Reflexion on Western Art Music and Electronica

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Abstract

This paper provides analytical models for avant-garde electronica through an analysis of *Metatron*, an original composition for percussion sextet and electronics, using a novel *Integrated Multi-Scale Analysis (IMSA)* model. The democratization of technology and information have ushered in an unprecedented flourishing of electronic music production. Despite its roots in dance music, electronica's experimental fringes now increasingly overlap with Western art music in terms of complexity, aesthetics, poetics, tools and techniques. New cultural architectures are eroding established boundaries and power structures and require new interdisciplinary approaches to describe and reconcile them. *Metatron* bridges this divide, acting as a reflective device and model for analysis. It embodies characteristics of a rapidly expanding, culturally significant repertoire that defies established genre boundaries and analytical techniques.

This dissertation consists of three sections. The first examines relevant aesthetic, technical and social issues surrounding avant-garde electronica and *Metatron*. The second presents a generalized analytical model of electronica that overcomes some of the limitations and incompatibilities inherent in established score-based and graphical analytical practices. *Integrated Multi-Scale Analysis* and its related *Electronica Production Syntax (EPS*), introduced in this text, integrate cultural studies, analytical approaches from Western art music's electroacoustic and instrumental traditions, and techniques from electronica production practices. The third section comprises a detailed case study, building on the first two sections and applying the *Integrated Mutli-Scale Analysis* approach to *Metatron*.

Resumé

Cette étude fournit des modèles d'analyse pour la musique électronique (l'electronica) avant-gardiste à travers l'analyse de *Metatron*, une œuvre originale composée pour sextuor de percussions et électronique, en se servant du modèle innovant de l'Analyse intégrée multi-échelles (Integrated Multi-Scale Analysis – IMSA). La démocratisation de la technologie et de l'information a annoncé une croissance sans précédent de la production de musiques électroniques. Malgré ses racines dans la dance music, les limites expérimentales de l'electronica se chevauchent actuellement de plus en plus avec la musique savante Occidentale en termes de complexité, d'esthétique, de sens poétique, et de ses outils et techniques de production. De nouvelles architectures culturelles font éroder les frontières bien établies ainsi que les structures de pouvoir, et exigent de nouvelles approches interdisciplinaires pour les décrire et les réconcilier. *Metatron* comble ce fossé, se comportant à la fois comme outil réflexif et comme modèle d'analyse. Ce projet incarne les caractéristiques d'un répertoire culturellement significatif qui s'accroit rapidement et qui défie les limites de genres et de techniques analytiques déjà établies.

Cette thèse consiste en trois sections. La première examine les enjeux esthétiques, techniques et sociaux pertinents qui entourent l'electronica avant-gardiste et *Metatron*. La deuxième présente un modèle analytique généralisé de l'electronica qui dépasse certaines des limitations et des incompatibilités propres aux pratiques reconnues qui se penchent sur la partition ou l'analyse graphique. L'IMSA et sa relation proche Syntaxe de la production électronique (Electronica Production Syntax - EPS), qui sont introduits dans ce texte, intègrent les études culturelles, les approches analytiques des traditions électroacoustiques et instrumentales de la musique savante Occidentale, ainsi que les techniques employées dans la production de l'electronica. La troisième section comprend une étude de cas détaillée, basée sur les deux premières sections, qui met en pratique l'approche de l'IMSA à *Metatron*.

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Part I: Context

Chapter 1: Introductions, Definitions, Scope

1.1 Introduction

Avant-garde electronica is a genre of abstract electronic music that traces its roots to production techniques, technologies and compositional practices associated with commercial electronic dance music and the democratization of audio production technologies. In this context, democratization refers to the increasing accessibility to the means of electronic music production.

The gradual democratization of music technology caused a creative explosion that began in the 1980s and expanded outward to the present (Brackett 2009, 550-553; Théberge 1997, 74-60) Sounds and tools, hitherto available only in academic institutions and large recording studios, have become easy to access and repurpose. Studio technology continues to be virtualized and compressed into smaller forms, shifting from hardware devices to software available across multiple platforms. Increased access to technology and information has altered societal power dynamics and cultural climates. This shift has allowed avant-garde electronica to grow and flourish into a diverse, yet intricately structured set of interpenetrating music genres, each with individual and shared structures, features and aesthetic constraints.

> At this particular moment in the history of computer music, the flow of ideas between high art and popular art seems to have a particular significance. Indeed, the protective parapet that has long kept high art and popular art mutually exclusive seems to be showing signs of vulnerability. It seems that we are about to enter a new cultural architecture that we cannot yet describe; yet we are aware that technology is changing the world and it will also change the world of computer music.[1]

[1] Chadabe, Joel. *Remarks on Computer Music Culture*. 2000. p. 9 - 11

Fourteen years have passed since Chadabe's musings on the future of computerized music making, and during that time, avant-garde electronica has continued to diversify and erode boundaries between high and low art.

Metatron, my composition for percussion sextet and electronics, serves as a reflective device, testing ground, and proof of concept providing a potential answer to Chadabe's questions regarding the erosion of barriers between institutional acousmatic music and avant-garde electronica. His *new cultural architecture* could be interpreted as any number of concurrent trends in the communities and scenes that form the web of electronic music cultures, but this dissertation has identified postdigital aesthetics, shifts in power structures and democratization of information as the *new cultural architectures* that are bringing change to electronic music's creative economy.

1.2 Metatron

Metatron for amplified percussion and electronics is a thirty-minute percussion sextet in five movements. It is scored for traditional percussion instruments as well as synthesizers, processing units, samplers and drum machines. Each movement explores the technological colours and music technologies that define a thirty-year block of music history.

1.3 Context and Motivation

Outside the subsidized, traditional new music sphere and beyond the fringes of popular electronic dance music exists a thriving and creative group of cultures and aesthetics that could challenge the role of art music in today's society. Performed in galleries, warehouses, discreet venues or outdoor festivals, distributed for free online or released through limited edition vinyl or cassette tapes to an audience of connoisseurs, this collection of avant-garde musical genres are highly abstract and structured. Just as Bach's partitas have their roots in the court dances of their day, avant-garde electronica is rooted in contemporary popular electronic dance music. Avant-garde electronica, however, like the baroque allemande, minuet or gigue, has transcended its original function as dance music. It has grown into a sophisticated art form that is created, performed, distributed and experienced in ways that, until recently, were impossible.

Electronica and electronic dance music have generated a great deal of interest from the press, publishers and academics. Histories, ethnographies, documentation and scholarship in both the academic (Butler 2006, Hockman 2014) and popular literature (Reynolds 1999; Bruewster 2000) spheres document and theorize elements of post-disco rave culture and the proliferation of the electronica genre. However, electronica and, to a greater extent, avant-garde electronica have outgrown scholarship that focuses on the birth of house, techno, and the explosion of 1990s DJ and rave culture. Johanna Demer's *Listening Through the Noise* takes a semiotic approach towards a theory of electronica, adding insightful commentary in the form of conceptual, cultural and philosophical analysis of electronica, sound art and academic art music. Her research tends towards a more abstract end of the electronica spectrum, but falls short of attempting to generalize or create a nomenclature or functional analysis.

Butler, on the other hand, generalizes and applies an effective nomenclature that focusing mostly on the DJ, analyzing only the most "characteristic"[2] electronic dance, ignoring the more complex genres that define electronica of the late 1990s and beyond.

Avant-garde electronica begins where the majority of electronic music scholarship drops off, leaving its intricacies poorly understood. How are works from the complex side of the spectrum structured? What is the nature of electronica's sophistication, and how does it compare to parallel trends in academic music spheres?

The walls of the avant-garde have been built up by historically polemic figures like Stockhausen, Boulez, Adorno, and Babbit. For example, Dick Witt's 1995 interview with Stockhausen, alarmingly entitled *Advice to Clever Children*, clarified Stockhausen's Western art music biases. For Stockhausen, avant-garde electronica is unsophisticated, rhythmically and tonally childish, and among other things, *post African* (Dick 1995). These types of condescending and divisive statements from the art music establishment appear increasingly defensive and antiquated when compared to those of Chadabe, but most importantly, they buckle under a close examination of electronica's aesthetics, materials and compositional techniques.

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[2] In this context *characteristic* refers to aesthetics, but specifically gestural complexity and rhythmic density. For example, minimal techno has more straightforward and characteristic rhythms than the breakcore or complextro genres.

1.4 Research Objectives and Methodology

The thrust of this dissertation involves three central research objectives. The first research objective is to examine relevant aesthetic, technical and social issues regarding avant-garde electronica from the perspective of a Western art music composer and electronica producer. This research objective is accomplished by collecting information from academic journals, published texts, interviews and personal observations as a composer, academic, and active member of the avant-garde electronica community. The second research objective is to develop and demonstrate a generalized analytical approach for electronica and avant-garde electronica, using my own work and examples from the repertoire. This research objective is accomplished through the integration of traditional, original and computer assisted analytical techniques. The third research objective is to provide a detailed case study of concepts introduced in the first two research objectives via the author's original composition *Metatron*. This is achieved by providing an *Integrated Multi-Scale Analysis* of *Metatron*, an analytical model developed as part of the second research objective.

1.5 Scope

This text is by no means a comprehensive study of the history of avant-garde electronica, nor does it seek to define what avant-garde **is** and what is **not** in a general sense. This document seeks only to further the discussion started by others, adding information to the somewhat under-theorized areas surrounding compositional practice and analysis. This text's primary focus begins where others have left off (Demers, Butler and Théberge), pushing past 1990's electronic music as a social, cultural and technological phenomena. Instead this text examines electronica's later, more abstract aesthetics through structural and syntactical details from an insider composer / producer perspective.

1.6 Original Contributions

The primary original contribution of the author is the development of an *Integrated Multi-Scale Analysis*[3] method applicable to electronica, avant-garde electronica and acousmatic music with significant rhythmic elements. This system integrates original,

[3] Abbreviated as IMSA

adapted and computer-assisted analytical and visualization techniques, revealing unifying elements, as well of aspects of structure, form and material.

A secondary original contribution of the author is an examination of the erosion of barriers between electronica and the institutional acousmatic music identified by Chadabe, as well as its cultural and aesthetic implications. This examination identifies the *new cultural architectures* that are driving these aesthetic and cultural shifts, as well as the points of connection between avant-garde electronica and institutional acousmatic music.

1.7 Introduction to Key Concepts

1.7.1 Electronica

The word "electronica" is a controversial term of convenience referring to:

> Electronic music that flourishes primarily outside of academia but also claims some independence from the mainstream music industry. Electronica is split between dance genres such as house or techno and non-dance-oriented music such as drone, ambient or glitch. No specific formal or stylistic parameters govern what is considered electronica; the one common factor seems to be a sense among artists and listeners that electronica is ideologically distinct from both mainstream culture and institutional electronic music.[4]

1.7.2 Avant-garde Electronica

For the purpose of this text, avant-garde electronica is defined as an experimental subset of electronica that in the process of pushing its own aesthetic boundaries, coming to overlap aesthetically with electroacoustic, acousmatic and other subsidized music typically associated with academia and research institutions.

Chapter two thoroughly introduces and discusses electronica and the emergence of avant-garde electronica.

1.7.3 Electronic Music vs. Elektronische Musik

For the purposes of this paper, electronic music refers to music made with electronic or digital instruments or computers. For a minority of scholars, electronic

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[4] Demers, Joanna. *Listening through the Noise: The Aesthetics of Experimental Electronic Music*. 2010 p. 167.

music refers to the post war period of serial synthesizer music experimentation. The more specific *elektronishe musik*, will be used in this particular context.

1.7.4 Postdigital

This dissertation presents an expanded definition of the term postdigital. In this text, postdigitalism, postdigital culture, or postdigital aesthetics identifies an emerging paradigm shift towards trends in artistic practice where digital technologies have become ubiquitous. My expanded definition includes the renewed interest in tactile interfaces, analog/digital hybrid technologies, and the cycle of production and virtualization of electronic musical instruments. This concept is discussed at length in section 3.3.

1.8 Organization

This thesis is divided into two volumes. Volume I is a written document examining avant-garde electronica and the author's original composition *Metatron*. Volume II contains the notated musical score for the work.

Volume I is divided into two parts. Part One introduces electronica and avant-garde electronica, and provides cultural and technological context. This section introduces terms, concepts, technologies and production methods. These ideas are applied to avant-garde electronica in general, and then more specifically to *Metatron*.

Part Two examines the syntax, structure and materials of avant-garde electronica, providing a multi-leveled analytical framework. i.e. the *Integrated Multi-Scale Analysis*. The IMSA framework is demonstrated with varied examples from the repertoire, and then by a more detailed analysis of *Metatron*.

Chapter 2: Avant-garde Electronica and Western Art Music

> The division between high-art electronic music and pop electronic music is best defined in terms of rhythmic content. Pop electronic music uses repetitive beats, primarily in 4/4 time, but a new generation of composers is working within that structure to create what is essentially the new art music. This phenomenon is an outgrowth of such historical currents as minimalism and postmodernism, along with the continuing development of a global technoculture; it is part of a larger cultural shift in which art is becoming more connected with society rather than being created by and for specialists. This positive development is being accelerated by the rapid evolution of new technologies for producing and reproducing music today, as well as by new possibilities for distribution and dissemination of music electronically.[5]

This chapter gives context to electronica as a genre by tracing its development and examining its points of contact with the Western art music field. Section 2.2 details the etymology of the term electronica by comparing and contrasting its contradictory and often loaded definitions. Section 2.3 places electronica and avant-garde electronica in a larger musical context using Brackett's *genre levels*, Bourdieu's *cultural capital* and Philip Tagg's *axiomatic triangle*. Section 2.4 examines the usage of the term electronica from contrasting perspectives. Section 2.5 provides a historical account of electronica, beginning with disco and tracing the emergence of increasingly diverse and abstract genres. Section 2.6 identifies characteristic features of avant-garde electronica, and 2.7 explores their similarities with aesthetic principals of Western art music. Section 2.8 provides examples of electronica musicians and communities crossing paths with academic institutions.

2.1 Electronica's Contradictory Etymology

> Of all the terms devised for contemporary non-academic electronic music (the sense intended here), 'electronica' is one of the most loaded and controversial. While on the one hand it does seem the most

[5] Pleasure Beats: *Rhythm And The Aesthetics Of Current Electronic Music*. 2002 p. 3

> convenient catchall phrase, under any sort of scrutiny it begins to implode.[6]

A discussion of the relationship between avant-garde electronica and Western art music's electroacoustic tradition requires functional definitions of both terms. Evolving genre definitions, historical trends and multiple perspectives eliminate the possibility of a concise, authoritative definition. However, *avant-garde* electronica *is* straightforward in that it refers to innovative and experimental electronica. This statement leads to questions such as: innovative and experimental compared to what, by whose standard, and at what point in time? The controversial and contradictory etymology of the term electronica compounds the difficulty in defining the scope and essential characteristics of the genre. The terms *avant-garde* and *electronica* are context and perspective dependent. An effective definition of avant-garde electronica as a genre can only be ascertained by unpacking and recombining these terms.

The following definitions from a variety of sources can serve as points of reference for our purposes:

Merriam-Webster:

> **Electronica:** A kind of popular dance music that is produced using electronic equipment (such as synthesizers).[7]

Webster's provides a simplistic and inaccurate definition, avoiding any distinction between electronica, and popular dance music. This definition implies a subtle Western art music bias due to the grouping of everything *other* as "popular" by default. In summary, according to Webster's Online, electronica is:

- Popular
- Dance Music
- Made with electronic equipment

[6] Blake, Andrew. *Living through Pop*. 1999 p. 155
[7] Electronica. 2014. In *Merriam-Webster.com*. Retrieved Dec 5, 2014, from http://www.merriam-webster.com/dictionary/electronica

Oxford Dictionary:

> **Electronica:** A popular style of music deriving from techno and rave and having a more ambient, esoteric, or cerebral quality.[8]

Oxford provides a more useful but somewhat contradictory definition. While it acknowledges esoteric and cerebral elements, the use of the term *popular* inaccurately associates all electronica with mass appeal, distribution and marketing. Identifying *techno* and *rave* as electronica's stylistic origin seems arbitrary, as they could have just as easily mentioned any number of other related genres. In summary, according to Oxford dictionaries online, electronica is:

- Popular
- Esoteric / Cerebral / Ambient
- Derived from techno / rave

Urban Dictionary:

> **Electronica:** A mostly media-made term for encompassing all forms of electronic music, as individual forms of electronic music aren't popular enough for record stores to devote full sections to. Generally, it will be found next to an equally small "dance" section that carries the more danceable stuff, while electronica section carries more listening music.
>
> House, Trance, Techno, IDM, Jungle, Anything-core, Trip-hop, Acid / Electronic Jazz, Whatever-bient, and thousands of other obscure genres are generally stuffed into "Electronica".[9]

Despite the polemic tone and light-hearted exasperation at the daunting number of genres electronica purports to encompass, Urban Dictionary.com provides an interesting and useful definition. While UrbanDictionary.com falls short of being considered a trusted scholarly source, it provides a democratically decided vernacular meaning that reflects a particular demographics' understanding of a word in an Internet culture context.

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[8] Electronica. 2014. In *oxforddictionaries.com*. Retrieved July 25, 2014, from http://www.oxforddictionaries.com/us/definition/american_english/electronica

[9] Electronica. 2005. In urbandictionary.com/ Electronica Retrieved Dec 2, 2014, from http://www.oxforddictionaries.com/us/definition/american_english/electronica

The site uses a voting system to filter multiple definitions, finding the one that most resonates with the online community. In this way, UrbanDictionary.com provides the current definition of electronica as understood by a majority[10] of people in a given community at a given time. Interestingly, this definition contains more subtlety and accuracy than the Oxford or Websters versions, although in some cases, it is contradictory, specifically its references to:

- Lack of mainstream appeal
- Emphasis on listening (as opposed to dancing)
- Umbrella term for multiple genres
- Media-constructed term

Wikipedia:

> **Electronica** is a music genre encompassing a wide range of contemporary electronic music designed for a wide range of uses, including foreground listening, some forms of dancing, and background music for other activities. Unlike electronic dance music (EDM), not all examples of electronica are necessarily made for dancing. The genre is loosely defined and has different connotations in different regions and time periods.[11]

Wikipedia's definition of electronica acknowledges the distinction and overlap with EDM[12] as well as the instability of the word in terms of perspective and time period. Notably, this definition emphasizes the function of electronica.

- Contemporary Electronic Music
- Foreground / Background listening
- Not necessarily for dancing
- Loosely defined

Demers: Listening Through the Noise:

> **Electronica:** Electronic music that flourishes primarily outside of academia but also claims some independence from the mainstream music industry. Electronica is split between dance genres such as house or techno and non-dance-oriented music such as drone, ambient, or glitch. No specific formal stylistic parameters govern what counts as

[10] This is limiting the source of this definition to people who use the internet.
[11] Electronica. 2011. In Wikipedia.com. Retrieved Dec 11, 2014, from http://en.wikipedia.org/wiki/Electronica
[12] More than simply referring to dance music made with computers, EDM is a marketing term used to promote dance music events in North America, skirting associations with 1980s/90s rave events that drew significant unwanted attention and were largely outlawed in the early 2000s.

> electronica; the one common factor seems to be a sense among artists and listeners that electronica is ideologically distinct from both mainstream culture and institutional electronic music. The term began to appear in the 1990s as a music-industry tool to brand what had become an explosion of niche EDM subgenres such as acid house and jungle. Along with electroacoustic music and electronic sound art, electronica is one of three metagenres of recent electronic music.[13]

In her text *Listening Through the Noise,* Johanna Demers provides a comprehensive examination of the term electronica. She discusses the scope of the term, as well as its ambiguity and origins. This definition also mentions the divide between dance and listening oriented music, as well as aspects of ideology. In summary, according to Demers electronica is:

- Outside Academia
- Independent from mainstream music industry
- No formal or stylistic parameters
- Media-made term
- Dance genres vs. Listening genres
- Ideologically distinct

[13] Demers, Johanna. *Listening Through the Noise*. 2010 p. 167

2.1.1 But is it Pop?

Philip Tag in his 1982 article *Analyzing Popular Music*, presents a model for differentiating folk music, art music and popular music according to multiple factors, including: methods of transmission, distribution, storage, role of notation, documented theory and aesthetics. The following table shows a portion of Tagg's axiomatic triangle, with the addition of electronica to the far right.

Characteristic		Folk Music	Art Music	Popular Music	Electronica
Produced and transmitted by	primarily professionals		X	X	X
	primarily amateurs	X			X
Main mode of storage and distribution	oral transmission	X			X (YouTube)
	musical notation		X		X (MIDI)
	recorded sound			X	X
Written theory and aesthetics	uncommon	X		X (?)	X (?)[14]
	common	X	X	Common[15]	X (?)

Table 2.1-1 Tagg Axiomatic Triangle and Electronica

Music scholarship, transmission, production and distribution has changed a great deal since 1982. While Tagg's axiomatic triangle provides a functional way of categorizing folk, art and popular music from earlier periods, it stumbles when confronted with a comparatively new genre like electronica. Electronica represents a quickly evolving technology dependent genre that is produced, documented, transmitted and performed both by professionals and amateurs. I do not intend to imply that electronica musicians are writing treatises, scores, and documenting their aesthetic practices in the same way as in the Western art music tradition (although informative print books are being released, see: Aikin, 2007; Adamo 2012) but rather that electronica is documenting itself on its own terms, in its own way, with its own language and conventions. Many aspects of electronica's aesthetics are effectively documented through online forums, video tutorials, production manuals and other resources. These

[14] Depending on your definition of *written theory and aesthetics*, writings focused on electronica's aesthetics and theory may be incredibly common. Traditional, peer reviewed scholarly academic sources? Uncommon. Online tutorials, videos, magazine articles and technical manuals? Common.
[15] More common now than when the article was published in 1982. In the original table, this was empty.

developments and their effect on the boundaries between Western art music and electronica are covered in detail in chapter 3.

What Tagg's axiomatic triangle does show is that this chapter's contradictory definitions are the result of discrepancies in analytical models sourced from before and after the cultural, technological and aesthetic shifts outlined in chapter three.

2.2 Levels of Genre

When examined as a whole, the bullet points in section 2.1 provide clear evidence that electronica has different and often-contradictory meanings in published, scholarly, popular and community driven sources. Why?

Electronica's multiple meanings, each dependent on the context and perspective in which they are used, threaten to render the term incapable of describing anything concrete. Difficulty with slippery genre terminology of this type has established precedents and reflects a common problem with writings on genre and identity in general. Multiple definitions, perspectives, and contexts may be reconciled, or at least clarified and contained, by introducing and identifying multiple *levels of genre* (Brackett, Forthcoming).

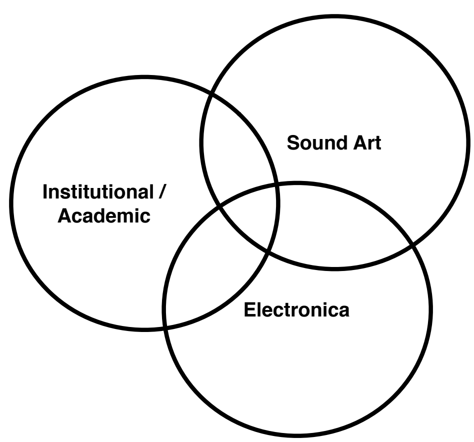

Figure 2.2-1 Electronic Music Metagenre Venn Diagram

For example, Demers uses the term electronica as a metagenre, in opposition to institutional/academic electroacoustic music and sound art (Demers 2010, 171). See figure 2.2-1 for a Venn diagram of Demers' electronic music metagenres. In this diagram the overlapping relationships between electronica, institutional art music, and sound art is evident. This definition clarifies her discourse, but quickly collapses when applied in other contexts. It is for this reason that Brackett's genre level based approach identifies and categorizes the context in which genres are used. In other words, the term *electronica* can most accurately be expressed as a multi-level schema that visualizes and integrates multiple perspectives. For example, relevant discourse surrounding avant-garde electronica and Western art music can be expressed through the following diagram:

2.2.1 Levels of Genre

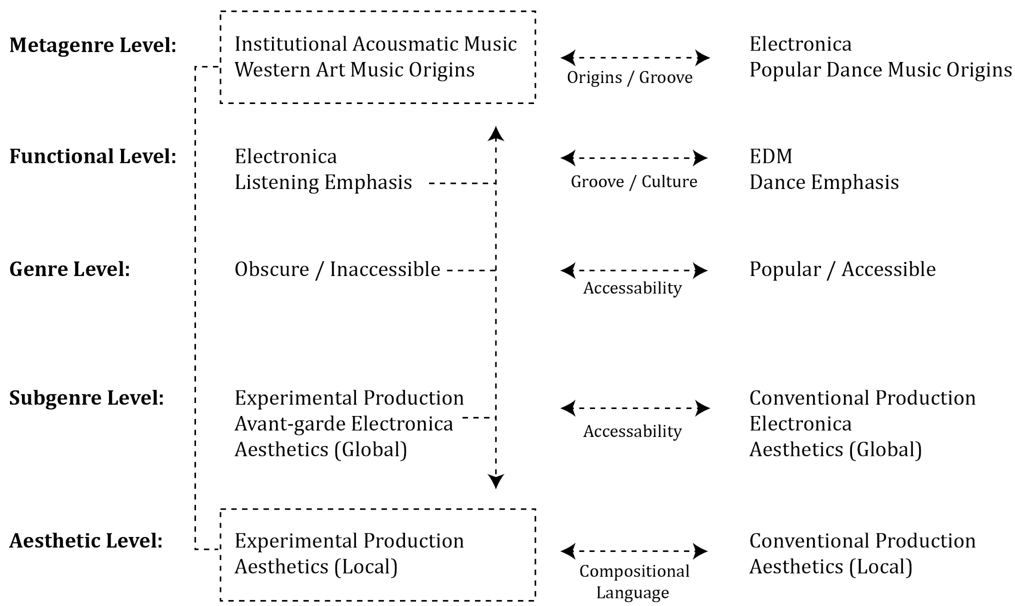

Figure 2.2-2 Electronic Music Genre Level Diagram (General)

The above figure illustrates the relationship between Western art music's institutional acousmatic music and electronica's genre level continua. Each genre level represents a field of musical production with its own aesthetic and cultural discourse. The genre levels are indicated on the left of figure 2.2-2, continuing horizontally across the schema, with horizontal arrows denoting a related spectrum. For example, At the *Subgenre Level,* an obscure minimal techno track can combine elements of conventional dance music production, while significant section elements overlap aesthetically with institutional acousmatic music. An example would be Amon Tobin's "Goto 10", from the 2011 album *ISAM*. Alternatively, at the *Aesthetic Level* a work of avant-garde noisecore or ambient may have compositional features that make it indistinguishable from institutional electroacoustic music without being connected to the institutions that define that community. The dashed vertical arrows represents a continuum of potential aesthetic overlap between experiential electronica and the Western art music tradition.

In figure 2.2-2 the ***Metagenre Level*** describes a genre continuum relating to music composed through electronic means. The left side being groove free electronic music of Western institutional/academic origins, the right side being groove based electronic music with popular music origins (Neil 2002, 3-6). Electronic music composed within the Western art music tradition or electronica metagenre can be expressed as a point on this line. The arrow refers to the spectrum of groove, compositional practices, tools and techniques. This genre level provides a point of reference for discourse on 'serious' electronic music, as defined by Demers (Demers 2010 15), Niel (Niel 2002), Chadabe, Reynolds, Tagg and others. This level is informed by academics, researchers and composer practitioners with institutional affiliation seeking to distinguish the Western cannon from popular sources (Tagg 1982).

The ***Functional Level*** provides an electronica specific genre continuum. At this level, electronica divides between popular electronic dance music on the right and more experimental, listening focused music on the left. Electronica, avant-garde electronica and EDM are distributed across this spectrum depending on their rhythmic elements, groove, cultural and genre affiliations. This level provides a functional framework for academics, fan-critics, concert promoters and electronica insiders to discuss aesthetics and ideology surrounding dance oriented vs. listening oriented electronic music, scenes and production practices.

The ***Genre Level*** encompasses works within the major genres of electronica and how they compare in terms of accessibility and relatedness to popular music compositional practices. Major categories include: techno, house, breakbeat, experimental, and ambient. Academics, audience members and practitioners are able to discuss electronica at this genre level with relative ease as the terms have stabilized over the last two decades. However, due to the number of subgenres these genres contain, the compositional features of the works they represent are highly varied. This genre level is the domain of promoters, record labels, fans, recommendation/classification engines and media outlets.

The ***Subgenre level*** presents an aesthetic continuum where electronica is described according to experimental and conventional production practices as well as aesthetics at a *global* level. This level encompasses the varying ideologies, stylistic elements, popular audience, age demographics, regional variations, and histories that inform a subgenre's discourse. This lower level, detailed genre level requires intimate knowledge of a specific genre or subgenre of electronica and is typically the domain of musicologists, producer / practitioners, dedicated fans, and DJs. The horizontal arrow presents the spectrum of electronica subgenres and their relative accessibility compared to global aesthetics.[16] For example, a producer working within a subgenre that defines itself through avant-garde experimentalism could find their works drifting towards the *Conventional Production Practices* side of the schema. This is due to the passage of time and aesthetic shifts at the global level. For example, early hardcore and drum and bass productions have gradually shifted to the right of the diagram. This is due to increasingly aggressive and uncompromising subgenres that redefine *conventional* production aesthetics on the global level.

This genre level is particularly significant because genre terminology is unstable, as terms describe different music depending on the decade and region. However, the short-lived descriptive genre terminology that fluctuates at this level is expected and an important part of electronica's sense of identity. Fan-critics, connoisseurs, DJs and specialized audience members populate this genre level.

In figure 2.2-2 the ***Aesthetic Level*** presents a genre, or subgenres', continuum of aesthetic practices at a *local level*. At this level, the aesthetic continuum identifies the avant-garde or experimental character of a work according to local, genre-specific production practices. For example, a producer may be expanding the boundaries of the complextro[17] genre and be considered an experimental pioneer according to local

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[16] In other words, the accessibility of a composition compared to mainstream popular music.

[17] Complextro or "complex electro" is a genre of electronic dance music that features elaborate re sampling of bass lines and vocal materials. It is "complex" in comparison to other dance floor genres due to a dense, syncopated, often shuffling rhythmic construction. It is noted for virtuosic use of micro-montage and modern digital audio workstation based production practices.

production aesthetics. However, as their work moves up the genre level schema, it will drift from the left to the right, as local experimental production aesthetics give way to groove oriented dance music. Alternatively, even the most derivative noisecore will tend towards the left side of the diagram.

2.3 Electronica Perspectives

2.3.1 Corporate and Commercial Usage

In 1997 Chris Norris' article *Recycling the Future* provides a cynical depiction of the recording industry's push for the universal adoption of the term electronica:

> With record sales slumping and alternative rock presumed over, the music industry is famously desperate for a new movement to replace its languishing grunge product. And so its gaze has fixed on a vital and international scene of knob-twiddling musicians and colorfully garbed clubgoers — a scene that, when it began in Detroit discos ten years ago, was called techno. If all goes according to marketing plan, 1997 will be the year "electronica" replaces "grunge" as linguistic plague, MTV buzz, ad soundtrack, and runway garb. The music has been freshly installed in Microsoft commercials, in the soundtrack to Hollywood's recycled action-hero pic The Saint, and in MTV's newest, hourlong all-electronica program, Amp.[18]

Another possibility for the adoption of the term *electronica* is that it replaces and de-emphasizes the terms *trance* and *techno*, as an attempt to distance profitable music from a media fueled drug panic. Drug culture euphemisms in the form of artist names such as: Chemical Brothers, Square Pusher, and album titles: "Better Living Through Chemistry" and song lyrics like Shaman's *Ebeneezer Goode* were commonplace.

Verse 1:

> Ebeneezer Goode, leading light of the scene, know what I mean?
> He created the vibe - He takes you for a ride as if by design
> The party ignites like it's comin' alive
> He takes you to the top, shakes you all around
> Then back down - you know as he gets mellow

[18] Norris, Chris. Recycling the Future. 1997 p. 64-5

Then as smooth as the groove that is making you move
He glides into your mind with a sunny "Hello!"
A gentleman of leisure he's there for your pleasure
But go easy on old 'Ezeer he's the love you could lose
Extraordinary fellow, like Mr Punchinello
He's the kind of geezer who must never be abused
When you're in town and Ebeneezer is around
You can sense a presence in the sound of the crowd
He gets them all at it - the party starts rocking - the people get excited
It's time to shout LOUD![19]

These tongue-in-cheek culture references generated interest and excitement among party goers, but fear and unwanted attention from law enforcement and policy makers. In the aftermath of the North American rave panic, the rebranding was only partially successful. Electronica did not replace grunge (Brackett 2009 550), as Napster[20] would launch in 1999 and access to digital music, through peer-to-peer file sharing, permanently altered the commercial music landscape.

2.3.2 Producer / Practitioner

To artists, practitioners and some audience members, the term electronica comes with connotations of commercial music's attempt to control, conform and monetize a music culture that existed separate from conventional notions of celebrity modeled on rock and roll (ibid 558-9; Norris 1997, 64 - 65). This association with popular music culture generates a great deal of hostility and ridicule as the producer/practitioner/insider community attempts to disavow a term intended to brand their culture and identity.

DJs and producers found their music appropriated and their images changed, reinvented, licensed and "used to sell everything from cars to blue jeans" (Harrison 2004). This cycle of underground scene development, expansion, exploitation, and commercialization has occurred numerous times in dance music culture, notable examples being late 1970s disco, rave culture in the 1980s and 1990s, and most recently the emergence of EDM marketing for North American EDM mega festivals[21].

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[19] DJ Mag TV. *The Story Behind 'Ebeneezer Goode*. 2014 https://www.youtube.com/watch?v=dPNbMQxPiC0
[20] Early peer to peer file sharing service launched in 1999 that allowed for the easy exchange of mp3s, until it was shut down by court order.
[21] Expensive, large scale outdoor electronic dance music events popular in the United States, criticized for their commercialization by a more community and scene driven European popular dance music writers.

2.3.3 Academic Usage

For academics and historians, electronica offers a convenient term to discuss trends in contemporary non-academic electronic music and its associated communities, aesthetics and production methods.

Demers' use of the term electronica as metagenre in an academic context proves to be the most appropriate for our purposes, considering the scope of this dissertation and the diversity of the music it describes. The unraveling of overlapping genre characteristics is not within the scope of this paper, especially considering the difficulty in defining a single term. However, electronica's approach to genre must be addressed.

2.3.4 Genre Cloud

The following is a partial list of subgenres copied from Wikipedia's article on electronic music genre as of 2014. Each genre, subgenre and sub-subgenre represents a unique history, related cultural demographic and experimental aesthetic fringe. The purpose of this list is not to provide information on specific genres, but to capture the scope of electronica's colourful, billowing genre cloud, and reinforce the fact that despite its weaknesses, the term electronica describes a set of aesthetics. The more influential genres are shown in bold.

- **Ambient**
- Ambient dub
- Ambient industrial
- Ambient house
- Dark ambient
- Drone music
- Isolationism
- **Breakbeat**
- Acid breaks
- Baltimore club
- Big beat
- Broken beat
- Nu skool breaks
- Florida breaks
- Nu-funk
- Miami bass
- **Video game music**
- Chiptune
- Bitpop
- Bleep techno
- Game Boy music
- Nintendocore
- Skweee
- **Disco**
- Cosmic disco
- Disco polo
- Euro disco
- Italo disco
- Nu-disco
- Space disco
- **Downtempo**
- Acid jazz
- Chill out
- Flamenco Chill
- **Ethnic electronica**
- Psybient
- New-age music
- Nu jazz
- Trip hop
- **Drum and bass**
- Darkstep
- Drumstep
- Drill and bass
- Drumfunk
- Funkstep
- Hardstep
- Jump-Up
- Jazzstep
- Liquid funk
- Neurofunk
- Sambass
- Techstep
- Dub fusion genres
- **Dubstep**
- Brostep
- Dubstyle
- Post-dubstep
- Dubtronica
- **Electro music**
- Freestyle music
- **Electroacoustic music**
- Acousmatic music
- Musique concrète
- **Electronica**
- Berlin school
- Chillwave
- Vaporwave
- Folktronica
- Funktronica
- Laptronica
- Livetronica
- Electronic rock
- **Alternative dance**
- Coldwave
- Dance-punk
- Dark wave
- Electronicore
- Ethereal wave
- Indietronica
- Krautrock
- New rave
- Nu-gaze
- Space rock
- **Synthpop**
- Synthpunk
- **Hardcore**
- 4-beat
- Breakbeat hardcore
- Bouncy techno
- Breakcore
- Digital hardcore
- Darkcore
- Gabber
- Happy hardcore
- Mákina
- Rave
- Speedcore
- Terrorcore
- Trancecore
- UK hardcore
- Hardstyle
- Hard house
- Hard bounce
- Hard NRG
- Nu-NRG
- Jumpstyle
- Jump House/Melbourne Bounce
- Lento violento
- Hi-NRG
- Eurobeat
- Eurodance
- Bubblegum dance
- Italo dance
- **House music**
- Acid house
- Balearic beat
- Chicago house
- Deep house
- Diva house/Handbag house
- Hardbag
- Electroclash
- **Electro house**
- Complextro
- Dutch house
- Fidget house
- **Moombahton**
- Moombahcore
- Electro swing
- Swing house
- Freestyle house
- French house
- Funky house
- Garage house
- Ghetto house
- Hip house
- Italo house
- Kwaito
- Jackin house
- Latin house
- Microhouse/Minimal house
- New beat
- Progressive house
- Big room house
- Tech house
- **Trap**
- Tribal house
- Vocal house
- **Industrial music**
- Aggrotech
- Cybergrind
- Electro-industrial
- Dark electro
- Electronic body music
- Futurepop
- Industrial metal

- Industrial rock
- Japanoise
- Neue Deutsche Härte
- Power electronics
- Death industrial
- Power noise
- Witch house/Drag
- **IDM**
- **Glitch**
- Wonky
- Jungle
- Darkcore jungle
- Raggacore
- Ragga-jungle
- Post-disco
- Boogie
- Dance-pop
- Dance-rock
- **Techno**
- Acid techno
- Detroit techno
- Free tekno
- Ghettotech
- Hardtechno
- Minimal techno
- Nortec
- Schranz
- Tecno brega
- **Trance**
- Acid trance
- Dream trance
- Goa trance
- Hard trance
- Ibiza trance
- Nitzhonot
- Psychedelic trance
- Dark psytrance
- Full on
- Psybreaks
- Suomisaundi
- Progressive trance
- Tech trance
- Uplifting trance
- Vocal trance
- UK garage
- 2-step garage
- Breakstep
- Future garage/Chillstep
- Grime
- Grindie
- Speed garage
- Bassline/4x4 garage
- UK funky

Table 2.3-1 Selected List of Electronic Music Genres[22]

Navigating this list highlights the importance of genre level introduced in section 2.2, as genre and associated cultures and identities emerge and disappear, only to be rediscovered and renamed at a later date. This fluctuating terminology can be alienating even for enthusiastic listeners. The transient nature of the terminology reflects the quickly-shifting aesthetic tastes and terminologies of dance music culture. The prolific approach to subgenre taken by electronica can only be fully understood, and rationalized, in the context of music production scenes and DJ performance practice. In other words, electronica as a term provides an excellent and functional defense against the endless, transient subgenrefication of electronic music. However, in the moment, the scene, or the club, DJs have little use for high level, metagenre terminology, instead favoring whatever terminology connects with their audience.

[22] List of Electronic Music Genres *Wikipedia.com* http://en.wikipedia.org/wiki/List_of_electronic_music_genres. retrieved Jul. 5, 2014.

2.4 Assembling the Elements of Avant-Garde Electronica

Armed with a multi-dimensional understanding of electronica as a term, we can move on to an examination of its stylistic elements, their origins, and how they developed into an avant-garde aesthetic, encroaching on acousmatic and Western art music traditions. Characteristic DJ and live PA[23] performance practice, performance spaces, production techniques, interactions between symbolic, sequenced sampled and synthesized materials, and loop-based composition techniques all stem from specific historical developments, associated technologies, and communities.

There are excellent ethnographies and histories of electronic dance music. The popularity of the subject has generated interest across the intended audience spectrum, from scholarly cultural studies and critical theory texts such as Gilber and Pearson's *Discographies*: *Dance, Music, Culture and the Politics of Sound*, to the semi-satirical and famously practical resource: *Ishkur's Guide to Electronic Music 2.5*[24] (Taylor 2014). Despite their differences in tone, content and approach, histories of electronica share a common narrative tracing a history from proto-disco dance culture and technology, to the complex metagenre ecosystem introduced in section 2.2 and figure 2.2-1.

2.4.1 Dance Music Scholarship

Gilbert and Pearson's *Discographies,* Demers' *Listening Through the Noise*, Reynolds's *Energy Flash*, and others (Cheren 2000; Elledge 2010; Gilbert 2002; Brackett 2009 550-63; Graham 2004) capture critical discourse relating to dance music culture. These texts examine electronic music through a structuralist paradigm, emphasizing relationships to larger social phenomenon, class, scene, gender, race, region and sexual orientation. Demers takes a semiotic approach, drawing on Nattiez, Foucault and

[23] Live PA or live *personal appearance,* in an electronica context, refers to a live performance beyond audio playback and mixing. This typically includes synthesizers, drum machines, samplers and other instruments augmenting playback, or replacing it altogether.
[24] Ishkur's guide is an interactive, multi-dimensional visual timeline complete with audio examples and humorous yet informative commentary. The guide provides interactive audio examples of subgenres, but most importantly it provides connections that display the relationship and chronological progression of technology and aesthetics. Unfortunately the content remains unapologetically biased and contains little citation other than the music itself. Despite these shortcomings (if they can even be considered as such), Ishkur's guide remains a logical first stop for anybody attempting to understand electronic music's genre web.

Bourdieu, emphasizing academic capital, materials, compositional and performance practice, and technology, splitting electronic music into sign, object and situation.

Reynolds takes a personal embedded ethnographic approach with *Generation Ecstasy* and *Energy Flash.* These texts provides a well-supported, insightful outsider/insider commentary and history of events, with a primary – possibly unconscious – focus on the UK rave movement within which Reynolds was participating. This approach is mirrored by numerous texts focusing on American techno like Dan Sicko's *Techno Rebels.*

Brewster and Broughton's *Last Night a DJ Saved My Life* provides a contrasting insider perspective on the origins of electronica. Unlike Reynolds' attempts to sidestep his academic bias by allying his opinions with populist genres, Brewster and Broughton's blatant, consistent anti-intellectual, anti-avant-garde populism caters to their intended audience, the fans themselves, not academics. Despite these shortcomings, their point of view captures the irreverence associated with popular electronic music. Unfortunately, many concepts outlined by Brewster and Broughton have not stood the test of time and have been undermined by changes in taste and technology.

Théberge's *Any Sound You Can Imagine, Making Music/Consuming Technology* and other technological ethnographies (Divine 2012; Sterne 2002, 2003; Manning 2004; Hockman 2014) draw together and fill out academic and popular sources that inform this upcoming section. Their methodical, chronological description of the changes technology imposes on culture creates a vivid, plausible narrative of electronica.

Electronica and avant-garde electronica are an increasingly online phenomenon. Music distribution platforms, online radio, electronica production forums, online communities of fans and practitioners, synthesizer builders and equipment fanatics, specialized aggregate news sites, YouTube tutorials, interviews and blogs combine into the current ecosystem in which electronica thrives. These primary online sources play a significant part in electronica's documentation.

2.4.2 Proto-Electronica (Disco)

Humans have likely been dancing for as long as they have been human. People dance for pleasure, expression, to release tension, to provide a sense of well-being, community, religious rituals, entertainment, sexual arousal, pure aesthetics, healing, and any conceivable combination of these factors and others. From first glimpses of recorded dance in pre-historic cave paintings in India's Bhimbetka rock shelters to live, holographic dance concerts starring virtual avatars like Hatsune Miku[25] (Kimochi 2010), it is clear that humans love to dance (Carter 1998 199; Lansdale and Layson 1994).

In order to avoid an exhaustive summary of the dance culture of human civilization, I will begin with the preconditions that gave rise to disco in North America. Disco is significant not only because it shares technological, stylistic and cultural threads with electronica, but because, like electronica, disco emerges from a similar set of interacting forces:

- Funk, Soul, Latin
- Multi-track recording technology
- Mature vinyl record and turntable technology
- Women's Liberation
- Gay Liberation

Elements utilized by disco that are significant to the development of electronica include:

- Establishing a repertoire of dance grooves
- Establishing models and standards for dance music production[26]
- The inclusions of synthesized elements
- DJ-oriented club culture
- Soulful diva vocals
- High fidelity loudspeaker technology
- Establishing a safe and inclusive performance space

[25] Miku Hatsune is a cartoon avatar associated with the Yamaha developed singing voice synthesis program Vocaloid.
[26] By models for dance music production, I am referring to characteristic recording, arrangement, mixing and mastering decisions that set a dance music standard.

2.4.3 Safe Space and Club Culture

Disco, as a distinct social dance and musical phenomenon has its origins in women's liberation in the societal mainstream and gay liberation on the fringes. The 1960s America provided unprecedented openness and new forms of freedom and sexual expression as a hard-earned result of marches, activism and demonstrations. The result was groupings of practices that were at the same time a musical genre, venue, dance style, "mode of participation and musical fandom." (Brackett 2009 340)

Disco as a social venue began in early 1970s New York as an idealistic, radically inclusive social dance phenomenon, which was popular due to the elimination of racial barriers and heteronormative dance practices. Men no longer controlled access to the dance floor (Lawrence 2011).

Proto-disco venues such as *Sanctuary* and *The Loft* played host to a diverse crowd, but were primarily comprised of young gay Latino and black males. Maturing turntable, mixer and speaker technologies provided high quality audio with a broad frequency range, deep impactful basses, and gave the ability to the DJ to control the flow of a dance party by manipulating frequencies segueing between records, or *segging*[27] (Disco Music Story: CBS News 1978; Brackett 2009 350).

Early disco DJs played a variety of genres, but favored bass-heavy, pulsating disco grooves[28] that suited newly improved sound systems. Consistent "four on the floor" kick drum patterns allowed for smooth transitions between records, establishing the DJ performance practice that continues to the present day. That is to say, creating a seamless mix of dance music based on crowed reactions.

As disco's popularity increased, new music was produced to cater to dance DJs. This shift presented a radical departure from the then established model that catered to radio DJs as the only way to drive record sales. Initially, disco wasn't on the radio, with records being sold through word of mouth. Trust between DJs and fans grew into an essential element in disco ideology (Disco Music Story: CBS News 1978; Brewster 2006 126-128).

[27] A disco era precursor to the term crossfade, encountered in period media and interviews.
[28] This dance oriented character stems from prominent square quarter note kick drum patterns often referred to as "four on the floor".

2.4.4 The Rise and Fall of Disco

Like electronica and EDM, disco began as an idealistic, radically inclusive social dance phenomenon. However, in the mid 1970s the popularity of disco exploded among the mainstream heterosexual population, and disco music and culture became heavily commercialized by record labels (Brewster 2006 124-126). Disco albums sold millions and homosexual pop disco groups like *The Village People* managed to temporarily slip under the heteronormative radar and into the American main stream. (Brackett 2009 358; Jones 2009 98-104)

With 1979 came a racist and anti-homosexual backlash. The slogan "Disco Sucks" and the *Disco Demolition*[29] drove dance music culture back underground. (Sciafani 2009). This moment proved to be a critical turning point for electronica's origins. As money and popularity dried up, so did the need to adhere to specific norms (Elledge 172-177). The disco demolition marks the beginning of a time of experimentation. With the collapse of the disco record market, the lavish studio production budgets of successful disco producers vanished overnight, taking with them the expensive production methods.

2.4.5 Italo-Disco and the European Disco Exodus

Disco's dramatic demise never occurred in Europe. In the mid 1970s, disco crossed the ocean and was given a synthetic overhaul by Italo-Disco[30] producers like Giorgio Moroder and Didier Marouani. By the late 1970s and early 1980s, disco had merged with a tradition of synthesized pop music established by pop acts like Kraftwerk and Jean Michelle Jare, later The Future, Human League, Depeche mode and others. (Sicko 2010; Paolo 2003)

2.4.6 Mining Disco Grooves and Forging Electronica

Italo-Disco and other synthesized music heavily influenced the next wave of North American electronic music producers. The collapse of mainstream disco production and encroaching digital recording and playback technologies placed analog

[29] A publicity stunt organized by Chicago rock and roll radio shock jock Steve Dahl, involving anti homosexual rhetoric and the public destruction of disco records.
[30] A European off shoot of American disco that emphasizes synthetic elements.

drum machines, synthesizers and tape machines within the grasp of independent dance music producers and DJs. Drum machine and tape loops allowed Chicago house DJ producers like Jesse Saunders to identify, augment, extend and synchronize specific dance floor friendly segments of existing records (Reynolds 1998, 29 – 31; Brewster 2000 314-30).

The practice of identifying, looping, and recontextualizing fragments of prerecorded materials based on specific rhythmic and timbral characteristics developed into an extensive production practice, forming a conceptual pillar of electronica and its avant-garde fringes.

2.4.7 Detroit, Chicago, New York

An unlikely group of influential producers and DJs emerged from North America's post-disco vacuum. In the early 1980s Chicago radio and club DJs Frankie Knuckles, Ron Hardy and Larry Levan mixed/performed multiple genres including disco, italo-disco, synth pop and electro. Chicago's *Warehouse* and New York's *Paradise Garage* recaptured the inclusive spirit of proto-disco venues such as the *The Loft*, prior to the excesses, elitism, and commercialization of *Studio 54*. (Cheren and Rotello 2000)

While *house* music revitalized Chicago and New York's post-disco vacuum, three middle-class black youths from Belville, a suburb of Detroit, developed an influential technology-driven aesthetic. Proto-techno emerged from a pseudo-intellectual, science fiction influenced aesthetic that catered to middle class black youth associated with Detroit *prep* and loft parties. Funk, electro, synth pop, experimental, electronic jazz, Chicago house and any synthetic music available in the early 1980s fed into the growing Detroit techno aesthetic. Juan Atkins, Kevin Saunderson and Derrick May, also known as *The Belville Three*, produced music that made its way to late night radio and Detroit clubs (Brewster 2000, 324-31; Reynolds 2010, 12-22).

2.4.8 The Techno Production Paradigm

The Bellville Three and the early proliferation of North American house and techno helped establish and solidify an influential aesthetic and production paradigm.

Cheap[31] post-disco analog synthesis technologies like the Roland Corporation's 1982 TB 303[32] and 1980 TR 808[33], 1981 TR 606[34] and 1984 TR 909[35] allowed early electronica musicians with limited means to create fully realized dance music productions (Butler 2006, 64).

The Roland TB and TR series serve as a critical milestone in electronica's complex relationship with technological limitation. The popularity of these devices established sonic, production and interface paradigms that remain influential in the present day. (Anderson 2008).

Roland's analog rhythm and bass machines were intended to be cost effective, limited alternatives to acoustic instruments. The TB 303, for example, has the following feature set (control parameters indicated in square brackets):

- Saw/square wave oscillator [selected via toggle]
- Basic envelope generator [decay only]
- Envelope Modulation
- Low pass filter [frequency cutoff, resonance]
- 16-step sequencer [accent, portamento, pitch, octave x 4]
- Volume [variable knob]

Compared to more extensive subtractive synthesizers like the 1970 *Minimoog*[36] and polyphonic subtractive synthesizer keyboards available at that time, notably the Sequential Circuits 1978 *Prophet 5*[37] and Roland's own 1981 *Jupiter 8*[38], the TB 303 lacked features and flexibility, and suffered from an awkward, difficult-to-program interface (Harrison 2005).

[31] Roland's TB and TR series equipment was considered cheap compared to comparable analog equipment from decades leading up to the 1980s. The TR 808's retail price was $1195.00 USD in 1980. Not cheap, but rather accessible.
[32] www.vintagesynth.com/roland/303.php
[33] www.vintagesynth.com/roland/808.php
[34] www.vintagesynth.com/roland/606.php
[35] www.vintagesynth.com/roland/909.php
[36] www.vintagesynth.com/moog/moog.php
[37] www.vintagesynth.com/sci/p5.php
[38] www.vintagesynth.com/roland/jup8.php

2.4.9 Extended Technology

Manipulating electronic and digital instrument technology like the TB 303 beyond its intended purpose expanded the sonic palate available to early electronica musicians, setting a precedent that continues into avant-garde electronica.

Programing realistic bass lines on the TB 303 as instructed in the manual was tedious and produced inhuman, stilted bass lines. However, by ignoring the recommended settings and exploring unconventional filter, octave, resonance and cutoff settings, the TB 303 produced the squelching 'acid' sound that defined the next decade of electronic music. 'Acid' refers to a specific interaction of a highly resonant diode ladder filter design, with filter and resonance being manipulated in real time. This new squelching, liquid synthetic sound defined acid techno and acid house, genres critical for the events detailed in 2.4.8. The TR 808 and TB 909 drum machines were similarly extended, creating a much wider sound palate than the Roland designers envisioned (Harrison 2005; Reynolds 2012 31-34; Brewster 315; Sicko 2010, 221).

An aesthetic built from limited technical means and the sound of squelching 303 bass lines and pulsing drum machines spread quickly, influencing the development of North American and European electronic music, notably German techno and UK hardcore. Drum machine and sequencer interfaces forced alternative methods of composing and developing materials. These compositional practices form the production backbone of many dance music genres, and are easily traced into its avant-garde fringes.

2.4.10 Anti-Rave Backlash and Appropriation

By 1989 acid dance music had swept the UK underground dance scene. Pirate radio stations played newly released tracks for specialized audiences (Reynolds 2012, 265). Readily available club drugs such as MDMA and LSD fed into newer, faster and edgier music. This positive future aesthetic captivated youth and unleashed the second summer of love[39], so named for the inclusive party culture that promoted and embraced a philosophy of acceptance, peace, love, drug use and all night dancing.

[39] The first summer of love refers to 1967 San Francisco and the Hippie revolution, youth culture movement.

With the increase in popularity of rave parties, came an increase in tempo and diversification of genre. This diversification fragmented the scene and by the mid-1990s, rave culture caught the attention of alarmist mainstream media. Raves and outdoor dance parties were made illegal, or impossible, due to changes in legislation. Crackdowns and police raids drove dancers, audience members, and events deeper underground.

At the same time that rave culture was being vilified in the media and aggressively pursued by law enforcement, the futuristic electronica aesthetic had captured the imagination of tastemakers. Watered-down electronica made its way into the public consciousness through a culture industry eager to cash in on the next big thing popular with young people. For example, in 1995 Robert Miles' *Dreamland* and Phil and Paul Hartnoll's (aka Orbital) *Mortal Kombat* movie soundtrack served as an electronica primer for the North American mainstream.

This trend of electronica appropriation continues with endless car commercials, action movies, notably *The Matrix (1999),* and more recently Disney's reboot of the *Tron (2010)* film franchise.

2.4.11 Sampling and Breakbeats

The introduction of truly affordable sampling hardware in the late 1980s and early 1990s expanded electronica's available sonic palate, and with it, introduced implications regarding synthetic and acoustic juxtapositions and the appropriation of prerecorded materials.

Hardcore, jungle, drum and bass, trip hop, break beat, big beat, tech step, neuro funk, liquid funk and other sample based genres emerged from a diverging UK rave scene. Newly affordable samplers allowed for precise resequencing of drum patterns "lifted", that is, 'transcribed', from vinyl recordings. This manipulation of breaks added a new and exciting energy to the "four on the floor" dance patterns of acid house, acid techno and hardcore (Hockman 2014, 22 - 37).

Like Roland's TB 303, the Akai MPC and other similar sampling technologies shaped the development of electronica through novel interfaces and limited features. Digital samplers coupled with a finger-sized percussion pad interface allow producers to quickly and easily sample and re trigger musical material. Sampling and re triggering refers to the segmentation of audio into segments, only to be redistributed across triggers pads, allowing for performance, improvising, sequencing and recording (Demers 2010, 44 - 61).

A significant feature of the MPC resampling production paradigm is the preservation of micro timings. In other words, with careful re sequencing it is possible to retain the original material's feel, swing and shuffle, despite being quantized[40] to a grid and locked into a sequencer. With samples and productions accurately and precisely synchronized, these characteristic micro-timings give sample based electronica a comparatively more organic, human *feel* than sequenced synthesized drum machines. Part of the appeal of jungle, drum and bass and their genre lineage is the tension between organic, digital and machine elements, and the contrasting technologies that make them possible.

The intersection of representational information (MIDI) and sampled materials further expanded electronica's sonic palate. The intricate and artful manipulation of percussive material by artists Richard David James (Aphex Twin) and Clifford Price (Goldie) mark a movement into a genre that values sophistication, aesthetics, listening, and production methods over danceability.

2.4.12 Trackers, Sequencers and Digital Audio Workstations

The microprocessor and personal computer revolutions of the late 1980s and early 1990s allowed for unprecedented control over music production hardware in the home studio environment. Both hardware and software-based sequencers synchronized and triggered electronic instruments and other music production technologies via the MIDI protocol (Manning 2004, 329-340 Théberge 1997, 222-231).

The sophisticated and detailed arrangements that fueled the rise of avant-garde electronica were aided by the centralized control structure of the early sequencer based project studios. Because of these developments more equipment could work together with greater ease, allowing producers to experiment with extreme rhythmic complexity and tempi.

[40] Quantization refers to the shifting of musical events to the nearest given subdivision. The effect is that imprecision and variation in recorded MIDI information becomes aligned with an underlying rhythmic grid.

The power of the home computer increased steadily in the 1990s and with each passing year additional processing tasks moved inside *the box*[41]. The chronological progression of features added to *Cubase,* the software used to compose *Metatron*'s pre produced elements, gives an accurate picture in this timeline. The following is a sampling of releases and new features added to Cubase between 1989 and 2012:

Release	**Year**	**Operating System**	**Features**
Cubase 1:	1989	Atari 520ST	Graphical User Interface, MIDI only.
Cubase Audio	1991	Mac	Limited audio via Digidesign hardware
Cubase Audio	1993	Atari Falchon 030	Built-in DSP. Incredible value at the time.
Cubase VST	1996/97	Mac / Windows	32 channels of audio. VST technology[42] virtual mixing environment
Cubase SX 1 /2	2002 /03	Mac / Windows	Upgraded audio engine, improved delay compensation[43], scalable sequencer grid. Built in audio editor.
Cubase 7	2012	Mac / Windows	64 bit audio engine. Built in FFT-based pitch correction.

Table 2.4-1 Selected Cubase Version Chronology 1989 - 2012

Beginning in 1996 and maturing between 2002 and 2012, the digital audio workstation, or DAW, became an instrument in itself, eliminating the requirement for external music hardware. The home studio can now be shrunk down into a laptop, and music produced anywhere at any time.

2.4.13 Taking Stock of Electronica's Core Elements

The mid-1990s saw electronica's central technological elements secured. From a compositional perspective these include:

- DIY electronic music production
- Loop based production paradigm
- Sample based production paradigm

[41] *The box* is a metaphor for the computer as a platform for virtualized music hardware. For example, a composer who works completely *in the box* uses only virtual instruments and computer-based tools, as opposed to electronic instrument hardware that is *outside the box.*
[42] VST: acronym for Virtual Studio Technology. This technology enabled Cubase to host third-party software instruments and effects.
[43] This feature calculates and compensates audio signal latency introduced via plugin or external processing.

- Extended technology
- Manipulation of symbolic information
- Digital Audio Workstations

From a cultural perspective, this includes:

- Radically inclusive dance culture (Similar to early disco)
- Specialized and unconventional performance and listening spaces
- A number of specialized and diverging audiences that exist outside mainstream culture
- Unconventional distribution system for vinyl releases and albums (Independent record labels, pirate radio, mix tapes and CD burning)

2.4.14 Electronica's Divergence

The interaction of culture and technology, combined with established production paradigms outlined in the previous sections, ushered in a period of stylistic divergence. The genre cloud in section 2.3.4 is a product of electronica's rapid expansion. DIY philosophies and democratization of technology and information meant that electronica could be created in a variety of socioeconomic contexts to suit the requirements and tastes of a wide variety of audiences, scenes and aesthetic poses.

By the mid 1990s the democratization of audio production technology and the popularity of electronica culture merged with the internet and genre streams flowed into a delta of sorts. This period of divergence signals the emergence of electronica as a globally interconnected cloud of ideas, with scenes and musical cultures feeding back into themselves and others.

From underground clubs and pirate broadcasts, to Hollywood and MTV; from bedrooms and headphones, to art galleries and concert halls, the mid 1990s period of electronica divergence provides a functional point of departure for a discussion of the experimental fringes of the still emerging electronica metagenre. Instead of a single movement, each of these diverging streams contains an experimental periphery that is avant-garde electronica.

2.5 Avant-garde Electronica

> On the cover of *Artificial Intelligence,* a robot reclines in a comfy armchair, blowing perfect smoke rings in the air and chilling to the atmospheric sounds wafting from a sleek hi-fi unit. (…) Two LPs are clearly recognizable as classic 'head' music, Pink Floyd's *Dark Side of the Moon* and Kraftwerk's *Autobahn.* With no little wit, *Artificial Intelligence's* cover tableau of domestic bliss-out heralds the birth of a new post-rave genre, which Warp records christened 'electronic listening music'.[44]

Armchair techno, intelligent dance music (IDM), intelligent techno, and ambient techno are all invented terms seeking to describe electronic music that emphasizes listening and contemplation in place of dancing. The term IDM stirred controversy, as its division between intelligent and unintelligent listeners instigated the beginning of a class war within electronica (ibid 344-345).

Battle lines were drawn between the working-class, dance oriented community and the 'rootless, cosmopolitan' intellectuals and purists. Some scholars are critical of a more esoteric approach to electronica production, as it alienates the community from which it grew, suggesting that self-obsessed avant-gardists are parasites, disavowing and ridiculing the community that provides the raw material for their art (Reynolds 2012, Brewster). Others balance this criticism with praise for avant-garde electronica's creativity, carefully crafted materials and ability to bridge aesthetics from both institutional/academic and electronica metagenres (Reynolds 2012).

2.5.1 Identifying Avant-garde Electronica

There are multiple approaches to identifying, describing and delineating avant-garde electronica. This delineation process demands the intersection of genre level and multiple versions of the 'high' vs. 'low' art discourse. As a self-described insider, Reynolds emphasizes genre, record labels and scene, describing audiophile purists and their disdain for predictable, derivative, and overtly rhythmic dance oriented styles.

[44] Reynolds, Simon. *Energy Flash: A Journey through Rave Music and Dance Culture*. 2012 p. 156

In *Listening Through the Noise* Demers categorizes and delineates conceptual frameworks of her text through compositional intent, performance context and approach to materials, emphasizing tension between academics and increasingly sophisticated outsiders. In *Unlocking the Groove: Meter, and Musical Design in Electronic Dance Music,* Butler focuses on performance practice; part two of this paper emphasizes objective structural and formal characteristics. Each of these approaches are equally valid and problematic. In its simplest sense, the term *avant-garde* attempts to describe works that are experimental and innovative.

The inescapable question remains: experimental compared to what? When, and by whom? The author? The practitioner? Audience? Scholar? In the context of this section, avant-garde electronica refers to an experimental subset of electronica that pushes its *own* internal aesthetic boundaries, which not surprisingly, encroach on the aesthetic territory of institutional acousmatic music.

An examination of genre delineations at a higher level (level 1 and 2 from figure 2.2-1) combined with stylistic information in section 2.4 reveals that avant-garde and Western art music's points of overlap can be grouped into the following categories:

- Recontextualization and quotation
- Noise
- Minimalism
- Complexity
- Technology

2.6 Avant-garde Electronica Overlap

Recontextualization, noise, minimalism, complexity and technology are substantial areas of shared artistic activity and practice, regardless of genre. However, avant-garde electronica's engagement with experimental practices does not necessarily imply causation, although this may be the case. This section seeks only to point out relevant points of stylistic overlap, or shared points of departure. In other words, the way similar artistic ideals and approaches are realized in different contexts.

A common element that binds avant-garde electronica and Western art music's avant-garde tradition comes from the notion of artistic credibility, taste, 'street cred', and reputation, among others. These concepts can be understood in terms of institutional and cultural capital laid out by Bourdieu. In this section, I will refer to *avant-garde capital* as a form of symbolic artistic capital, relating to perceived notions of experimentalism, originality and taste.

2.6.1 Recontextualization vs. Quotation

Manipulating and recontextualizing fragments of existing music is a practice as old as the Western musical tradition itself, as in cantus firmus based music and melodic manipulations in modal counterpoint, from Bach to Beethoven to Berio's *Sinfonia;* and from Oswald's *Plunderphonics* to Madeon's *Pop Culture*[45]. Manipulating familiar musical materials, symbolic, physical or digital[46], serves not only as a tangible connection to a musical legacy, but draws in listeners familiar with the material being manipulated.

Avant-garde electronica and acousmatic music both span the gamut from self-conscious hyper awareness of material and narrative via direct quotation, to completely stripping sounds of all meaning, context, and using sound as raw material to create larger structures. In electronica production, an intuitive form of Schaffer's reduced listening naturally occurs when a musical whole is constructed from sampled audio materials. Employing aspects of Smalley's *gestural surrogacy*[47] for aesthetic effect is par for the course, and depends a great deal on extrinsic factors. In other words, both avant-garde electronica and acousmatic music strive to manipulate listener perception and recognition as part of the compositional process.

Notions of avant-garde capital in this case can be understood as a function of multiple elements:

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[45] Madeon (Hugo Pierre Leclerc) produced a particularly flashy mash-up entitled "Pop Culture" that raised production standards re defined a quickly stagnating mash-up genre.

[46] *Symbolic* representation in this context refers to forms of musical notation that encode a musical performance. For example, western musical notation, graphical notation and MIDI. *Physical* refers to representations of sound in the real world. Music performances, magnetic tape and records are examples. *Digital* acts as both symbolic and physical, and refers to captured audio in a flexible digital space.

[47] Gestural surrogacy is a concept introduced by Dennis Smalley, involving the perception of sound and its concrete or abstract relationship to reality.

- The clever selection and informed quotation of *culturally significant*[48] source materials, pushing a polemic concept or political agenda.
- The artful, indiscriminate sampling and micro-montage of materials stripped of any meaning.
- Any combination of materials stripped of, and imbued with meaning, generating interest from the interplay between each of these practices.

A loss of avant-garde capital is a function of the appropriation of audio in poor taste, or lacking in technical sophistication with regards to micro-montage.

These aesthetic goals remain consistent across avant-garde electronica and institutional acousmatic music. The differences manifest themselves in the methods of realization and, to some degree, in the value attributed to specific aesthetic parameters. For example, the use of familiar metric rhythms and tonal harmonic and melodic materials remains a divisive issue in both communities.

2.6.2 Organized Sound

In his 1913 letter *The Art of Noises: Futurist Manifesto,* Luigi Russolo introduces noise as a compositional element, demanding that sounds of the modern world take their rightful place alongside pitch, a premonition of sampling and the techno-industrial aesthetic that informs avant-garde electronica (Cox and Warner 2009, 10-4) In 1923, design pioneer of the Bauhaus school László Moholy-Nagy[49] suggested that new composition paradigms will arise through increases in turntable technology and the etching of sound directly into records, foreshadowing modern audio editing and digital audio workstations (ibid, 328-31).

John Cage's *The Future Music: Credo* (ibid. 25-8), Edgard Varèse's *The Liberation of Sound* (ibid 17-21) and Henry Cowell's *The Joys of Noise* (ibid 22-24) each examine the musical potential of structured noise. These polemicists, pioneers and

[48] Culturally significant depends on context. Examples include, Martin Luther King Jr's "I have a dream" speech sampled in Hip Hop and Electronica, or Frederic Rzewski's use of *The People United Will Never Be Defeated.*
[49] Hungarian painter, photographer and professor linked to the Bauhaus school.

practitioners paved the way for current generations of acousmatic and electroacoustic musicians that revel in field recording, synthesis, and improvisation.

The avant-garde fringe of noise core, ambient, breakbeat, glitch, techno, industrial, and many others, actively embody the principles envisioned by the noise pioneers mentioned above. That is to say, these genres were born and defined by the inclusion of noise as a default. With the proliferation of samplers, noise lost its polemical shocking properties. Noise and all sound simply became a readily available source for percussion and texture.

In avant-garde electronica and Western art music contexts that involve noise, avant-garde capital is gained through extreme volumes[50], subtle and aggressive timbre, novelty and creativity. As outlined by Bourdieu's *The Field of Cultural Production,* the less the music adheres to conventional musical norms, as defined by the Western art music and electronica fields, the more avant-garde capital it gains.

2.6.3 Minimalism

In the 1960s and 1970s La Monte Young, Terry Riley, Steve Reich, and Philip Glass introduced the Western music world to music without narrative, where gradually-evolving processes became the focal points of the listener. The minimalist school and minimalism in general conceptually inform electronica. Cyclical repetitions and gradual transformations form the backbone of many electronica genres including, for example, house, techno, trance, and breakbeat. Motivic fragments and pulsing percussion patterns increase tension through layering and slowly evolving processes.

In other cases, though perhaps a more pure form of minimalism, a sense of stasis is achieved through the use of sustained tones and/or sparse slowly evolving arrhythmic material. Ambient, minimal, drone, chillout, soundscape and other electronica genres fall into this stylistic subcategory category.

As with minimalism in the Western concert music tradition, some forms of electronica minimalism are appealing, soothing and enjoyable for a broad audience, undermining their artistic credibility. Their popular appeal drains avant-garde capital. In

[50] Both high and low volumes

other words, more extreme and alienating forms of minimalism maintain a stronger claim to traditional notations of avant-garde, whether in Western art music or electronica.

2.6.4 Complexity

Subtle and extreme complexity have long been seen as an indicator of artistic credibility. From surface level complexity in the Baroque, and the New Complexity of Brian Ferneyhough, to the deceptive internal complexity of the classical period and spectralism, artistic capital flows from complex arrangements of musical materials. The perceptibility of complexity and its relationship to avant-garde status shifts depending on the context.

Avant-garde electronica typically gains avant-garde capital through surface level complexity, presumably because of the lack of traditionally notated score. The lack of a notated score means the work must be appreciated at face value, and that any sophistication in structural underpinnings cannot be appreciated in isolation from the music unless it is explicitly explained by the composer/producer. Structural elements are gained through listening to completed productions. Exceptions exist in the form of embedded images[51] in the spectrogram, as is the case with Aphex Twin's "Equation" from the album *Window Licker*, or works whose appreciation requires the understanding of specific hardware constraints.

Genres that ascribe to Bourdieu's theories of achieving avant-garde capital tend to be genres with the *core* suffix. *Core*, as in *hardcore*, in this context refers to the dedication of the audience and producers to an aggressive and extreme pole in a genre continuum. For example, breakcore fetishizes extremely intricate, aggressive breakbeats. Standard breakbeats have fewer events per second and explore groove and texture more than complexity as an end in itself.

[51] Using spectral synthesis software, images can be translated into sound. These images are able to be decoded when the audio is visualized with a spectrogram.

2.6.5 Technology

Leveraging new technology to create novel and interesting sound appeals to both institutional acousmatic, academic composers and producers of avant-garde electronica. These metagenres share an entwined history, but derive artistic capital from their technology through different means. Institutions develop novel devices and associated compositional practices and are careful to stay ahead of the technological curve. Avant-garde electronica has a more pragmatic approach, which exploits existing technology to create novel aesthetics, focusing on the qualities of the sound itself, the interface and potential for use in the studio and performance.

In the historical context of academic research institutions, expensive rare equipment represents an exchange of financial capital for the potential for academic and artistic capital. In other words, novel artworks created with costly, specialized equipment attract interest, attention, prestige and research potential. Technological capital can be gained and maintained by well funded research institutions who regularly exchange financial capital for equipment beyond the reach of non academically affiliated composers and producers.

For example, the Columbia Princeton Music Center's RCA Victor Mark II synthesizer, a costly technological marvel in 1957 made possible from the Rockefeller foundation, allowed for the realization of complex serial works such as *Philomel* by Milton Babbit and the Pulitzer Prize winning work *Time's Encomium* by Charles Wuorinen. However, due to its fleeting nature, technological capital drains away with technological democratization. The RCA Mark II was obsolete within ten years. It was overshadowed by the proliferation of solid-state subtractive synthesizers manufactured by Moog, Buchla and others (Manning 2003, 95-8).

Avant-garde electronica approaches technological capital from a different perspective. High-quality audio equipment remains important, but not crucial, and staying ahead of the technological curve less so.

Instead of older technologies signaling a decline into irrelevance, certain older technologies represent quality, challenge, rarity, and an expanded, diverse sonic palate. These positive connotations increase technological capital according to the nature of the equipment. In this way, for avant-garde electronica, technology and aesthetics are intimately linked. Each new machine or piece of software represents the potential for experimentation despite carrying aesthetic connotations of an earlier period of music production.

Without the budgets of universities or large recording studios, independent producers of avant-garde electronica create using whatever accessible technology suits their aesthetics. In some cases they will go to great lengths to expand the potential of older equipment through retrofitting and modifying. For example *Kiwitechnics*, an Australian synthesizer restoration and support company, retrofits synthesizers with new modern components, greatly increasing their functionality. Other examples include the retro-computing and circuit bending communities, all of which are examples of re-contextualizing, expanding and prolonging the usefulness of technology.

2.6.6 Integrated Capital and Genre Level

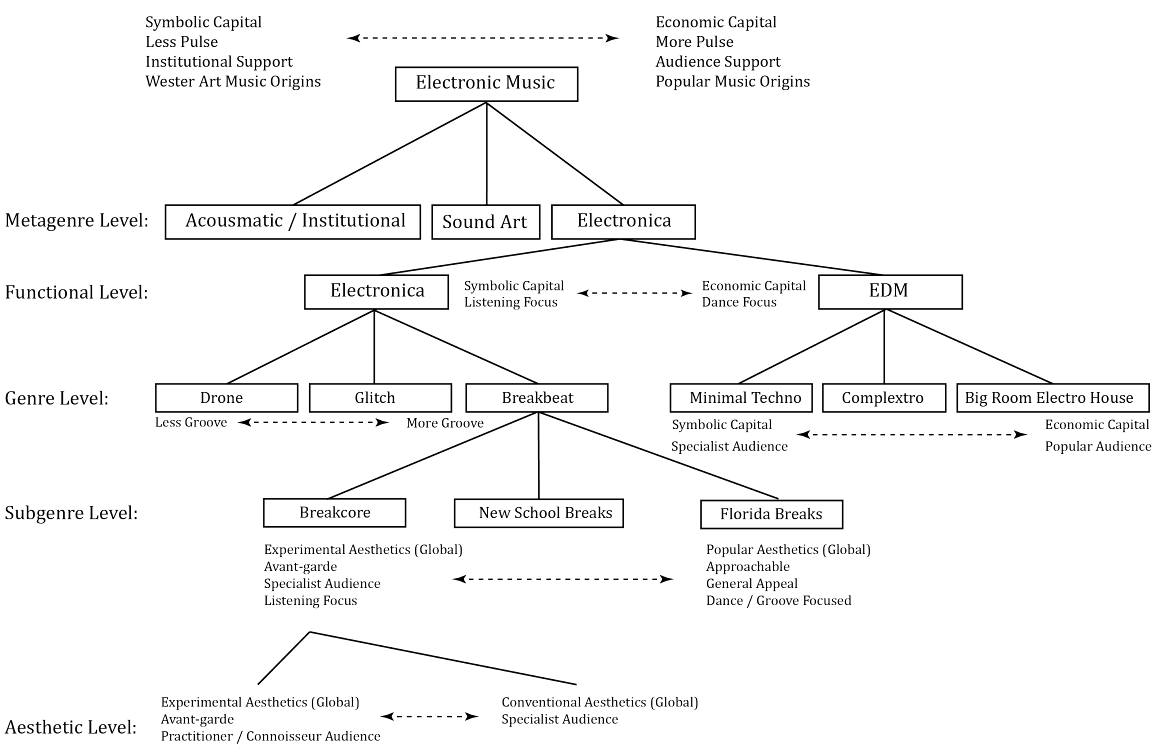

Figure 2.6-1 Symbolic, Economic Genre Level Diagram of Avant-garde Electronica and Western Art Music

Figure 2.6-1 integrates the theories of artistic and economical capital introduced in section 2.6 into the *Genre Level* schema from section 2.2-1. (See section 2.2-1 for details on genre levels). Beginning at the top of the diagram, electronic music relevant to this dissertation spreads across a continuum defined by capital, rhythm, support and origin. This level reflects the critique of academic bias put forward by Niell and Demers (Neill 2002 3-6, Demers 2010). The *Functional Level* shows a relationship between symbolic and economic capital in terms of a work's focus, be it dancing or listening. The *Genre Level* illustrates that clusters of genres can be organized according to symbolic capital, groove and other factors. These factors can change depending on their position within the *Functional Level* continuum. The *Subgenre Level* shows the diverse spectrum of aesthetic practices and communities that co-exist within a genre. The breakcore vs. florida breaks respectively represent the extreme avant-garde fringe and fun dance party music. New school breaks sits between these extremes, as a meticulously crafted music for listening, with occasional moments suitable for dancing. The *Aesthetic Level* shows the struggle between established and experimental aesthetics.

2.7 Proto-Avant-garde Electronica (Points of Connection)

Avant-garde electronica's origins can be traced to technological and musical developments before disco and the later aesthetic divergence in the 90s. While these electronica pioneers are not necessarily the first to develop and perform with new technologies and aesthetics, they are the most visible and influential. Their large audience and popular appeal inspired many young artists and influenced the emergence of experimental electronica and its avant-garde fringes. Also, despite the popular appeal of the artists in the next section, there are notable points of contact with institutional/electroacoustic institutions. In many ways, avant-garde electronica absorbed academic concepts indirectly through well informed experimental pop acts, then rebuilt a more eccentric, less appealing, avant-garde scene outside the institution. One that suited its own tastes and internal aesthetic pressures.

2.7.1 Kraftwerk

The German synth group Kraftwerk released a self-titled album in 1970 and have had a profound and lasting effect on music, electronic or otherwise. Ralf Hütter (Flute, Synthesizer Electronic Violin) and Florian Schneider (Keyboards) were active participants in the experimental German art and music scene in 1970s Düsseldorf. Their connection and familiarity with post war modernist compositional aesthetic is reflected by the circumstances surrounding their meeting and the formation of Kraftwerk.

> Hütter and Schneider met as music students at Düsseldorf's Kunstakademie art school, bonding over an interest in electronic music and controversial composer Karlheinz Stockhausen. On forming *Organisation*, they slipped into the burgeoning intellectual scene of young, electronic-leaning German musicians opposed to vacuous 'flower power'. A collective – who considered themselves as performance artists rather than 'bands' – would play lengthy improvised shows in universities and art galleries.
>
> Krautrock, as it would soon be tagged, had sprung that year from the 1968 Essen rock festival, where the inventions of Frank Zappa clashed with German acts such as Tangerine Dream and Amon Düül. They were politically-minded art commune outfits merging Sixties psychedelia with the surrealism of Dali and the technological innovations of the Fifties minimalist avant-garde composers such as Terry Riley and Steve Reich.[52]

Is Kraftwerk modernist music according to the standards of Western art music, as described in the genre level diagram? That depends. Kraftwerk's informed modernist musical aesthetic, and their connections with western avant-garde art music tradition via academic institutions, as well as their position as a founding force of electronica, make them a critical point of departure for experimentalism in avant-garde electronica. This experimentalism stems from their conscious engagement with the aesthetic ideals of the Western art music tradition.

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[52] Beaumont, Mark. *Rise of the Machines,* Shortlist.com. Web. 25 June 2014. http://www.shortlist.com/entertainment/music/rise-of-the-machines.

2.7.2 Jean Michelle Jarre

Similarly, Jean Michelle Jarre's early work influenced avant-garde electronica pioneers, most notably the ambient and trance genres. He is also associated with complex multimedia stage performances employed decades later by some avant-garde electronica producers who made a shift away from DJ oriented performances towards a more traditional live performance model (Reynolds 2012).

Jarre's engagement with Western art music and the avant-garde come from his traditionally trained composer father as well as a musical education in counterpoint and harmony from the Paris conservatory. Also, he studied at the GRM with Pierre Schaeffer, the father of musique concrete. Jarre's interactions with Western art music and the avant-garde influenced his musical career via considerable technical skill with synthesizers, experimentation, live performance, and tonal harmony. Avant-garde and Western art music merged into music that captivated a broad audience. His debut album *Oxygene* is the bestselling French record of all time (Hughes 1998, 303). Jarre has channeled Schaeffer's meticulous, yet playful, approach to sound into carefully constructed and appealing music that inspired avant-garde electronica pioneers which served as a reminder that electronic music did not need to be conventional or created only for the dance floor.

2.7.3 Plunderphonics

Plunderphonics, as described by Canadian John Oswald in his essay *Audio Piracy as a Compositional Prerogative*, refers to the manipulation and processing of existing audio in order to create a new composition. It can be considered a form of audio collage, and one of many conceptual forerunners to electronica's micro-montage, or 'mashup' production style (Oswald 1985). Oswald manipulated tape and later digital samples, creating conceptual art that questioned notions of *the auteur*, copyright, and ownership. An active polemicist, Oswald's work highlights the importance of *fair use*. That is, the right for artists to create derivative works of art that directly appropriate past works as a form of commentary and expression.

While Oswald's ideas and ideals are closely related to issues close to the hearts of sample based producers, any direct influence remains unclear. More likely the artful manipulation of sampled audio is an inevitable product of available sampling technology, rather than a conscious, informed realization of a set of aesthetic and political ideals. Nevertheless, Oswald's work is a significant conceptual precursor, even if it is technically rudimentary when compared to avant-garde electronica's tightly controlled micro-montage style.

2.8 Summary

This chapter has provided an in-depth look at the origins of electronica, as a term, cultural phenomenon, and electronic music metagenre. From disco's inclusive dance space through to electronic music's post rave divergence, producers continue to find new ways of creating music with whatever technology is at their disposal.

The journal articles, interviews, videos and technological ethnographies that inform this chapter come from practitioners, producers, critics, historians, theorist academics, and researchers, each with valid, yet varying, perspectives. While definitions of electronica are typically inconsistent or antithetical, each reflects its own field. Demers' definition of electronica as metagenre provides a polemic cultural studies perspective. It places electronica in opposition to sound art and the institutional electroacoustic tradition. Here, electronica's use of material as sign, sound object, noise, minimalism, and complexity generates considerable overlap with institutional 'high art' music. Electronica as a media constructed term elicits bitterness from practitioners and scene members who saw their mode of self-expression and communion appropriated, exploited and thoroughly monetized by 1990s advertising machinery.

The genre level model clarifies how, and to what end, the term *avant-garde* can be prepended to electronica. Multiple levels of economic, cultural and technological capital define a work's avant-garde status, and the genre level models in this paper have suggest they are contextually and chronologically dependent. Definitions of electronica and avant-garde electronica will not become consistent until outmoded definitions are replaced with words that reflect the 21st century's increasingly democratized field of electronic music production.

Chapter 3: New Cultural Architectures

> …we are about to enter a new cultural architecture that we cannot yet describe; yet we are aware that technology is changing the world and that it will also change the world of computer music.[53]

> For Free, For everyone, Forever.[54]

This chapter outlines numerous *new cultural architectures*, their intersection with avant-garde electronica, and their destabilizing effect on established power structures. Section 3.1 addresses the democratization of information by examining the effects of easily accessible software tools, media archives, and 3D printing. Section 3.2 examines the effect of decentralized education, creative communities and revenue models on the relationship between avant-garde electronica and Western art music. Section 3.3 explores postdigital aesthetics and their effects on financial and academic capital as well as established power structures. The effects of postdigital aesthetics on electronica are addressed in section 3.4 through an examination of the aesthetics of failure and the Art of Technological Limitation. Section 3.5 touches on emerging artistic paradigms in an increasingly democratized creative economy.

Metatron, the subject of this dissertation, and avant-garde electronica in general, are examples of the intersection of technological, cultural trajectories that are eroding barriers, creating new architectures and validating Chadabe's prediction in unexpected ways.

3.1 Democratization of Information

The concept of *technological democratization* introduced in previous sections defines the emergence of electronica as a genre, but represents only a narrow fragment of a greater process of democratization. While access to basic tools of electronic music

[53] Chadabe, Joel. *Remarks on Computer Music*. 2000

[54] https://www.khanacademy.org/ Free online education portal

production removed a critical barrier to entry, the democratization of *information* has created a gaping hole in Chadabe's figurative high art parapet.

3.1.1 Software Information

The democratization of information with regards to avant-garde electronica refers to new pathways and retrieval made accessible through the relatively recent [55] proliferation, adoption, and increased bandwidth of internet technologies. There are numerous areas of increased access to information that are applicable to the democratization of information in general.

Information is accessible in the form of professional level software tools for audio manipulation, sound design, and synthesis. These tools are readily accessible through piracy, paid download, or free through open source projects. Unlike the hardware driven 1980s, where studio cast offs and failed products found their way into the hands of eager electronica producers, the modern DAW/third party software combinations represent a true leveling of the playing field. This is not to say that anything can be produced anywhere without financial resources, but rather that the democratization of information has eliminated the economic barrier to software, provided the user has access to even a modest computing device such as a cellphone, tablet, gaming console, laptop or pc.

In this way, open source software and piracy have destabilized and influenced the economic conditions that support the development of high-priced, specialized software products as well as the professional studios and research institutions that rely on them. Companies are increasingly developing products for the hobbyist, semiprofessional and prosumer[56] markets. These shifts have an effect on the sound of the music being created in both avant-garde electronica and academic contexts. Composers, each working within their respective metagenre communities, are forced to choose from similar software.

The democratization of information as software is indirectly responsible for *Metatron*. Before beginning a university education, I had achieved fluency in DAW-based composition and synthesis techniques using a combination of pirated, open source

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[55] While there are numerous and significant examples of early IRC, USENET and other online communities that discussed and shared information on all types of electronic music, it is the mass adoption period of the late 1990s and early 2000s that is the most useful in this context.

[56] In this context, prosumer refers both to equipment that is professional quality, but targeted at the hobbyist consumer, or amateurs who are working at a professional level.

and legitimate free, or paid, software tools. This fluency, combined with a powerful and inexpensive home studio allowed me the independence required to take on more ambitious projects, regardless of institutional access. As a synthesis of avant-garde electronica and institutional electroacoustic music, *Metatron* required a type of facility that leads to independence. This independence is largely a product of the democratization of information as software.

3.1.2 Democratization of Data

Easily accessible archives and databases have inundated electronica with a wealth of hitherto inaccessible information. Instead of struggling with cobbling together fragments of low fidelity sound with low quality samplers or approaching technology through trial and error, artists and producers struggle with swarms of information accessible in seconds. Just as with software, these resources are a mixture of free/open source, pirated or purchased. Examples relevant to *Metatron* include a number of resources. The Internet Archive is an online database that among other things hosts public domain and historical recordings of cylinder, 78, 45 and 33 RPM records, golden age radio broadcasts[57], CDs, podcasts and PDFs of public domain scores that are accessible through the IMLSP.[58] FreeSound.org hosts a community driven database of original audio content of all types. Waffles.fm and What.cd provide fast access to remarkably well organized, high quality illicit archives of copyright music, which is important because it makes available impossible to find works that are under copyright protection but deemed to be no longer profitable. Apple's iTunes store[59], Naxos.com and beatport[60] provide a lower quality, slower, but legal alternative[61] for a fee. *Metatron* takes full advantage of all these online resources and more.

Other examples of democratized access to information as manifested in *Metatron* include a familiarity with music hardware and techniques of the 1970s, 1980s and 1990s.

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[57] Sometimes referred to as *old time radio,* this refers to radio content produced before the 1950s and the adoption of television.
[58] Pettruci Music Library: An online repository of public domain scores in pdf format.
[59] Apples iTunes store is an online media store that was launched in 2003. It is currently the largest seller of music in the world (Apple 2010).
[60] Beatport LLC is a privately held online music store that caters to the electronic music community.
[61] It is common for online music downloading and streaming sites to degrade audio quality in the interest of speed, cost, and digital rights management.

Manuals, patch databases, instructional texts, and video demonstrations for the *Yamaha TX-802* and 81Z, tutorials and patch demonstrations on Roland and Oberheim analog synthesis, all allowed for more authentic representations of specific production practices in these time periods.

Not only do producers and composers have access to an unprecedented amount of data in various forms, but they have access to tools to manipulate and create their *own* databases. One of the most significant sound sources for *Metatron* grows from a personal, ever-expanding sound database created and maintained over the past 15 years. This personal database no longer resides on hard-drives, but in cloud storage, allowing access from anywhere, at any time. This shift in technology and easy access to large quantities of customized information provides remarkable new and destabilizing cultural architectures. Access to an increasing amount of information no longer depends on established institutions and their leveraged technological and information capital.

With regards to avant-garde electronica specifically, a significant intersection comes from the combination of two parts: access to the raw data and information on how to use it. In other words, the critical element to this specific shift in cultural architecture comes from the intersection of access to information with embedded instructive and educational elements, a concept further discussed in section 3.2.

The access to information provided by *big data* moves both ways. With unprecedented access to information comes unprecedented levels of *targeted advertising*, *data mining* and *search filtering*. That is to say, the companies that are allowing consumers access to information are perpetually harvesting, storing and selling information about their users. For example, Google and Facebook's filter bubble attempts to tailor search results to coincide with the opinions held by the user or according to who has paid for advertising. Both of these information filter algorithms are optimized for revenue as opposed to truth or aesthetic quality (Halliday 2010; Pariser 2012). Unseen commercial forces shape the flow of information on the internet, affecting aesthetics, privacy, safety, and truth in the interests of profit, showing that the democratization of data can act as a double edged sword.

3.1.3 Democratization of Objects

A final and more speculative shift in cultural architectures comes from the intersection of democratized information and 3D (three dimentional) printing, or rapid prototyping technologies. 3D printing allows users to create and share designs for physical objects, then create them in the home (Bradshaw 2010 8-10). In other words, it is a harbinger of the democratization of objects. With regards to electronica, this facilitates simple maintenance of aging vintage hardware, as is the case with the OP-1 and the release of hardware specifications for replacement printing (Dayal 2012). Another example is the resurrection of old equipment through shared circuit board designs and printed PCBs. Though there are no 3D printed electronic instruments in *Metatron*, available schematics allowed me to repair the analog synthesizers that provide the unique and difficult to achieve colours of the work.

3.2 Decentralization

Decentralization, understood as part of the framework of *new cultural architectures*, builds on the technological shifts responsible for the democratization of technology and information mentioned in section 3.1. Decentralization in this context refers to a number of communities, technologies, and practices that at one time required institutional support and are now thriving independently without central control. This shift destabilizes established power structures in economic, cultural, and technological fields. More than online communities developing around obscure sub-genres of electronica, decentralization is bringing fundamental shifts to the way music is learned, created, distributed, and consumed.

3.2.1 Decentralized Creative Communities

> There are active online communities for every kind of music and its subcultures. Whether you're into Dusty's Deep Cut reggae, minimal electronics, symphonic pop, Texas blues, Japanese noise, power electronics, children's music, christmas music, Raymond Scott, or Burl Ives, I guarantee there is an online community where you can connect with other enthusiasts to indulge the minute specificity of your tastes.[62]

[62] Albini, Steve. *Steve Albini on the Surprisingly Sturdy State of the Music Industry.* 2014.

Avant-garde electronica practitioners and enthusiasts are thinly spread across the globe and rely on the Internet as a means of seeking out individuals with similar interests. These online meeting places began with text based discussion groups and chat rooms and have grown to encompass interactive platforms for listening, performing, and collaborating. Communication within online communities grows in parallel to the technological curve, moving from text based discussions to communication through whichever combination of text, image, audio, and video provides the most effective communication in a given context. A discussion on advanced FM synthesis technique will inevitably be augmented with links to past video tutorials, currently-active video streams, audio examples, wikis, ebooks, previous threads[63] on similar subject matter, as well as whatever media content adds to the discussion. Geographic location no longer impedes an artist's ability to benefit from, and contribute to, a creative and dynamic artistic community, virtual though it may be. Even time begins to erode as a barrier to community as online content is not necessarily organized chronologically, but rather according to search criteria. Therefore, engaging with a discussion thread abandoned a decade earlier is no more difficult than continuing a conversation started that morning. This allows individuals to engage with community members who are no longer active, only to have any other interested party pick up the discussion. In other cases, the original poster will answer a question regarding a comment from a past decade, without missing a beat.

For producers of electronica, or composers who aspire to work within any of Demers' metagenres, accessing a staggeringly diverse community of practitioners, technical enthusiasts and audience members has had a tremendous influence on the type and quality of music being produced. *Metatron* would not exist in its current form without the support of not only the McGill and Canadian new music communities, but of the online synthesis and hardware enthusiasts as well who happily took the time to explain and discuss the finer points of sound design to a fifteen year old boy.

The months leading up to the premiere of *Metatron* involved a great deal of online community engagement. Interviews with composers, videos of rehearsals, blog posts, audio examples, images, were all woven together in the social media fabric, generating discussion and interaction.

[63] *Thread* in this context refers to a chronological progression of forum posts on a given topic accessible from a larger forum.

3.2.2 Decentralized Economy

> … there's no reason to insist that […] obsolete bureaux and offices of the lapsed era be brought along into the new one. The music industry has shrunk. In shrinking it has rung out the middle, leaving the bands and the audiences to work out their relationship from the ends. I see this as both healthy and exciting. If we've learned anything over the past 30 years it's that left to its own devices bands and their audiences can get along fine: the bands can figure out how to get their music out in front of an audience and the audience will figure out how to reward them.[64]

Decentralization has destabilized established economic structures, affecting all music being sold as physical or digital objects. Artists are increasingly being forced to explore alternative decentralized revenue models (IFPI 2014). For example, crowdsourcing through sites like *Patreon* and *Kickstarter* are allowing audience members to support individual artists from the perspective of a patron of the arts, as opposed to simply paying for a digital file.

Patreon connects patrons and content creators through an online framework that fosters ongoing monetary relationships through micro payments. The patron does not pay for the content itself, but rather has an agreement to pay the artist for creating it. This encourages artists to engage with their fans, and maintain good relationships. For example, a patron may choose to give an artist a small amount of money per month in exchange for access to their catalog. Alternatively, a patron may choose to pay a pre-determined amount for each work published by the creator. The amount of money contributed each month allows access to specific rewards in the form of additional content or services. Kickstarter operates through a similar model, except it works on a per project basis. For example, funds to secure studio time and a mix and mastering engineer may be funded through kickstarter with a physical album sent to patrons who donate above a certain threshold.

Decentralized economic models are putting consumers and artists in direct contact with each other thus replacing the traditional arts management infrastructure and record

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[64] Albini, Steve. *Steve Albini on the Surprisingly Sturdy State of the Music Industry*. The Guardian. 17 Nov. 2014. Web. 8 Dec. 2014.

labels that at one time had a monopoly on effective mass distribution and professional recording. This shift has had mixed results with the avant-garde electronica community. It has allowed enthusiastic audience members and fans to support composers in meaningful ways knowing they are supporting the artist directly. On the other hand, these types of models are essentially a popularity contest where artists pitch their creative visions to an anonymous public hoping for enough micro payments to support a project. Artist development and support becomes essentially non-existent and artists are left to manage their own public image, often with limited results.

The Internet and decentralization of communities and economies have eliminated many opportunities and created others. Determining whether these opportunities are an improvement, or a detriment, does not lie within the scope of this paper. However, the fact remains that as new models are introduced the balance of economic and cultural capital shifts (IFPI 2014).

3.2.3 Decentralized Education

"You can learn anything. For free, for everyone, forever" (Khan Academy 2014).

Decentralized education refers to an extension and interaction of internet technologies and democratized, decentralized information. This new cultural architecture comes in multiple forms including, but not limited to: online teaching tutorials, games, and interactive classes, lectures, and other educational software. Kahn Academy, Code Academy, Syntorial, and Code Avengers are examples of decentralized education platforms.

The distinction between decentralized education and democratized data and decentralized creative communities mentioned in section 3.1.2 and 3.2.1 is one of intent and structure. That is to say, decentralized education instructs through interactive learning in graduated steps, as opposed to simply displaying accessible organized information.

Decentralized education acts as a key that unlocks the greater potential of democratized technology and information, especially in the context of electronic music. In other words, the amount of available information resources can be overwhelming to the point of being useless. Learning to learn and take advantage of available resources then becomes a critical step. Information formatted in meaningful and engaging ways allows individuals to take better advantage of available information resources. In this way, decentralization erodes traditional educational models that rely on information and education coming from a single sanctioned source. In other words, educational institutions are no longer the only viable approach to effective learning. This shift has begun to realize Chadabe's prediction of complexity and sophistication rivaling institutional electroacoustic music.

Syntorial, a subtractive synthesizer tutorial provides a characteristic example of new directions in decentralized education. Launched through a community driven kickstarter[65] grant, this educational tool encompasses many of the ideas presented in the previous section.

> Syntorial is the most direct route between hearing a sound in your head and knowing how to bring it to life. Lesson-by-lesson, module-by-module, Syntorial shows you almost everything that synths can do without getting bogged down in theory. Learn to aurally recognize VCO waveforms, filter bandwidths, LFO rates, ADSR parameters, effects types, and more. Get the edge on sound design by educating yourself with this new approach to tutorial software[66]

So while Syntorial is not intended to be a complete substitute for all theoretical information regarding subtractive synthesis, it provides a thorough hands-on introduction that puts any further theoretical readings in a context only possible after gaining a strong practical foundation. The educational interface doubles as a musical interface, therefore any knowledge acquired is directly transferable into music, or indirectly transferred into any work in sound design or electronic music.

The creation of *Metatron* did not benefit from integrated, interactive software like Syntorial, but rather from a slower, more organic process of accumulation of information from various online, print and multimedia sources. If Syntorial had been available on the Internet when I was a curious child, it would have fast tracked my understanding of

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[65] Kickstarter is a global crowdfunding platform where individuals pledge money to projects they support. www.kickstarter.com/

[66] *The 2014 Electronic Musician Editors' Choice Awards*." Electronic Musician. January 9, 2014.

synthesis and given me a stronger foundation sooner than my self directed introduction to electronic music. Of course, I have taken, benefited from, and taught electroacoustic music courses at the university level. They are rewarding experiences, although less so for their technical information than for practical understanding of how others approach technical and aesthetic problems.

While university programs do not need to fear being replaced by online tutorials, the increase in the numbers of young, skilled, synthesis savvy sound designers will raise expectations for what can be considered artful and contemporary. Perhaps Chadabe's prediction is a warning that institutions need to adapt, or risk being left behind in terms of aesthetics and technical ability.

3.3 Postdigitalism

> Like air and drinking water, being digital will be noticed only by its absence… face it — the digital revolution is over.[67]

> …the distinction between production and consumption has become increasingly blurred, and to a certain degree, meaningless.[68]

Postdigitalism refers to a set of emergent aesthetic practices that result from the saturation of digital technologies via the idea of new cultural architectures introduced in previous sections. Democratization and decentralization have changed relationships between the artist, audience, and technology as the means of audio production have moved from rare to ubiquitous to tedious. In other words, in an environment where fully-featured DAW, software and high fidelity audio samples can be instantly accessed from a cell phone and used to emulate the collected history of music production technology, aesthetics and expectations change. Increases in audio fidelity become meaningless beyond a point and the exchange between technological and artistic capital has fallen into a cycle of diminishing returns. In a postdigital environment, novel technology and the

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[67] Negropointe, Nicolas. *Beyond Digital*. 1998.
[68] Théberge, Paul. *Any Sound You Can Imagine.* 1997. p. 242

cutting edge simply pour into a noisy technological landscape defined increasingly by limitation, integrity, and rarity, as opposed to the dream of endless possibility.

For the purposes of this dissertation, many related concepts and aesthetics fall under the term postdigital. The aesthetics of failure, retro-mania, technological colour, and the art of technological limitation co-exist within the postdigital sphere. These terms, and the aesthetic shifts they represent, define *Metatron*.

3.3.1 The Aesthetics of Failure

Kim Cascone's *The Aesthetics of Failure* captures one of the concepts that drove early definitions of postdigital within the avant-garde electronica community. As early as the late 1990s, digital synthesis and emulations of analog hardware were mired in saturation and commercial appropriation. Analog and digital sounds, once indicative of an experimental futuristic aesthetic, fell victim of their own clichés and popularity. In the rush to shrink and virtualize studios, remove inconvenient hardware, and move everything into the computer, many producers lost sight of the advantages of imperfection. The virtual studio is convenient, stable and repeatable, but with these advantages can come a sameness and loss of character. As a result, some producers reacted against this trend seeking instead to imbue their music with unique character by embracing imperfection and inducing glitches and failures. Cascone describes the postdigital aesthetic in the following way:

> The 'postdigital' aesthetic was developed in part as a result of the immersive experience of working in environments suffused with digital technology: computer fans whirring, laser printers churning out documents, the sonification of user-interfaces, and the muffled noise of hard drives. But more specifically, it is from the 'failure' of digital technology that this new work has emerged: glitches, bugs, application errors, system crashes, clipping, aliasing, distortion, quantization noise, and even the noise floor of computer sound cards are the raw materials composers seek to incorporate into their music.
>
> While technological failure is often controlled and suppressed - its effects buried beneath the threshold of perception - most audio tools can zoom in on the errors, allowing composers to make them the focus

> of their work. Indeed, 'failure' has become a prominent aesthetic in many of the arts in the late 20th century [69]

3.3.2 The Art of Technological Limitation

> **Postdigital** (adjective), of or pertaining to art forms that address the humanization of digital technologies through interplay between digital, biological, cultural and spiritual systems, between cyberspace and real space, between embodied media and mixed reality in social and physical communication, between high tech and high touch experiences, between visual, haptic, auditory, and kinesthetic media experiences, between visual and augmented reality, between roots and globalization, between auto ethnography and community narrative media through participation interaction, and collaboration in which the role of the artist is redefined.[70]

A more refined interpretation of the postdigital approach moves beyond Cascone's glitches and induced errors, and emphasizes a return to controlled forms of imperfection, treating technology as though it were a physical instrument with limitations that define its character and beauty. Music created on instruments with limitations has a vibrancy and tension that results from inherent imperfections, and the ability of the audience member to appreciate virtuosity. It is based on the difference between fool proof triggering with little margin of error, and live performance, where the potential for failure is large. A practical example relating to avant-garde involves subtle differences in bass drum sound design.

An analog bass drum sampled from a drum machine and stored in a sound library can be massaged and crafted to be a perfectly round, crisp kick, with ideal attack, transient, envelope and decay characteristics. Once loaded into a sampler, said perfection can be accessed an infinite amount of times in exactly the same way. In doing so, the drum sound meets stylistic expectations and is stable, but quickly begins to lose its inherent interest, especially if that same sample is being used by hundreds of other artists working within a similar subgenre. Criticism of this type of sampling would be that the results are too perfect and therefore unmusical.

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[69] Cascone, Kim. *The Aesthetics Of Failure: "Postdigital" Tendencies In Contemporary Computer Music* 2000 p. 12-18.
[70] Alexenberg, Melvin. *The Future of Art in a Postdigital Age.* 2011 p.35

A standard postdigital aesthetic approach would be to purposefully induce errors into the sampling process transforming a perfect ideal digital drum sample into something with more individual character. This is the aesthetic approach introduced in 3.3.1, the *aesthetics of failure*. An alternate approach would be to find a real analog drum machine and create an original sound that embraces the limitations and character of the device. This approach has disadvantages:

- Sounds are inconsistent
- Interface lacks detailed, stable digital controls
- Inconvenient compared to a virtual emulation
- Slow to access and setup
- Takes up physical space
- Analog hardware introduces noise and distortion

With the addition of a postdigital perspective, these disadvantages revert to advantages.

- Every sound produced is unique
- Tactile interface means creating sound by ear instead of by eye
- Analog noise and distortion adds colour and character
- A genuine sound requires less treatment compared to emulation.

Despite this specifically analog vs. digital example, the postdigital approach has little to do with the nature or physical components of the technology itself, but rather how technology is approached and how this shapes aesthetic results. The question moves beyond whether new technology is superior to older technology, but rather which technology provides the appropriate tool for a given application in a given context.

3.4 Hybrid Hardware Renaissance

The resurgence of the analog and hardware synthesizer market in the late 2000s captures the proliferation of the postdigital aesthetic ushering in what Dave Smith[71] refers

[71] Dave Smith of the synthesizer design company Sequential Circuits is the creator of the now famous and desirable Prophet 5 polyphonic synthesizer, as well as a member of the group that create the influential MIDI standard, After Sequential Circuits went out of business, Dave Smith re launched his company as

to as the second 'golden age' of hardware synthesizers (Hamil 2014, Boothroyd 2013). Due to the postdigital hardware renaissance, synthesizer designers Tom Oberheim[72], Dave Smith, and companies such as Moog[73], and Buchla are back in business after falling victim to Japanese mass production of synthesizers in the 1980s. Other companies, including Novation, Waldorf, Korg, and a multitude of boutique hardware manufacturers are creating new products aimed at a variety of markets and price points (Boothroyd 2013). These instruments embrace postdigital ideals, imperfection and limitation, and focus on interface, tactile experiences, performance, and sonic authenticity. The elaborate performance setup and production of *Metatron* was possible only because of the availability of these new devices.

3.4.1 Chip Sounds

The hardware renaissance is not limited to a resurgence of analog equipment. Synthesizer designers have gone to great lengths to produce authentic sonic recreations of early digital hardware. The Elektron SID station wraps an early digital chip within updated control hardware allowing composers and producers access to the gritty and surprisingly expansive textures of cheap 1980s digital synthesis. Other methods of accessing these sounds include retrofitting videogame hardware like the original Gameboy, or creating custom synthesis cartridges for the Nintendo Entertainment System, essentially transforming these obsolete devices into instruments.

Increasingly, simplistic early digital synthesis chips are being virtualized and emulated inside standalone boutique music hardware. Examples include: Plogue[74], DM Basic 65, NES Pulse and others[75]. This approach at first appears strange, because these emulations would be much easier to access via virtual instruments within a DAW. Furthermore, since the sounds are created and altered in the digital domain, the argument to preserve the dynamic irregularities of an analog signal path becomes irrelevant. Some

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Dave Smith Instruments, or DSI, and has spearheaded the hardware synthesizer revival by continually producing innovative synthesizers.

[72] Tom Oberheim is an influential American synthesizer designer and manufacturer and creator of polyphonic, monophonic analog synthesizers and drum machines. After retiring from the synthesizer business, Oberheim has recently re appeared and is re-releasing popular expander modules.

[73] Moog music, founded by Robert Moog is a synthesizer company that builds monophonic synthesizers.

[74] http://www.plogue.com/

[75] http://woolyss.com/chipmusic-plugins.php

producers chose to work strictly within a DAW, a practice referred to within the community as *fake bit.* However the designers and the performers, composers, and producers who buy these boxed digital emulations of retired DSP chips are interested in sounds as limited instruments within a performance context. That is to say, they embrace the 'instrument-ness' of their technological palate knowing that it has a profound effect on the types of sounds they will create.

The production and performance of *Metatron* implements all the approaches to synthesis mentioned above, including analog, digital, authentic, emulated, fake bit[76], chiptune, and whichever combination of synthesis and interface would give the desired result. Often the most satisfying results were the result of blurring the boundaries of analog and digital.

3.4.2 Analog/Digital Hybrids

The subtle interaction of analog and digital hardware is a natural progression of a postdigital aesthetic. Increasingly, hardware designers and manufacturers are building devices that integrate postdigital principals into their deeper structures. Earlier examples of this include synthesizers with digital control of analog components. Synthesizers from the 1980s and 1990s such as the Waldorf *Pulse*, Roland *JUNO 106,* and Oberheim *Matrix 1000* synthesizers are used in *Metatron* and implement this strategy in various ways. These synthesizers employ digital stabilization of analog oscillators (DCO[77]) which keeps synthesizers in tune, as well as digital patch recall[78], envelopes, MIDI, and sequencing options.

The *Modcan Series B* modular synthesizer used in the production and performance of *Metatron* was designed and built in 2010 by Bruce Duncan, a boutique synthesizer manufacturer based in Toronto, Ontario. This synthesizer differs from the digitally stabilized synthesizers of the 1980s and 1990s in that its oscillators are voltage

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[76] Fakebit refers to the emulation of retro videogame sound chips in software. Depending on the context, it can be viewed as a negative term, implying an artist lacks aesthetic integrity and that they are therefore *faking* their sound sources.
[77] Digitally controlled oscillator refers to synthesizer oscillators being kept in tune by a digital clock.
[78] Digital patch recall refers to the ability of a synthesizer to store and recall configurations of parameters, called "patches", which is a hold over from earlier modular systems that require elements to be patched together manually using cables.

controlled (VCO[79]). The Modcan Series B's voltage controlled oscillators are unstable compared to DCOs, as they are more akin to voltage controlled technologies used by LeCaine, Moog, Oberheim and others in the late 1950s, 1960s and 1970s. These instabilities and irregularities appeal to the postdigital aesthetic, as they respond musically and have an inherent imperfection that sets them apart from their DCO and purely digital cousins.

As a postdigital hybrid device, the Modcan Series B integrates digital components in the synthesizer's control structures, allowing for modulation possibilities only feasible through the complex interaction of digital and analog signal paths. As a modular synthesizer, the Modcan allows for external sound sources to be routed through its analog circuitry. In this way, digital sources are coloured to sound as if they were analog, and analog sources are coloured to sound digital. This option allows for the further blending of digital and analog technologies that is essential in *Metatron's* poetic and compositional processes.

As mentioned in section 3.3.2, new cultural architectures and the postdigital hardware renaissance are not simply retromania, or a matter of technological regression, but rather an acknowledgement that each piece of music technology has a specific colour palate that is shaped not only by the limitations of the circuitry and hardware components, but by the interface and the way it shapes the compositional process as well. In this way, music technology is maturing as a collection of instruments with their own histories of established sounds and respective performance practices.

3.5 Pseudo-Modernism and the Cloud

Democratization of technology and information interacting with decentralization and postdigital aesthetics are pushing avant-garde electronica in exciting directions. Postdigital aesthetics can be accurately compared to postmodernism in that additional meaning grows from increased understanding of historical, and in this case technological, context. However, the new cultural architectures introduced earlier in this chapter do not require historical foreknowledge for their aesthetic shaping effects to be felt.

[79] Voltage controlled oscillator refers to synthesizer oscillators tuned with raw voltage which typically requiring manual tuning adjustments with each performance.

Due to these shifts, some argue that these new cultural architectures and postdigital aesthetics are bringing the period of post-modernism to a close and ushering in a new period of narrative free, cloud based artistic practice some are calling pseudo-modernism, or for the purposes of this text, postdigitalism (De Ugarte 2012) or cultural singularity. *Metatron* sits on the cusp, existing between the two worlds, during this period of transition (Kirby 2006).

3.6 Summary

The democratization and decentralization of information, technology and education are eroding established power structures between avant-garde electronica and institutional electroacoustic music. Access to this unprecedented diversity of creative tools and resources is fueling electronica's aesthetic development. This expanding postdigital aesthetic draws new sounds from old technologies, and old sounds from new technologies. The postdigital compositional paradigm values stable, repeatable, digital, pristine sound sculpting tools just as much as unpredictable error prone equipment that is often seeking integration in a single experience. This renewed interest in the tactile, imperfect and unpredictable has blossomed into a vivid repertoire of technologically and historically informed electronic music. *The art of technological limitation and the colour of technology* are effective, compositional devices that add an exciting dimension to *Metatron.*

Chapter 4: Metatron

> Until 1877, when the first sound recording was made, sound was a thing predicated on its own immediate disappearance; today it is increasingly an object that will outlast its makers and consumers. It declines to disappear, causing a great weight of dead music to press upon the living. What to do with it?[80]

Metatron[81] literally and figuratively examines the audible colours of technology as filtered through my personal compositional language. It draws inspiration and influence from several sources, including the lifecycle of sound reproduction and music technologies, as well as media formats and how society produces, relishes, then abandons them. In a more specific sense, *Metatron* is an intersection of various musical artifacts passed on to me by my family, explored through a compositional language that straddles avant-garde electronica and Western art music.

This chapter unravels a network of new cultural architectures surrounding the origins of the work through a personal, cultural studies based approach. Section 4.1 explains the significance of *Metatron* as a title for the work. Section 4.2 addresses *Metatron* as a research creation project within an academic institution. Section 4.3 introduces the poetics and thematic elements of individual movements. Sections 4.4 and 4.5 examine the peculiar personal, cultural and technological circumstances that gave rise to the work. Section 4.6 addresses issues relating to performance practice. Finally, section 4.7 looks at *Metatron's* connections to democratization, copyright and postdigital aesthetics.

4.1 Metatron the Name

The title *Metatron* is a combination of the Greek prefix *meta* with a literal meaning "beyond" or "after", and the term *tron*, which is a Greek suffix meaning instrument. These two terms have multiple forms of expression, depending on the context and content of the work (Thomson 1990, 248; Harper 2014). *Metatron* can thus be interpreted as meaning the *final tool*, or an abstract tool beyond the scope and purpose of

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[80] Cutler, Chris. *Plunderphonia* 2004 p. 139-156.
[81] *Metatron* available here: http://www.ebritton.com/uploads/media/51/MetaMixFullWeb.mp3

the original tool. In this way, both the terms *meta* and *tron* refer to functional and self-reflective applications of technology. As such, the title evokes the central themes of the work and of this text as outlined below:

Postdigital Aesthetics

- The colour of technology in an orchestrational and music production context
- Technology as an aesthetic shaping device (i.e. self-imposed limitations).
- The aesthetics of failure as a controllable compositional parameter

Democratization and Decentralization

- Democratized / decentralized technology
- Democratized / decentralized information
- Pseudo-modernism and a potential withdrawal from post-modernism

4.1.1 Metatron the Celestial Scribe

Metatron as a title holds special significance in that it refers to an archangel from medieval Jewish and Christian mythology (also *Mattatron*), a celestial scribe mentioned in the non-canonical book of Enoch and other apocrypha. This sacred definition loosely evokes thematic ties between the chronological nature of *Metatron* as a composition and Metatron the archangel's role as celestial scribe. While not of primary thematic importance in the work itself, the notion of Metatron the archangel as a seemingly infallible celestial chronicler provides an apt metaphor for emerging cultural architectures brought about by developing internet culture and big data[82].

4.2 Metatron in a Research Creation Context

4.2.1 Academic Western Art Music

Metatron bridges Western art music and avant-garde electronica by combining and resynthesizing resources, techniques and aesthetic elements from each metagenre. As a federally funded doctoral thesis composition in the Music Research Department of a major Canadian research university, *Metatron* maintains a strong connection to the

[82] *Big data* is an all-encompassing term that refers to data sets large and complex enough to defy traditional analysis techniques. (Goldston 2008, 15; The Economist 2014)

Western academic art music tradition, regardless of the aesthetic, polemic or conceptual elements it evokes. The score uses standard Western musical notation for both instrumental and electronic elements. The premiere took place in the Schulich School of Music's MMR (Multimedia Room), a four-story research/production facility beneath street level.

The performers at the premiere were university-trained percussionists, four of whom are members of the *Architek* ensemble. *Architek's* musicians formed the core of the work, which was presented in a traditional Western art music concert setting[83].

The concert itself was produced and funded through a collaboration between CIRMMT[84] (Centre for Interdisciplinary Research in Music Media and Technology) and the McGill Digital Composition Studios. Support for *Metatron*'s recording and other audiovisual documentation came about through collaboration with recent graduates of McGill's Sound Recording program, as well as video support from graduate students in design from Concordia University. Everything down to the poster design and promotional materials was created by colleagues with graduate degrees and thus affiliated with the Western academic tradition in some way.

The Western academic culture, funding, performance context, technical and human resources surrounding *Metatron's* creation and premiere were sanctioned and supported by an academic art institution. The aesthetics, on the other hand, are a slightly more complex topic.

4.2.2 Avant-garde Electronica Context

Metatron embraces aesthetics, techniques, instruments and performance practices associated with the electronica metagenre. To put it plainly, I created *Metatron* by unabashedly embracing my alternate identity outside the academy as an electronica producer and sound designer.

[83] The standard western art music performance configuration refers to a seated audience facing forward with mannered concert decorum.

[84] "CIRMMT" is a multi-disciplinary research group centred at the Schulich School of Music of McGill University. It unites researchers and their students from several Quebec institutions - McGill University, l'Université de Montréal, l'Université de Sherbrooke, Concordia University, école de technologie supérieure, INRS, and Marianopolis College. (CIRMMT 2014)

When created and performed in an academic context, this project subverts established conventions of contemporary art music practice. Wherever possible, *Metatron* embraces democratized technologies and familiar musical materials, undermining an established symbolic economy that thrives on the disavowal of the common and the accessible. Not only are the studio-produced fixed media[85] elements of *Metatron* created from extensive avant-garde electronica production experience, but considerable effort went towards using authentic[86] electronica techniques and equipment.

Beyond equipment and experience, stylistic elements of avant-garde electronica are synthesized into the deepest internal structures, the smallest motives, and the largest formal and conceptual elements. The notated parts for percussion and electronics are built from characteristic gestures and rhythmic patterns created on analog and digital sequencers, and drum machine interfaces. See Figure 4.2 – 1.

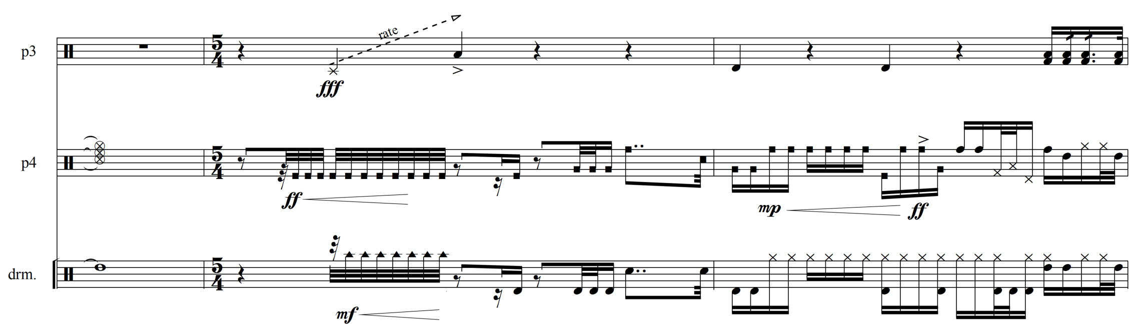

Figure 4.2-1 *Metatron* mm. 560 – 562, time: 21:33

Melodic patterns are modeled after monophonic chip style arpeggiation (m. 433: 17:28); analog delay (mm. 15-20, 00:42). Other produced materials are constructed from from DJ style filtering, feedback, and synthetic textures. These elements are produced in studio or live in performance using analog modular (mm. 206-212, 10:26), wavetable, FM, digital emulation and chip synthesizers.

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[85] *Fixed media* or, anachronistically *tape music,* refers to pre-composed sound files that are played back during a performance. These elements can be short manually triggered excerpts, or lengthy passages, or entire compositions as is the case with works for *instrument and tape* (fixed media).

[86] From an electronica perspective, the idea that some production equipment embodies more *authenticity* than others quickly moves into shaky territory. This authenticity comes more from a respect of the tools, history, and an understanding of the relationship between technology and compositional practice. In other words, authenticity in this case refers to not creating a poor approximation out of ignorance of the materials and techniques.

Each of these tools carries a specific set of associations. An instrument's position along the avant-garde capital continuum shifts depending on the time and context in which it is being used. *Metatron* exploits this fluidity. For example, while instruments like the modular synthesizer have origins in and connections to research facilities and academia, the current technological and performance climate associates them more with DIY electronica production (Hamil 2014).

4.3 Movements and Themes:

The title of each movement of *Metatron* references a fictional character presented through a media format that captures something of the spirit of the era in which said media was developed, produced, and consumed. These titles are meant to be tongue-in-cheek, with varying degrees of relevance to the composition and its thematic materials.

Each movement and its relationship to a specific era of music production does not create pastiche in that they attempt to recreate specific styles. Instead, the connections are deeper and more abstract. References and relationships come in the form of pre-recorded and specially captured audio materials, adhering to technological limitations associated with period specific technologies. In this way, I hope to transcend the limitations of allusion, and in so doing, capture and reflect something deeper and more fundamental about the spirit of each era.

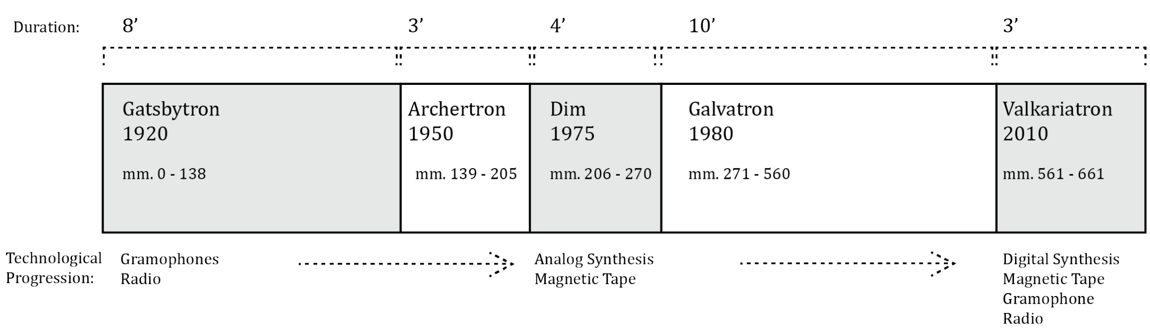


Figure 4.3-1 *Metatron* Movement Overview

The technological progression at the bottom of figure 4.3-1 is not exhaustive, but serves only to illustrate a gradual technological progression from the recording technology of the 1920s to the 2010s.

4.3.1 First Movement: "Gatsbytron" (1920)

The following is a list of the technologies that underlie the "Gatsbytron":

- Songbooks
- Gramophone Technology
- Golden Age Radio
- Monophonic Sound

"Gatsbytron" refers to Jay Gatsby, protagonist of the F. Scott Fitzgerald novel *The Great Gatsby*. The media objects, technologies and ideas that inform this movement are radio, vinyl, song books and the decline of parlour piano culture (Théberge 1997 22-40). This movement is constructed from thousands of fragments of popular songs from the era, most notably works by Irving Berlin (See mm. 24-35, 01:01), including:

- "A Pretty Girl is Like a Melody" (1919)
- "All Alone" (1924)
- "Blue Skies" (1926)
- "How Deep is the Ocean" (1932)
- "Cheek to Cheek" (1935)

From this list, Irving Berlin's "Blue Sky" and "How Deep is the Ocean" have the most prominent roles, although each work connects to the theme of *Metatron* in different ways. For example the refrain from "A Pretty Girl is Like a Melody":

"A Pretty Girl is Like a Melody" [Refrain]:

> A pretty girl is like a melody
> That haunts you night and day
> Just like the strain of a haunting refrain
> She'll start upon a marathon
> And run around your brain
> You can't escape, she's in your memory
> By morning, night and noon
> She will leave you and then come back again
> A pretty girl is just like a pretty tune

Berlin's refrain alludes to melody and music becoming stuck in the public consciousness, drifting into obscurity and coming back again, in the case of *Metatron*, as a dissected group of sampled materials and sonic characters. A similar theme is captured by the first verse of Berlin's "All Alone":

"All Alone" [Verse 1]:

Just like a melody that lingers on
You seem to haunt me night and day
I never realized till you had gone
How much I cared about you

Audible structural, thematic and formal materials are generated from "How Deep is the Ocean?" and "Blue Skies".

"How Deep is the Ocean" [Verse 1]:

How much do I love you?
I'll tell you no lie
How deep is the ocean?
How high is the sky?

"Blue Skies" [Verse 1]:

Blue skies
Smiling at me
Nothing but blue skies
Do I see

Bluebirds
Singing a song
Nothing but bluebirds
All day long

These two lyrical fragments introduce a secondary poetic image of *sky*, which serves as recognizable material for manipulation. (See mm. 90-100, 04:20; m. 150, 08:04)

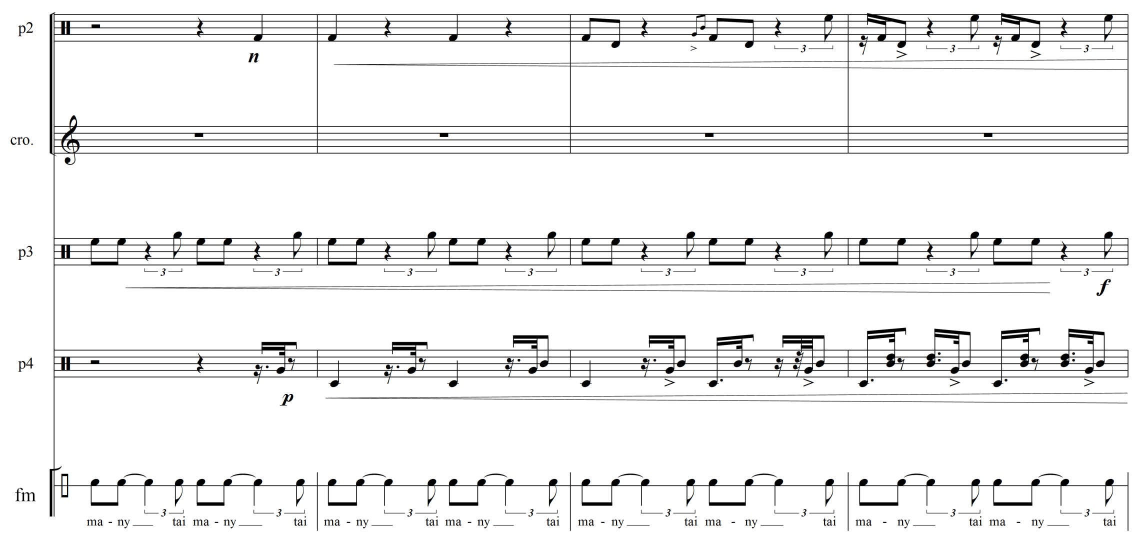



Figure 4.3-2 "Gatsbytron" Vocal Sample Manipulation Exerpt. mm. 21-24

Compositional devices applied in "Gatsbytron" include: 1) abrupt transitions inspired by early radio and early vinyl records; 2) imitation of radio static and record noise through extended percussion techniques. For example, vertical wire brushes grinding into woodblocks; 3) accelerandi and slowdowns inspired by turntable technology, executed through audio montage and pitch shifting over time paired with live instrumental gestures. The overall effect delivers an orchestration with a narrow spectral bandwidth and unstable pitch, evoking the playback of 78 RPM shellac records. (See m. 603; listen at m. 7, 0:20)

Compositional constraints derived from period technology are achieved by portraying limited audio fidelity through narrow dynamic and harmonic ranges. The selective application of mono imaging, band pass filters, compressors, equalization and coloured distortion evoke the pre hi-fi audio of the mechanical 78 RPM hand crank systems.

Using ribbon controlled synthesizers with performer generated vibrato, a convincing Theremin sound is evoked through the unstable pitch and legato contours characteristic of the instrument, further solidifying connections to the 1920s[87]. These themes and techniques reoccur multiple times throughout the work.

[87] Theremin instrument: Developed by Léon Theremin in 1920

Orchestration and micro-montage combined with careful audio sound design and sample selection recreate and imitate specific technological behaviors and limitations of the 1920s technology. This creates an overall synthesis that is reflective of the spirit of the age, but with a new expression of its character. (See m. 75, 03:26)

4.3.2 Second Movement: "Archertron" (1950)

Media objects and technology:

- Mature Vinyl
- Hi Fi Systems
- Stereophonic Sound
- B Movies
- Technicolor

"Archertron" is named after John Archer from the 1950 science fiction film *Destination Moon*. The trailer for the film opens with a text overlay stating: "Technicolor camera reveals secret rocket ship takeoff to the moon" (*Destination Moon* 1950). This one sentence captures the excitedly optimistic science fiction aesthetic of the post World War II period. In *Metatron*, the shift from a 1920s to 1950s *zeitgeist* develops alongside an increase in audio fidelity, stereo imaging, spatial effects, tape technology, and jazz idioms. In particular, vibraphone, swing patterns on drum set, and early plate and spring reverbs are all associated with this period of music production. (See mm. 139-153, 07:24)

Just as "Gatsbytron" is a celebration and exploration of the sonic character of vinyl, "Archertron" celebrates the beauty and unique colour of magnetic tape. Materials processed and manipulated on an analog tape machine at the McGill Digital Composition Studios are given a slightly overdriven quality. (See mm. 183-195, 09:29)

"Archertron" includes processed material from the 1958 Ella Fitzgerald recording of Irving Berlin's "Blue Skies". [88] In this movement, the specific swing character from the Ella Fitzgerald recording was extracted and applied to sampled percussion materials, acting both as a compositional parameter and constraint.

During this movement, the "Blue Skies" theme appears performed on a transformation of the historic Columbia Princeton RCA Victor II synthesizer's rendition. The odd combination of warm analog polyphonic tones, unstable oscillators and

[88] Verve Records, *Ella Fitzgerald Sings the Irving Berlin Songbook.* 1958: www.discogs.com/Ella-Fitzgerald-Sings-The-Irving-Berlin-Songbook/release/1389285

mechanical percussion tie this segment to the period in question and foreshadow juxtaposition of warm, organic and mechanical colours of later movements. (See mm. 159-171, 08:28)

4.3.3 Third Movement: "Dim" (1975)

Media objects and technology:

- Monophonic VCO-based subtractive synthesis
- Polyphonic and monophonic DCO-based subtractive synthesis

"Dim" disrupts the established thirty-year pattern (1920, 1950, **1975**, 1980, 2010) and takes its name from a minor character in Stanley Kubrick's 1971 film, *A Clockwork Orange*. This movement emphasizes the sound of the subtractive analog synthesizer, forever associated with *A Clockwork Orange* through the distinctive soundtrack by Wendy Carlos. Carlos gained notoriety through her recordings of Baroque music produced on a Moog modular analog synthesizer, particularly the album *Switched On Bach*. The sound track for *A Clockwork Orange* features subtractive Moog modular synthesizer modules that provide a distinctive warm, buzzy analog quality. In *Metatron* these same characteristics are achieved through the use of a contemporary Canadian modular analog synthesizer, the Modcan Series B described in section 3.4.2.

Subtractive synthesis sounds are prominently featured in the third and final movements where they are performed live and in the pre produced electronics. The use of a modular analog synthesizer captures the spirit of the 1970s through the elaborate progressive rock evoking instrumental configuration. Along with striking visual elements, the subtle analog distortions and tuning characters of the Rhodes keyboard, synthesizers and modulating analog delay unit are strongly associated with specific 70s technologies and performance practices. (See m. 201, 10:16)

4.3.4 Fourth Movement: "Galvatron" (1980)

Media objects and technology:

- Television
- Polyphonic DCO based Analog Synthesis
- Early Digital Synthesis (Chip Synthesis)
- FM synthesis

The title "Galvatron" comes from the second incarnation of the robot arch-villain from the popular 1980s children's cartoon television franchise, *The Transformers.* The obvious choice for the movement title would have been *Megatron,* as anybody born in the 1970s, 80s or 90s would associate the suffix "tron" with *Megatron*, the first incarnation of the arch-villain from *The Transformers*. Instead of ignoring the *Mega/Meta-tron* relationship, I integrated it into the movement title through a tongue in cheek, obscure *Transformers* reference.

Television, analog polyphonic synthesis, and early digital synthesis evoke the spirit of 1980s pop culture and emerging digital technologies. This movement features digital synthesis from a variety of sources and instruments, embracing and transforming the distinctive chiptune aesthetic. Specific technologies used to capture the sound and spirit of the 1980s include:

1.) the MOS-6502, pronounced "sixty-five oh two" which is familiar to some for its use in the Nintendo Entertainment System, providing a buzzy digital sound;
2.) the MOS-6581 chip found in the Commodore 64 with a distinctive digital buzz, which was impressive at the time due to pulse width modulation and full ADSR envelope capabilities;
3.) LinDrum sampling drum machine as well as the Tanzbar[89] analog drum machine;
4.) The Waldorf Blofeld[90] digital wavetable synthesizer, which acts as a functional stage based stand-in for fragile vintage consumer electronics.

Compositional and orchestrational connections to cheaper consumer-grade 1980s synthesis technologies occur through pseudo-polyphony (i.e. the illusion of polyphony achieved through rapid, near audio rate arpeggiation). Monophonic digital sound chips, like the 6502 and 6581, used rapid arpeggiation to give the impression of polyphony. Similar textures are used at the climax of the movement in measure 433. (See mm. 432-465, 17:23)

[89] http://www.mfberlin.de/
[90] http://www.waldorf-music.info/

4.3.5 Fifth Movement: "Valkaratron" (2010)

Media objects and technology:

- Video Games
- Postdigital Synthesis

"Valkaratron" is named after *Garrus Valkarian*, a supporting character from the space opera series *Mass Effect*, a game that to many represents a milestone of video games as a mature storytelling medium. This is due to its compelling script and adaptive narrative, where the player makes morally difficult decisions (Zakouski 2014). *Mass Effect*'s central premise resonates with *Metatron* in that it focuses on biological and computer interfaces and the synthesis of a new life from biological and digital origins. Its speculations on future human-computer interaction and emphasis on gritty utopian/dystopian technologies capture the postdigital *zeitgeist* surrounding the game's creation in 2010.

A video game was chosen as the representative media format for the final movement because it continues the process of expanding sensory experience and dominant media formats that begins in the first movement: Song Books ➔ Radio/Silent Films ➔ Record Players/Cinema ➔ Television/Video Recorders ➔ Videogames/Internet

Compositional devices taken from contemporary videogames and sound design manifest themselves in "Valkaratron" through an anything goes, kitchen sink approach. Historically appropriate technological limitations are replaced by free and playful juxtaposition of all previously introduced materials. The juxtaposition and resynthesis of earlier elements into new, hybrid structures yields a postdigital climactic intersection of mechanical, analog, digital and biological technologies. (See mm. 561-512, 21:33)

The booming robotic voice that begins "Valkaratron" ties together lyrical, melodic, mechanical, analog and digital elements while drawing its spectral profile and flavour from the synthesized voice of the villain in *Mass Effect*, further unifying the thematic elements of the work. The distinctive full sound of the synthesized voice comes from injecting an audio signal into a performer's throat via a talk box.[91] The talk box bypasses the vocal cords with synthesized elements by projecting them via a tube held in

[91] A talk box is an enclosed speaker attached to a plastic tube. The speaker signal moves down the tube and enters the performer's throat, using the mouth and throat as a resonant filter.

the performer's mouth, and relying on the throat and oral cavity to modify the sounds. In this way the robot voice creates a synthetic integration of biological (using the mouth and head as a formant filter), analog and digital synthesis. (See mm. 537-559, 20:34)

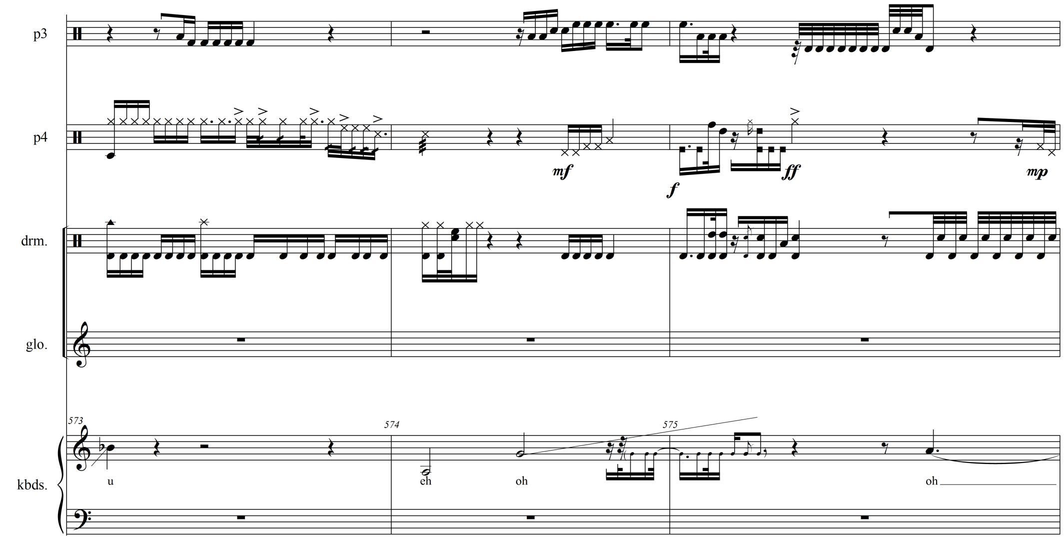



Figure 4.3-3 "Valkaratron" Postdigital Climax mm. 573 – 575)

4.3.6 Bound by Common Threads

Metatron draws together a sprawling network of conceptual, textual, melodic, and technological themes. This meticulously unified material is bound together with a straightforward chronological structure as well as readily identifiable musical materials. While the whimsical titles each have considerable connection to the themes and tropes present within each movement, they are not necessarily intended to be an essential programmatic element.

4.4 Cultural Context, Personal Compositional Language

In *Metatron* I have attempted to create an effective and *sincere* synthesis of Western art music and avant-garde electronica. I say this with the intention of differentiating a deeply integrated and personal compositional language from the surface stylistic appropriation that is sometimes used by Western art music composers attempting to relate to contemporary culture and a broader audience. The compositional language of *Metatron* is inseparable from the context in which I developed as an artist and continue to live and develop my craft. A deeper understanding of this synthesis requires a breakdown of the components influencing this language and how they interact.

4.4.1 Varied Early Musical Influences

This synthesis of Western art music and avant-garde electronica is not a conceptual project or an aesthetic choice. It comes from a natural outgrowth of varied musical experiences during my formative years and the musical culture in which I developed my compositional language. Music education in my life has been a sporadic collection of popular and traditional sources.

Early experiences include a brief, but intense, period in Brandon University as a boy soprano paired with inconsistent music lessons in multiple contexts. Later, as a young adult, electric and double bass defined my early ensemble participation in a variety of styles: big band jazz, jazz combos, punk, ska, rock and folk bands, wind ensembles and orchestras, and computer based music production. An active generalist musical experience taught me to value the differences and points of connection between metagenres, instead of arranging them in a hierarchy.

4.4.2 The Aesthetics of Planned Obsolescence

The formative musical experiences described in the previous section overlap with the late 1980s and 1990s, a time of transition in music technology and media formats. In 1979 Sony introduced the first affordable, portable audio cassette player. The popularity of Sony's *Walkman* ensured the success of the cassette tape format, undermining and eventually surpassing vinyl records as the dominant audio format of the 80s. At the same time, early adopters of the comparatively expensive and then futuristic digital compact disc format (CD) were applying pressure to vinyl's dominance of the audiophile market (Haire 2009; Gay 1997). While Sony, Philips, Nakamichi, Revox and others battled for supremacy in the emerging cassette tape market, videogame hardware manufacturers waged economic war for space on the floors of living rooms of North America.

After a wave of highly profitable vinyl sales peaking in 1978, audio cassette and later compact disc technologies triggered a period of rereleases and planned obsolescence (Degusta 2011). Videogame companies like Atari, Commodore, Nintendo, Sega and

ColecoVision adopted the same business model, providing hardware devices that lacked backward capability.

The cycle of consumption and planned obsolescence in the 1980s and 1990s ensured a steady stream of newly obsolete, unwanted media objects that flowed into basement rec rooms, garage sales, street corners, and bargain bins. Unwanted electronics were often made available to children. Some of the earliest and most vivid soundscapes of my childhood are the result of planned obsolescence and the buildup of unwanted media and electronics. These characteristic soundscapes directly and indirectly inspired *Metatorn's* compositional language.

As a child with an undeveloped aesthetic filter, my record collection was *diverse*. Highlights from my early childhood record collection include:

- The soundtrack from Milos Forman's 1984 *Amadeus*
- B52s self-titled debut album
- Wendy Carlos' *A Clockwork Orange* soundtrack
- Kubrick's 1968 *2001 a Space Odyssey soundtrack*, (with a then puzzling but significant *Lux Aeterna*)
- *He Man and the Masters of the Universe*
- *Jospeh and the Technicolour Dream Coat*
- *Ella Fitzgerald sings the American Song book*
- *Good Housekeeping's Plan for reducing The Sporting Way*
- James Last
- Kraftwerk
- Prokofiev
- Disney
- Disco
- New Wave: *Tom Tom Club*

Videogame consoles encountered during this period include:

- Intelevision 1980
- Commodore 64 (C64) 1982
- Atari 2600 Jr. 1984

- Nintendo (NES) 1983
- Super Nintendo (SNES) 1990
- Sony Playstation 1994

Early millennials[92] witnessed the transition of a number of technologies from being coveted and costly, to disposable and ubiquitous, making them a flexible medium for experimentation. The pops and clicks of abused vinyl, tape hiss and flutter of overused tapes, beeps and digital noises from error prone cartridge consoles inform the colourful technological soundscape of my youth and in turn *Metatron.*

4.4.3 Digital Adolescence

In 1995-6 my first composition teacher, Judith Snowdon, introduced me to MIDI, sequencers, and synthesizers. Immediately I began producing electronic music by exploiting her then fully featured external samplers and synthesizers. This was achieved by triggering external hardware from a computer sequencer and performing live automations. The results were recorded directly to cassette tape.

By age 12 I had cobbled together a primitive home studio of my own, using my parent's office computer and a cheap, but useful and MIDI capable, Casio keyboard and a tape deck. The only software I could access at this time was a primitive notation editor and sequencer program with manual MIDI list entry. The vertical interface was not unlike tracker editors (see figure 4.4-1). In order to gain any meaningful functionality from this system I was forced to completely memorize and internalize the MIDI communications protocol.

[92] Millennials, also known as generation Y refers to individuals born between the early 1980s and the early 2000s.

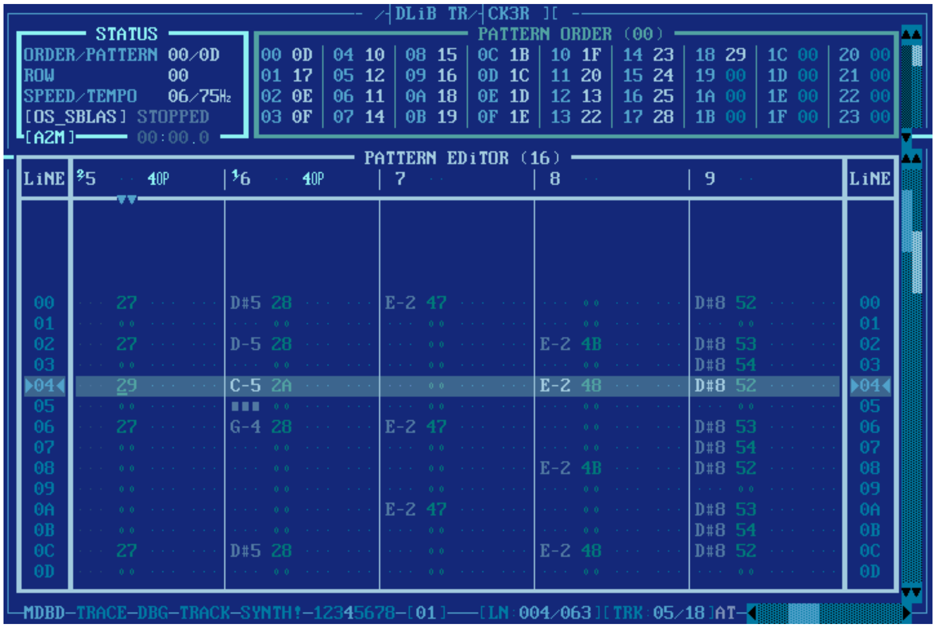


Figure 4.4-1 Pattern Editor Interface Example[93]

Fortunately, my family was an early adopter of the Internet. My curiosity about music production immediately led me to IRC[94], sequencing software, midi files and the basics of home audio production. On the Internet, I was able to communicate with other producers and begin exchanging information, media and advice. Initially these took the form of text and MIDI files, but eventually grew to include MP3s and full resolution audio. This period of online exploration provided a quick introduction to a larger, international world of computer based music production and the underground electronica scene.

My early musical aesthetic was shaped by what could be accessed for free inside the computer. MIDI, subtractive synthesis, FM synthesis, drum machine programming, sound design, sequencing and production basics were all skills I acquired through virtualized versions of difficult to find or expensive hardware. In this way my musical experience embodies the new cultural architectures outlined in chapter 3. That is, the intersection of democratized technology and information.

[93] www.adlibtracker.net/index.php

[94] Internet Relay Chat, a text based communication protocol and precursor to instant messaging and mainstream social media.

4.4.4 Metatron and Millennial Specific Cultural Context

The connections between *Metatron,* and a millennial specific cultural context are evident. The transitional period of consumer electronics and media production spanning the late 1970s and '80s generated a backlog of orphaned technology that defined my early musical experiences.

Growing up in the vanguard of Chadabe's new cultural architectures caused aesthetics, genre and technology to be understood on a flexible continuum. This new cultural context triggered a lifetime of technological awareness and listening that has informed every aspect of *Metatron* as an exploration of technology and genre. More specifically, these experiences instilled the notion that sound, media, format, technology and genre are interpenetrating flexible objects. In other words, there is a flexible world within each sound that can be stretched beyond physical, digital limits into a postdigital world beyond.

4.5 Personal Context

This program note from the premiere of *Metatron* explains some of the more personal aspects of the work, specifically my grandmother's song books, the piano and its eventual destruction.

> "I never really played what was written, just looked at the melody and made it up as I went along", said Gran[95], referring to a lifetime of sheet music piled neatly atop a massive 1904 upright piano. An instrument that was already old when acquired secondhand after WW2. My grandmother's collection of yellowing song sheets with its seemingly unbelievable publishing dates and prices (5 cents, 6 cents in Canada) sat carefully folded between the pages of an old *Reader's Digest Family Song Book*. Watercolour illustrations of well-dressed couples dance across each page, beaming out at the reader, a portable music format it its own right, overflowing with sentimentality for dance culture that had slipped away. A beautiful memory but the piano had to go, and it would go by chainsaw.
>
> *Metatron*, for percussion, and electronics, grew out of the technological cast offs that bullied their way into my life. Gran's music collection, the destruction of the piano and an obsession with vintage audio equipment catalyzed a greater reaction that had been building for years. A resolution to use of the equipment and media objects that saturate my

[95] British English, short for grandmother.

> life, and somehow make them mine. Formats (song sheets, phonograph recordings, tape recordings, CDs) and their associated recording and performance technologies, carefully preserved for a century, are revisited and woven together with threads and a riot of technological colours provided by the many versions of Irving Berlin's "Blue Sky" and "How Deep is the Ocean".
>
> Age does strange things to people. Driven by the compulsion to settle affairs, and possibly resentment at no longer having hands that could play, Gran wanted the piano gone. Pianos as old, heavy and ornate as this generated a great deal of curiosity, but few brave enough to attempt a move. No takers. So, one afternoon I helped my ninety five year old grandfather (at his insistence) slide the piano into the garage. Six months later on a return visit, I was greeted by a stripped piano, was handed a dull chainsaw and asked to finish the job. With grim determination and numb hands from the vibrations of a hopelessly dull tool, I dismembered my first musical experiences, thinking only of the strange place technology holds in our lives. Firewood, or maybe something more.[96]

4.5.1 The Piano

In his book *Any Sound you can Imagine: Making Music / Consuming Technology*, Paul Théberge describes how the piano, a sophisticated piece of music technology and symbol of elite Western art music, made its way into the living rooms of middle class North Americans (Theberge 1997 17-31). This process of decline is echoed by Craig and Kellman (Craig 1989; Kallman 1960 196-7). This democratization of music making in the home provides a thematic precursor to chapter three's new cultural architectures. Also, this early intersection of music education, instrument production, mass marketing and manufacturing resonates with *Metatron's* central themes and acts as a starting point for technological progression employed as a formal element. In other words, *Metatron* began with Gran's piano, and my realization that it was her 1940s version of the digital audio workstation.

My grandmother, Pat Britton, an English war bride, was able to buy a used piano for $40 and with great effort, move it into a modest home on the Canadian prairie. Through her piano Gran was able to engage with, and interpret, a collection of popular songs purchased in Canada and brought over from England after The War. The examples

[96] Britton, Eliot. *Metatron Program Note Live*@CIRMMT Feb. 13. 2013

relevant to *Metatron* are Irving Berlin's "Blue Skies", "How Deep is the Ocean" and the *Reader's Digest Family Song Book*. The song book, the piano and my grandmother's relationship with both of these musical artifacts are a significant conceptual link to the various forms of democratization outlined in chapter three.

4.6 Instrumentation and Performance Practice

4.6.1 Traditional Percussion + Commercial Instruments

The instrumentation for *Metatron* includes instruments from both electronica and Western art music / institutional electronic music canons.

Electronica	Overlapping	Western Art Music
Wavetable Keyboard	Modular Synthesizer	Multi-Percussion[97]
Analog Drum Machine	Drum Kit	Glockenspiel
Ribbon Synthesizer	Vibraphone	Crotales
Delay Pedal	Laptop Playback	Suspended Cymbals
Talk Box	Found Objects	Bass Drum
Rhodes Piano		

Table 4.6-1 Instruments and Metagenre Affiliations

The points of overlap are important, not only because they physically link avant-garde electronica and the Western art music tradition, but because they point out an interesting shift in perception and genre association. For example, computer-controlled subtractive synthesis and its associated sound palette and performance practices were once the domain of elite research institutions. Now this technology and performance practice have come to be associated with avant-garde electronica and the booming modular synthesis revival movement. This is interesting because it shows that similar sounds and performance practice from institutional electroacoustic music and electronica, or even pop, may be separated only by time.

[97] In this context, multi percussion refers to groupings of percussion instruments within the context of institutional percussion practice. (i.e. Percussion pedagogy within a university setting.)

As is mentioned in earlier sections, the relationship between commercial instruments and institutional music making is complex, especially with regards to definitions of art music that rely on technological capital. The instruments in *Metatron* were specifically selected to subvert and highlight the discrepancies in the technological capital that was once used by institutions to define aesthetic boundaries, in other words, appropriating both the sounds and symbols of institutional / academic music culture further destabilizes boundaries.

4.6.2 Notation and Performance Practice

Metatron is a traditionally notated work, which in itself binds it to the Western tradition. However, using traditional notation for non-traditional instruments is insufficient, since the work relies in part on popular music performance practice. Some electronica affiliated instruments map easily to traditional notation: for example, drum machines, Rhodes piano, and talk box. Other instruments such as the modular synthesizer, polyphonic wavetable synthesizer and 2D touch controller are less easily adapted to traditional notation, requiring specialized graphics and instructions to clearly communicate the composer's wishes.

To avoid difficulties in interpretation, the notation in *Metatron* is as straightforward as possible. This streamlining attempts to stave off obsolescence as technology progresses and overly specialized notation schemes become impractical and obsolete. This decision comes from an observation made by myself and others (Bernardini 2014) that overspecialization in notation, especially with regards to specific technologies, lowers the possibility of repeat performances. Digital synthesis, filtering, drum machines, sampling, and talk boxes will undoubtedly continue to be used in performance contexts, but the interfaces and underlying technologies will change.

This conservative approach to notation places the burden of interpretation on the performers. Arguments against general approaches to notation emphasize the possibility of inaccurate future interpretations. On the other hand, varied interpretation can add life and flexibility to a work, allowing ensembles to take ownership of their unique version in each performance. Furthermore, due to the possibility of including additional video and audio documentation, drastically inaccurate interpretations will remain unlikely and well worth the risk of informed, alternate interpretations on future instruments.

4.6.3 Ensemble, Band, DJ?

Metatron integrates three performance practices. The traditional instrumental ensemble with adherence to a notated score, a *band* paradigm that requires groove based thinking, improvisation and cues, as well as a DJ live PA[98] paradigm, with the triggering and manipulation of long segments of pre produced audio. For these reasons and others, *Metatron's* performance practice is positioned between avant-garde electronica and Western art music traditions.

4.7 *Metatron's* New Cultural Architectures

As discussed below, every part of *Metatron* connects directly, or indirectly, to the new cultural architectures outlined in chapter three.

4.7.1 Metatron's Democratization of Technology

The prerecorded electronic elements from *Metatron* were produced on a computer built from relatively affordable components and using second hand audio equipment. Adequate processing power, solid state hard drives and a multi-channel audio interface translate into a fully functional home studio that rivals institutional production facilities in terms of basic stereo audio production. This is not to say that institutions do not purchase higher quality equipment, but rather that access to technology is no longer the barrier of entry for quality. Instead, skill and knowledge are the primary ingredients for creating appealing, provocative and professional sounding works, not the size of the budget or cost of the tools. In other words, the democratization of technology has leveled a large portion of the music production playing field, and *Metatron* takes advantage wherever possible.

Furthermore, the use of analog synthesizers and equipment, now out of fashion in academic institutions due to leveraged technological capital, gives *Metatron's* synthesized elements a richness and organic quality rarely achieved in software.

[98] Live PA is a term used in DJ culture referring to the integration of synthesizers, drum machines and samplers into a live performance as opposed to playing pre-recorded material in a more traditional DJ set.

4.7.2 Metatron's Democratization of Information

The democratization of information touches many aspects of *Metatron's* creation on both practical and conceptual levels. For example, because of the Internet's ability to connect specialized communities, the notoriously opaque 1987 Yamaha TX81Z synthesizer has enjoyed a resurgence in popularity and usability. Detailed information, technical specifications and history were readily available to me from Wikipedia and Vintage Synth Explorer[99].

Next, reviews, tutorials and discussion are available on synthesis forums and YouTube. The vintage FM synthesis community maintains a number of software editors and patch librarians that allow users to create and share patches for this difficult, but powerful, machine. Even though FM synthesis historically fell out of favour in electroacoustic music, it is enjoying a resurgence in electronica (Gregory 2013). Without access to these communities and information, the authentic sound of the TX81Z would not be a viable option for works like *Metatron* that strive for technological authenticity.

The Internet Archive, *The Pirate Bay*, *Waffles.com* and *The Free Sound Project* act as repositories for sound of all types with varying degrees of legality. Access to archives of public domain, grey market and illegal information creates the media rich environment essential for works like *Metatron* to flourish. Unrestricted access to digitized versions of Irving Berlin's early music would be impractical and in many cases impossible, without community driven and maintained searchable databases. Of course there are more legitimate sources of information accessible by university students. However, university databases are cumbersome by comparison because of their adherence to copyright laws and pay walls intent on monetizing information as well as restricting access to non privileged individuals.

4.7.3 Metatron and Copyright

In the context of *Metatron*, Irving Berlin's "Blue Skies" and "A Girl is Like a Melody" hold special significance with regards to the democratization of information and the public domain. Irving Berlin's 1926 "Blue Sky" should have entered the public domain in 2002. However, the Sonny Bono Copyright Term Extension Act of 1998 blocked this transition. Now, technically "Blue Skies," as well as the majority of Irving

[99] http://www.vintagesynth.com/

Berlin's popular works, will never enter the public domain if copyright after death continues to be extended (Karjala 2014). For this reason, "Blue Skies" was chosen as a symbol for the importance of a healthy public domain in the creation of new and reflective artworks.

4.7.4 Postdigital Aesthetics

Metatron captures the emerging postdigital aesthetic in multiple ways, through the use of technology, compositional practice, and musical materials.

Standard Definition:

Metatron exploits and integrates errors and glitches in music technology by embracing the so-called *aesthetics of failure*. These glitches encompass everything from record pops, hiss from reel to reel tape machines; to digital artifacts introduced through pushing time stretching algorithms beyond their limits.

In *Metatron* these errors come in many flavours. The first is the rare and unpredictable, intermittent errors that result from an unstable or malfunctioning systems. These include:

- Intermittent warbling on the cutoff frequency and envelope slider on a malfunctioning Roland Juno 106.
- Fluctuations affecting the Modcan Series B modular synthesizer's pitch stability.
- The temperature sensitive components of the Oberheim Matrix 1000 synthesizer.
- Glitching and rounding errors occurring via accidental overloaded processors and DSP algorithms.

The second type includes deliberately generated, repeatable and controllable errors. These include:

- Percussive digital pops and clicks caused by non zero crossings in an audio file.
- Record scratches, pops and dust noises.
- Intentionally overwhelming the CPU of the Blofeld wavetable synthesizer

- Overdriving and tampering with various hardware components of the Modcan Series B and Moog MF-104 analog delay unit.

The third type, most characteristically postdigital in concept, comes from emulated hardware errors. These are software tools that are designed with the express purpose of recreating and controlling specific errors and colours of imperfection in a pristine digital environment. These tools include:

- Bit crushers.
- Modeled tape delays, distortions and saturators.
- Modeled rounding noise in computer based FM synthesis.
- Modeled pitch drift in emulated subtractive synthesizers.
- Artificially imposed processing limitations for low fidelity digital chip synthesis.

Postdigital - *Expanded Definition*

The expanded definition of the postdigital paradigm used in this dissertation includes the re adoption of tactile equipment into modern music production. This comes after over a decade of virtualization and movement into mouse and screen based music production with general controllers.

The postdigital hardware resurgence grows from a different origin than the retromania (Reynolds 2012) movement that fetishizes vintage equipment. This extended branch of the postdigital paradigm embraces technological limitation through new, practical and functional music production tools. In other words, the vintage nature of the equipment is irrelevant compared to its functionality. These newly designed tools may be analog, digital or, most interestingly, hybrids, as is increasingly the case. This is not a move backwards in music technology as it may seem at first glance, but instead an acknowledgement of the importance of tactile elements of sound design and gesture based control.

The Modcan Series B Modular Synthesizer featured prominently in *Metatron* exemplifies this type of postdigital hybridization. It integrates digital and analog oscillators and control with a carefully-designed tactile interface. This integrated analog/digital system connects the precision, variety, stability and accuracy of digital synthesis with the limited, unpredictable, organic-sounding nature of analog.

4.8 Summary

Metatron is a highly personal work that summarizes a century of technological progress by the music industry, through a unique language shaped by postdigital aesthetics, planned obsolescence, and the Western art music aesthetic.

Metatron's integration of high and low technology, digital synthesis and audio processing avoids the self-reflective, sometimes ironic pose of postmodernism, and transcends the fetishism of Simon Reynold's *retromania*. Instead, *Metatron* embraces postdigital aesthetics and practices, resulting from the intersection of Chadabe's new cultural architectures, a particular period in the history of consumer technology, and the Western art music tradition. In this way, a synthesis of avant-garde electronica is achieved through decentralization, democratization and the manipulation of a rich technologically and socially connected palette.

PART II (Analysis)

Chapter 5: Analytical Models for Avant-garde Electronica

This chapter addresses analytical challenges posed by electronica, and more specifically, avant-garde electronica. It surveys applicable models and highlights elements that are relevant to this project. A number of approaches are critically examined to find those elements that are most successfully used to describe electronica's core elements. Section 5.1 describes the analytical challenges inherent in the field. Section 5.2 introduces a model for identifying rhythmic tension and release. Section 5.3 provides an overview of analytical techniques from the electroacoustic field and examines their usefulness in analyzing electronica. Section 5.4 presents a series of original glyphs and annotations developed by the author to analyze electronica. This *Electronica Production Syntax model* identifies characteristic techniques and rhythmic manipulations in electronic music. Computer assisted analytical techniques relevant to this dissertation are introduced in sections 5.5. Section 5.6 and 5.7 address various forms of transcription and notation.

These elements are then translated into a system of glyphs[100] and integrated into a hybrid analysis system that incorporates novel analytical techniques. This novel analytical system is referred to as an *Integrated Multi-Scale Analysis* and is described in detail in chapter 6. In this way, this chapter acts as an introduction to chapter 6.

5.1 Analytical Challenges

Analyses of electronica and more specifically avant-garde electronica face two inter related challenges. First, a lack of traditionally notated scores; second, a lack of compatibility with analytical techniques associated with Western art music tradition. Electronica's young, rapidly expanding and inconsistently documented repertoire compounds these challenges.

5.1.1 Incompatibilities

The characteristic compositional features, internal relationships and processes of avant-garde electronica remain under theorized. The current lack of theoretical analysis is

[100] A symbol within an understood set of symbols.

the result of any number of factors including: biased positions among research and performance communities (Witts 1995, Sandow 2010, Adorno 1941), an inherent incompatibility between Western art music's notation system, or simply the growing pains of a young and quickly developing aesthetic.

Electronica's salient features are not accounted for by standard musical notation. While on the surface some of its rhythms are easily transcribed, its gestural content, groove, micro montage and extreme speeds resist traditional notation methods.

Rhythmic transcriptions of electronica are akin to identification of chord qualities in tonal music. Knowing if a chord is major or minor is an important information, but without an understanding of the function of the chords in relation to one another, they merely provide superficial detail. A deeper understanding of a tonal work comes from examining how tension is built and resolved, and how chords interact with melodies, themes, and larger formal structures. For electronica, deeper understandings are gleaned through examinations of how tension is built and resolved *within* the language and context of electronica itself. That is, a language of rhythm, gesture, groove, sign re-contextualization, and technological colouring. Melody and harmony in a traditional sense exist within the electronica framework, but their importance within each work's hierarchy varies widely between producers, productions, and subgenres.

5.1.2 Textual and Technical

Despite the technical challenges related to notation and low-level analysis, discourse surrounding electronica and its multitude of approaches, aesthetics and artistic poses continues to grow through popular music and cultural studies areas (Demers 2010, Raynolds 2012; Brackett 2009; Hockman 2013). However, these analyses emphasize cultural relationships, context, technology, and ideology more than details of structure, material, and compositional practice. In other words, due to analytical incompatibilities there is a great deal of scholarship addressing what electronica *means*, but very little on what it is and how it works.

In particular, compositional features of electronica's avant-garde fringe resist traditional analysis based on Western music models. Traditional notation, functional harmony, and rhythmic transcription are incapable of reconciling the grooves, micro-montage, or timbre and gesture that define the genre. Extreme speed, complexity and additional levels of abstraction exacerbate inherent analytical challenges and require an alternate approach as detailed in chapter six.

5.1.3 Textual vs. Technical

A shifting emphasis between textual and technological aspects is the result of electronica's indiscriminate re-contextualizing and mixing of original and borrowed materials. For example, lyrics may be treated as sounds, as meaningful signs, or something in between. The same goes for all sampled materials. Sometimes a sample references material critical to the interpretation of a work; sometimes a sample is merely an audio fragment selected for no other reason than its desirable spectral profile. Navigating this web of potential meanings requires careful content analysis and an understanding of the materials and production techniques in question.

Textual analyses in a popular music context examine lyrics, song structures, and other features de-emphasized in electronica. However, vocals in electronica are just as likely to be sliced up and re-sampled into rhythmic elements as they are to be used to convey complex meanings. One could examine Daft Punk's "Around The World" and contemplate the one hundred and forty four statements of "around the world" in a search for deeper messages about unification and globalization, but that would be searching for art in the wrong place. Whether the audience is aware of it or not, the appeal of Daft Punk's *Around the World* lies in a careful interaction of a small group of elements. Synthesizers, drum machines, compressors, filters and groove carry the music, not the meaning of the text, which serves more as a rhythmic and melodic hook than a conveyor of meaning. This is not to say that lyrics are never important in electronica, and that they hold no meaning. In some cases lyrics are just as important as any lyric driven genre within the rock metagenre. Generally, however, lyrics in electronica tend to be de-emphasized and re-contextualized as rhythmic and melodic material (Bracket 2009, 554-555).

5.1.4 Discussion

The methodological tools required to analyze avant-garde electronica exist but are dispersed across multiple disciplines. In order to analyze electronica effectively, appropriate elements need to be assembled, integrated, and organized. The integration of multiple analytical strategies, both symbolic notation[101] and literal[102], with models specifically tailored for electronica is necessary to formulate a deep analysis of a work. The following sections introduce analytical methods that have informed the development of the *Integrated Multi-scale Analysis.*

5.2 Generalized theories of Rhythm

5.2.1 Basics

Electronica is most often composed in 4/4 time and constructed from seemingly straightforward rhythmic materials. Electronica is therefore effectively described *in part* by elementary rhythmic models of common practice music. These systems include rhythmic hierarchies based on logical principals of numerical division. That is, the subdivision of rhythmic values into equally distributed rhythmic subdivisions equaling the same duration where a whole note divides into four quarters and so on. These theories accurately describe elementary rhythmic materials. However, they are targeted towards common practice period music and may be less applicable when used to describe syncopation, shuffle, and other rhythmic aspects fundamental to electronica.

5.2.2 Rhythmic Tension

Researchers have expanded common practice rhythmic models creating more applicable methods of the analysis of electronica rhythms. These include generalized theories of syncopation by Fitch and Rosenfeld (Fitch 2007, 43-58; Smither 1964, 54-88; Gomez 2005, 27-84), as well as rhythmic consonance and dissonance (Yeston 1976, 355). Yeston's rhythmic stratification and models of rhythmic tension are highly applicable because they emphasize compositional elements that are at the heart of the majority of pulse driven electronica tension-release events.

According to Yeston, rhythmic dissonance is a product of the increase in rhythmic complexity and density in relation to the fundamental pulse and its subdivisions. That is to say, rhythmic instability increases the more a rhythmic pattern deviates from an

[101] In this context, symbolic refers to symbolic notation, as in visual glyphs that indicate musical properties, relationships or analytical features. For example, western standard notation graphic scores and MIDI.
[102] Literal analyses refers to identification of features from visual representations of the sound itself. For example, waveforms and sonograms.

established pulse. A return to a state of alignment and simple subdivision is a return to consonance.

Consonant <---> Dissonant

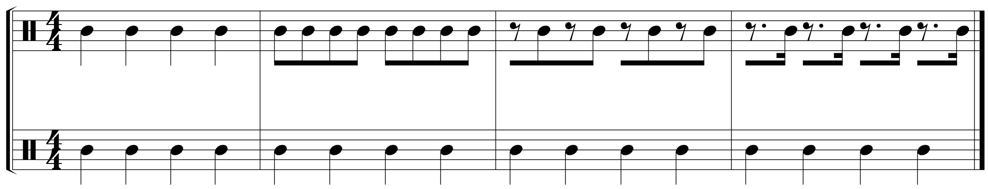


Figure 5.2-1 Rythmic Consonance vs. Dissonance

Figure 5.2-1 provides a simple example of Yeston's rhythmic consonance versus dissonance principal. The parallel synchronization of the first measure is completely consonant. The second measure is still quite consonant but not completely. This is because the 8^{th} note subdivision adds minor instability when compared to the first measure. The third measure increases dissonance by lowering the rhythmic stability. In this case the patterns are out of alignment, while still subdividing 8^{th} notes. Although the upper rhythm is on an 8^{th} note pulse, it is offset and syncopated, deviating from exact alignment, or 'perfect' rhythmic consonance. The 4^{th} example exemplifies moderate dissonance as the upper rhythm falls on a weak beat of a 16^{th} note subdivision. In other words, rhythmic dissonance increases as rhythms invoke lower-order subdivisions from non-symmetrical subdivisions. For example, figure 5.2-1 measure 4's dissonance level invokes a 16^{th} note subdivision, measure 3 an 8^{th}.

According to Yeston's model, as rhythmic juxtapositions become more complex and syncopated, rhythmic dissonance builds. A return to a more consonant rhythmic state of a higher order subdivision is referred to as a *rhythmic resolution*. Rhythmic resolution and its ability to describe electronica's tension release events makes Yeston's model an invaluable element in an integrated analysis of electronica.

5.2.3 Electronica specific approaches

Mark Butler's Unlocking the Groove: *Rhythm, Meter, and Musical Design in Electronic Dance Music* integrates Yeston's concepts of rhythmic consonance and dissonance with DJ specific performance practice and production techniques. His text provides effective models for analyzing early techno as it bridges the gap between performance practice, technology, composition and structure. This holistic aspect of Butler's research easily fits into the *IMSA*. However, Butler's rhythmic analyses are not effective for analyzing avant-garde electronica, and many genres of contemporary electronica. Specifically regarding rhythm, his research emphasizes early and comparatively simplistic[103] electronic dance music idioms. His research does not cover abstract dance genres that bleed into avant-garde electronica and acousmatic music.

Kristopffer Yddal Bjerke's chapter *Timbral Relationships and Microrhythmic Tension* from Anne Danielsen's *Rhythm In the Age of Digital Reproduction* (Yddal 2010, 86-121) provides excellent close analyses of short audio excerpts using an integrated analysis. Yddal Bjerke employs sonogram, waveform, and intensity diagrams generated from the linguistics analysis software *Praat*[104] to successfully illustrate micro timings and syncopation, and their relationship to tension. Bjerke's paper provides clearly applicable methods for integrating visual data into the analysis of syncopation.

5.3 Acousmatic Analysis

A rich tradition of scholarship has developed around the analysis of acousmatic[105] music. This includes categorizing sounds and morphologies into lexica and models describing the relationship between sound, composer intent and audience perception. Schaeffer's *Traité des objets musicaux: Essai interdisciplines* (Schaeffer 1966), Trevor Wishart's *On Sonic Art* (Wishart 1996), R. Murray Schafer's *Tuning of the World* (Schafer 1977), Dennis Smalley's *Spectromorphology* (Smalley 1997, 107-26), Roy's *Analyse Fonctionelle* (Roy 2003), and temporal semiotic units (TSUs) from the Laboratoire Musique et Informatique de Marseille, all propose methods for categorizing sonic gestures with varying levels of detail and overlap. These various models are indispensable when analyzing electronica, as the music is in essence micro and macro audio elements of electroacoustic music aligned on a rhythmic grid. However, these analytical systems have a number of significant limitations. In particular, they are

[103] I do not mean to imply that techno is simplistic on all levels. In terms of rhythmic construction it is more straightforward than other more 'baroque' styles of electronica.
[104] www.fon.hum.uva.nl/praat/

primarily intended to analyze and describe music from the institutional electroacoustic metagenre which de-emphasizes regular pulse (Hautbois 2013). Nonetheless, these models are well adapted to describing the morphologies and functions of gestural materials on grid or off.

The analyses in the following chapters borrow and integrate elements of Dennis Smalley's *Spectromorphology*, Stéphane Roy's *Analyse Functionelle*, with elements of the MIM's (Laboratoire Musique et Informatique de Marseille) *Temporal Semiotic Units* (TSU)[106]. These approaches are the most succinct and effective methods of explaining gesture and syntax in the context of electronica. Each of these models is flexible enough to account for electronica's significant gestural content. These specific methods were selected because they integrate best when analyzing a variety of materials at multiple time scales.

5.3.1 Temporal Semiotic Units

The temporal semiotic unit model segments sound objects and provides temporal context. This analytical system comes from observations made by acousmatic composers at the Laboratoire Musique et Informatique de Marseille, and their desire to reintroduce syntactical meaning stripped away by Shaefferian reduced listening (Hautbouis 2013). *TSU*s are identified by the listener and assigned one of many categories based on their character and syntactical function. For example: *Braking, Chaotic, Compressing-stretching out, Divergent, Endless trajectory, Fading away, Falling, Floating, Heaviness, In suspension, Moving forward, Obsessive, Propulsion, Spinning, Stationary, Stretching, Suspending-questioning, Wanting to start, Waves.*[107]

The important distinction between the Shaefferian sound object and the TSU is that the *TSU* considers semantic meaning and position of a unit in a larger temporal process, whereas *sound objects* are intended to be stripped of meaning through reduced listening. That is to say, in TSU sounds are identified and categorized according to their position within the larger context of the work, as opposed to isolating and identifying them as a discreet event. According to the MIM, their approach is "consistent with

[106] (UST) in the original French texts
[107] www.labo-mim.org/site/index.php?2013/03/29/225-temporal-semiotic-units-tsus-a-very-short-introduction

various empirical and theoretical approaches to classification based on time perception" (*ibid*).

I do not use TSUs directly as part of my analyses, but rather apply their principals to my own system of segmentation and categorization in a way that is more tailored towards the electronica metagenre.

5.3.2 Spectromorphology

Dennis Smalley's influential spectromorphology article (Smalley 1997) provides descriptive tools for acousmatic music. Among other concepts, his paper introduces and describes 'spectral trajectories' and 'texture-motion,' which are directly applicable to electronica in the context of an integrated analysis. Smalley's paper includes descriptions of numerous morphologies and audio events that have informed my approach. For example, Smalley's spectral trajectories, harmonicity, spectral density, space and reverberation, and gestural surrogacy combine with other analytical methods that influence the *IMSA* and *EPS* (electronica production syntax) models.

Spectral Trajectories

Spectral trajectory refers to the unfolding of a sound's spectrum over time. For example, an audio sample being pitch shifted higher over time would be identified as a 'spectral ascent' as indicated by the corresponding glyph below. 'Plane' refers to spectral stability, a sustained, consistent spectrum over time. For example, a drone or pink noise. Divergence and convergence refer to expanding and contracting spectra respectively.

The following is a list of spatial trajectories adapted from Smalley's article and paired with an original descriptive glyph. Identifying these complex spectral trajectories graphically using glyphs allows Smalley's spectromorphology to easily coexist with other descriptive and analytical systems.

Ascent / Decent / Plane 

Divergence / Convergence 

Texture Motion

Texture motions refer to the motion of a layered textural unit over time. "*Streaming* refers to a combination of moving layers, and implies some way of differentiating between the layers, either through gaps in the spectral space or because each layer does not have the same spectromorphological content. *Flocking* describes the loose but collective motion of micro or small object elements whose activity and change in density need to be considered as a whole, as if moving in a flock (Smalley 1997)." In other words, flocking refers to groups of sound particles that are swarming together in a group. *Erratic* refers to streams of textures or particles that are irregular, chaotic and aperiodic (*ibid*).

Streaming 

Flocking 

Erratic 

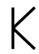
5.3.3 Functional Analysis

Stéphane Roy's *analyse fonctionelle* achieves an integrated analysis in its own right. It applies similar principals as temporal semiotic units in that it assigns syntactical functions to units of sound within a temporal framework. *Analyse fonctionelle* also integrates elements of spectromorphology, in that it tracks shifts in spectra, texture and amplitude over time. Roy's model stands out due to the necessity of an accompanying visual listening guide. This visual guide is constructed as a precursor to the use of Roy's notation in the analysis process. Due to its flexibility and potential for integration with other visual notation systems, Roy's system of glyphs is ideal for an integrated analysis. However, despite the ability of Roy's *analyse fonctionelle* to effectively assign syntax, rhetoric and hierarchy to audio gestures, it struggles to describe rhythmic materials and widely varying time scales.

In the *Integrated-Multi Scale Analysis* I have adapted and simplified elements of Roy's notation to integrate with other systems. This streamlined version suits the format of the *IMSA* and simplifies the interactions between Roy's system, other annotations, and visualizations.

Below is a partial list of Roy's glyphs, selected according to their applicability in the analysis of electronica. The accompanying definitions are translated from Roy's text[108].

Syntax and Glyphs:

Introduction / Conclusion  

Introduction *identifies units that begin a work or a large section, whether by increase in dynamic, morphological density, or any other gradual process that does not trigger surprise in the listener. The introduction glyph indicates a conclusive introduction or beginning, and indicates to the listener that something new is happening. Introduction glyphs indicate consequent material, need no precedent, or introduction, and are always followed by the section they are introducing.*

Conclusion *identifies unambiguous resolutions of large sections of a work. A conclusion has only antecedents and has no bearing on causal relationship to material that comes after. Unlike the 'interruption' the conclusion is context dependent, indicating well prepared and unexpected endings.*

In an IMSA the introduction and conclusion glyphs are somewhat freely used at different analytical scales. For example, the conclusion glyph may at one scale indicate conclusion of a single gesture, while on a larger scale, the entire work.

Suspension 

The suspension glyph also indicates a resolution to a large section or gesture. It is necessitated by endings that are too ambiguous, unstable or un-resolved to be considered an unambiguous conclusion. In other words, the material in said ambiguous endings are 'suspended', instead of concluded. When the end of a large section is interrupted by new material, it should be considered a suspension instead of an

[108] The translated portions are in italics; my own additions and commentary are in standard type.

interruption. In this way, the suspension has a similar but distinct function from the conclusion.

Trigger $\longmapsto$

The trigger glyph indicates a morphological shift that abruptly and suddenly begins another gesture. Like the introduction, the trigger has only consequent actions. It may or may not be preceded by silence. The difference between the introduction and the trigger is that the trigger occurs at any moment in the musical flux, and independent of any context.

In the context of an IMSA, triggers are used to identify the beginnings of new material, as well as re-statements of cyclical patterns on a shorter time scale.

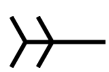
Interruption $\longrightarrow\!|$

The interruption indicates a sudden stop in development of a gesture within a musical flux. Unlike the trigger glyph's foreseeable introductory launch of new material, the interruption glyph indicates a complete and unpredictable change.

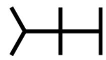
Precursor (fr. engendrement) 

A precursor does not indicate a new gesture, but instead is a connecting element that creates the impression that one gesture flows into the next. Typically, it employs a brief, energetic, morphological gesture to connect adjacent material at the local level. Precursor gestures connect material with upward and downward morphological contours, derived from pitch, amplitude harmony and spectral density.

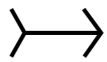
In an electronica context, the precursor gesture indicates material that propels a gesture forward into a rhythmic resolution.

Graft 

A graft may occur at any moment in a musical process. It indicates the prolongation of a gesture through the linking of a new sound with a different identity and *timbre. Typically the consequent material has morphological similarities with the antecedent material onto which it has been grafted.*[109]

Prolongation 

Prolongations are typically situated after concluding sections. Their role is to prolong a stable chain of events with related, chronologically flexible morphological material. A prolongation is distinct from an extension in that prolongations occur after the active phase of a musical section in order to help it disperse and liquidate into other material.[110]

Transition 

The transition glyph generally occurs at the borders of large musical sections where it connects concluded, or partially concluded, materials. The transition thus is related to both antecedent and consequent material. It chains together progressions, giving a sense of cohesion to the larger work.

Process:

Accumulation / Dispersion 

The term accumulation as we find it defined in Shaefferien morphology, indicates a gradual transition between discreet impulses with low entropy and a cohesive unit with higher entropy. In this way these two glyphs represent the gradual accumulation and dispersion of constituent sounds.

This notation differs slightly from Roy's in that it does not include dashes indicating the rate of accumulation. This makes it indistinguishable from Roy's glyph for intensification, which I have indicated as a solid triangle. These small changes make busy analyses easier to follow. In an electronica context this glyph indicates any increase of decrease in attack density, be it a rhythmic, a-rhythmic, or gestural context.

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[109] In the context of electronica this gesture is sometimes similar to a crossfade, where material is carefully spliced and seamlessly transitioned.
[110] In an IMSA a prolongation has taken on a somewhat more general definition, indicating similar material extending over a period of time.

Acceleration / Deceleration ` 

This pair of glyphs indicates a change in the temporal structure of a section. Essentially, acceleration and deceleration indicate the progressive expansion and contraction of the space between the attacks of constituent sounds and the larger structures they form.

Intensification / Attenuation 

The intensification and attenuation glyphs indicate increase or decrease in dynamic, spectral, and/or melodic density.[111]

Rhetoric:

Call / Answer ? C > > A !

The call and answer glyph pair indicates related, contiguous antecedent consequent material. These glyphs do not work in opposition, but rather complement one another, linking expressive materials.[112]

Statement / Reminder > S > < R <

This functional pair concerns the re-occurrence of similar material spread out over a given timespan within the piece. These timespans can be short of long in duration.

Theme / Variation 

The variation serves as the counterfoil to the theme. The variation glyph indicates a re-statement of thematic materials with morphological changes, while maintaining a timbral relationship.[113]

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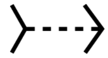
[111] The above glyphs have been slightly modified from Roy's original for the sake of simplicity and clarity. The original glyph appears as a transparent triangle where the above version is filled in. In an electronica context, intensification / attenuation typically indicates the increase in spectral range and spectral density of a section, through morphological shifts, or increase in elements.

[112] In the *IMSA* the call and answer glyphs are treated relatively freely.
Compared to Roy's usage, and include non-contiguous material of close proximity.

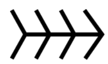
[113] The theme glyph has been slightly modified from Roy's original. Theme is an x with dashes, as opposed to a ">" which was slightly confusing in dense IMSAs.

Anticipation 

The anticipation glyph signifies a local preparation for a significant event. For example, a figure or conclusion. [114]

Affirmation > !

The affirmation glyph indicates a significant reprise of markedly important material. This reprise maintains the timbral signature of the original due to characteristic changes in morphology. The affirmation is often dynamic, sometimes spectral.

Reiteration 

Reiteration manifests itself through the intensification of expressive character via repetition. Reiteration is an expressive rhetorical device that works at the local level through the immediate repetition of slightly transformed materials with similar timbral signatures.[115]

Imitation 

Imitation indicates sounds constructed of units fashioned through immediate replication of identical or similar constituent parts. The recognition of constituent parts is due to immediate repetition, overlap, and even simultaneous statements of material.

Simultaneous / Sequential Antagonism  

Antagonism is a binary function indicating two simultaneous or sequential elements in conflict, within a musical context. Antagonism exists with the presence of

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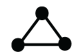
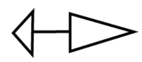
[114] In electronica, anticipation is treated somewhat more freely. Most often this glyph refers to the anticipation of a resolution when a pattern of tension and release has been established.

[115] Reiteration has a slightly different meaning in electronica, as loop based music constantly reiterates and develops. Instead, this glyph indicates exact obvious duplications, looped material, or repeating gestures or motives.

simultaneous [or sequential] units, each with contrasting timbres, creating a sense of tension within the musical flux.[116]

Spatial Progression 

This glyph represents sudden shifts in reverberation characteristics and localization. These localizations may include perceived motions within the spatial field (high/low, front/back, left/right) according to the positioning of the speakers, excluding motions introduced through live diffusion.

Retention 

The retention glyph indicates moments in the work where brief silence is introduced, in order to temporarily restrain the energy of a gesture. Tension increases during the brief period before the sound's re deployment. Optimal length of silence is determined by the musical context in which the retention occurs.[117]

Parenthesis ( )

Parenthesis indicates a morphologically stable device that divides gestures without the perceived introduction of new material. It has the effect of turning the attention of the listener to new material.

Extrinsic < >

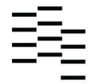
The extrinsic glyph indicates an explicit extra-musical reference. It turns the attention of the listener from the internal sound world of the piece, to the external world of reality.[118]

5.4 Original Glyphs and Lexica

[116] Electronica's texture is typically built from contrasting materials so the simultaneous antagonism layer is more specific, typically involving two layers with conflicting tempi, rhythmic patterns, technological profiles or harmonic elements. The sequential antagonism is more straightforward.
[117] In an electronica context this type of gesture typically occurs as part of a tension building anti-climax before a particularly strong rhythmic resolution.
[118] This glyph is rarely used because of electronica's relationship with extrinsic references in the form of sampled materials and specific technologies. These have their own glyphs that will be introduced in future sections. The only context in which the extrinsic glyph appears in these analyses is to indicate non-musical extrinsic materials.

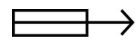
This section introduces glyphs and notations I have developed to clarify my analyses of electronica. The following symbols introduce rhythm, harmony, melody and technical listening into the analytical schema above.

Chord Progression:



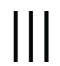
This glyph marks the starting point of a chord progression. The graphic evokes shifting chords in a spectrogram or piano roll notation.

Source Pattern:



The source pattern glyph represents the introduction of a structurally cyclical pattern, characteristic in electronica. The source pattern glyph represents a sound bloc; the arrow, continuing variation.

Periodic Pattern:



The horizontal lines from this glyph indicate the appearance of a significant abrupt increase in the periodicity of material. An example in context would be a transition from a three measure periodic pattern, to a pattern that cycles on every 8th note.

Gestural Progression:

This glyph is used to indicate significant aperiodic gestural material when the time-scale is too large to identify each gesture individually. Similar in some ways to Roy's concept of *gap fill,* this glyph has different meanings depending on time scale and context. In general, the larger the timescale, the more sub-material the gestural progression glyph encompasses.

Sample: <S>

This glyph indicates significant and recognizable sampled materials.

Melody: <M>

This glyph signals the occurrence of a significant melodic fragment, melody or theme.

Transformation: <T>

This symbol indicates a significant transition from one texture, or figure, to another. The transformation glyph indicates an audible, structurally significant process that occurs over time, where constituent sounds gradually transform from one form to another. Not to be confused with a cross fade where one sound transitions to another by gradual changes in amplitude mixing.

Impact: 

This glyph signals the occurrence of a significant percussive impact gesture.

5.4.1 Pulse Profiles

Pulse profiles are used in *IMSA* as a way of indicating the perceived periodicity of a section of a work. In other words, these lines indicate the presence of a stable groove at any given moment in the work. The mix of dots and dashes indicates transitional material, or moments where the periodicity is unclear.

For example, a repeating drum loop slowly disintegrating into a granular cloud transitions from periodic material, to unstable material somewhere between periodic and a-periodic, to material free of any periodic rhythmic content or pulse.

Periodic

Unstable

Free

5.4.2 Electronica Production Syntax

Electronica Production Syntax, or (EPS), is a collection of rhythmic and gestural devices characteristic of electronica. Many of these devices owe their origins to early manipulation of breakbeats[119] via sequencer, sampler and drum machine technologies. The producer's drive to create complexity and variety with limited technical means created many characteristic gestures, which in time, became part of the electronica vernacular (Hockman 2013, 113-125, Britton 2010).

RollUp (RU)

A rhythmic gesture or grouping of periodic micro-sound events with a clear trajectory leading towards a point of rhythmic resolution. The (RU) gesture fuses spectral and rhythmic characteristics into a single event.

Related to both 'accumulation' from Roy's functional analysis and the *drum-fill* from pop music, the (RU)'s motion comes from both a linear pitch shift and a dynamic envelope. For example, a cyclical sampled drum fragment that gradually pitches upwards over a short time span, using a change in pitch to emphasize the return of a downbeat.

Rollups can be extremely short to emphasize single beats of a pattern, or they can be of a long duration and emphasize the rhythmic resolution of an entire section. Within the colloquial electronica production terminology, large time scale RU gestures are referred to as *rhythmic*

[119] In this context, breakbeat refers to a sampled drum loop re-contextualized and manipulated to create new materials.

builds, whereas at a smaller time scale they are referred to as *tears*. See “Galvatron” mm. 535-537, 20:32.

RollDown (RD)

A rolldown is similarly fused rhythmic and spectral gesture to the RU, except the spectral shift moves downwards in pitch, typically accompanied by a decrease in amplitude.

RollOver (RO)

A syncopated rhythmic pattern builds intensity and elides a point of rhythmic resolution on a downbeat, generally resolving into a strong beat in the next measure. The effect is a delayed resolution that disrupts established antecedent and consequent rhythmic patterns. See “Galvatron” mm. 356-359, 15:32.

MicroLoop (MicL)

A periodic sub-grouping unexpectedly created within an already established pattern. MicroLoops are often created from asymmetrical rhythmic groupings that temporarily shift the pulse pattern away from established subdivisions. This highly syncopated shifting has the effect of temporarily increasing the sensation of rhythmic intensity / attack density leading into a rhythmic resolution. See “Galvatron” mm. 500-501, 19:47.

MacroLoop (MacL)

A comparatively slower periodic sub pattern that unexpectedly established a half time groove within an established pattern. A MacroLoop temporarily decreases the attack density and rhythmic tension.

Pause (P)

The opposite of a rollup, (P) indicates a silence inserted before a rhythmic resolution. When used to disrupt an established pattern of (RU)s, and downbeats, the effect of the *pause* is to increase the intensity of the rhythmic resolution through anticipation. See figure 5.1.4.

Off Beat Shift (OBS)

When a rhythmic pattern is shifted by a short rhythmic value, (OBS) shows a temporary increase in rhythmic instability. See figure 5.1.4.

Combinations (C)

EPS[120] events preceding points of rhythmic resolution often occur in combination, increasing their effectiveness and variety. For example, a pause followed by a rollup is a common combination. See figure 5.1.4.

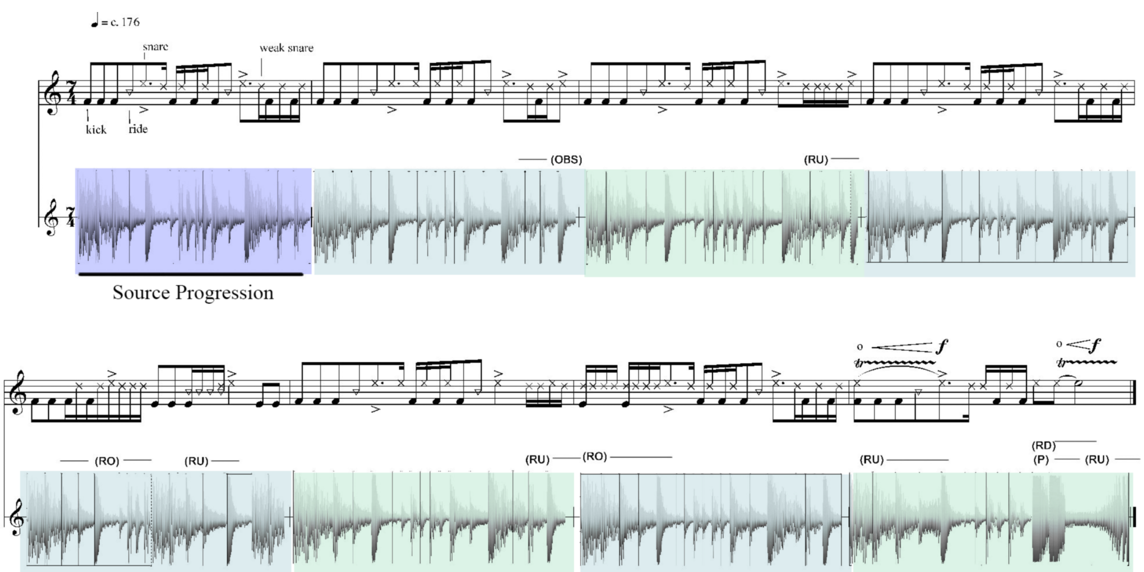


Figure 5.4-1 "Szerencsétlen" from Ventian Snares *Rossz Csillag Alatt Szüetett* - mm. 17 – 24

SweepUp (SwUp)

(SwUp) indicates an upwards shift in spectral motion. They are similar in function to a *RollUp*, in that they typically push into rhythmic resolutions. However, they can occur

120 Electronica Production Syntax

anywhere; from decorative gestures, to down beat accentuations. See figure 6.5.2 in the next chapter.

Sweep Down (SwDn)

(SwDn) indicates an downwards shift in spectral motion similar to the *SwUp*. These gestures are similar in function to a *RollDown* in that they typically push into rhythmic resolutions. However, they can occur anywhere; from decorative gestures, to down beat accentuations. See figure 6.5.2 in the next chapter.

5.5 Computer-assisted Analysis

In this context, computer-assisted analysis refers to the application of algorithms to extract analytical information from a target audio file. This information includes visualizations such as sonograms and waveforms, as well as feature extraction in the form of x y graphs, breakpoint functions and other data.

5.5.1 Literal Analyses:

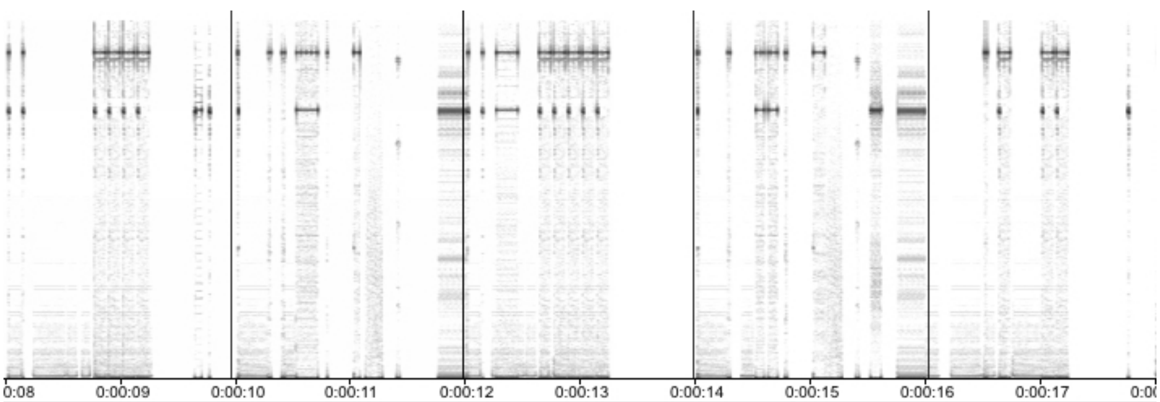


Figure 5.5-1 Sonogram Exerpt of Rioji Ikeda's Supercodex "no.8"

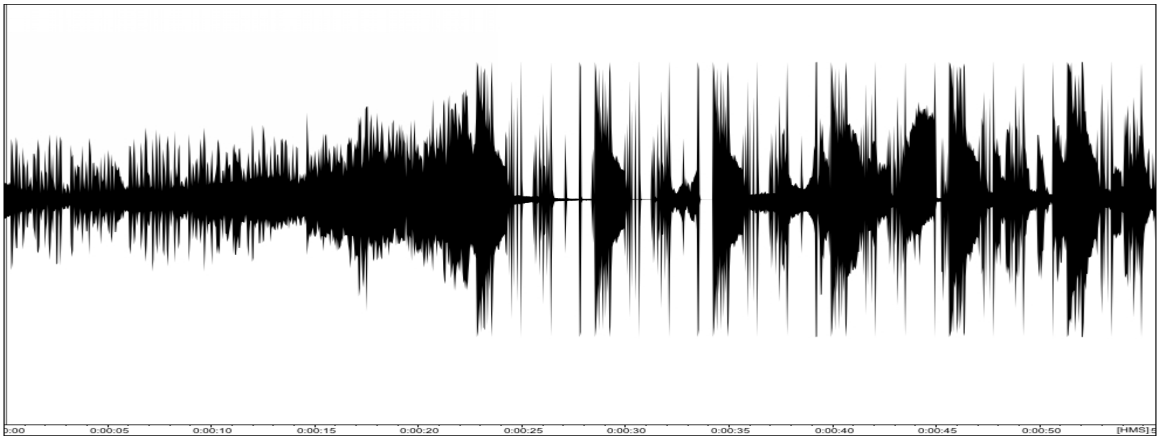


Figure 5.5-2 Waveform of Tipper's "Table Flipping" from *Forward Escape,* 2014

Literal representations include sonograms and waveforms. These graphical sound visualization formats allow for the analysis of gestural and spectral content, without relying on common practice notation, or a transcribed graphic score. In the context of this paper, IMA analyses take the form of annotated literal representations of sound. This is similar in approach to the graphical interface and markers found in INA/GRM's *Acousmographe* and the *Praat* software used in linguistics.

5.5.2 Automated Feature extraction

Feature extraction, as applied in the analysis of audio materials in this dissertation, involves the application of computer algorithms in the identification, pre-processing, and representation of selected characteristics of a sound file. This method produces simplified, functional information for manual analysis. For example, an averaging of the amplitude of a given audio file can be expressed as a single value, or as a simple or complex curve. The precision or resolution of the result depends on the way values are averaged over time. This averaging process simplifies complex audio signals, giving up detail but providing useful information. For example for practical reasons, a representation of a river on a map changes drastically depending on the scale of the image. The same effect occurs with lines of activity generated via feature extraction algorithms.

The appeal of automated feature extraction comes from its ability to generate impartial, accurate data, allowing for more objective analyses. Adjusting the algorithm and analysis parameters for automated feature extraction can increase the usefulness of information from a complex audio signal. However, when performing these adjustments, one introduces a new form of selection bias (Buloock 2007). Features are extracted automatically, but the conditions under which they are extracted may be manipulated to provide specific results and support specific hypotheses.

Keeping the aforementioned pitfalls in mind, the automated feature extraction techniques used in *Integrated Multi-scale Analysis* are limited to algorithms with straightforward and scalable results. These include spectral centroid, average amplitude, spectral spread and transient detection.

5.5.3 Zsa Descriptors (Max/MSP)

Zsa.descriptors[121] is a library for real-time sound descriptors developed by Mikhail Malt and Emmanuel Jourdan (Malt 2008). It provides the processing backbone for a Max/msp[122] patch developed for *IMSA* that tracks and plots audio descriptors over time. Audio segments are analized, with results captured and stored in real time. Output from the Zsa.descriptor objects can be smoothed to create informative graphics. These graphics are then integrated into an IMSA, where they provide objective visual data about the audio segment being analyzed.

5.6 Transcription and Symbolic Representation

5.6.1 Standard Notation Transcription

Transcribing electronica into traditional notation can produce useful results in some cases, but less so in others. Rhythmic transcription for example, can provide functional and effective symbolic representations of abstract and surface level rhythmic material. See figure 5.6-1

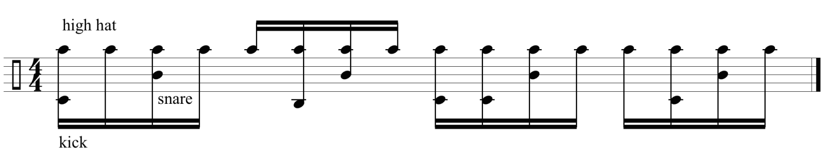


Figure 5.6-1 Rhythic Transcription in Standard Notation

[121] www.e--j.com/index.php/what-is-zsa-descriptors/
[122] https://cycling74.com/

Similarly within online electronica culture, rhythmic patterns are commonly transcribed into text-based rhythmic tablature as shown below. This format allows for easy distribution and interfaces easily with pattern sequencers, digital audio workstations, and drum machines. For example:

Kick:	K***,*K**,KK**,*K**,
Snare:	**S*,**S*,**S*,**S*,
High hat:	hhhh,hhhh,hhhh,hhhh

Both traditionally notated rhythmic transcription and rhythmic tablature are limited in their ability to capture some salient features of electronica. Examples include precise timbre and amplitude gradation as well as extreme tempo fluctuations. This limitation varies widely, depending on the material being analyzed. Simple rhythms in transparent textures are easily transcribed. Multi-track productions with interrelated, simultaneous sample layers, each with minor differences in swing, groove and rhythmic timing, make transcription impractical. In these cases, simplified rhythmic reductions may be a solution. However, simplified reductions provide a false impression of the music, and tend to reduce complex and elegant productions into material indistinguishable from a disco beat. See figure 5.6. This can be akin to reducing a photograph of a human being to a stick figure – the basic idea is there, but critical details are missing.

Accurate and precise melodic and harmonic transcriptions have similar challenges depending on the complexity of the material. For example, melodic and bass elements may contain any numbers of synthesized, sampled and recorded layers; each containing spectrally and rhythmically rich material that has undergone significant processing and compression gluing them together. In these cases, traditional pitched notation captures only simplistic pitches and rhythms, missing all the timbre, movement and depth of image. However, despite its limitations, the clarity and universality of western music notation with regards to discrete pitches makes it a useful tool for integrated analyses.

5.6.2 Piano Roll Notation

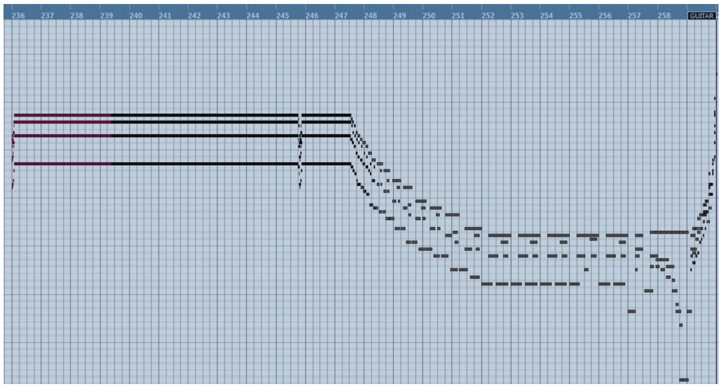


Figure 5.6-2 Piano Roll Notation: *Metatron*, "Galvatron" mm. 236 - 259

Piano roll notation provides an interesting solution to the density and detail problems mentioned in the previous section. It addresses these problems by abandoning the traditional staff in favor of a system of equally distributed colored lines on a grid with the y axis representing time, and x pitch. This visualization method captures a remarkable amount of information in a small space. The proportional representation of intervallic relationships reveals patterns difficult to see using staves, clefs and accidentals. However, in tonal music staves, clefs and accidentals simplify the representation of keys, scales and chords. Additional information on each note is typically available in midi control lanes or midi note data. In this way, each note may contain a great deal of rhythmic and gestural information. These patterns can be observed in piano roll notation, but experience interpreting these graphics may be necessary.

5.7 Reverse Engineering

Reverse engineering, *reconstruction*, *remixing* or *sound-alikes* are all terms describing electronica's DIY answer to graphic scores and traditional notation. Instead of creating graphic scores for analysis, practitioners simply reproduce the target audio as closely as possible using whatever means they may have at their disposal. This process may be as simple as transcribing rhythmic and melodic information and mapping them onto a virtual instrument studio mockup, or may go as far as locating, cutting, processing and creating a micro montage of the precise samples from the original recording. The ability to identify and isolate the role of specific technologies, sounds or processes within recorded music is referred to as *technical listening*, and can yield remarkably detailed results.

Reverse engineered audio materials and reconstructions are often shared as video tutorials or downloadable project files. An example of this can be observed in Jim Pavloff's *The Making of Smack My Bitch Up, Vodoo People* and *Firestarter* (Pavloff 2014) that reverse engineer singles by *The Prodigy*[123] using a contemporary DAW.

The reverse engineering process in electronica is similar to score copying and the transcription, both pedagogical tools common among classical and jazz musicians. Only by completely rebuilding a composition from basic components do all the deeper details and relationships become apparent. This practitioner based approach has a high barrier of entry. It requires a considerable functional knowledge of materials and techniques of electronica, which makes it impractical for most. Despite the associated difficulties, technical listening is an important part of the Integrated Multi-scale Analysis from chapter 6.

5.8 Summary

This chapter has focused on identifying, and circumventing, the analytical challenges inherent in electronica. Lack of score, complex rhythms, groove oriented aesthetics, elaborate gestures, extreme tempi and incompatibility with conventional notation practices sit at the heart of electronica's analysis problem. However, by appropriating and modifying analytical models from diverse sources, the inner workings of electronica are revealed. The integration of symbolic notation, computer assisted analysis, audio visualizations and specialized annotation allows for compelling, detailed analyses.

[123] *The Prodigy* is an English electronica group from the 1990s who pioneered a genre of danceable sample driven music that came to be known as *big beat.*

Chapter 6: Integrated Multi-Scale Analysis

This chapter describes and demonstrates an analytical model tailored to electronica and avant-garde electronica. *Integrated*, in that the model applies multiple analytical approaches simultaneously, depending on the nature and scale of the material being studied. *Multi-scale* refers to a continuum of potential scales from macro to micro. That is to say, the analytical model can be applied on all a variety of time scales, from the smallest microsound gestures to the entire work.

Integrated Multi-scale Analysis combines analytical types in a structured hierarchy. The hierarchy moves from objective metadata to a more subjective analysis of specific details. This is accomplished through the intersecting analyses of literal and symbolic notation. The overall analytical hierarchy of IAMA is as follows:

Metadata ➔ *Segmentation* ➔ *Identification*➔ *Analysis*

The *metadata* phase assembles general information that informs the selection of visual representation types for the next three phases. The *segmentation phase* examines the material identified and visualized during the first phase and divides the selected musical material into functional modules or *segments*[124]. The *identification phase* identifies features according to analytical models and lexica appropriate to the material in question. The *analysis phase* considers the information from the three previous phases and generates a map of tension/release events and draws conclusions, searching for patterns and elements of structural unity in the work.

[124] In this context *segments* refer to blocks of musical material identified as having formal or syntactical significance at a given timescale, similar in concept to INA/GRM's temporal semiotic unit. See figure 6.3-1, where segments are numbered and divided by thick lines.

6.1 Metadata

The *metadata* phase assembles features consistent across segments and magnification levels.

Composer:
Composition:
Date:
Performance Archetype:
Structural Archetype:
Genre Affiliations:
Tempo:
Instrumentation:

Performance archetypes have original and specific meanings in this context and require explanation, as do genre affiliation, instrumentation, instrumentation and technology. These terms are explained in more detail in subsequent sections. Composer, composition, date are self-evident. Tempo can be expressed as a fixed value, set of values or range.

6.1.1 Performance Archetype

Performance archetype refers to combinations of performance and listening practices, technologies and media formats that surround a specific composition at a specific time. From an IDM single on a vinyl record to a concert work for electronics, electronica is experienced in widely differing contexts and listening frameworks. The performance format can be compared to the instrumental forms of Western art music in that they are associated with specific notation formats, compositional conventions, instrumental combinations, audiences and performance contexts. For example, the symphony's association with the concert hall and orchestras, is mirrored by the vinyl dance singles associated with turntables and dance clubs. The following list provides examples of performance formats common to avant-garde electronica.

Single:

A single work intended for home or automobile listening, headphones or small to medium sized loudspeakers. Available online as a digital download or as part of a compilation, less frequently released as a limited edition short run vinyl, cassette tape, or other obscure boutique format.

DJ Vinyl:

A vinyl record tailored specifically for DJs and turntable enthusiasts, typically with extended introductions and outros that are required for smooth beat matching between multiple records. Vinyl releases are associated with DJ performance culture, mixers and turntables. They are specifically mastered according to the limitations of vinyl playback systems, as well as powerful club sound systems.

Album:

A collection of produced works intended to be listened to as a whole. The album archetype is associated with personal listening environments. For example, headphones, cars and small to medium sized loudspeakers. Typically released online, on CD, or limited edition vinyl, the album strives to be more than a collection of singles, with care taken in track order, mastering and other aesthetic elements. (O'Hagan 2014; Philips Research 2014)

Live PA set:

The artist's *live personal appearance* emphasizes original material. In the context of a live PA[125], a 'performance' can refer to everything from straight file playback with cursory knob manipulation, to traditional DJ vinyl mixing, to fully integrated live electronics performance setups. Live PA sets take place in a variety of venues, ranging from arenas to art galleries (Fritch 2012, 47-66).

The Concert Work:

Avant-garde electronica intended for a concert environment. This performance archetype includes traditional concert venues with front facing audiences in chairs with concert programs, as well as concerts in club venues and alternative spaces. These works may be for fixed media, electronics, or any combination of acoustic and electronic instruments. Concert works of electronica are associated with improvisation culture and academic institutions. In general,

[125] http://www.livepa.org/faq/#what_is_a_Live_P.A.

the concert work is defined more by concert etiquette than the type of music performed (Ross 2005).

Visual Music

Visual music is electronica or avant-garde electronica with an essential visual component that is part of the composition. This can include lasers, video projectors, actuator controlled sculptures and others. Examples include: Robert Henke's *Lumière*[126] and Rioji Ikeda's *Datamatics*[127]

Visual music is distinct from a producer / DJ sets which are increasingly associated with live visual elements such as lasers, audio visualizations, fog and video. The distinction lies in the music's relationship to the visual elements. For visual music, the visual elements are an essential and integral part of the work from its initial conception, rather than an inessential visual afterthought intended to create a dynamic stage show.

Contemporary Dance and Electronica

This includes avant-garde electronica written specifically for contemporary dance performances[128]. This format borrows freely from acousmatic music, electronica, and live electronics.

Installation / Sound Sculpture

This archetype refers to sound art installations that run, with or without, composers or performers. Audio installations take many forms; from looping audio fragments in an empty gallery space or interactive sound producing sculptures, to outdoor sculptures that sonically interact with natural elements such as rain, wind or sunlight. Characteristic practitioners in this field are the Swiss artist Zimoun[129] and American Maryanne Amacher (Zimoun 2014; Kozinn 2009).

[126] http://www.monolake.de/concerts/lumiere.html
[127] http://www.ryojiikeda.com/
[128] While this music can be considered 'dance music', it does not share the same function or features as club and festival oriented EDM (electronic dance music)
[129] http://www.zimoun.net/

Art-Game Music.

Art-Game music describes sound and interactive audio experiences created in a videogame context. Increasingly, videogames are developing into a platform for avant-garde aesthetics, including real and virtual sculpture elements, abstract narrative, and interactive performance art. For example, New York based performance duo foci + loci[130] creates and presents audio sculpture performance art using in game physics engines.

As avant-garde videogame aesthetics become increasingly sophisticated, major galleries have begun acquiring and showing games as interactive installations (Parker 2013; Antonelli 2012). Associated genres include: Chiptune, OST, VGmusic.

6.1.2 Structural Archetype

Structural Archetype refers to groupings of objective features in electronica, including formal, harmonic, gestural and rhythmic characteristics. Structural archetype identification seeks to categorize based on objective features, as opposed to genre affiliation that may be influenced by a number of cultural factors[131]. The goal of structural archetype categorization is not to provide perfect matches, but instead to identify groups of features and compositional techniques that lend themselves to specific analytical methods. For example, gestural music with no pulse or fixed pitches may not be well suited to transcription using traditional notation, but rather to spectrograms, annotation and computer-assisted feature extraction. On the other hand, standard notation or other symbolic information may do a good job describing material containing a melody, rhythmic accompaniment, lyrics and so on. Conventional works may contain a single archetype, but any number may be possible, especially in a poly-stylistic works like *Metatron*.

The following list identifies the structural archetypes I propose to categorize electronica during the context phase.

[130] http://www.tamarayadao.com/foci-loci

[131] Not to say that genre affiliation is not a crucial element in categorization and understanding, but genre in electronica is flexible, imprecise and depends on many factors explained in section 2.1 – 2.2.

Static:

This structural archetype features little or no periodic pulse, and is characterized by slow moving harmonic and inharmonic gestures, drones and textures. Tension/release events are generated over long periods of time if at all through increasing spectral and attack density. Associated genres include various genres of drone, ambient and static music.

Gestural:

The gestural structural archetype is characterized by free flowing musical gestures that do not strictly adhere to an underlying rhythmic grid. Music that falls under the gestural archetype overlaps with institutional electroacoustic music in that their aesthetic and production techniques are similar on a surface level. In both, impact gestures, fixed and shifting textures, rapid transitions and effects generate tension/release events. However, in an avant-garde electronica context, gestural music more often places an emphasis on, and draws energy from, repeating rhythmic materials and allusions to metric underpinnings. In other words, gestural avant-garde electronica builds tension by manipulating established rhythmic conventions and navigates an aesthetic space between electronica and acousmatic music. Associated genres include: Experimental, Glitch, Noise, Noise, and Improvised Music.

Rhythmic Stasis:

An avant-garde electronic archetype with minimal rhythmic materials. Cyclical, repetitive rhythmic sequences with understated development progress highlight minute changes in material, which places it in an aesthetic space that overlaps with minimalism. Examples include: Robert Hood - *Minus Kenny,* Larkin – “Groove”, Rioji Ikeda – *Supercodex*, Oval – “Do While”.
Associated genres include: Microhouse Minimal, Minimal Techno and Glitch

Rhythmic Arc:

One of the more common structural archetypes used in electronica, the rhythmic arc generates tension/release events through gradual addition and subtraction of layers of rhythmic patterns. As complexity and attack density increase, tension rises. When layers are stripped away, revealing basic elements, this archetype creates a sense of rhythmic release. Audience members and producers refer to this process as 'the drop.' These builds and 'drops' are woven into a large-scale arc that forms the backbone of many works in the electronica and avant-garde electronica genres. Associated genres include: Techno, House, Breakbeat, Drum and Bass, and many others.

Interrupted Rhythmic Arc:

Like the rhythmic arc, elements are layered additively over a steady pulse, building tension/release events through builds and drops. However, the interrupted rhythmic arc builds to a rhythmic climax followed by the sudden removal of pulsed materials, creating an increased sense of expectation that builds tension, increasing the intensity of the rhythmic resolution when the pulsed material returns. Associated genres include Trance, Dub Step, House, among others.

Verse / Chorus:

Verse-Chorus refers to an adherence to the conventional song structures of pop, rock, folk and others. Electronica that employs the verse/chorus structural archetype need not include lyrics. The alternating sections may adhere completely too conventional pop song structures, or simply involve a return to a recurring chorus like section.

Sectional:

This archetype shares similarities with verse/chorus structural archetype in that it alternates between contrasting or similar sections. However, this is a more general archetype that is less connected to the formal limitations of verse/chorus, as it may involve any number of sections repeating in different orders. This archetype is more common in avant-garde electronica. *Metatron* is an example of this structural archetype.

Chord Progression:

This structural archetype refers to the existence of an underlying, repeating harmonic progression. With chord progressions, tension/release events arise from linear and vertical arrangement of pitches according to the syntax of whatever harmonic system is being employed by the composer, be it tonal, modal or other.

6.1.3 Genre Affiliations

In genre affiliation, the work exists within a metagenre map and may also comment on relationships with other subgenres. The goal of genre affiliation is not to be exhaustive or definitive, but instead to provide context to the work, and identify precedents in terms of aesthetics, compositional practice, production techniques and technologies.

Works of avant-garde electronica may include genre affiliations and similarities to existing genres either consciously, or unconsciously.

For example, *Metatron* exists at the point of overlap between electronica and institutional / academic music. The work of Rioji Ikeda exists between sound art and electronica.

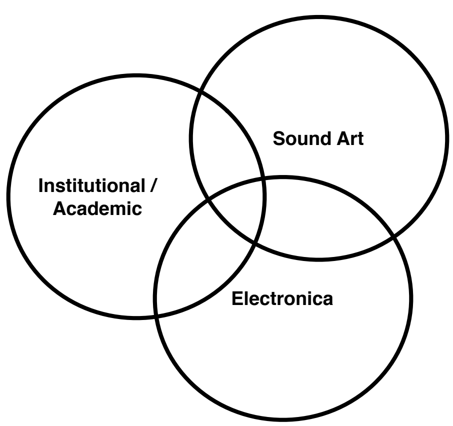


Figure 6.1-1 Electronic Music Metagenres

6.1.4 Tempo

The tempo of a work is important because it sets limits on genre association as well as the rhythmic conventions that can be expected within a work. For example, the rhythmic conventions of a tempo of 172 BPM are associated with drum and bass, and are different from rhythmic conventions associated with material at a tempo of 128 BPM. While maintaining a single tempo throughout the duration of a work is by far the most common, changes in tempo are accompanied by changes in rhythmic conventions.

6.1.5 Instrumentation

Instrumentation refers to any identifiable instrument or technology employed in the performance or production of a work. Again, the goal isn't to provide a comprehensive listing, although information on the exact instruments and technologies used to produce and perform a composition *is* useful if available. Instead, the point is to listen, identify sound sources, and make a list of possible technologies used considering the date of production. This process becomes increasingly difficult with virtualized versions of possibly historic hardware instruments and effects processors. However, this step provides important context to the sound world of the composition.

6.1.6 Visualization

The metadata phase concludes by selecting one or more visual representations of the audio material to be analyzed. This representation serves as the foundation for IMSA. Spectrograms, waveforms, and transcriptions are particularly useful during this phase due to their objective qualities. A listening guide can be substituted for a spectrogram, but this may unconsciously organize the material according to the listener's perception, which may not be ideal at this early point in the analytical process. Objective and literal representations of the sound provide a neutral basis for later analytical phases and minimizes selection biases that inevitably occur to some degree in the segmentation and analysis phases.

Waveform:

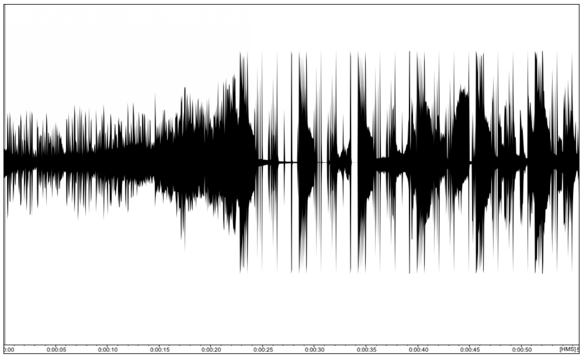


Figure 6.1-2 Tipper "Table Flipping" Introduction and mm. 1-5

The waveform is a graphic representation of an audio signal over time. It provides useful information about amplitude over time, and the relative intensity of events. As the complexity of the material increases, the ability of waveforms to provide useful detail may decrease.

Spectrogram:

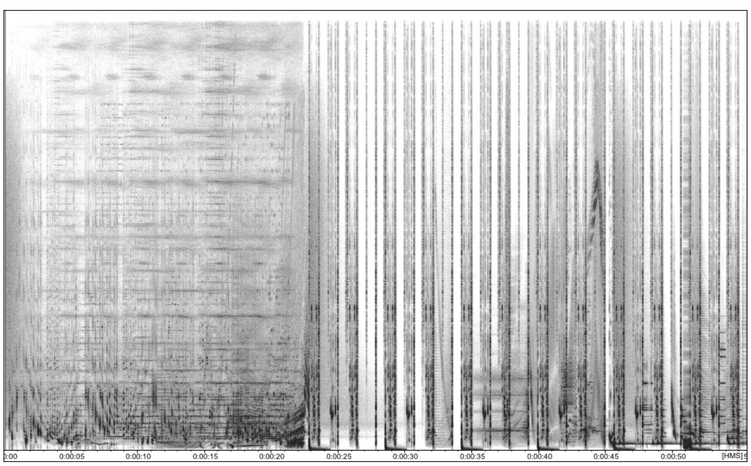


Figure 6.1-3 Example of Sonogram

The sonogram is a visual representation of the sound spectrum over time. The y axis represents frequency content, with lower values on the axis representing low frequencies, and higher values representing high frequencies. Time is represented on the x axis, progressing from left to right. This visualization type is useful for tracing harmonic and inharmonic information over time. Like the waveform, as the density increases it becomes more difficult to discern useful information.

Standard Notation:

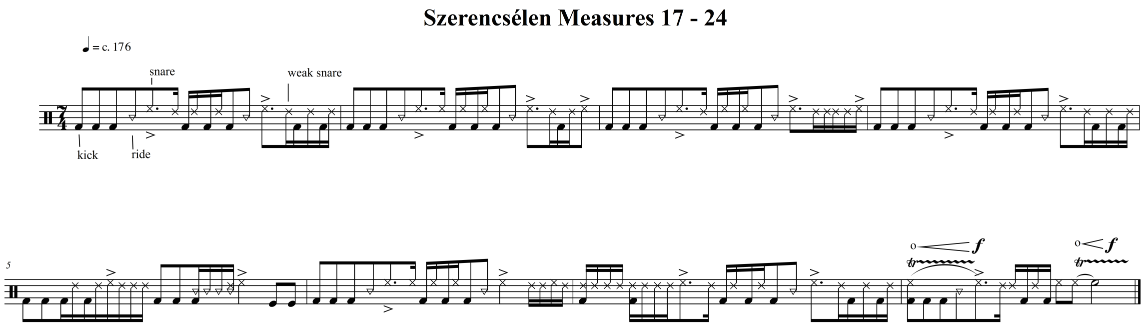


Figure 6.1-4 Rhythmic Transcription of Venetian Snares' "Szerenscsélen" mm. 17-24

Transcriptions of electronica provide a simplistic summary of rhythms. Since so much of electronica's compositional process and information is in the texture and sound itself, symbolic representation may be misleading and capture little of what is salient in the work.

Piano Roll Notation:

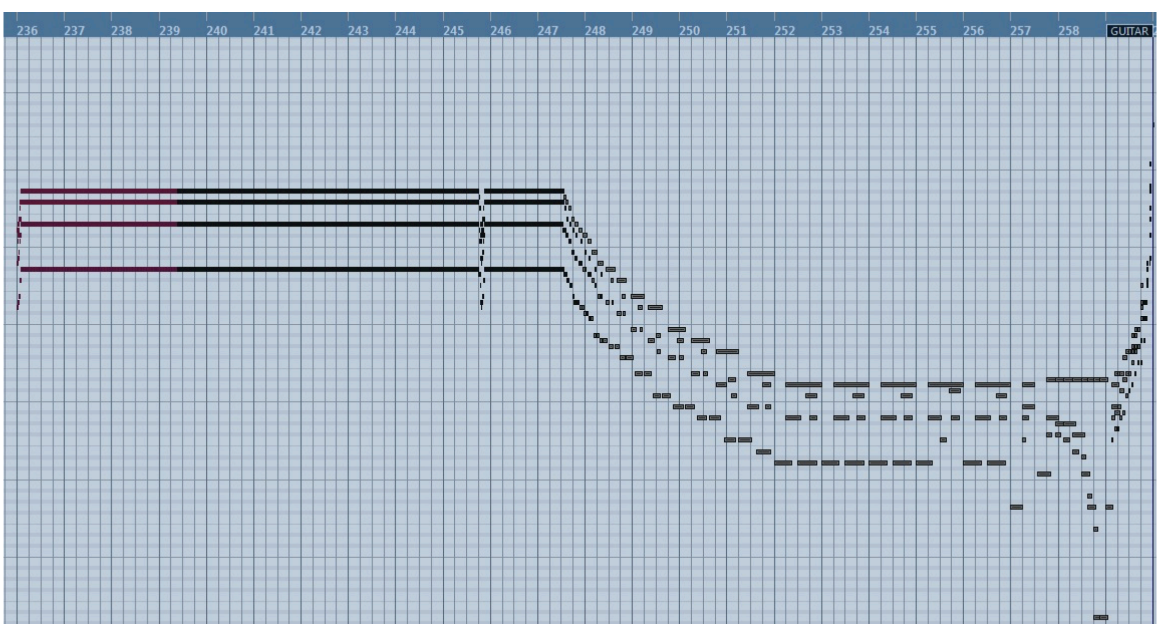


Figure 6.1-5 Piano Roll Notation: *Metatron*, Digital Synthesizer Trigger Data mm. 236 - 259

Piano roll notation describes midi events that are used to trigger synthesizers and samplers. It exists part way between symbolic notation and literal notation in that it does not capture the sound itself, but is instead a very precise representation of midi data. Piano Roll notation is useful for visualizing processes that are incompatible with the western notation system because of extreme speed, extreme pitch, and rhythmic complexity. For example, the above graphic shows a transition from audio rate rhythmic materials into a rhythmic pattern, then a fragmentation.

6.1.7 Example

The following is an example of the *general features* phase of an *Integrated Multi-Scale Analysis.*

Composer: David Tipper (1976)

Composition: *Table Flipping* from the album *Forward Escape*

Date: 2014

Performance Archetype: Digital Download

Structural Archetype: Rhythmic Arc

Genre Affiliations: Trip Hop, Glitch Hop, Down-Tempo, Nu School Breaks

Tempo: 84 bpm

Duration: 4’23”

Instrumentation: Access Virus synthesizer, Nord Modular, digital audio workstation and software.

Metagenre Map:

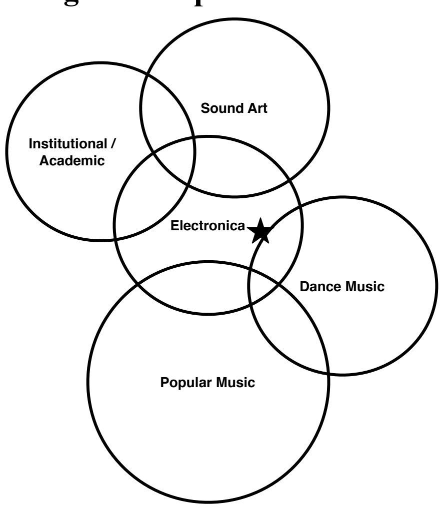


Figure 6.1-6 IMSA Metadata Genre Affiliation Venn Diagram

The work *Table Flipping* sits primarily within the electronica metagenre category, approaching dance music. The grooves are steady and stable enough to dance to, but that isn't necessarily the purpose of the music.

6.2 Segmentation

The segmentation phase involves splitting the source audio into functional units or segments. Performance archetypes, structural archetypes and analytical scale dictate the most useful segmentation points. Works that adhere to structural archetypes with steady pulse and cyclical structures are easily segmented into powers of two: 4, 8, 32, 64, 128... measure sections. Gestural pieces can be segmented according to functional phrases similar to temporal semiotic units. Works that contain irregular time signatures and phrase lengths, or that shift between gestural, pulsed and transitional materials can be segmented according to any useful combination of gesture, phrase or rhythmic construction.

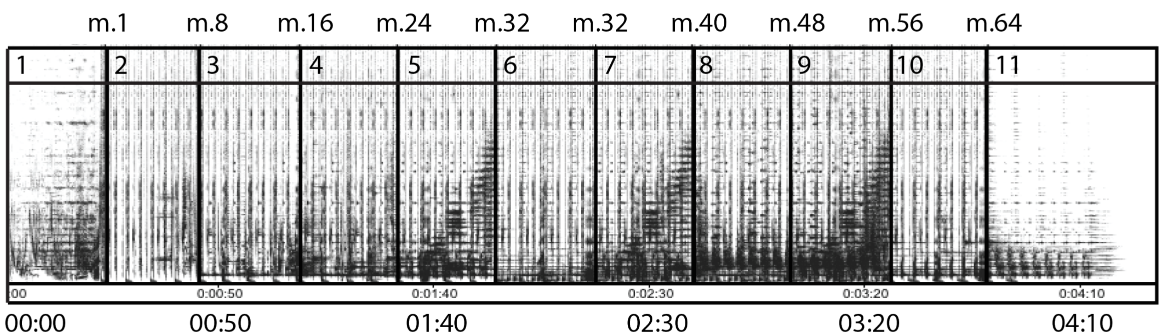


Figure 6.2-1 Tipper "Table Flipping" Full Piece mm. 0 – 64.

The diagram above demonstrates a simple segmentation of an entire work into nine eight-measure segments, preceded by a more gestural introduction. The pulse is still audible/visible, but downbeats are elided.

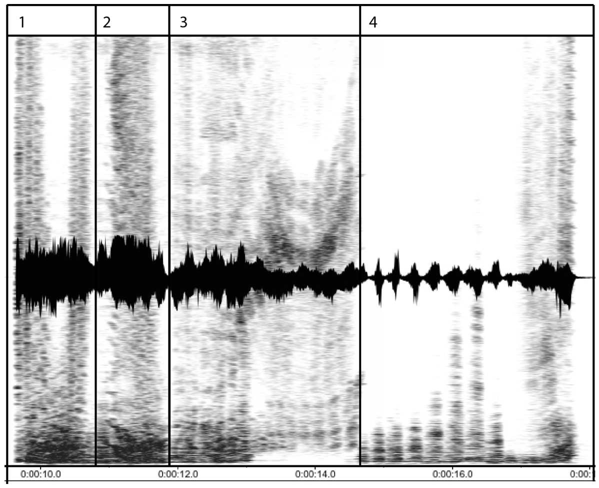


Figure 6.2-2 Amon Tobin "Goto 80" Micro-level Gesture

Figure 6.2-2 shows a micro-scale visualization of a single opening gesture from Amon Tobin's "Goto 80" from the 2011 album ISAM[132]. This gesture divides into four segments. The first two segments are filter sweeps, the third a spectral shift upward, and the fourth a tremolo figure. Tremolo is visible in the ridged patterning of the spectrogram. Filter sweeps are visible in marked increases and decreases in the upper partials. Upward spectral shift is visible in the upward drift of segment three.

6.3 Identification

The identification phase highlights, categorizes and organizes salient features in the audio material according to which descriptive system, lexicon or syntax is most appropriate to that structural archetype and scale. In this way, multiple analyses are able to work together to form a clearer picture of the audio being analyzed. This integrated, multidimensional view provides more insight than any one system could provide in isolation. This step is analogous to the addition of chord symbols, figured bass and cadence identification in a traditional analysis of tonal music.

There are a number of options for combining symbolic and literal representations in *Integrated Multi-Scale Analyses*. The flexibility and scalability required for analysis of electronica are provided via stacked analytical lanes. These analytical lanes are modular and can be swapped out according to the needs of the material. The lanes may be

[132] http://www.amontobin.com/

populated in any order, or simultaneously. This is because as different categories of features are incorporated, they may inform one another. See figure 6.3 - 1.

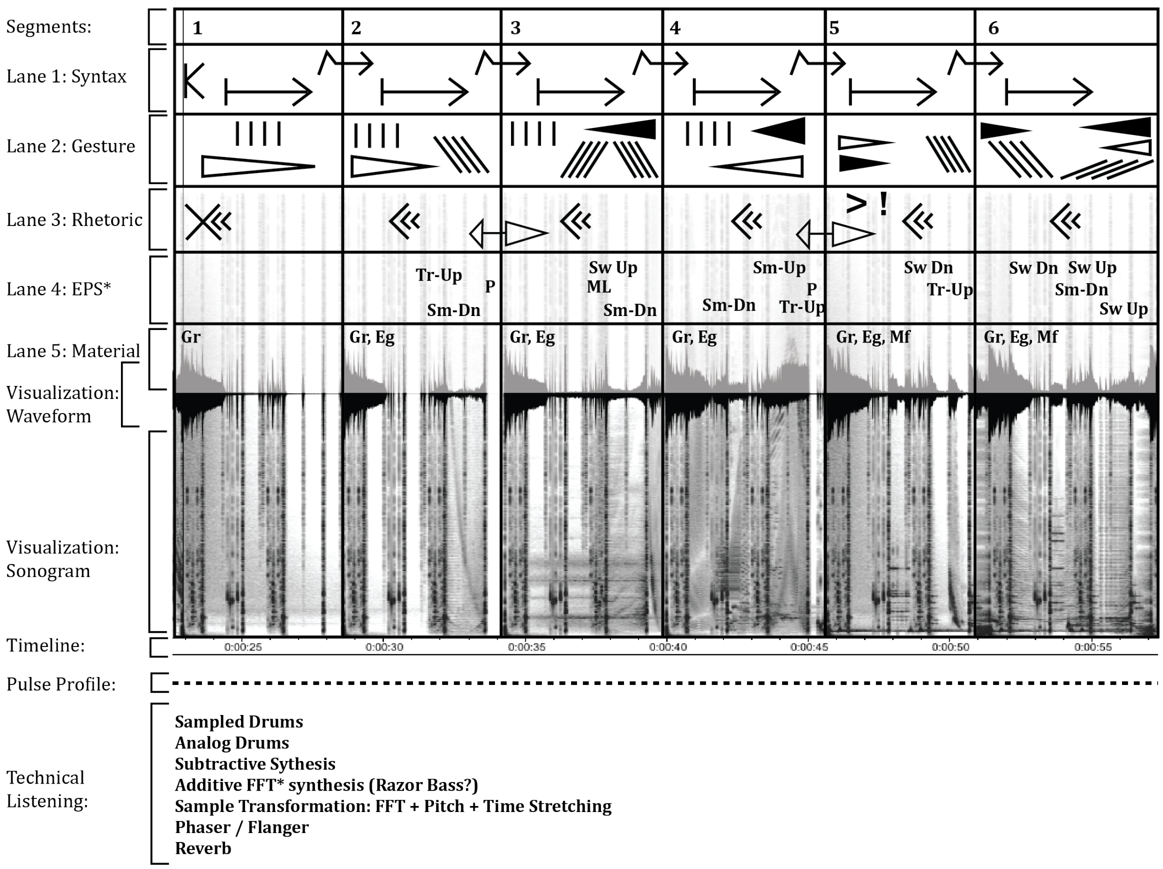


Figure 6.3-1 Tipper "Table Flipping" Mid-Level IMSA

The diagram shown above integrates the following visualizations and lexica:

Visualization:	**Source:**
Waveform	Computer Generated (Acousmographe[133])
Sonogram	Computer Generated (Acousmographe)

Lexicon:	**Source:**
Level 1: Syntax	Stephane Roy's functional analysis
Level 2: Spectrum	Stephane Roy's functional analysis
Level 3: Rhetoric	Stephane Roy's functional analysis
EPS Syntax	Original Contribution
Theme Identification	Specific to each work
Pulse profile	Original Contribution

[133] www.inagrm.com/accueil/outils/acousmographe

6.3.1 Figure 6.3.1 In Detail

Figure 6.3.1 analyzes the first pulsed material in *Table Flipping*'s opening section. The segmentation phase delineates the material based on a repeating two-measure pattern that forms the foundation on which the work is constructed. Segment no.1 holds a particular significance that will be discussed in section 6.5.2.

Analytical Lanes:

The identification phase is modular and flexible. Analytical lanes serve as slots for appropriate information and can be easily swapped out, and new models and lexicons added. This following describes the analytical lanes in figure 6.3 – 1, beginning at the top and moving downwards:

- ***Lane 1*** contains a linear and overlapping arrangement of syntax glyphs, identifying relationships between segments[134]. These glyphs are identified and categorized by listening to each segment and observing their transitions and relationships. At this level each loop adds new material, building tension and propelling the work into the downbeat of the next section.
- ***Lane 2*** contains a linear arrangement of glyphs representing gesture archetypes[135]. Gestural motions are identified and categorized by observing the literal notation as well as listening to the material. The information in this lane supports the syntax information in lane one. The relationships between gesture, form and phrasing are readily apparent. For example, new sections as indicated in lane one are preceded by a spectral shift in density, increase in amplitude, or a brief moment of decreased activity as indicated in lane two and three.

[134] See appendix Glyph Map / Syntax
[135] See appendix Glyph Map / Gesture Archetypes

- ***Lane 3*** contains rhetorical glyphs[136]. These glyphs are placed according to perceived rhetorical concepts embedded in the work. This perception is based on the analyst's listening and interpretation of visual representation and information from other lanes.
- ***Lane 4*** contains rhythmic syntax glyphs[137]. These glyphs highlight specific rhythmic devices that vary material and build tension between segments.
- ***Lane 5***, material identification [138] identifies musical material, be it distinctive or reoccurring rhythmic, melodic, harmonic or textural elements. The material identification lane is comparatively general and subjective in that it identifies and categorizes new material based on the composer's perception, and reading of the IMSA as a whole.

Pulse Profile:

The dashed line below the timeline in figure 6.3 - 1 represents the pulse profile. This line indicates the presence of a stable pulse at that point in the piece. A solid line represents no pulse, a dashed line indicates a pulse, and a mixed line represents transitional or ambiguous material.

Technical Listening

Beneath figure 6.3 – 1 is a space for information on technical listening. Salient audio and visual technical features are identified and indicated using abbreviated text. For example, 6.3 – 1 includes digitally sequenced sampled drums, subtractive and additive synthesis, as well as reverberation effects.

Effective technical listening draws on a number of resources, primarily that analyst's familiarity with production techniques, technologies and sounds. At one level it requires guesswork, but experienced ears and careful analysis of all available materials can create a clear picture of the technology behind the production.

Technical listening relies heavily on the listener's ability to identify multiple synthesis types, filters, effects and music technologies from audible features. This is not

[136] See appendix *Rhetoric*
[137] See appendix EPS
[138] See appendix Themes in Tipper's "Table Flipping"

unlike a theorist or musicologist being capable of identifying orchestral instruments in an orchestral or instrumental texture. Information from the context phase typically limits the types of possible technologies by providing clues based on the technology available during the period the material was produced.

Visual clues from the spectrogram and waveform can also suggest specific technologies. For example, additive software synthesizers, like Native Instrument's *Razor Bass,* create characteristic designs on a spectrogram. Subtly different or identical drum waveforms can indicate the difference between digital samples and analog drum synthesis hardware.

Interviews and photographs of the studios of electronica producers can further inform technical listening. While there is no guarantee that the equipment in the studio was used on a specific track, it provides context on workflow and sound sources that adds to the complete picture.

For example, Tipper has discussed his use of the *Access Virus* virtual synthesizer as well as his tendency to produce using software plugins. In the same interview, there are pictures of his studio equipment, which includes a *Nord Lead* keyboard synthesizer and *Nord Modular* Synthesizer (Tipper Interview 2014).

6.4 Analysis Phase:

The analysis phase of an IMSA examines and synthesizes information gathered during the first three phases. Conclusions are summarized and presented in the form of hierarchical tension/release events, annotated formal sections and commentary regarding the technical aspects of the work. The goal of this phase is to provide a clear understanding of how the elements of the composition work together and generate interest for the listener, as well as uncovering any patterns or links between time scales. See figure 6.4 -1.

6.4.1 Tension/Release Events

In an IMSA, tension/release events are indicated with one or more exclamation marks. A greater number of exclamation marks indicates a higher relative intensity and an importance release event within the context of the work. See figure 6.4 –1, top. The exclamation marks are preceded and followed by lines, indicating increasing or decreasing tension. These tension lines are not the objective result of computer-assisted analysis, but rather the subjective analysis and summary of multiple analytical lanes by the analyst.

6.4.2 Formal Analysis

With the information from the *context*, *segmentation* and *identification* phases clearly annotated and organized with a hierarchical indication of tension/release events, a formal analysis becomes a straightforward interpretation of the data. The purpose of this final step is to describe the development of the section being analyzed, giving a larger picture of the work using its own internal structures and devices. Examples of this process are discussed in section 6.5.

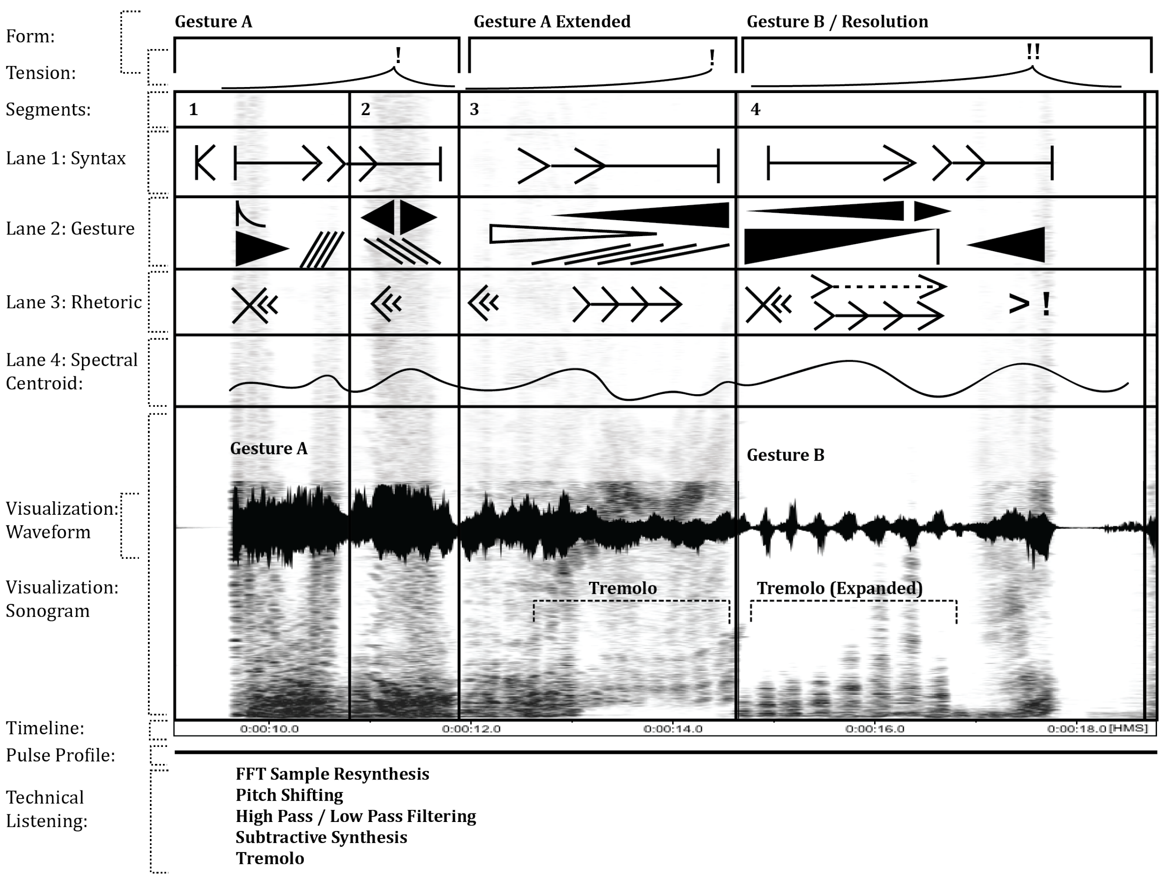


Figure 6.4-1 Amon Tobin: "Goto10" Micro-level IMSA

Figure 5.4 –1 is an example of an IMSA of a single compound gesture at a time-scale of eight seconds. Notably, at this magnification there is much greater potential for detailed analysis of individual gestures in terms of spectral motion, density and micro tension/release events.

6.4.3 Source Pattern Identification

Source patterns are cyclical groupings of layered materials on which larger structures and musical gestures are derived. More than a theme or ostinato, source patterns are electronica's analog of the fugal subject, tone row or modal module[139], a set of relationships designed to be examined in different configurations. Source patterns are identified in the IMSA diagram with this glyph: ‘ ’.

Rules that govern a source patterns vary according to stylistic parameters, but generally take rhythm, groove, spectrum, harmony and melody into consideration. These elements are then combined into an elaborate structure built around a compact and strict framework where all the elements interconnect[140].

A source pattern commonly takes the form of a two, four or eight bar phrase, or periodic set of rhythmic relationships that builds tension and resolves into a similar or slightly altered version of itself. Interlocking melodies, rhythms and bass patterns appear together, filling the spectrum and dividing rhythmic elements for *maximal evenness*[141]. In other words, elements are carefully introduced and distributed in order to create a complete pattern with interesting elements divided evenly. For example, see figure 6.4-2.

[139] A modal module refers to a two or three voice fragment of modal counterpoint that can be arranged, juxtaposed and offset as a block unit, with accompanying voices being composed above or below. (Schubert 2009 227- 242)

[140] In western classical music these types of musical structures are typically derived from cadential formulae that resolve back into themselves.

[141] A term borrowed from scales, maximal evenness refers to the equal distribution of elements between two points. In this case, rhythmic elements between two down beats.

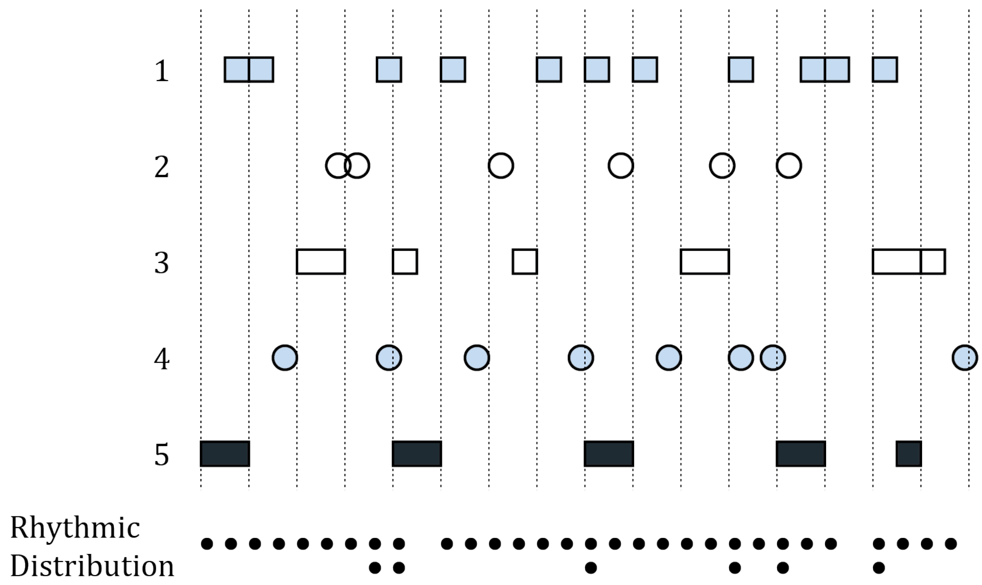


Figure 6.4-2 Complementary Rhythmic Distribution Characteristic of *Source Patterns*.

In the above figure, elements 1 through five each contain a unique rhythmic profile, yet when aligned, they distribute relatively evenly across the grid, as indicated by the black dots at the bottom of figure 6.4-2. These dots signify the number of events per step. Some steps have two, others none; but in general the events are distributed fairly evenly. While not every source pattern has maximal distribution, a tendency towards the distribution of rhythmic materials can be observed in many genres of electronica.

Also, note that some notes in patterns 1, 2 and 4 are offset from the grid. These deviations are examples of the minute tempo fluctuations sometimes employed by producers in the creation of a source pattern. These millisecond time differences bring a sense of dynamism, life and swing to a collection of materials, providing contrasting effects when connected to different material.

This tightly interlocked structure is then unpacked in a manner similar to compositional methods described by Nadia Boulanger, Rameau and others (Schubert 2006 12). By unpacking, overlapping, eliding, varying and ornamenting materials from the source pattern, it is possible to create large developing structures that come together in contrasting, elegant combinations. See figure 6.4-3, which shows how a source pattern can be layered, arranged to isolate and emphasize the difference between elements, as well as provide a sense of completion and stability when all elements lock together. For example, figure 6.4-3 shows a straightforward source pattern distribution one would find in early electronica.

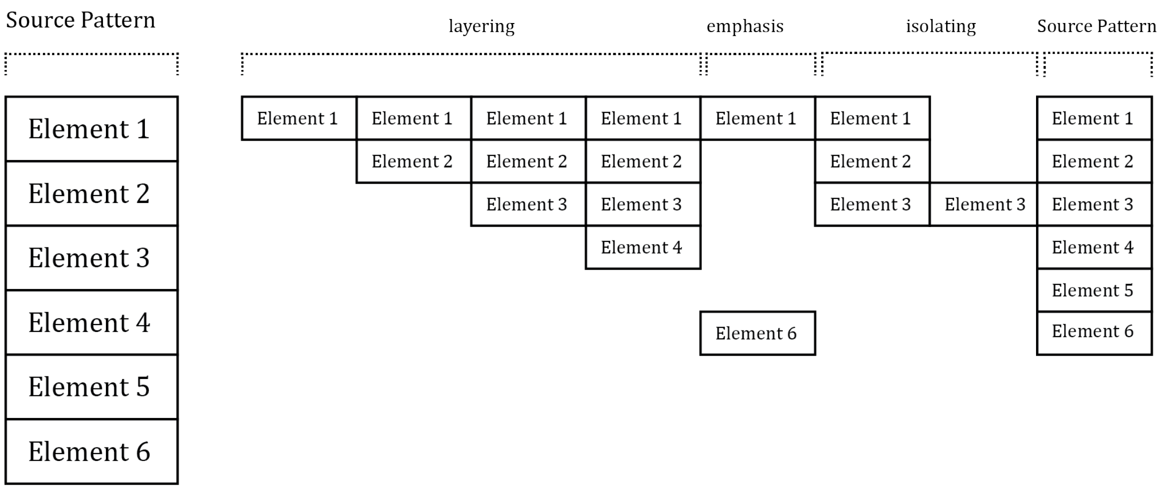


Figure 6.4-3 Characteristic *Source Pattern* Unpacked

Each vertical segment of the source pattern's elements may remain unchanged or undergo embellishments and small changes that generate interest and build intensity into significant moments of rhythmic resolution. See figures 6.4 -3 and 6.4 – 4.

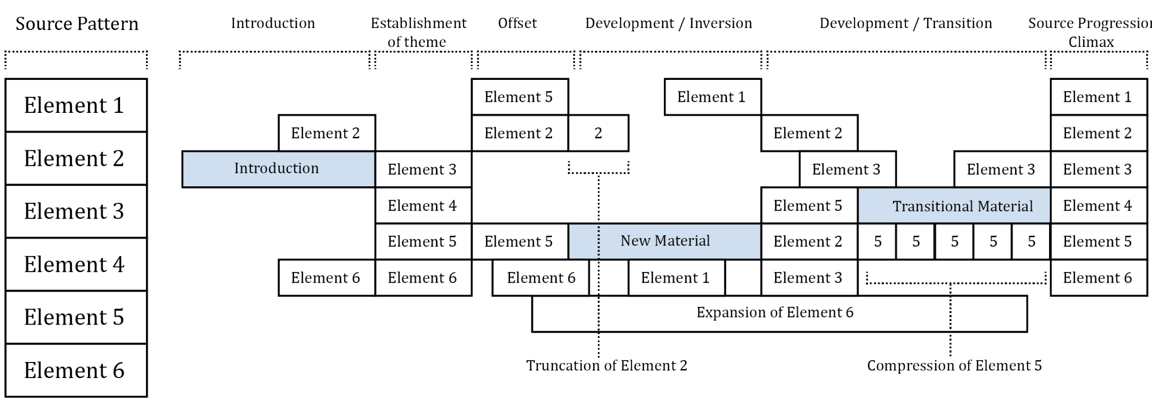


Figure 6.4-4 Elaborate *Source Pattern* Unpacked

Figure 6.4-1 shows a characteristic source pattern distribution for more abstract forms of electronica, where elements of the source pattern are offset, transformed, inverted, truncated and expanded. This style of material organization overlaps with compositional approaches common in the Western art music tradition, from modal counter point to electroacoustic music.

The inversion of elements within a source patterns is often a matter of re-distributing the spectral weight of rhythmic elements through EQ, transposition or other processing. Expansion, contraction and truncation typically occur via micro montage in a DAW, or through the manipulation of sequence data on external hardware.

6.5 Bringing It All Together:

6.5.1 Macro Scale Analysis

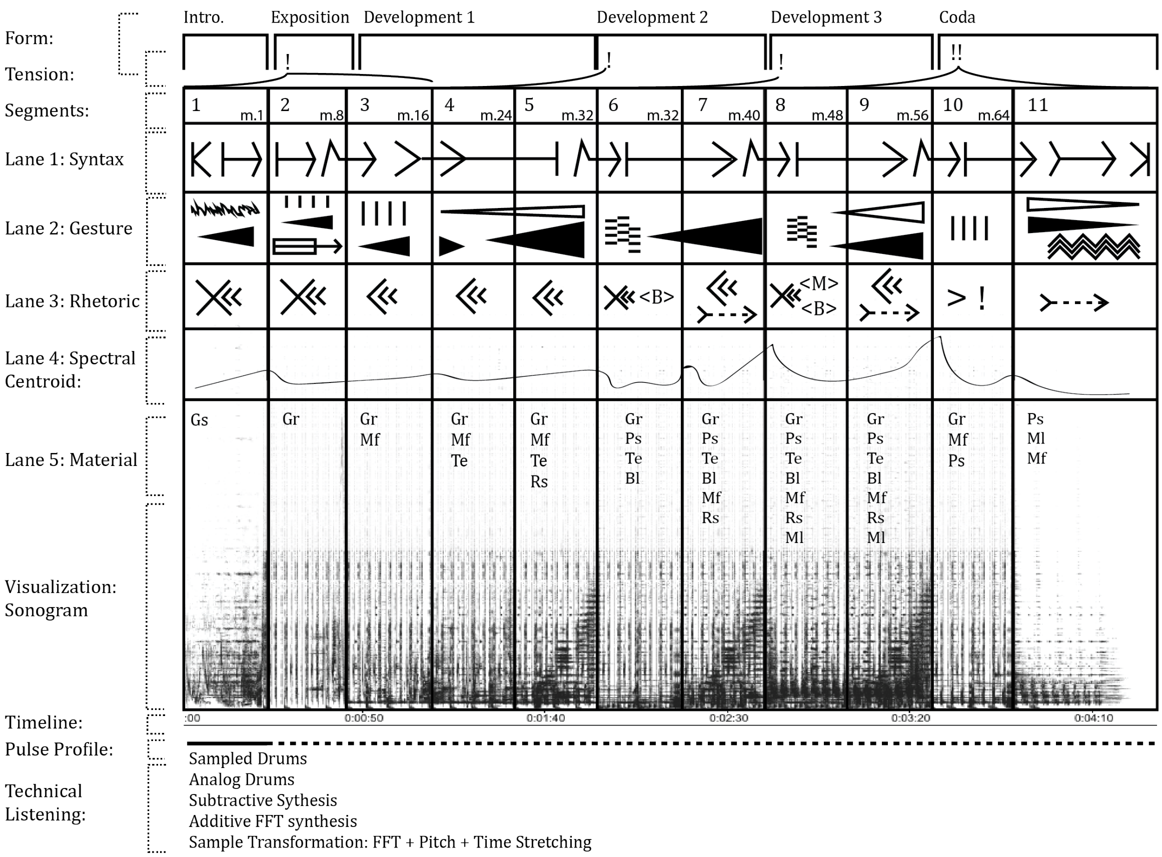


Figure 6.5-1 Tipper "Table Flipping" *IMSA* Macro-scale.

Themes for Tipper:
Gr: Groove
Mf: Melodic Fragments
Tr: Tears

Rs: Riser
Ps: Polyphonic Synthesizer
Ml: Melody
Eg: Embellishing Gestures

Table 6.5-1 Tipper Themes

Figure 6.4-1 is an analysis of Tipper's *Table Flipping* in its entirety. The combination of literal and symbolic materials clearly illustrates a gestural introduction followed by an exposition and three increasingly intricate development sections.

The placement and annotation of tension release events reinforces information from the spectrogram and gestural analysis lanes. These can be observed in figure 6.5 –2 at the intersection between segments 1 and 2, 5 and 6, 9 and 10. Increases in amplitude and spectral density are followed by abrupt and satisfying rhythmic resolutions, propelling the work from one section to the next.

The relationship between the thematic and rhetorical levels reveals an arch form where elements are introduced and removed, with intensity peaking during the transition between the third development. See: segment 9 and the coda and segments 10 – 11.

The addition of layers and increasing spectral and attack density illustrate a clear build from segments 2 to 9, followed by a release in 10. This type of build and release is characteristic of electronica, especially within the context of the rhythmic arch archetype.

6.5.2 Mid Scale Analysis

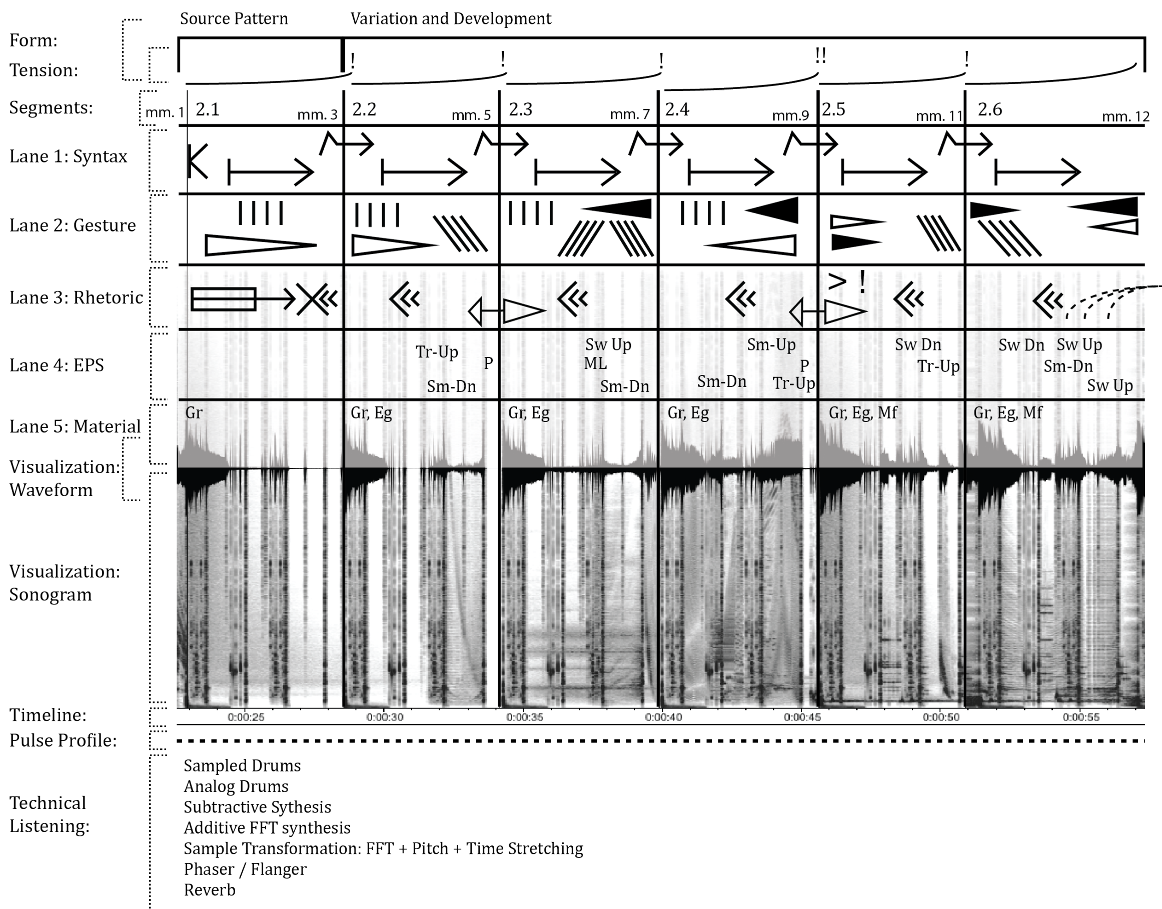


Figure 6.5-2 Mid-level IMSA of Tipper's "Table Flipping"

EPS Abbreviations:

SwUp:	Sweep Up
SwDn:	Sweep Down
TrUp:	Tear Up
TrDn:	Tear Down
Sm:	Smear
P:	Pause
ML:	MicroLoop

Figure 6.5 – 2 is a magnification of segment 2 of the high level analysis in figure 6.5 – 1. At the middle level, the context and technical listening lanes remain consistent but the other annotations are adapted to provide useful information at this timescale. The syntax, gesture and rhetorical levels remain in place, but are supplemented by a waveform analysis and an analysis of rhythmic syntax.

Figure 6.5 – 2 Segment 1:

Segment no.1 in figure 6.5 – 2 has particular significance because it contains the first statement of the *source pattern* introduced in section 6.4.3.

Figure 6.5 – 2 Segment 2:

This segment is a variation of the first. It is propelled forward through a minor rhythmic resolution leading out of the first segment, as is indicated by the tension-release, syntax, rhetorical and gestural lanes. The rhythmic syntax lane indicates an upward micro gesture and a downward smear leading into a pause, heightening the anticipation and increasing the rhythmic resolution of the downbeat of segment 3.

Figure 6.5 – 2 Segment 3:

Like segment 2, segment 3 is a variation of the source pattern. It contains a different configuration of rhythmic and textural devices leading into the downbeat of segment 4, then a micro-loop followed by a short upward sweep. The pause established in previous segments is elided by a downwards smear into the downbeat of segment 4.

Figure 6.5 – 2 Segment 4 – 6:

The pattern established in the first 3 segments continues throughout the analysis. Additional layers are introduced in sequence. Rhythmic and gestural devices identified in the rhythmic syntax lane embellish and propel the work forward. The tension/release and rhythmic resolution event in the 5^{th} measure is significant in that it completes ideas introduced in the first measures with a stronger resolution. This is expected, as the measure number is a higher power of two. Similar resolutions occur with increasing intensity at 8, 16, 32, 64 measures, as can be observed in figure 6.5 – 1.

6.5.3 Micro Scale Analysis

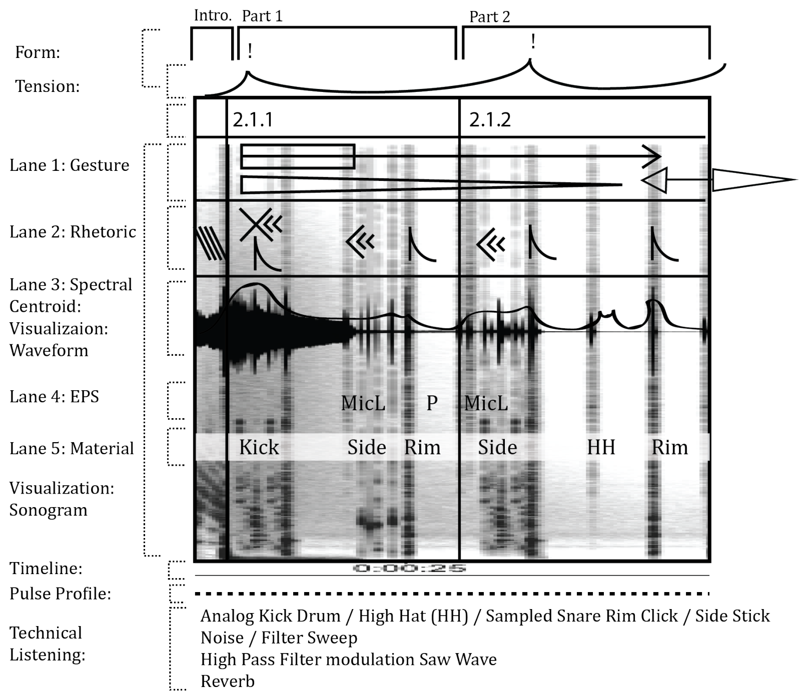


Figure 6.5-3 Micro-level IMSA of Tipper's "Table Flipping" from Forward Escape 2014

Figure 6.5 – 3 Segment 2.1.0 (Intro):

Segment 2.1.0 (Intro.) serves as a brief downward sweeping introduction to the analog kick drum impact in segment 2.1.1. The reverberation tail leftover from this build up is visible as a light grey wash, dissipating over segments 2.1.0

Figure 6.5 – 3 Segment 2.1.1:

Segment 2.1.1 begins the source progression, introducing analog kick drum, side stick and rim samples. The side stick pattern repeats with a micro loop leading into the second impact.

6.6 Summary

This chapter introduces the *Integrated Multi-Scale Analysis,* a model developed for the analysis of electronica. The *IMSA*'s integrated, flexible approach reveals relevant compositional processes, structural unity, form, gesture, cultural context, technologies, poetics and materials. This systematic, hierarchical system begins with general features such as: structural archetype, genre affiliations, visualizations and metadata. It then segments audio into structurally significant time windows, progressively narrowing its focus towards increasingly detailed analyses and annotation. These annotations can span the macro, mid and micro time scales equally, revealing structural unity. Analyses and annotations are notated across multiple lanes using glyphs and other text based lexica. The resulting tension / release diagram integrates into the formal outline, giving a succinct overview of material from any time scale.

Chapter 7: Integrated Multi-Scale Analysis of Metatron

Metatron aims to be a true synthesis of Western art music and avant-garde electronica. This synthesis manifests itself at every level of the work from macro scale elements such as formal design, performance practice and instrumentation, to micro scale elements such as gestures, syntax, and micro-montage. This chapter applies the *Integrated Multi-Scale Analysis* (IMSA) model to *Metatron*, revealing points of synthesis at all levels.

Section 7.1 of this chapter presents an analysis of *Metatron* as a whole. In sections 7.2 to 7.6, each movement is analyzed in isolation, emphasizing specific compositional features. Each successive analysis begins with an *IMSA* diagram. The results of the analysis are then discussed. Examples are given primarily from the movement being analyzed, but additional examples are referenced from other sections throughout the score.

7.1 Metatron IMSA

The following section contains a grouping of features that make up *Metatron's* metadata.

Composer: Eliot Britton (1983)

Composition: *Metatron* For Percussion Ensemble and Live Electronics

Date: 2014

Performance Archetype: Concert Work – Live Electronics

Structural Archetype: Interrupted Rhythmic Arc. *Varies by Movement. See table 7 –1*

Genre Affiliations:

Avant-garde Electronica
Live Electronics
Noise
Chiptune
Complextro
Dub-step
Prog Rock
Nu-Jazz
Down-Tempo
Glitch Hop
Experimental Breaks
New School Breaks

Tempo: Varied (100, 110, 96, 120, 5, 196, 112, 206, 76, 63)

Duration: c. 28 minutes

Instrumentation:

Percussion 1:
- Bass drum
- Large metal plate (suspended)
- Medium metal plate (suspended)
- Small medal plate (suspended)
- Metal chimes
- Large guiro (Long ridged pipe or bamboo)
- Finger cymbals
- Triangle
- KP mini (2D touch synthesizer)

Percussion 2:
-Crotales
- Bass drum (mounted kick drum possible)
- 3 toms Low, med, hi
- 2 bongos
- Sandpaper blocks
- Large guiro (ridged metal or plastic)
- 5 wood blocks low to high
- Monotron (ribbon synthesizer)

Percussion 3:
- Wood block
- Wooden box
- Spice nut shaker
- Goat hooves
- Piccolo wood block
- Guiro (standard, wooden)
- Suspended cymbal
- Spring drum (as large as possible)

Percussion 4:
- Bottle
- Glass bowl
- 3 rice bowls (low med, high)
- floor tom
- 6 table items
- Flexatone
- 3 metal cans
- 3 metal pipes
- Cell phone or other micro synthesizer

Percussion 5: (Drum set)
- Kick drum
- 3 toms
- Deep snare (rock snare)
- Piccolo snare
- High Hat
- Ride Cymbal
- 2 Crash Cymbal (normal + character)
- Glockenspiel
- Drum Machine

Percussion 6:
- Rhodes piano
- Polyphonic synthesizer
- Monophonic modular synthesizer
- Vocal processor (MXR 222 Talk Box)
- Analog delay Moog MF104-M

Table 7.1-1 *Metatron* IMSA Instrument List

Movements:

Gatsbytron (1920)

Archertron (1950)

Dim (1975)

Galvatron (1980)

Valkaratron (2010)

Metatron IMSA Formal Outline

Metatron Duration: c. 28 minutes Format: Concert Work Structural Archetype: interupted rhythmic arc				
Gatsbytron 1930 M: 0 - 138	Archertron 1950 M. 139 - 205	Dim 1950 M: 206-270	Galvatron 1980 M: 271 - 560	Valkaratron 2010 M: 561 - 611
c. 8 min	c. 3 min.	c. 4 min.	c. 10 min.	c. 3 min.
Interrupted rhythmic arc Gestural	Interrupted rhythmic arc	Rhythmic accumulation	Interrupted rhythmic accumulation Gestural Tonal / Modal Chord Progression	Interrupted rhythmic arc Gestural

Table 7.1-2 *Metatron* IMSA Formal Outline

The above document shows an approximate visual distribution of the proportions of *Metatron* as well as including the multiple structural archetypes that make up the work.

7.1.1 IMSA Metadata Discussion

Sources:

The IMSA metadata for *Metatron* was collected from information found in the score and recordings, program and concert footage. The performance archetype was set as the *Concert Work / Live Electronics* archetype due to the cultural context, space and physical location surrounding the premiere as outlined in section 4.2.

Structural Archetypes:

Due to *Metatron's* multiple movements and long duration, there are differing structural archetypes that interact on two levels. As a whole, *Metatron* fits the interrupted rhythmic arc archetype outlined in section 6.1.2. The work contains large sections, whose materials swell and ebb in intensity and density, both gradually and abruptly, all while maintaining an arc form. Within *Metatron* as a whole, each movement contains features that mirror the large scale, as well as introduce contrasting archetypes at a smaller scale.

“Gatsbytron” mixes the grove locked elements of the interrupted rhythmic arc with elements of gestural archetype introduced in section 6.1.2. “Archertron” is composed mainly from rhythmic materials that layer through both sudden and gradual introduction and elimination of elements, making it an interrupted rhythmic arc. The “Dim” movement is defined by a gradual increase in rhythmic and spectral density through layering, making it a rhythmic accumulation as outlined in section 6.1.2. “Galvatron” combines elements of the previous three movements with a recognizable repeating chord progression, not unlike a baroque chaconne. The final movement “Valkaratron” marks a return to the beginning of the work, mirroring the juxtaposition of interrupted rhythmic arc and gestural archetypes found in “Gatsbytron”.

Tempo:

Metatron’s Tempo varies considerably. The list of tempi shown in section 7.1 is list of tempi found in the score, not a comprehensive of each tempo change.

Instrumentation:

Metatron’s instrumentation was carefully selected to meet multiple requirements. Firstly, instruments were selected for poetic reasons outlined in sections 4, 4.6 and 4.7. In short, the visual and sonic character of tangible, historically significant electronic instruments supports the overall concept and poetics of the work. Second, the found objects, traditional percussion and synthesizers were carefully selected in order to blend digital, analog and acoustic worlds. Just as a French horn helps bridge the winds and brass, and the bassoon can bridge the winds and low strings, some instruments bridge analog, digital and acoustic sounds.

For example, the guiro blurs synthesized and acoustic elements because it can perform rapid shifts in tempi, blurring the perception of audio rate sounds and discreet attacks. These audio rate transitions on the threshold of perception are more characteristic of a synthesized sound.

The acoustic drums blend with digitally processed and synthesized analog drums, creating a richer hybrid than either can achieve in isolation. The purity of the vibraphone and crotales bridge the gap between, synthesized sounds and acoustic timbres. The remarkably synthetic character of the spring drum ties acoustic and pre-recorded tape elements during softer transitional passages.

Attempts at blurring instrumental categories moves from analog to acoustic as well. For example, the ribbon synthesizer delivers characteristic human gestures due to the continuous nature of its control interface. The talk box relies on biological and synthetic elements to function properly, further blending the digital, acoustic and analog sound worlds.

7.1.2 Macro-Scale Formal Considerations

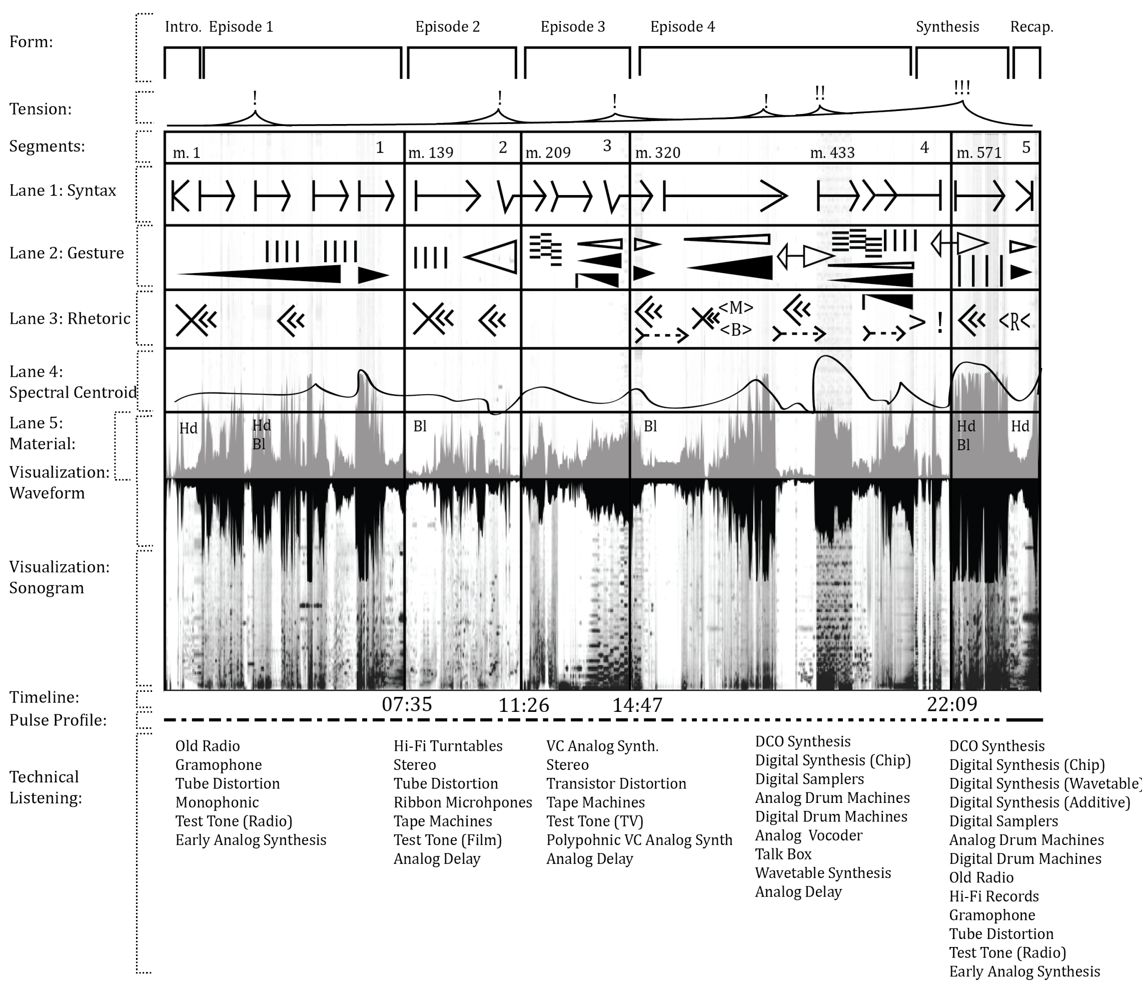


Figure 7.1-1 *Metatron*, Complete, *IMSA* Macro- (meta-) level

The above diagram is an IMSA of *Metatron* in its entirety. *Metatron's* form is straightforward when observed at the largest possible time-scale. The composition is derived from two main themes, Irving Berlin's "How Deep is the Ocean," and "Blue Skies." Material generated from "How Deep is the Ocean" begins and ends the work. "Blue Skies" serves as the basis for a series of episodic variations as shown above.

At this time-scale *Metatron's* form is a synthesis of formal archetypes from electronica and western art music. Interrupted rhythmic arcs and accumulations similar to a DJ set are applied in combination with elements of sonata form, theme and variations, and fugue.

DJ Set Elements:

Like a DJ set. *Metatron's* materials and transitions between episodes are a function of spectral climax and rhythmic resolutions. During transitional phases, elements interact to create new relationships. Moreover, movement-long gestures are carefully controlled, sometimes abruptly for dramatic effect. For example, the smooth transition between episode 3 and 4 occurs through a transformation of a synthesized tone into the *Blue Sky* theme. This transformation occurs through the manipulation of audio rate micro-sound. The transition from segment 4 into 5 builds intensity through an anticlimax, increasing the climactic impact of the initial gesture in segment 5.

Elements of Sonata Form:

Intermixed with the DJ model is the rough outline of the elements of Sonata form: exposition (Introduction), development (Episodes, synthesis) and recapitulation in the final section. See figure 7.1 –1.

Elements of Fugue:

The relationship to fugue is not audible, or based on counterpoint, but rather structural. The "unpacking the box" (Schubert, 1999; 2006, 12) approach explained in section 6.4.3 is exploited throughout the work, but most notably in the synthesis of the final movement where all the elements of the work come together. The climactic nature of the final movement relies on material initially created as a single unit and then unpacked into the various movements, planting the seeds for the culmination in the final movement. Later, additional thematic statements and materials are overlapped and adjusted to fit, similar to the stretto of a fugue. See "Valkaratron" mm. 572-89 22:13.

The music beginning at 572 does not sound like a fugue, but rather like a golden age radio/electroacoustic/dubstep chimera. However, the development of compact, interlocking musical materials through expansion, contraction, juxtaposition, elision and retrograde, is *fugue like*. Instead of being governed by contrapuntal practices, this section is governed by rhythm, groove, and elements of EPS. Just as carefully prepared invertible counterpoint, false entries and thematic manipulation can invoke feelings of sublimity or exegesis in fugal stretti, the climax of "Valkaratron" seeks to a similar result. This result is achieved a through carefully prepared rhythmic, spectral and technological interlock at multiple time scales.

Sampled Audio as Form:

Audio samples from *"*Blue Skies*"* and "How Deep is the Ocean*"* generate form indirectly. After being triggered at the beginning of the movement, the audio source material continues inaudibly, with derived amplitude envelopes and processing applied to the audible sound materials. These inaudible sound profiles are expanded and enhanced by the instrumental writing in measures. For example, mm. 27 – 38, mm. 75 – 84 and mm.164 – 171.

The reoccurring gestures and impacts from material in "Gatsbytron" and "Valkaratron" are examples of this. Vocal lines from "How Deep Is the Ocean*"* generate amplitude and pitch contours that are re-orchestrated in the percussion and electronics. For example, see mm. 561 – 586, 21:33. In these sections, a vocal sample from "How Deep is the Ocean" is stretched out and used as a formal device. Consonants, plosives, sibilance, and melodic contours are expanded and accentuated in the instrumental and fixed media parts. For example, see mm. 583 – 589, 23:05.

Technology as a Form and Function Bearing Device:

Metatron's intensity curve tracks a chronological progression through multiple periods of music, media and technology. Gatsbytron's frequency range and technological palate are comparatively limited by the fidelity of archival recordings used, but also by analogy to the technologies that are being invoked. For example, audio samples from golden age radio, 78-rpm gramophones, and early tube distortion are employed, with midrange frequencies emphasized. The gradual increase in audio fidelity and music technology over the work enlarges the available amplitude and frequency range. Like a DJ opening and closing a filter, *Metatron's* sound palate serves a supporting role to the overall energy and trajectory of the work.

Working Together:

Elements of electronica, acousmatic and western art music are employed in parallel, informing one another's processes, reinforcing the larger arch of the work. At this timescale the swells in density and amplitude, and their relationship to the overall progression of the work, are readily apparent. Tension/release events, rhythmic resolutions and climactic moments are indicated at the top of the diagram. The notation indicates a series of increasingly intense climactic moments. See figure 7.2-1

7.2 Gatsbytron IMSA

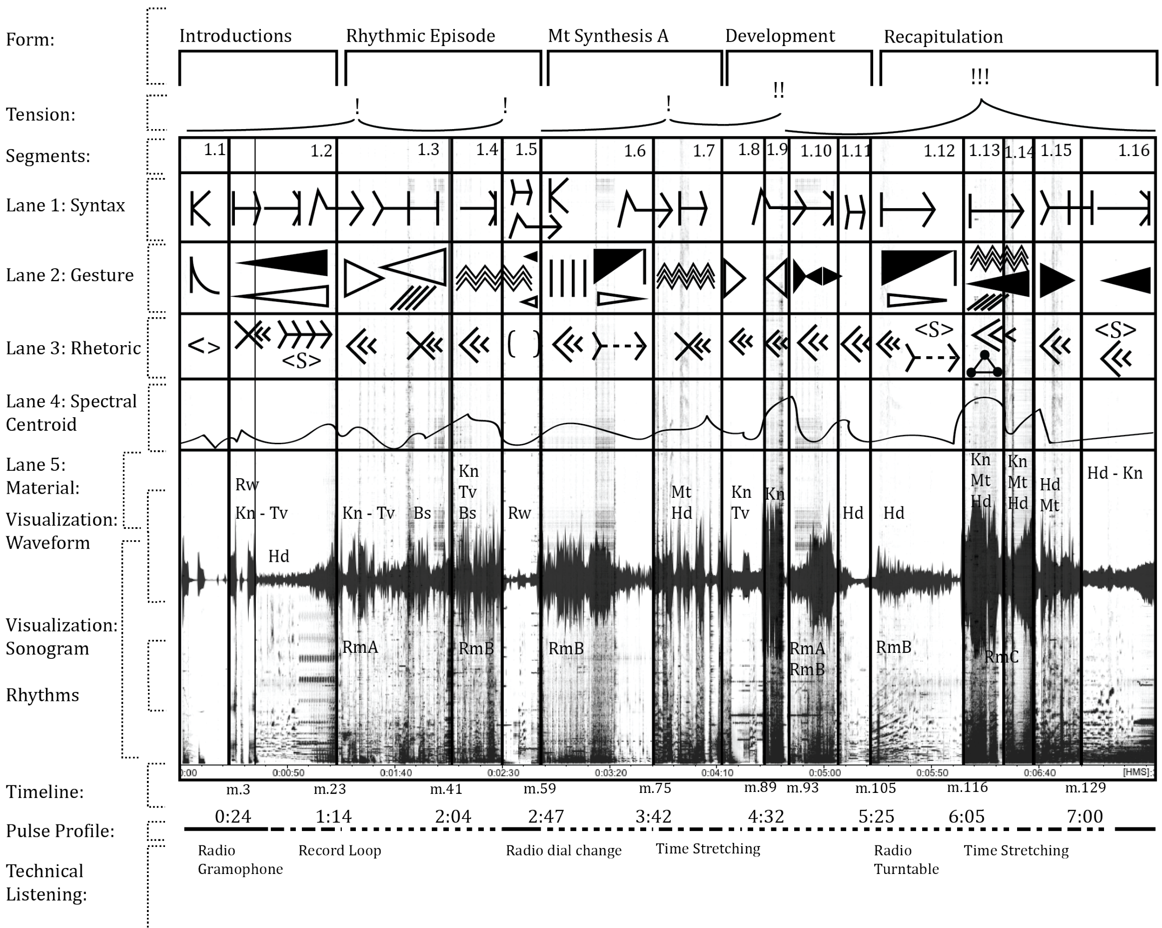


Figure 7.2-1 "Gatsbytron" *IMSA* Macro-level

7.2.1 Gatsbytron Form

The overall form of Gatsybtron mirrors the form of the entire work as illustrated in figure 7.2-1. Both this movement and the overall work contain introductions, episodes, development, synthesis and recapitulation. A comparison of the tension, gestural, formal and rhetorical lanes in Figures 7.2-2 and 7.3-1 reveals a similar distribution and positioning of climactic moments and tension/release events.

7.2.2 Gatsbytron Themes

Thematic material in *Metatron* appears in many guises. The conventional sources, melody, harmony, rhythm and texture are joined by audio samples, and specific technologies as thematic elements. "Gatsbytron" contains the following themes, as indicated in figure 7.2 –1:

Kn: Knocking Motive
Tv: Television transition gesture
Bl: "Blue Skies"
Hd: "How Deep is the Ocean"
Mt: *Metatron* theme (synthesis)
Rw: Radio window

The knocking and radio window motives typically occur together and are employed as a transitional device, evoking a change of radio stations. The opening measures of "Gatsbytron" (measures 3 to 5) are an example of this combined gesture in isolation. The knocking motive in the electronics joins the percussion woodblocks, building into the radio window gesture in measure 4 or segment 1.2 in figure 7.2.1, indicated by Kn and Tv. These two themes serve a specific function in the work. In this case, evoking the changing of stations on an analog television or radio.

7.2.3 Radio Window Theme

The radio window theme consists of short bursts of layered, simultaneous archival recordings of radio broadcasts. The cacophony of music and voices in a narrow spectral bandwidth provides a striking contrast to the instrumental texture, while retaining a percussive character. Each radio window statement appears in a slightly modified form through the manipulation of the entry and exit points of the audio segments. In this way, each statement of the radio window theme is unique, but cohesive. This technique generates considerable variety by manipulating the alignment of audio files, a technique related to the *audio as form* concept introduced in section 7.1.1.

7.2.4 Synthesis in Gatsbytron

As the movement progresses, themes are varied, combined and resynthesized with additional themes, adding to tension/release events and building up the fabric of the piece in an economical manner. This approach of constant variation and recontextualization integrates Western art music practices and production techniques associated with electronica. For example, in the Western tradition, a similar approach is used by Frederic

Rzewski's in his 1975 set of 32 piano variations entitled *The People United Will Never Be Defeated!* Rzewski's piano variations and "Gatsbytron" are similar in that they transform popular songs using modified common practice techniques such theme, variation, recapitulation.

Electronica's interrupted rhythmic arc, archetype easily fuses with theme and variations form, as both approaches rely on similar devices for building tension and interest. For example, Rzewski's changes in timbre, dynamics harmony, attack density and character are analogues to *Metatron's* shifts in technological character, and spectral density and production techniques.

7.3 Archertron IMSA

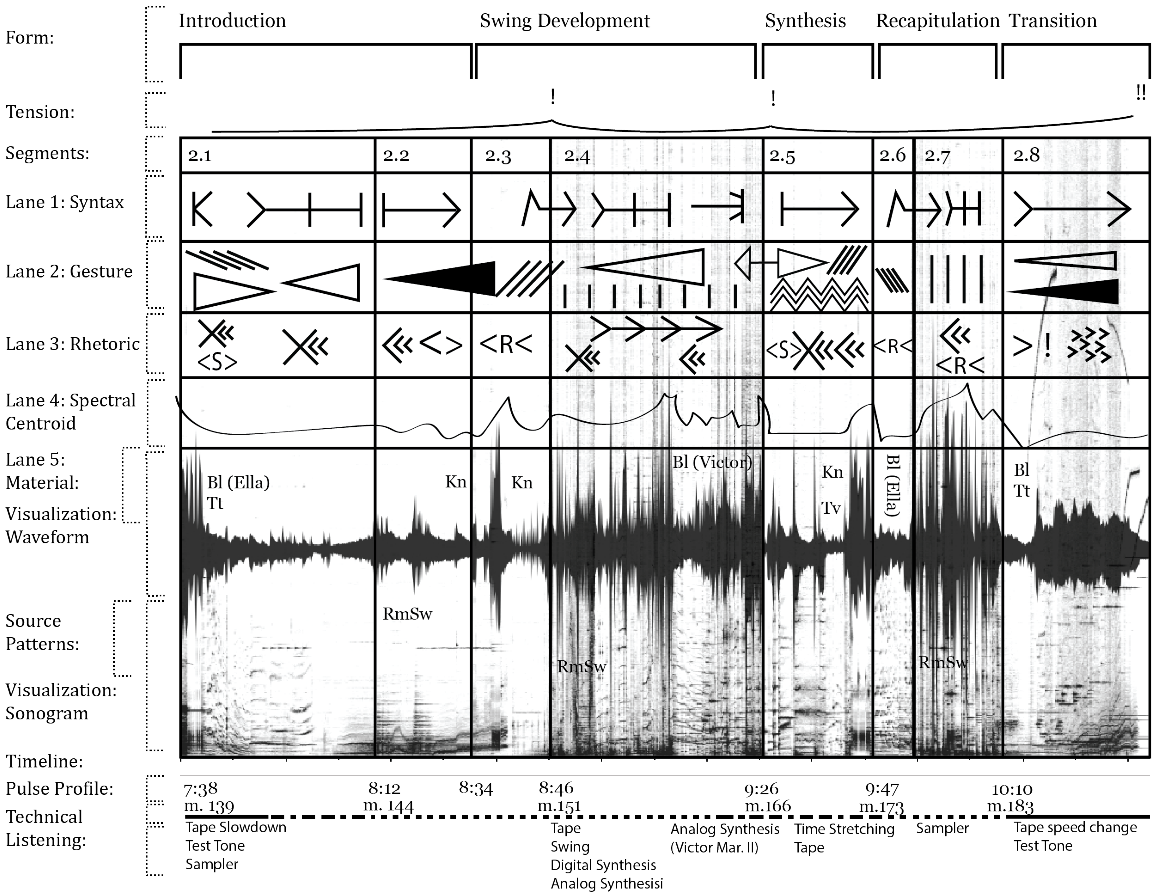


Figure 7.3-1 "Archertron" Macro-level *IMSA*

7.3.1 Form in Archertron

"Archertron's" form adheres to the pattern established by "Gatsbytron", see figure 7.2-1, which relates to the overall structure of *Metatron.* Material is introduced, developed, synthesized into new material and recapitulated. Transitions between sections are marked by the knocking motive. See segments 2.1, 2.4, 2.5, 2.6, 2.7 in figure 7.3-1. The rhetoric, gesture and syntax lanes indicate a similar pattern of themes and variations delineated by shifts in spectrum and amplitude. This movement differs slightly from the others in that the moment of highest tension occurs during the transition from segment 2.8.

Archertron Themes

Tt: Test Tone
Bl: Blue Skies
Kn: Knocking Motive
Tv: Television Transition

Segment 2.1 opens with material generated from Ella Fitzgerald's vocal introduction from the 1959 recording of Berlin's *"Blue Skies"* on the album *Get Happy* indicated as 'Bl' in the list above. In this section the vocal material is stretched and smeared through the application time-stretching and reverberation, becoming a static drone. From this drone, a swing groove gradually coalesces through sequenced materials and acoustic percussion instruments (See 2.2, 2.3 m.144).

In segment 2.4 the swing groove gains intensity and combines with processed vocal samples and instrumental jazz gestures. Here the "Blue Skies" melody appears untransformed for the first time, via an archived recording of the famous and thematically pertinent Columbia Princeton RCA Mark II Synthesizer "Victor."[142] See mm. 159 – 163.

In segment 2.5, jazz and acousmatic gestures are synthesized into new material related to segment 1.7 and section 1.13 from figure 7.2-1. For the synthesis sections in "Gatsbytron". See m. 71 and m.116. Segment 2.6 recapitulates the vocal material from the beginning of the work, but instead of stretching it into a drone as it did at the beginning of the movement; the samples increase in tempo through the use of an analog tape recorder. These sped up vocal materials are fragmented and re-sequenced into the swing groove. This process of fragmentation, speeding up and re-sequencing is repeated until it surpasses an audio rate frequency and merges with the test tone, forming the transition into the next movement. See segments 2.7 and 2.8 in figure 7.3 –1. (m. 173 and 183)

[142] The RCA Mark II synthesizer, nicknamed *Victor*, installed at the Columbia Princeton Computer Music Centre in 1957. Victor is considered to be the first programmable synthesizer.

7.3.2 Groove

Figure 7.3-2 Computer assisted groove manipulation in cubase

The groove from Ella Fitzgerald's "Blue Skies" recording provides a thread that runs through "Archertron". Just as the amplitude envelopes of phonograph singles and archived radio broadcasts informed the structure of "Gatsbytron", "Archertron" draws its rhythmic construction from a specific groove, a swing profile with an eighth note shuffle at 93%. In this case the percentage describes the position of the shifted note between straight time and a 6/8 or triplet feel[143]. See figure 7.3-2.

These specific elements of Fitzgerald's "Blue Skies" groove were measured by carefully aligning audio materials and sequenced MIDI materials in a DAW, then adjusting swing values until the patterns synchronized. See figure 7.3-3.

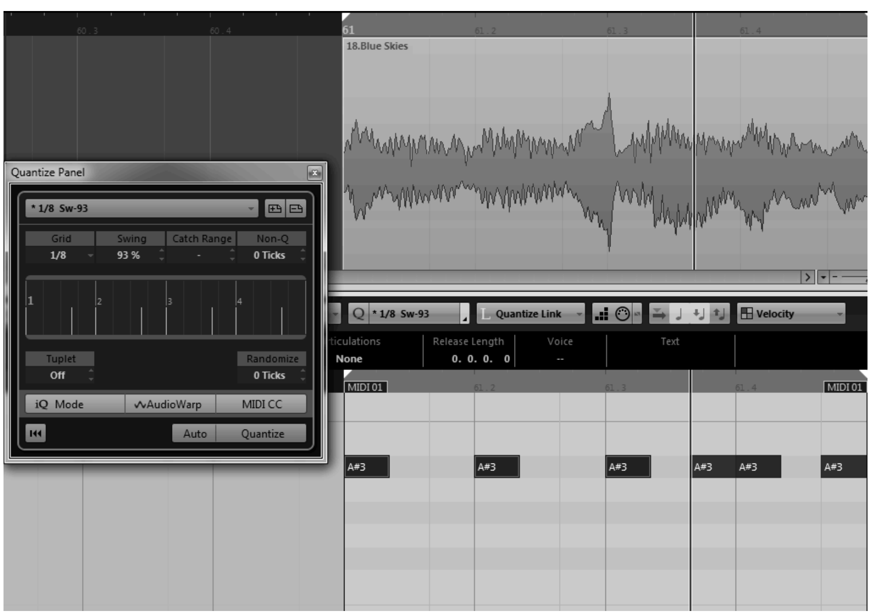


Figure 7.3-3 Computer assisted groove alignment in Cubase

[143] In this case a triplet feel refers to a compound duple meter (6/8).

The customized swing profile can be stored as a custom quantization[144] pattern in Cubase[145] and applied to midi data sequences. These carefully modified and aligned midi sequences are then used to trigger sampled audio materials, resulting in a convincing blend of prerecorded and sequenced audio. In other words, the Fitzgerald swing groove becomes a flexible compositional parameter that glues together disparate musical materials.

7.3.3 Synthesis in Archertron

Detailed control over the quantization of each percussion layer allows for subtle manipulation of the swing feel within the section. This occurs in segments 2.2 to 2.7 in figure 7.3 - 1. Gestural acousmatic audio materials can be warped and resampled, adding further complexity to the relationship between the groove of the original audio samples, the groove of the sequenced midi data, and the live performance. In other words, material with a jazz feel and gestural material indicative of electroacoustic composition are rebuilt through live performance, using one another's structural idioms, creating a true synthesis of the two genres.

These subtle shifts are impractical to notate using traditional techniques. For this reason, the traditionally notated score of *Metatron* is incapable of capturing its deeper structure. Only general notation such as 'swing' and 'straight' are indicated in the score. See m. 150. The intuitive musical ability of the performers to match the rhythmic feel of the electronics and one another is critical to the success of these shifts in groove.

7.4 Dim IMSA

"Dim" is a transitional movement that sits in contrast to the rest of the work. It introduces analog synthesis as a technological theme and bridges the gap between digital and analog technologies. It also serves as a rhetorical aside, intended to break up repetition of chronological and formal patterns established in previous and subsequent movements. "Dim" reduces the textural complexity established in the first two

[144] In a musical context, quantization refers to the shifting or alignment of musical materials in relation to a set grid.
[145] http://www.steinberg.net/en/products/cubase/start.html

movements, allowing the listener to refocus their attention on the unique colours of analog technology.

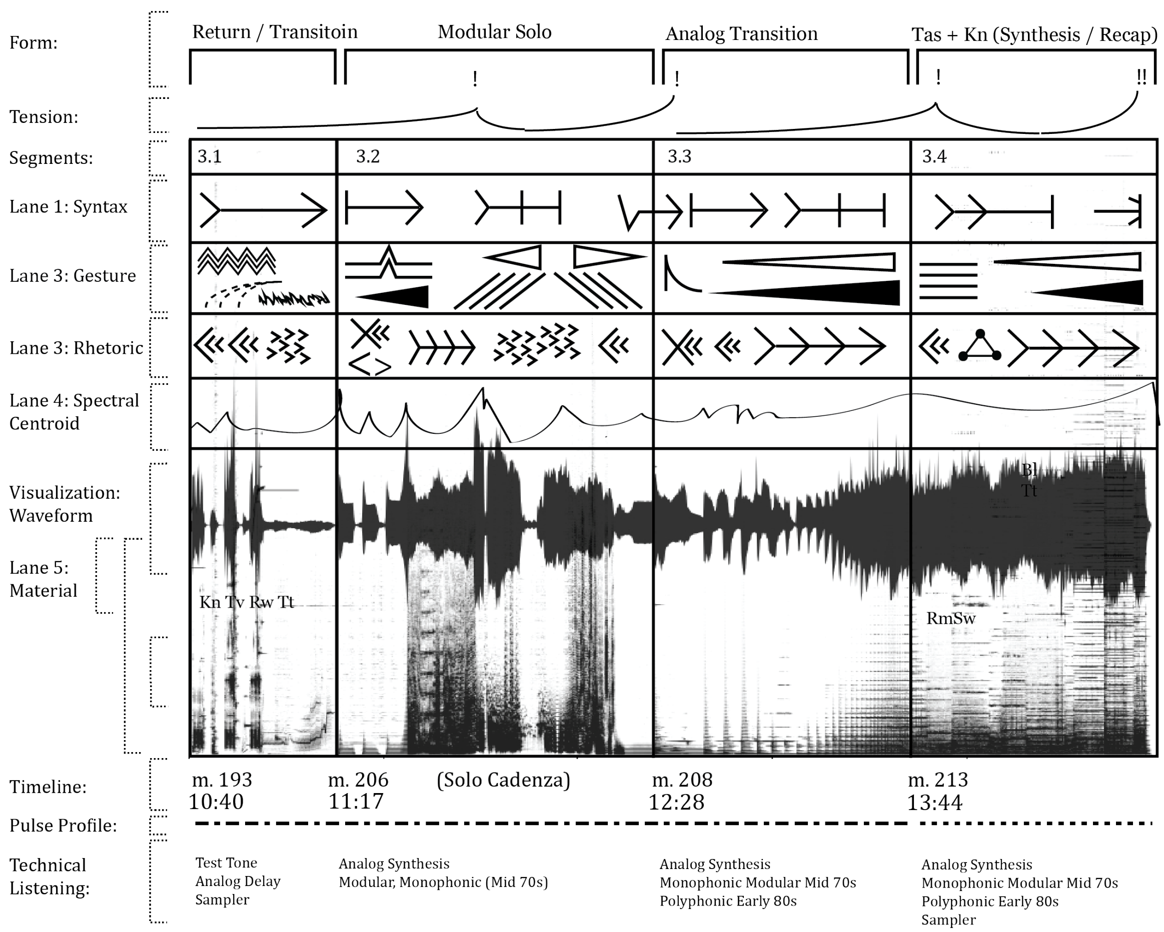


Figure 7.4-1 "Dim" macro-level *IMSA*

7.4.1 Chronological and Thematic Pivot Point

"Dim" breaks the chronological thirty-year pattern of reference for the movements, acting as a point of symmetry:

1920, 1950, **1975**, 1980, 2010

The mid 1970s have a particular significance within the context of *Metatron* because of the intersection and transition of analog and digital synthesis methods during this period. The sounds of analog tape saturation, analog delay and analog synthesis are prominently featured. These sounds occur in the fixed media[146] accompaniment, as well as the electronic instruments in the instrumental parts. Analog delay and voltage-controlled analog synthesizer are prominently featured in this movement, resurrecting live patching[147] performance gestures and practices associated with progressive rock and an earlier period of live electronics (Manning 2004, 156-67; Brackett 2009, 334-1). This can be seen in the modular solo[148] before measure 206 in the score and segment 3.2 in figure 7.4 –1

7.4.2 Transitions and Technical Listening

Technical listening ability varies greatly among audience members. Therefore, employing it as an effective compositional parameter presents a difficult challenge. For this reason "Dim" accentuates the colours of analog synthesis in the most exposed and blatant way possible, to the point that their unique timbre can be appreciated and identified without prior understanding or experience. See Score / figure 7.4-1 mm. 206-240, 14:30-15:20.

Appreciating the stark contrast between mature analog and early digital synthesis and the enjoyment of any subtle transitioning between the two requires explicit examples and comparisons within the work. These types of comparisons occur at measure 203, throughout the modular solo, segments 3.3 and 3.4, and into movement 4, "Galvatron."

In figure 7.4—1, the technological lane shows a gradual transition from analog to digital hybrid technology. It begins with references to VCO[149] technology like the Modcan synthesizer and gradually shifts to the hybrid DCO[150] technology of the mid 80s. Instruments used during this process to evoke the transition into the 1980s include the

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[146] *Fixed media* refers to pre recorded and produced elements that are played back during a concert. Commonly called 'tape', a term that is loosing traction due to the obsolescence of magnetic tape technologies.

[147] Live patching refers to the process of re-programming an analog modular synthesizer on stage, by setting control voltage parameters and cable patch points.

[148] The notated modular synthesizer solo was dropped in favor of improvisation for practical reasons. Mostly the instability of analog electronics and the difficulties reproducing specific results with limited rehearsal time.

[149] Voltage controlled oscillators are signal producing elements of a synthesizer where frequency is dictated by voltage input. Slight variations in incoming voltage cause tuning discrepancies that are partially responsible for the *analog sound*.

[150] Digitally controlled oscillator is an analog/digital hybrid device, where the frequency of an analog oscillator is controlled digitally, allowing for more stable pitches.

Oberheim Matrix 1000[151] synthesizer and *Roland Juno 106*[152] synthesizer. This chronological progression results in a transition from buzzy, warm monophonic analog bass and lead sounds through the more precise sound of DCOs to the crystalline, brittle sound of early digital technologies.

7.4.3 Intention and Perception

Accurate recognition of the specific synthesizer technologies behind this transition is not the point of this movement, but rather the familiarization of analog and digital colours, to the point that they become recognizable elements that may be transformed and manipulated. Similar processes occur at numerous points in *Metatron:* Radio technology in "Gatsbytron," tape technology in "Archertron," digital technology in "Galvatron," software and hybrid technologies in "Valkaratron."

7.4.4 Synthesizing Western Art music and Electronica

The synthesis of western art music and electronica in "Dim" is expressed through technology and through performance and compositional practice. More than simply appropriating the tools of pop music as a form of exoticism, the technology and associated performance practices are deeply connected to the concept, narrative and deeper structure of the work.

7.5 Galvatron IMSA

"Galvatron" celebrates contrast, in audio fidelity, amplitude, saturation, tempo, melody and harmony. The chronological sound world of this movement revolves around the sounds of early videogame consoles and arcade machines, and early digital drum synthesis. Within the context of *Metatron* as a whole, "Galvatron" includes the most striking contrasts. The brittle, delicate near silent digital synthesis in segments 4.7 and 4.10 acts as an anticlimax before the abrupt saturation of segment 4.9 (See figure 7.5 –1 mm. 393-433). The purpose of this movement is to reconcile digital, analog and

[151] http://www.vintagesynth.com/oberheim/mat1000.php
[152] http://www.vintagesynth.com/roland/juno106.php

instrumental sound worlds before moving to the final movement. After setting the elements against one another in order to observe their differences, this reconciliation or *synthesis* occurs via segment 4.9 and 4.12.

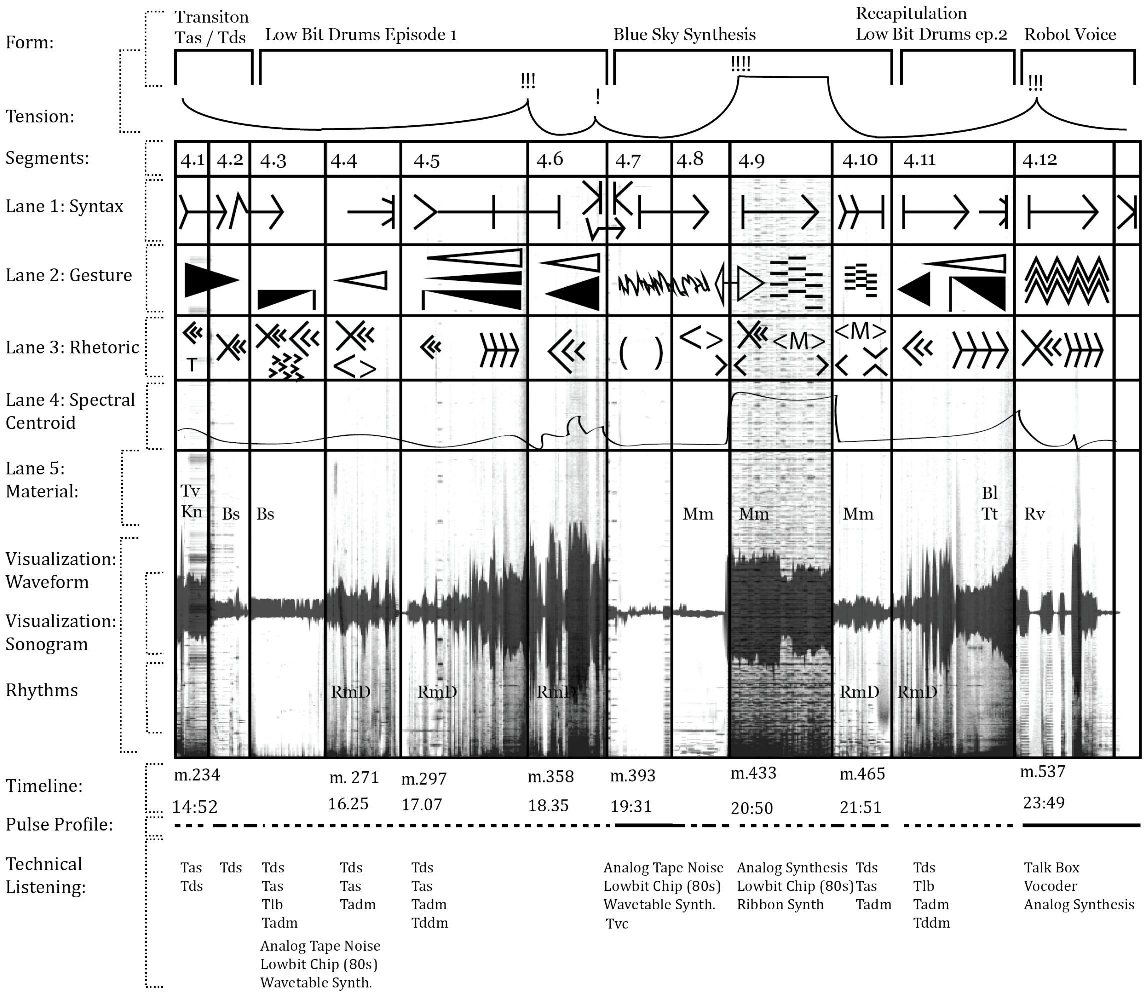

Figure 7.5-1 "Galvatron" macro-level *IMSA*

7.5.1 Form in Galvatron

The form of "Galvatron" adheres to previously established patterns in *Metatron*. It begins with transitional materials from "Dim," followed by a statement of technological and rhythmic themes that will be developed throughout the movement. These themes are developed in segments 4.3 to 4.6 and recapitulated in segment 4.11.

Segment 4.12 introduces new material, in the form of a robot voice[153] theme at the end of the movement. This material serves formal, thematic and rhetorical functions. The

[153] The 'robot voice' refers to a speaking computer sound performed from within the ensemble. This sound is produced with analog and digital vocoding, formant filtering and talk box, which pumps an audio signal

robot voice serves to transition into the final movement of the work while simultaneously providing a powerful anticlimax. Furthermore, the robot voice sings the lyrics, “blue skies, smiling at me” as a quotation of Berlin’s original melody. This original melodic contour morphs into the more inhuman digital sounds of the next movement. (See section 4.14)

7.5.2 Themes in Galvatron

Galvatron Themes

Tt: Test Tone
Bl: Blue Skies
Kn: Knocking motive
Tv: Television transition

Galvatron Technical listening

Tas: Analog synthesis
Tds: Digital synthesis

Segment 4.1 to 4.2

“Galvatron” begins with a transformation of an analog test tone into a low fidelity digitally synthesized version of the “Blue Skies” theme. See figure 7.5-2.

into the performers mouth, using it as a type of biological formant filter. The result of this analog, digital and biological format filtering then amplified and reinjected into the hall.

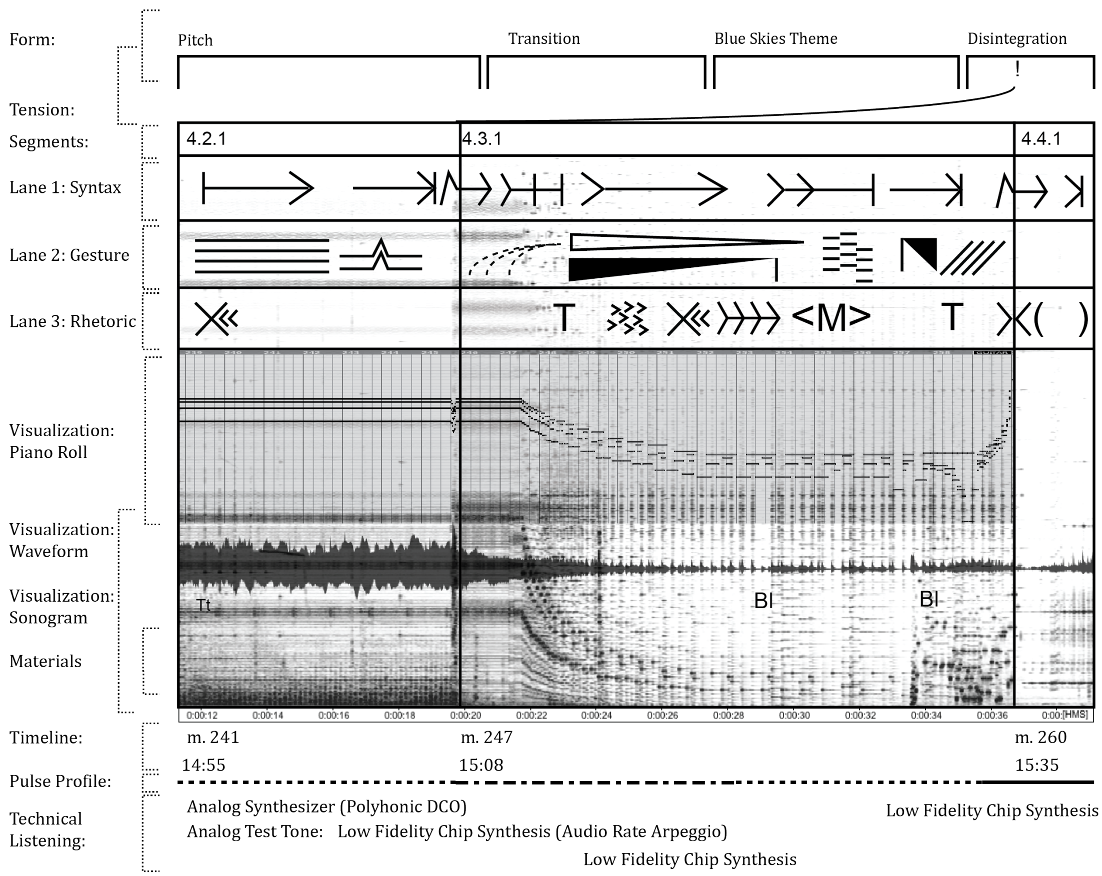

Figure 7.5-2 "Galvatron" segment 4.2 IMSA mid-level

Figure 7.5-2 uses piano roll notation to illustrate the transformation of an audio rate tone into the "Blue Skies" melody accompaniment pattern.

Segment 4.3 to 4.6

The low-bit drums episode segments 4.3, 4.4, 4.5, 4.6, develops from rhythmic materials that progressively increase in complexity, density and intensity. This group of segments progressively pushes forward into the rhythmic resolution between segments 4.5 and 4.6. It begins with quiet drum machines, synthesizers and cell phone ring tones, and then technological layers are gradually added. The most characteristic sounds in this section are the *Tanzbar* and *Linndrum* drum machines, as well as the *KP mini* touch interface. (See instrument list in reference score)

Segment 4.7 to 4.8

Segments 4.7 and 4.8 foreshadow the *Metatron* melody. See figure 7.5.3 The melody is performed at low volume by a wavetable synthesizer. The extensive modulations and routings on the synthesizer obscure the melody, only allowing fragments of “Blue Skies” to poke through the texture. The “Blue Skies” melody and *Metatron* melody are further obscured by sounds associated with 1980s media. Examples include a videocassette recorder rewinding, tapes being rattled and their cases being opening and closed. See technical listening lane, figure 7.5-1.

Segment 4.9 to 4.10

Segment 4.9 was designed to be the most impactful moment in *Metatron.* This is due to the extreme contrast in amplitude, spectra, harmony and melody. Segment 4.9 introduces the *Metatron* melody. See figure 7.5-3:

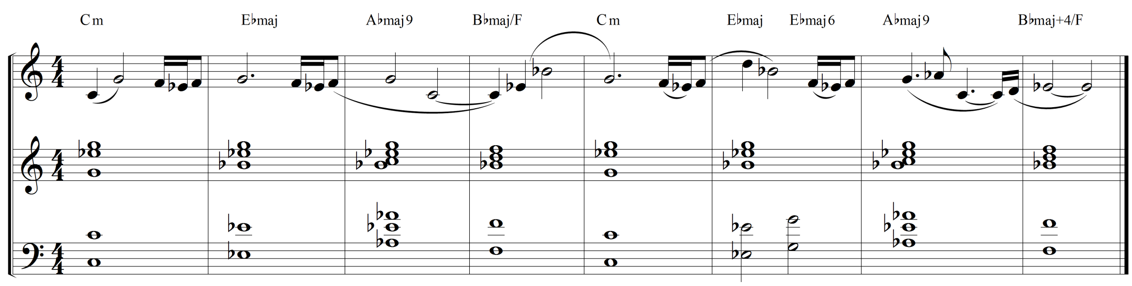

Figure 7.5-3 “*Metatron*” melody and harmony

After many minutes of inharmonic gestures and rhythmic builds, segment 4.9 introduces conventional harmony and melody in a broad and spectrally-rich orchestration.

Analog and digital technological themes are integrated with melodic and harmonic materials. Segment 4.10 juxtaposes contrasting themes: the sweetness of the *Metatron* melody performed on a Rhodes electric piano and the angular gestural rhythmic content from segments 4.3 to 4.6. The tempo is so slow, however, that the rhythmic materials are unrecognizable.

Segment 4.11

Segment 4.11 continues the rhythmic materials recapitulated in segment 4.10. The tempo increases gradually until the material becomes recognizable. The accelerando continues past the previous tempo into a frenetic blur, building intensity until the drop into segment 4.12.

Segment 4.12

Segment 4.12 introduces the ‘robot voice’ mentioned in 7.5.1. From a thematic perspective, segment 4.12 integrates analog, digital and physiological elements into a single sound or ‘voice’, foreshadowing the ‘synthesis of synthesis’ theme that dominates the final movement, “Valkaratron.”

7.5.3 Rhythm

The majority of “Galvatron’s” rhythmic materials are derived from the rhythmic sequence and contours in figure 7.5-4. This rhythmic material acts as a *source pattern* as explained in section 6.5.2.

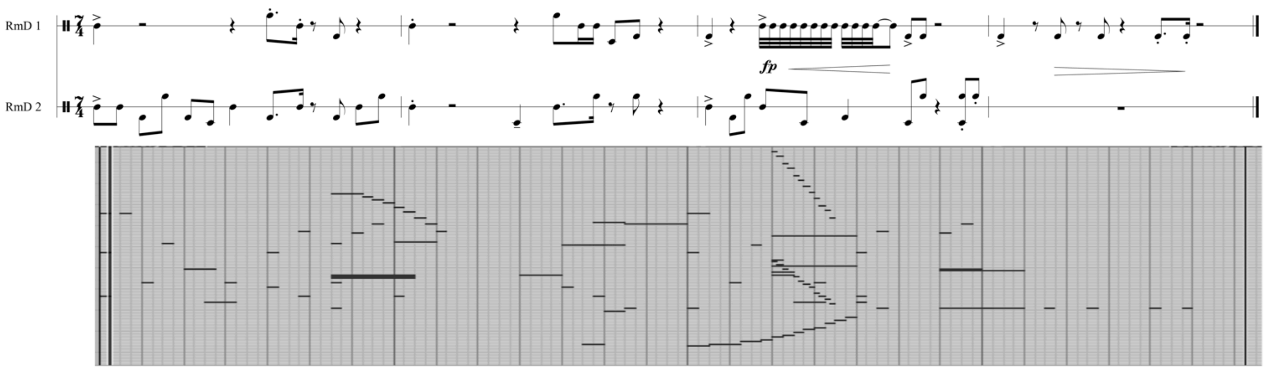

Figure 7.5-4 RmD 1 and 2 from “Galvatron” mm. 303 – 306, score vs. piano roll

The top part of figure 7.5-3 provides a traditionally notated skeletal version of the RmD source pattern as it occurs in “Galvatron.” The lower section of the diagram shows a more accurate piano roll version than what can be notated using traditional notation. The chromatic arcs of 32, 64 and 128th notes indicate complex gestures created from micro montage of individual sampled audio. In other words, these combinations of near audio-rate micro events combine to create single gestural sweeps. These sounds push into, or lead away from, larger rhythmic impulses. For example, the 3rd measure, 3rd beat in figure 7.5-4 shows a simplified version in standard notation with a more complex and accurate micro gesture in the piano roll.

RmD1 and RmD2 are abstractions and transformations of the *Amen Break*[154], spread across a 7/4 measure, as opposed to the original 4/4. The primary drum pattern from figure 7.5-3 is truncated, expanded, embellished and transformed throughout "Galvatron." Examples of this are easily observed in measures 271, 376, and 497.

7.5.4 Melody / Orchestration

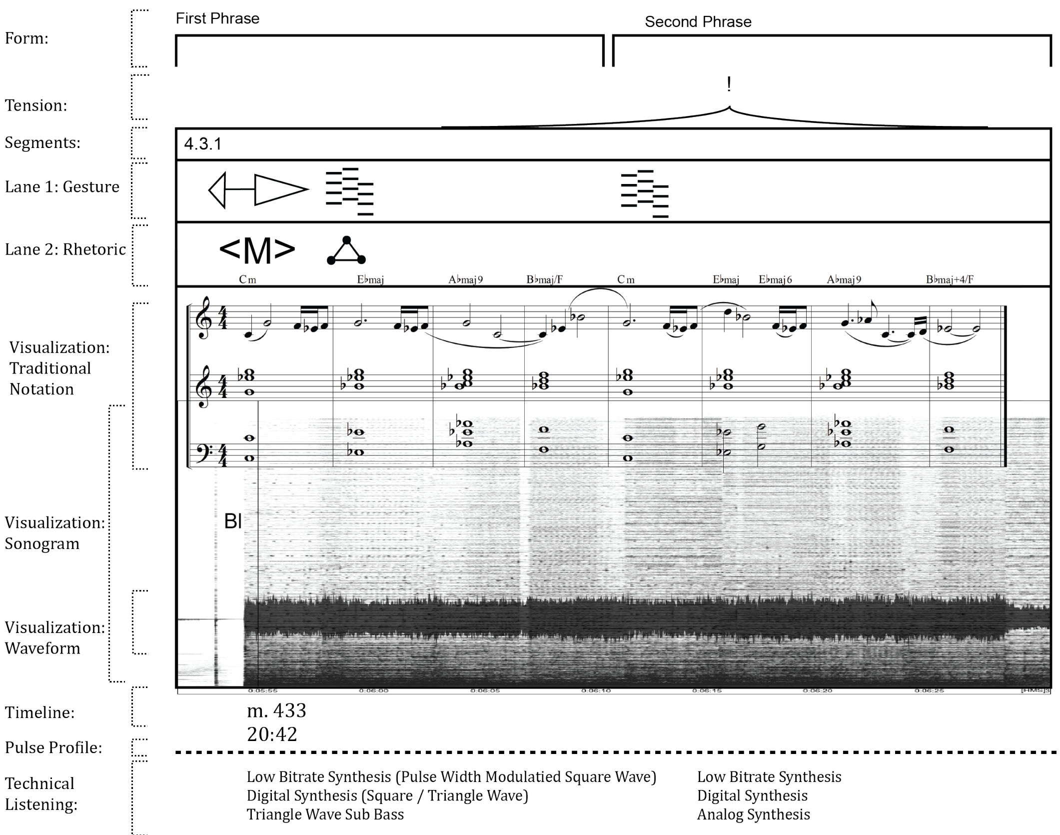

Figure 7.5-5 "Galvatron" IMSA mid-level mm. 433 - 448

Figure 7.5-5 shows the harmonic progression[155] and melody from segment 4.9 of figure 7.5-1. The tonal chord progression supports the dense digital, analog and acoustic arpeggiation used to orchestrate this passage. As shown in figure 7.5-4 the harmonic spectrum is nearly saturated with multiple synthesizers and mallet percussion. The goal of this passage was to fill the harmonic spectrum with a rich, pleasing sound, constructed

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[154] The *Amen Break* refers to a famous, heavily used drum solo sampled from the 1969 album *Amen Brother* recorded by the funk / soul group The Winstons. This particular sampled drum solo or "break" is frequently used in hip hop, jungle and drum and bass production (Harrison 2004).

[155] The note values for this melody and chord progression were shortened in order to fit into the diagram.

from many small, lower fidelity sounds. See figure 7.1-1 for a comparison of relative spectral density.

Orchestration: See m. 433, the instruments in this section include:

Acoustic Instruments
Vibraphone
Crotales
Flexatone
Glockenspiel
Metal Pipes

Live Electronics and Fixed media
Wavetable Synthesizer
Modcan Analog Synthesizer bass: 4
Rhodes Piano
Chip synthesizers: 6
Oberheim Matrix 1000: 2

This particularly lush texture is achieved by layering multiple instruments, each outlining the chord progression at drastically different rates. For example, wavetable and chip synthesizers are both moving at near audio rate, generating arpeggios that span the entire spectrum, while the acoustic instruments move at more deliberate, human-scale tempi.

The slightly out of tune analog synthesizers and crotales interact with these rapid arpeggips, creating beating in the upper harmonics, resulting in a shimmering, full texture.

Melody:
The melody follows rhythmic and pitch contours from Irving Berlin's "Blue Skies", maintaining the sentimental spirit of the original.

7.5.5 Synthesis

This section fuses analog and digital synthesis, exploiting the timbre similarity of analog and square waves with modulating pulse width.

7.6 Valkaratron IMSA

"Valkaratron" brings closure to *Metatron* through the synthesis of previous synthesis sections, a 'meta-synthesis'. That is to say, each movement produces a climactic synthesis of its constituent elements, with "Valkaratron" following this pattern at the level of the entire work. Thus "Valkaratron" summarizes and synthesizes each individual movement, just as the previous movements synthesized their own internal elements, unifying form and structure at multiple hierarchical levels.

Material from the first movement is of particular significance, as it gives a sense of closure and finality to the work, a sense of returning to the beginning.

The knocking motive, radio window gesture, tv gesture, test tone, "How Deep is the Ocean," "Blue Skies," warm analog timbres, grooves, cold digital timbres and robot voice are reintroduced and synthesized with all available technologies into a final climactic gesture. See figure 7.6-1.

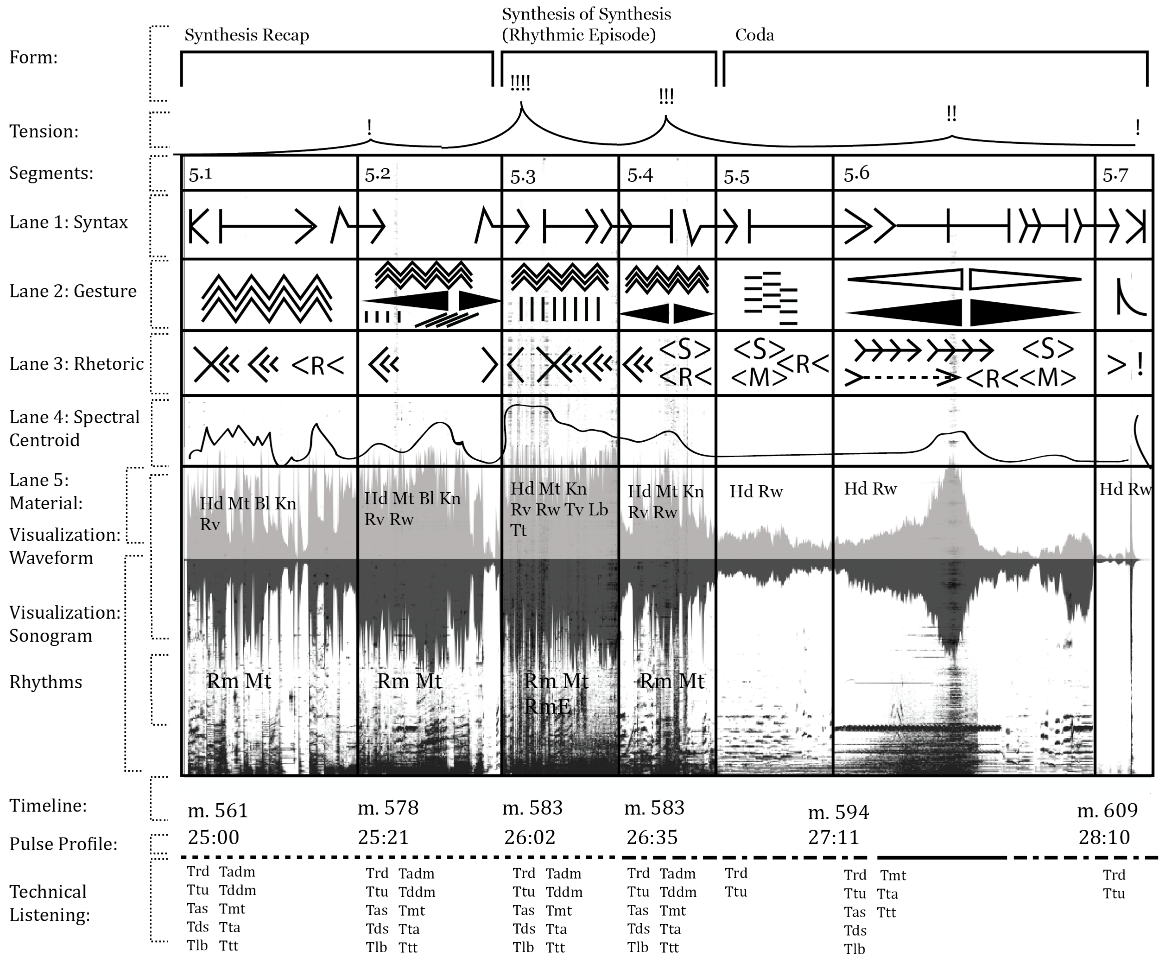

Figure 7.6-1 "Valkaratron" mm. 561 – 611 macro-level *IMSA*

7.6.1 Form and Rhythmic Synthesis

"Valkaratron" can be divided into three large sections. The first section, segments 5.1 and 5.2, recapitulates the synthesis sections and technological colours from earlier movements. The second section, segments 5.3 and 5.4, introduces a new rhythmic motive that fuses the knocking motive, radio window and low fidelity digital drum machine patterns, robot voice and jazz samples. This section fuses *all* gestural and rhythmic elements into a brief fusion of complextro[156], bro-step[157] and acousmatic music. This

[156] Complextro, or 'complex electro' is a genre of electronic dance music that features elaborate resampling of bass lines and vocal materials. It is 'complex' in comparison to other dance floor genres due to a dense, syncopated, often shuffling rhythmic construction.
[157] Bro-step is a light hearted semi derogatory term describing a micro-genre of dub-step that has gained traction, media attention and criticism c. 2010. Where dub-step emphasizes deep sub bass, bro-step emphasizes mid-range robotic sounds produced by wavetable synthesis, formant filters and additive

synthesis of syntheses, or *metasynthesis*, creates a fluid and intense moment that continually resamples and resequences itself until the gestures lose their rhythmic stability and implode due to extreme ranges and tempi. The third segment, ‘coda’ 5.5, 5.6 and 5.7 brings closure to the work by resolving musical and thematic materials. Most importantly this closing section contains transformations and expansions of the knocking motive, as well as other material derived from Berlin’s “How Deep is the Ocean?”.

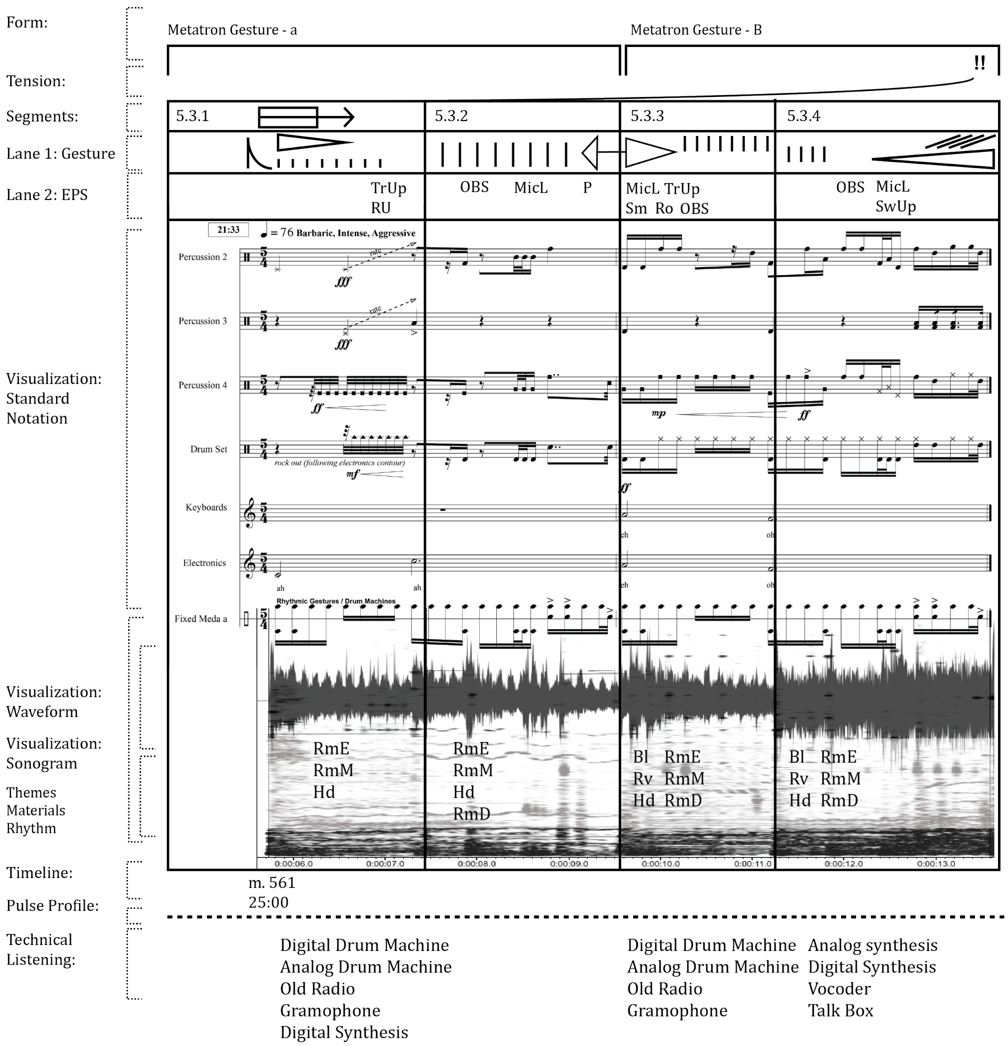

Figure 7.6-2 “Valkaratron mm. 562 – 562 mid-level *IMSA* with notation

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synthesis. The “bro” in “bro” step refers to the popularization of the genre among patrons of commercial festivals and clubs in the United States.

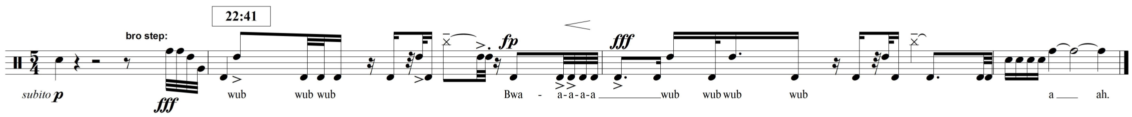

Figure 7.6-3 "Valkaratron" dub-step pattern mm. 577 - 579

7.6.2 Theme

Segments 5.5 and 5.6 reintroduce the original sample of "How deep is the ocean? How high is the sky?" from the first movement, transforming it into a roaring surge of noise containing a compressed and processed version of all the Irving Berlin's "Blue Skies" samples used in the work. Just as in the closing section of the first movement, the accompanying test tone melts into the sound of a skipping record, giving the impression of the vocalist holding a note for an impossibly long duration. However, instead of being interrupted, the record loop from "How Deep is the Ocean" skips on, and extends the word *cry* from the lyric of this song. After a swell in the acoustic percussion and electronics, the previously interrupted question is finally answered: "How much would I cry?" is followed by, "How deep is the ocean, how high is the sky?" giving a sense of closure to the work.

7.7 Summary:

This chapter has demonstrated the *Integrated Multi-Scale Analysis* model through an analysis of *Metatron.* The process began with an assessment of general features including genre affiliation, structural archetype and instrumentation. These general features then informed the creation of *IMSA* diagrams that integrate diverse analysis and visualization strategies. The first *IMSA* diagram surveyed *Metatron* as a whole, revealing a chronological form that integrates elements of Western art music and electronica. The analysis of "Gatsbytron" serves as an introduction to key themes and compositional devices like the radio window and knocking motive. The analysis of "Archertron" emphasizes groove and the reveals a synthesis of a gestural acousmatic language and jazz idioms. "Dim's" *IMSA* follows gradual technological shift from analog to digital, revealing the movement's function as formal, technological pivot point. The *IMSA* of "Galvatron" addresses melody, rhythm and orchestration through its distribution across acoustic and electronic sources. "Valkaratron's" analysis reveals a final, cumulative integration of theme, form, time and technology. The climactic rhythmic gesture provides an opportunity to integrate *Electronica Production Syntax*

7.8 Conclusions

Summary

This dissertation has carefully examined the relationship between avant-garde electronica and Western art music. Part I applied a cultural studies approach and traced the development of electronica from its origins in disco to its role as a flowering metagenre that threatens to destabilize established boundaries and genre definitions. The democratization and decentralization of technology has fueled this transformation and shows no signs of diminishing. Technology continues to define electronica and its avant-garde aesthetic. However, by moving towards an expanded definition of postdigital aesthetics, technological limitation are recontextualized from tedious nuisance powerful aesthetic parameter. This dissertation has shown that *Metatron* embodies and integrates electronica's democratized, postdigital technocolour with the tools, techniques and aesthetics of the Western art music tradition.

Contributions

Part II of this dissertation addresses the inherent difficulty in analyzing avant-garde electronica. The novel *Integrated Multi-scale Analysis* model addresses these challenges through the selective integration of acousmatic, computer-assisted, traditional and novel strategies. *Electronica Production Syntax* has proven itself an effective tool for the describing and annotating the electronica specific techniques used in *Metatron,* and other works. Significant structural elements like the *Source Progression* are easily overlooked by traditional or acousmatic analytical techniques.

Future Research

The *Integrated Multi-scale Analysis* shown in this dissertation acts as a proof of concept that can be easily applied to other works. Avant-garde electronica's growing body of under theorized repertoire deserves more effective descriptive tools and analytical strategies that are both flexible and robust enough to adapt as electronic music progresses into the next set of cultural architectures.

Appendix:

IMSA abbreviated Terms:

Metatron Theme Index:

Gatsbytron Themes

Kn: Knocking Motive
Tv: Television transition gesture
Bl: "Blue Skies"
Hd: "How Deep is the Ocean"
Mt: *Metatron* theme (synthesis)
Rw: Radio window

Archertron Themes

Tt: Test Tone
Bl: Blue Skies
Kn: Knocking Motive
Tv: Television transition

Galvatron Themes

Tt: Test Tone
Bl: Blue Skies
Kn: Knocking motive
Tv: Television transition

Technical Listening Index:

List of Technologies:

Trd: Old Radio
Ttu: Turntable
Tas: Analog Synthesis
Tds: Digital Synthesis
Tlb: Low Bit rate synthesis
Tadm: Analog Drum Machine
Tddm: Digital Drum Machine
Tmt: Monotron
Tta: Tape
Ttt: Test Tone

List of Themes / Materials:

Kn: Knocking Motive
Tv: Television Transition Sound

Bl: Blue Sky
Hd: "How Deep is the Ocean"
Mt: *Metatron* Theme
Mm: *Metatron* Melody
Rw: Radio Window
Sw: Swing Theme
Lb: Low Bit rhythm
Rv: Robot Voice

Rm:	*RmA (First Rhythm Straight)*
	RmB (6/8) Rhythm
	RmC (Swing)
	RmD (lowbit theme
	RmE (Dub-Step)
	Rm Metatron

Themes in Tipper's "Table Flipping":

Gr: Groove
Mf: Melodic Fragments
Tr: Tears
Rs: Riser
Ps: Poly Synth
Ml: Melody
Eg: Embellishing Gestures

Electronica Production Syntax (EPS):

SwUp:	Sweep Up
SwDn:	Sweep Down
TrUp:	Tear Up
TrDn:	Tear Down
Sm:	Smear
Ru	RollUp
Rd	RollDown
Ro	RollOver
MicL	MicroLoop
MacL	MacroLoop
P	Pause
OBS	Off Beat Shift
C	Combinations

Glyph Map:

Gesture Archetypes:

Ascent / Decent / Plane

Divergence / Convergence

Streaming

Flocking

Erratic

Syntax:

Introduction / Conclusion

Suspension

Trigger

Interruption

Precursor

Extension

Prolongation

Transition

Process:

Accumulation / Dispersion

Acceleration / Deceleration

Intensification / Attenuation

Rhetoric:

Call / Answer	? C >	> A !
Statement / Reminder	> S >	< R <
Theme / Variation		

Anticipation	
Affirmation	> !
Reiteration	
Imitation	
Simultaneous Antagonism	
Sequential Antagonism	
Spatial Progression	
Retention	
Parenthesis	( )
Extrinsic	< >

Original Glyphs:

Chord Progression:	
Source Pattern:	
Periodic Pattern:	
Gestural Progression:	
Sample:	<S>
Melody:	<M>
Transformation:	<T>
Impact:	

Pulse Profiles

Periodic

Unstable

Free

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Part III (Reference Score)

Eliot Britton

Metatron

For Amplified Percussion
and Electronics

Recording:

http://www.ebritton.com/uploads/media/51/MetaMixFullWeb.mp3

Instrument List

Percussion 1:

-Bass drum
-Large metal plate (suspended)
-Medium metal plate (suspended)
-Small metal plate (suspended)
-Metal chimes
-Large guiro (Long ridged pipe or bamboo)
-Finger cymbals
-Triangle
-Korg KP mini (2d touch synthesizer)

Percussion 2:

-Crotales
-2(3) toms Low, med, high
-Kick drum (mounted kick drum in place of low tom if available)
-2 bongos
-Sandpaper blocks
-Large guiro (ridged metal or plastic)
-5 wood blocks low to high
-Korg Monotron (ribbon synthesizer)

Percussion 3:

-Wood block
-Wooden box
-Spice nut shaker
-Goat hooves
-Piccolo wood block
-Guiro (standard, wooden)
-Suspended cymbal
-Spring drum (as large as possible)
-Flexatone
-Cell phone or other micro synthesizer

Percussion 4:

-Bottle
-Glass
-3 rice bowls (low med, high)
-Floor tom
-6 table items. (Visually and sonically interesting found objects selected by the performers that fit the character of the work)
-Flexatone
-3 metal cans
-3 metal pipes
-Cell phone or other micro synthesizer

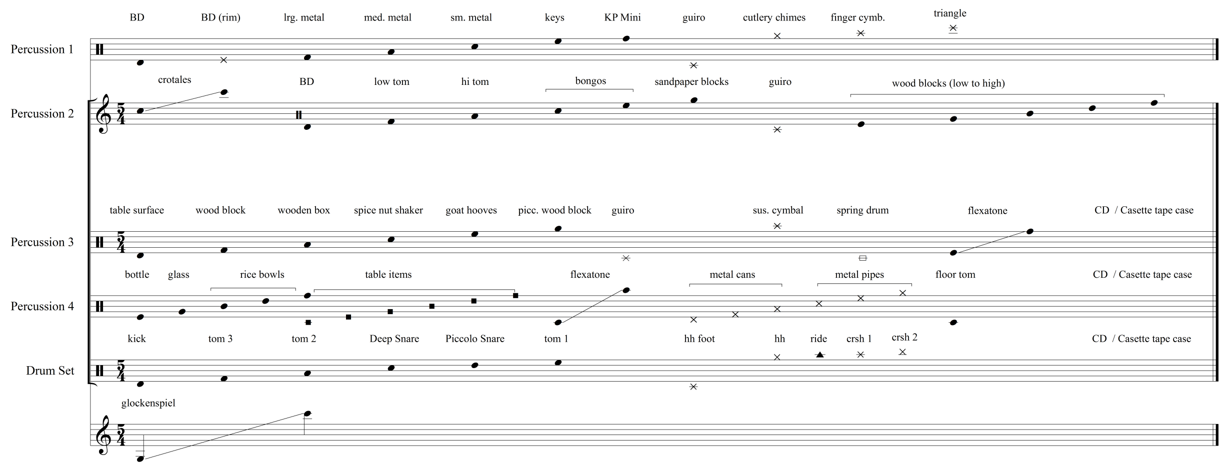
Percussion 5: (Drum set)

-Kick drum
-3 toms
-Deep snare (rock snare)
-Piccolo snare
-High Hat
-Ride Cymbal
-2 Crash Cymbal (normal + character)
-Glockenspiel
-Drum machine

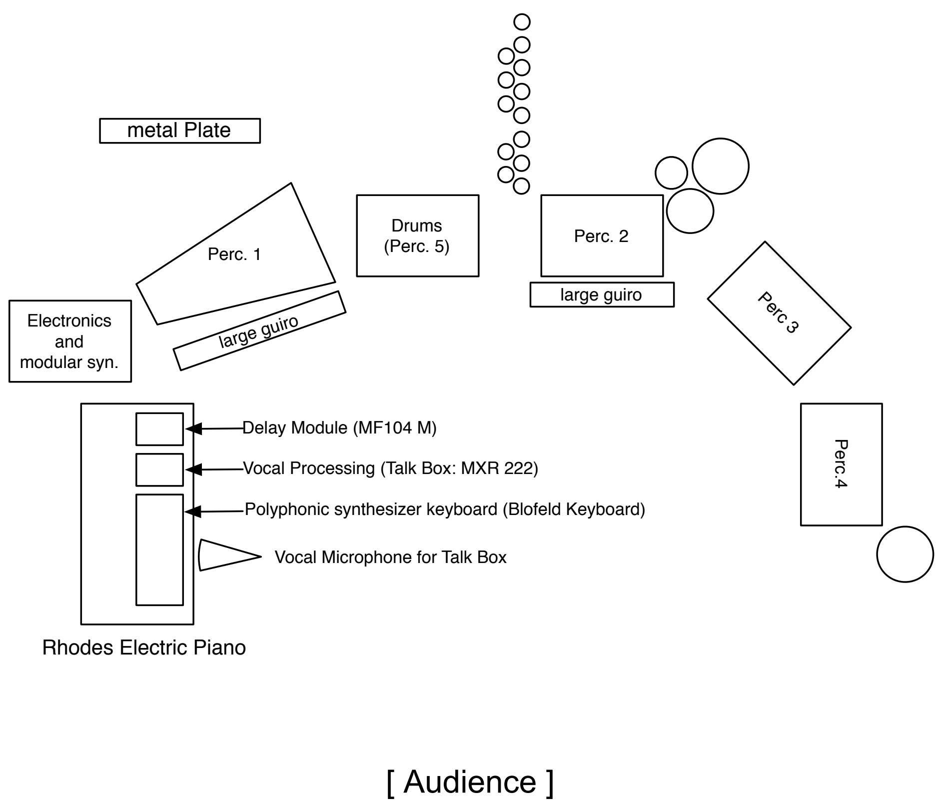
Percussion 6:

-Rhodes piano
-Polyphonic synthesizer
-Monophonic modular synthesizer
-Vocal processor (MXR 222 Talk Box)
-Analog delay Moog MF10
-Laptop or audio playback device

Percussion Key



Stage Diagram



Electronics:

The setup for percussion 6 requires a modular synthesizer, polyphonic digital synthesizer, processing units and playback device arranged within arm's reach. Placing the keyboard and effects on top of the Rhodes piano is a functional solution, although they should be placed on a foam pad on top of the piano.

The Rhodes and modular synthesizer are sent to the mixer directly, while the digital polyphonic synthesizer passes through the vocal processor. The tube from the vocal processor uses the performer's vocal cavity as a biological formant filter, and the sound from the tube is recaptured by a standard microphone, and sent to the mixer.

The analog delay processes a mix of the Rhodes, polyphonic synthesizer and modular synthesizer. This sub-mix can be achieved at the mixer and sent back through the pedal on an axillary send, or alternatively, where a simplified setup is required, a sub-mix can be created within percussion 6's setup.

The remaining electronic instruments, (two-dimensional touch synth, drum machine, ribbon synthesizer and cell phones) are connected to the mixer directly or amplified via microphone.

-Digital Polyphonic Synthesizer
-Talk box (Vocal Processor)
-Analog Delay
-Rhodes Piano

-Modular Synthesizer

-Analog Delay

-Monophonic Ribbon Synthesizer -Korg KP Mini -MFB Tanzbar Drum Machine

Modular Synthesizer:
The modular synthesizer has three patches mixed into a single output:

1. Monophonic triangle wave with a low pass filter.
2. LFO-controlled saw wave with a multi-mode filter.
3. Third is a pink noise generator with a multi-mode filter.

Route as required according to performance instructions, and available synthesis and modulation parameters.

It may be necessary to replace the modular synthesizer with the digital polyphonic synthesizer in reduced performance situations. In this case, create the appropriate patches as indicated above, and use mod wheel and available control parameters to replace the modular synthesizer interface.

Digital Polyphonic Synthesizer:
Performance patches developed for *Metatron* can be transferred to any Waldorf Blofeld unit via patch bank upload. Other polyphonic synthesizers are possible, but would require additional programming. Contact the composer for detailed patch recreation instructions.

Equipment Substitutions:
With regards to electronic instruments, this piece was conceived for the Walorf Blofed, Rhodes MK1, Modcan modular, MXR 222, Moog 104M, KP mini, Korg Monotron and MFB Tanzbaer drum computer. If any of these are unavailable, contact the composer regarding possible substitutions.

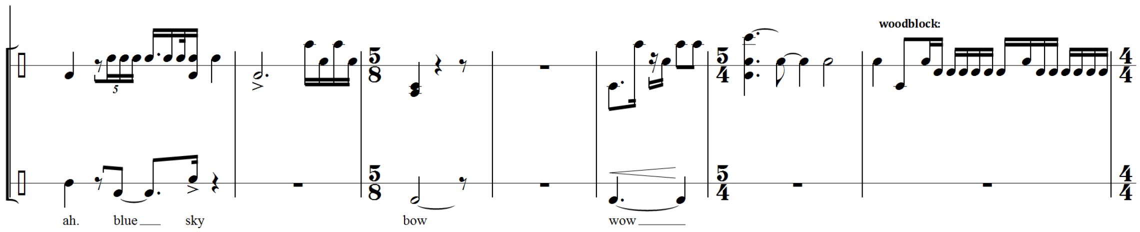
Analog modeling synthesizers, keyboards and processing units may be swapped for rare analog units, but this should be done as a last resort, as it erodes the sound, poetics and spirit of the work.

Patches and Parameter Changes:
Parameter changes are represented in two ways:

1. Patch states. These boxes indicate lists of parameter values to be dialed into a device. In these cases the performer should modify the parameters according to the list in their part. All used parameters are listed, in case the performer is unable to return the device to the default state after each gesture.
2. Parameter changes over time are indicated with arrows and boxes with values. Up indicates an increase, down a decrease and so on. The KP mini represents a special case, as it is a 2d touch surface. Here, swipe gestures are used, and an arrow indicates the direction.

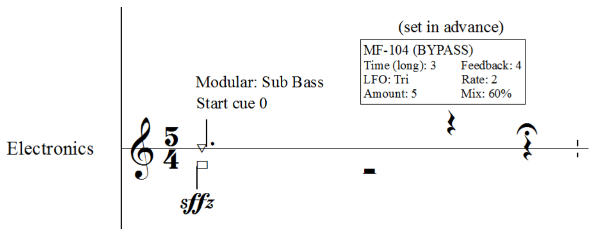
Special Notations:

Electronics Staff:



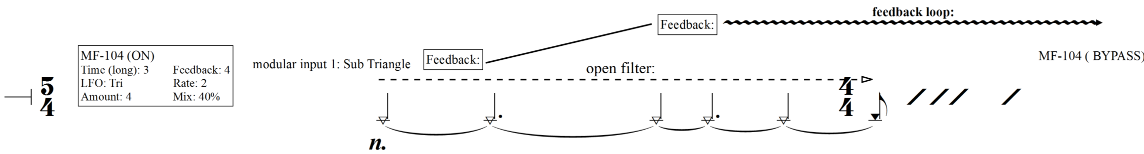
The electronics cue staff (shown above), provides a selective reduction of the pre-produced elements. The loudest and most prominent elements are included only in so far as they are able to guide the performer, and help maintain correct synchronization.

Electronics Parameter State Notation:



The above diagram shows an electronic parameter state box. These boxes show settings for electronic devices, in this case the delay pedal. Numbers are used when available, otherwise, percentages or other appropriate parameters are indicated. These parameters are meant to be approximate.

Parameter Changes:



The above example shows a parameter state being set and then modified over time. Angled lines connecting boxes indicate gradual changes in parameter values. An increase is represented by an ascending line, decrease with a descending line etc. Also, instructions paired with dotted lines and arrows indicate that an action is to be performed over the duration indicated by the arrow.

Numberless Bars and Dotted Barlines:

Dotted barlines occur at the borders between movements and cued material. They indicate that instrumental parts are meant to drift out of synchronization with the pre-produced components.

Numberless measures typically occur in small clusters during transitional moments between synchronized elements. In these sections, play the part as written, and listen for the entry of the click track or recorded electronic elements.

Special Instructions:

Click track and Cues:

Each instrumental part includes a simplified rhythmic reduction of the pre-produced and created electronic elements. These cue parts only contain material essential for following the electronics.

While not essential, a click track is included with the support materials, and is synchronized with the electronic cues. If used, take care that the audio from the click track does not bleed into the microphones or the concert hall during performance. An in-ear monitoring system or headphones with effective isolation are best.

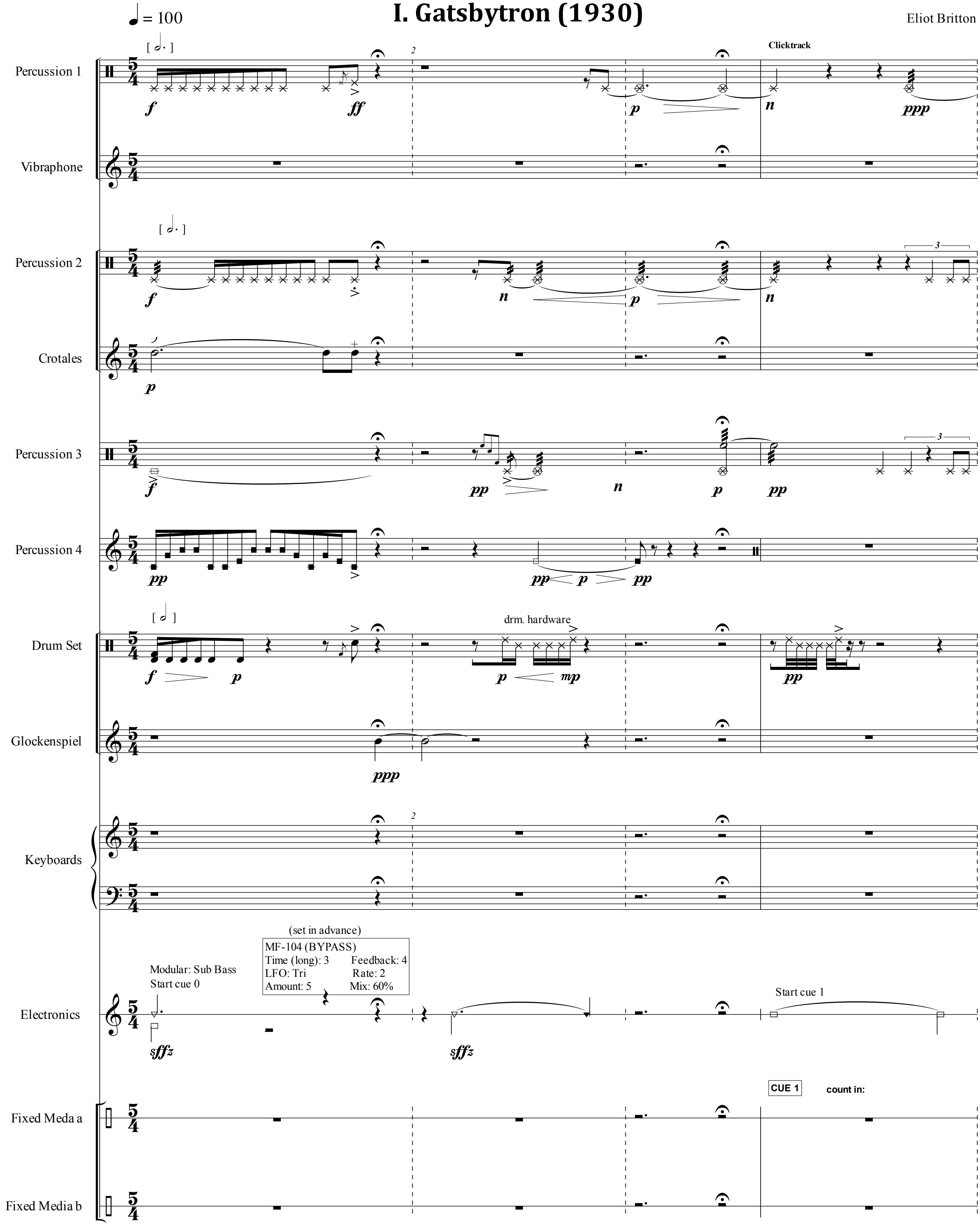
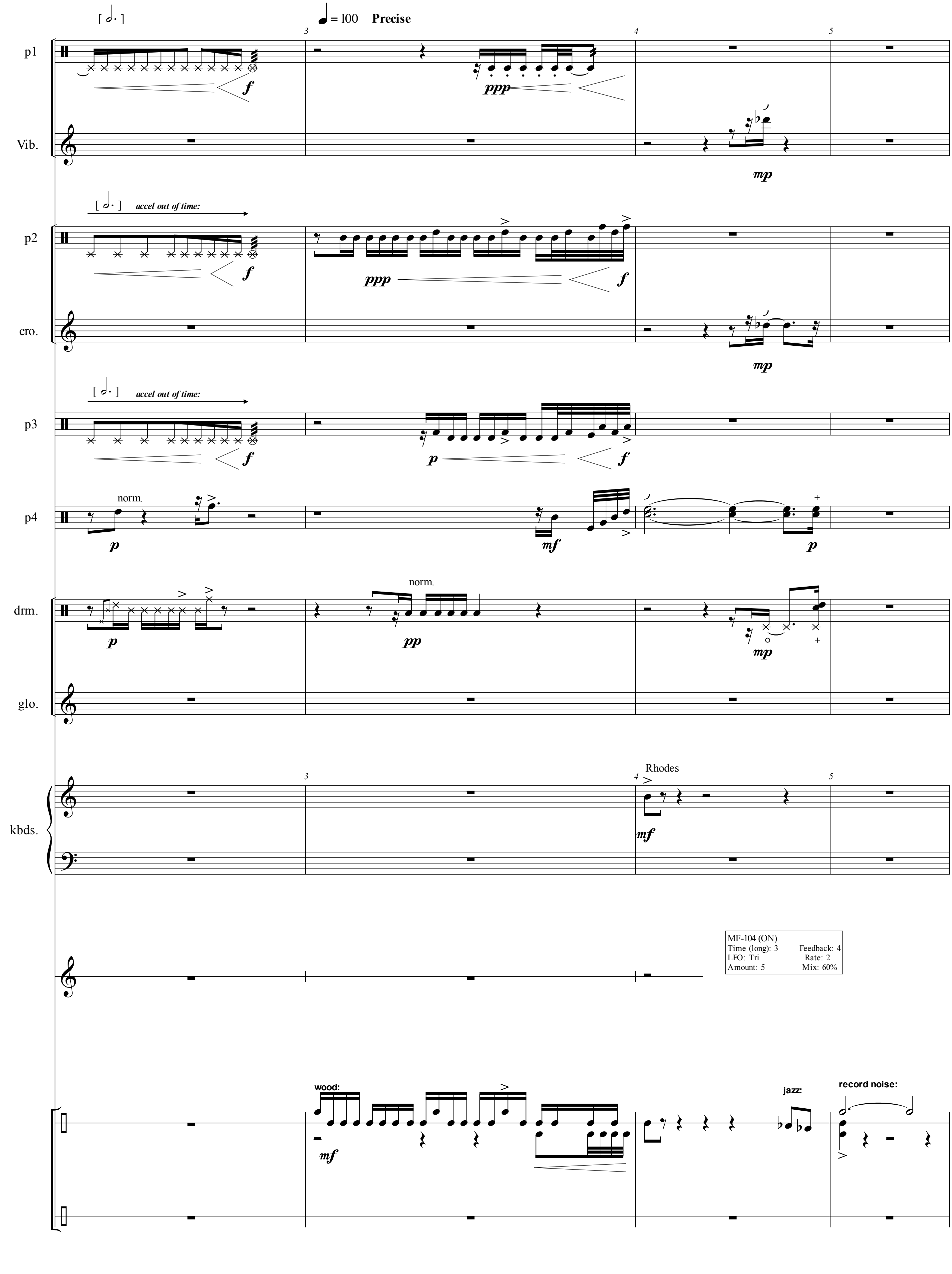
Amplification:

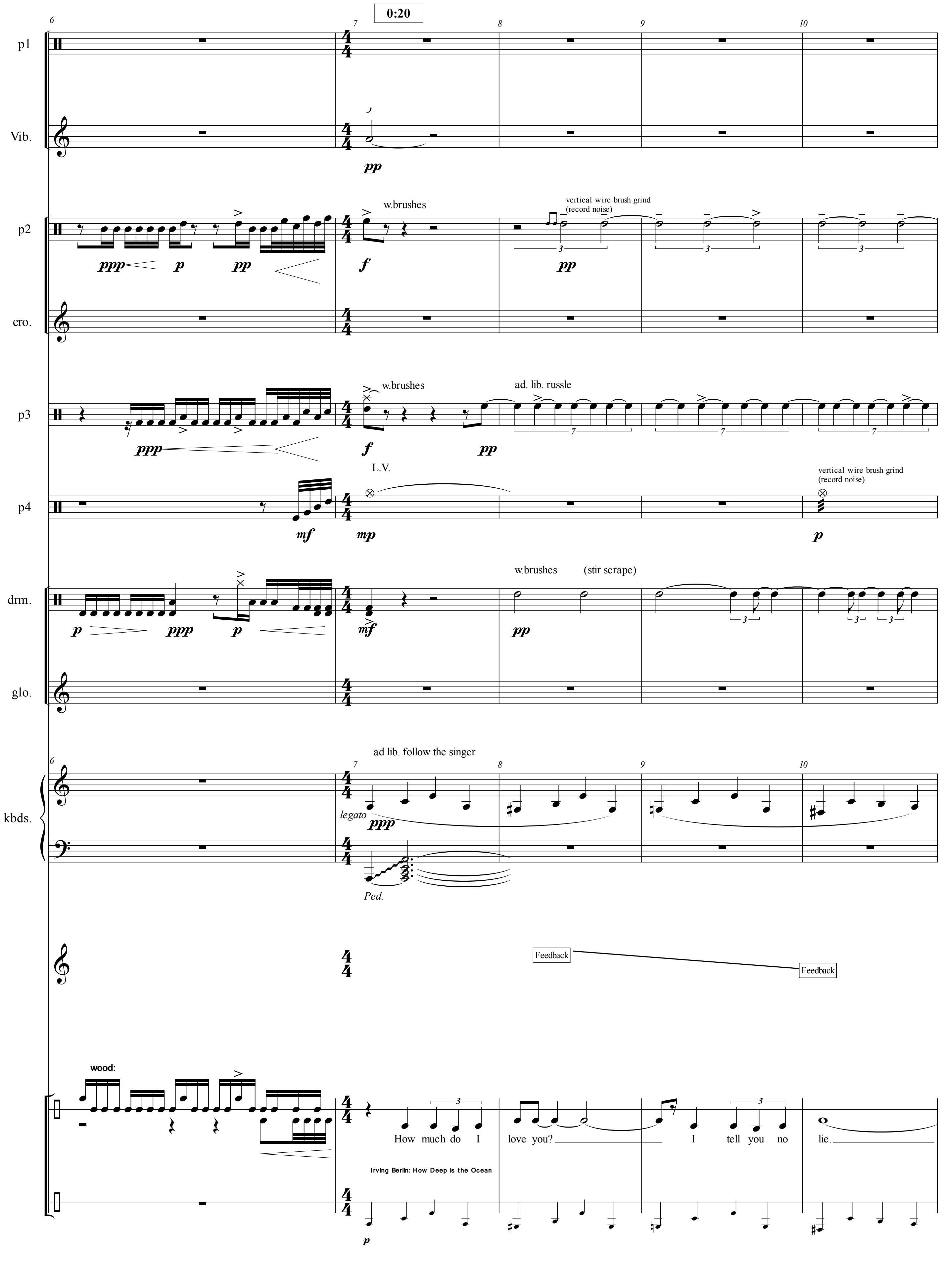
With the exception of the Rhodes piano and talk box, amplification of the percussion instruments is at the discretion of the performer and technicians. At least one microphone per station is required, and the performer should be able to hold and play smaller, quieter objects directly in front of the microphone. This may require an additional stage of compression and EQ if available.

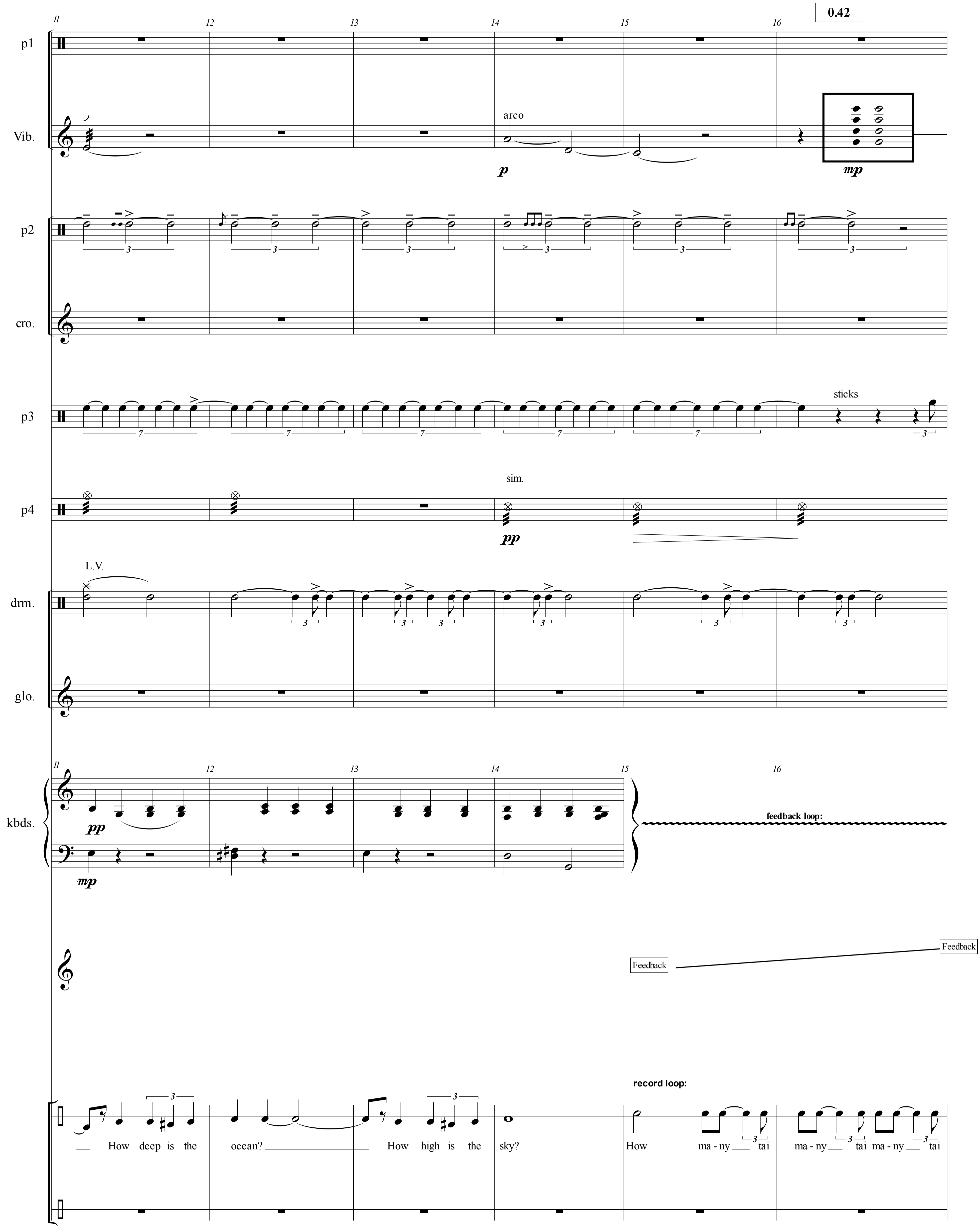
Score

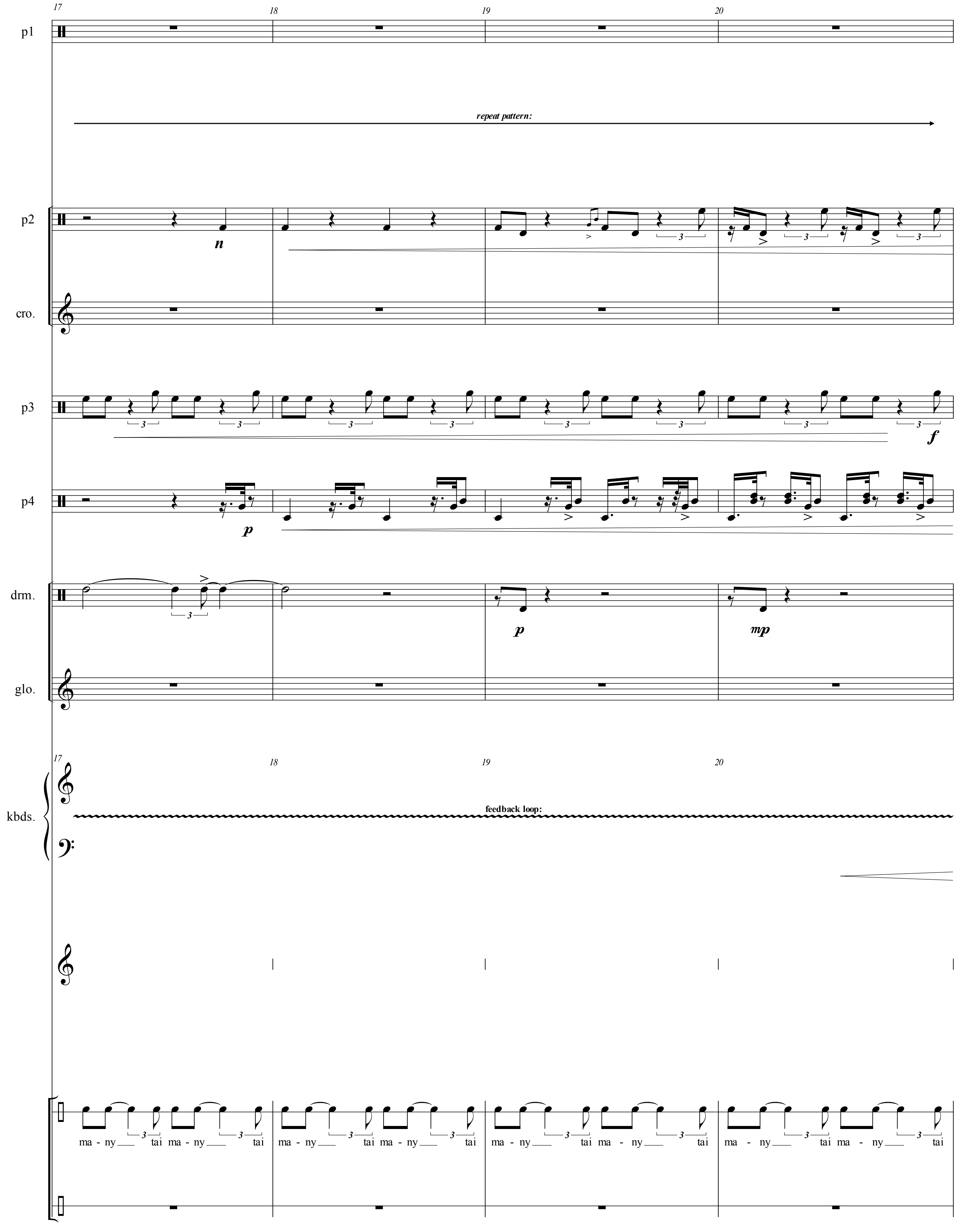
Metatron

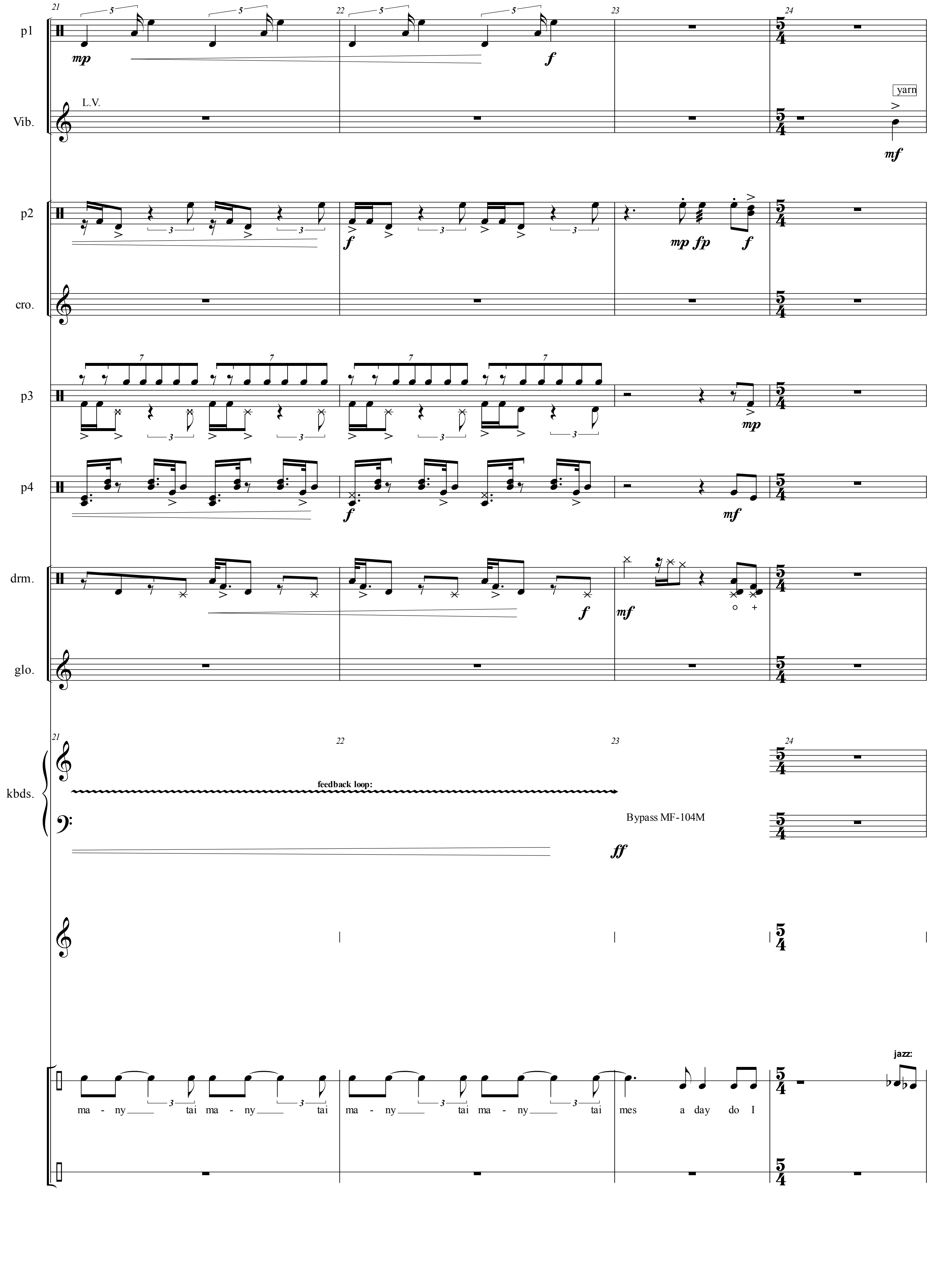
I. Gatsbytron (1930)

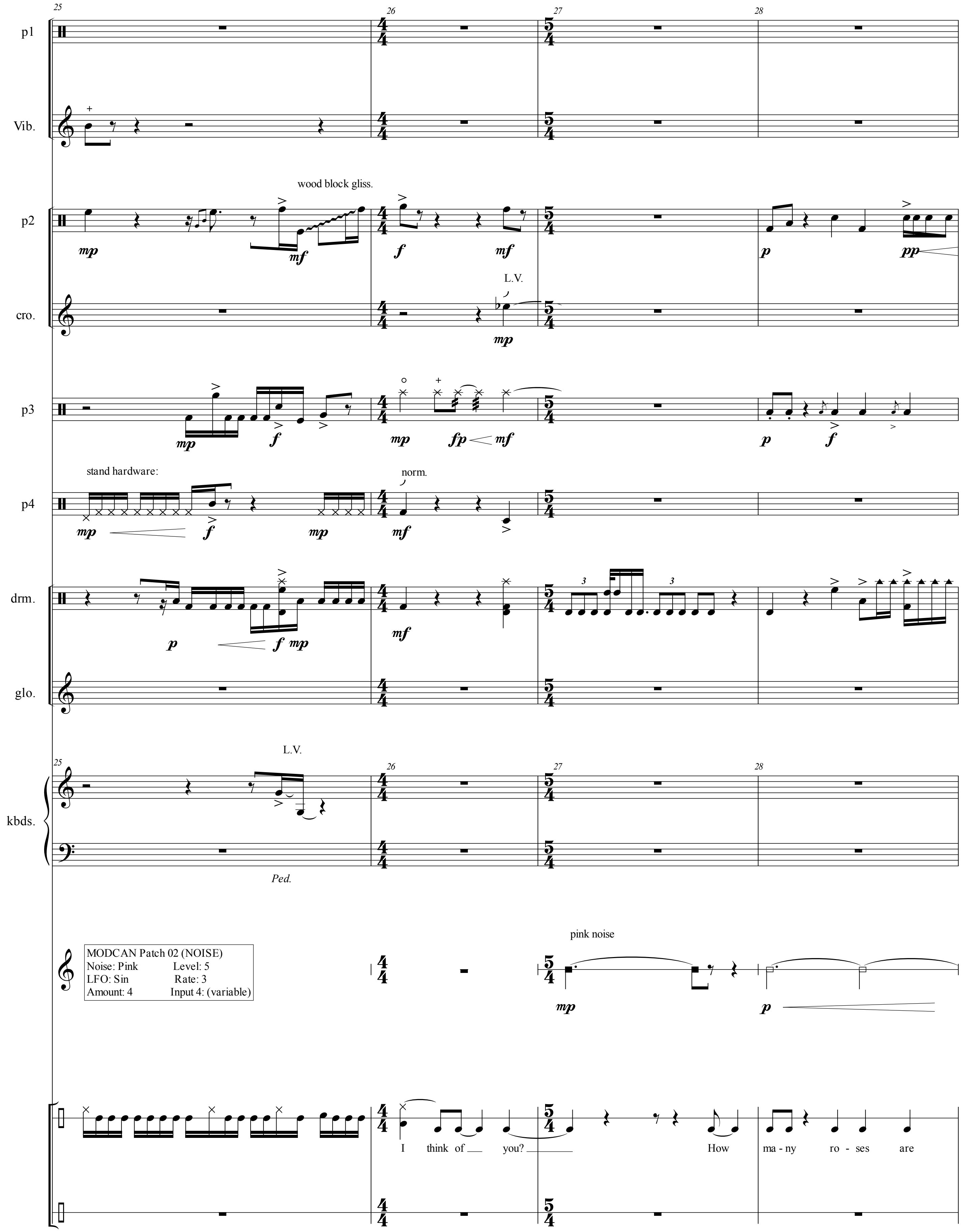
Eliot Britton


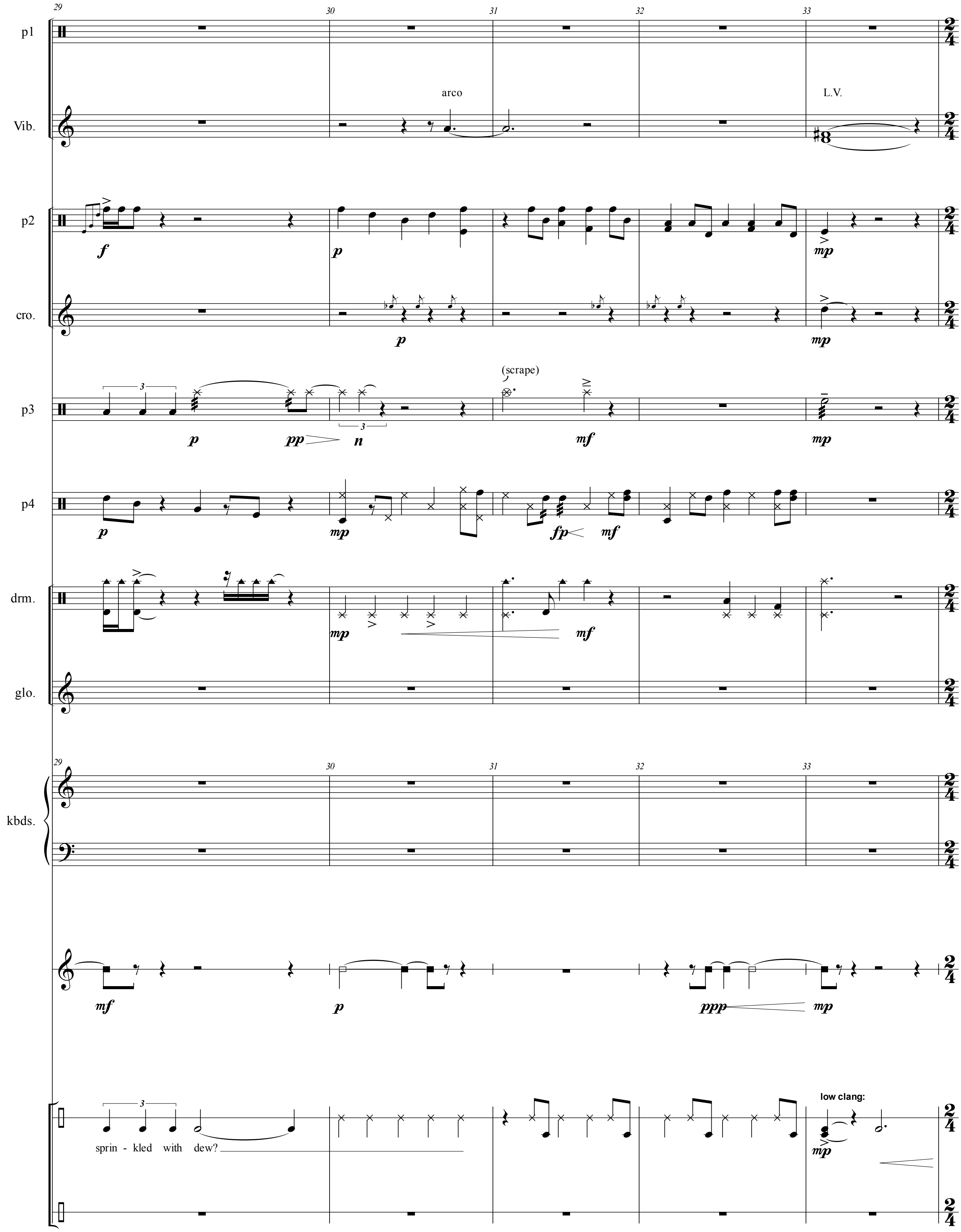
= 100 Precise
p1
Vib.
p2
accel out of time:
cro.
p3
accel out of time:
p4
norm.
drm.
norm.
glo.
Rhodes
kbds.
MF-104 (ON)
Time (long): 3
Feedback: 4
LFO: Tri
Rate: 2
Amount: 5
Mix: 60%
wood:
jazz:
record noise:


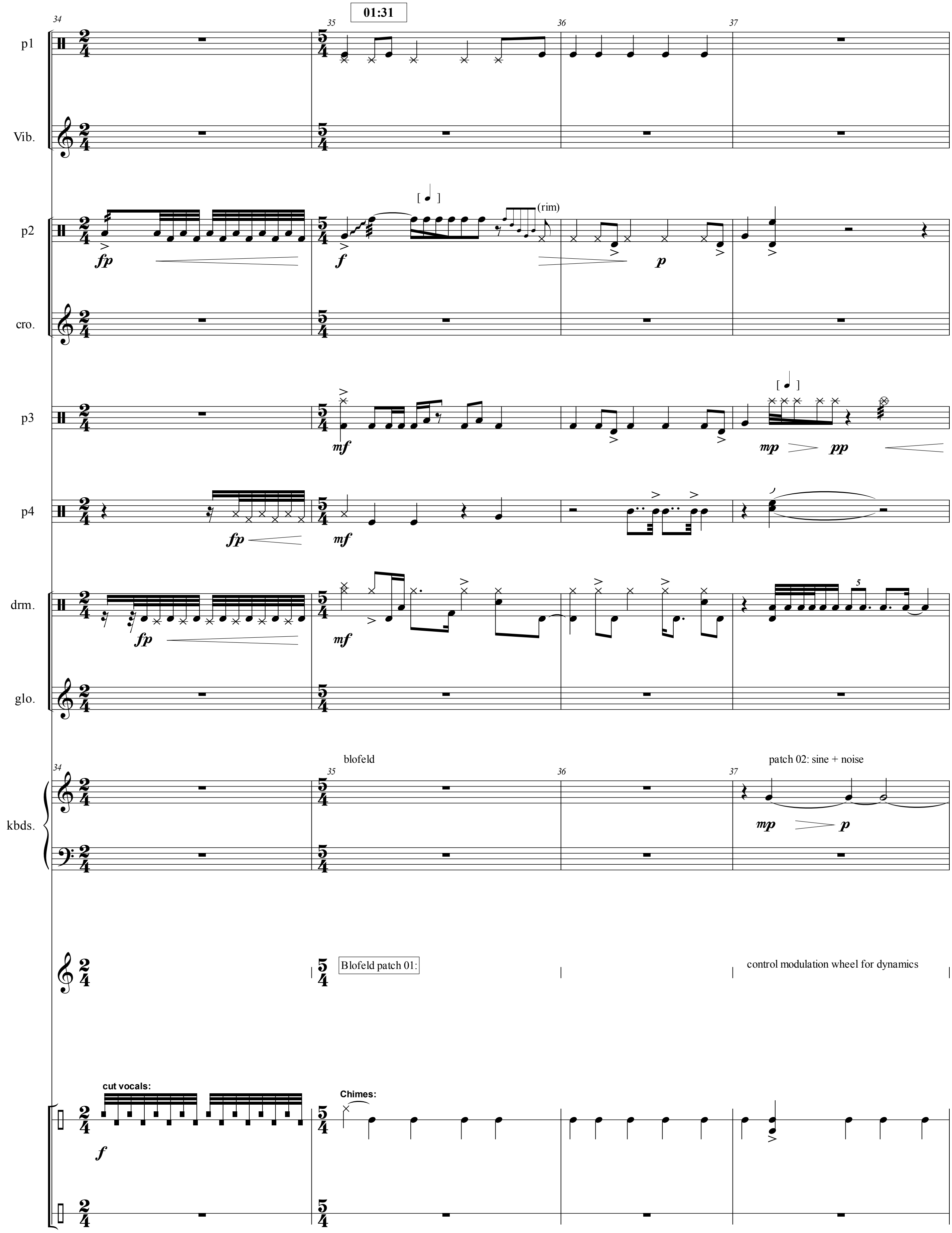
0:20
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
w.brushes
vertical wire brush grind
(record noise)
ad. lib. russle
L.V.
(stir scrape)
ad lib. follow the singer
legato
Ped.
Feedback
Feedback
wood:
How much do I love you? I tell you no lie.
Irving Berlin: How Deep is the Ocean


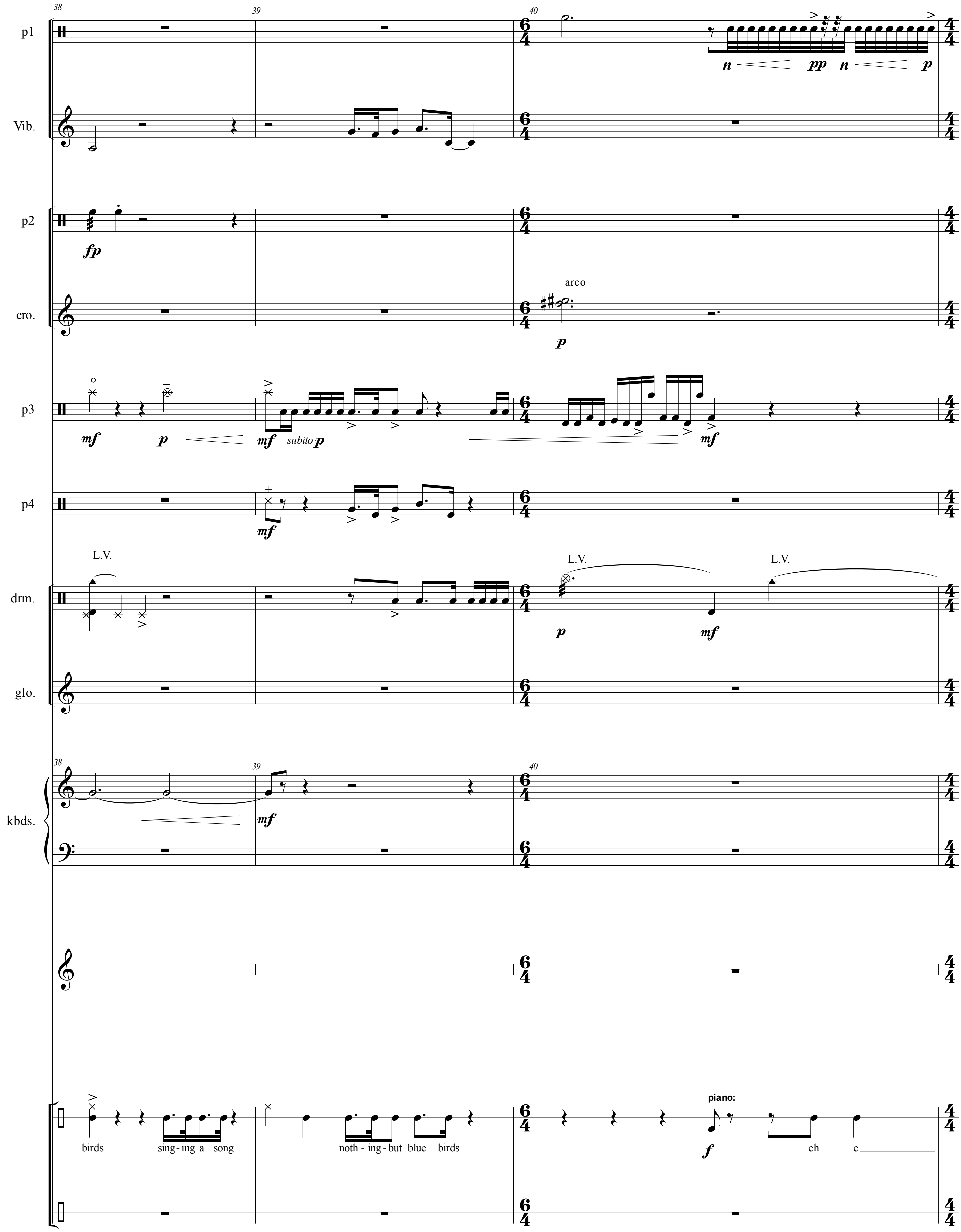
0.42
p1
Vib.
arco
p2
cro.
p3
sticks
p4
sim.
L.V.
drm.
glo.
kbds.
feedback loop:
Feedback
Feedback
record loop:
How deep is the ocean?
How high is the sky?
How ma - ny tai
ma - ny tai ma - ny tai


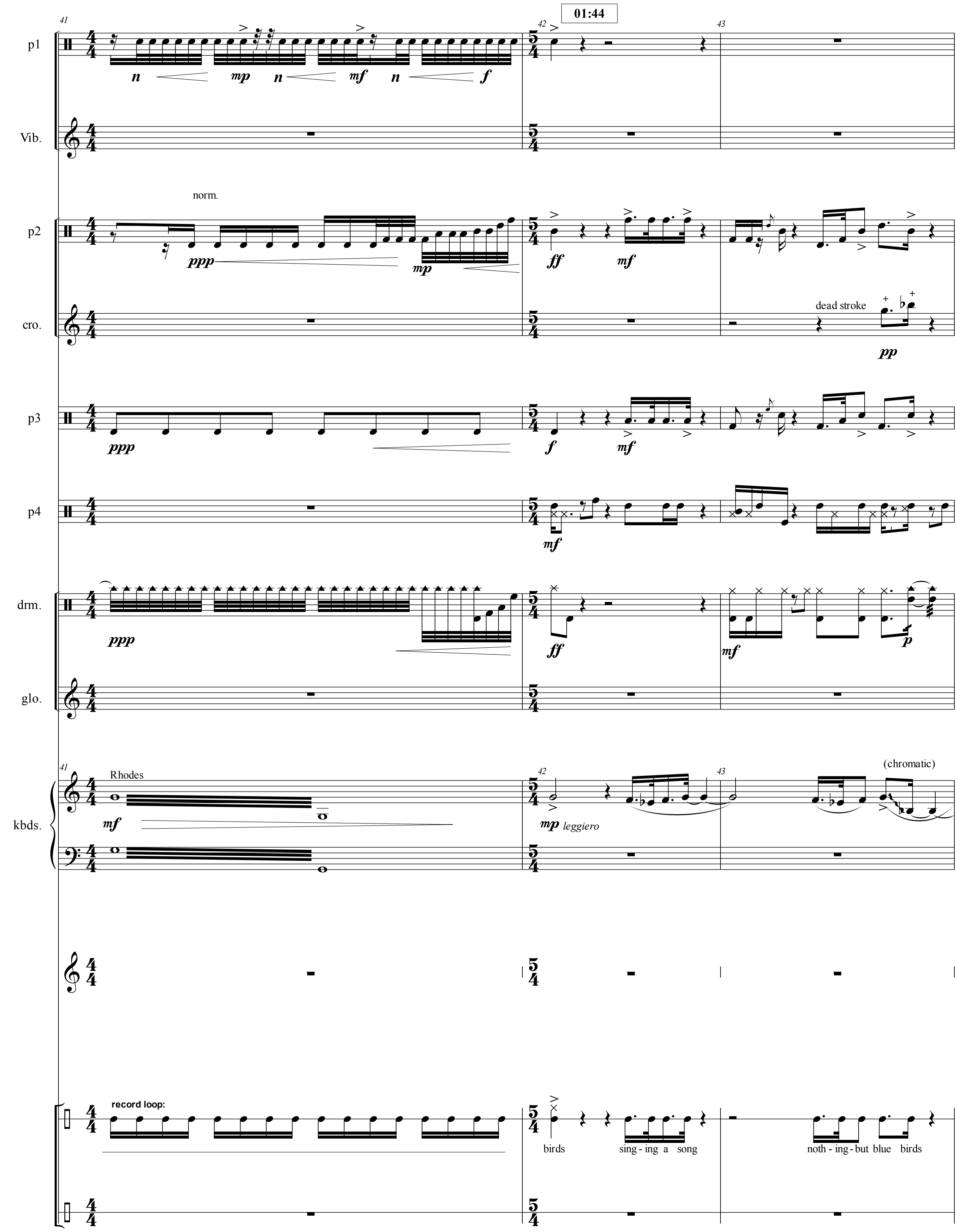
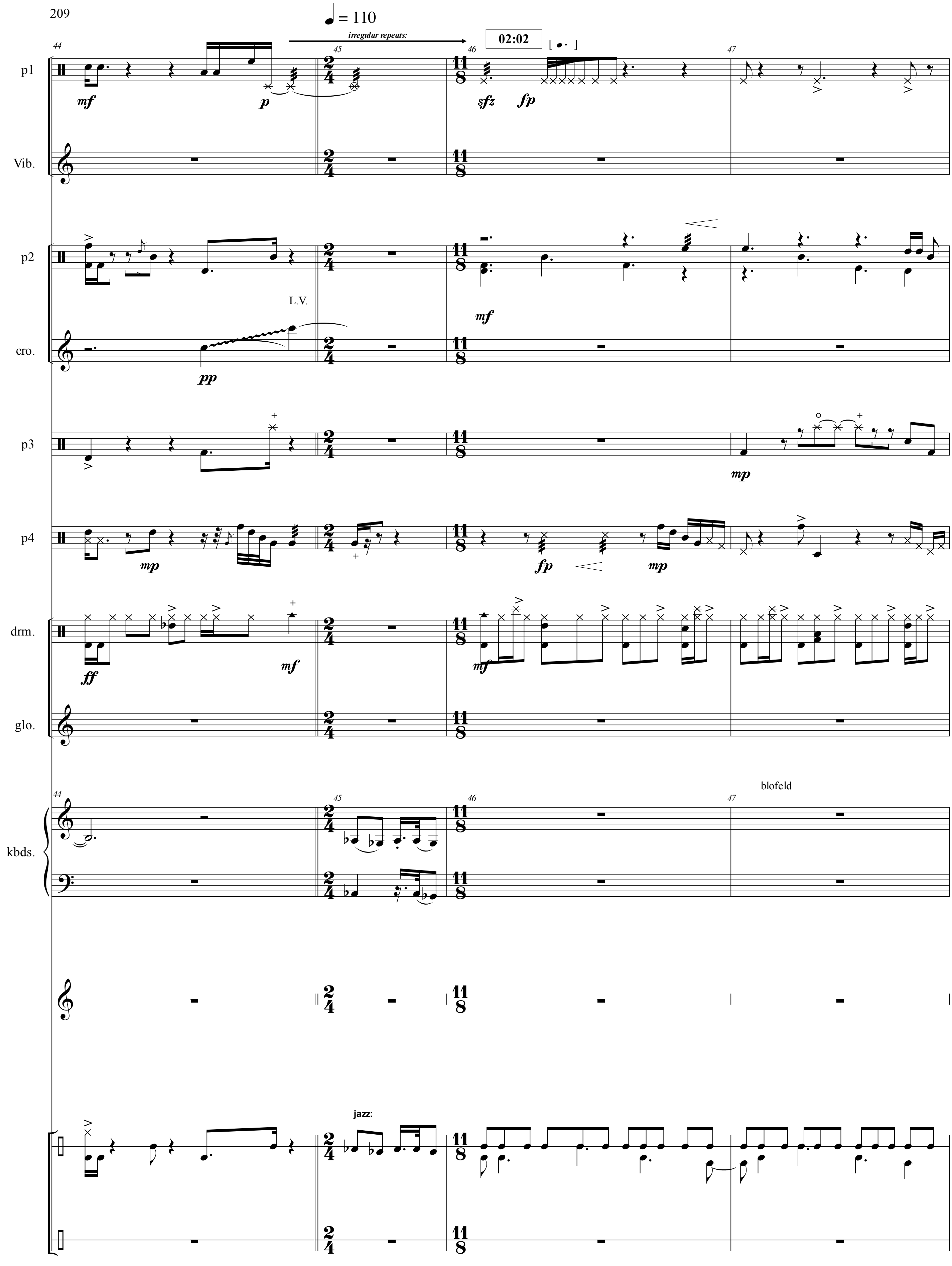
p1
repeat pattern:
p2
cro.
p3
p4
drm.
glo.
kbds.
feedback loop:
ma - ny tai ma - ny tai


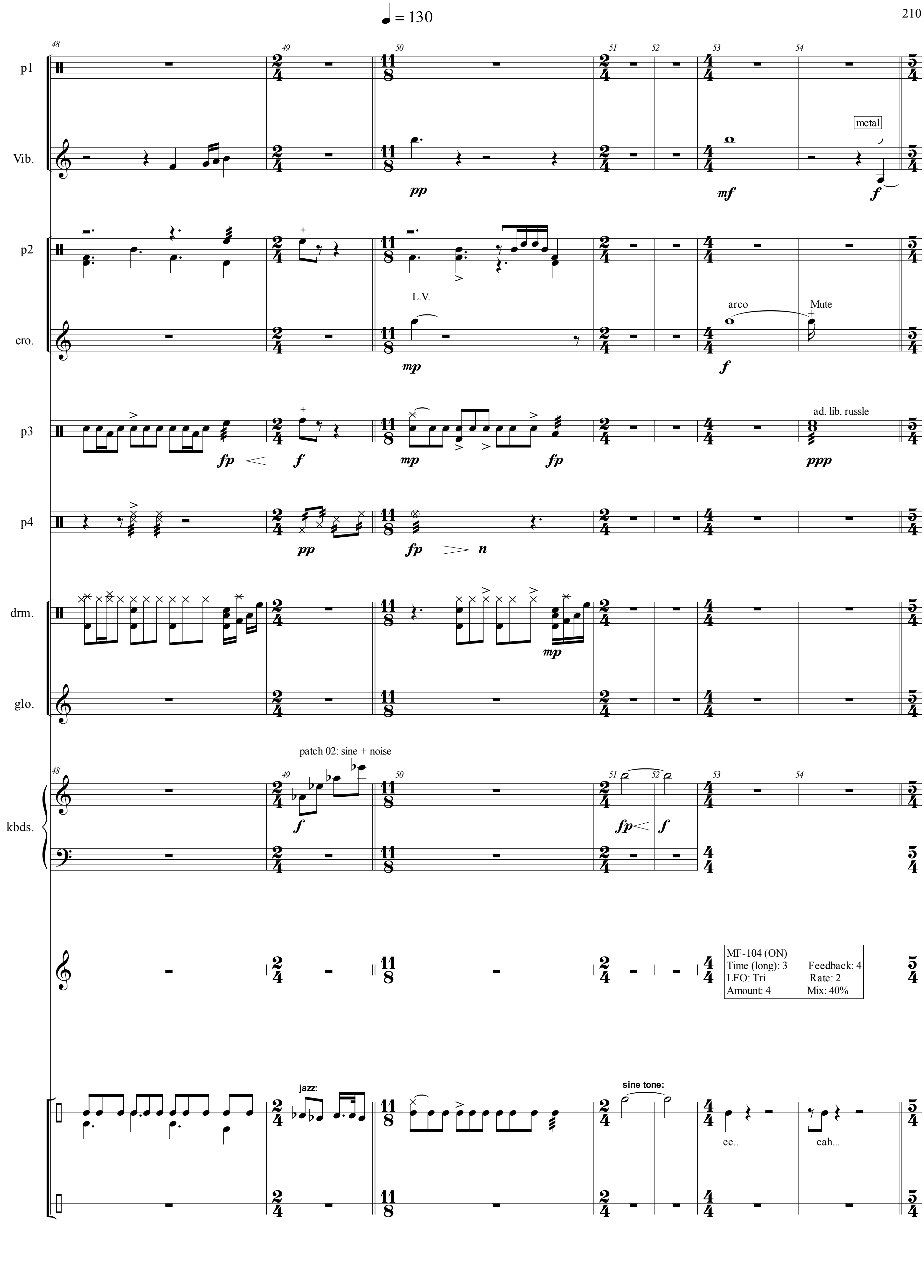
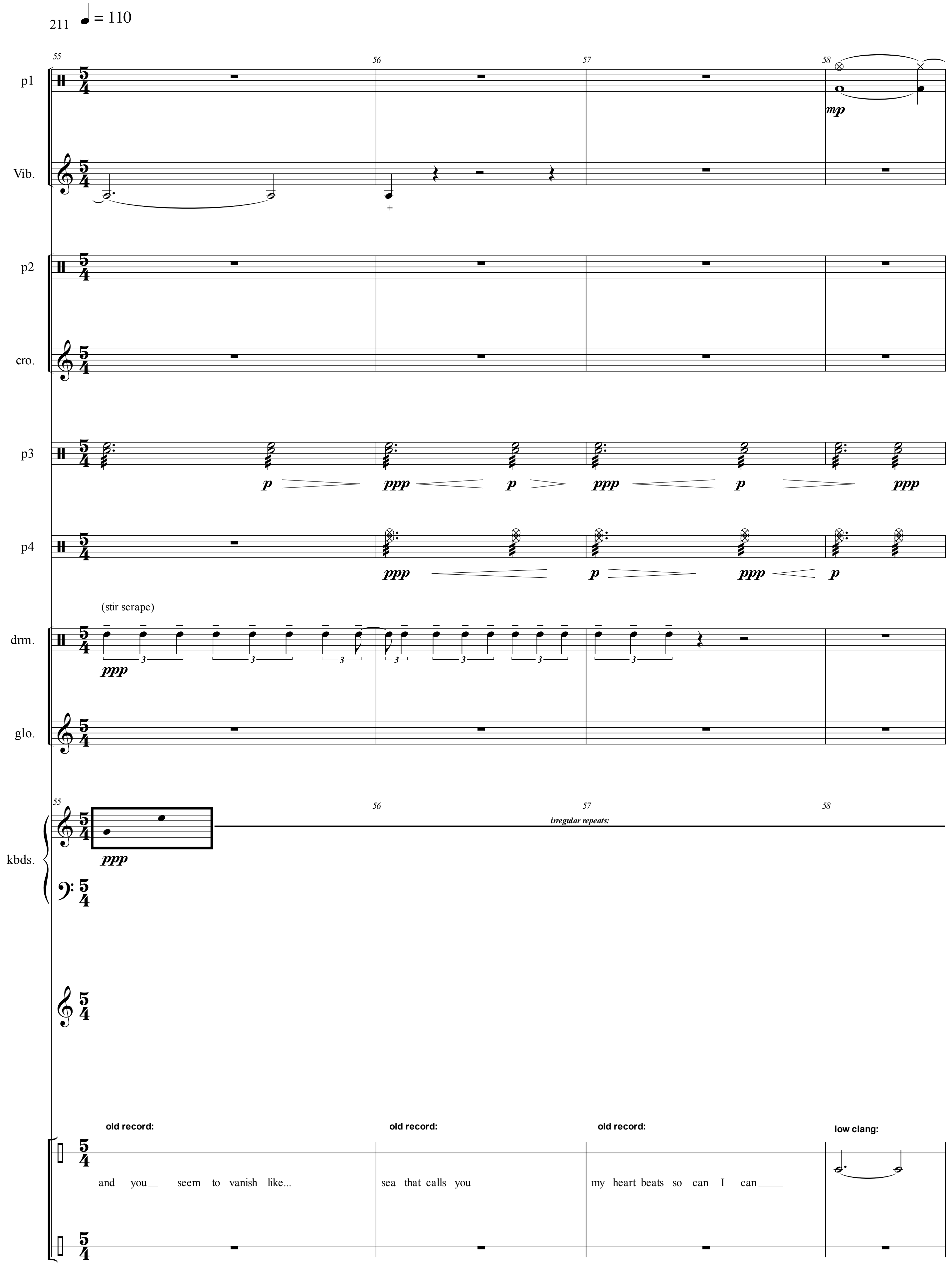
p1
Vib.
L.V.
yarn
p2
cro.
p3
p4
drm.
glo.
kbds.
feedback loop:
Bypass MF-104M
jazz:
ma - ny tai ma - ny tai ma - ny tai ma - ny tai mes a day do I


p1
Vib.
wood block gliss.
p2
L.V.
cro.
p3
stand hardware:
norm.
p4
drm.
glo.
L.V.
kbds.
Ped.
MODCAN Patch 02 (NOISE)
Noise: Pink Level: 5
LFO: Sin Rate: 3
Amount: 4 Input 4: (variable)
pink noise
I think of you? How ma - ny ro - ses are


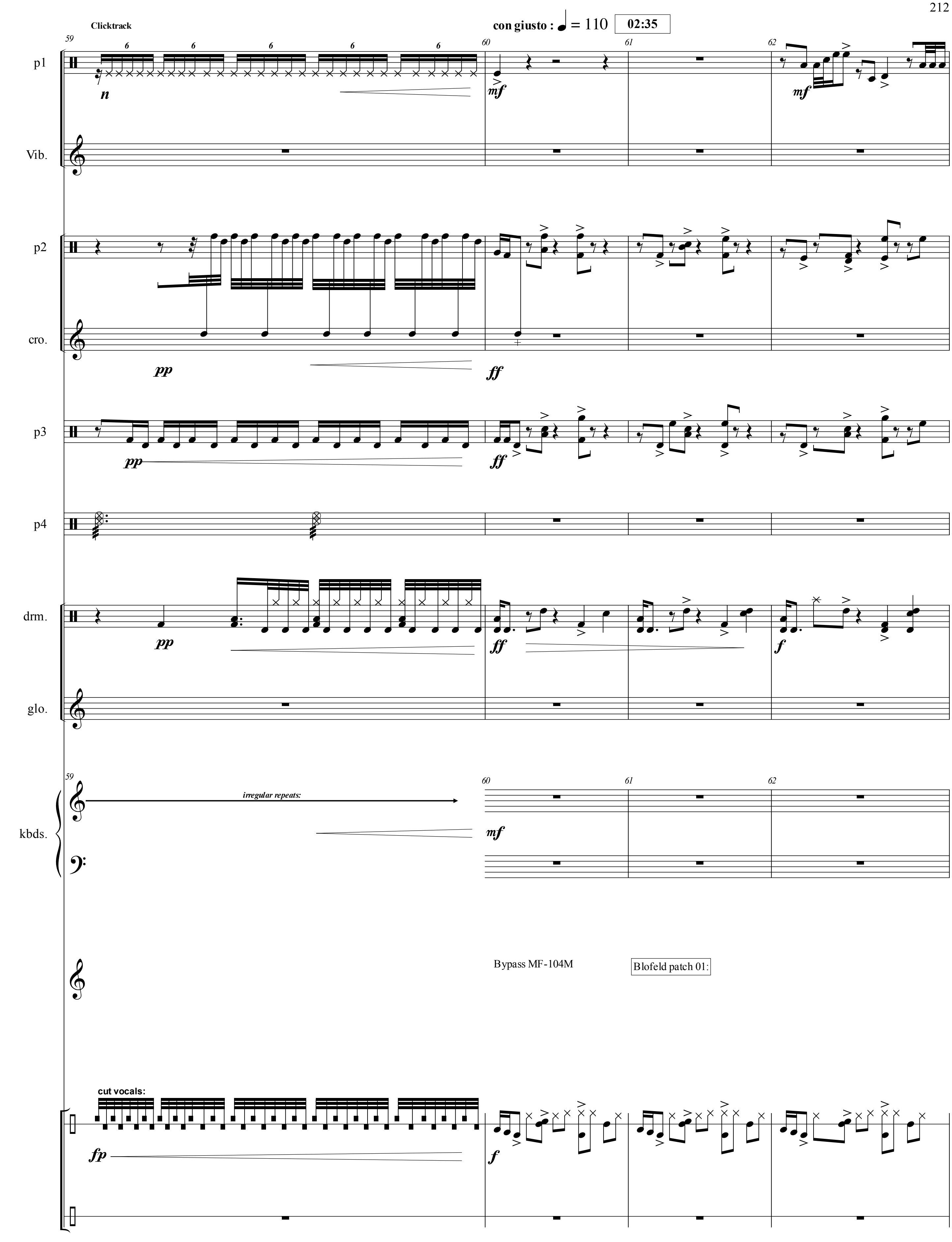
p1
Vib.
arco
L.V.
p2
cro.
p3
(scrape)
p4
drm.
glo.
kbds.
sprin - kled with dew?
low clang:


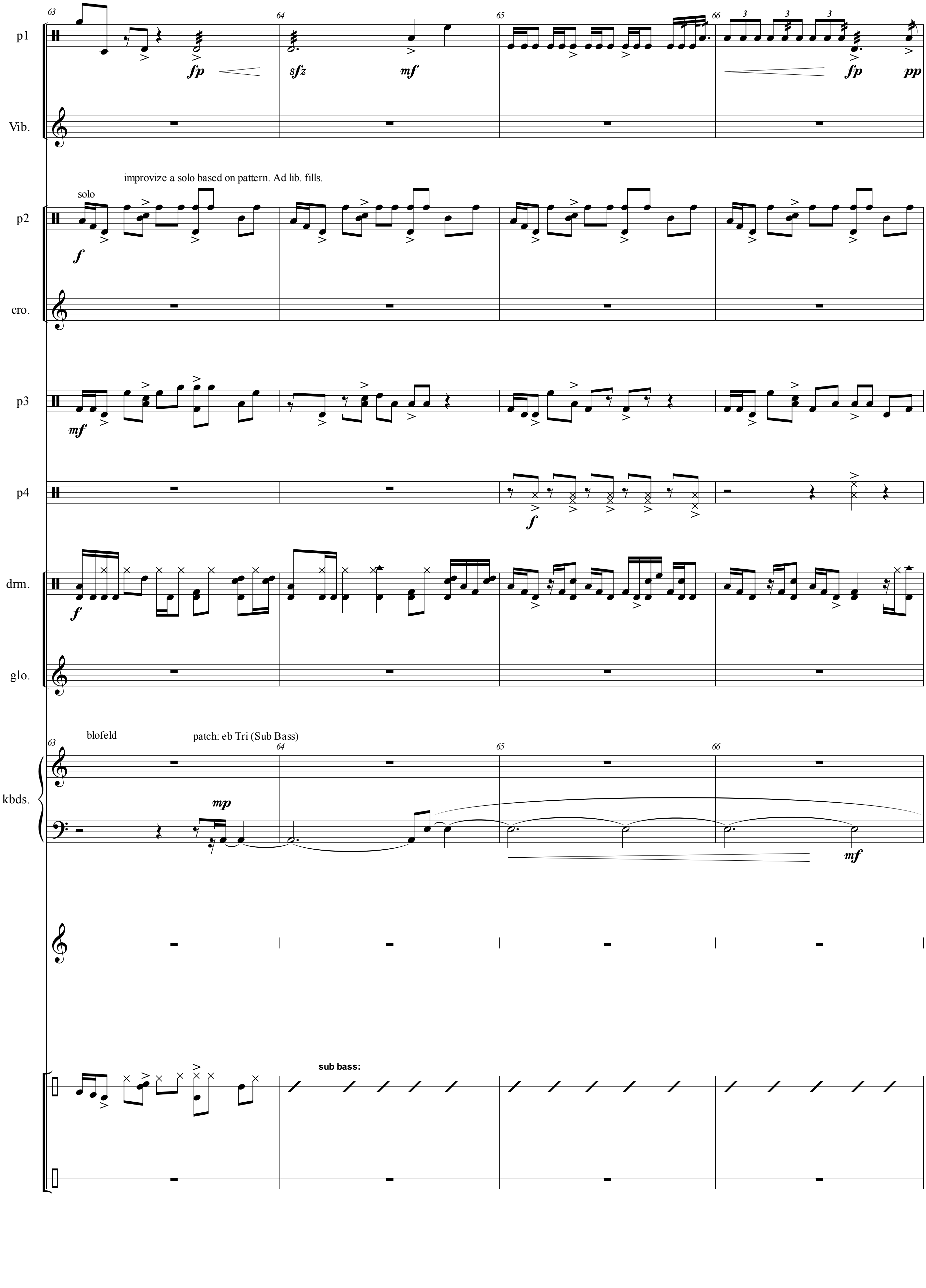
01:31
p1
Vib.
p2
(rim)
cro.
p3
p4
drm.
glo.
kbds.
blofeld
patch 02: sine + noise
Blofeld patch 01:
control modulation wheel for dynamics
cut vocals:
Chimes:


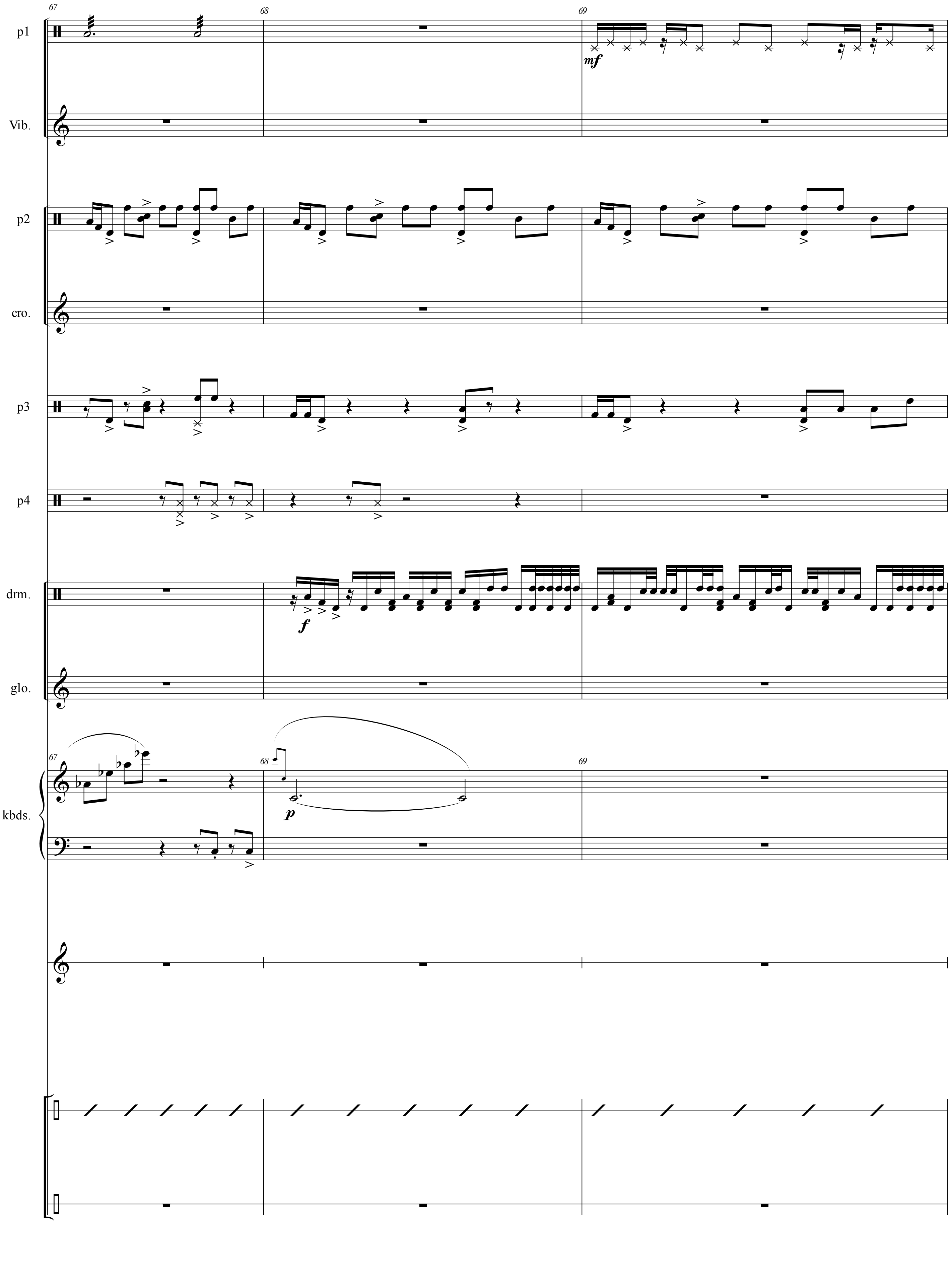
38
39
40
p1
n
pp
n
p
Vib.
p2
fp
cro.
arco
p
p3
mf
p
mf
subito p
mf
p4
mf
L.V.
drm.
L.V.
L.V.
p
mf
glo.
kbds.
mf
piano:
f
birds
sing-ing a song
noth-ing-but blue birds
eh
e

01:44
p1
Vib.
norm.
p2
cro.
dead stroke
p3
p4
drm.
glo.
Rhodes
leggiero
(chromatic)
kbds.
record loop:
birds sing - ing a song
noth - ing - but blue birds


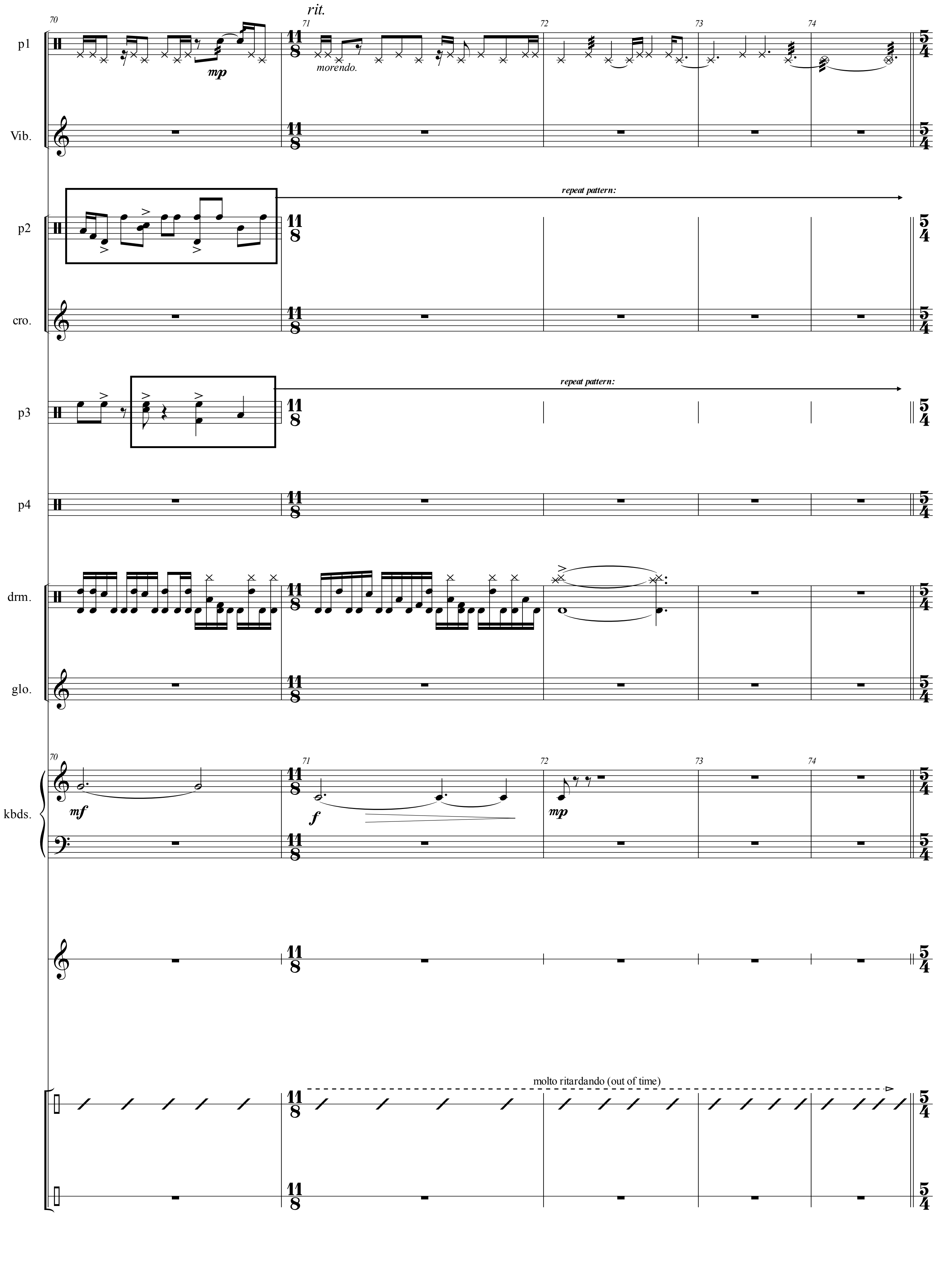
♩ = 110
irregular repeats:
02:02
p1
Vib.
p2
L.V.
cro.
p3
p4
drm.
glo.
kbds.
blofeld
jazz:
mf
p
sfz
fp
mf
pp
mp
fp
mp
ff
mf
mf

♩= 130
p1
Vib.
metal
p2
cro.
L.V.
arco
Mute
p3
ad. lib. russle
p4
drm.
glo.
kbds.
patch 02: sine + noise
MF-104 (ON)
Time (long): 3
Feedback: 4
LFO: Tri
Rate: 2
Amount: 4
Mix: 40%
jazz:
sine tone:
ee..
eah...


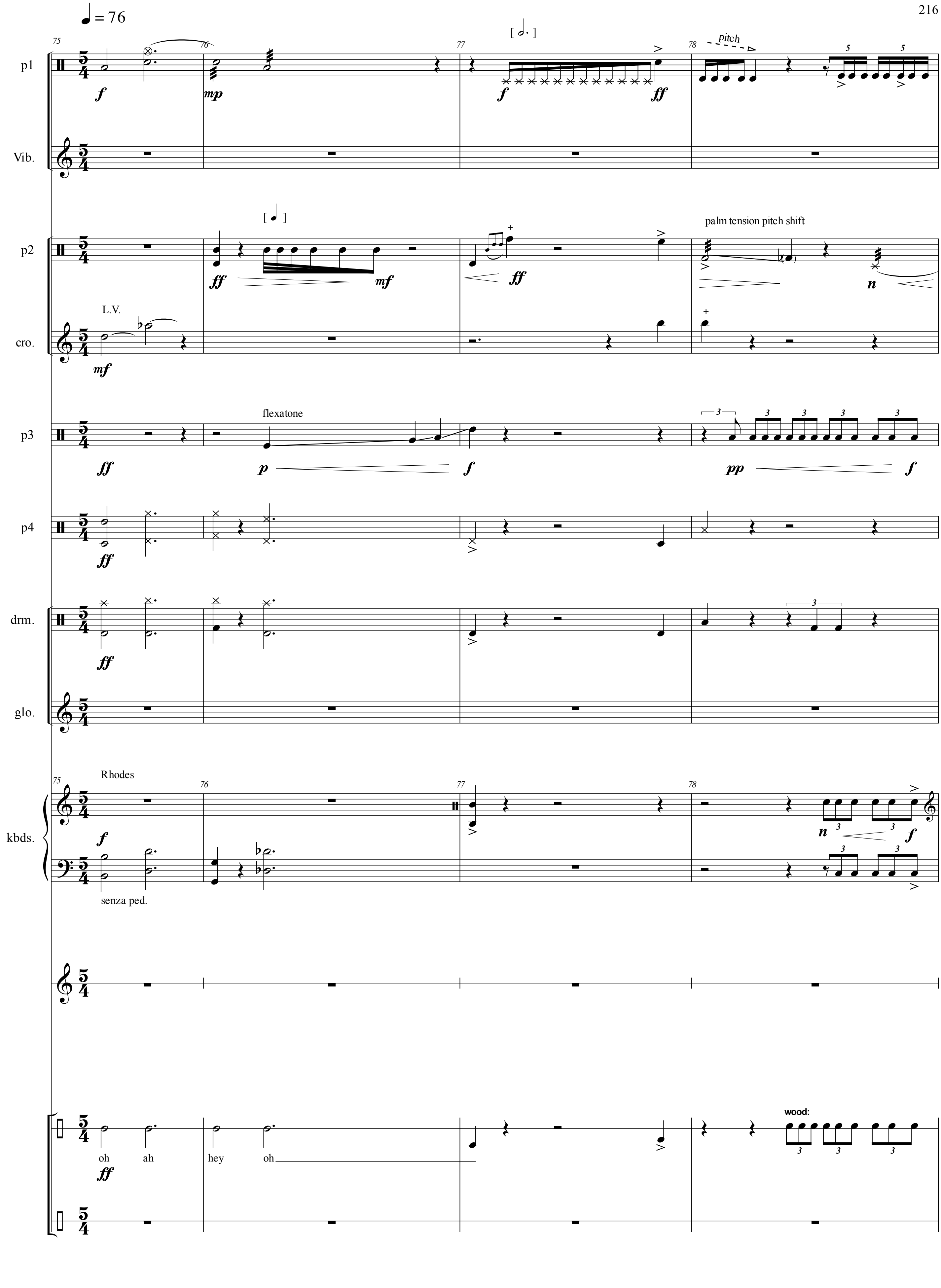
♩ = 110
55
56
57
58
p1
mp
Vib.
p2
cro.
p3
p
ppp
p4
(stir scrape)
drm.
glo.
kbds.
irregular repeats:
old record:
and you seem to vanish like...
sea that calls you
my heart beats so can I can
low clang:

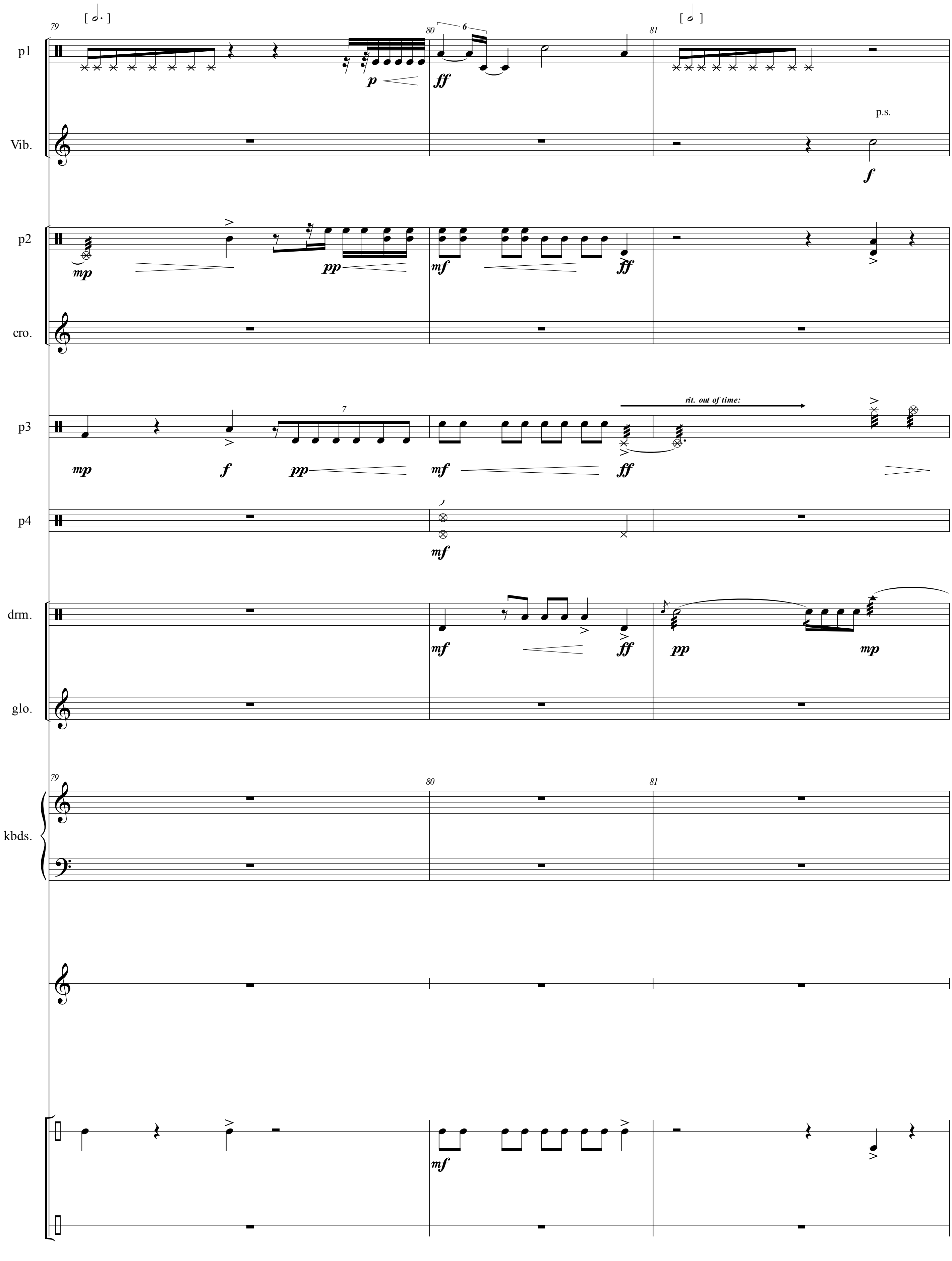
6 6 6 6 6


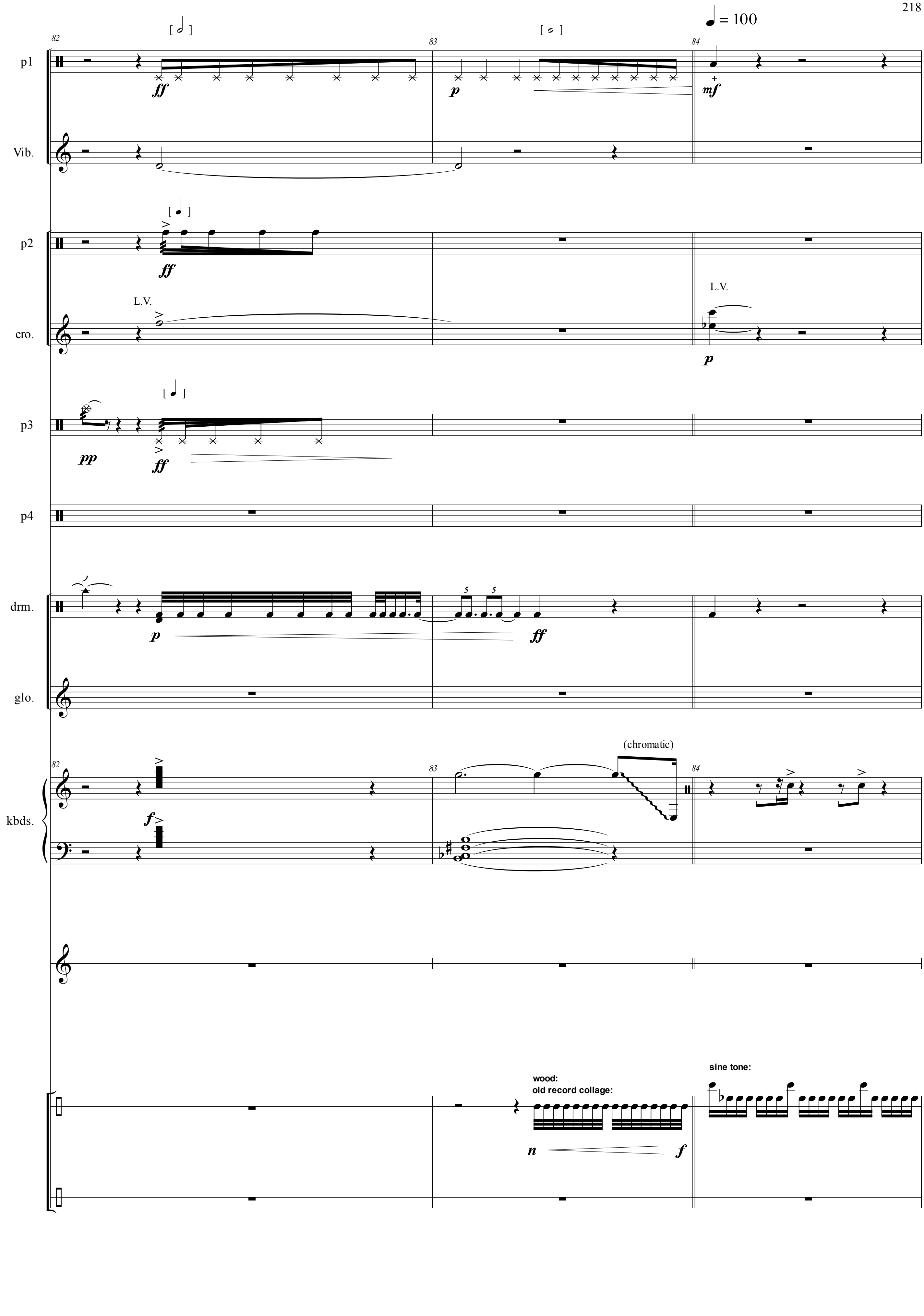
Clicktrack
con giusto : = 110
02:35
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
irregular repeats:
Bypass MF-104M
Blofeld patch 01:
cut vocals:


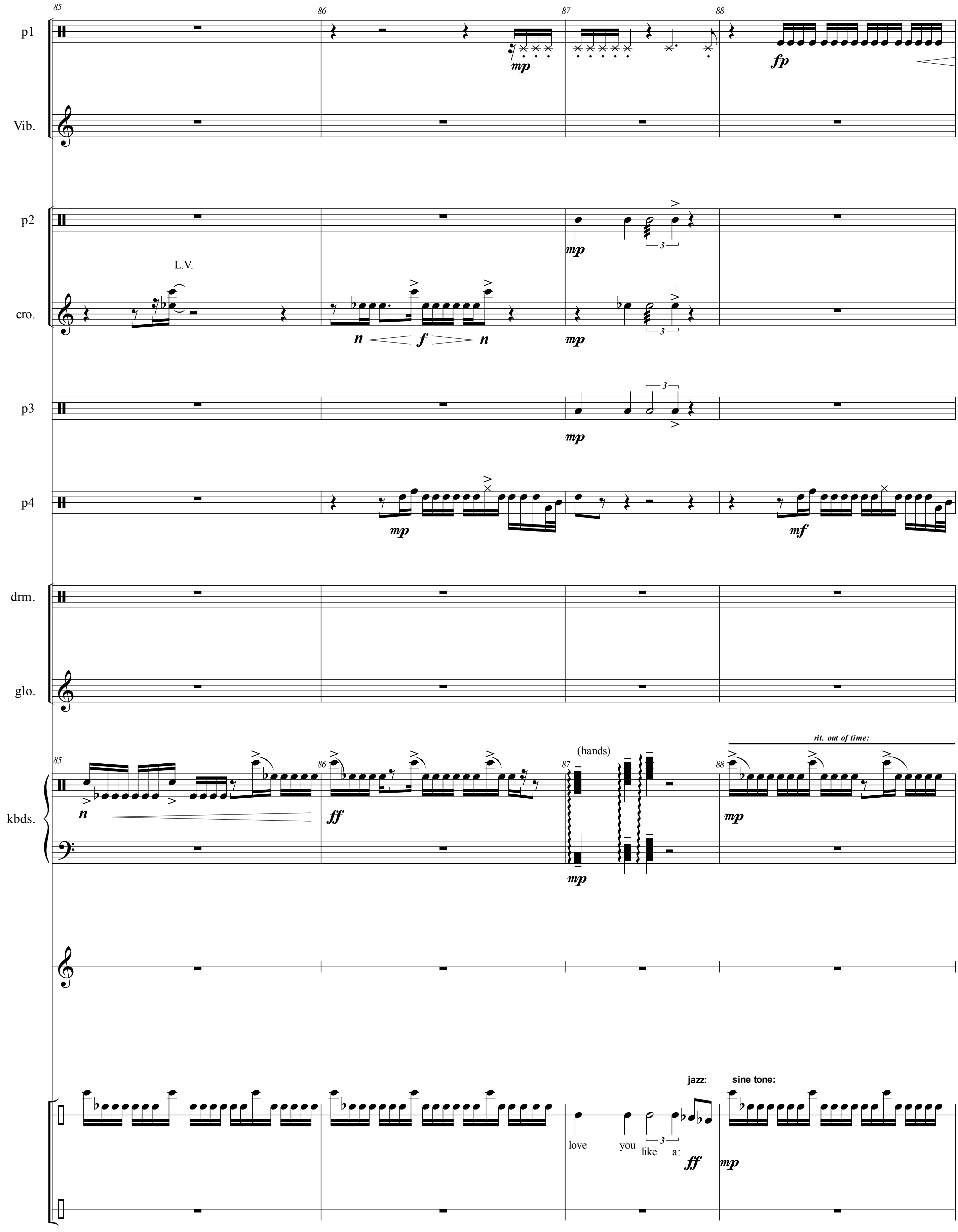
p1
Vib.
improvize a solo based on pattern. Ad lib. fills.
solo
p2
cro.
p3
p4
drm.
glo.
blofeld
patch: eb Tri (Sub Bass)
kbds.
sub bass:


67
68
69
p1
mf
Vib.
p2
cro.
p3
p4
drm.
f
glo.
kbds.
p


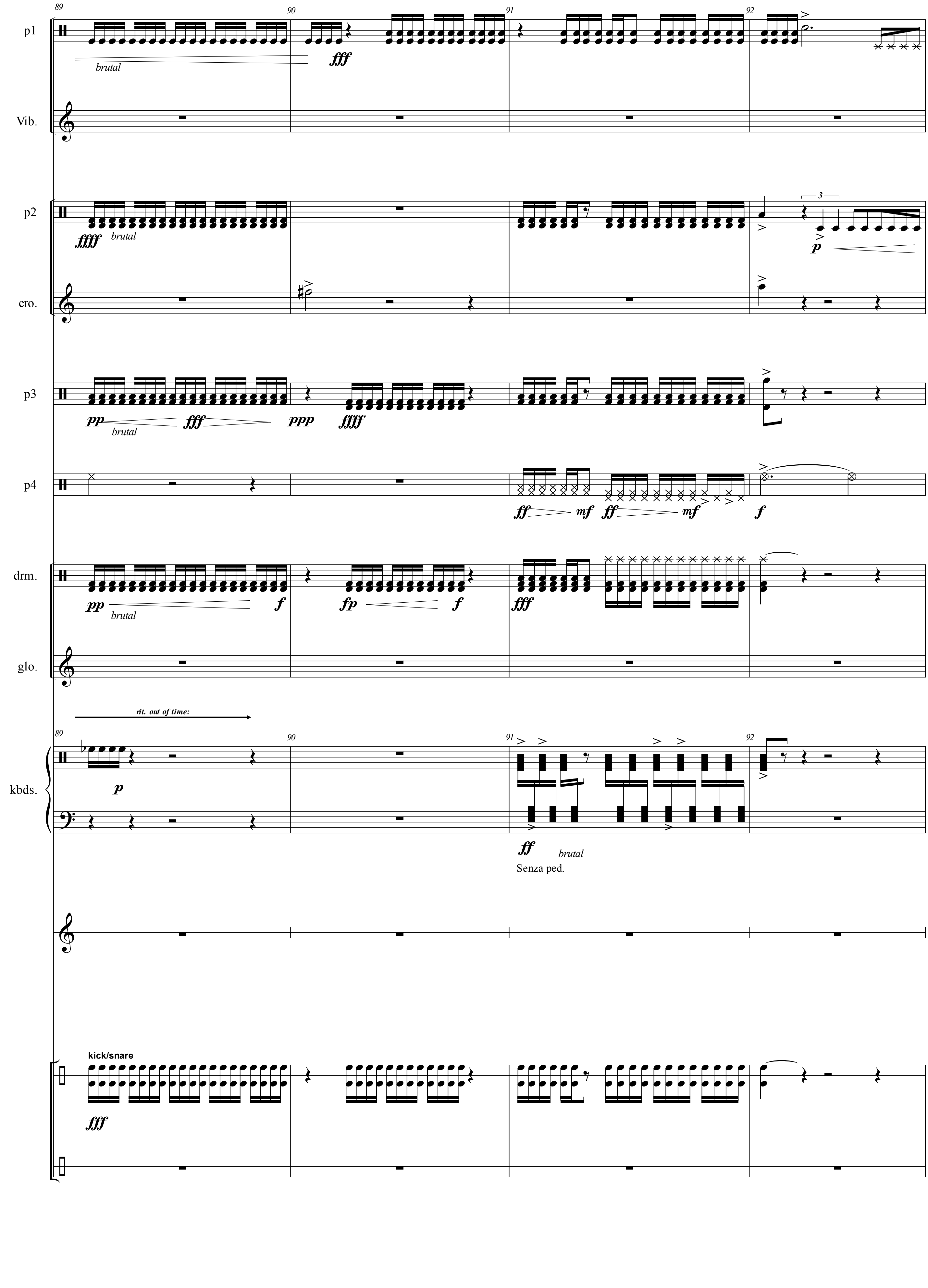
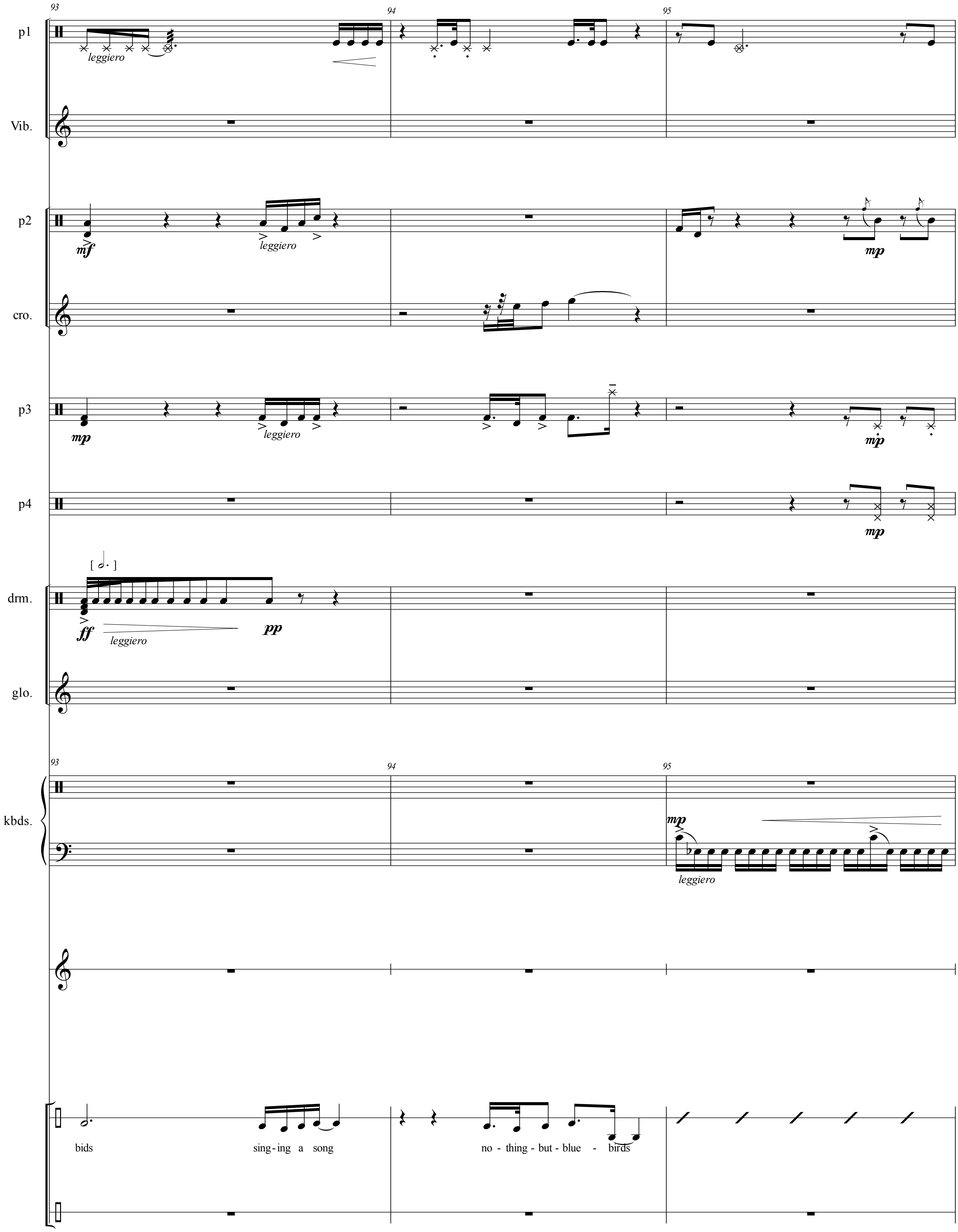
rit.
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
mp
morendo.
repeat pattern:
repeat pattern:
mf
f
mp
molto ritardando (out of time)


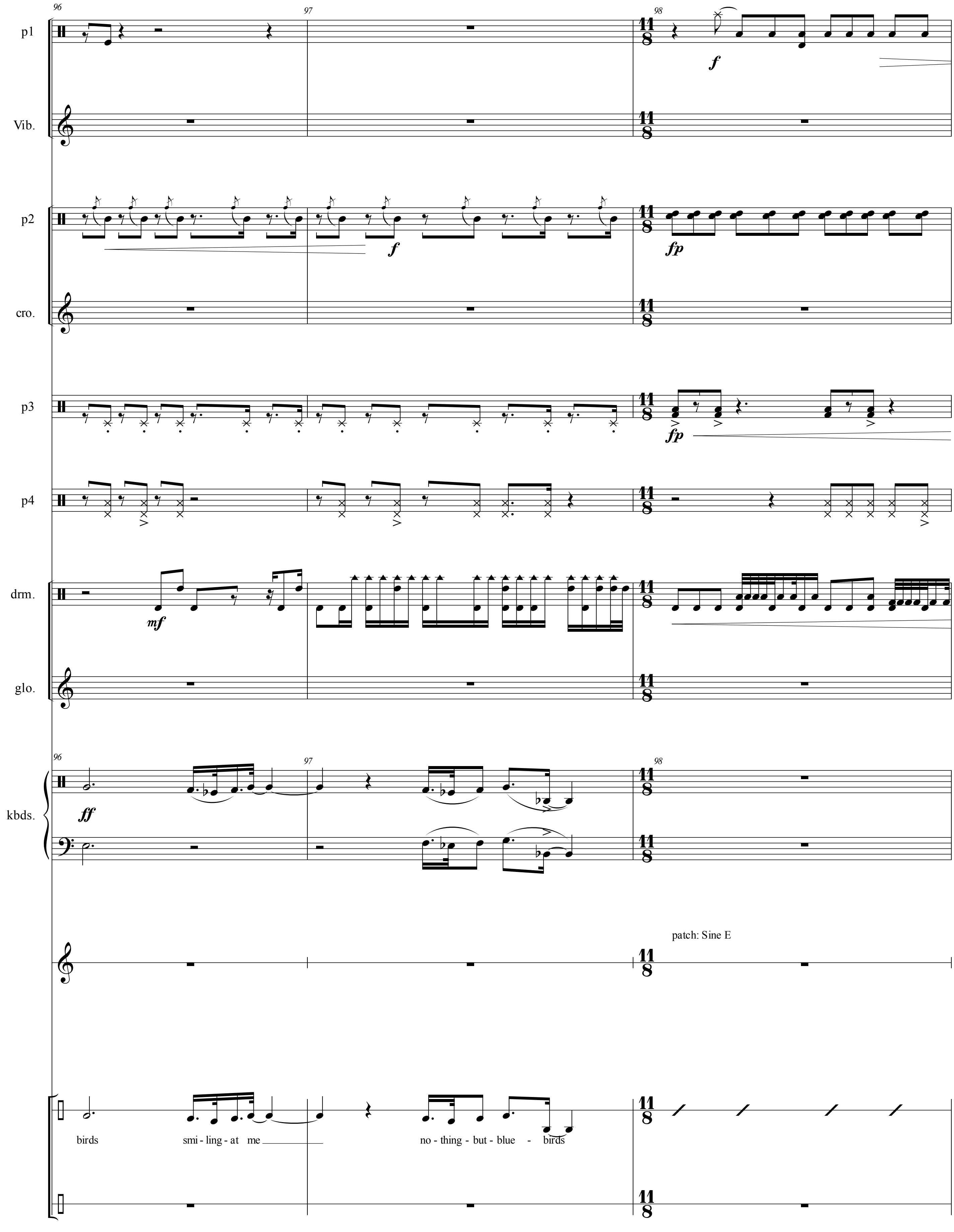
♩ = 76
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
[𝅗𝅥.]
[♩]
pitch
palm tension pitch shift
L.V.
flexatone
Rhodes
senza ped.
wood:
oh
ah
hey
oh


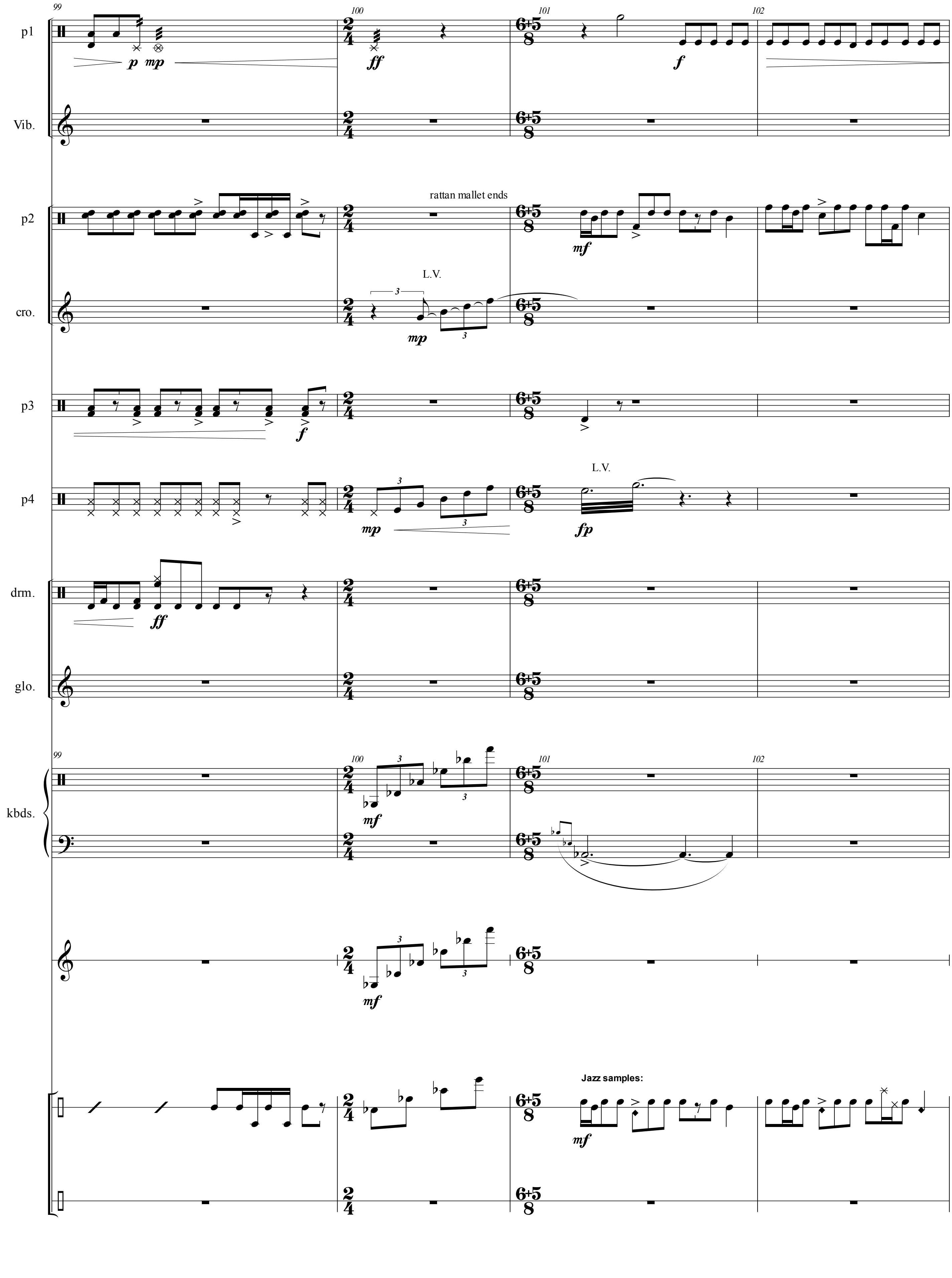
79
80
81
6
7
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
p.s.
rit. out of time:
p
ff
f
mp
pp
mf


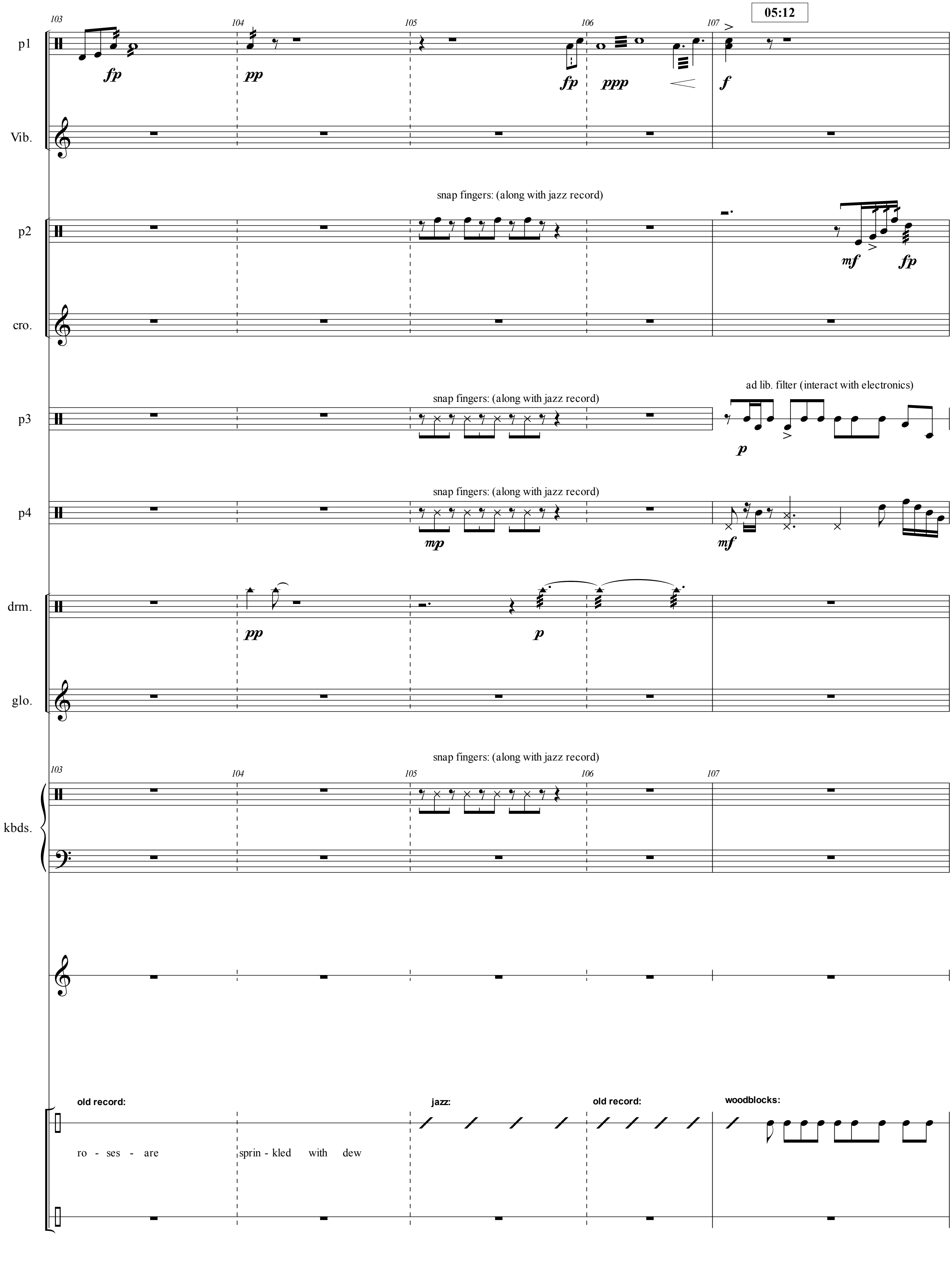
= 100
82
83
84
p1
Vib.
p2
L.V.
cro.
L.V.
p3
p4
drm.
glo.
kbds.
(chromatic)
wood:
old record collage:
sine tone:


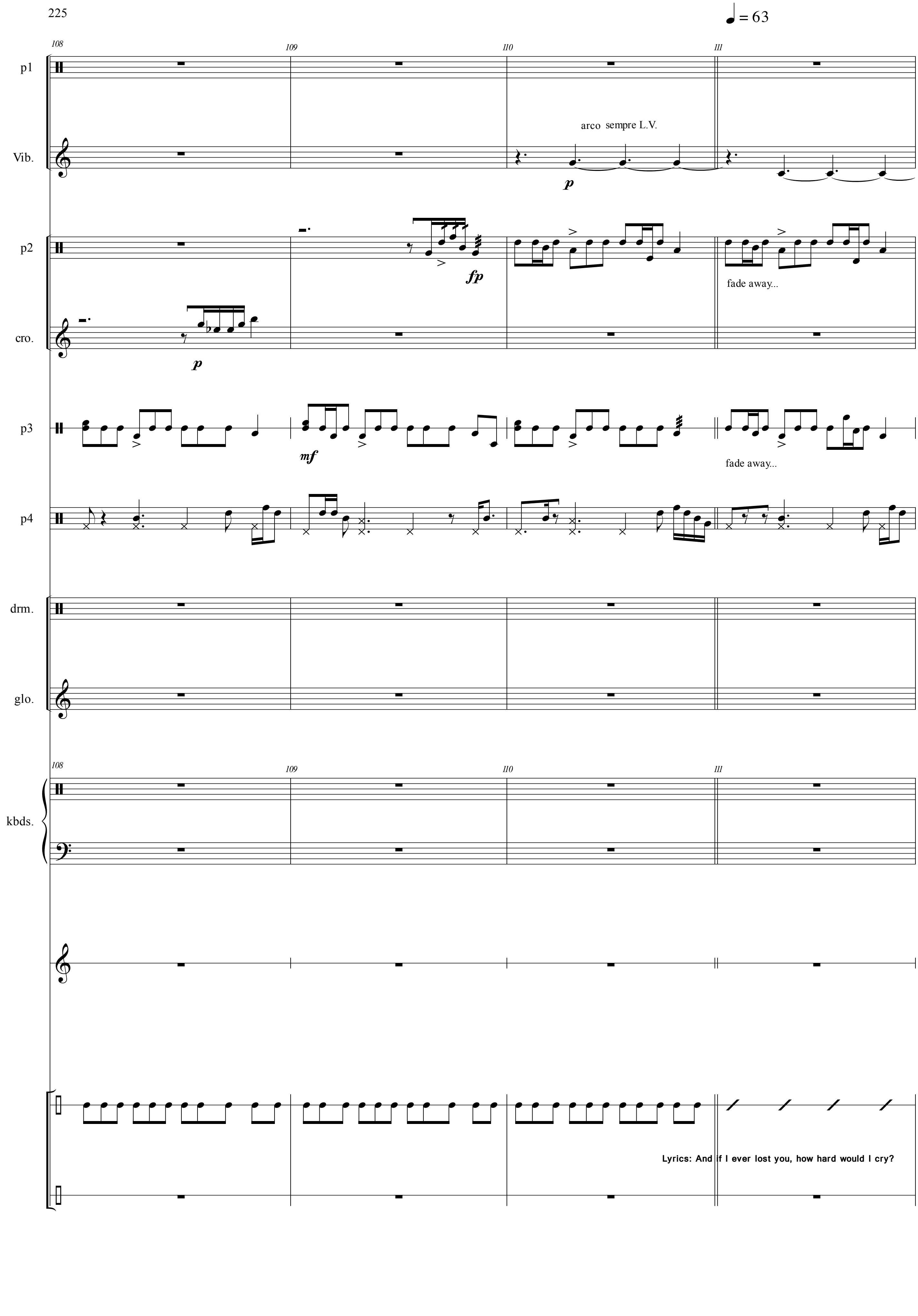
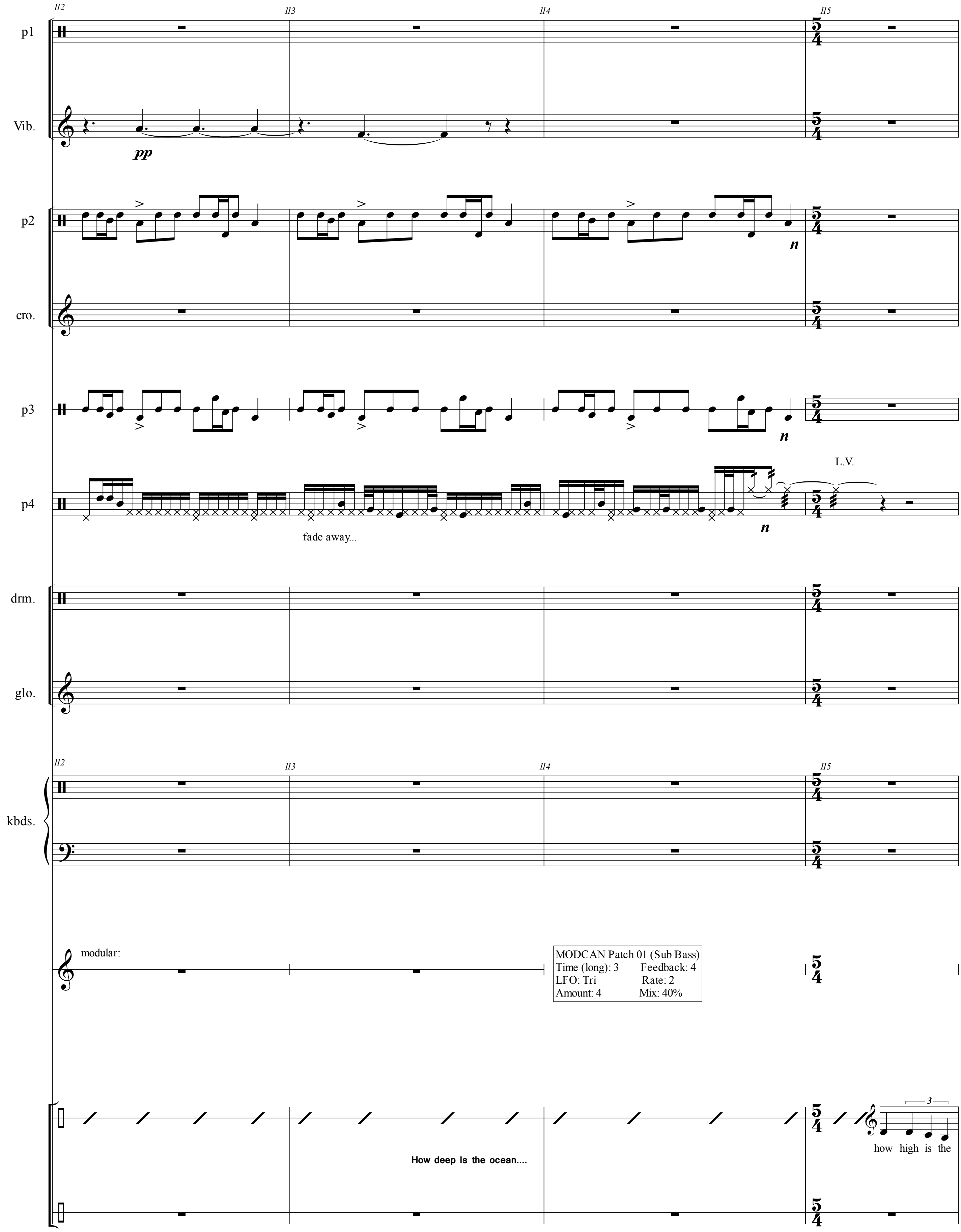
p1
Vib.
p2
L.V.
cro.
p3
p4
drm.
glo.
(hands)
rit. out of time:
kbds.
jazz:
sine tone:
love
you
like
a:

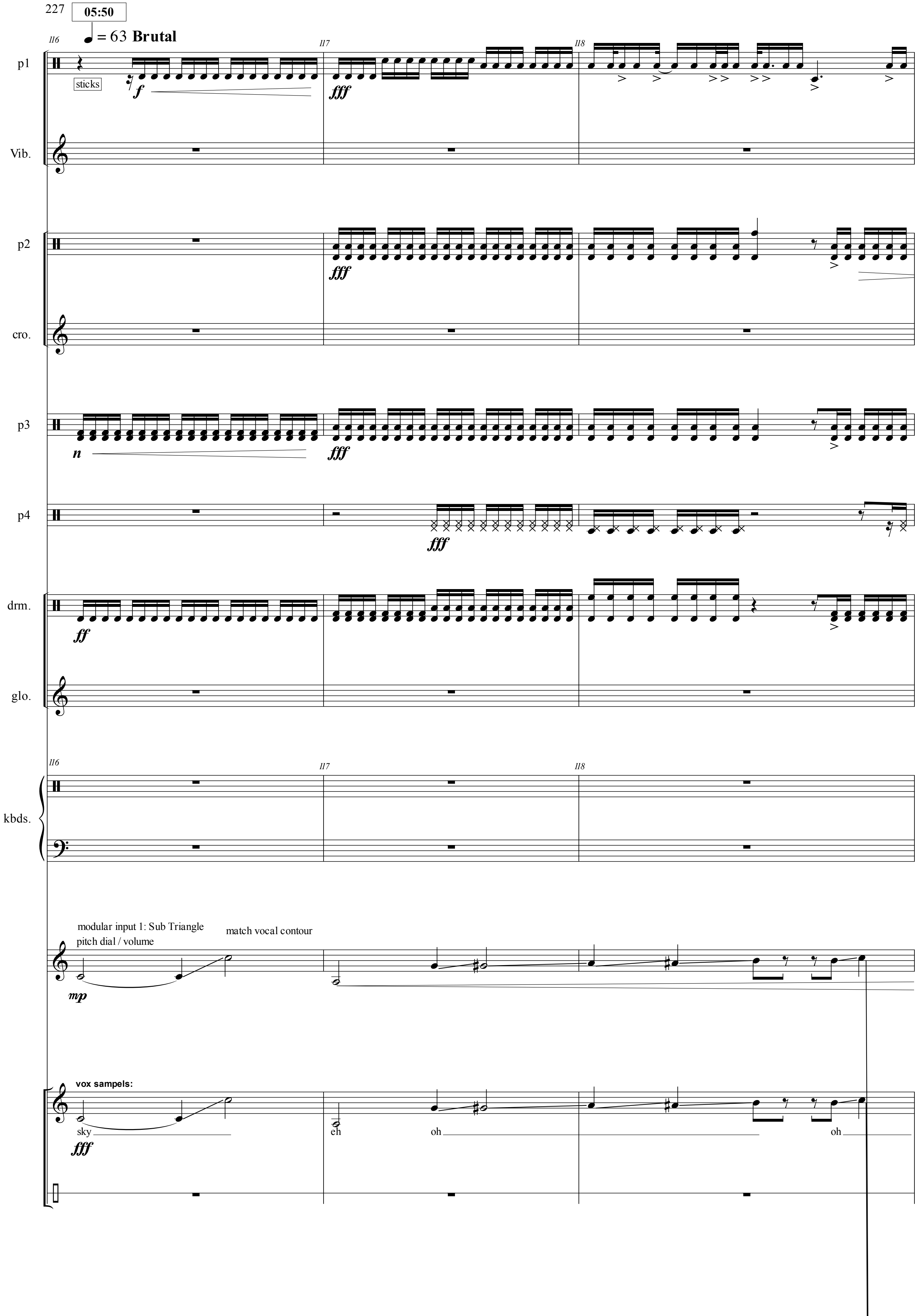

p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
89
90
91
92
brutal
fff
ffff
pp
ppp
fp
ff
mf
f
p
rit. out of time:
Senza ped.
kick/snare


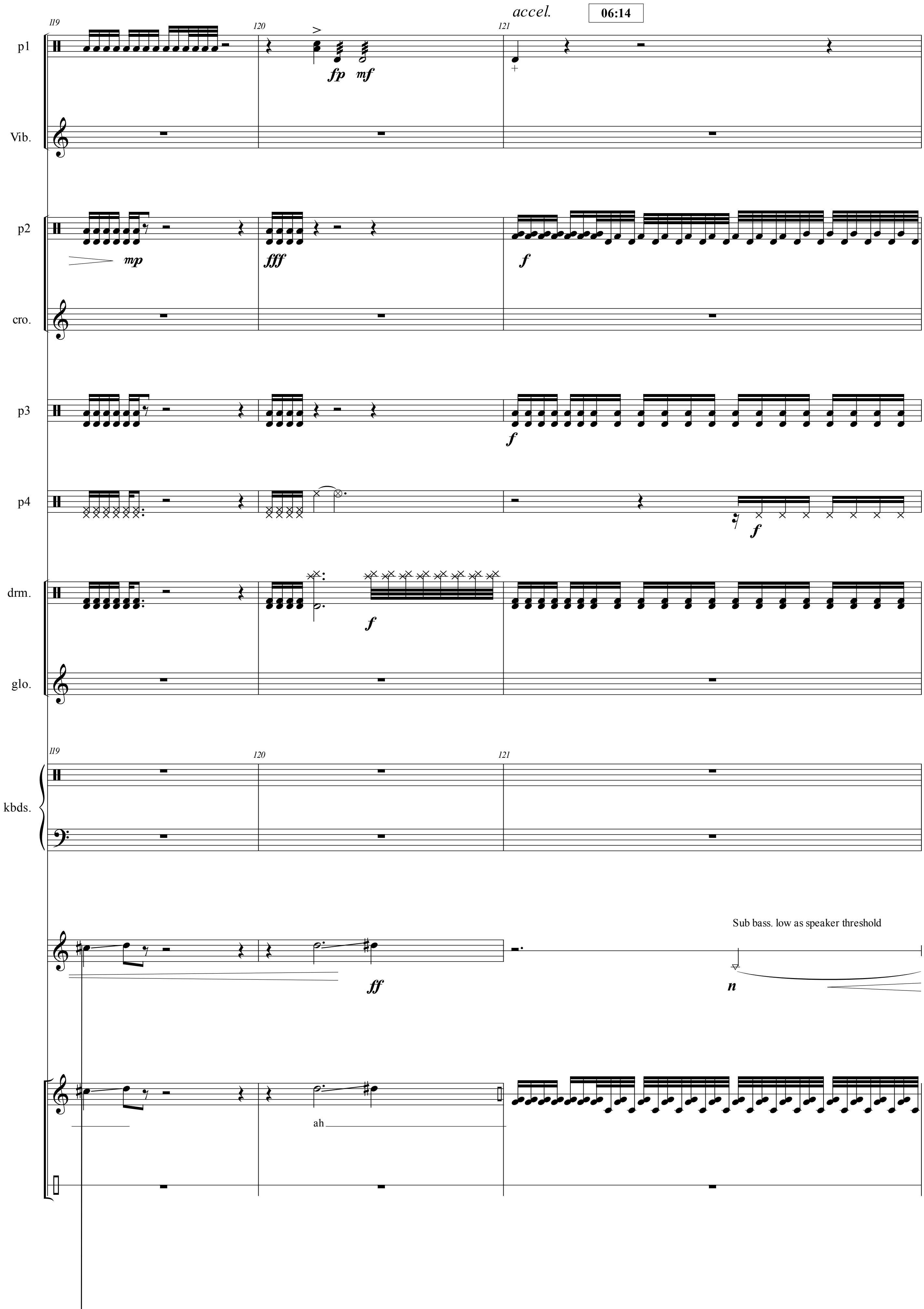
93
94
95
p1
leggiero
Vib.
p2
mf
leggiero
mp
cro.
p3
mp
leggiero
mp
p4
mp
drm.
ff
leggiero
pp
glo.
kbds.
mp
leggiero
bids
sing - ing a song
no - thing - but - blue - birds


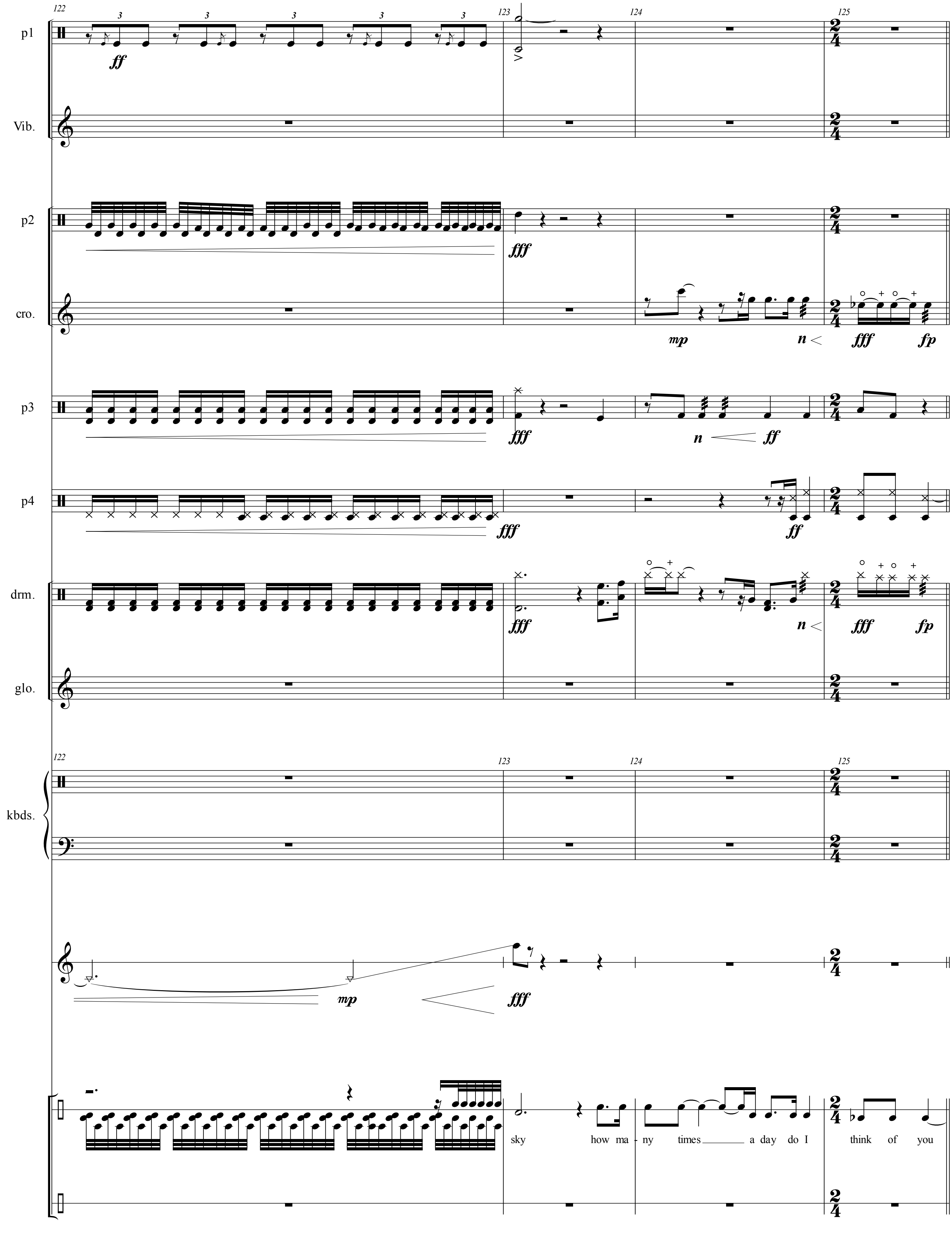
96
97
98
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
11/8
f
fp
mf
ff
patch: Sine E
birds
smi - ling - at me
no - thing - but - blue - birds


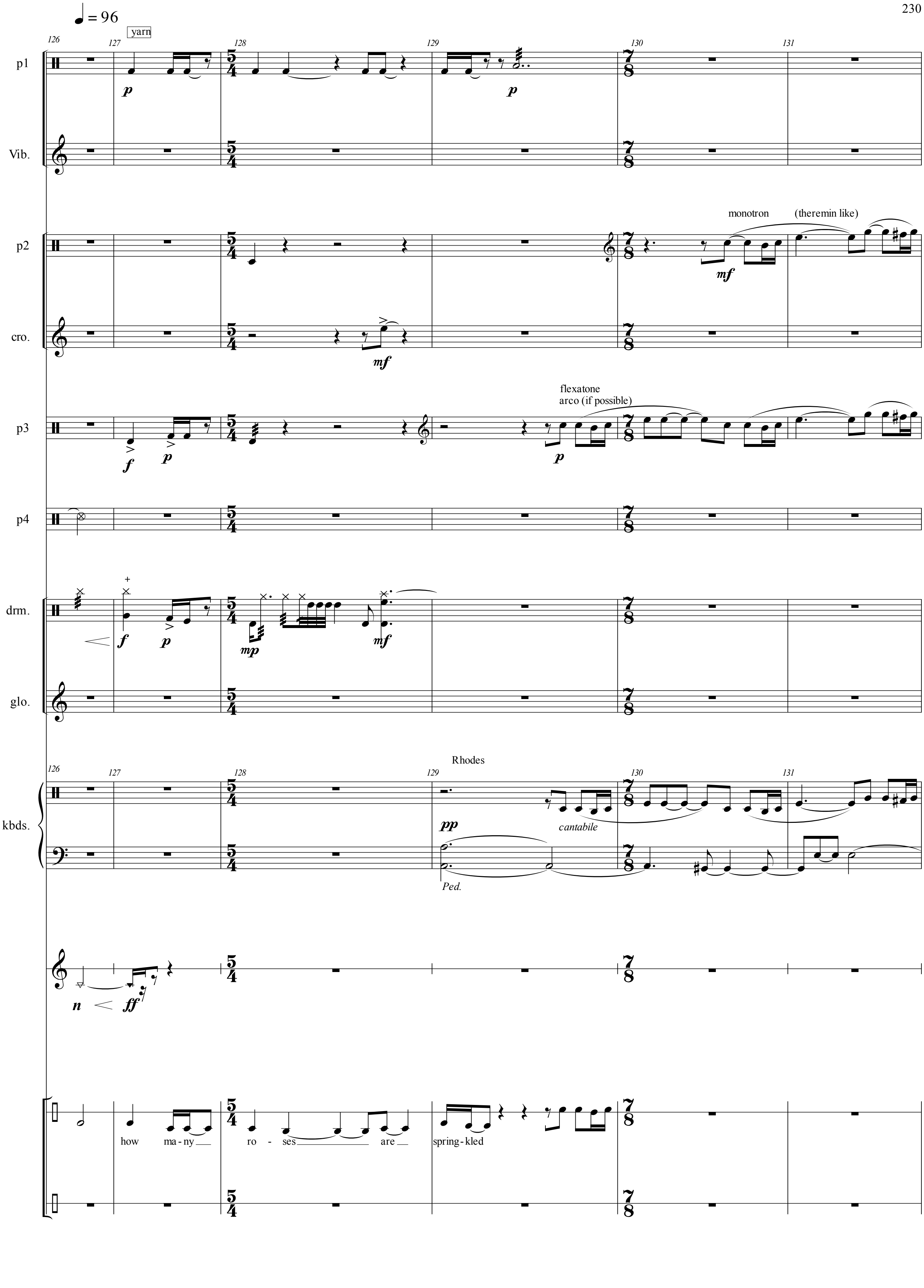
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
rattan mallet ends
L.V.
L.V.
Jazz samples:


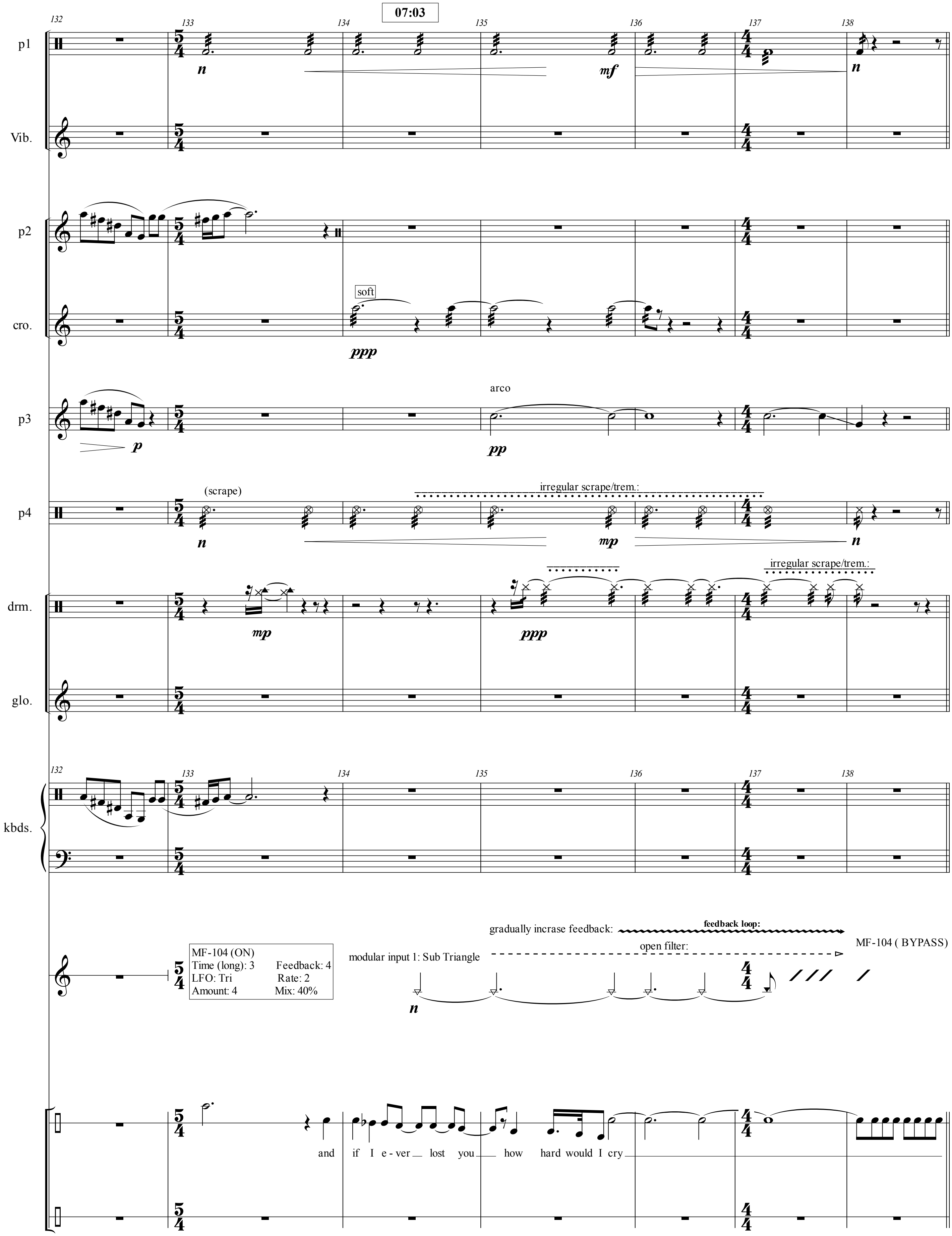
05:12
p1
Vib.
snap fingers: (along with jazz record)
p2
cro.
snap fingers: (along with jazz record)
ad lib. filter (interact with electronics)
p3
snap fingers: (along with jazz record)
p4
drm.
glo.
snap fingers: (along with jazz record)
kbds.
old record:
ro - ses - are
sprin - kled with dew
jazz:
old record:
woodblocks:

♩ = 63
108
109
110
111
p1
Vib.
arco sempre L.V.
p
p2
fp
fade away...
cro.
p
p3
mf
fade away...
p4
drm.
glo.
kbds.
Lyrics: And if I ever lost you, how hard would I cry?


112
113
114
115
p1
Vib.
pp
p2
n
cro.
p3
n
p4
fade away...
n
L.V.
drm.
glo.
kbds.
modular:
MODCAN Patch 01 (Sub Bass)
Time (long): 3 Feedback: 4
LFO: Tri Rate: 2
Amount: 4 Mix: 40%
How deep is the ocean....
how high is the


05:50
= 63 Brutal
116
117
118
p1
sticks
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
modular input 1: Sub Triangle
pitch dial / volume
match vocal contour
vox sampels:
sky
eh
oh
oh


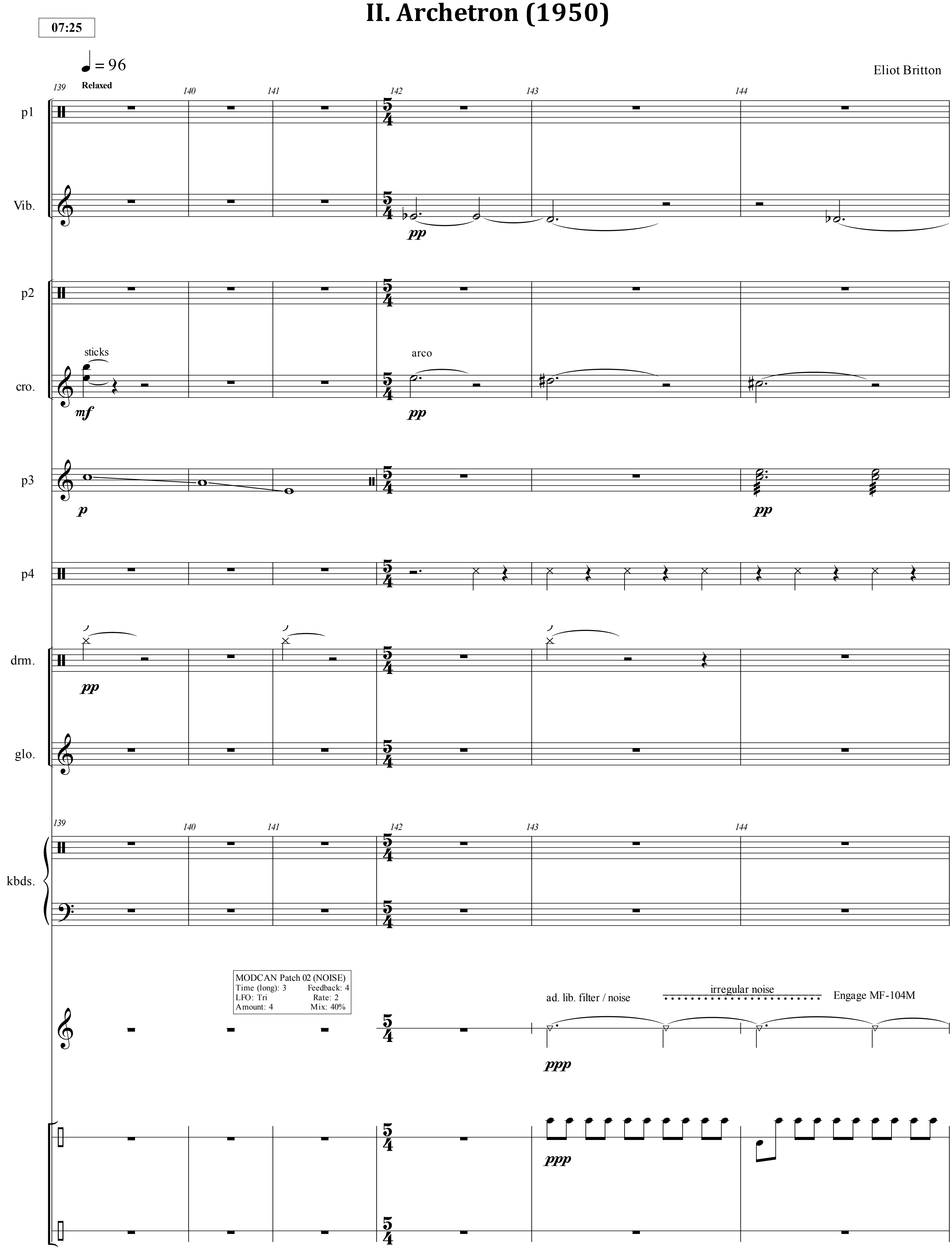
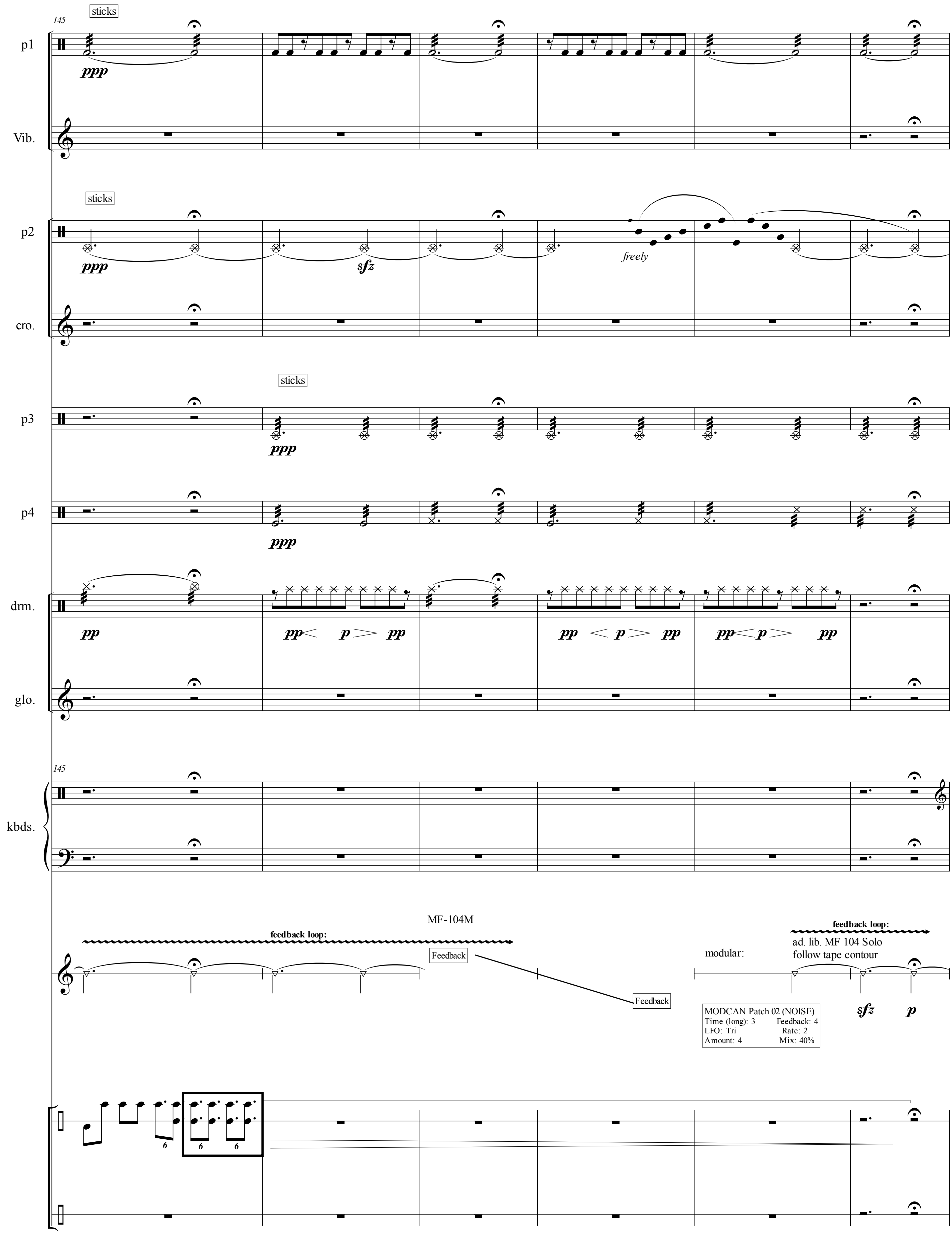
accel.
06:14
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
Sub bass. low as speaker threshold
ah


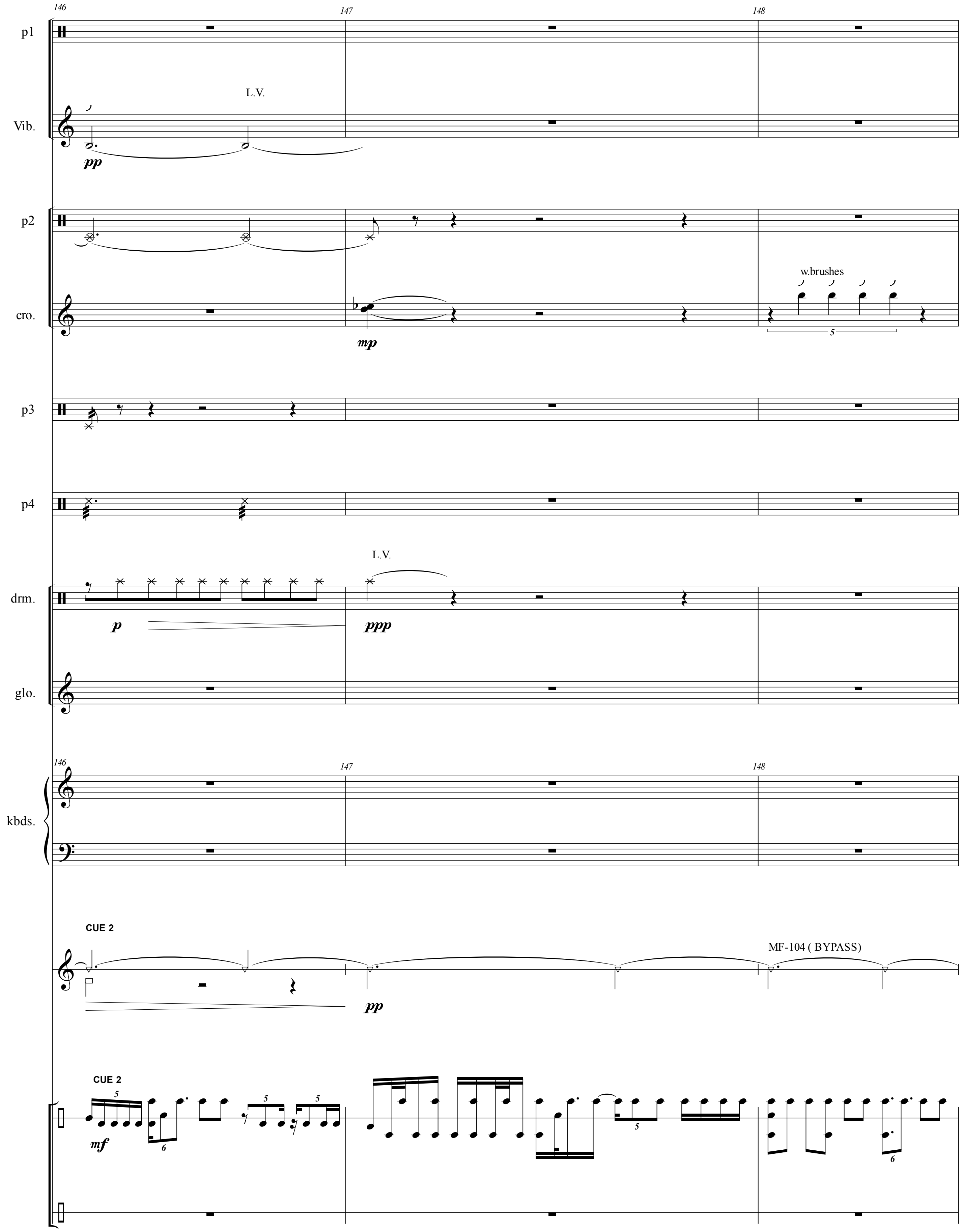
122
123
124
125
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
ff
fff
mp
n
fp
sky how ma - ny times a day do I think of you


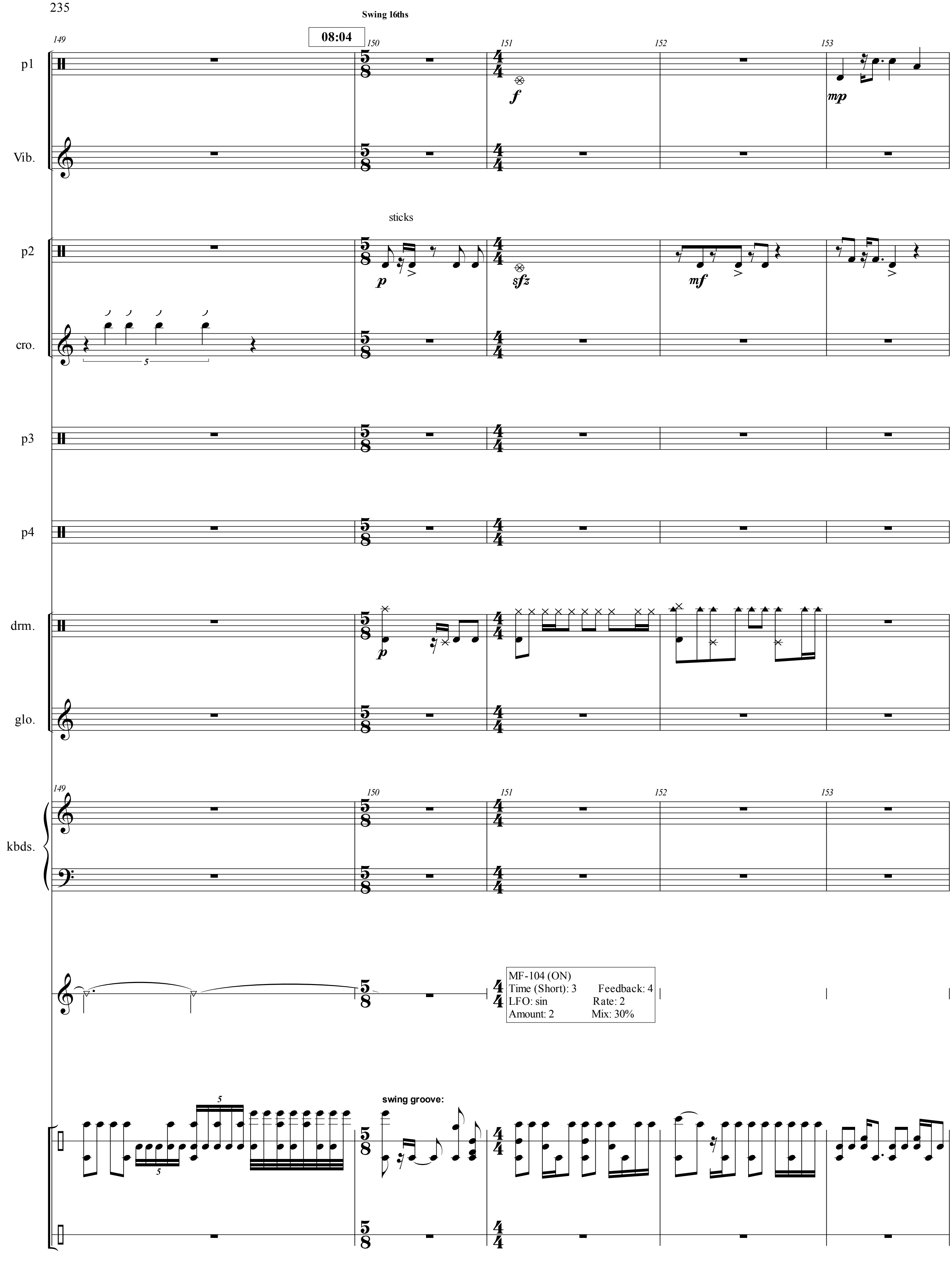
♩ = 96
yarn
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
monotron
(theremin like)
flexatone
arco (if possible)
Rhodes
cantabile
Ped.
how ma - ny ro - ses are spring - kled


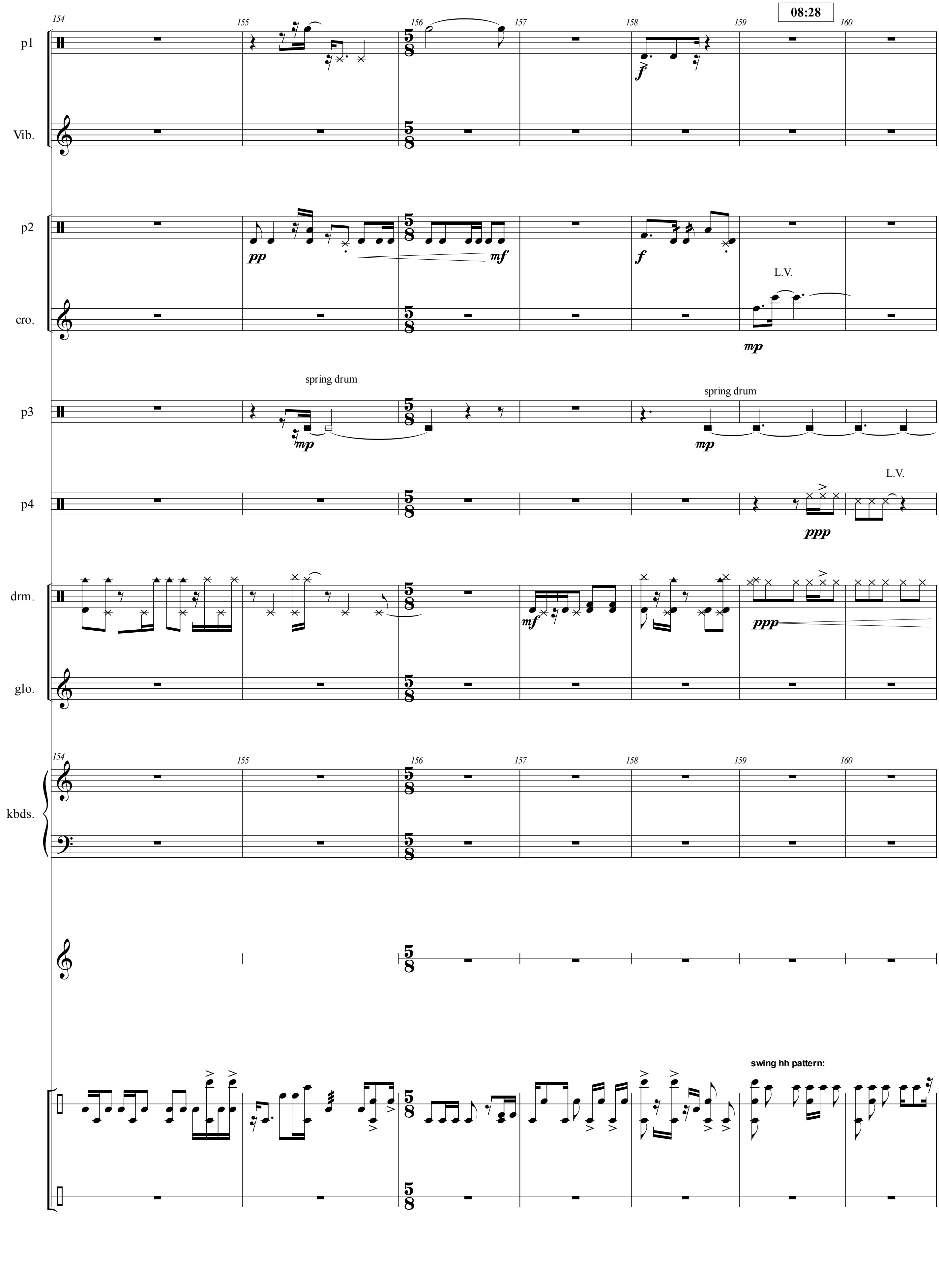
07:03
p1
Vib.
p2
cro.
soft
p3
arco
p4
(scrape)
irregular scrape/trem.:
drm.
irregular scrape/trem.:
glo.
kbds.
MF-104 (ON)
Time (long): 3
Feedback: 4
LFO: Tri
Rate: 2
Amount: 4
Mix: 40%
modular input 1: Sub Triangle
gradually incrase feedback:
feedback loop:
open filter:
MF-104 (BYPASS)
and if I e-ver lost you how hard would I cry

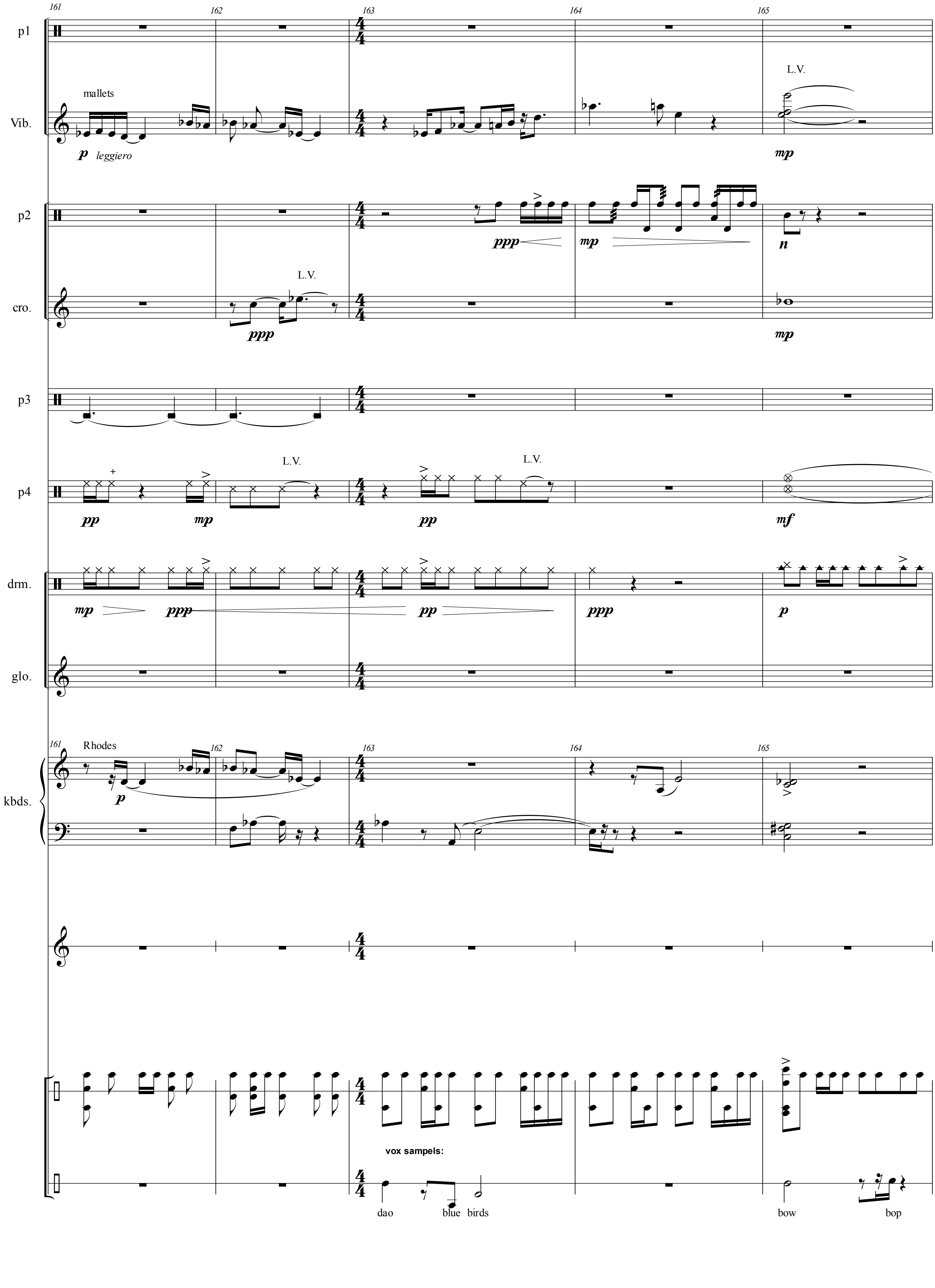
II. Archetron (1950)

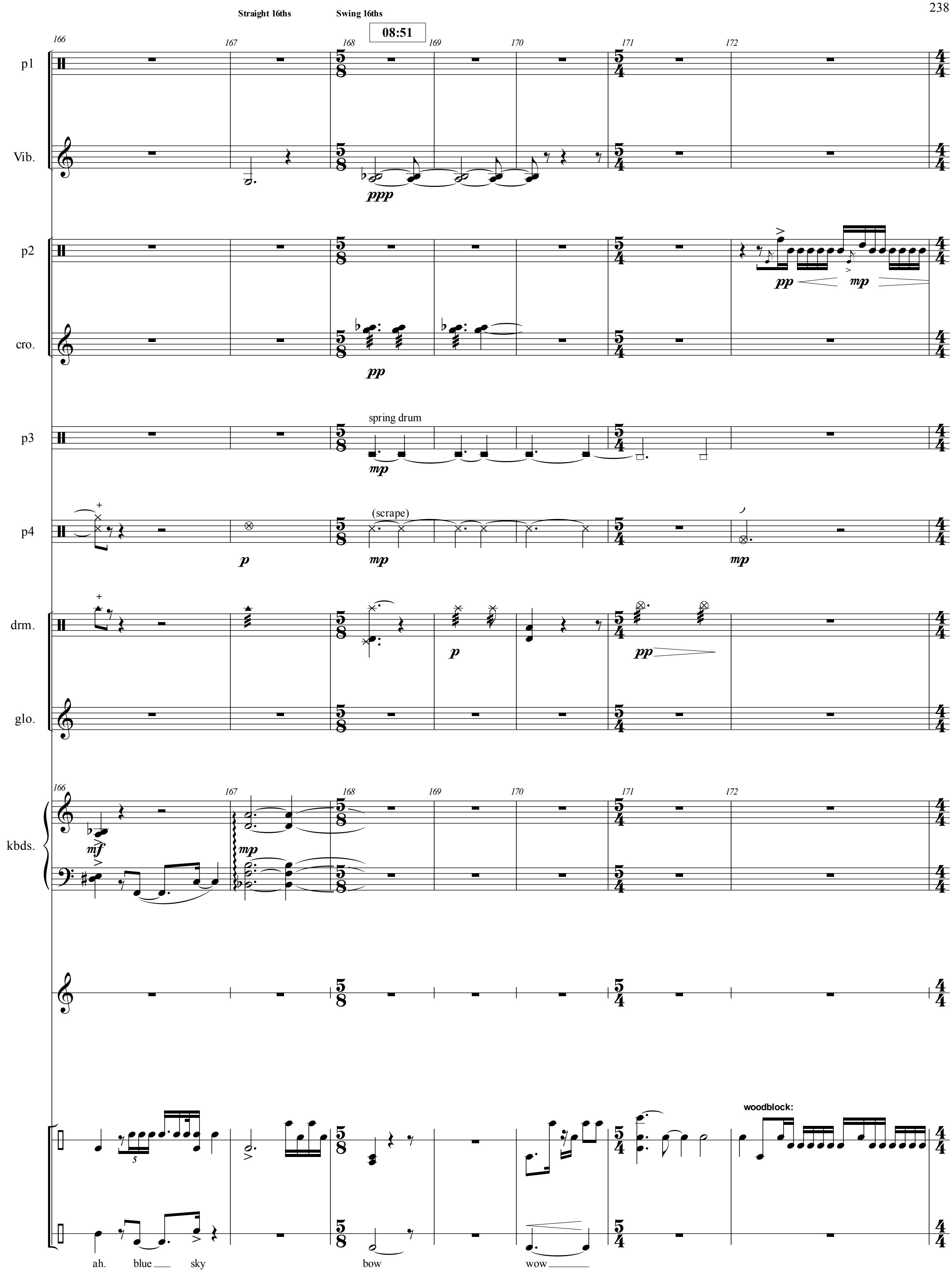
Eliot Britton


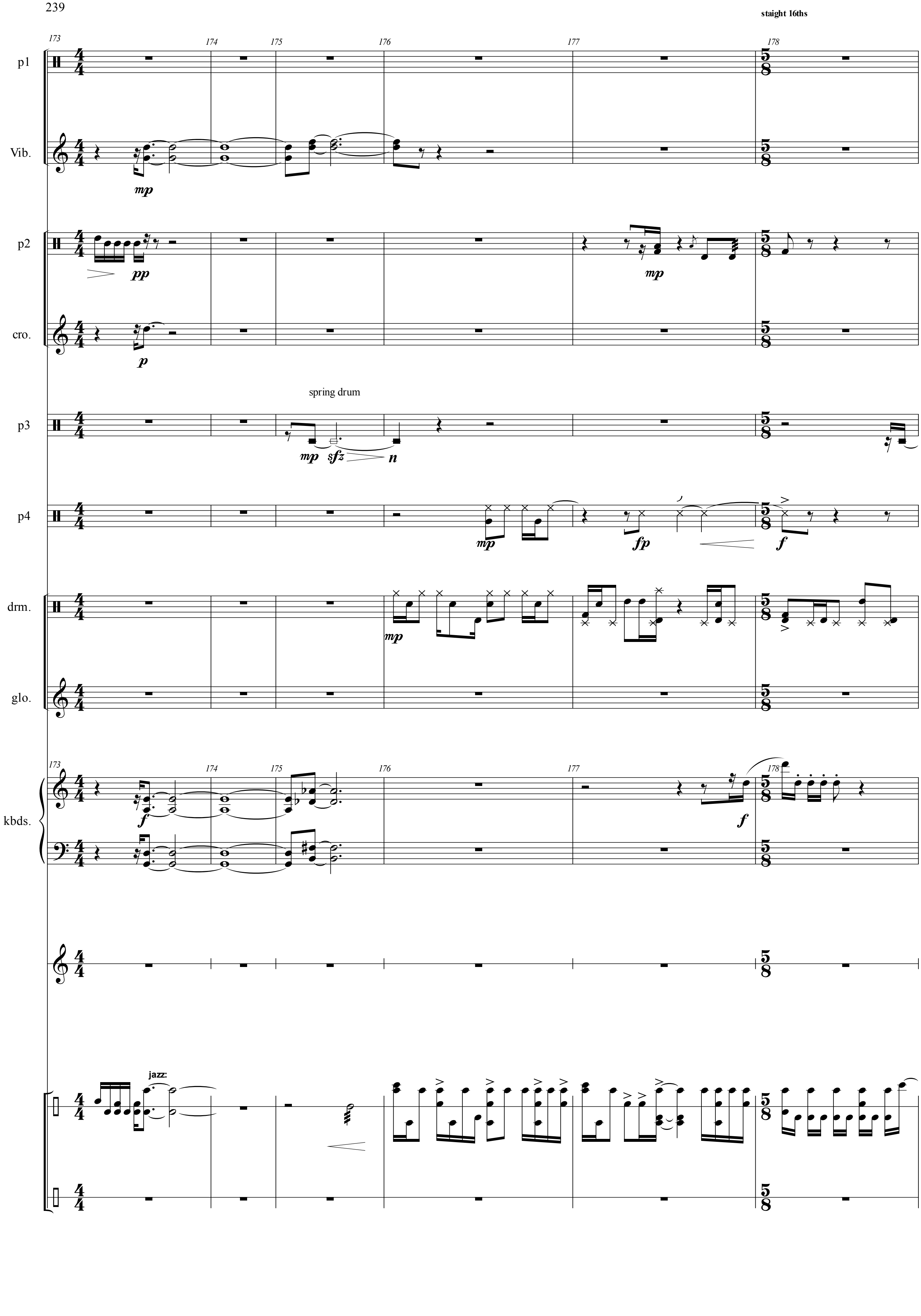
sticks
145
p1
ppp
Vib.
sticks
p2
ppp
sfz
freely
cro.
sticks
p3
ppp
p4
ppp
drm.
pp
pp
p
pp
pp
p
pp
pp
p
pp
glo.
145
kbds.
MF-104M
feedback loop:
Feedback
Feedback
modular:
feedback loop:
ad. lib. MF 104 Solo
follow tape contour
MODCAN Patch 02 (NOISE)
Time (long): 3
Feedback: 4
LFO: Tri
Rate: 2
Amount: 4
Mix: 40%
sfz
p
6
6
6


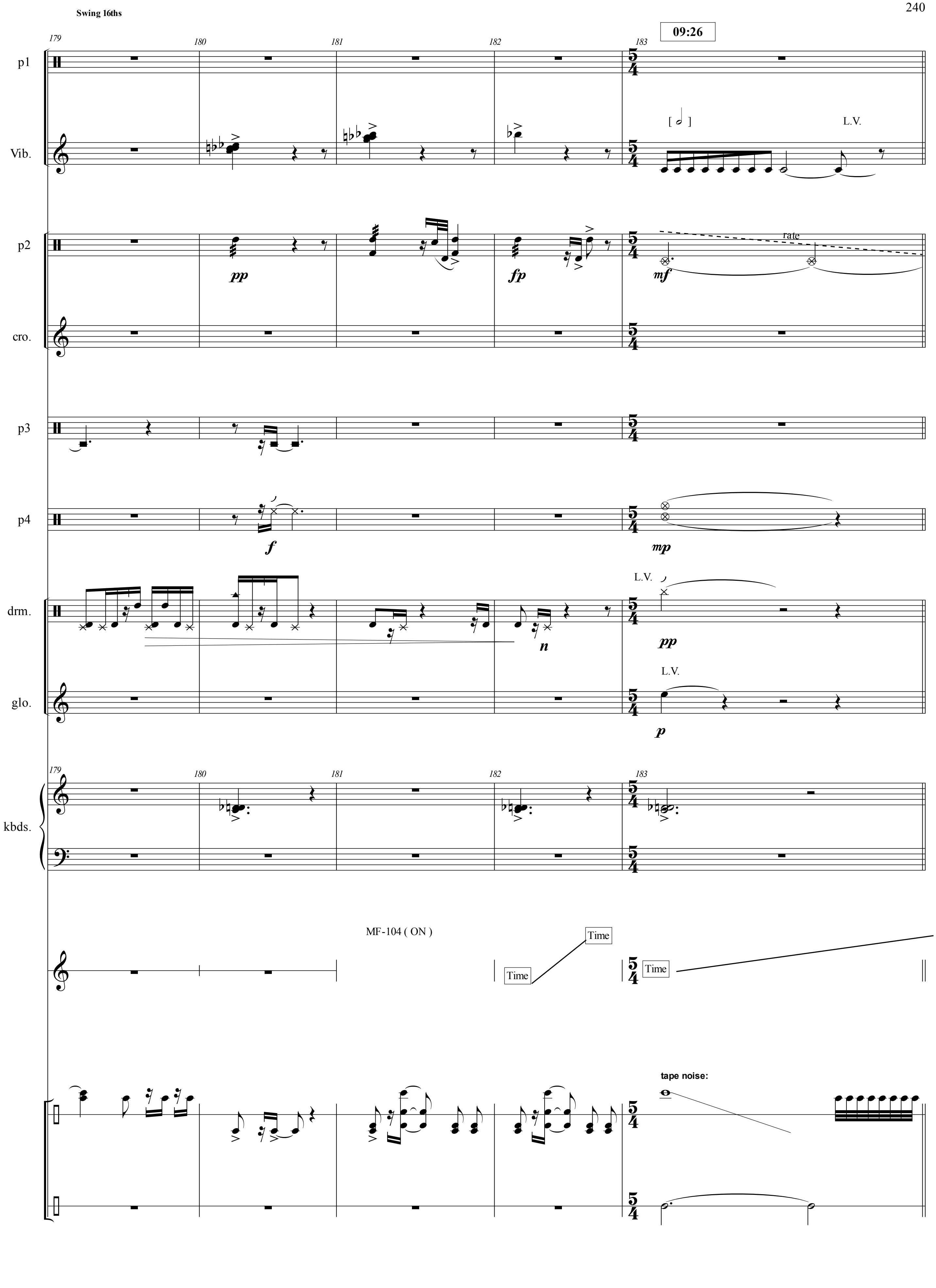
146
147
148
p1
L.V.
Vib.
pp
p2
w.brushes
cro.
mp
5
p3
p4
L.V.
drm.
p
ppp
glo.
kbds.
CUE 2
MF-104 (BYPASS)
pp
CUE 2
mf
5
6


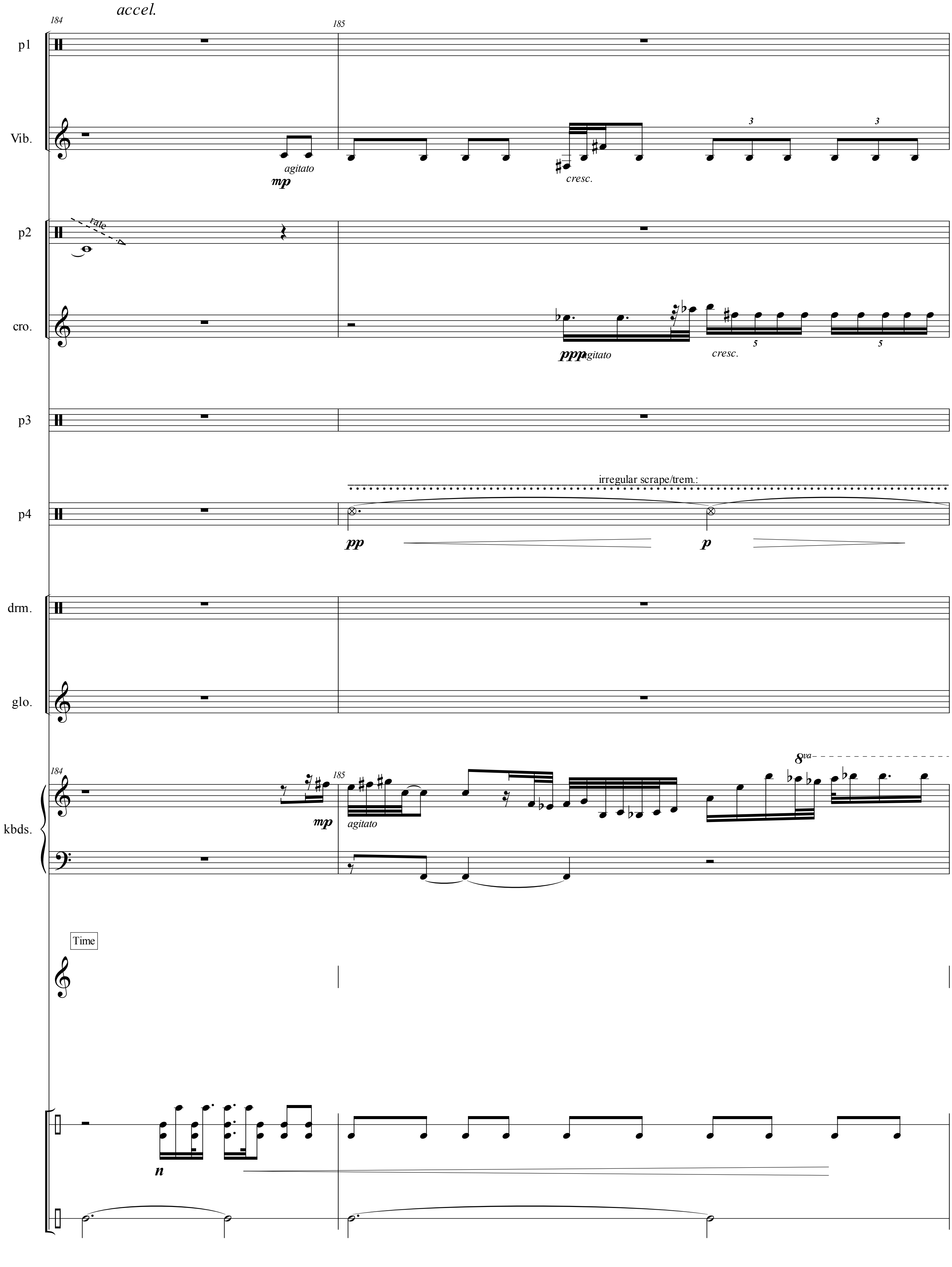
Swing 16ths
08:04
149
150
151
152
153
p1
Vib.
sticks
p2
cro.
p3
p4
drm.
glo.
kbds.
MF-104 (ON)
Time (Short): 3
Feedback: 4
LFO: sin
Rate: 2
Amount: 2
Mix: 30%
swing groove:


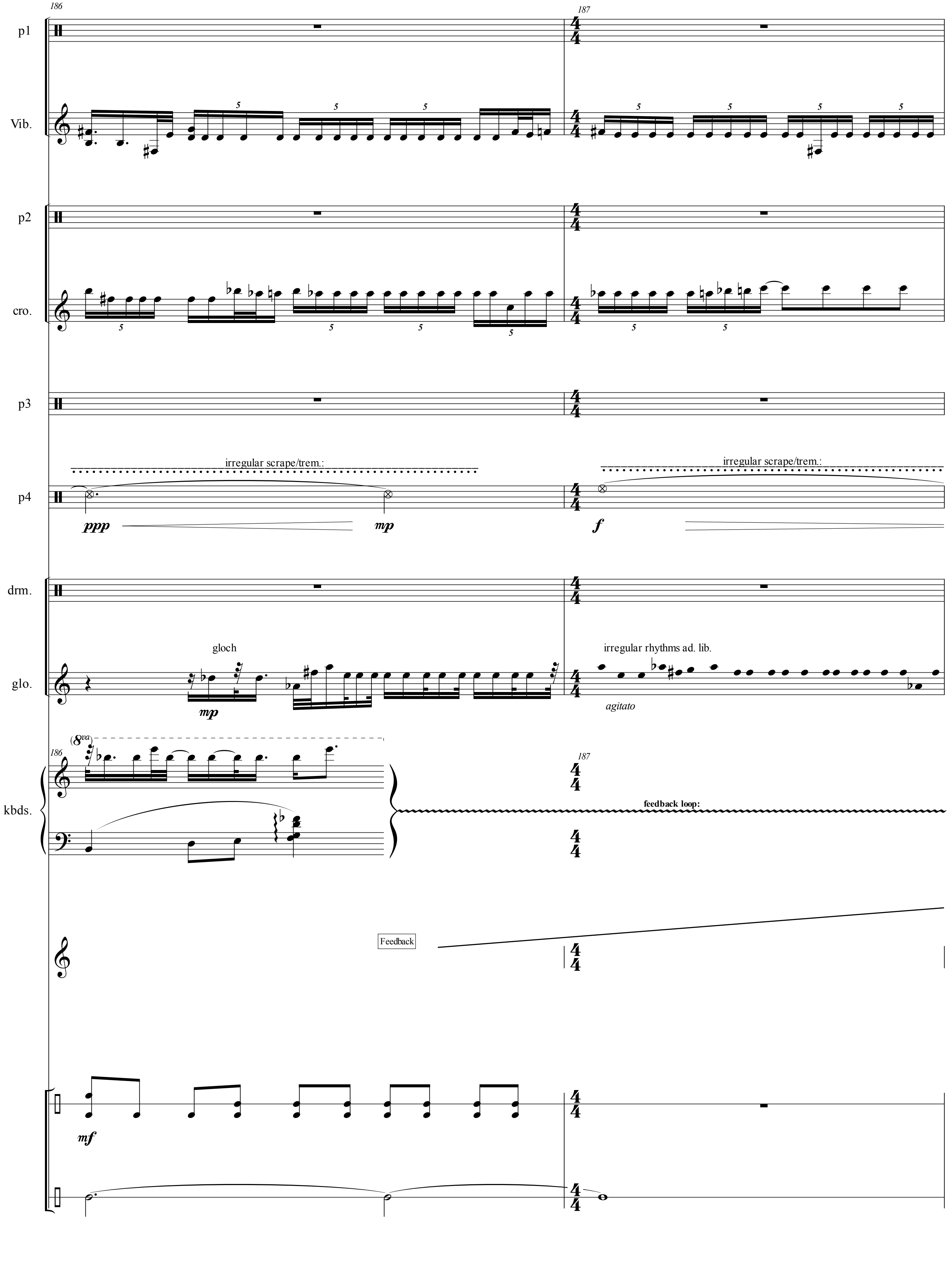
08:28
154
155
156
157
158
159
160
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
pp
mf
f
L.V.
mp
spring drum
mp
spring drum
mp
L.V.
ppp
mf
ppp
swing hh pattern:


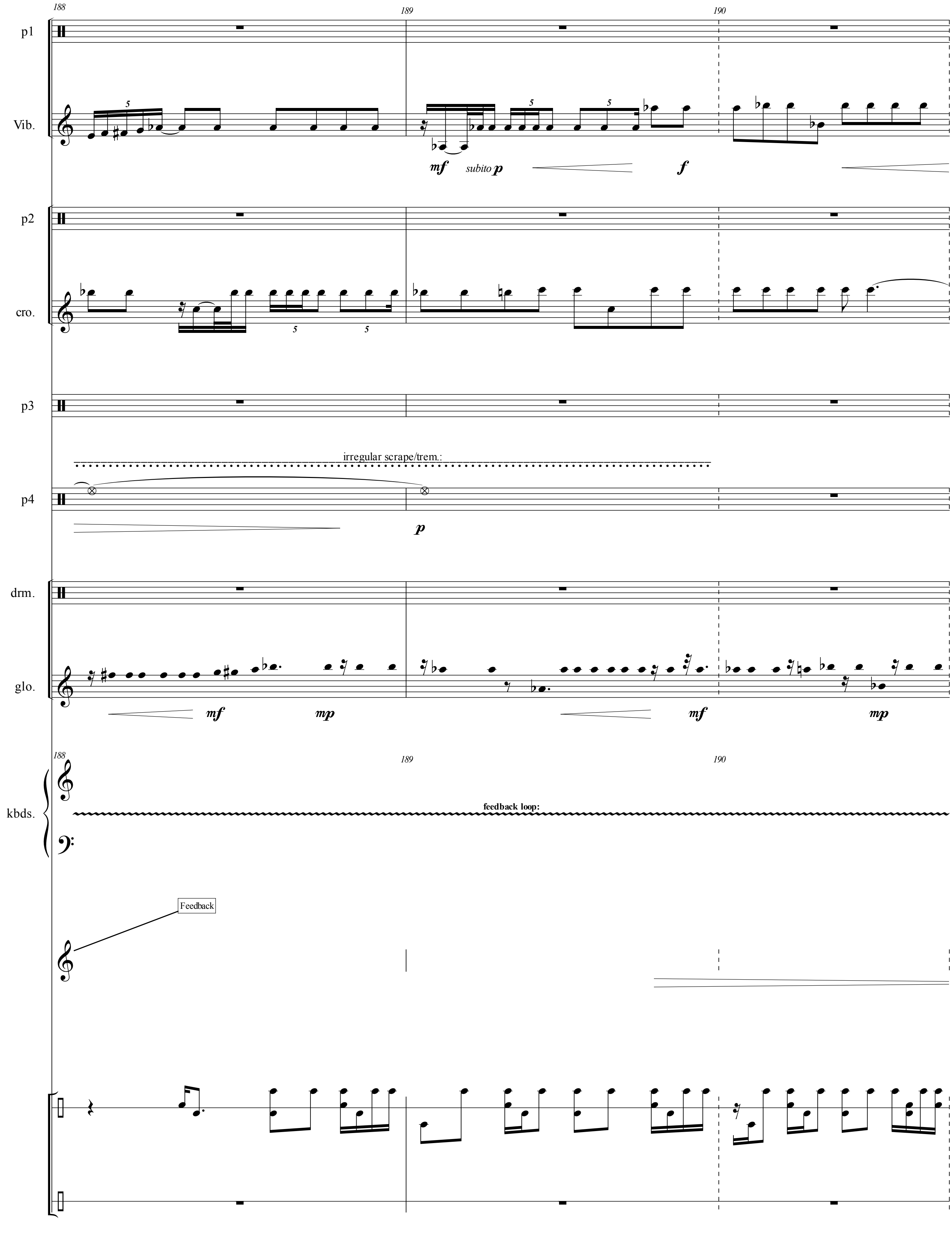
161
162
163
164
165
p1
mallets
Vib.
p
leggiero
L.V.
mp
p2
ppp
mp
n
L.V.
cro.
ppp
mp
p3
L.V.
p4
pp
mp
L.V.
pp
mf
drm.
mp
ppp
pp
ppp
p
glo.
Rhodes
kbds.
p
vox sampels:
dao
blue
birds
bow
bop


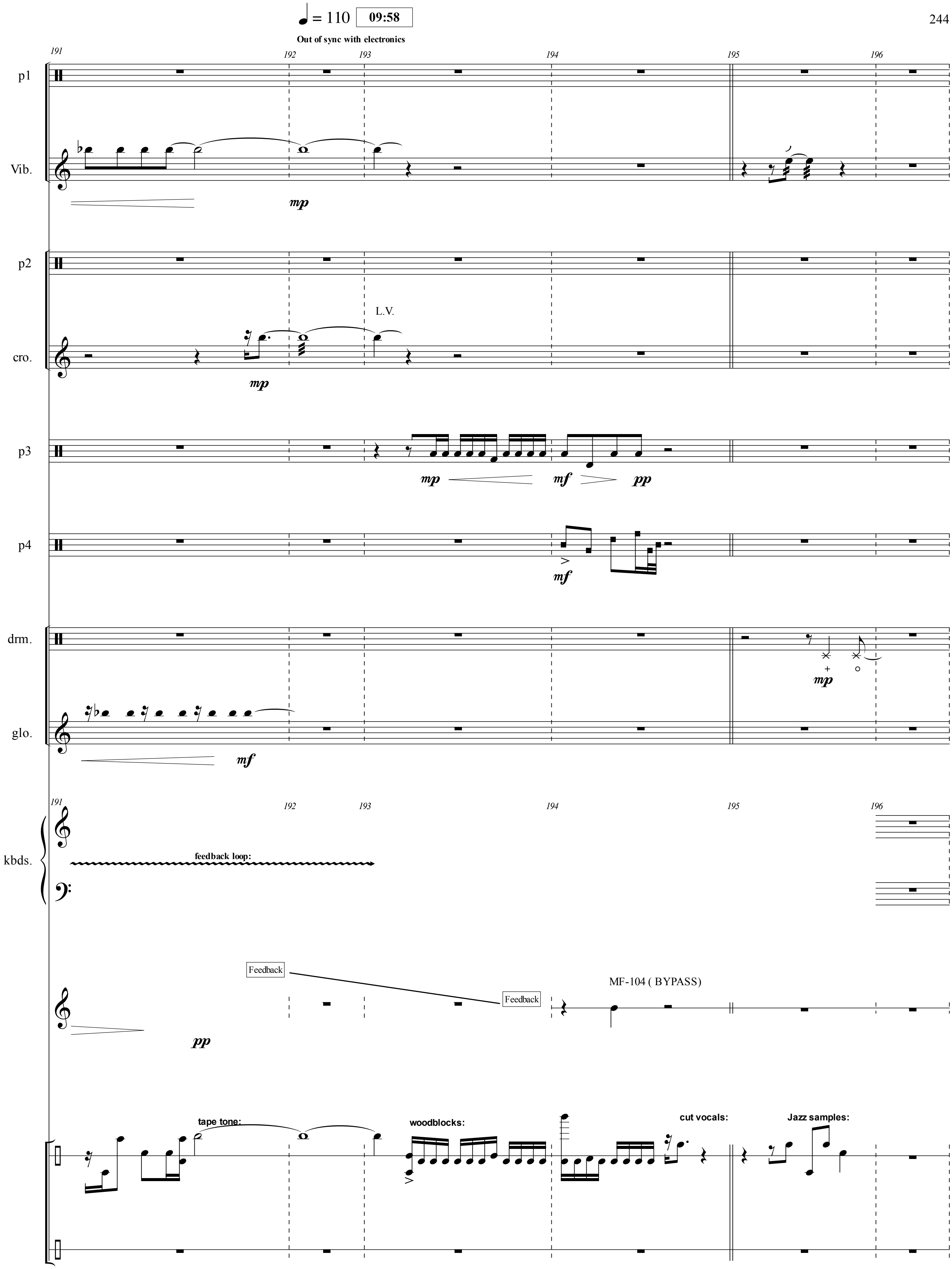
Straight 16ths
Swing 16ths
08:51
p1
Vib.
p2
cro.
p3
spring drum
p4
(scrape)
drm.
glo.
kbds.
woodblock:
ah. blue sky
bow
wow


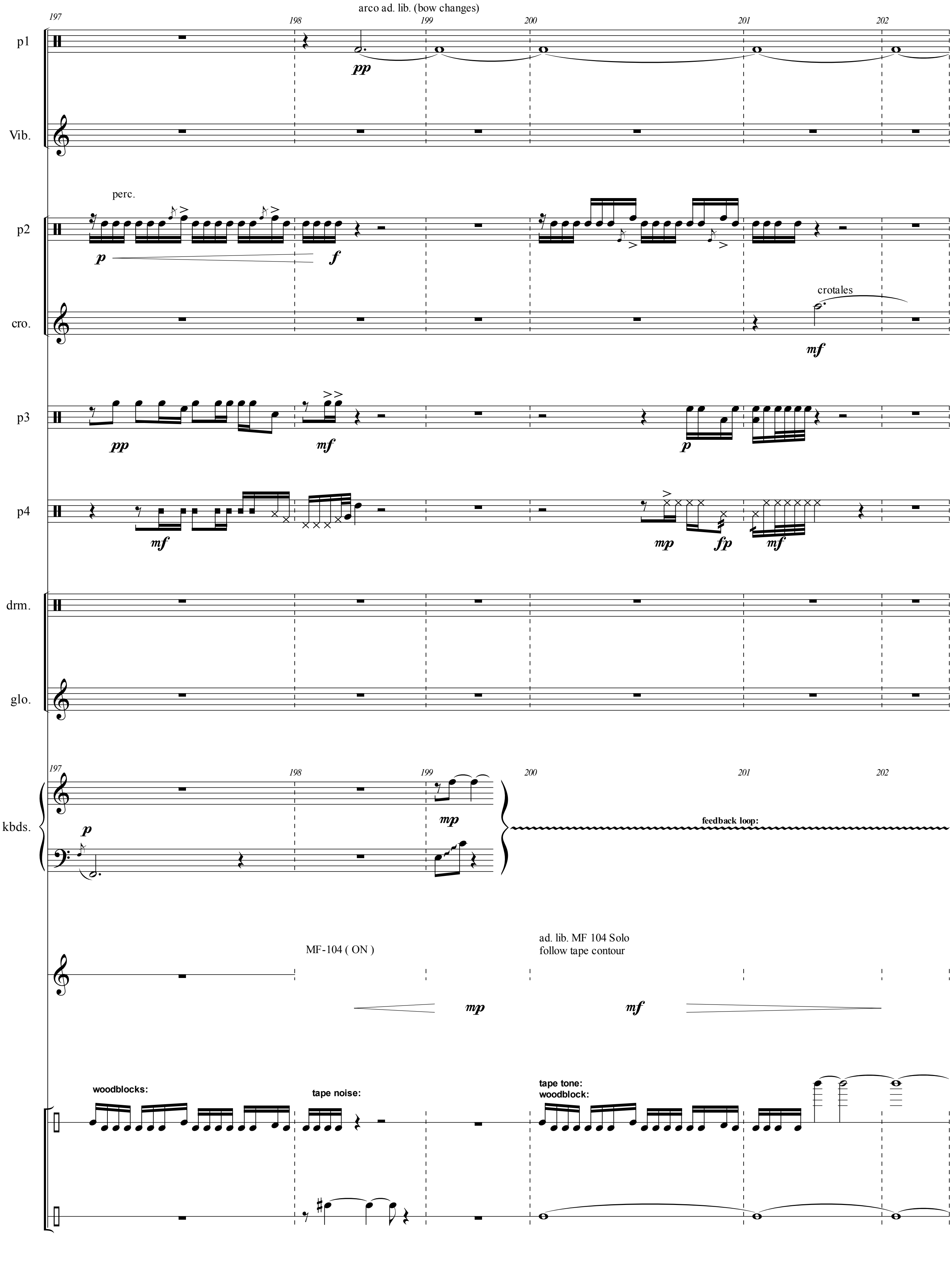
staight 16ths
p1
Vib.
p2
cro.
spring drum
p3
p4
drm.
glo.
kbds.
jazz:


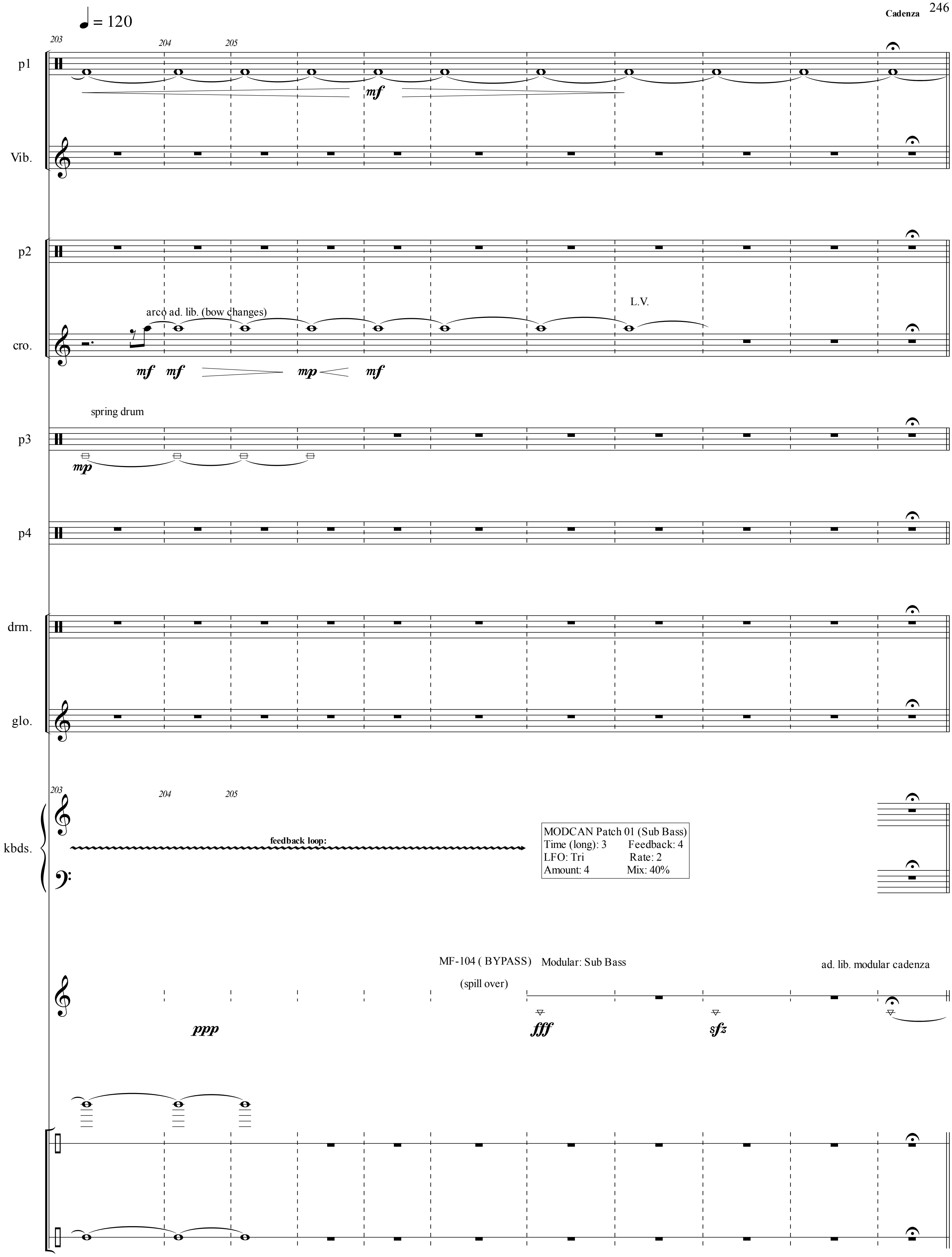
Swing 16ths
09:26
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
[𝅗𝅥]
L.V.
rate
L.V.
L.V.
MF-104 (ON)
Time
Time
Time
tape noise:
pp
fp
mf
f
mp
pp
n
p


accel.
184
185
p1
Vib.
3
3
agitato
mp
cresc.
p2
rate
cro.
ppp
agitato
cresc.
5
5
p3
irregular scrape/trem.:
p4
pp
p
drm.
glo.
8va
kbds.
mp
agitato
Time
n


186
187
p1
Vib.
p2
cro.
p3
irregular scrape/trem.:
p4
ppp
mp
f
drm.
gloch
irregular rhythms ad. lib.
glo.
agitato
(8va)
kbds.
feedback loop:
Feedback
mf


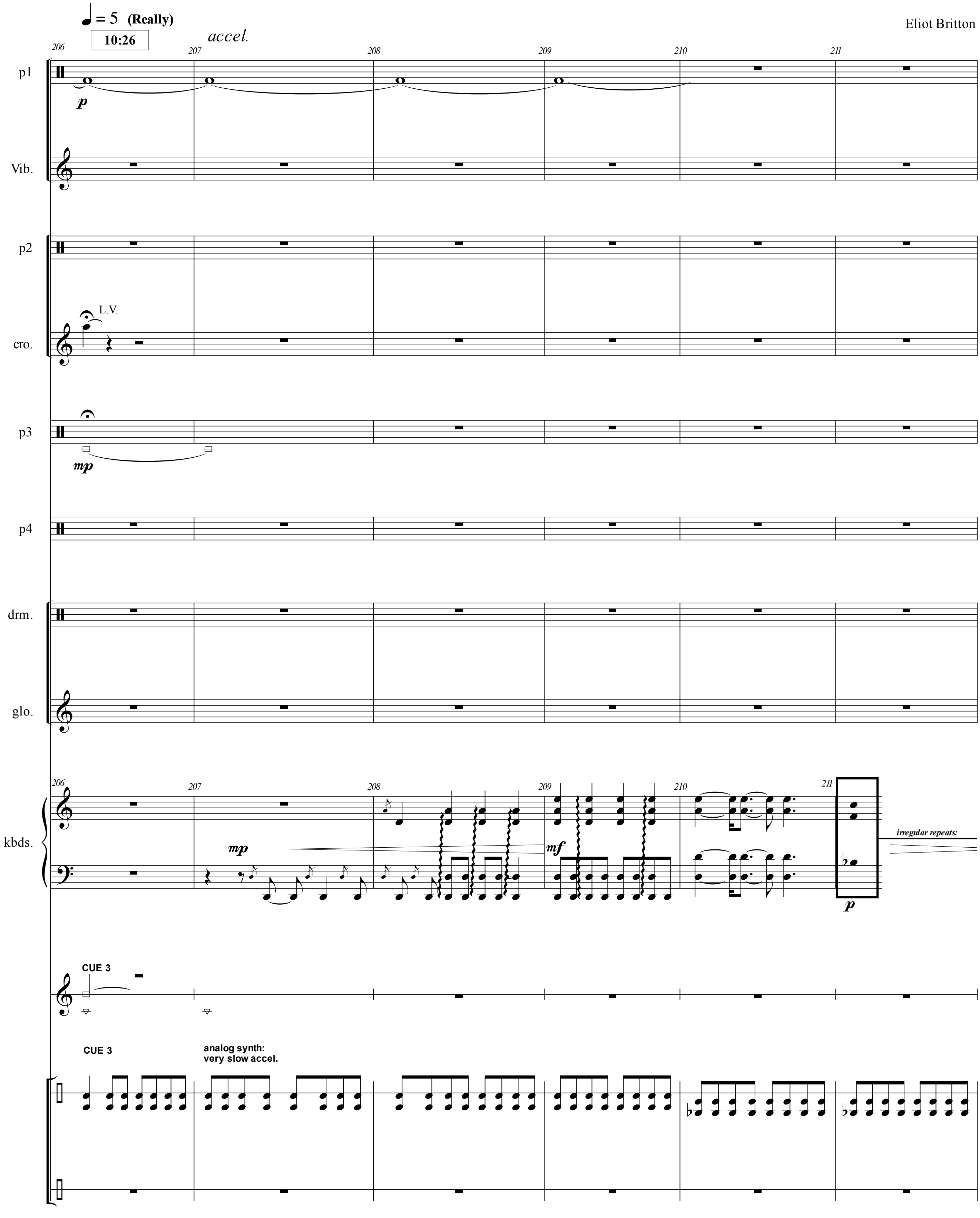
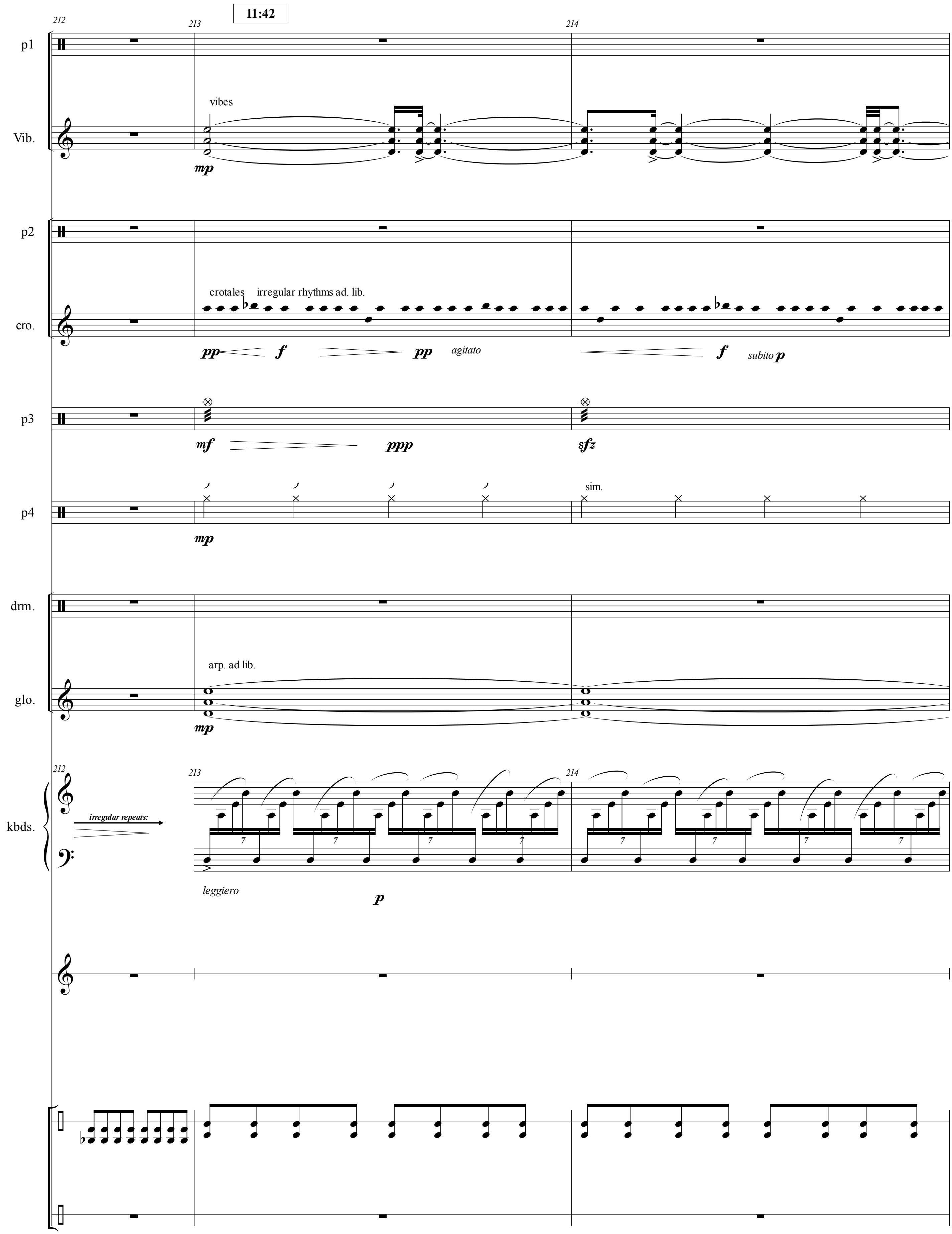
188
189
190
p1
Vib.
5
mf
subito p
f
p2
cro.
p3
irregular scrape/trem.:
p4
p
drm.
glo.
mf
mp
kbds.
feedback loop:
Feedback


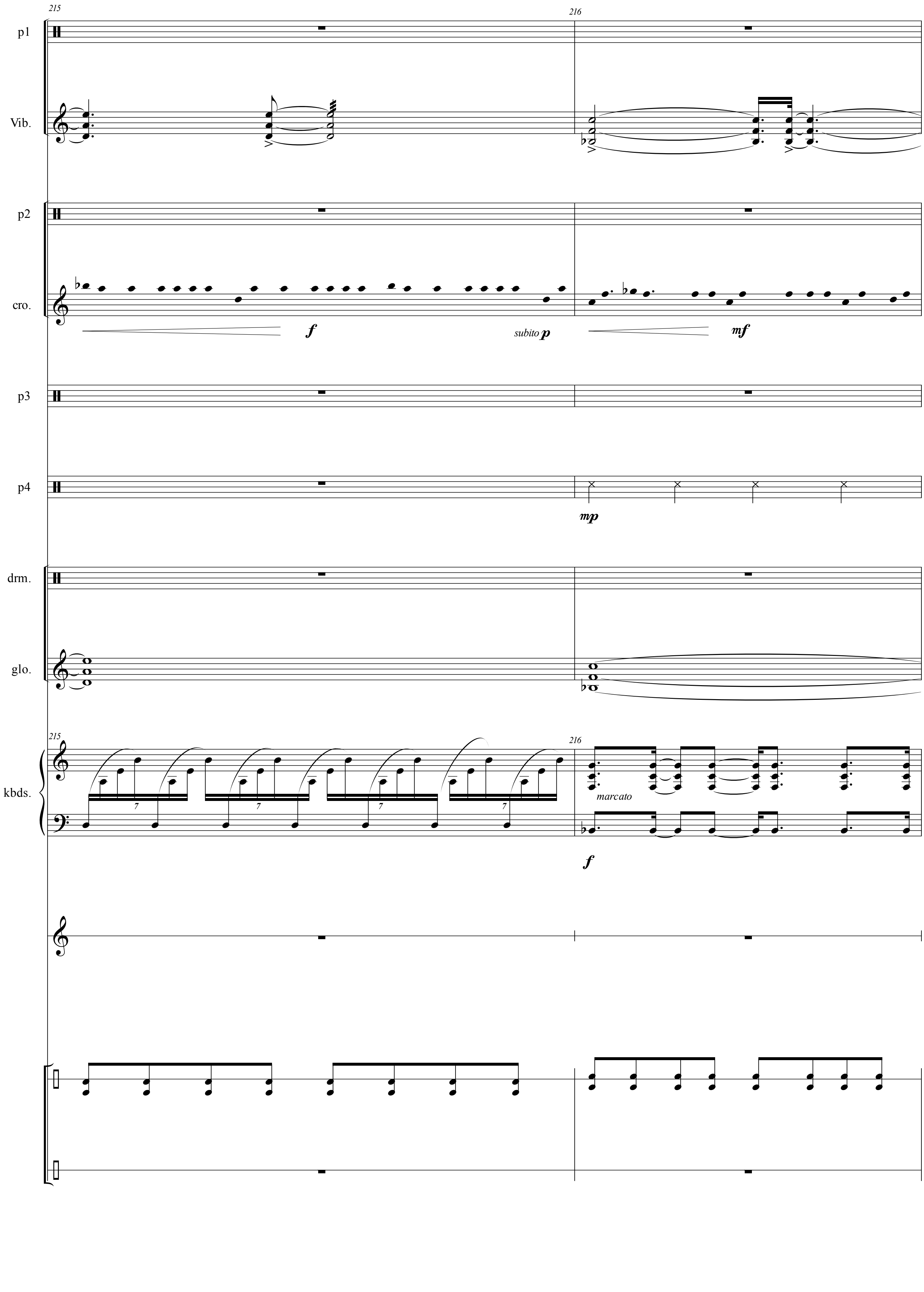
♩ = 110
09:58
Out of sync with electronics
191
192
193
194
195
196
p1
Vib.
mp
p2
L.V.
cro.
mp
p3
mp
mf
pp
p4
mf
drm.
mp
glo.
mf
kbds.
feedback loop:
Feedback
Feedback
MF-104 (BYPASS)
pp
tape tone:
woodblocks:
cut vocals:
Jazz samples:


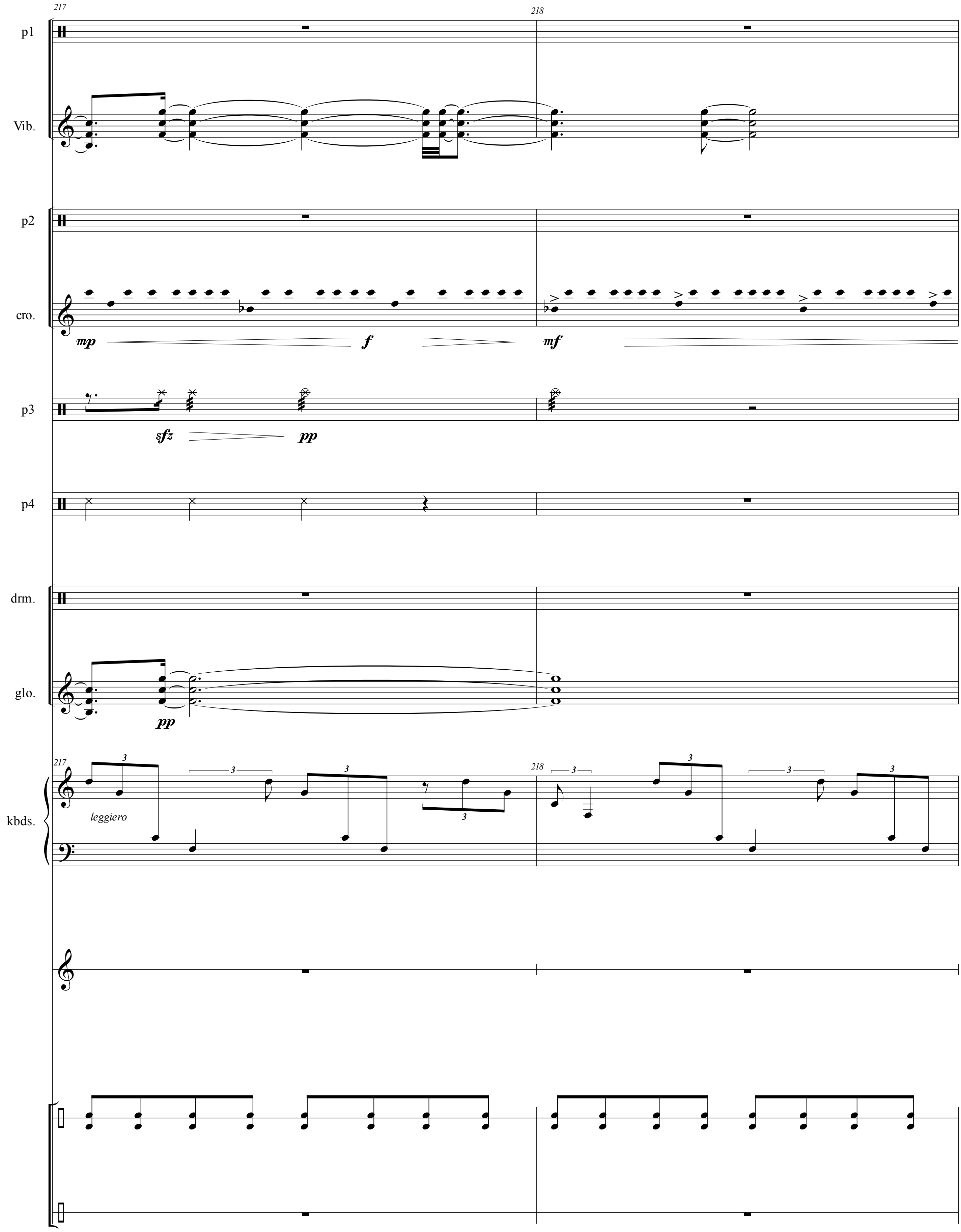
arco ad. lib. (bow changes)
197
198
199
200
201
202
p1
pp
Vib.
perc.
p2
p
f
crotales
cro.
mf
p3
pp
mf
p
p4
mf
mp
fp
mf
drm.
glo.
kbds.
p
mp
feedback loop:
MF-104 (ON)
ad. lib. MF 104 Solo
follow tape contour
mp
mf
woodblocks:
tape noise:
tape tone:
woodblock:


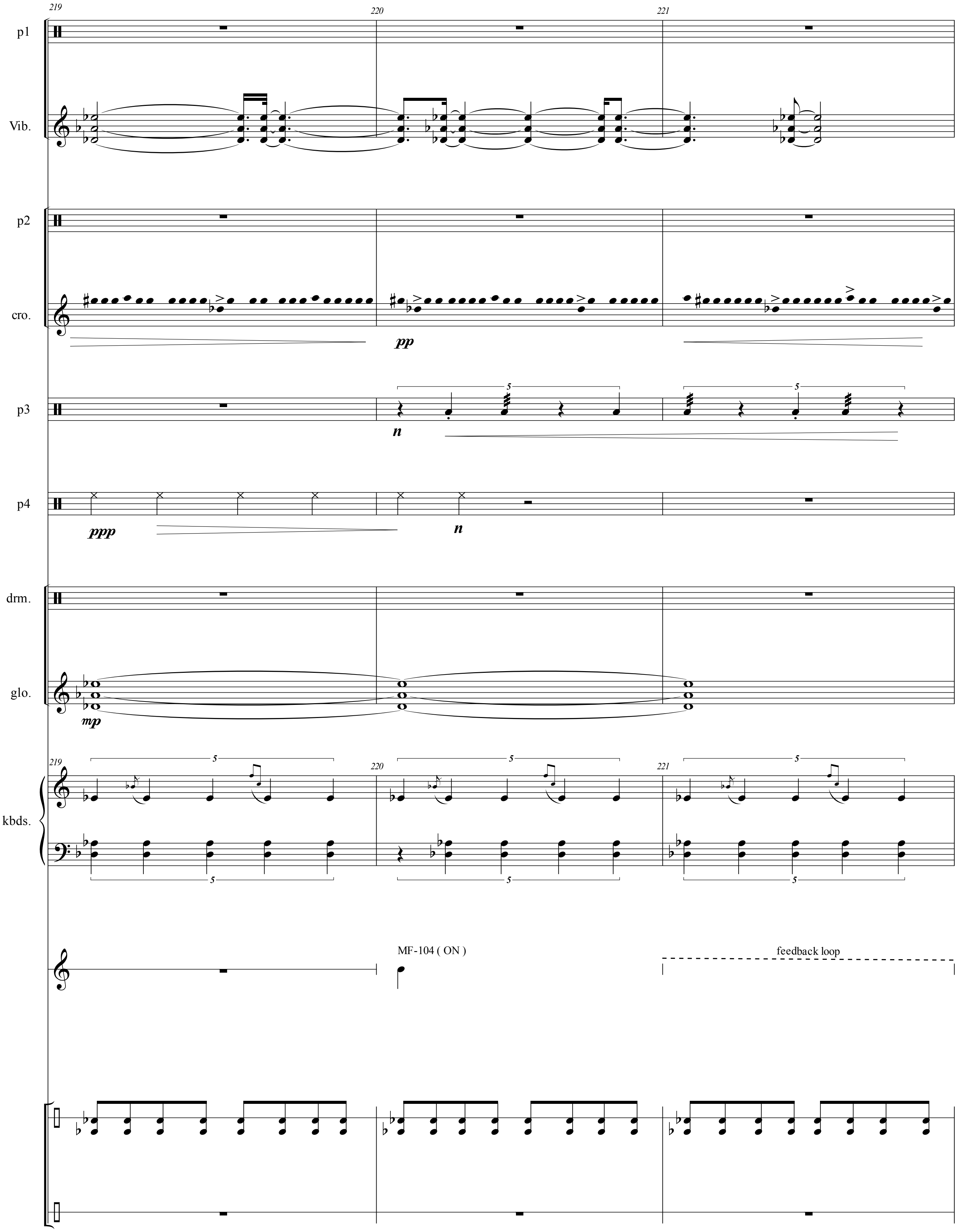
♩ = 120
203
204
205
p1
mf
Vib.
p2
arco ad. lib. (bow changes)
L.V.
cro.
mf
mf
mp
mf
spring drum
p3
mp
p4
drm.
glo.
kbds.
feedback loop:
MODCAN Patch 01 (Sub Bass)
Time (long): 3 Feedback: 4
LFO: Tri Rate: 2
Amount: 4 Mix: 40%
MF-104 (BYPASS)
(spill over)
Modular: Sub Bass
ad. lib. modular cadenza
ppp
fff
sfz

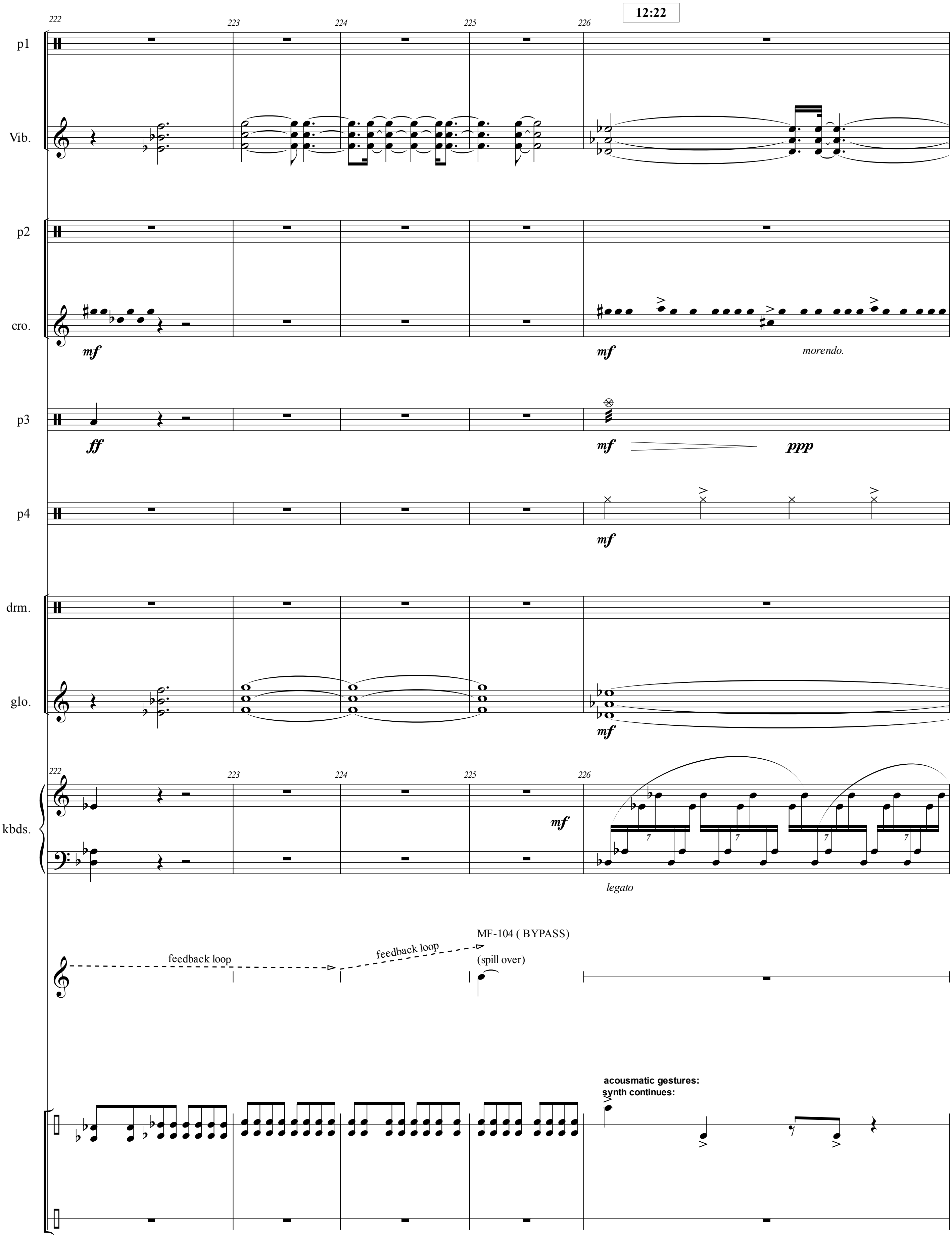
III. Dim (1975)

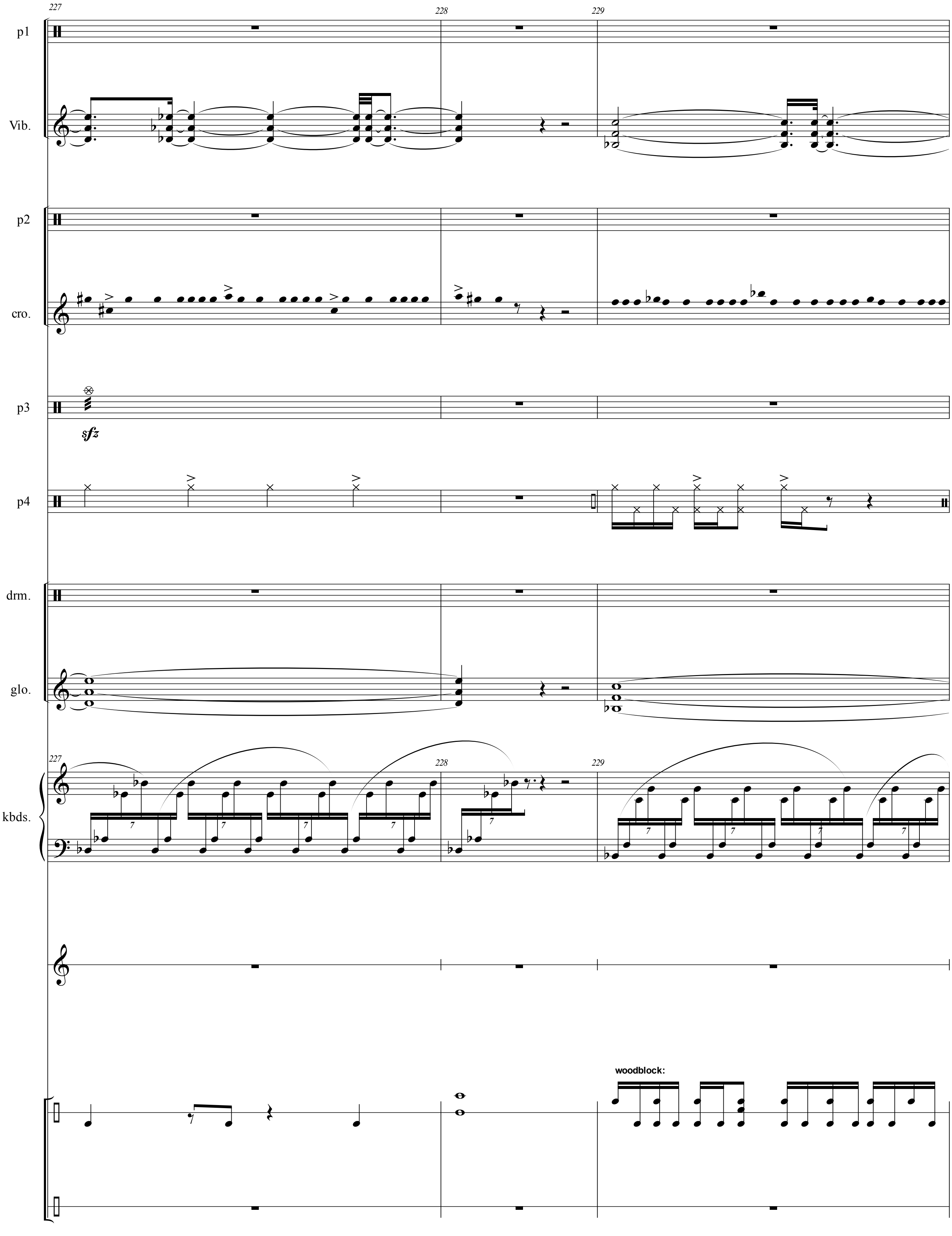
Eliot Britton


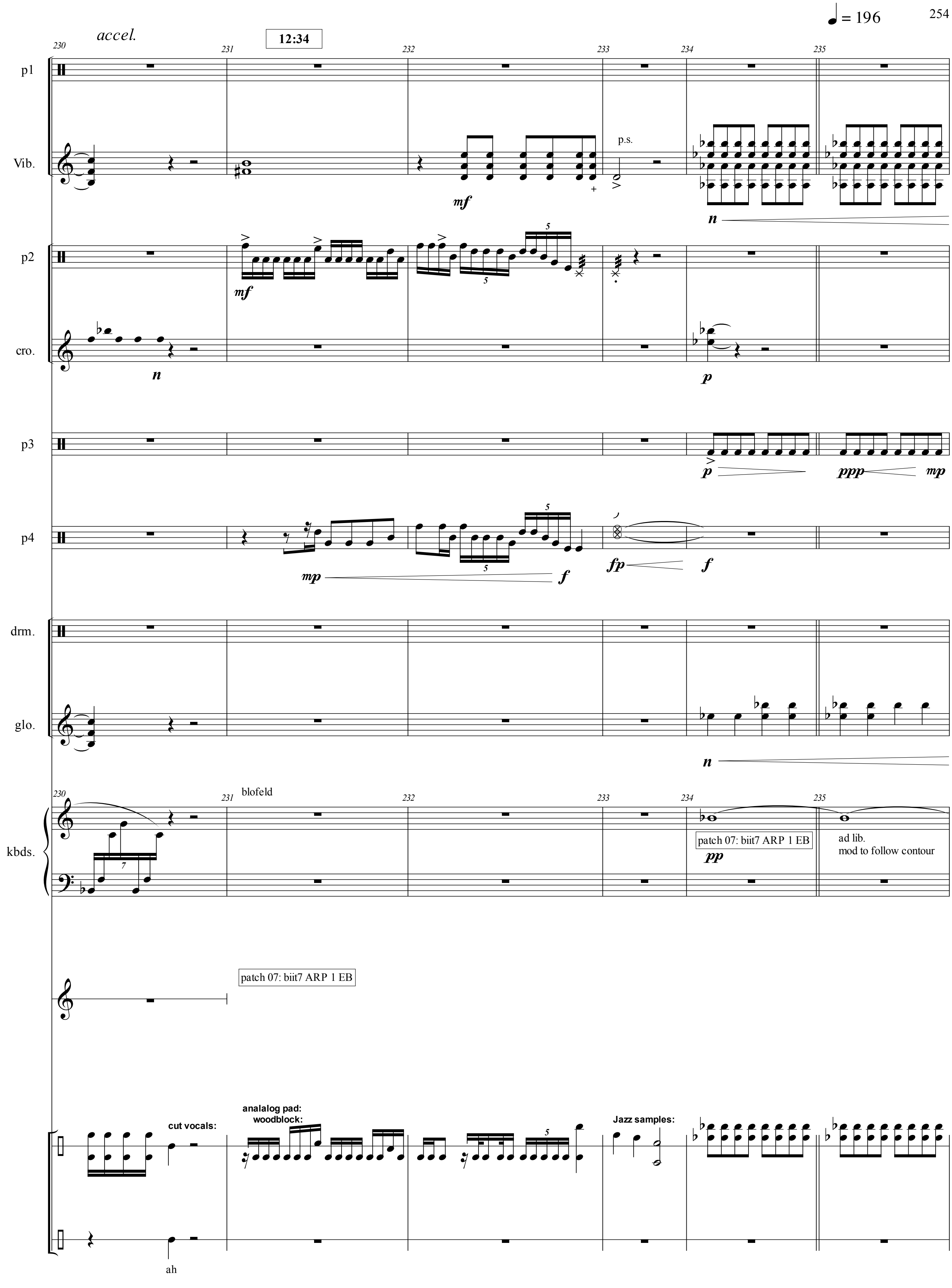
11:42
212
213
214
p1
vibes
Vib.
mp
p2
crotales irregular rhythms ad. lib.
cro.
pp f pp agitato
f subito p
p3
mf ppp
sfz
sim.
p4
mp
drm.
arp. ad lib.
glo.
mp
kbds.
irregular repeats:
leggiero
p


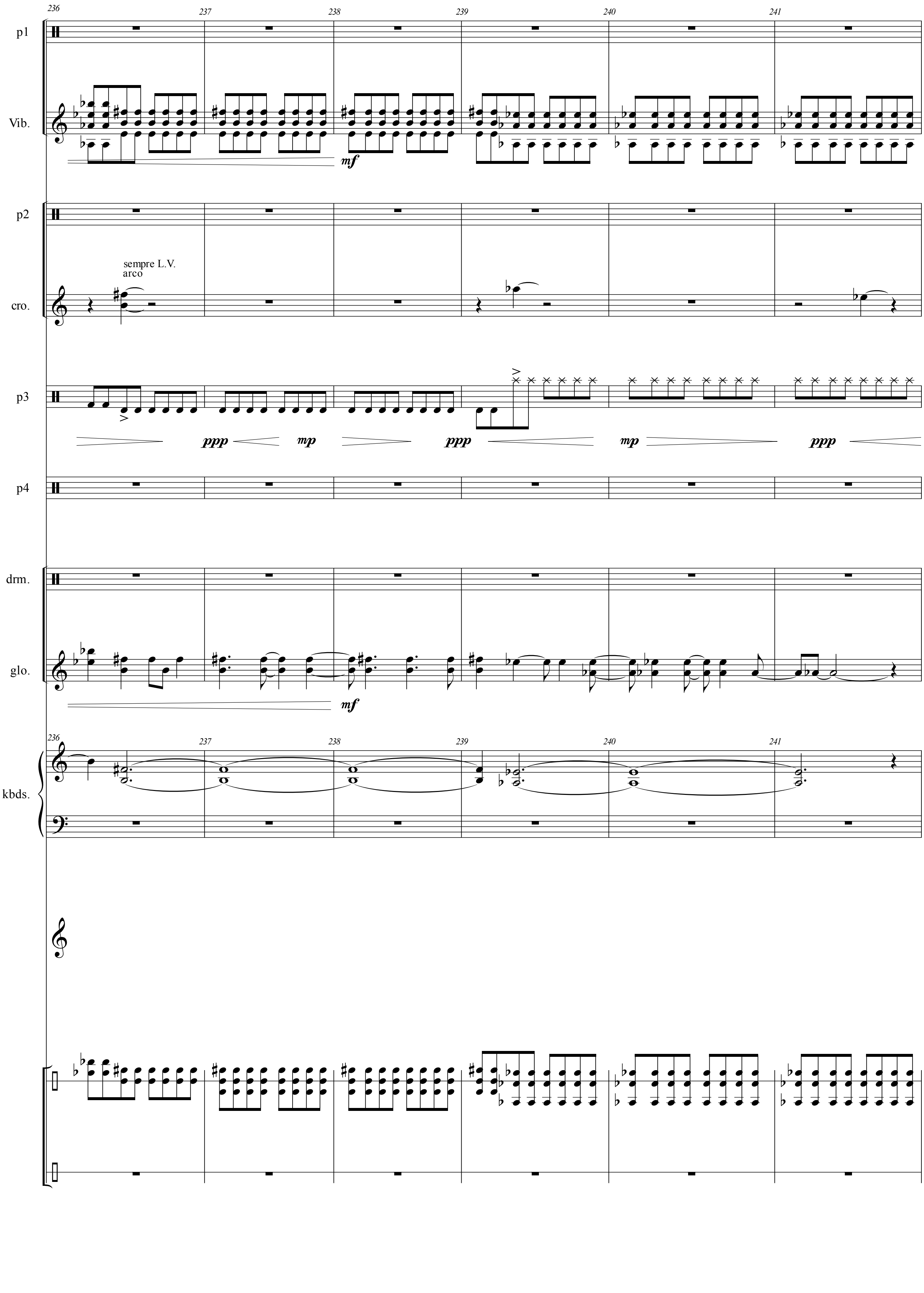
215
216
p1
Vib.
p2
cro.
f
subito p
mf
p3
p4
mp
drm.
glo.
kbds.
7
marcato
f


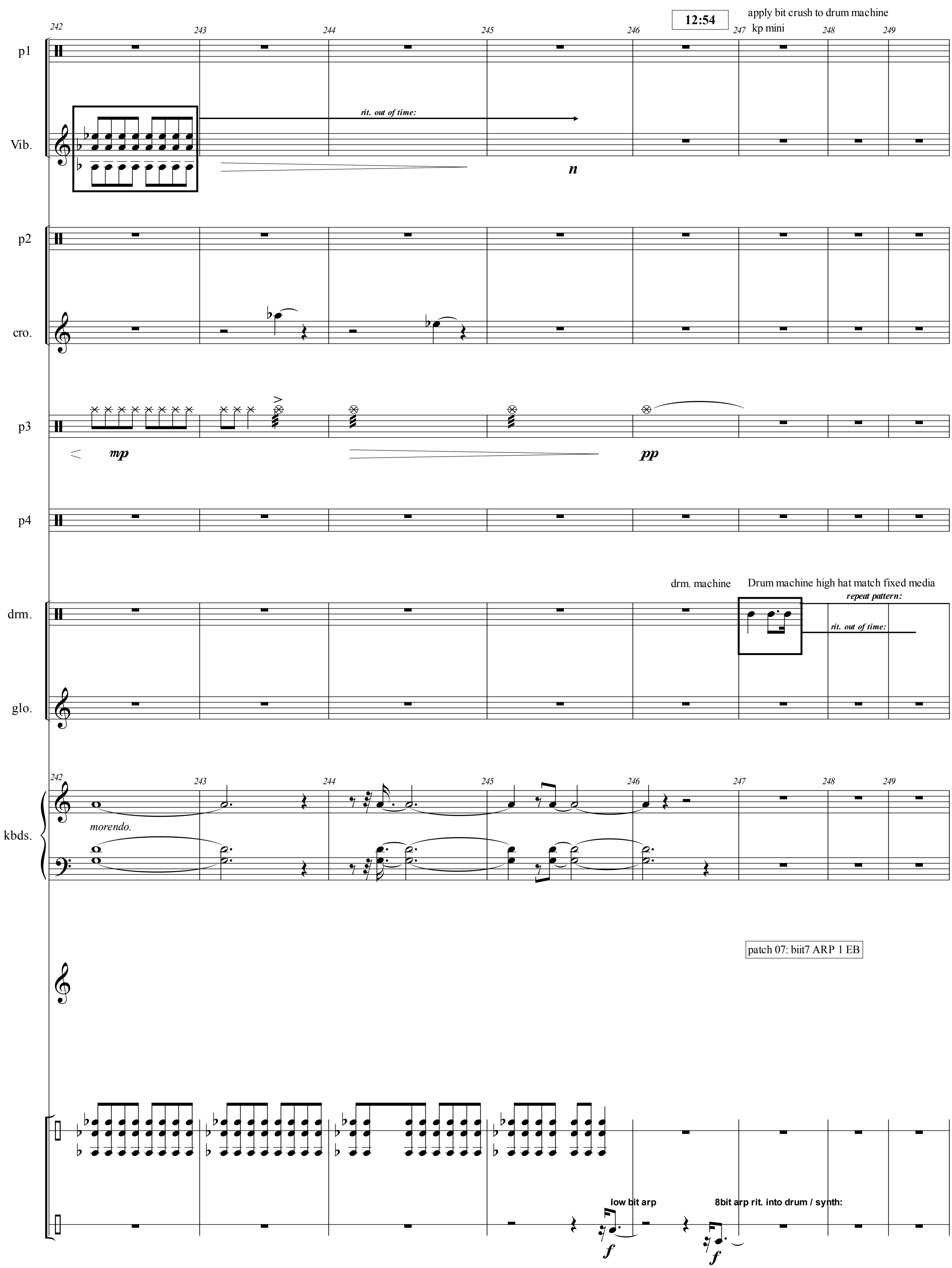
217
218
p1
Vib.
p2
cro.
mp
f
mf
p3
sfz
pp
p4
drm.
glo.
pp
kbds.
leggiero
3


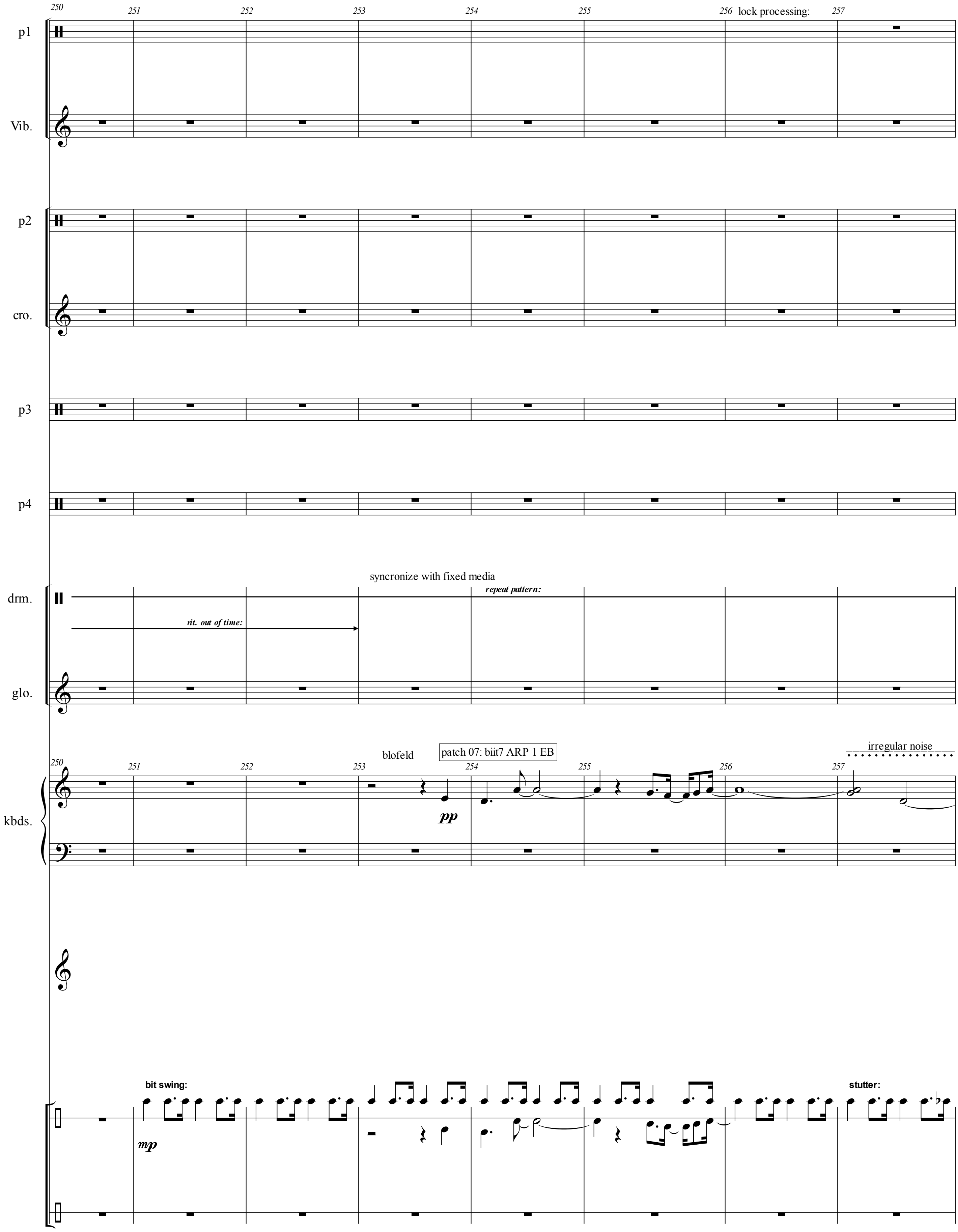
219
220
221
p1
Vib.
p2
cro.
pp
p3
n
p4
ppp
n
drm.
glo.
mp
kbds.
MF-104 (ON)
feedback loop


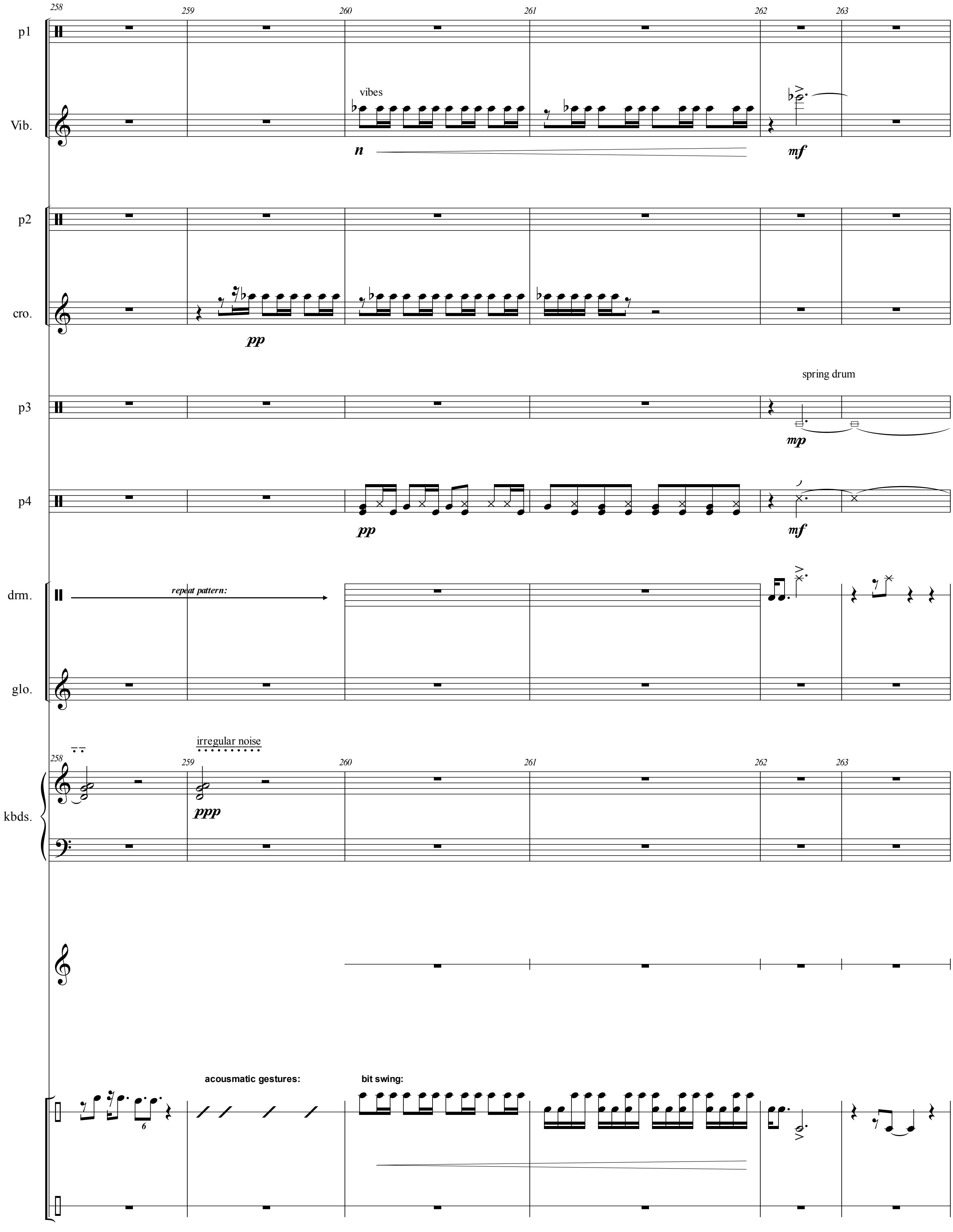
12:22
p1
Vib.
p2
cro.
mf
mf
morendo.
p3
ff
mf
ppp
p4
mf
drm.
glo.
mf
kbds.
mf
legato
feedback loop
feedback loop
MF-104 (BYPASS)
(spill over)
acousmatic gestures:
synth continues:


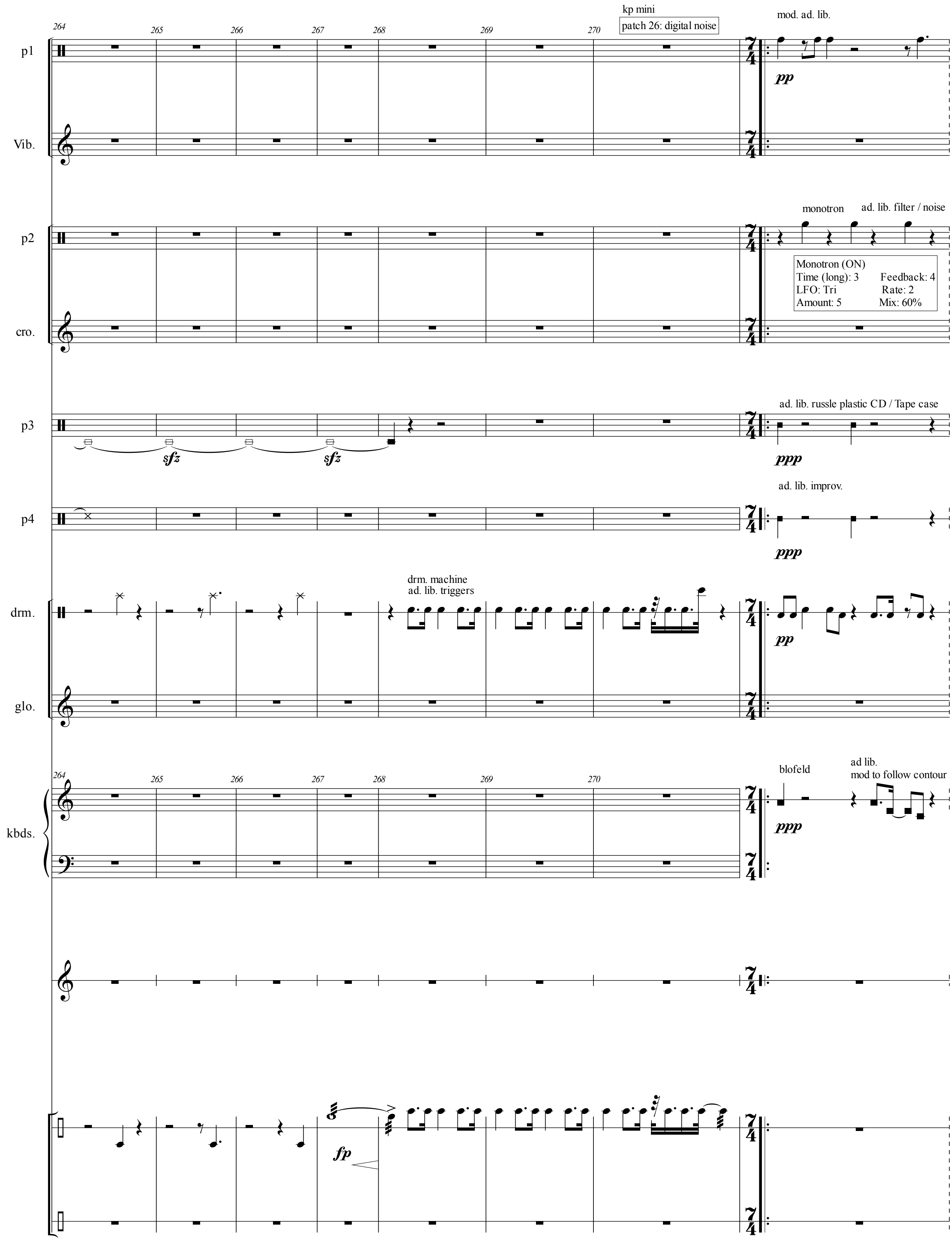
227
228
229
p1
Vib.
p2
cro.
p3
sfz
p4
drm.
glo.
kbds.
7
woodblock:


♩= 196
accel.
12:34
230
231
232
233
234
235
p1
Vib.
p.s.
mf
n
p2
mf
cro.
n
p
p3
p
ppp
mp
p4
mp
f
fp
f
drm.
glo.
n
kbds.
blofeld
patch 07: biit7 ARP 1 EB
pp
ad lib.
mod to follow contour
patch 07: biit7 ARP 1 EB
cut vocals:
analalog pad:
woodblock:
Jazz samples:
ah


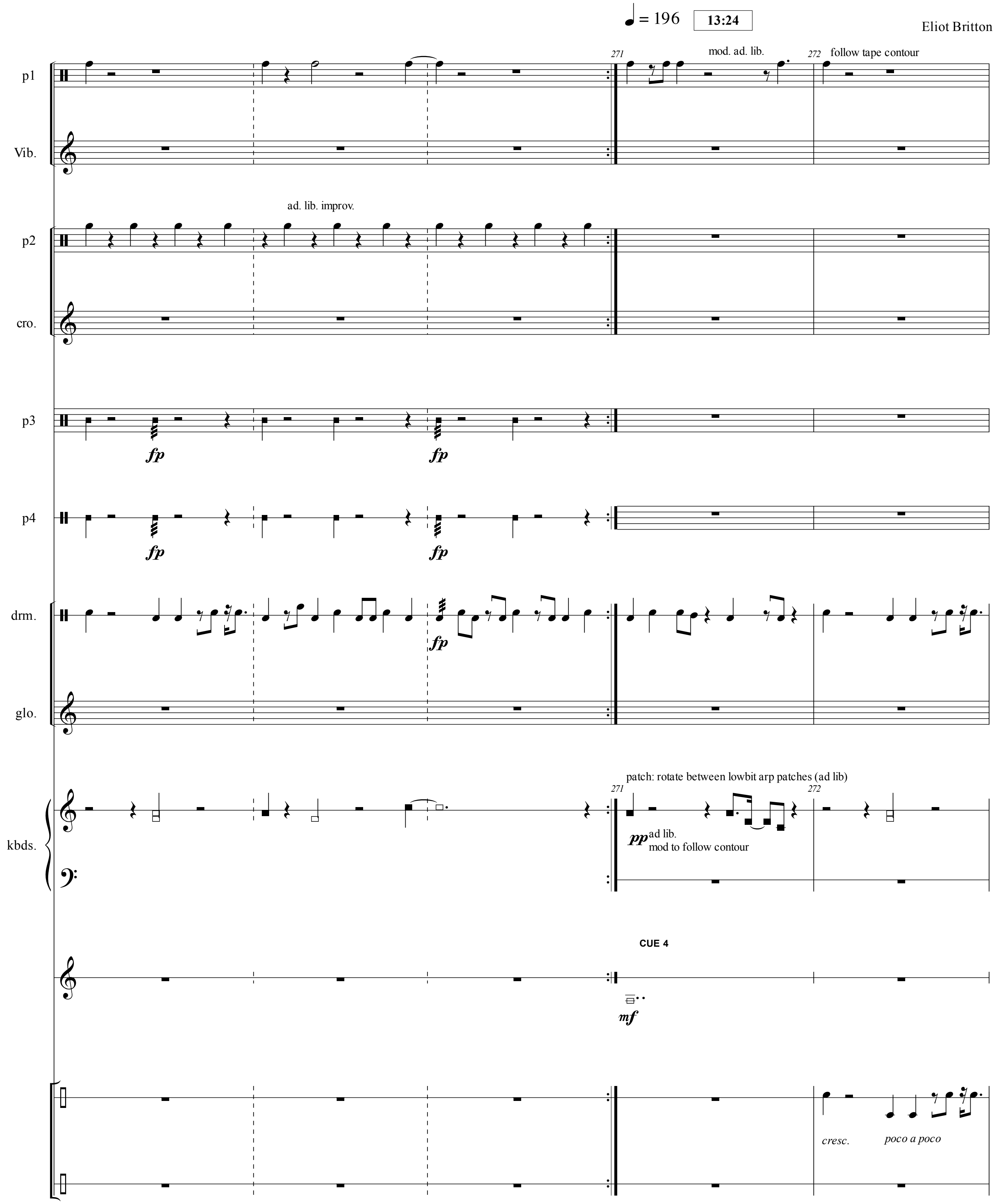
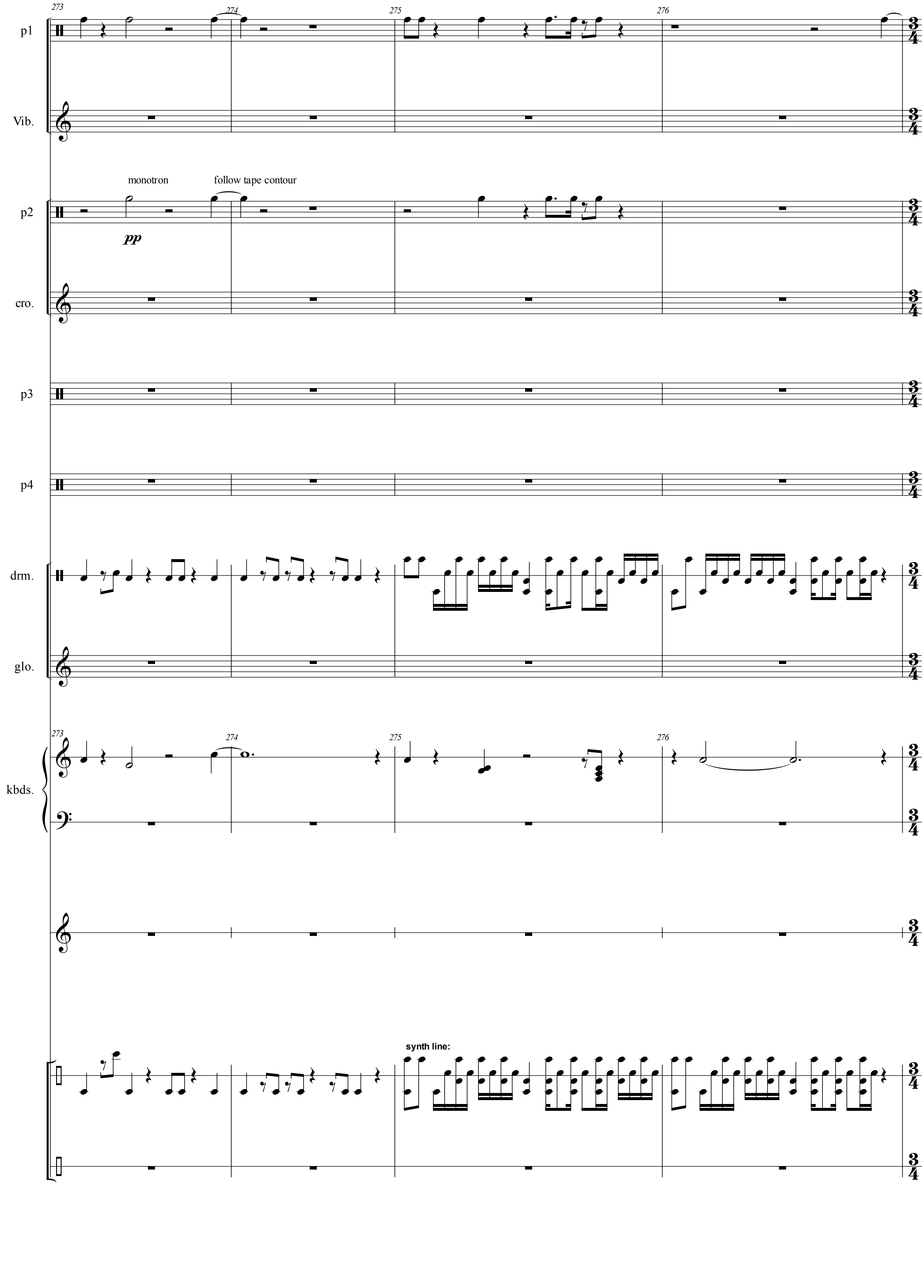
236
237
238
239
240
241
p1
Vib.
mf
p2
sempre L.V.
arco
cro.
p3
ppp
mp
ppp
mp
ppp
p4
drm.
glo.
mf
kbds.


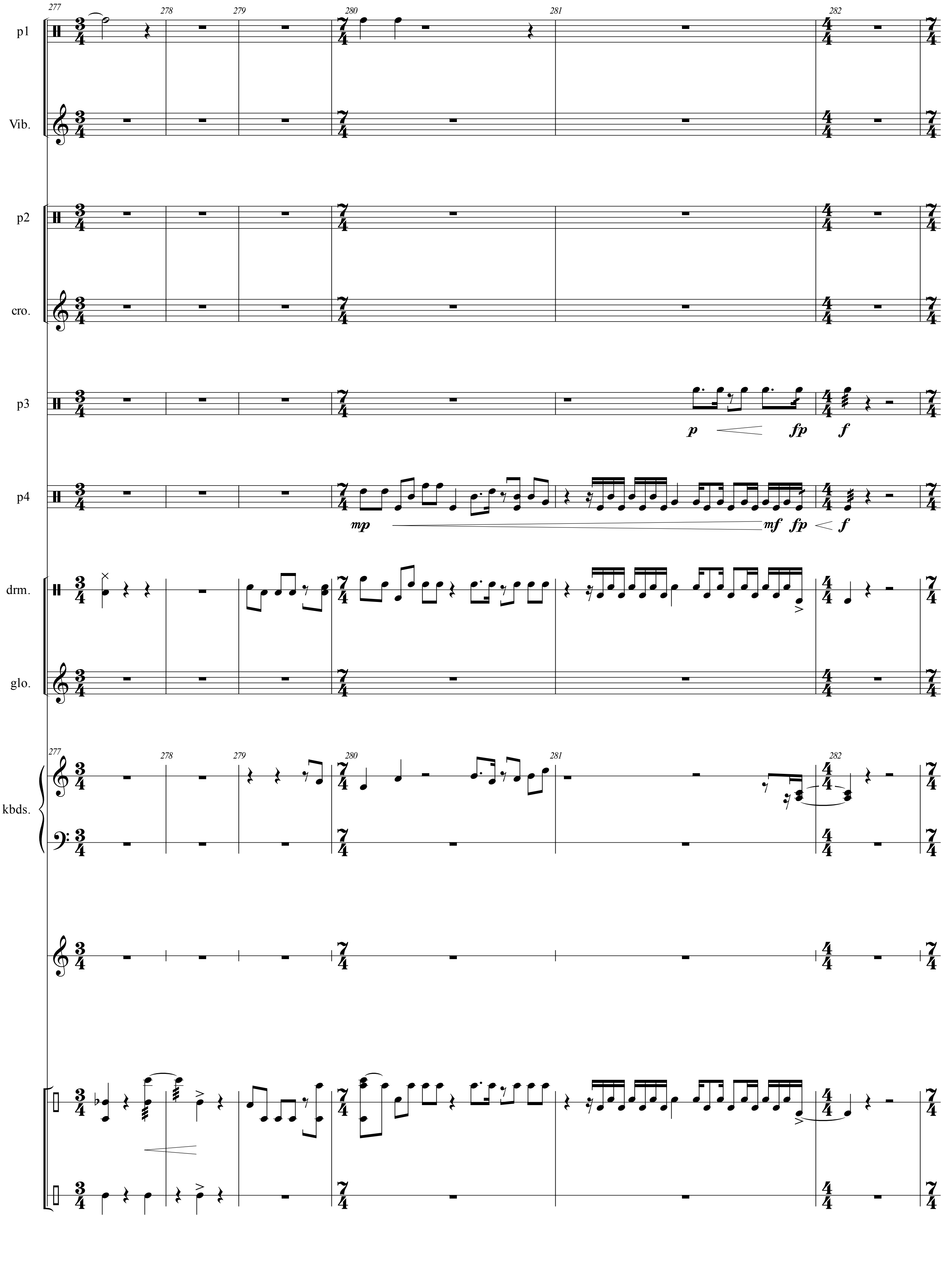
12:54
apply bit crush to drum machine
kp mini
p1
Vib.
rit. out of time:
n
p2
cro.
p3
mp
pp
p4
drm. machine
Drum machine high hat match fixed media
repeat pattern:
rit. out of time:
drm.
glo.
kbds.
morendo.
patch 07: biit7 ARP 1 EB
low bit arp
8bit arp rit. into drum / synth:
f
f


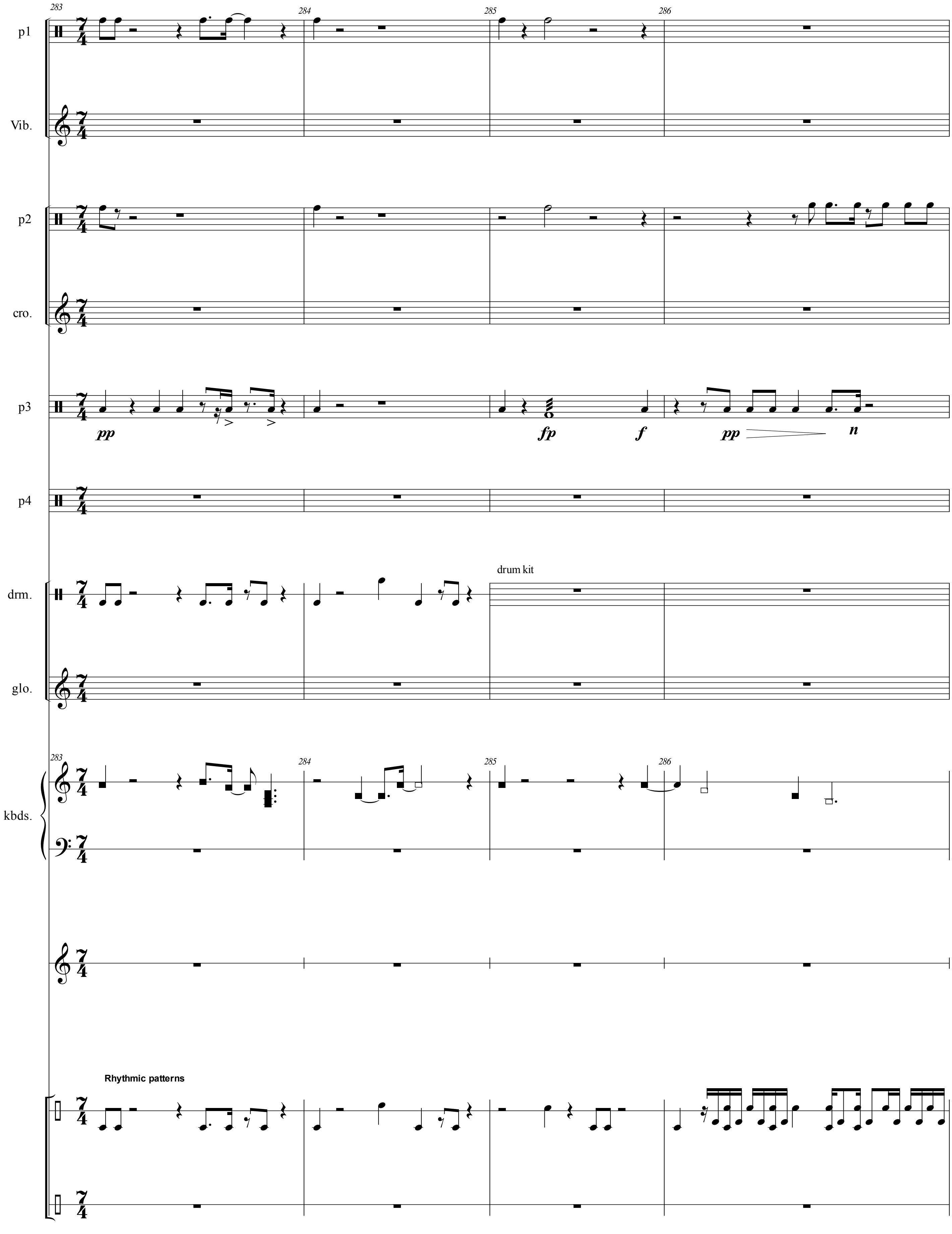
250
251
252
253
254
255
256
lock processing:
257
p1
Vib.
p2
cro.
p3
p4
syncronize with fixed media
repeat pattern:
drm.
rit. out of time:
glo.
blofeld
patch 07: biit7 ARP 1 EB
irregular noise
kbds.
pp
bit swing:
mp
stutter:


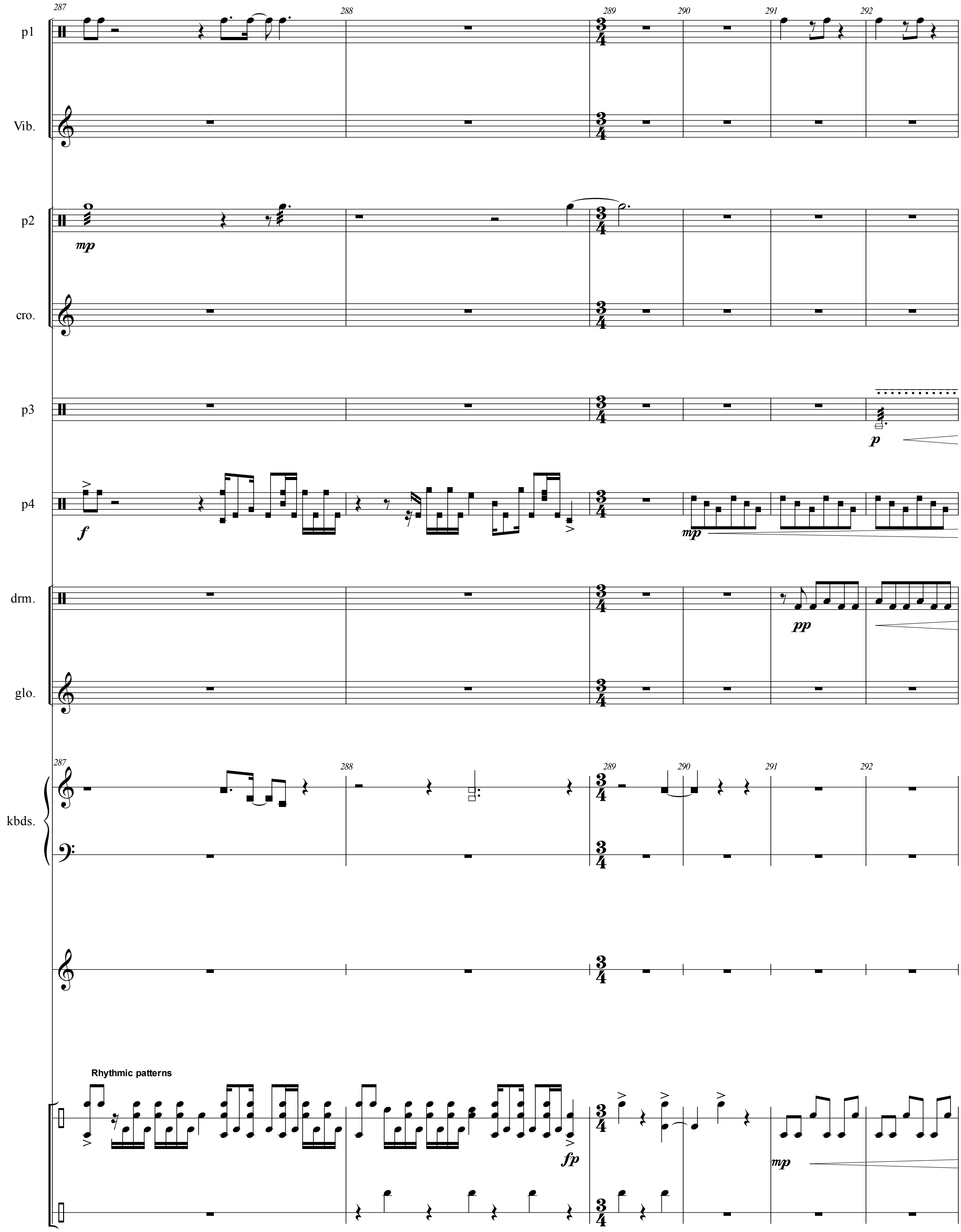
258
259
260
261
262
263
p1
vibes
Vib.
n
mf
p2
cro.
pp
spring drum
p3
mp
p4
pp
mf
drm.
repeat pattern:
glo.
irregular noise
kbds.
ppp
acousmatic gestures:
bit swing:
6


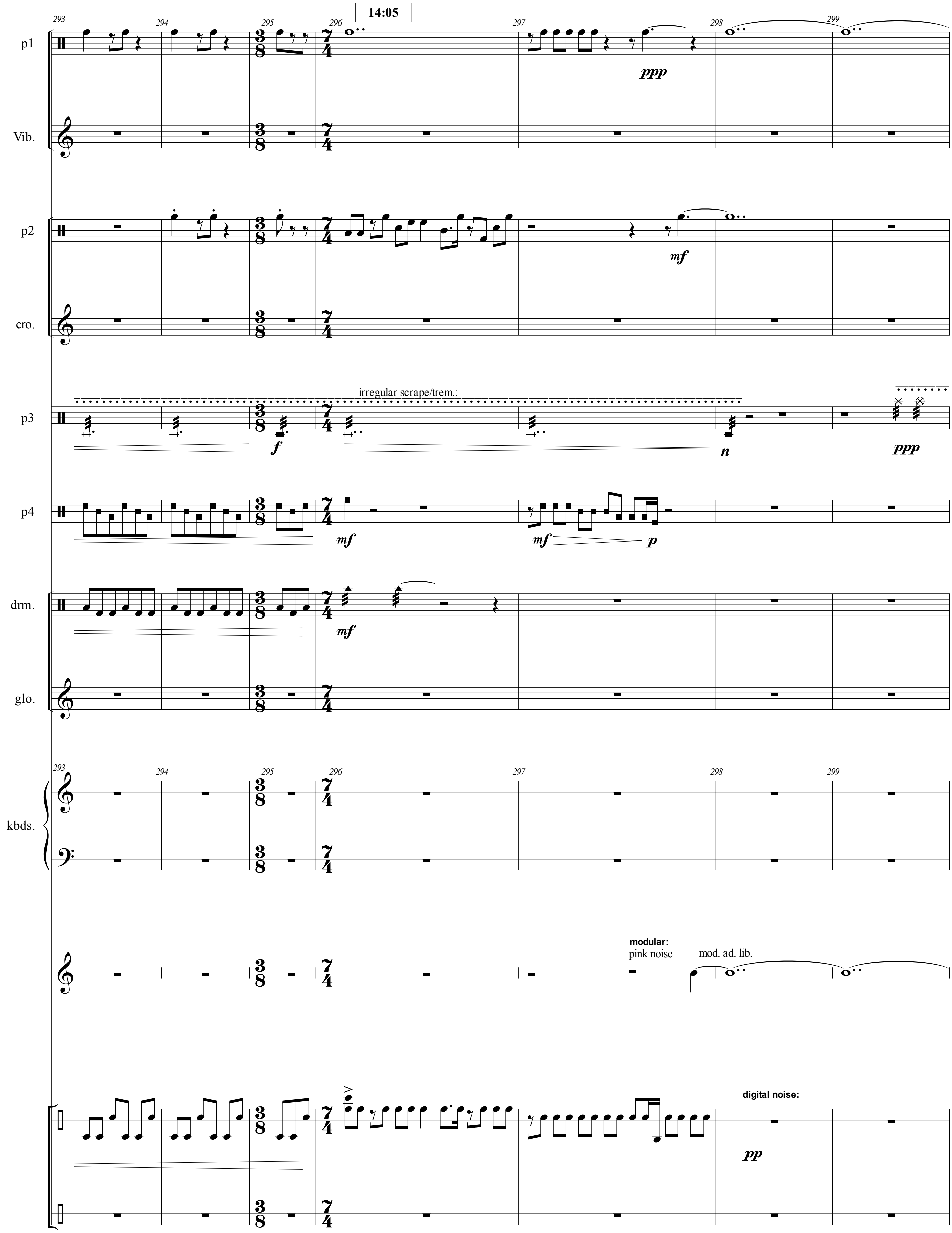
264
265
266
267
268
269
270
kp mini
patch 26: digital noise
mod. ad. lib.
p1
pp
Vib.
p2
monotron
ad. lib. filter / noise
Monotron (ON)
Time (long): 3
Feedback: 4
LFO: Tri
Rate: 2
Amount: 5
Mix: 60%
cro.
p3
sfz
sfz
ad. lib. russle plastic CD / Tape case
ppp
p4
ad. lib. improv.
ppp
drm.
drm. machine
ad. lib. triggers
pp
glo.
kbds.
blofeld
ad lib.
mod to follow contour
ppp
fp

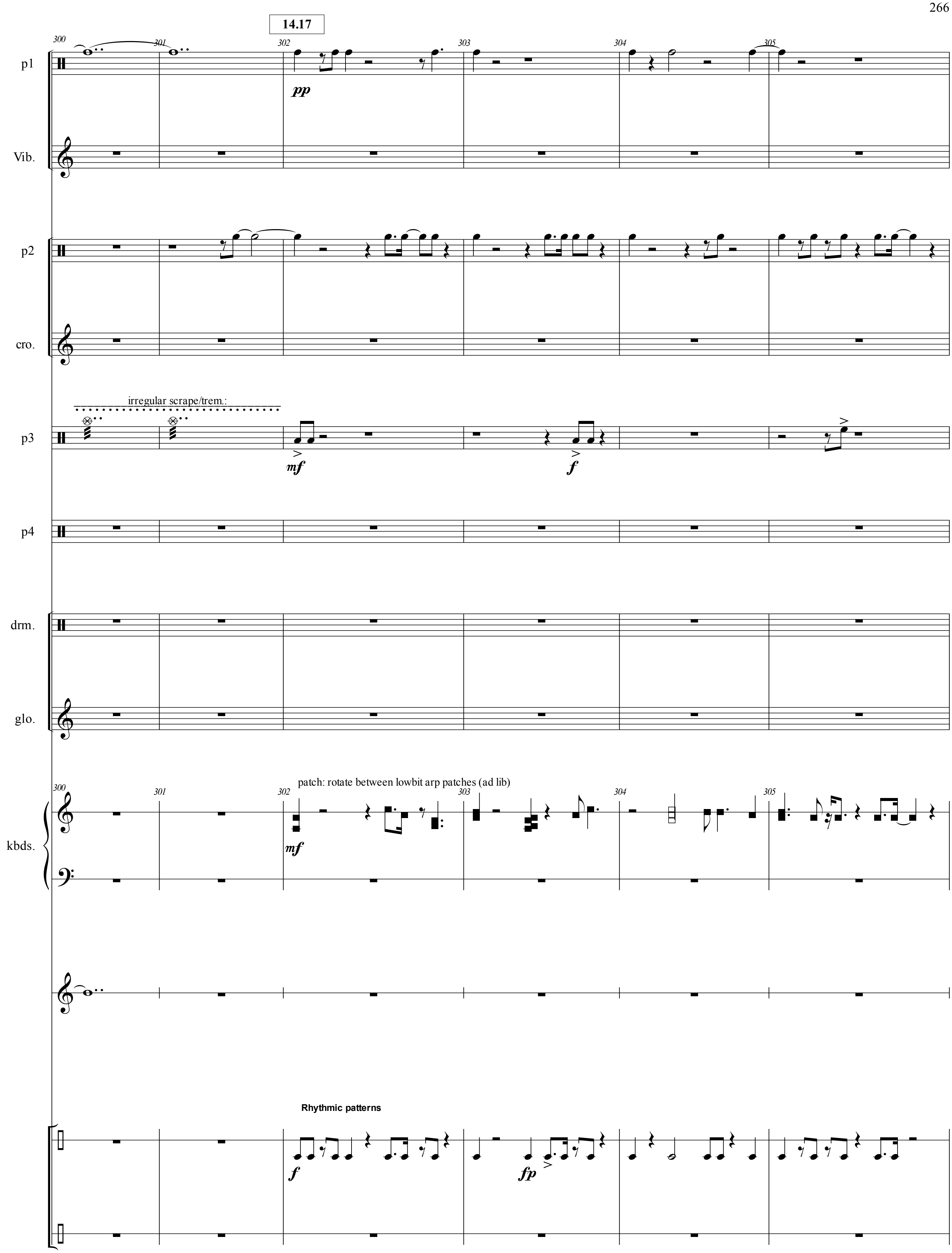
IV. Galvatron (1980)


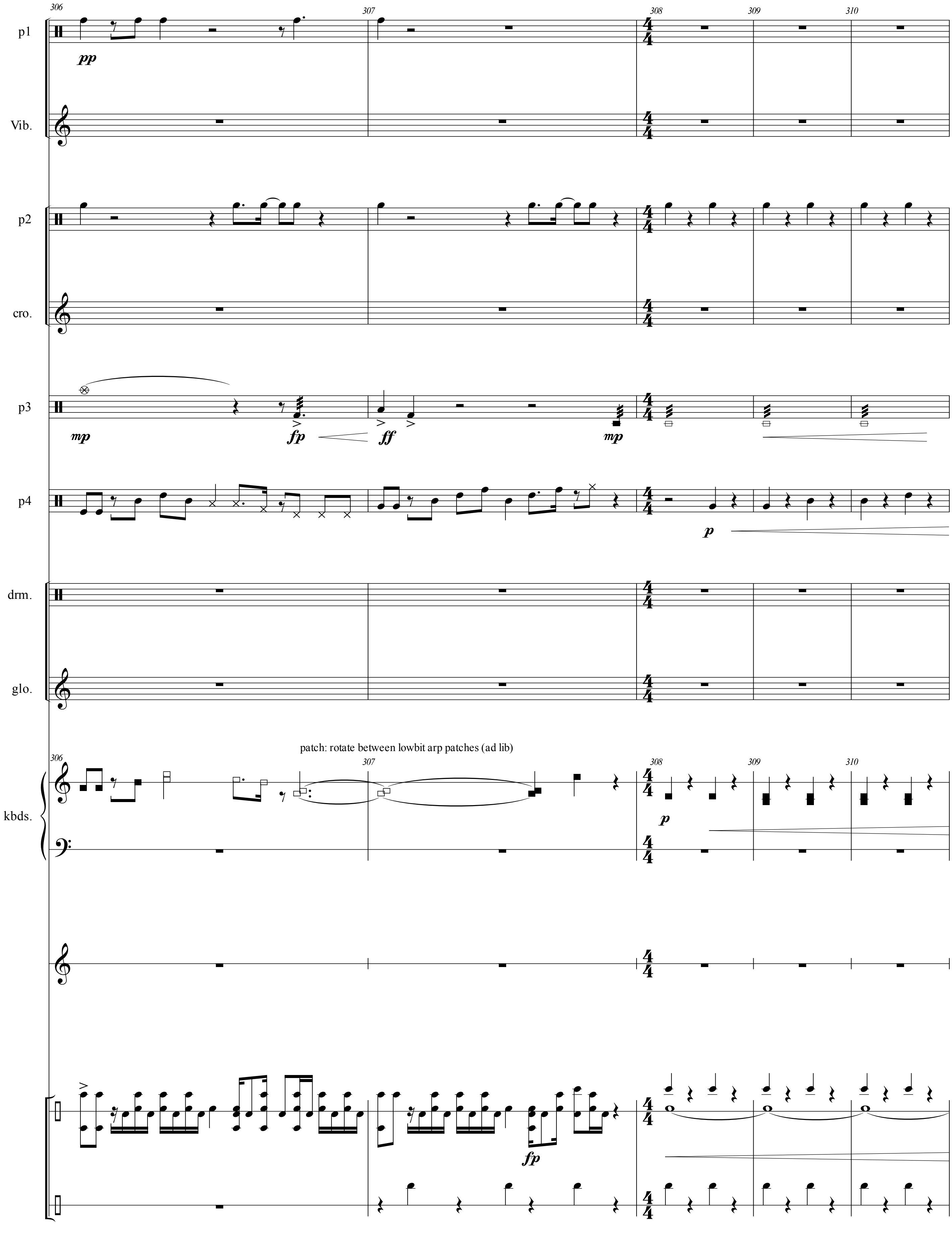
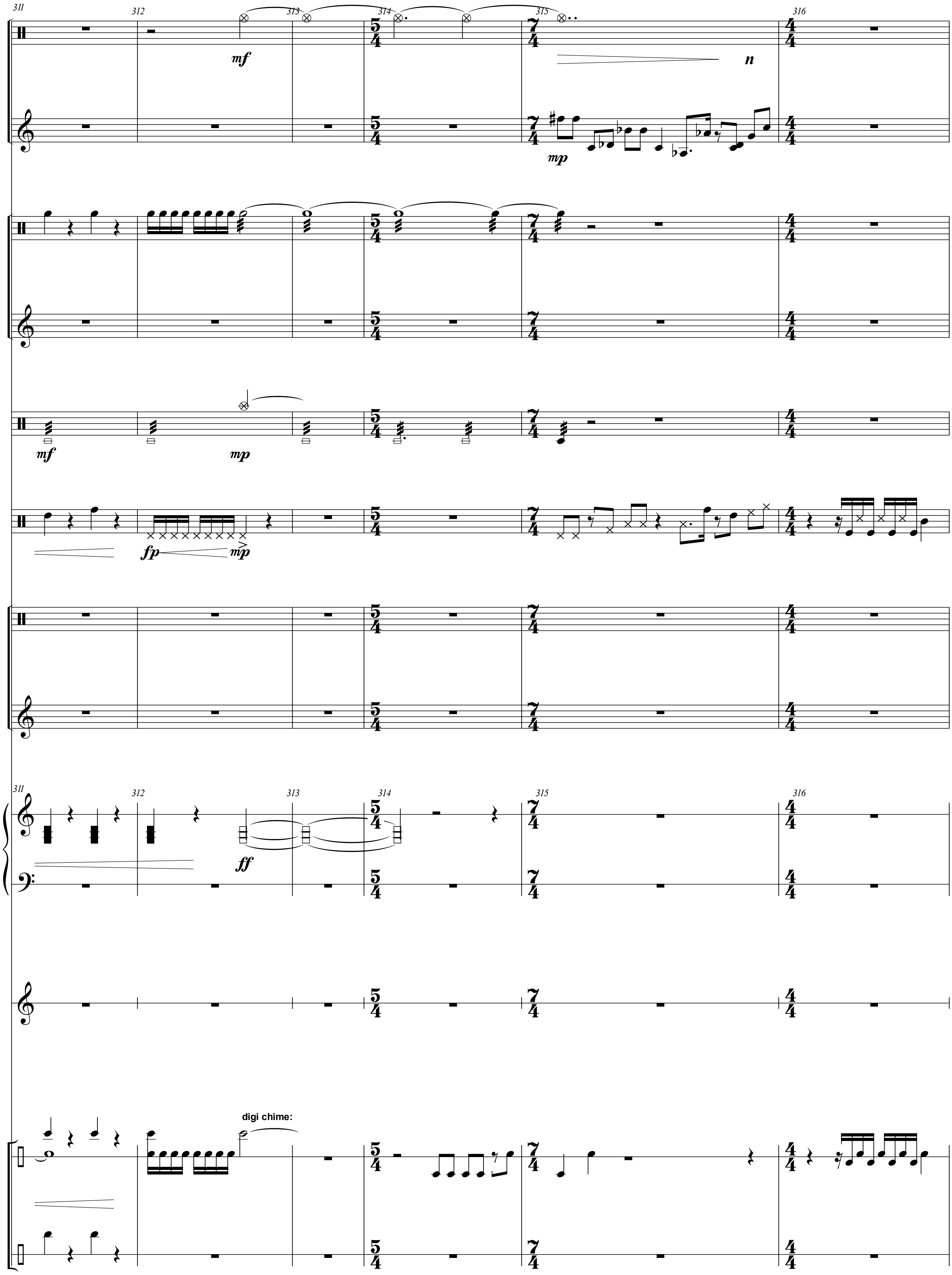
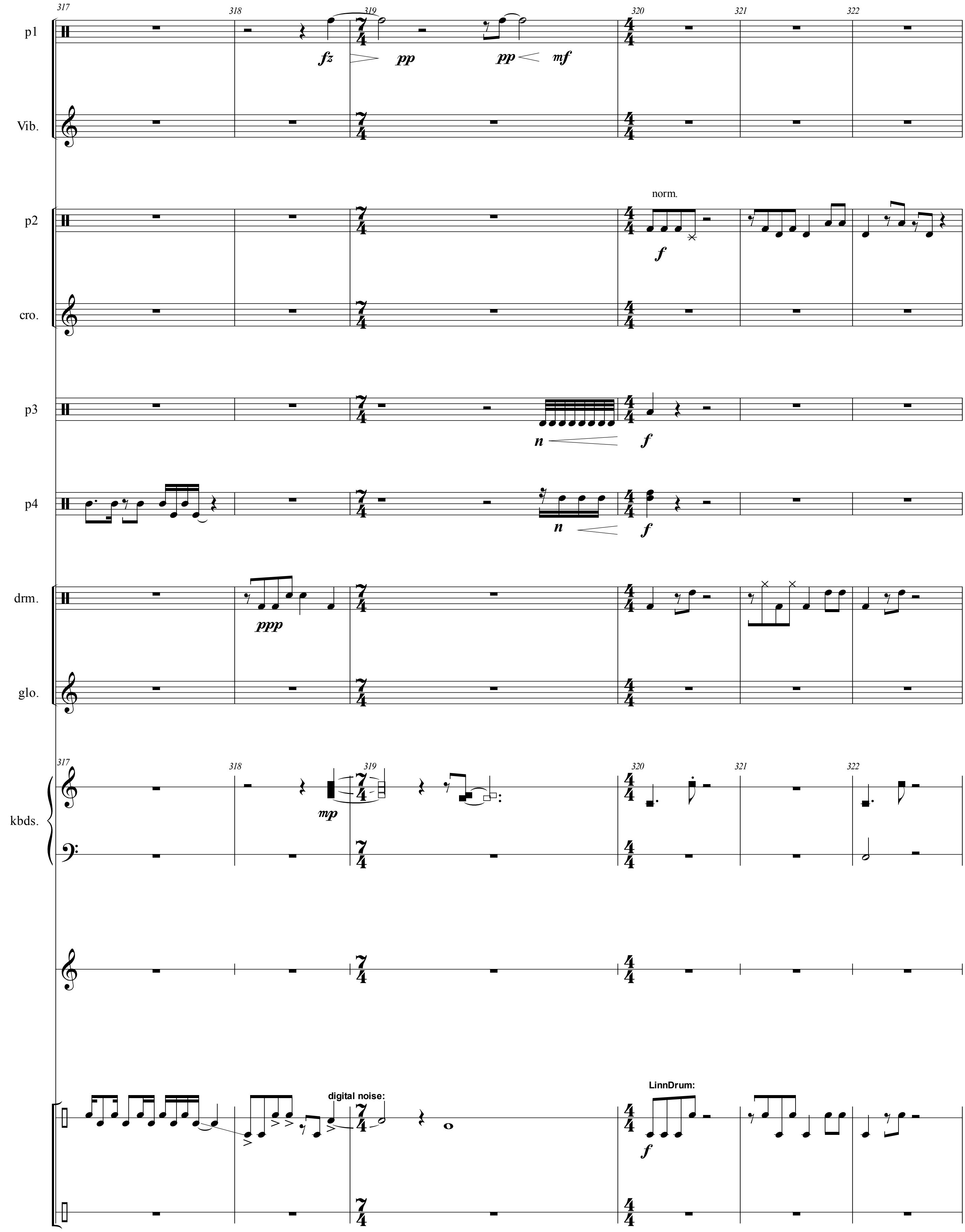
273
274
275
276
p1
Vib.
monotron
follow tape contour
p2
pp
cro.
p3
p4
drm.
glo.
kbds.
synth line:


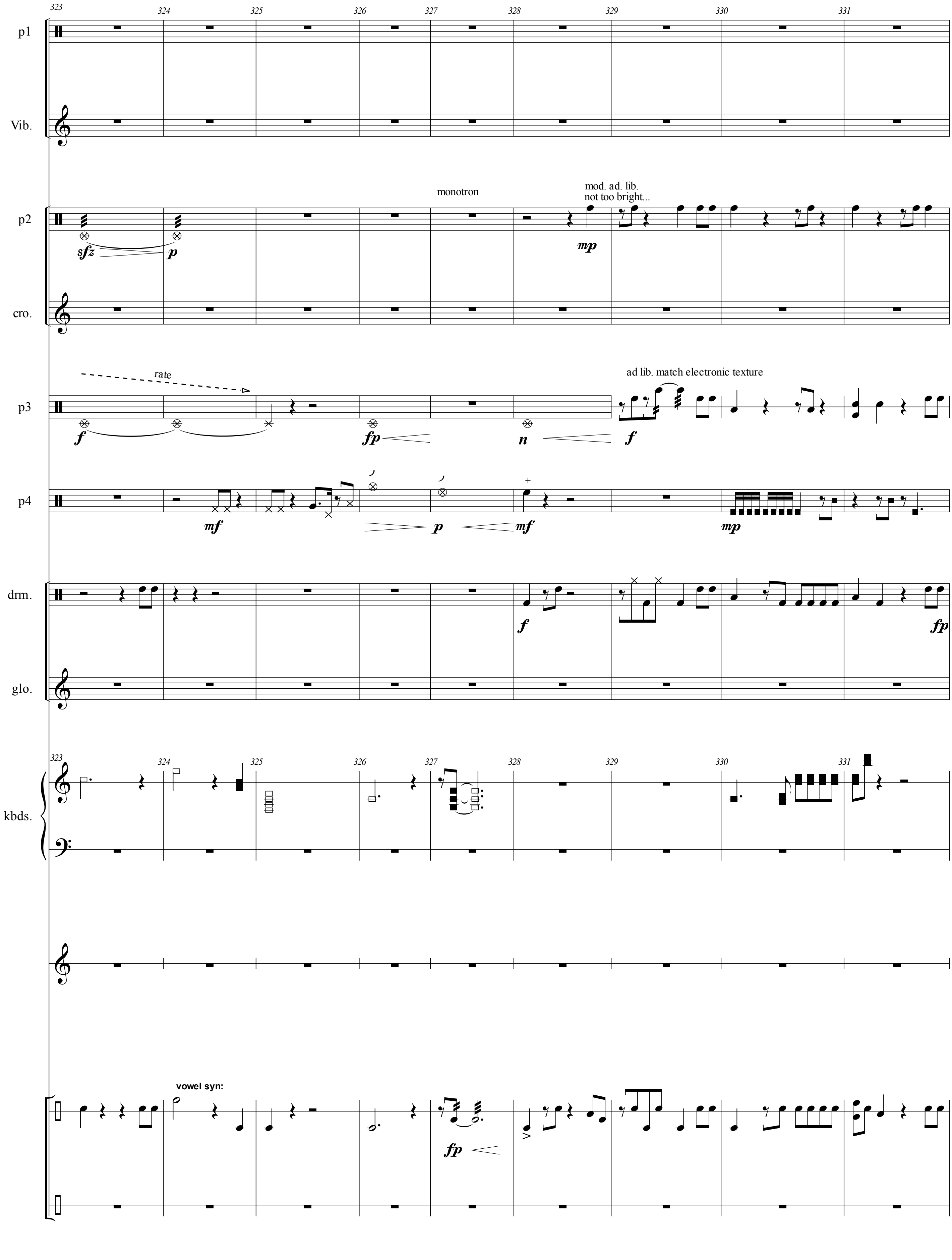
277
278
279
280
281
282
p1
Vib.
p2
cro.
p3
p fp f
p4
mp mf fp f
drm.
glo.
kbds.


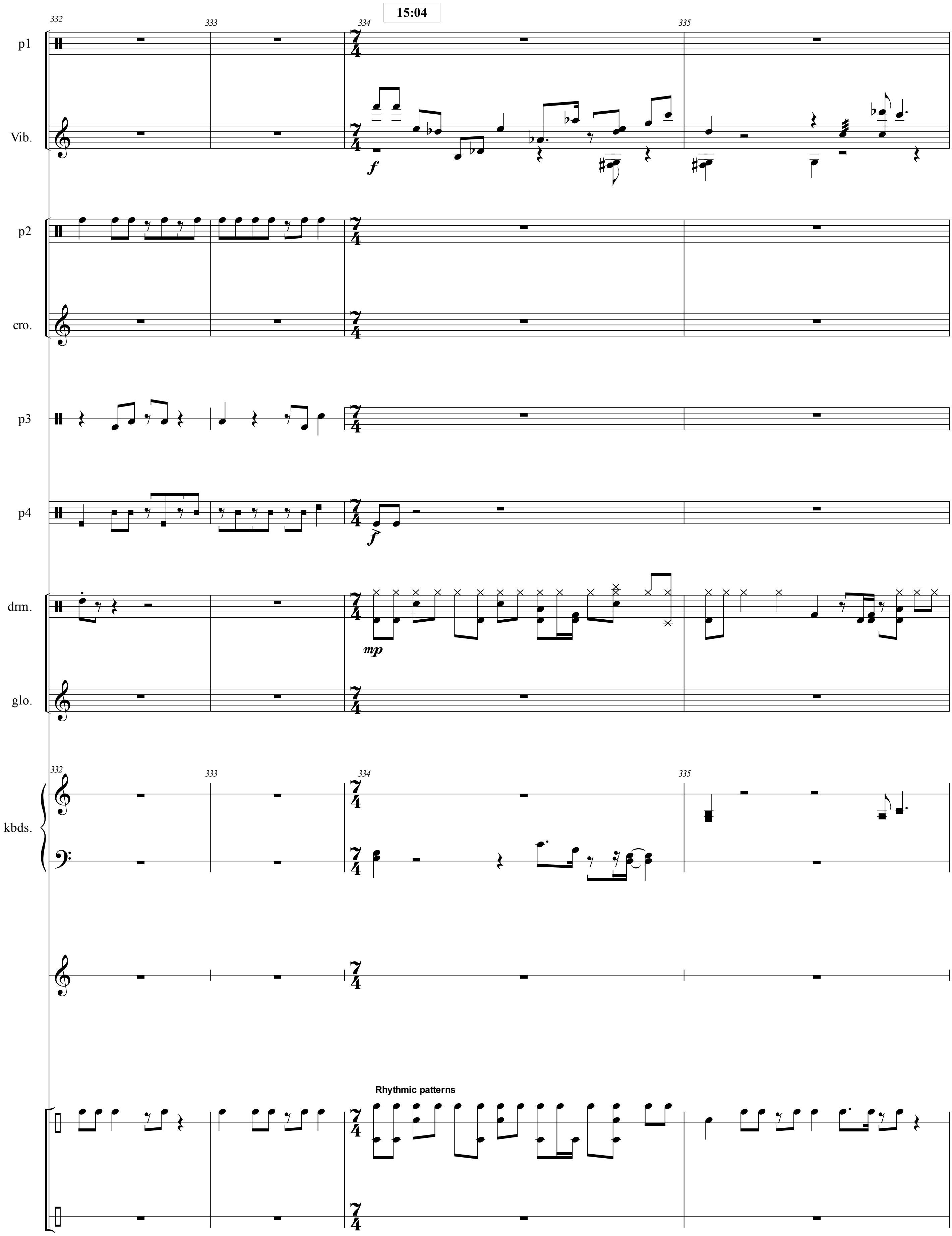
283
284
285
286
p1
Vib.
p2
cro.
p3
pp
fp
f
pp
n
p4
drum kit
drm.
glo.
kbds.
Rhythmic patterns


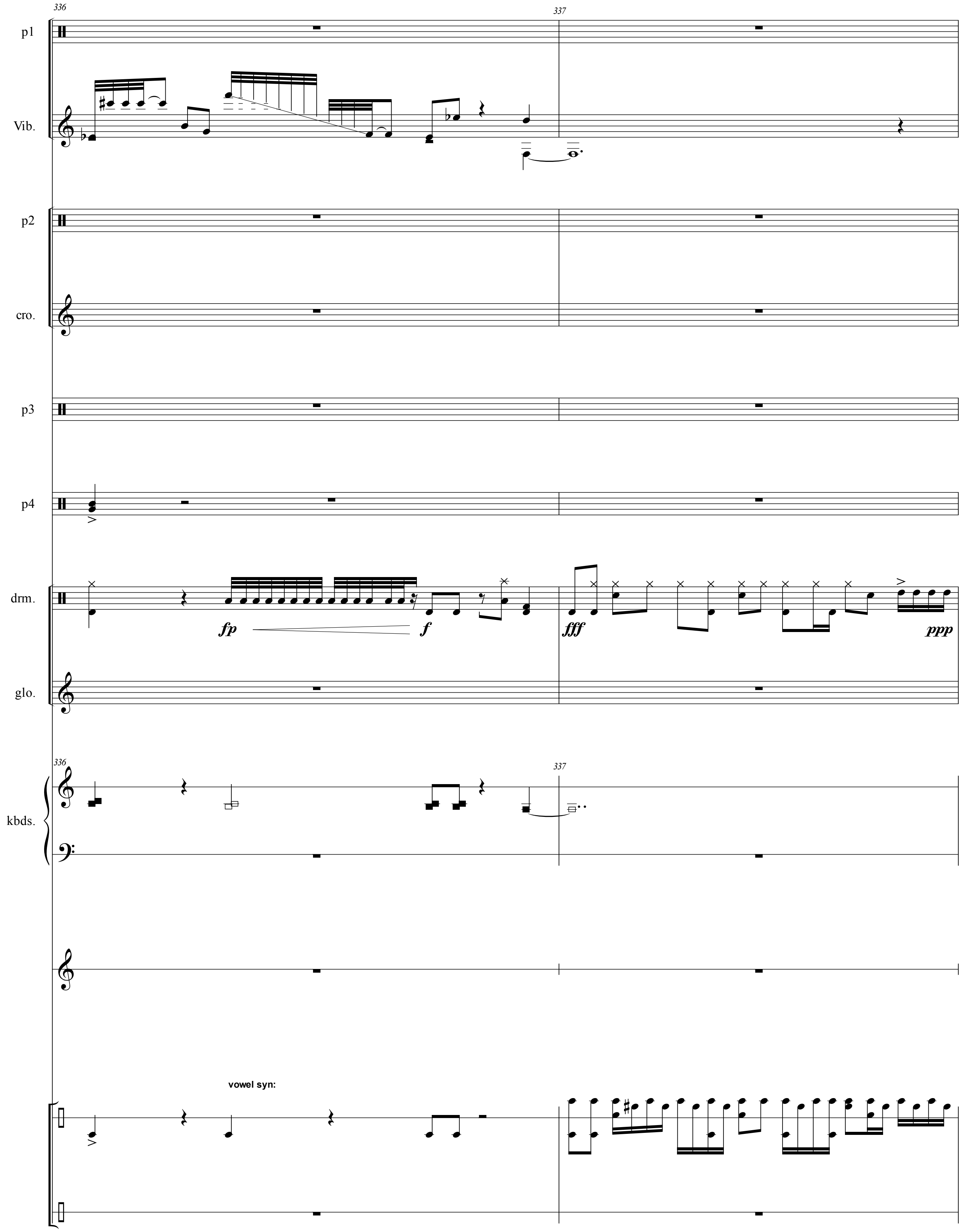
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
Rhythmic patterns
287
288
289
290
291
292
mp
p
f
pp
fp


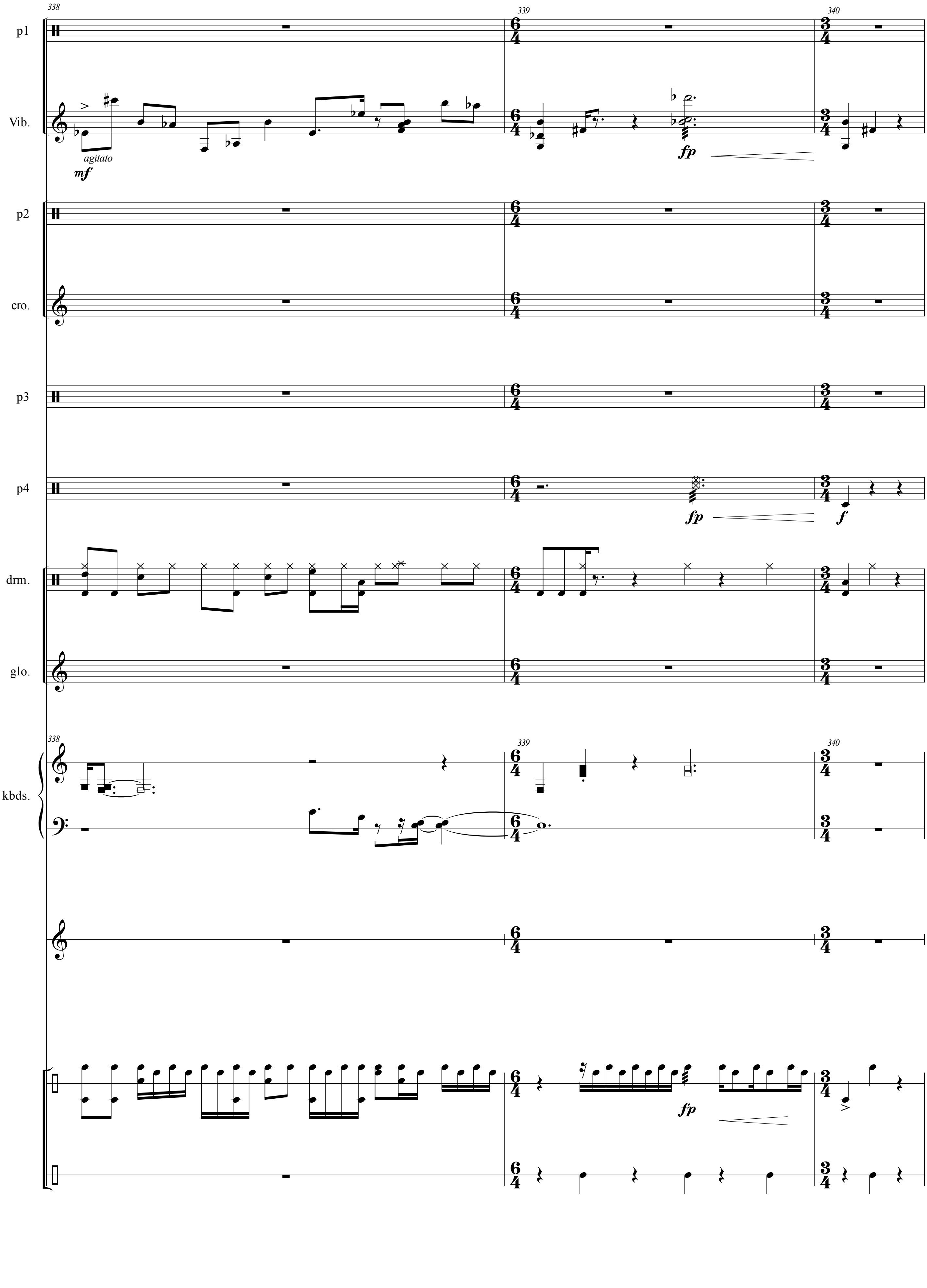
14:05
293
294
295
296
297
298
299
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
ppp
mf
irregular scrape/trem.:
f
n
ppp
mf
mf
p
mf
modular:
pink noise
mod. ad. lib.
digital noise:
pp


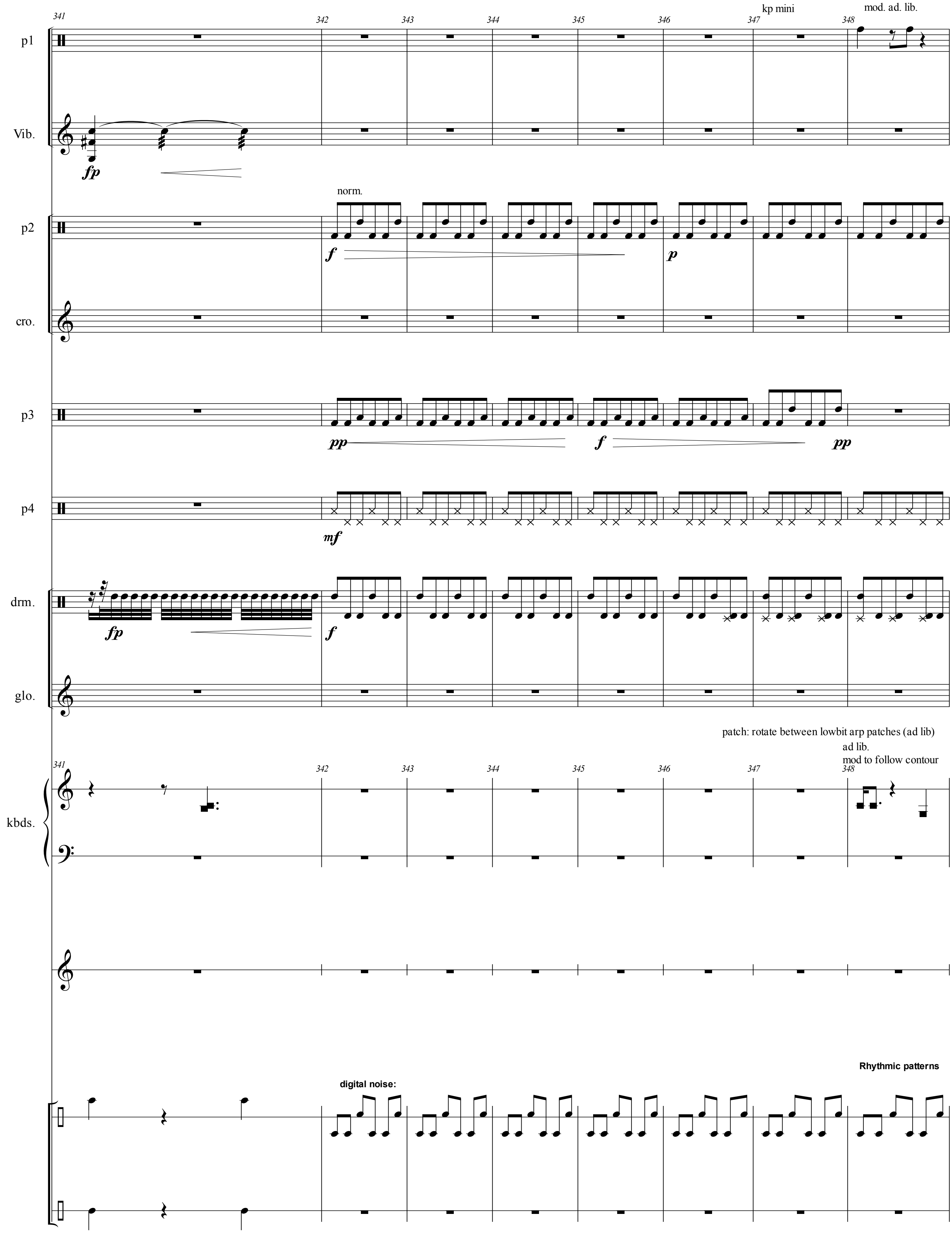
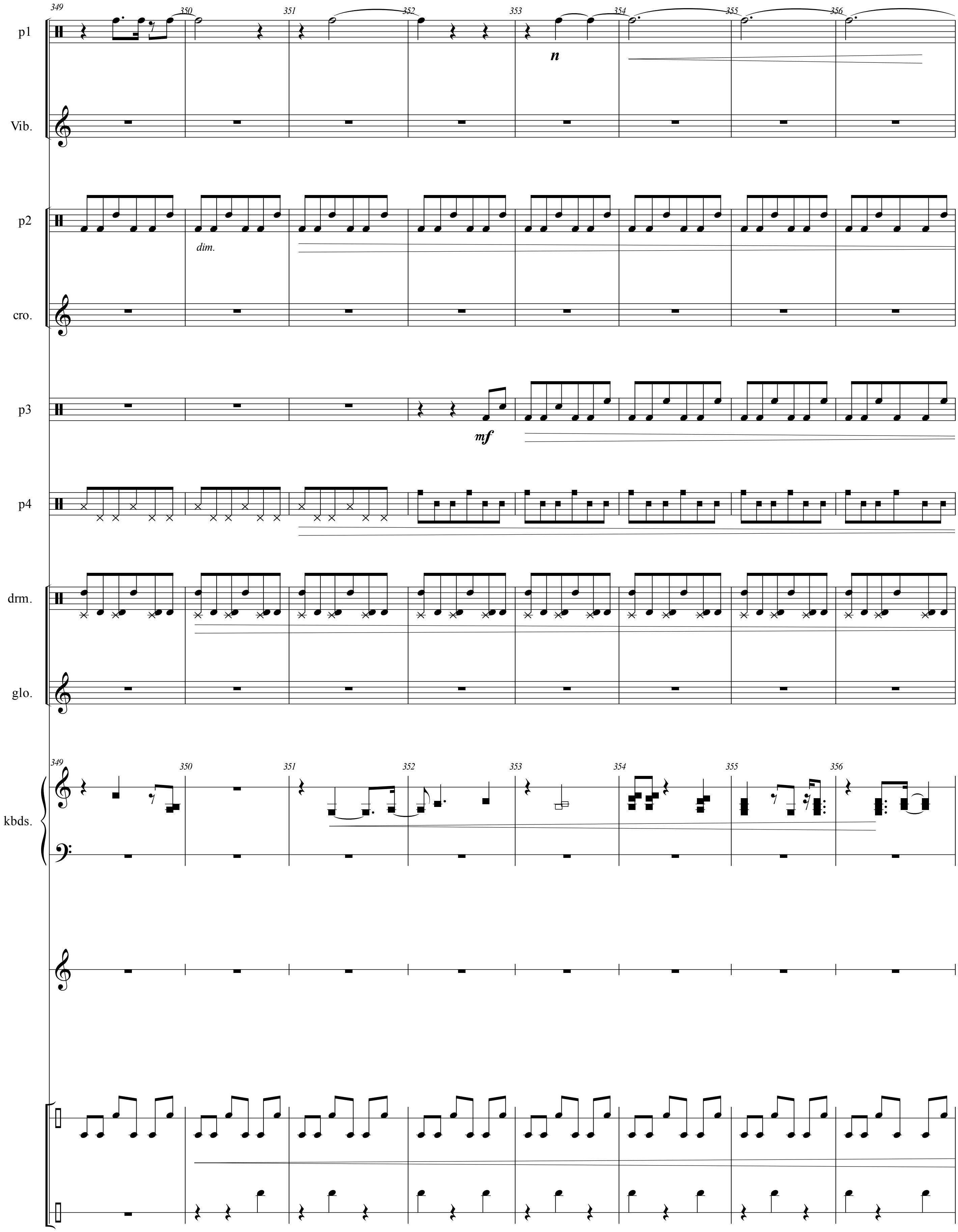
14.17
p1
Vib.
p2
cro.
irregular scrape/trem.:
p3
p4
drm.
glo.
patch: rotate between lowbit arp patches (ad lib)
kbds.
Rhythmic patterns
pp
mf
f
fp

306
307
308
309
310
p1
pp
Vib.
p2
cro.
p3
mp
fp
ff
mp
p4
p
drm.
glo.
patch: rotate between lowbit arp patches (ad lib)
kbds.
p
fp

311
312
313
314
315
316
p1
mf
n
Vib.
mp
p2
cro.
p3
mf
mp
p4
fp
mp
drm.
glo.
kbds.
ff
digi chime:


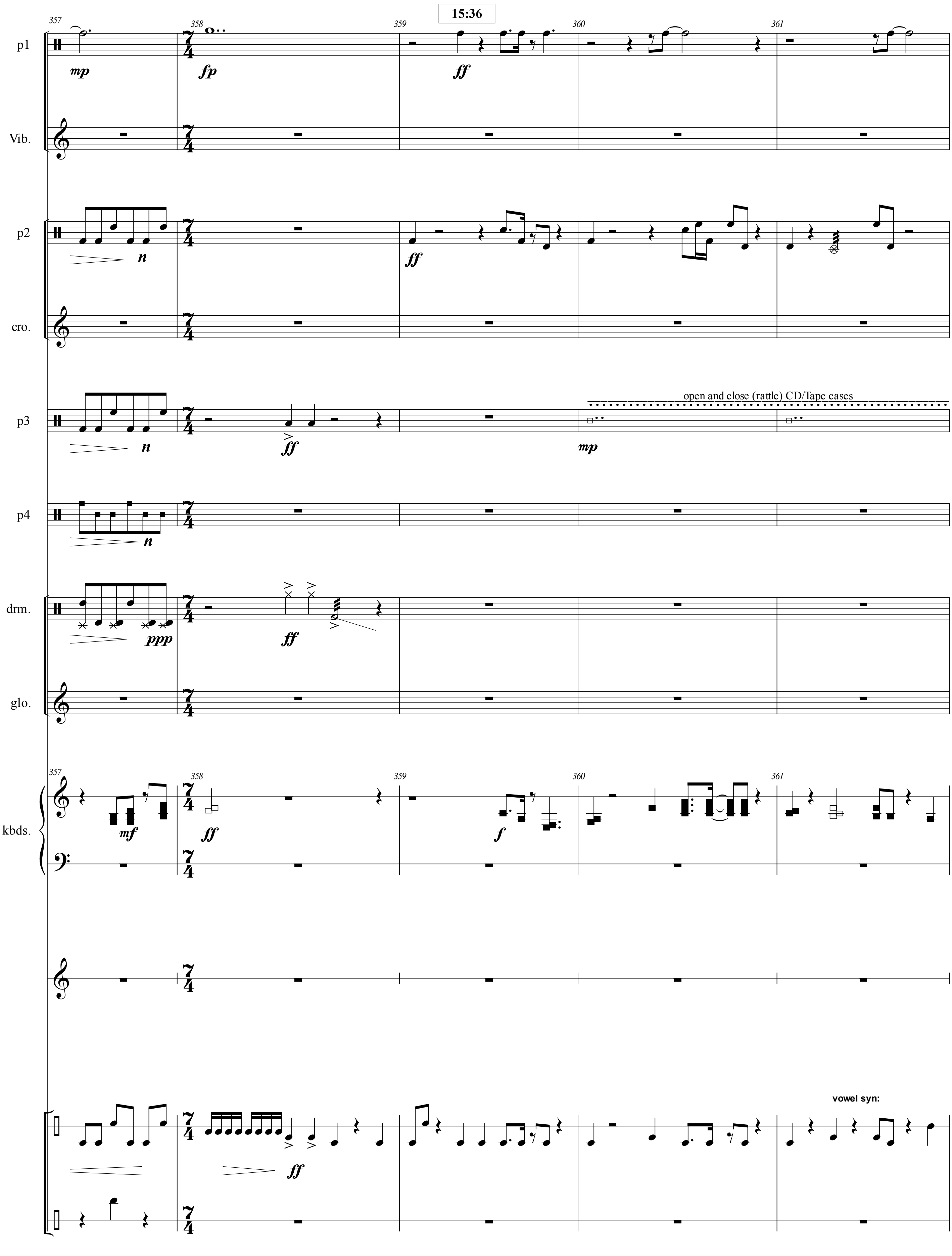
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
317
318
319
320
321
322
fz
pp
pp
mf
norm.
f
n
f
n
f
ppp
mp
digital noise:
LinnDrum:
f


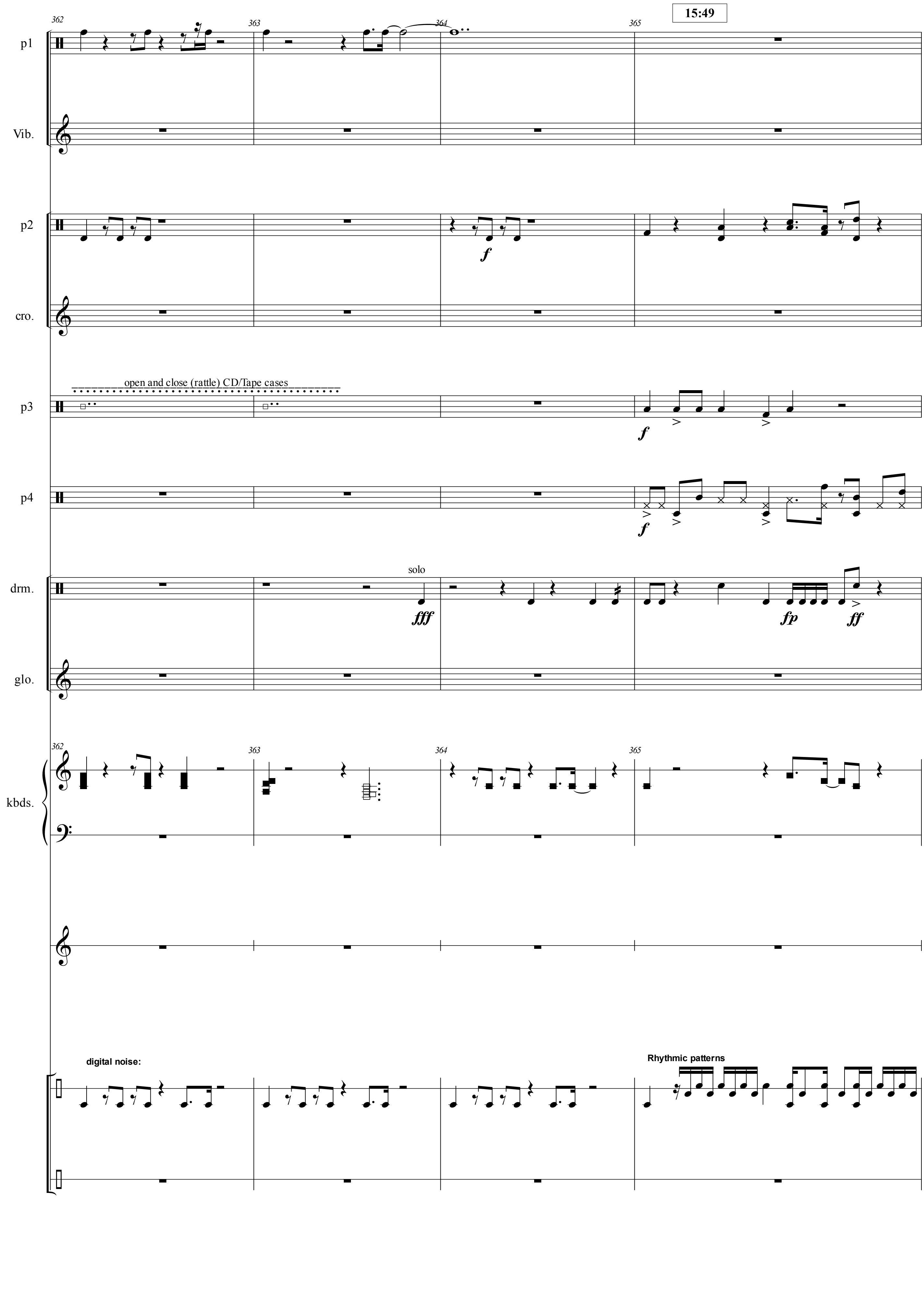
323
324
325
326
327
328
329
330
331
p1
Vib.
monotron
mod. ad. lib.
not too bright...
p2
sfz
p
mp
cro.
rate
ad lib. match electronic texture
p3
f
fp
n
f
p4
mf
p
mf
mp
drm.
f
fp
glo.
kbds.
vowel syn:
fp


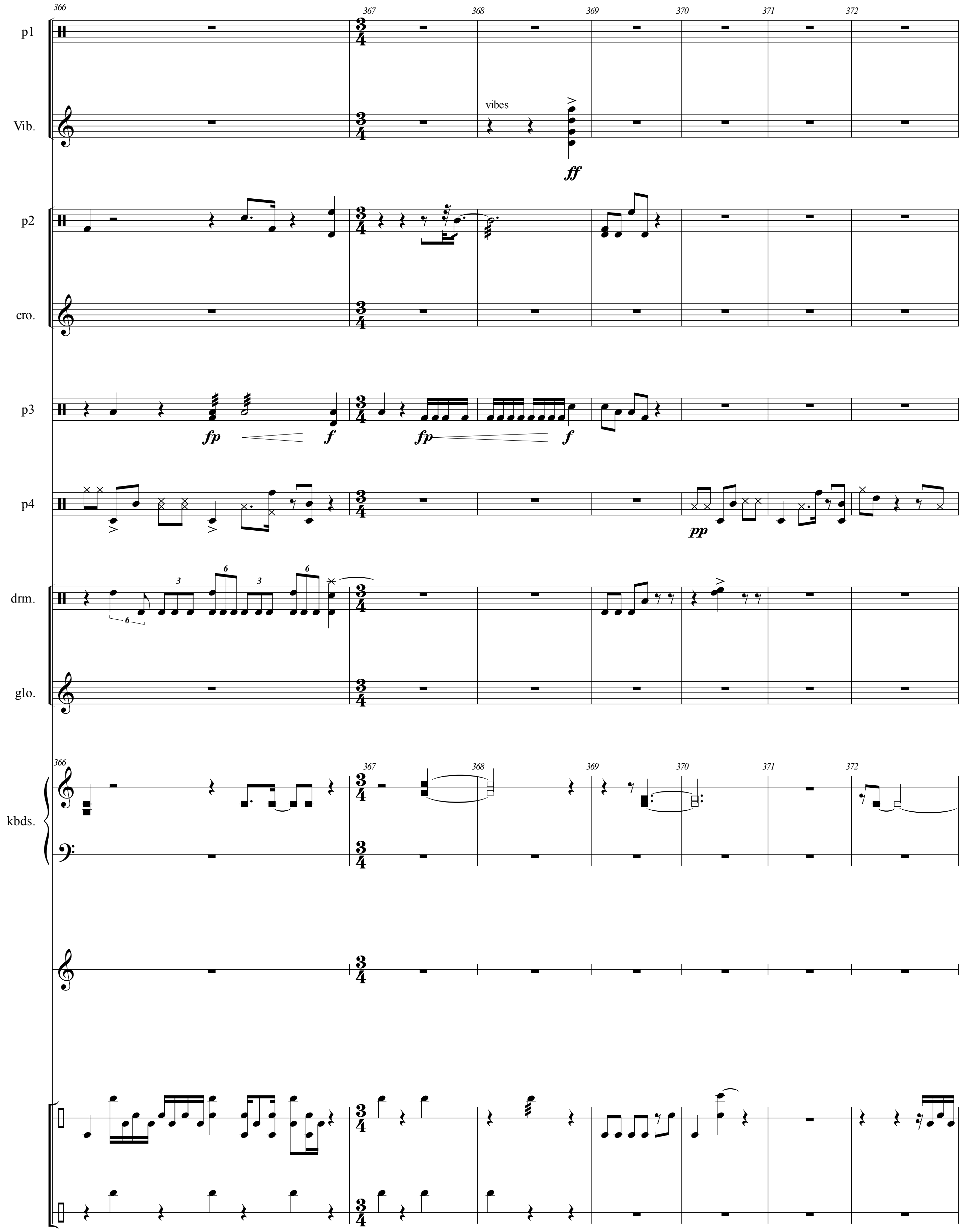
15:04
332
333
334
335
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
Rhythmic patterns


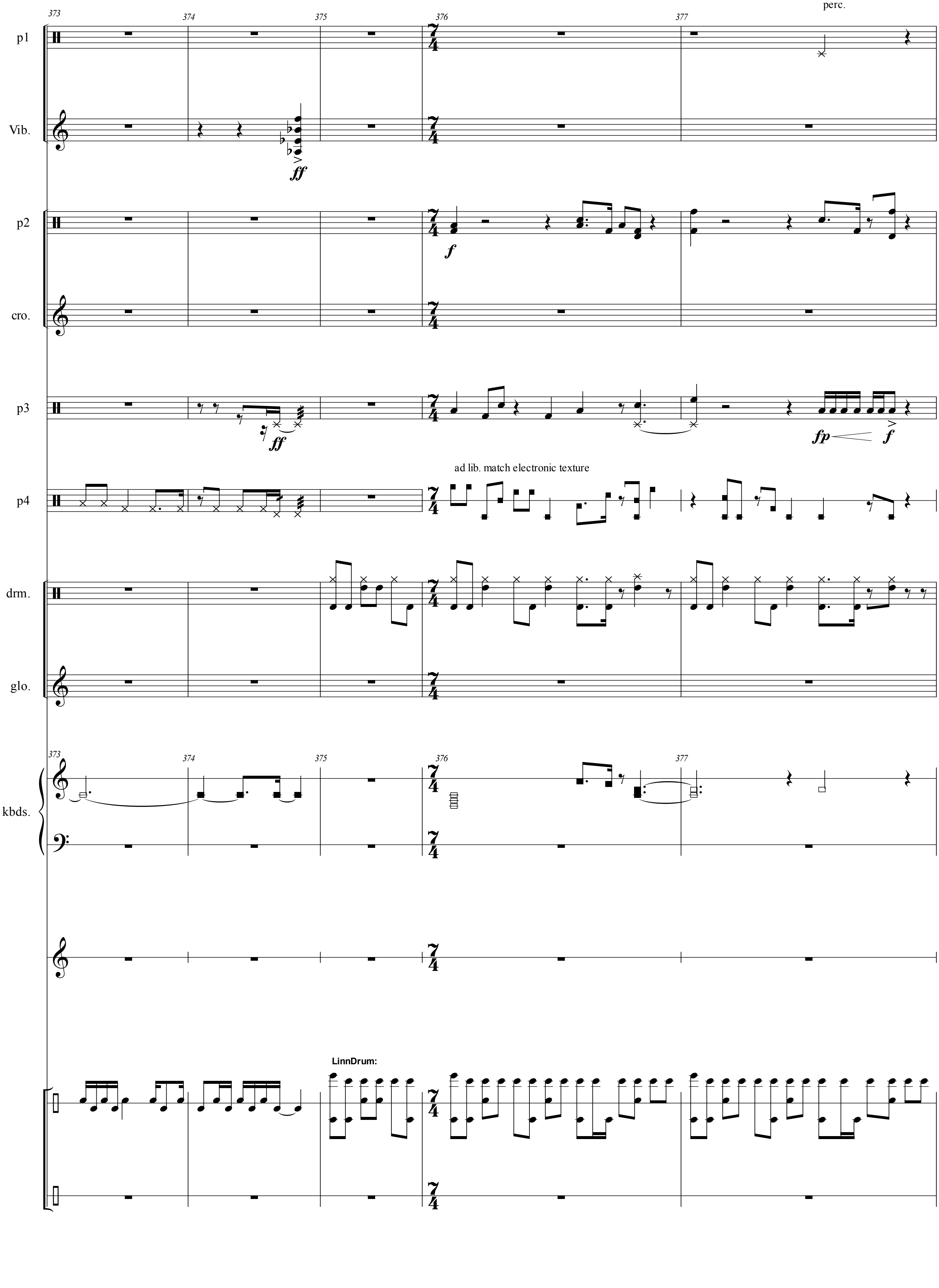
336
337
p1
Vib.
p2
cro.
p3
p4
drm.
fp
f
fff
ppp
glo.
kbds.
vowel syn:


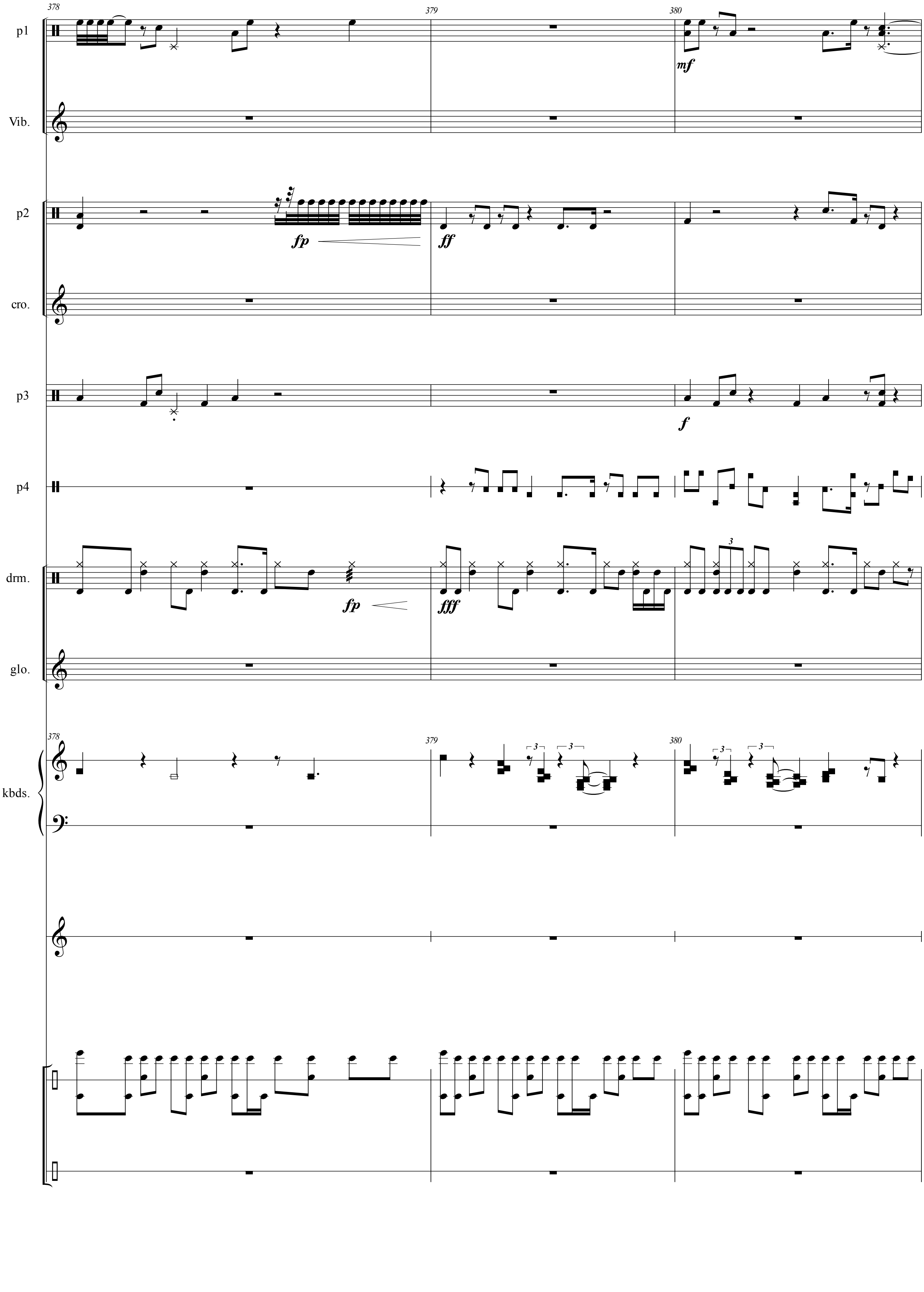
338
339
340
p1
Vib.
agitato
mf
fp
p2
cro.
p3
p4
fp
f
drm.
glo.
kbds.
fp

p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
341
342
343
344
345
346
347
348
kp mini
mod. ad. lib.
fp
norm.
f
p
pp
f
pp
mf
fp
f
patch: rotate between lowbit arp patches (ad lib)
ad lib.
mod to follow contour
Rhythmic patterns
digital noise:


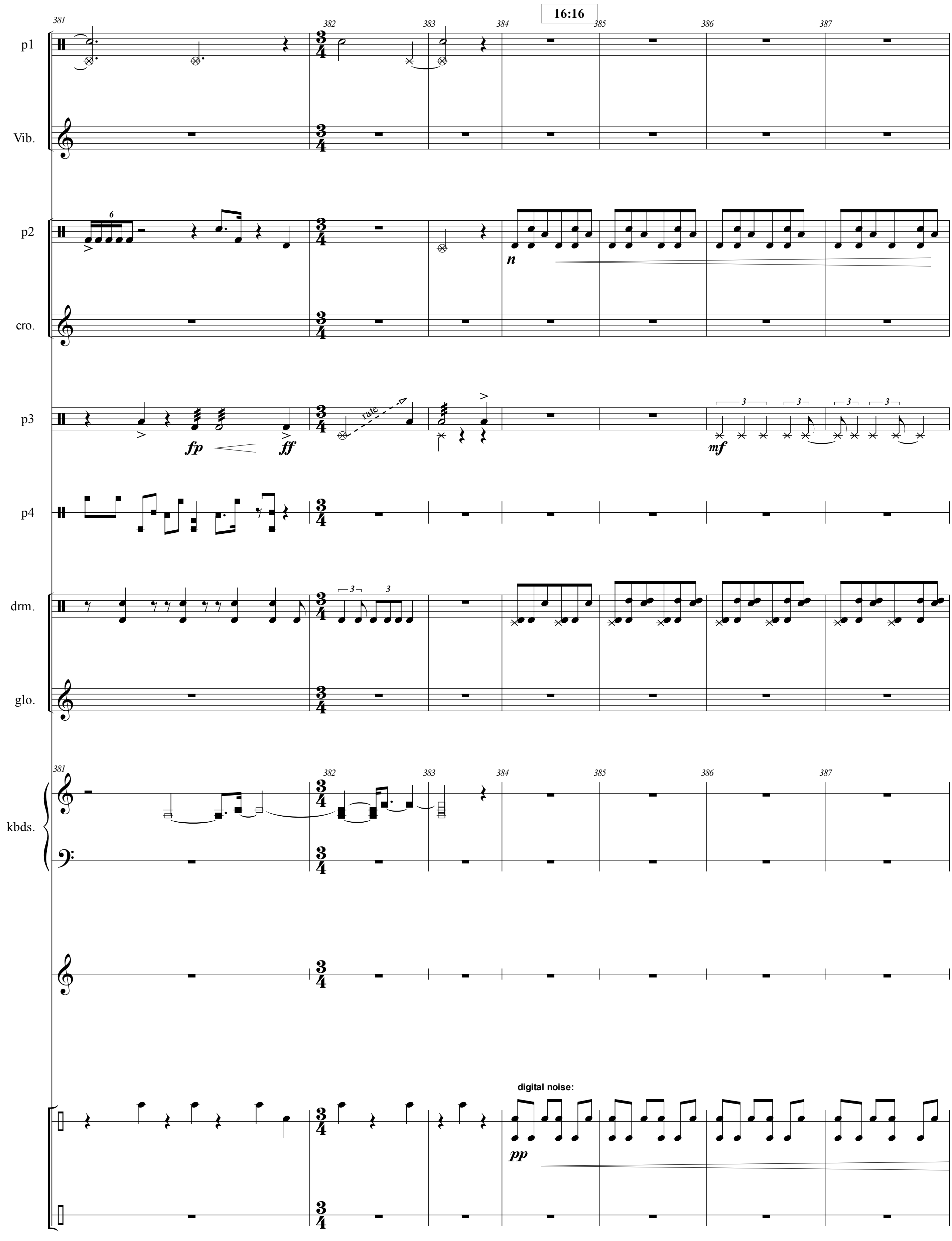
349
350
351
352
353
354
355
356
p1
n
Vib.
p2
dim.
cro.
p3
mf
p4
drm.
glo.
kbds.


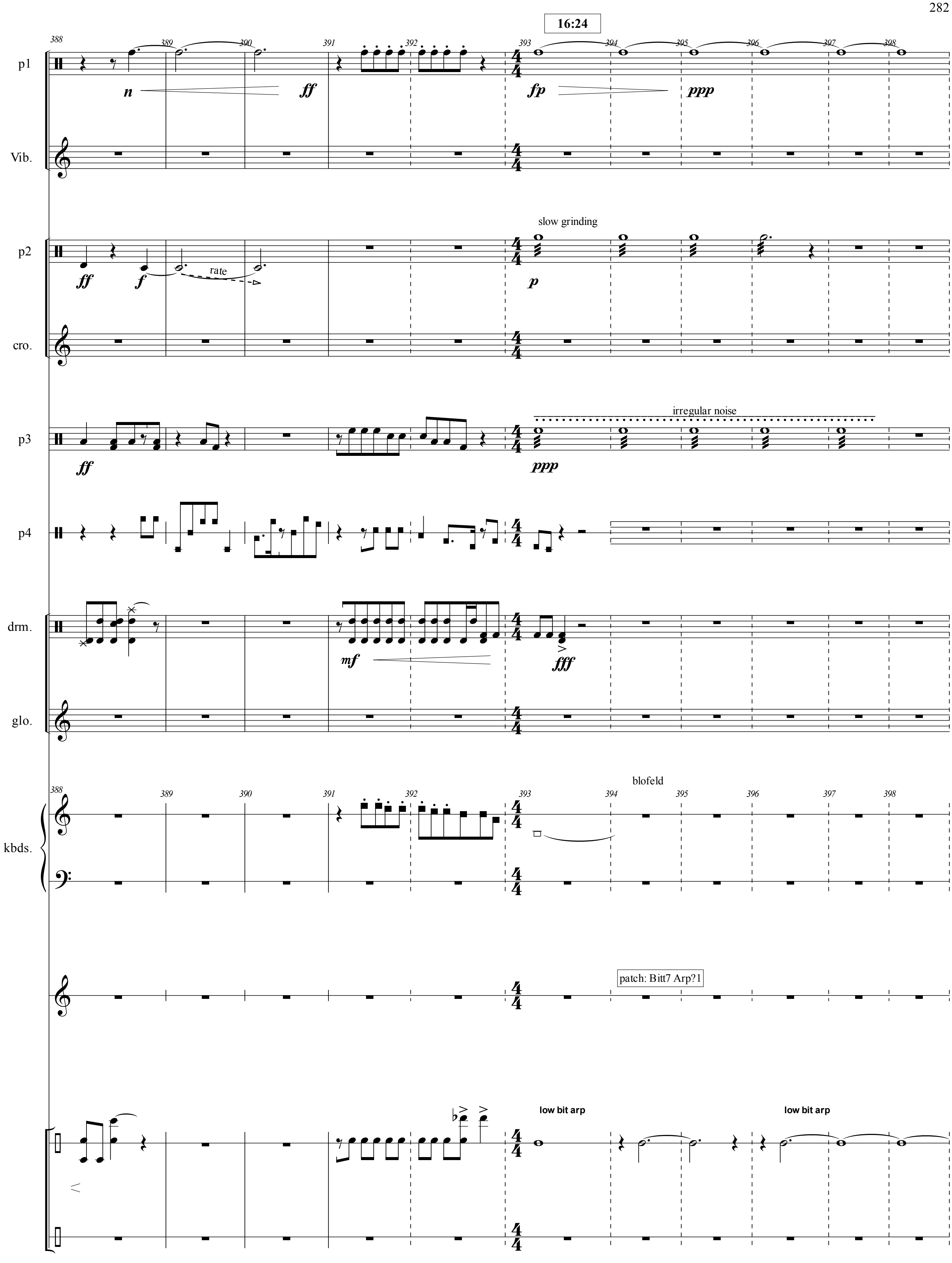
15:36
357
358
359
360
361
p1
mp
fp
ff
Vib.
p2
n
ff
cro.
p3
n
ff
open and close (rattle) CD/Tape cases
mp
p4
n
drm.
ppp
ff
glo.
kbds.
mf
ff
f
ff
vowel syn:


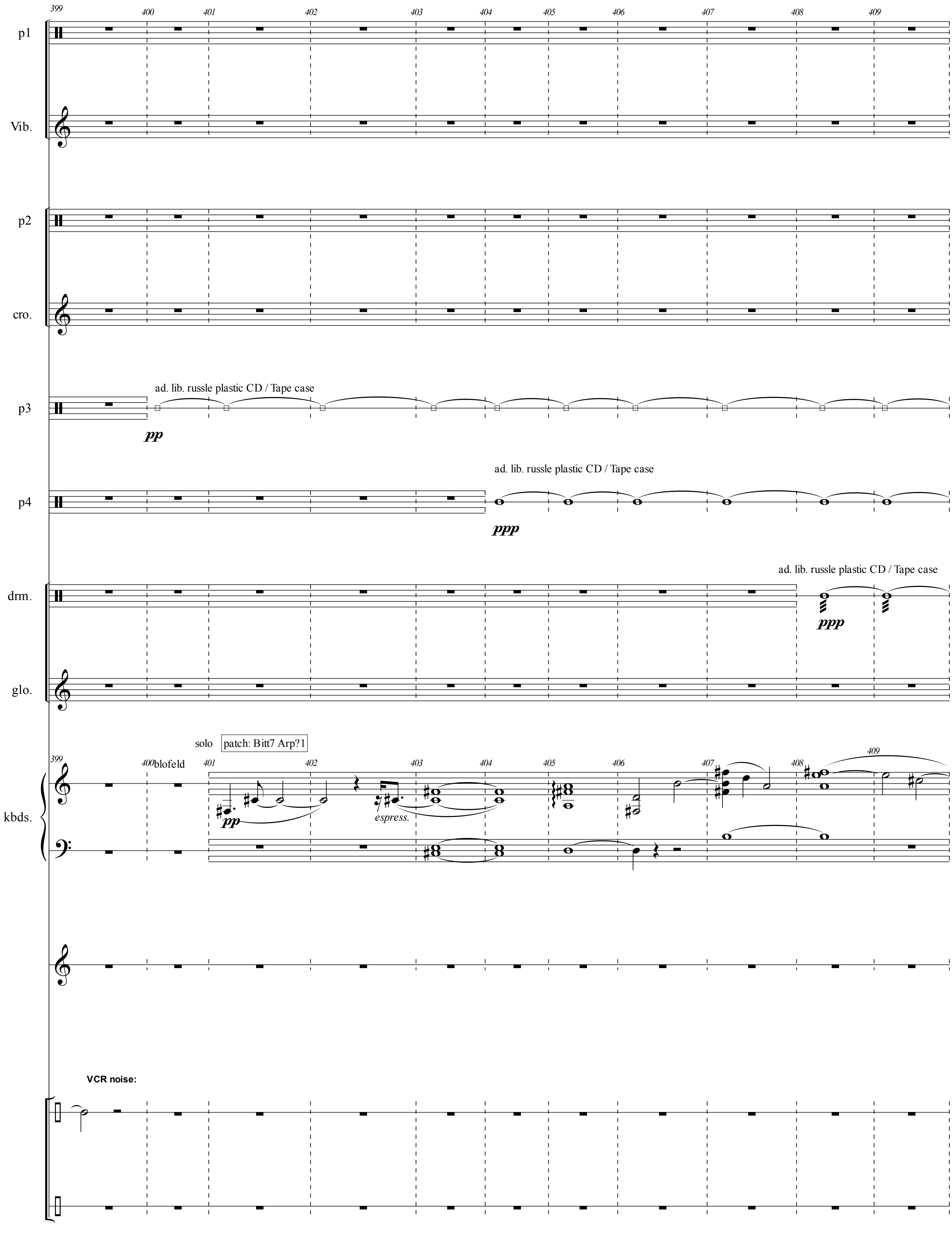
15:49
362
363
364
365
p1
Vib.
p2
cro.
open and close (rattle) CD/Tape cases
p3
p4
solo
drm.
glo.
kbds.
digital noise:
Rhythmic patterns


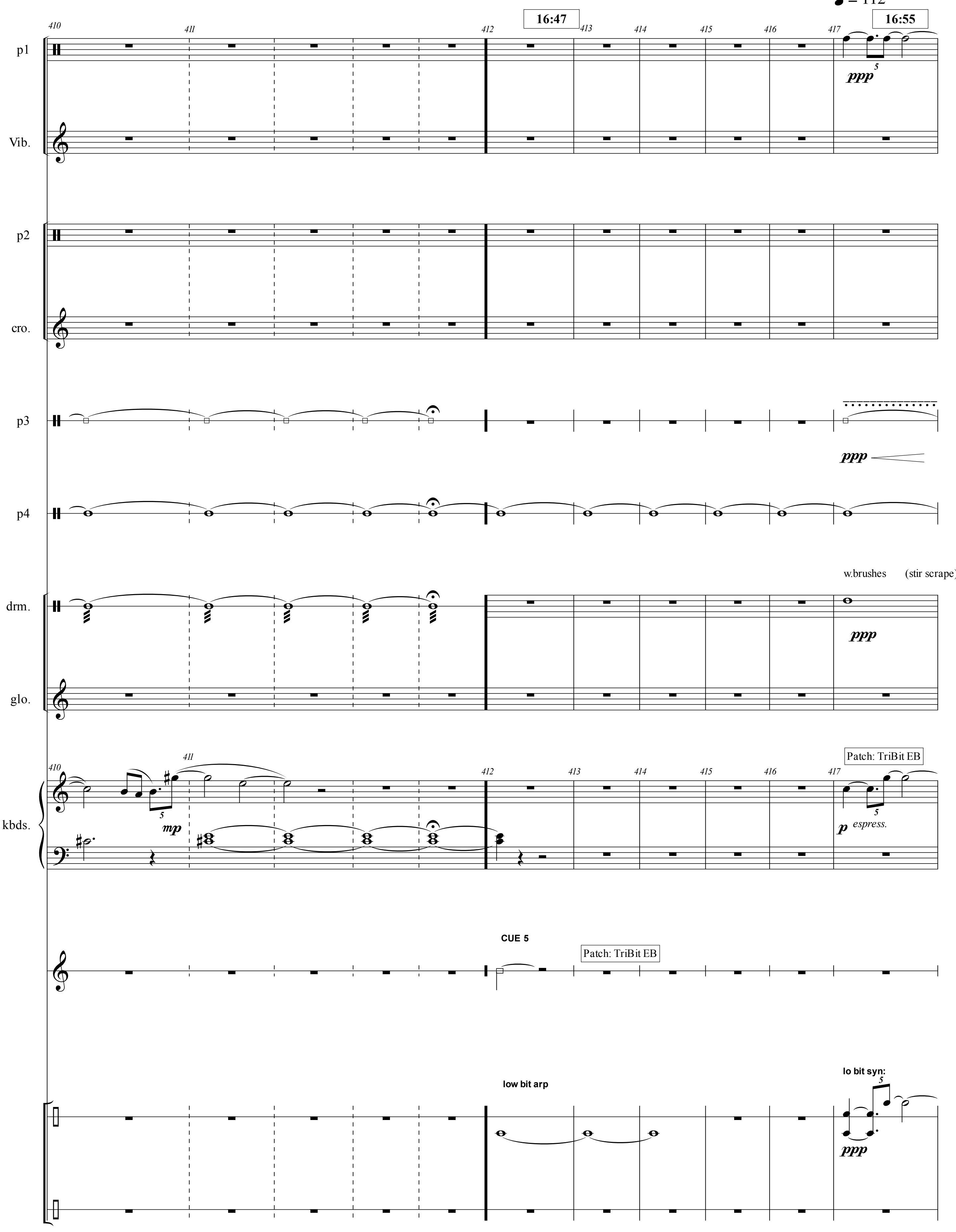
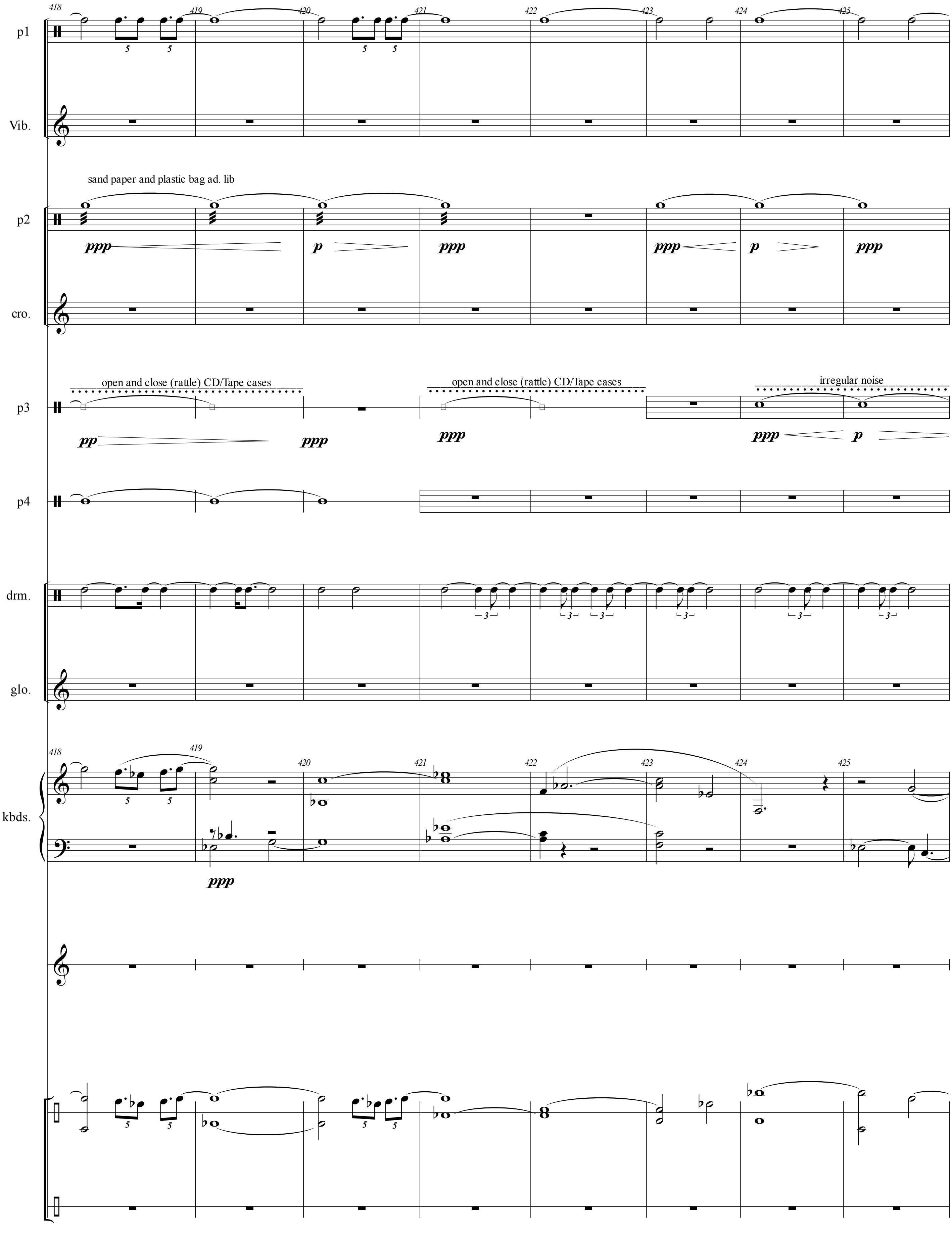
p1
Vib.
vibes
ff
p2
cro.
p3
fp
f
p4
pp
drm.
glo.
kbds.
366
367
368
369
370
371
372


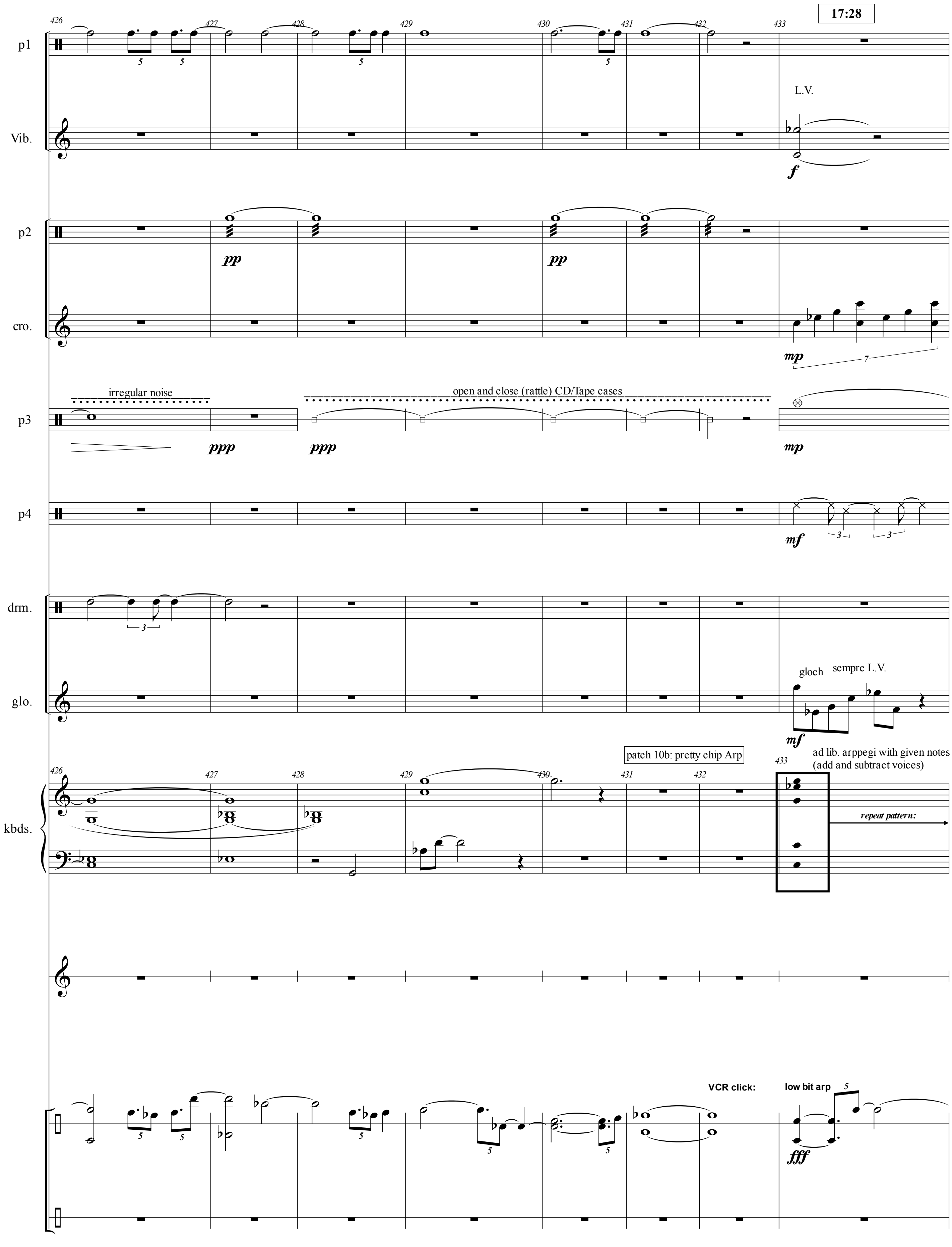
373
374
375
376
377
perc.
p1
Vib.
ff
p2
f
cro.
p3
ff
fp
f
p4
ad lib. match electronic texture
drm.
glo.
kbds.
LinnDrum:


378
379
380
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
mf
fp
ff
f
fff
3


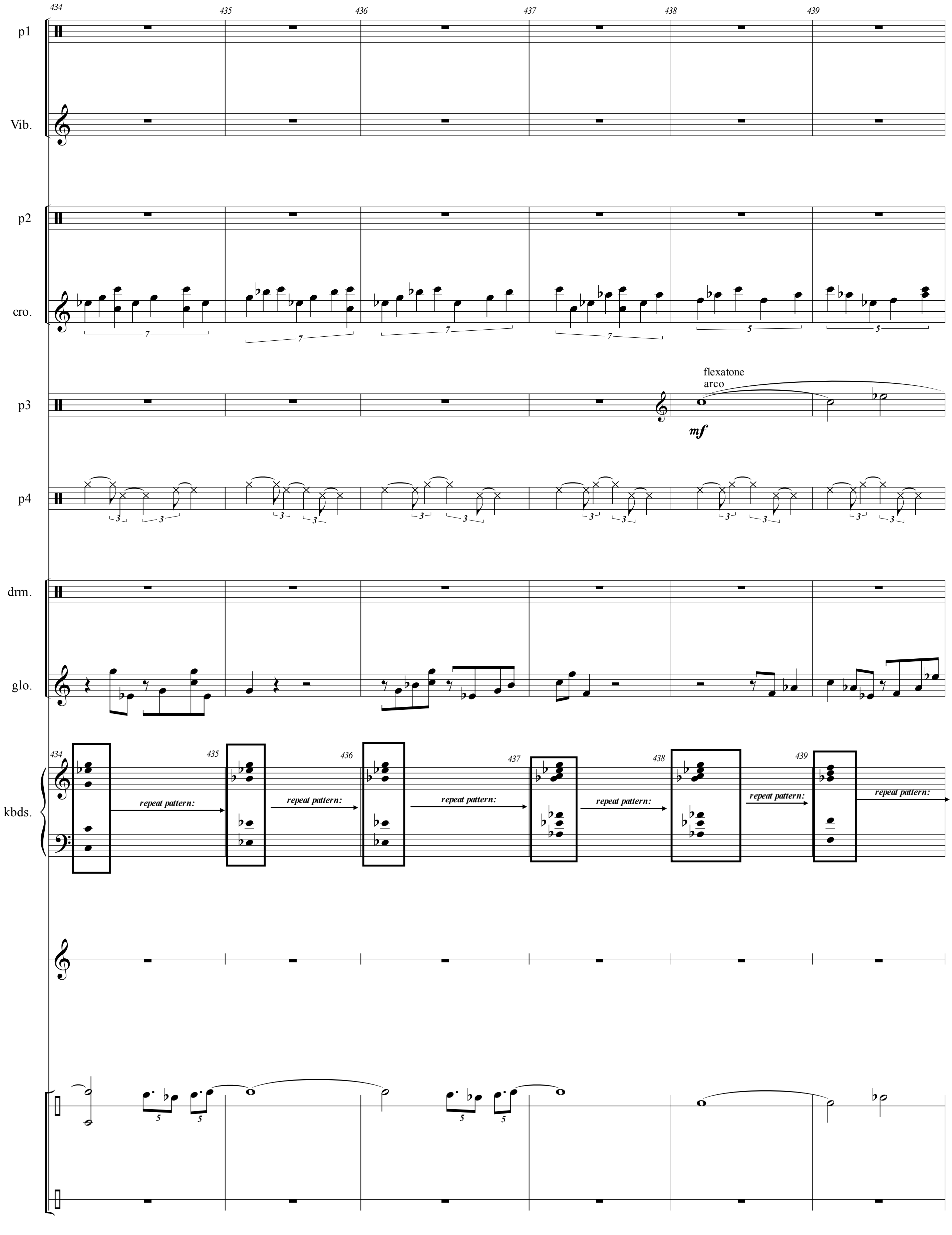
16:16
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
rate
digital noise:
fp
ff
mf
n
pp


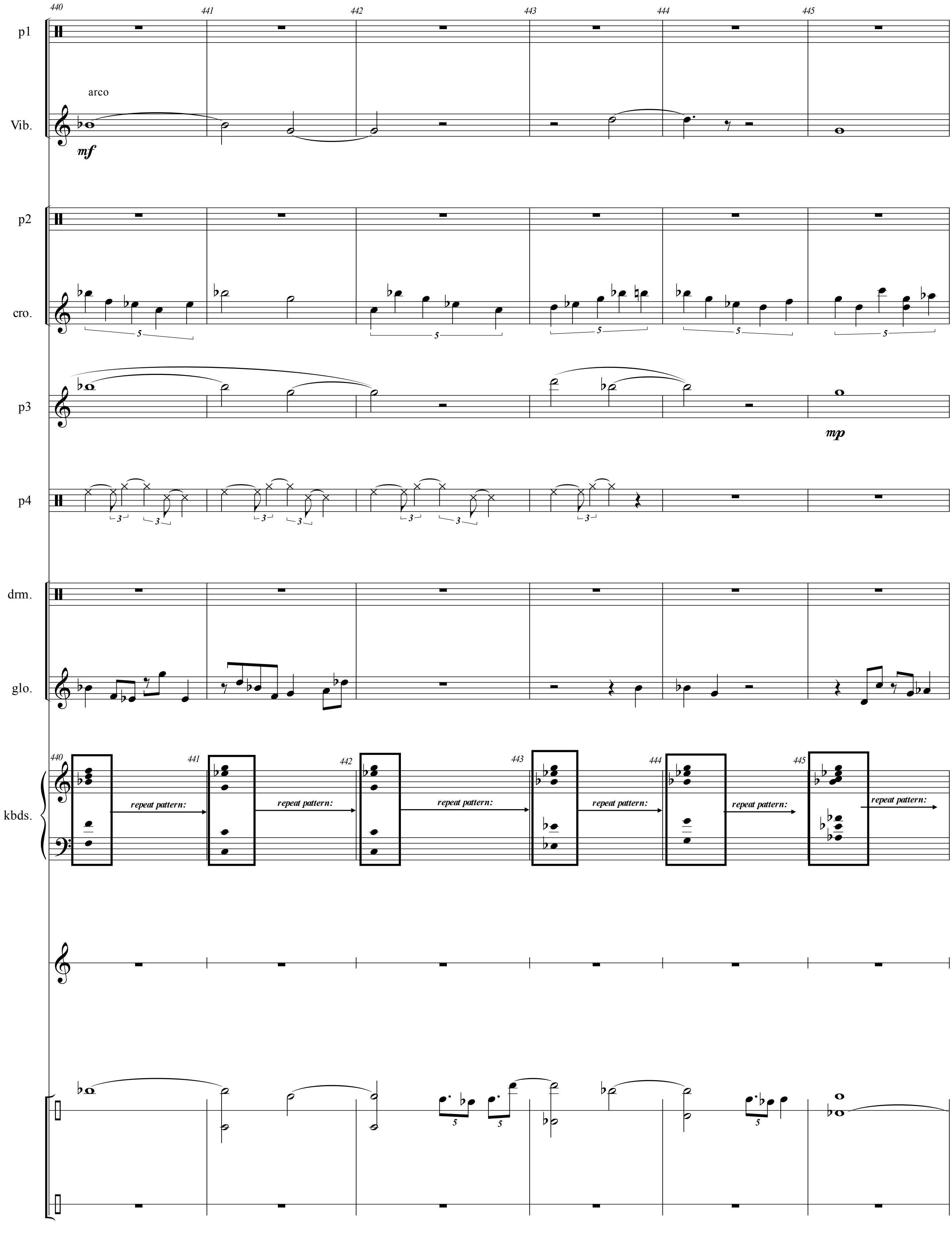
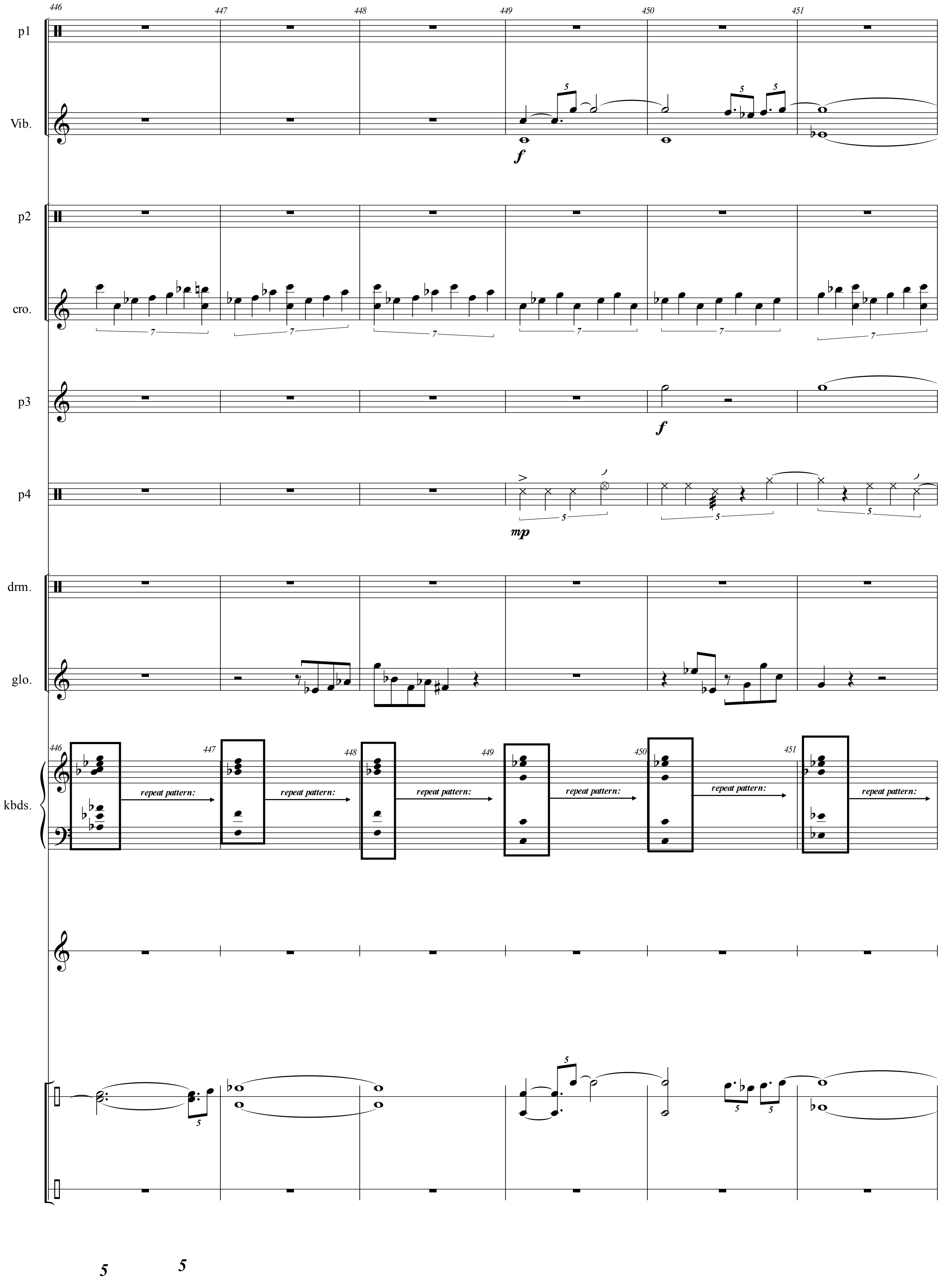
16:24
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
slow grinding
rate
irregular noise
blofeld
patch: Bitt7 Arp?1
low bit arp
low bit arp


p1
Vib.
p2
cro.
p3
ad. lib. russle plastic CD / Tape case
pp
p4
ad. lib. russle plastic CD / Tape case
ppp
drm.
ad. lib. russle plastic CD / Tape case
ppp
glo.
kbds.
solo
patch: Bitt7 Arp?1
blofeld
pp
espress.
VCR noise:

= 112
16:47
16:55
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
ppp
w.brushes
(stir scrape)
Patch: TriBit EB
mp
p espress.
CUE 5
Patch: TriBit EB
low bit arp
lo bit syn:


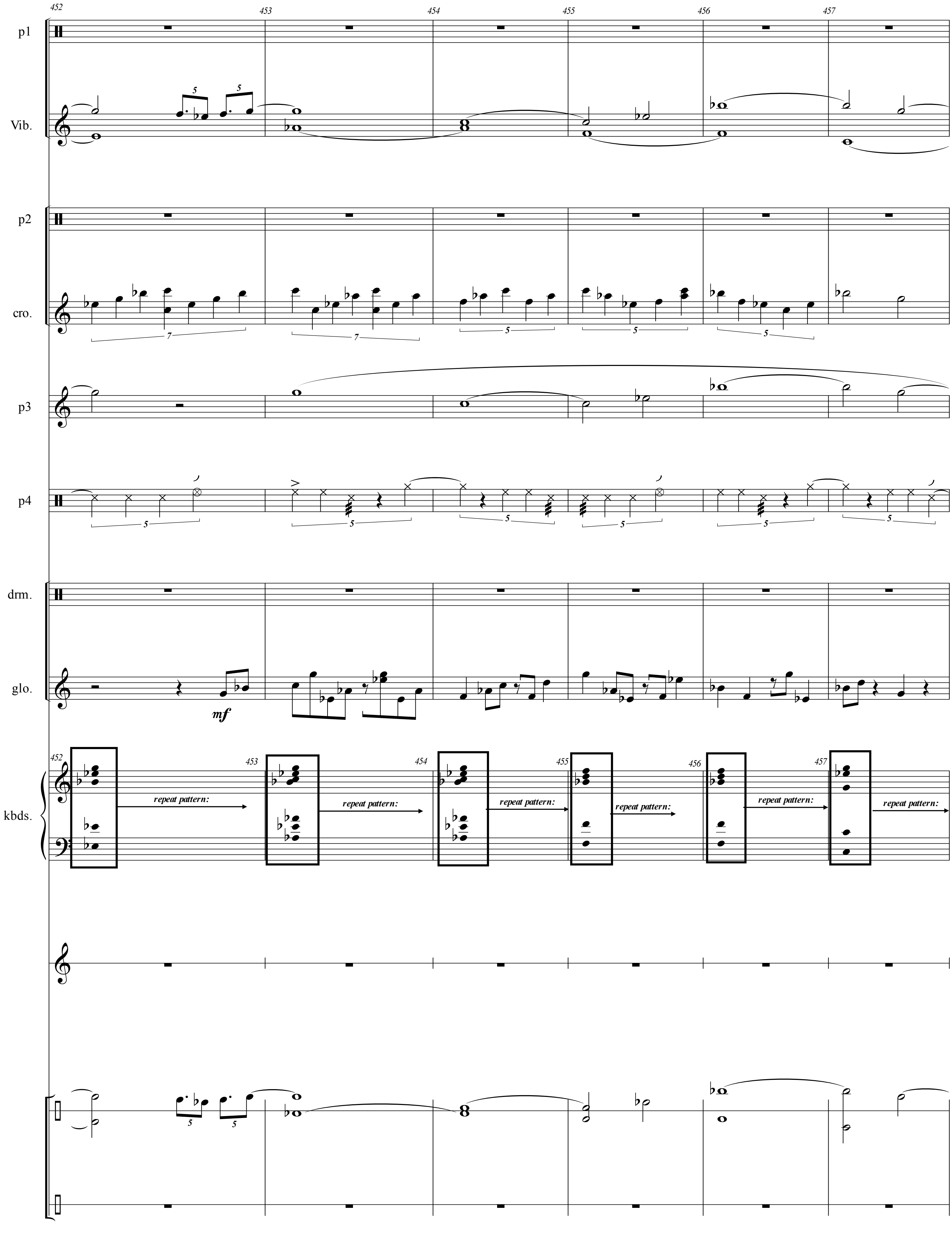
418
419
420
421
422
423
424
425
p1
Vib.
sand paper and plastic bag ad. lib
p2
ppp
p
cro.
open and close (rattle) CD/Tape cases
irregular noise
p3
pp
p4
drm.
glo.
kbds.


17:28
p1
Vib.
L.V.
p2
cro.
irregular noise
open and close (rattle) CD/Tape cases
p3
p4
drm.
gloch
sempre L.V.
glo.
patch 10b: pretty chip Arp
ad lib. arppegi with given notes
(add and subtract voices)
repeat pattern:
kbds.
VCR click:
low bit arp


434
435
436
437
438
439
p1
Vib.
p2
cro.
7
5
flexatone
arco
mf
p3
p4
3
drm.
glo.
kbds.
repeat pattern:

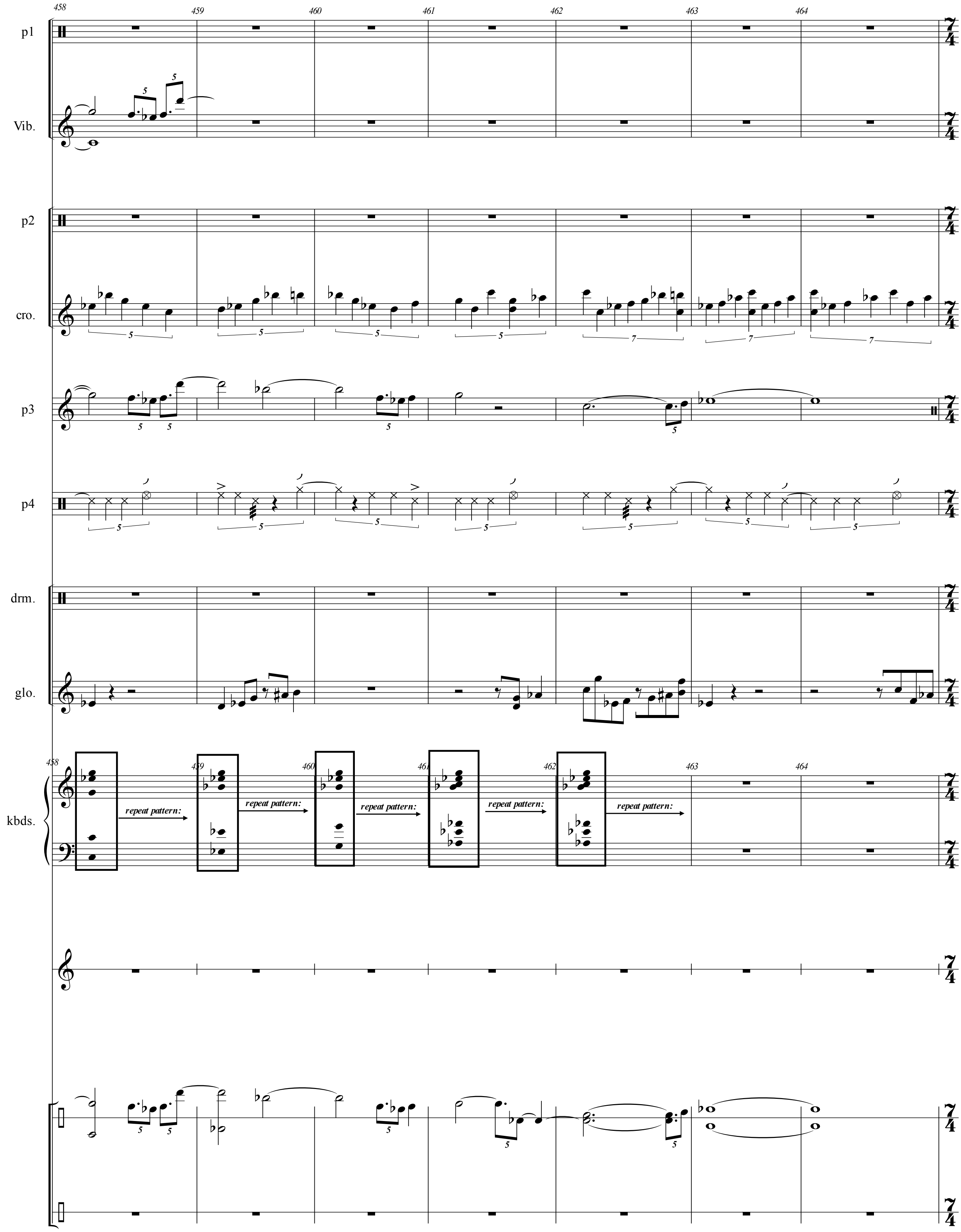
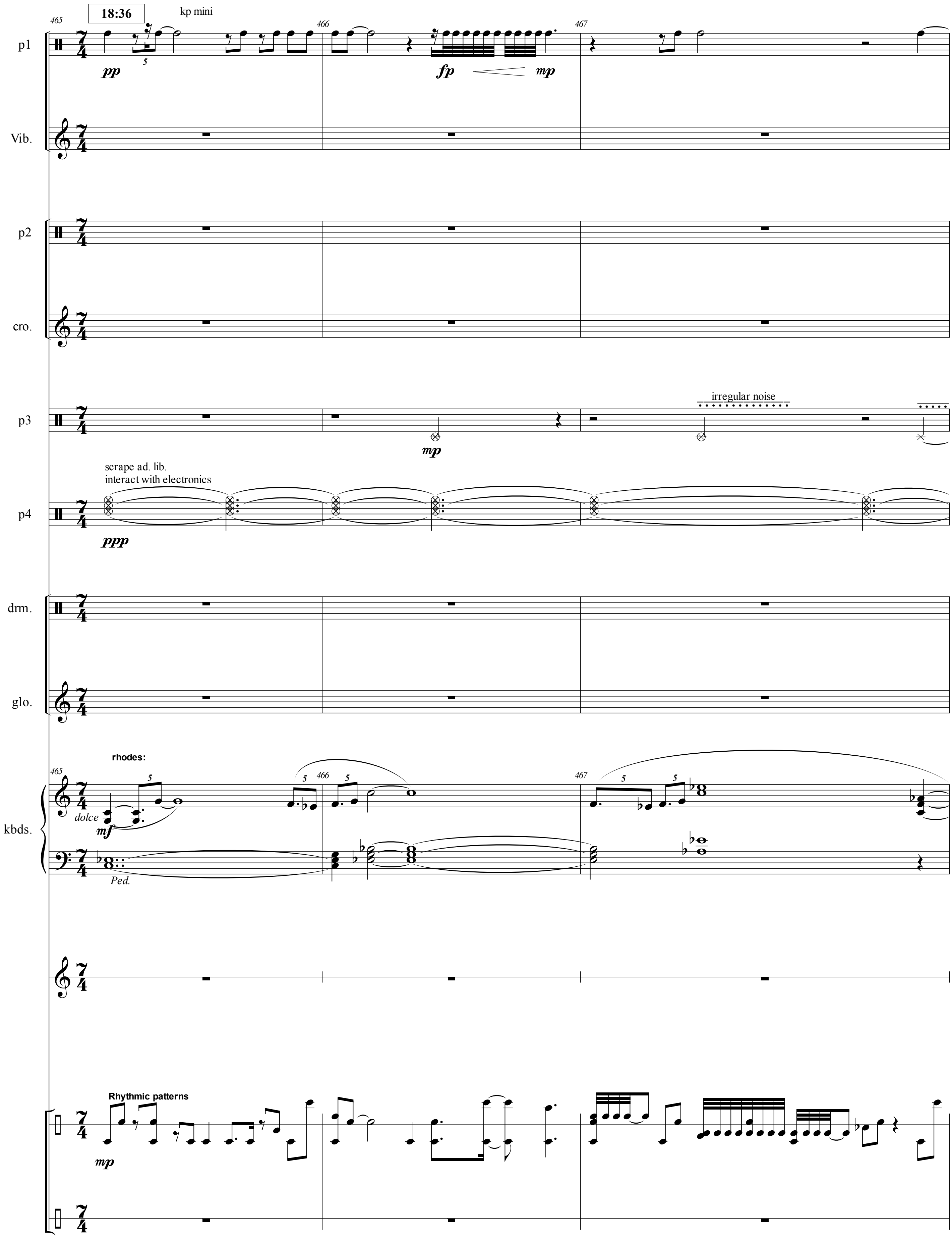

440
441
442
443
444
445
p1
arco
Vib.
mf
p2
cro.
p3
mp
p4
drm.
glo.
kbds.
repeat pattern:


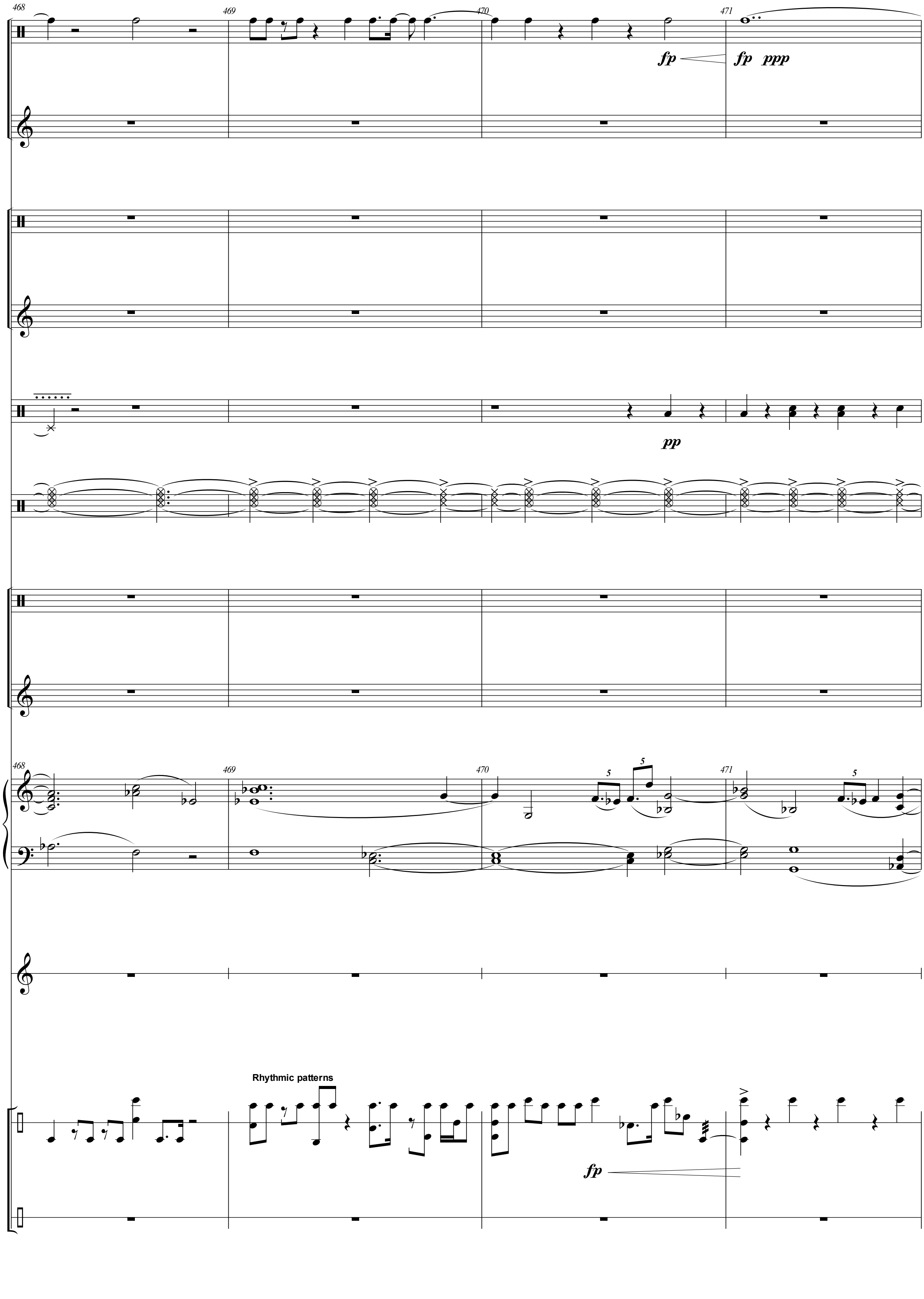
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
446
447
448
449
450
451
repeat pattern:
f
mp


452
453
454
455
456
457
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
mf
kbds.
repeat pattern:

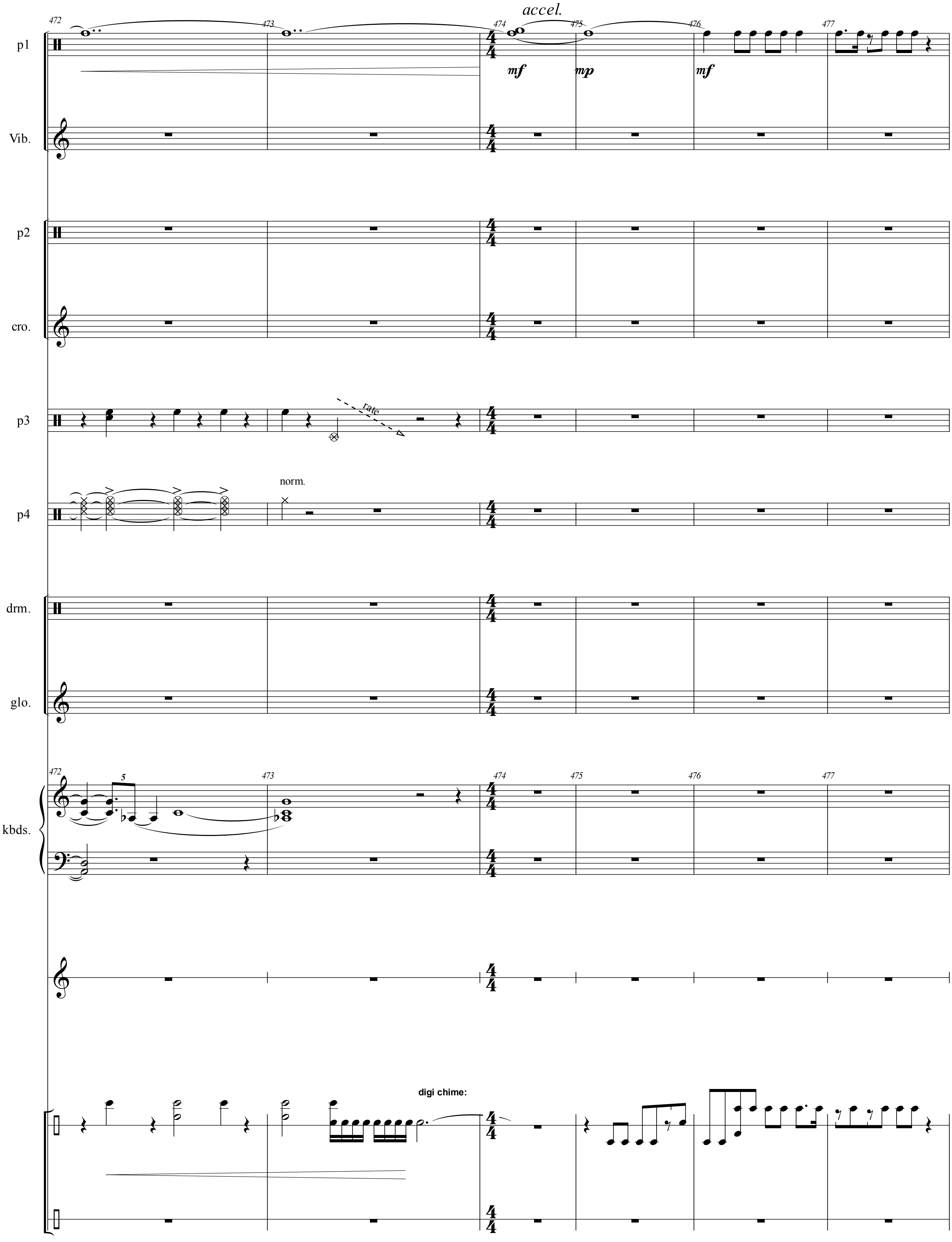
5

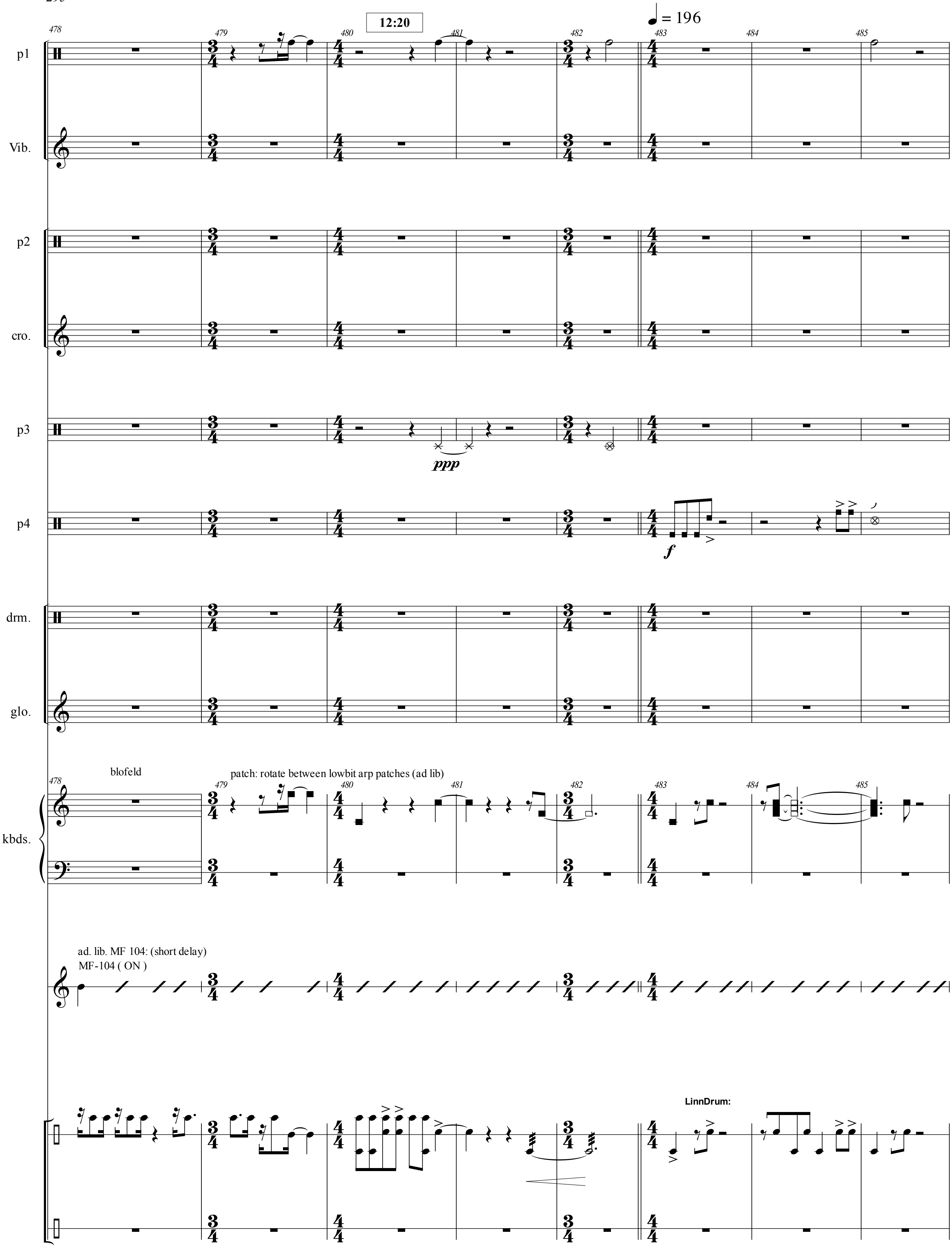
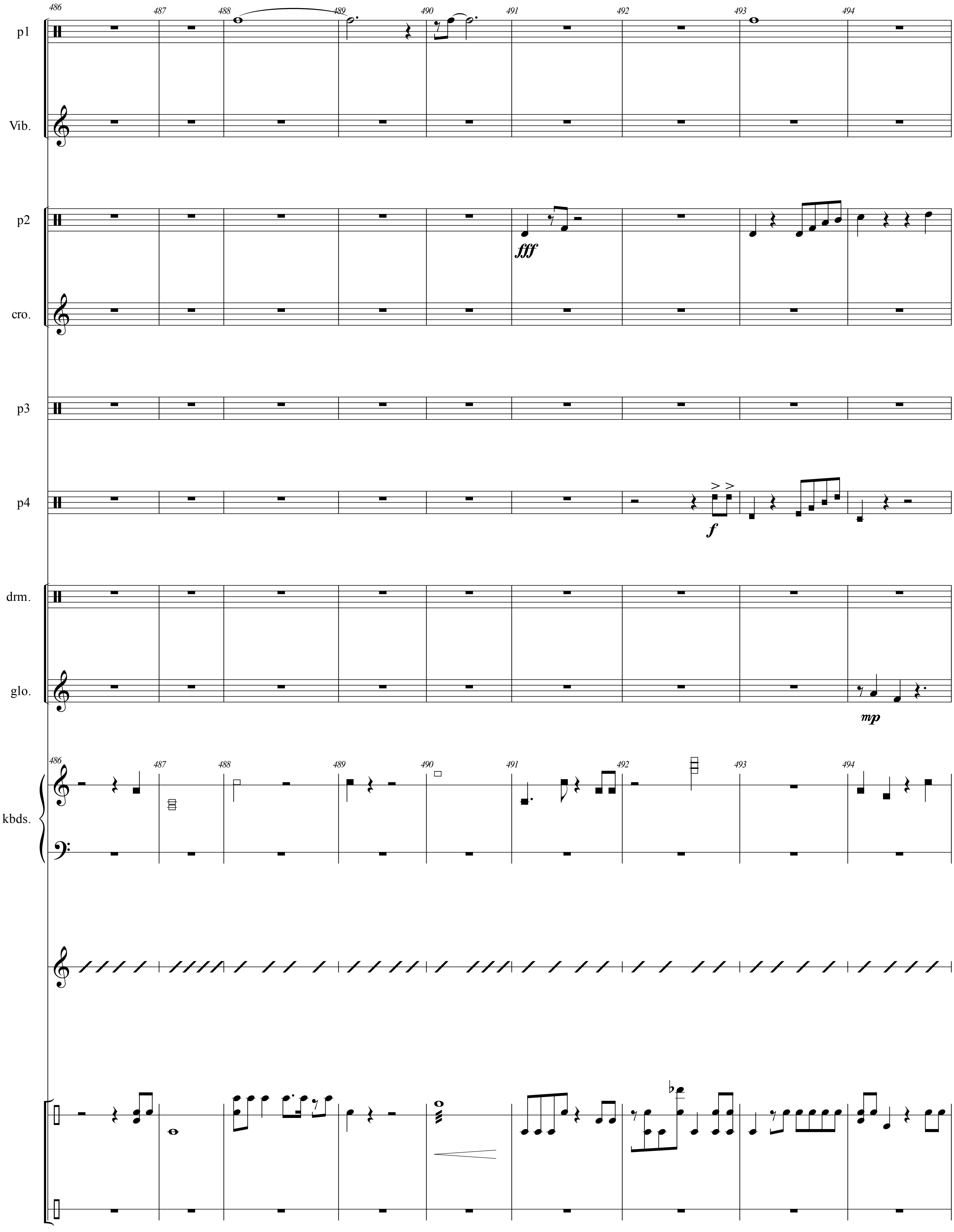
5

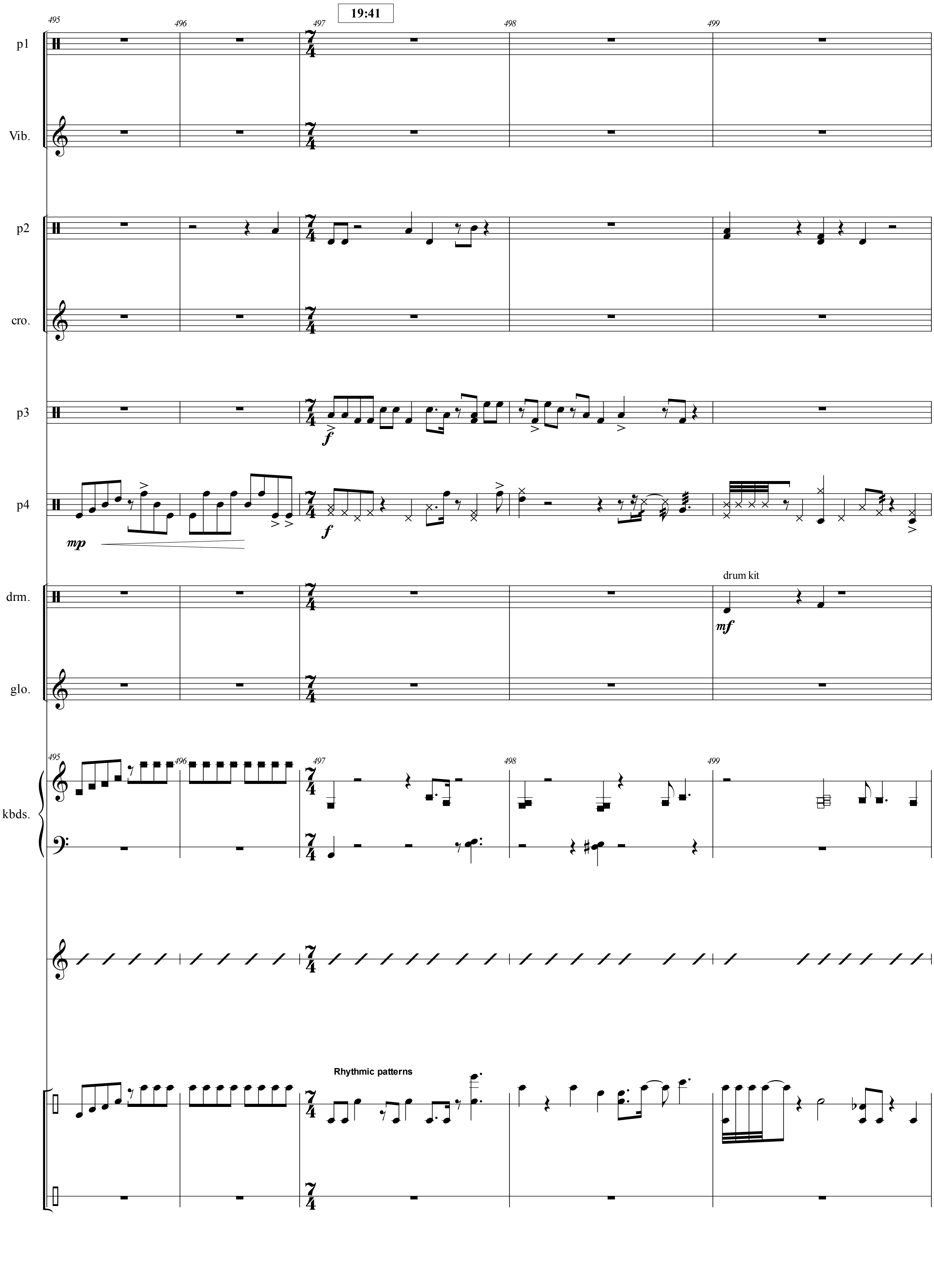

458
459
460
461
462
463
464
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
repeat pattern:
repeat pattern:
repeat pattern:
repeat pattern:
repeat pattern:


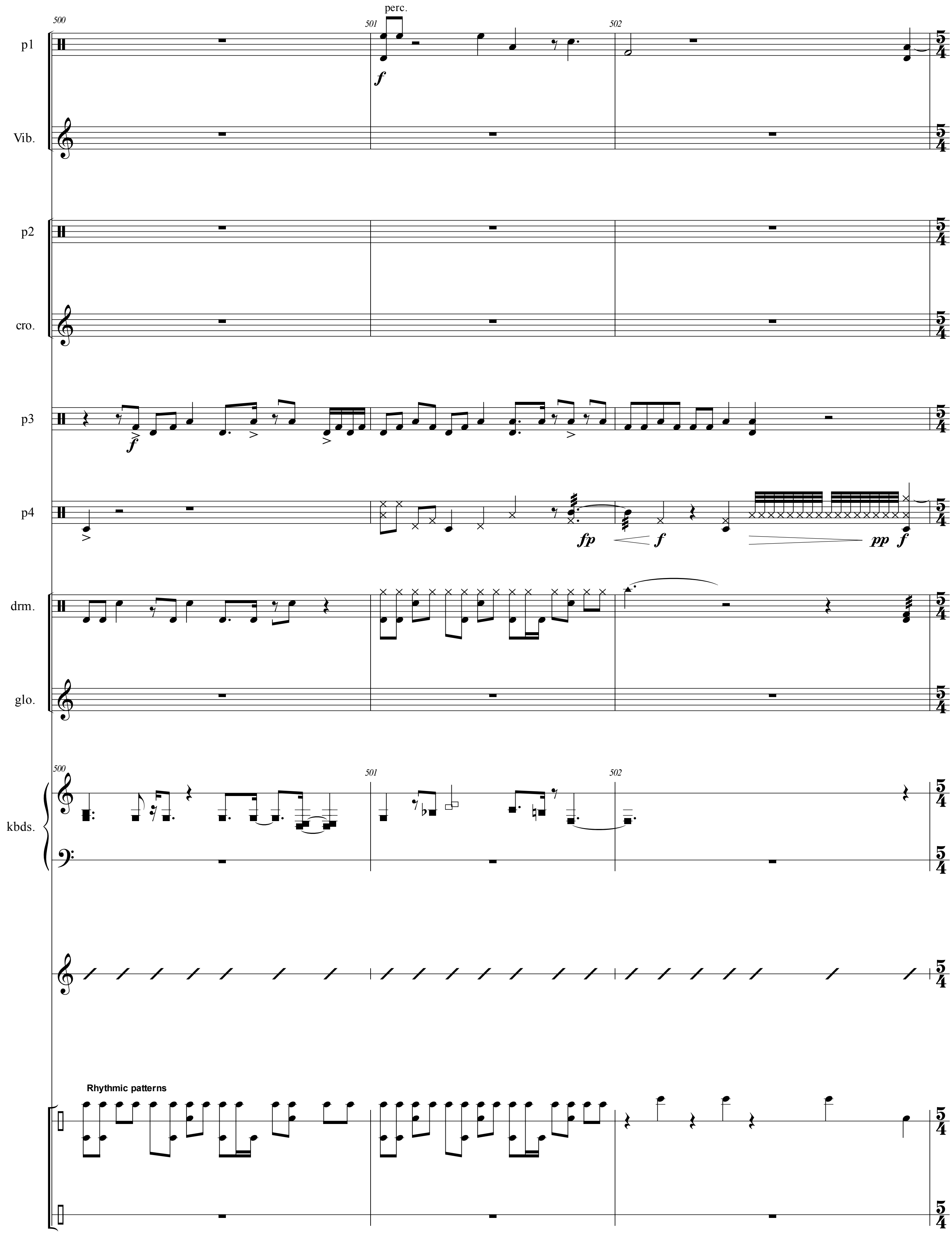
18:36
kp mini
465
466
467
p1
pp
fp
mp
Vib.
p2
cro.
p3
irregular noise
mp
scrape ad. lib.
interact with electronics
p4
ppp
drm.
glo.
rhodes:
kbds.
dolce
mf
Ped.
Rhythmic patterns
mp


468
469
470
471
p1
fp
fp ppp
Vib.
p2
cro.
p3
pp
p4
drm.
glo.
kbds.
5
5
5
Rhythmic patterns
fp

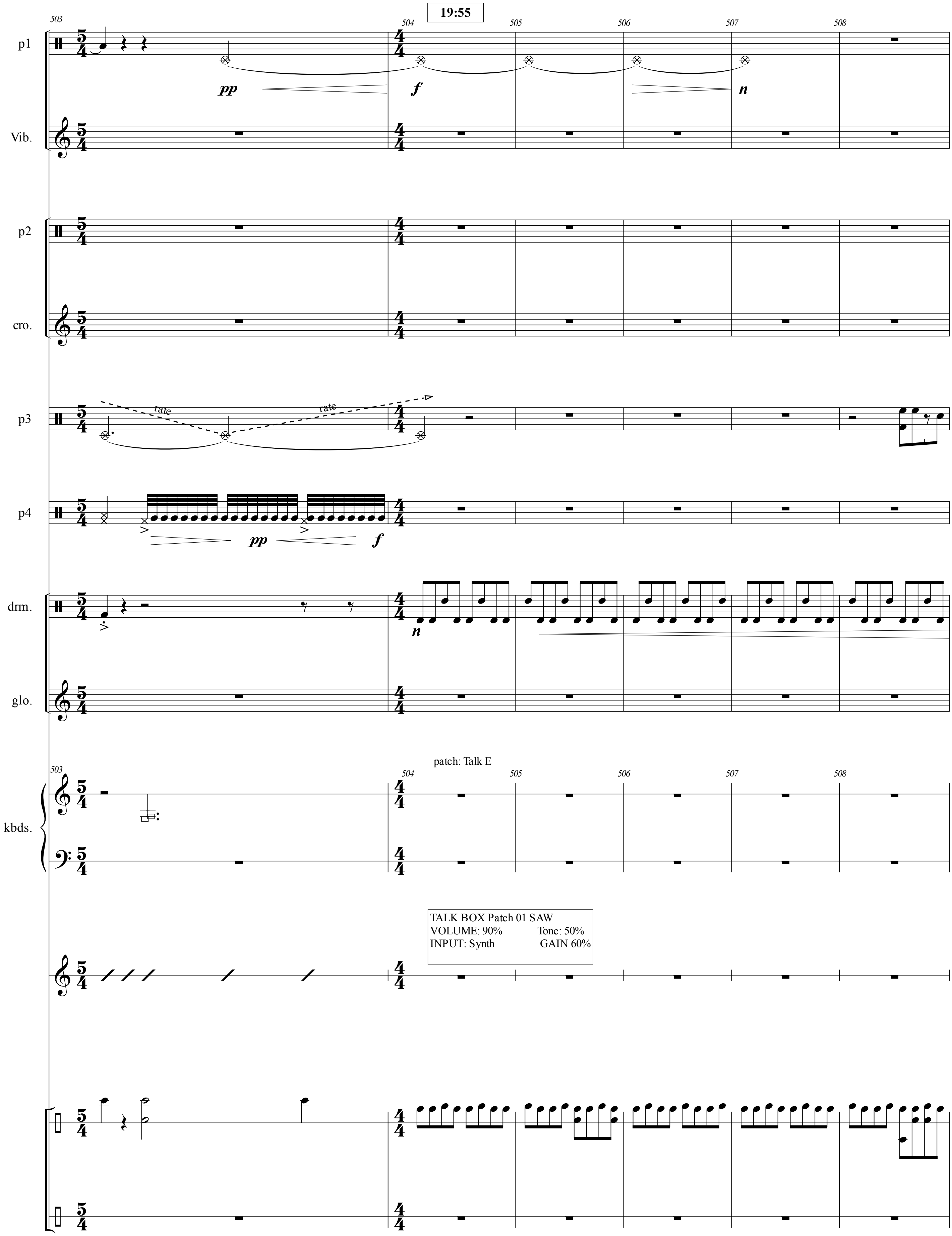
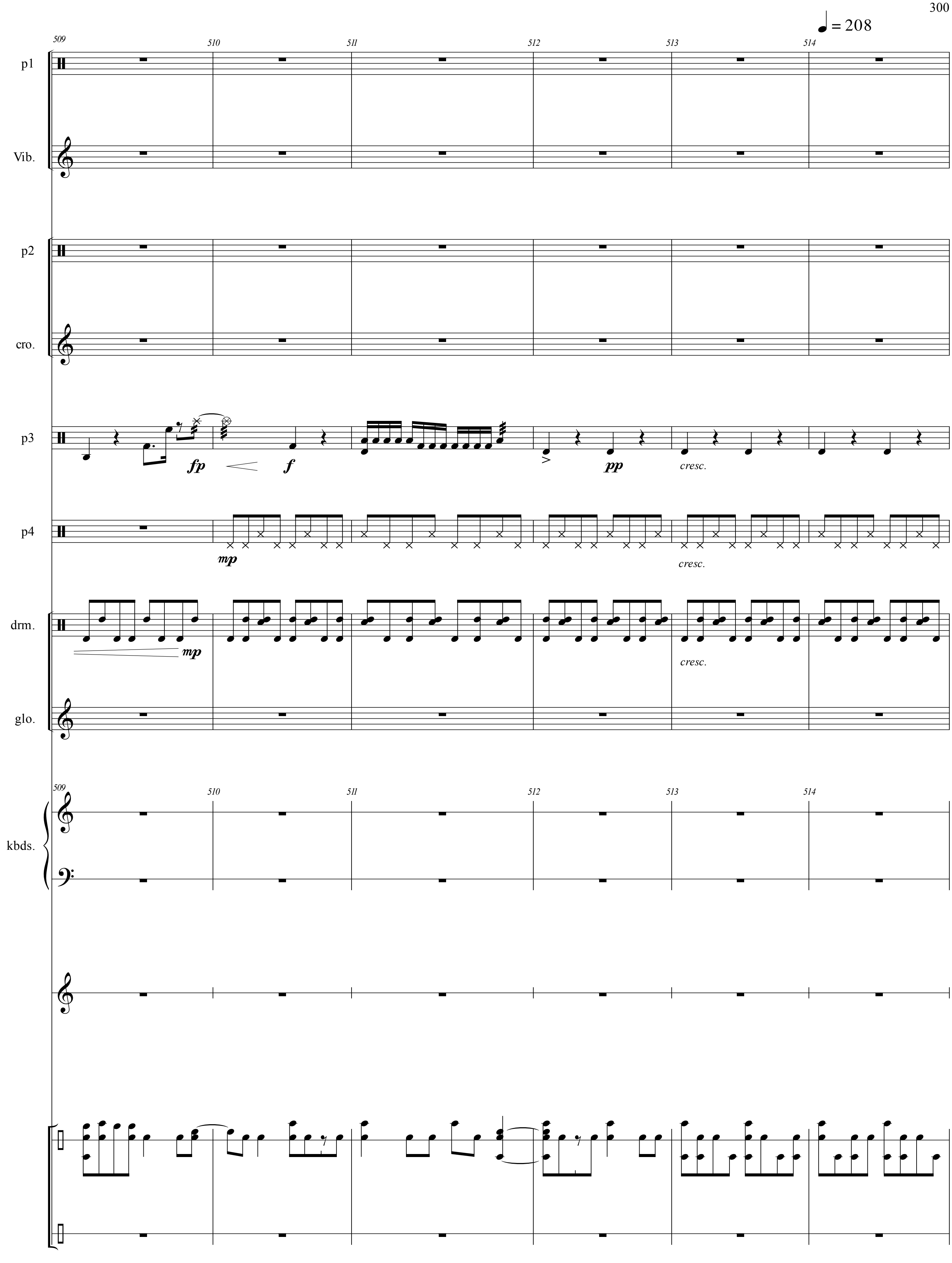
5 5 5


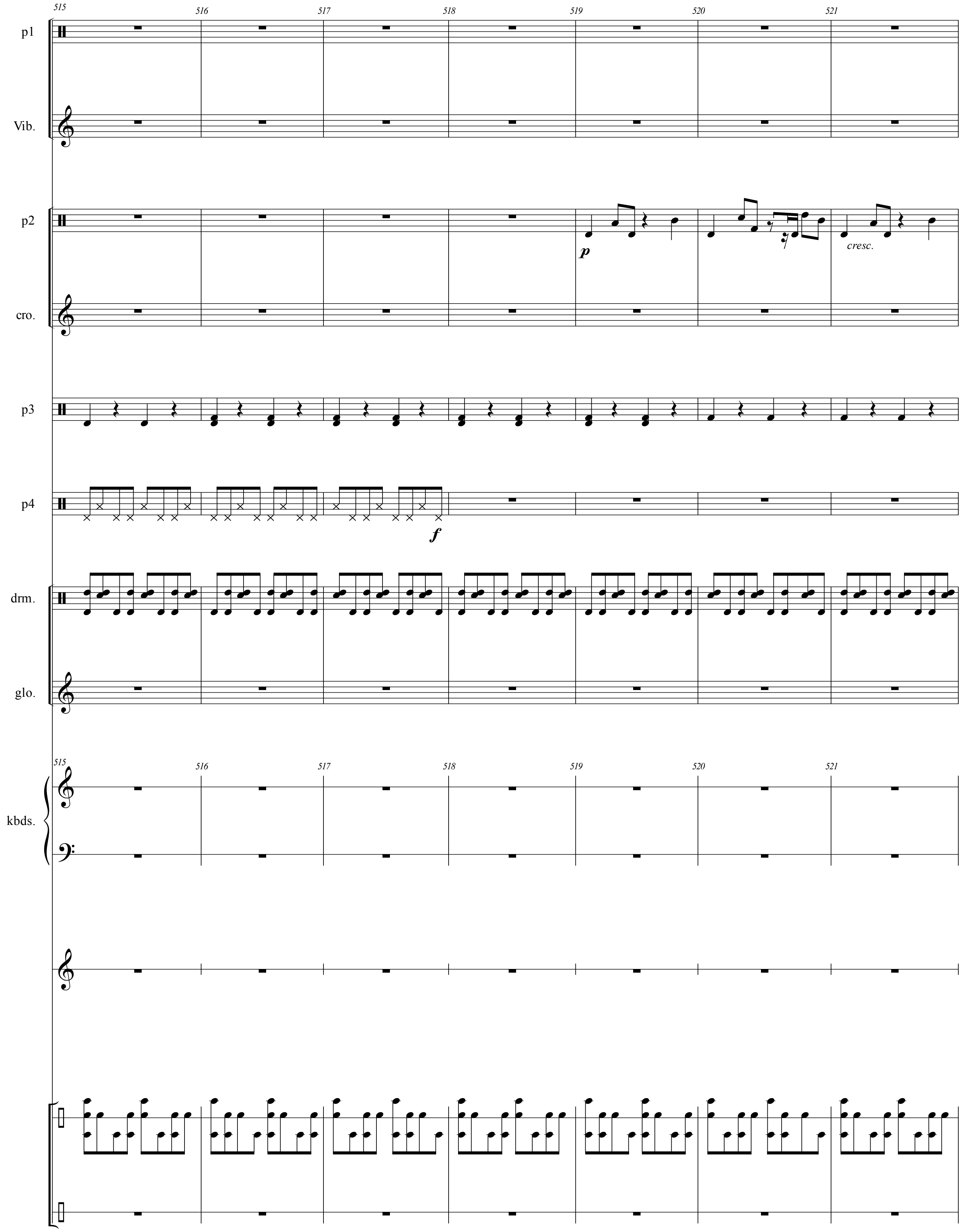
accel.
472
473
474
475
476
477
p1
mf
mp
mf
Vib.
p2
cro.
p3
rate
p4
norm.
drm.
glo.
kbds.
5
digi chime:

12:20
♩ = 196
p1
Vib.
p2
cro.
p3
ppp
p4
f
drm.
glo.
blofeld
patch: rotate between lowbit arp patches (ad lib)
kbds.
ad. lib. MF 104: (short delay)
MF-104 (ON)
LinnDrum:


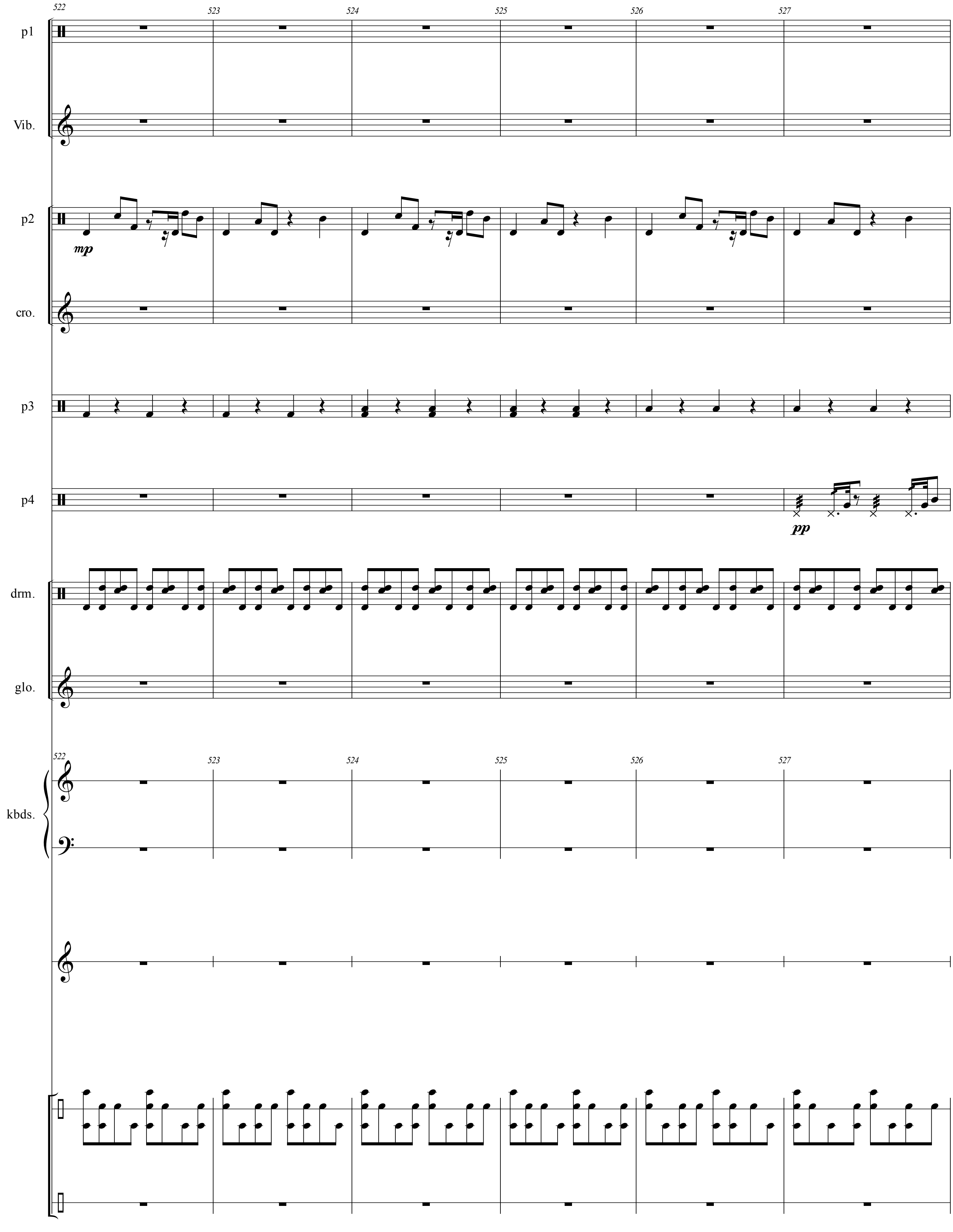
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
486
487
488
489
490
491
492
493
494
fff
f
mp


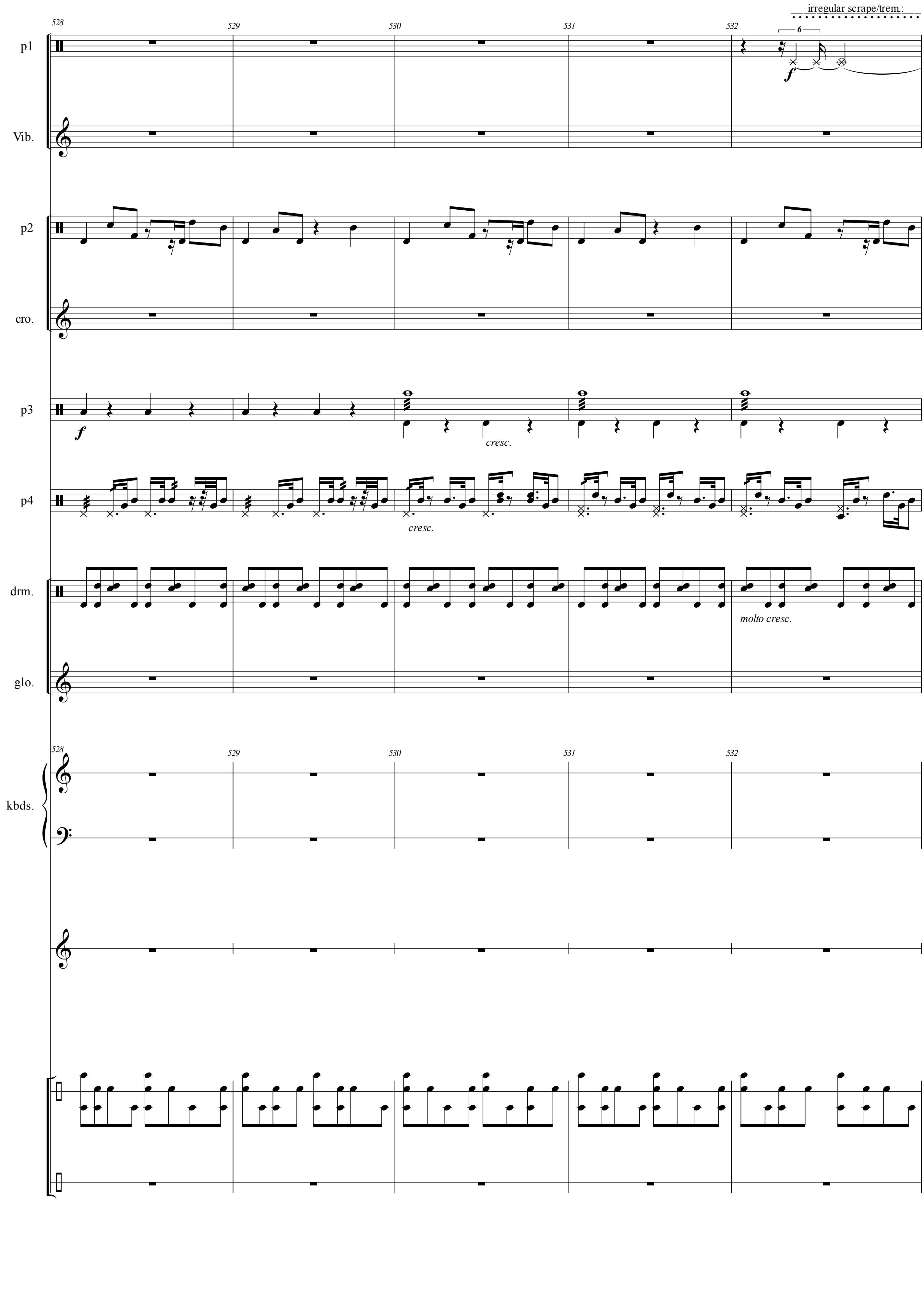
19:41
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
mp
f
mf
drum kit
Rhythmic patterns


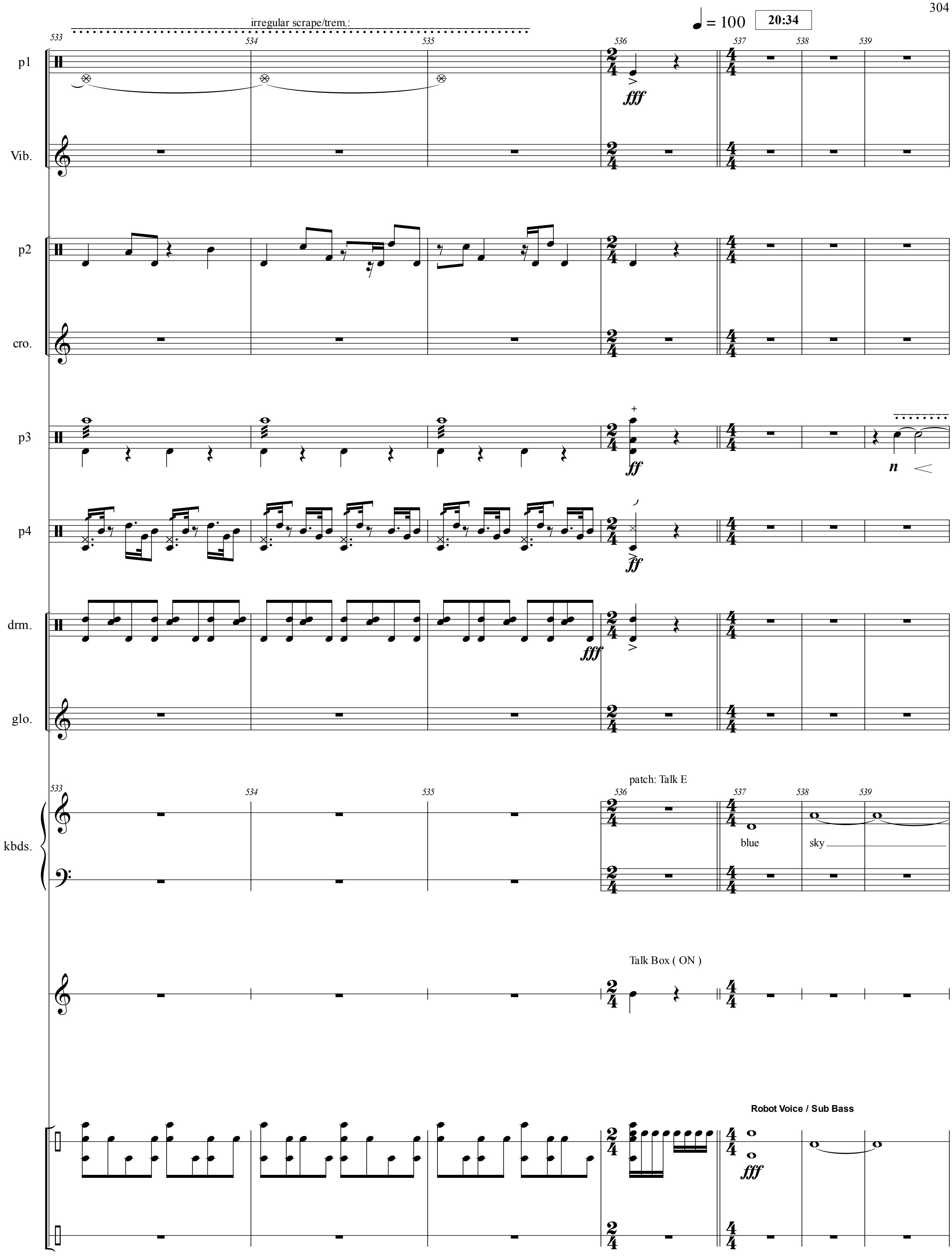
500
501
502
perc.
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
Rhythmic patterns

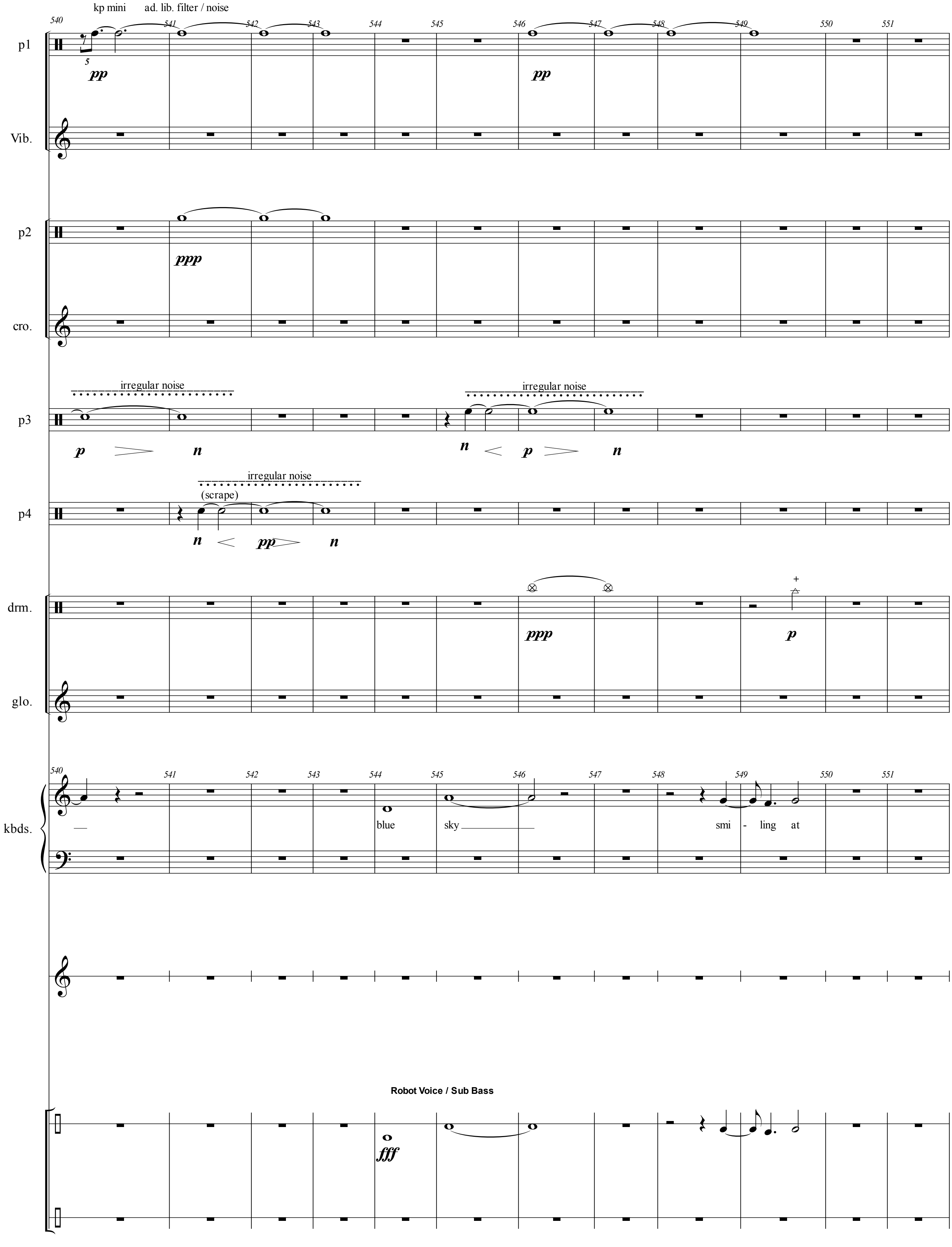

19:55
503
504
505
506
507
508
p1
pp
f
n
Vib.
p2
cro.
p3
rate
rate
p4
pp
f
drm.
n
glo.
patch: Talk E
kbds.
TALK BOX Patch 01 SAW
VOLUME: 90%
Tone: 50%
INPUT: Synth
GAIN 60%


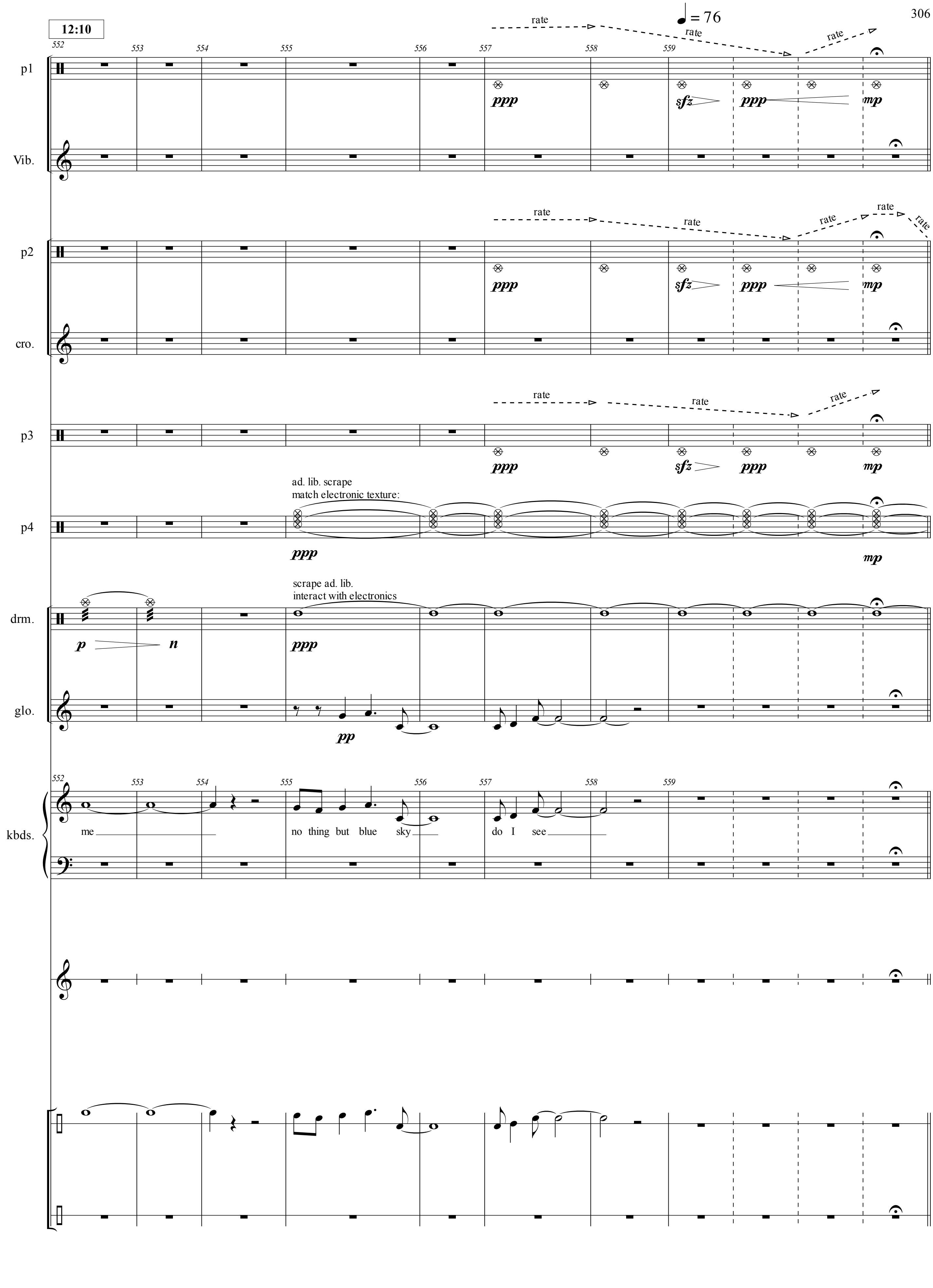
= 208
509
510
511
512
513
514
p1
Vib.
p2
cro.
p3
fp
f
pp
cresc.
p4
mp
cresc.
drm.
mp
cresc.
glo.
kbds.


515
516
517
518
519
520
521
p1
Vib.
p2
p
cresc.
cro.
p3
p4
f
drm.
glo.
kbds.


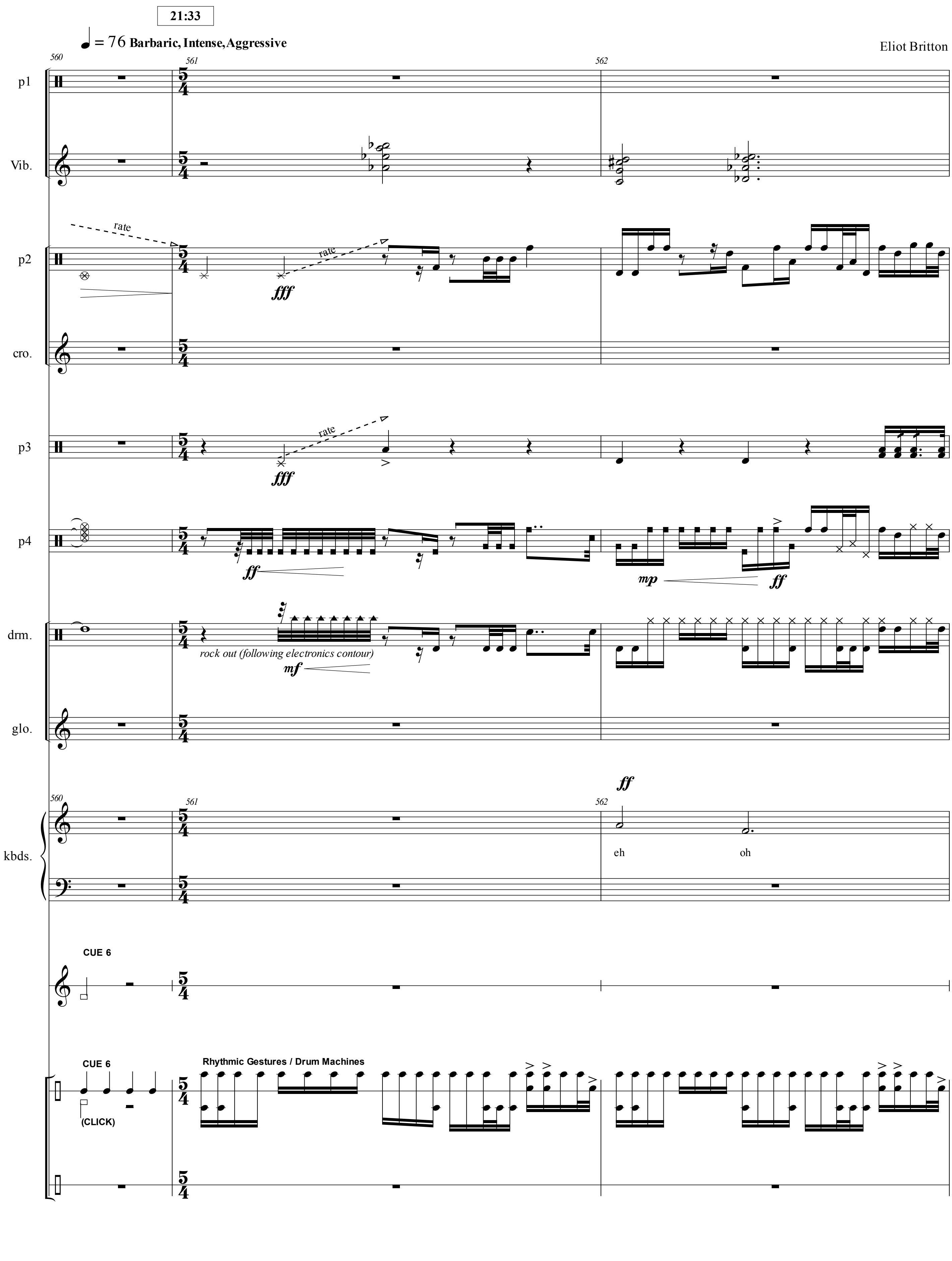
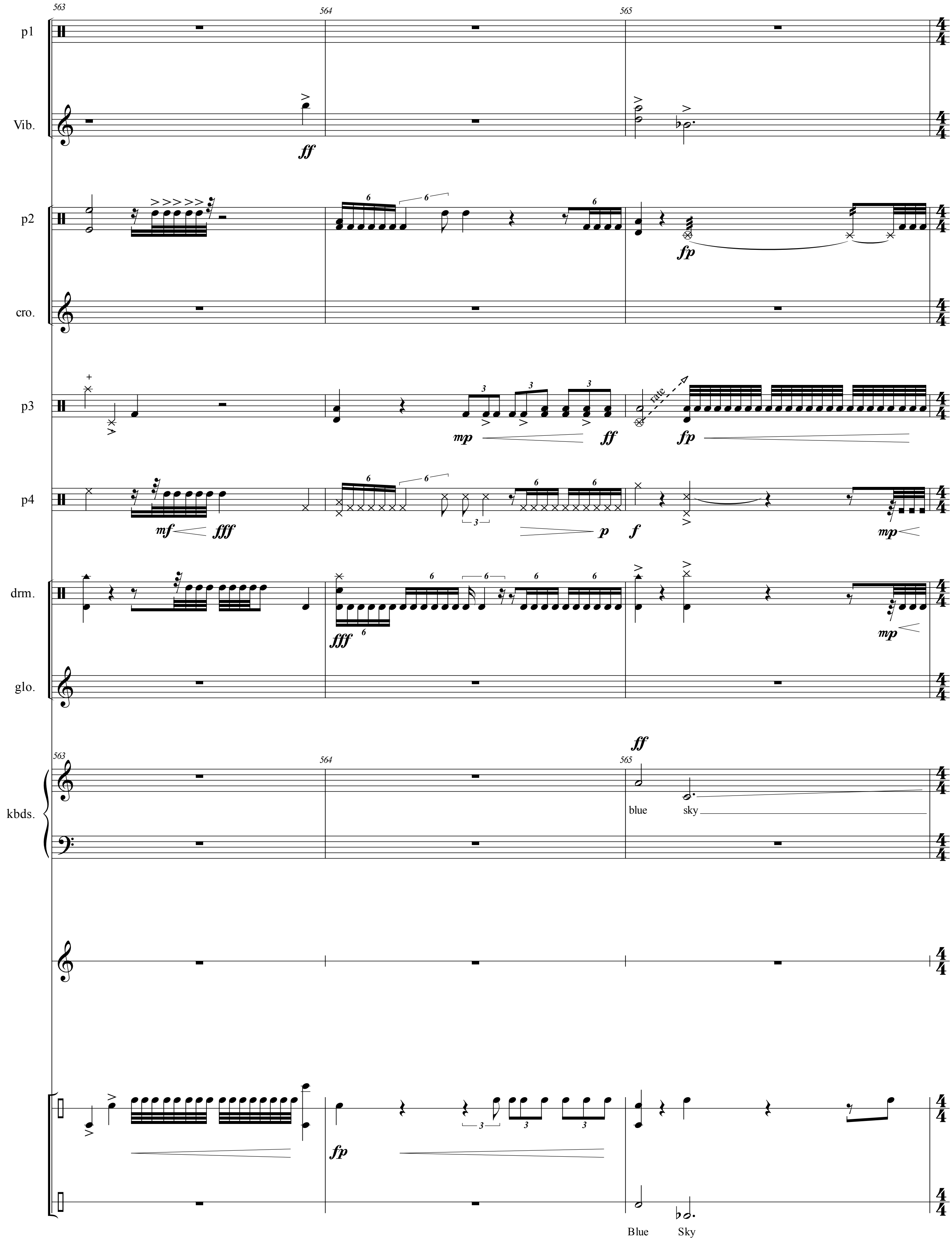
522
523
524
525
526
527
p1
Vib.
p2
mp
cro.
p3
p4
pp
drm.
glo.
kbds.


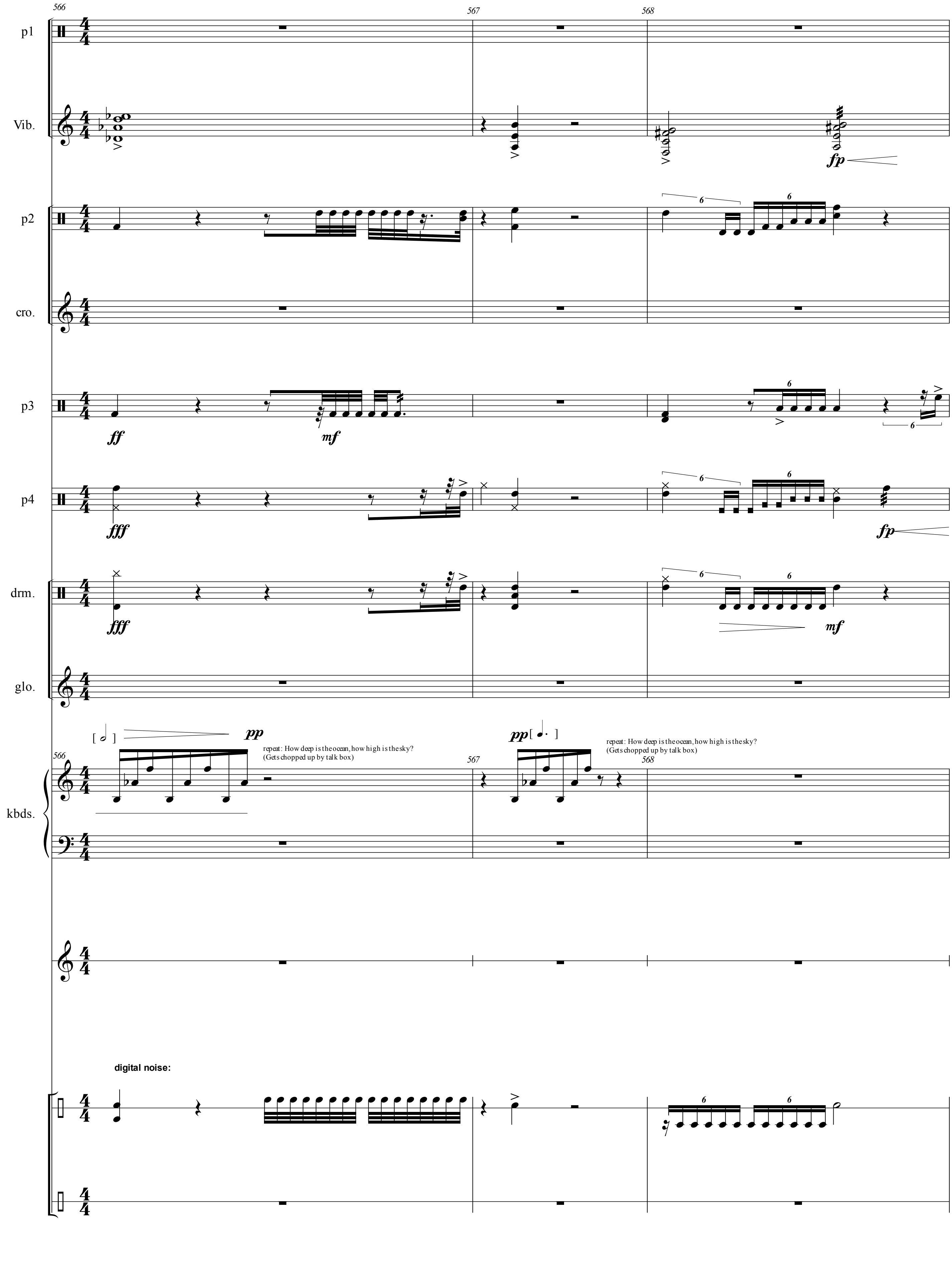
irregular scrape/trem.:
528
529
530
531
532
6
f
p1
Vib.
p2
cro.
p3
f
cresc.
p4
cresc.
drm.
molto cresc.
glo.
528
529
530
531
532
kbds.


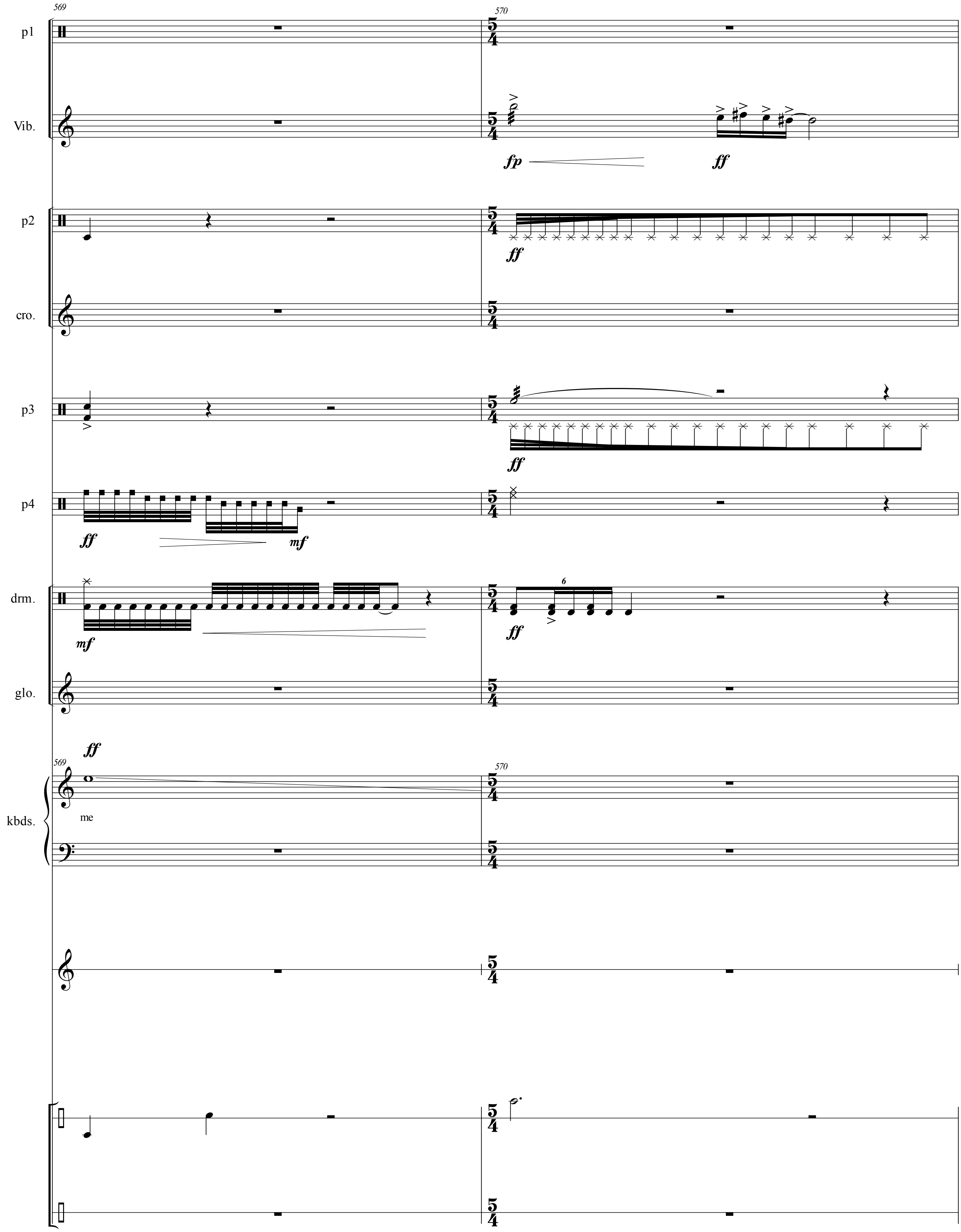
irregular scrape/trem.:
♩ = 100
20:34
533
534
535
536
537
538
539
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
fff
ff
n
patch: Talk E
blue
sky
Talk Box (ON)
Robot Voice / Sub Bass


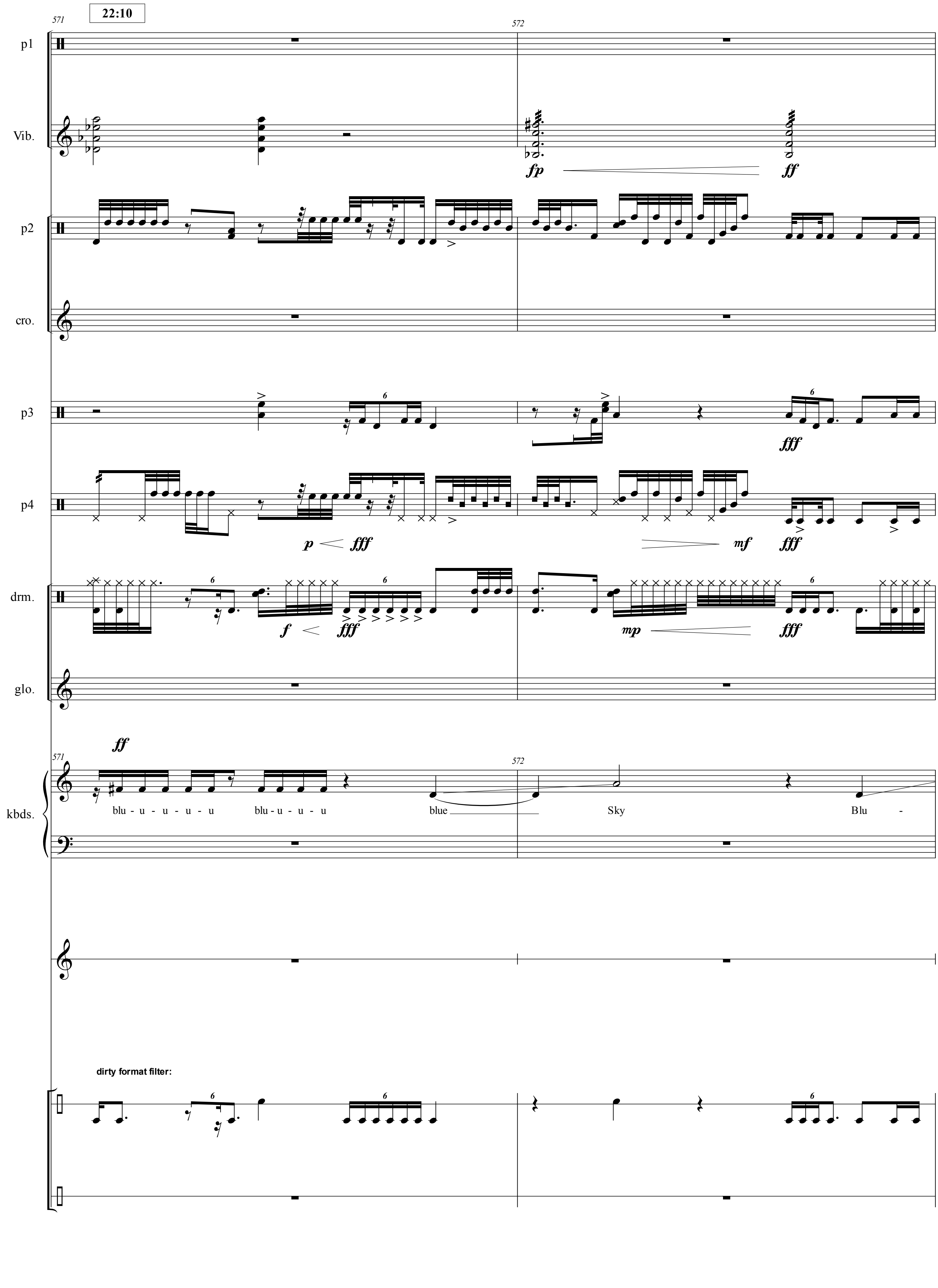
kp mini
ad. lib. filter / noise
p1
Vib.
p2
cro.
irregular noise
p3
irregular noise
(scrape)
p4
drm.
glo.
kbds.
blue
sky
smi - ling at
Robot Voice / Sub Bass


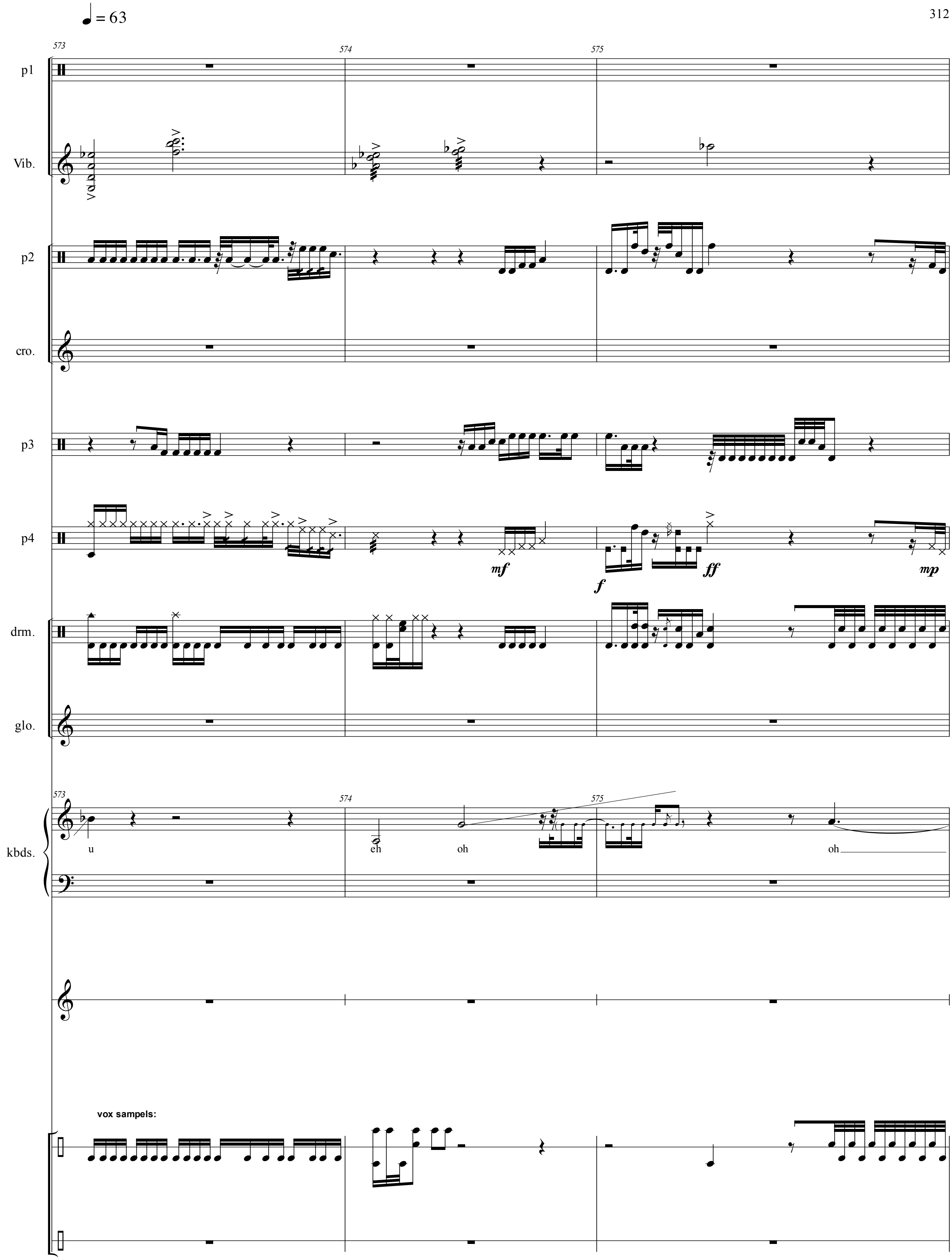
12:10
rate
rate
rate
p1
Vib.
p2
cro.
p3
p4
ad. lib. scrape
match electronic texture:
drm.
scrape ad. lib.
interact with electronics
glo.
kbds.
me
no thing but blue sky
do I see

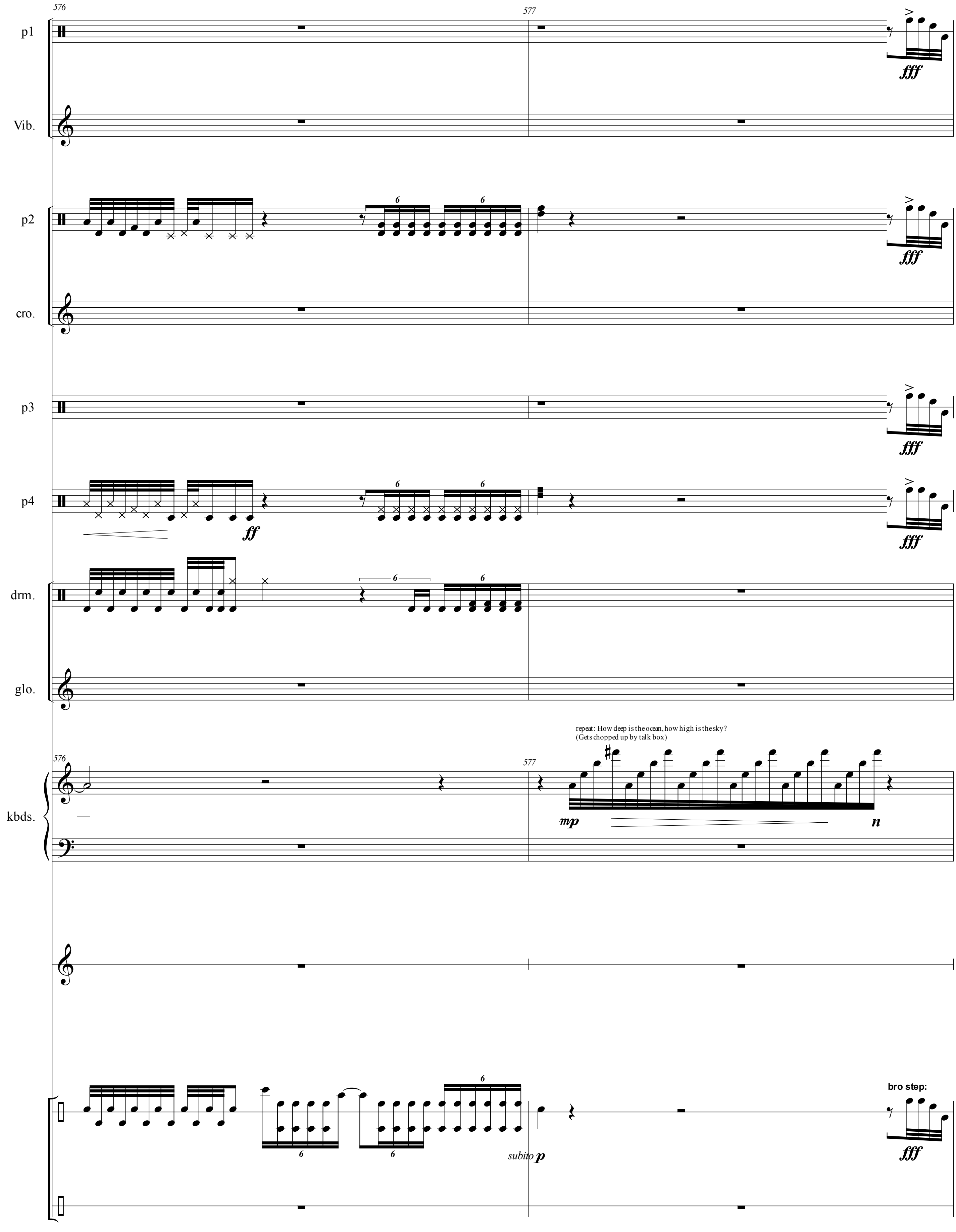
V. Valkaratron (2010)


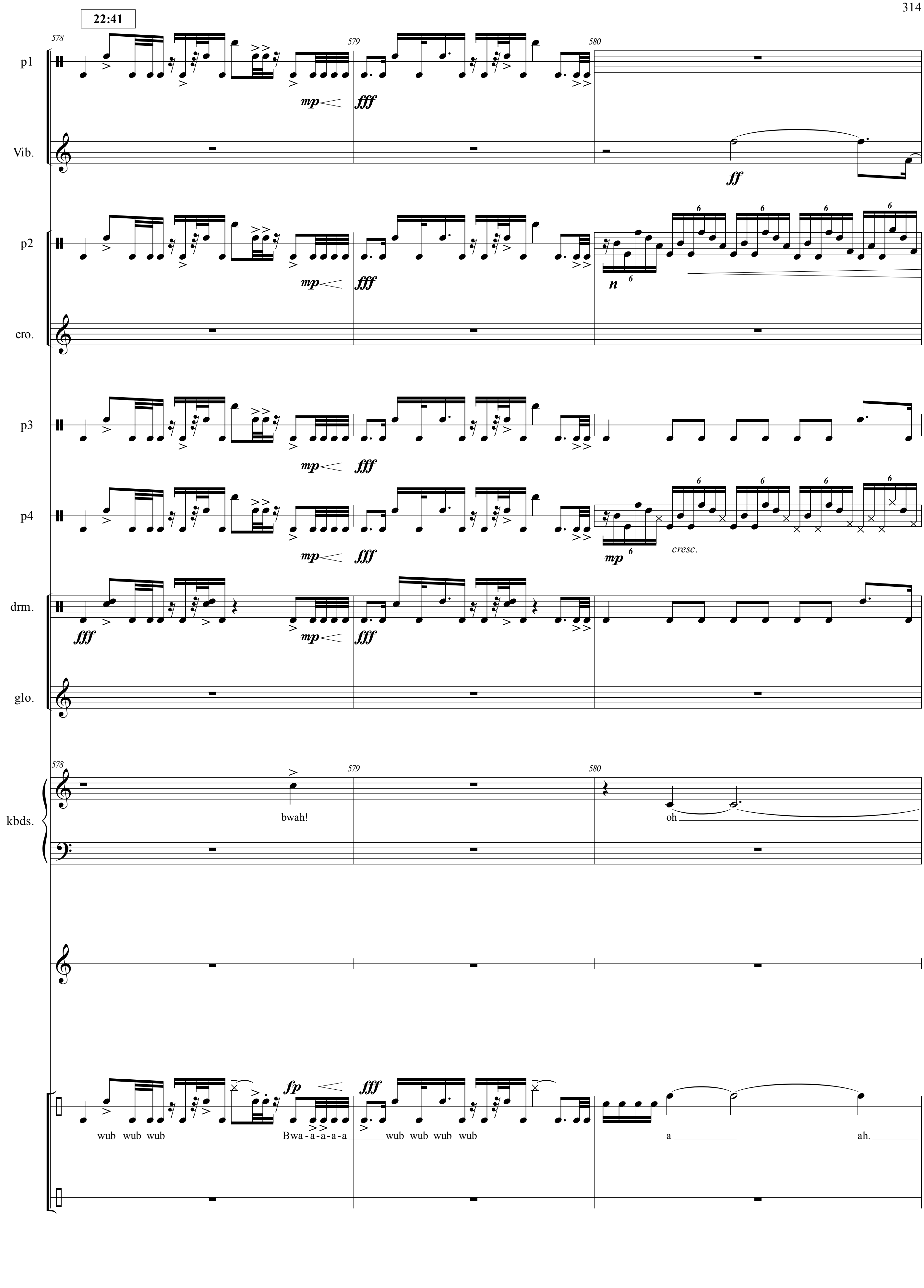
563
564
565
p1
Vib.
ff
p2
fp
cro.
p3
mp
ff
rate
fp
p4
mf
fff
p
f
mp
drm.
fff
mp
glo.
ff
kbds.
blue
sky
fp
Blue
Sky


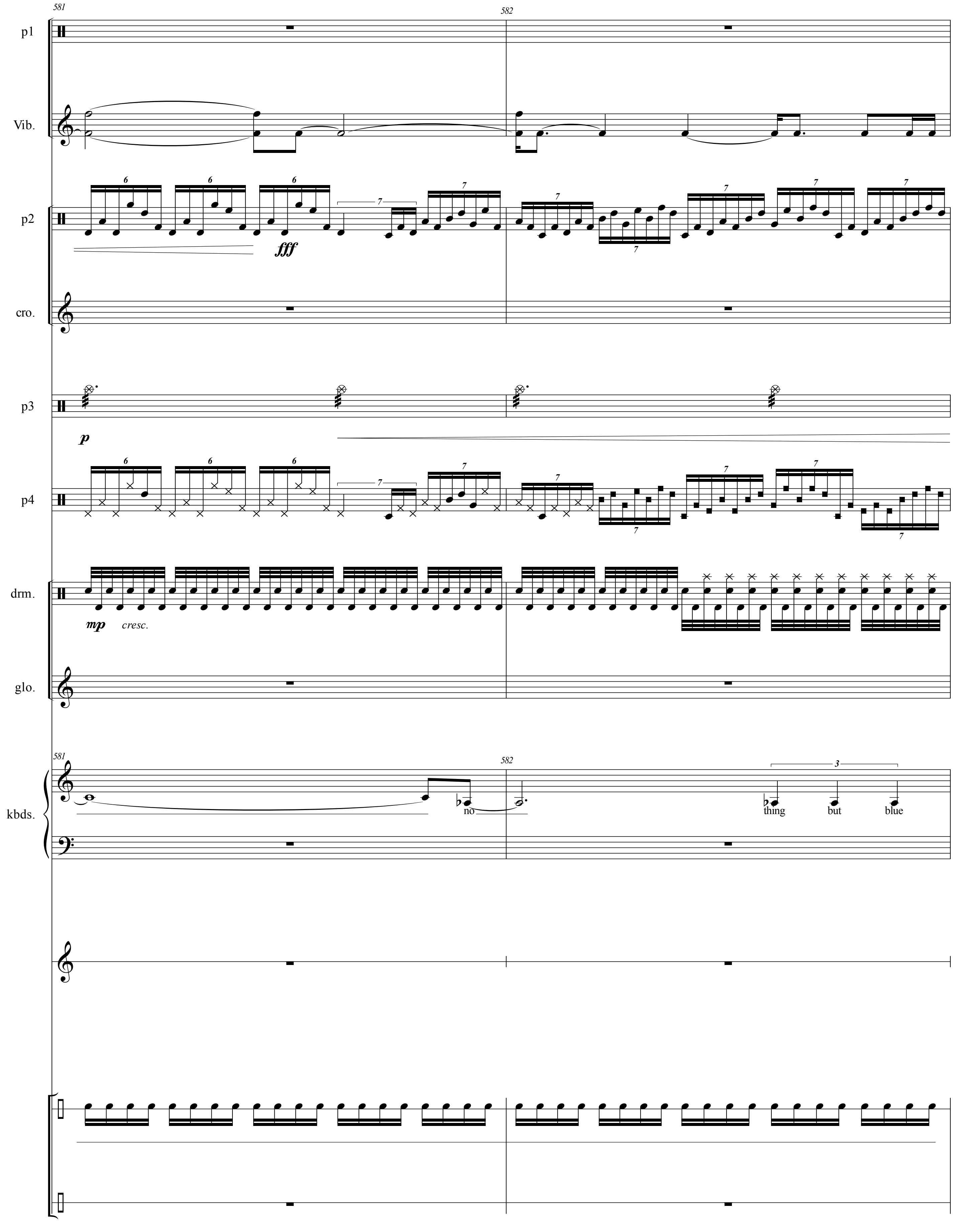
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
566
567
568
repeat: How deep is the ocean, how high is the sky?
(Gets chopped up by talk box)
digital noise:


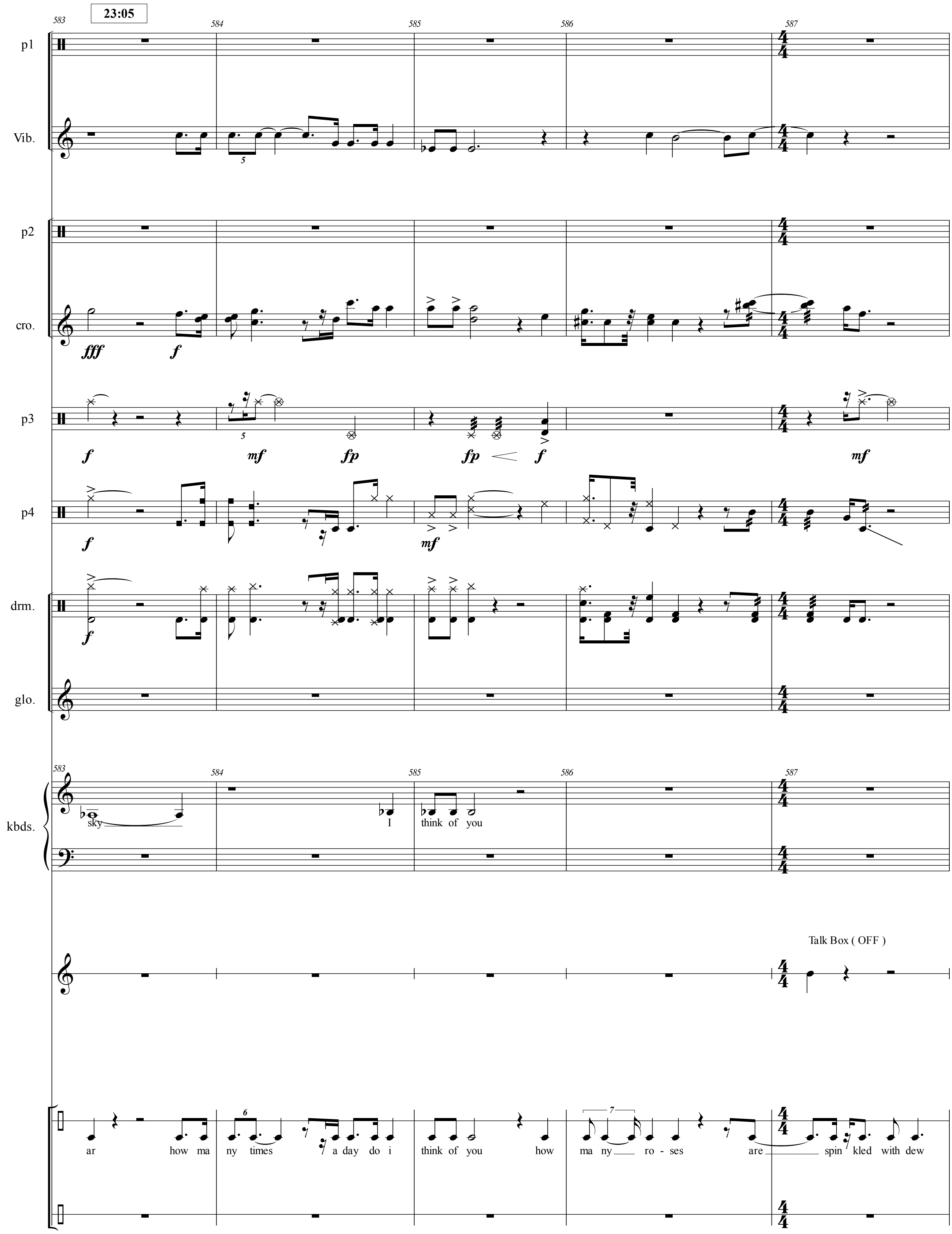
569
570
p1
Vib.
fp
ff
p2
ff
cro.
p3
ff
p4
ff
mf
drm.
mf
6
ff
glo.
ff
me
kbds.


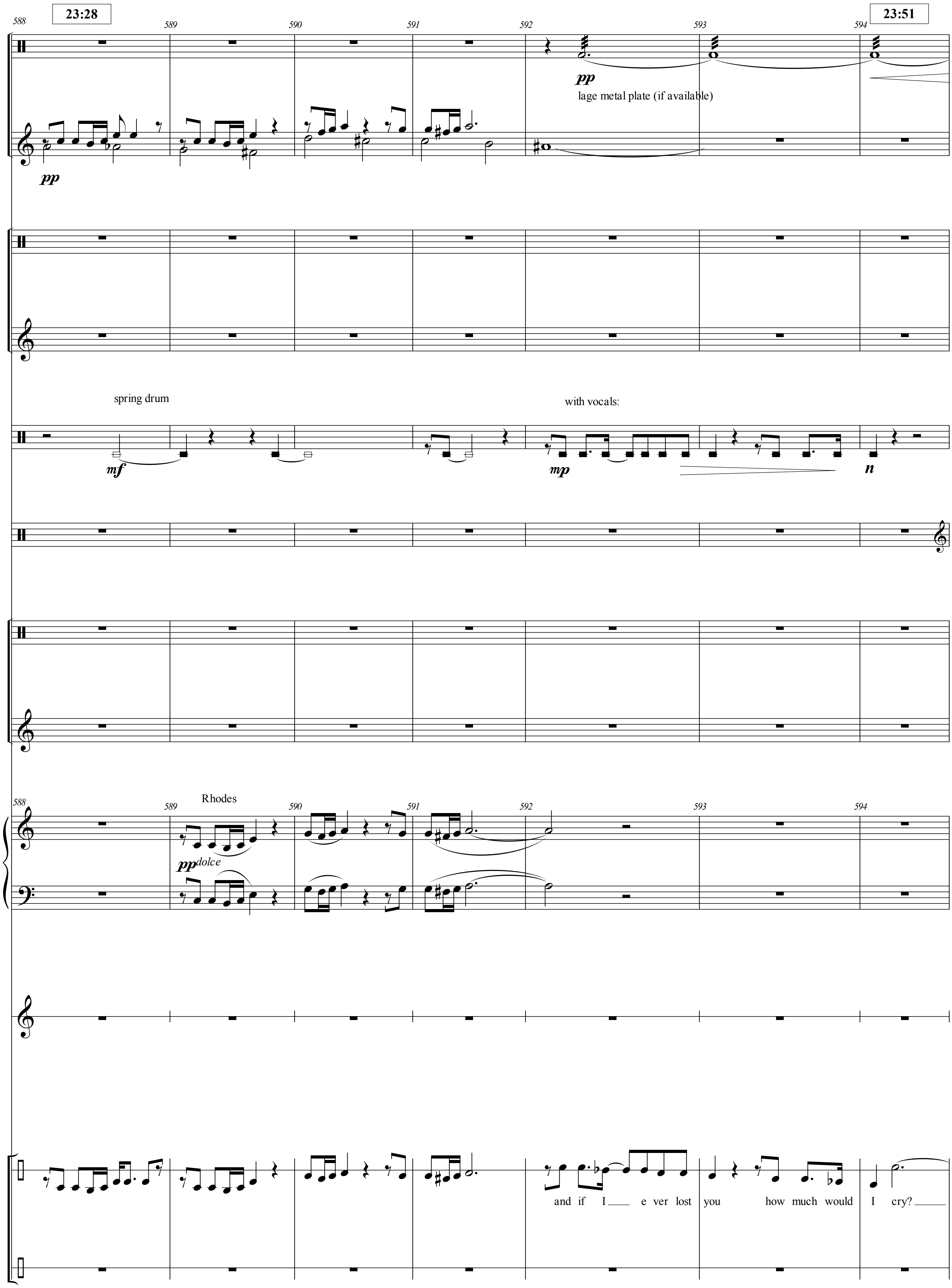
22:10
571
572
p1
Vib.
fp
ff
p2
cro.
p3
6
fff
p4
p
fff
mf
drm.
f
mp
glo.
ff
kbds.
blu - u - u - u - u
blu - u - u - u
blue
Sky
Blu -
dirty format filter:


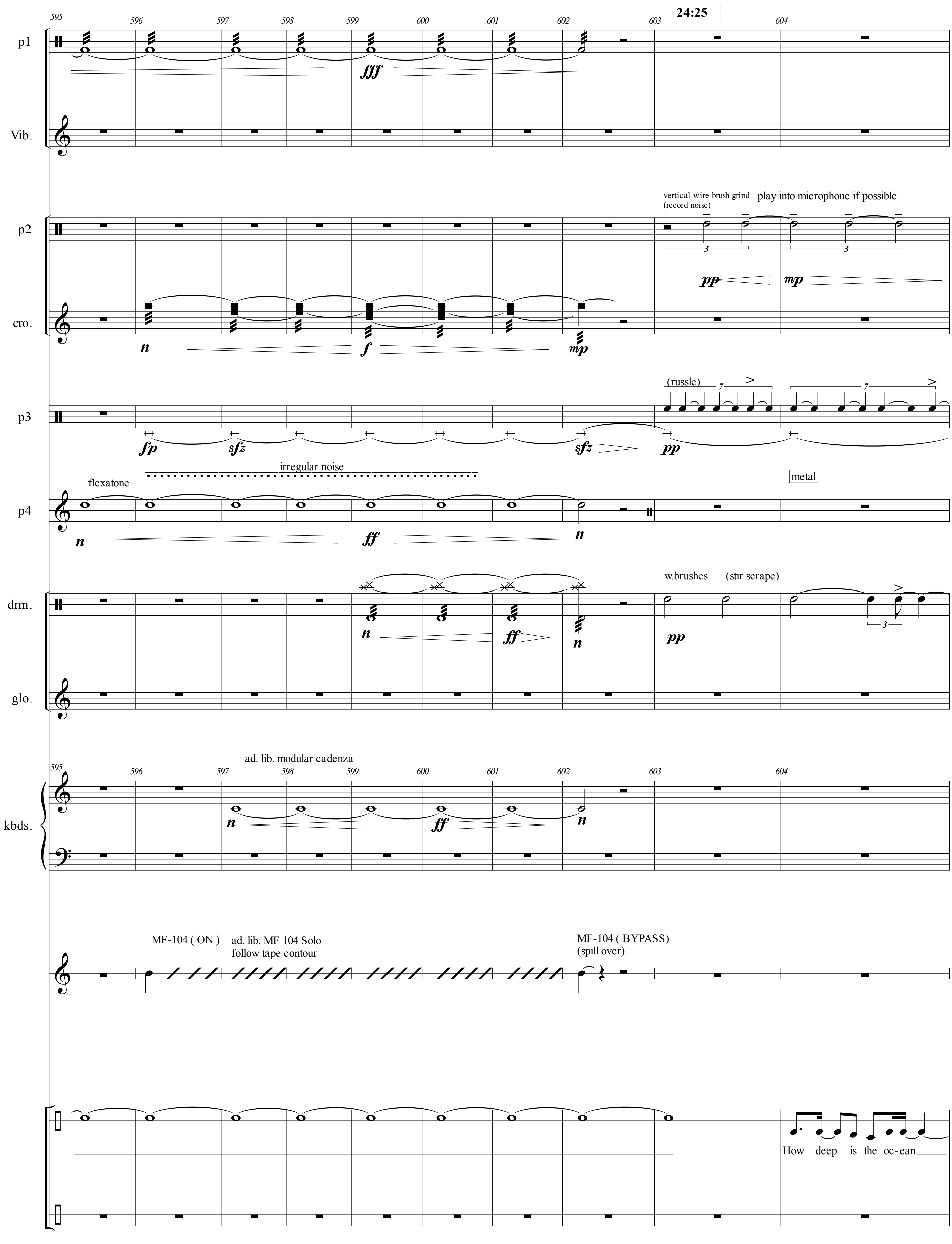
♩ = 63
573
574
575
p1
Vib.
p2
cro.
p3
p4
mf
f
ff
mp
drm.
glo.
kbds.
u
eh
oh
oh
vox sampels:


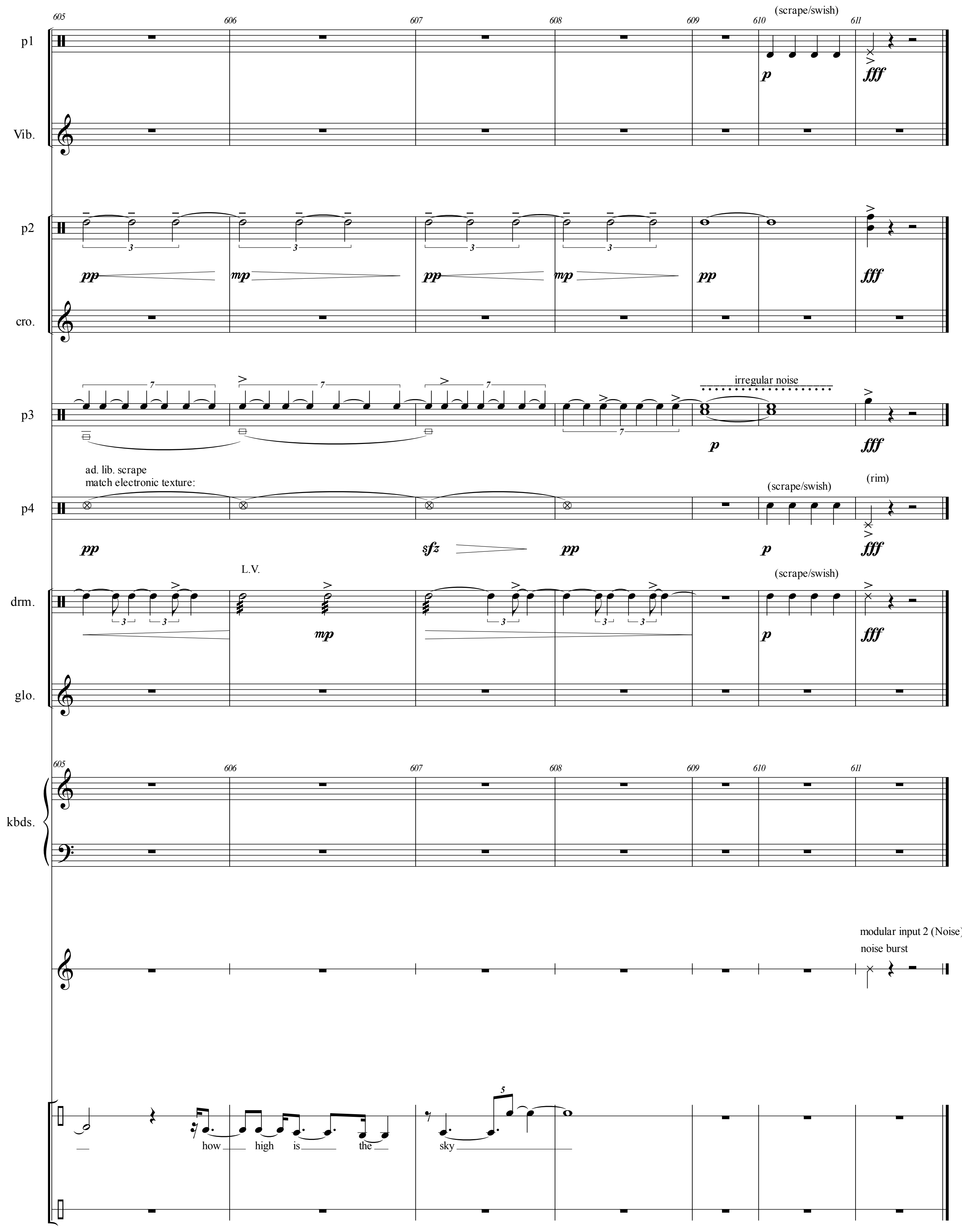
576
577
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
repeat: How deep is the ocean, how high is the sky?
(Gets chopped up by talk box)
subito p
bro step:


22:41
578
579
580
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
mp
fff
ff
n
cresc.
fp
bwah!
oh
wub wub wub
Bwa - a - a - a - a
wub wub wub wub
a
ah.


581
582
p1
Vib.
p2
6
7
fff
cro.
p3
p
p4
drm.
mp
cresc.
glo.
kbds.
3
no
thing
but
blue


23:05
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
sky
I
think of you
Talk Box (OFF)
ar how ma ny times a day do i think of you how ma ny ro - ses are spin kled with dew


23:28
23:51
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
pp
lage metal plate (if available)
spring drum
mf
with vocals:
mp
n
Rhodes
pp dolce
and if I e ver lost you how much would I cry?


24:25
p1
Vib.
p2
cro.
p3
p4
drm.
glo.
kbds.
fff
vertical wire brush grind
(record noise)
play into microphone if possible
pp
mp
n
f
mp
(russle)
fp
sfz
sfz
pp
flexatone
irregular noise
metal
ff
n
w.brushes
(stir scrape)
pp
ad. lib. modular cadenza
MF-104 (ON)
ad. lib. MF 104 Solo
follow tape contour
MF-104 (BYPASS)
(spill over)
How deep is the oc-ean


605
606
607
608
609
610
611
p1
(scrape/swish)
p
fff
Vib.
p2
3
pp
mp
fff
cro.
p3
7
irregular noise
p
fff
ad. lib. scrape
match electronic texture:
p4
(scrape/swish)
(rim)
pp
sfz
p
fff
L.V.
drm.
mp
glo.
kbds.
modular input 2 (Noise)
noise burst
how
high
is
the
sky
5