Marc Beaulieu: TEMPS EN TEMPS (times in time)

Music for voice and instruments in a multi-track recording environment.

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1. ABSTRACT

TEMPS EN TEMPS (times in time): Music for voice and instruments in a multi-track recording environment, by **Marc Beaulieu**, is a work meant to be experienced on many levels of perception. This analysis attempts to present the work at its most important (relevant) levels.

This work is written for a multi-track recording studio. The first section of this thesis describes the expanded possibilities of compositional procedure, orchestration and vocal / linguistic construction inherent in this particular medium.

The concept of the work is deeply rooted in the sociological thesis expounded in Alvin Toffler's "*The Third Wave*". These sociological 'undertones' and their bearing on the background structure of the work are examined in the following section of the thesis.

The subsequent sections of the thesis introduce the perceptual and conceptual aspects of the overall musical language, and discuss essential characteristics of the harmonic, rhythmic and linguistic fabric of the work as well as special applications of studio recording techniques such as digital sound processing, sampling and mixing. This leads to a discussion of formal structure based on three (3) conceptual waves co-existing and interacting in time.

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Table of contents.

1. ABSTRAIT

TEMPS EN TEMPS(times in time): Musique pour voix et instruments dans un environnement d'enregistrement multi-piste, par **Marc Beaulieu**, est une oeuvre dont l'expérience auditive se fait à plusieurs niveaux de perception. Cette analyse tâche de présenter l'oeuvre à ses niveaux les plus importants (pertinents).

L'oeuvre est composée pour le studio d'enregistrement multi-piste. Ce médium offre au compositeur des possibilités étendues dans les domaines de la composition, de l'orchestration et de la construction vocale et linguistique. En un premier temps, ces extensions au potentiel du compositeur sont exposées.

Le thème de l'oeuvre est inspiré des idées présentées dans l'ouvrage du sociologue Alvin Toffler intitulé:"The Third Wave". Les rapports entre cette thématique sociologique et la structure primaire de l'oeuvre sont examinés en second lieu.

Les sections suivantes de la thèse portent sur les aspects perceptuels et conceptuels du language musical, sur les caractéristiques essentielles de l'étoffe harmonique, rhythmique et linguistique de l'oeuvre ainsi que sur les techniques spécifiques au studio d'enregistrement multi-piste tels les procédés numériques de transformation sonore (dsp), l'échantillonage (sampling) et le mixage.

Suit ensuite une description des aspects formels de l'oeuvre, dont la structure est définie par la présence de trois vagues conceptuelles (*waves*) qui co-existent et se croisent dans le temps.

2. WRITING FOR THE RECORDING STUDIO

i. The contemporary medium

Music exists where it can be heard. Each historical period has its own preferred medium for music. The advent of mass media in the twentieth century has brought music to the forefront of daily life for practically everyone.

At first, radio took music away from the elite concert hall and brought it into the homes of millions. Today, radio, television, cinema and the hi-fi recording industry have not only made music accessible to all, they have reshaped social patterns vis-a-vis music perception.

In the earlier stages of development, non-live i.e. recorded music was but an imperfect record of a performance and in no way replaced or displaced the concert or purely acoustic perception of music. Early recordings were viewed as low-fidelity accounts of a higher, more refined perceptual experience; the concert performance.

With improved sound quality brought about by the development of the new art-science of hi-fi, recordings would become works of art in their own right. The concert hall would no longer be the preferred medium for propagation of these works of art.

The 20th century is the century of mass media and the musical medium most fitting the times is the loud-speaker...the extended concert hall. Whether it be in the headset of a portable cassette player, in a movie theatre, on a television set or as part of an automobile hi-fi system, the loud- speaker is the instrument that brings music into the daily lives of nearly all members of contemporary society. It also de-massifies the medium of music perception by giving the individual listener his own musical environment, his own little concert hall.

Most importantly, recent developments in sound engineering have refined the sound quality of recorded and broadcast music to a very high degree. Improvements in the fields of microphone and speaker design along with such innovations as digital recording, editing and mastering, and the compact disc and digital audio tape formats have raised recorded music to a level where it stands as an alternative to the concert experience.

It is very important to stress the concept of the studio-recorded music as an alternative medium for the communication of music. The advent of personal, individual musical perception, via home stereo systems or portable CD and cassette players, as well as the expanded musical possibilities brought about by modern studio techniques such as multi-track recording, sampling, digital sound processing, mixing and editing justifies the composition of musical works tailored to this new perceptual situation.

TEMPS EN TEMPS(Times in time) is such a work.

ii. Music in contemporary culture

It is dificult to refer to contemporary culture without encountering the paradox of Toffler's waves.[1] Thanks to tele-comunication and the media, modern man is reminded daily of the fact that his way of life, his culture, is only one of many social realities. Therefore contemporary culture becomes not only the culture of today but all cultures coexisting in time and space.

Hence, music in contemporary culture is dependent on the musician's awareness of his own regional or specific culture and his situation in the global culture.

In all cultures, human or otherwise, music serves very specific social functions. Whether it be communication with others of the species (whale song, wolf calls), meditative or religious functions (communication with the inner soul or with God), musical expression has always been closely tied to life within a group, life in society.

Regardless of the social function, music has evolved in human culture as a shared experience, a phenomenon which brings individuals together.

However, the advent of mass distribution of music through radio, television, and hi-fi recordings extracts music from its original social context and transfers it to the individual's context. Thus for example, whale song which has a communicative function in the context of cetacian society acquires a relaxing or meditative function in the human individual's context.

The existence of an individual, private audition of music, which was much less common a century ago has become a very integral part of modern human musical experience. This along with the recorded media's power to transfer music from one context to another opens up a wider field of creative possibilities. **TEMPS EN TEMPS (times in time)** explores some of these new possibilities.

iii. Extension transference

The transference of music from one context to another via the recorded media is a phenomenon which is better understood when related to the concept of extension transference. This concept, outlined by the anthropologist E.T.Hall explains certain aspects of human culture in the light of relationships between man and his extensions.[2]

According to Hall, "extensions are basically tools and instruments, including tools of communication such as language."[3] These tools are the means through which human evolution has taken place. In Hall's opinion, "no other species even approaches man in the elaboration of evolution by extension."[4]

In addition to language, some other basic extensions cited by Hall include: "the telephone extending the human voice, television extending both the eye and the ear, cranes

extending the hand and the arm and the back, computers extending the memory and some of the arithmetic parts of the central nervous system, telescopes extending the lens of the eye, cameras extending visual memory...".[5] To this list one could also add CDs and tapes extending aural memory.

Following the same logic, the modern recording studio reveals itself not only as an extension of the human ear but more importantly, as an extension of the composer's imagination. As such it becomes a powerful tool for expanding the possibilities of musical expression.

Keeping in mind Hall's definition of extension transference as " the common intellectual maneuver in which the extension is confused with or takes the place of the process extended" [6], it becomes clear that the recording of a musical work can be confused with the actual work. Such a musical structure, composed for a modern multi-track recording environment and existing primarily in the recorded medium is the ultimate product of musical extension transference.

***iv.* The expanded orchestra**

The history of the evolution of musical instruments can also be better understood as a history of the extensions of the most basic natural human sound producing capabilities: the voice singing and the hands clapping. All subsequent types of musical instruments and combinations thereof can be viewed as extensions of these two basic processes.

In the history of western music, composition and orchestration have followed parallel evolutionary paths. Towards the end of the 19th century, the symphony orchestra had become the standard ensemble, the ultimate palette of sonorities. This palette was expanded in the late 19th and early 20th century with the addition of percussion instruments.[7]

Starting with Rimsky-Korsakov and the group of five in Russia and leading to works such as Webern's Orchesterstüke op.10 or Varèse's Amériques one can find fine examples of musical works in which the composer uses the symphony orchestra as a bank of possible sonorities, a palette of instrumental colours.

However, the 20th century also brought about the development of new techniques of sound production and manipulation. The advent of electronic music and musique concrète not only opened the ears and minds of composers but was the precursor of a whole new line of evolution of musical instruments.

From the point of view of the contemporary composer, heir of both the "classical" and "popular" traditions, all these so called new instrumental timbres are but additions to the 19th century palette. The symphony orchestra as an ensemble may not be well suited for the performance of rock n'roll, but instrumental sonorities developed in one area of musical evolution

such as jazz or rock must somehow be brought together with the sonorities passed down from the 18th and 19th centuries.

The synthesized sonorities which were originally confined to the electronic music studio have since been brought to the forefront of live, real time concert music. Some attempts have been made towards integration of live electronics within the symphony orchestra in concert situations.[8] The medium in which the old and new timbres are best combined and amalgamated is that of recorded music.[9]

The advent of the tape recorder extended human aural memory by allowing the recording of musical performance, the capture of the magic of musical interpretation and expression. It also revolutionized human relationships to sound. With the tape recorder, sound was brought into the realm of the tangible. Sound was no longer ephemeral, and dependent on real time perception. It could be encoded, stored and played back out of context. It could also be manipulated, transformed, reshaped; it became a raw material, clay in the hands of the composer.

Today, modern recording techniques enable the composer/producer to approach the production of a musical work as an additive process in which the work is carefully pieced together in stages. Such techniques as sampling and sequencing of MIDI information along with sophisticated techniques of synchronization of computer based digital work-stations and computer driven sequencers to multi-track tape enable the composer / producer to control all possible musical situations and achieve true integration of all possible musical sonorities in time and space.

The modern multi-track recording studio must not merely be viewed as a facility in which live musical performances are recorded and packaged for distribution via the media. The recording studio's capacity of bringing together live musical performance and electronic sound creation and manipulation broadens the composer's potential. It is thus more than a tool but rather an instrument. As such, it is the most sophisticated extension of human sound producing capabilities.

As the 19th century symphony orchestra coalesced into the ultimate instrument for the expression of music, so the contemporary recording studio has become the new symphonic medium, the medium which brings together all possible sounds: the expanded orchestra.

At the outset, **TEMPS EN TEMPS (times in time)** was written to showcase this expanded orchestra.

***v.* A work for multi-track studio**

At the very core of the conception of **TEMPS EN TEMPS (times in time)** lies the idea that the multi-track recording environment extends the ensemble of acoustic instruments, voice and digital and analogue sound modules (samplers and synthesizers), and brings them together in a more controled manner than in live performance.[10]

Thus the ideal performance situation for the audition of the work is the play-back of the recording on CD or Tape. This does not however rule out the possibility of live performance in a concert setting. In fact there are three possible performance situations designed into the score: **integral play-back, live ensemble with voice and tape, solo voice with tape.**

The particular configuration of the ensemble and the flexibility of extracting multiple mixes make these alternate performance situations feasible. The performers in the ensemble are divided into different groups or **elements** for recording.

a. Five elements

The first element consists of **synthesizers and samplers** sequenced via MIDI sequencer and synchronized to the multi-track tape via SMPTE time code. The sampled materials include samples of the female voice for text manipulation and samples of xylophone and marimba as well as modified samples of wind and string instruments (called syn-instruments eg. syn-horn, syn-clarinet etc.).

The second element is made up of **acoustic instruments** organized as in a symphony orchestra (flute (piccolo), clarinet bassoon, french horn, trumpet, trombone, percussion, violin I, violin II, viola, cello, bass). Each instrument is recorded twice (multi-tracked) so in actual fact the ensemble is doubled.

The third element is a **quartet of female voices**. It is actually one mezzo voice multi-tracked four times.

The fourth element is the **solo voice**.

The fifth and final element is the **instrumental ensemble** from the second element. Here it is recorded as an ensemble and not multi-tracked but rather mixed down to stereo.

***vi.* Alternate performance situations**

a. Integral play-back

The first performance situation (**integral play-back**) is the most closely related to the conception of the work. It consists of a personal audition on home hi-fi equipment of the total work. The five elements are mixed down and mastered to CD. All peripheral effects (reverberation, panning, digital sound processing, equalization, filtering etc.) are applied in the mix-down phase.[11]

b. The first concert alternative: live ensemble with voice and tape

In the second performance situation the first three elements are mixed down to a stereo performance tape (with SMPTE time code synchronizing capabilities) and the fourth and fifth **elements** (voice and instrumental ensemble) play live. The ensemble performs on stage and the live sounds are picked up via microphones and mixed to the three first **elements** (in real time). Peripheral effects such as equalization and reverberation are applied to the live **elements** at the mixing console. All five **elements** are then reinforced and fed to the concert hall via audio speakers.[12]

In this version, a conductor directs the live ensemble following a guide (metronome) track which is generated by a sound module, sequenced via MIDI and synchronized to the playback tape via SMPTE time code. (This guide track is actually included in a dedicated mix which is fed to the conductor through in-ear headphones. In an ideal setting, every performer has in-ear headphones with individual mixes.)

c. The other concert alternative: solo voice and tape

In the third performance situation, one female singer (the fourth **element**) performs live on stage to a tape consisting of an alternate stereo mix-down of **elements** one, two, three and five. As in the second performance situation, the singer has a dedicated mix including a guide track fed back to in-ear headphones. Both the microphone and the in-ear headphones are wireless to facilitate movement on stage.

This performance situation is open to any degree of staging including visual effects, lighting and multi-media. All of these can be synchronized via SMPTE time code and MIDI sequencing.[13]

3. SOCIOLOGICAL UNDER-TONES

Before moving on to the analysis of the work, certain sociological aspects of time will be exposed.

i. The sea of time

Time is the most elusive of concepts. In a musical context, time is felt as duration, tempo, rhythm, meter, to mention but a few. In a sociological context, time is culture dependent. Time is perceived differently in different cultures, and takes on different significance depending on the context in which it is experienced.

In his book "*The Dance of Life*" in which he studies the cultural nature of time, the anthropologist E.T.Hall states: "Since the beginning, mankind has been submerged in a sea of time. The sea is characterized by many diverse currents and countercurrents, fed by rivers from different lands. The rivers alter the mix and produce a unique chemistry of time for each location. Human beings, like fish in water, have only slowly made themselves aware of the time-sea in which they live."[1] In the initial chapter of the book, he examines many kinds of time. Among these he cites:

***1.* Biological time:**
the relationship of biological organisms to the natural temporal cycles of their environment such as the rotation of the earth, the tides etc.

***2.* Personal Time:**
"the way in which people experience the flow of time in different contexts, settings, emotional and psychological states..."

***3.* Physical time:**
time as understood through science.

***4.* Meta-physical time:**
temporal experience such as "déjà-vu" which goes beyond the scrutiny of science.

***5.* Micro time:**
experience of "time which is unique to each culture."

***6.* Sync time:**
The temporal phenomena whereby "when people interact, they synchronize their motions..."
"...people who are out of sync are disruptive and do not fit in."

***7.* Sacred time:**

"This type of time is imaginary. It is repeatable and reversible, and it does not change."..."When American Indian people participate in ceremonies, they are in the ceremony and in the ceremony's time. They cease to exist in ordinary time."

***8.* Profane time:**

"...profane time marks minutes, hours, the days of the week, months of the year, years, decades, centuries - the entire explicit, taken-for-granted system which our civilization has elaborated."

***9.* Meta time:**

"...all those things that philosophers, anthropologists, psychologists and others have said and written about time."..."Much of the...lack of consistency between the many theories of time are due to different individuals looking at one kind of time from the perspective of another...or confusing meta time with reality."[2]

TEMPS EN TEMPS(Times in time) is the product of a reflection on these multiple layers of time. It is inspired by the image of flowing time; multiple streams of time, flowing independently, sometimes crossing, sometimes merging, constantly changing from the listeners point of view.

***ii.* Toffler's waves**

The idea that time can be perceived as flowing at different speeds on many levels was inspired by another non-musical influence: Alvin Toffler's historical / sociological thesis, "*The Third Wave*"[3]. In this book, Toffler contemplates the fundamental changes in the social patterns of tomorrow by identifying three waves of evolution of human civilisation. According to Toffler, the three waves of change in the history of human civilization are the evolution towards agricultural cultures (first wave), the evolution towards industrial culture (second wave) and the evolution towards information culture and expanded consciousness (third wave).

Even though these waves of human civilization are usually seen as a historical, evolutionary process, they can and should also be envisaged as a contemporary phenomenon. These streams of social evolution are actually happening at the same time in different layers of society.

Although it reflects on both Hall's "Sea of Time" and Toffler's "Waves", **TEMPS EN TEMPS(times in time)** does not attempt to render these ideas through music. The composition of this piece is approached rather as a musical simile. The idea of currents of time, flowing at

different rates simultaneously is a very potent one in musical terms. This idea in itself is the germ at the basis of this work. The specific applications of Toffler's waves and of Hall's theories of time and extension transference in this musical work will be examined in subsequent sections of the analysis below.

4. ANALYSIS

i. The conception / perception phenomenon (compositional procedure vs. perceptual analysis)

Whenever a composer is asked to analyze his own work, he must take into account the basic differences between conception of the work and perception of the completed performance of the piece. The composer's intimacy with the procedures involved in the conception of the work can sometimes interfere with his objectiveness vis-a-vis the work.

In works such as this, it is very easy to get carried away with details which pertain to conceptual aspects of the work which may or may not be relevant to a perceptual analysis.

It is very important for the composer to put himself in the place of the listener, or the theorist when he attempts such an analysis. The ideal analytical approach should present a well balanced combination of conceptual and perceptual insights.

For example, the discussion of harmonic language in this work could easily get caught up in very involved, detailed analysis of permutational procedures which are applied to perfect vertical structures. Much of this analysis would stem directly from the composer's own intimate knowledge of the procedures involved and not from insightful aural, perceptual analysis.

The following analysis attempts to introduce relevant concepts on both the conceptual and perceptual levels. Furthermore, all conceptual aspects are measured against the template of aural perception.[1]

It is hoped that this analytical approach will permit the reader to follow the logical stream of the text without being distracted by tedious details.

ii. General formal overview: three *waves.*

When attempting to analyze a large work such as this, it is always important to get an overview of the formal organization of the work and the means through which this organization is achieved. Once the general concepts have been made clear, it will be possible to go into greater detail.

As it has already been implied in section **3, *ii.***, the piece is comprised of three *waves.*[1a] These *waves* can be perceived as three individual musical entities made up of smaller structures which will be referred to as **SOUND OBJECTS**. These three *waves* are intertwined as it were to form one complex musical work. The work as a whole is punctuated in such a way that one may

perceive three formal sections. (cf. fig. 1) The conditional nature of the preceding statement must be stressed because it is important to note the difference between conceptual and perceptual analysis.

In the pre-compositional lay-out of the work, the musical materials were formalized in elapsed time to form a symmetrical structure, dividing the total duration of 21 minutes into three sections of 8, 5 and 8 minutes respectively. In each of these sections, the three *waves* are present but at varying degrees.

The first 8 minutes contain *first wave* **SOUND OBJECTS** in a higher percentage than *second wave* and *third wave*. The next 5 minutes contain more *second wave*, and the last 8 minutes contain more *third wave*. Figure 1 is a graphic representation of the work showing how the three *waves* and their respective **SOUND OBJECTS** interact in time.(cf. fig.1)

In each section, the three *waves* are either perceived individually or combined. As the piece as a whole progresses, instances when *waves* sound together increase. In essence, it is as if the listener is experiencing these three *waves* independently of each other at first but gradually becomes aware of their co-existence in time through "flashes of expanded consciousness".

As is true in the social metaphor, the three *waves* not only evolve in time but influence each other. Thus at the end of the work, the respective *waves* have evolved through interaction with each other (a kind of musical cross-fertilization).

At some instances, only two *waves* interact but at other times, all three *waves* sound together. These moments in the piece which are referred to as "**nodes**", happen at structurally important points in time and help to punctuate the work and thus organize the listeners perception of elapsed time.[2]

It is important to note that the use of the musical simile of *waves* is a conceptual tool to help organize and then describe the compositional procedure. However, the listener's perception of the work and of its structure need not be dependent on prior knowledge of the extra-musical impetus. In fact, the work must stand on its own, without the use of a program.

In order to ensure that the listener may attain some degree of perceptual understanding of the work, the composer must rely on the sounds themselves and on their intrinsic referential qualities.

Each *wave* is thus made up of **SOUND OBJECTS** that define it through their particular character. Once the composer has made sure that each *wave* has its own aural signature, it becomes possible for the listener to identify each *wave* as he or she hears it. It follows that the interaction between the *waves* and their distribution in elapsed time will also be perceived. This ensures a certain degree of understanding through perceptual experience of the work.

The degree to which the perceptual and conceptual understanding of the work concur is entirely dependent on the amount of information the listener can obtain through the perception of the **SOUND OBJECTS**. These have been composed in such a way as to deliver varying amounts of information to the listener.

Depending on their content, the **SOUND OBJECTS** can relay this information through orchestration, harmonic-rhythmic-textural make-up, or textual-linguistic coding, all of which rely on the iconic nature of certain sounds to codify the information. However, since no two listeners share the same socio-cultural background, the information perceived will be decoded in varying degrees based on each listener's experience and degree of familiarity with the icons.[3]

A more thourough examination of the concept of **SOUND OBJECTS**, the building blocks of the work, will be needed in order to gain insight into the structure and organisation of this piece.

iii. Identification of SOUND OBJECTS

The term "**objet sonore**" was coined by Pierre Schaeffer in his "*Traité des objets musicaux*"[4]. "**L'objet sonore**", as exposed by Schaeffer could be defined as a disembodied sound; a sound taken out of context and reduced to the state of an object. This object can then be described and categorized on the basis of its various objective aural characteristics.

Although the term **SOUND OBJECT** is chosen to describe a particular aspect of the compositional procedure in this work, the concept of the sound object here is much more closely related to the "sound masses" or "planes" in the music of **Edgar Varèse** than the "objets sonores" in the musique concrète of Pierre Schaeffer.[5]

The concept of the **SOUND OBJECT** which is at the center of the compositional procedure in this work is related to Varèse's planes in that it applies to composed structures whithin the work rather than found objects such as in Schaffer. These composed structures are perceived in space and time and evolve and interact whithin the time frame of the work.

The term **SOUND OBJECT** seems well suited since it refers to an aural element in the work which is characterized by its constituent attributes. **SOUND OBJECTS** can either be static or dynamic (metamorphic) in their constitution. If any of the attributes are composed in an evolving manner, the object is perceived in a state of flux

Furthermore, the concept of the **SOUND OBJECT**, as in Schaeffer, must be understood as a phenomenon that is perceived on many levels; from the micro to the macro. Taken to the extreme, the largest sound object could be the piece itself and the smallest, a single note within the piece.

The composition of **TEMPS EN TEMPS(Times in time)** involves the construction of particular **SOUND OBJECTS** and their combination to form larger **SOUND OBJECTS** perceived on higher levels.

Some of the attributes that help define **SOUND OBJECTS** in this work are: timbral content, harmonic density, temporal density, registral envelope, texture, spacial focus, temporal focus and panoramic distribution. Each *wave* contains **SOUND OBJECTS** which have specific characteristics. These act as cultural signatures and help define the *wave* as such. Each **SOUND OBJECT** is characterized by a combination of any number of the above attributes:

1. **Timbral content**:
The orchestration of a particular **SOUND OBJECT** renders it identifiable as such to the listener.

2. Harmonic density:
The harmonic language of this work is based on the concept of harmonic density; the relative vertical space between tones (frequencies) in a given vertical structure. Since the unit of pitch here is the semi-tone the limit of harmonic density is the semi-tone cluster. **SOUND OBJECTS** can therefore be categorized by their relative situation on the scale of harmonic density from the semi-tone cluster to the extreme sparse density of the two octave cycle. (cf. section **4.** ***iv.*** **b** and **c** for a comprehensive exposition of this harmonic system.)

3. **Temporal density:**
The relative number of events in a given time period can also serve to determine the nature of a **SOUND OBJECT.** As with the harmonic density, objects can range from extreme high to extreme low density. (Compare the **SOUND OBJECT** at 12:54 with the following **SOUND OBJECT** at 13:00)

4. **Registral envelope:**
SOUND OBJECTS can be categorized according to their placement in the registral space and according to the relative area they occupy. The envelope or shape of the object can be either static or dynamic.

5. **Spacial focus**:
A given **SOUND OBJECT** can be situated in a particular spacial perspective. Such orchestration techniques as tremolo strings or muting horns can be used to achieve spacial focus. In addition, varying reverberation in the recording or the reinforcement of the instruments also serves to place **SOUND OBJECTS** in space. (cf. sections **4.*vi.h.*** and **i.**)

6. **Panoramic distribution:**
This refers to the situation of a **SOUND OBJECT** within the left / right stereo image or the more complex possibilities of spacial diffusion of sound in a live performance situation.

7. Temporal focus:

This is a much more elusive concept which involves the establishment of a socio-historical point in time for a given **SOUND OBJECT**. (cf. section **4.v.b.**)

8. Texture:

The concept of texture encompasses all of the above attributes. Texture is established by combining temporal and harmonic densities at variable degrees of the periodic / aperiodic continuum, as well as timbre and relative amplitude (loudness). (cf. section **4.*iv*.g.** below for more on the periodic / aperiodic continuum and its relation to texture.)

It must be stressed that the perception of a **SOUND OBJECT** as such is the only criterion which permits its classification. In this manner, the conceptual and perceptual aspects of composition are kept very close together.

***iv*. Overall musical language**

In order to better understand the nature of the **SOUND OBJECTS**, general aspects of harmonic, rhythmical, orchestrational, linguistic and technological organization will be examined.

a. Duality in aural perception: vertical / horizontal

As a first step towards understanding the basic musical concepts that come together to form the musical language of this work, one should re-examine a very fundamental aspect of aural perception: the duality of vertical and horizontal perspectives.[6]

As with many concepts in music such as high / low or dark / light, vertical and horizontal are just visual metaphores. Here the metaphore serves to illustrate the most fundamental duality inherent in aural perception: the cross-relationships of sounds heard simultaneously or in sequence.

In order to perceive the structure of complex aural stimuli such as music, the listener must decode the relationships between individual sounds. Since sound as such is only perceived in relation to time and many sounds can be present in a given aural structure, it follows that sounds will be perceived both simultaneously and in sequence. The listener is exposed to both coincidental and sequential information and makes distinctions based on perception of relative frequency, relative timbre, relative placement in time and in space. It then becomes possible to infer inter-relationships of these multiple sounds in both perspectives.
(cf. fig. 2)

This phenomenon is basic to such musical concepts as melodic structure, counterpoint, harmonic function, harmonic density, temporal density, timbre perception, orchestration and texture, to name but a few.

By returning to this fundamental duality and using it as the starting point, it becomes possible to impose one's own particular set of guidelines for organization which become the essence of the musical discourse. All aspects of the musical language pertaining to this work and presented in the discussion that will follow will be measured against the background of this duality.

b. Harmonic system: The Magic Square

It has already been stated (c.f section **4.*iii.***) that the harmonic language of this work is based on the concept of harmonic density. Here harmonic (or vertical) density is defined as the relative space in register between the frequencies of the tones that sound together in time. This concept is exposed aurally in the first 6 seconds of the work, in the **first element**. (sampled and synthesized vocal sounds).(cf. score p. 1) In essence, this initial gesture is a nut-shell statement of the underlying harmonic system of the work.

The vertical structures are organized in a scale from extreme low to extreme high density, with vertical structures of two octave cycles at the low density limit and semi-tone clusters at the opposite limit. Every step in between represents one grade in the scale. These grades can be named in terms of the semi-tone count of their vertical intervals: (24, 23, 22, 21...1,0) where 24 is the two octave cycle, 12 is the octave cycle, 2 is the whole-tone cluster, and 0 is the unison, etc.?(cf. fig. 3)

The **SOUND OBJECT** referred to above is better described as a **Magic Square**[7a], presenting movement from extreme low (24) to extreme high (1) density and resolving on 0 or no density. The resulting melodic or horizontal lines unfold the vertical interval cycles over time. (A discussion of the horizontal aspects will follow in **4. *iv.*d** and **e**.)

In this work, **SOUND OBJECTS** in different *waves* are composed at different segments of the density scale. *First wave* **SOUND OBJECTS** are generally melodic in nature and thus evolve at density 0, the unison. *Second wave* **SOUND OBJECTS** occupy the intermediate segment of the density scale (1-11), and *third wave* **SOUND OBJECTS** are characterized by harmonic densities between the octave and the two octave span (12-24). **SOUND OBJECTS** which span the whole density scale, such as the **Magic Square** cited above, appear only in sections of the work where all three *waves* coincide.

Furthermore, towards the end of the work, the purity of application of the system is tainted as the *waves* begin to show signs of their intermingling. (The particular harmonic character of each of the three *waves* will be examined in greater detail below. cf. **5. *iii.* a,b,**and **c**)

The use of such a system permits the instantaneous aural identification and classification of harmonic structures at the extreme limits of the scale. Such quick identification is crucial if one is to recognize the nature of a particular **SOUND OBJECT** as *first, second* or *third wave*.

This system also permits simultaneous sounding of **SOUND OBJECTS** from different *waves* while at the same time, keeping them in perspective. (eg. *second wave* **SOUND OBJECTS** evolving between densities 3-4 can be embedded in *third wave* **OBJECTS** at densities 14-23 and both keep their intrinsic harmonic nature clearly defined). (cf. score at 11:14 p.34)

Furthermore the ambiguities resulting in the use of segments at the middle of the scale (10,11,13,14) or the use of octaves vs. unison permits the opposite effect; blending. The slow migration of **SOUND OBJECTS** from one segment of the density scale to another also helps to create a sense of evolution from one *wave* to the next.

Besides serving as a system of stratification of vertical sonorities, this harmonic approach also helps determine the overall harmonic palette of a given **SOUND OBJECT**.

The grades on the density scale are but the pillars on which this harmonic system stands. Like all aspects of music, one only understands the true function of the system when it is examined over time.

c. Points between perfect structures

The perception of harmonic motion in this piece rests on the listener's ability to hear the difference between **perfect** and **imperfect** structures.

A quick examination of all the vertical structures delineating the scale of densities in the **Magic Square** reveals an obvious fact: they are all constituted of only one type of interval; ie. density 0 = unison, density 1 = minor second, density 5 = perfect fourth, etc. (cf. fig. 3) These vertical sonorities, referred to as "**perfect**" structures, serve as signature sonorities in the piece since they all share a certain blandness or transparence. This aural attribute becomes obvious when one compares the sound of these **perfect** structures with vertical sonorities composed of mixed intervals: "**imperfect**" structures.

The harmonic discourse in any given **SOUND OBJECT** is achieved by creating motion between perfect and imperfect structures. Any step-wise motion of any voice within perfect structures will result in imperfect structures. The nature of the resulting imperfect structure

depends on the originating perfect structure, the type of motion and the number of voices moving. Given the number of perfect structures in the **Magic Square** and the number of variables involved in their setting in motion, it becomes clear that this system yields a great variety of possible harmonic colours while insuring a certain degree of structural integrity. (cf. section ***5.iii.b*** for detailed analysis of this harmonic process in the *second wave* **SOUND OBJECTS** at 3:00, 4:10 and 4:53)

d. Melodic implications of the pitch organization: streams of sound

In any given **SOUND OBJECT**, sounds can be related to one another based on the listeners identification of their shared attributes. For example, three conjunct tones played sequentially by a clarinet will be grouped together in the listener's ear since they share the particular timbre of the clarinet. However, if these same three sounds occur at very distant points in time from each other, their inter-relationship stands less of a chance of being noticed.

The listener's ability to group sequential sounds together is entirely dependent on his particular capacity of remembering sounds over time: his aural memory. Within the limits of the listener's aural memory, such groups of sounds evolving in the horizontal perspective will be perceived as **streams**.

As soon as at least one **stream** of sounds evolves in time, the brain recognizes the changes in aural stimuli and infers relationships between them. When many **streams** evolve simultaneously, the brain perceives not only the sequential relationships within each **stream** (horizontal perspective) but also the combinatorial relationships (vertical perspective) between the sounds that coincide at any given point in time.

Furthermore, when sounds in one single **stream** overlap due to resonance or reverberation, relationships on the horizontal perspective translate to the vertical perspective. To illustrate this point, one needs only imagine the three aforementioned clarinet tones heard in a reverberant space. Although the instrument produces three distinct sounds in sequence, the reverberation causes each one to linger and the listener hears all three sounds both 'in time' and 'at one time'. Melody becomes harmony.

In essence, the two perspectives (horizontal and vertical) are never really separate. They come together to form a whole.

The **Magic Square** referred to above (***4.iv.b***) also contains the germ of this idea. Since it is comprised of perfect vertical structures evolving and succeeding each other, the **Magic Square**, much like the figure and ground icons in visual arts, simultaneously presents two complementary yet conflicting perspectives.[8] Here, in aural perception, both the vertical and

horizontal aspect of the perfect structures are discernible. Perception can shift from one to the other at will.

Since the different vertical structures have their harmonic character spread out over time, the listener hears this character both 'at one time' as a harmony or chord and 'in time' as a melody or sequence of sounds.[9]

This duality in perception will be experienced in all *waves* and to varying degrees. In the **nodes** where three *waves* coincide the predominant use of perfect structures and homogeneous textures will intensify the phenomenon. In such instances, the listener can choose at will between vertical and horizontal perception by focusing his attention on one or the other. At other instances, aspects such as temporal density, orchestration, or articulation can direct the listener's perception towards either the vertical or the horizontal perspective.

For example, in the fourth **node** at 10:30,(cf. score p 30-33), the sampled and synthesized voices in the **first element** sound a succession of perfect vertical structures: (12,13,14,16,19,24,16,3,18 etc). Starting with the flute, clarinet and bassoon of the **fifth element** and proceding with the other acoustic instruments of the **second** and **fifth elements**, individual or composite horizontal **streams** are drawn out of the vertical structures. This orchestrational procedure directs the listener's perception towards the horizontal perspective.

e. Melodic mode from intersecting perfect structures

In an effort to help distinguish them from the *second* and *third wave* **SOUND OBJECTS**, *first wave* **OBJECTS** have at their core a rather different compositional approach which should be examined in greater detail.

It has already been stated above (**4.iv.b**) that *first wave* **SOUND OBJECTS** are composed at the absolute limit of the density scale: 0. What this means is that they will be perceived mainly as melodic structures in which events unfold along the horizontal plane.

The vertical perspective in these **OBJECTS** is heard either as the result of resonance and reverberation within one **stream** or the effect of interaction betweeen multiple **streams**.

In order to maintain a certain degree of integrity on overall sound, a special dedicated melodic mode was extracted from the multitude of possibilities offered by the **Magic Square**.

In the **Magic Square**, the listener hears simultaneously, a succession of perfect vertical structures and a collection of decending **streams** of perfect structures.

Of these **streams**, the structures of density 2 and 5 (whole tone scale and cycle of perfect fourths) have been extracted and crossed to form an imperfect mode.(cf. fig. 4) This mode -- which will be called the **2-5** mode for obvious reasons -- is basic to the composition of melodic **streams** in first *wave* **OBJECTS**.

Further examination of fig.4 shows the particular structure of the **2-5** mode. The intersection of the two perfect structures creates a mode in which semi-tone segments are inserted into the whole-tone scale at every minor seventh. This is due to the fact that the perfect fourth (5) is not common to both structures while the minor seventh (10) is.

The insertion of semi-tone relationships in the whole-tone scale creates points of tension in the **streams**. These points of tension can be made to serve as local tonics (or centers) in the melodic structures. The fact that these points of tension occur at every minor seventh allows for the establishment of many local pitch centers. These local tonics are thus stratified and so, being fixed in register, they impose their own attraction at specific points along the vertical perspective.

Since the *first wave* **SOUND OBJECTS** are primarily built around the **third** and **fourth elements** (voice quartet and solo voice), the **streams** span a relatively small segment of the vertical perspective, namely the two octave range with the lower limit of Ab (major third below middle C). In this two octave span, three local points of tension occur: Bb-B-C at the lower segment, G#-A-Bb at the middle and F#-G-Ab at the top. Closer examination of the following sections in the score will help illustrate this point.

The solo voice (**fourth element**) from 0:16 to 3:00 carries the main **stream** of a long *first wave* **SOUND OBJECT**. This **SOUND OBJECT** is separated into four segments by *third* and *second wave* **OBJECTS** at 1:09, 1:50 and 2:22. In the first and second of these segments, the vocal **stream** evolves in the lower range of the **2-5** mode, stressing Bb and B. In the third segment (1:55-2:22) the melodic line expands to the middle range of the **2-5** mode and stresses G#-A-Bb. Finally, in the fourth segment (2:43-3:00) the vocal **stream** in the **fourth element** (solo voice) arrives at the top of the range stressing F# and G while voice 1 of the **third element** (vocal quartet) spans the low and mid ranges ending on Bb and A in the middle range.

This melodic mode remains constant in *first wave* **OBJECTS** throughout the course of the work.

f. Multiple levels of perception

The concept of shifting perspectives dealt with in section **4.*iv*.d** implies the listener's ability to focus at will on different aspects of a given **SOUND OBJECT**. The vertical and horizontal perspectives, while being fundamental, are but two of many aspects of aural perception. Other dimensions unfold through the listener's directed attention to multiple levels.

It has already been suggested that **SOUND OBJECTS** can be heard as multi-leveled structures. (cf. **4,*i*.**: Identification of **SOUND OBJECTS**) Since these structures are made up of multiple elements, the listener may focus at will on the small detail (the micro-level) or the big picture (the macro-level).

In any given **SOUND OBJECT** the listener is free to move from one level of perception to another, and the level of understanding or coherence depends on the listener's ability to infer not only the low-level (foreground) relationships among an object's constituent elements but more importantly, the many tiered middle-level (middleground) and high-level (background) relationships within the **SOUND OBJECT**.

This multi-dimensional perception can be extended outward to infer relationships between **SOUND OBJECTS** within one *wave* and ultimately between the three *waves*. It can also be extended inwards to levels where 'microscopic' relationships betweeen sounds generate actual acoustic phenomena such as timbre and harmonic colour. (This aspect of aural perception will be explored in greater detail below. cf. **4.*iv*.g.**)

Although the micro and macro aspects of perception are referred to separately, both perspectives are coincident in the listener's conciousness. The ability to focus at will on one aspect or the other enhances the listener's perceptual experience. In attempting to analyze any **SOUND OBJECT** it is therefore important to keep it in perspective, to be aware of its place in the scheme of multiple levels of perception.

g. The periodic / aperiodic continuum

An important related aspect in the composition of **SOUND OBJECTS** is that of texture. The understanding of the approach to texture revolves around a basic duality in aural perception; namely the difference between periodic and aperiodic distribution of events in time.

The degree to which events will be perceived as periodic or aperiodic is determined by the level of predictability in their temporal organization. Predictability is achieved through the establishment of discernable patterns, however simple or complex, and the repetition of these patterns.

This duality takes on its real significance when examined in the light of multiple levels of perception. The resultant aural effect of degree of periodicity in a given **SOUND OBJECT** changes depending on the level at which it is perceived.

A highly periodic **SOUND OBJECT** perceived at the macro level will translate to a metrical, rhythmic perception of **pulse**. A highly aperiodic one on the same level will translate to a sporadic, non-metrical rhythmic **field**.

However, a **SOUND OBJECT** with a high degree of periodicity translates on the micro level to the perception of oscillatory **tone**. The opposite end of the spectrum on this level will be heard as **noise**.

These four limits, **pulse, field, tone** and **noise**, frame a system of values which, taken together, constitute a continuum in aural perception. On this continuum there exists a point at

which pulse becomes tone and field becomes noise. This point is the **threshold** at which the brain brings together individual events and perceives them as a whole. (cf. fig. 5)

To analyze and qualify the texture of a given **SOUND OBJECT** is to place it in the context of this continuum.[10]

The periodic / aperiodic continuum is basic to the perception of timbre at the micro level and of texture at the macro level. The distinction between timbre and texture is merely dependent upon which side of the **threshold** the **SOUND OBJECT** lies.

In addition to, and somehow included in the notions of texture and timbre, concepts such as dissonance / consonance, harmonic and orchestrational colour, and articulation are also related to the periodic / aperiodic continuum. All of these complementary aspects of aural perception depend on the degree of complexity in the micro-level interaction between multiple **streams** of patterns at different points along the periodic / aperiodic continuum.[11]

Armed with this insight on the periodic / aperiodic continuum, it is now possible to assess the textural characteristics of **SOUND OBJECTS** in the three *waves* that make up the work. For the purpose of further illustration we can compare two relatively simple **SOUND OBJECTS**: the *second wave* **SOUND OBJECT** at 3:00 (cf. score p.7 and 8) and the *first wave* **SOUND OBJECT** at 3:27 (cf. score p.9).

The basic difference between these two **OBJECTS** is their relative place on the axis of the periodic / aperiodic continuum. On the macro level, the *second wave* **SOUND OBJECT** conveys a definite sense of pulse through repetition of short melodic and rhythmic patterns. The *first wave* **SOUND OBJECT** while not entirely devoid of rhythmic patterns exhibits a more irrational temporal structure which is experienced as a rhythmic field.

On the micro level however, they occupy the same relative region of the periodic / aperiodic continuum. Although their orchestration is different, they share the same percussive, aperiodic timbrical nature. They also share the added element of periodicity supplied by the sustained tones in the brass and strings.

h. Rhythm as a textural / temporal tool

In light of the preceding descriptions, it becomes obvious that rhythm is used here as a means to an end. In general terms, **streams** of events are organized in time in such a way as to create a combinatorial effect which results in a great variety of textures. These textures are not only perceived as such but also lead to altered perception of time.

In highly periodic **SOUND OBJECTS** such as the *second wave* **SOUND OBJECT** at 3:00 described above, **streams** of rhythmic and melodic patterns impress a sense of pulse on the listener by means of articulation and repetition. The relative length of the individual patterns

within the **stream** determines a higher-level meta-pulse or meter in that particular **stream**. When textures such as these are heard, the listener experiences time flowing, time as motion.

When two or more **streams** of conflicting meters are superimposed, the listener experiences complex textures where time seems to flow at different apparent speeds (or tempi) depending on whether he or she choses to focus on one or the other **stream.**

In **SOUND OBJECTS** of aperiodic texture such as the *first wave* **SOUND OBJECT** at 3:27, non repetitive **streams** are combined to create fields in which the absence of pulse leaves the listener in a sort of temporal limbo. Even though the rhythmic structure of the individual **streams** may be highly organized, this organization is intended to insure the non-establishment of meter. The aim is to alter the listener's sense of time in such a way as to expose different temporal perspectives.

The following examination of yet another **SOUND OBJECT**, the *third wave* **SOUND OBJECT** in the **first element** at 13:00 (cf. score p.44-49), will shed more light on the relationship between rhythm, texture and temporal perspective.

In this **SOUND OBJECT**, synthesized sounds with vocal characteristics are organized to create a different type of aperiodic structure. It spans the total range of the vertical perspective but its harmonic density is low. As in the *first wave* **SOUND OBJECT** examined above, each **stream** follows its own rhythmic scheme. Here however, the duration values are on a much longer scale. The lower voices evolve in durations of 21, 13 or 8 seconds while the higher voices ring for shorter durations (5,3,2,1 sec.)

This particular combination of aperiodic rhythmic structure with long durations and ringing resonant tones places the **SOUND OBJECT** somewhere in the middle of the periodic / aperiodic continuum. Although it is relativelty free of readily discernable repetitive patterns at the macro level, the resonant nature of the timbre is highly periodic on the micro level.

Furthermore, when heard in the proximity of other **OBJECTS** evolving on much shorter time scales, the extremely long durations convey a sense of timelessness, of grand proportion. This sense of multiple temporal perspective is even more apparent when such *third wave* **OBJECTS** sound coincidentally with **OBJECTS** on a shorter time scale. (cf. score p 34-44).

i. Metamorphic SOUND OBJECTS

Until now, the discussion of **SOUND OBJECTS** has been limited to statements pertaining to their nature and make-up. Although many of their attributes may remain unchanged over the span of time in which they are heard, one or more may be dynamic.

The most common form of modulation or motion happens in the vertical or horizontal perspective. In these instances, **OBJECTS** evolve by articulating motion in vertical structures and by establishing **streams** in which horizontal motion is apparent.

As may be implied by the preceding discusion of the periodic / aperiodic continuum, **OBJECTS** can be made to evolve along the textural axis as well. Keeping in mind the four limits of the continuum; **pulse, field, tone** and **noise**, and the **threshold** that separates micro and macro levels of perception, it becomes obvious that modulation or motion through the continuum of texture is also a possibility.

Since texture is affected by phenomena on both sides of the **threshold**, changes in degree of periodicity on the micro level will affect change in the timbre and harmonic colour of the **SOUND OBJECT**. Changes in degree of periodicity on the macro level will affect modulation or flux in the texture of the **SOUND OBJECT**.

j. Micro-rhythmic and Macro-rhythmic distortion

Once the texture of a particular **SOUND OBJECT** has been established, a certain number of procedures may be applied to impose motion or change in texture. Whether these changes be in timbre or in harmonic colour, the mechanism that brings about the change is the same.

When **OBJECTS** have high periodicty on the micro level, they are heard as **tones**. Even though their periodicity is perceived on the micro side of the **threshold**, the relationships between the various repetitive patterns which make up the waveform and determine the aural signature of the tone can be visualized or better yet conceptualized as poly-rhythmic relationships of microscopic proportions; **micro-rhythm**.

Any change in the micro-rhythmic relationship between the constituent waveforms of a given tone will affect a change in timbre. A change in timbre is made more drastic by introducing change in the aperiodic micro-rhythmic relationships, noise content.

When tones are combined, their constituent waveforms intermingle and engender complex poly-rhythmic micro-structures. The ratios betwen the waveforms determine the aural signature of the combined tones, their harmonic colour.

When the established texture of a given object is transformed, its stasis is distorted and the listener perceives change. In this sense, changes in timbre and harmonic colour within a given **SOUND OBJECT** can be referred to as **micro-rhythmic distortion**.

All that has been stated above also applies to the **OBJECTS** perceived at the macro level. When an **SOUND OBJECT** displays a highly periodic texture, its periodicity can be distorted by introducing conflicting periodic **streams** or by introducing **streams** of aperiodic

events. Such change in the texture of a given **SOUND OBJECT** can be referred to as **macro-rhythmic distortion**.

An examination of the complex *second wave* **SOUND OBJECT** heard from 11:05 to 13:00 (cf.score p. 32-44) will help illustrate this aspect of the musical language. (cf. section ***5.iii.d*** for detailed analysis of this **SOUND OBJECT**)

v. Linguistic aspects of composition

TEMPS EN TEMPS (times in time) is a work which brings together instrumental and vocal elements. The texts which have been woven into the musical fabric of the work are short excerpts taken from works by John Cage (*45' For a Speaker*)[12], Jean-Paul Sartre (*La Nausee*)[13], Wolfgang Borchert (*Nachts Schlaffen die Ratten doch*)[14], D.H. Lawrence (*Apocalypse*)[15], Nina Hagen (*T.V. Glotzer*)[16], Gerald LeBlanc (*Geographie de la nuit rouge*)[17] and Rainer Maria Rilke (*Herbsttag*)[18]. In addition to these excerpts from the litterature, five words; "SOUFFLE", "BREATHE", "HAUCHE","START!" and "STOP!" are also used.

As this list implies the texts are in three languages; English, French and German. They are not set to music in the conventional sense but rather incorporated into the musical discourse. They were chosen for their sonorous character as well as for their capacity to communicate vivid images which can be related to the *three waves*.

The compositional approach to text and its incorporation into the musical discourse is heavily reliant upon fundamental aspects of language. In order to gain insight into this other perspective of the musical language of this work, it is essential to explore several basic linguistic concepts and their relationship to the purely musical phenomena discussed so far.

a. The semantic / phonetic continuum

Spoken and sung language relies upon the same raw materials as music for its construction. Spoken language and music can both be understood as organized sound. The boundary between text and music, word and tone, is elusive to say the least. It can not be clearly defined since it is entirely subject to the understanding of implied meaning: semantics.

When in the context of a musical work, a listener hears a **SOUND OBJECT** which displays a textual constituent, the aural experience takes on a totally different added perspective. The perception of such a **SOUND OBJECT** will trigger a multitude of connections and relationships to ideas and images (gestalts) at many levels of the listener's consciousness. However, the degree to which these connections are made is entirely dependent on the listener's ability to understand the semantic content of the **SOUND OBJECT**. If the meaning encoded in the sound is not understood, all that is perceived is its phonetic content; the sound itself.

Here again, as in the case of periodic and aperiodic aural stimuli, the perception of the phonetic aspect of a **SOUND OBJECT** and the understanding of its semantic content are two opposite extremes on yet another axis of aural perception. There are so many points in between these two opposites that one may again speak of a continuum; **the semantic / phonetic continuum**. (cf. fig. 5)

In order to clearly demonstrate this point, it is necessary to emphasize the perceptual nature of the semantic / phonetic continuum. From a purely conceptual point of view, the phonetic content of a **SOUND OBJECT** remains constant even as the semantic content increases. A **SOUND OBJECT** which displays no semantic content communicates no meaning to the listener. It exists only as a phonetic **SOUND OBJECT**. On the other extreme of the axis, **SOUND OBJECTS** which display total semantic content convey their entire meaning to the listener but still retain their phonetic character.

However, from the point of view of the listener's perceptual relationship to these **SOUND OBJECTS** the importance or relevance of the phonetic aspect of a **SOUND OBJECT** decreases as the semantic content increases. The listener perceives **SOUND OBJECTS** with high semantic content as language and the phonetic or purely aural nature of these **SOUND OBJECTS** is taken for granted. In this sense only may we speak of the phonetic and semantic aspects of **SOUND OBJECTS** as opposites. (cf. fig. 6a and 6b)

In addition to the vertical / horizontal and the periodic / aperiodic dimensions of aural perception, any given **SOUND OBJECT** can also evolve along the axis of the semantic / phonetic continuum. (cf section **4.*iv*.a.** and **g.**) The relationship between these extremes is further qualified by the listener's acquaintance with the particular rules which determine how the sounds are combined and sequenced in the horizontal perspective to form larger units which convey meaning.

The successful transmission of meaning (semantic content) through sound (phonetic aspect) implies the establishment of a hierarchical system of organization of sounds in time.

In spoken language, sounds are organized in time following an additive system. In this scheme, basic units of vocal sounds called phonemes are combined along the horizontal perspective to form larger units.

There are two basic types of phonemes which are categorized according to their placement in the context of the periodic / aperiodic continuum. Vowels are phonemes which display a high degree of periodicity and are therefore of a resonant nature. Pure vowels (monophthongs) can combine to create more complex units of periodic (resonant) phonemes (diphthongs, triphthongs).

At the other pole of the periodic / aperiodic continuum are phonemes which have a higher degree of aperiodic structure. These phonemes called consonants display a higher noise content and are therefore more percussive in nature.

Phonemes are combined to form larger units of sound called syllables which in turn combine to form words. At this level in the scheme of organization, the units of sound (words) acquire a semantic content. They convey meaning. Certain types of syllables can unite to form morphemes which can be added to words to change or alter their semantic content.[19]

From this point on, words are categorized according to their semantic content and organized in the horizontal perspective following a system of rules (syntax) governing their function in the context of still larger units of sound called phrases. These units combine in turn to form larger units of growing complexity: sentences, paragraphs, chapters, etc.[20]

The analysis of the textual or linguistic aspects of **SOUND OBJECTS** in **TEMPS EN TEMPS (times in time)** will rely upon an understanding of these basic notions of language and an examination of the compositional procedures used in the treatment of the text.

Even though the use of text in a musical work requires that the listener be able to decrypt linguistic codes as well as purely musical ones, the intrinsically aural nature of spoken and sung texts in a musical context gives the composer the added option of treating text as sound.[21] By carefully controlling the degree of semantic communication, the composer can establish the focus of a particular textual **SOUND OBJECT** along the axis of the semantic / phonetic continuum and by the same token, impose motion along this axis. In essence, **SOUND OBJECTS** can evolve over time in the listener's perspective from sound as sound to sound implying meaning. (cf. fig. 5) The following analysis of two textual **SOUND OBJECTS** from the score should help put these notions into perspective.

In the **third** and **fourth elements** in the *first wave* **SOUND OBJECT** from 0:10 to 3:00 (cf.score p. 2-7) the semantic content of the text is totaly hidden. The solo voice presents the periodic vowel sounds [ü] [e] and [aù] from the words "**souf**fle, breathe and **hau**che" in different combinations and gradually adds the other phonemes : ("f", "s", "the", "ffle") to the **stream**. The voices in the third **element** present only the sibilant content of these words ("s", "sh", "th") in an aperiodic field.

Although the semantic content may be inferred through the combined effect of these two **streams**, none of the words is expressly stated until the point at 2:22 when the **third element stream** converges on the word "SOUFFLE".

In the *second wave* **SOUND OBJECT** from 6:20 to 6:56 (cf.score p.17-19) the sampled voices of the **first element** present the Borchert text "Nachts schlaffen die Ratten doch"[20] in a Magic Square structure where the vertical and horizontal perspectives contain the total phonetic content of the phrase at all times. Although it is possible to discern the semantic content by focusing perceptual attention on any of the four individual **streams**, the quasi-identical timbre of each sampled voice and the masking effect of their superimposition renders this very difficult.

In the subsequent **SOUND OBJECT** (6:41-6:56) the pattern of repetition of words in each voice is slightly altered so as to cause a gradual convergence. As each voice in turn becomes synchronized, the semantic content becomes progressively more apparent and in the final two seconds the total phrase is heard in unison. This **SOUND OBJECT** is thus perceived as moving forward along the axis of the semantic /phonetic continuum.

b. Referential quality of SOUND OBJECTS

Once text is reduced to its phonetic aspect it can be incorporated into a larger system of musical organization, where all sounds or combinations of sounds can be perceived in the context of the semantic / phonetic continuum. Although the semantic / phonetic axis of perception is most relevant to **SOUND OBJECTS** with textual content, the concept of sound versus meaning can also come into play in the perception of purely musical, non textual **SOUND OBJECTS**. In these **SOUND OBJECTS**, certain sounds or combinations of sounds are understood as iconic signs.

In the field of semiotics, the generally accepted definition of a sign is that given by Charles Sanders Peirce. According to Peirce a sign is "something which stands to somebody for something in some respects or capacity"[23]. Peirce also emphasized the distinct nature of iconic signs (or icons) in his statement of the fact that "their relation to that of which they are a sign lies in the sharing, or joint possession, of some quality or property; in other words, the iconic sign and the thing depicted have the same property."[24]

The notion of aural stimuli as iconic signs implies the recognition of a relationship between a particular sound, a listener and an idea or a "thing depicted". An example of such an iconic sign in music is the horn call. This particular sound, characterized by its timbre, its rhythm and its harmonic signature (usually fifths and fourths) carries with it the meaning of the hunt or the charge. Upon hearing this particular pattern of aural stimuli, a multitude of related images may be conjured up in the mind of the listener.

In other words, such **SOUND OBJECTS** have the capacity to convey meaning, to refer to certain related ideas or gestalts without the use of linguistic coding. Much the same as in the recognition of the semantic content of spoken text, this referential quality of **SOUND OBJECTS** is highly dependent on context and culture. The listener can not fully understand the meaning of a text if it is in a foreign language. Likewise, the listener will not recognize the iconic nature of a sound if there is no equivalent in his or her experience for "that which is signified".

The proliferation of global culture via the mass media (films, television and radio) has placed a very large number of such aural icons into the collective consciousness. It is therefore possible to expect that the referential quality of certain **SOUND OBJECTS** will be readily recognized by the listener, regardless of his or her regional cultural background.

The following example of an aural iconic sign and its "signification" in the collective consciousness should help illustrate this point.

The characteristic sound of a teletype machine has been used to such an extent in the introductions to radio and television news bulletins that it has aquired an iconic nature. Upon

hearing such a sound, the related concepts of information transmission, news flash, etc. are brought to mind. This type of icon also carries a relatively precise cultural / temporal signature in that it not only relates to the concept of information transmission but also places this concept in the context of an industrialized, information based culture in the middle part of the twentieth century. A comparative list of related icons which signify roughly the same ideas but at different historical periods could include; the sound of morse code, the sound of a young boy shouting "Extra! Extra!", the sound of a town crier ringing a bell and shouting "Hear ye! Hear ye!"

Although all these examples carry a certain amount of linguistic coding, their intrinsic referential qualities stem from the listener's recognition of their particular aural signature. This recognition on the part of the listener is independent of his or her decryption of the linguistic code. (ie. It is not necessary to decipher the message encrypted in the Morse code transmission in order to make the semiotic connection.)[25]

In the context of this work, the relative placement of a given non textual **SOUND OBJECT** on the semantic / phonetic continuum will be determined by the degree to which it is recognized as an iconic sign. The use of referential non textual **SOUND OBJECTS** along with textual **SOUND OBJECTS** helps bridge the gap between the linguistic and purely musical aspects of aural perception.

The *second wave* **SOUND OBJECT** from 6:20 to 6:56 (cf. score p.17-19) described in section **4.*v*.a.** above contains one such iconic sign. The snare drum in the **fifth** and **second elements** presents a timbrical and rhythmic signature which evoques a military context and all its potential related images.

As this example illustrates, a complex musical structure can also serve as an iconic sign. Such is the case in the instance of musical parody or pastiche in which the depiction of a particular style of music may trigger cognitive connections to related ideas or images in the experience of the listener.[26]

The **SOUND OBJECT** at 8:24 is a case in point. Here, the Rilke poem "Herbstag" is set in a style which is reminicent of late romantic, early twentieth century lyricism (Alban Berg). The style of this pastiche itself acts as an iconic sign, placing the listener in the temporal (and social) context of that particular historical period. (cf. section **4.*vi*.f.** for further discussion of this **SOUND OBJECT**.)

c. Language as a HIGH-DEFINITION referential SOUND OBJECT

Although both textual and purely musical **SOUND OBJECTS** can be placed in the context of the semantic / phonetic continuum, it is important to realize that linguistic coding permits a much higher degree of semantic focus. In this sense, language can and should be viewed as a **high-definition referential SOUND OBJECT**; a complex pattern of aural stimuli that has the power to convey very precise streams of information to a listener.

In the context of a work such as this one which relies partly on the iconic nature of **SOUND OBJECTS** for the establishment of a system of reference which will help engender the perception of form, the use of text can serve as an extremely potent tool for the communication of clues that will help the listener decipher the information encoded in a particular **SOUND OBJECT**.

The degree to which any given listener will be able to decipher the information encoded in a particular referential **SOUND OBJECT** is mainly dependent upon his or her familiarity with its socio-cultural context. In the up-coming examination of the formal aspects of the work, it will become clear that this reliance upon the listener's socio-cultural literacy introduces a certain element of unpredictability in the perception of form.(cf.section **5. *ii.***)

It is precisely this element of unpredictability which gives the work its "abstract" character and leaves it open to multiple interpretations. As the work is intended mainly for personal audition, in an intimate relation with the listener, the prospect of multiple auditions is highly probable. It is expected that subsequent auditions of the work will yield slightly altered perceptual experiences.

***vi.* Studio techniques as applied to the musical language**

The studio techniques made available to the composer are to be understood as extensions of his craft. (cf. sections **2.*iv*** and **2.*v.***) Through applications of studio techniques the very notion of orchestration is twice expanded.

The first extension is a result of the possibility of integration of practically every alternate sound source (electronic or acoustic) with the conventional palette of the orchestra. The second extension results from increased degree of control over the materials and their inter-relationships, made possible by techniques such as sampling, sequencing, synchronization and sound processing and mixing.

These extensions of compositional potential and their applications to the work will be explored in order to gain the insight needed for a thorough analysis of the work.

a. Sampling

Samplers have been in general use in electronic music studios and in the fields of pop, rock and jazz for roughly fifteen years. The concept of sampling however has roots that can be traced back to the "musique concrète" of Pierre Schaeffer and Pierre Henri in the 1950s.

The basic concept of sampling could be described as the digital recording of a sound for the purpose of modification and / or performance. Samplers permit their users to make digital recordings of sounds (called samples) and to edit and configure these "digitized sound files" for eventual play-back.

Their design includes many editing tools for altering and combining the samples. Such tools are actually sub-routines in the instrument's software that permit the user to access and edit the digitized sound files, to organize them into a configuration best suited for performance and to save all the information pertaining to these operations on an external data storage medium.

The types of operation which have become standard in modern samplers include truncating, looping, mixing, pitch shifting, time shifting and digital filtering. In addition, standard types of operations commonly found in synthesizer design such as envelope generators, time variant amplifiers and time variant filters are also standard features on most modern samplers.

As with any standard instrument, the composer's approach to the sampler must respect and exploit the conventionally established mode of performance and also explore the expanded possibilities of performance practice. Many of the expanded possibilities offered by sampling are made even more feasible when samplers are used in conjunction with MIDI sequencers and SMPTE time code synchronization.

b. Sequencing and synchronization

The concept that turns the multi-track recording studio into an expanded orchestra is **integration**. When it becomes possible to unite the expanded palette of orchestral, vocal and electronic performance and to control its evolution in the perspectives of time, register and depth, then the studio becomes an expanded medium. The tools that help to make this integration possible are MIDI sequencers and SMPTE time code synchronization.

MIDI is an acronym which stands for Musical Instrument Digital Interface. It is a standard international protocol which permits the transmission of data between electronic instruments, sound processing units and hardware or software based sequencing programs.

MIDI data consists of messages which are recognized by all modern electronic instruments adhering to the MIDI standard. Such messages include basic commands such as

note on and note off as well as quantitative values such as key pressure, program change, main volume, pan, pitch bend and modulation. All of these messages relate to standard operations performed by electronic sound modules. This data flows between instruments in the network on channels numbered from 1 to 16. Networks are not limited to the number of channels since these can be multiplied via multiple MIDI ports.

All of this data is recorded, edited, synchronized and played back using computer programs called sequencers which are designed explicitly for this purpose. The role of the sequencer in a MIDI network is similar to that of a multi-track tape recorder in a recording studio. The basic difference is that sequencers do not record the sound generated by the instruments, but rather the information that causes the instruments to generate the sound. In order for the sound generated by the modules in the MIDI network to be recorded, the sequencer must be synchronized with the tape recorder.

This synchronization may be achieved via several means including MIDI time code (MTC) but the most reliable and widely used standard is SMPTE time code.

SMPTE time code is a standard code which was developed for the synchronization of sound to film and has become widely used for all types of synchronization in the film, recording, television and video industries. SMPTE time code can basically be described as an audio signal which has been encoded with time values in hours, minutes, seconds, frames and subframes. Although it exists in a number of formats and rates, the format most often used for synchronizing MIDI sequencers, automated mixing consoles and multi-track tape recorders is 30ND (non drop) at 30 frames per second. In the modern multitrack recording studio, SMPTE time code is literally the pulse that brings everything together.

c. Multi-tracking

The concept of multi-tracking combined with synchronization of hard-disc based digital multi-track recording devices opens up new possibilities of sound combination which go beyond the standard uses and extend the composer's craft.

One of the most fundamental advantages of multi-tracking involves the non-sequential nature of the recording process. The materials that make up the work need not be recorded in sequence, from beginning to end. This permits instantaneous changes in instrumentation, texture and ambience which would otherwise prove impractical.[27] The very form and texture of this work reflect this basic fact.

Another advantage of the medium is its capacity for the layering of parts. Besides allowing for large ensemble textures with a relatively small group of musicians, layering enables the construction of extremely homogeneous **SOUND OBJECTS** through the over-dubbing of

identical instruments or voices. It also allows for greater control over quality of performance in complex textures since takes (individual recordings) can be rehearsed and re-recorded until the desired performance is achieved.

For example, the *first wave* **SOUND OBJECT** in the voices at 7:36 represent a complex extension of the word "souffle". (cf. score, **third and fourth elements**, p.21). The solo voice (**fourth element**) sings the word following a descending melodic pattern in the 2-5 mode. This vocal part is enveloped or shadowed by the vocal quartet (**third element**).

Here three of the voices follow the downward motion of the solo voice by performing timed glissandi which converge at different points in the melodic line. The fourth voice extends the aperiodic phonetic content of the word over the other voices.

The effect is that of an expansion or enlargement of the solo voice into a more complex multi-layered texture. (cf. score 4:27, **third and fourth element**, p.12 for another example of such vocal layering)

Moreover, multi-tracking permits the recording of guide tracks which can contain click tracks (metronome guides) or reductions of accompanying material to aid in the control of the accuracy of rhythm and pitch. Such guide tracks are included in the monitor mixes fed back to the performers in the studio. In this manner, the performer hears only the necessary background materials when constructing a particular **SOUND OBJECT**.

In the case of the **SOUND OBJECT** referred to above (cf. score, **third and fourth elements**, p.21) the singer needs a head-phone mix made up of the vocal guide track and a soft metronome click to record the melodic line (**fourth element**). Each newly recorded track is then added to the monitor mix as the four voices of **element three** are subsequently recorded. This procedure is repeated for the recording of all such **SOUND OBJECTS**.

d. Expansion of compositional potential.

The following over-view will expose some major examples of how samplers, sequencing, synchronization and multi-tracking are used to expand the scope of compositional and orchestrational possibilities in the context of this work.

***1.* Expansion of range:**

One of the most basic sound transformations made possible by the use of samplers is transposition of original samples. Although the digital recording (sample) tends to lose its integrity of timbre when transposed beyond a minor third up or down, this very transformation, can yield interesting alternate timbres when mixed with the originals in the right proportion.

The **SOUND OBJECT** referred to in section **4.*iv*.b** above as the **Magic Square** is a good example of such extension of range. (cf. score 0:00 to 0:06 in the first **element** p.1) This **SOUND OBJECT** is constructed using samples of human voice mixed with synthesized sounds with vocal characteristics. Although no human voice could ever extend to such extreme high and low registers, the use of sampled voices in extended ranges helps create a **SOUND OBJECT** with somewhat familiar yet strangely "alien" texture.

This particular extended vocal timbre serves as a signature in the context of the work since it is present in all the **nodes**. (cf. section **5.*iv*.b.** for more on **nodes**.)

2. Expansion of the timbrical domain:

In addition to the altered timbre referred to above, other more direct applications of samplers can achieve even more drastic modulations of timbre. Since modern samplers are hybrid instruments, combining elements of synthesizer design with sampling technology, they can be used to create extensions of acoustic instruments.

By starting with sampled copies or clones of acoustic instruments, and applying dynamic modulations to parameters in the time variant amplifiers and time variant filters which act upon the sampled sound, subtle or extreme extrapolations of the instrumental timbre can be achieved. For example, a sampled cello tone can be altered through manipulation of its harmonic spectrum via time variant filters, varying the amount of amplification of chosen segments over time. Synthesized cello tones (or any other sounds) can also be combined with the altered samples. Once these extrapolated timbres are created, they can be performed at the keyboard and the MIDI data relative to these performances can be recorded and edited with the sequencer. These performances can then be combined with the actual acoustic instruments recorded on the multi-track tape.

Instances in which such expansions in the domain of timbre are exploited occur in *third wave* **SOUND OBJECTS** from 13:35 to the end of the work. In one such example (cf. score at 13:35-13:55, p. 46-47), strings, horn, clarinet and bassoon in the fifth **element** combine with their "syn-extensions" in the first **element** to create a **SOUND OBJECT** which blends with another **SOUND OBJECT** (sampled and synthesized voices in the first **element**) and forces it into motion along the axis of the periodic / aperiodic continuum (modulation in timbre).

3. Expansion of articulation:

When used in conjunction with MIDI sequencing, instrumental textures and especially vocal and linguistic materials can be manipulated and articulated in the temporal and spacial dimensions in ways which would be impractical in a "live" performance situation.

Although it is possible to mimic the articulation and expression of live performance with sampled acoustic timbres, the effect very rarely justifies the effort. However, within certain limits, the sequencing of sampled acoustic timbres can yield textures which excede the articulative possibilities of conventional performance technique, especially when very precise complex rhythmic structures need to be executed.

In such instances the use of samplers and sequencers as an alternate for acoustic timbres is justified. In order to retain a certain degree of realism in such instances, it is more practical to limit these applications of sequencing and sampling to percussive timbres rather than longer more expressive sonorities which would require looping.

In the context of this work, such extensions of articulation in instrumental textures can be heard in all the *second wave* **SOUND OBJECTS** which involve xylophone and marimba timbres. In these **SOUND OBJECTS** the construction of highly periodic textures in acoustic timbres is intended to convey "mechanical" connotations. This effect is better achieved through the computer-driven sequencing of sampled xylophone and marimba. The inflexible rhythmic rigor and extended articulative scope which results from this procedure is attained without reliance upon undue virtuosity on the part of a performer. (cf. score, first **element** at 11:06-13:00, p.32-44)

The extension in articulation afforded by the use of sequencing and sampling is even more drastic when applied to vocal performance of spoken text. By sampling an excerpt of spoken text and truncating the words into their constituent elements (phonemes and syllables), each syllable (or phoneme) can be assigned to a key on the keyboard. Once this is accomplished, it becomes possible to rearrange them in any desired sequence with a high degree of accuracy. This application allows for the construction of complex verbal structures that would otherwise require unnaturally demanding performance on the part of the vocalist.

The *second wave* **SOUND OBJECT** cited in section **4.v.a.** above (cf. score from 6:20 to 6:56 (p17-19)) is one case in point. Here the sentence "Nachts schlaffen die Ratten doch" is sampled four times with slightly different inflections and each sample is truncated into words (Nachts/schlaffen die/Ratten/doch). These words are then reorganized with the help of the sequencer to form the structure described in above. (cf. section **4.v.a.** and **4.v.c.**)

An even more complex example of this type of application occurs in the *second wave* **SOUND OBJECT** heard from 11:06 to 13:00 (cf. score p. 32-44). Here the excerpt from Gerald LeBlanc's "*Geographie de la nuit rouge*" is sampled twice and and each sample is truncated into forty-two (42) syllables. The syllables are then rearranged to form a complex metamorphic **SOUND OBJECT** which evolves on the axis of the semantic / phonetic continuum.

In this **SOUND OBJECT**, two **streams** of text are set in motion. In the first **stream** the text is reconstructed following a pattern which evolves systematically from the extremities to the

middle of the line of text:**1/42**, **1-2/41-42**, **1-2-3/40-41-42 ...** until the whole original text has been allowed to unfold. The second **stream** follows a similar pattern but evolves from the middle to the ends: **21/22, 20-21/22-23, 19-20-21/22-23-24 ...** When perceived together these two parallel **streams** create a **SOUND OBJECT** which only reveals its true semantic content gradually over a span of one minute and fifty-five seconds.(cf. fig. 7)

Moreover, these two **streams** of text are actually evolving in space as well as in time. They start at the center of the panoramic field but slowly gravitate towards the edges, the first moving towards hard left and the second towards hard right. This gradual spacial separation combines with the systematic unfolding of the text and so enhances the dynamic quality of the **SOUND OBJECT**. Such a complex structure is achieved with ease through the sequencing of MIDI information which controls both the sequence of sampled events (note on / note off) and the panoramic positionning (MIDI controller number 10: pan).

Besides these extensions made possible by sampling and sequencing, other aspects of modern multi-track studio recording can expand the composer's palette. The following sections will describe some of these extensions and their applications in this work.

e. Analog and digital signal processing

The advantages cited above are further enhanced by the use of analog and digital signal processing devices. In each of the basic steps of standard multi-track recording, a number of peripheral processing procedures involving analog electronic circuits or digital signal processing devices may be applied to the sound.

Sound sources may need to be fine-tuned with filters, equalizers, amplifiers, compressors or limiters before they are recorded. Then in the process of mixing down to stereo (or other formats for use in the film industry) the recorded sounds will undergo other modifications or enhancements.

In both cases, it is important to note the difference between those techniques which are essential to the actual recording process and those techniques which serve to qualify the mix and give it a particular character.

In a general sense it is safe to define the difference between these two aspects of recording technique as a distinction between the *craft* and the *art* of sound recording. The proliferation of digital and analog signal processing devices and procedures allows the composer / producer unlimited creativity in the shaping and sonic design of the final mix.

f. Filtering and equalization

Among the basic modifications applied to recorded sounds are filtering and equalization. Both these procedures relate to the harmonic spectrum of the sound.

In its most basic form, filtering is a substractive procedure which when applied to a sound source reduces the relative amplitude of a particular band of frequencies. Equalization is a related procedure that shapes a sound by selectively increasing or reducing the relative loudness of segments of its harmonic spectrum.

Equalization is a very powerfull tool not only for fine-tuning the timbre of a particular sound but also for adjusting the harmonic spectrum of multiple sounds in order to either blend or separate them in a mix. In this sense equalization serves to extend the possibilities of orchestration in that it allows the combination or separation of timbres that would prove unpractical in a purely acoustic setting.

In the case of complex textures such as that of the **SOUND OBJECT** which culminates at 13:00 (cf. score p.42-44), judicious use of equalization at the mix-down phase of the recording will insure a higher degree of clarity and separation of timbres.

g. Real-time transformation of acoustic timbres

Besides its application to enhance the clarity of the mix, equalization can also serve to re-shape acoustic sonorities and combine them in unexpected ways. A case in point in this work is the use of third-octave filters in real time.

A third-octave filter is a special type of graphic equalizer which separates a signal in narrow bands of frequencies, a third of an octave appart. Each band is assigned to an individual fader and each fader serves to either reduce or augment the loudness of the frequency band. By applying this type of equalization to particular timbres in a drastic manner, novel sonorities can be created.

A distinct example of this type of application can be noted in the *third wave* **SOUND OBJECT** at 1:09 (cf. score, second **element**, p. 3). Here, dense tone clusters (density 1 and 2) are sounded by french horn, bassoon and clarinet and recorded on a hard disk based multi-track recorder. As indicated by the direction: **eq.= *f.o.f.* + ↑** the third octave filter is then applied to this recording in such a way as to totally filter out the fundamental *(f.o.f.)* frequencies.(cf. score p. *iii* for description of special notations.)

Selected bands of the harmonic spectrum are then singled out and drastically enhanced in real time. The resultant **SOUND OBJECT** is then recorded to a different track of the multi-track recorder. This procedure is repeated several times at different bands of the spectrum and

each pass is subsequently layered on the multi-track and placed in the stereo image to create a complex **SOUND OBJECT** in which the harmonics of the recorded instruments are heard evolving dynamically in time and space.

This **SOUND OBJECT** is then dubbed to two tracks of the multi-track tape and eventually mixed with the *sul tasto* double basses and celli and the viola and violin harmonics to create a composite **SOUND OBJECT**. (The string component of this **SOUND OBJECT** will be discussed below. cf. **4.*vi*.i.**)

h. Establishing referential sound objects through filtering

Filters and equalization can also be used to create iconic signs in sound. For instance, the referential nature of the passage described in section **4.v.b** above is enhanced by the application of low pass and high pass filters.(cf. score at 8:24, **second and third elements**, p.23-27) Since this passage is intended as a pastiche of early twentieth century lyric style, its placement in the historical period is emphasized by the actual sound of the recording.

In this example, the strings and voice are recorded as a chamber ensemble and assigned to their relative tracks on the multi-track tape. The passage is then sub-mixed to mono and bounced to an individual track of the hard disc multi-track recorder. At this point low-pass and high-pass filters are applied to the track to roll-off the upper and lower segments of the frequency spectrum and equalization in the mid-range is enhanced. This procedure simulates the effect of early gramophone recordings and radio transmission. The mono track is then bounced to an individual track of the multi-track tape while the filters are gradually opened-up in real time.

In the mix-down phase, this mono track is heard alone at first and the original tracks are then slowly cross-faded. In this mannner, the **SOUND OBJECT** is perceived as evolving in its temporal focus. This "temporal" evolution is further articulated by the cumulative orchestration and the gradual increase in rhythmic and harmonic complexity.[25]

i. Reverberation, chorusing and harmonizing

***1.* Depth perception as musical parameter:**

The perception of depth in music represents the third dimension in aural perspective. Along with the horizontal and vertical perspectives discussed in great length above (cf. section **4.*iv*.a**), depth perception plays a major role in separating or combining **SOUND OBJECTS** regardless of their relative pitch or temporal placement. (cf. fig. 2) Through the establishment of

a combination of relative loudness and reverberation, sounds can be perceived as originating from different points in space; from very near (dry and loud) to very far (reverberant and quiet).

In the context of a work such as this where three *waves* evolve and create complex textures, depth perception is essential in assuring clarity.

2. Multiple levels of depth:

The perception and placement of **SOUND OBJECTS** may be greatly enhanced by the judicious use of artificial reverberation. Through the medium of multi-track recording, ambience need not be limited to the particular space in which the sound is recorded. As each sound is isolated to a certain degree on its individual track of the tape, a great many types of reverberation may be applied selectively to any given track.

Since the amount of reverberation tends to help situate a sound in space by enhancing its proximity, the establishment of multiple levels of reverberation yields a high degree of control over the phenomenon of depth perception. In general terms, differences in depth in this work will help determine the association of **SOUND OBJECTS** with *first, second or third wave*. Longer reverberation times are associated with *third wave* **SOUND OBJECTS** while *first and second wave* **SOUND OBJECTS** are heard in relatively dry ambiance.

Along with reverberation, another characteristic of sound perception which could be referred to as **"focus"** also helps create the illusion of depth. Here again the use of the visual metaphore helps to define an aural phenomenon which is otherwise better described through an example.

For instance, the difference between the sound of a solo violin and that of a section of twenty violins can be described as a difference in focus. Every aspect of the solo violin's sound is clearly defined and readily perceivable. In comparison, these same aspects are blurred in the violin section due to slight differences in the sonority of each violin in the group and in each individual section violinist's particular approach to pitch and vibrato.

Several traditional techniques in orchestration such as muted strings, "sul tasto"and "tremolando" bowing, or different types of muting of horns and brass, alternate placement of instruments on or off stage can help to define aspects of depth and focus in orchestral texture.

In the context of multi-track studio recording, the application of digital and analogue signal processing devices to control effects such as reverberation, chorusing and harmonizing is yet another extension of classical orchestration techniq . Taken as such, the use of these peripheral devices greatly enhances the composer's control over depth perception.

Another look at the *third wave* **SOUND OBJECT** at 1:09 cited in section **4.*vi*.f.** above should help illustrate these points. (cf. score, **second element**, p. 3)

In this **SOUND OBJECT** the filtered wind clusters discussed above are combined with string harmonics at density 13.(cf. section **4.iv.b** for description of the density scale.) The timbre and focus of this string **SOUND OBJECT** is established by means of classical orchestration techniques. The celli and basses play *sul tasto* while the violas and violins play artificial harmonics. The focus of the **SOUND OBJECT** is further shaded by the application of chorusing and harmonizing at the mix-down phase (as indicated by the ≈ notation). These digital signal processing procedures help create the illusion of a larger ensemble. The chorus does so by applying slight pitch and amplitude modulation to the recorded signal. The harmonizer mixes digitally transposed (slightly detuned) copies to the signal at varying degrees.

Both the string and wind components of the **SOUND OBJECT** are then fed to a relatively long reverberant space (ca. 5 seconds) with very little early reflections so as to simulate the effect of a large enclosed space. This has the twofold effect of blending the instrumental timbres together and of associating a sense of depth with the **SOUND OBJECT**. This perception of depth is enhanced by the juxtaposition of the **SOUND OBJECT** with the preceding (*first wave*) material which is relatively dry and well defined (in focus).

In other sections such as the combined *second and third wave* **SOUND OBJECTS** at 11:14 (cf. score p. 34-44) differences in reverberation help to dissociate *third wave* **SOUND OBJECTS** from *second wave* **SOUND OBJECTS** as well as blend certain **SOUND OBJECTS** across *waves*.

A quick glance at reverb indications on page 34 of the score shows how **SOUND OBJECTS** will be placed relative to *second and third wave*. The sampled and synthesized voices in the **first element** as well as voice 1 of the **third element** and the **fourth element** voice are sent to the long reverberant space (ca. 5 sec.) associated with *third wave* **SOUND OBJECTS**. *Second wave* **SOUND OBJECTS** in the strings, percussion of the **second** and **fifth elements** as well as the sampled text in voices 2 and 3 of the **third element** are left relatively dry.

The remaining **SOUND OBJECTS** (in woodwinds and brass in the **second** and **fifth elements**) are indicated at ca.2.5-3 seconds. Although their instrumental timbres have up to now been associated with *second wave* **SOUND OBJECTS**, the intermediate reverberant space in which they are heard here helps separate them from the purely *second wave* **SOUND OBJECTS** and move them towards the space of the *third wave* **SOUND OBJECTS**.

j. Other applications of digital signal processing.

Besides their use in establishing depth, digital signal processing devices such as harmonizers can be applied to **SOUND OBJECTS** to drastically transform their timbrical attributes.

One clear example of this type of application is in the sampled text of the *third wave* **SOUND OBJECT** at 9:29. (cf.score, **first element**, p. 26) Here, the sampled text "Ich glotze" is fed to a harmonizer set to generate multiple transpositions at several octaves. The effect gives an artificial quality to the text and suggests a computer-generated or other-worldly connotation associated with *third wave* **SOUND OBJECTS**. (cf. section **5.*iii*.c.**) Another such application occurs at the end of the piece in the **first element**. (cf. score, p. 68)

5. FORMAL STRUCTURE

TEMPS EN TEMPS (times in time) is a work in which form is directly linked to substance. This particular relationship in the nature of the work requires an analytical and descriptive procedure whereby substance (the musical and extra-musical characteristics of the materials) and form (structure and process) are presented in tandem. The following sections of the analysis will therefore deal with these two aspects in cunjunction.

i. Cinematic form

In order to gain clear insight into the formal aspects of **TEMPS EN TEMPS (times in time)** it is necessary to borrow another image from a different yet not unrelated art form: cinema. In a sense, the model for the formal structure of this work is more akin to cinematic form than to any other structural template.

It has been stated in section **4.*ii*** that the content of the work evolves along three distinct lines called *waves*. For purpose of clarity, the evolution of these *waves* and their inter-relationships in time can be compared with three parallel sub-plots within the scope of a film.

Each sub-plot (*wave)* follows its own logical "dénouement" along its particular temporal line. However, the action is presented to the viewer (listener) in scenes. In presenting these scenes in sequence over the time span of the film the director / film editor can jump cut, or cross fade from one scene or sub-plot to another. At certain points along the story line, characters or events in one sub-plot can be introduced in the context of another and a great number of cross-relationships can be introduced between the sub-plots. This can eventually lead to the weaving of all the sub-plots into one general story line.

Without going as far as describing the piece as a work intended as a sound track to an unseen film, it is safe to say that the formal aspects of **TEMPS EN TEMPS (times in time)** can be better understood in this light. The use of the comparison to cinematic form enhances the perception of **TEMPS EN TEMPS (times in time)** for the purpose of analysis since the purely aural perception of form in music is somewhat more abstract than the combined visual / aural perception of form in cinema.

ii. Three waves: Form as structure and process

The general musical characteristics of the **SOUND OBJECTS** that make up the three *waves* or "sub-plots" in the work can be understood as relating to aural, temporal and cultural aspects of each of the three waves of human evolution outlined in Alvin Toffler's book "*The Third*

Wave.[1] (cf.section **3.*ii.***) Because of this conceptual approach, each *wave* has its own distinct musical identity, and this identity is retained throughout the work.

In the context of this work, the initial relationship between extra-musical subject matter and musical materials is conceptual rather than perceptual. Although the reflection upon socio-cultural ideas influenced the compositional choices made in the conception of the music, it is not intended nor expected that these connections will necessarily be understood by the listener. However, each of the **SOUND OBJECTS** composed following this conceptual premise carries with it the suggestive (referential) qualities inherent in its initial conception and as such has the potential for the transmission of related ideas or images to the listener, even without reliance upon a program.

The aspects of form in this work must be understood on two distinct yet related levels. The first level is that of **structure**; the conceptual account of what is heard at any given point in elapsed time. The second is that of **process**; the evolution and interaction of musical materials within the work that convey to the listener a sense of experienced time.[2]

Unlike structure which is imposed by compositional choice, perception of process is highly dependent on the listener's interaction with the music. Perception of formal process in the context of this work is comparable to playing a game or solving a puzzle. From a perceptual point of view, **TEMPS EN TEMPS (times in time)** is like an enigma to be pondered, and the only "clue" given to the listener is the title.

Since a composer's analysis of such a work delivers the solution of the enigma through privileged insight the reader of the analysis forfeits any chance at ever truly participating in the game.

In this work, the analysis of form both as structure and as process is highly dependent on the recognition of the particular *waves* (or sub-plots). The musical and extra-musical characteristics specific to each *wave* must therefore be exposed in detail before dealing with aspects of form.

iii. Characteristics of the three waves

Aspects of harmony, melody, rhythm, text, orchestration and texture in *first, second* and *third wave* **SOUND OBJECTS** can all be analysed in the light of their relationship with the socio-cultural traits associated with Toffler's waves. (cf. section **3.*iii.***)

At the outset of the compositional process, certain pertinent socio-cultural traits are singled out and are attributed musical equivalents. An important part of the analysis of the work involves the description of these correlations and their role in establishing the particular musical signature of **SOUND OBJECTS** in the *three waves*.

a. *First wave*

***1.* Orchestrational and textural character**

The particular orchestrational character of *first wave* **SOUND OBJECTS** was arrived at following reflection on the intimate relationship between man and his environment as well as the relatively primitive state of technological evolution in first wave society. In order to maintain the identification of *first wave* **SOUND OBJECTS** throughout the span of the work, a particular palette of instrumental and vocal sonorities was chosen and remains unchanged for the duration of the piece.

This particular aproach to orchestration can be compared to casting in the cinema or the theatre. In a sense, instrumental and vocal colours are chosen as would be actors. Together, they form the cast which will be acting out the *sub-plot* of the *first wave*.

The central sonority in the *first wave* is the voice. Besides the need for a focal point in the ensemble, the voice is associated here with the human element. The other timbres in the palette of the *first wave* are also linked to the human element in that they are either direct expansions of human sound producing capacity or primitive products of extension transference.(cf. section ***2.iii.***)

The sonority second in importance to the voice in the ensemble is hand claps. Hand claps represent the percussive aspect of human sound production. Together with the voice, they stand at the beginning of a long line of extensions which eventually led to the developement of all modern sound producing devices and media.

All the other timbres in the *first wave* palette are primitive extensions of voice or hand claps. Bowed strings are extensions of the human vocal apparatus and bongo drums extend the basic percussive nature of hand claps. Tom toms played with wooden sticks further extend the bongos and plucked (pizzicato) strings exhibit a cross-relationship between the resonant (periodic) nature of the voice and the percussive (aperiodic) nature of the hand claps.

Taken together, these sonorities define the timbrical and orchestrational character of the *first wave*. The inter-relationships between the sonorities are also related to their placement on the line of extension transference.

These vocal and hand clap materials evolve along two distinct **streams** which will eventually converge. The strings which extend the voice follow along the vocal stream and act as an artificial resonator, enveloping the vocal stream and translating its horizontal perspective to the vertical.

The bongo drums and tom toms shadow the hand claps along the percussive **stream**. Both streams start out as single lines and gradually grow more complex.

A quick examination of the *first wave* **SOUND OBJECTS** from 0:06 to 3:00 in the score will serve to illustrate this. (cf. score, **first, third, fourth** and **fifth elements**, p. 1-7)

The hand claps at 0:08 in the first and fourth **elements**, the first purely *first wave* sonorities to be heard in the piece, mark the beginning of a **SOUND OBJECT** that sounds up to 1:09. The voice and hand claps of the fourth element (solo voice) are at the focal point of this **SOUND OBJECT**. They are shadowed or doubled by their relative extensions. Sampled and slightly detuned hand claps double the singer's claps, pizzicato double bass and cello, and later, arco viola and violin double the singers voice.

The third **element** voices (1,2,&3) constitute the final component of this **SOUND OBJECT**. They are first heard at 0:35 as an aperiodic field made up of the (aperiodic) sibilant phonetic content of the text. (The solo voice sounds its periodic, resonant vowel content.)[3] The textual aspect of *first wave* **SOUND OBJECTS** will be examined in greater detail below.

This basic texture evolves gradually over the next three *first wave* **SOUND OBJECTS**. (1:17-1:50, 1:55- 2:22, 2:43-3:00) As the melodic range of the solo voice expands and the length of the sustaining string tones increases, the texture of the string "shadow" becomes more complex.

The percussive **stream** also grows in complexity over time. The temporal density of this **stream** is increased through the gradual introduction of parallel rhythmic **streams** in the bongo drums (fifth **element**) and lower-pitched sampled hand claps (first **element**).

In the last of these three **SOUND OBJECTS** (2:43-3:00), a more drastic change in texture occurs. The three voices of the third **element** are now heard sounding vowel tones. Voice #1 sings in counterpoint with the solo voice while voices 2 & 3 articulate a pedal tone (or drone). The resultant nature of the string "shadow" is further extended by the transposition of the first voice's resonant double one and two octaves lower in the double bass. (cf. score, voice #1 in the third **element** and double bass in the fifth **element**, at 2:43, p. 7)

This change in the textural aspect of the third **element** moves the global texture of the **SOUND OBJECT** back along the axis of the periodic / aperiodic continuum. This move happens both at the micro level of perception, where aperiodic sibilant phonemes have been replaced with periodic vowel sounds, and at the macro level where the aperiodic field is replaced by two **streams** of periodic rhythmic paterns.

Subsequent audition of these four **SOUND OBJECTS** at a higher level of perception will reveal their coherence (or connectedness). At this level of perception, they can be understood as one higher level metamorphic **SOUND OBJECT**. Although its orchestration remains relatively constant, the gradual increase in temporal density is readily perceivable.

2. Linguistic character

In attempting to relate linguistic aspects of **SOUND OBJECTS** to formal analysis of this work, it is important to keep in mind the referential nature of **SOUND OBJECTS** which display a high degree of semantic content. (cf. section **4.v.c**) Such **SOUND OBJECTS**, placed throughout the work, are intended as clues to the listener. These can serve as aural keys that may help the listener attain a perceptual understanding of the conceptual aspect of the form.

The linguistic content of *first wave* **SOUND OBJECTS** has been tailored to convey the most basic biological aspect of human existance: breathing. The linguistic palette of the *first wave* is relatively limited. In essence, *first wave* **SOUND OBJECTS** contain only three words which carry the potential semantic value of breathing: **SOUFFLE - BREATHE - HAUCHE**.

Although most of the phonetic aspects of these words are present throughout *first wave* **SOUND OBJECTS** their semantic content is revealed only gradually over the span of the piece. This gradual evolution of *first wave* **SOUND OBJECTS** along the axis of the semantic / phonetic continuum reflects the historical evolution of language.

Once the semantic content of the words "SOUFFLE, BREATHE, HAUCHE" is revealed, the recurrence of the idea of breathing to varying degrees throughout the piece may help bring to mind the extra-musical aspects conceptually imposed on *first wave* **OBJECTS**.

The repetition of the breathing "icon" may also serve as a sort of mantra, subtly implying the connection between controlled breathing and meditation. This "mystic" connection is conceptually intended to transcend the *first wave* and reflect the presence of expanded consciousness throughout the history of human evolution.

In addition to the words "breathe, souffle and hauche", there are several occurrences of different textual material in *first wave* **SOUND OBJECTS**. These occurrences serve as premonitions or precursors of *second wave* or *third wave* linguistic events. The two first such events occur in the *first wave* **SOUND OBJECTS** at 7:00 and 7:36 and in the combined *first and second wave* **SOUND OBJECTS** at 7:44.

Here the words "la nuit" point forwards to the *second* and *third wave* texts which allude to the concept of night. These cross references abound in the texts of all three *waves* and are intended as a reflection on the contemporaneity of the three waves: the fact that, although they represent waves of social evolution, these aspects of human society actually co-exist in time. (see sections **5.*iii*.b.** and **c.** for details on *second* and *third wave* texts.)

***3.* Harmonic / melodic character**

Since the human voice is at the focal point of *first wave* **SOUND OBJECTS**, the fundamental aspects of harmonic and melodic character are in essence imposed by the basic needs of vocal performance practice. Hence, a compositional choice in orchestration establishes the melodic nature of the *first wave* through a causal relationship.

The **2-5** mode which gives *first wave* **SOUND OBJECTS** their particular melodic-harmonic signature has already been described in detail in sections **4.*iv*.d.** and **4.*iv*.e**. However, in order to better grasp the harmonic implications of the **2-5** mode, one point which was introduced in section **4.*iv*.d.** must be developed here. It is important to emphasize the organic inter-relationship between the melodic and harmonic aspects - the horizontal and vertical perspectives - in perception of *first wave* textures.

Here again, the pre-compositional reflection upon the primitive nature of first wave civilization determined the compositional procedure which would bring about the harmonic characterization of *first wave* **SOUND OBJECTS**.

Speculation about the earliest occurrence of harmony in human musical evolution suggested that natural reverberation and echo in caves and canyons would cause the sound of melodic intervals, normally perceived in the horizontal perspective, to linger and sound synchronously as harmonic intervals in the vertical perspective. The decision to use the strings, the primitive extensions of the voice, as a resonator for the modal vocal melody was prompted by the need to establish a musical parallel with this natural phenomenon.

Since the melodic material of the *first wave* is composed almost exclusively in the **2-5** mode, and that as such this mode fixes particular pitches in register, the harmonic colours reflected in the string "shadow" will be defined directly by the nature and the registral envelope of the melodic line. Moreover, when two or more vocal **streams** evolve together in the horizontal perspective, different shadings of the vertical sonorities of the **2-5** mode will resonate in the strings.

In examining the four *first wave* **SOUND OBJECTS** described in section **5.*iii*.a.1.** above from the point of view of the horizontal-vertical scheme of perspective, these points become clear. (cf. score, **first, third, fourth** and **fifth elements**, p. 1-7)

From the outset of the initial *first wave* **SOUND OBJECT** at 0:06, the vocal line is shadowed by the strings. At first the cello and bass merely mix their respective timbres and articulation with the voice. This does not result in translating the horizontal perspective to the vertical until the point where the length of the resonating tone in the strings excedes the length of the sustained tone in the voice. The first occurrence of this "harmonization" is at 0:50 in the viola and second violin. (cf. score, **fifth element**, p.3)

The effect becomes more pronounced already in the second *first wave* **SOUND OBJECT** at 1:17. Here the high strings add a 3 second resonance to the vocal melody. (dotted half at 60 BPM = 3 seconds) Since the temporal density of the vocal **stream** is increasing, rapid successions of pitches in the melody are suspended and superimposed in the strings. In the third *first wave* **SOUND OBJECT** at 1:55, the string resonance has been increased to up to 5 seconds. This along with the increase in temporal density in the melodic line generates a more complex harmonic texture where the vocal melody is completely washed over by the sustaining strings.

Finally, in the fourth *first wave* **SOUND OBJECT** at 2:43, the texture of the vocal **stream** itself becomes contrapuntal. Here three separate vocal lines interact in the **2-5** mode while the strings continue to reflect their pitches. This evolution from monodic texture through sympathetic vibration and resonance to polyphonic texture is in essence a model of the actual historical evolution towards polyphony.

4. Rhythmic character

As the title **TEMPS EN TEMPS (times in time)** suggests, the concept of time is at the root of the musical language of this work. In a general sense, the analysis of the rhythmic aspect of **SOUND OBJECTS** in this piece will show how rhythm affects the listeners perception of texture and of time. This basic premise was expressed in detail in section **4.*iv*.h.**.

The particular rhythmic treatment of musical materials in *first wave* **SOUND OBJECTS** also has its roots in reflections of concepts of time in first wave human civilization. Perception of time in first wave culture could be best described as cyclical; relating to natural cycles of days, moons, seasons, punctuated by religious rites and always relevant to the agricultural nature of the society. More importantly, time is not standardized in first wave societies as it is in industrial society. Since first wave social life is relevant to small isolated comunities, many different perceptions of time coincide as different isolated cultures follow different cycles.[4]

The analysis of rhythmic values in *first wave* **SOUND OBJECTS** shows how these temporal concepts translate to musical structures. Here, rhythm must be understood as punctuation and subdivision of elapsed time.

In the first **SOUND OBJECT** (0:06-1:09), the percussive **stream** (hand claps in the **fourth element** and sampled hand claps in the **first element**) is structured as a 16 second cycle (16 quarter notes at 60 BPM). This cycle is punctuated at irregular intervals equivalent in seconds to numerical values contained in the Fibonacci sequence of numbers: 5-3-8 / 3-8-5 / 8-5-3 / 5-3-2-3. (cf. fig. 8a) The fourth cycle (0:56- 1:09) is cut short by the "jump-cut" to the *third wave* **SOUND OBJECT** (1:09-1:17). The fact that this structure is imposed by compositional

choice but not necessarily recognized through aural perception reflects the organic nature of natural cycles and first wave man's instinctive, unconscious relationship to temporal perception.

Analysis of the rhythmic interaction of the percussive and vocal **streams** in this **SOUND OBJECT** demonstrates yet another translation of first wave temporal concepts to musical structure.

The vocal **stream** (**fourth** and **fifth elements**, 0:17- 1:09) follows a shorter cycle of 13 seconds. This cycle is likewise punctuated at irregular Fibonacci intervals: 5-8 / 5-8 / 5-3-5 / 8-5. (cf. fig. 8b) Conceptually, the coexistence of these unequal cycles (16sec. and 13 sec.) reflects the polychronic nature of first wave temporal perception.[5]

From the listener's point of view, the synchronous sounding of these two irregular cycles results in perception of an aperiodic field. Due to the length of the temporal intervals and the lack of repetition, the rhythmic structure does not convey a sense of movement (time passing) but rather creates an alternate temporal perspective.(c.f section **4.*iv*.h**) Towards the end of this **SOUND OBJECT** the temporal density is increased and the listener perceives a gradual acceleration which implies motion forward. (This sense is further enhanced by the abrupt change to *third wave* texture at 1:09.)

By increasing the temporal density, events happen closer together in time and patterns can be recognized. As more and more local rhythmic patterns are identified, their reoccurence will establish relationships over time. Furthermore, as rhythmic structures acquire a more periodic nature, **SOUND OBJECTS** will begin to convey the sense of time passing.

Analysis of the rhythmic structures in the three following *first wave* **SOUND OBJECTS** (1:17-1:50, 1:55- 2:22, 2:43-3:00) will demonstrate how the perception of time is gradually altered by creating **SOUND OBJECTS** that exhibit an increase in temporal density and that evolve in relation to the periodic / aperiodic continuum.

In the **SOUND OBJECT** at 1:17, the vocal and percussive **streams** still evolve following independent cyclical time. However, both **streams** have become slightly more complex in their structure.

The percussive **stream** in the **fourth element** (singer's hand claps) still follows a 16 second cycle: 8-3-5 / 8-5-3. This **stream** is complemented by a second percussive **stream** in the **first element** (sampled handclaps detuned lower). This complementary **stream** does not follow a strict cycle but rather establishes local relationships with events in the first **stream**. These relationships translate to patterns or "motives" which linger in the aural memory of the listener and alter the temporal perception. (cf. fig. 8c) This compound **stream** (in the **first element**) is further doubled and complemented by the bongos in the **fifth element**.

The vocal **stream** follows a cyclical scheme in which subsequent cycles get progressively shorter: 13s / 11s / 7s (5-3-3-2 / 8-3 / 3-1-3). The temporal density is also

increased through the introduction of shorter subdivisions of time (eighth note triplet- .33s) on the local level. Besides resulting in more complex vertical structures as seen above, these shorter time values begin to inject momentum - forward motion - in the horizontal perspective.

This momentum, which will become standardized and controled in *second wave* **SOUND OBJECTS** is present to a more sporadic and irregular degree in *first wave* **SOUND OBJECTS**.

A quick overview of these two **streams** in the third and fourth *first wave* **SOUND OBJECTS** (1:55-2:22, 2:43-3:00) reveals how the increase in temporal density gradually raises this horizontal momentum in such a way as to prepare the listener for the "outburst" of the first *second wave* **SOUND OBJECT** at 3:00. This along with the introduction of more periodic rhythmic patterns in the vocal **stream (third** and **fourth elements** at 2:43) reflects the sociological fact that the seeds of the second wave industrial revolution were already present in first wave agricultural cultures.

Further analysis of *first wave* **SOUND OBJECTS** in section **5.*iii*.d.** will demonstrate how these rhythmic and harmonic traits gradually evolve towards the standardization of temporal perception characteristic of second wave society and *second wave* **SOUND OBJECTS**.

b. *Second wave*

***1.* Orchestrational and textural character**

Decisions pertaining to instrumentation of *second wave* **SOUND OBJECTS** are guided by the compositional need to build an ensemble which represents the *first wave* vocal and percussive **streams**, along with their primitive instrumental extensions, at a much higher level of evolution along the line of musical extension transference.

In a general sense, the instrumental aspects of the *first wave* which were mere extensions of human sound producing capabilities have evolved in *second wave* **SOUND OBJECTS** to such an extent that they completely dominate the texture. In the *second wave* the human element is but one of many constituent parts of an overpowering orchestral apparatus. The parallel with second wave industrial society is self evident.

When compared to that of *first wave* **SOUND OBJECTS**, the instrumental and vocal palette of *second wave* **SOUND OBJECTS** is much more varied. It does however present certain traits which remain constant throughout the work and will be examined in detail here.

The most obvious and recognizable aspect of *second wave* orchestration is that it is truly symphonic in character. This orchestrational choice suggests a parallel between the symphony orchestra in its standardized form and the rigid standardization of second wave industrial society.

Throughout the work, *second wave* **SOUND OBJECTS** are composed and orchestrated as if they were written for the symphony orchestra. The second **element** strings, brass,

woodwinds and percussion along with the fifth **element** chamber ensemble are combined in most *second wave* **SOUND OBJECTS**. In many instances, signal processing procedures such as multi-tracking, harmonizing and chorusing are applied to the recorded instruments to achieve the effect of a large orchestral ensemble. In this manner, a small group of 13 musicians is extended in order to offer the scoring possibilities of a modern symphony orchestra. (cf. section ***4.vi.***)

Given the extensive array of textural possibilities offered by such an ensemble in this performance situation, it is not surprising that *second wave* **SOUND OBJECTS** display a relatively wide scope of orchestral and textural colours. However, two distinct textural characters dominate the global sound of the *second wave*.

The first textural character is exposed at 3:00 and could be described as the "mechanical texture". Here, highly articulated rhythmic and melodic figures interlock like gears in a clock and create a highly periodic texture. This "mechanical texture" has the qualitiy of being readily recognizable in the context of *first* and *third wave* material due to the extreme contrast in the degree of periodicity and temporal flow. It also serves as very clear aural iconic sign in that it shares many characteristic properties with that which it signifies; it sounds like machines.

The second textural character is first heard imbedded in the mechanical texture of the *second wave* **SOUND OBJECT** at 4:10 (bassoons, horns and trombones in the **second element**, bassoon and horn in the **fifth element**.), and is later exposed in the **fifth element** chamber ensemble at 8:00. This texture, which could be coined the "lyric texture", could be understood to represent the transference of the human element from the *first wave* voice to its *second wave* instrumental extensions. As such this texture is characterized by the lyric, singing style reminiscent of the *first wave* vocal treatment but heard in instrumental colours.

This transfer of the human element from the vocal to the instrumental in the *second wave* is further enhanced by the narrative nature of the vocal **elements**, and hence the relative scarcity of vocal melody or singing in *second wave* **SOUND OBJECTS**. In fact, the only occurrence of vocal lyricism in the *second wave* happens within the context of the pastiche beginning at 8:24 and discussed at length in sections **4.v.b.** and ***4.vi.f.*** and is the result of cross-relationships between the *first* and *second waves*. (These cross-relationships will be examined in section ***5.iii.d.***)

Over the course of the *second wave*, these two textural characters, "mechanical texture" and "lyric texture" (or machine and man) are juxtaposed to one another in a sometimes complementary and sometimes conflicting relationship. (Once again, the allusions to second wave society are self evident.) These juxtapositions will often result in modulations or distortions of the "mechanical texture". These "distortions", were discussed in section ***4.iv.j.*** above and will be analysed in greater detail below.(cf. section ***5.iii.b.***)

Notwithstanding the fact that vocal lyricism is almost excluded from *second wave* **SOUND OBJECTS**, the voices of the **third** and **fourth elements** comprise a very important aspect of *second wave* character. Here however, their role is of a narrative rather than lyric nature. In fact, the voices in *second wave* **SOUND OBJECTS** are the vehicle for the text.

2. Linguistic character

Compared to the extremely limited text in *first wave* **SOUND OBJECTS**, the *second wave* presents a veritable explosion of linguistic material. The texts that can be perceived within *second wave* **SOUND OBJECTS** are woven into the fabric of the work and act as signs that have the potential of enlightening the listener in his quest for perceptual appreciation of the musical structure.

Besides the two words **"STOP"** and **"START"**, which point directly to the machine identity of the "mechanical texture" (cf. score 3:00), all the *second wave* texts are excerpts taken from ninteenth and twentieth century French, Acadian, American and German literature.

Although these excerpts cover a broad range of ideas, images and feelings, they all share two common basic themes which relate to second wave society: linear time and the need for spacial identification or dwelling.

A quick glance at the following texts should suffice to demonstrate these common threads and to correlate these themes to the concept of second wave society.

**"Nachts schlaffen die Ratten doch. Nachts kanst du ruhig nach Hause gehen.
Nachts schlaffen sie immer. Wenn es dunkel wird, schon."[6]**

**"Wer jetzt kein Haus hat, baut sich keines mehr.
Wer jetzt allein ist, wird es lange bleiben,
Wird wachen, lesen, lange Breife schreiben
Und wird in die Alleen hin und her
Unruhig wandern, wenn die Blätter treiben."[7]**

**"La nuit tombe. Au premier étage de l'Hôtel Printania, deux fenêtres viennent de s'éclairer.
Le chantier de la Nouveile Gare sent fortement le bois humide; demain il pleuvra sur Bouville."[8]**

**"J'étais waiter dans un abri nucléaire, en stand by pour une autre planète.
Je voulais t'écrire une lettre d'amour car ma plume enregistrait 6.5 sur l'échelle Richter."[9]**

"We carry our homes within us..."[10]

(cf. section **8.** for English translations of French and German texts)

The semantic content at the surface of these texts – the lowest level of perception – shows a certain degree of inter-relatedness along the common themes cited above. Further analysis of these excerpts at deeper levels of meaning and their placement in the context of their sources and historical period reveal many other levels of intricate and sometimes far-fetched relationships to second wave social and historical themes. Taken together these suggested and implied semantic interpretations of the texts direct the compositional decisions as to where, when and to what degree they should be revealed in the fabric of the *second wave* **SOUND OBJECTS**.

The basic mechanism of placement of **SOUND OBJECTS** along the perceptual axis of the semantic / phonetic continuum and the particular relationships to second wave concepts implied in the Borchert text have already been discussed in section **4.v.**. Further analysis of the linguistic treatment and its relationship to form will follow in section ***5.iii.d.***.

Before examining the harmonic / melodic and rhythmic characteristics of *second wave* **SOUND OBJECTS**, a final aspect of the linguistic character of the *second wave* must be discussed. Keeping in mind the concept of non textual referential **SOUND OBJECTS** introduced in section **4.v.b.**, it is possible to identify two non textual referential **SOUND OBJECTS** which play a prominent role in defining the overall sound of the *second wave*.

The first of these is the "parade drum" icon which appears in the fifth **element** at 6:20. (cf. section **4.v.c.**) This icon reappears under slightly different guises throughout the course of the *second wave*. (6:45 -6:56, 7:44 - 7:55, 10:03 - 10:07, 15:13 -15:17, 15:25 - 15:33, 17:00 - 17:55, 19:30 - 19:33)

Another such icon is the "pastiche of early twentieth century lyric style" which occurs from 8:24. (cf. section **4.v.c.** and **4.vi.g.**) All these icons combine their phonetic (or sonic) caracter with that of the texts and thus help define the aural signature of the *second wave*.

3. Harmonic / melodic character

The harmonic and melodic concepts that underlay the pitch structures of *second wave* **SOUND OBJECTS** have already been discussed at length in section **4.iv.**. The practical applications of these concepts and their relationships to aspects of second wave society will now be examined.

The compositional choices that shape harmonic and melodic character of *second wave* **SOUND OBJECTS** are influenced by the need to reflect certain aural and cultural aspects of second wave society. Here again, aspects of the orchestrational and textural character of the *second wave* determine its overall harmonic and melodic nature.

For example, the decision to limit the harmonic density of *second wave* **SOUND OBJECTS** to within the octave (density 1-11) (cf. sections ***4.iii.*** and ***4.iv.b.***) is brought about by a

willingness to reflect both the"chordal, consonant" nature of early second wave western music and the "dense, dissonant" nature characteristic of many late second wave musical styles.

Furthermore, the composition of "mechanical textures" brings about a particular approach towards harmony and melody in which their inter-relationship could be characterized as artificial. In this approach the underlying harmonic motion progresses slowly in the horizontal perspective through stepwise motion between voices in vertical structures while the surface textures are articulated by relatively faster disjunct motion between voices. In such textures, melodic structures are limited to very short repetitive patterns which impose horizontal motion on an otherwise static vertical sonority.

Whereas *first wave* harmony exists as a result of organic melodic motion, *second wave* harmony is architectural and relatively static and must be set in motion artificially by the application of surface melodic activity.

The contrasting "lyric textures" in *second wave* **SOUND OBJECTS** display the same harmonic / melodic relationship as the "mechanical textures". Here however, the melodic structures are non-repetitive and display longer note values at the surface. While these "lyric textures" initially outline the horizontal motion of the coinciding "mechanical textures" they eventually break away and establish their own harmonic rhythm. By accelerating the flow of motion along the horizontal perspective they often foreshadow the coming harmonic changes in the "mechanical textures" and thus create micro-rhythmic distortion by increasing the level of dissonnance in the **SOUND OBJECT**. (see section ***4.iv.j.***)

It is impossible to attempt a thorough analysis of such harmonic phenomena without first exposing the rhythmic aspects of *second wave* **SOUND OBJECTS**.

4. Rhythmic character

The best way to describe the rhythmic character of the "mechanical textures" that characterize *second wave* **SOUND OBJECTS** is to use the analogy of "clockworks".

Much akin to the inner workings of a clock or any well tuned mechanical apparatus, the "mechanical textures" are composed of multiple **streams** evolving in the horizontal perspective along different but highly inter-connected temporal lines. These lines are cyclic as in the *first wave*. However, contrary to *first wave* cyclic structures which progress slowly and organically over time, *second wave* structures display much shorter cycles which interact and mesh like gears.

The composition of such poly-cyclical structures imposes mathematical relationships between **streams** whereby systematic points of convergence will automatically occur. Such points of convergence become focal points for musical events such as change in vertical sonority.

In a sense, these **SOUND OBJECTS** are composed following a few very simple rules which govern their evolution and define the process which unfolds once they are set in motion. Perception of such **SOUND OBJECTS** places the listener in a very linear temporal plane where events have a clear beginning, middle and end, and where time is experienced as flowing in a straight line from past to future. All these rhythmic aspects reflect time as perceived by most members of second wave society.

This temporal rigor is offset by the contrasting "lyric textures" which retain many of the rhythmic aspects characteristic of *first wave* structures. When "lyric" and "mechanical" textures interact, the difference in their rhythmic make-up disrupts the perceived flow of time and forces the **SOUND OBJECT** back along the axis of the periodic / aperiodic continuum. (cf. section **4.*iv*.g.**)

The following analysis of the three first *second wave* **SOUND OBJECTS** will demonstrate these points.

The three *second wave* **SOUND OBJECTS** at 3:00, 4:10 and 4:53 can be considered as one higher level **SOUND OBJECT**. Perception of this **SOUND OBJECT** is interrupted by the *first wave* **SOUND OBJECT** at 3:27 and the **node** at 4:00 and then again by another *first wave* **SOUND OBJECT** at 4:27. Figures and 9b represent a basic reduction of the rhythmic and harmonic structure of the **SOUND OBJECT** as a whole. (cf. fig. 9a and 9b)

The poly-metrical texture is defined by three parallel **streams**. The first of these **streams** (in flute 1, clarinet 1, bassoon 1 of the second **element**, and sampled xylophone 1 in the **first element**) establishes a rhythmic pattern which has a cyclical period of 5 16ths (1.25 sec.). The second **stream** (in the corresponding second chairs) displays a 3 16th period (.75 sec.) and the third **stream** (in the fifth **element** woodwinds and **first element** xylophone 3) establishes a pattern of 7 16ths (1.75 sec.). Together they form an inter-locking poly-metrical texture in which **streams** shift in and out of phase with each other following the combinatorial pattern of their respective cyclical periods (5-3-7).

Points where two **streams** are in phase are marked by change in the texture, either through harmonic colour of the vertical structures or insertion of contrasting "lyric" textures. The process unfolds until the three **streams** are in phase (at 5:52).

The harmonic density shifts progressively from 3 to 8 throughout the **SOUND OBJECT**. The process begins with the perfect structure (3) at 3:00 and evolves through imperfect structures. After the interruption at 3:27 the process resumes at the next perfect structure (4). At 4:53 the remainder of the the **SOUND OBJECT** is allowed to unfold uninterrupted from density 5 through 6 , 5 and 7 until its culmination with the perfect structure (density 8) at 5:52. Each of these perfect structures arrives at a point of convergence between waves. (cf. fig. 9b)

This underlying process is disrupted by the presence of the contrasting "lyric" textures. These "intrusions" also occur at points of convergence. The effect of these "lyric" intrusions on the "mechanical" textures varies according to the harmonic rhythm of the lyric **SOUND OBJECT**. The contrasting **SOUND OBJECT** at 3:08 in horns, trumpets and trombones follows the harmonic rhythm of the "mechanical texture" and alters its texture without introducing elements of dissonance.

Other contrasting **SOUND OBJECTS** such as the one in trumpets and horns at 5:17 outline the harmony of the "mechanical texture" at an accelerated pace and thus distort the texture by sounding pitches that are foreign to the immediate vertical structures. (The ascending line :A-A#-B-C# in trumpet 1 spans a mere 5 seconds while the equivalent line implied in the clarinette 2 **stream** unfolds over 16 seconds.)

The "lyric" nature of these **SOUND OBJECTS** gradually permeates through the "mechanical texture". This transformation starts in the string **stream** (from 5:17) where longer tones gradually appear among the rhythmic patterns and slowly gain importance. These long tones then begin to take over the other streams as well until only the xylophones are left to articulate the poly-metric **streams**. This type of textural modulation, seen here in its simplest form, is characteristic of most metamorphic **SOUND OBJECTS** in the work.

As is the case in the *first wave*, where rhythmic and harmonic traits gradually evolve towards the standardization of temporal perception, *second wave* **SOUND OBJECTS** display a gradual break-down of the "mechanical" textures as they are taken over by the "lyric" character. These aspects of the form will be examined in section **5.*iii*.d.** below.

c. *Third wave*

Musical aspects of the *third wave* in **TEMPS EN TEMPS (times in time)** are inspired by general ideas related to Toffler's vision of the emerging wave of social change. (cf. section **3.*ii*.**) All of these ideas share one common thread; they reflect a vision of the future.

The first of these ideas is that of the age of information; the demassification of the media through the proliferation of information technology, the internet and satelite and cable distribution of cultural information.

Another related idea is the emergence of a global culture which transcends second wave national and cultural / linguistic boundaries.

Other images that generate musical reflections in the *third wave* are less tangible, more philosophical, even mystical. The first of these is the vastness of space and time when viewed in the light of modern theories of physics and cosmology. The final and conclusive idea is that

human evolution through the first, second and third waves reaches towards an expanded consciousness and a realization that man can be "at one" with the universe.

1. Orchestrational and textural character

As with the *first* and *second waves*, *third wave* orchestration and texture are determined by a willingness to suggest these sociological and philosophical ideas through aural icons. Choices in instrumentation and in the treatment of timbres are meant to imply human sound producing capabilities at a future stage of evolution.

As such, the vocal and instrumental sonorities of the *first* and *second waves* appear in *third wave* **SOUND OBJECTS** as distant descendants of the primitive voice and hand claps of the *first wave*, much further down the line of musical extension transference.

The application of synthesizers, samplers, filters and digital sound processors as described in section ***4.vi.*** results in the creation of orchestral textures where vocal and instrumental timbres unite. In these textures, sampled and synthesized voices blend with transformed and expanded instrumental timbres to form compound sonorities such as the *third wave* **SOUND OBJECT** heard from 13:35.

Here, sampled and synthesized vocal timbres combine with acoustic instruments (horn, clarinet, bassoon and string harmonics) and their synthetic extensions to form a large scale **SOUND OBJECT** that spans the total vertical perspective and resonates for over 25 seconds.

The relatively low level of harmonic and temporal density of such **SOUND OBJECTS** reflects the astronomical proportions of time and space referred to above, especially when heard in the context of the preceding *second wave* **SOUND OBJECTS**.

2. Linguistic character

Although the voice has transcended its human form and has converged with instrumental timbres in *third wave* **SOUND OBJECTS**, its human character is retained in the text. Contrary to the *first* and *second wave*, where the semantic content of the text is revealed gradually, in the *third wave* the meaning and message of the text are never very far from the surface and easily perceived.

In addition to certain *second wave* texts such as "**J'étais waiter...**" and "**We carry our homes...**" which point to the *third wave* from the vantage point of the *second*, several other texts carry purely third wave connotations and are associated with *third wave* textures.

Of these, "**... bienvenue à la nuit des temps...**"[11] and "**Herr, es ist Zeit...**"[12] address the concept of time directly. They occur relatively early in the work and put forward the association of man with time or with temporal perception: "...welcome to the dawn of time...", "Sir, it is time...".

Along with the title of the work, they also serve as clues which may help put the listener in the context of the work.

There are only two other occurrences of text in *third wave* **SOUND OBJECTS**. The first of these is heard in association with the "Morse code" icon at 9:29. The phrase **"Ich glotze t.v."**[13] translates roughly as "I stare at t.v.". In its context it reflects the mesmerizing effect that the media can have on human consciousness at the dawn of the third wave.

The last text to be heard is the excerpt from **Apocalypse** by D.H.Lawrence: **"I am part of the great whole and I can never escape."** [14](cf. score p.68, 20:18) The particular treatment of this text warrants more detailed analysis.

This text is divided in two sections - **I AM PART OF THE GREAT WHOLE / and I can never escape**. The first section is treated much in the same manner as the **Magic Square** that opens the work. The sampled text is organized in six paralell **streams**, each placed at a particular point in the stereo image. The text is thus distributed over time and (apparent) spaco in such a way as to place the total phonetic content of the phrase on the vertical perspective in the span of 6 seconds. However, the spacialization of the **streams** allows for the listener to focus on any of the six horizontal **streams** and thus easily decode the semantic content.

Because of this particular panoramic distribution and due to the displaced order of words, each individual **stream** conveys a slightly altered semantic message . In addition to this effect, a great number of altemate messages can by perceived by shifting perceptual attention from one **stream** to another. The solo voice (fourth **element**) singles out one specific alternate message among the many possibilities of this particular **Magic Square: "I...the great...am...part of...I."**

This cyclical statement along with the concluding phrase ("..**and I can never escape.**") place the related concepts of eternity and unity in the forefront of the listener's consciousness at the end of the work.

***3.* Harmonic / rhythmic character**

The harmonic and rhythmic aspects *of third wave* **SOUND OBJECTS** can be understood as extensions of the musical language of *second wave* **SOUND OBJECTS**. Here again, these two aspects of the musical language combine to form textures characteristic of the *third wave*. As such, *third wave* **SOUND OBJECTS** differ only in their harmonic and temporal density.

Since *third wave* **SOUND OBJECTS** occupy the sparser region of the density scale (12-24) and display longer note values (slower pace) than *second wave* **SOUND OBJECTS**, they are characterized by more open, transparent textures.

Although they both display the same linear motion between perfect structures through imperfect structures, (cf. section **4.iv.c.**) *third wave* **SOUND OBJECTS** do not display the dense temporal density of *second wave* **SOUND OBJECTS**.

Instead of quick melodic activity at the surface as in the *second wave*, *third wave* **SOUND OBJECTS** present either unison (block) rhythmic structures as in the **SOUND OBJECT** at 2:22, or stratified rhythmic structures such as in the **SOUND OBJECT** in the first **element** at 13:00.

In the latter case, tones at lower frequencies follow extremely long rhythmic patterns while the upper frequencies sound at a slightly faster pace. For example, the lowest **stream** in this **SOUND OBJECT** (A-Bb-B) resonates in very long tones following the rhythmic sequence: (13,8,13,2,8,5,13,8,13...seconds) while the higher **stream** (Ab-F#-E-Eb-D-C#-C-B) moves at a relatively faster pace: (5,3,5,3,2,1,5,4, 5,3,2,1,3,3,3,2,2,5,3,2,3,5...seconds).

The aural effect of such structures could be described metaphoricaly as a turning wheel. In this visual metaphor, the high tones, like objects at the rim of the wheel are perceived as going by quickly while low tones "turn" more slowly at the hub.

These "turning wheel" textures are as characteristic of the *third wave* as the "mechanical textures" are of the *second*. Here again, a semiotic relationship can be implied between the aural image of the "turning wheel" and the expanded concepts of time and space implicit in modern physics and cosmology.

Opposed to the mechanical / industrial imagery implied in the *second wave*, these *third wave* **SOUND OBJECTS** can suggest the astronomical imagery of rotating spiral galaxies in an expanding universe; celestial rather than industrial mechanics.

When perceived as a whole, the combined aspects of *third wave* orchestration, texture, texts, harmony and rhythm characterize the *third wave* as both the spacial and temporal context in which the *first* and *second waves* evolve, and the ultimate goal of their evolution. As such, *third wave* **SOUND OBJECTS** do not display dramatic evolution over the course of the work.

In keeping with the previous astronomical imagery, the temporal contexts of the *first* and *second waves* are dwarfed by the cosmic scale of the *third wave* to such an extent that the *third wave* seems timeless and unchanging when perceived from the temporal vantage point of the *first* and *second waves*.

In order to grasp this concept and how it relates to form as process in the work, it will suffice to examine the evolution of *first* and *second wave* characteristics over the course of the piece.

d. Evolution of *wave* characteristics

The preceding analysis of the *first wave* **SOUND OBJECTS** from 0:06 to 3:00 (cf. sections ***5.iii.*a.1.** and ***5.iii.*a.3.**) and the three *second wave* **SOUND OBJECTS** at 3:00, 4:10 and 4:53 (cf. sections ***5.iii.*b.1.** and ***5.iii.*b.4.**) revealed their metamorphic nature. These two preliminary **SOUND OBJECTS** are expository in nature in that they display at a more local level the long range evolutionary trend of each respective *wave*.

Over the span of the work, individual **streams** that make up *first wave* textures slowly converge and eventually unite to form **SOUND OBJECTS** which display the metrical regularity and temporal flow characteristic of the *second wave* . At the same time, in the *second wave*, the "lyric" quality, retained from the *first wave* and extended to instrumental textures gradually breaks down the linear temporal flow and destabilizes the "mechanical textures".

A quick analysis of selected *first* and *second wave* **SOUND OBJECTS** in the latter sections of the work will illustrate this evolution.

The *first wave* **SOUND OBJECT** at 14:33 still displays the percussive and vocal **streams** in a relatively independent relationship. Both **streams** have grown in rhythmic complexity and in temporal density but they still combine to form a rhythmic field. In the **SOUND OBJECT** at 18:01, the increase in temporal density in the vocal stream (**third element**) as well as in the percussion (toms, bass drums and hand claps) results in perception of individual yet distinctly inter-related metrical patterns. This trend continues through to the **SOUND OBJECT** at 19:06. At this point, the individual percussive **streams** have completely converged and beat in unison. The vocal **streams** are also converging towards the point at 19:25 where they culminate on the unison utterance of the word "SOUFFLE". In the final *first wave* **SOUND OBJECT** at 19:39, the percussive and vocal **streams** unite and procede in melodic and rhythmic unison.

In the complex *second* and *third wave* **SOUND OBJECT** which sounds from 11:05 to the climax at 13:00, the *second wave* instrumental components in the **first**, **second** and **fifth elements** display the destabilization of the"mechanical texture" mentioned above.

Here the marimba samples (in the **first element**) begin a process which moves from the perfect structure (density 4) - A,F,C#,A - through sixteen imperfect structures and culminates at 13:00 on the perfect structure (density 3) - F#,Eb,C,A. (cf. fig. 10) At first, a steady eighth note pulse (.5 sec.) is established. The xylophone in the fifth **element** enters at 11:07 with the same pulse offset by one sixteenth note (.25 sec) thus establishing the steady sixteenth note motion which follows the rhythmic process already established in the vocal samples of the first **element**. (cf. section ***4.vi.*b.**).

The temporal density of this percussive **stream** increases over the span of the **SOUND OBJECT** through gradual inclusion of thirty-second note motion (starting at 11:29) and the eventual articulation of unmesured tremolandos from 12:48 to 13:00.

The degree of periodicity of this texture is gradually disrupted by the conflicting presence of **SOUND OBJECTS** which flow at a slightly faster or slower pace. One good example of this procedure occurs at 11:34 where a **SOUND OBJECT** in the woodwinds of the **second** and **fifth elements** imposes eighth-note triplet motion (clarinet 2, **second element**) and later sixteenth-note quintuplet motion (bassoons, **second element** - clarinet, **fifth element**) on the steady sixteenth-note pulse of the marimbas and xylophone. This process of macro-rhythmic distortion is intensified over the course of the **SOUND OBJECT** towards the point of maximum temporal density at 12:54-13:00. (cf. section ***4.iv.j.***)

In the final *second wave* **SOUND OBJECT** at 19:26 - 19:39 the "mechanical texture", now completely disrupted, decelerates over the span of thirteen seconds and sounds vertical structures of maximum density (1) in note values which follow the ascending Fibonacci series; 1,2,3,5,8,13,21 sixteenth-notes. In the final *first wave* **SOUND OBJECT** which follows (19:39), the vocal ensemble and solo voice converge to the unison (density 0) and in essence wrap up the convergence initiated in the *second wave* **SOUND OBJECT** at 11:05 (densities 4-3-2-1-0).

This reunification of *first* and *second wave* textures at the end of the work is summed up by the utterance of the *third wave* text **"I am part of the great whole...and I can never escape."**

***iv.* Architectural structure**

Although the preceding discussion of formal process in **TEMPS EN TEMPS (times in time)** has attempted to describe the dynamic forces that guide the listener's perception of form, the architectural form or structure on which these formal processes are founded has yet to be described in any detail.

The overall three-part structure of the work has already been described in section ***4.ii.*** However, the musical gestures that help define the boundaries of the three sections and instill a sense of proportion on the overall structure need to be exposed.

a. Sectional boundaries

The first point to be stressed in the description of the architectural structure of the work is the inter-relationship between the perceived formal process and the conceptual structure.

In a general sense, the formal processes described above occur in the framework of a formal structure which is compositionally imposed. At the same time, their evolution is directed towards points of culmination or climax which serve as cadential events, defining the boundaries of the large formal sections.

Along with these cadential arrivals, textual **SOUND OBJECTS** with relatively high semantic content always occur in the moments following cadential climaxes and help to define them as sectional boundaries. Their semantic content either points back to close the preceding section or points forward to open the next.

The third and last general characteristic of the major cadential gestures of the work is an extreme contrast in vertical and horizontal densities at cesura points between sections.

In the first of these cadential gestures (7:36 leading to 8:00), aspects of *first* and *second wave* textures blend to form a composite **SOUND OBJECT** where macro-rhythmic distortion disrupts the "mechanical texture" which has been established as the aural signature of the *second wave* and has been heard evolving since 3:00. (cf. section **5.*iii*.d.**)

The abrupt shift from this dense texture to the low C drone in the double basses and celli leaves the air clear for the statement of the *second wave* texts : "**La nuit...tombe**"[15] (Night falls.) and "**Nachts kanst du ruhig nach hause gehen.**"[16] (At night, you can go home quietly.) Both these texts convey a dual sense of closure and of "moving on"; the end of the day, the beginning of the night, ...going home.

Following this cadential gesture, the *second wave* "lyric" texture is heard in the **fifth element**. Appearing as it does here for the first time independently of the "mechanical texture", it marks the beginning of the second formal section which will unfold until the next climax at 13:00.

At this point in the work (13:00) the tensions that have been building up through the processes described above (section **5.*iii*.d.**) are released. In the combined *second* and *third wave* **SOUND OBJECT** that leads to this point, the highly automated permutational procedure applied to the treatment of the Gérald LeBlanc text (**J'étais waiter...**) serves as a guiding force that directs the motion of the whole *second wave* **SOUND OBJECT** to one precise point in time. (cf. section **4.*vi*.d.3**) When the two vocal streams converge, their one and only unison statement of the total phrase culminates inevitably at the 13:00 point.

Here again, the rarified *third wave* texture which has been sounding throughout the previous **SOUND OBJECT** is left alone in the wake of the preceding cadential gesture. It is against this relatively still and open texture that the final line of Jean-Paul Sartre's "La nausée" is

heard: "**...demain il pleuvra sur Bouville.**"[17] As is the case in the perception of the text on the boundary between the first and second formal sections, the semantic content of this phrase is readily apparent to the listener.

Depending on his or her degree of cultural literacy, the listener may grasp, at the least, the general sense of future invoked by the word "**demain**" (tomorrow) or a more defined sense of foreboding; "**demain il pleuvra...**" (tomorrow it will rain...). At the extreme limit of cultural literacy, a listener who has read "*La nausée*" and recognizes the quotation may transpose the experience and the context of Sartre's novel to the perception of this moment in the formal structure of the work. Regardless of the level at which it is grasped, the Sartre quotation points away from the second formal section and determines the general mood of the coming section.

In the light of the preceding descriptions of the two major cadential gestures that punctuate the formal sections of the work, the cadential nature of the final *first, second* and *third wave* **SOUND OBJECTS** described above becomes obvious. (cf. section ***5.iii.*d.)

b. Pitch centricity

Besides these gestural and textual aspects of cadence, another more fundamental element helps to determine the sense of closure at boundary points in the form. Even though it is not tonal in the classical sense, this work does adhere to a general long range scheme of fundamental pitch centers which gravitate around C.

After the initial statement of C as the fundamental of the first **node** (0:00 -0:06) and its reiteration as the fundamental of the second **node** (4:00-4:10) the basic centricity of C is well established. (cf. section ***5.iv.*c** below for more on **nodes**) The further divergence towards G as the fundamental of the third **node** at 6:30 and the return to the C drone at the end of the first formal section not only rounds it off as a closed formal unit but also strengthens the central character of the pitch C.

Following the logic of this C centricity, the relative openness of the second formal section at 13:00 (arriving with an A as fundamental pitch) and the ultimate closure of the final section and of the work as a whole on C at density 24 become obvious.

All these forces combine to punctuate the three-part architectural structure of the piece.

c. The nodes

In addition to the major cadential gestures and pitch centricity described above, another major aspect of the fabric of the work helps define its architectural structure. Points of convergence of the *three waves* called **nodes** are placed at structurally important points in

elapsed time. Due to their highly recognizable texture, characterized by **streams** of perfect vertical structures (variations on the **Magic Square** described above) they serve as pillars in the form.

Except for the first **node** which opens the piece (0:00-0:06) all the **nodes** occur at middle points of formal sections. (cf. fig. 1) The second **node** at 4:00 marks the middle point of the first section (0:00 - 8:00). The third **node** at 6:30 comes at the middle point of sections one and two taken together (0:00 - 13:00). The fourth **node** at 10:30 is at the middle point of both the second section (8:00 - 13:00) and the piece as a whole (0:00 - 21:00). Finaly, the fifth **node** at 17:00 marks the middle point of the last section (13:00 - 21:00).

Standing as they do at structurally important points in elapsed time, they help define the proportions of the work by counter-balancing the effect of the cadential gestures at the boundaries between sections.

d. Fibonacci related boundary points

At this point in the analysis, the recurrence of the figures 3,5,8,13, 21 pertaining to temporal aspects of the work leaves no doubt as to the relationship between temporal values and proportions implied in the Fibonacci sequence of numbers.[18]

The application of values from this series of numbers to temporal elements at all levels of perception insures a certain unity of proportion throughout the piece. The subdivision of the total duration of 21 minutes into three sections of 8,5 and 8 minutes respectively establishes the Fibonacci proportions at the highest level of perception. In this particular temporal organization the proportional relationship between the first and second sections (8:5) is maintained between the first and second together and the third (13:8) as well as between the whole piece and sections 1 and 2, or 2 and 3 (21:13).

These proportions are respected in many temporal aspects of the work, several of which have already been pointed out in this analysis. (cf. section **5.*iii*.a.4.**)

e. Proportional distribution of *waves*

Since all three *waves* are present coincidentally throughout the work, it would be wrong to equate formal sections 1,2 and 3 directly with *first, second* and *third wave*. However, the distribution of *first, second* and *third wave* **SOUND OBJECTS** throughout the three formal sections of the piece does follow a logical scheme which could be described as follows: each formal section displays a preponderance of its respective *wave* and gives the following *wave* secondary importance.

Thus the first section (0:00 - 8:00) presents *first wave* **SOUND OBJECTS** in a higher proportion (289 seconds). *Second wave* **SOUND OBJECTS** are second in importance (181 seconds) and *third wave* **SOUND OBJECTS** are third (120 seconds).

The second section displays a preponderance of *second wave* **SOUND OBJECTS** (254 seconds) while *third wave* and *first wave* **SOUND OBJECTS** are respectively second and third in importance (184 sec.- 89 sec.)

In the third section, *third wave* **SOUND OBJECTS** are the most present (337 sec) while *first wave* **SOUND OBJECTS** are second (186 sec) and the *second wave* is least in importance (99 sec).

Although they are in no way systematically controlled, the proportional relationships between these figures reflect the proportions exhibited in the Fibonacci sequence; 2:1(2), 3:2(1.5), 5:3(1.666.), 8:5(1.6) etc.

Furthermore, the proportional relationships between *waves* sounding individually and overlapping or coincidental sounding of different *waves* also reflects Fibonacci proportions. For example, the first, second and third formal sections exhibit 68 sec, 183 sec. and 115 sec. of overlaping *waves* respectively. These figures are in exact Fibonacci proportions; 68 + 115 = 183. (cf. fig. 11 for detailed statistical chart of these and other temporal relationships.)

All these aspects of architectural structure, although subliminaly perceived, come together to insure unity and coherence of form.

6. CONCLUSION

TEMPS EN TEMPS (times in time) is a complex work, highly reliant upon its medium for the perception of its mesage. It will exist mainly in recorded form since the recording studio is its instrument.

The extra-musical themes that are at the origin of its conception are encoded within its fabric and may be communicated to the listener through repeated audition made possible by the very nature of the recorded medium.

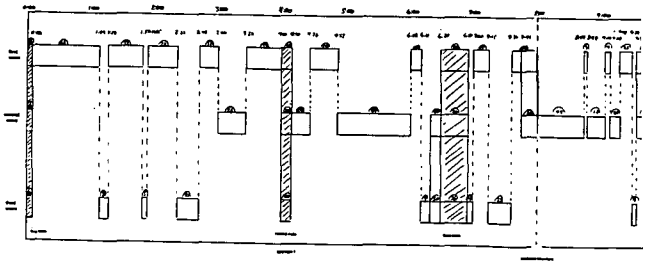
The preceding description and analysis not only brings to light the particular treatment of musical materials vis-a-vis its medium but also shows the piece as a work of art, inextricably linked to its medium but at the same time standing on its own, oblivious to space and time, and ringing free within the listener's consciousness.

7. FIGURES AND ILLUSTRATIONS.

Figure 1.

The following graph shows the formal structure of **TEMPS EN TEMPS (times in time)**. The three horizontal lines of blocks represent the **SOUND OBJECTS** of the first, second and third *waves* respectively. Vertical dotted lines show points where "jump cuts" occur between **SOUND OBJECTS** of different *waves*. Blocks joined together by vertical solid lines represent points in the form where **SOUND OBJECTS** of two different *waves* coincide. Finally, the shaded blocks represent the five **nodes** where **all three waves are mixed.**

The first time line (top) shows elapsed time. The second time line corresponds to the temporal markings in the score and shows the beginning of each new **SOUND OBJECT.**



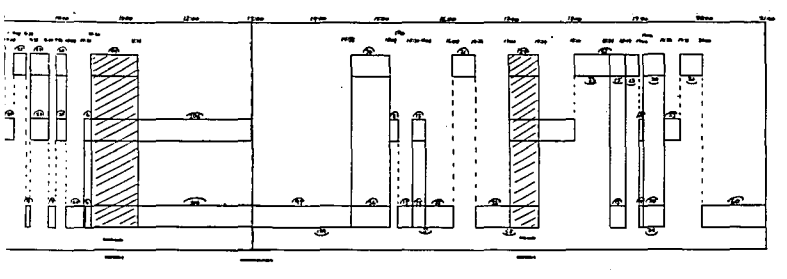
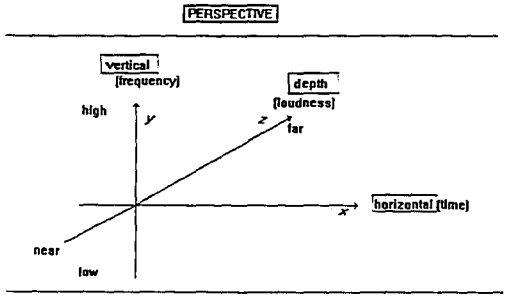


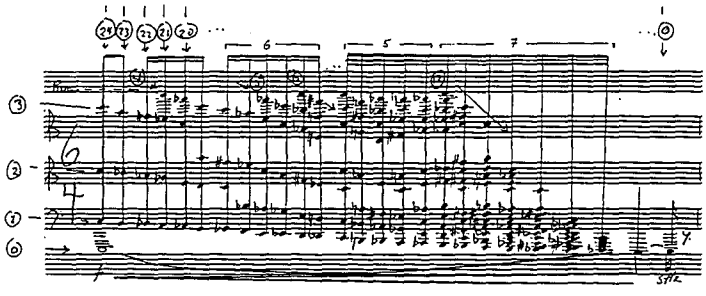
Figure 2.



x axis = horizontal perspective
y axis = vertical perspective
z axis = perspective of depth

Figure 3.

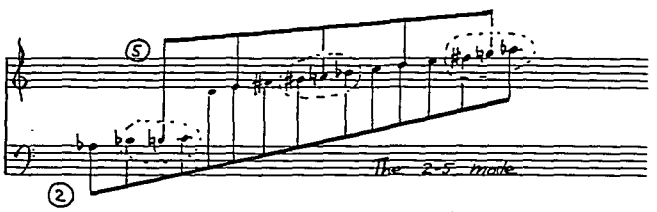
The Magic Square.



This excerpt taken from the first node (cf. score p. 1, first element, 0:00 - 0.06) shows the sequence of perfect vertical structures (density 24, 23, 22, 21, 20,...0) and the coinciding linear (horizontal) unfolding of perfect structures (0, 1, 2, 3, 4, ...12).

Figure 4.

The 2- 5 mode.



The 2 - 5 mode is a melodic structure which results from the interlocking of two perfect horizontal structures; the whole-tone scale (2) and the cycle of perfect fourths (5).

Figure 5.

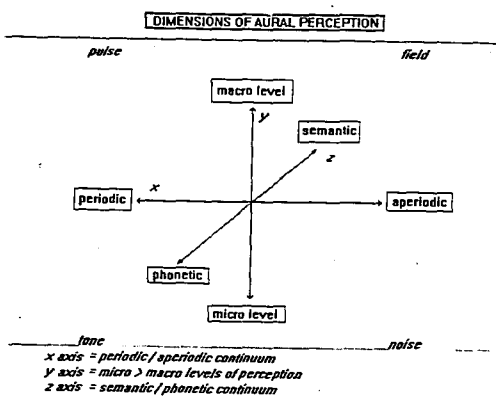


Figure 6a.

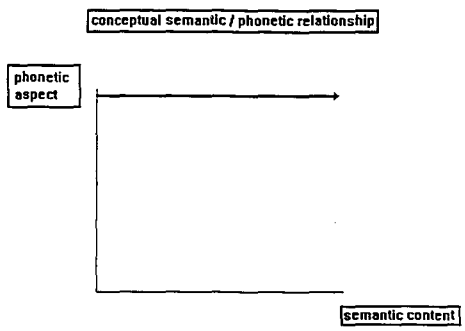


Figure 6b.

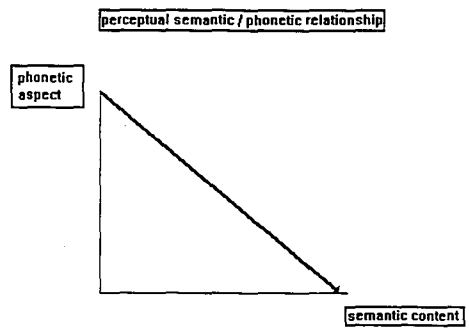
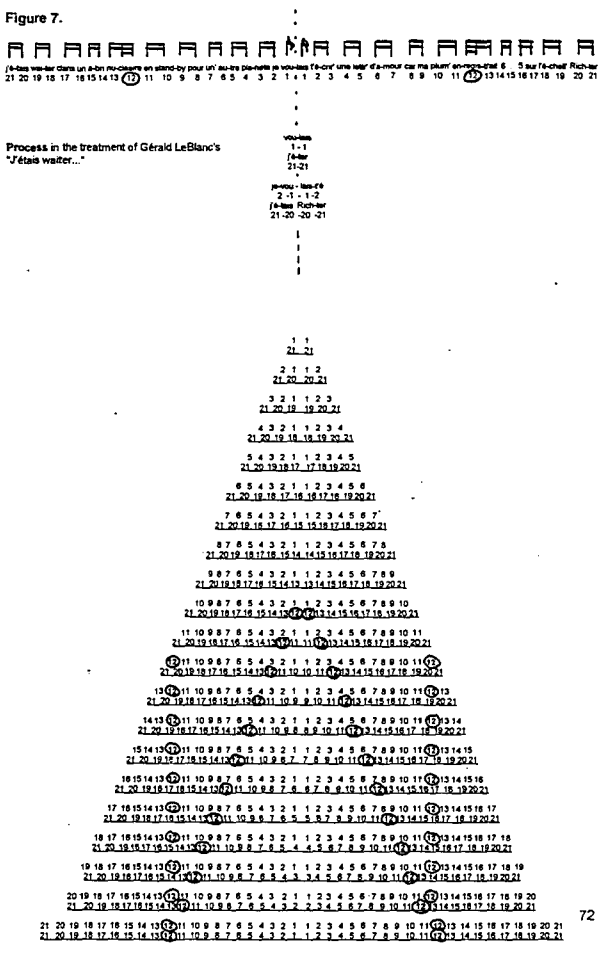


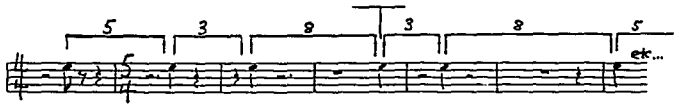
Figure 7.



Process in the treatment of Gérald LeBlanc's "J'étais waiter..."

Figure 8a.

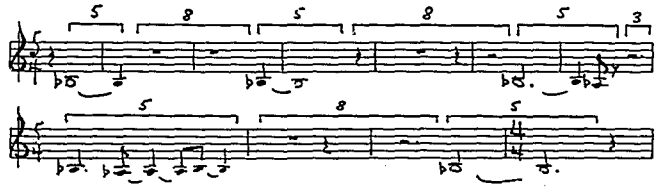
The 16 second cycle.



cf. score, 0:06 - 0:09, p 1 - 2, first and fourth elements. (hand claps)

Figure 8b.

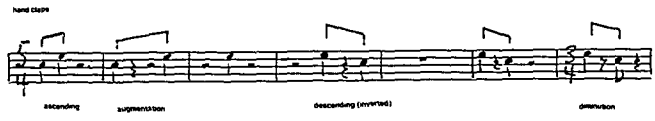
The thirteen second cycle.



cf. score, 0:17 - 1:09, p 2 -3, fourth and fifth elements. (vocal line)

Figure 8c.

Patterns or "motives".

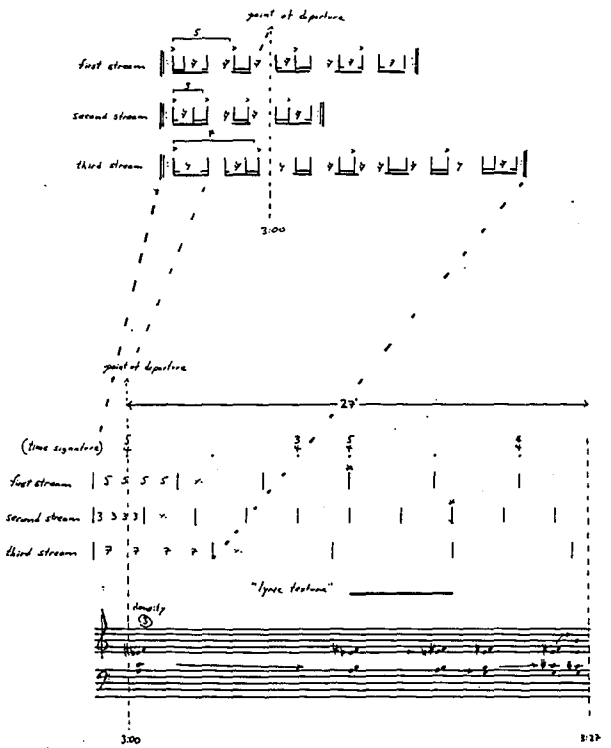


cf. score, 1:17 - 1:50, p 3 - 4, first element. (sampled hand claps)

Figure 9a.

Poly-metrical textures.

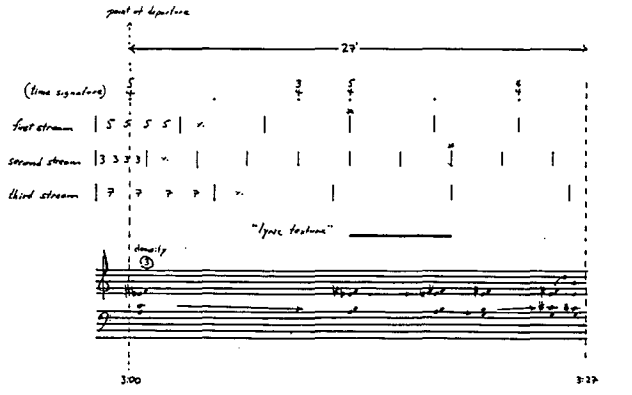
Three rhythmic streams in the second wave SOUND OBJECTS at 3:00, 4:10 and 4:53.

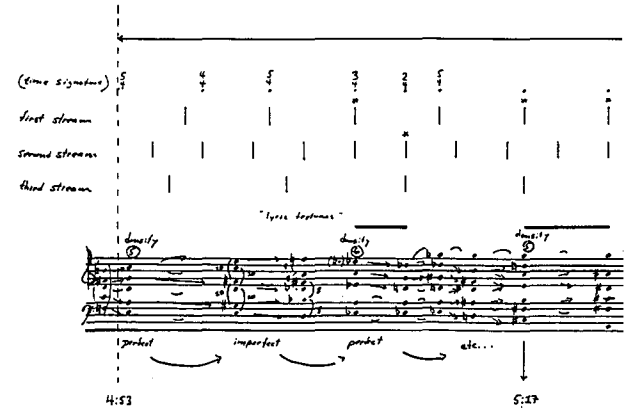


cf. score, 3:00, p 3 - 4, second and fifth elements.

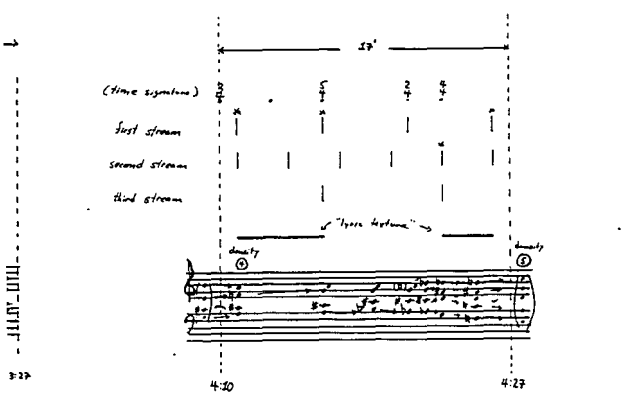
Figure 9b.

Temporal, harmonic and textural relationships in SOUND OBJECTS at 3:00, 4:10 and 4:53.





cf. score, 3:00 - 6:02, p 7 -16, first, second and fifth elements.


17'
(time signature)
first stream
second stream
third stream
"hyper texture"
density
density
4:10
4:27

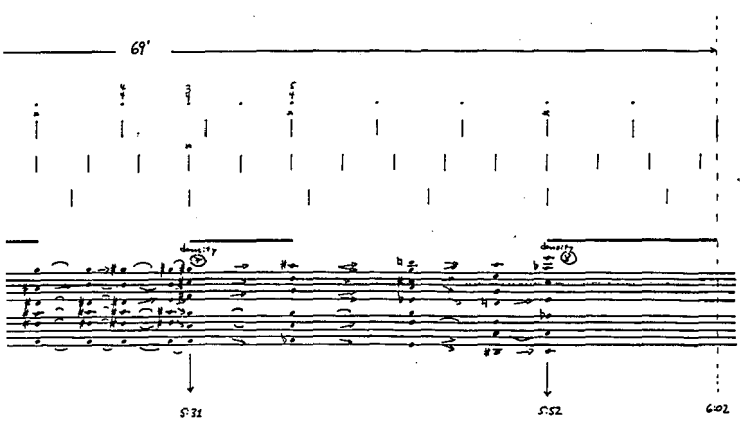
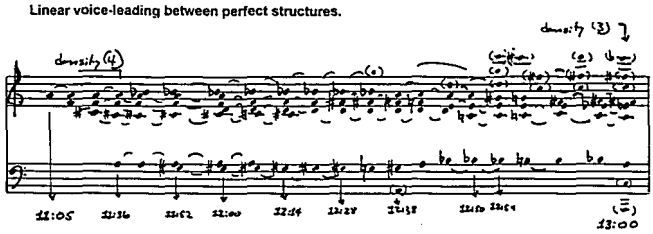

69'
density
density
5:31
5:52
6:02

Figure 10.

Linear voice-leading between perfect structures.



cf. score,11:05 -13:00, p 32 - 44, first, second and fifth elements.

Figure 11.

Table of proportional relationships between *waves*.

This chart shows temporal relationships between the three *waves* in each of the three formal sections. The proportions are calculated according to three separate criteria: the first is a measure of the total time in which a particular *wave* is heard independently (without overlap) in a given formal section (**independent**); the second is a measure of the total time in which a particular *wave* is heard both independently and overlapping with other *waves* (**cumulative**); the third is a measure of the total time in which the *waves* overlap. The proportional relationships between **independent** and **overlapping** temporal values are also shown.

Section 1: 0:00 to 8:00

	independent			**cumulative**	
first *wave*:	231 sec.	56%		289 sec.	49%
second *wave*:	113 sec.	27%		181 sec.	31%
third *wave*:	68 sec.	17%		120 sec.	20%
total time:	412 sec.	(100%)		590 sec.	(100%)
overlap relationships:					
independent:	412 sec.	85%	**overlapping:**	68 sec.	**15%**
			waves 1,2 & 3:	42 sec.	**61%**
			waves 1 & 2:	16 sec.	**24%**
			waves 2 & 3:	10 sec.	**15%**

Section 2: 8:00 to 13:00

	independent			**cumulative**	
first *wave*:	18 sec.	**15%**		89 sec.	17%
second *wave*:	71 sec.	**61%**		254 sec.	48%
third *wave*:	28 sec.	**24%**		184 sec.	35%
total time:	117 sec.	(100%)		527 sec.	(100%)
overlap relationships:					
independent:	117 sec.	39%	**overlapping:**	183 sec.	**61%**
			waves 1,2 & 3:	44 sec.	**24%**
			waves 1 & 2:	27 sec.	**15%**
			waves 2 & 3:	112 sec.	**61%**

Section3: 13:00 to 21:00

	independent			**cumulative**	
first *wave*:	88 sec.	**24%**		186 sec.	30%
second *wave*:	55 sec.	**15%**		99 sec.	16%
third *wave*:	222 sec.	**61%**		337 sec.	54%
total time:	365 sec.	(100%)		527 sec.	(100%)
overlap relationships:					
independent:	365 sec.	76%	**overlapping**	115 sec.	**24%**
			waves 1,2 & 3:	27 sec.	**24%**
			waves 1 & 3:	71 sec.	**61%**
			waves 2 & 3:	17 sec.	**15%**

8. TRANSLATION OF GERMAN AND FRENCH TEXTS.

Nachts schlaffen die Ratten doch (Rats sleep at night), Wolfgang Borchert

Rats sleep at night. At night, you can go home quietly (in peace).
They always sleep at night, when it gets dark.

Herbsttag (Autumn Day), Rainer Maria Rilke

Sir, it is time.

He who has yet no house will not build one.
He who is alone will remain so for long.
He will stay awake, read and write long letters.
He will roam the streets, to and fro as the leaves blow.(drift)

La nausée (Nausea), Jean-Paul Sartre

Night falls. On the first floor of the Printania Hotel, two windows have just now lit up.
The construction site at the new train station reeks of damp wood: tomorrow, rain will fall on Bouville.

Géographie de la nuit rouge (Geography of red night), Gérald LeBlanc

Welcome to the dawn of time.

I was a waiter in a nuclear fall-out shelter, on stand-by for another planet.
I wanted to write you a love letter because my pen was registering 6.5 on the Richter scale.

Ich glotze T.V (I stare at the television), Nina Hagen

I stare at the television.

9. GLOSSARY

Aural memory:
Faculty of the brain which allows for the storage and recall of characteristics of sounds or combinations of sounds such as pitch, timbre, rhythmic and melodic patterns.

Chorus:
Analog or digital signal processing where slight pitch and amplitude modulation is applied to the recorded signal.

Digital Signal Processing (DSP):
The transformation of sound using digital algorithms.

Digital Audio Work-station (DAW):
A device which integrates digital recording, processing, editing and hard-disk based storage of audio signal.

Element:
One of the five instrumental or vocal groups in this piece.

Envelope generator:
Signal processor in synthesizers and samplers which determines the shape of a sound by assigning values for levels and times of attack, sustain, decay and release.

Equalizer:
Analog or digital sound processor which shapes a sound by selectively increasing or reducing the relative loudness of segments of its harmonic spectrum.

Equalization:
A procedure that shapes a sound by selectively increasing or reducing the relative loudness of segments of its harmonic spectrum.

Extension transference:
The common intellectual maneuver in which the extension is confused with or takes the place of the process extended.

Field:
A random distribution of sounds throughout the macro level of the listener's perspective. (The opposite of **pulse**)

Filtering:
A substractive procedure which, when applied to a sound source, reduces the relative amplitude of a particular band of frequencies

Gestalt:
A structure, configuration, or pattern of physical, biological or psychological phenomena so integrated as to constitute a functional unit with properties not derivable from its parts in summation.

Harmonizer:
Signal processor which produces digitally transposed (detuned) copies of an audio signal. The transposed signal may be used alone for transposition or tuning, or in cunjunction with the original sound source for 'out-of-focus' effects.

Hi-fi (high fidelity):
The reproduction of sound with a high degree of faithfulness to the original.

Icon (iconic sign):
Type of sign which relates to that which it signifies, in the sharing, or joint possession of some quality or property.

Magic Square:
A 12 x 12 matrix of numbers that can be used as a guide to all permutations of a 12-tone row. In this piece, a sound structure which is defined by a succession of perfect vertical structures and a collection of decending **streams** of perfect structures.

Multi-tracking:
Sound recording process whereby sounds are recorded and stored on individual, coincidental segments (tracks) of tape (or virtual tracks on hard-disk based DAWs).

Mixing:
The process of combining multiple sound sources. This process entails the adjustment of relative amplitude of the individual sources as well as the application of audio procedures such as filtering, equalization, reverberation, compression, panning etc.

MIDI:
(Musical Instrument Digital Interface.) A standard international protocol which permits the transmission of data between electronic instruments, sound processing units and hardware or software based sequencing programs.

Nodes:
Points of convergence of the *three waves* in this work, placed at structurally important points in elapsed time.

Noise:
"White noise" (or white sound) is a mixture of all audible frequencies at random amplitudes. In the classification of **SOUND OBJECTS** in this work, a very low degree of periodicity on the micro level is perceived as **noise**. (the opposite of **tone**)

Perfect and **imperfect** structures:
In this work, vertical sound structures which display only one type of interval are dubbed **perfect**. Those made up of a mixture of interval types are **imperfect**.

Phonetic:
Of or relating to spoken language or speech sounds.

Pulse:
In the classification of **SOUND OBJECTS** in this work, a very high degree of periodicity on the macro level is perceived as **pulse**. (the opposite of **field**)

Sampling:
The digital recording of a sound for the purpose of modification and / or performance.

Semantic:
Of or relating to meaning in language.

Semiotics:
A general philosophical theory of signs and symbols that deals especially with their function in both artificially constructed and natural languages and comprises syntactics, semantics and pragmatics.

Sequencing:
The recording of MIDI information pertaining to the performance of electronic musical instruments or sound processing devices.

SMPTE time code:
(Society of Motion Picture Technicians and Engineers) A standard code which was developed for the synchronization of sound to film and has become widely used for all types of synchronization in the film, recording, television and video industries.

SOUND OBJECT:
In this work, a composed sound structure that evolves and interacts whithin the time frame of the piece and which is characterized by its constituent attributes.

Stream:
In this work, a group of sounds, evolving in the horizontal perspective and related to one another based on the listeners identification of their shared attributes.

Time variant amplifier:
Signal processor in synthesizers and samplers which determines the shape of an audio signal by varying its amplitude (loudness) over time. (see envelope generator)

Time variant filter:
Signal processor in synthesizers and samplers which determines the shape and timbre of an audio signal by varying the state of filters which act upon its harmonic spectrum over time. (see envelope generator)

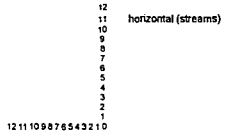
Threshold:
Term applied in this analysis to the point at which the brain brings together individual auditory events and perceives them as a whole.

Tone:
A sound of definite pitch and duration. In the classification of **SOUND OBJECTS** in this work, a very high degree of periodicity on the micro level is perceived as **tone**.
(the opposite of **noise**)

2-5 mode:
Melodic mode constructed by crossing two perfect structures; the whole tone scale (density 2) and the cycle of perfect fourths (density 5).

Wave:
In this work, one of three musical entities, evolving and interacting over the time span of the piece.

7a. In actual fact, the **SOUND OBJECT** refered to as Magic Square is an aural extrapolation of two sides of the 13 x 13 matrix for the series of numbers from 0 to 12, where each number represents an interval (vertical or horizontal):

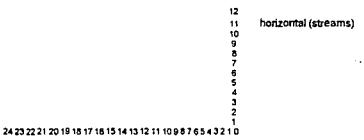


This actual "Magic Square" can be seen on beats 4, 5 and 6 of the initial 6/4 measure, p. 1 first **element**.

8. cf. Wilden, Anthony. *Ideology and the Icon. Contradiction and Paradox: An Essay in Context Theory*

9. In this sense, the **SOUND OBJECT** referred to above (cf. score page 1) is actually only a partial depiction of the **Magic Square** (more like a magic rectangle) . Although it presents vertical structures which span the scale of densities (24 to 0), only half these structures become audible as horizontal lines (0-12) This is not due to compositional choice but rather to the practical limits of the spectrum of audible frequencies.

The whole **SOUND OBJECT** in the first element (the total 6/4 measure in the sampled and synthesized voices) may be understood as a rectangle since it represents the following matrix:



10. For example: A **SOUND OBJECT** consisting of the purest sinusoidal tone, repeating at regular intervals of one second duration would be placed at one limit of the continuum. Its high degree of predictability gives it purety of **tone** on the micro level and an aspect of metrical **pulse** on the macro level.

However, a related **SOUND OBJECT** made up of a great many of these same sine tones, distributed randomly and at random intensities over the vertical and horizontal perspectives will be perceived as a **field**. Although each individual sine tone retains its degree of periodicity at the micro level, the overall **SOUND OBJECT** has an extremely low degree of predictability at the macro level and would be placed closer to the opposite pole of the continuum.

Furthermore, by speeding up the flow of individual events to a point beyond the **threshold**, the **SOUND OBJECT** will now be perceived as **noise** and placed at the extreme opposite pole of the continuum.

11. In order to analyze and qualify a **SOUND OBJECT** composed of two marimba sounds played simultaneously at the interval of a perfect fifth, one would need to speak of the percussive nature of the attack which is attributed to a high noise content, a low level of periodicity in the transient portion of the wave-form.

    One would then describe the resonant portion of the timbre by pointing out the quick decay of the aperiodic waveform and the highly periodic nature of the sustaining portion of the wave. The analysis would then procede with the description of the relative frequencies and amplitudes of particular harmonics, multiples of the fundamental frequency.

    The particular aural signature of the perfect fifth could then be described by giving a precise account of the ratios between the fundamentals and the harmonics of both tones. Since all of these aspects of periodicity happen on the micro side of the **threshold**, their effect is perceived as timbre and harmonic colour.

    It is also possible to imagine a **SOUND OBJECT** where aspects of periodicity happen on the macro side of the **threshold**. In this case, the **SOUND OBJECT** could be described as a random **field** of marimba tones or events quickly giving way to a highly periodic structure. In this structure a **stream** of events at lower frequencies exhibits a fundamental metric **pulse** and other **streams** at higher frequencies evolve at rates related to the fundamental pulse following strict ratios.

    Two such **OBJECTS** could be superimposed at the ratio of the perfect fifth to create a composite **SOUND OBJECT**, a mega-image of the marimba fifth described above. Since all the aspects of periodicity in this **SOUND OBJECT** would occur on the macro side of the **threshold**, their effects would be perceived as texture.

12. Cage, John. *45' For a Speaker.*

13. Sartre, Jean-Paul. *La nausée.*

14. Borchert, Wolfgang. *Nachts Schlaffen die Ratten doch.*

15. Lawrence, D.H. *Apocalypse.*

16. Hagen, Nina *T.V. Glotzer*, German tr. of "White Punks on Dope"

17. LeBlanc, Gérald. *Géographie de la nuit rouge.*

18. Rilke, Rainer Maria. *Herbsttag.*

19. The morpheme "un" combines with word "fasten" to form "unfasten" which carries a different yet related meaning.

20. For more detailed description of phonetics, semantics and syntax see: Crystal, David ;*The Cambridge Encyclopedia of the English Language*.

21. For more on the concept of text as sound cf. Ianza, Alcides.*"lettrism" and concret poetry: their influences in the evolution of electronic music.* See also: Pierre Schaeffer: *Traité des objets musicaux.*

22. Borchert, Wolfgang. op. cit.

23. Peirce, Charles S. *Collected Papers of Charles Sanders Peirce* as cited in Eco, Umberto. *Semiotics and the Philosophy of Language*

24. Peirce, Charles S. *Collected Papers of Charles Sanders Peirce* as cited in Pelc, Jerzy. *Iconicity. Iconic signs or Iconic Uses of Signs*

25. The **SOUND OBJECT** at 13:00 in the first **element** is actually made up of three **streams** of Morse code repeating the phrase "I am the pulse that brings together" in the three languages of the piece: English, French and German. The sound source from which the Morse code is constructed is actually SMPTE time code audio signal, (processed via limiter to protect against unwanted peaks). The recognition of the total semantic content of this particular **SOUND OBJECT** (with its recursive or self referential nature) requires that the listener be familiar with the sound of SMPTE time code audio signal and well versed in Morse code decryption. However, the aural signature or the particular rhythmic patterns of Morse code render it readily recognizable as such and help place the **SOUND OBJECT** in its proper temporal perspective.

26. cf. Osmond-Smith, David. *The Iconic Process in Music Communication.*

27. cf. score p. 35,36, second **element**, strings at 11:28 and 11:39. The gradual transfer from *pizz* to *col legno batt.* articulation and back is made possible through punch-in procedures in the recording which permit instantaneous transition from one articulation to the other at any given point in time. Though this effect would be impractical in real time, it is achieved with great precision through the extension of multi-tracking.

28. A good example of this process can be heard in the PinkFloyd song "Wish you were here" from the Album *Wish you were here.*

Section 5: FORMAL STRUCTURE

1. Toffler, Alvin. Op. cit.

2. cf. Stockhausen, Karlheinz. *Structure and experiencial time.* cf.also Hall, E.T.*The Dance of Life*, p. 127-152.

3. Keeping in mind the concept of multiple levels of perception, these three basic components (solo voice and string shadow, percussive **stream**, and sibilant field) could also be referred to as **SOUND OBJECTS** on a lower level of perception. However, for the purpose of clarity, **SOUND OBJECTS** will be discussed at the level of the *wave* unless noted otherwise.

4. cf. Toffler, Alvin. Op. cit., p.104-105. cf. also Hall, E.T. *The Dance of Life*, p. 20-21

5. cf. Hall, E.T. *The Dance of Life*, p. 45-58

6. Borchert, Wolfgang. op.cit.

7. Rilke, Rainer-Maria. op.cit.

8. Sartre, Jean-Paul. op. cit.

9. LeBlanc, Gérald. op. cit.

10. Cage, John. op.cit

11. LeBlanc, Gérald. op. cit.

12. Rilke, Rainer-Maria. op.cit.

13. Hagen, Nina. op. cit.

14. Lawrence, D.H. op.cit.

15. Sartre, Jean-Paul. op. cit.

16. Borchert, Wolfgang. op.cit.

17. Sartre, Jean-Paul. op. cit.

18. For more on Fibonacci sequence and other recursive processes cf. Hofstadter, Douglas R., *Godel, Escher, Bach: An Eternal Golden Braid*. p. 127-152.

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Rainer Maria Rilke's "Herbsttag" from Rainer Maria Rilke: Ausgewählte Gedichte ©1966 by Suhrkamp Verlag by permission Insel Verlag Frankfurt am Main.

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Marc Beaulieu:

TEMPS EN TEMPS (times in time)

Music for voice and instruments in a multi-track recording environment.

FOREWORD

TEMPS EN TEMPS (times in time) is a piece written for the multi-track recording studio. At the very core of its conception is the idea that the multi-track recording environment, complete with MIDI sequencer and SMPTE synchronization, extends the ensemble of acoustic instruments, voice and digital and analogue sound modules (samplers and synthesizers), and brings them together in a more controlled manner than in live performance.

Thus the ideal performance situation for the audition of the work is the play-back of the recording on CD or Tape. However, this does not rule out the possibility of live performance in a concert setting. In fact, three possible performance situations are designed into the score: **integral play-back, live ensemble with voice and tape, solo voice with tape.**

The particular configuration of the ensemble and the flexibility of multiple mixes make these alternate performance situations feasible. The performers in the ensemble are divided into different groups or ***elements*** for recording.

five elements

The first element consists of **synthesizers and samplers** sequenced via MIDI sequencer and synchronized to the multi-track tape via SMPTE time code. The sampled materials include samples of the female voice for text maipulation and samples of xylophone and marimba as well as modified samples of wind and string instruments (called syn-instruments eg. syn-horn, syn-clarinet etc.).

The second element is made up of **acoustic instruments** organized as in a symphony orchestra (flute (piccolo), clarinet, bassoon, french horn, trumpet, trombone, percussion, violin I, violin II, viola, cello, double-bass)[1]. Each instrument is recorded twice (multi-tracked) so in actual fact the ensemble is doubled.

The third element is a **quartet of female voices**. It is actually one mezzo voice multi-tracked four times.

The fourth element is the **solo voice**.

The fifth and final element is the **instrumental ensemble** from the second element. Here it is recorded as an ensemble and not multi-tracked but rather mixed down to stereo.

three performance situations

The first performance situation (**integral play-back**) is a personal audition on home hi-fi equipment of the total work. The five elements are mixed down and mastered to CD. All peripheral effects (reverberation, panning, digital signal processing, equalization, filtering etc.) are applied in the mix-down phase.

In the second performance situation (**live ensemble with voice and tape**) the first three elements are mixed down to a performance tape and the fourth and fifth element (voice and instrumental ensemble) play live. The ensemble performs on stage and the live sounds are picked up via microphones and mixed to the three first elements of the tape. Peripheral effects such as equalization and reverberation are applied to the live elements at the mixing console. All five elements are then reinforced and fed to the concert hall via audio speakers.

In this version, a conductor directs the live ensemble following a guide track which is generated by a sound module, sequenced via MIDI and synchronized to the tape via SMPTE time code. (This guide track is actually included in a dedicated mix which is fed to the conductor through head-phones or ear implants. In an ideal setting, every performer has ear implants with individual mixes.)

In the third performance situation, (**solo voice and tape**) one female singer (the fourth element) performs live on stage to a tape consisting of an alternate mix-down of elements one, two, three and five. As in the second performance situation, the singer has a dedicated mix including guide track fed back to ear implants. Both the microphone and the ear implants are wireless to facilitate movement on stage.

This performance situation could be open to any degree of staging including visual effects, lighting and multi-media. All of these can be synchronized via SMPTE time code and MIDI sequencing.[2]

1. All instruments are notated at concert pitch. See below for complete list of percussion instruments.

2.The advent of portable digital multi-track recorders or hard-disk based digital multi-track recorders makes the second and third performance situations even more practical. Thanks to hard-disk units like the Roland DM-800, it is possible to have all three alternate mixes as well as the guide tracks on one eight-track machine which is highly portable and easily synchronized to SPMTE time code or MTC (midi time code).

INSTRUMENTS

First element: Sampled and synthesized sound sources

Second element: Multi-tracked instrumental ensemble

2 flutes
2 clarinets (Bb)
2 bassoons

2 french horns
2 trumpets
2 tenor trombones

2 percussionists
(bongos, congas, toms, snare drum, bass drum)

4 violins (I & II)
2 violas
2 cellos
2 double-basses

Third element: Vocal quartet

female voice 1
female voice 2
female voice 3
female voice 4

Fourth element: Solo female voice

Fifth element: Chamber ensemble

flute (&piccolo)
clarinet (Bb)
bassoon

french horn
trumpet
tenor trombone

percussion
(xylophone, marimba, bongos, congas, toms, snare drum,
bass drum & electronic bass drum)

violin I
violin II
viola
cello
double-bass

Guide to special notation

1. The score is divided into five elements. These elements are distinguished by the left hand brackets:

[first element:sampled and synthesized sound sources.
[second element: multi-tracked instrumental ensemble.
[third element: vocal quartet.
[fourth element: solo voice
[fifth element: chamber ensemble.

2.  = harmonizing or chorusing effect to create out of focus ensemble effect.

3.  = highest possible pitch.

4. H[AU]---CHE = phonetic content of sound object.

5. [aù-ü] = international phonetic symbols are used to ensure accurate pronunciation of phonemes.

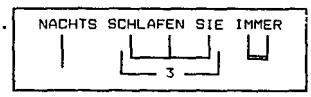
6. ⊦ RVB = Add artificial reverberation (digital or analog)

7. sss
: ss sh :
sh ss ----- = repeat ad lib. for length of dotted line.

8. eq. f.o.f. + ↑freq. = Equalization directive for recording sound source. (use of parametric eq. or third octave filter to filter out fundamental (f.o.f.) and adjust relative amplitude of upper harmonic content of the sound source.

9. rev.ca. 'n' sec. = record sound source in reverberant ambience of length 'n' (hall type not specified)

10.  = graphic display of sibilant 's' symbols depicting sounds generated by vocalist.

11. 

= Exact rhythmic enunciation of phrase.

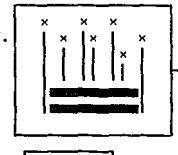
12. (whisp.) = whispered phrase.

13. SAMPLE = indicates that the sound object is constructed from sampled material. (tone or syllable)

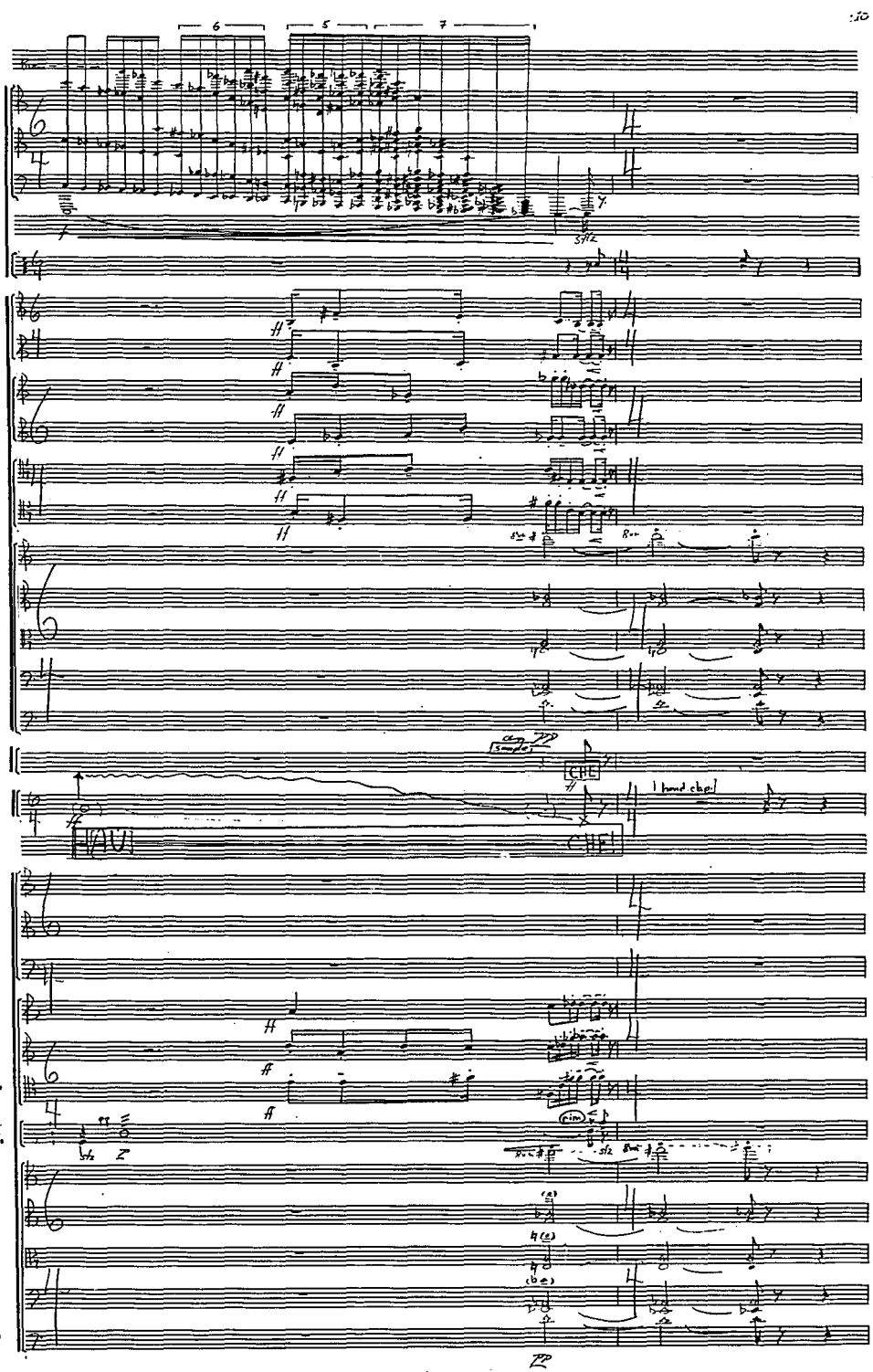
14.  or = in voice parts indicate non pitched sounds with exact time values.

15.  = indicates relative placement of sound in the stereo image. (pan) ∅ hard left ⊘ hard right.

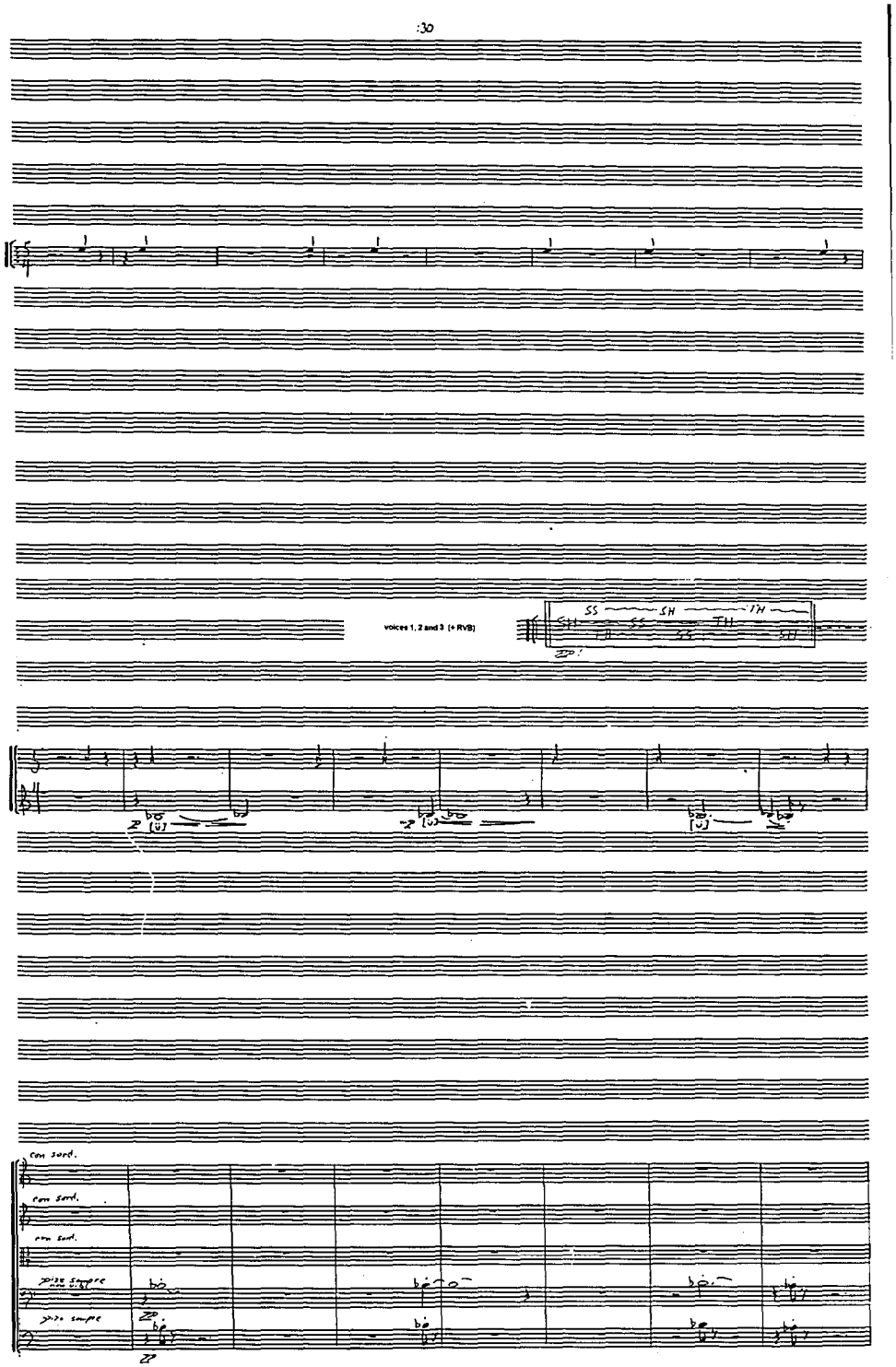
16. pizz.——≈≈≈≈≈≈⟶col legno batt. = gradual change from one form of articulation to the other.

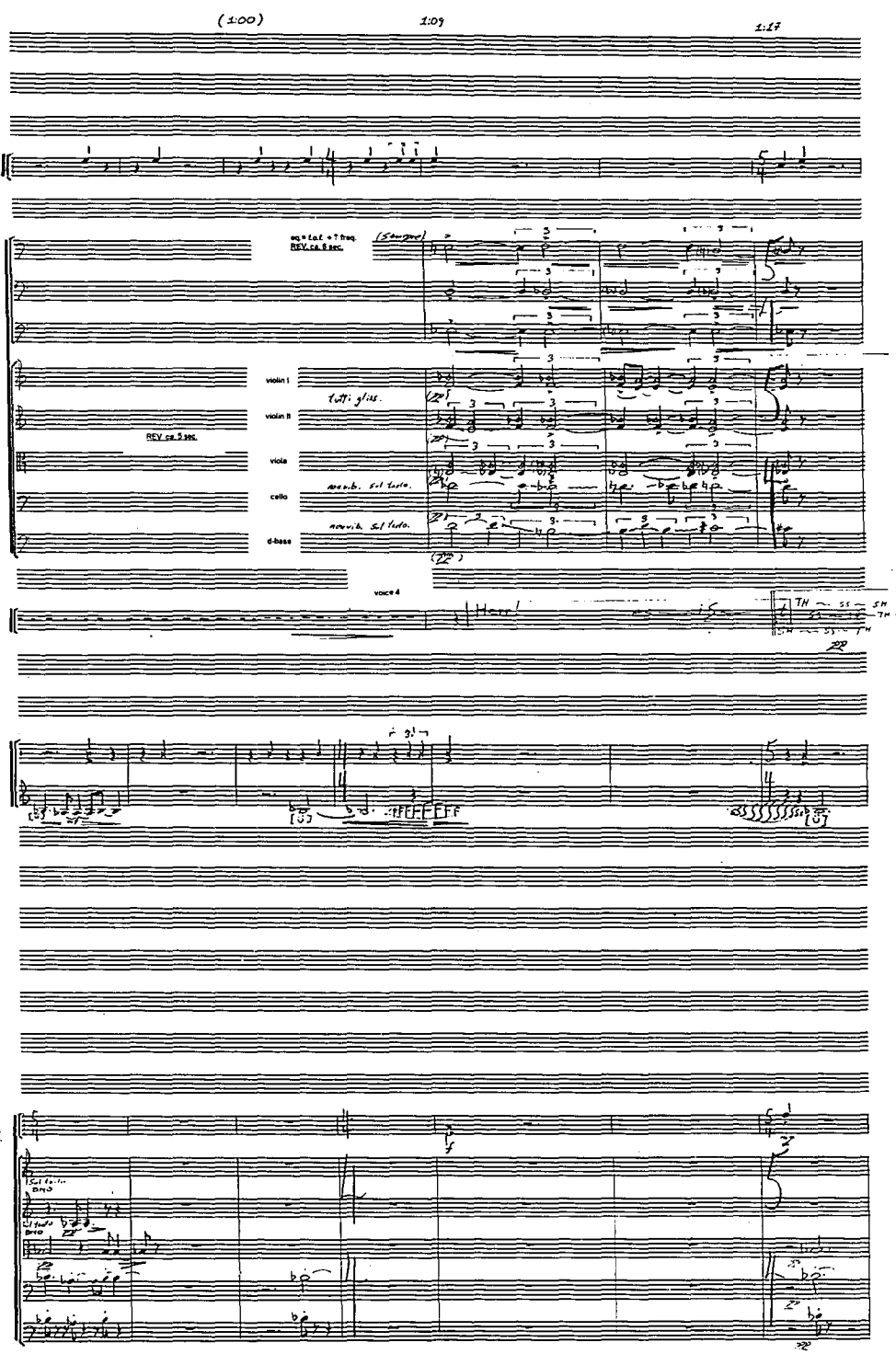
17.  = High density mixtures of transformed sound sources.

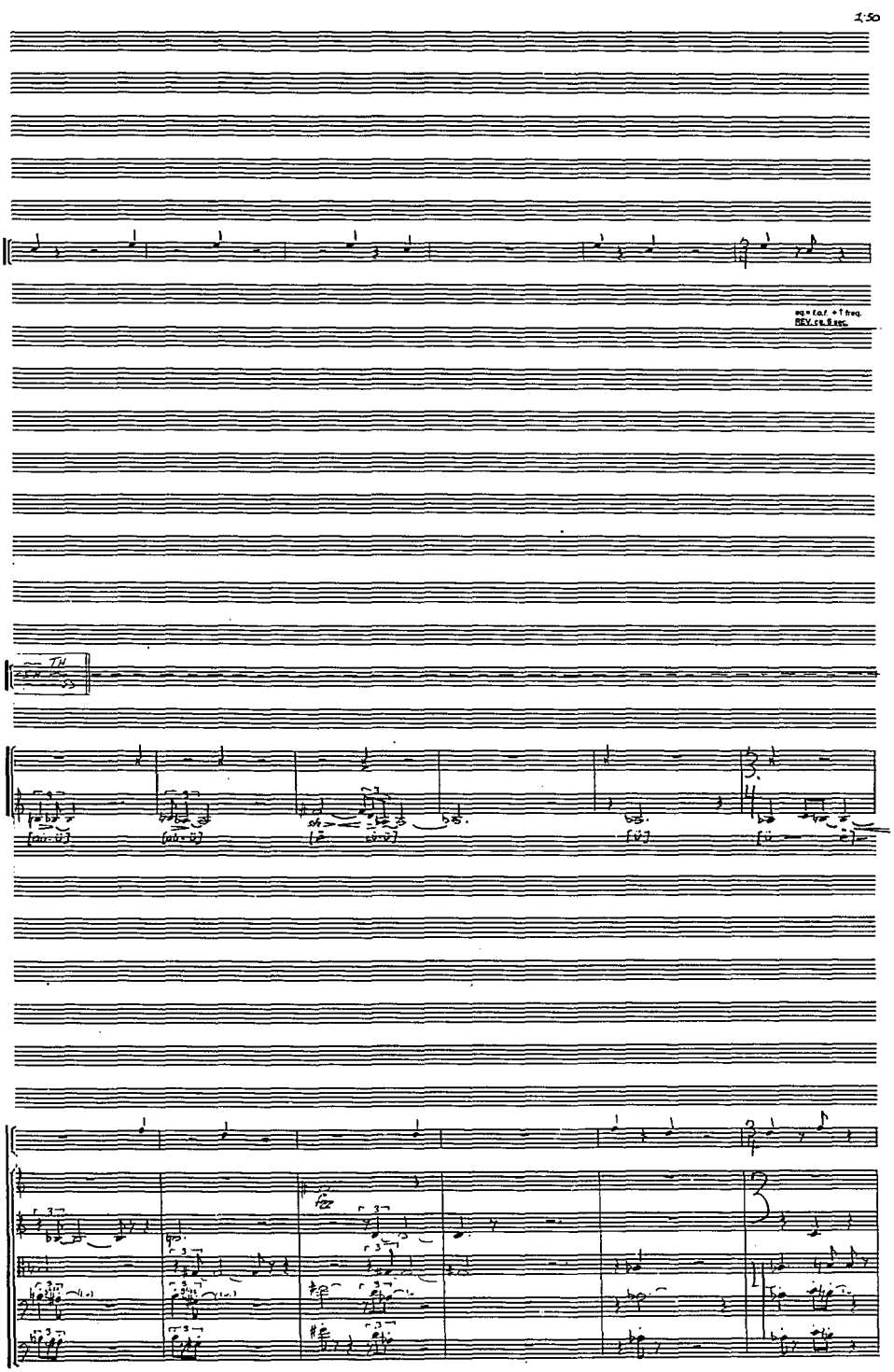
18. Syn-Clar = synthesized instrumental tones constructed from digital samples of original instruments. (here syn-clar =synthesized clarinet)

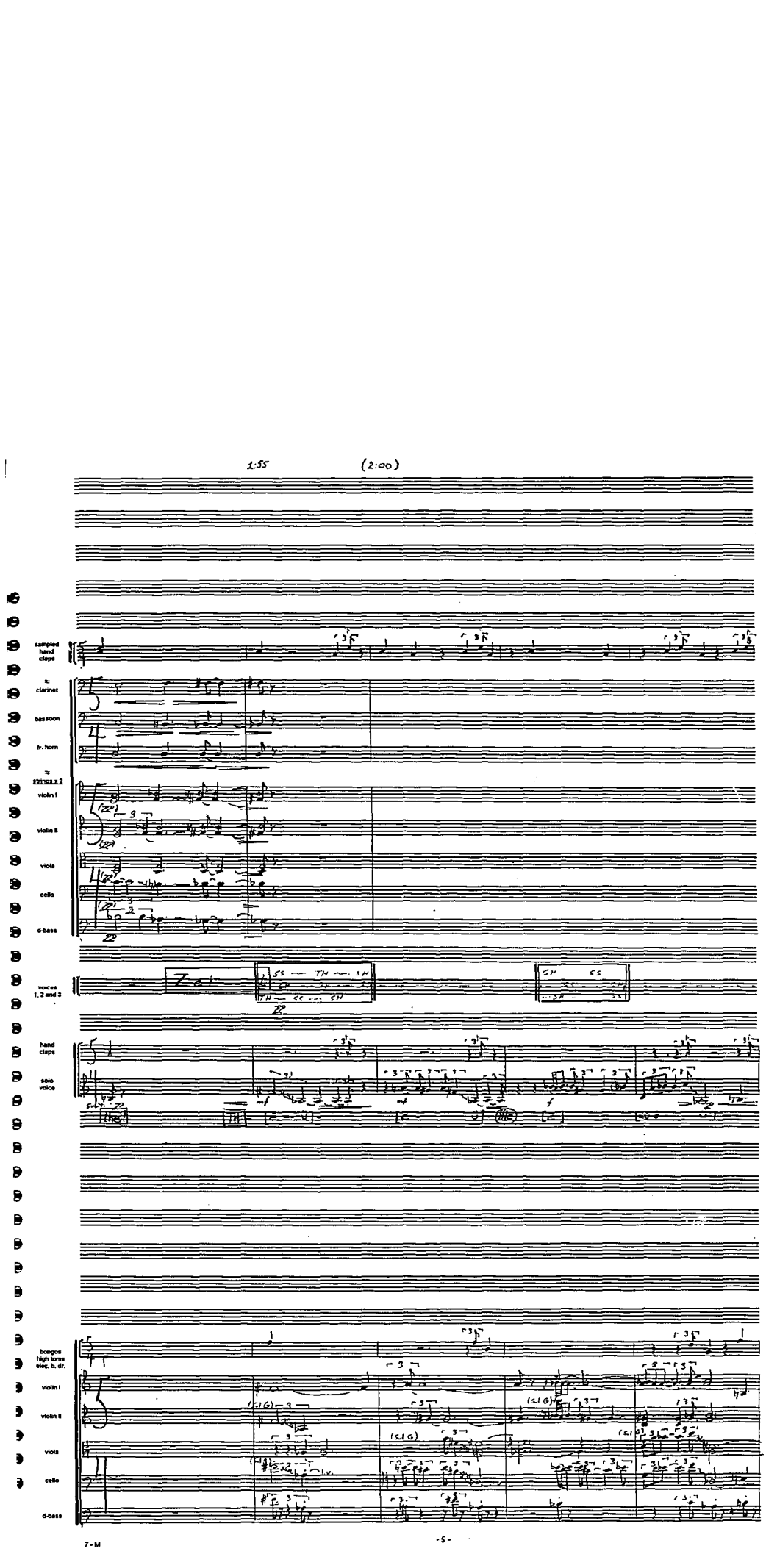

:50
6
5
7
sampled and synthesized voices
sampled hand claps
french horn I
french horn II
trumpet I
trumpet II
trombone I
trombone II
≈ strings x 2
violin I
violin II
viola
cello
d-bass
4 voices
solo voice
CHE!
1 hand clap!
flute
clarinet
bassoon
french horn
trumpet
trombone
snare dr. bass dr. elec. bass dr.
violin I
violin II
viola
cello
d-bass

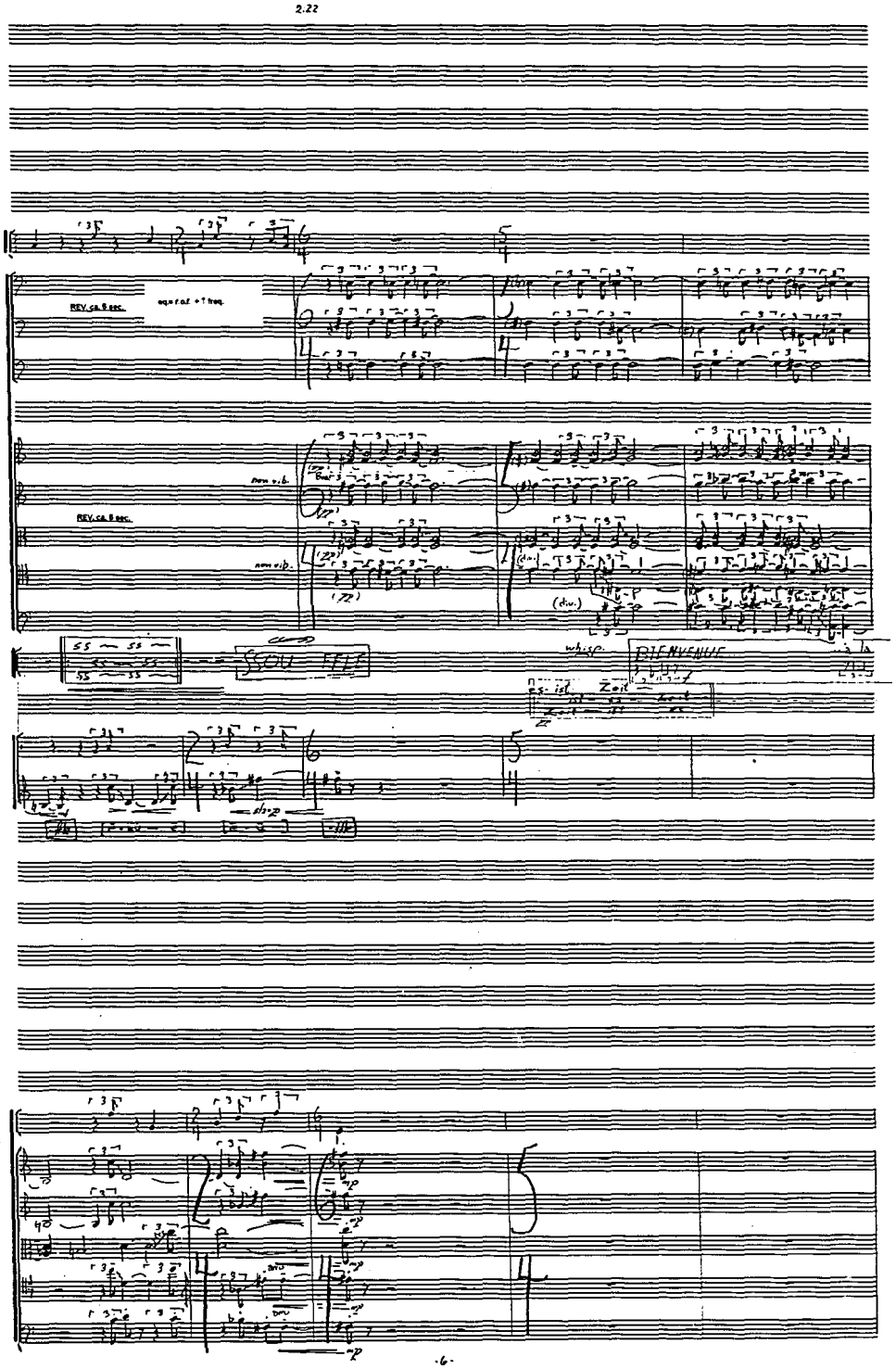
:30

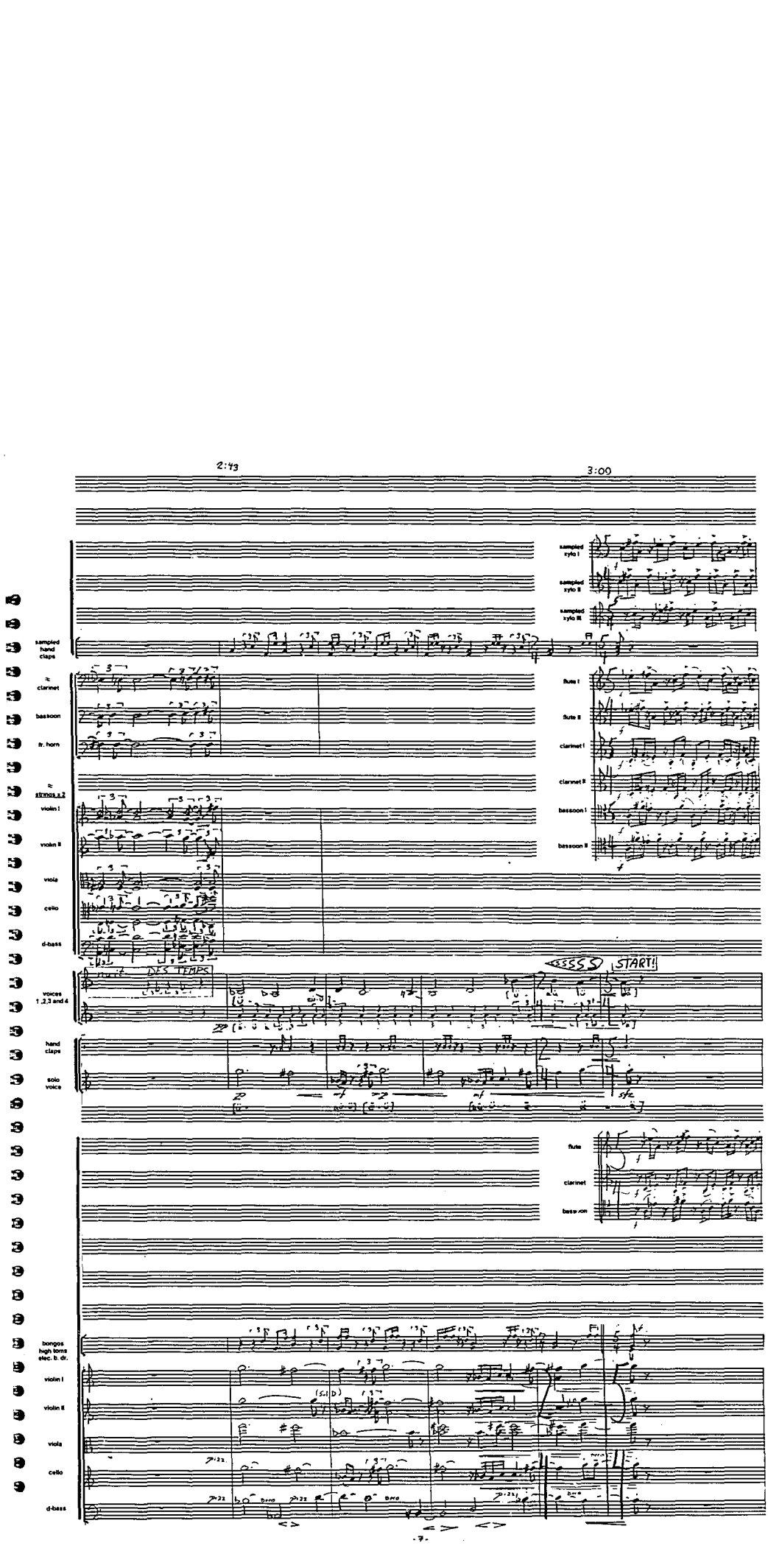

sampled hand claps
voices 1, 2 and 3 (+ RVB)
SS SH TH
hand claps
solo voice
con sord.
violin I
violin II
viola
cello
d-bass

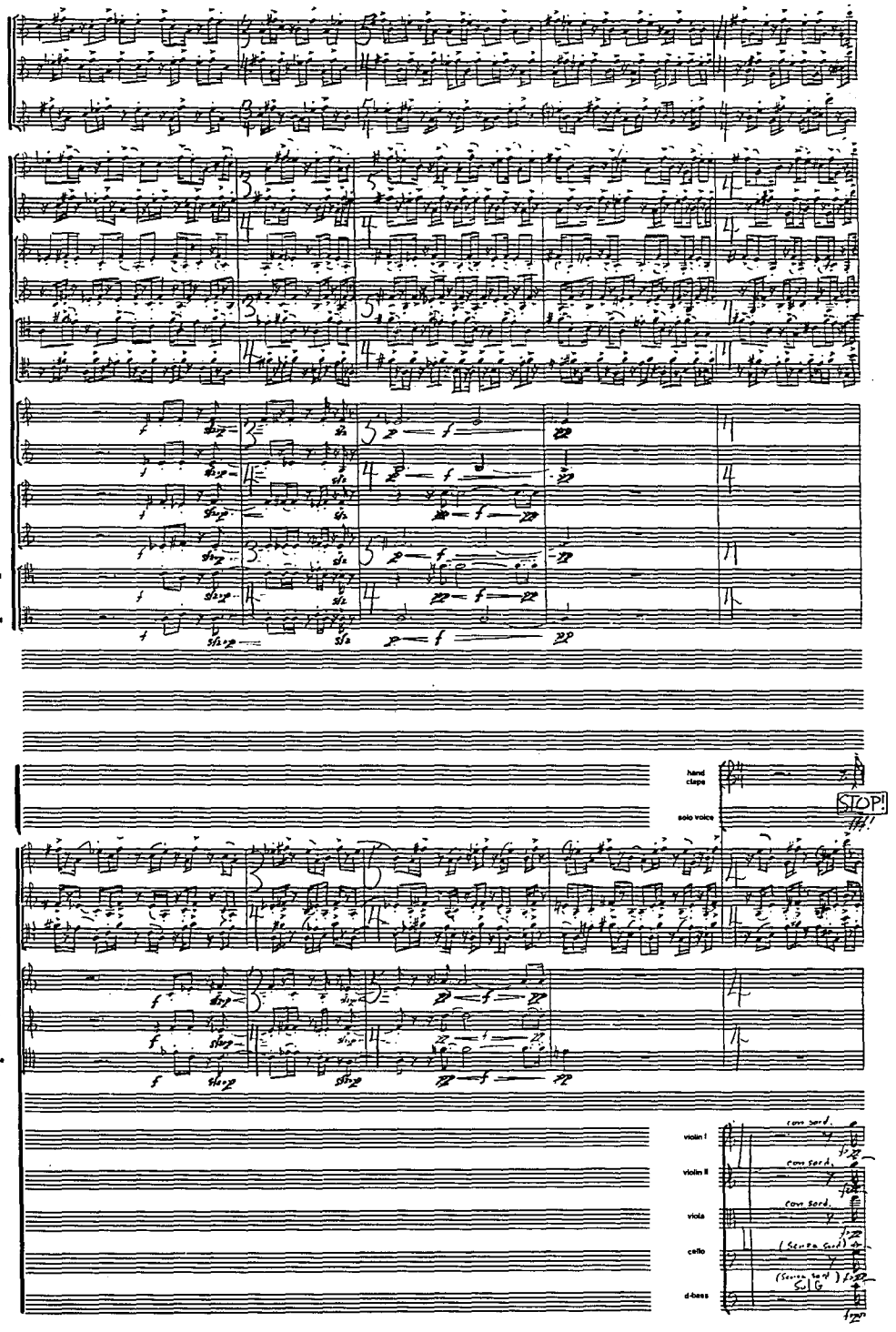

(1:00)
1:09
1:17
sampled hand claps
clarinet
bassoon
fr. horn
violin I
violin II
viola
cello
d-bass
REV ca. 5 sec.
REV ca. 9 sec.
eq + f.c.f. + ↑ freq.
(Sempre)
tutti gliss.
non v.b. s.t. tasto.
non v.b. s.t. tasto.
voice 4
Hem!
voices 1, 2 and 3
hand claps
solo voice
bongos high toms elec. b. dr.
violin I
violin II
viola
cello
d-bass

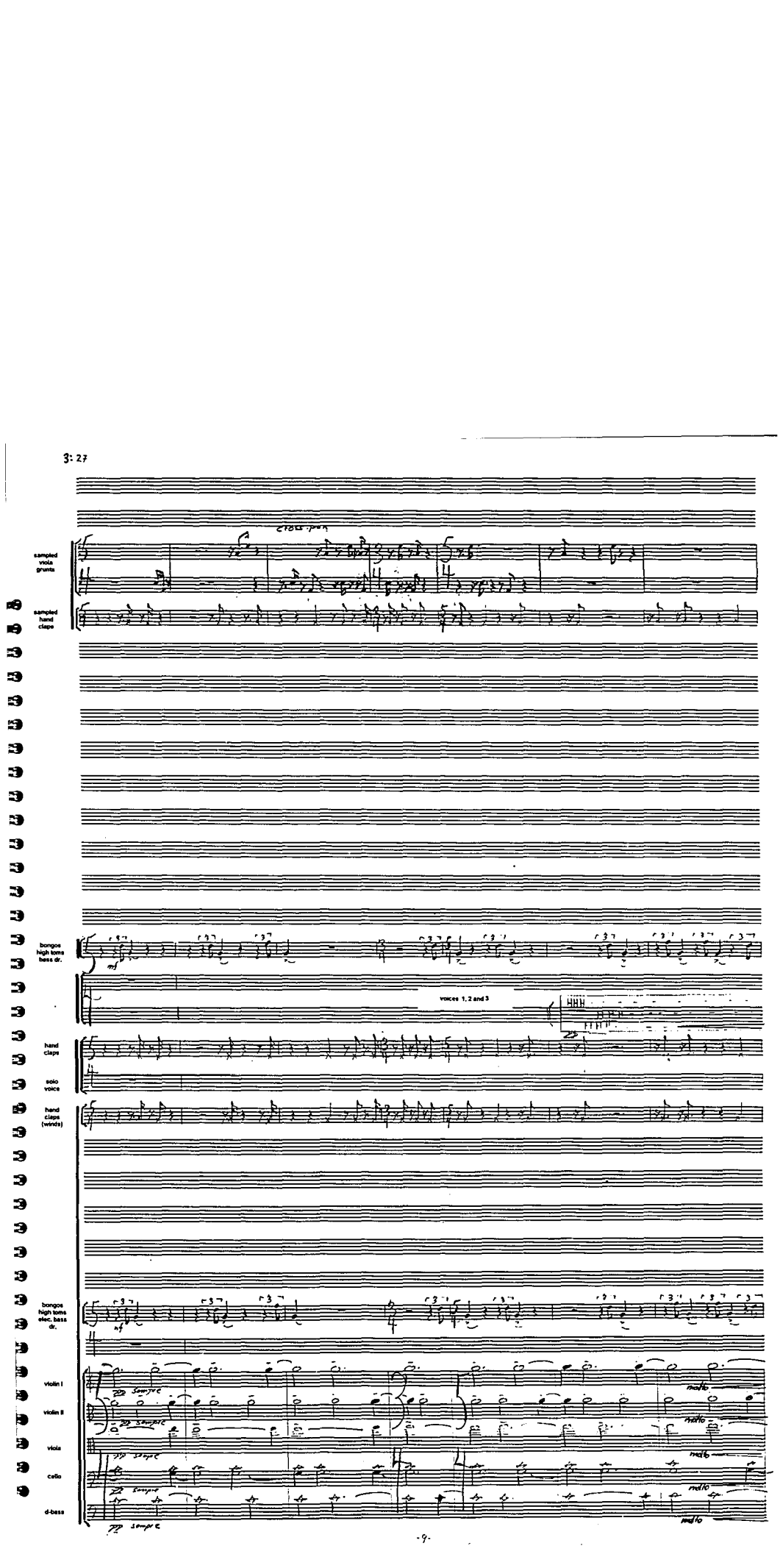

1:50
sampled hand claps
eq = f.c.f. + f freq.
REV. ca. 8 sec.
voices 1, 2 and 3
TH
hand claps
solo voice
bongos high toms elec. b. dr.
violin I
violin II
viola
cello
d-bass

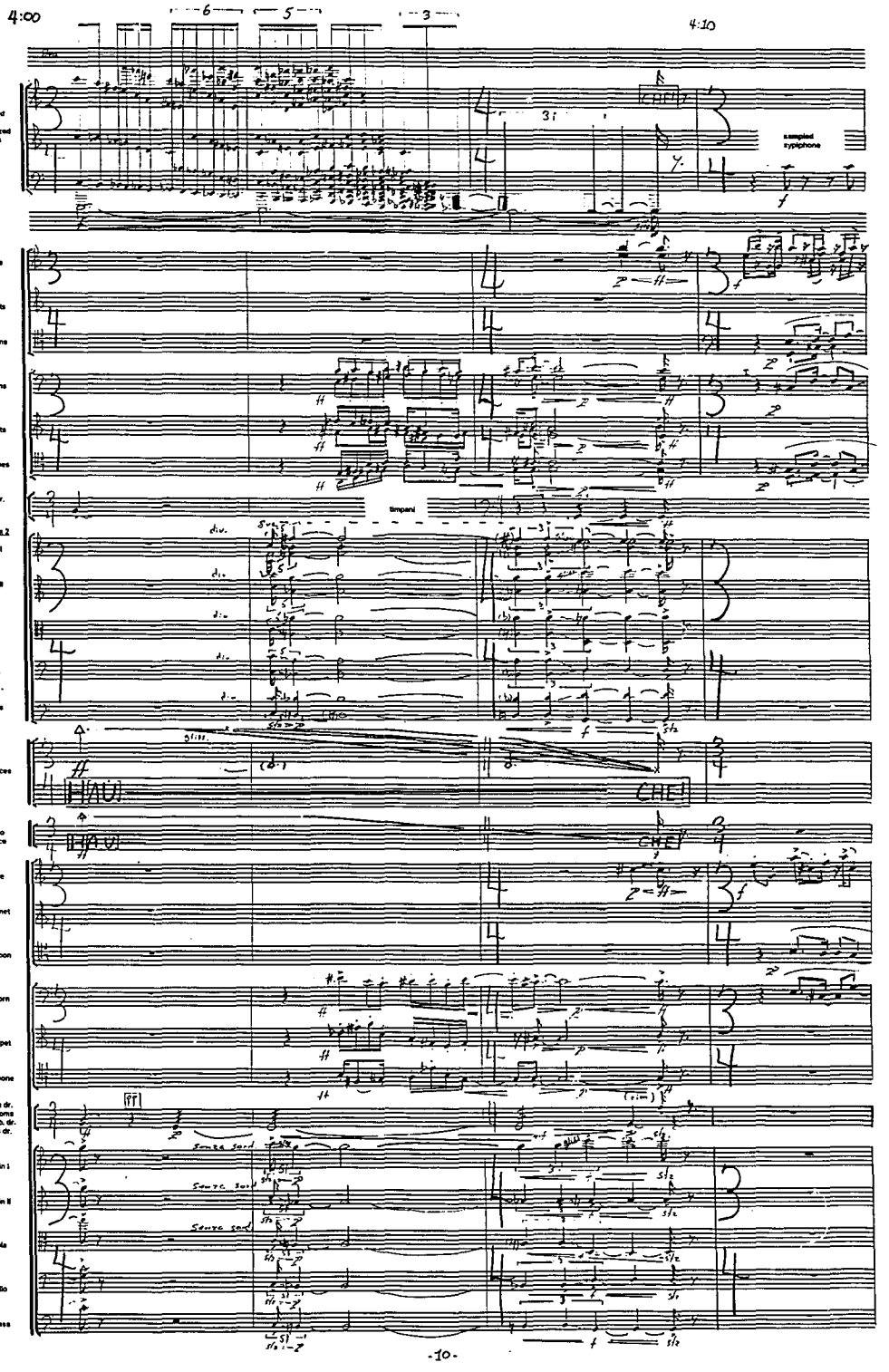

1:55
(2:00)
sampled hand claps
≈ clarinet
bassoon
fr. horn
≈ strings x 2
violin I
violin II
viola
cello
d-bass
voices 1, 2 and 3
hand claps
solo voice
bongos high toms elec. b. dr.
violin I
violin II
viola
cello
d-bass

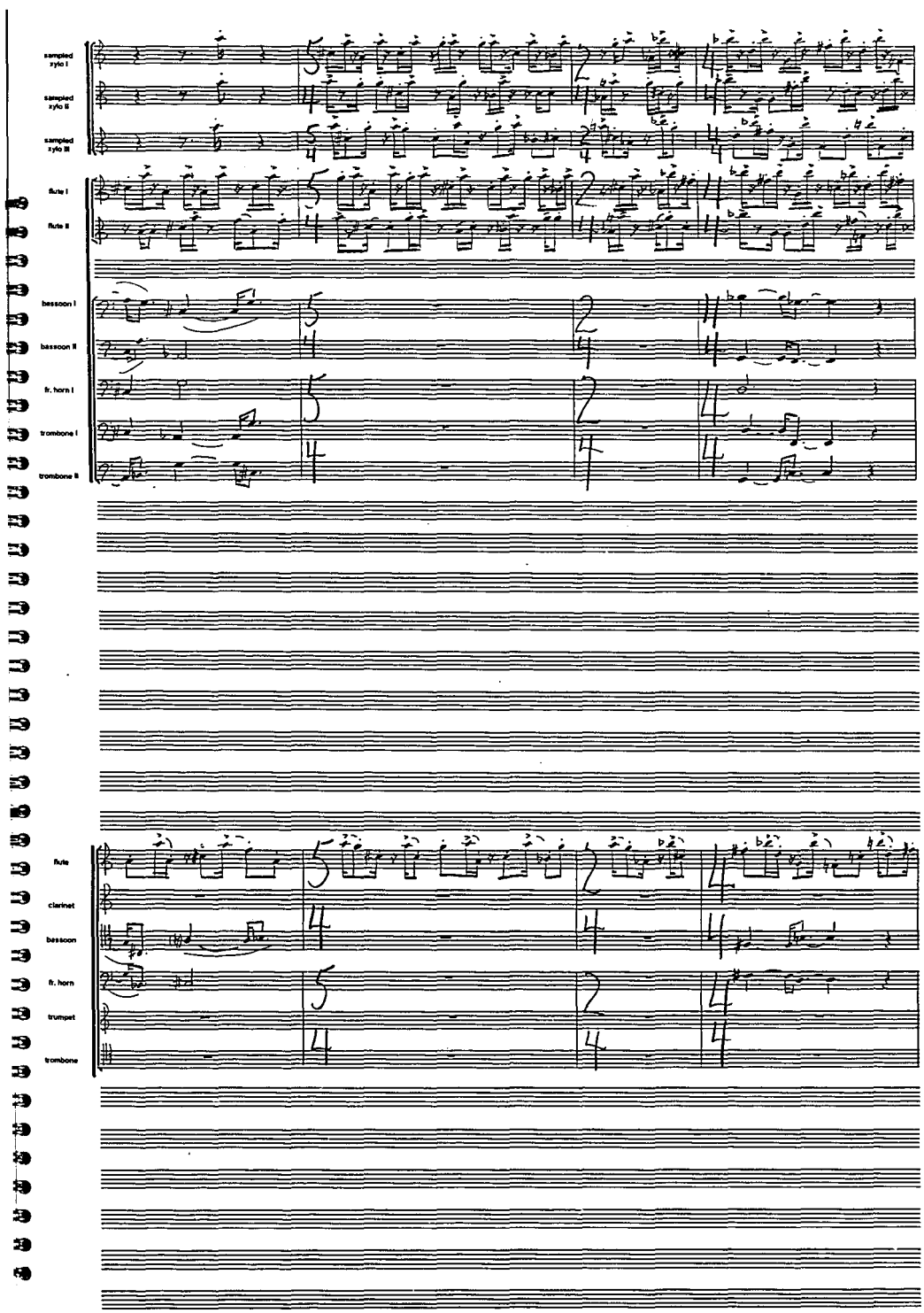

2.22
sampled hand claps
clarinet
bassoon
fr. horn
strings x 2
violin I
violin II
viola
cello
d-bass
REV. ca. 8 sec.
equ r.o.f. + f freq.
REV. ca. 8 sec.
arco
voices 1, 2, 3 and 4
hand claps
solo voice
bongos high tones elec. b. dr.
violin I
violin II
viola
cello
d-bass

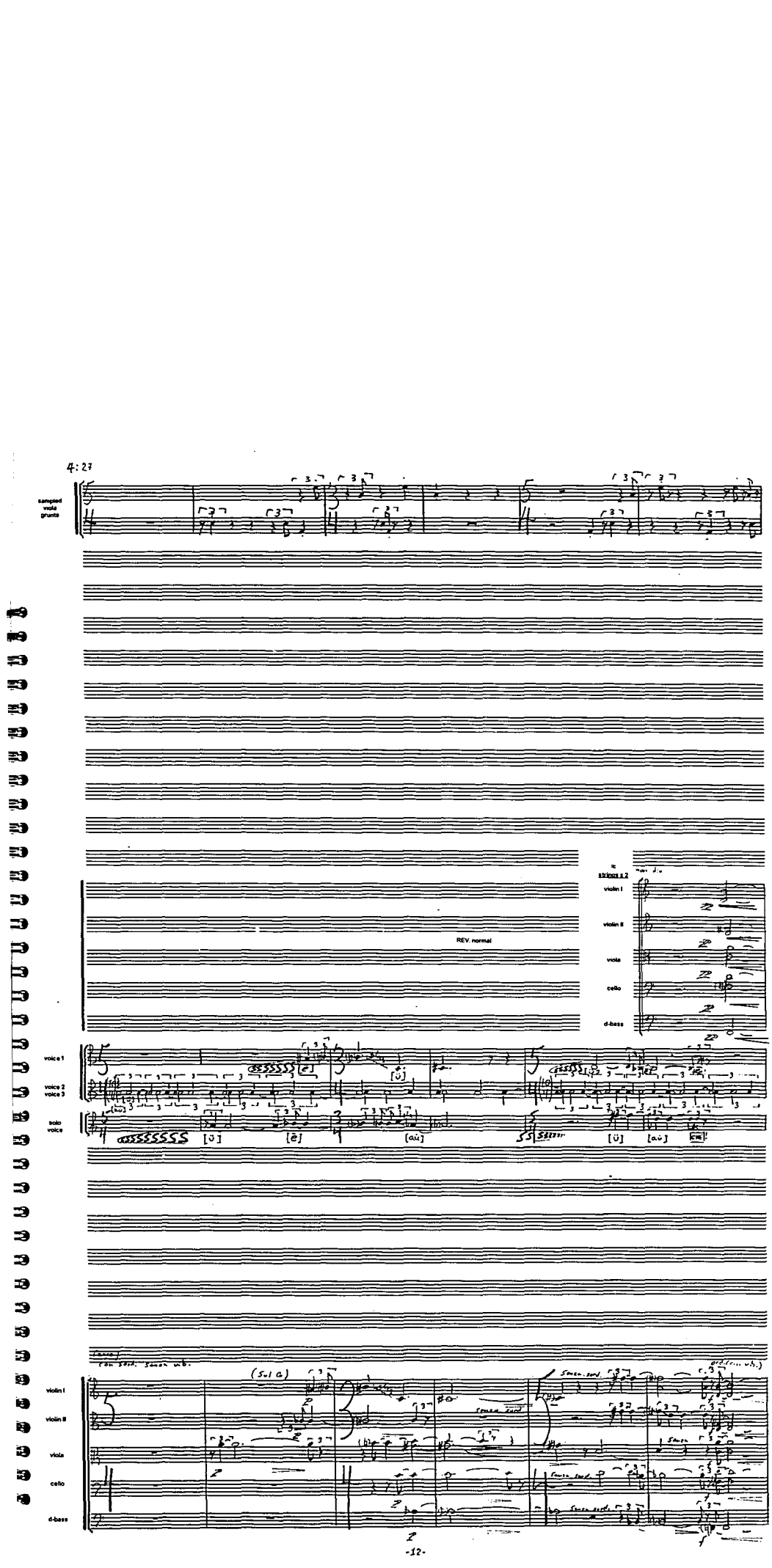

2:43
3:00
sampled xylo I
sampled xylo II
sampled xylo III
sampled hand claps
≈ clarinet
bassoon
fr. horn
≈ strings a 2
violin I
violin II
viola
cello
d-bass
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
DES TEMPS
START!
voices 1,2,3 and 4
hand claps
solo voice
flute
clarinet
bassoon
bongos high tons elec. b. dr.
violin I
violin II
viola
cello
d-bass

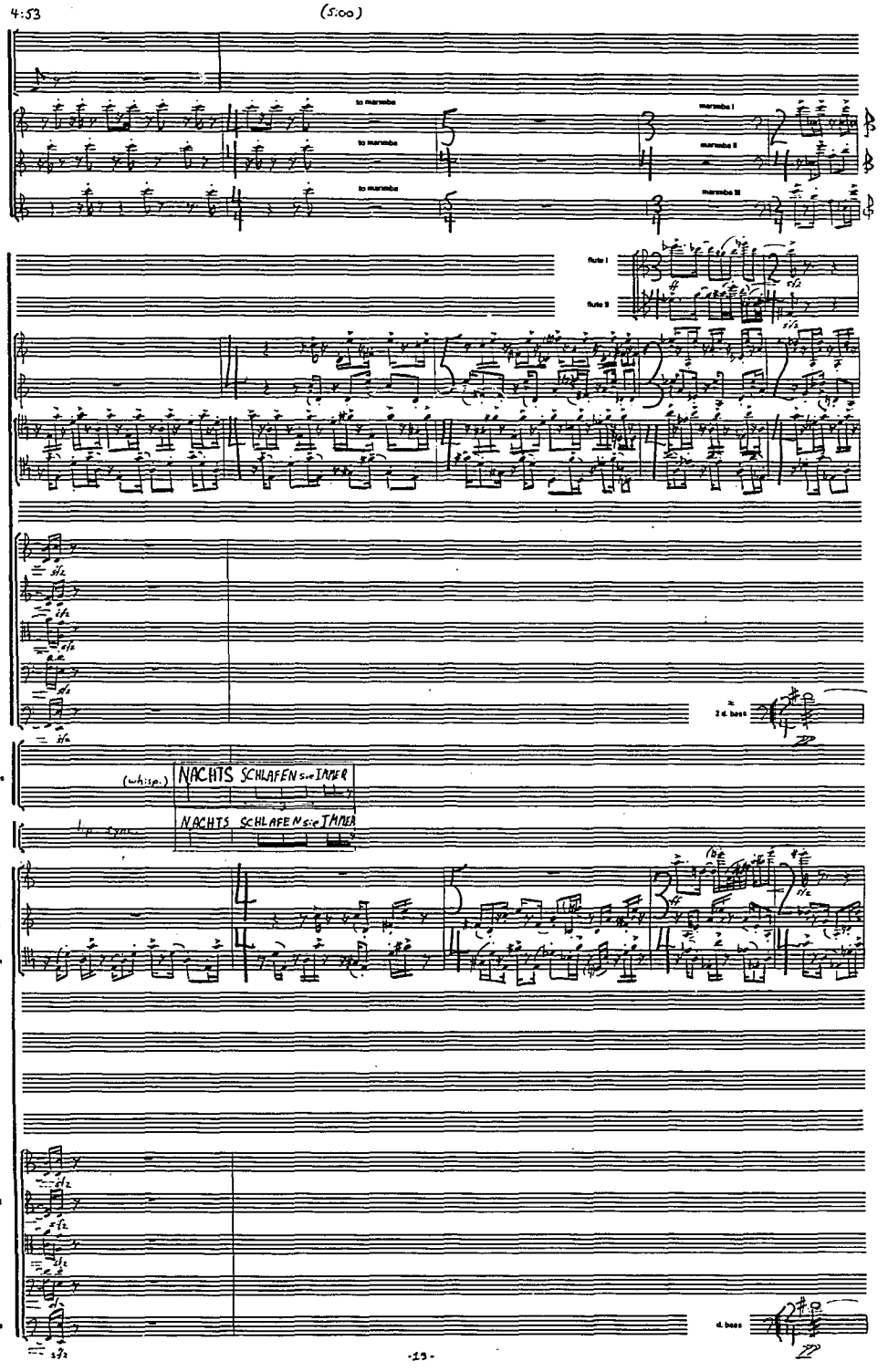

sampled xylo I
sampled xylo II
sampled xylo III
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
fr. horn I
fr. horn II
trumpet I
trumpet II
trombone I
trombone II
hand claps
solo voice
STOP!
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
con sord.
con sord.
con sord.
(Secco Cue)
(Secco cue)
Solo

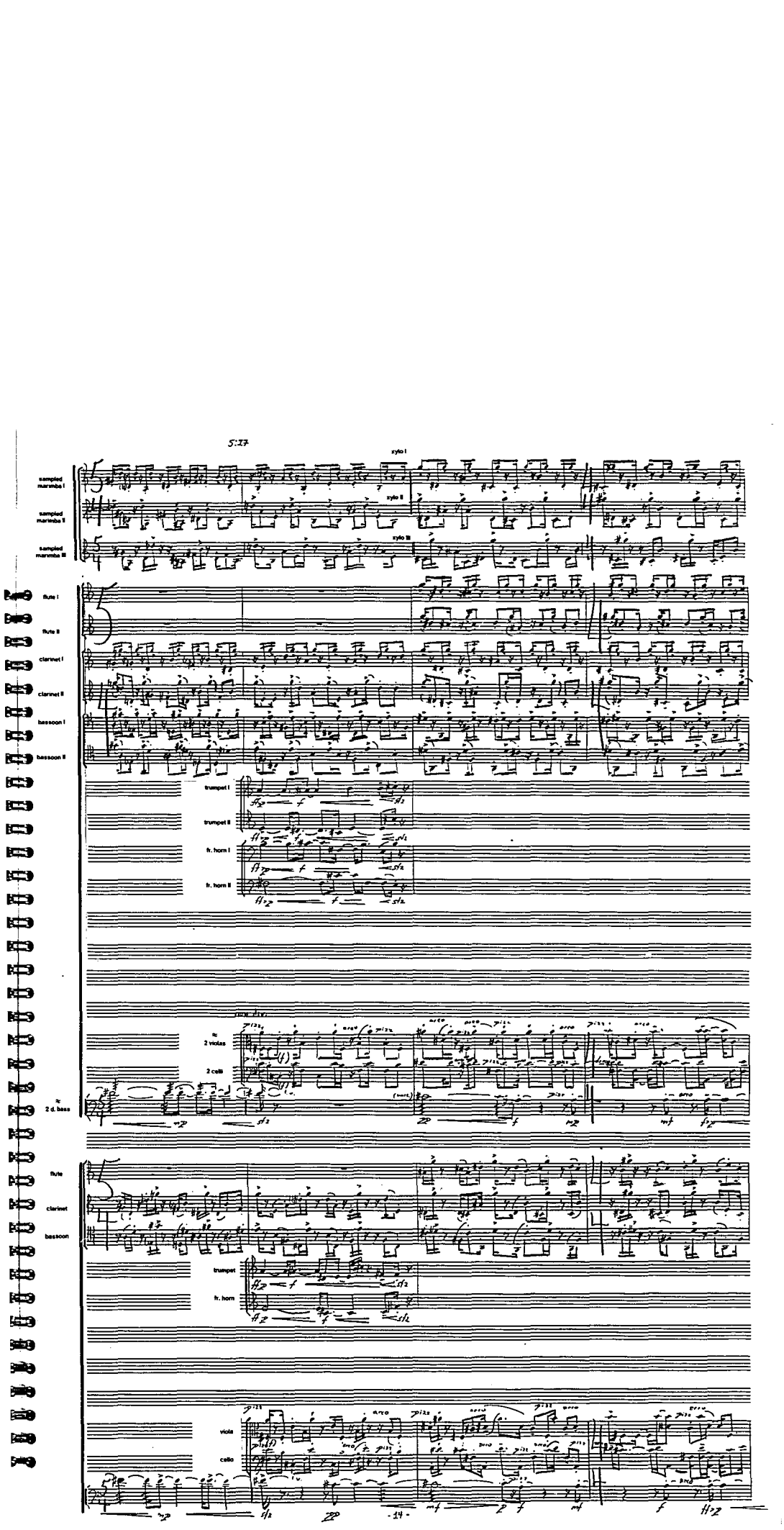

3: 27
sampled viola grunts
sampled hand claps
bongos high toms bass dr.
voices 1, 2 and 3
hand claps
solo voice
hand claps (winds)
bongos high toms elec. bass dr.
violin I
violin II
viola
cello
d-bass
pp sempre
molto

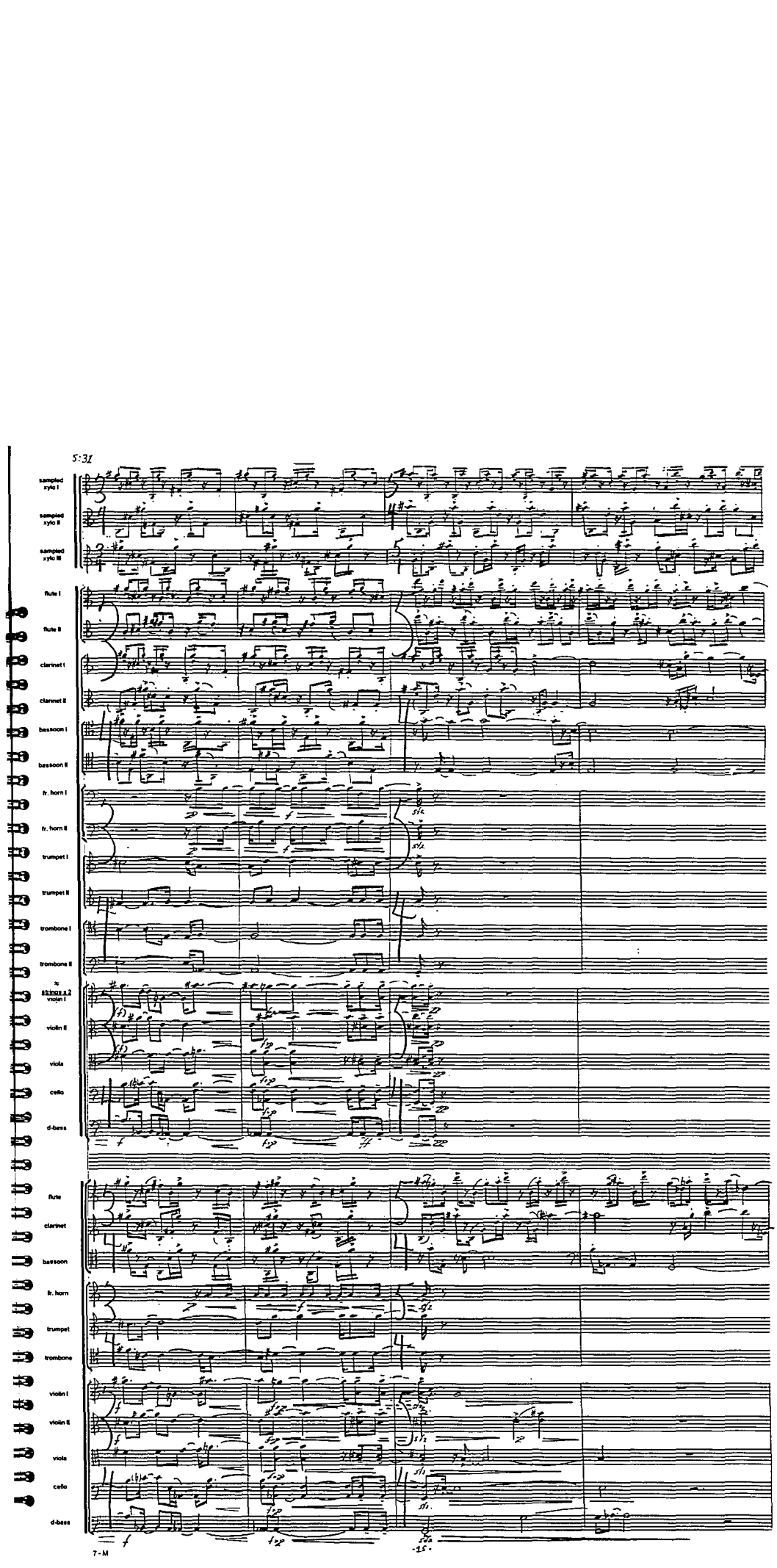

4:00
4:10
sampled and synthesized voices
sampled xylophone
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
bass dr.
timpani
strings a 2
violin I
violin II
viola
cello
d-bass
4 voices
HAU!
CHE!
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr. low toms elec. b. dr. bass dr.
Sonic Sand

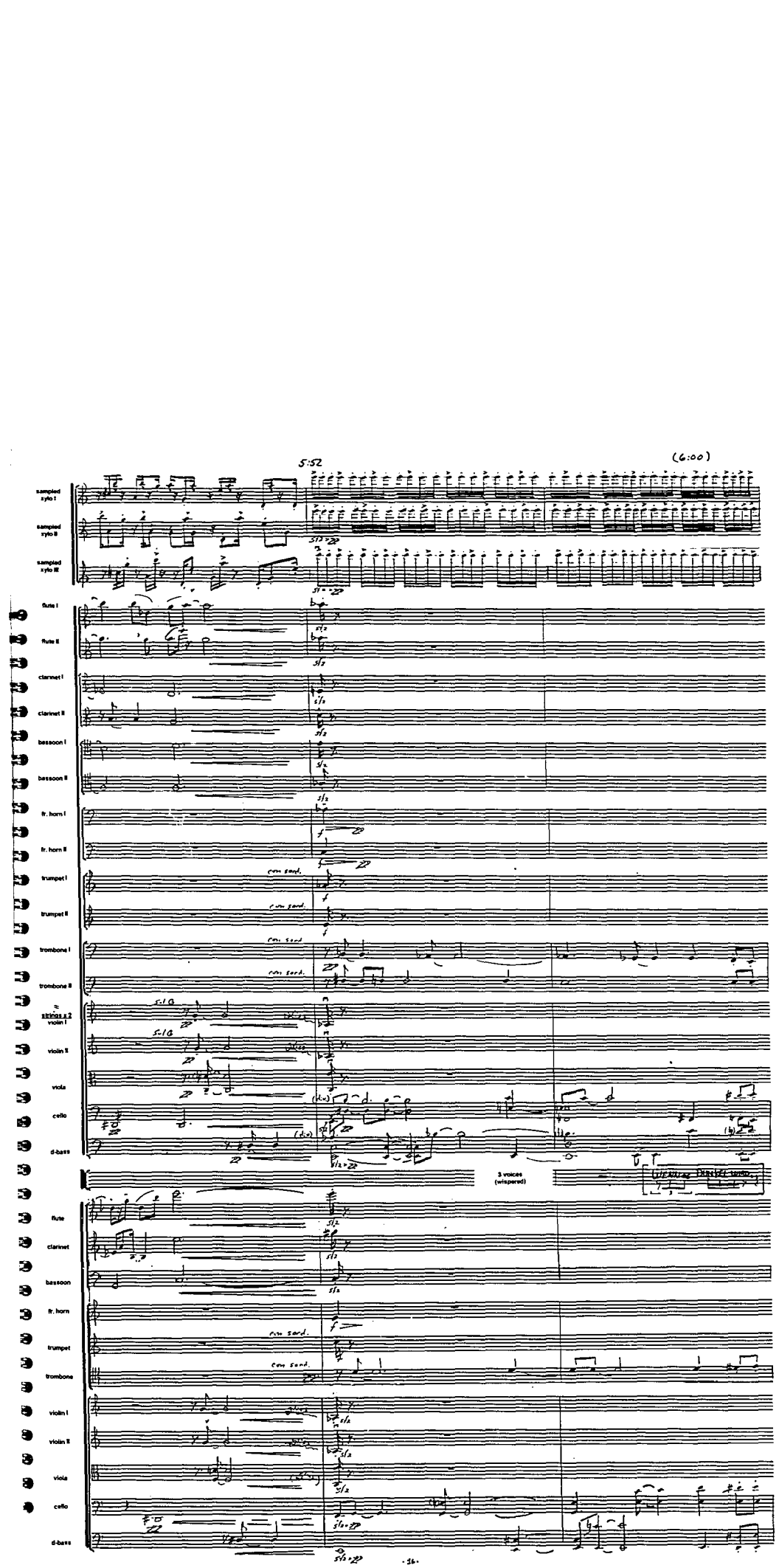

sampled xylo I
sampled xylo II
sampled xylo III
flute I
flute II
bassoon I
bassoon II
fr. horn I
trombone I
trombone II
flute
clarinet
bassoon
fr. horn
trumpet
trombone

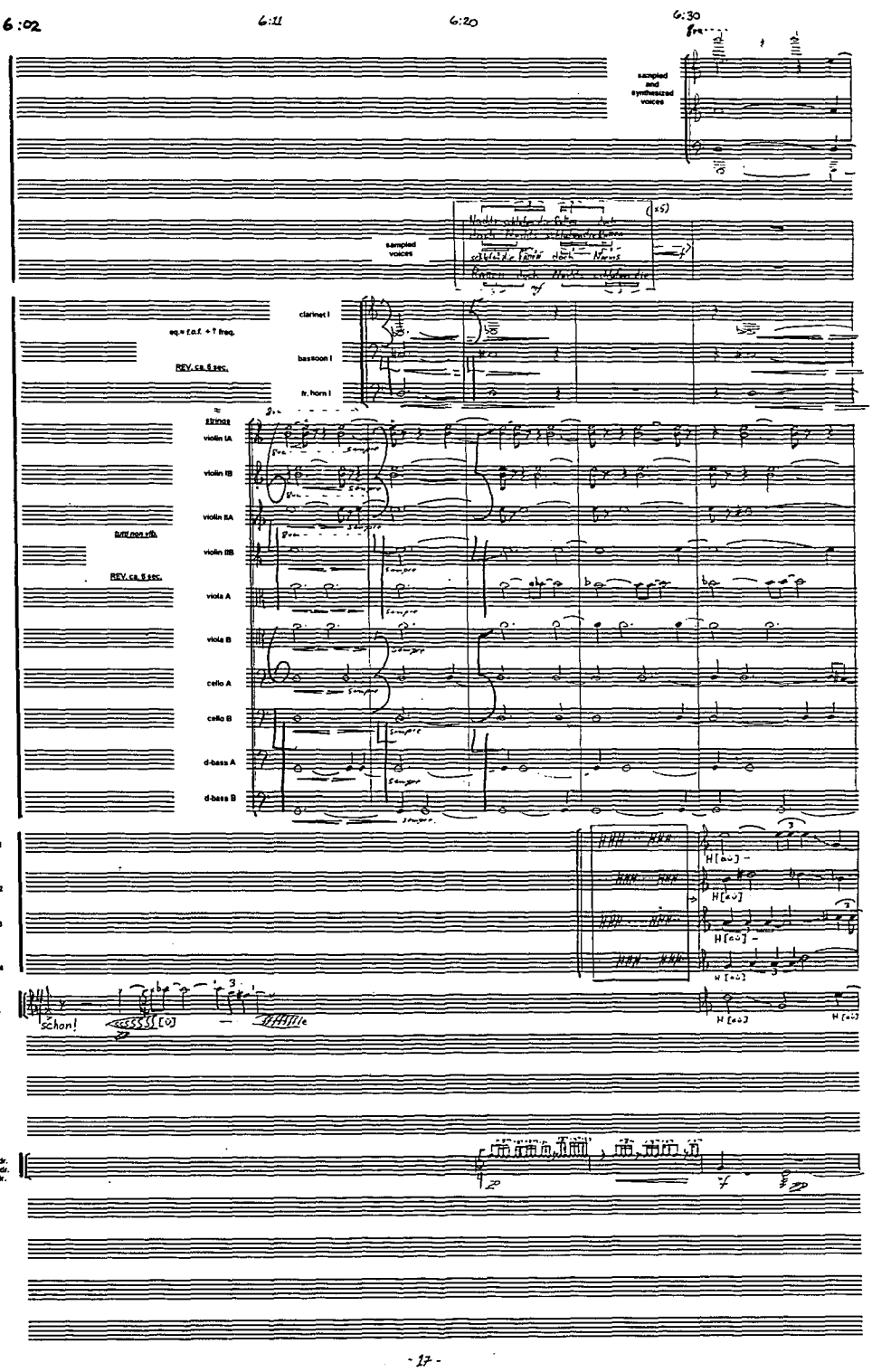

4:27
sampled viola grunts
REV. normal
strings x 2
violin I
violin II
viola
cello
d-bass
voice 1
voice 2
voice 3
solo voice
[ʊ]
[e]
[aʊ]
[ʊ]
[aʊ]
violin I
violin II
viola
cello
d-bass

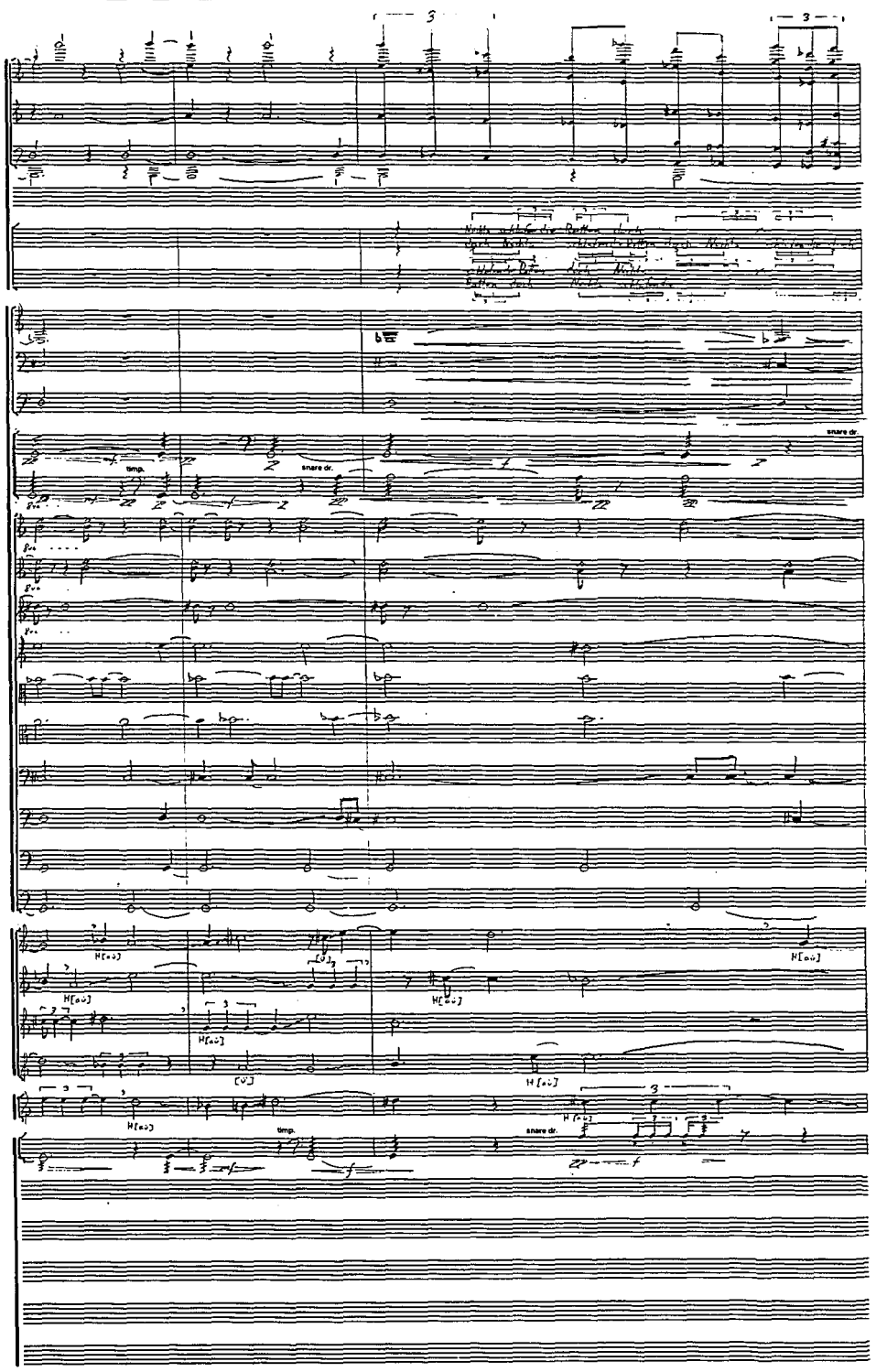

4:53
(5:00)
sampled viola grunts
sampled xylo I
sampled xylo II
sampled xylo III
to marimba
to marimba
to marimba
marimba I
marimba II
marimba III
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
strings x 2
violin I
violin II
viola
cello
d-bass
2 d. bass
4 voices
(whisp.)
NACHTS SCHLAFEN sie IMMER
NACHTS SCHLAFEN sie IMMER
solo voice
flute
clarinet
bassoon
violin I
violin II
viola
cello
d-bass
d. bass

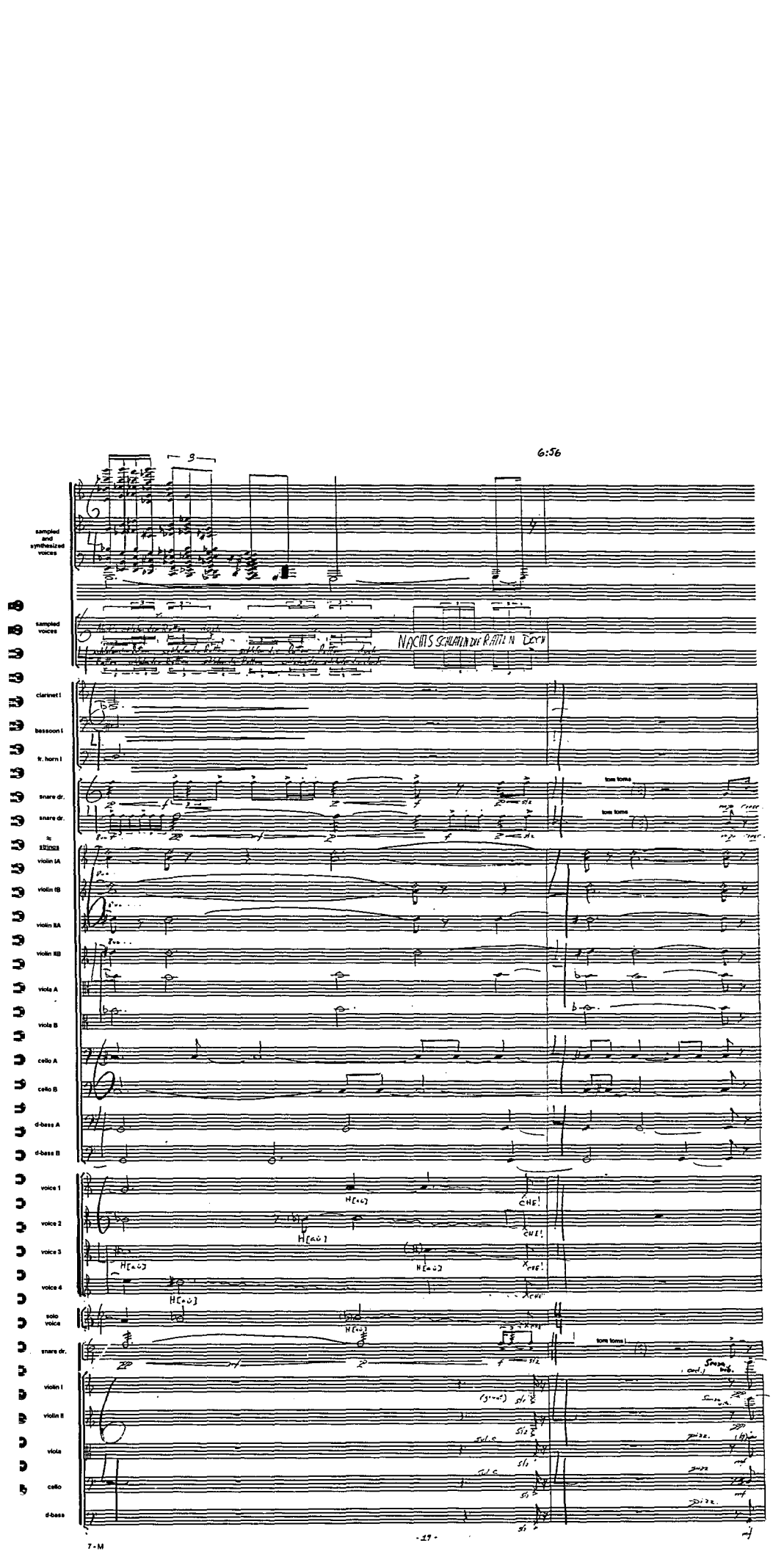

5:27
xylo I
xylo II
xylo III
sampled marimba I
sampled marimba II
sampled marimba III
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
trumpet I
trumpet II
fr. horn I
fr. horn II
2 violas
2 cells
2 d. bass
flute
clarinet
bassoon
trumpet
fr. horn
viola
cello
- 24 -

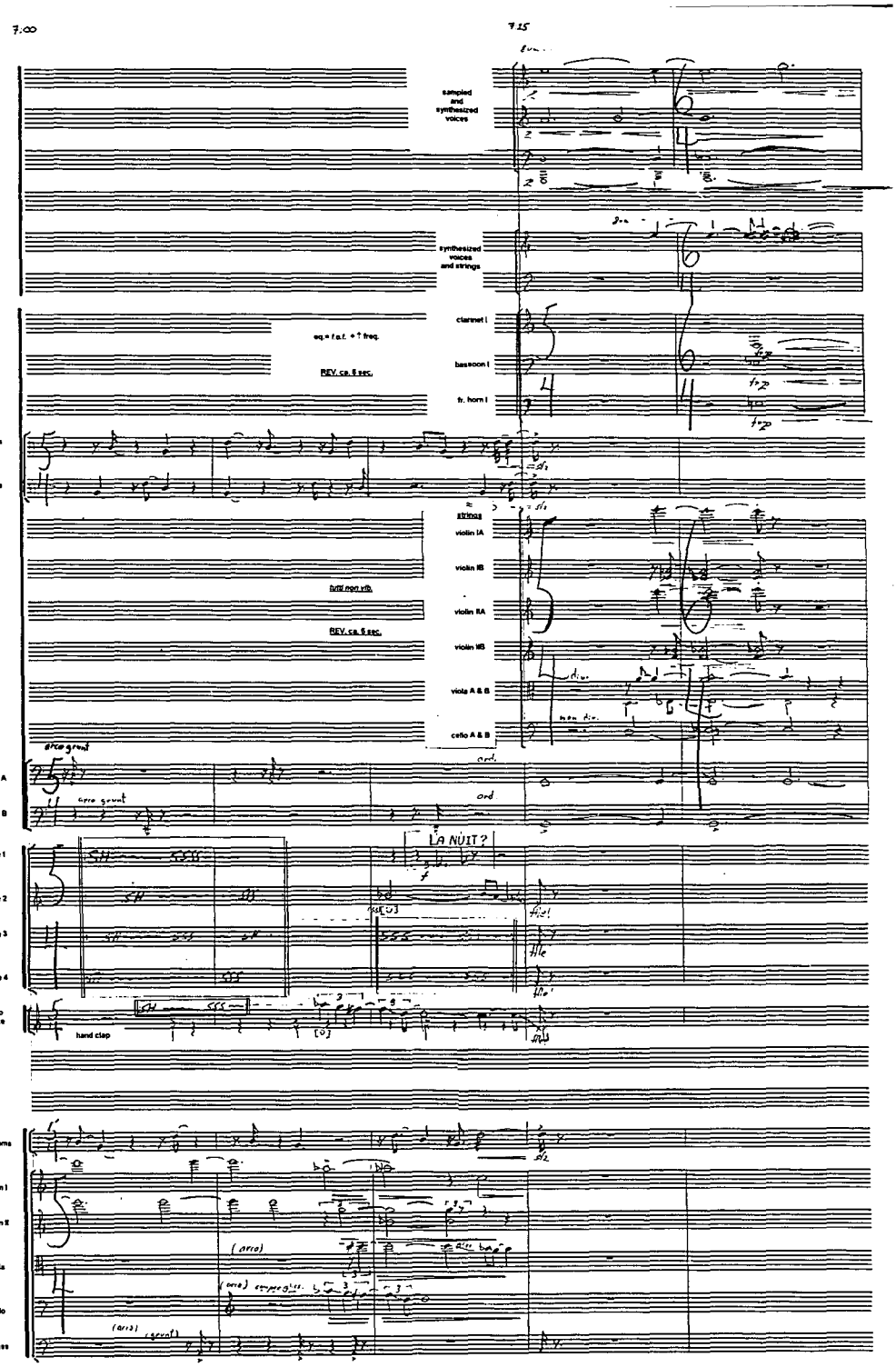

5:31
sampled xylo I
sampled xylo II
sampled xylo III
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
fr. horn I
fr. horn II
trumpet I
trumpet II
trombone I
trombone II
STRINGS x 2
violin I
violin II
viola
cello
d-bass
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
7-M
-15-

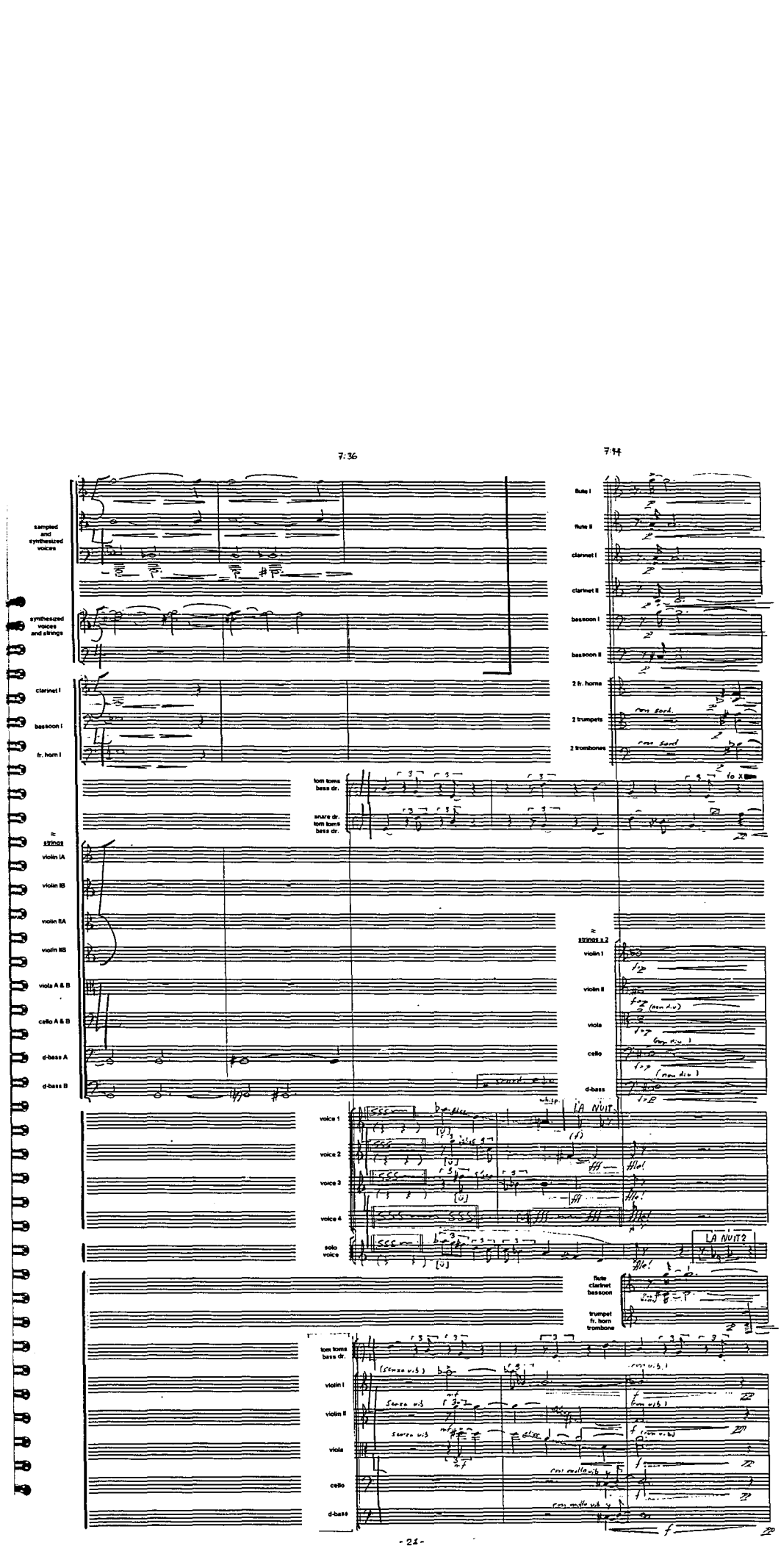

5:52
(6:00)
sampled xylo I
sampled xylo II
sampled xylo III
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
fr. horn I
fr. horn II
trumpet I
trumpet II
trombone I
trombone II
strings 1 & 2
violin I
violin II
viola
cello
d-bass
con sord.
3 voices
(wispered)
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass

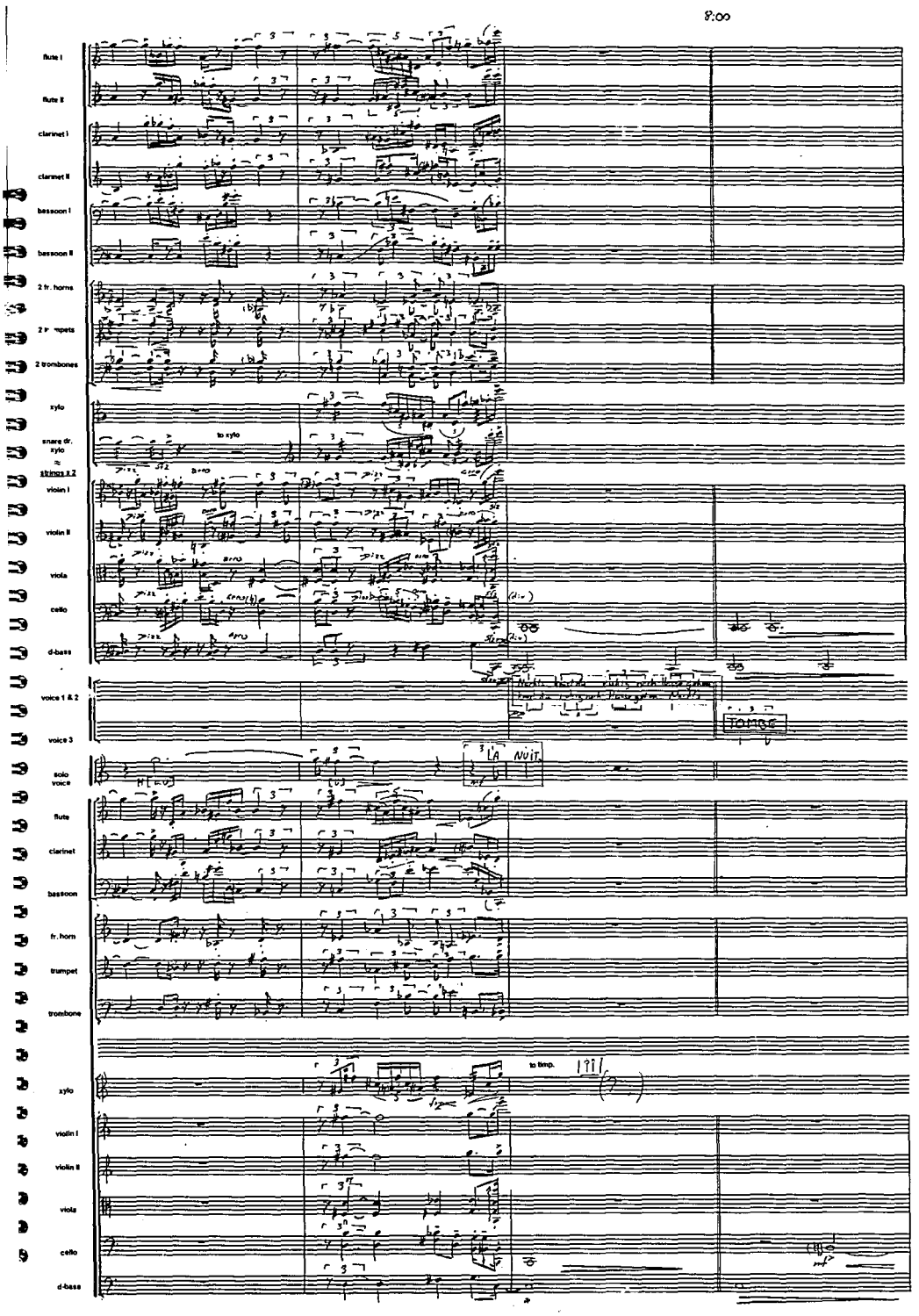

6:02
6:11
6:20
6:30
sampled and synthesized voices
sampled voices
eq.= f.o.f. + f freq.
REV. ca. 6 sec.
clarinet I
bassoon I
fr. horn I
strings
violin IA
violin IB
violin IIA
violin IIB
viola A
viola B
cello A
cello B
d-bass A
d-bass B
DATE non vib.
REV. ca. 6 sec.
voice 1
voice 2
voice 3
voice 4
solo voice
schon!
H[au]
snare dr.
elec. b.dr.
bass dr.


sampled and synthesized voices
sampled voices
clarinet I
bassoon I
fr. horn I
snare dr. timpani bass dr.
snare dr. timpani bass dr.
≈
strings
violin IA
violin IB
violin IIA
violin IIB
viola A
viola B
cello A
cello B
d-bass A
d-bass B
voice 1
voice 2
voice 3
voice 4
solo voice
snare dr. timpani bass dr.
timp.
snare dr.
H[aʊ]


6:56
sampled and synthesized voices
sampled voices
NACHTS SCHLAFEN DIE RATTEN DORF
clarinet I
bassoon I
fr. horn I
snare dr.
snare dr.
tom toms
tom toms
strings
violin IA
violin IB
violin IIA
violin IIB
viola A
viola B
cello A
cello B
d-bass A
d-bass B
voice 1
voice 2
voice 3
voice 4
solo voice
CHE!
snare dr.
tom toms I
violin I
violin II
viola
cello
d-bass
7-M
- 29 -

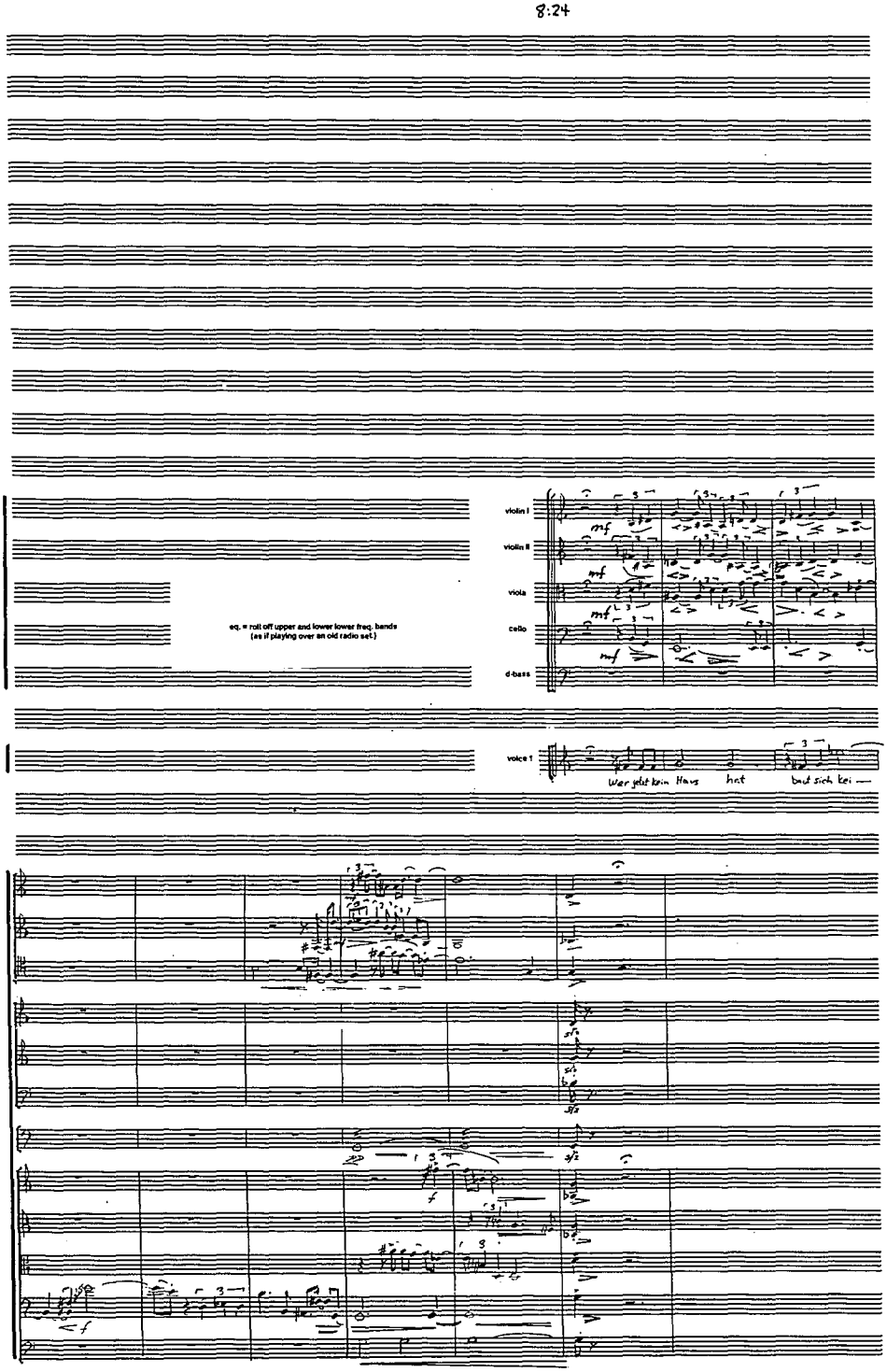

7:00
7:15
sampled and synthesized voices
synthesized voices and strings
clarinet I
bassoon I
fr. horn I
eq = f.o.f. + ↑ freq.
REV. ca. 8 sec.
tom toms
tom toms
strings
violin IA
violin IB
violin IIA
violin IIB
viola A & B
cello A & B
full non vib.
REV. ca. 8 sec.
arco grand
ord.
d-bass A
d-bass B
LA NUIT ?
voice 1
voice 2
voice 3
voice 4
solo voice
hand clap
tom toms
violin I
violin II
viola
cello
d-bass
(arco)
(arco) sempre
(arco)
(senza)

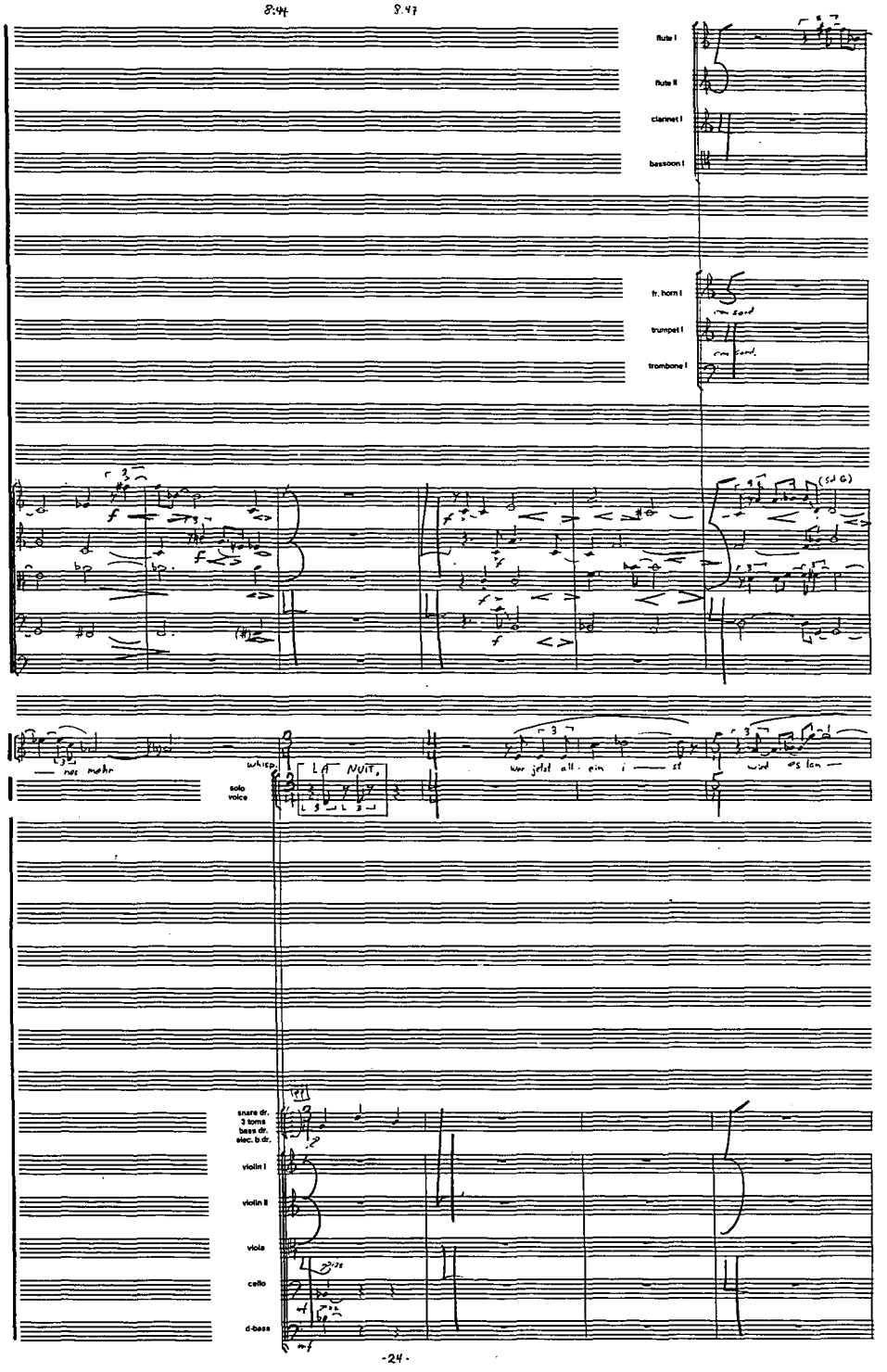

7:36
7:44
sampled and synthesized voices
synthesized voices and strings
clarinet I
bassoon I
fr. horn I
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
2 fr. horns
2 trumpets
2 trombones
con sord.
con sord
tom toms bass dr.
snare dr. tom toms bass dr.
10 X
strings
violin IA
violin IB
violin IIA
violin IIB
viola A & B
cello A & B
d-bass A
d-bass B
strings x 2
violin I
violin II
viola
cello
d-bass
(non div.)
voice 1
voice 2
voice 3
voice 4
solo voice
LA NUIT
Ho!
flute
clarinet
bassoon
trumpet
fr. horn
trombone
(senza vib.)
senza vib
non molto vib.
- 21 -

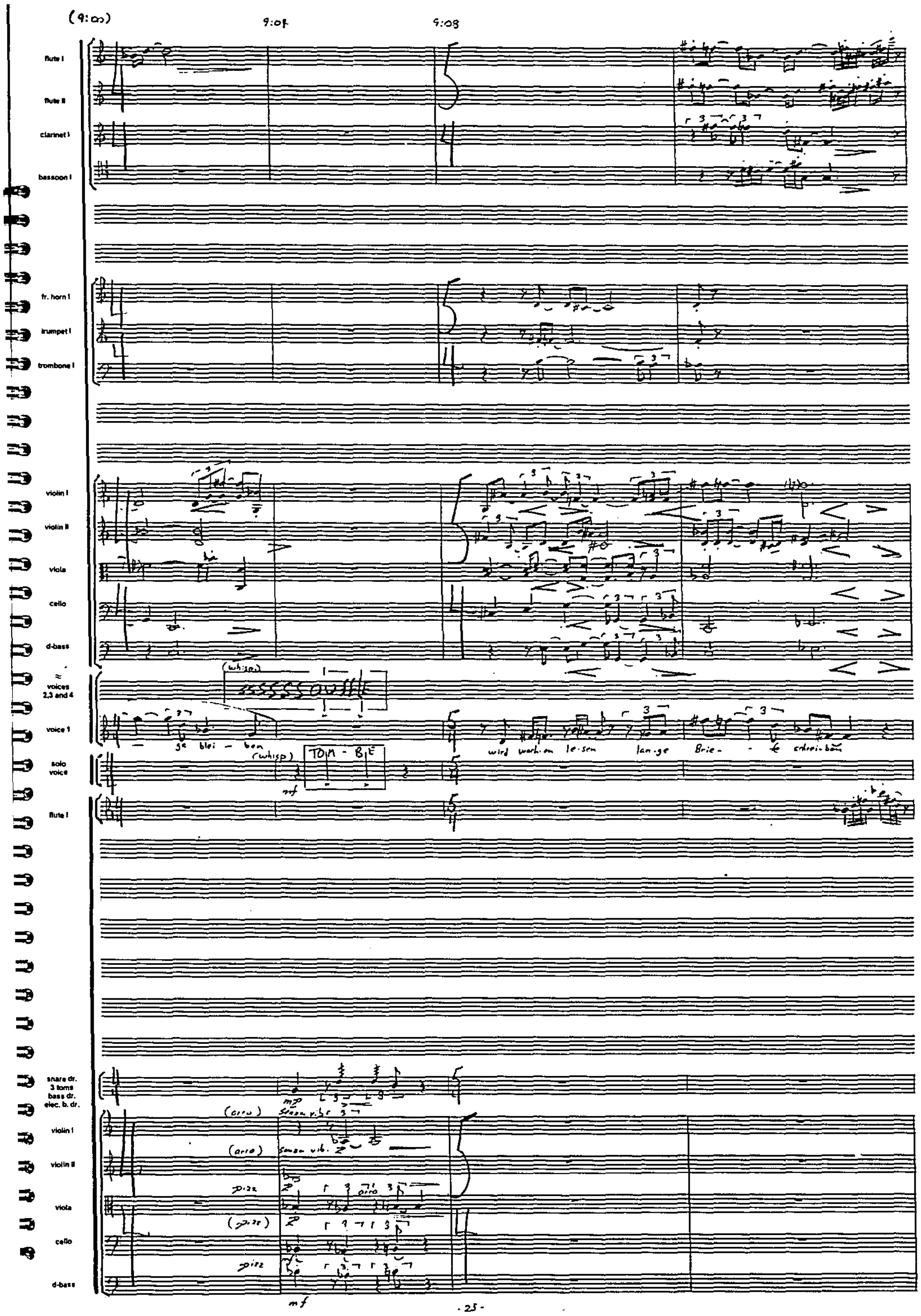


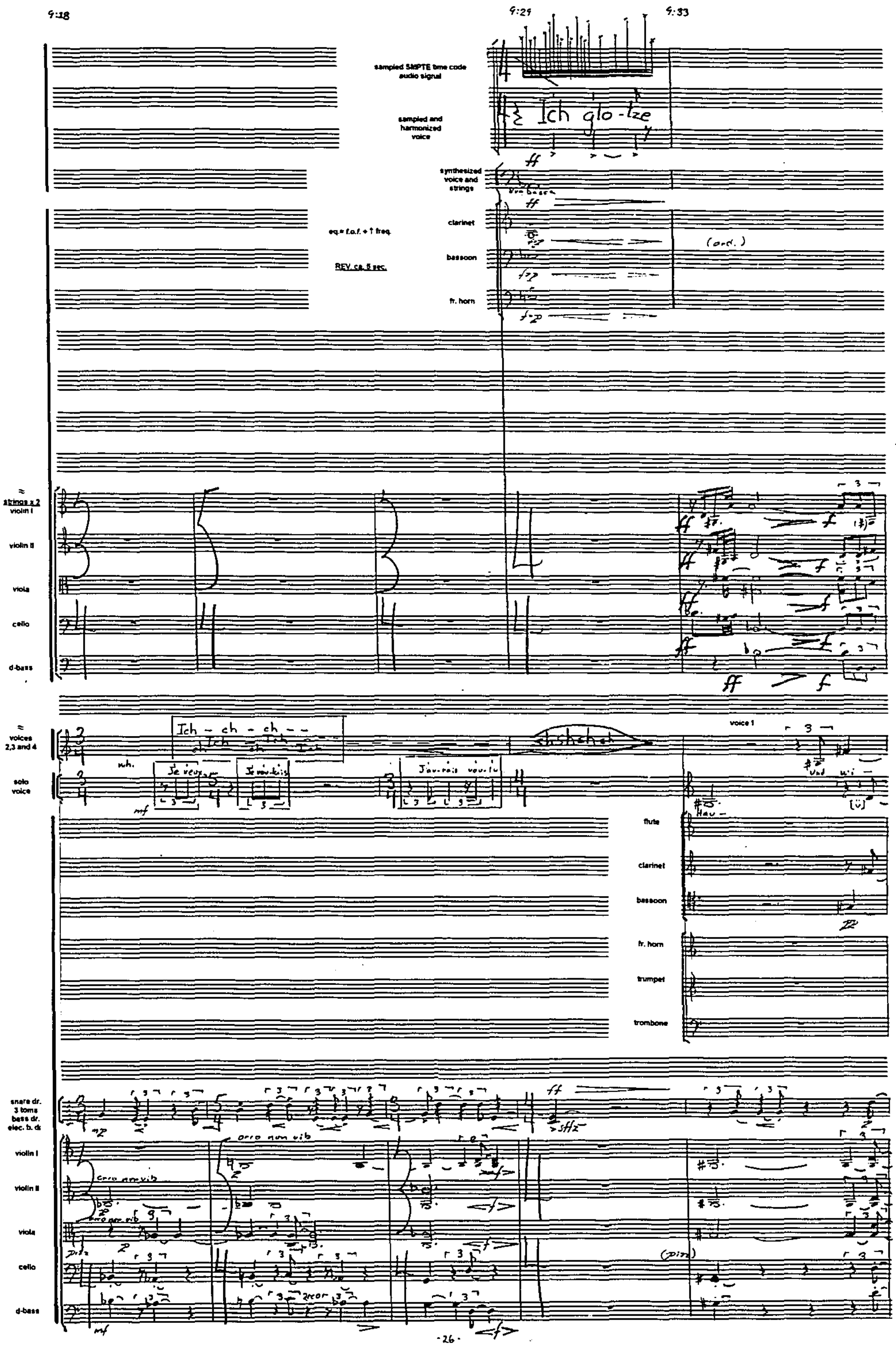
*8va basso with extension

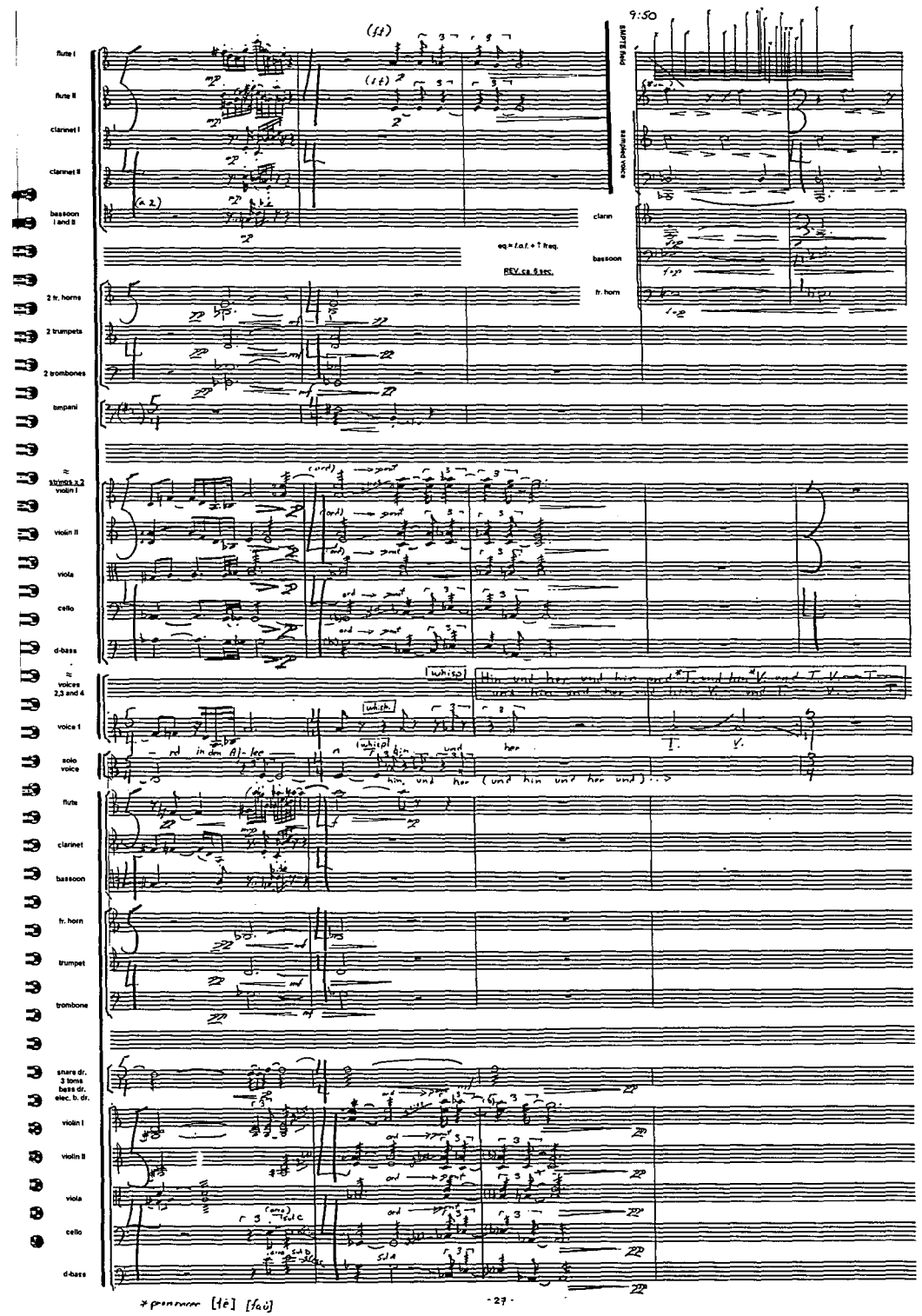
8:24

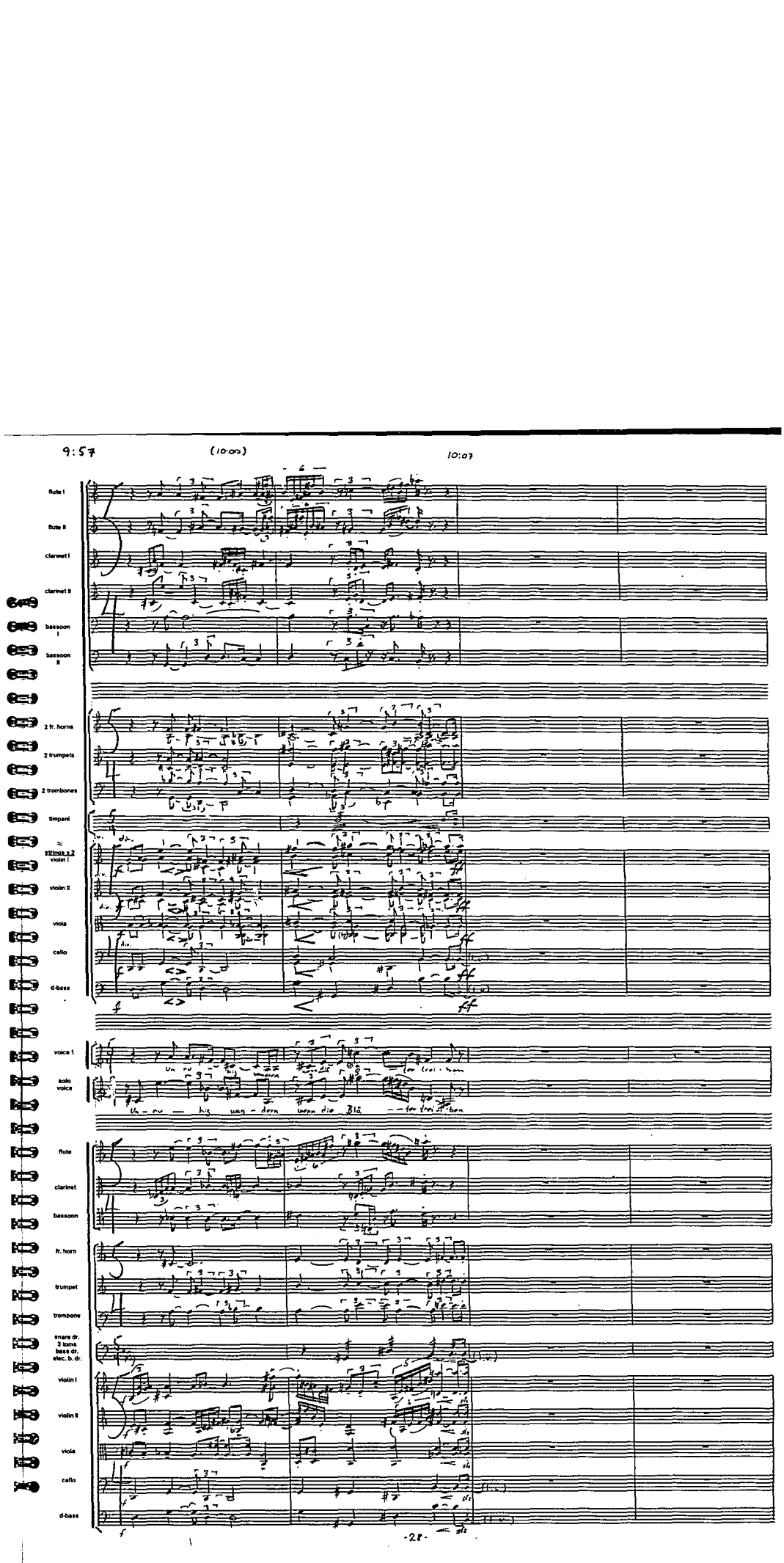

violin I
violin II
viola
cello
d-bass
mf
eq. = roll off upper and lower lower freq. bands
(as if playing over an old radio set.)
voice 1
Wer gelt kein Haus hat baut sich kei —
flute
clarinet
bassoon
french horn
trumpet
trombone
timpani
violin I
violin II
viola
cello
d-bass

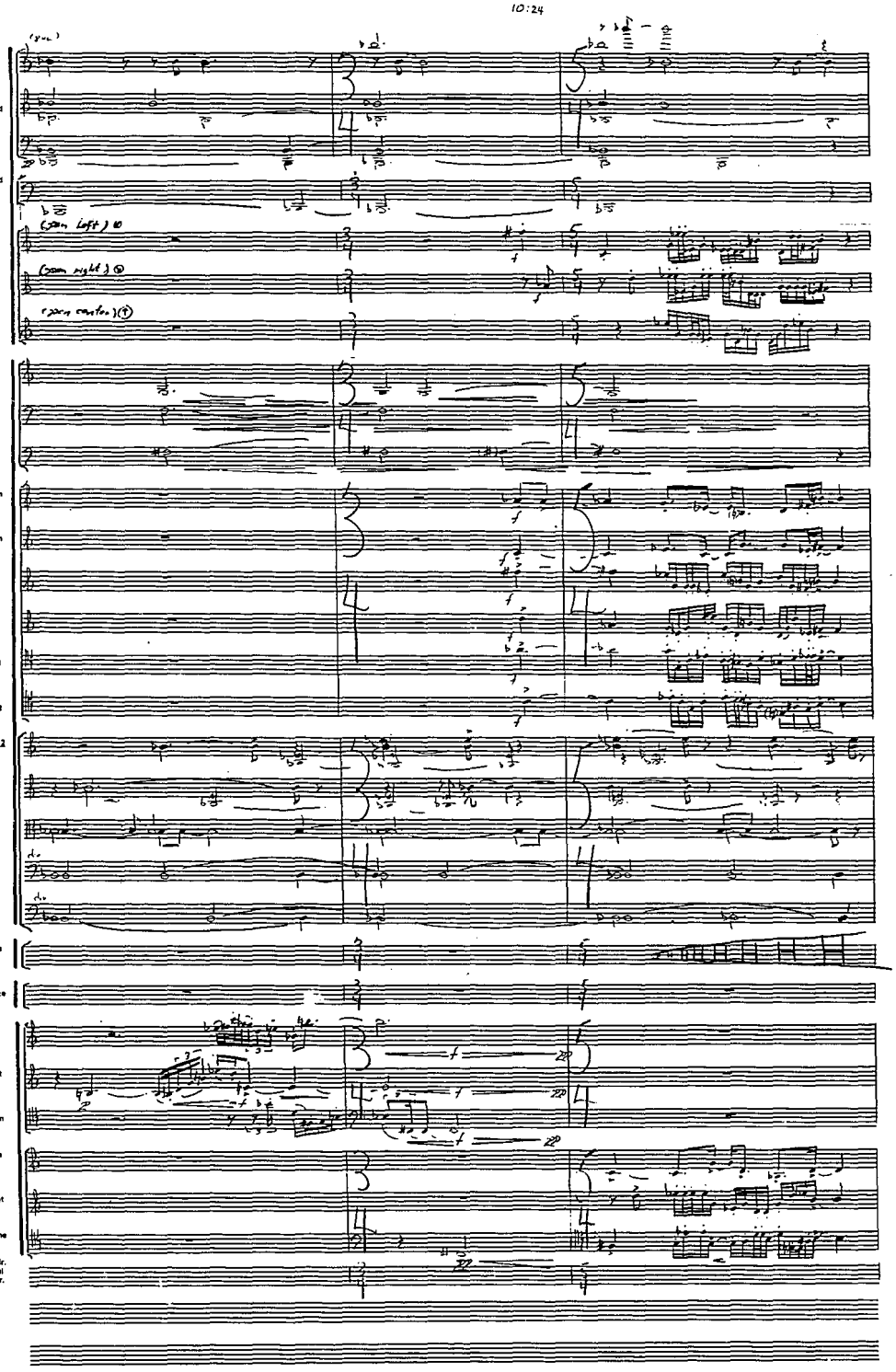

8:44
8:47
flute I
flute II
clarinet I
bassoon I
fr. horn I
trumpet I
trombone I
violin I
violin II
viola
cello
d-bass
voice 1
solo voice
snare dr.
3 toms
bass dr.
elec. b dr.
violin I
violin II
viola
cello
d-bass


(9:00)
9:04
9:08
flute I
flute II
clarinet I
bassoon I
fr. horn I
trumpet I
trombone I
violin I
violin II
viola
cello
d-bass
voices 2,3 and 4
voice 1
solo voice
flute I
snare dr. 3 toms bass dr. elec. b. dr.
violin I
violin II
viola
cello
d-bass
(whisp.)
(whisp.)
pizz
mf

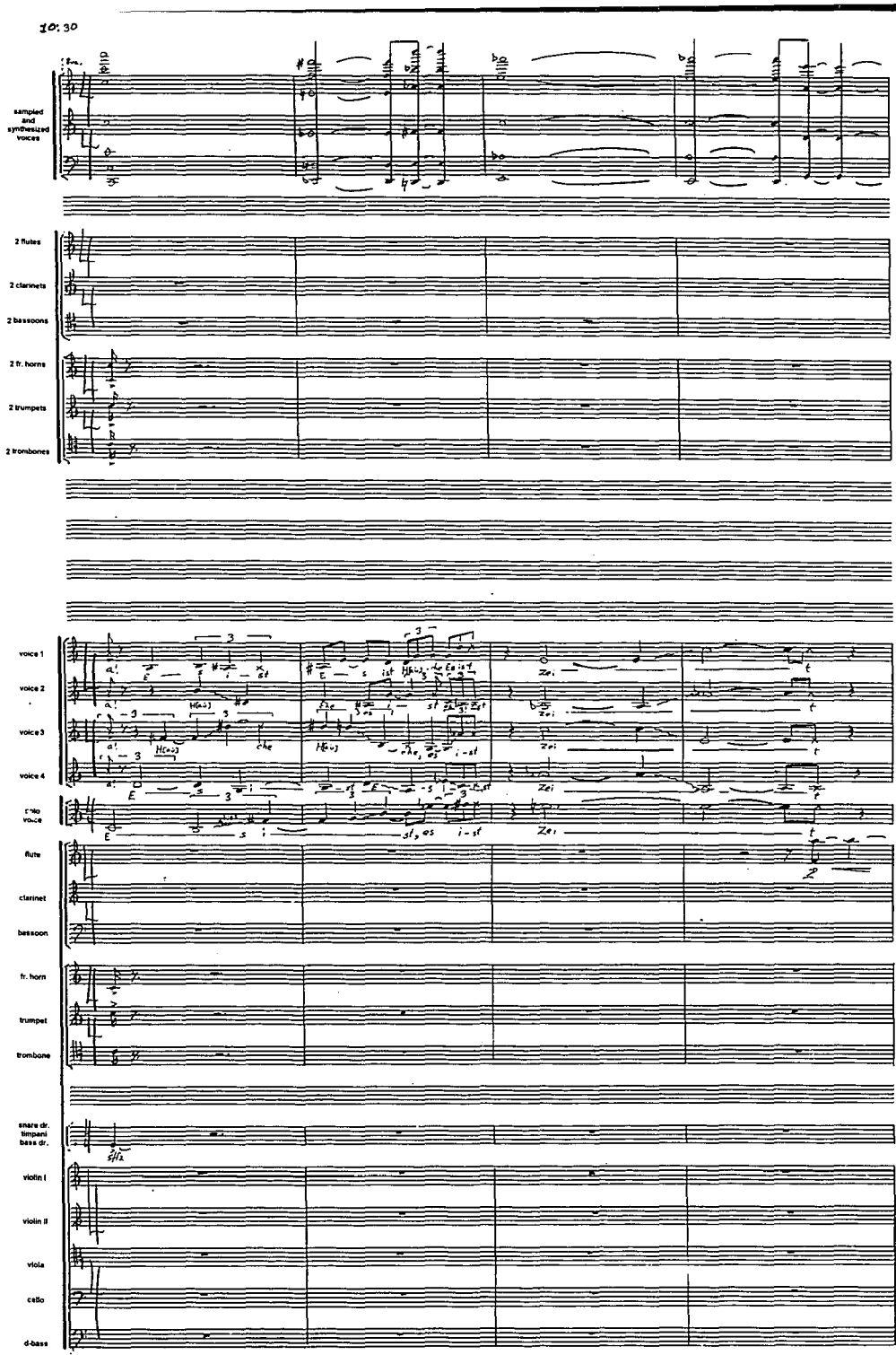

9:28
9:29
9:33
sampled SMPTE time code audio signal
sampled and harmonized voice
Ich glo-tze
synthesized voice and strings
eq + f.o.f. + ↑ freq.
REV. ca. 8 sec.
clarinet
bassoon
fr. horn
(ord.)
strings x 2
violin I
violin II
viola
cello
d-bass
voices 2,3 and 4
Ich - ch - ch - -
solo voice
Je veux
Je voudrais
J'aurais voulu
voice 1
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr.
3 toms
bass dr.
elec. b. dr.
violin I
violin II
viola
cello
d-bass

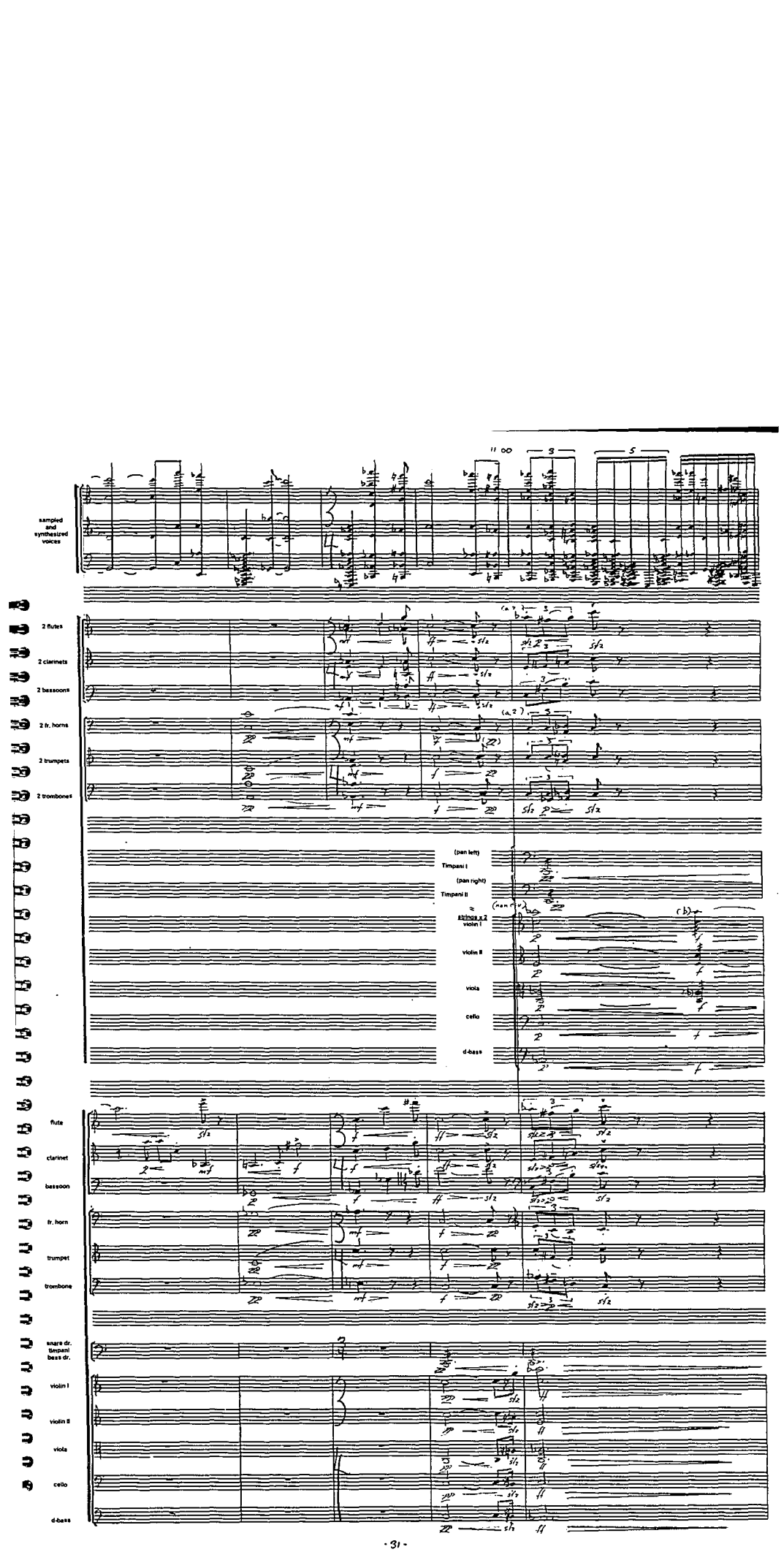

flute I
flute II
clarinet I
clarinet II
bassoon I and II
2 fr. horns
2 trumpets
2 trombones
timpani
strings x 2
violin I
violin II
viola
cello
d-bass
voices 2,3 and 4
voice 1
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr. 3 toms bass dr. elec. b. dr.
violin I
violin II
viola
cello
d-bass
(ff)
(a 2)
clarin
bassoon
fr. horn
eq × f.o.f. + f freq.
REV. ca 6 sec.
sampled voice
9:50
(ord)
sul pont
whisp
him und her
(und hin und her und)
* pronounce [tē] [faü]

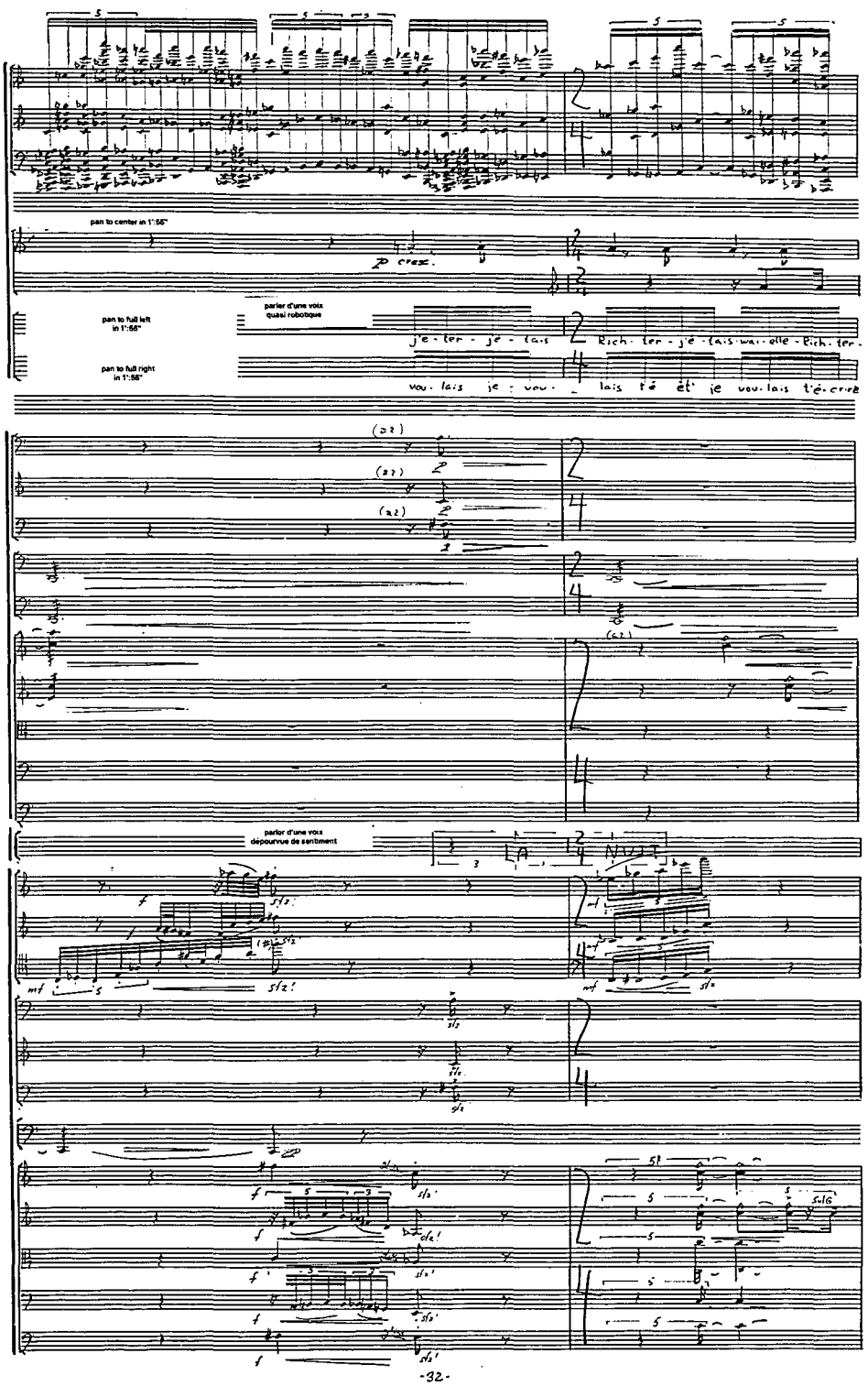

9:57
(10:00)
10:07
flute I
flute II
clarinet I
clarinet II
bassoon I
bassoon II
2 fr. horns
2 trumpets
2 trombones
timpani
violin I
violin II
viola
cello
d-bass
voice 1
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr.
3 toms
bass dr.
elec. b. dr.
violin I
violin II
viola
cello
d-bass
-28-

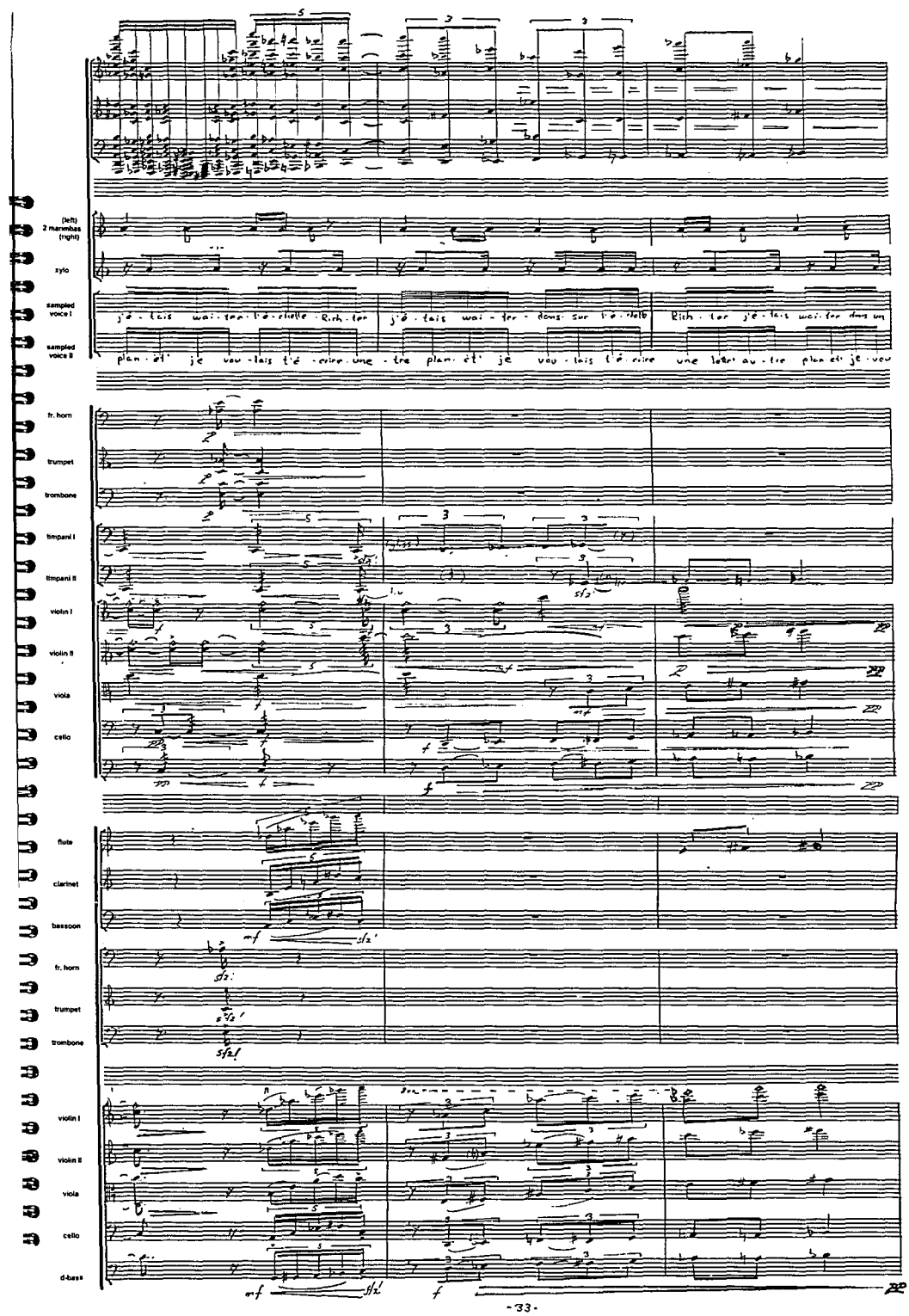

sampled and synthesized voices
synthesized voice and strings
marimba I
marimba II
Xylo
clarinet
bassoon
fr. horn
french horn I
french horn II
trumpet I
trumpet II
trombone I
trombone II
= strings x 2
violin I
violin II
viola
cello
d-bass
4 voices
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr.
timpani
bass dr.

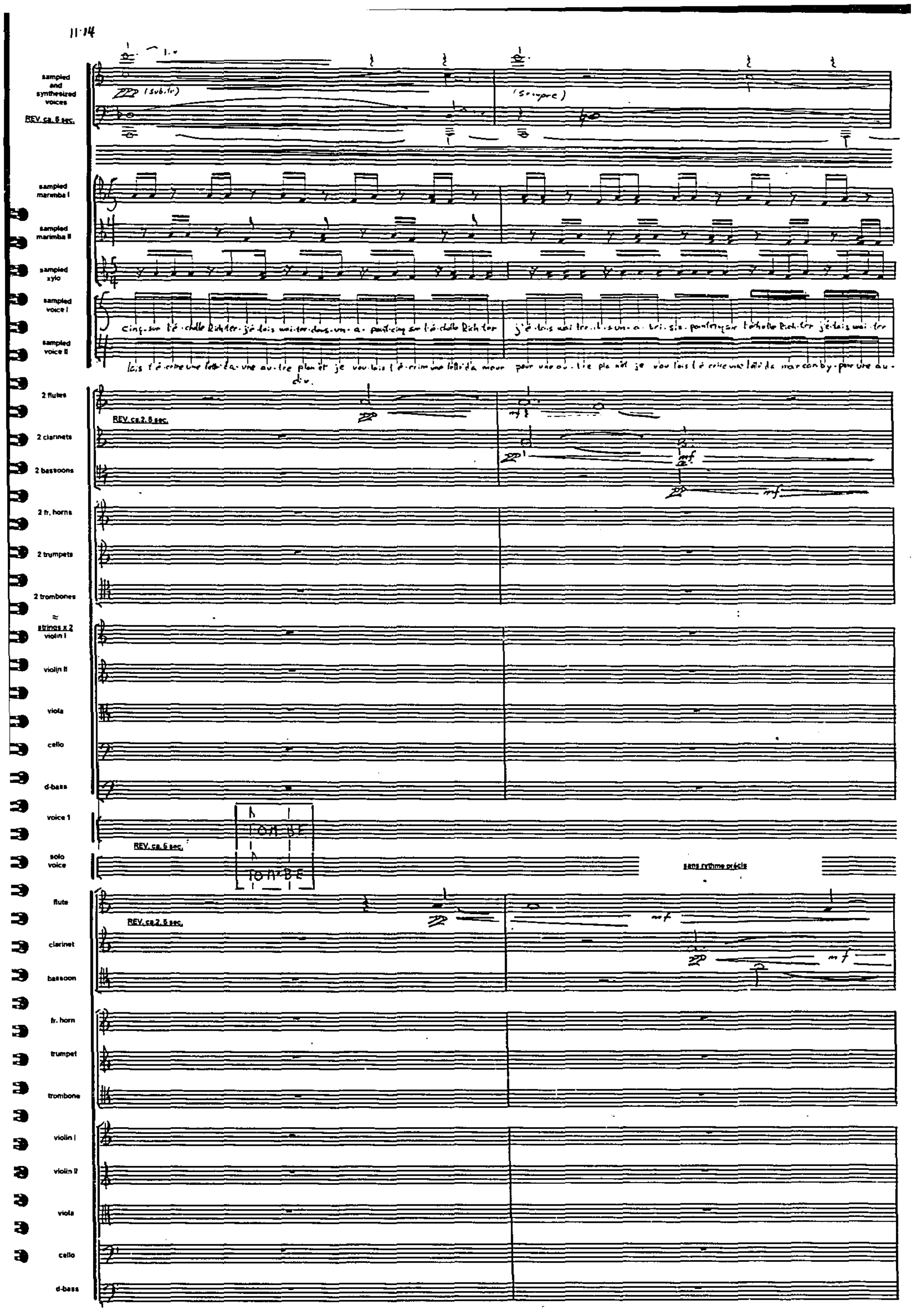
10:30

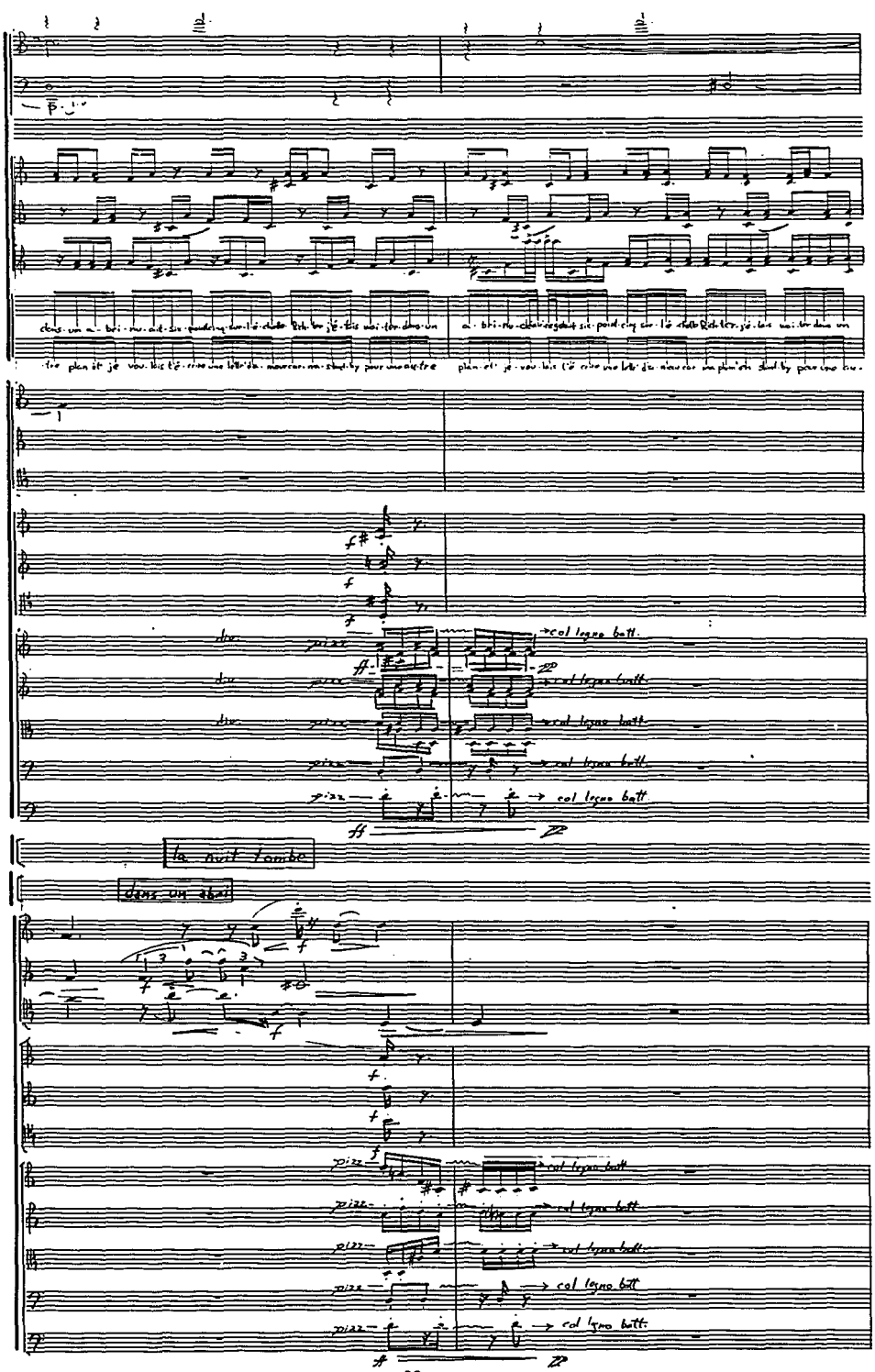

sampled and synthesized voices
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
voice 1
voice 2
voice 3
voice 4
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr.
timpani
bass dr.
violin I
violin II
viola
cello
d-bass

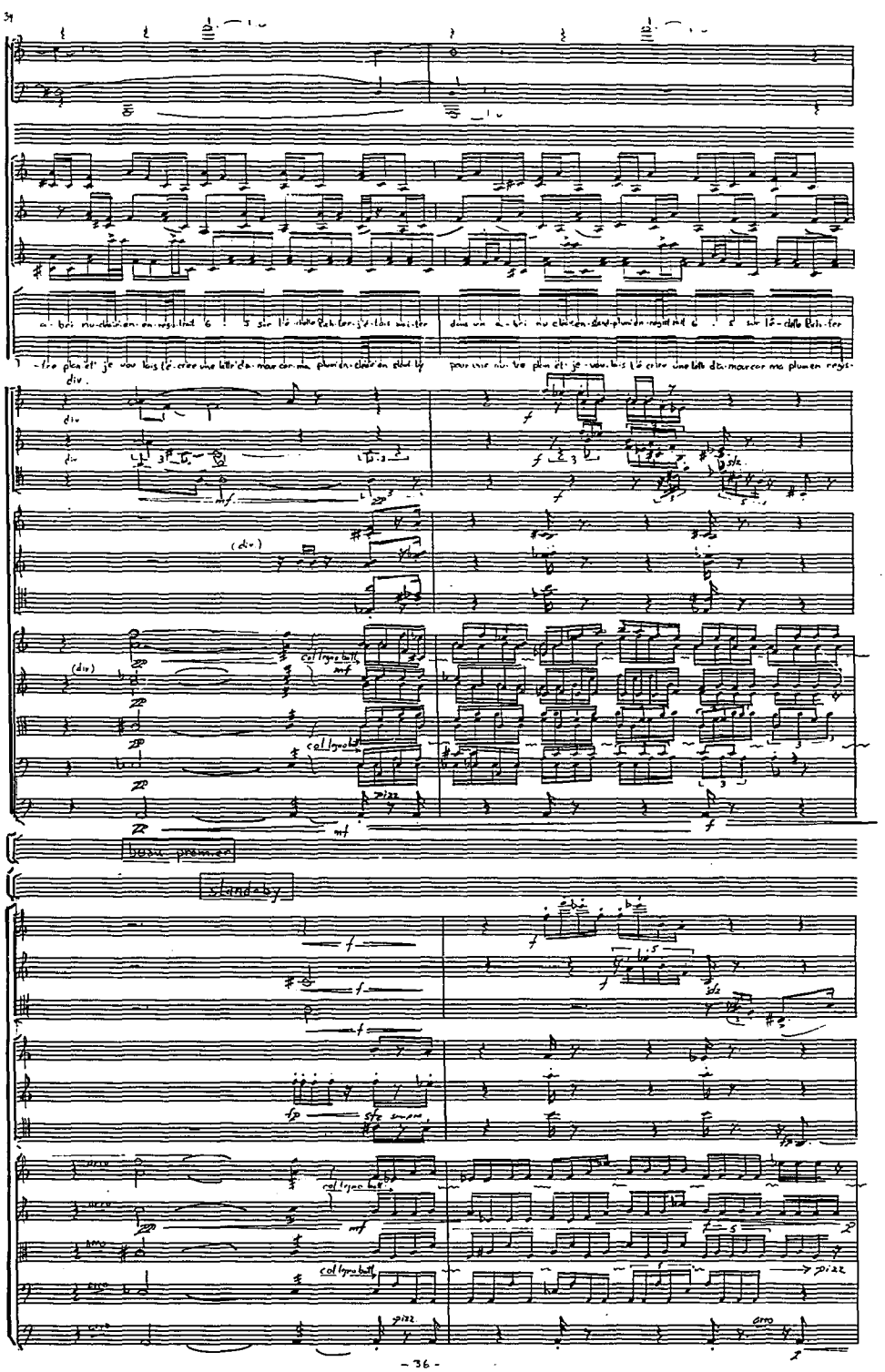

sampled and synthesized voices
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
(pan left)
Timpani I
(pan right)
Timpani II
strings x 2
violin I
violin II
viola
cello
d-bass
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr.
timpani
bass dr.
violin I
violin II
viola
cello
d-bass

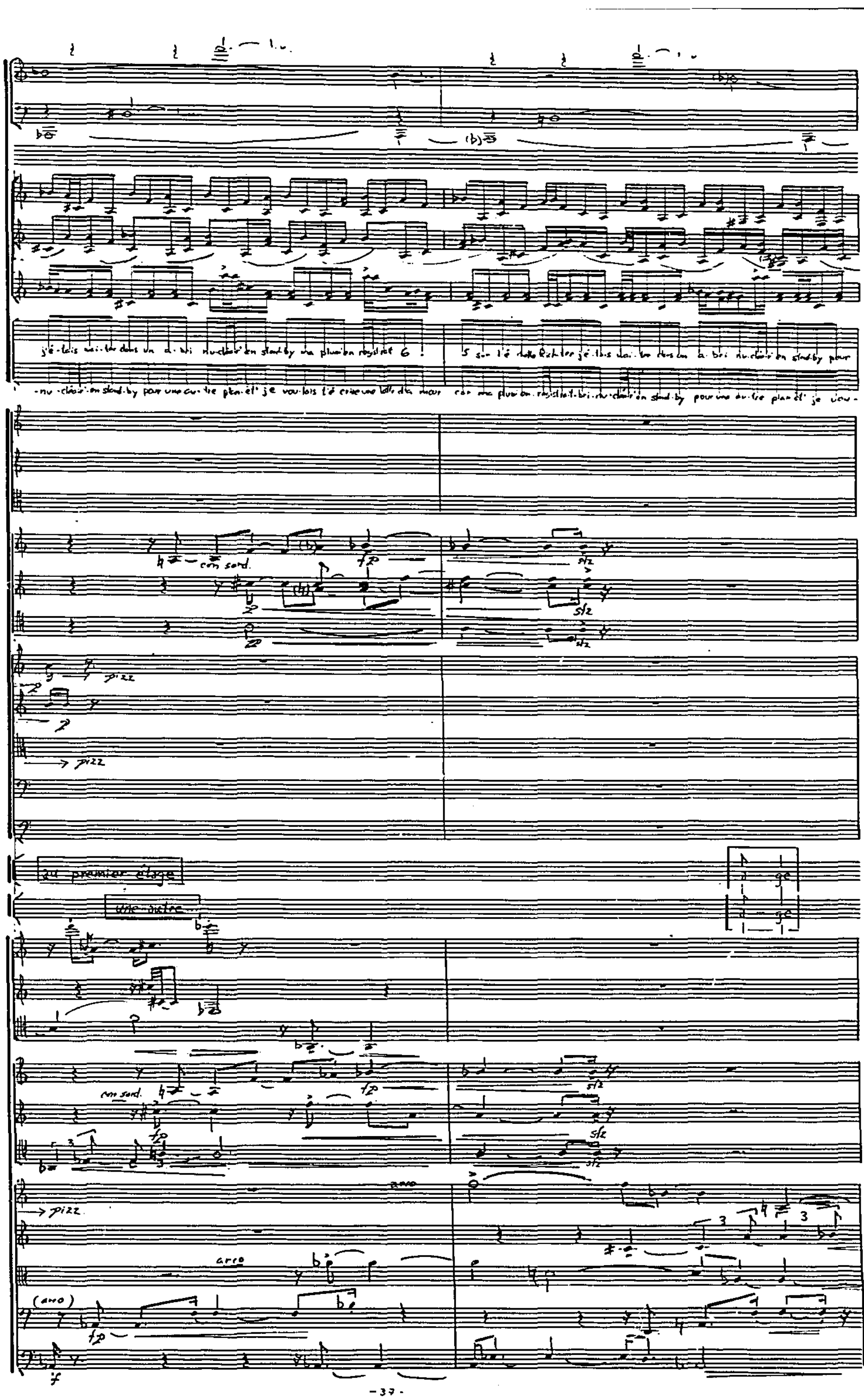

sampled and synthesized voices
pan to center in 1':55"
[left] 2 marimbas (right)
xylophone
parler d'une voix quasi robotique
pan to full left in 1':55"
sampled voice I
pan to full right in 1':55"
sampled voice II
je - ter - je - tais
Rich - ter - je - tais - wai - elle - Rich - ter -
vou - lais je - vou - lais té ét' je vou - lais t'é - crire
trumpet
trombone
timpani I
timpani II
violin I
violin II
viola
cello
d-bass
solo voice
parler d'une voix dépourvue de sentiment
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr. timpani bass dr.
violin I
violin II
viola
cello
d-bass

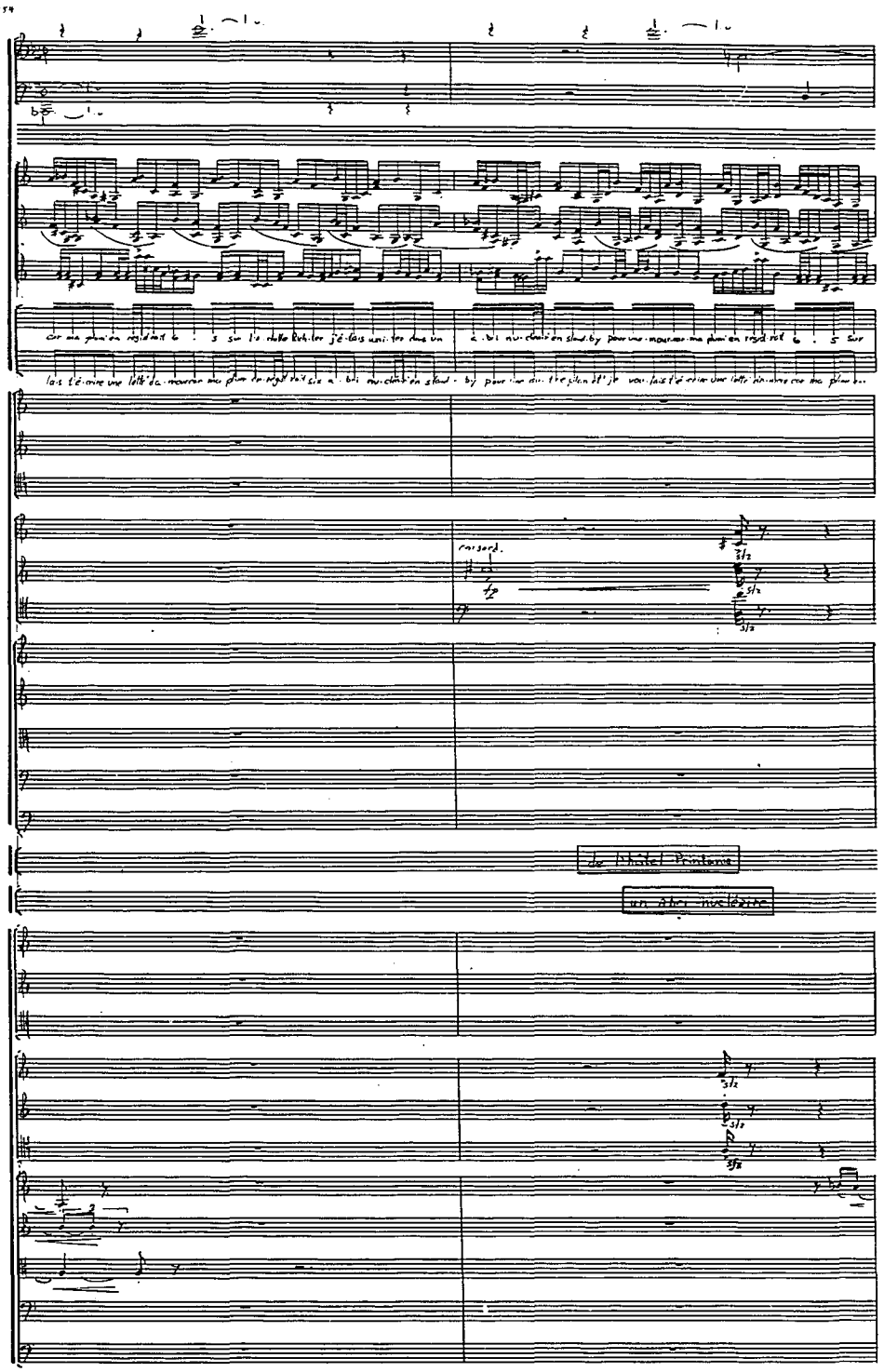

(left) 2 marimbas (right)
xylo
sampled voice I
sampled voice II
fr. horn
trumpet
trombone
timpani I
timpani II
violin I
violin II
viola
cello
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
j'é - tais wai - ter - dans sur l'é - toile Rich - ter
j'é - tais wai - ter - dans sur l'é - toile
Rich - ter j'é - tais wai - ter dans un
plan - ét' je vou - lais t'é - crire une - tre
plan - ét' je vou - lais t'é - crire une
lettre au - tre plan ét je vou

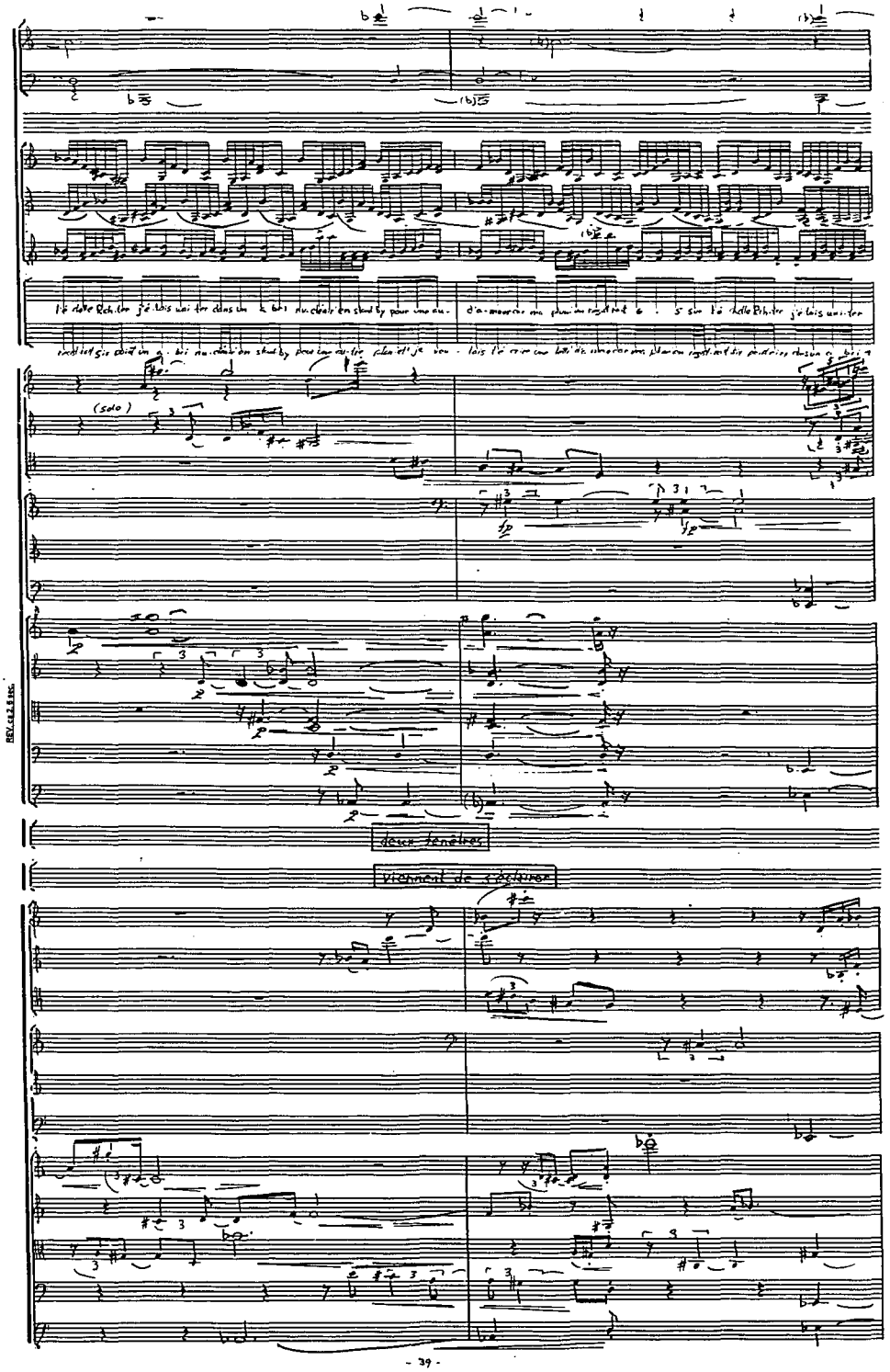

11·14
sampled and synthesized voices
REV. ca. 6 sec.
sampled marimba I
sampled marimba II
sampled xylo
sampled voice I
sampled voice II
2 flutes
REV. ca.2. 6 sec.
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
strings x 2
violin I
violin II
viola
cello
d-bass
voice 1
REV. ca. 6 sec.
solo voice
sans rythme précis
flute
REV. ca.2. 6 sec.
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass

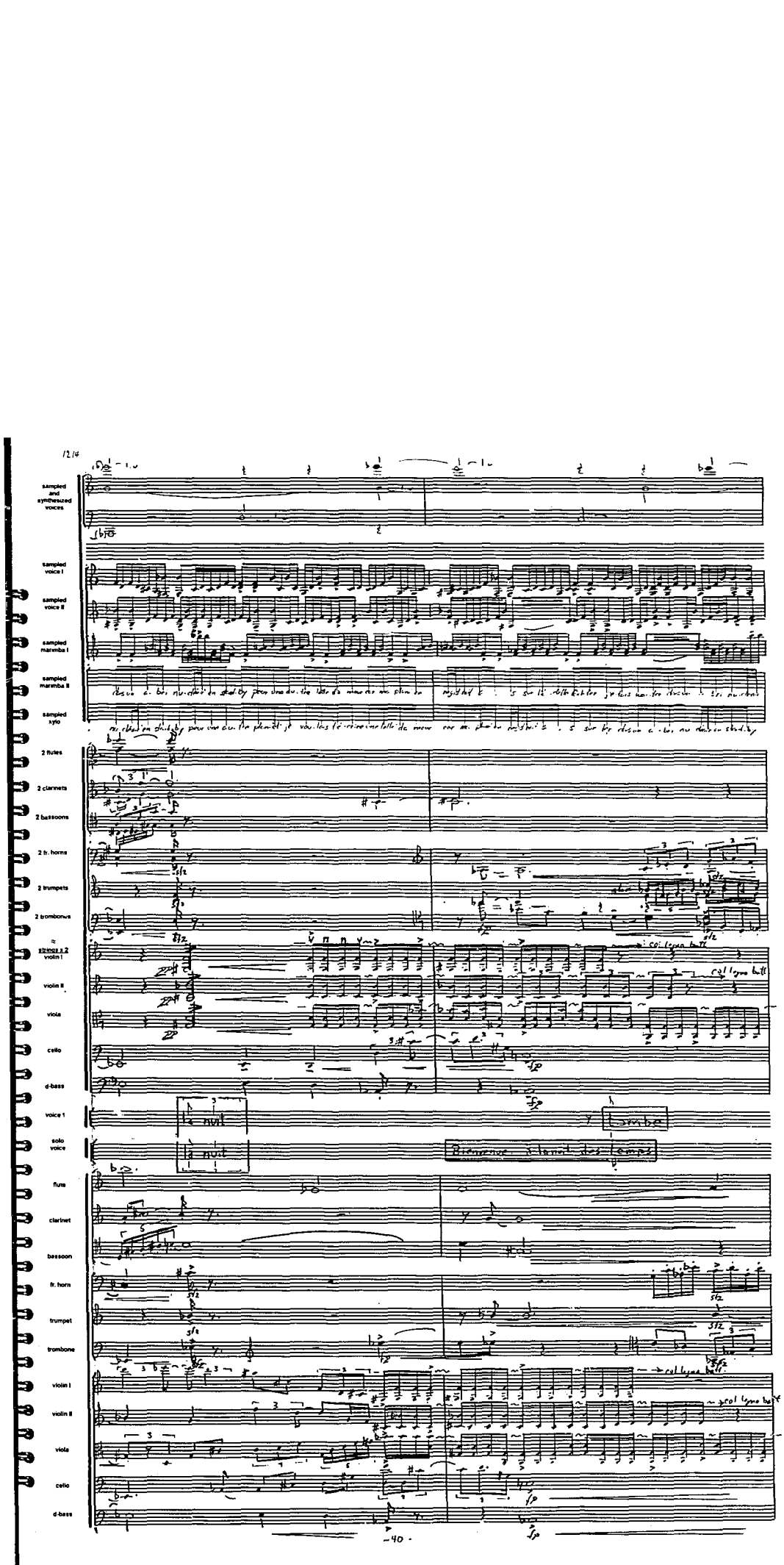

la nuit tombe
dans un abri
col legno batt.

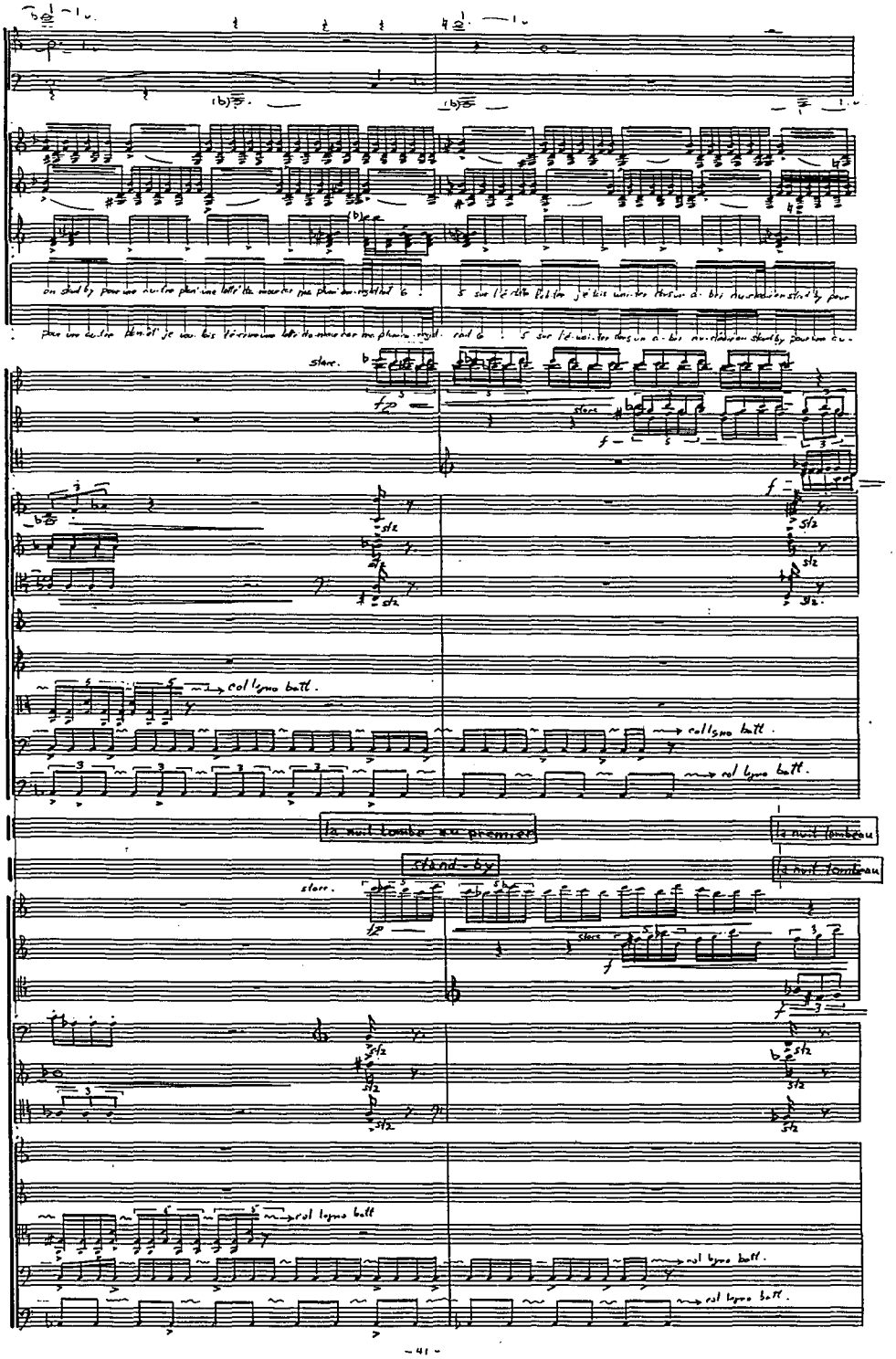

sampled and synthesized voices
sampled marimba I
sampled marimba II
sampled xylo
sampled voice I
sampled voice II
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 gombones
strings x 2
violin I
violin II
viola
cello
d-bass
voice I
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
stand-by

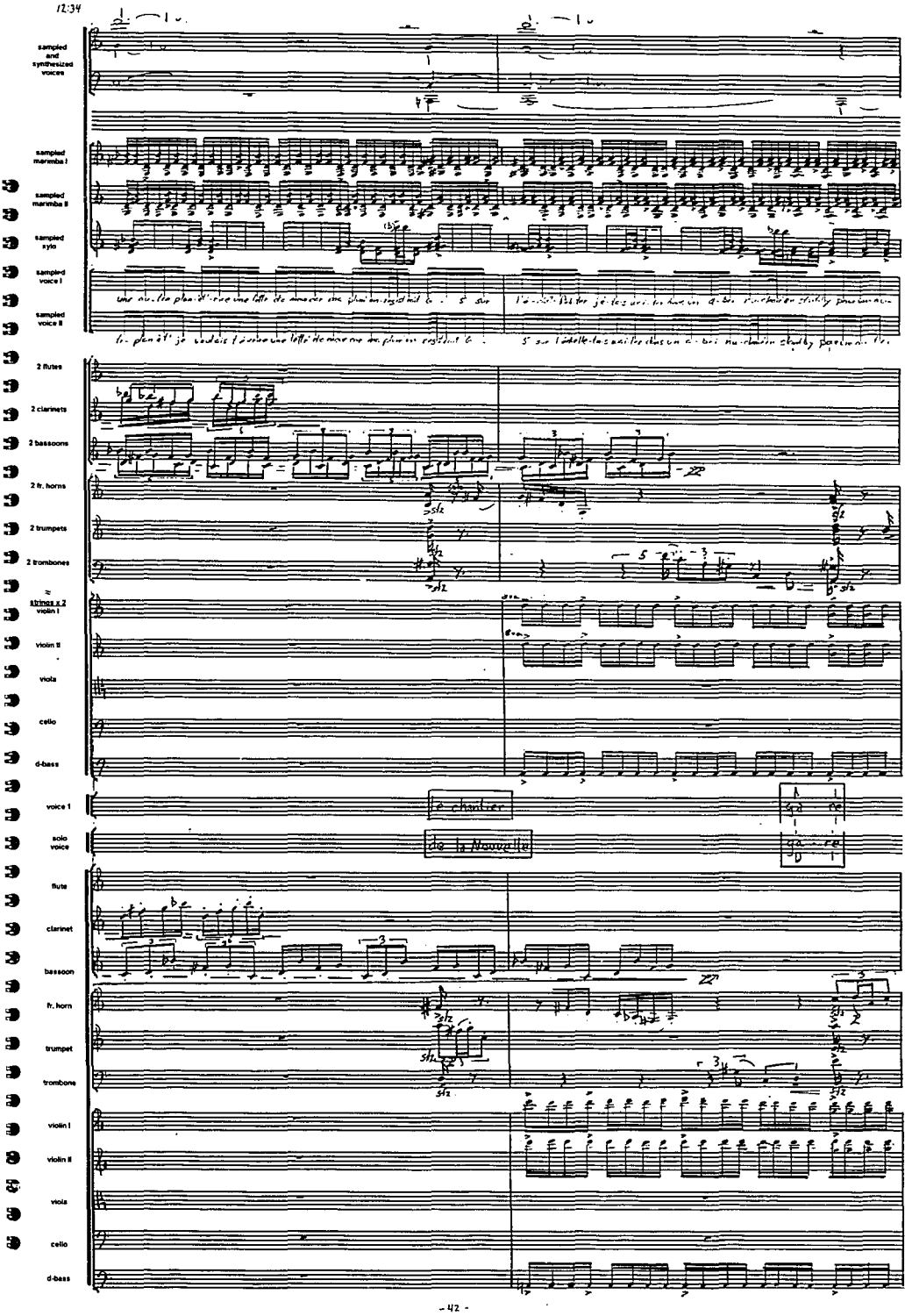

j'é-tais nu-cléaire dans un a-bri nu-cléaire en stand-by ma plu-ton-rési-stant 6 !
5 sur l'é-chelle Richter j'é-tais nu-cléaire dans un a-bri nu-cléaire en stand-by pour
-nu-cléaire en stand-by pour une au-tre pla-nète je vou-lais t'é-crire une lettre d'a-mour car ma plu-ton-rési-stant a-bri nu-cléaire en stand-by pour une au-tre pla-nète je vou-
con sord.
pizz
au premier étage
une autre...
arco
(arco)

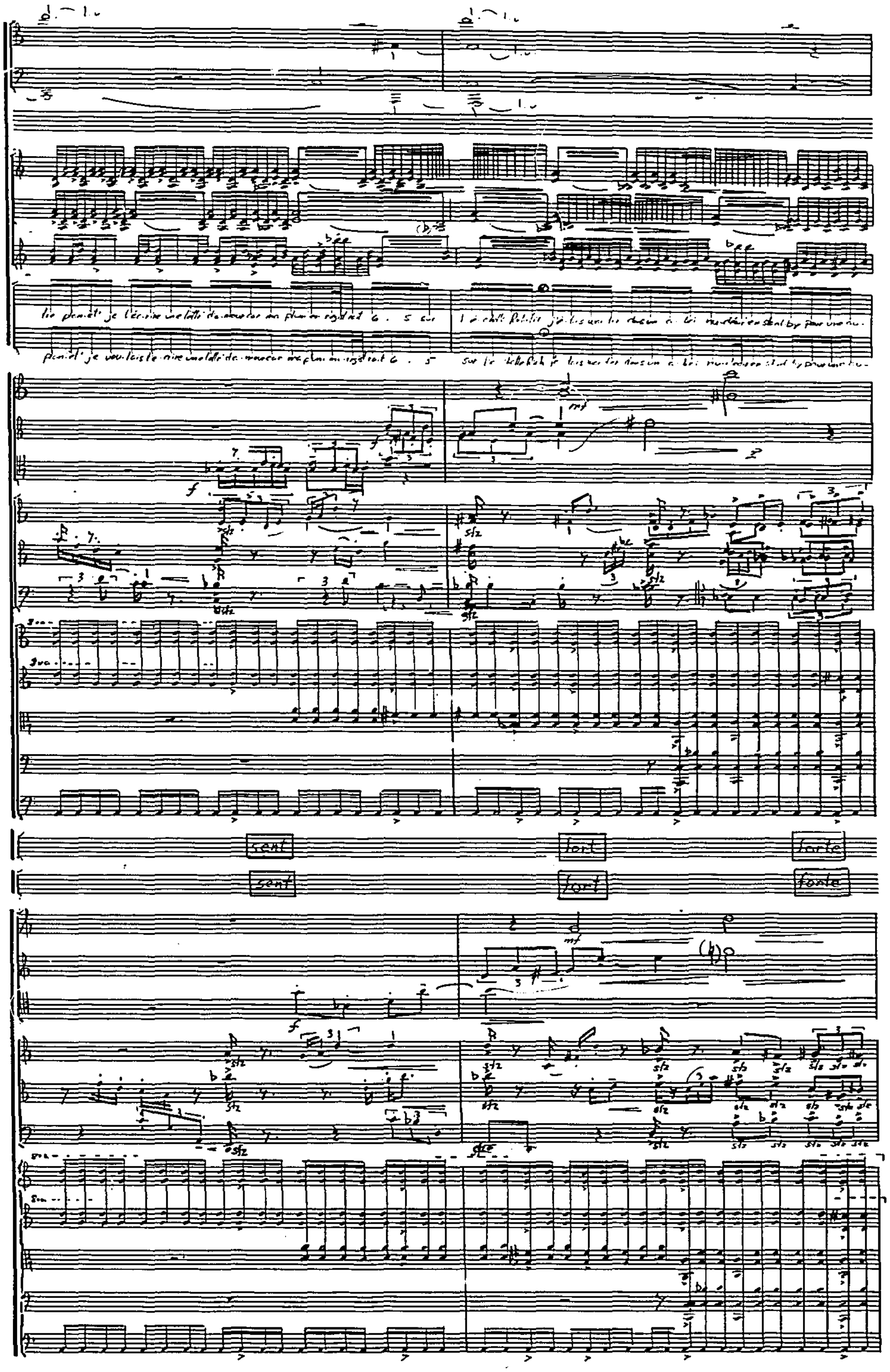

sampled and synthesized voices
sampled marimba I
sampled marimba II
sampled xylo
sampled voice I
sampled voice II
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
strings a 2
violin I
violin II
viola
cello
d-bass
voice 1
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
raised.

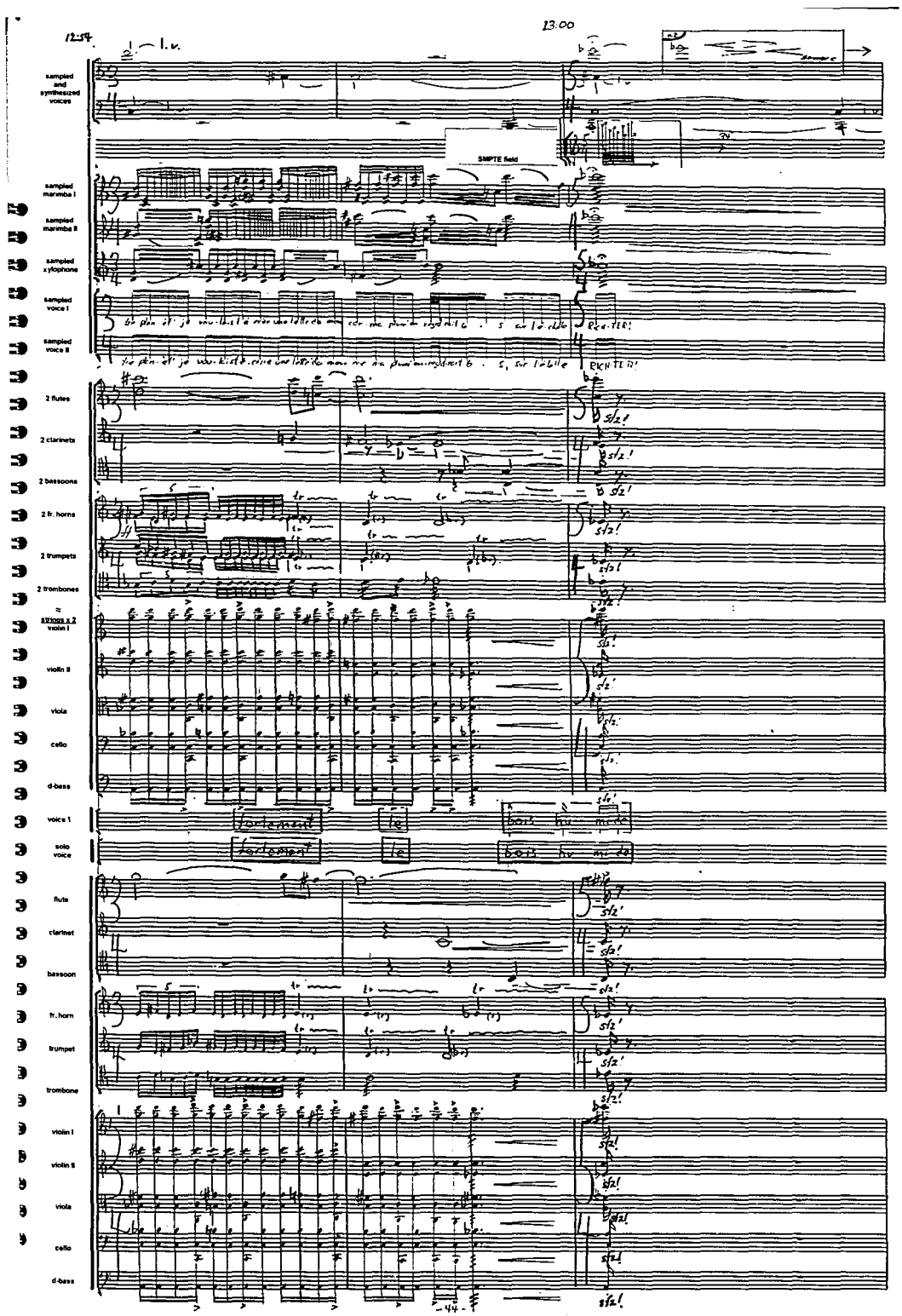

(solo)
deux ténèbres
viennent de s'éclairer

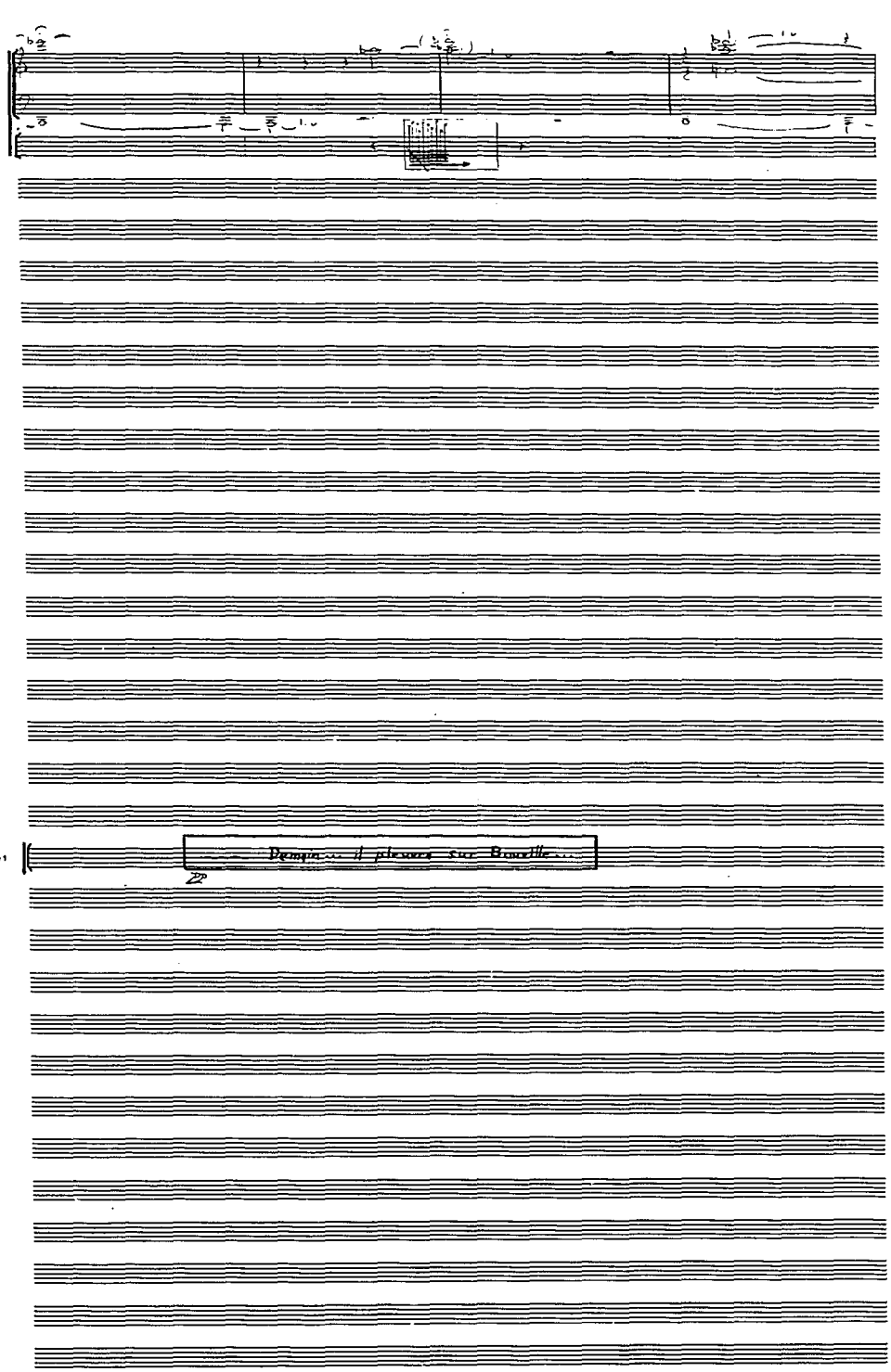

12/4
sampled and synthesized voices
sampled voice I
sampled voice II
sampled marimba I
sampled marimba II
sampled xylo
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
strings x 2
violin I
violin II
viola
cello
d-bass
voice 1
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
nuit
nuit
Bienvenue à bord des temps
col legno batt.
col legno batt.
col legno batt.
-40-

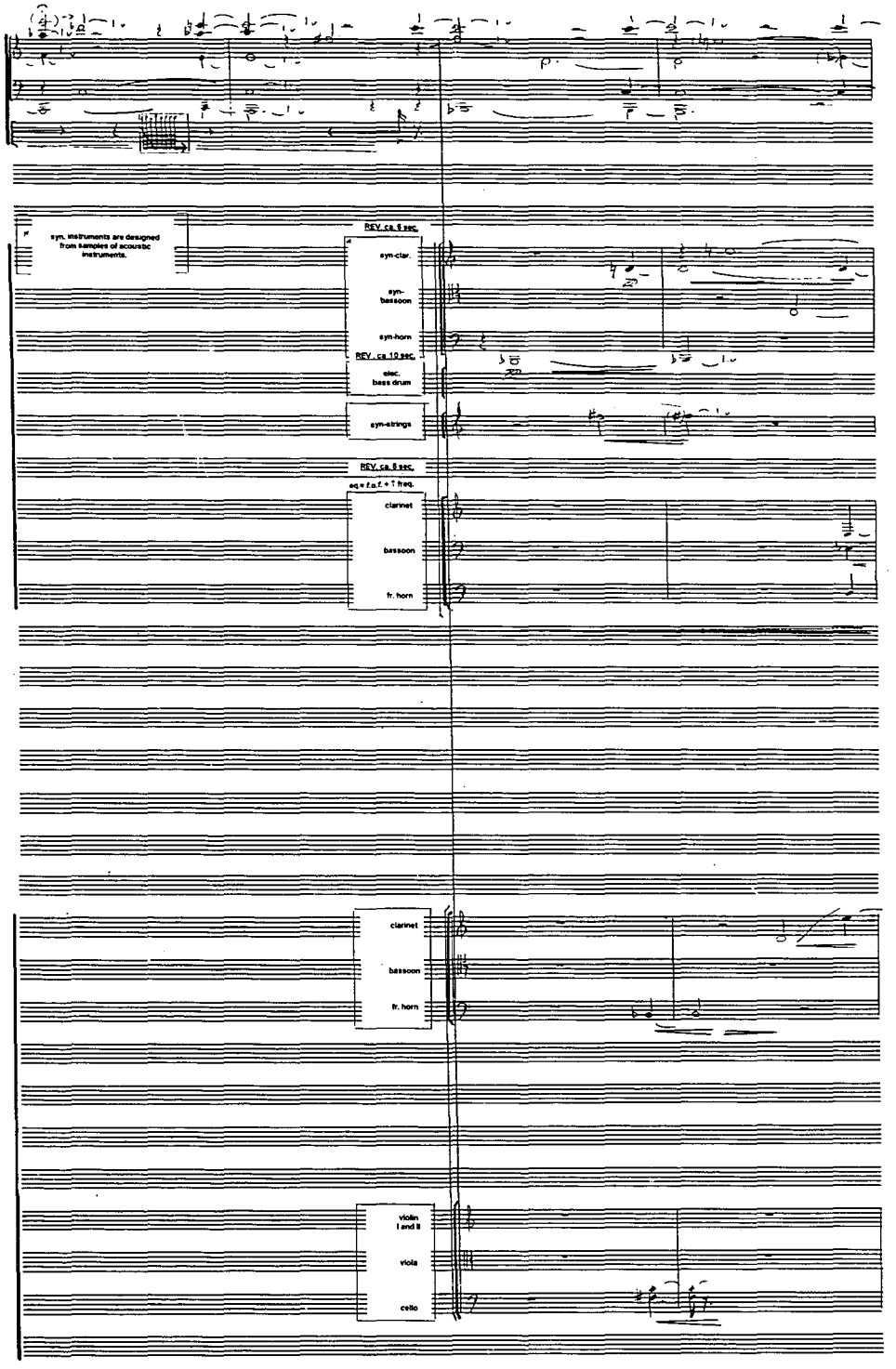

stand-by
stacc.
col lyno batt.
la nuit tombe au premier
la nuit tombeau

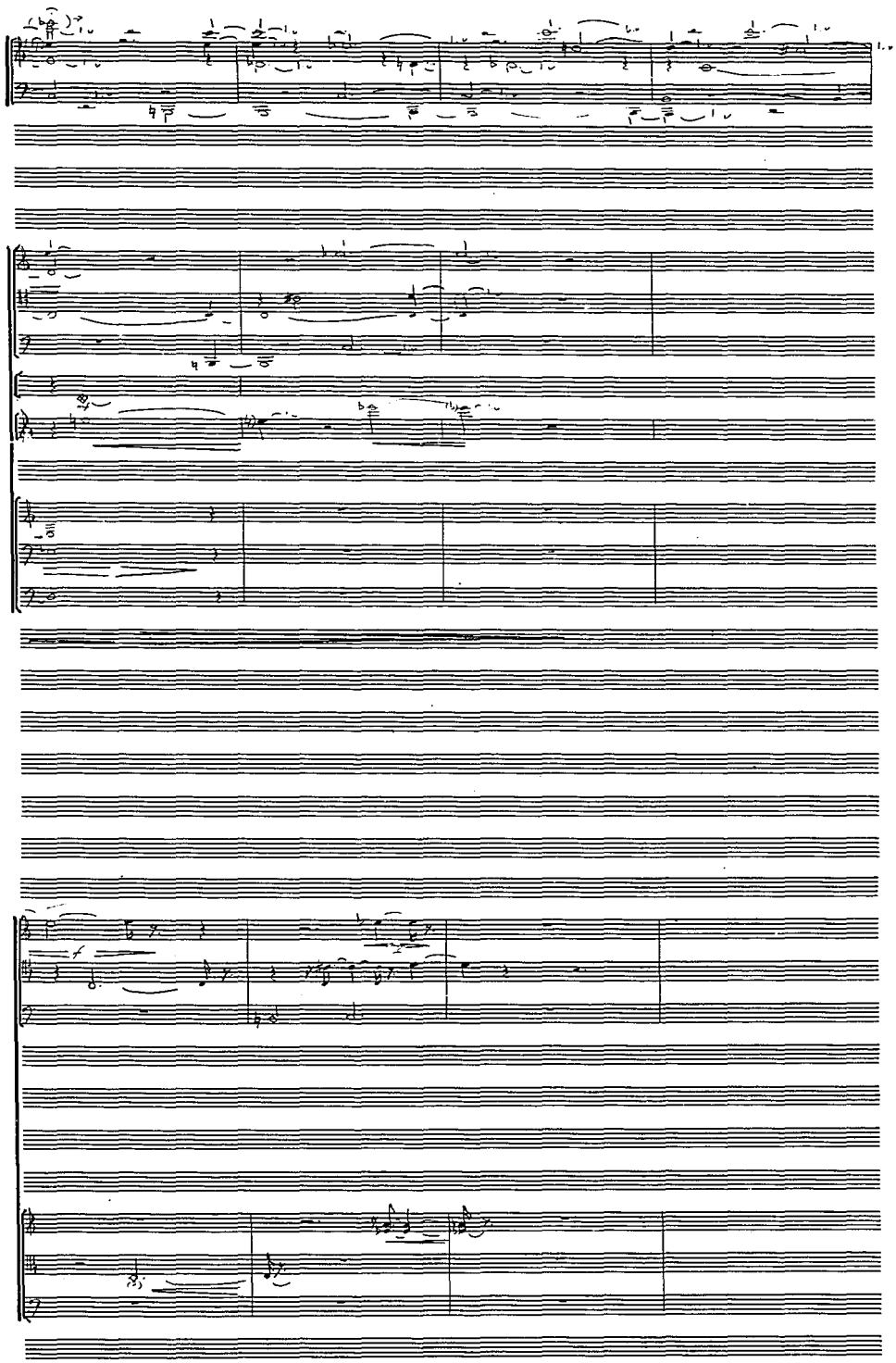

12:34
sampled and synthesized voices
sampled marimba I
sampled marimba II
sampled xylo
sampled voice I
sampled voice II
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
strings x 2
violin I
violin II
viola
cello
d-bass
voice 1
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
le chanteur
de la Nouvelle

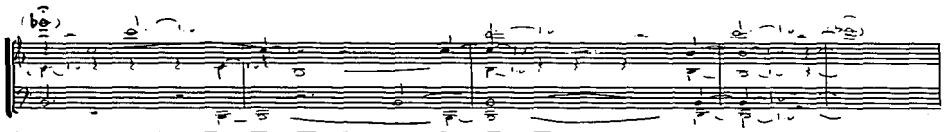

sent
fort
forte
sent
fort
forte

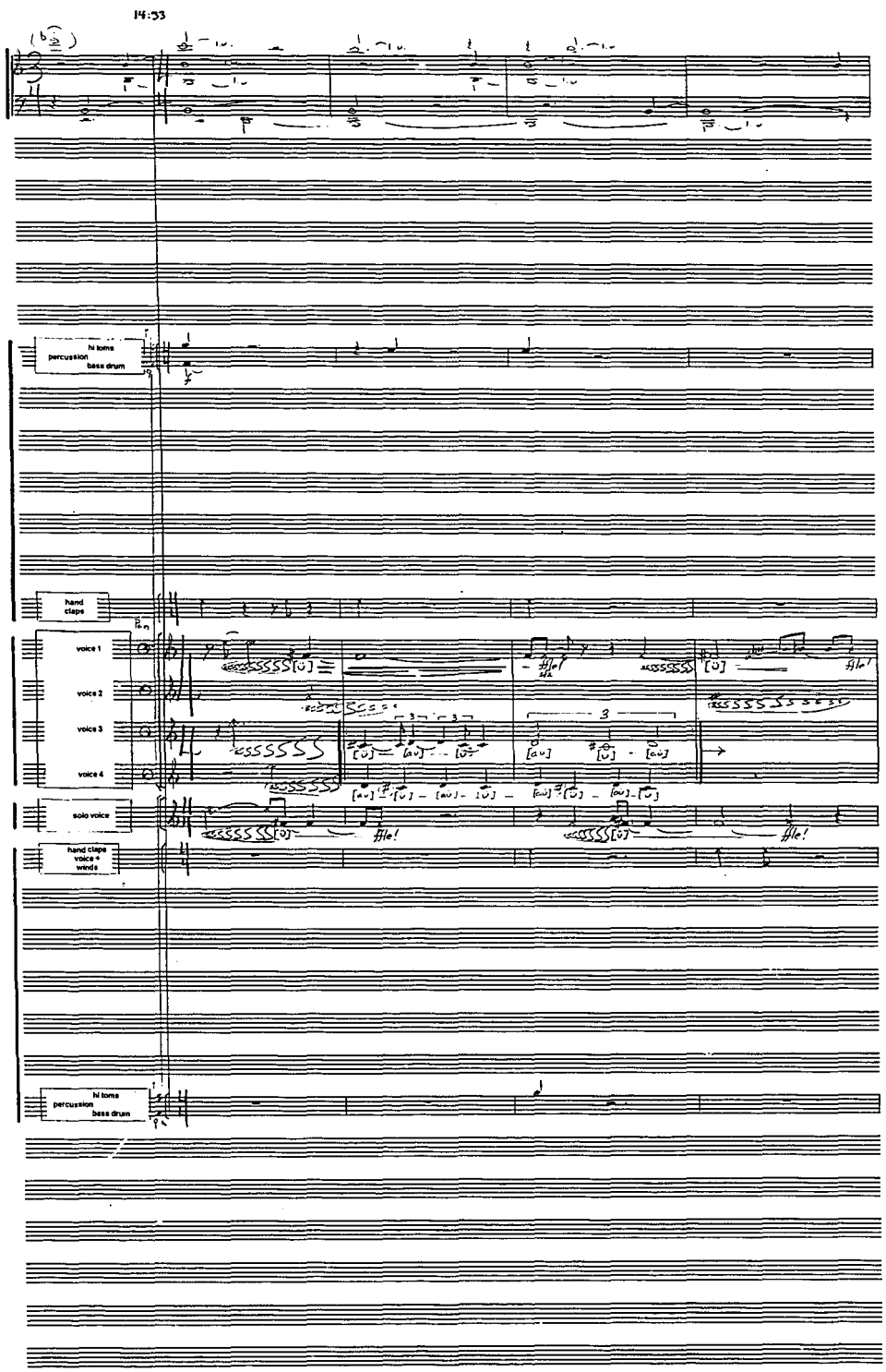

12:59
13:00
l. v.
sampled and synthesized voices
SMPTE field
sampled marimba I
sampled marimba II
sampled xylophone
sampled voice I
sampled voice II
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
≈ strings x 2 violin I
violin II
viola
cello
d-bass
voice 1
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
violin I
violin II
viola
cello
d-bass
sfz!
-44-

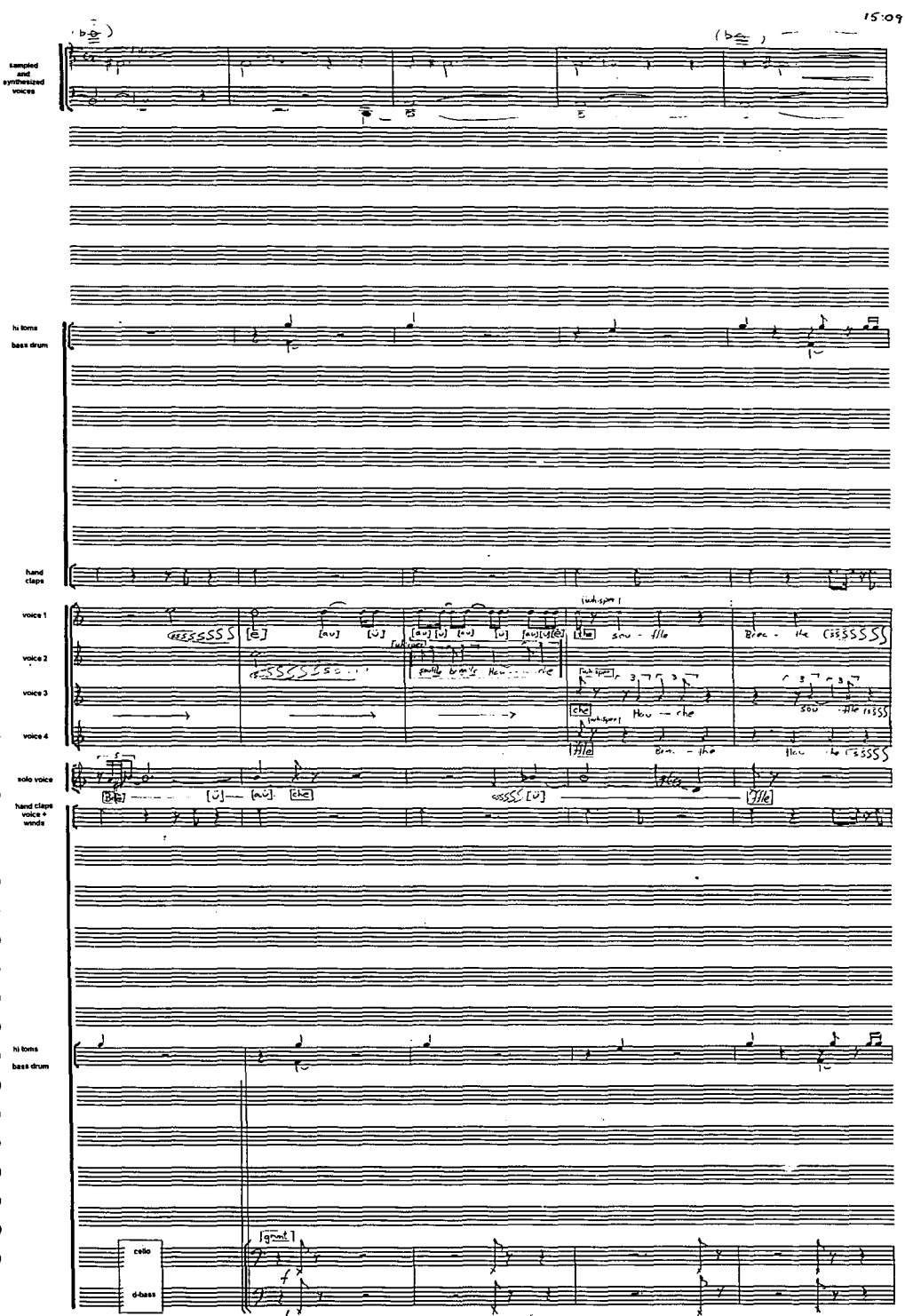

sampled and synthesized voices
voice 1
Demain ... il pleuvra sur Brocéliande ...
2p

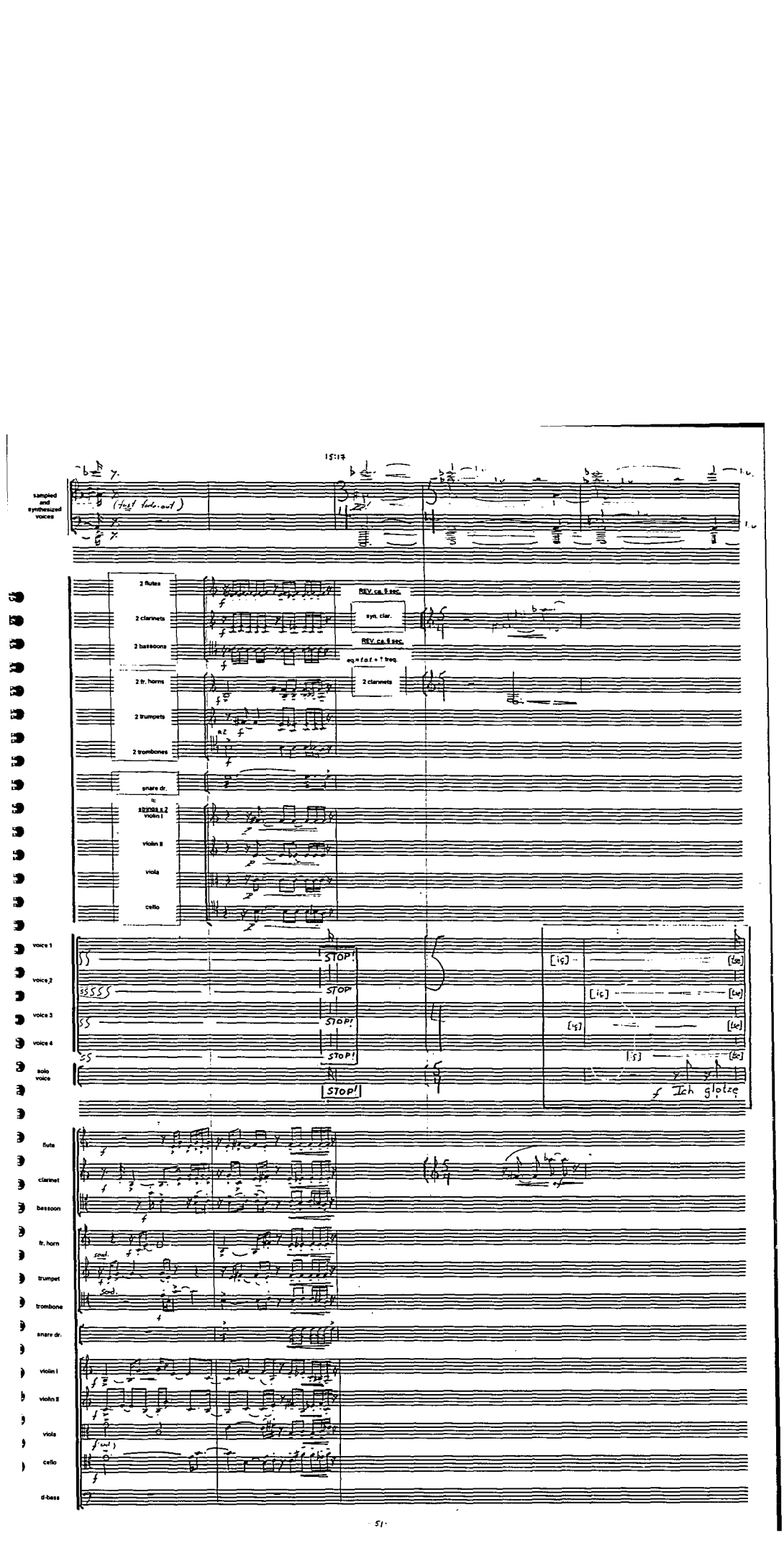

sampled and synthesized voices
syn. instruments are designed from samples of acoustic instruments.
REV. ca. 6 sec.
syn-clar.
syn-bassoon
syn-horn
REV. ca. 10 sec.
elec. bass drum
syn-strings
REV. ca. 8 sec.
eq = f a f. + f freq.
clarinet
bassoon
fr. horn
clarinet
bassoon
fr. horn
violin I and II
viola
cello

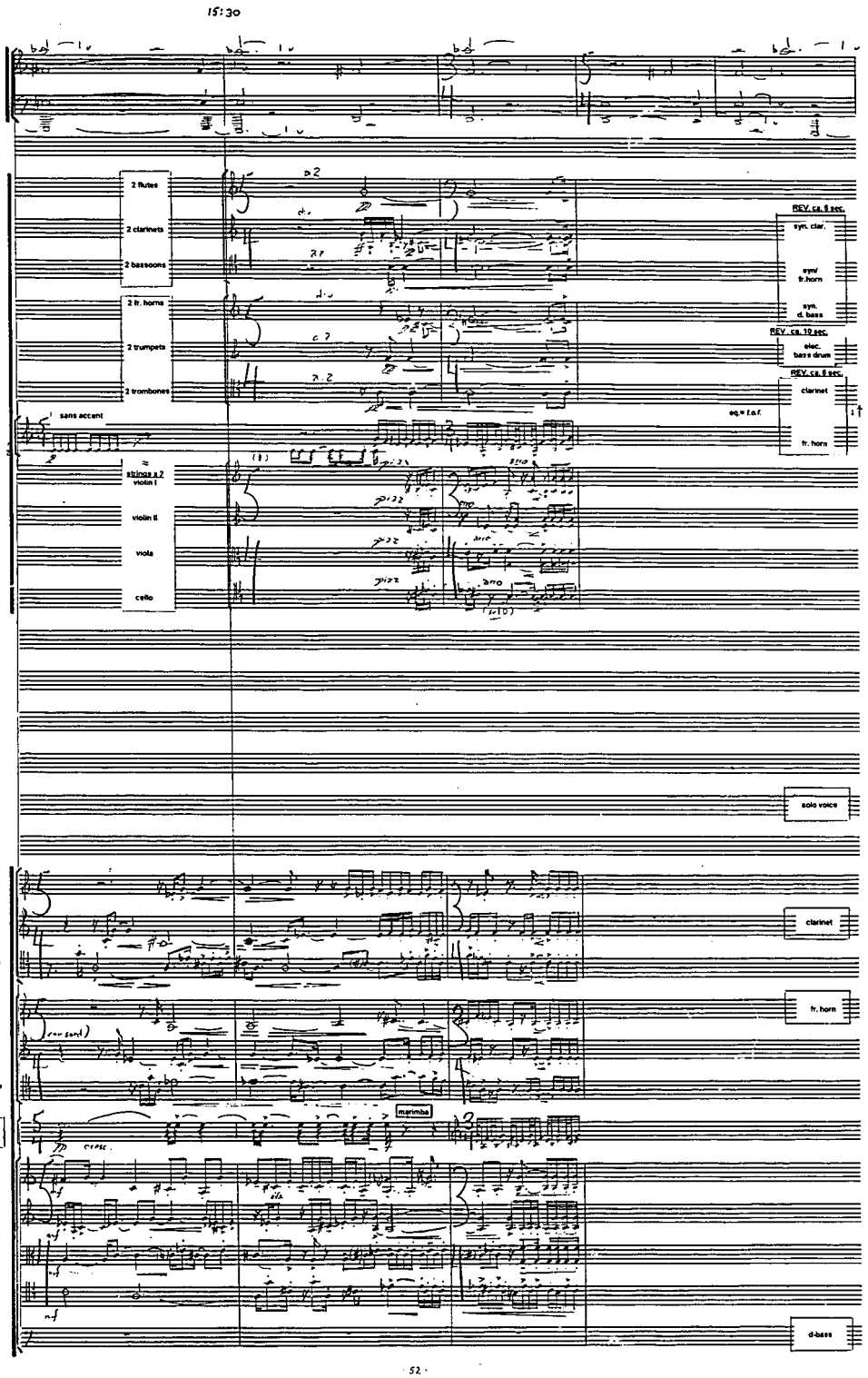


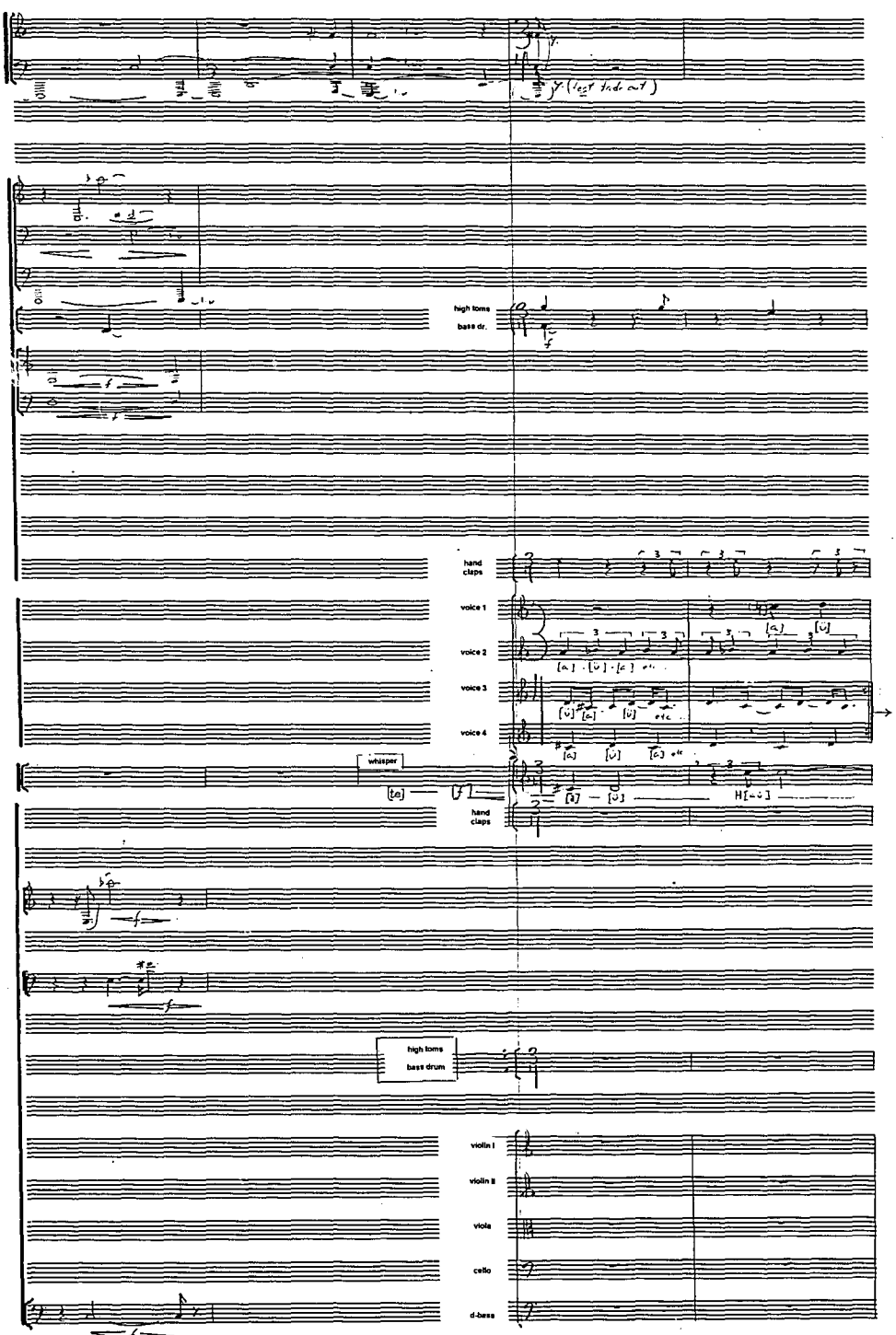

sampled
and
synthesized
voices

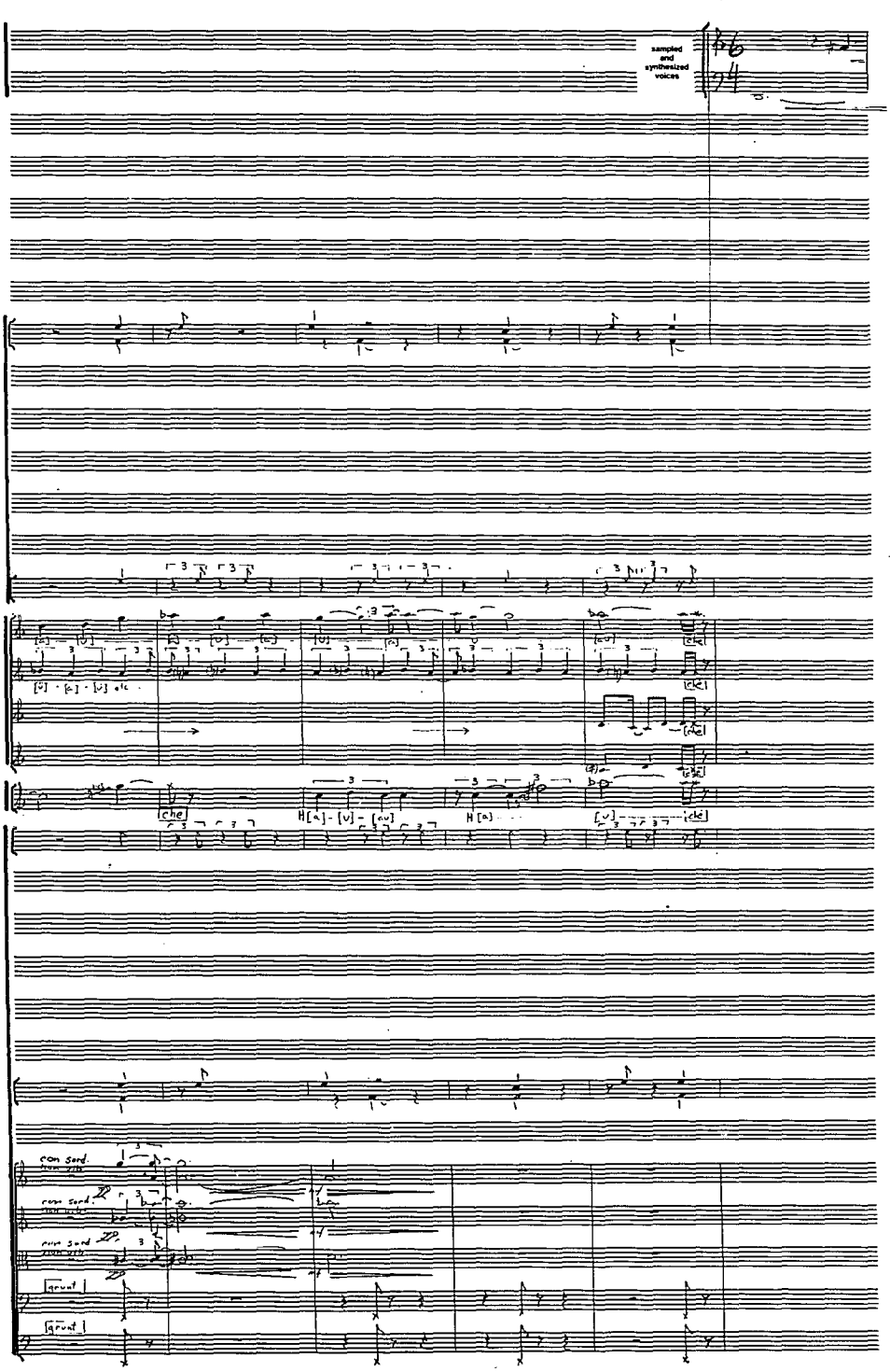

14:53
sampled and synthesized voices
hi toms
percussion
bass drum
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
hand claps voice + winds
hi toms
percussion
bass drum

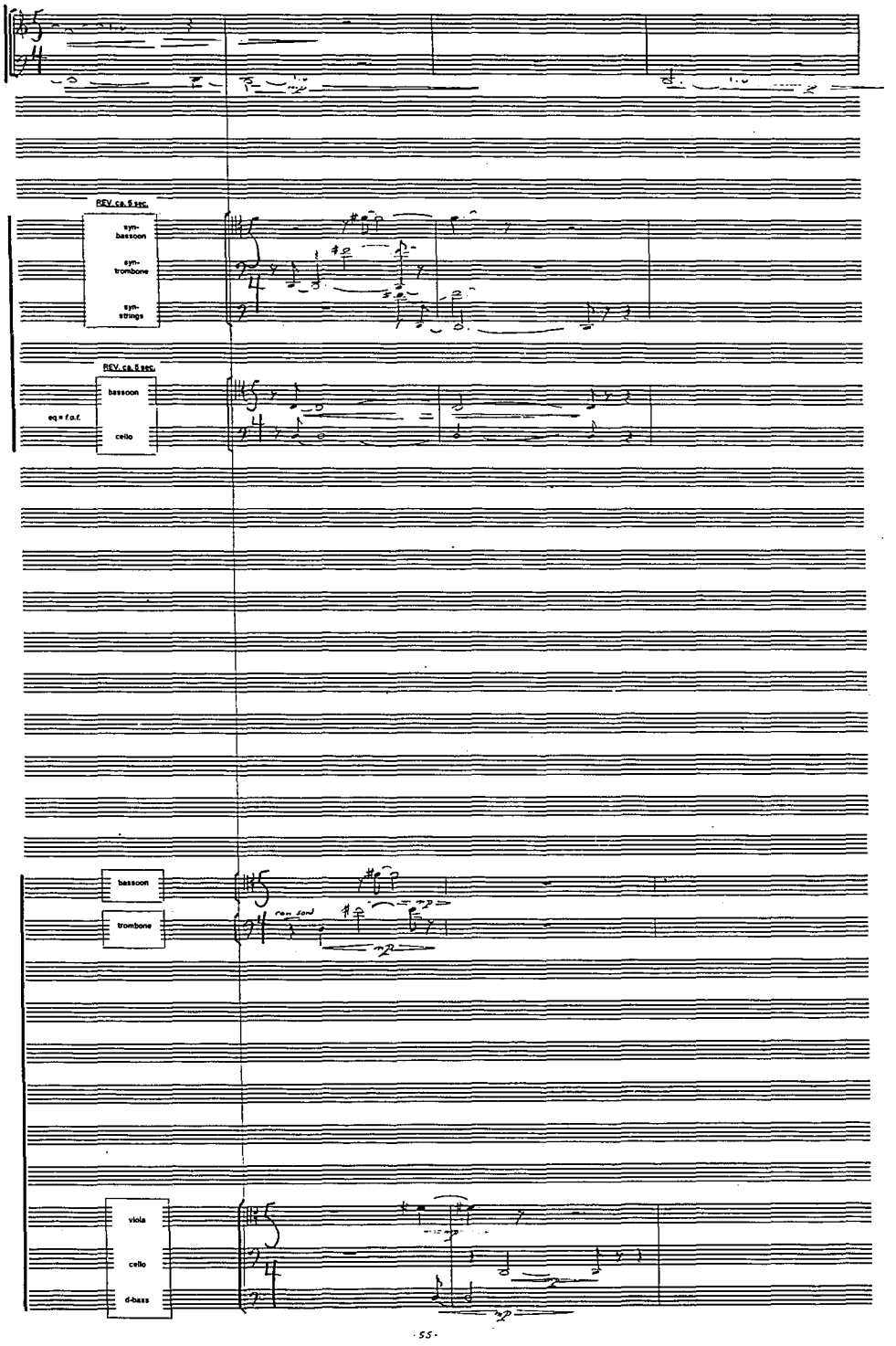

sampled and synthesized voices
hi toms
bass drum
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
hand claps voice + winds
hi toms
bass drum
cello
d-bass

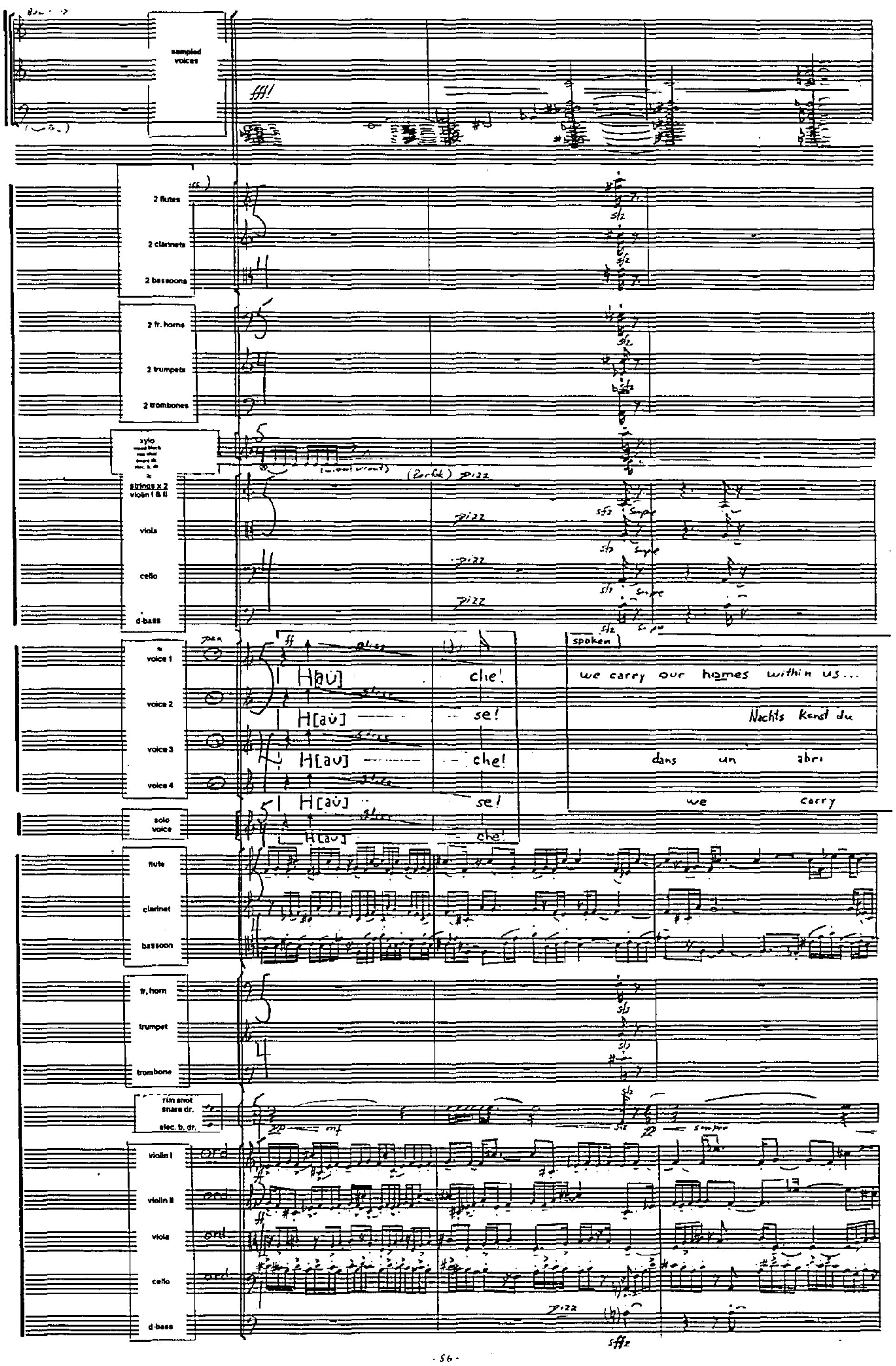

15:17
sampled and synthesized voices
(fast fade out)
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
snare dr.
strings x 2
violin I
violin II
viola
cello
REV. ca. 6 sec.
syn. clar.
REV. ca. 6 sec.
eq = f.o.f. + ↑ freq.
2 clarinets
voice 1
voice 2
voice 3
voice 4
solo voice
STOP!
STOP!
STOP!
STOP!
STOP!
[ig]
[ge]
[ig]
[ge]
[ig]
[ge]
[ig]
[ge]
f Ich glolze
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr.
violin I
violin II
viola
cello
d-bass
sord.
sord.

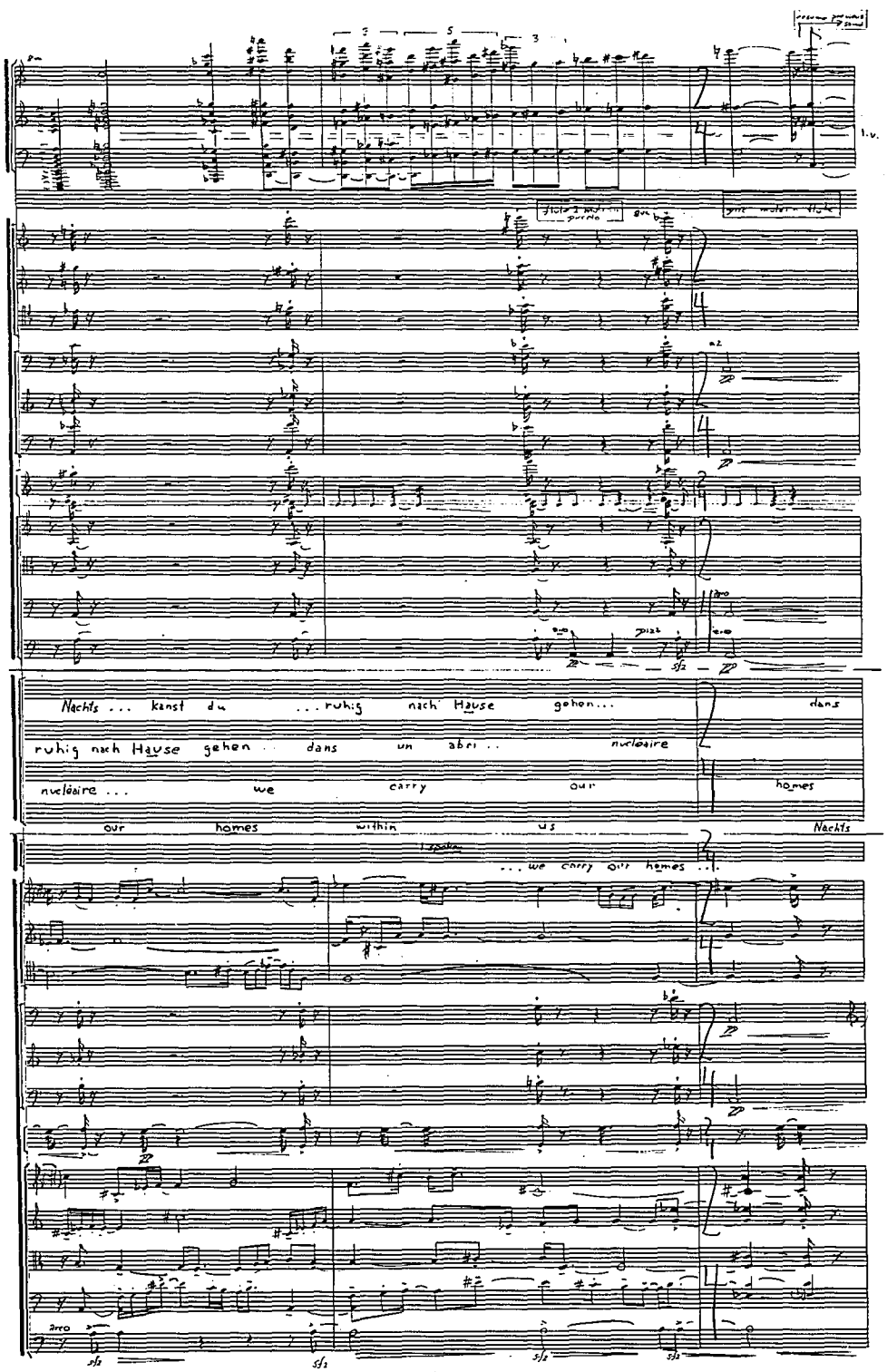

15:30
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
sans accent
strings a 2
violin I
violin II
viola
cello
REV. ca. 5 sec.
syn. clar.
syn./ fr.horn
syn. cl. bass
REV. ca. 10 sec.
elec. bass drum
REV. ca. 5 sec.
clarinet
fr. horn
eq.= f.o.f.
marimba
snare dr.
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
marimba
snare dr.
violin I
violin II
viola
cello
d-bass
clarinet
fr. horn
d-bass

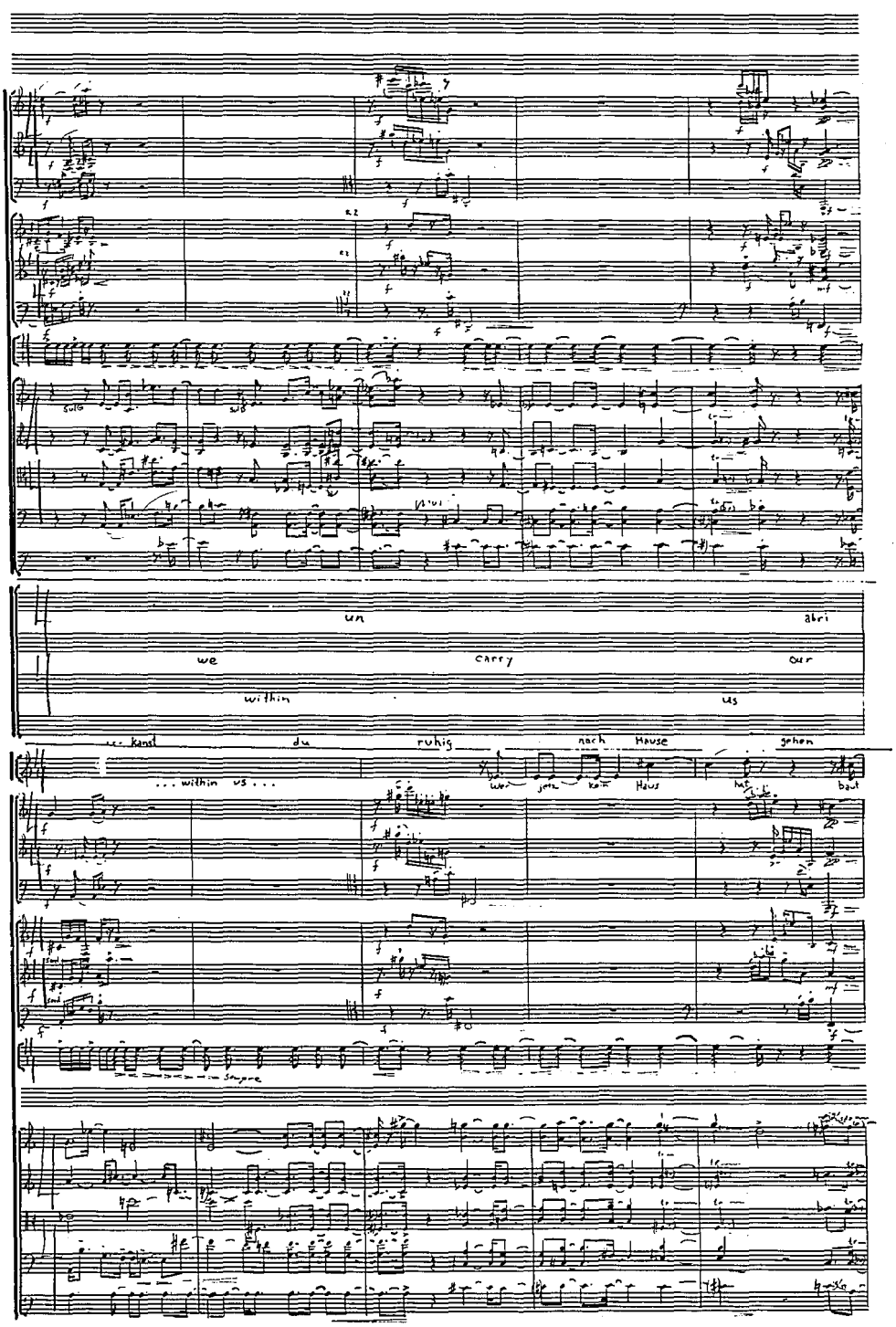

high toms
bass dr.
hand claps
voice 1
voice 2
voice 3
voice 4
whisper
[a]
[ü]
hand claps
high toms
bass drum
violin I
violin II
viola
cello
d-bass

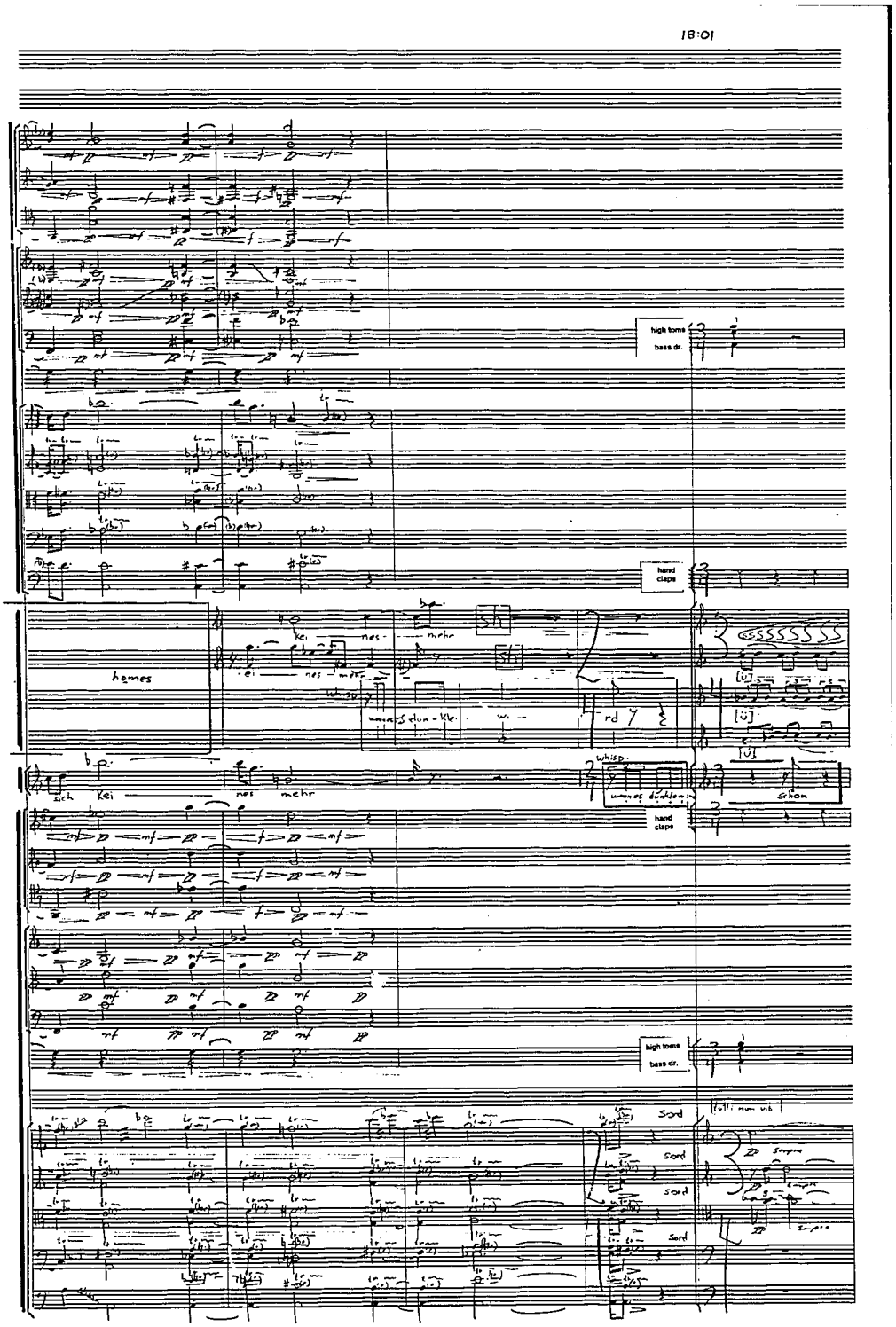

sampled and synthesized voices
high toms
bass dr.
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
hand claps
high toms
bass drum
violin I
violin II
viola
cello
d-bass
con sord.
non vib.
[grunt]

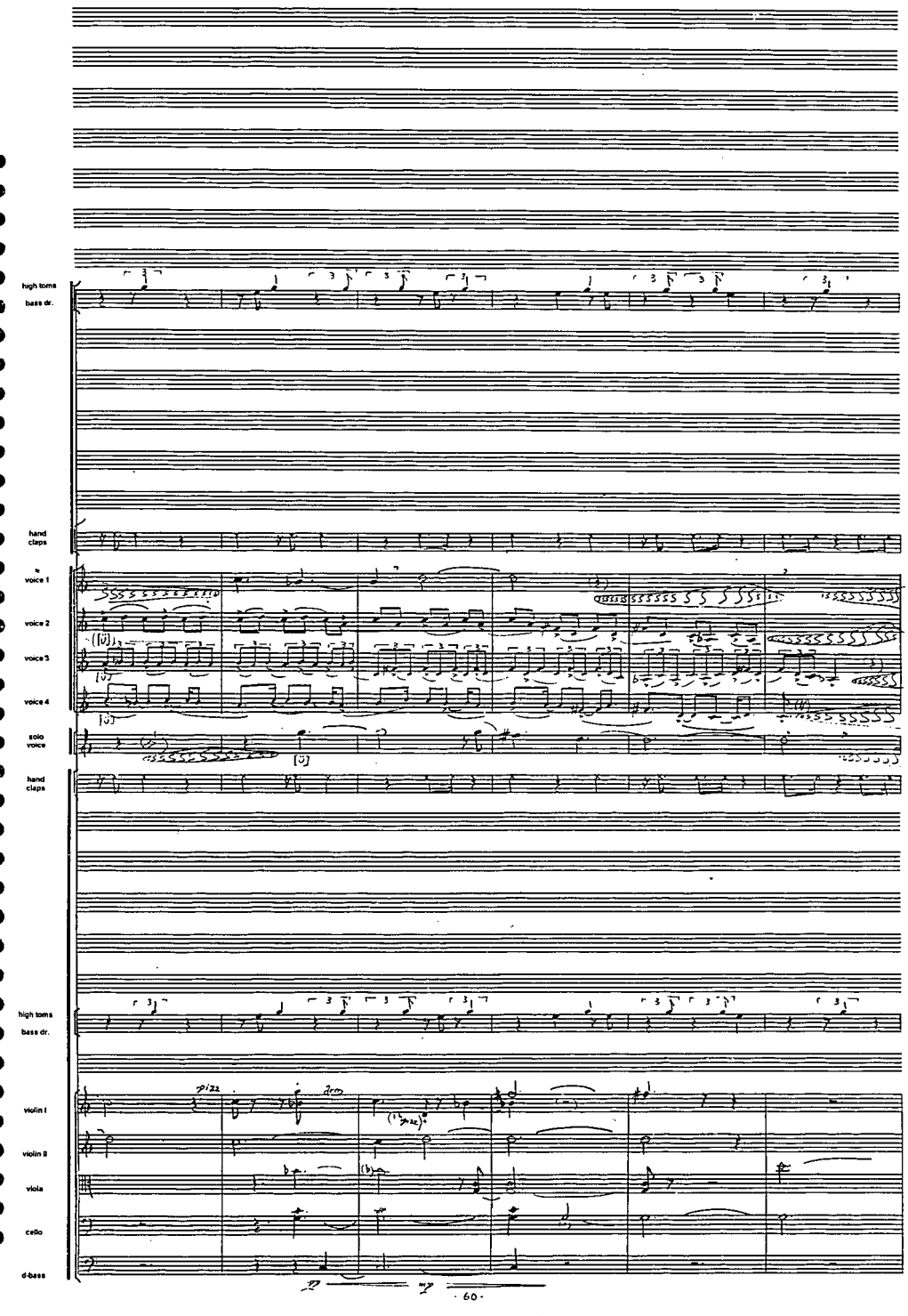

REV. ca. 5 sec.
syn-bassoon
syn-trombone
syn-strings
REV. ca. 5 sec.
bassoon
cello
eq = f.o.f.
bassoon
trombone
ron. sord.
viola
cello
d-bass


sampled voices
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
xylo
strings x 2
violin I & II
viola
cello
d-bass
voice 1
voice 2
voice 3
voice 4
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
rim shot
snare dr.
elec. b. dr.
violin I
violin II
viola
cello
d-bass
pizz
spoken
H[aʊ]
che!
se!
we carry our homes within us...
Nachts kanst du
dans un abri
we carry
ord

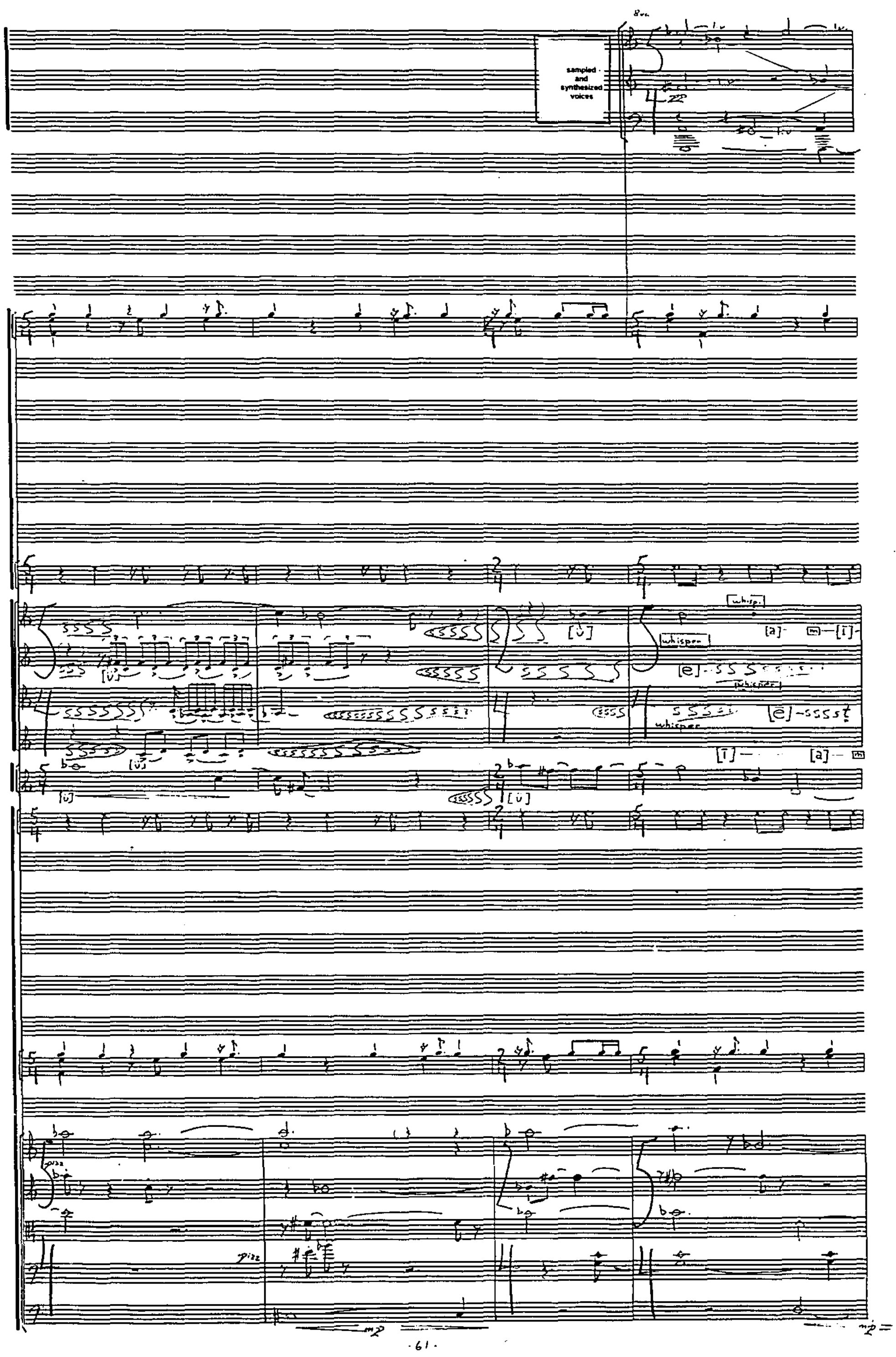

Nachts ... kannst du ... ruhig nach Hause gehen...
dans
ruhig nach Hause gehen ... dans un abri ... nucléaire
nucléaire ... we carry our homes
our homes within us
Nachts
... we carry our homes ...

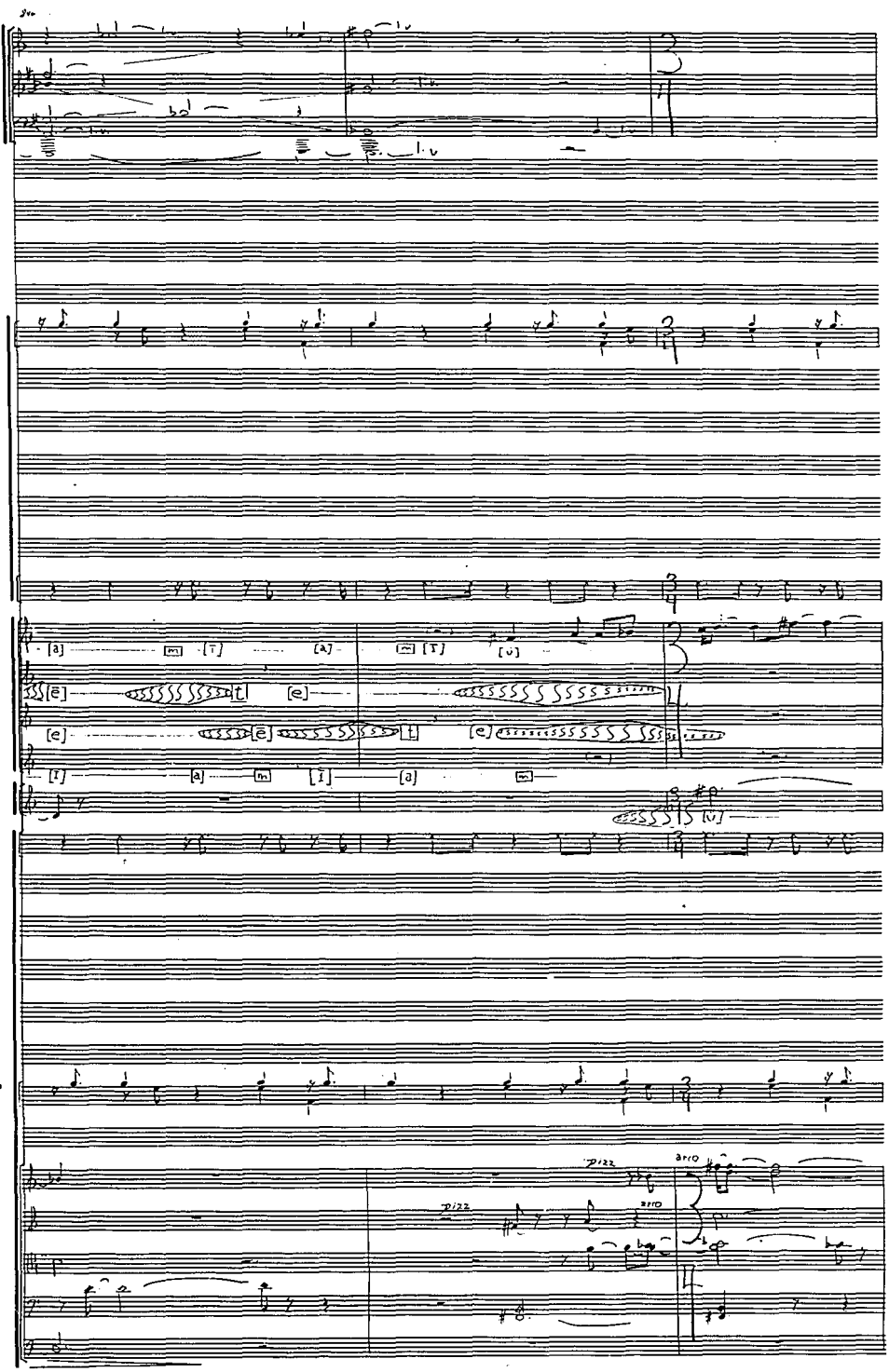

13:27
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
snare dr.
strings x 2
violin I
violin II
viola
cello
d-bass
voice 1
voice 2
voice 3
voice 4
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
snare dr.
violin I
violin II
viola
cello
d-bass
un
abri
we
carry
our
within
us
... kenst
du
ruhig
nach
Hause
gehen
... within us ...
Wir
gehn
ins
Haus
hat
Platz
baut
Snare

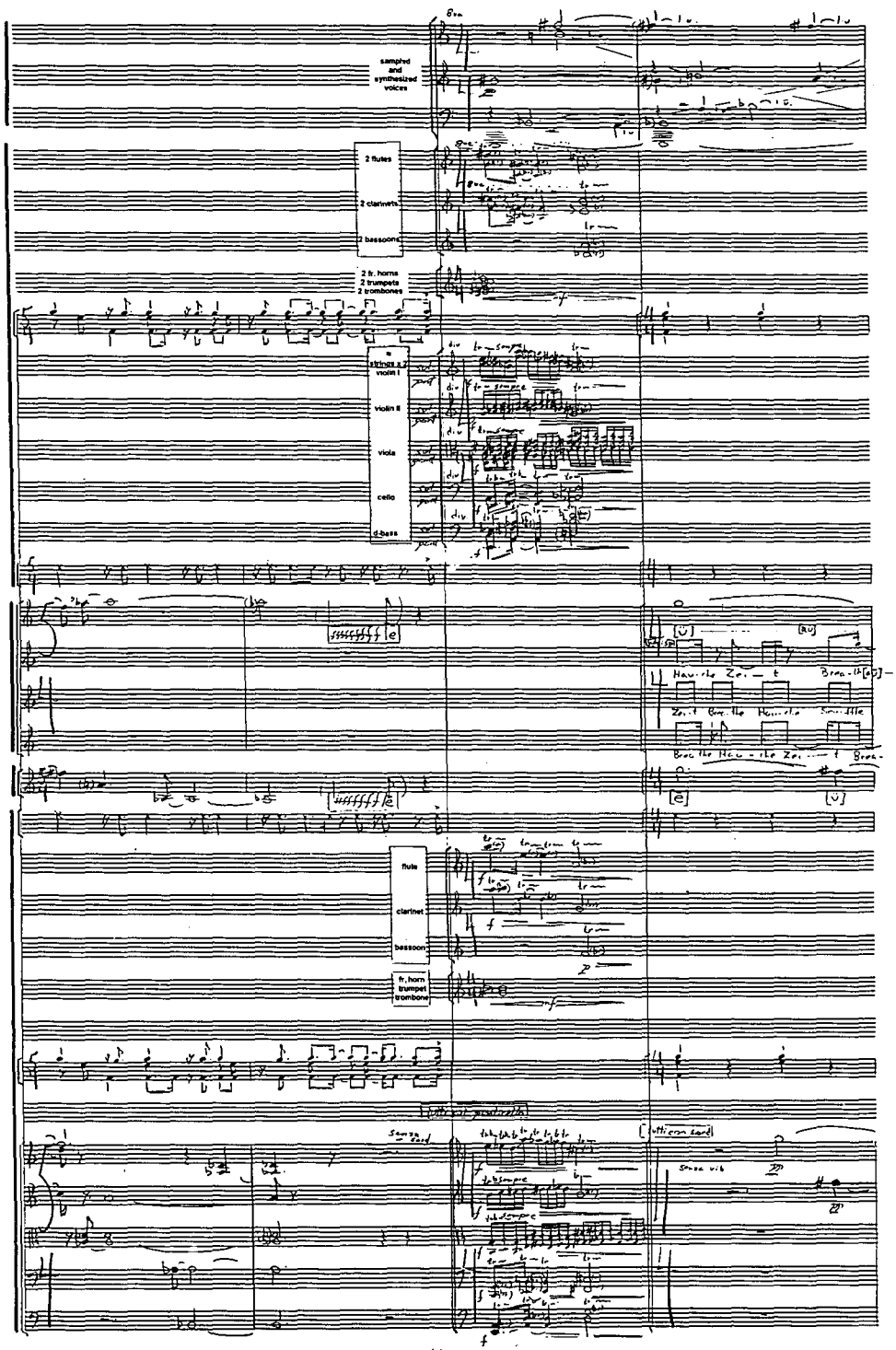

high toms
bass dr.
hand claps
hand claps
high toms
bass dr.
Sord
Sord
Sord
Sord

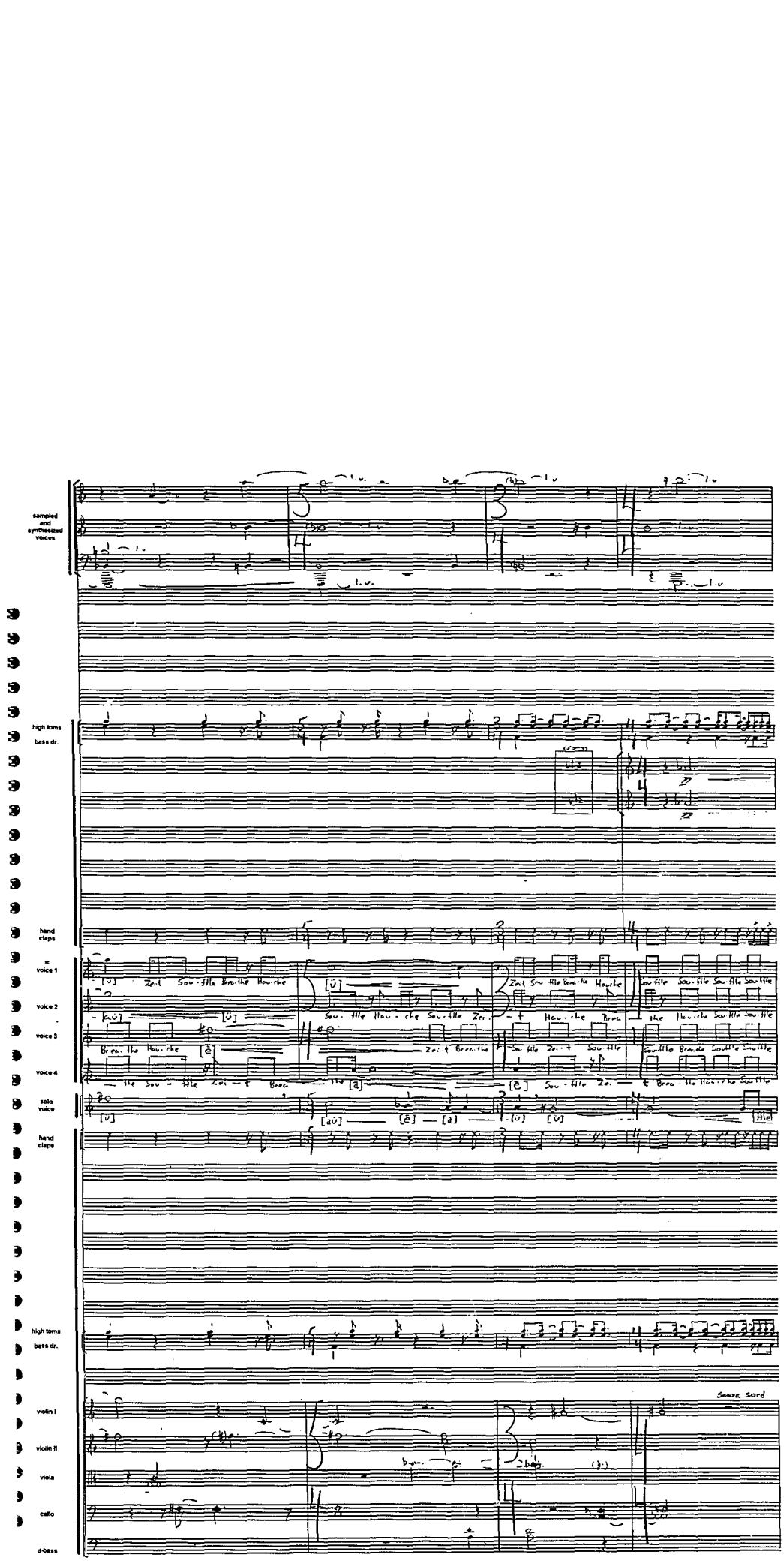

high toms
bass dr.
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
hand claps
high toms
bass dr.
violin I
violin II
viola
cello
d-bass

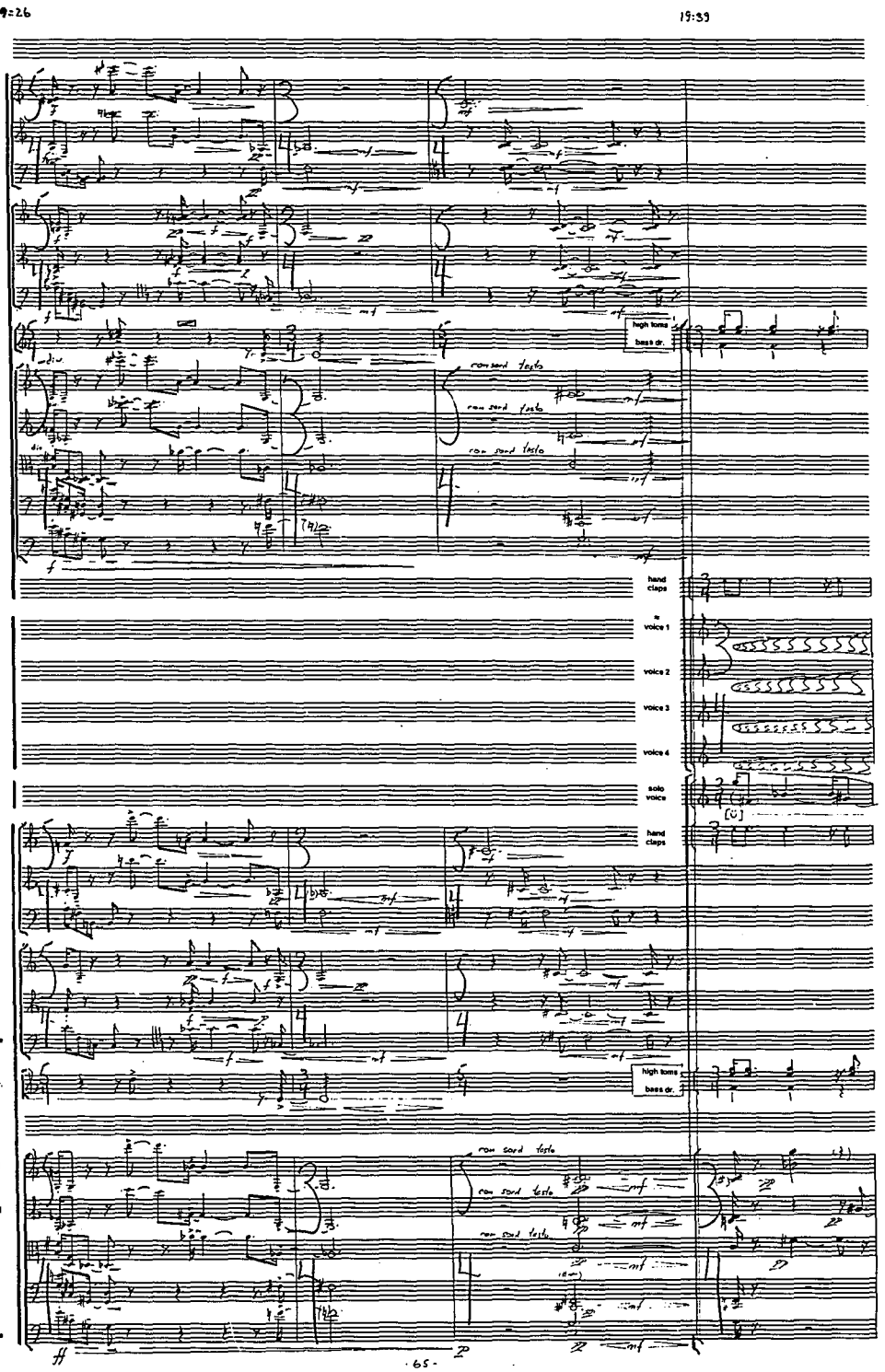
18·34

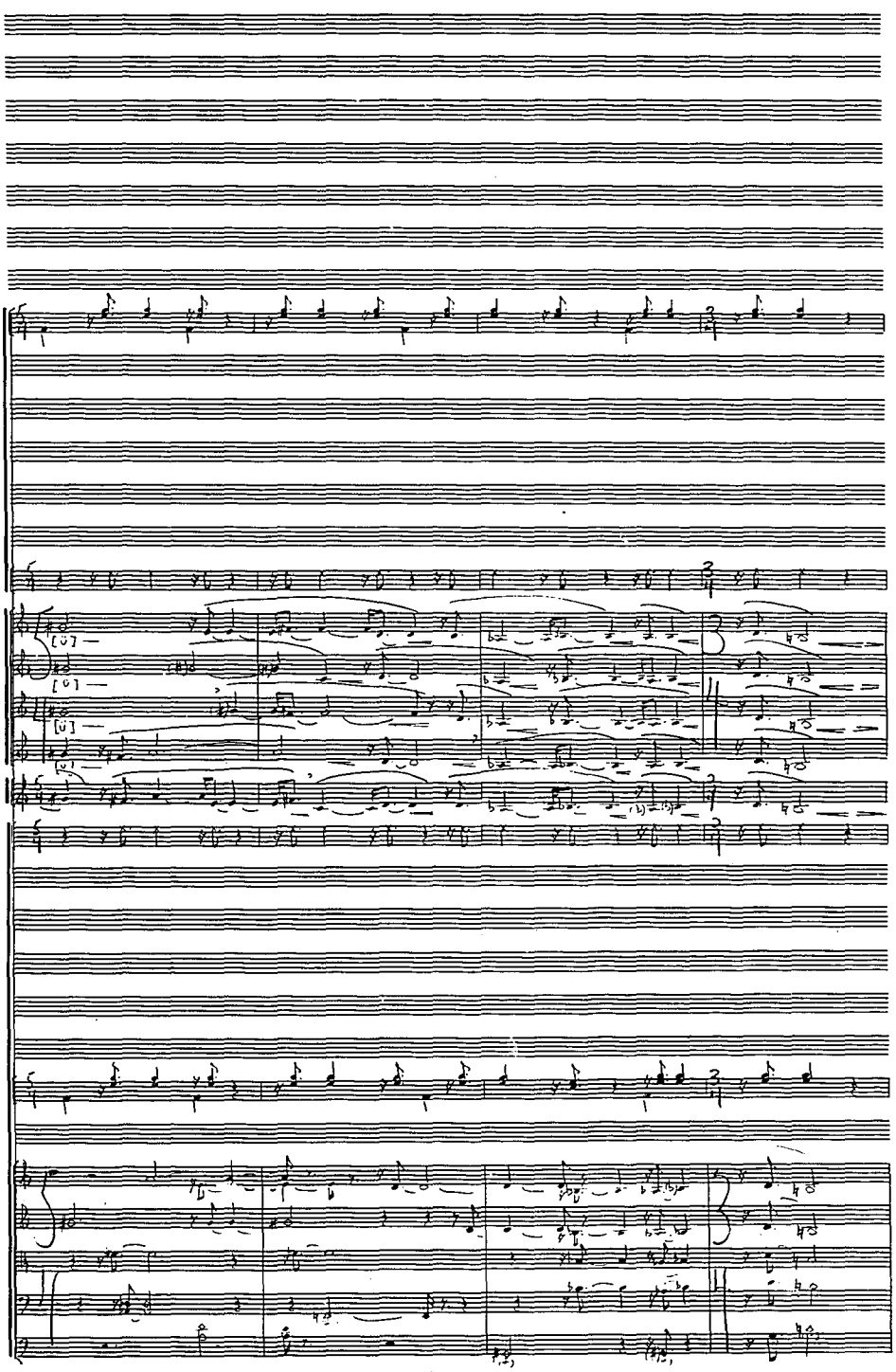

sampled and synthesized voices
whisper
whisper
whisper
pizz

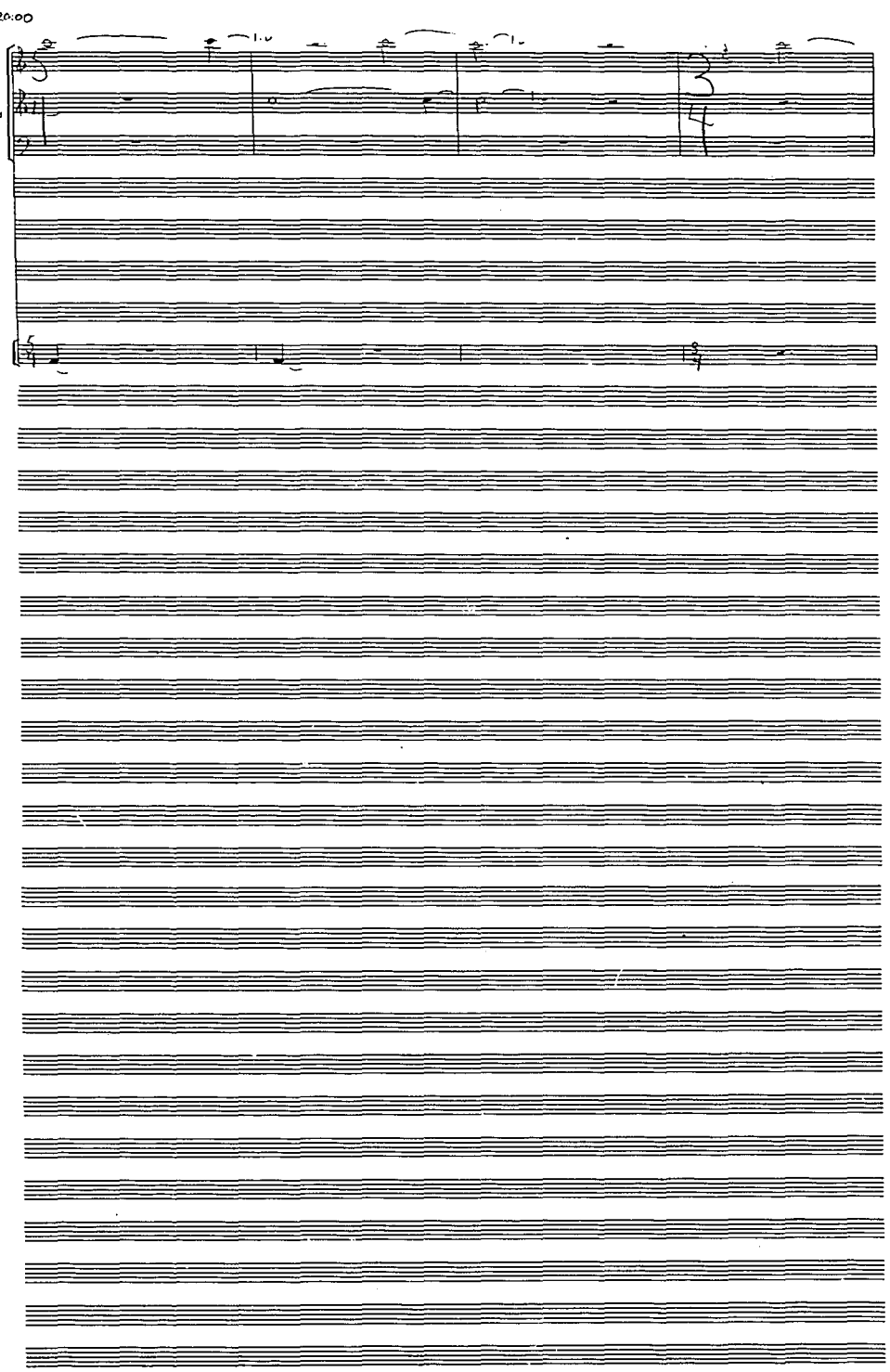

sampled and synthesized voices
high toms
bass dr.
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
hand claps
high toms
bass dr.
violin I
violin II
viola
cello
d-bass
arco
arco

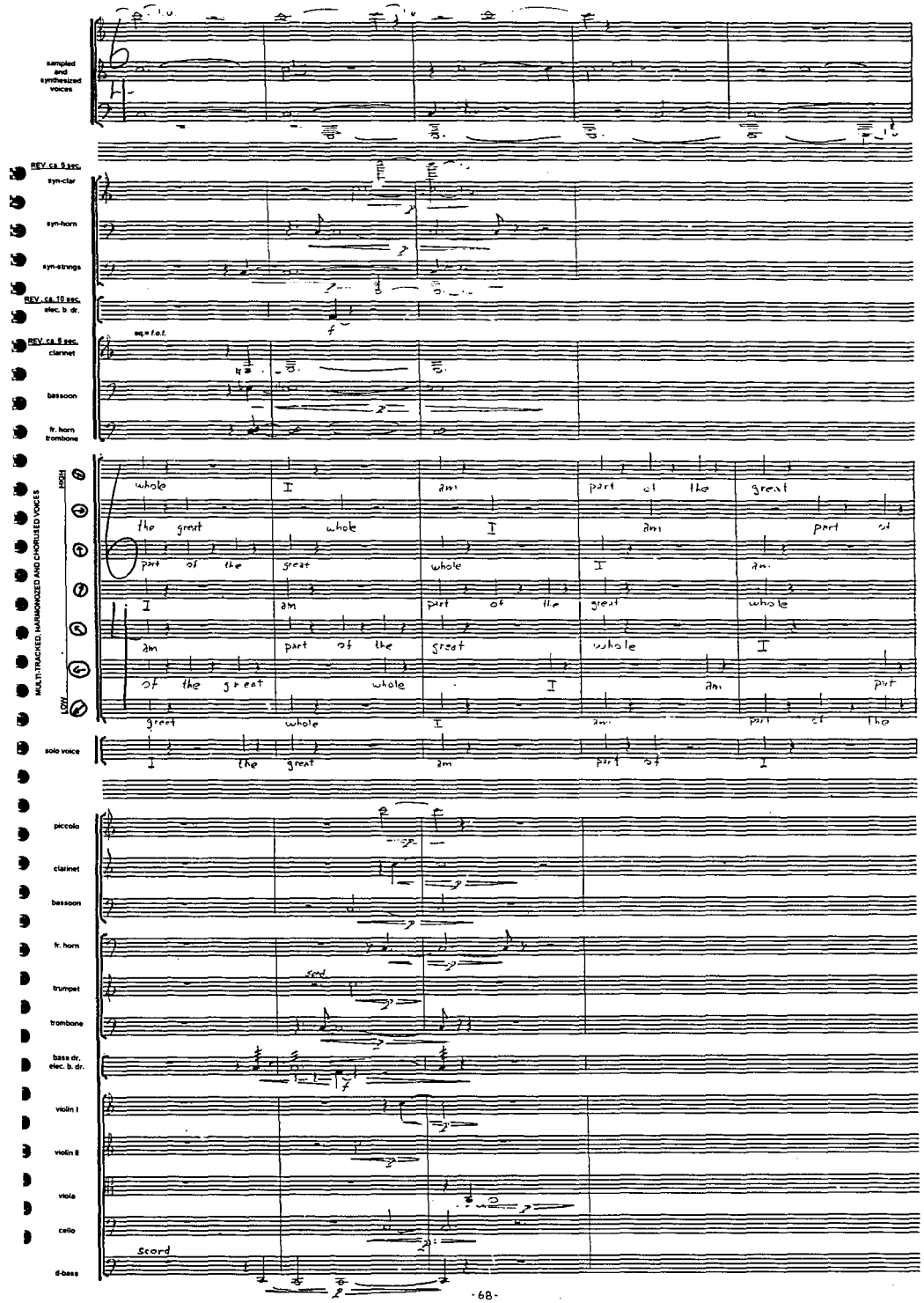

sampled and synthesized voices
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
violin I
violin II
viola
cello
d-bass
flute
clarinet
bassoon
fr.horn
trumpet
trombone


sampled and synthesized voices
high toms
bass dr.
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
hand claps
high toms
bass dr.
violin I
violin II
viola
cello
d-bass
l.v.
Zoi! Sou-ffle Bre-the Hou-che
Sou-ffle Hou-che Sou-ffle Zoi-
Zoi-t Bre-the
Sou-ffle Zoi-t Sou-ffle
Sou-ffle Sou-ffle Sou-ffle Sou-ffle
Bre-the Hou-che
Zoi-t Bre-the
Sou-ffle Bre-the Hou-che Sou-ffle
senza sord


19:26
19:33
2 flutes
2 clarinets
2 bassoons
2 fr. horns
2 trumpets
2 trombones
xylo
snare dr.
strings x 2
violin I
violin II
viola
cello
d-bass
high toms
bass dr.
con sord tasto
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
flute
clarinet
bassoon
fr. horn
trumpet
trombone
xylo
snare dr.
violin I
violin II
viola
cello
d-bass


high toms
bass dr.
hand claps
voice 1
voice 2
voice 3
voice 4
solo voice
hand claps
high toms
bass dr.
violin I
violin II
viola
cello
d-bass


20:00
sampled and synthesized voices
bass dr.


sampled and synthesized voices
REV. ca. 5 sec.
syn-clar
syn-horn
syn-strings
REV. ca. 10 sec.
elec. b. dr.
REV. ca. 5 sec.
clarinet
bassoon
fr. horn
trombone
MULTI-TRACKED, HARMONIZED AND CHORUSED VOICES
HIGH
LOW
whole I am part of the great
the great whole I am part of
part of the great whole I am
I am part of the great whole
am part of the great whole I
of the great whole I am part
great whole I am part of the
solo voice
I the great am part of I
piccolo
clarinet
bassoon
fr. horn
trumpet
trombone
bass dr. elec. b. dr.
violin I
violin II
viola
cello
d-bass
sord
sord

21:00