

Codecs

(Volume I of II: Analysis)

Eliot Britton
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McGill University
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Abstract

This thesis contains two volumes. The first is a written text that describes my compositional techniques in the context of an analysis of *Codecs*. The second volume is the score of this work. Volume one is divided into six sections: Introduction, harmony, rhythm and time, melodic materials, form, live electronics and future directions. Each section describes techniques and processes I developed throughout the compositional process.

Codecs was inspired by the subversive proliferation musical materials through the use of audio codecs. I developed compositional tools based on encryption and compression in order to explore the audio codec metaphor.

Volume two is the full score of *Codecs*, a work for large ensemble and live electronics. It is comprised of three sections and has a duration of approximately 14 minutes. The work is scored for flute (doubling on piccolo), oboe, clarinet in Bb (doubling on bass clarinet), bassoon, horn in F, trumpet, trombone, tuba, string quintet and percussion. Electronic drum pads and captured live sounds are used to control the live electronic elements.

Ce mémoire est en deux volumes. Le premier volume est un texte décrivant mes techniques de composition dans le contexte d'analyse de *Codecs*. Le second volume est la partition de cette oeuvre. Le premier volume est divisé en six sections: introduction, harmonie, rythme et mesure, matériaux mélodiques, hiérarchie formelle, musique électronique en direct et recherches futures. Chaque section décrit des techniques et processus que j'ai développés tout au long du processus de composition. *Codecs* était inspirée par des matériaux musicaux à prolifération subversive. Les outils de composition ont été développés à base d'encryptage et de compression afin d'explorer la métaphore audio codec.

Le second volume est la partition d'orchestre de *Codecs*, oeuvre pour grand ensemble et instruments électroniques en direct. Elle est composée de trois sections et a une durée d'environ 14 minutes. L'oeuvre est arrangée pour flute (secondée par le piccolo), hautbois, clarinette en Sib (secondée par la clarinette basse), basson, cor en Fa, trompette, trombone, tuba, quintette à cordes et percussions. Des pads de batterie électronique et des sons captés en direct servent au contrôle des instruments électroniques.

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Chapter 1: Introduction

1.1 Description

Codecs is a work for large ensemble and live electronics. It is comprised of three sections and has a duration of approximately 14 minutes. The work is scored for flute (doubling on piccolo), oboe, clarinet in Bb (doubling on bass clarinet), bassoon, horn in F, trumpet, trombone, tuba, string quintet and percussion. Electronic drum pads and captured live sounds are used to control the live electronic elements.

1.2 Objectives

My primary objectives in the composition of *Codecs* were to: a) to control live electronics in an expressive and musically meaningful way from within the ensemble without a click track, and, b) to obscure and reveal musical materials using techniques and processes inspired by contemporary electronic music, production methods and culture. To accomplish this goal I created a system for organizing musical materials called *Harmonic Encryption*. The following section offers an introduction to concepts that will be covered in detail in the following chapters.

1.3 Materials

1.3.1 Harmonic Encryption

Harmonic encryption draws on literal and metaphorical uses of the terms “encryption” and “decryption”. Like the standard use of the term encryption, *harmonic* encryption transforms and obscures musical information using a compression algorithm and a pseudo cipher. Through the encryption process, the musical materials are encrypted into a single chord, which I have called the *cipher chord* in keeping with the encryption metaphor.

Although the metaphors of data compression and encryption are cultivated in all layers of *Codecs*, the harmonic encryption system is not a functional

encryption process. It does not encode and decode information the same way as is done using computers. The harmonic encryption system was created to produce aesthetically pleasing self-referential harmonic materials.

1.3.2 Harmony

Harmonic structures in *Codecs* are created by transforming and repeating a single chord progression. This progression is called the “Source Progression” and it is explained in detail in section 2.2. The source progression used in *Codecs* is an incomplete fragment of the chorale *Christ lag in Todesbanden* (BWV 227) by J.S Bach. The use of a J.S Bach chorale helped strengthen the concept of revealing and obscuring musical materials. As a familiar sound object, *Christ lag in Todesbanden* can maintain recognizable characteristics despite a great deal of obfuscation.

1.3.3 Form

Codecs’ form is like a tree that grows out from the source progression. Branches are created by expanding the source progression using harmonic encryption and decryption. The expanded source progressions are superimposed, aligned and transformed to create larger structures. On the highest level *Codecs* is split into three continuous sections, each drawing on different genres of electronica¹.

1.3.3 Melody

Monophonic, contrapuntal and homophonic melodic materials are sculpted and distilled from the source progression by manipulating various parameters of harmonic encryption and decryption.

1.4 Live Electronics

Codecs takes a sample-based approach to live electronics. The manipulation of pre-composed sound materials in conjunction with the sounds

¹ Electronica is a blanket term for all subgenres that have grown from electronic dance music.

being made by the performers gives freedom to the instrumentalists, conductor and composer. When designing the software system that allows *Codecs* to run, I chose to focus on sound quality, composer-friendly features and work flow as opposed to real time signal capture and processing.

I used Max/MSP² to connect and control external software and hardware devices in real time. The software and hardware being connected and controlled could be anything, but I chose to use a fully featured software sampler called Kontakt³. High quality electronic drum pads called V-Drums⁴ control both Max/MSP and Kontakt. The Max/MSP interface was created with an emphasis on usability, stability and composer-friendly features.

1.4.1 Spatialization

The role of sound and space in *Codecs* is to broaden the stereo image and keep the majority of the sound sources on the stage. Despite the complete elimination of any rear speakers, side speakers achieve a similar result as surround sound. It was my hope to expand the size of the so-called “sweet spot”⁵ and provide a focused and enjoyable experience for all audience members as opposed to the few in the centre of the hall.

1.5 Codecs

The title of this piece encapsulates many ideas at the heart of this composition. A codec is a software or hardware device that encodes /decodes a digital stream or signal. This process is related to the transformation processes used throughout the piece. The term *Codecs* ties these ideas into the greater musical and cultural context of the work. Though the use of audio codecs, compression and encryption have triggered a change in the way music is shared

² Max/MSP is a visual programming language for digital media. <http://www.cycling74.com/products/max5>

³ Software developed by the Native Instruments corporation. It specializes in retriggering audio files.

<http://www.native-instruments.com/index.php?id=kontakt3>

⁴ <http://www.roland.com/V-Drums/>

⁵ The position in the hall where optimum balance is achieved between all sound sources. In this case, balance between instruments and speakers

and appreciated the world over. Torrents, file sharing, the dark web⁶, mp3s and iPods demonstrate the battle for control of digital objects and intellectual property, which is won and lost through data encryption. Obscuring and revealing data has become an integral part of the way data moves around the globe. Artists, corporations, listeners and users all have their own agendas and their own reasons for manipulating codecs and encryption algorithms.

Audio codecs are important not only because they revolutionized the distribution of music but also because they colour, distort and degrade sound to varying degrees. Destructive audio codecs like the MPEG Layer 3 Codec or “.mp3” imbue a distinctive sound quality to the music they compress. Many people are not aware that when they load a CD into a computer, the software automatically goes to work degrading sound quality for efficient storage. Increased use of portable music players and ear bud headphones has slowly altered people's expectations of sound quality.

Codecs explores these issues metaphorically as is the case with the harmonic encryption system and, literally, with the use of sound samples suffering from exaggerated quality loss due to excessive encoding and decoding.

1.6 Organization

Each chapter begins with an introduction then explores techniques and concepts through explanations, diagrams, reductions and score excerpts. Some of the processes create materials too large or complex for reductions. In these cases measure numbers are provided for in score examples.

⁶ The dark web refers to unreachable network hosts on the internet

Chapter 2: Harmony

2.1 Introduction

I create the harmonic structures in *Codecs* by applying transformational techniques to a short fragment of musical material. This initial fragment is called the “source progression”. The transformation techniques applied to the source progression include intervallic compression and expansion, as well as a procedure I have developed for harmonic encryption and decryption.

2.2 Source Progression

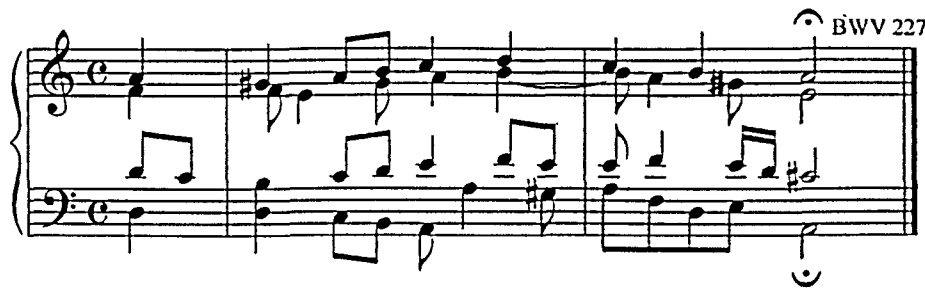


Figure 2.1 Bach Source Progression

I chose the first phrase of J.S. Bach's *Christ lag in Todesbanden* (BWV 227) as the source progression for *Codecs*. Figure 2.1 is the original form of the piece. In the figure below, the progression has been stripped down to facilitate harmonic encryption. Every chord represents a change in harmony.

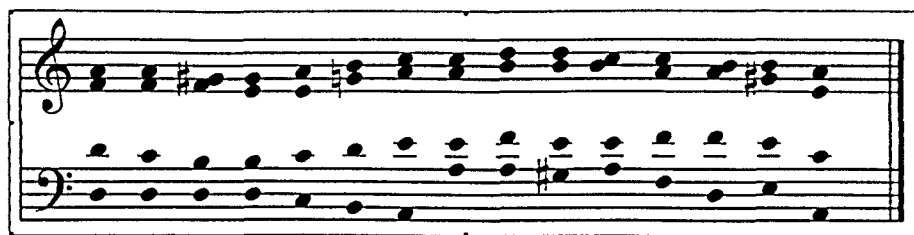


Figure 2.2 Stripped Source Progression

I chose this particular chorale fragment because it has intervallic and voice leading properties that make it suitable for the types of transformations used in *Codecs*. The progression has a balance of repetition and change, a variety of chord qualities, consistent close-position voicing in the upper voices, an independent bass contour and mainly conjunct voice leading in the upper voices. The G in the sixth chord of the stripped source progression was altered for

aesthetic reasons. In general, this progression retains its identity well even as it is being subjected to the harmonic transformations that I use in the piece.

2.3 Transformational Techniques

2.3.1 Harmonic Encryption

Harmonic encryption transforms the source progression into a cipher chord through a series of repetitions with gradual modifications. Harmonic decryption is a similar process in which the cipher chord is used to reconstruct the source progression.

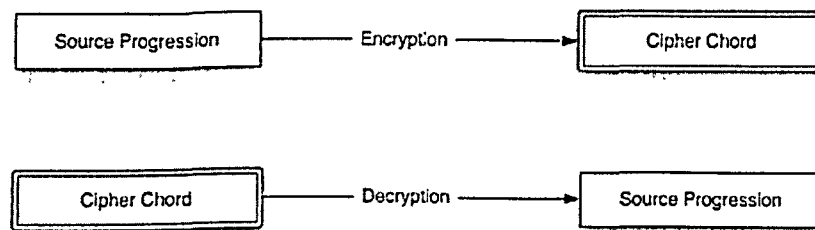


Figure 2.3 Cipher Role

I developed the harmonic encryption process in an attempt to bring together techniques used in the production of electronica and instrumental composition. By transforming and repeating fragments of the source progression as though it was an audio sample, I found that I was able to create musical effects reminiscent of encryption and decryption. A modest source progression can generate large, intricate, flexible and unified structures through harmonic encryption. The material created during the encryption and decryption process varies greatly, depending on the type of transformation used.

2.3.2 The Encryption Process

Throughout the piece a number of different processes are applied to harmonic material that are analogous to the encoding and decoding of information that takes place within an audio codec⁷. During these processes a large amount of varied pitch material is generated from a limited number of chords. As in the encoding process of a codec, large streams of these chords are compressed into

⁷ An audio codec is a hardware device or a computer program that compresses/decompresses digital audio data.

“lossless”⁸ states through the application of transformational techniques. These transformations involve the freezing of specific voices of a harmonic progression while other voices continue with their intervallic content adjusted to accommodate these fixed voices. That is, the intervals of the harmonic progression are maintained, but rather than moving in relation to the previously changing pitches of the frozen voice, the notes of the chords are transposed to maintain the same intervallic relationship to the fixed pitch of the frozen voice.

For example, in the following figure a structural progression of fifteen chords is gradually encrypted as the upper chord tones lock into place. In each section marked “Encryption Phase” another voice becomes fixed. In this case, the order is from highest to lowest. In compression phase 1, for example, the soprano voice becomes fixed and we can see that the alto voice maintains the same intervals below this frozen voice as in the original progression. With each additional compression phase, the highest moving note joins the static tones, transforming the remaining voices of the progression. After the 3rd compression phase, all the voices have become fixed and the fifteen-chord progression has been reduced to a single repeating harmonic entity. This chord is called the “cipher” since it can be understood metaphorically as containing hidden within itself, all of the material from the source progression. In this case, this is the first chord of the initial progression.

The diagram illustrates the process of harmonic encryption through musical notation. It is divided into two main systems of staves. The first system shows a 'Source Progression' of 15 chords and 'Compression Phase 1' where the soprano voice is fixed. The second system shows 'Compression Phase 2' (fixing the alto voice), 'Compression Phase 3' (fixing the tenor voice), and 'Compression Phase 4 (Cipher Chord)' where all voices are fixed, resulting in a single repeating harmonic entity. A 'Cipher Chord' is also indicated at the start of the first system.

Figure 2.4 Harmonic Encryption

⁸ A lossless encryption can be decrypted without compromising the data in any way.

2.3.3 The Decryption Process

The decryption process is the reconstruction of the source progression from the cipher chord. A true decryption of the source progression isn't possible but reverse transformations of harmonic encryptions can be used to achieve the same result. If we reverse the process shown in figure 2.4, we begin with the cipher and rebuild the source progression through three decryption phases.

The musical score in Figure 2.5 illustrates the decryption process. It is divided into five sections: 'Cipher Chord', 'Compression Phase 1', 'Compression Phase 2', 'Compression Phase 3', and 'Source Progression'. The 'Cipher Chord' section shows a single chord in the bass. 'Compression Phase 1' and '2' show the chord expanding into a full texture. 'Compression Phase 3' shows further development. 'Source Progression' shows the final reconstructed harmonic sequence, which begins with a 'Cipher Chord' in the bass.

Figure 2.5 Harmonic Decryption

There are many possible variations of harmonic encryption and decryption. In figure 2.5 a different chord from the source progression is used as a cipher chord. Also, the ordering of fixed voices begins in the bass and moves to the soprano. Fixed voices can begin anywhere in the chord. A harmonic encryption and decryption beginning with internal voices can be observed in measures 319 to 330 of the score.

Figure 2.6 is an example of a harmonic decryption with altered parameters. The cipher chord is the twelfth in the source progression as opposed to the first in figure 2.5. Also, the source progression dissipates in reverse order.

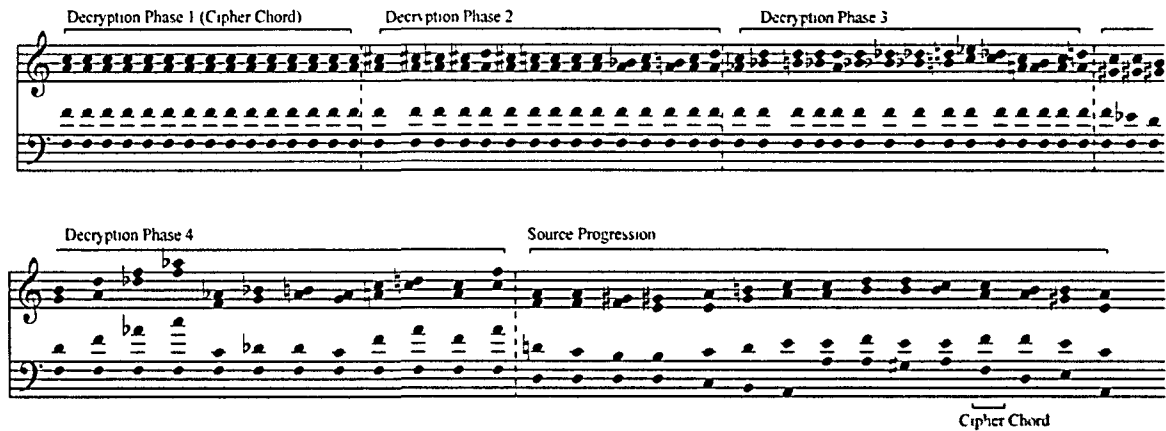


Figure 2.6 Harmonic Decryption

This process can be clarified visually with the use of piano roll notation⁹.

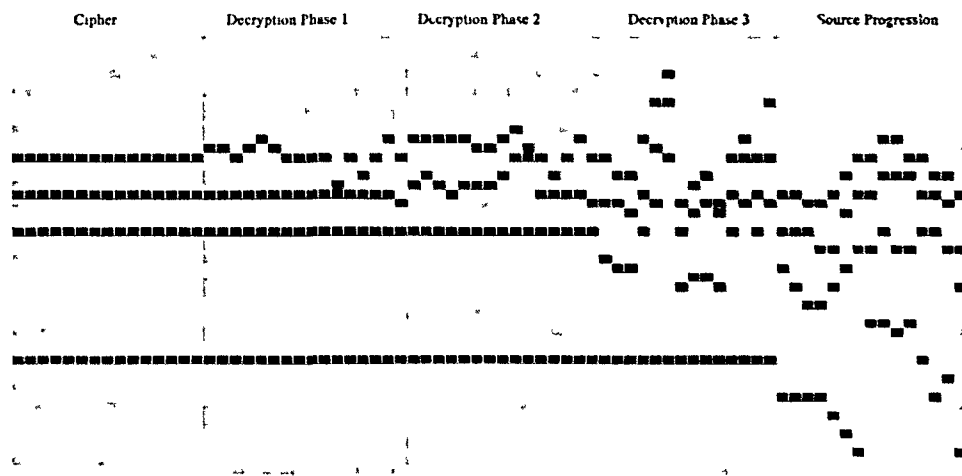


Figure 2.7 Harmonic Decryption in Piano Roll

2.4 Intervallic Expansion and Compression of the Source Progression

In *Codecs*, harmonic materials are expanded through a process of multiplication. This transformation technique increases or decreases the interval space between chord voices according to a given ratio. MIDI note values¹⁰ are used to allow notes to be transformed using numerical processes. Multiplying and

⁹ Piano roll notation represents pitch on the y axis and time on the x axis. The darker horizontal lines indicate black keys on a keyboard.

¹⁰ MIDI assigns notes a numerical value between 0 and 127, with middle C being given the value 48 (or 60, depending on the system). The increase of one MIDI value represents the increase of a semi tone.

dividing midi values increases or decreases the distance between notes. For example, multiplying a chord by 1.2 will increase the space between notes, where multiplying by 0.8 will make them closer together. The following figure shows a chord being multiplied by 1.2.

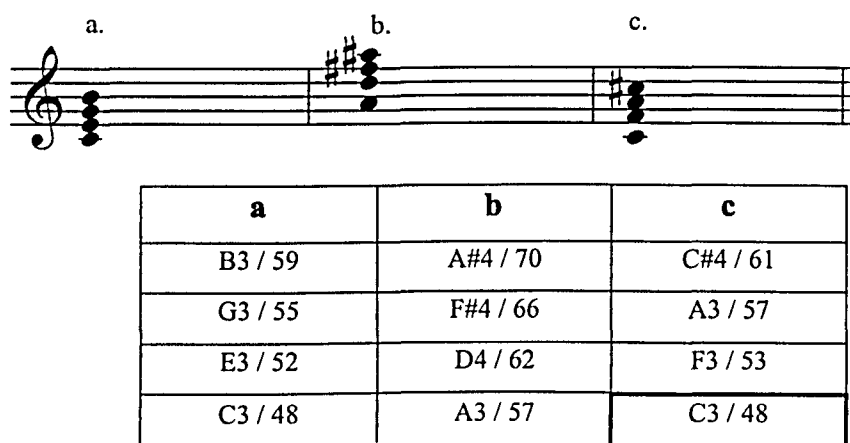


Figure 2.8 Expansion Diagram

After a chord has been multiplied it is normally transposed so that the bass voice returns to its original pitch level.

Ratio multiplication allows the harmony to be altered for musical purposes, while maintaining approximate contour and voice leading.



Figure 2.9 Harmonic expansion of source progression at 1.2 ratio

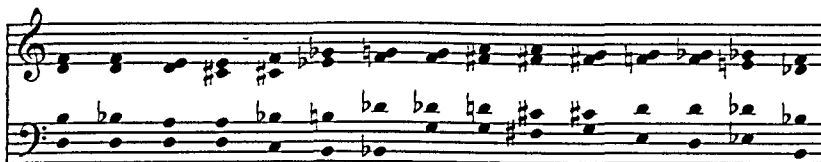


Figure 2.10 Harmonic compression of source progression at 0.8 ratio

When taken to extremes, these techniques can obscure and reveal musical information in a similar way to harmonic encryption. Chords can be crushed together with progressively extreme ratios until they become a single pitch. This

is the case in 241 to 246, except the process is happening in reverse. A single pitch expands into a chord progression.

2.5 Dynamically Changing Ratios

In some cases the ratio applied to harmonic materials changes very quickly and yields interesting results. This occurs in the passage starting at measure 154. In figure 2.8 the number used to modify the harmony is shown above the brackets on the top staff. Common notes between successive chords are tied together. In measure 355 the characteristic leap from the source progression is exaggerated.

The musical score for Figure 2.11, titled "Changing Ratios," spans measures 153 to 159. It features five staves: Violin I (Vln I), Violin II (Vln II), Viola (Vla), Violoncello (Vc), and Contrabasso (Cb). Above the Vln I staff, numerical ratios are indicated above brackets: 15, 14, 13, 12, 11, 10, and 9. A box labeled 'L' is placed above the first measure (153). The score includes dynamic markings: *p* (piano) and *mf* (mezzo-forte). An "accel" (accelerando) marking is present above the Vln I staff in measure 158. The Cb staff has a "ritardando out of time" marking in measure 153. The Vln I staff has a "p" marking in measure 154 and an "mf" marking in measure 158. The Vln II, Vla, and Vc staves also have "p" and "mf" markings. The Cb staff has a "p" marking in measure 154. The score shows a progression of chords with common notes tied between measures.

Figure 2.11 Changing Ratios

Chapter 3: Rhythm and Time

3.1 Introduction

The rhythmic processes used in the composition of *Codecs* are inspired by electronic music production techniques. The manipulation of audio loops and samples from electronica production is metaphorically mapped onto instrumental writing idioms.

The harmonic encryption process relies on the transformation over time of repeating materials. Repeating and transforming the source progression creates a shifting rhythmic profile that follows metaphors similar to harmonic encryption and decryption.

3.2 Rhythm as a Function of Harmony

Despite its uniform rhythmic values, the source progression develops a distinct rhythmic profile when repeated at high speeds. As the harmonies change through transformation processes, so does the rhythmic profile. Rhythmic interest as a function of repeating harmony is a technique heavily exploited by electronica producers. From an instrumental perspective, composers like Stravinsky and minimalist composers like Terry Riley and Steve Reich exploit a similar technique.

As shown in figure 2.3, harmonies flatten out as they approach the cipher chord. So does the rhythmic profile. Provided notes are being played at the same volume, a series of quickly repeating sixteenth note chords has a flat rhythmic profile. As the source progression is reconstructed during the decryption process, so is the shifting rhythmic profile associated with the transformation. This process can be clearly observed in the strings between measures 109 and 133.

3.3 Rhythmic Expansion

The process illustrated below is a way of generating rhythmic interest from the rhythmically static materials generated by harmonic encryption. It relies

on the principal that modifying phrase lengths can create rhythmic contrast. This process works by isolating fragments of the source progression. As fragments are selected, their start and end points move across the progression while changing the size of the selection. After fragments with complementary rhythmic profiles are selected I connected them together to create a larger pattern.

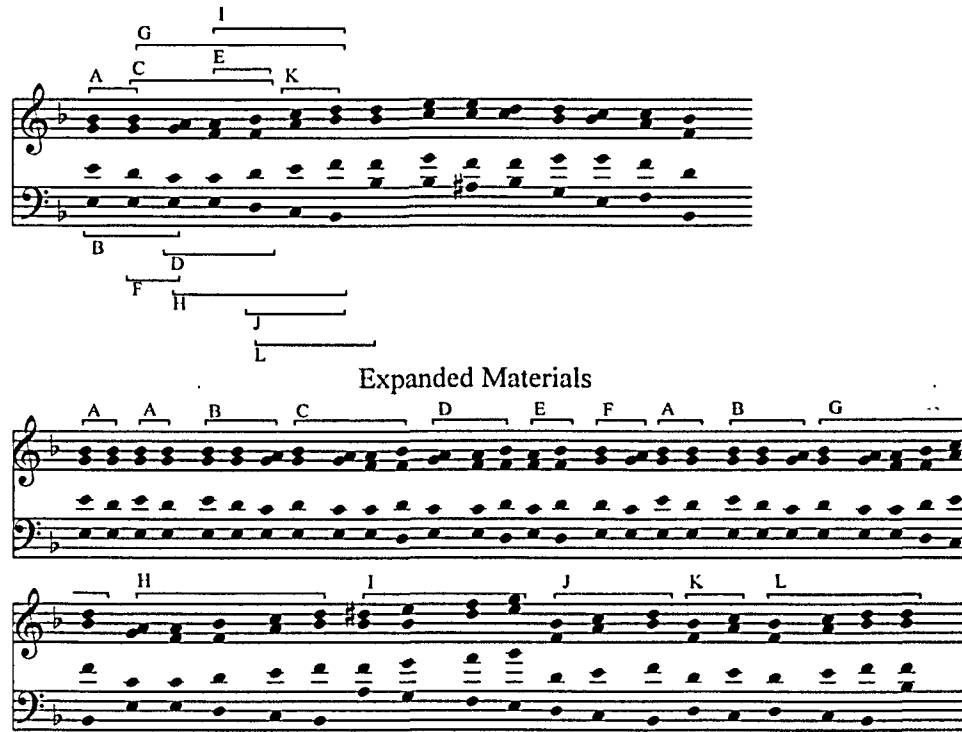


Figure 3.1 Rhythmic Expansion * letter I is transposed up a Perfect 4th

The above diagram shows the source progression with brackets that correspond with sections of the expanded materials. Figure 3.1 is a fragment of a larger rhythmic expansion that is found in many transpositions and expanded forms throughout the piece. See Measures 301 to 319 for examples in the score.

A similar technique is used in electronica production by carefully cutting up audio samples and loading them into a sampler. Stress patterns are altered as the borders of a repeating pattern are expanded and contracted. The repeating region moves across the source progression, re-contextualizing familiar patterns with each change. Like a spotlight moving across a darkened room, the beam reveals what is in the path of the flashlight but the rest remains obscured. In this way I was able to play with the listener's expectations by increasing and

decreasing the length of recognizable fragments.

3.4 Time Expansion and Time Compression

Time expansion and compression are process I used to create written out shifts in tempo rather than an imprecise accelerando. These shifts are achieved though a numerical process similar to those described in section 2.4. For example, a half note multiplied by 0.5 will result in a quarter note. When notes are multiplied by dynamic or complex ratios, the results change over time and are rounded to the nearest sixteenth or triplet. The numbers in figure 3.2 represent the number of sixteenth notes within the brackets.



Figure 3.2 (mm.193 - 199)

This process has not been applied rigidity. I have allowed myself to make changes to my rhythmic structures in order to avoid simultaneous attacks. Figure 3.2 comes from a section of *Codecs* where lines with different rates of rhythmic compression slowly align to form the source progression. In this section the source progression acts as a point of rhythmic stability, just as the cipher chord acts as a point of harmonic stability during a harmonic encryption.

To create variety and slower changes in tempo I used a process based on addition and subtraction combined with ratio multiplication. After rounding to the nearest sixteenth note the results are similar.



Figure 3.3 (mm.199-198)

Of course, some rhythmic materials in *Codecs* are simply freely composed gestures that are applied to melodic lines drawn from transformations of the source progression. The rhythmic profile of the clarinet solo at the beginning of the piece is an example of this.



Figure 3.4 (mm. 1-3)

3.5 Negative Space

The relentless pulsing in the fast sections of *Codecs* makes even the smallest gap a dramatic moment. By taking notes out of a repeating pattern, I created rhythmic interest and contrast.



Figure 3.5 (mm. 371-373)

As the size of the space increases, so does the tension built by the lack of sound. A more dramatic use of negative space can be observed in the score at measure 386.



Figure 3.6 (mm. 386-388)

Chapter 4: Melodic Materials

4.1 Introduction

The melodies in *Codecs* are derived from materials generated by the transformation processes explained in chapters 2 and 3. Harmonic encryption and decryption varies the intervallic relationships between notes in the source progression. Melodic materials are a natural by-product of the chordal shifts that occur during this process. Melodic contours collapse or expand as they are repeated, obscuring and revealing melodic content. This means that there is a shifting hierarchy of melodic interest. As voices lock into their fixed position they fade into the background, making way for previously obscured voices. Many of these melodic lines are left as is and enhanced though orchestration and doubling. Others are transformed with rhythmic processes discussed in chapter 3 and harmonic ratios as discussed in 2.4.

4.2 Melodic Extraction:

4.2.1 Melodic Encryption and Decryption

Once a source progression has been unfolded through various processes, splitting apart voices and examining their contours can reveal interesting melodies. Changes in processing yield melodic materials with different characteristics. For example, harmonic encryption begins with melodic materials that are easily recognizable but gradually flatten out as they merge with the cipher chord. The oboe line at measure 57 is an example.



Figure 4.1 Melodic Encryption (mm. 57 – 60)

Melodic decryption is the same process in reverse. It begins with a single pitch and slowly reveals melodies. In both of these contexts, familiar melodic materials

are obscured and revealed through time.

4.2.2 Tying Common Notes

Contrast and melodic variation can be created by substituting repeated notes with held pitches. Not only does this soften the severity of the repeating metric units, it blends sections together, softens entries and creates rhythmic variety.

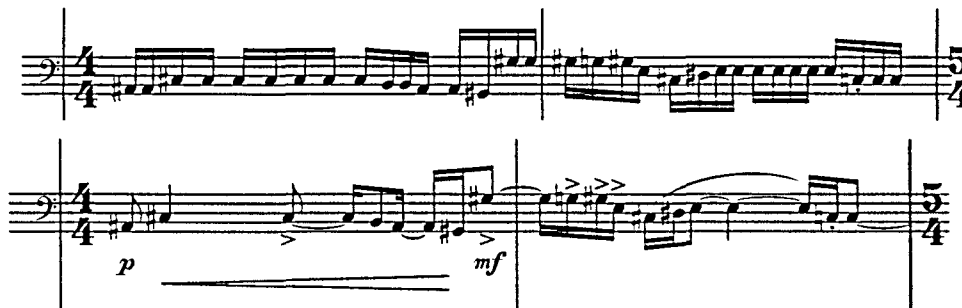


Figure 4.2 before/after tied common notes (20-21)

4.2.3 Counterpoint

The logical continuation of the technique explained in 4.2.2 is to create counterpoint by tying common notes of multiple voices simultaneously. The resulting materials are similar in texture and rhythmic profile to decorated vocal homophony. (Horton 26). The careful selection of tied notes creates pseudo tension release events similar to traditional cadences and suspensions. This works because the contours and voice leading of the source progression are partially preserved during different phases of the harmonic encryption process.



Figure 4.3 counterpoint (Measure 19-21)

4.2.4 Free Rhythmic Composition



Figure 4.4 Clarinet Solo (Measures 1-3)

Taking the source progression or decrypted materials and composing a unique rhythmic profile creates the melodic materials shown above. Contrasting rhythms and decorative figures help melodies stand out in rhythmically homogenous sections.

4.3 Melodic Arpeggiation

Not all melodic materials used in *Codecs* are limited to single lines extracted from the source progression and its transformed states. Some melodic materials are created through arpeggiation. That is to say, they drift between the voices of a chord progression. The first part of the following diagram is a fragment of a harmonic encryption in its raw form. The second part is the arpeggiated version.

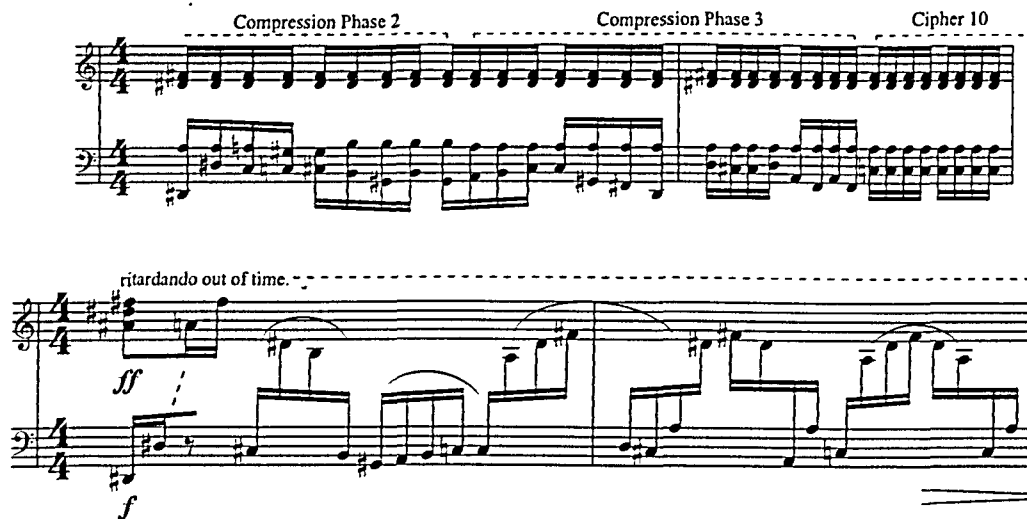


Figure 4.5 arpeggiation (measure 289-290)

5.1 Introduction

```
graph TD; A[Formal Sections] --> B[Glitch]; A --> C[Ambient]; A --> D[Gabber]; B --> E[Harmonic Transformations]; B --> F[Ratio Transformations]; B --> G[Rhythmic Transformations]; C --> E; C --> F; C --> G; D --> E; D --> F; D --> G; E --> H[Secondary Ratio Transformations]; E --> I[Secondary Rhythmic Transformations]; E --> J[Secondary Melodic Transformations]; F --> H; F --> I; F --> J; G --> H; G --> I; G --> J;
```

The flowchart illustrates the proposed methodology for music analysis. It begins with 'Formal Sections' at the top, which branches into three categories: 'Glitch', 'Ambient', and 'Gabber'. Each of these categories then leads to a set of three transformations: 'Harmonic Transformations', 'Ratio Transformations', and 'Rhythmic Transformations'. Finally, each of these transformation sets leads to a set of three secondary transformations: 'Secondary Ratio Transformations', 'Secondary Rhythmic Transformations', and 'Secondary Melodic Transformations'.

The second structural layer is marked by the obscuring and revealing of the source progression using the transformational techniques described in chapter 2 and 3. This structural level is illustrated in appendix A, and will be referenced throughout the section. The diagram in Appendix A is a formal outline that was used during the planning of the piece and doesn't reflect the finished score. It shows the second level structural blocks that form the backbone of *Codecs*. Each structural block represents a harmonic process of encryption or decryption. Rhythmic transformations are indicated below the timeline using dotted brackets.

19

secondary transformations of materials from level 2. These third level transformations expand and vary materials on a gestural basis. These smaller intricate structures are created using the same processes that are applied to level 2. This is the final level of processing and the result is the final score.

5.2 Formal Sections

5.2.1 Section 1: Glitch

Measures 1 to 149 are based on Glitch¹¹ music. This post digital music aesthetic emphasizes errors created by modern digital technology. This style of electronica zooms in on, and combines sounds created by, digital hardware or software failure (Cascone 24).

This formal section of *Codecs* is constructed from electronic glitch samples made from processed instrumental as well as electronic sounds. The instrumental part uses comparatively unstable rhythmic gestures, rubato, jagged contours and surprising punctuations. These elements create similarities in texture and feel to the glitch aesthetic. Stylistically characteristic and "glitchy" percussive sounds based on errors caused by the Mp3 encoding process are triggered using live electronics to punctuate and blend musical events.

5.2.2 Section 2: Ambient

Measures 149 to 241 are related to the Ambient electronica aesthetic¹² which is often characterized by long, drawn-out gestures and washes of sound. Stretching out audio samples until they lose all recognizable relationship to the original materials is a technique often used to create ambient electronic music. This section of *Codecs* was created using time expansion techniques to stretch out a harmonic encryption in a similar way. Instead of a recognizable chord progression, the source progression is transformed into a textural layer of varying attack density.

¹¹ A Glitch is a short lived fault in a system. In "Glitch Music" this is referring to digital glitches in software and hardware systems. For audio examples go to: <http://www.allmusic.com/cg/amg.dll?p=amg&sql=77:11635>

¹² Ambient electronica is a wide genre with many sub genres. For information and audio examples go to: <http://www.ambientmusicguide.com/>

5.2.3 Section 3: Gabber

Measures 241 to 390 make up the gabber section of the work. Gabber is a sub genre of electronica characterized by high speeds and audio samples that are distorted beyond the point of recognition. These samples often reflected themes of violence, drugs or profanity. Gabber was a rejection of the “elitist” attitude associated with electronica in Detroit and Amsterdam in the mid to late 90s. Relentless rhythmic pulse, harsh noises and extreme volumes in both the electronics and orchestration tie this section to the gabber aesthetic¹³.

5.3 Connecting Materials

This section covers the second level of formal structures and how they interact. Sculpting and modifying the way transformed source progressions connect is the key to creating beauty, unity and interesting musical gestures in *Codecs*. Transitioning between materials can be done in many ways. The following are examples of how encryptions and decryptions are connected.

5.3.1 Palindrome

When harmonic encryptions and decryptions connect they form a palindrome shape like the one shown below. Note that the palindromic design of this example is based on the phrase structure, not on a chord by chord mirror image.

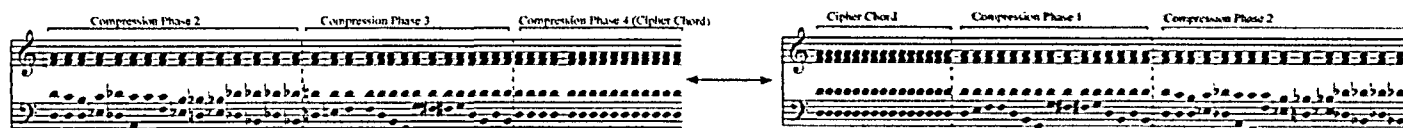


Figure 5.2 Palindrome Shape

The palindrome can be exact or modified (as in the case of the above example), depending on the type of transformations used. An exact palindrome requires its second half to be a mirror image of its first half. Each half of a modified palindrome has the same start and end points as in an exact palindrome,

¹³ For examples of gabber go to: <http://www.enzyme.nl> (turn down your speakers)

but different transformations are used in the second half. The smoothest way to connect encryptions and decryptions is by using a common cipher chord. This is because shared rhythmic and harmonic materials blur the edges of the structural blocks like the ones shown in Appendix A.

The second section of *Codecs* (mm. 149 – 241) is an example of a large palindrome that is connected by the source progression.

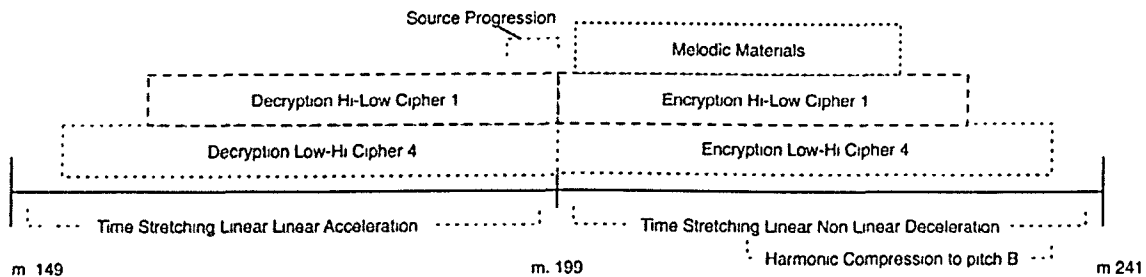


Figure 5.3 Palindrome Structural Back-bone

Modified palindromes are structurally interesting because each side is transforming the source progression in a different way. These alterations are archived through subtle or drastic modifications to the transformation processes. Imperfect palindromes serve two purposes. Firstly, it increases structural variety by not limiting symmetrically related materials to perfect palindromes; secondly, a false palindrome works well for introducing new materials. Measures 150 to 199 to 230 are an example of this type of formal structure. See Appendix A section 2.

5.3.2 Forced Splice

Warping harmonic encryptions by using free compositional techniques or ratio multiplication can splice two structural blocks together in a convincing way. This is done when two sections cannot be connected through any available harmonic encryption or rhythmic expansion process. An example can be found in the score at mm. 241 – 250. In the score excerpt below, the pitch B is harmonically expanded to connect with an encryption with a harmonic ratio of 0.5.

The image displays a musical score for three instruments: Percussion (Perc), Piano (Pno), and Violin I (Vln I). The score is marked with a '24/' at the beginning of each staff, indicating a forced splice at measure 24. The Percussion part features a complex rhythmic pattern with dynamic markings of *sf*, *p*, *mf*, *pp*, and *mf*. The Piano part shows a melodic line with dynamic markings of *ppp* and *mp*. The Violin I part includes a tempo marking of $\text{♩} = 76$ and dynamic markings of *sf*, *mp*, and *p*. The score is written in a standard musical notation with a treble clef for all parts.

Figure 5.4 Forced Splice

5.4 Overlaying Multiple Encryptions

The cipher chord acts as a point of rest for harmonic encryptions. When two different harmonic encryptions share a cipher chord, and are superimposed, the result is a more harmonically dense structure with a shared point of rest. The same phenomenon occurs during harmonic decryption, except the role of the cipher and the source progression is reversed. For examples see mm. 149 to 199 Appendix A, section 2.

5.5 Secondary Transformations

The majority of *Codecs* has been subjected at least three levels of transformation. Rhythmic, harmonic and melodic transformations stack and create complexity and variety. These transformations affect one another and the result is an expansion of the formal outline seen in Appendix A. The dotted brackets underneath the timelines give a rough approximation of secondary processing.

Chapter 6: Electronics

6.1 Introduction

The electronic component of *Codecs* consists of pre-composed electronic materials that are broken down into discreet events and triggered according to strictly ordered, overlapping multi-track sound cues¹⁴. Sounds are triggered using Roland V-drums¹⁵, which are connected to a software sampler called Kontakt¹⁶. This connection is made via Max/MSP¹⁷. The triggered sounds are processed using envelopes and amplitude data derived from a real-time analysis of the audio from the live ensemble. Once the materials have been processed they are spatialized through a ten-speaker setup.

6.1.1 Working Methods

I chose to focus on triggering and filtering pre-composed sound files, as opposed to working with the live sound of instruments, because this working method eliminates many risks that are out of the performer's hands. After working with performers I have realized that a great deal of anxiety is associated with musical systems where the performer feels a lack of control.

The hardware and software setup from *Codecs* combines the stability of commercial software with the flexibility and control of Max/MSP. The sound quality and complexity of pre-composed sounds combined with the responsiveness of real time filtering, triggering and spatialization create musically convincing results. The following diagram illustrates the Codecs performance setup:

¹⁴ A sound cue is a sound file that is played back through the speaker setup at a given point in time

¹⁵ A velocity sensitive virtual drum kit designed by the Roland company <http://www.roland.com/products/en/TD-20K/index.html>

¹⁶ Software developed by the Native Instruments corporation. It specializes in retriggering audio files <http://www.native-instruments.com/index.php?id=kontakt3>

¹⁷ A visual development environment for music and multimedia <http://www.cycling74.com/>

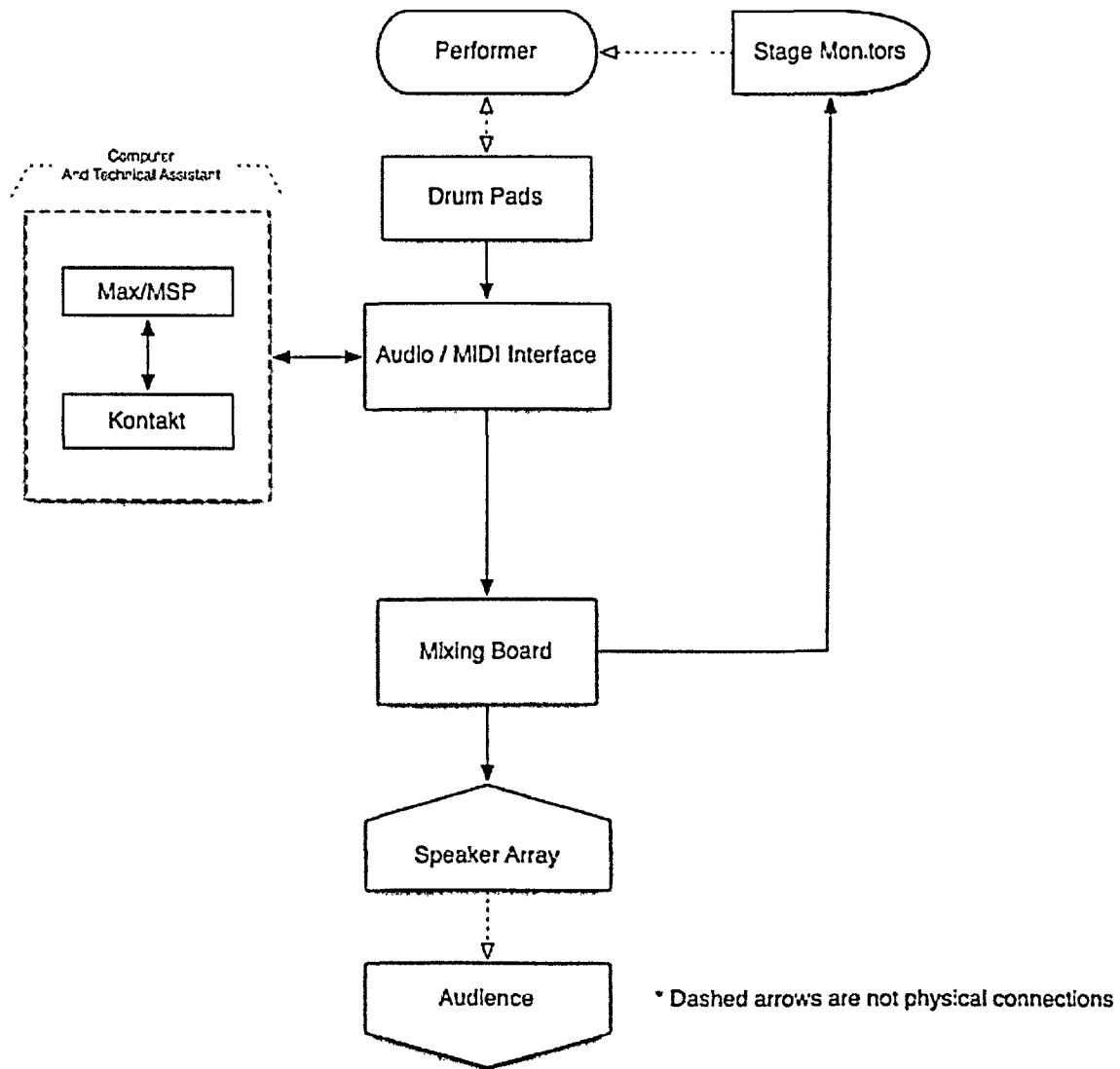


Figure 6.1 Codecs Setup Diagram

6.2 Creating a Gesture

6.2.1 Selecting Sound Files

The process of creating an electronic gesture begins with selecting, trimming and cleaning up raw audio materials. Sound materials used in *Codecs*' electronic component come from a variety of sources. These sources are related to the poetics of the piece to varying degrees and in different ways. For example, some sounds are related to the source progression, others to electronica genres mentioned in chapter 5. Some sounds are related because the methods in which

they are processed mirror processes outlined in chapter 2, 3 and 5. This type of process based relationship is an electronic extension of ideas explained in section 5.1. Some sounds have no obvious relationship, but are used for the sole purpose of adding specific attack characteristics to related sounds, or to fill out the harmonic spectrum.

Thematically related sound sources include:

- Instrumental recordings from rehearsals as well as individual recording sections with the oboe.
- Source progression being performed on harpsichord, organ, piano and analog synthesizer.
- V-I cadences from selected J.S Bach works performed by Canadian artists.
- Isolated artifacts¹⁸ from the Mp3 Codec.
- Fragments of electronic music related to the three large formal structures of *Codecs*.
- Digital communication technology. (Cell phones, modems, fax machines)

Unrelated sound sources:

- Analog and digitally synthesized sounds
- Skateboard clattering on pavement
- Power tools
- Yelling
- Factory Machines

6.2.2 Montage

After the selection process, sounds were loaded into a digital audio workstation for mixing, sequencing and processing. These sounds were manipulated in such a way as to obscure and reveal their relationships to the source progression. Sounds are overlaid and combined to create larger gestures

¹⁸ Artifacts are a type of noise created when processing a sound. In this case, the mp3 codec creates a distinctive noise pattern during the compression process.

that integrate into the instrumental part.

In order to keep track of which sound is associated with which drum pad, I routed audio files in the DAW¹⁹ through three separate outputs. This allowed me to work quickly and efficiently with large gestures created from layers of samples triggered by multiple drum pads. Working with separate outputs helps me break down complex sound events. I can quickly switch between groups of sounds; from an individual drum pad, to how it relates to the larger soundscape.

6.2.3 Timelines

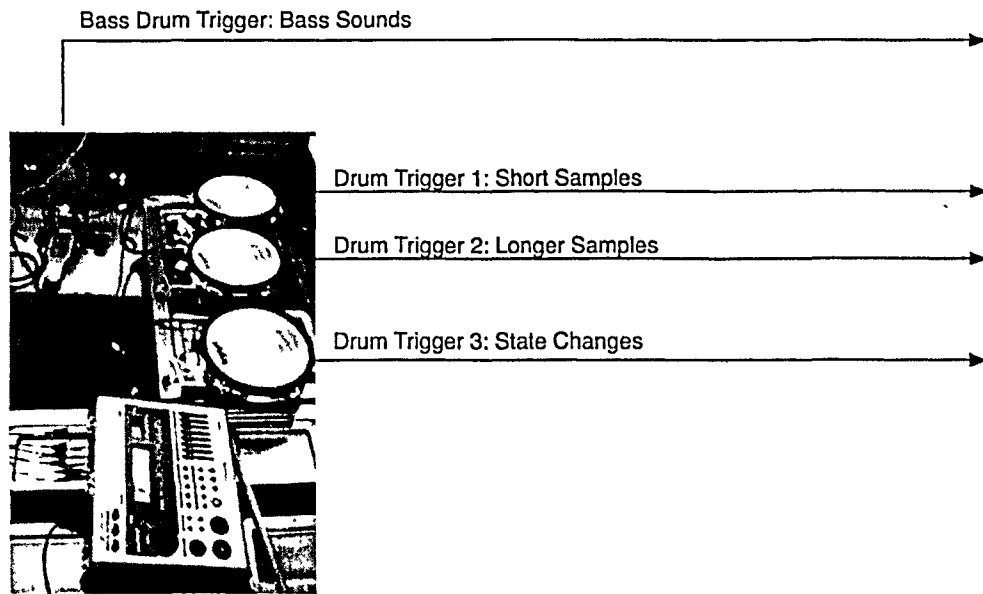


Figure 6.2 Trigger Time Line

The Max/MSP patch used in *Codecs* communicates with four drum controllers (shown above), which are three velocity sensitive drum pads and one foot-operated drum controller. Drum pad 1 primarily controls shorter sounds on timeline one. Drum pad 2 controls long sounds on timeline two. Drum pad 3 sends state changes to Max/MSP. And the bass drum pedal triggers bass sounds on the third timeline. A state is a collection of timing and processing parameters that control the samples being triggered by the drum pads. This configuration allows for three timelines of multi-channel samples; each being triggered, filtered and spatialized independently. The sounds that are triggered on each timeline can be changed at any time using the third drum trigger. I built the Max/MSP patch to

¹⁹ Digital Audio Workstation

be scalable so more or fewer triggers may be added for different performance situations.

6.2.4 Simulation

During the compositional process, large complex events can be quickly integrated into a mock-up simulation by exporting the material from the three outputs mentioned in 6.2.2 and loading them into Kontakt. Once the sounds are loaded into Kontakt, they are further divided using transient and zero crossing detection²⁰. This interface illustrated by figure 6.2. The three timelines can then be triggered and manipulated along with a mock-up of the instrumental score. Additional automation can be entered along with the audio to simulate the data coming from the ensemble.

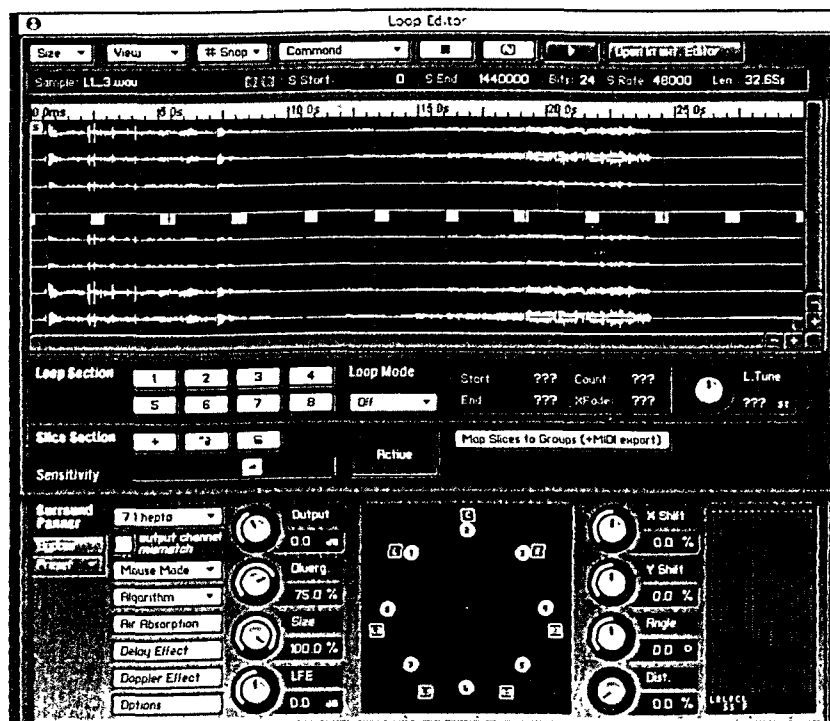


Figure 6.3 Kontakt

Working this way allows for a great deal of speed, experimentation and flexibility while manipulating a staggering amount of audio material. Proper simulation is very important as it identifies many problems without wasting rehearsal time.

²⁰ Kontakt searches for logical places to split a sound without causing undesired pops and clicks.

6.5 User Interface

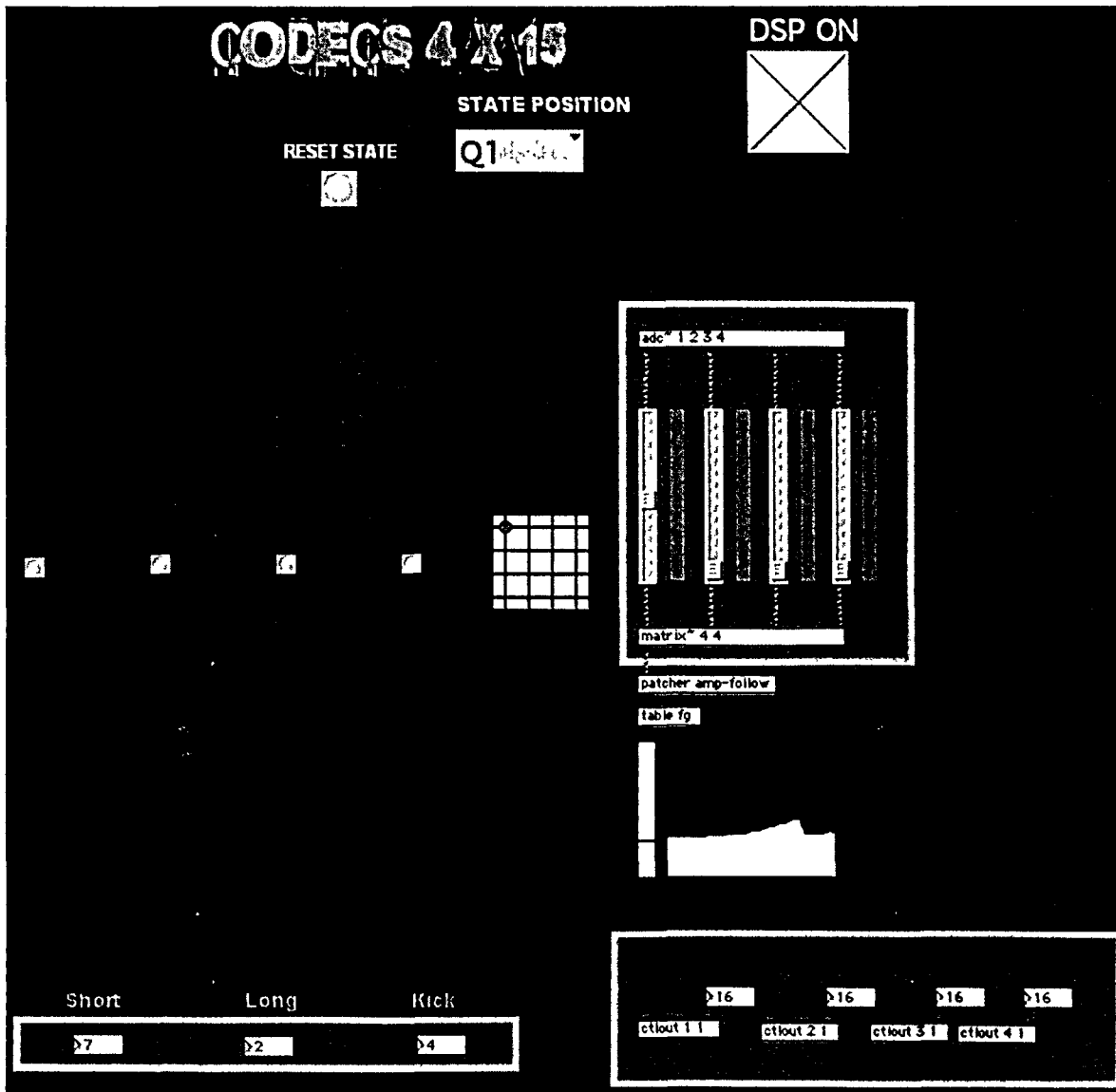


Figure 6.4 Patch Interface

6.5.1 Composer Interface

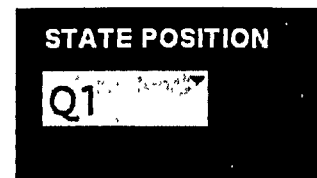
Once the desired gestures are broken down into appropriate components and loaded into Kontakt, the triggering process gets passed from the DAW²¹ to the V-Drums via Max/MSP patch (Shown above). The patch I created connects the V-Drums to Kontakt and manages the ordering of audio events. When the musical gestures are performed on the v-drums, the composer can quickly make

²¹ Digital Audio Workstation

changes and revisions in order to make gestures more musically convincing. Event sequencing, voice count, filtering and spatialization can be further refined from within the patch. It is helpful that Kontakt contains many audio shaping and filtering tools. Most importantly, if a gesture needs to be replaced altogether, it can be altered and quickly re-loaded.

6.5.2 Hierarchical Triggering

The timeline of audio events for each drum pad is controlled by a dynamic 2D array. This means that a list of audio events is assigned to each drum pad at any given moment during the piece. As the performer strikes a pad, Max/MSP triggers a sound and checks the list for the next event. Triggering audio in a list means that if the performer makes a mistake, he or she will be out of sync with the ensemble. To combat this problem, I devised a hierarchical triggering and error-compensation system. Infrequent but critical audio events are assigned to the left drum pad while shorter and more frequently occurring sounds are assigned to the right drum pad. If the order of events on the right pad's timeline is shifted, the sounds are similar enough that the effect will be negligible. Also, the lists of audio events associated with a drum pad are updated when the third drum pad is triggered. The third drum pad resets the lists of events for the next section of the piece. Constantly re-setting lists of events as the player progresses through the piece allows every section to begin at the right point. The list can be seen under “state position” in figure 6.4.



6.5.3 Rehearsal

In rehearsal, cue numbers associated with measure numbers are used to move the Max/MSP patch to different sections of the piece. As the conductor repeats and changes sections, the technical assistant or performer has to select the appropriate state position. A stereo version of the setup for *Codecs* is compact and streamlined enough that it can be setup in ten minutes before rehearsal. Not having live processing means there are no levels that need to be checked.

6.5.4 Performance

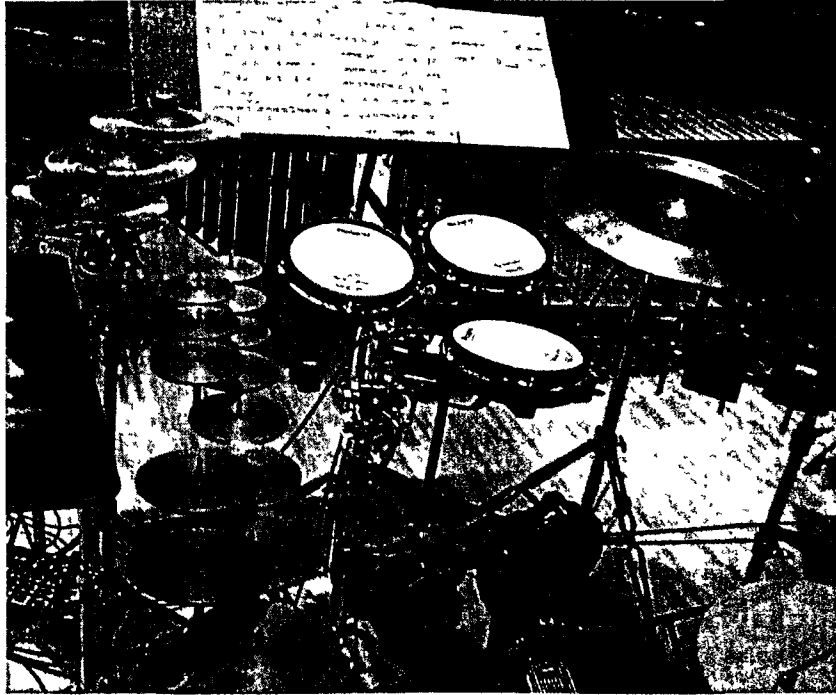


Figure 6.5 Stage Setup

The drum pad interface for *Codecs* has a very small physical and visual footprint on stage. There are no computers, tangles of wires or midi cables. This minimizes distractions and helps the audience to focus on the music. The connection between the v-drum pads and the v-drum module helps to make this possible. This connection is analog and can be fed through built-in stage inputs that can be connected to the mixing desk. The drum pads are seamlessly integrated into the percussion section of the ensemble so there are no visual distractions. There are stage speakers behind the percussion section that serve as monitors for the percussionists, as well as a localized logical sound source for the majority of the electronic sounds.

6.6 Spatialization

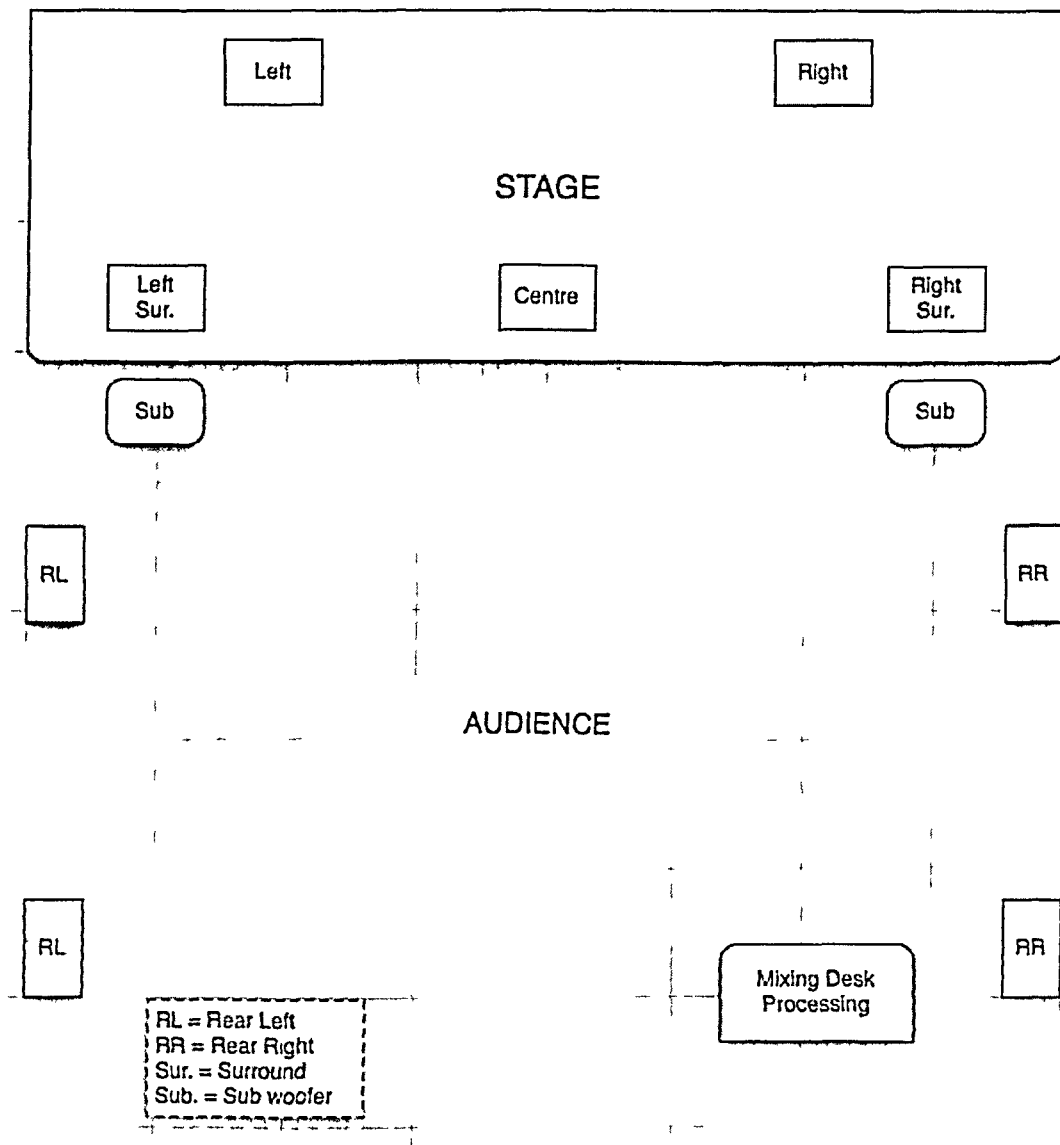


Figure 6.6 Speaker Placement

I chose a non-standard "big stereo" speaker setup as opposed to the more common circular²² setup. By placing the main speakers behind the ensemble, I was able to blend sounds convincingly without amplifying the live instruments. Sounds perceived as coming from the same place in physical space are naturally grouped together by the brain. This is called grouping by common fate. By not amplifying instruments, I also avoid issues with sound quality loss and feedback.

²² A circular speaker setup surrounds the audience with equally spaced speakers

The centre speaker is reserved for particularly subtle and delicate sounds. It is not used often because of the proximity to the audience and the way it collapses the stereo image. The additional speakers are be used to broaden the stereo image to the point of surround sound. For example, sounds can begin behind the ensemble and move out as an ultra wide stereo until they fragment into a series of spatialized sounds.

The side speakers were suspended on metal cables. By raising the speakers I sacrificed some clarity for an increase of the sweet spot²³. Keeping the side speakers higher on the wall reduces the problem of sitting on the side, and having a single speaker blaring in one ear.

With the speaker setup illustrated in figure 6.6, true surround sound is not possible because of the lack of rear speakers. This was an aesthetic decision as I find sounds positioned behind the audience to be distracting.

6.7 Spatialization Types:

There are different ways that I used the surround speakers during the performance. The following sections explain these techniques.

6.7.1 Stereo Swell

At different points during the piece the panning of the audio materials is controlled by the volume of the instrumentalists. This means that as instruments got louder, the sound source of the electronic elements moved out into the hall. Panning sounds off the stage creates a sense of energy and excitement that builds with the volume of the performers. This technique was used in the middle section. At measure 147 the stereo swell is triggered by the bass drum.

6.7.2 Individual Sources

I used Kontakt's built in surround panner to place certain sounds within the surround space. Depending on where the sounds were placed, this could give the impression of a larger than life drum kit, or a natural localized sound. This technique was used in the introduction. mm. 1-5

²³ The sweet spot is the point in the hall where all audio elements are well balanced from a listening perspective

6.7.3 Moving Sources

There are many ways to control the placement of sounds in real time using Kontakt. Each sound file can be given a unique path through space like in M.M. Or, as was the case in the final section, triggered sound can be randomly panned all over the hall. This effect was particularly dramatic.

Chapter 7: Future Directions

7.1 Introduction

During the pre-compositional processes of *Codecs* I anticipated technical problems and developed solutions, often in the form of added features in my patch that I programmed for Max/MSP. When *Codecs* was performed my working method and Max/MSP patch were tested in rehearsal and concert settings. These experiences gave me the opportunity to create a list of changes that would improve the functionality and the musicality of my working method. The following section outlines possible improvements to my working method.

7.2 Improvements in the Electronics

7.2.1 Improved Panic Functions

In rehearsal it was sometimes necessary to stop all electronic sounds and processes instantly. A feature that allows for a full stop in processing to occur with one click is called a “panic” function. A panic function is a useful feature in many musical situations. For example, during a false start the conductor cuts off the ensemble and quickly restarts. The electronics need to be able to start and stop just as quickly. Usually implementing this feature is not an issue because audio is handled within Max/MSP where it is easy to stop all outputs. I chose to use Kontakt as my primary audio source, and panic functions are not as straightforward in this software. Although, believe it is possible to send mute functions to Kontakt from Max/MSP.

7.2.2 Start Anywhere

I structured my Max/MSP patch in such a way that the electronics could start at many different places in the score. These places included rehearsal letters and beginnings of gestures. In rehearsal I realized that conductors want to be able to start anywhere, no exceptions. More often than not, they want to start just before a gesture, never right on it.

In order to solve this problem, I would need to create a program that calculates approximate positioning within a sound file according to a given measure number. This would require a complete overhaul of my max patch and the possible elimination of the Kontakt from the framework.

7.2.3 Visual Feedback:

A screen with a simplified interface could help the performer recover from missed cues during performance. Not knowing the state of the electronics is a source of stress for the performer. The problems with a lack of visual feedback became apparent when both the performer and technician compensated for an error simultaneously, canceling out both of their efforts. A straightforward diagram with cue number, rehearsal letter, and upcoming cue would be enough. Fixing this problem would involve a secondary monitor, which would unfortunately add clutter and complexity to an already complex setup.

7.3 Customized Software Tools

7.3.1 Open Music

It would be a straightforward process to create a set of Open Music²⁴ tools that can transform a source progression in the ways outlined in chapters 2, 3 and 4. These tools would save a lot of time during the pre-compositional process and allow for more experimentation with complex materials.

7.3.2 Harmonic Simulations

I would like to create a software tool that takes any musical material and calculates possible source progressions and cipher chords. This would require simulations and brute force computation. The result would be a piece of software that reverses the working order that I used in the creation of *Codecs*. Being able to invert diagram 2.2 would be exciting and would expand the possibilities of my system.

²⁴ Open music is a visual programming language for music. <http://sourceforge.net/projects/ircam-openmusic/>

7.4 Practical Considerations

7.4.1 Mallets

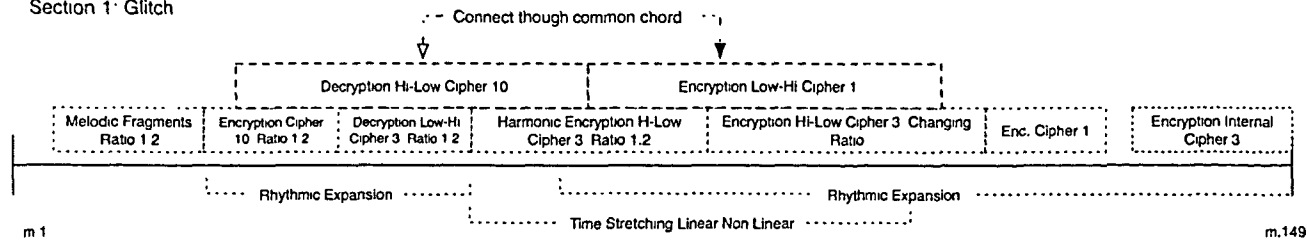
The V-Drums shown in figure 6.4 emit an audible clicking sound when struck with wooden drumsticks. This is not a problem during loud sections. However, during softer sections of the performance, some clicking was audible. Softer mallets and adjusting the sensitivity of the V-Drums could rectify this problem although not entirely solve it. This is because of the minimum physical impact required for a trigger.

7.4.2 Numbering

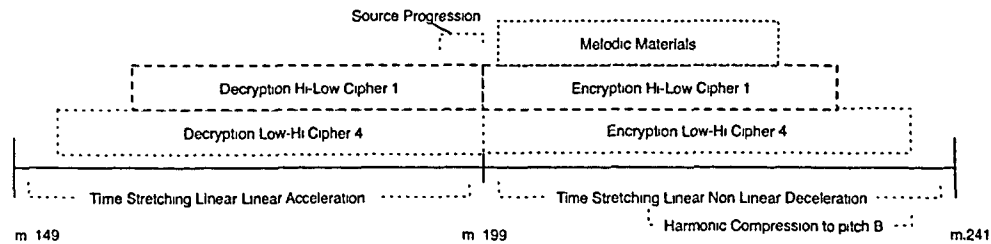
Separating cue numbers and measure numbers was a mistake. It added a level of abstraction that made it difficult for the technician to reset the patch quickly and to follow the conductor during rehearsal. This problem is easy to fix but would require modifying and re-printing the score and parts.

Appendix A: Formal Sketch

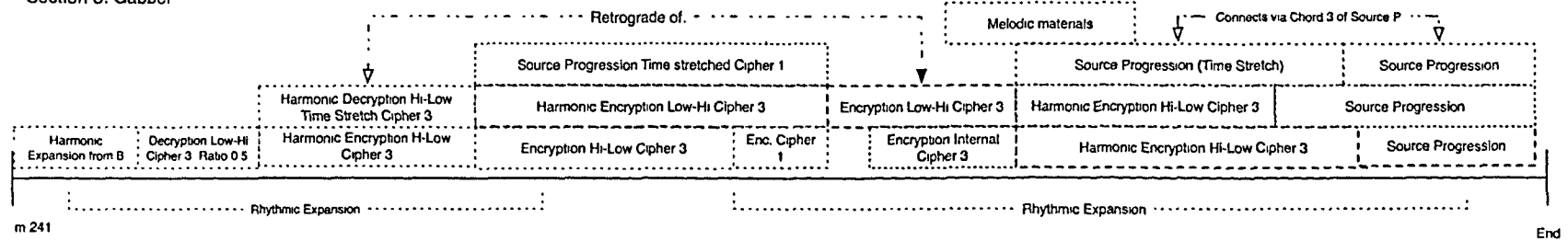
Section 1: Glitch



Section 2: Ambient



Section 3: Gabber



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Eliot Britton

CODECS

**for 16 instruments
and Live Electronics**

Eliot Britton

Codecs (2008)

Instrumentation:

Flute/Piccolo

Oboe

Bassoon

Clarinet in Bb / Bass Clarinet

Horn in F

Trumpet in C

Trombone

Tuba

Piano

Percussion x 2

2 violins

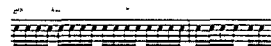
Viola

Cello

Bass

Instructions:

-(==>) Represents a gradual change in timbre example: (air ==> pitched) would be a transition as slow as possible from blowing through the instrument to playing clear notes. The transition covers the length of the dotted line. Molto sul tasto ==> molto sul point represents slowly sliding the bow to the bridge.



-Hairpin dynamic levels should be gradual, even over several measures

-All pitch bends are approximate. Continue the bend for the duration of the thick line. If the line moves to a second note head, bend the first pitch to that of the second.



* Strings.

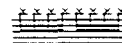
Stay on the same string when possible. When not possible, switch smoothly

-X notation*

Horn/Winds: Air blown through the instrument.

Strings: Bow on the wood of the bridge, creating a dry rasping sound.

Accortion: Blow air through the air release valve.



Blocks Notation:

Cluster chords: Play all chromatic pitches that fall under the hand.

Button Cluster: Press many buttons with the palm.



Courtesy accidentals have been added for the convince of the performers. Conventional accidental rules still apply.

-Duration: 13 - 14 minutes

-Score notated in C

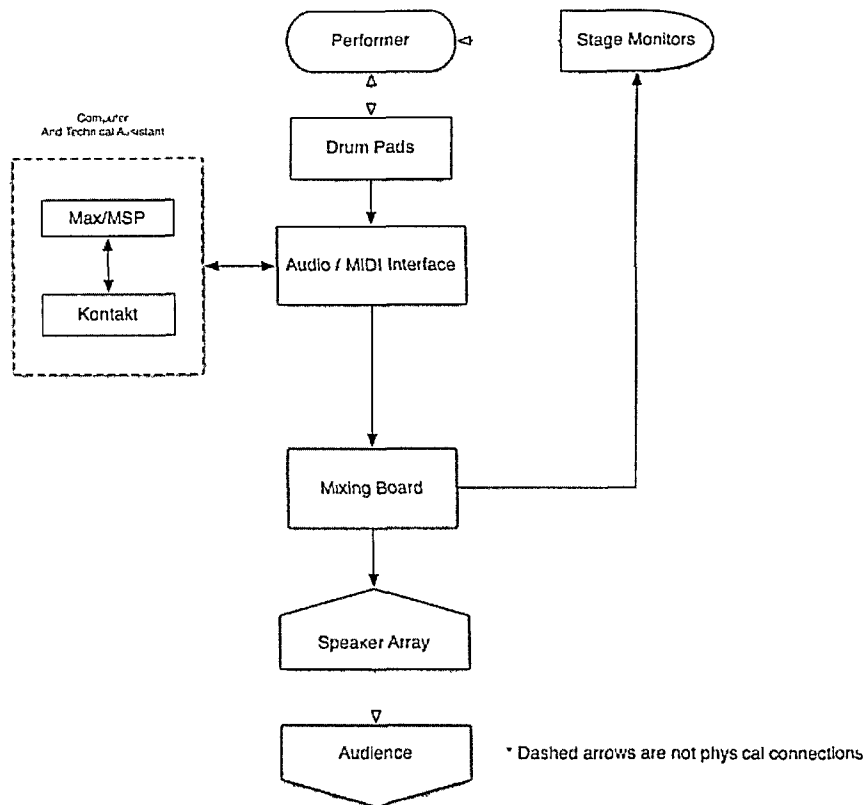
-Instruments at sounding pitch. (Except basses and piccolo)

-Almglocken and gongs are relative pitches.

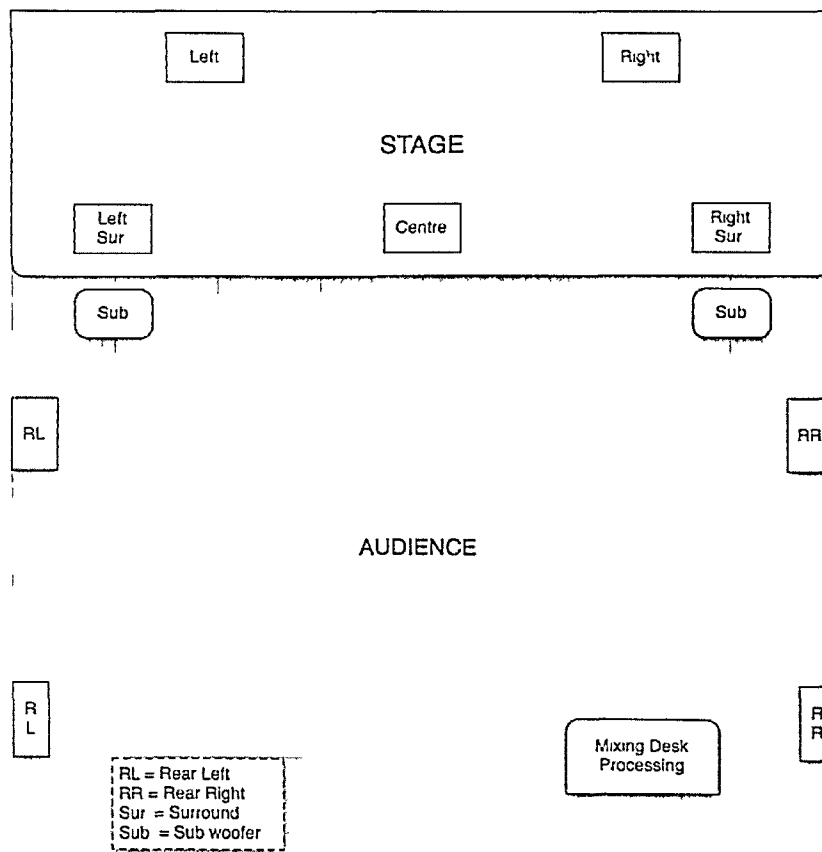
Percussion 1: piccolo snare, vibraphone, bass drum, Large Tam, Toms 1 tubular Bell, 2 Toms, Piccolo woodblocks

Percussion 2: 3 Drum Pads, 5 low cow bells, 3 resonant metals, ride cymbal. glockenspiel.

Signal Path



Speaker Placement



Codex Percussion Key

Percussion 1 Marimba +

Bass Drum

Toms

Piccolo Snare

Rim

Large Tam

Nipple Gongs

Piccolo Woodblocks

C → N → C

During tremolo, slide between the centre and resonant nodes of the marimba bar

Percussion 2

Glockenspiel +

Electronic Drum Pads:

Bass Drum Pad triggers bass drum sounds and longer samples.
 Drum pad 1 (Short): This drum pad triggers shorter dynamic sound files.
 Drum pad 2 (Long): This drum pad triggers longer sound files.
 Drum pad 3 (State): This drum pad triggers patch changes in the electronics.

Drum pads 1, 2 and BD are dynamic sensitive so monitoring will be provided.

Bass Drum

short

long

state

Almglocken x 5

Ride Cymbal

Resonant Metals

Find 3 pieces of metal with interesting resonant qualities and timbres (Hi med low pitch)

N.B. There is one section where perc 2 is asked to play the bass drum

CODECS

Eliot Britton

Flute $\text{♩} = 88$ Glitchy, Quirky *rit.* *a tempo*

Oboe

Clarinet *solo expressive* *mp* *mf* *sfz* *f* *fp* *mp* *mf* *f* *p* *mf* *fp* *mf*

Bassoon

Horn

Trumpet

Trombone

Tuba

Percussion Large tam, metal beater (scrape)

Percussion + Electronics **State A1** *expressive* *mp* *mf* *mp* *mf* *mp* *p* *mf* *f* **State A2** *pp* *mf* *f*

Piano *pp* With pedal where appropriate, except where specified

Violin I $\text{♩} = 88$ Glitchy, Quirky *rit.* *a tempo* *fppp*

Violin II *mp*

Viola *mp*

Cello

Contrabass

[illegible]

This page of a musical score is for a percussion ensemble, featuring multiple staves with complex rhythmic patterns and dynamic markings. The score is written in a key signature of one flat (B-flat) and a 3/4 time signature. The first system includes a grand staff (treble and bass clef) and a separate staff for Toms. The second system continues the percussion parts, with a specific instruction for the Toms to play 'State A3'. The third system shows further development of the rhythmic patterns, with dynamic markings ranging from *pp* (pianissimo) to *f* (forte). The score is characterized by intricate rhythmic figures, including sixteenth and thirty-second notes, and various dynamic markings such as *f*, *mp*, *sfz*, *p*, *mf*, *ppp*, and *p*. A specific instruction 'slowly start trilling' is noted above a staff in the first system. The score is divided into measures by vertical bar lines, and the overall layout is professional and detailed.

GONGS
choke

3

p p q q r r s s t t u u v v w w x x y y z z

Codecs

4 ----- [B] ♩ = 84

Fl 17 2/4 5/4 4/4 5/4

Ob 2/4 5/4 4/4 5/4

Cl 2/4 5/4 4/4 5/4

Bsn 2/4 5/4 4/4 5/4

Hr 17 2/4 5/4 4/4 5/4

Tpt 2/4 5/4 4/4 5/4

Tbn 2/4 5/4 4/4 5/4

Tuba 2/4 5/4 4/4 5/4

Perc 17 2/4 5/4 4/4 5/4

El Perc 2/4 5/4 4/4 5/4

Pno 2/4 5/4 4/4 5/4

Vln I 17 2/4 5/4 4/4 5/4

Vln II 2/4 5/4 4/4 5/4

Vla 2/4 5/4 4/4 5/4

Vc 2/4 5/4 4/4 5/4

Cb 2/4 5/4 4/4 5/4

mf *p* *pp*

f *p* *mf* *n*

mp *mf* *p* *mf* *p*

mf *p* *mf* *f* *p*

pp *p* *n*

n *mf* *ppp* *State 81*

mf *p* *ppp*

p *mp* *mp*

p *mp* *mp*

p *mp* *mp*

p *mp* *mp*

f *pp*

CROTALES + = muted

22

Fl *mp* *mp* *p* *mf*

Ob *pp* *mp*

Cl *pp* *mp* *p* *mf* *mp* *mf* *p* *mf*

Bsn *pp* *mf* *sfz* *p* *f* *f* *mf*

22

Hr *pp*

Tpt

Tbn

Tuba

22

Perc CROTALES *mp* MARIMBA

El Perc *f* *p* *f* *pp* *mf* *mf* *mp* *p* *State B2*

Pno *pp*

22

Vln I *mp*

Vln II *mf* *p* *pp*

Vla *mf* *p* *pp*

Vc *f* *p* *pp*

Cb *mp* *pp*

Codecs

6

C

half pitch half breath

half pitch half breath

26

Fl

sfz *ff* *mf* *mf* *mp*

Ob

Cl

ff *mf* *mp* *pp* *mf* *mp* *mf* *mp*

Bsn

mf *f* *mf* *mf*

Hn

26

Hn

Trpt

Tbn

Tuba

Perc

MARIMBA

fp *mf* *pp* *sfz*

SOFT MALLETS

DRUM STICKS

State C1

p *pp* *mf* *p*

Pno

mf *mp* *pp* *mf* *f* *mf* *p* *ff*

Vln I

26

mf *pp* *mf*

Vln II

Vla

Vcl

Cb

mf

accel

34

Fl

Ob

Cl

Bsn

Hn

Tpt

Tbn

Euba

Perc

El Perc

Pno

Vln I

Vln II

Vla

Vc

Cb

ff *fp* *f* *mp* *f*

ppp *blow through instrument* *f*

ppp *blow through instrument* *f*

ppp *blow through instrument* *f*

ppp *blow through instrument* *f*

ppp *blow through instrument* *f*

mf *mp* *f* *p* *mf*

mf *ppp* *f* *ff*

mp *p* *f* *mp* *f* *ff*

mp

accel

34

ff *pp* *f*

ff *mf* *f*

ff *pp* *f* *mf*

ff *pp* *f*

over bridge

over bridge

over bridge

D

wait for sound file to finish

[illegible]

45

Fl

Ob

Cl

Bsn

Hn

Tpt

Tbn

Tuba

Perc

El Perc

Pno

Vln I

Vln II

Vla

Vc

Cb

p

mf

f

ff

mp

f

ff

mp

pp

mf

pp

ff

gl

gl

gl

pp

ff

MARIMBA

MARIMBA

State D1

A little slower

[illegible]

Codecs

12

wait for sound file to finish **F** ♩ = 88

62 *rit* Except electronics

Fl *mf* *mp* *fp* *p*

Ob

Cl *mf* *mp*

Bsn *mf* *mp*

Hn *pp* *mp* *pp*

Ipt

Tbn *p* *pp*

Tuba *<mp* *pp*

Perc *p* *mf* *p* *f* **State F1**

Cl Perc *mp* *f* *n* *f*

Pno *mf* *mf* *pp*

♩ = 88 **F**

Vln I *mf* *ppp* *mp* *pp* *mp* *sfz*

Vln II *p* *f* *p* *mf* *ppp* *mp* *pp* *mp* *sfz*

Vla *mf* *ppp* *mp* *pp* *mp* *sfz*

Vc *p* *mf* *ppp* *mp* *pp* *mp* *sfz*

Cb *mp* *pp* *mp* *sfz*

sul tasto *molto sul pont*

gl

Keep steady tempo - repeat pattern until fermata

Codecs

13

G Glitchy, Quirky
♩ = 84

67

Fl *pp* *mf* *ppp* *mf* *p*

Ob *mf*

Cl *mf* *ppp* *mf* *p* *mf*

Bsn *mf* *ppp* *f* *p*

Hn *mf* *pp* *mf*

Tpt *mp* *f*

Tbn *mp* *f*

Tuba *mp* *f*

Perc MARIMBA *mf* *p* *ppp* *State G1*

El Perc *mf* *p* *mf*

Pno *mf* *ppp*

Vln I *mf* *mp* *pizz* *arco gl* *fp*

Vln II *mf* *mp* *pizz* *arco gl* *fp*

Vla *mf* *mp* *pizz* *arco gl* *fp*

Vc *mf* *mf* *gl* *mp*

Cb *mf* *mf* *gl* *mp*

blow through instrument

blow through instrument

blow through instrument

how over bridge

how over bridge

how over bridge

how over bridge

how over bridge

71

Fl *mf*

Ob *f*

Cl *mf* *p* BASS CLARINET *f*

Bsn *f*

Hn *p* *fp* *mf* *f* *p* *mp* *n*

Tpt *fp* *mf* *f* *p* *mp* *n*

Tbn *mf* *f* *p* *mp* *n*

Tuba *mf* *f* *p* *mp* *n*

Perc 71 *f* metal beater *p* scrape tam with metal beater

El Perc *f* *ff* *ff* *p* *mf* *f*

Pno *mp*

Vln I 71 *f* *mp* *sfz* *mp* *sfz* *f* *mp* slide over bridge pressure screech norm

Vln II *f* *mp* *sfz* *mp* *sfz* *f* *mp* slide over bridge pressure screech norm

Vla *f* *mp* *sfz* *mp* *sfz* *f* *mp* slide over bridge pressure screech norm

Vc *f* *mp* *sfz* *mp* *sfz* *f* *mp* slide over bridge pressure screech norm

Cb *f* *mp* *sfz* *f* *sfz* *f* *mp* slide over bridge pressure screech norm

Codecs

H $\text{♩} = 108$ 15

rit -----

77

Fl 4/4 6/4 4/4 4/4 4/4

Ob 4/4 6/4 4/4 4/4 4/4

Cl 4/4 6/4 4/4 4/4 4/4 Bb CLARINET

Bsn 4/4 6/4 4/4 4/4 4/4

77

Hr 4/4 6/4 4/4 4/4 4/4

Tpt 4/4 6/4 4/4 4/4 4/4

Tbn 4/4 6/4 4/4 4/4 4/4

Tuba 4/4 6/4 4/4 4/4 4/4

77

Perc 4/4 6/4 4/4 4/4 4/4

El Perc 4/4 6/4 4/4 4/4 4/4 **State H1**

Pno 4/4 6/4 4/4 4/4 4/4

77

rit -----

$\text{♩} = 108$ **H**

Vln I 4/4 6/4 4/4 4/4 4/4

Vln II 4/4 6/4 4/4 4/4 4/4

Vla 4/4 6/4 4/4 4/4 4/4

Vc 4/4 6/4 4/4 4/4 4/4

Cb 4/4 6/4 4/4 4/4 4/4

pp *ff* *mf* *sf* *pp*

gl *gl* *gl* *gl*

Codecs

16

[illegible]

90

Fl

mf sfz mp mf mp f mf

Ob

pp mp mf f sfz f mf

Cl

Bb CLARINET

mp mf

Bsn

Hn

mp pp

Tpt

Tbn

Tuba

Perc

soft mallets GONGS

pp mf

Fl Perc

rim dome rim

ppp mp p

mp mf

choke

State 11

Pno

Vln I

n

Vln II

n

Vla

n

Vc

n

Cb

n

90

1 1 = 88

[illegible]

This page of a musical score, likely for a symphony orchestra, contains staves for the following instruments:

- Woodwinds:** Flute I (Fl), Oboe (Ob), Clarinet I (Cl), Bassoon (Bsn), Horn (Hn), Trumpet (Tpt), Trombone (Tbn), and Tuba.
- Percussion:** Percussion (Perc), Electric Percussion (El Perc), and Piano (Pno).
- Strings:** Violin I (Vln I), Violin II (Vln II), Viola (Vla), Violoncello (Vc), and Contrabass (Cb).

The score is written in 2/4 time and includes various dynamic markings such as *mp*, *f*, *ff*, *mf*, *p*, and *norm*. It also features articulation marks like accents and slurs. A rehearsal mark 'J' is present at the top right. The page number '19' is in the top right corner.

112

Fl *fp* *ff* *pp* *ff* *mf* *ff* *sfz*

Ob *fp* *ff* *pp* *ff* *mf* *ff* *sfz*

Cl *fp* *ff* *pp* *ff* *mf* *ff* *sfz*

Bsn *fp* *ff* *pp* *ff* *mf* *ff* *sfz*

Hn

Trpt

Tbn

Tuba

112

Perc

El Perc

Pno

Vln I *ffp* *f* *f* *mp* *mf* *ff* *mp* *ff* *pp*

Vln II *ffp* *f* *f* *mp* *mf* *ff* *mp* *ff* *pp*

Vla *ffp* *f* *f* *mp* *mf* *ff* *mp* *ff* *pp*

Vc *ffp* *f* *f* *mp* *mf* *ff* *mp* *ff* *pp*

Cb

State J2

LONG SOUND FILE

MARIMBA *mp* *mf*

f *mp* *mf* *ff* *mp* *f* *n*

slight rit ----- *a tempo*

[illegible]

Codecs

22

accel

jagged

K 126 *a tempo*

Fl *f mf ff*

Ob *mp f mf ff*

Cl *f mf ff*

Bsn *f mf ff* *f*

Hrn 126 *f mf ff*

Tpt *mf*

Tbn *f*

Tuba

Perc 126 MARIMBA *pp*

El Perc *mf*

Pno *mf mp*

Sea *Sea* ***

K 126 *a tempo*

Vln I *ff* *fff* *f mf f mf ff* *mf*

Vln II *ff* *fff* *f mf f mf ff* *mf*

Vla *ff* *fff* *f mf f mf ff* *mf*

Vcl *ff* *fff* *f mf f mf ff* *mf*

Cb *ff* *fff* *fff*

[illegible]

142

11 *mf* *f* *ff* *mf* *ff* *mf* *ff* *mp* *f* 16 7/4

Ob *ff* *mp* *mf* *pp* *f* *ff* *mf* *ff* *mf* *ff* *f* 16 7/4

Cl *ff* *mp* *mf* *pp* *f* *ff* *mf* *ff* *f* *ff* *mp* *f* 16 7/4

Bsn *f* *ff* *mf* 16 7/4

Hn 142 7/16 7/4

Tpt 7/16 7/4

Tbn 7/16 7/4

Tuba 7/16 7/4

Perc 142 TOMS *pp* *ff* 7/16 7/4

1st Perc *mp* *pp* *mf* *ff* 7/16 7/4

Pno 7/16 7/4

Vln I 142 *ff* *mp* *mf* *pp* *ff* 7/16 7/4

Vln II 7/16 7/4

Vla *mf* 7/16 7/4

Vc *mp* *ff* 7/16 7/4

Cb *ff* *arco* *mp* 7/16 7/4

Codecs

26

Codecs

L

accel

M

27

♩ = 136

[illegible]

164

FLUTE

Fl

Ob

Cl

Bsn

164

Hn

Tpt

Tbn

Tuba

164

Perc

El Perc

LONG SOUND FILE

f

Hold down the pedal until [N]

Pno

164

Vln I

Vln II

Vla

Vc

Cb

174

Fl

Ob

Cl

Bsn

Hn

Tpt

Tbn

Tuba

Perc

El Perc

Pno

Vln I

Vln II

Vla

Vc

Cb

p

f

p

p

ffz

pp

ffz

p

ppp

p

ff

mf

p

mp

pp

ffz

p

pp

ffz

p

pp

ffz

p

mp

ffz

p

LONG SOUND FILE

BASS DRUM wooden mallets

181

Fl *mp*

Ob *mp*

Cl *mp*

Bsn *mp*

181

Fln *ff* *mp* *apca*

Tpt *mp*

Tbn *mp*

Tuba *pp* *sfz* *mp*

181

Perc *mf* *pp*

Fl Perc *p* *fff* *f*

BASS DRUM

PADS

LONG SOUND FILE

Pno *fff*

181

Vln I *mp*

Vln II *mp*

Vla *mp*

Vcl *mp*

Cb *mp*

This page of the musical score covers measures 187 through 191. The instrumentation includes Flute I, Oboe, Clarinet, Bassoon, Horn, Trumpet, Trombone, Tuba, Percussion, and String ensemble. The score is written in a key with one sharp (F#) and a 3/4 time signature. The music is characterized by intricate rhythmic patterns, including sixteenth and thirty-second notes, and various dynamic markings such as *mf* (mezzo-forte), *pp* (pianissimo), and *f* (forte). The Flute I part begins in measure 187 with a *mf* dynamic, while the Oboe and Clarinet parts enter in measure 188. The Bassoon part is present throughout the measures. The Horn, Trumpet, Trombone, and Tuba parts also feature complex rhythmic figures. The Percussion part includes a snare drum and cymbal, with a *f* dynamic marking in measure 187. The String ensemble part is written for Violin I, Violin II, Viola, Violoncello, and Contrabasso, with a *f* dynamic marking in measure 187. The score is a page from a larger work, as indicated by the measure numbers and the page number 187.

N

N

[illegible]

199 shadow the horn

Fl *pp* *p* *ppp* *mp* *pp* *p* *ppp*

Ob

Cl shadow the horn

Cl *pp* *p* *ppp*

Bsn

199 solo expressive

Hn *fp* *f* *ppp* *f* *mp* *ff* *mp*

I pt

1 bn shadow the horn

1 bn *ppp* *pp* *p* *ppp*

Tuba

199 bowed IV CROTALES

Perc *mf*

Cl Perc *f* *f* *mp* *ff* *mp*

State N1

Pno shadow the horn
play chromatic clusters around the given pitch
Use both hands to slur passages together

Pno *pp* *p* *ppp* *mp* *pp* *p*

senpre pedale

199 sul tasto

Vln I subito *pp* *mf* molto sul pont

Vln II subito *pp* *mf* molto sul pont

Vla subito *pp* *mf* molto sul pont

Vc subito *pp* *mf*

Cb subito *pp* *mf*

205

Fl

pp mp pp < p > pp sfz pp p pp > ppp

Ob

pp mp pp < p > pp sfz pp p pp > ppp

Cl

pp mp pp < p > pp sfz pp p pp > ppp

Bsn

pp mp pp < p > pp sfz pp p pp > ppp

Fin

mf ff f < ff > f sfz p ff f > mf

Tpt

Tbn

pp mp pp < p > pp sfz pp p pp > ppp

Tuba

Perc

pp mp pp sfz pp p pp > ppp

El Perc

mp ff mf f f p mf

Pno

pp mp mf pp p pp > ppp

Vln I

pp mf

Vln II

pp mf

Vla

pp mf

Vc

pp mf

Cb

pp mf

molto sul pont

molto sul pont

211

Fl

Ob

Cl

Bsn

Hn

Tpt

Tbn

Tuba

Perc

Cl Perc

Pno

Vln I

Vln II

Vla

Vc

Cb

p *mp* *pp* *mf* *f* *pp* *mp* *f* *p* *norm* *n* *norm* *norm* *norm* *norm*

Detailed description of the musical score: The score is for measures 211 to 214. The woodwind section (Fl, Ob, Cl, Bsn, Hn, Tpt, Tbn, Tuba) and Percussion (Perc, Cl Perc, Pno) play melodic and harmonic lines with various dynamics. The string section (Vln I, Vln II, Vla, Vc, Cb) provides a harmonic foundation, marked 'norm' (normal). The score includes many slurs, ties, and articulation marks. The key signature has one sharp (F#) and the time signature is 4/4.

Codecs

36

215

Fl *pp* *mf* *f* *mp* *p*

Ob *pp* *mf* *f* *ppp*

Cl *pp* *mf* *f* *mp* *p*

Bsn *pp* *mf* *f* *mp* *p*

215

Hn *mp* *mf* *f* *mp* *p*

Tpt

Tbn *pp* *mf* *f* *mp* *p*

Tuba

Perc *f*

State N2

El Perc

Pno *pp* *mf* *f* *mp*

215

Vln I

Vln II

Vla *n*

Vc *n*

Cb *mf*

TUBULAR BELLS
MARIMBA

t-bells = top note
mrmb = bottom note

This musical score is for a piece titled 'Codecs'. It features a large orchestral ensemble. The woodwind section includes Flute (Fl), Oboe (Ob), Clarinet (Cl), Bassoon (Bsn), Horn (Hn), Trumpet (Tpt), Trombone (Tbn), and Tuba. The percussion section includes Percussion (Perc), Electric Percussion (El Perc), and Piano (Pno). The string section includes Violin I (Vln I), Violin II (Vln II), Viola (Vla), Violoncello (Vc), and Contrabass (Cb). The score is divided into measures, with dynamic markings such as *pp* (pianissimo), *mf* (mezzo-forte), *f* (forte), *mp* (mezzo-piano), and *p* (piano) indicating volume changes. A specific section is labeled 'State N2' in a box. Performance instructions for 'TUBULAR BELLS' and 'MARIMBA' are provided, clarifying that 't-bells' refers to the top note and 'mrmb' refers to the bottom note. The score begins at measure 215.

22/

Fl *n.* *pp*

Ob *pp* *mf* *mf* *mp*

Cl *n.*

Bsn. *n.*

Hn. *n.*

Tpt

Tbn *n.*

Tuba *p* *mp* *sfz*

Perc 22/ *mf* *f*

El Perc *f* *f* *f*

Pno. *normal pedaling*

Vln. I 22/

Vln. II *n.*

Vla

Vc.

Cb *sfz* *sfz* *mp*

38

230

Fl

mf

pp

Ob

Cl

Bsn

230

Hn

1 pt

Tbn

Tuba

230

Perc

State N3

transitional sound file

f

f

Pno

230

Vln I

Vln II

Vla

Vc

Cb

n

n

241 $\text{♩} = 76$

Hr

Ob

Cl *gliss*
p *mf* *p* *mf* *f*

Bsn

241

Hrn

Tpt

Tbn

Tuba

241

Perc *sf* *p* *mf* *pp* *mf*

El Perc

Pno *ppp* *mp*

241 $\text{♩} = 76$

Vln I *gl* *n* *mp* *p*

Vln II *n* *mp* *p*

Vla *gl* *p* *mf* *f*

Vc *p* *mf*

Cb *f*

Codecs

40

246

Fl *ppp* *f* *ff*

Ob *ppp* *mf* *pp* *f*

Cl *ppp* *mf* *pp* *f* *n*

Bsn *f*

246

Hrn

Tpt *ppp* *mf* *f* *p*

Tbn *mf*

Tuba

246

Perc *f* *mp* *f*

El Perc *mp*

Pno *ff* *f* *ff*

246

Vln I *f* *p* *f*

Vln II *f* *p* *f*

Vla *f* *p* *f*

Vcl *f* *p* *f* *f*

Cb *f* *f*

State 01

25/

Fl

Ob

Cl

Bsn

Hn

1pt

Tbn

Tuba

Perc

El Perc

Pno

Vln I

Vln II

Vla

Vcl

Cb

ff *mp* *p* *f* *mp* *p* *f*

f *mp* *f* *mf* *mp* *p*

subito p *p*

ppp *f* *ppp* *f* *p* *f* *p*

f *ppp* *f* *pp* *f*

ff *p* *State P1* *LONG SOUND FILE* *mf*

mf *ff* *subito p* *f*

p *mf* *ff* *mf* *fp* *ff* *p* *f*

mf *ff* *mf* *fp* *ff* *p* *mf*

n *ff* *mf*

mp *mf* *ff* *mp* *f* *subito p* *f* *mf*

mp *mf* *ff* *mp* *f* *subito p* *f* *mf*

This musical score page, titled "Codecs" and numbered 42, contains measures 256 through 265. The score is written for a large orchestra and includes the following instruments and parts:

- Flute (Fl):** Measures 256-265, starting with a *mf* dynamic and ending with a *ff* dynamic.
- Oboe (Ob):** Measures 256-265, starting with a *mf* dynamic and ending with a *ff* dynamic.
- Clarinet (Cl):** Measures 256-265, starting with a *mf* dynamic and ending with a *ff* dynamic.
- Bassoon (Bsn):** Measures 256-265, starting with a *f* dynamic and ending with a *ff* dynamic.
- Horn (Hn):** Measures 256-265, starting with a *pp* dynamic and ending with a *f* dynamic.
- Trumpet (Tpt):** Measures 256-265, starting with a *mf* dynamic and ending with a *f* dynamic.
- Trombone (Tbn):** Measures 256-265, starting with a *mf* dynamic and ending with a *f* dynamic.
- Tuba:** Measures 256-265, starting with a *mf* dynamic and ending with a *f* dynamic.
- Percussion (Perc):** Measures 256-265, starting with a *mf* dynamic and ending with a *f* dynamic. A **MARIMBA** part is also indicated.
- Flute Percussion (Fl Perc):** Measures 256-265, starting with a *mf* dynamic and ending with a *f* dynamic.
- Piano (Pno):** Measures 256-265, starting with a *p* dynamic and ending with a *f* dynamic.
- Violin I (Vln I):** Measures 256-265, starting with a *p* dynamic and ending with a *ff* dynamic.
- Violin II (Vln II):** Measures 256-265, starting with a *p* dynamic and ending with a *ff* dynamic.
- Viola (Vla):** Measures 256-265, starting with a *p* dynamic and ending with a *ff* dynamic.
- Violoncello (Vc):** Measures 256-265, starting with a *p* dynamic and ending with a *ff* dynamic.
- Double Bass (Cb):** Measures 256-265, starting with a *p* dynamic and ending with a *ff* dynamic.

The score is written in 2/4 time and features a variety of dynamics, including *mf* (mezzo-forte), *p* (piano), *f* (forte), *ff* (fortissimo), and *pp* (pianissimo). The measures are numbered 256 through 265, with a repeat sign at the end of measure 265.

H

267

Fl *n*

Ob

Cl *n* *pp*

Bsn

267

Hn

I pt *ppp*

Tbn *ppp*

Tuba *ppp*

267

Perc *mf* *f* *bowed* *lv* *State Q2*

El Perc *p* *mf* *f* *mf*

Pno *pp* *mp* *n*

267

Vln I *sfz*

Vln II *sfz*

Vla *sfz* *mp*

Vc *sfz* *n*

Cb

271 *half push half breath*

Fl *ppp* *pp* *sfzp* *sfzp* *sfz*

Ob

Cl *n* BASS CLARINET

Bsn

Hr *f* *ppp* *f*

Lpt *f* *ppp* *f*

Tbn *f* *fff*

Tuba *f* *fff*

Perc *f* *pppp* *mf* *pp* *fff*

El Perc *f* *ppp* *mp* *pp* *ff*

Pno *p*

Vln I *n* *pp* *ff*

Vln II *pp* *mp* *ff*

Vla *n*

Vc

Cb *fff* *fp*

tam (metal beater) middle rim lv bd wooden mallets

276

Perc

4/4

3/4

6/16

State R1

mp

mf

Perc

4/4

3/4

6/16

16

Pno

4/4

3/4

6/16

16

mp

f

mf

MARIMBA

276

Violin I

Violin II

Viola

Violoncello

Contrabasso

mf

28/

Fl $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
mp sfz

Ob $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$

Cl $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$

Bsn $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
f

Lin $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
p mp f mp

Tpt $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
p mp f mp

Tbn $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
p mp f mp

Euba $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
p mp f mp

Perc $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff mf f mf

El Perc $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff f

Pno $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff mf f

Vln I $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff sf mf p molto sp pp

Vln II $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff sf mf p molto sp pp

Vla $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff sf mf p molto sp pp

Vcl $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff sf mf p

Cb $\frac{6}{16}$ $\frac{2}{4}$ $\frac{3}{4}$ $\frac{5}{16}$
ff

292 *accel* $\text{♩} = 88$ Driving Forward T $\text{♩} = 84$

Fl *pp* *mf*

Ob *p*

Cl *Bb CLARINET* *mp*

Bsn *mp* *p*

Hr *pp*

Trpt *solo* *Bright heroic* *f* *sfz*

Tbn *mp* *mp*

Tuba *mp*

Perc *mf* *f*

El Perc *State S2* *with the trumpet*

Pno *ppp* *mp* *f*

Vln I *accel* $\text{♩} = 88$ Driving Forward *pp* *mf*

Vln II *pp* *mf*

Vla *pp* *mf*

Vc *pp* *mf*

Cb *pp* *mf*

296

Fl *mp*

Ob *mf* *mp* *f* *mp* *f* *ppp*

Cl Bb CLARINET *mp* *mf* *f* *mp* *f* *ppp*

Bsn *mf* *mp* *f* *ppp* *mf*

Hn 296 *ppp*

Lpt *mf* *f* *mf* *mp* *f* *ppp*

Tbn *mf* *mp* *ppp*

Tuba *mf* *ppp*

Perc 296 MARIMBA *mf* *ppp* *mp*

Fl Perc *mf* *mf*

Pno

Vln I 296 *sfz* *mp* *f* *mf* *f* *ppp*

Vln II *sfz* *mp* *f* *mf* *f* *ppp*

Vla *sfz* *mp* *f* *mf* *f* *ppp*

Vc *sfz* *mp* *f* *mf* *f* *ppp*

Cb *mf* *sfz* *mp* *f* *mf* *f* *ppp*

State S3

This musical score page, titled "Codecs" and numbered 51, contains measures 302 through 305. The score is arranged in a multi-staff format with the following instruments and parts:

- Fl** (Flute): Measures 302-305, dynamics *mp*, *sfz*, *mf*.
- Ob** (Oboe): Measures 302-305, dynamics *mp*, *sfz*, *mf*.
- Cl** (Clarinet): Measures 302-305, dynamics *mp*, *sfz*, *mf*.
- Bsn** (Bassoon): Measures 302-305, dynamics *sfz*, *mf*.
- Hn** (Horn): Measures 302-305, dynamics *mp*, *sfz*, *mf*, *p*.
- Lpt** (Lyra/Percussion): Measures 302-305, dynamics *mp*, *sfz*, *mf*, *p*.
- Tbn** (Trumpet): Measures 302-305, dynamics *mp*, *sfz*, *mf*, *p*.
- Tuba**: Measures 302-305, dynamics *mp*, *sfz*, *mf*, *p*.
- Perc** (Percussion): Measures 302-305, dynamics *mp*, *mp* > *p*, *mf* > *p*.
- El Perc** (Electric Percussion): Measures 302-305, dynamics *mp*. A box labeled "State S3" is present in measure 303.
- Pno** (Piano): Measures 302-305, dynamics *mf*, *f* *mp*.
- Vln I** (Violin I): Measures 302-305, dynamics *mf*.
- Vln II** (Violin II): Measures 302-305, dynamics *mf*.
- Vla** (Viola): Measures 302-305, dynamics *mf*.
- Vc** (Violoncello): Measures 302-305, dynamics *mf*.
- Cb** (Cello): Measures 302-305, dynamics *mf*.

The score features complex rhythmic patterns, including sixteenth and thirty-second notes, and various dynamic markings such as *mp* (mezzo-piano), *sfz* (sforzando), *mf* (mezzo-forte), and *p* (piano). The time signature changes from 5/16 to 4/4 and then to 3/4. A box labeled "State S3" is located in the Electric Percussion part in measure 303.

U

U

This musical score page, titled "Codecs" and numbered 53, contains measures 31 through 33 of a composition. The score is written for a large orchestra and includes the following parts:

- Fl** (Flute): Measures 31-33, dynamics *ff*, *mf*.
- Ob** (Oboe): Measures 31-33, dynamics *mf*.
- Cl** (Clarinet): Measures 31-33, dynamics *sfz*, *mp*, *f*, *ff*, *mf*.
- Bsn** (Bassoon): Measures 31-33, dynamics *ff*.
- Hrn** (Horn): Measures 31-33, dynamics *mf*, *ff*, *fp*.
- Trpt** (Trumpet): Measures 31-33, dynamics *mf*, *ff*, *fp*.
- Tbn** (Trombone): Measures 31-33, dynamics *mf*, *ff*, *fp*.
- Tuba**: Measures 31-33, dynamics *mp*, *ff*.
- Perc** (CROTALES v): Measures 31-33, dynamics *mf*, *ff*, *ppp*, *mp*. Includes the instruction "ritardando out of time" starting at measure 33.
- Cl Perc**: Measures 31-33, dynamics *f*, *mf*, *f*, *ff*.
- Pno** (Piano): Measures 31-33, dynamics *f*, *mf*, *ff*, *p*. Includes the instruction "ritardando out of time" starting at measure 33.
- Vln I** (Violin I): Measures 31-33, dynamics *ff*, *mf*, *mp*.
- Vln II** (Violin II): Measures 31-33, dynamics *ff*, *mf*, *mp*.
- Vla** (Viola): Measures 31-33, dynamics *ff*, *mf*, *mp*.
- Vcl** (Violoncello): Measures 31-33, dynamics *ff*, *mf*, *mp*.
- Cb** (Cello): Measures 31-33, dynamics *ff*.

The score features complex rhythmic patterns, including triplets and sixteenth notes, and dynamic markings such as *sfz*, *mp*, *f*, *ff*, *mf*, *fp*, *ppp*, and *p*. The tempo/mood changes from 3/3 to 6/16 to 3/4 across the measures.

Codecs

54

V

Molto Rubato

Fl *pp*

Ob

Cl *p*

Bsn *mf* *p* *sfz* *mf* *mp*

Hrn *p* *pp*

Tpt *pp*

Tbn *f* *pp* *sfz* *pp* *sord*

Tuba *mp*

Perc *ppp* *State V1* *LONG SOUND FILE* *follow bassoon*

El Perc *mf* *mf* *mp* *mf*

Pno *p*

V

Molto Rubato

Vln I *n* *pp* *mp* *mf* *p* *mf* *p* *<sfz* *mp*

Vln II *n* *pp* *mp* *mf* *p* *mf* *p* *<sfz* *mp*

Vla *n* *pp* *mp* *mf* *p* *mf* *p* *<sfz* *mp*

Vcl *n* *pp* *mp* *mf* *p* *mf* *f* *mp* *<sfz* *mp* *mf*

Cb *n* *pp* *mp* *mf* *p* *mf* *f* *mp* *<sfz* *mp* *mf*

328 FLUTE

Non Rubato

F1

mp

Ob

mp

Cl

mp

Bsn

fz

p

mp

328

Hn

Tpt

solo

p

mp

sfz

pp

senza word

Tbn

p

mp

sfz

pp

Iuba

328

BASS DRUM

Perc

pp

mp

ppp

State V2

LI Perc

f

Pno

pp

Non Rubato

Vln I

p

mp

p

Vln II

p

mp

p

Vla

p

pp

Vc

mp

p

mp

Cb

mp

p

mp

gl

gl

334

Fl

Ob

Cl

Bsn

Hn

Tpt

Tbn

Tuba

Perc

PI Perc

Pno

Vln I

Vln II

Vla

Vc

Cb

ff

pp

mf

mp

f

aggr vivcly

cuivre

State V3

334

349

Codecs

x

$\text{♩} = 60$

57

339

Fl f fp pp Lyrical

Ob f fp mf sfz mp

Cl f fp p

Bsn f fp

339

Hln f fp f sfz mp pp

Tpt f fp

Tbn f fp

Tuba f fp

339

Perc BD mf sfz pp

Fl Perc f mf State X0 LONG SOUND FILE

Pno f

$\text{♩} = 84$

339

Vln I ff $\text{♩} = 60$ Lyrical

Vln II ff

Vla ff

Vcl ff

Cb ff sfz mf

Codecs

58

345

11 *mf* *mp* *sfz* *mp* *p*

Ob *mf* *mp* *mf* *mp*

Cl *mf* *mp* *mf* *mp*

Bsn *mf*

Hn

Trpt

Tbn

Tuba

Perc *p* *mf* *f* *p*

Fl Perc *mp* *mf* *f* *p*

Pno *p* *pp* *mf* *mp*

Vln I

Vln II

Vla

Vc

Cb

$\text{♩} = 30$

accel

349

mp

pp

mf

pp

pp

mf

mp

mf

p

mp

mp

p

mf

p

Hr

349

Tpt

Ibn

Tuba

349

Perc

El Perc

State X1

p

Pno

mp

$\text{♩} = 30$

accel

molto sul pont

mp

molto sul pont

mp

molto sul pont

mp

molto sul pont

mp

Vln I

Vln II

Vla

Vc

Cb



As fast as possible, frantic

♩ = 100

11

pp

mp

Ob

pp

mp

Cl

pp

mp

Bsn

pp

mp

352

Hr

5/16 6/16 4/4

Tpt

5/16 6/16 4/4

Ibn

p sfz p sfz p

Tuba

p sfz p sfz p

352

Perc

5/16 6/16 4/4

El Perc

mf

5/16 6/16 4/4

Pno

f

5/16 6/16 4/4

352

Vln I

sul tasto mf norm

5/16 6/16 4/4

Vln II

sul tasto mf norm

5/16 6/16 4/4

Vla

sul tasto mf norm

5/16 6/16 4/4

Vc

sul tasto mf norm

5/16 6/16 4/4

Cb

ff

5/16 6/16 4/4

356

Fl *mf* *mp*

Ob *mf*

Cl *mf*

Bsn *mf*

Hr *open* *chvr* *f* *ff*

Lpt *chvr* *sfz* *p* *mp* *mf* *f*

Tbn *chvr* *sfz* *p* *mp* *mf* *f*

Tuba *chvr* *sfz* *p* *mp* *mf* *f*

Perc 356 *mp* **State Y1**

L1 Perc *f* *mp*

Pno *mp*

Vln I 356 *f* *mp*

Vln II *f* *mp*

Vla *f* *mp*

Vc *f* *mp*

Cb *f* *mp*

365

Fl

Ob

Cl

Bsn

365

Hrn

Tpt

Tbn

Tuba

365

Perc

El Perc

Pno

365

Vln I

Vln II

Vla

Vc

Cb

f *ff* *mf*

f *ff* *mf*

f

ff *solo* *cuvré* *rip* *sfz* *mp* *ff*

fp *f*

fp *f*

p *ff*

sfz *p* *ff*

sfz *p* *ff*

sfz *p* *ff*

sfz *p* *ff*

Codecs

64

368

PICCOLO

Fl *f* *mp*

Ob *f* *mp*

Cl *f* *mp*

Bsn *f* *mp*

368

Fltn *f* *mf* *mp* *f* *ff* *mf* *mp*

Trpt

Trbn *CHAVE* *ff* *f* *ff* *mf* *mp*

Liba *mp*

368

MARIMBA

Perc *f* *sfz* *ppp* *sfz* *pp* *sfz* *mp*

El Perc *f* *p* *f* *solo*

368

Pno *f* *mp* *ff* *mf* *mf* *p*

368

Vln I *f*

Vln II *f*

Vla *f*

Vc

Cb

State 22

373

fl *f mp ff mf mp*

Ob *f mp ff mf mp*

Cl *f mp ff mf mp*

Bsn *f mp ff mf mp*

373

fln *mf f*

Trpt *f*

Tbn *f*

Tuba *mf mf*

373+ N → C

Perc *sfz mp sfz*
LONG SOUND FILE

El Perc

Pno *f sfz sfz*

373

Vln I *ff*

Vln II *ff*

Vla *ff*

Vc *ff*

Cb *ff Heavy*

Codecs

66

[illegible]

382

Fl I *p* *ff p* *ff pp* *ff mp* *ff pp*

Ob *p* *ff p* *ff* *ff mp* *ff pp*

Cl *p* *ff p* *ff pp* *ff mp* *ff pp*

Bsn *p* *ff p*

Hr *p* *ff p* *f* *pp* *pp*

Trpt *p* *ff* *pp* *ff pp* *ff pp*

Tbn *p* *ff p* *ff pp* *ff pp*

Tuba *p* *ff p* *ff pp* *ff pp*

Perc *fppp* *mf*

El Perc *ff* *ff* *ff*

Pno *p* *ff* *pp* *ff ppp* *ff* *pp*

Vln I *ff p* *ff p* *ff p* *ff p* *ff pp*

Vln II *ff p* *ff p* *ff p* *ff p* *ff pp*

Vla *ff p* *ff p* *ff p* *ff p* *ff pp*

Vcl *ff p* *ff p* *ff p* *ff p* *ff pp*

Cb *ff p* *ff p* *ff p* *ff p* *ff pp*

