For Mr. Michael [LRL]

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I.B. Each and every note in a musical score conveys two pieces of information: (a) its pitch, indicated by the note's position on the staff; (b) its duration, signified by the form of the note symbol. Both these data must be supplied to the Compiler for each note [tff].

I.B.1.a. Pitch. The pitch of a note may be indicated to the Compiler by a number representing the position on the staff which the note occupies: the correspondence between position and pitch number is shown in Fig. 1. The lowest possible pitch number is 0; the number may be as high as necessary.
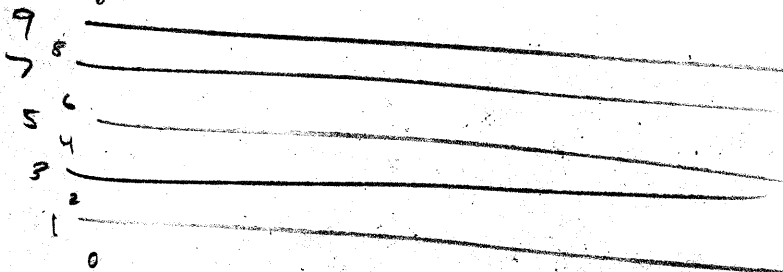

Figure 1. Pitch Numbers

I.B.1.b. Duration. A note's duration can be specified by a number as demonstrated by Fig. 2. No duration number may be used except the seven listed [ert].
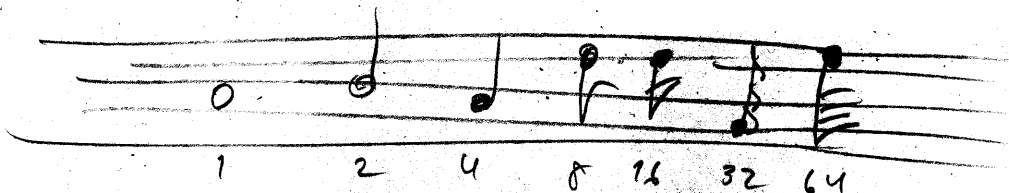
Figure 2. Duration Numbers

I.B.1.c. Notes specified by two numbers. A pitch number and a duration number conjoined form a note. The numbers must be in the order "pitch--duration". To distinguish the two numbers, they must be separated by one or more non-numeric characters: the letter "t" is availvable especially for this purpose. Fig. 3 shows some notes and their Compiler representations as formed in this manner.

5t1   6t4   7t4   0t16   2t16   4t16   6t16   9t32   14t4

Figure 3. Notes specified by pitch
number and duration number

Hereafter, it will be stated that certain characters may be placed "anywhere" in a note: actually, there is the one restriction that no character may be placed between the digits of a pitch number or duration number.

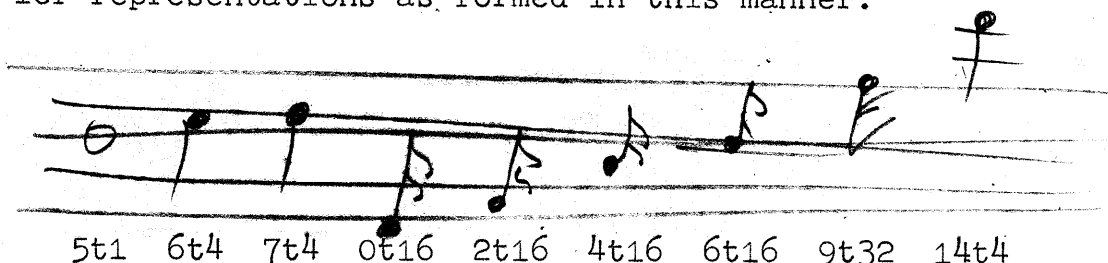I.B.2. A rest may be expressed by the letter "r" and a duration number. The number and the "r" may be put in either order, although practice has favored putting the duration number last. A pitch number may not occur in the same note as an "r" [tmf]. A note should not contain more than one "r" [tmr]. Examples are in Fig. 4.
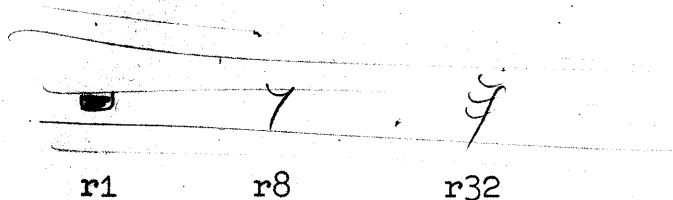

r1   r8   r32

Figure 4. Rests

I.B.3. A comma may be used alone as a note, meaning to copy the previous note exactly. Also, the comma may be used with "r" or a pitch number to form a note; the comma in this case indicates to copy only the duration from the previous note. The comma and the pitch indicator may come in either order. There should be no more than one comma in a note [tmc], there should never be a duration number in the same note with a comma [tmf]. Fig. 5 demonstrates the use of the co comma.
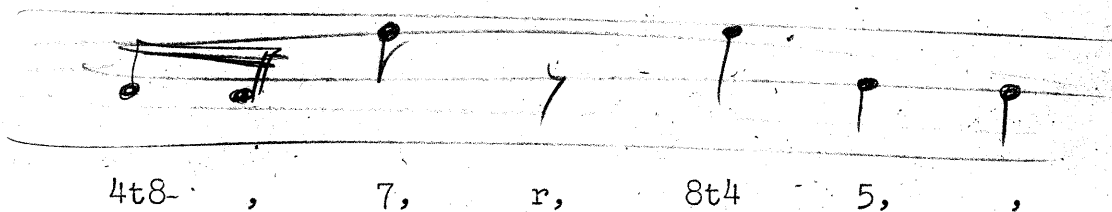

4t8-   ,   7,   r,   8t4   5,   ,

Figure 5. Comma Usage

I.B.4.a. Dotted notes. Often one or more dots occur directly after a note indicating that the duration of the note is to be lengthened. This notation is carried over into the Compiler, using the character "." (period). Each dot adds an amount to the duration; the first dot in a note adds one-half the duration of the note; each succeeding dot adds half the duration of the dot before it. A dot whose duration is less than that of a sixty-fourth note is ignored [dtu]. It is occasionally convenient to avdd a smaller fraction than half the note's duration. To enable this, the Compiler interprets the letter "x" in a note to mean, "halve the value of the dot". Periods and x's may be used anywhere in the note, and need not be contiguous. Their order is significant only among themselves. Either character will suffice to separate the pitch number from the duration number. The period may not occur in the same note as a comma [tic]. Fig. 6 shows some dotted notes and their translations for the Compiler.
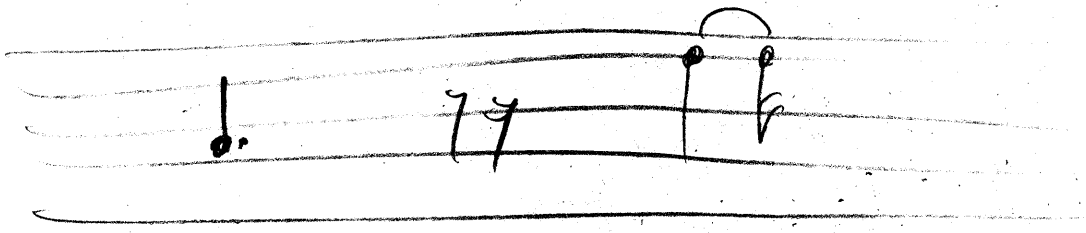
meaning
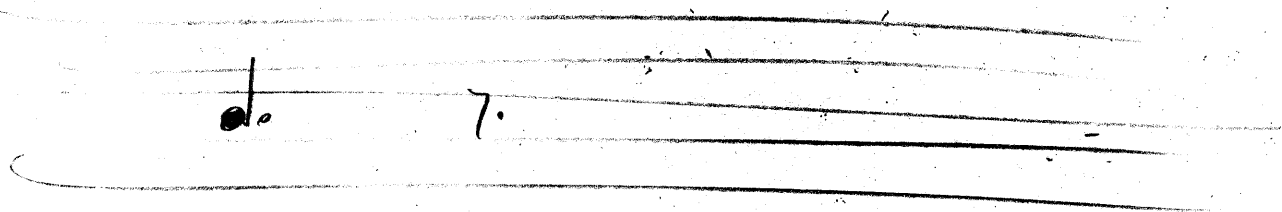
4.4   r8.   7x.4

Figure 6. Dotted Notes

I.B.4.b. Triplets. Sometimes three notes are to be played in the
time intended for two, musical notation indicates this
with the numeral "3" above the notes, directing that each
note be played for two-thirds its usual duration. This
is indicated to the Compiler by including the letter "c"
anywhere in each note so affected. Dots and x's may be
included. It is not necessary to the Compiler that the
notes in a triplet be adjacent. A comma in the following
note will copy the "c" only if the note in which the "c"
occurs does not contain a comma. (A note with a comma
may contain a "c".) For instances of use, see Fig. 7.
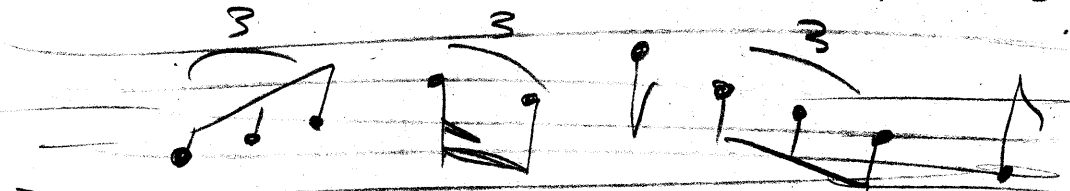
3c8 4, 5, 7c16 6c8 8t8 7c, 6c, 5c, 3,

or

7c8ᵇ 6, 5, 3t8

Figure 7. Triplets

I.B.5.a. Tone relocation. Occasional notes will be found which
are either above or below the staff. The Compiler assumes
staves to exist above and below the staff in use, as per
VFig. 8. To refer an individual note to either adjoining
staff, include the letter "a" (above) or "b" (below) any-
where in the note. These letters may occur more than once
in a note, and their effect is cumulative; e.g. "aa" refers
to the second staff above. The highest pitch available
is the treble clef's "a1"; the lowest is the bass clef's
"b2" [uat] [aor].
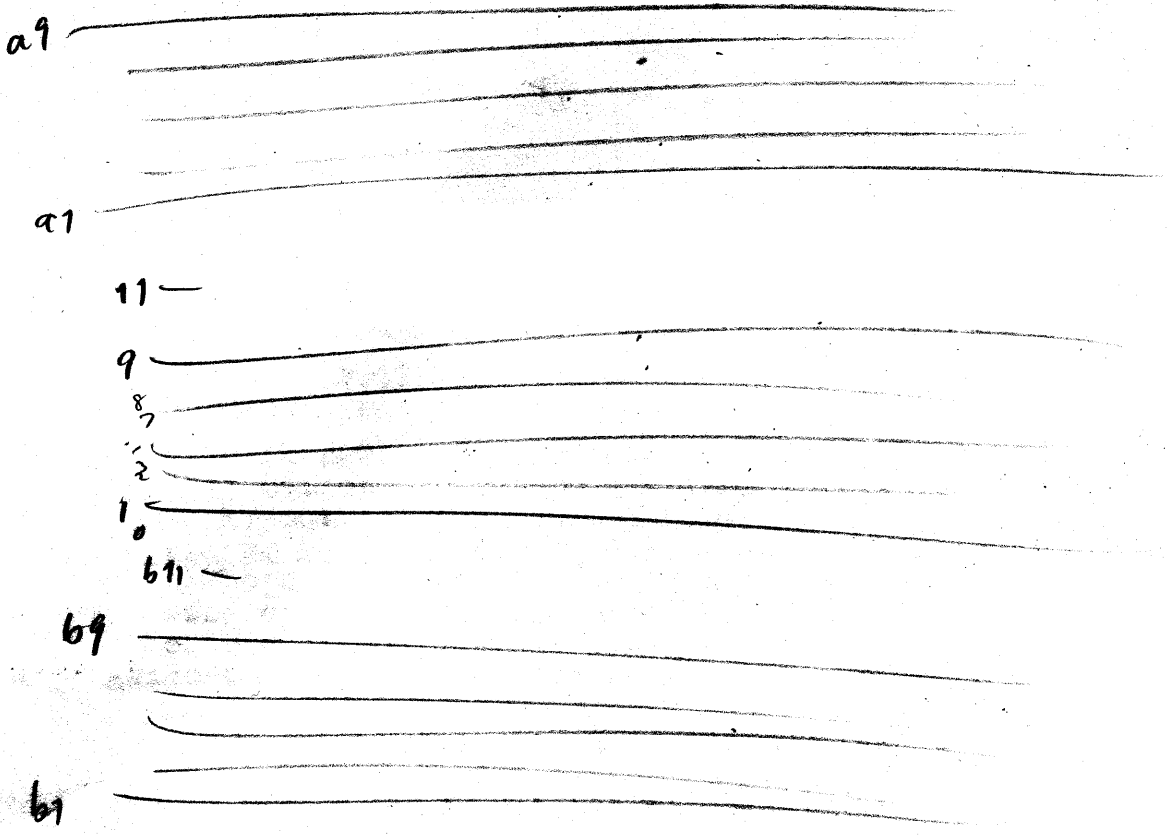
Figure 8. Tone Relocation

I.B.5.b. Accidentals. Accidental signs, and the characters to
signify them to the Compiler, are shown in Fig. 9. The
appropriate characters may be placed anywhere in the note
that they affect. An accidental appearing on a rest is
ignored [air]. If ")" appears in the same note with "-"
or "(", the ")" takes precedence [nor].

natural flat   sharp   double double
                                flat   sharp
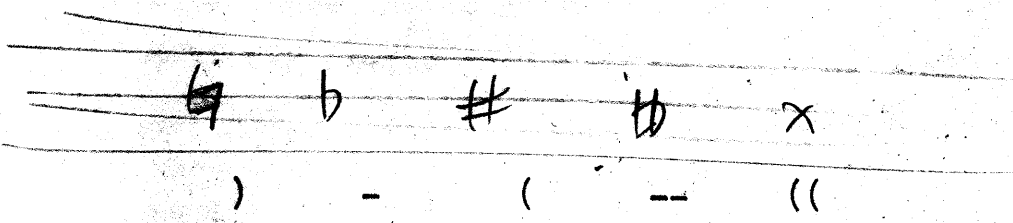
Figure 9. Accidentals

I.B.6. Two notes played in succession are made distinct to the ear
by articulation: the effect of a short duration of silence
between them. The duration of the preceeding note is
shortened by the amount taken for the period of articu-
lation. The articulation following a note can be expressed
to the Compiler by including an identifying letter any-
where in the note: the five letters available are explained
in the following table.

letter	name	duration of note	duration of articulation	used for
l	legato	1	0	slurs, legato notes
e	eighth	7/8	1/8	notes not specially marked
h	half	1/2	1/2	staccato for organ works
q	quarter	3/4	1/4	alternative to "e"
s	staccato	~3/8	~5/8	alternative to "hv"

The articulation of notes not containing "e", "h", "l", "q", or "s" is explained in I.D.5. The effect of these letters in a note is not copied by a comma in a subsequent note. If more than one of these letters should occur in a note, the last one will prevail [tms]. A slur is expressed to the Compiler by making legato all notes in the slur except the last. A few examples are shown in Fig. 10.
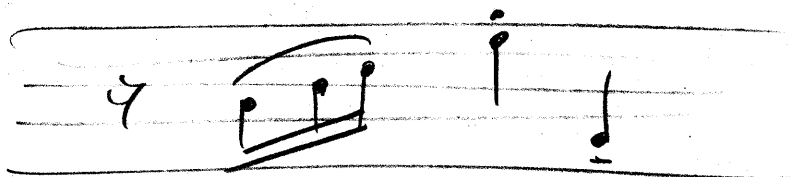
r16   14, 15, 6,   8s4   21,

Figure 10.   Staccato and Legato notes

I.B.7. Various embellishment signs may appear on a note in a piece
   of music, indicating that the note is to be performed
   more elaborately than written. In Fig. 11 are (a) the
   symbols (as used by C.P.E.Bach in his "Essay on the True
   Art of Playing Keyboard Instruments"), (b) the patterns
   compiled, (c) the minimum duration on which the Compiler
   will perform that embellishment [eit], (d) the letter used to
   signify that embellishment in a note.

Figure 11. Embellishments

short   trill   trill   praller   turn   trill
mordent   (without   with   (later
            suffix)   suffix   composers)

d   m   n   .p   u   w

If more than one embellishment is chosen for one note,
the last one will be taken [tme]. Embellishments may
not be called for on triplet notes [etr]. Comma does
not copy embellishments. An embellishment will be illegal
if any note it generates is out of range [eor].

I.B.8. A grace note (appoggiatura) steals its playing time from
the first non-grace-note to follow: such a note should
have sufficient duration to sound itself as well [itg].
A duration may be specified in a grace note, either by
a number or by the comma; if a time is not specified,
a thirty-second note will be compiled. The letter "g"
anywhere in a note marks it a grace note. Only one "g"
should be used in a note [tmg].

I.VC. Music is divided into sequential segments called measures,
each measure (usually) taking the same amount of time
to play and containing the same total duration of notes.
In score, measures are separated by a bar; for the Com-
piler the bar is represented by the slash "/".

I.C.1. The Compiler assigns successive numbers 1,2,3,...etc. to
successive measures of the music. If a number alone
(not part of a note) occurs in the input to the Compiler,
it is checked against the Compiler's measure count [bbl].
It is wise to use such bar labels frequently; they
warn of missing or duplicated measures, and also serve
to identify the measures they appear in.

I.C.2. When the Compiler encounters a slash, it adds up the dur-
ation of all notes since the last slash, and checks their
total duration against the expected length of the measure
[mtl] [mts].

I.D. Certain instructions must be supplied to the Compiler on an
infrequent basis; this is accomplished by including in
the Compiler input certain special words called commands.
Also some commands are provided merely to make the Com-
piler input more compact or easier to prepare.

I.D.1. The command "end" signifies the end of a line of music. When
this command, followed by a space, tab, or carriage return,
is encountered, the Compiler stops reading tape.

I.D.2. The total duration of a measure should be stated to the Com-
piler before any notes or rests occur. To do this, the
command "units" should appear, followed directly by a
number indicating the number of thirty-second notes in
a measure. This number may be computed by multiplying
the time signature (as a fraction) by 32. The "units"
command may occur anywhere in the text, and takes effect
immediately, referring to the measure where it occurs
and to all following measures (until the next use of
"units").

I.D.3. Prior to the appearance of any notes in the text, the Com-
piler should be informed on the clef which heads the staff
being read. There are four commands, representing four
clefs shown in Fig. 12.

bass   tenor   alto   treble
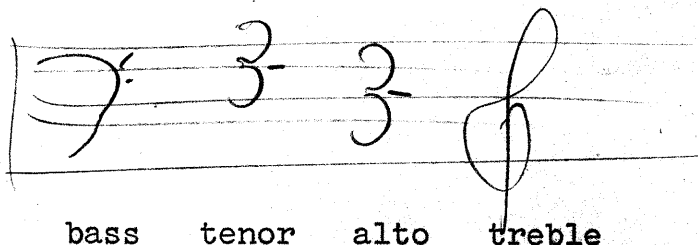
Figure 12. Clefs

A clef command may occur anywhere in the text, in order to
follow changes of clef in the music or simply for conveni-
ence where a long run of notes is above or below the staff
in use.

I.D.4. At the beginning of the music the key signature should be
stated; in the text this is done by use of the command
"key" followed by; ")" meaning no sharps or flats;
                    "-" for flats; or
                    "(" for sharps.
In case of sharps or flats, the symbol should be instantly
followed by a number which tells how many sharps or flats
are in the key signature. Samples are in Fig. 13.
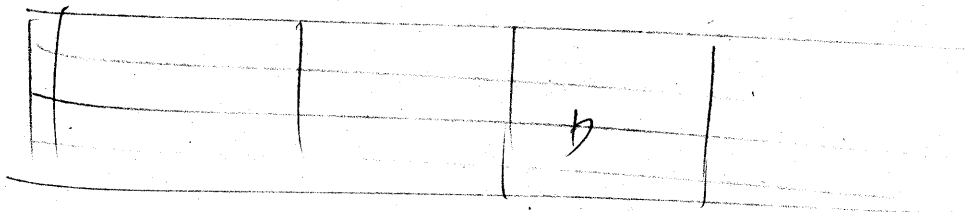
key)   key (3   key -1   key -6

Figure 13. Key signatures

I.D.5. One often encounters runs of several notes which have the
same degree of articulation. To facilitate expressing
this to the Compiler, one may use the single letters "s",
"l", "e", "h", and "q" alone as commands, selecting the
indicated degree of articulation for all following notes
which do not contain themselves any letter "s", "l", "e",
"h", or "q", with the exception of any note which immed-
iately preceeds a rest in the same measure, such annote is
automatically made legato unless it contains an articu-
lation letter. The articulation commands may occur any-
where in the text. At the beginning of each line of music
the Compiler is in the "e" mode. Fig. 14 demonstrates
articulation commands.

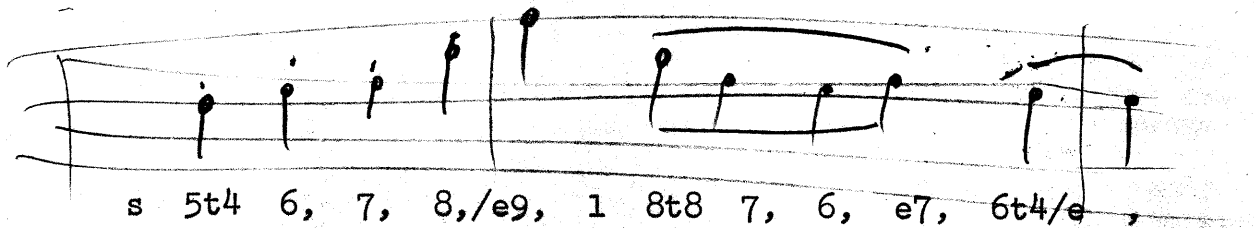s 5t4 6, 7, 8,/e9, 1 8t8 7, 6, e7, 6t4/e ,

Figure 14. Articulation commands

I.D.6. A given line may be silent for one or more measures. This
should be expressed to the Compiler by the command "restV"
followed by the number of inactive measures. (They will
all be given the current measure length.) The rest com-
mand may not be used when notes have already been written
in a measure [ilr]. Since it adds no duration to any
measure, there must not be a slash directly after use of
the "rest" command.

I.D.7. One or more measures may be identical to measures that have
gone before. It is advised in this case to use the com-
mand "copy" to duplicate previously written measures.
"Copy" should be followed by two numbers, the number of
the measure to start copying from, and the number of the
last measure to be copied. The first number must be lower
than the present measure number [blc], and the second
number must not be lower than the first [brc]. The second
number may be higher than the present measure number,
thus a section may be copied more than once. Like "rest",
"copy" may not be used when some notes are already written
in a measure [ilc], copied measures do not affect the
current measure's duration count, so "copy" should not
be followed by a slash. The measures are copied exact-
ly, they are not modified by change in the meaning of
the comma, or by a change in the mode of articulation,

or clef, or measure length, nor do they change any of
these for non-copied measures to follow.

I.D.8. The Compiler is able to transpose music with the commands
"up" and "down", a number follows the transposition com-
mand to indicate the number of semitones that the compiled
music will be above or below the music as written in the
text. These commands may occur at any point in the text
and take effect immediately. To restore the compiled
music to no transposition, say "up 0" or "down 0". The
compiler starts each tape at 0 transposition.

I.E. The Compiler expects the text punched on 8-channel paper tape
in FIO-DEC code. The tape may be prepared away from the
Computer, on a FIO-DEC Flexowriter or similar machine, or
it may be prepared on the Computer via some editing pro-
gram.

I.E.1. The characters "space", "tab", and "carriage return" are treated
identically by the Compiler. Two or more of these char-
acters in a row are treated the same as one. These facts
allow great flexibility in the appearance of the printed
page of text, but usually it proves worthwhile to follow
a format which is stricter than necessary. One such
format, which has proven satisfactory, is described below.

        a) the title is as long as desired (using any
               number of lines) and is ended by a slash.
        b) after the title the clef, time, key and tempo
               are specified in any order.
        c) each line represents one measure, the measure
               number is put at the beginning, and the
               "space" is used to separate notes, the
               line is ended with a slash.
        d) if a measure is too long to fit on one line,
               it is continued on the next line, indented
               by a tab. Only the last line of a meas-
               ure is ended with a slash.
        e) the commands "copy" and "rest" get a line to
               themselves, with no slash at the end.
        f) "end" is followed by a carriage return.

I.E.2. Any material (not in the title) that is typed in upper case
is ignored by the Compiler. Comments may thereby be entered
in the text at any point.

I.E.3. The text for each line of the music may be punched on a separate
tape, for convenience in tape handling, several lines may
be punched, one after the other, on one piece of tape, each
part must have its own title, "key", "units", clef, "tempo",
and "end".

FIGURE 4

ERRORS

code	meaning	effect
air	accidental in rest	accidental ignored
aor	accidental out of range	note replaced by rest
bbl	bad bar label	bar label ignored
blc	bad left argument to "copy"	"copy" ignored
brc	bad right argument to "copy"	"copy" ignored
dtu	dot underflow	time truncated to 64th
eit	embellishment on illegal time	embellishment ignored
eor	embellishment out of range	embellishment ignored
ert	erroneous time	note ignored
etr	embellishment in triplet	embellishment ignored
ilc	illegally located "copy"	"copy" ignored
ilr	illegally located "rest"	"rest" ignored
itg	insufficient time for grace notes	grace note(s) ignored
mtl	measure too long	long measure compiled
mts	measure too short	short measure compiled
nor	mixed accidentals	natural assumed
nps	no such pseudoinstruction	word ignored
tff	too few fields in note	note ignored
tic	time in comma note	comma overrules
tmc	more than one comma in note	one comma assumed
tme	too many embellishments in note	last embellishment taken
tmf	too many fields in note	note ignored
tmg	too many "g"s in note	one "g" assumed
tmr	too many "r"s in note	one "r" assumed
tms	too many "s", "l", "e" in note	last occurrence rules
uat	unavailable tone	note replaced by rest
unc	unprepared comma (no note before it)	note ignored