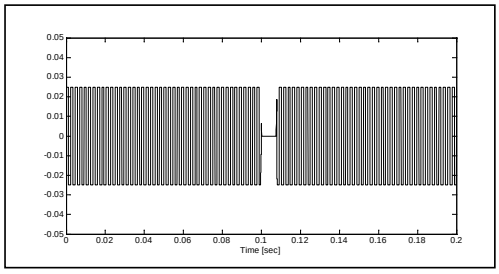
Chime Number	Chime Name	Index	Freq.	Relative Amplitude (based off of magnitude plot)	Absolute Peak Amplitude ***	Absolute Between Chime Amplitude ***	Abs. Start Time	Attack Time within Index	Peak Duration within Index	Decay Time within Index	Fall Time within Index	Zero Gain Time between Indexs	Total Duration of Index (sec)	Abs. Stop Time	Decay Time after final Index	Loud-ness	Wave-form
			? 1 Hz	? 5%	? 50mv	? 30mv	? 3ms per index	? 5ms	? 5ms	? 5ms	? 5ms	? 5ms	? 3ms per index	? 3ms per index	? 50ms	Sones	
Chime_33	eLatch Lock Chime	1	n/a	100%	500mv	0mv	0 ms	eLatch_Index 1.wav				248 ms	69 ms	317 ms	0 ms	4.5 +/- 0.5	
(Dirana 3)		2	n/a	100%	500mv	0mv	317 ms	eLatch_Index 2.wav				0 ms	42 ms	359 ms	0 ms	4.5 +/- 0.5	
Chime_34	eLatch UnLock Chime	1	n/a	100%	500mv	0mv	0 ms	eLatch_Index 2.wav				248 ms	42 ms	290 ms	0 ms	4.5 +/- 0.5	
(Dirana 3)		2	n/a	100%	500mv	0mv	290 ms	eLatch_Index 1.wav				0 ms	69 ms	359 ms	0 ms	4.5 +/- 0.5	
Beep	Touch Screen or EFP initiated	1	660 Hz	100%	500mv	0 mv	0 ms	1 ms	0 ms	59 ms		0 ms	60 ms	60 ms	40 ms	7 +/- 1	Sine

Chime Parameter Table Additional Requirements:

Note 1: A single request of an FCW chime consists of four bursts, repeated three times as shown below:



The following graph is a zoomed view of two bursts.



Note 2: The Tic and the Toc sound signals shall be synchronized with the cluster's turn-signal / hazard indicator lights, where the Tic will sound when the light turns ON, while the Toc will sound when the light turns OFF, in accordance with existing turn-signal / hazard requirements.
Note 3: Control of on/off time is specified in Driver Information Audio Generated DNA Chimes - Cluster Chime Arbitrator - CGEA STSS. For non-CGEA programs, consult Driver Information for the appropriate arbitration specification.

TARGETS

DETAILS