

Parameters I: The Myth Of Liberal Democracy

for string quartet

David Pocknee

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“The greatest myth of modern, democratic society is the illusion of choice.”
-F. Droppe

duration: 20-30minutes

About

This piece explores ways of listening and reacting to four musical parameters: pitch, dynamics, duration, and timbre.

This is done through the technique of “parameter mapping” (see below).

By arranging sets of parameter mappings into recursive loops of 2,3 or 4 players (Movements I, II, and III, respectively), chaotic systems arise in which the material is created by the system itself.

The Set-up

The players should be seated in the shape of a square, with each player placed on one of the corners of the square, facing inwards towards the rest of the group.

The players should be sat as close together as practical.

Each performer should be able to clearly see all the other players and their instruments.

The audience should be seated around the players, close enough for the performance to be intimate, but not so much that the audience becomes a distraction for the performers.

Parameter Mapping

Key terms:

A **parameter** is the pitch, dynamics, duration or timbre of an instrument.

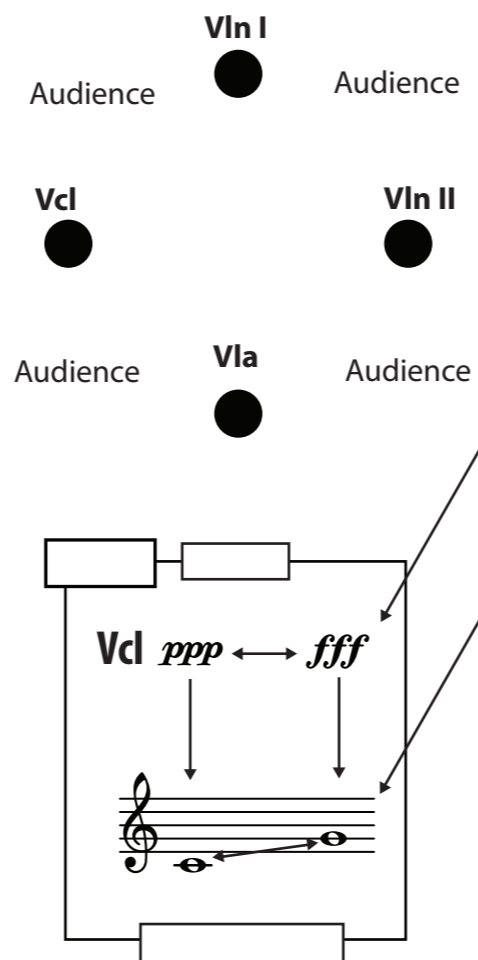
parameter value is the level of the parameter. e.g. the value of the parameter 'dynamics' is *mf*.

parameter range is the total ambitus of values encompassed.

e.g. a parameter range of the parameter 'dynamics' could stretch from *ppp* to *f*.

parameter mapping is the process of translating the range and values of one parameter onto the range and values of another (see right).

Diagram of the set-up



Parameter Mapping

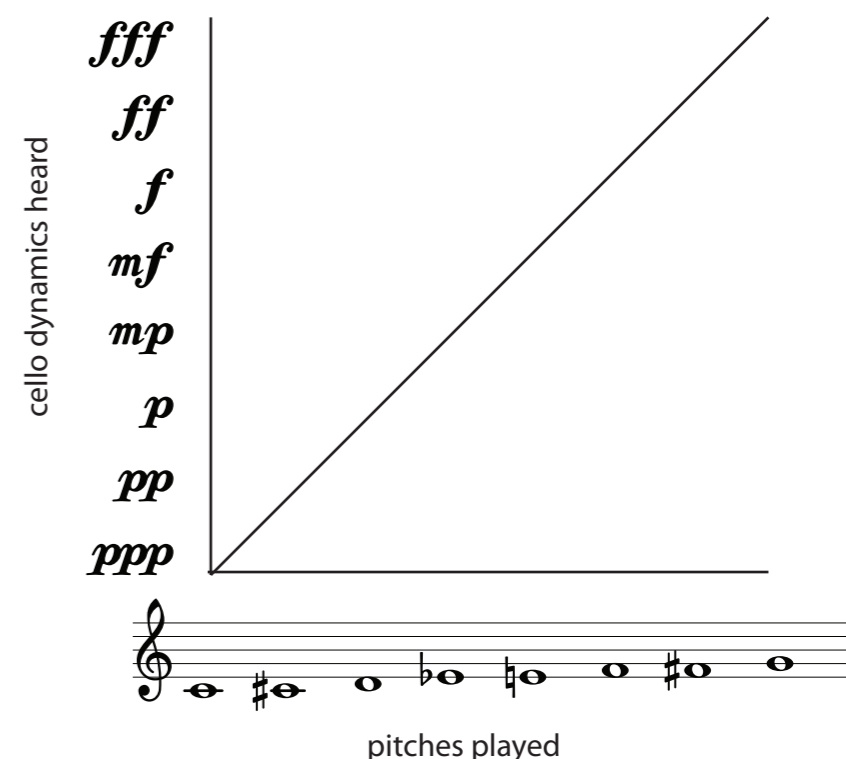
In parameter mapping a player will listen to the range and values of another performer's parameters and map those onto one of their own parameters. This relationship is represented in each box by a series of symbols showing the ranges and values of parameters to be mapped to or from.

The example below on the left shows a typical box that a performer might come across in the piece.

The top line of symbols always indicates who and what the performer has to listen to (in this case, cello dynamics). Two symbols joined by a double-headed arrow indicate that these are the minimum and maximum parameter values that this player (the cello) will be using.

The lower line of symbols indicates what the performer has to do (in this case modify their pitch). Two symbols joined by a double-headed arrow indicate that these are the minimum and maximum values that can be used in the mapping - the values of the cello's dynamics should be proportionally scaled to the pitch range given. This relationship could also be represented by the graph below:

The player must imagine there is a 1:1 correspondence between dynamics and pitch - that *ppp* is equal to middle C and *fff* is equal to the G a fifth above, and every dynamic and pitch in between is an extrapolation of this relationship.



The graph on the previous page simplifies the relationship between dynamics and pitch by helpfully quantizing the dynamic range into 8 values of dynamics and the pitch range into equal-tempered tuning. However, in the actual piece, no such quantization should occur, with infinitesimally small changes in one parameter invoking similarly scaled changes in another. The piece will involve players reacting to and performing changes that are far smaller than equal-tempered tuning or even the most precise dynamic markings.

When playing a box, only the parameter which the box specifies to change, should alter.

All other parameters should stay at the same values as they were at the end of the last box they played.

If there is more than one set of parameter mapping in a box, all mapping indicated must be done simultaneously.

Parameter Ranges

In this piece the following ranges are used:

Pitch

Most of the piece uses pitch ranges in which the limits of each range are given in equal-tempered tuning with 12 notes to the octave. However, in the last two boxes of the piece, the following equal-tempered quarter-tone notation is used:

- ‡ = a quarter-tone higher
- = a quarter-tone lower

Dynamics

The dynamics used in this piece are:

ppp = as soft as possible while creating an unbroken tone.

pp

p

mp

mf

f

ff

fff = as hard as possible, without creating a scraping sound.

These instructions refer to bowing pressure, NOT the audible nature of the sound, with *fff* representing the maximum bow pressure possible, without a scraping sound occurring, and *ppp* representing the minimum bow pressure at which a continuous tone can be sustained.

This distinction is made due to the variable nature of dynamics when bowing at different string positions.

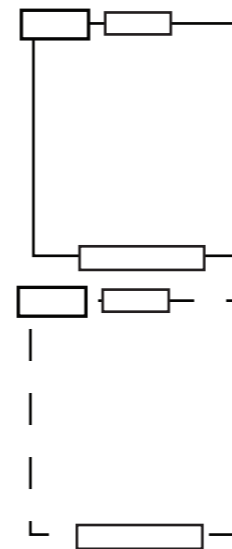
Performers mapping their parameters from dynamics should be careful to compensate for the use of mutes in Movement II.

Duration

The duration of a note is based on the amount of the bow used before either changing the bowing direction, or re-attacking the string from the same direction.

In the score, the bow is split up into eighths.

The notation specifies how much and which part of the bow can be used in each box.



There are two types of bowing;

The first type is indicated by an unbroken line surrounding each box, indicating that at the end of each bow-stroke the direction of bowing should be changed.

The second type is indicated by a box made of dashed lines and symbolizes that the performer should always bow in the same direction. This direction is indicated by conventional bowing symbols above the box: $\square \downarrow$ $\square \uparrow$

With each type of bowing the shortest bow-stroke possible is a tremolo as fast as possible and using as little of the bow as possible. The longest bow-stroke possible would be one which encompasses the entirety of the range of the bow given.

The length of each bow-stroke should always take the extreme of the range closest to the frog (base) of the bow as the point of departure or termination for the stroke. The length of the stroke is then measured in relation to this point, whether it is at the beginning or end of a stroke.

Timbre

XST = Extreme Sul Tasto - as close to the fingers of the fingering-hand as feasible/possible

ST = Sul Tasto

ord = Ordinario

SP = Sul Ponticello

XSP = Extreme Sul Ponticello - as close to the bridge as feasible/possible

The Score

The score is arranged as a series of blocks, grouped together in phrases. Each block contains information about how each player should map the parameter range and values of another player onto their own parameters.

Timing

In the middle of the top of each box is a fraction, indicating how much longer or shorter that box should last in relation to the previous box. e.g. if the fraction is "2/3" that box should be 2/3rds of the length of the previous box.

This fraction should only be taken in reference to the actual length of the box directly previous. If the previous box lasted longer or shorter than anticipated, then the length of the following box should be adjusted proportionally (i.e. lengthened or shortened).

The length of the box should be subjectively determined by the performer who cues the following box.

The length of the box should not be measured using a stopwatch, other temporal measuring device, or any sort of counting, but should spring out of the performer's intuitive sense of time during the performance of the piece.

Cueing

The top left corner of the box shows which performer is to cue the start of the box.

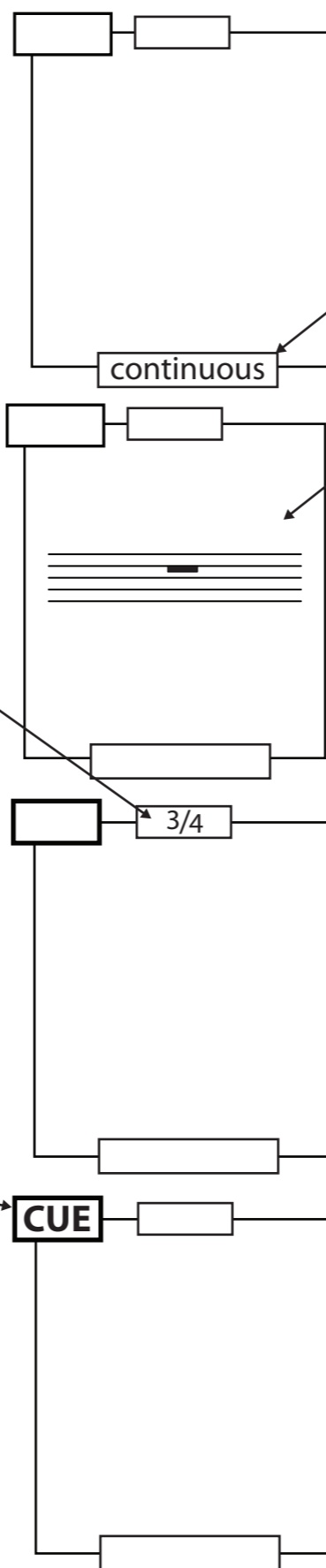
All performers start and end each box simultaneously.

The indicated performer is in charge of judging the length of the previous box and cueing the start of the indicated box.

Each cueing indication either gives the name of another performer, who is the performer to cue that box, or the instruction "CUE" which indicates to a player that they are in charge of cueing that box.

All players should look ahead to the next box when playing, to ensure that they are cognizant of which boxes they should be monitoring the length of, and which ones they should be cueing.

Where a box occurs at the beginning of a phrase, the cueing performer should cue the end of the last box of the previous phrase, wait the correct amount of silence (see right) before cueing their box.



Continuous/Stepped

In the bottom centre of the box is an indication of how the parameters inside should be mapped.

"continuous" = the performer's parameter values should be constantly and fluidly changing, reacting immediately to the changes in other players.

"stepped" = the performer only changes the value of any parameter inside the box upon beginning a bow-stroke, and these values are static for the entirety of the stroke, creating a stepped, quantized effect.

Rest Bars

Bars which feature a five-lined staff with a rest, indicate that the performer should not play in this box. When they begin playing again, they should start that box with exactly the same parameter values as they had at the last box that they played in.

Phrases

Boxes are grouped together into "phrases" of 2-4 boxes. This is indicated through the use of phrase markings and a thick horizontal line which joins the boxes together. Boxes grouped like this should be played *attacca* with no silence between them.

At the end of a phrase, an apostrophe above the boxes indicates a short rest (approximately 1/6th of the length of the previous box).

A longer length of silence should be inserted between movements (approximately the length of the previous box).

Starting The Piece

The first box of the piece is slightly different to those that follow, in that no parameter mapping takes place. This box sets the initial conditions for all that follows.

All players should start simultaneously and sustain the sound specified (full bow-strokes, middle G#, mezzo-forte, ordinario) until they receive a cue from the cello to start the second box. The piece then proceeds as described above.

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(Version 2)
August 2012

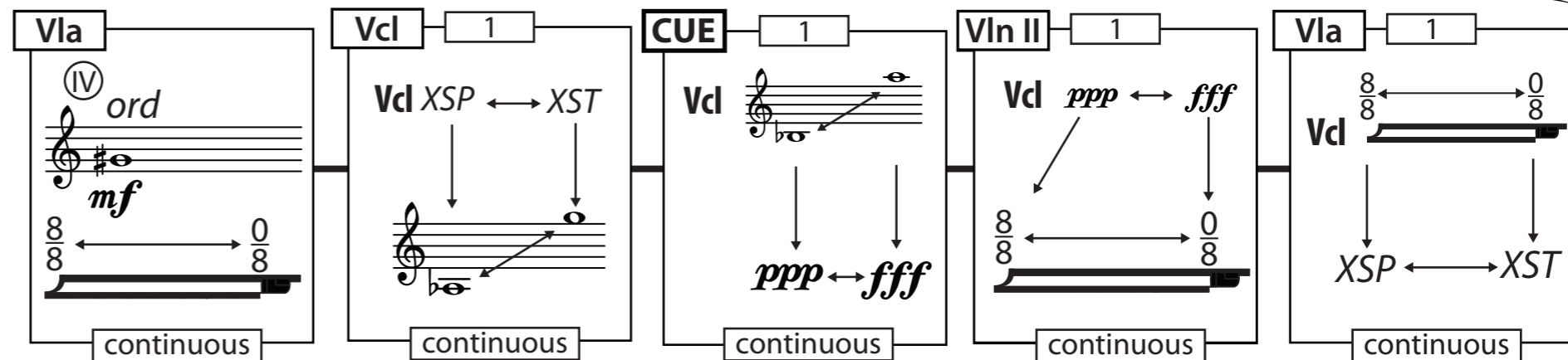
for String Quartet

(2010 - 2012)

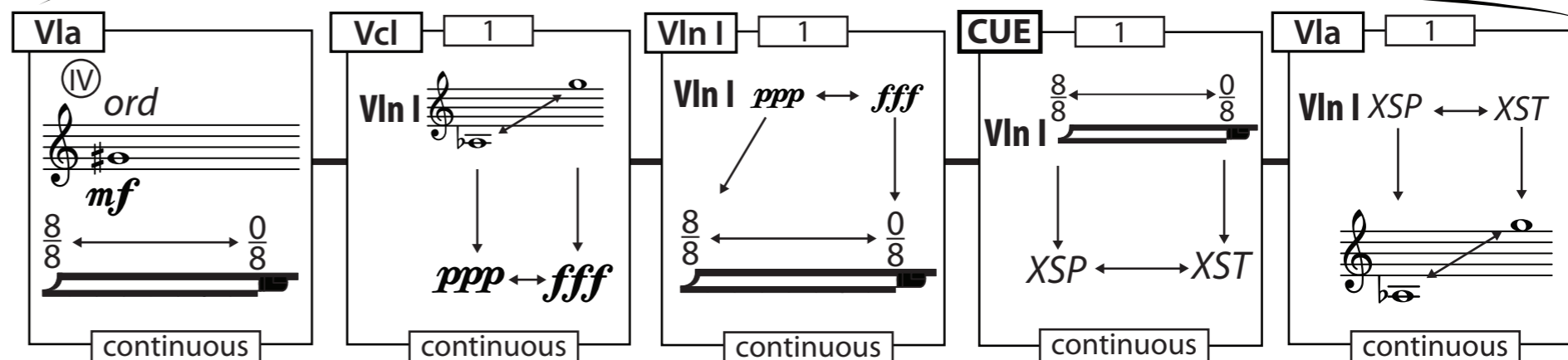
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Movement I

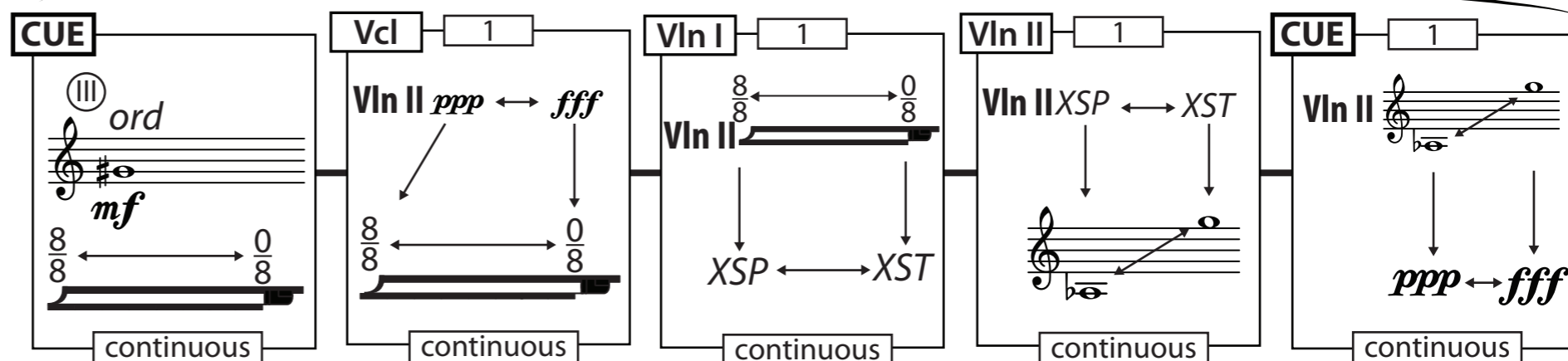
Violin I:



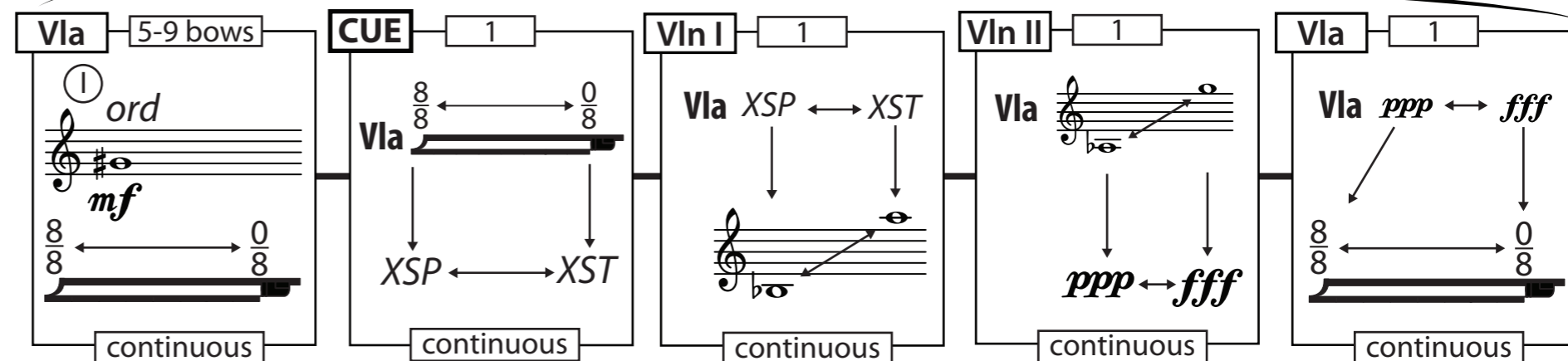
Violin II:



Viola:



Violoncello:



A

CUE $\frac{2}{3}$ **Vln II** $\frac{3}{4}$ **Vla** 1 **Vcl** $1\frac{1}{4}$

Vln II *pp* ↔ *fff* Vln II *ST* ↔ *XSP* Vln II *fff* ↔ *pp* Vln II $\frac{7}{8}$ ↔ $\frac{0}{8}$ Vln II *ppp* ↔ *ff* Vln II $\frac{3}{4}$ ↔ $\frac{0}{8}$ Vln II *ppp* ↔ *fff* Vln II *XSP* ↔ *ST* Vln II $\frac{7}{8}$ ↔ $\frac{1}{8}$

continuous continuous continuous continuous

Vln I $\frac{2}{3}$ **CUE** $\frac{3}{4}$ **Vla** 1 **Vcl** $1\frac{1}{4}$

Vln I *fff* ↔ *pp* Vln I $\frac{8}{8}$ ↔ $\frac{1}{8}$ Vln I *pp* ↔ *fff* Vln I *ST* ↔ *XSP* Vln I $\frac{7}{8}$ ↔ $\frac{0}{8}$ Vln I *ff* ↔ *ppp* Vln I *XSP* ↔ *ST* Vln I $\frac{3}{4}$ ↔ $\frac{0}{8}$ Vln I *ff* ↔ *ppp* Vln I $\frac{7}{8}$ ↔ $\frac{1}{8}$

continuous continuous continuous continuous

Vln I $\frac{2}{3}$ **Vln II** $\frac{3}{4}$ **CUE** 1 **Vcl** $1\frac{1}{4}$

Vcl *SP* ↔ *XST* Vcl $\frac{7}{8}$ ↔ $\frac{0}{8}$ Vcl *fff* ↔ *ppp* Vcl *XST* ↔ *SP* Vcl *fff* ↔ *pp* Vcl $\frac{8}{8}$ ↔ $\frac{1}{4}$ Vcl *XST* ↔ *SP* Vcl $\frac{7}{8}$ ↔ $\frac{1}{8}$

step step step step

Vln I $\frac{1}{3}$ **Vln II** $\frac{3}{4}$ **Vla** 1 **CUE** $1\frac{1}{4}$

Vla *ff* ↔ *ppp* Vla *XST* ↔ *SP* Vln II *SP* ↔ *XST* Vla $\frac{8}{8}$ ↔ $\frac{1}{8}$ Vla $\frac{8}{8}$ ↔ $\frac{1}{4}$ Vla *pp* ↔ *fff* Vla *XST* ↔ *SP* Vla *fff* ↔ *pp* Vla $\frac{7}{8}$ ↔ $\frac{1}{8}$

step step step step

B

CUE $11/3$ **Vln II** $2/3$ **CUE** $4/5$ **Vla** $2/3$

Vla $\frac{1}{4}$ **Vla** *XST* ↔ *SP* **Vla** *XST* ↔ *SP* **Vla** $\frac{1}{4}$ **Vla** *ff* ↔ *pp* **Vla** $\frac{1}{2}$ **Vla** *ff* ↔ *pp*

ppp ↔ *f* *ppp* ↔ *f* *SP* ↔ *XST* *SP* ↔ *XST*

step step step step

Vln I $11/3$ **CUE** $2/3$ **Vln I** $4/5$ **Vla** $2/3$

Vcl $\frac{3}{4}$ ↔ $\frac{0}{8}$ **Vcl** *XSP* ↔ *ST* **Vcl** *pp* ↔ *ff* **Vcl** *XSP* ↔ *ST* **Vcl** $\frac{1}{2}$ ↔ $\frac{0}{8}$

p ↔ *fff* *ST* ↔ *XSP* *p* ↔ *fff* $\frac{5}{8}$ ↔ $\frac{0}{8}$ *pp* ↔ *ff* $\frac{5}{8}$ ↔ $\frac{0}{8}$ *ST* ↔ *XSP*

step step step continuous

Vln I $11/3$ **Vln II** $2/3$ **Vln I** $4/5$ **CUE** $2/3$

Vln I *ppp* ↔ *f* **Vln I** $\frac{1}{4}$ **Vln I** *f* ↔ *ppp* **Vln I** $\frac{3}{8}$ **Vln I** *SP* ↔ *XST* **Vln I** $\frac{1}{2}$ **Vln I** *SP* ↔ *XST*

SP ↔ *XST* *SP* ↔ *XST* *pp* ↔ *ff* *pp* ↔ *ff*

continuous continuous continuous step

Vln I $11/3$ **Vln II** $2/3$ **Vln I** $4/5$ **Vla** $2/3$

Vln II *p* ↔ *fff* **Vln II** $\frac{3}{4}$ ↔ $\frac{0}{8}$ **Vln II** *p* ↔ *fff* **Vln II** $\frac{5}{8}$ ↔ $\frac{0}{8}$ **Vln II** *XSP* ↔ *ST* **Vln II** $\frac{1}{2}$ ↔ $\frac{0}{8}$ **Vln II** *XSP* ↔ *ST* **Vln II** $\frac{1}{2}$ ↔ $\frac{0}{8}$ **Vln II** *pp* ↔ *ff* **Vln II** $\frac{1}{2}$ ↔ $\frac{0}{8}$ **Vln II** *pp* ↔ *ff*

ST ↔ *XSP* *ST* ↔ *XSP* *ST* ↔ *XSP* *pp* ↔ *ff* *pp* ↔ *ff*

step step step step

C

Vcl $11/4$ **Vln II** $3/4$ **CUE** $2/3$ **Vla** $11/2$

Vcl $XST \leftrightarrow SP$ **Vcl** $fff \leftrightarrow pp$

Vcl $XST \leftrightarrow ord$ **Vcl** $\frac{7}{8} \leftrightarrow \frac{3}{8}$ **Vcl** $\frac{7}{8} \leftrightarrow \frac{3}{8}$ **Vcl** $mp \leftrightarrow fff$ **Vcl** $ord \leftrightarrow XST$

Vcl $mp \leftrightarrow fff$ **Vcl** $ord \leftrightarrow XST$

step step step step

Vcl $11/4$ **CUE** $3/4$ **Vln I** $2/3$ **Vla** $11/2$

Vla $ST \leftrightarrow XSP$ **Vla** $XSP \leftrightarrow ord$ **Vla** $XSP \leftrightarrow ord$ **Vla** $mf \leftrightarrow ppp$ **Vla** $mf \leftrightarrow ppp$

Vla $ppp \leftrightarrow f$ **Vla** $ppp \leftrightarrow f$ **Vla** $ppp \leftrightarrow f$ **Vla** $ord \leftrightarrow XSP$ **Vla** $ord \leftrightarrow XSP$

continuous step step continuous

Vcl $11/4$ **Vln II** $3/4$ **Vln I** $2/3$ **CUE** $11/2$

Vln II $\frac{1}{2} \leftrightarrow \frac{0}{8}$ **Vln II** $ppp \leftrightarrow f$ **Vln II** $ppp \leftrightarrow f$ **Vln II** $XSP \leftrightarrow ord$ **Vln II** $ord \leftrightarrow XSP$

Vln II $XSP \leftrightarrow ST$ **Vln II** $ord \leftrightarrow XSP$ **Vln II** $ppp \leftrightarrow mf$ **Vln II** $ppp \leftrightarrow mf$

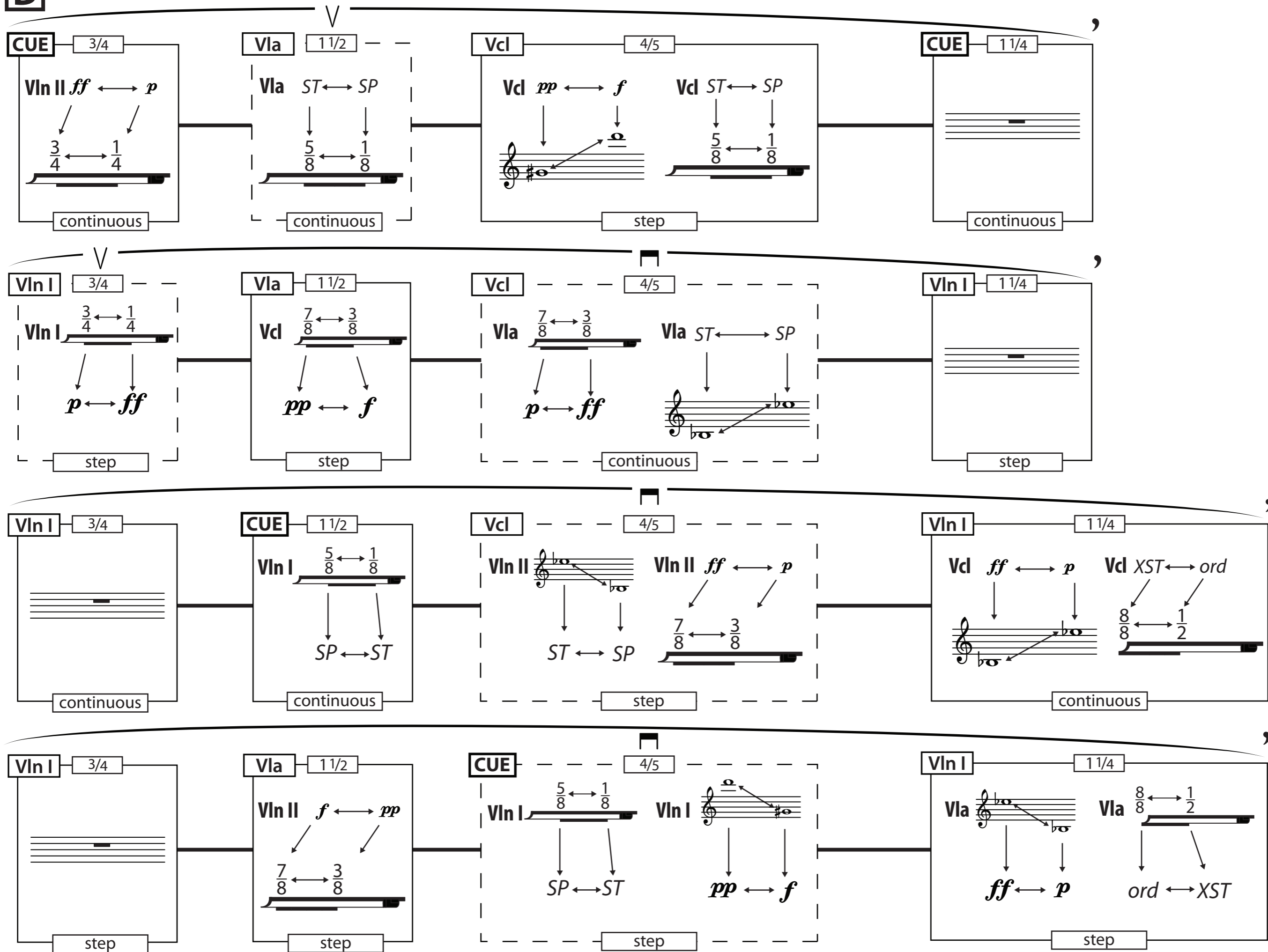
step continuous continuous step

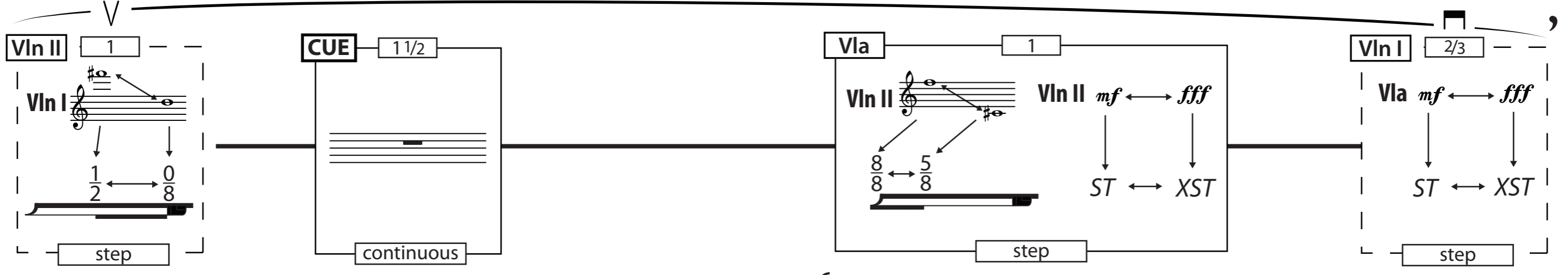
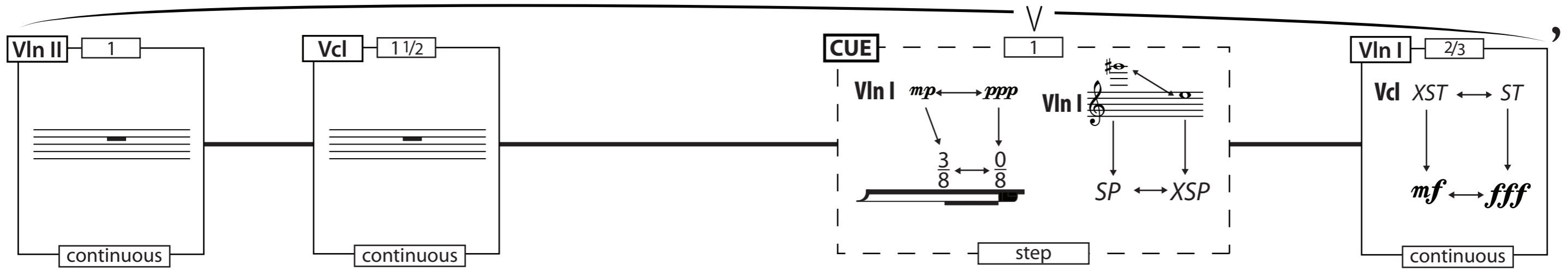
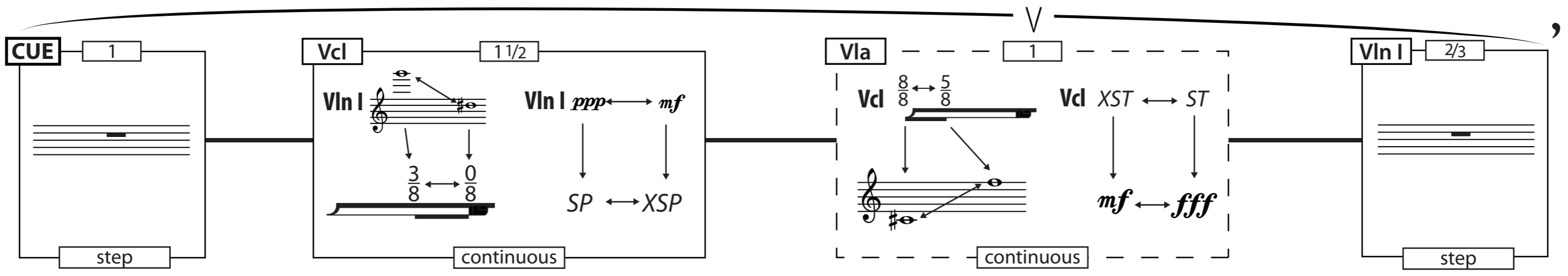
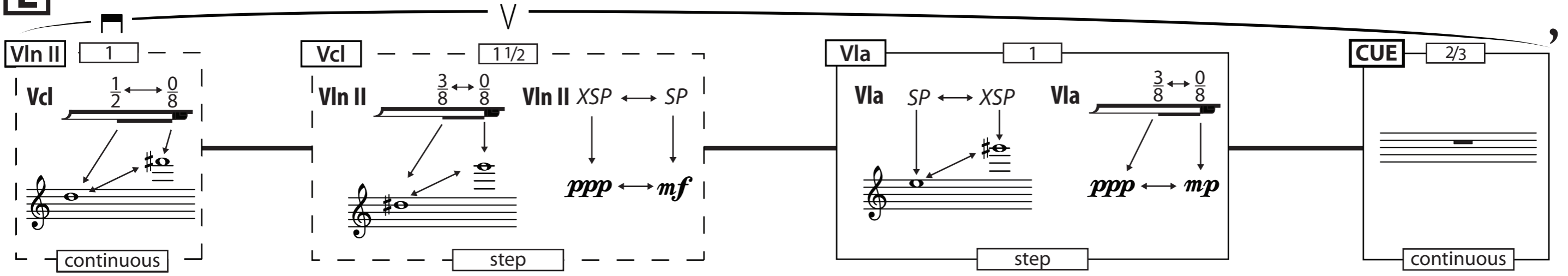
CUE $11/4$ **Vln II** $3/4$ **Vln I** $2/3$ **Vla** $11/2$

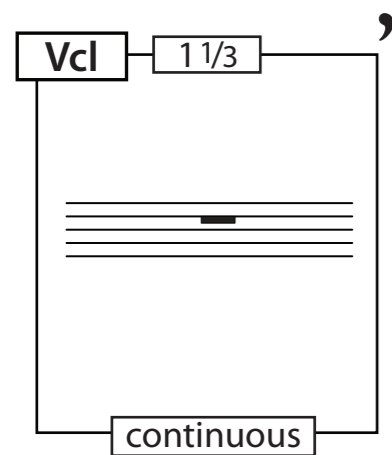
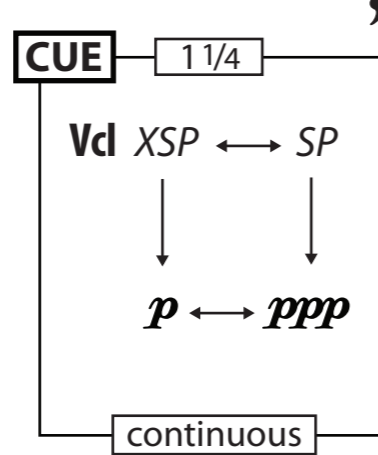
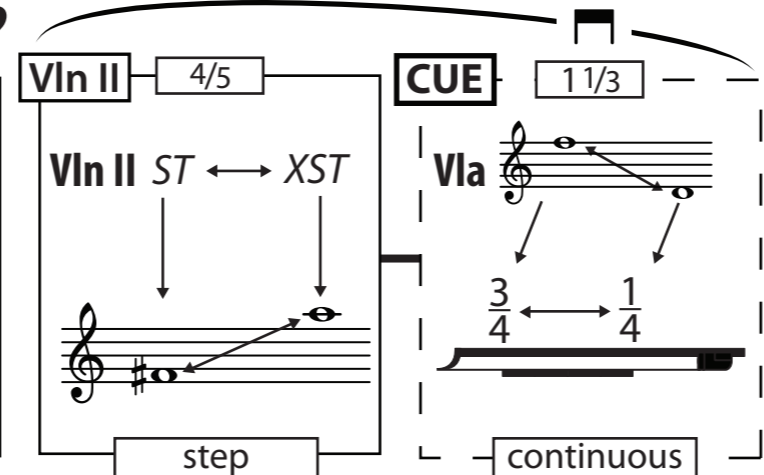
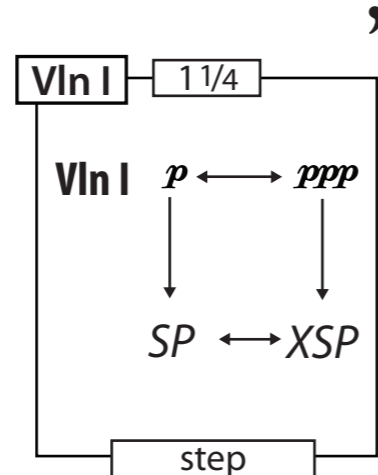
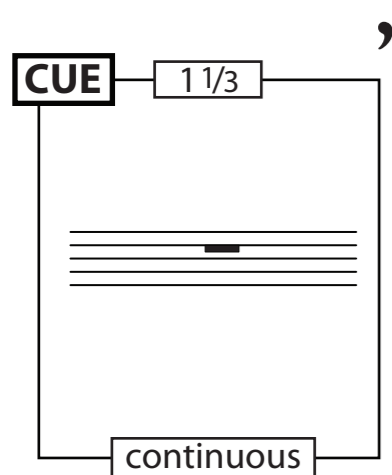
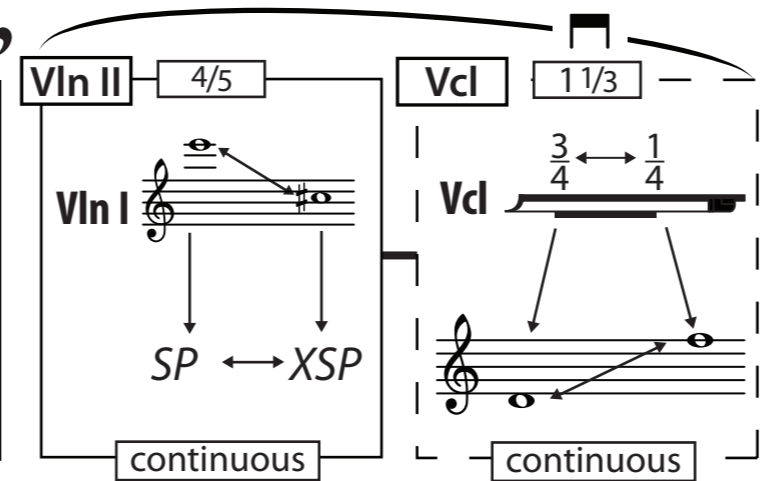
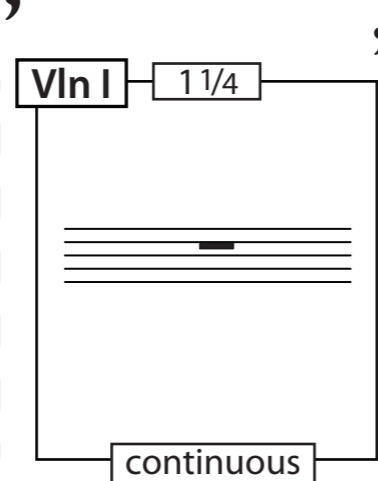
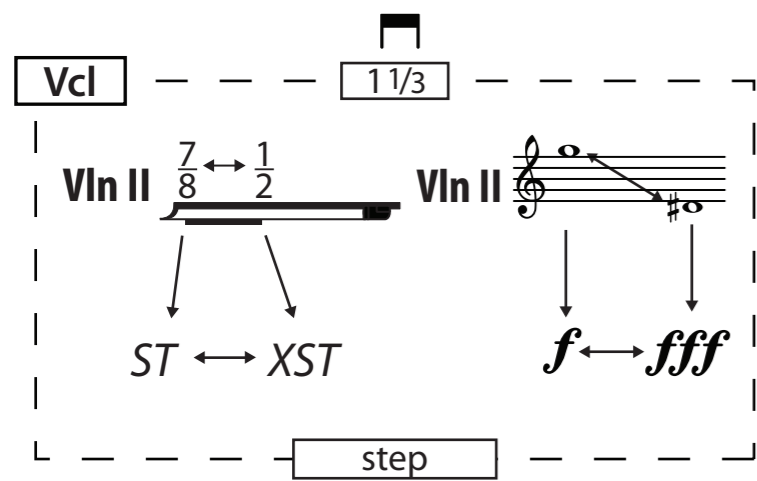
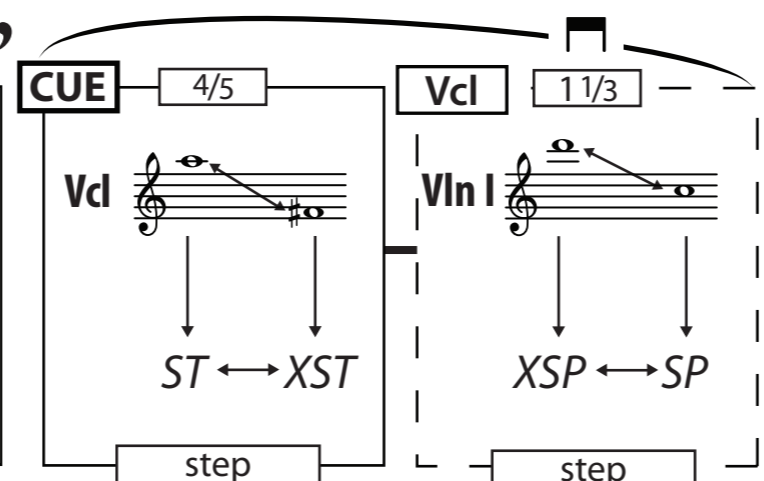
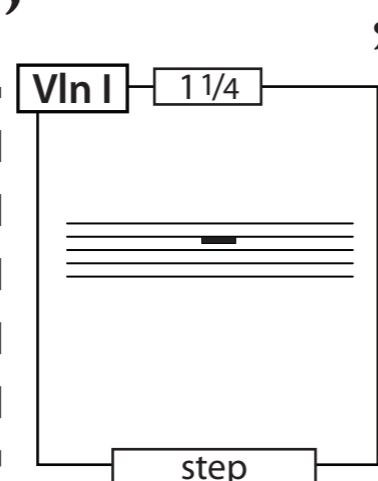
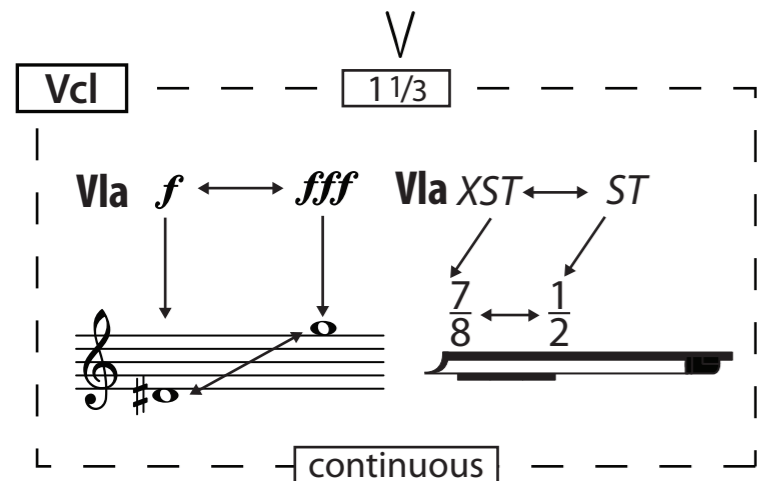
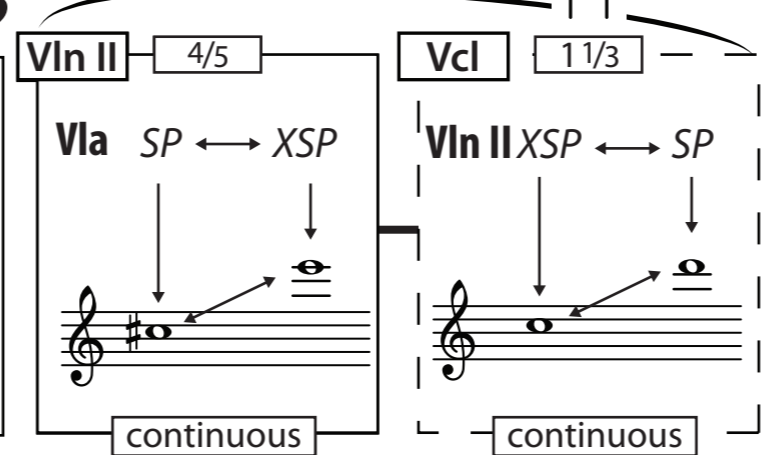
Vln I $\frac{8}{8} \leftrightarrow \frac{1}{2}$ **Vln I** $fff \leftrightarrow p$ **Vln I** $fff \leftrightarrow mp$ **Vln I** $ord \leftrightarrow XST$ **Vln I** $XST \leftrightarrow ord$ **Vln I** $mp \leftrightarrow fff$ **Vln I** $ord \leftrightarrow XST$

Vln I $p \leftrightarrow fff$ **Vln I** $XST \leftrightarrow SP$ **Vln I** $ord \leftrightarrow XST$ **Vln I** $ord \leftrightarrow XST$ **Vln I** $mp \leftrightarrow fff$ **Vln I** $ord \leftrightarrow XST$

step step step step

D

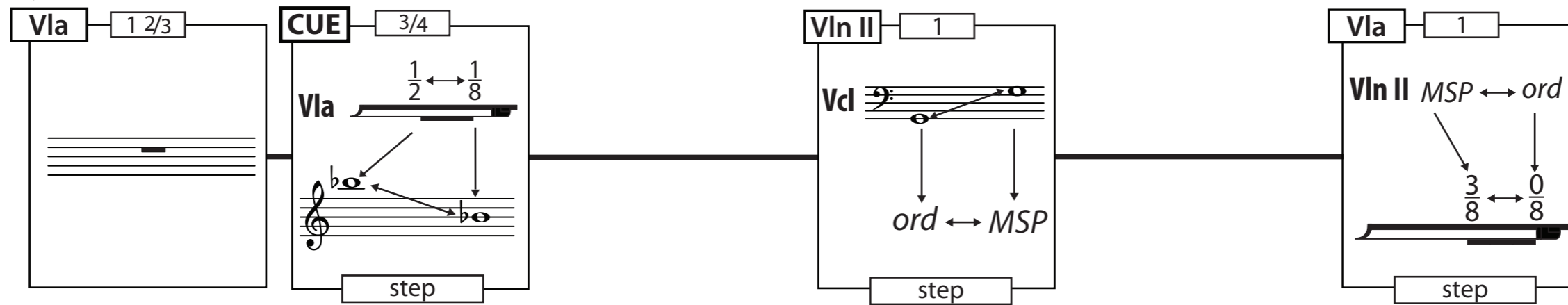
E

F**G****H**

Movement II

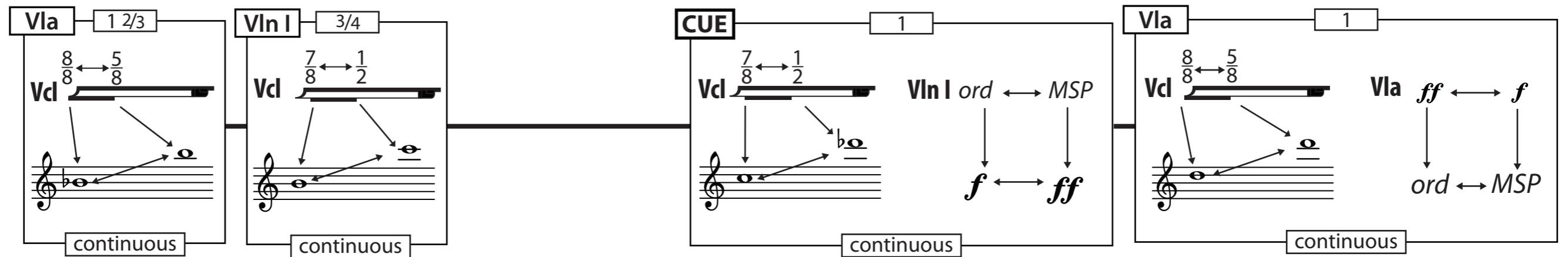
with mute

Vln I:



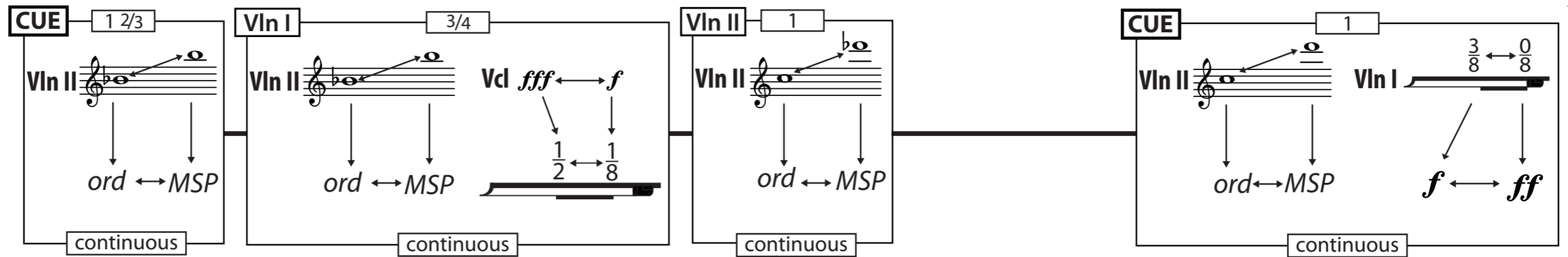
with mute

Vln II:



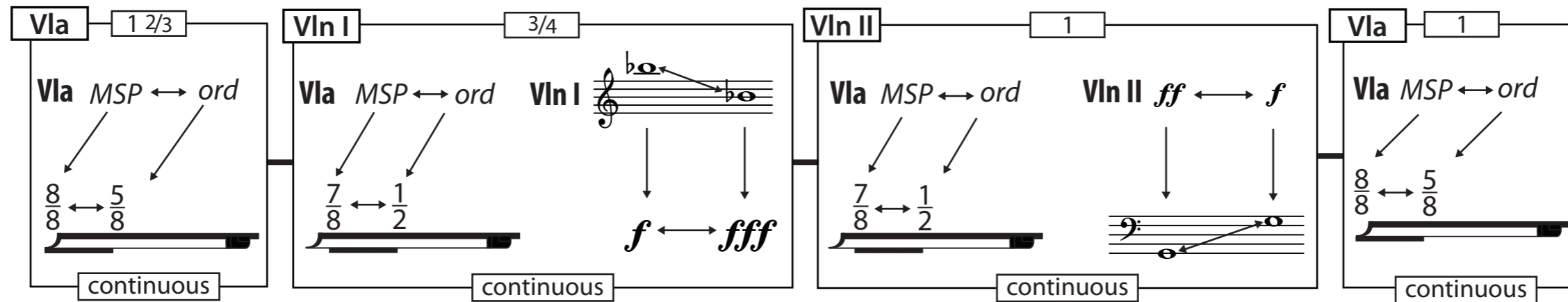
with mute

Vla:



with mute

Vcl:



I

Vcl 11/4
Vcl $\frac{8}{8} \leftrightarrow \frac{5}{8}$
pp ↔ *mp*
continuous

Vla 4/5
Vcl $\frac{8}{8} \leftrightarrow \frac{3}{4}$
pp ↔ *mp*
continuous

CUE 1
Vcl $\frac{8}{8} \leftrightarrow \frac{3}{4}$
p ↔ *mp*
continuous

Vln II ord ↔ ST
ST

J

Vln II 11/3
Vla ord ↔ ST
continuous

Vcl 2/3
Vla $\frac{1}{4} \leftrightarrow \frac{1}{8}$
p ↔ *mf*
continuous

Vcl ord ↔ ST

Vcl 11/4
Vln I *pp* ↔ *mp*
continuous

Vla 4/5
Vln I *pp* ↔ *mp*
continuous

Vla $\frac{1}{4} \leftrightarrow \frac{0}{8}$
ord ↔ ST

Vln I 1
Vln I *p* ↔ *mp*
continuous

CUE 11/3
Vln I *mp* ↔ *p*
continuous

Vcl 2/3
Vln I *mf* ↔ *p*
continuous

Vcl 11/4

CUE 4/5
Vln II $\frac{1}{4} \leftrightarrow \frac{0}{8}$
step

Vln I 1
Vcl *mf* ↔ *f*
step

Vln II 11/3
Vln II $\frac{8}{8} \leftrightarrow \frac{7}{8}$
continuous

Vcl 2/3
Vln II $\frac{8}{8} \leftrightarrow \frac{7}{8}$
continuous

Vln I ord ↔ ST
f ↔ *mf*

CUE 11/4
Vln II $\frac{8}{8} \leftrightarrow \frac{5}{8}$
continuous

Vla 4/5
Vln II $\frac{8}{8} \leftrightarrow \frac{3}{4}$
continuous

Vln I 1
Vln II $\frac{8}{8} \leftrightarrow \frac{3}{4}$
continuous

Vln I ord ↔ ST
mf ↔ *f*

Vln II 11/3

CUE 2/3
Vln I *mp* ↔ *f*
 $\frac{1}{4} \leftrightarrow \frac{1}{8}$
step

K

CUE 1 2/3

Vcl *p* ↔ *mf*

continuous

Detailed description: This block shows a cue for a Violoncello (Vcl) part. At the top left, a box labeled 'CUE' is connected to a box containing the measure number '1 2/3'. Below this is a musical staff in bass clef with a whole note chord consisting of two notes: a lower note and an upper note with a flat. A double-headed arrow indicates a dynamic range from *p* (piano) to *mf* (mezzo-forte). Two vertical arrows point from the notes on the staff down to the dynamic markings. At the bottom, a box labeled 'continuous' is connected to the main staff line.

Vln I 1 2/3

Detailed description: This block shows a cue for a Violin I (Vln I) part. At the top left, a box labeled 'Vln I' is connected to a box containing the measure number '1 2/3'. Below this is an empty musical staff with five lines. At the bottom, a box labeled 'continuous' is connected to the main staff line.

Vln I 1 2/3

Vln I *p* ↔ *mf*

ST ↔ *SP*

continuous

Detailed description: This block shows a cue for a Violin I (Vln I) part. At the top left, a box labeled 'Vln I' is connected to a box containing the measure number '1 2/3'. Below this is the text 'Vln I' followed by a dynamic range from *p* to *mf* with a double-headed arrow. Below that is another dynamic range from *ST* to *SP* with a double-headed arrow. Two vertical arrows point from the first dynamic range down to the second. At the bottom, a box labeled 'continuous' is connected to the main staff line.

Vln I 1 2/3

Vln I *ord* ↔ *ST*

p ↔ *mf*

continuous

Detailed description: This block shows a cue for a Violin I (Vln I) part. At the top left, a box labeled 'Vln I' is connected to a box containing the measure number '1 2/3'. Below this is the text 'Vln I' followed by a performance instruction from *ord* to *ST* with a double-headed arrow. Below that is a musical staff in bass clef with a whole note chord consisting of two notes: a lower note and an upper note with a flat. A double-headed arrow indicates a dynamic range from *p* to *mf*. Two vertical arrows point from the performance instruction down to the musical staff. At the bottom, a box labeled 'continuous' is connected to the main staff line.

Movement III

L

without mute

Vln I: CUE 1, Vcl 1, Vln II 1, Vla 1, Vcl 1, CUE 1, Vln II 1

Vln II: Vln I 1, Vcl 1, CUE 1, Vla 1, Vcl 1, Vln I 1, CUE 1

Vla: Vln I 1, Vcl 1, Vln II 1, CUE 1, Vcl 1, Vln I 1, Vln II 1

Vcl: Vln I 1, CUE 1, Vln II 1, Vla 1, CUE 1, Vln I 1, Vln II 1

The score is organized into four systems, each with a section label on the left and a 'without mute' instruction above. Each system contains multiple cues for different instruments, with musical notation and dynamic markings.

- System 1 (Vln I):** CUE 1 (Vcl *ord* ↔ *SP*), Vcl 1 (Vcl *ord* ↔ *SP*), Vln II 1 (Vcl $\frac{3}{8} \leftrightarrow \frac{1}{4}$, *mp* ↔ *p*), Vla 1 (Vla $\frac{1}{2} \leftrightarrow \frac{1}{4}$, *pp* ↔ *mp*), Vcl 1 (Vla $\frac{1}{2} \leftrightarrow \frac{3}{8}$), CUE 1 (Vla $\frac{1}{2} \leftrightarrow \frac{3}{8}$, *pp* ↔ *mp*), Vln II 1 (Vcl *pp* ↔ *p*, Vcl $\frac{1}{2} \leftrightarrow \frac{1}{4}$, XSP ↔ *ord*).
- System 2 (Vln II):** Vln I 1 (Vln I *mf* ↔ *p*), Vcl 1 (Vln I $\frac{3}{8} \leftrightarrow \frac{1}{4}$), CUE 1 (Vln I *p* ↔ *mp*, *ord* ↔ *SP*), Vla 1 (Vln I *mp* ↔ *pp*, *ord* ↔ *SP*), Vcl 1 (Vln I *ord* ↔ *SP*), Vln I 1 (Vln I *mp* ↔ *pp*, *ord* ↔ *SP*), CUE 1 (Vla $\frac{1}{2} \leftrightarrow \frac{3}{8}$, XSP ↔ *ord*), Vln II 1 (Vln II *pp* ↔ *mp*).
- System 3 (Vla):** Vln I 1 (Vln II *p* ↔ *mf*), Vcl 1 (Vln II $\frac{3}{8} \leftrightarrow \frac{1}{8}$, *mp* ↔ *p*), Vln II 1 (Vln II *ord* ↔ *SP*), CUE 1 (Vcl $\frac{1}{2} \leftrightarrow \frac{1}{4}$), Vcl 1 (Vcl *mp* ↔ *pp*, $\frac{1}{2} \leftrightarrow \frac{1}{4}$), Vln I 1 (Vcl *ord* ↔ *SP*, $\frac{1}{2} \leftrightarrow \frac{1}{4}$), Vln II 1 (Vln I $\frac{3}{8} \leftrightarrow \frac{1}{4}$, Vln I XSP ↔ *ord*, *mp* ↔ *pp*).
- System 4 (Vcl):** Vln I 1 (Vla $\frac{3}{8} \leftrightarrow \frac{1}{8}$, SP ↔ *ord*), CUE 1 (Vla *p* ↔ *mp*, SP ↔ *ord*), Vln II 1 (Vla $\frac{3}{8} \leftrightarrow \frac{1}{4}$), Vla 1 (Vln II *ord* ↔ *SP*), CUE 1 (Vln II *ord* ↔ *SP*, *pp* ↔ *mp*), Vln I 1 (Vln II SP ↔ *ord*), Vln II 1 (Vln II *ord* ↔ XSP, Vln II *pp* ↔ *p*, $\frac{1}{2} \leftrightarrow \frac{1}{4}$).

Vcl $\frac{3}{4}$ **CUE** $\frac{11}{4}$

Vcl *mp* ↔ *pp* Vcl *ord* ↔ *SP* Vcl $\frac{5}{8} \leftrightarrow \frac{3}{8}$ Vcl *ord* ↔ *XSP*

p ↔ *b* $\frac{1}{2} \leftrightarrow \frac{1}{4}$ $\frac{5}{8} \leftrightarrow \frac{3}{8}$ *pp* ↔ *p*

step step

M

Vla $\frac{11}{2}$ **Vln II** $\frac{11}{3}$

Vln II *SP* ↔ *XSP* Vln II *mp* ↔ *pp* Vln II $\frac{3}{4} \leftrightarrow \frac{1}{2}$ Vln II *p* ↔ *ppp*

p ↔ *#* $\frac{3}{4} \leftrightarrow \frac{1}{2}$ $\frac{3}{4} \leftrightarrow \frac{1}{2}$ *SP* ↔ *XSP*

step step

Vcl $\frac{3}{4}$ **Vln I** $\frac{11}{4}$

Vla *SP* ↔ *ST* Vla *p* ↔ *pp* Vla *SP* ↔ *ST* Vla $\frac{5}{8} \leftrightarrow \frac{3}{8}$

$\frac{1}{2} \leftrightarrow \frac{3}{8}$ *p* ↔ *b* *pp* ↔ *mf* $\frac{5}{8} \leftrightarrow \frac{3}{8}$

step step

Vla $\frac{11}{2}$ **CUE** $\frac{11}{3}$

Vcl $\frac{5}{8} \leftrightarrow \frac{1}{2}$ Vcl $\frac{5}{8} \leftrightarrow \frac{1}{2}$ Vcl *ord* ↔ *SP* Vcl $\frac{5}{8} \leftrightarrow \frac{1}{2}$

XSP ↔ *SP* *pp* ↔ *mp* *ord* ↔ *SP* *p* ↔ *ppp*

continuous continuous

Vcl $\frac{3}{4}$ **Vln I** $\frac{11}{4}$

Vln I $\frac{1}{2} \leftrightarrow \frac{1}{4}$ Vla $\frac{1}{2} \leftrightarrow \frac{1}{4}$ Vln I $\frac{1}{2} \leftrightarrow \frac{1}{4}$ Vln I *p* ↔ *pp*

b ↔ *e* *pp* ↔ *p* *ST* ↔ *SP* *ST* ↔ *SP* $\frac{5}{8} \leftrightarrow \frac{3}{8}$

continuous continuous

CUE $\frac{11}{2}$ **Vln II** $\frac{11}{3}$

Vln I $\frac{3}{4} \leftrightarrow \frac{1}{2}$ Vln I $\frac{3}{4} \leftrightarrow \frac{1}{2}$ Vln I $\frac{3}{4} \leftrightarrow \frac{1}{2}$ Vln I *XSP* ↔ *SP*

pp ↔ *p* *SP* ↔ *ord* *ppp* ↔ *p* *XSP* ↔ *SP*

step step

CUE $\frac{3}{4}$ **Vln I** $\frac{11}{4}$

Vln II $\frac{1}{2} \leftrightarrow \frac{3}{8}$ Vln II $\frac{1}{2} \leftrightarrow \frac{3}{8}$ Vln II *mp* ↔ *pp* Vln II $\frac{5}{8} \leftrightarrow \frac{3}{8}$ Vln II *XSP* ↔ *ord*

pp ↔ *mp* *XSP* ↔ *ord* $\frac{5}{8} \leftrightarrow \frac{3}{8}$ *XSP* ↔ *ord*

step step

Vla $\frac{11}{2}$ **Vln II** $\frac{11}{3}$

Vla *p* ↔ *pp* Vla *ord* ↔ *SP* Vla *p* ↔ *ppp* Vla $\frac{5}{8} \leftrightarrow \frac{1}{2}$

$\frac{5}{8} \leftrightarrow \frac{1}{2}$ *SP* ↔ *ord* *SP* ↔ *ord* $\frac{5}{8} \leftrightarrow \frac{1}{2}$

step step

N

Vcl $\frac{3}{4}$

Vln II $p \leftrightarrow ppp$

Vcl $XSP \leftrightarrow SP$

$\frac{3}{4} \leftrightarrow \frac{1}{2}$

step

Vla $\frac{11}{4}$

Vla $SP \leftrightarrow XSP$

Vcl $p \leftrightarrow pp$

8va

$\frac{3}{4} \leftrightarrow \frac{1}{2}$

continuous

CUE $\frac{3}{4}$

Vla $\frac{3}{4} \leftrightarrow \frac{5}{8}$

Vcl $pp \leftrightarrow p$

8va

ord $\leftrightarrow SP$

continuous

Vla $\frac{11}{3}$

Vla $XSP \leftrightarrow SP$

Vcl $p \leftrightarrow pp$

$\frac{8}{8} \leftrightarrow \frac{3}{4}$

continuous

Vcl $\frac{3}{4}$

Vcl $\frac{7}{8} \leftrightarrow \frac{5}{8}$

Vcl $p \leftrightarrow ppp$

$SP \leftrightarrow XSP$

continuous

Vla $\frac{11}{4}$

Vla $\frac{7}{8} \leftrightarrow \frac{5}{8}$

Vcl $p \leftrightarrow ppp$

ord $\leftrightarrow XSP$

step

Vln I $\frac{3}{4}$

Vla $\frac{8}{8} \leftrightarrow \frac{3}{4}$

Vcl $SP \leftrightarrow XSP$

$p \leftrightarrow ppp$

step

Vla $\frac{11}{3}$

Vla $XSP \leftrightarrow ord$

Vcl $\frac{7}{8} \leftrightarrow \frac{5}{8}$

$p \leftrightarrow ppp$

step

Vcl $\frac{3}{4}$

Vln I $ppp \leftrightarrow p$

Vln I $\frac{3}{4} \leftrightarrow \frac{1}{2}$

ord $\leftrightarrow SP$

step

CUE $\frac{11}{4}$

Vln I 8va

Vln I $\frac{7}{8} \leftrightarrow \frac{5}{8}$

Vln II $ppp \leftrightarrow p$

$SP \leftrightarrow XSP$

step

Vln I $\frac{3}{4}$

Vln I ord $\leftrightarrow SP$

Vln II $p \leftrightarrow ppp$

$\frac{3}{4} \leftrightarrow \frac{5}{8}$

step

CUE $\frac{11}{3}$

Vln I $\frac{8}{8} \leftrightarrow \frac{3}{4}$

Vln II $ppp \leftrightarrow p$

$XSP \leftrightarrow ord$

step

CUE $\frac{3}{4}$

Vla $XSP \leftrightarrow SP$

Vla $\frac{7}{8} \leftrightarrow \frac{5}{8}$

$ppp \leftrightarrow p$

step

Vln I $\frac{11}{4}$

Vln I $\frac{3}{4} \leftrightarrow \frac{1}{2}$

Vln II $XSP \leftrightarrow ord$

$p \leftrightarrow pp$

continuous

Vln I $\frac{3}{4}$

Vln I 8va

Vln I $\frac{8}{8} \leftrightarrow \frac{3}{4}$

$XSP \leftrightarrow SP$

$p \leftrightarrow pp$

continuous

Vla $\frac{11}{3}$

Vln I $SP \leftrightarrow XSP$

Vln II $pp \leftrightarrow p$

$\frac{7}{8} \leftrightarrow \frac{5}{8}$

continuous

O

CUE 4/5

Vln II *ppp* ↔ *pp* Vcl *XSP* ↔ *ord*

8va

step

Vln II 1

Vln II *ppp* ↔ *pp* Vcl *ord* ↔ *XSP*

8va

step

Vcl 4/5

Vln II *ppp* ↔ *pp* Vcl *ord* ↔ *XSP*

8va

continuous

Vln I 4/5

Vln I *pp* ↔ *ppp* Vla *ord* ↔ *XSP*

8va

continuous

CUE 1

Vln I *ord* ↔ *XSP* Vla *pp* ↔ *ppp*

8va

continuous

Vcl 4/5

Vln I *pp* ↔ *ppp* Vla *XSP* ↔ *SP*

8va

step

Vln I 4/5

Vln II *ppp* ↔ *pp* Vcl *ord* ↔ *XSP*

continuous

Vln II 1

Vln II *ppp* ↔ *p* Vcl *ord* ↔ *XSP*

continuous

Vcl 4/5

Vln II *p* ↔ *ppp* Vcl *SP* ↔ *XSP*

continuous

Vln I 4/5

Vla *ppp* ↔ *pp* Vln I *XSP* ↔ *SP*

step

Vln II 1

Vln I *ord* ↔ *XSP* Vla *p* ↔ *ppp*

step

CUE 4/5

Vln I *ppp* ↔ *p* Vla *ord* ↔ *XSP*

8va

continuous

P

Vla 11/2

Vla *ord* ↔ *XSP* Vla $\frac{7}{8} \leftrightarrow \frac{3}{4}$ Vla

pp ↔ *ppp*

continuous

CUE 11/4

Vla *SP* ↔ *XSP* Vla Vla *ppp* ↔ *pp*

SP ↔ *XSP*

step

Vla 11/2

Vln I $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vln I Vln I *ppp* ↔ *pp*

pp ↔ *ppp* *SP* ↔ *XSP*

step

Vln I 11/4

Vcl Vcl *ppp* ↔ *pp* Vcl $\frac{8}{8} \leftrightarrow \frac{3}{4}$

pp ↔ *ppp* *SP* ↔ *XSP*

continuous

CUE 11/2

Vcl $\frac{7}{8} \leftrightarrow \frac{3}{4}$ Vcl *XSP* ↔ *ord* Vcl *ppp* ↔ *pp*

ord ↔ *XSP*

step

Vln I 11/4

Vln II *SP* ↔ *XSP* Vln II $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vln II *ppp* ↔ *pp*

pp ↔ *ppp* *XSP* ↔ *SP*

step

Vla 11/2

Vln II Vln II *XSP* ↔ *SP* Vln II *ppp* ↔ *pp*

pp ↔ *ppp* *ord* ↔ *XSP*

continuous

Vln I 11/4v

Vln I *SP* ↔ *XSP* Vln I Vln I *ppp* ↔ *pp*

XSP ↔ *SP*

step

Vcl 2/3

Vln II $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vln II *SP* ↔ *XSP* Vln II

8va $\frac{8}{8} \leftrightarrow \frac{7}{8}$ *pp* ↔ *ppp* *SP* ↔ *XSP*

continuous

Vln II 1

Vcl *SP* ↔ *XSP* Vcl $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vcl $\frac{8}{8} \leftrightarrow \frac{7}{8}$

pp ↔ *ppp* *SP* ↔ *XSP*

continuous

Vcl 2/3

Vcl $\frac{8}{8} \leftrightarrow \frac{3}{4}$ Vcl *ppp* ↔ *pp* Vcl $\frac{8}{8} \leftrightarrow \frac{7}{8}$

ppp ↔ *pp* *SP* ↔ *XSP*

continuous

CUE 1

Vla $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vla *ppp* ↔ *pp* Vla *SP* ↔ *XSP*

$\frac{8}{8} \leftrightarrow \frac{7}{8}$ *ppp* ↔ *ppp*

step

Vcl 2/3

Vln I $\frac{8}{8} \leftrightarrow \frac{3}{4}$ Vln I *SP* ↔ *XSP* Vln I *ppp* ↔ *pp*

8va $\frac{8}{8} \leftrightarrow \frac{3}{4}$ *pp* ↔ *ppp* *XSP* ↔ *SP*

continuous

Vln II 1

Vln I *ppp* ↔ *pp* Vln I *SP* ↔ *XSP* Vln I $\frac{8}{8} \leftrightarrow \frac{7}{8}$

ppp ↔ *ppp* *SP* ↔ *XSP*

continuous

CUE 2/3

Vla $\frac{8}{8} \leftrightarrow \frac{3}{4}$ Vla *SP* ↔ *XSP* Vla *ppp* ↔ *pp*

$\frac{8}{8} \leftrightarrow \frac{3}{4}$ *ppp* ↔ *ppp*

step

Vln II 1

Vln II $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vln II *ppp* ↔ *pp* Vln II

$\frac{8}{8} \leftrightarrow \frac{7}{8}$ *XSP* ↔ *SP* *SP* ↔ *XSP*

continuous

Vla 11/3

Vln II *ppp* ↔ *pp* Vln II $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vln II *SP* ↔ *XSP* Vln II *SP* ↔ *XSP*

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ $\frac{8}{8} \leftrightarrow \frac{7}{8}$

continuous

Vln II 11/2

Vcl $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vcl *SP* ↔ *XSP* Vcl *pp* ↔ *ppp* Vcl *pp* ↔ *ppp*

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ $\frac{8}{8} \leftrightarrow \frac{7}{8}$ *XSP* ↔ *SP*

continuous

Vla 11/3

Vla *pp* ↔ *ppp* Vla $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vla *SP* ↔ *XSP* Vla *SP* ↔ *XSP*

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ $\frac{8}{8} \leftrightarrow \frac{7}{8}$

continuous

CUE 11/2

Vln I *SP* ↔ *XSP* Vln I *pp* ↔ *ppp* Vln I *ppp* ↔ *pp* Vln I *ppp* ↔ *pp*

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ *XSP* ↔ *SP*

step

CUE 11/3

Vcl *pp* ↔ *ppp* Vcl $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vcl *SP* ↔ *XSP* Vcl *SP* ↔ *XSP*

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ $\frac{8}{8} \leftrightarrow \frac{7}{8}$

step

Vln II 11/2

Vln II *SP* ↔ *XSP* Vln II *pp* ↔ *ppp* Vln II *ppp* ↔ *pp* Vln II $\frac{8}{8} \leftrightarrow \frac{7}{8}$

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ *XSP* ↔ *SP*

continuous

Vla 11/3

Vln I $\frac{8}{8} \leftrightarrow \frac{7}{8}$ Vln I *SP* ↔ *XSP* Vln I *pp* ↔ *ppp* Vln I *pp* ↔ *ppp*

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ $\frac{8}{8} \leftrightarrow \frac{7}{8}$ *XSP* ↔ *SP*

continuous

Vln II 11/2

Vla *SP* ↔ *XSP* Vla *pp* ↔ *ppp* Vla *ppp* ↔ *pp* Vla $\frac{8}{8} \leftrightarrow \frac{7}{8}$

pp ↔ *ppp* $\frac{8}{8} \leftrightarrow \frac{7}{8}$ *XSP* ↔ *SP*

continuous