

Appendices

Appendix A: Standard Keys of the Flute

The following list of the keys of a typically equipped Boehm flute references a drawing (Figure 8, below) of the mechanism of the instrument itself. The descriptions apply to instruments usually encountered in France and the United States; warnings are made of certain important variants that would affect the use of the fingering charts given throughout this work. Each key is assigned a finger which alone (save for two exceptions) may handle that key in normal playing. Any fingering requiring the use of a finger on a key to which it is not assigned requires in effect an abnormal hand position. Such fingerings always bear footnotes to this effect and, when used, must be spaced in the musical flow in such a way that the player has time both to get into the required configuration and to get out of it. In particular, it is not possible — except for a few players with exceptionally large fingertips — to open either of the two trill keys and simultaneously close completely any of the numbered keys beside it with one finger, if the flute in question is of the French model.

Lefthand mechanism

No. 1 key	Closed by index finger.
B=flat thumb key	(Thumb lever.) Depression by thumb closes both B=natural thumb key and the plate between No. 1 and No. 2 keys.
B=natural thumb key	(Thumb key ordinarily in use.) Closed by thumb.
No. 2 key	Perforated on the French model. Depression by middle finger closes No. 2 key and the plate between it and No. 1 key.
No. 3 key	Perforated on the French model. Depression by ring finger closes No. 3 key and the plate immediately below it.
G=sharp key	Opened by little finger.

Note: The above information regarding the No. 3 key and the G-sharp key does not apply to the open G-sharp fingering system, not frequently encountered outside of Eastern Europe. In that system, the G-sharp key closes the plate immediately below the No. 3 key. Operation of the No. 3 key does not affect this plate.

Righthand mechanism

B=flat shake (Lacking on some older piccolos, most alto flutes, all bass flutes.) Depression by knuckle of index finger closes the plate between No. 1 and No. 2 keys.

Note: The shake on some flutes made in Germany, Britain, and the United States before 1920 is called the B=natural thumb key. Other arrangements have been made on special order.

No. 4 key Perforated on the French model. Depression by index finger closes No. 4 key, the plate above it, and the plate between No. 1 and No. 2 keys.

D trill key (Lacking on most bass flutes.) Depression by middle finger (less often by index finger) opens the lower of two small plates (not shown in diagram) above No. 1 key.

No. 5 key Perforated on the French model. Depression by middle finger closes No. 5 key and the plate above No. 4 key.

Note: The split E mechanism, an extra-cost option, changes the operation of the No. 3 and No. 5 keys in an effort to improve the somewhat faulty e₃=natural of the standard closed G-sharp finger system. Closing the No. 5 key also closes the plate below the No. 3 key without affecting the No. 3 key itself, which is only indirectly linked to that plate. Note well that this mechanical arrangement alters the actual key configuration of any fingering in which the No. 3 key is open and the No. 5 key is closed or on the rim. The data contained here apply only to flutes not equipped with the split E mechanism, so far as such fingerings are concerned.

D=sharp trill key (Lacking on most bass flutes.) Depression by ring finger (less often by middle finger) opens the upper of two small plates (not shown in diagram) above No. 1 key.

No. 6 key Perforated on the French model. Depression by ring finger closes No. 6 key and the plate above No. 4 key.

D=sharp key Opened by little finger. Held open in most normal fingerings to provide full venting; serves as a point of support when holding the instrument.

C=sharp key (Lacking on piccolo.) Closed by little finger.

C=natural key (Lacking on piccolo.) Depression by little finger closes C=natural key and C=sharp key.

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B=natural key (Optional equipment, available for the most part on concert flutes only.)
 Closed by little finger and ordinarily independent of other keys. (Sometimes in lefthand mechanism, operated by little finger.)

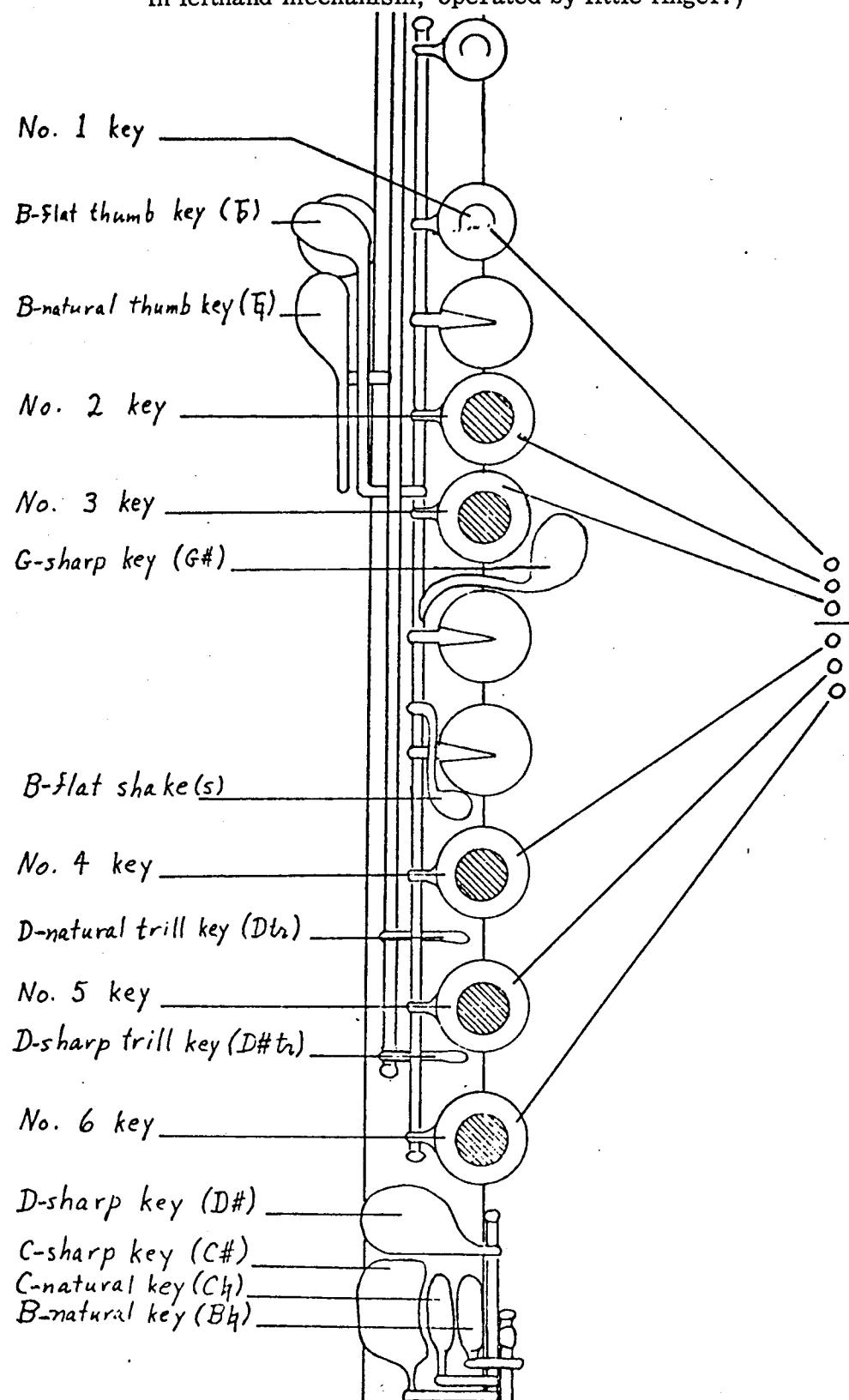


Figure 8. Standard flute keys.

Appendix B: Normal Fingerings

The first fingerings given for each pitch are traditional, accepted by all authorities as standard on the closed G-sharp flute or piccolo, up to d_4 . Above that pitch authorities differ, in large measure because of differences among instruments.

Only rarely can a piccolo attain a pitch higher than c_4 =natural or c_4 =sharp; some older instruments will not exceed b_3 =flat. Alto flutes are also in some measure restricted above d_4 ; bass flutes vary unpredictably. The extreme high-register fingerings are therefore my own, reflecting the suggestions of various players, and include without apology fingerings requiring the French model.

Alternate fingerings are also my own, with the help of many others too numerous to cite. Their status as primary fingerings varies and so requires some enumeration (see Figure 9):

1. a_1 =sharp and a_2 =sharp. The three fingerings should be chosen solely on the basis of convenience in context. The second and third fingerings produce identically the same configuration.
2. c_2 =sharp. The parenthetical second fingering may be used to facilitate register crossings and to lower slightly the sharp pitch of the main fingering. The optional D=sharp key is purely for the sake of convenience.
3. f_3 . The parenthetical second fingering may be used to add refinement to the tone quality of this note in normal playing. (The normal fingering gives a strangely coarse timbre for reasons as yet unexplained.)
4. f_3 =sharp. This case is very similar to 3.
5. g_3 =sharp. The parenthetical fingering is used to lower the pitch, which is too sharp on some instruments, but at the expense of somewhat deadened tone quality. Its use is unnecessary on most B foot instruments.
6. a_3 . The use of the C=sharp key instead of D=sharp slightly refines the timbre and raises the pitch, which is often slightly flat with the D=sharp key.

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7. a_3 =sharp. Choose between the first two fingerings on the basis of individual instruments. The first is too flat but gives a timbre more in character with the rest of the instrument than the second. The third is known as the "Mignon" fingering because of its use at the top of an ascending pianissimo E=flat seventh arpeggio in the Ambroise Thomas opera of that name. It is slightly sharp-pitched and can be played quite softly.
8. b_3 . The parenthetical fingering is slightly flatter than the usual fingering, which is too high on some flutes; however, the ring finger must cover a key normally under the middle finger of the right hand.
9. c_4 . The parenthetical fingering is available only on B foot flutes and is used to lower the very high pitch of the standard fingering. Closing the No. 5 hole lowers the pitch more than half-holing, which is possible only on the French model.
10. c_4 =sharp. Choose the fingering that is best on the particular instrument. It makes no difference on some.
11. d_4 . The C=natural key improves the note on some flutes, worsens it on others.
12. d_4 =sharp. The second and third fingerings are slightly flatter than the first. Choose the one that is best on the particular instrument.
13. e_4 . The first fingering is too high; the second corrects the pitch.
14. f_4 . The first fingering is too flat; the second corrects the pitch and blows more easily.
15. f_4 =sharp. The first fingering is fairly reliable on B foot flutes only; the second works on about 1 percent of C foot flutes.

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The chart displays standard Boehm flute fingerings across four staves, each with five lines. The fingerings are indicated by dots and numbers, with some notes grouped by brackets. The notes range from low B-flat to high E. Fingerings include various combinations of hole closures, such as C# (D#), D# (D#), C# (C#), D# (C#), and so on. Some fingerings are preceded by a sharp sign (#) or a flat sign (b). The first staff starts with B-flat, the second with A, the third with G, and the fourth with F. The chart includes several groups of fingerings, likely corresponding to different note sets or scales.

Figure 9. Standard fingerings of the Boehm flute.

Appendix C: Trill Fingerings

As in Appendix B, the traditional fingerings are given first, followed by variants that for various reasons are desirable and sometimes preferable. I depart from this convention only in the case of the very difficult a_3 - b_3 trill, of which the standard fingering is so unsatisfactory as to be virtually useless.

The notation used here is the same as elsewhere in this work, except for the additional wiggling character that denotes key movement (w). Multiple key movements must be made simultaneously; it is of course difficult to synchronize these if they are in opposite hands or in nonadjacent fingers. Such trills must be executed slowly.

The c_1 =sharp- d_1 =sharp trill must be avoided at all cost; the reason for this fact should be plainly apparent from the bracketed notes in the chart below. (Figure 10.) The g_3 - a_3 and a_3 - b_3 trills should not be attempted on piccolo; in fact, any trill with an upper note higher than b_3 =flat will prove unreliable or impossible on piccolo. The bass flute, of course, lacks the D=natural and D=sharp trill keys; this renders the written c_2 - d_2 , c_2 =sharp- d_2 =sharp, c_3 - d_3 , and c_3 =sharp- d_3 =sharp trills impossible. (The downward trills, given later, obviate some other problems on bass flute — such as the written c_2 =sharp- d_2 , c_3 =sharp- d_3 , and g_3 =sharp- a_3 trills.)

Figure 10. Upward trills.

Figure 10 (Continued).

The following fingerings (Figure 11) are traditional with the French masters and are given for the sake of completeness, but not without reservations owing to changes in the size of the tone-holes made at the time of the adoption of the modern 440-Hz A_1 . Since in each case the main note is fingered as usual, the only fingering given is that of the auxiliary (downward neighbor) pitch, which is in each case considerably sharper than the same pitch normally fingered.

These fingerings are used in rapid passagework and as turns for upward trills. Only an abridged list is given, since special fingerings for this purpose are not needed elsewhere on the instrument.

Diagram illustrating selected downward trills (Figure 11) with their corresponding hole-poking diagrams:

- Example 1:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Note: [use on most piccolos].
- Example 2:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Note: [poor].
- Example 3:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$.
- Example 4:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$.
- Example 5:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$.
- Example 6:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Note: [hole partially covered].
- Example 7:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Note: [use on most piccolos].
- Example 8:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$.
- Example 9:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Note: [use on most piccolos].
- Example 10:** Fingerings: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$. Hole-poking: $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$, $\begin{smallmatrix} \text{I} \\ \text{II} \end{smallmatrix}$.

Figure 11. Selected downward trills.

Appendix D: Fingerings for Quarter Tones

Fingerings are given for the quarter tones of the 24-tone scale only; refer to Appendix B for normal fingerings, often helpful in forming a preview of the playability of a projected passage.

Quarter tones for which no fingering is given are not playable to the best of my knowledge on flute. Fingerings for plateau system are given wherever possible, but their availability is limited. Not all fingerings given here are workable on piccolo.

The chart displays fingerings for quarter tones on a five-line staff. The notes are labeled with quarter-tone symbols (♯, ♭, ♪, ♫) and corresponding fingerings (F, G, A, B, C, D, E, F♯). The bottom row shows fingerings for notes with sharp or flat quarter-tones, such as ♪, ♫, and ♭. The chart also includes a note about the plateau system and a note about the availability of fingerings.

Figure 12. Quarter-tone fingerings.

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to ho to #o ho ho #o ho ho ho ho #o

h h # h h h # h h # h h h # h h # h h # h

	F	F						
0	E	E	E	E	E	E	E	E
0	•	•	•	•	•	•	•	•
0	G#	DG#	O	O	O	O	G#	G#
0	•	•	•	•	•	•	0	0
0	•	•	•	•	•	•	0	0
0	•	•	•	•	•	•	0	0
C#	D#	[sharp]	D#	D#	D*	D*	D#	D#
			[weak]	[weak]				

			F		F
T	•	•	T	•	•
0	0	0	0	0	0
—	—	—	—	—	—
•	•	0	0	0	0
D#	0	•	0	0	D#
0	0	D#	0	0	0
0	0	0	•	0	D#
0	0	0	•	0	0
D#			D#		D#
			C#		C#

Figure 12 (Continued).

Appendix E: Fingerings for 31-Tone Scale

Natural pitches given here do not and are not meant to correspond with those in 12-tone temperament, though in some cases a fingering will correspond for lack of a better one. The fingering list given below (Figure 13) is set up so that a_1 equals the a_1 of 12-tone temperament, which is also Helmholtz's usage. A certain degree of humoring with the embouchure is needed to bring the pitches into temperament, and the fingering list includes an indiscriminate mixture of normal tones, weak pitches, and simple and complex harmonics. Any experienced flutist can instantly distinguish between the fingering types, but for other readers the services of a flutist are indispensable in giving some impressions of what the various pitches sound like.

The degree of evenness of the 31-tone scale given below is approximately equivalent to that of a 12-tone chromatic scale executed on a seventeenth- or eighteenth-century single-keyed flute, or possibly slightly better than the latter. Just as was the practice of the masters of the Baroque, it is necessary in the case of 31-tone writing to take positive advantage of these unevennesses.

Pitches for which no fingering is given are essentially unavailable. These include in particular c_1 =flat, b =sharp, d_1 =double flat, d_1 =flat, c_1 =double sharp, e_1 =double flat, g_1 =flat, a_1 =double sharp, and c_4 =flat.

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Diagram illustrating fingerings for a 31-tone scale across five staves. Each staff shows a sequence of notes with corresponding fingerings below them. Brackets indicate groups of fingerings.

Staff 1:

- Notes: $b_{\#}$, $b_{\#}$, $\#_{\#}$, $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$, $b_{\#}$.
- Fingerings: $F^{\#} B$, $F^{\#}$ [often low], $F^{\#}$, $F^{\#}$ [often low], $F^{\#}$, $F^{\#}$.

Staff 2:

- Notes: $\#_{\#}$, $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$, $b_{\#}$.
- Fingerings: F , F [often low], F , F [high], F [low], F , F .

Staff 3:

- Notes: $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$.
- Fingerings: F , F [often low], F , F [high], F [low], F , F , F , F , F , F , F .

Staff 4:

- Notes: $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$.
- Fingerings: F , F [awkward hand position], F , F [low], F , F [high], F [low], F , F , F , F .

Staff 5:

- Notes: $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$, $bb_{\#}$, $\#_{\#}$, $b_{\#}$, $x_{\#}$, $b_{\#}$.
- Fingerings: F , F , F , F [low], F [high], F , F , F , F , F , F , F .

Figure 13. 31-tone fingerings.

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F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

#₁ b₂ x₃ b₄ b₅ #₆ b₇ bb₈ #₉ b₁₀ x₁₁ b₁₂ bb₁₃

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

#₁ b₂ x₃ b₄ b₅ #₆ b₇ bb₈ #₉ b₁₀ x₁₁ b₁₂ bb₁₃

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F

b₁ #₂ b₃ bb₄ #₅ b₆ x₇ b₈ bb₉ #₁₀ b₁₁ x₁₂ b₁₃ bb₁₄

F
<img alt="Handwritten musical score for F major, similar to the ones above but with different note patterns. The first staff starts with a high note (open circle) followed by a series of eighth notes. The second staff starts with a low note (filled circle) followed by a series of eighth notes. The third staff starts with

Figure 13 (Continued).

Appendix F: Available Multiphonics

This list of multiphonics and similar sounds was prepared by running a computer program that printed out a complete list of available fingerings for French model flute equipped with the B foot but no other optional or special keys. These fingerings were then played through and their available multiphonics were rather selectively listed, while the least reliable ones and many duplications were omitted. The materials thus obtained were ordered by pitch and retested — in the process small errors in pitch notation were corrected and many more unreliable multiphonics and duplications were eliminated. A third pass was made in preparing the descriptions of multiphonics; still more corrections and eliminations were made at this stage.

Two Verne Q. Powell flutes, serial numbers 18 and 591, were used in preparing the list. The former of these lacks the B foot, but it proved possible to interchange the foot joints of the two instruments; therefore much testing was done with hybrid instruments. In addition, I had the use during part of the testing process of a head joint in white gold made by N. D. Lamberson of Oskaloosa, Iowa. Its playing characteristic were profoundly different from those of either of the Powells, which in turn differed greatly between themselves, but little or no unsettling effect on the production of the various multiphonics was found, much to my surprise. The embouchure chimneys of the three instruments varied in height from a low and free-blowing 0.187 inch (Powell number 18) to a high and very resistant 0.212 inch (N. D. Lamberson head, which was used with Powell number 18), as opposed to the more typical height of 0.195 inch of Powell number 591.

Interchanging the B and C foot joints was found to have virtually no effect on the production of multiphonics not containing pitches of c_4 or higher. The extremely high pitches — c_4 and above — were profoundly affected, however, and many multiphonics containing such extremely high pitches had to be eliminated for this reason. (In general, the B foot improves the extreme high range; some fingerings are changed slightly. However, the overall timbre of the instrument is affected by the B foot — in some cases bettered, in some cases

worsened, depending on the instrument and on the taste of the player.)

The multiphonics were notated using a system of temperament containing 31 pitches, equally spaced, to the octave, the pitches in parentheses denoting enharmonic equivalences (Figure 14). With very few exceptions, the simplest enharmonic form relative to C-natural was used regardless of the chords being spelled. Several considerations impelled me to employ the relatively unfamiliar 31-tone scale in preference to the more popular 12-tone, divided as is commonly done into quarter tones making a 24-tone scale. A somewhat

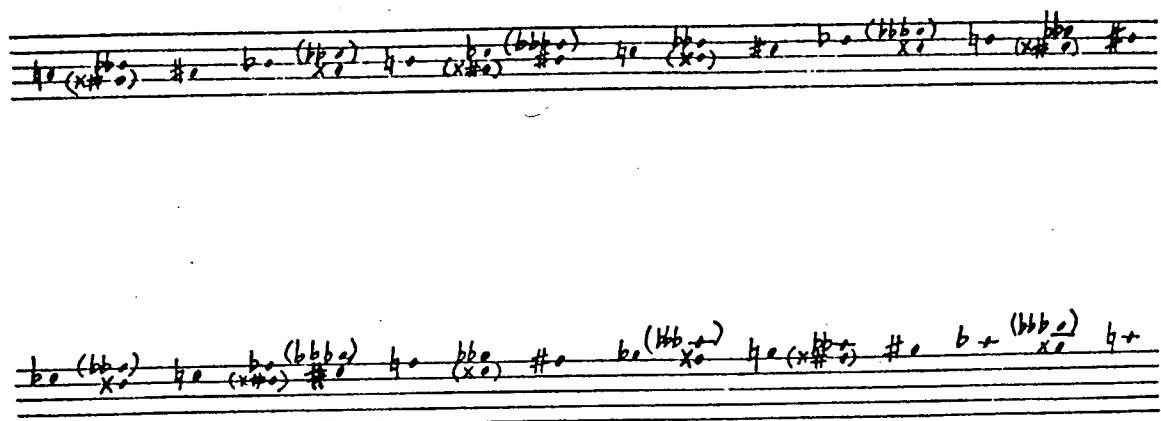


Figure 14. The 31-tone scale with enharmonic equivalences.

sketchy list of these considerations includes the following: (a) No special symbols such as half-sharp ($\#$), one-and-a-half sharp ($\#\#$), half-flat (\flat), or one-and-a-half flat ($\flat\flat$) are needed. Instead the normal accidental symbols are used to their fullest significance. (b) The representation of the major third is greatly improved over that of 12- or 24-tone equal temperament, and the fifth, though slightly worse than that of the 12-tone, is still quite good. Also, the augmented sixth of the 31-tone is a very close approximation of the pure seventh (ratio of 7 to 4), which has no equivalent in the 12- or 24-tone and which occurs in a number of multiphonics that would otherwise be non-notable. This equivalence is also lacking in the otherwise superior 53-tone system. (c) The diesis, or interval between adjacent steps in the 31-tone system, is the highest degree of precision that can be expected of a flute with technology at its present level. The assignment of a flute pitch to one or another slot in the 53-tone system is too minute a task; in other words, flutes are not capable of such a high degree of precision. (d) The degree of precision given by 31-tone notation is the minimum that would be useful to facilitate the work of those composers who use exact numerical ratios rather than temperaments in their work. Lip adjustments with half a diesis to make a pitch true are almost always reasonable; adjustments of one-half

semitone or even one-quarter semitone in 12-tone may well be unreasonable in context.

(e) The surprising discovery was made that the French model flute, with or without the B-foot, is capable of a better approximation of a 31-tone scale than of a 24-tone or quarter-tone scale.

In general, the higher the register, the narrower the tremolo that can be performed with reasonable certitude without awkward lip movements. This is because of the conflicting overtone series in the alternating tones. The partials get closer together and harder to isolate as one goes into the higher range. This is over and above the fact that the fingerings in the upper range are relatively clumsy because of the amount of key manipulation involved, unless simple harmonics are used in their stead. Table 1 gives the usual maximum range of tremolos.

Tremolos wider than a major second involving pitches above g_3 =sharp are generally impractical, as are lip tremolos of the octave between the lower or fundamental octave and the second register.

Table 1

Maximum range of tremolos by register.

<u>Lower Pitch</u>	<u>Upper Pitch</u>	<u>Maximum Safe Interval</u>
lower octave ($b-c_2$ =sharp)	lower octave ($b-c_2$ =sharp)	minor seventh; possibly major seventh
lower octave	second register (d_2-c_3 =sharp)	augmented fourth; possibly fifth
second register	second register	perfect fourth
second register	third register (d_3-g_3 =sharp)	if upper note is d_3 , augmented fourth; otherwise major third
third register	third register	minor third

Table 2
Frequencies of 24-tone versus 31-tone pitch systems.

24-Tone Temperament			31-Tone Temperament		
Pitch	Frequency	Cents	Pitch	Frequency	Cents
a ₁ natural	440.0	0	a ₁ natural	440.0	0
a ₁ half-sharp	452.9	50	b ₁ double flat	449.9	39
a ₁ sharp	466.2	100	a ₁ sharp	460.1	77
b ₁ half-flat	479.8	150	b ₁ flat	470.5	116
b ₁ natural	493.9	200	a ₁ double sharp	481.2	155
b ₁ half-sharp	508.4	250	b ₁ natural	492.0	194
c ₂ natural	523.3	300	c ₂ flat	503.2	232
c ₂ half-sharp	538.6	350	b ₁ sharp	514.5	271
c ₂ sharp	554.4	400	c ₂ natural	526.2	310
d ₂ half-flat	570.6	450	d ₂ double flat	538.1	348
d ₂ natural	587.3	500	c ₂ sharp	550.2	387

Table 2 (Continued)

24-Tone Temperament			31-Tone Temperament		
Pitch	Frequency	Cents	Pitch	Frequency	Cents
d ₂ half-sharp	604.5	550	d natural e ₂ ² double flat	588.4 601.7	503 542
d ₂ sharp	622.3	600	d ₂ sharp	615.3	581
e ₂ half-flat	640.5	650	e ₂ flat	629.2	619
e ₂ natural	659.3	700	d ₂ double sharp e ₂ natural	643.5 658.0	658 697
e ₂ half-sharp	678.6	750	f ₂ flat	672.9	735
f ₂ natural	698.5	800	e ₂ sharp	688.1	774
f ₂ half-sharp	718.9	850	f ₂ natural	703.7	813
f ₂ sharp	740.0	900	g ₂ double flat f ₂ sharp	719.6 735.9	852 890
g ₂ half-flat	761.7	950	g ₂ flat	752.5	929
g ₂ natural	784.0	1000	f ₂ double sharp	769.5	968
g ₂ half-sharp	807.0	1050	g ₂ natural a ₂ ² double flat	786.9 804.7	1006 1045
			g ₂ sharp	822.9	1084

Table 2 (Continued).

24-Tone Temperament			31-Tone Temperament		
Pitch	Frequency	Cents	Pitch	Frequency	Cents
g_2 sharp	830.6	1100	a_2 flat	841.5	1123
a_2 half-flat	854.9	1150	g_2 double sharp	858.6	1161
a_2 natural	880.0	1200	a_2 natural	880.0	1200

Those who wish to translate the given 31-tone material to 24-tone or quarter-tone notation should make use of the equivalence table, Table 2, where A=natural equals A=natural.

To use the listings as conveniently as possible, reference should be made to a particular pitch in a particular octave register. Typically, this one pitch may be but one of several possibilities for the situation: if so, then the following process should be repeated for the various possibilities until the multiphonic best suited to the situation emerges.

Refer to the Index to Multiphonic List.

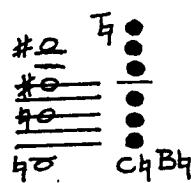
1. This is an index by pitch, ascending in 31-tone sequence from lowest to highest. Under each pitch heading all multiphonics containing that pitch as an original (not a derived) frequency are listed by number.
2. Find the listed multiphonics in the chart in front of the Index. The multiphonics are numbered sequentially, lowest pitches first.
3. Pick a working possibility and look up its number in the Descriptive Notes behind the Index. Please heed all warnings contained therein; failure to do so is to ask for trouble. If the limitations of a particular multiphonic are not appropriate to the demands of the situation, then by all means find something else or adapt the situation to the multiphonic.
4. If you are not writing for a player equipped with French model flute with B foot, then the indications "F," "B," and "FB" above the fingerings must be taken into account. These notations mean respectively, "French model required," "B foot required," and "French model with B foot required." Where possible, I have given plateau fingerings preferentially, even if a French model fingering works better, in cases where multiple fingerings exist.
5. If desired, convert the notation to some form of 12- or 24-tone notation using Table 2.

Some phenomena are mentioned as aleatoric fingerings rather than as true multiphonics. In any case, but especially with these, the Descriptive notes should be heeded scrupulously.

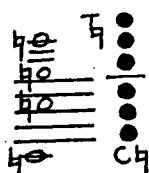
One last warning must be made — namely, that some of the present test results are not applicable to flutes equipped with the split E mechanism. Specifically, any fingering in which the No. 5 key is closed or on the rim and the No. 3 key is open can be expected to behave differently on a flute with the split E mechanism than on a flute not so equipped. This is not a statement of prejudice against such a device; the fact is simply that this writer did not have such an instrument at his disposal. The split E mechanism is expensive and rather unusual in the United States and France; it is generally applied on closed G-sharp flutes and especially piccolos in eastern Europe.

The Multiphonics

1 B



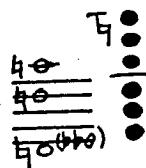
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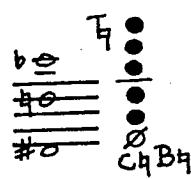
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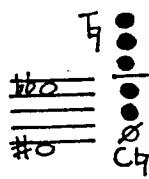
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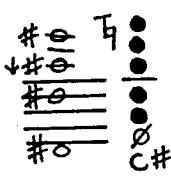
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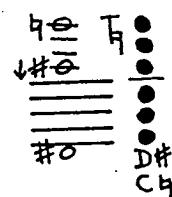
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7 F



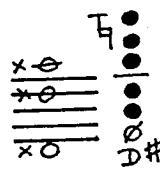
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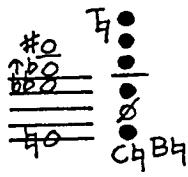
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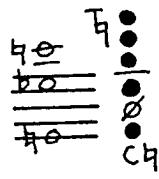
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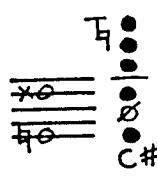
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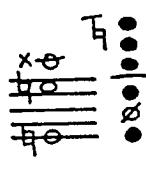
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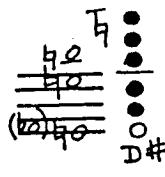
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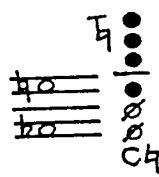
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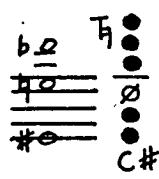
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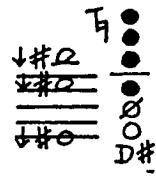
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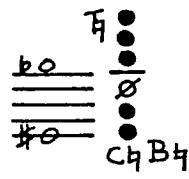
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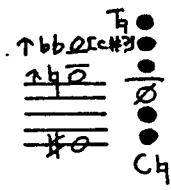
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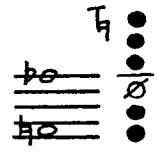
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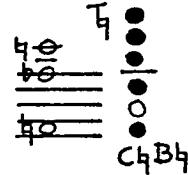
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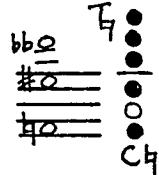
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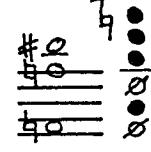
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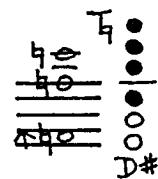
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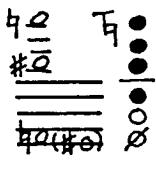
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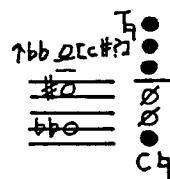
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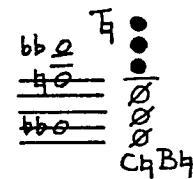
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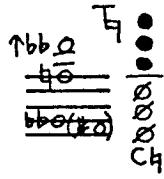
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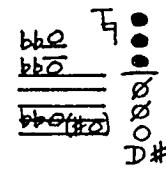
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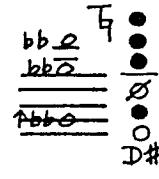
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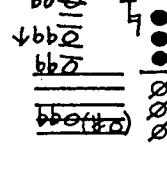
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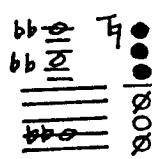
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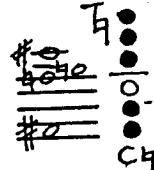
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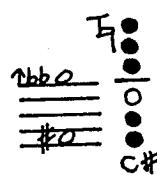
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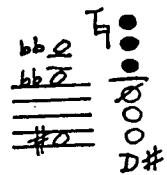
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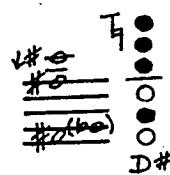
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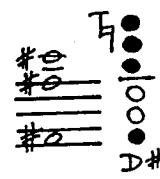
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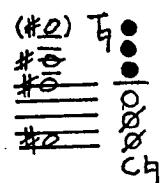
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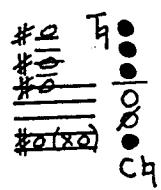
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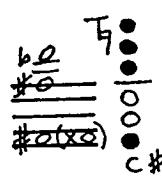
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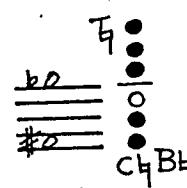
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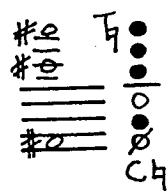
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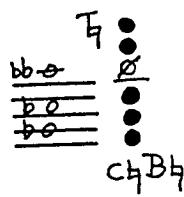
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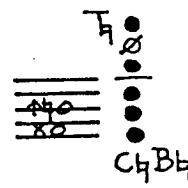
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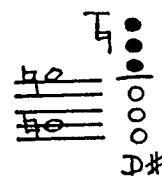
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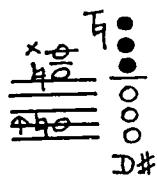
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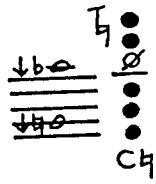
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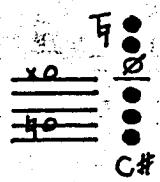


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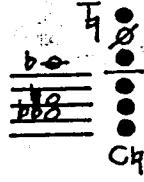


66 THE MULTIPHONICS

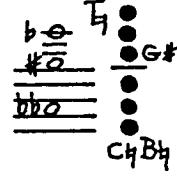
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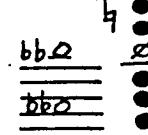
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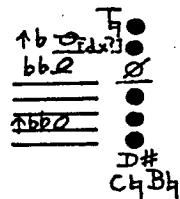
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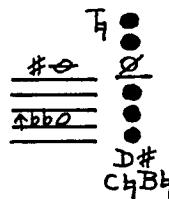
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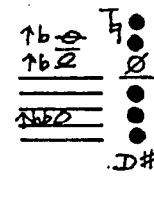
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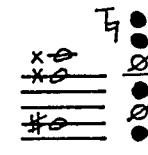
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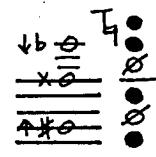
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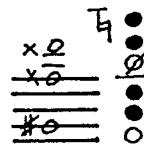
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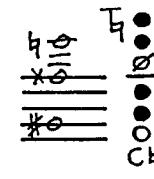
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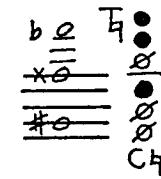
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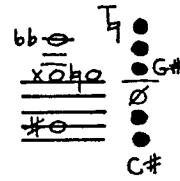
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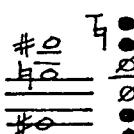
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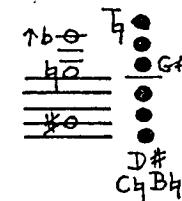
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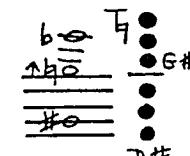
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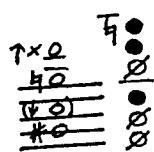
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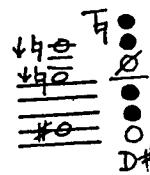
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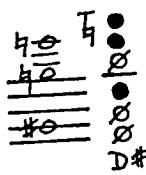
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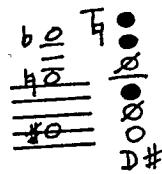
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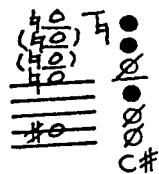
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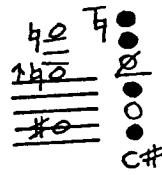
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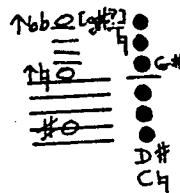
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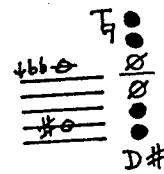
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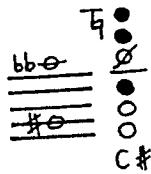
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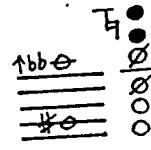
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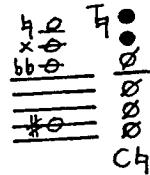
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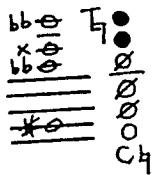
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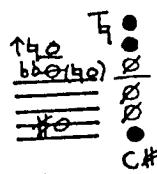
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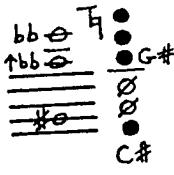


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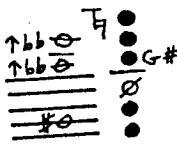


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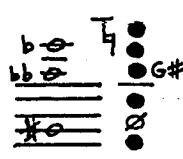


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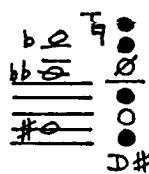


68 THE MULTIPHONICS

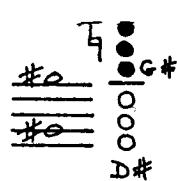
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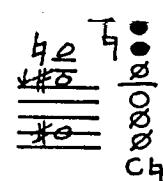
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83



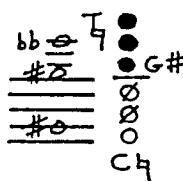
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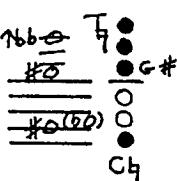
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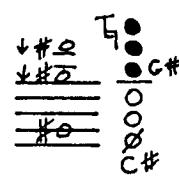
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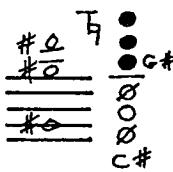
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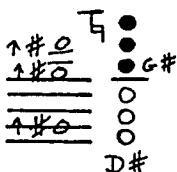
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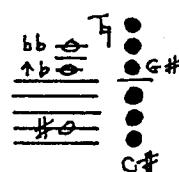
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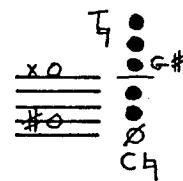
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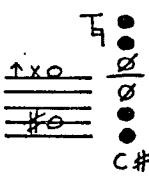
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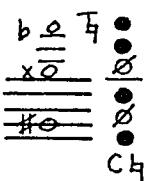
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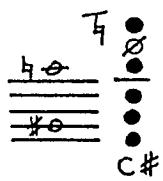
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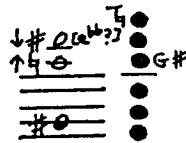
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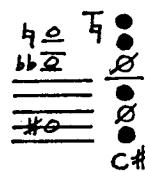
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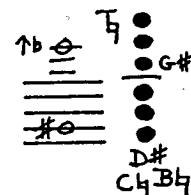
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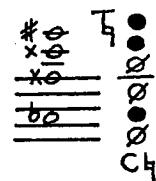
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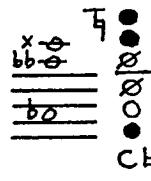
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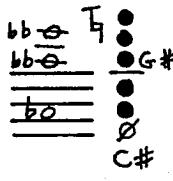
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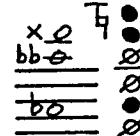
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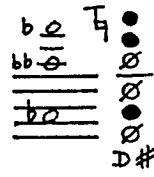
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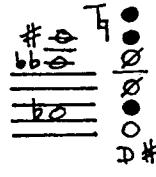
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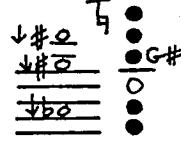
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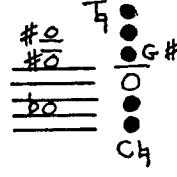
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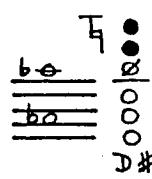
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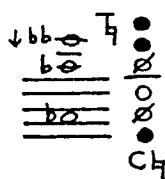
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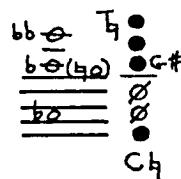
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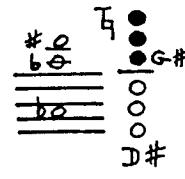
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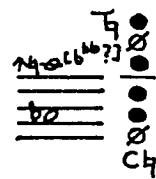
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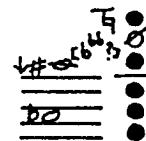
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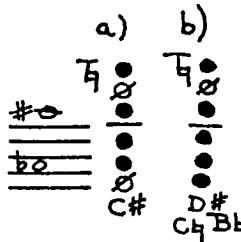
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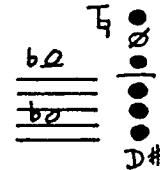
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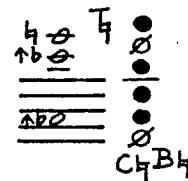
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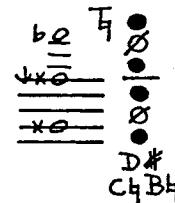
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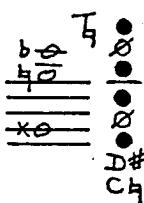
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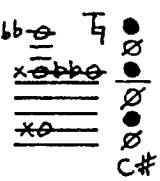
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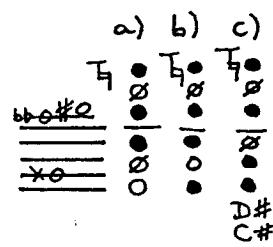
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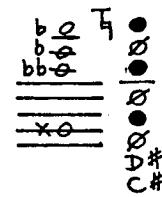
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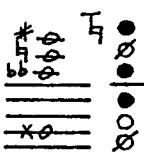
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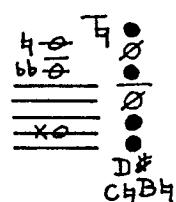
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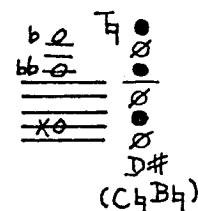
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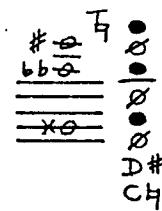
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125 F(B)



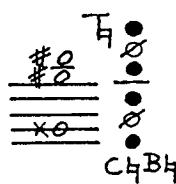
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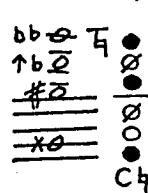
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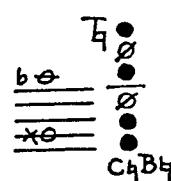
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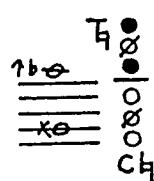
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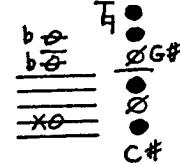
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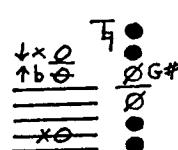
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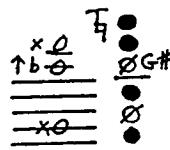
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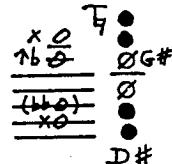
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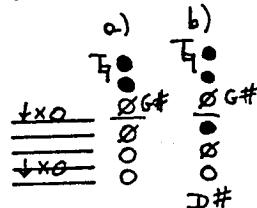
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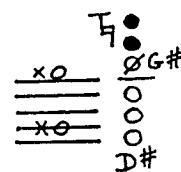
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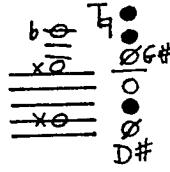
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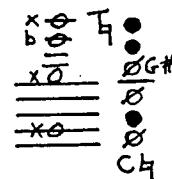
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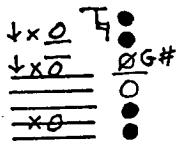
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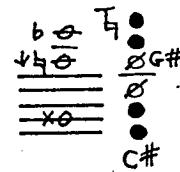
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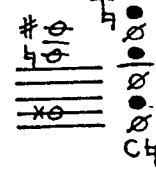
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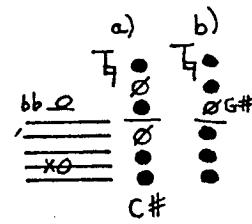
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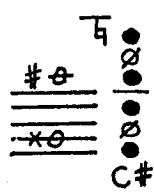
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143 F F



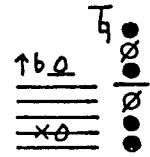
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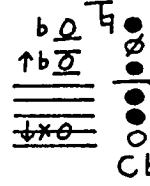
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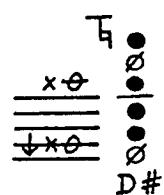
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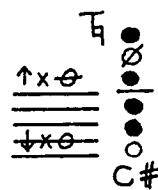
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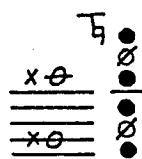
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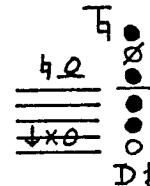
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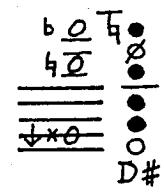
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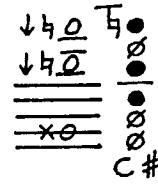
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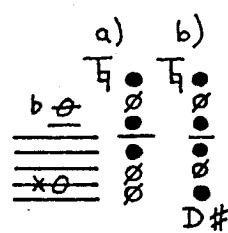
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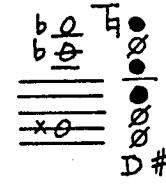
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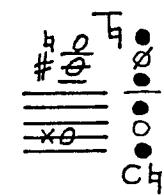
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156 F



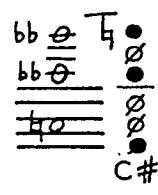
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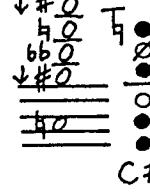
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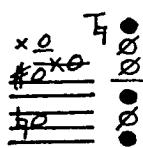
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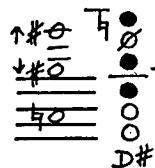
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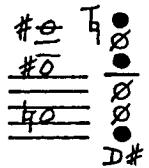
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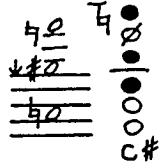
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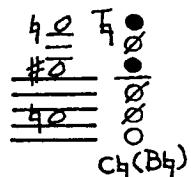
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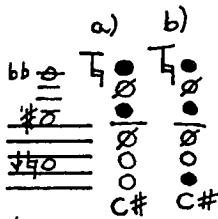
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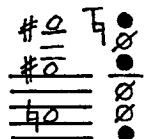
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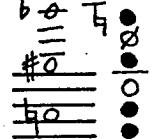
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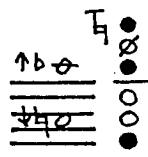
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168 F



169 F



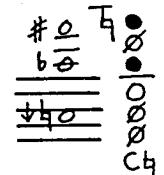
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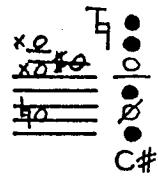
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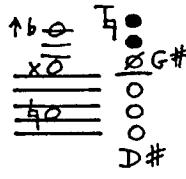
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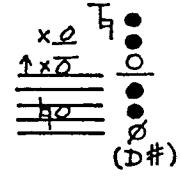
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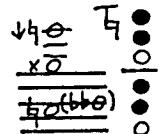
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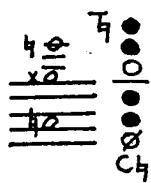


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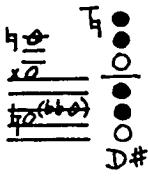


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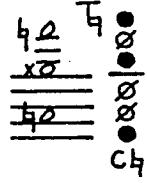
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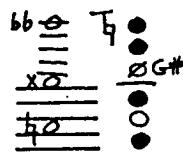
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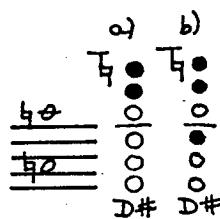
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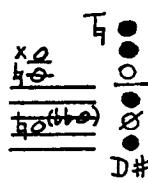
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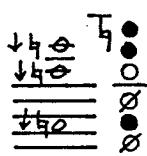
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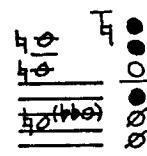
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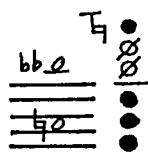
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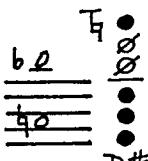
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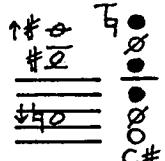
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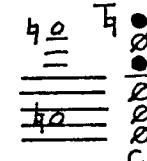
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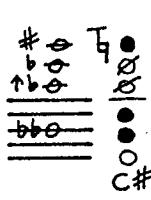
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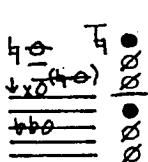
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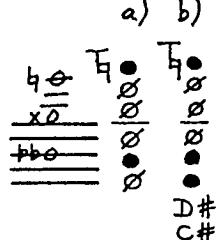
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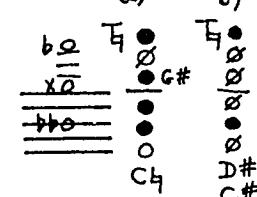
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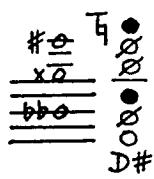


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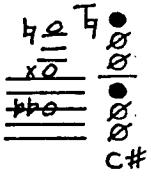


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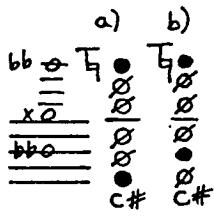
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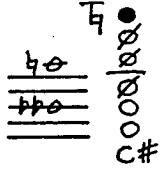
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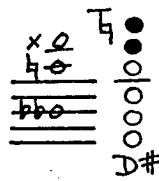
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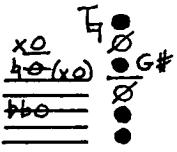
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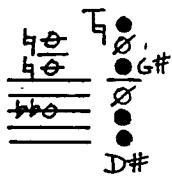
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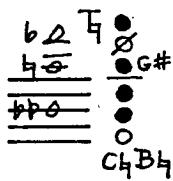
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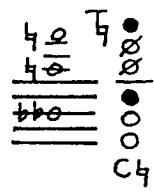
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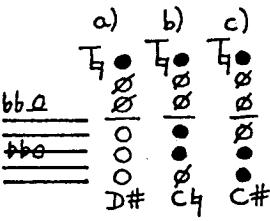
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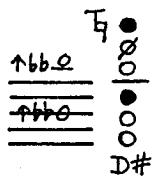
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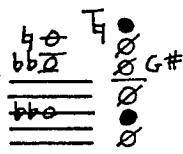
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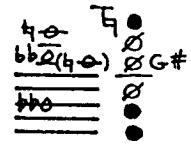
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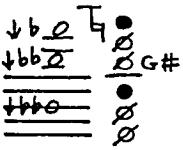
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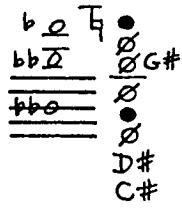
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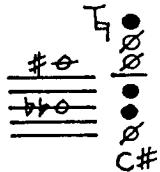
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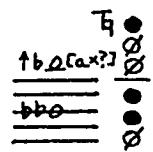
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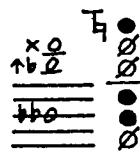
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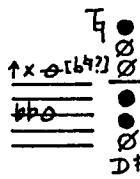
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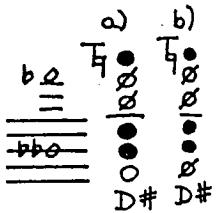
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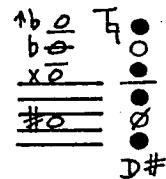
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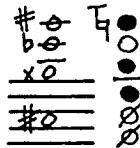
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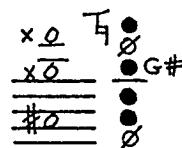
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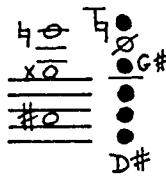
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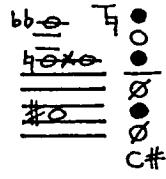
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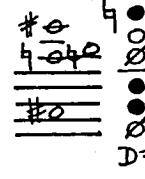
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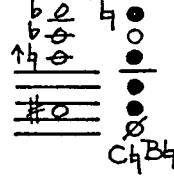
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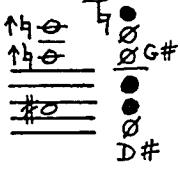
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219 FB



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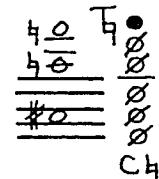
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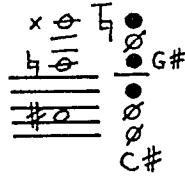
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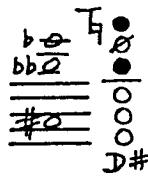
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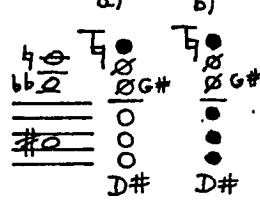
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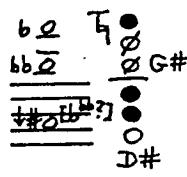
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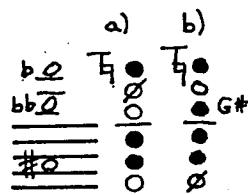
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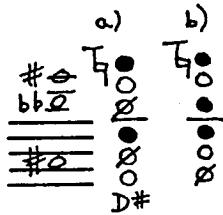
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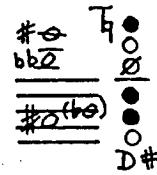
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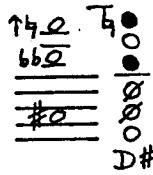
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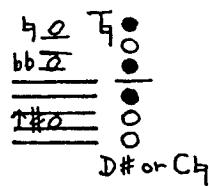
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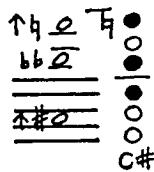
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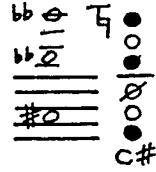
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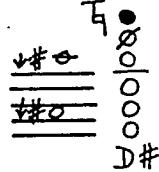
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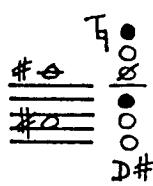
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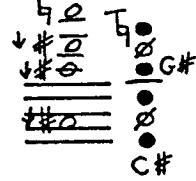
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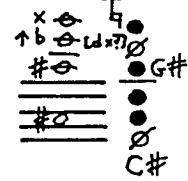
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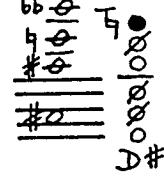
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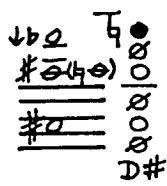
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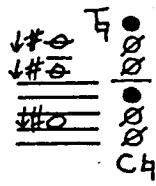
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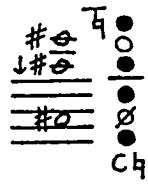
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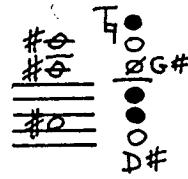
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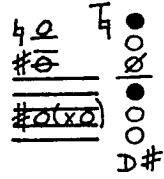
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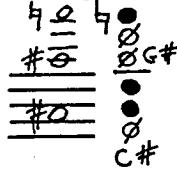
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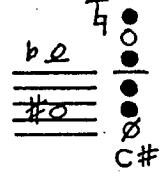
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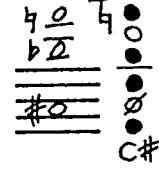
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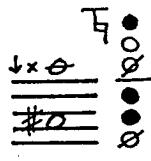
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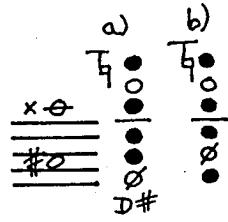
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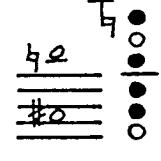
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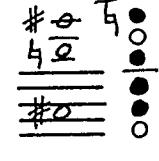
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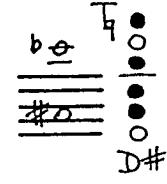
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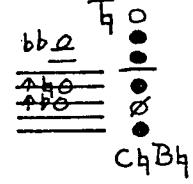
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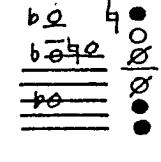
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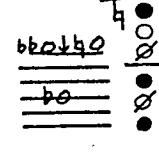
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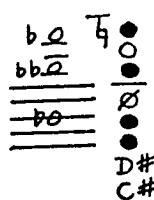


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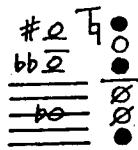


THE MULTIPHONICS 79

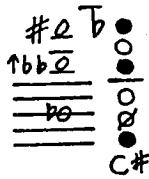
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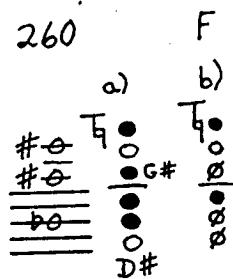
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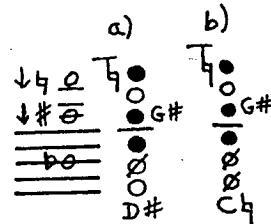
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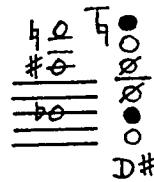


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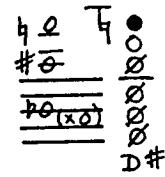


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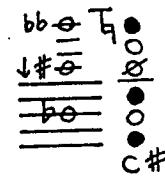
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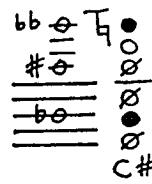
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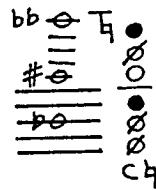
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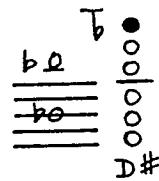
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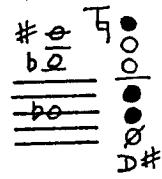
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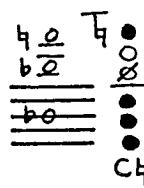
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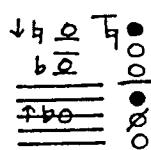
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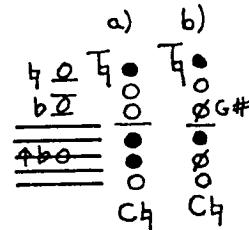
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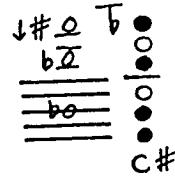
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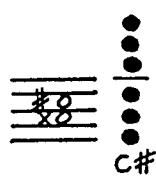
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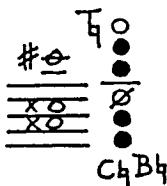
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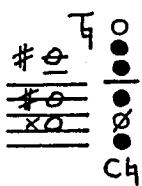
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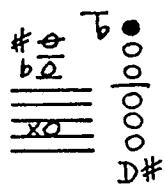
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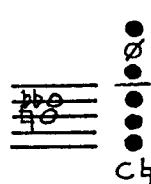
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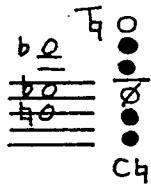
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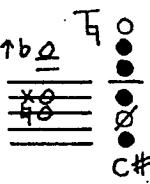
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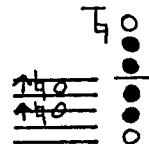
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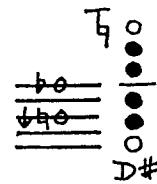
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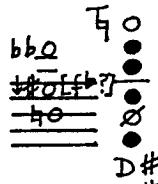
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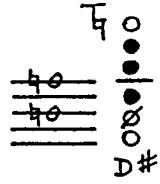
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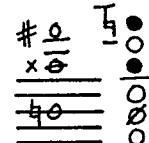
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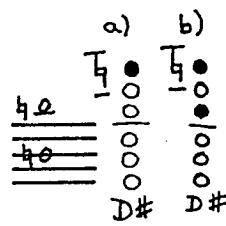
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284 F



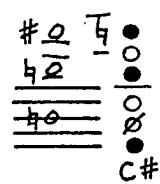
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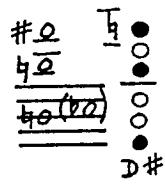
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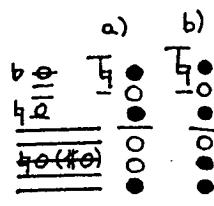
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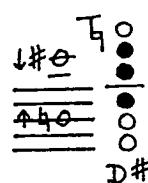
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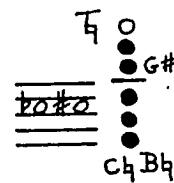
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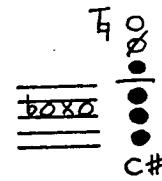
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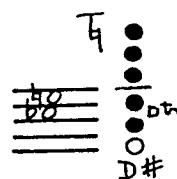
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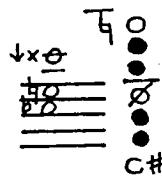
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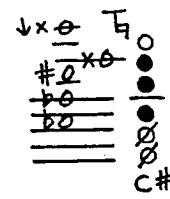
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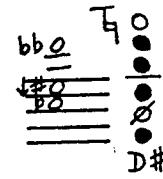
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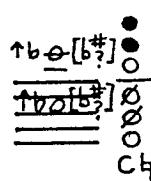
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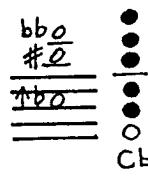
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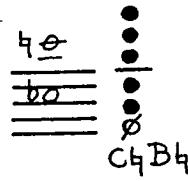
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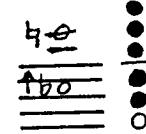
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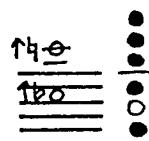
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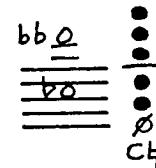
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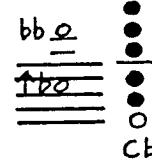
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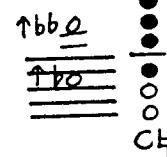
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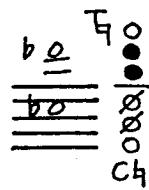
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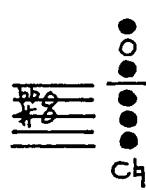
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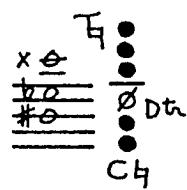
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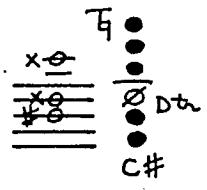
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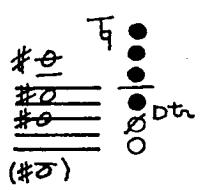
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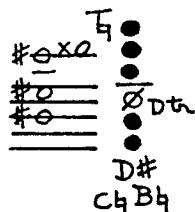
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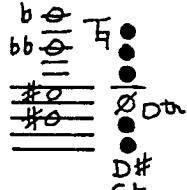
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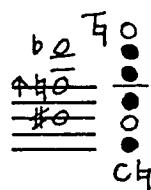
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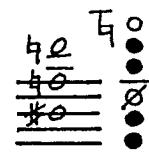
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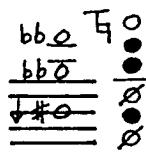
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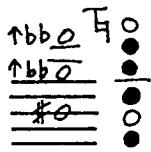
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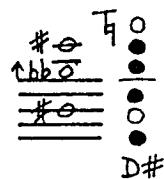
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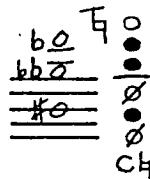
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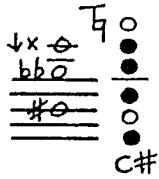
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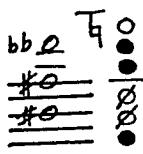
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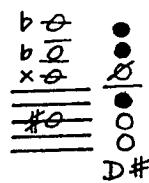
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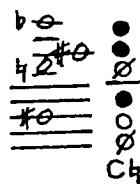
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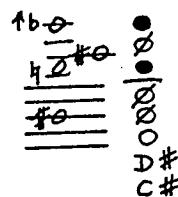
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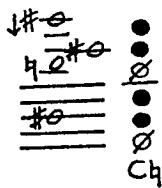
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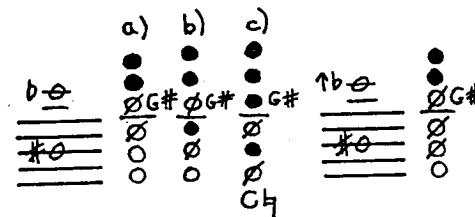
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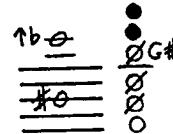
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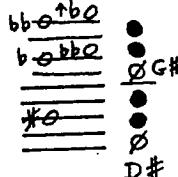
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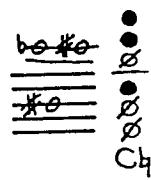
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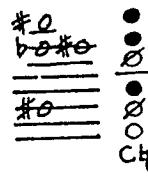
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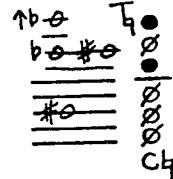
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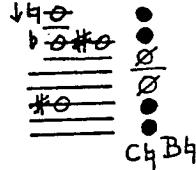
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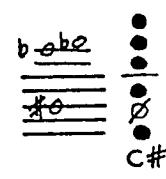
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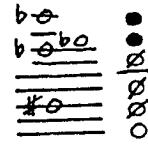
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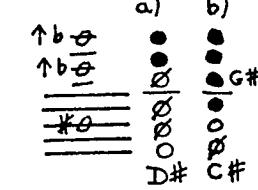
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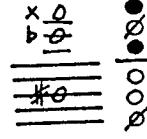
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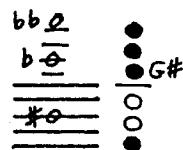
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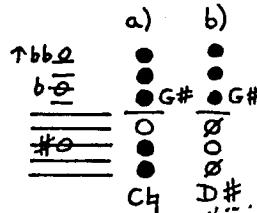
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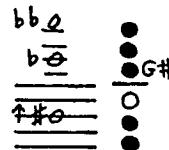
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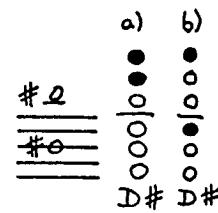
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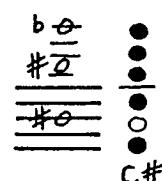
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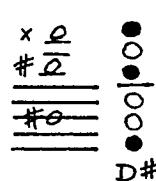
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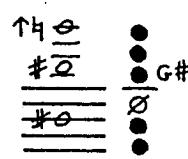
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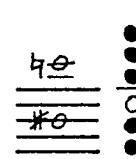
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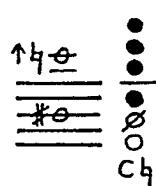
343 F



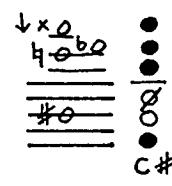
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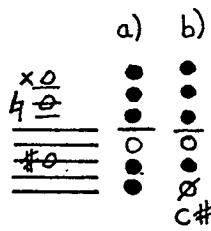
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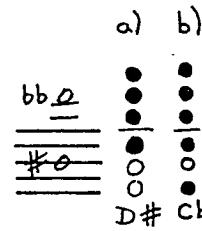
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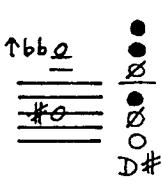
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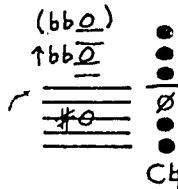
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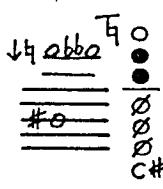
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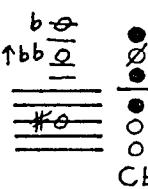
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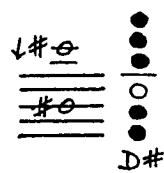
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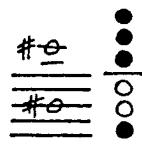
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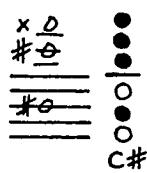
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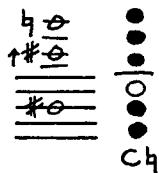
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355



356

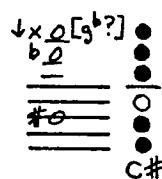


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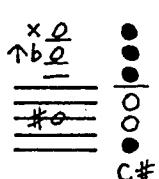
A

358 F

359



360



361

362 F

363

364 F

A handwritten musical staff consisting of five horizontal lines. It features several notes: a whole note with a vertical stem and a crossbar, a half note with a vertical stem and a dot, a quarter note with a vertical stem and a dot, a eighth note with a vertical stem and a dot, and a sixteenth note with a vertical stem and two dots. There are also several rests: a long rest (a large square), a half rest (a small square), and a quarter rest (a small circle).

四〇
●●●●
C_b

7
0 ●
0 ○
● ●
C#

365 FB

366 F

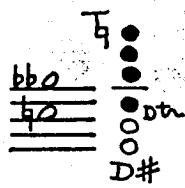
367

368 F

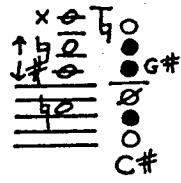
T_4 
 \emptyset 
 \emptyset 

b6-
—
b6
—
b7 (b7-)
—
Dtr.

369



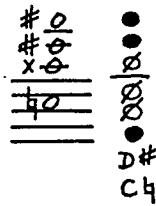
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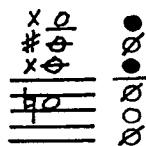
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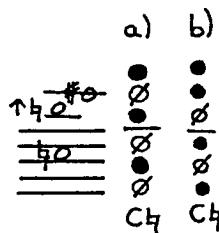
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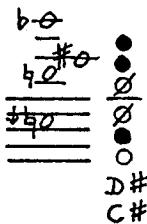
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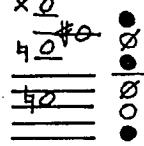
374 F F



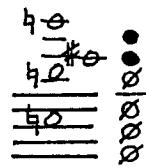
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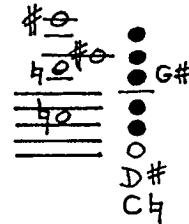
376 F



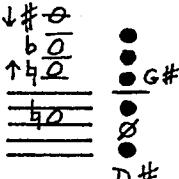
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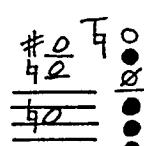
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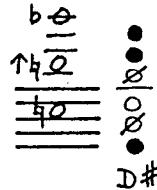
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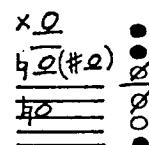
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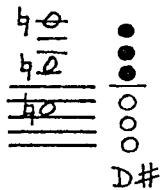
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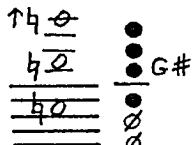
382 F



383

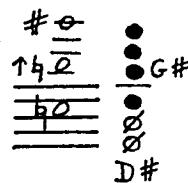


384 F

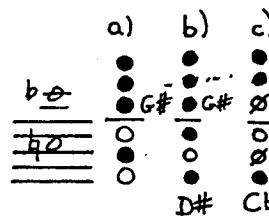


THE MULTIPHONICS 87

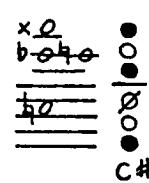
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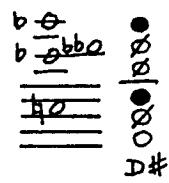
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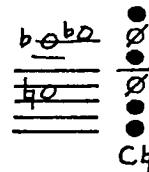
F 387 F



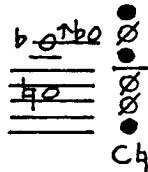
388 F



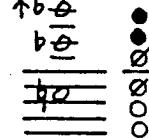
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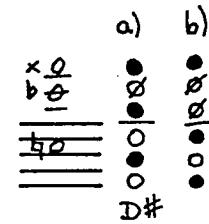
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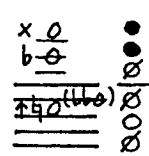
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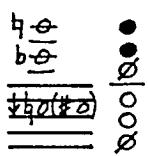
392 F F



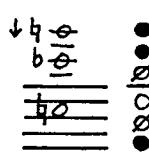
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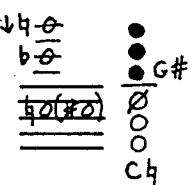
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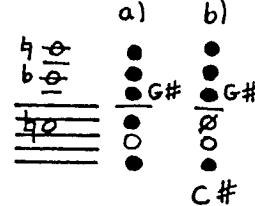
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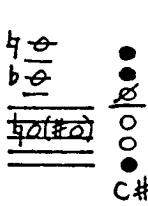
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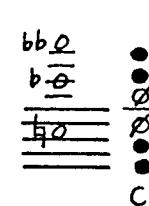
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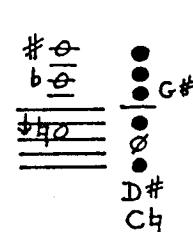
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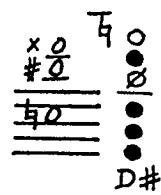
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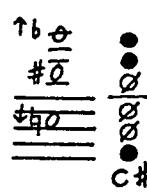
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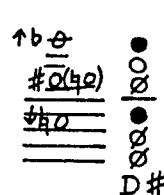
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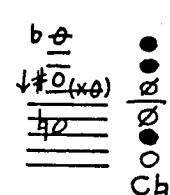
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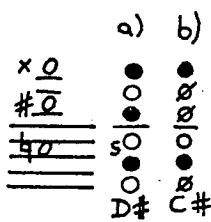
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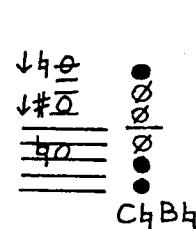
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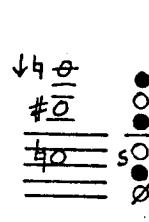
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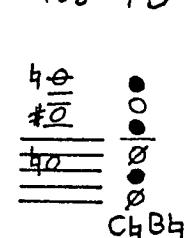
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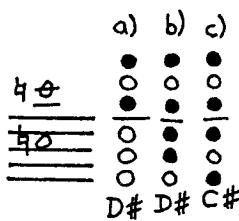
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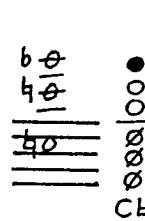
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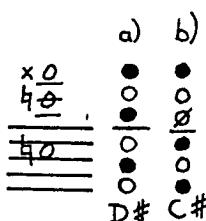
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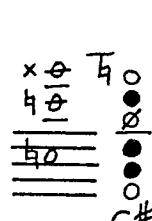
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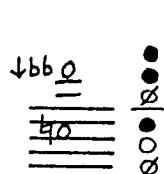
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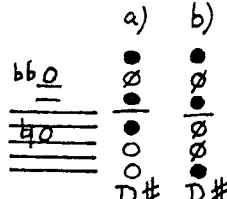
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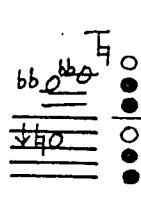
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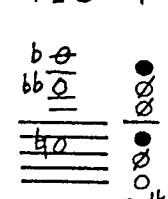
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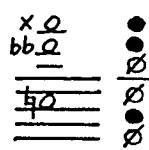
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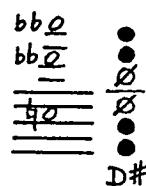
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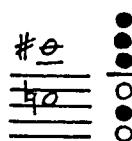
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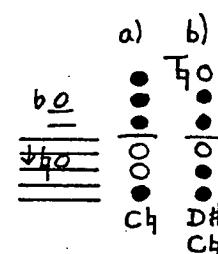
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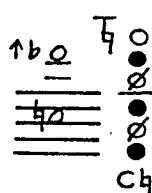
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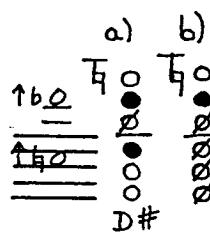
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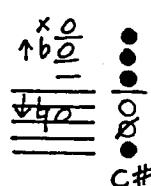
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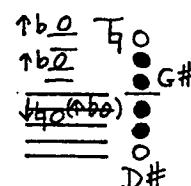
422 F F



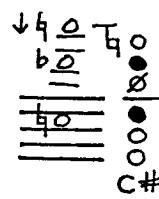
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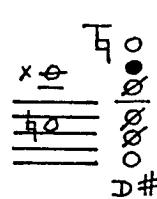
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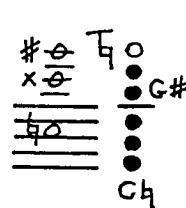
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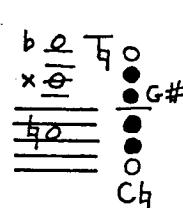
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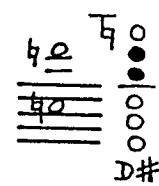
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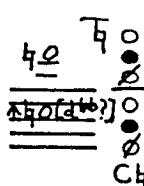
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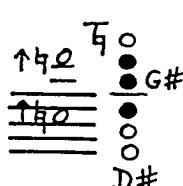
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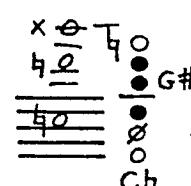
430 F



431



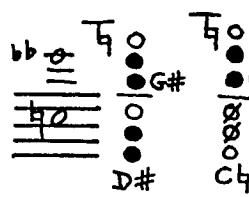
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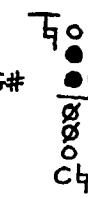
433

F

a)



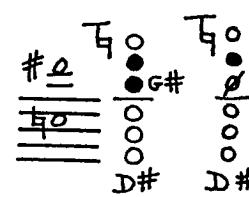
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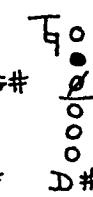
434

F

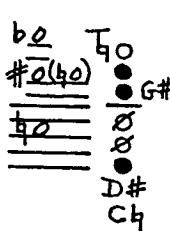
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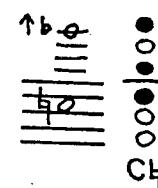
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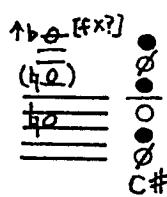
435 F



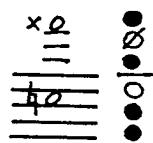
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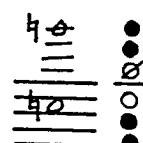
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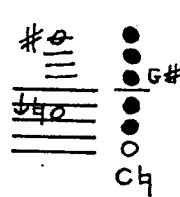
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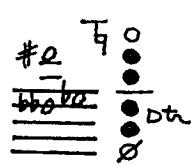
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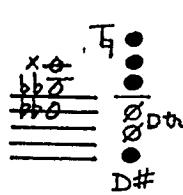
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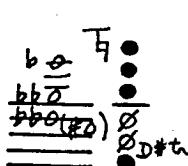
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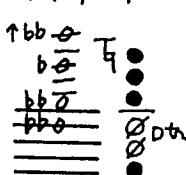
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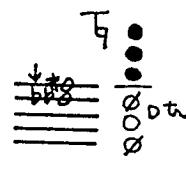
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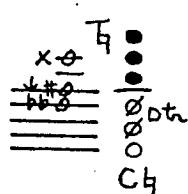
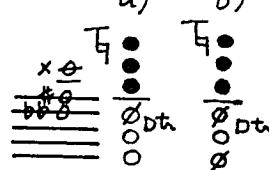
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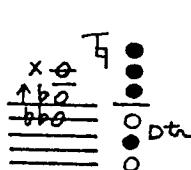
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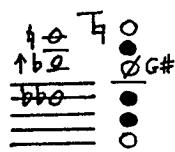
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447 F
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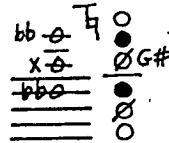
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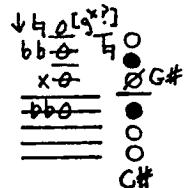
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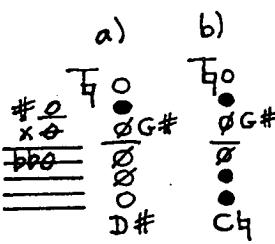
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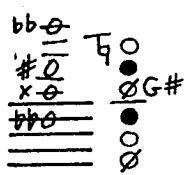
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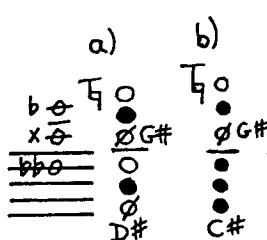
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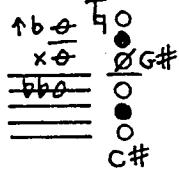
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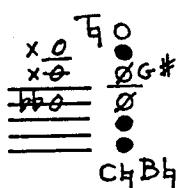
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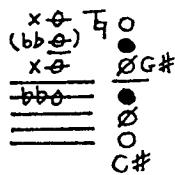
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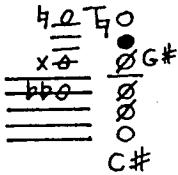
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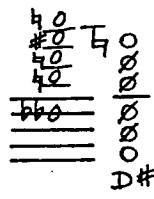
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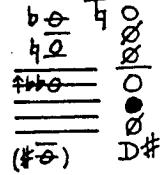
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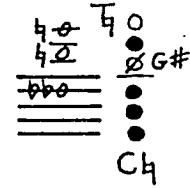
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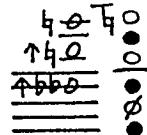
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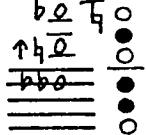
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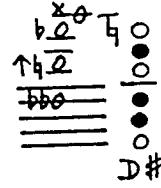
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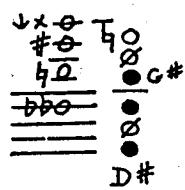
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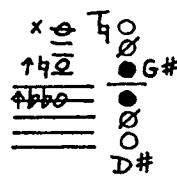
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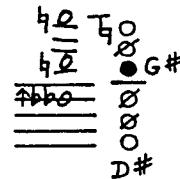
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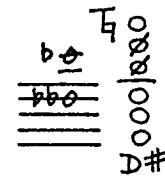
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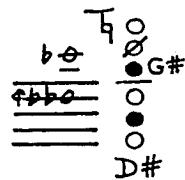
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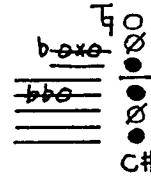
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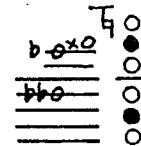
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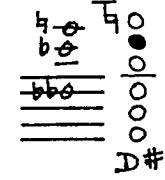
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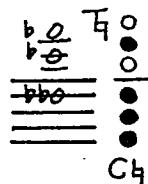
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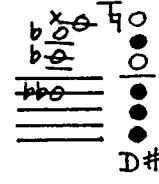
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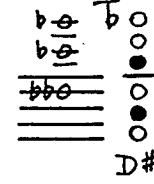
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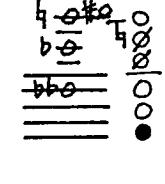
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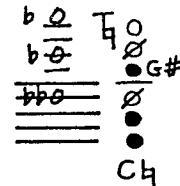
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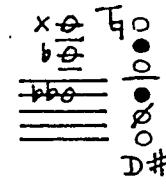
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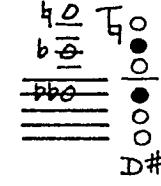
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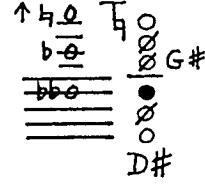
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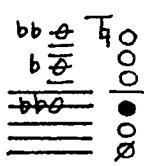
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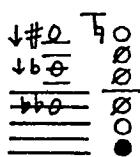
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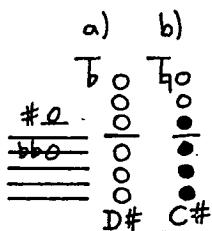
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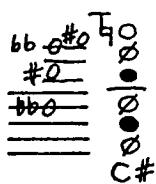
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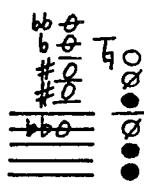
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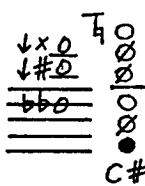
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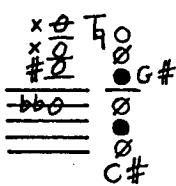
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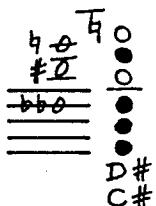
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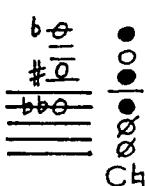
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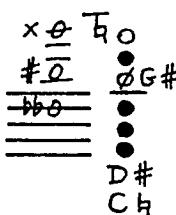
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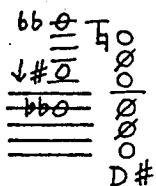
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491 F

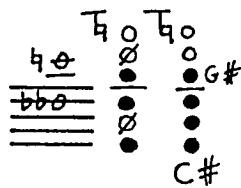


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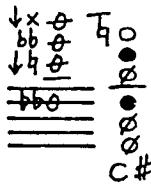


493 F

a) b)



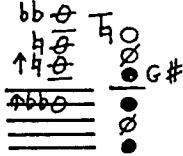
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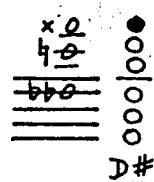
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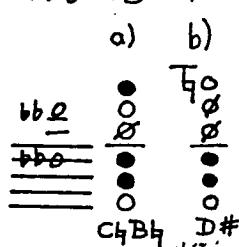
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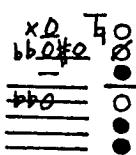
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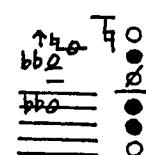
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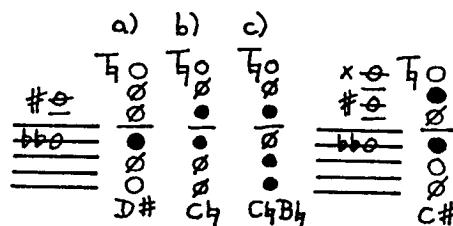
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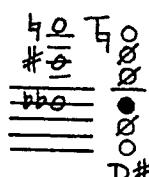
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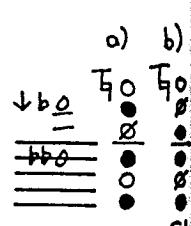
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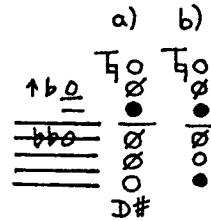
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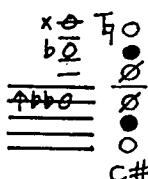
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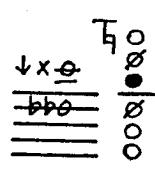
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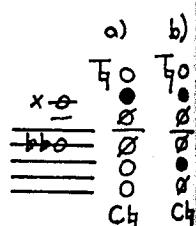
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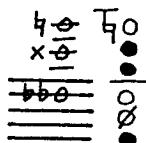
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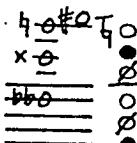
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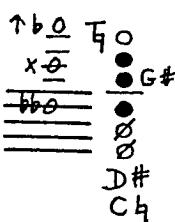
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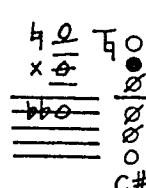
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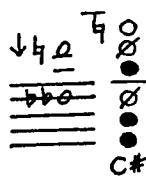
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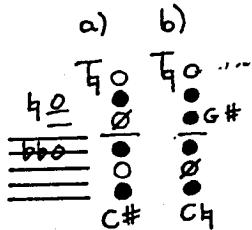
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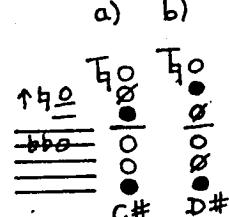
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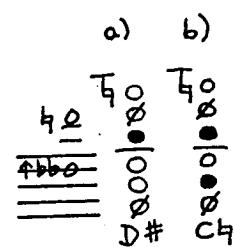
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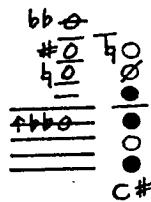
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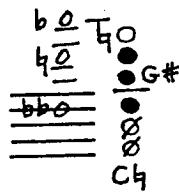
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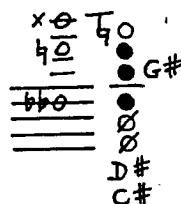
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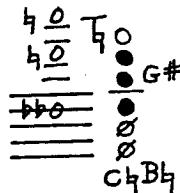
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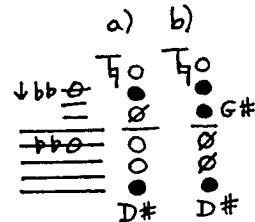
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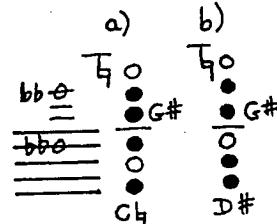
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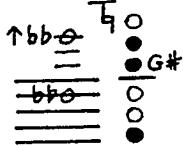
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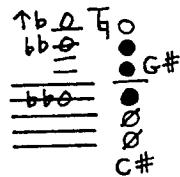
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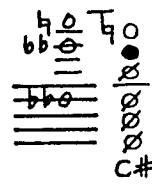
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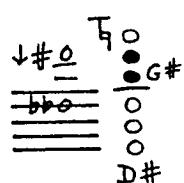
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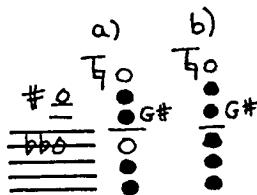
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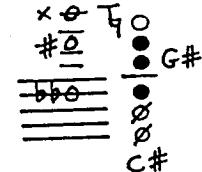
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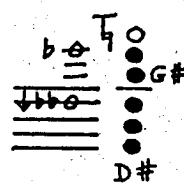
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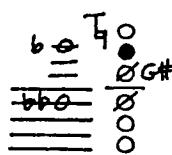
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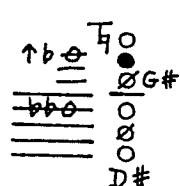
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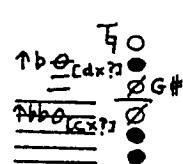
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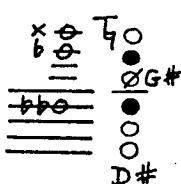
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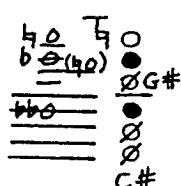
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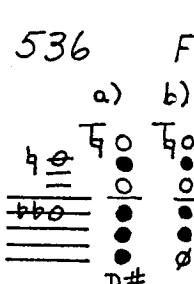
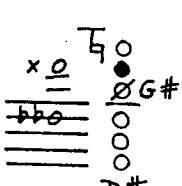
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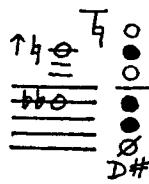
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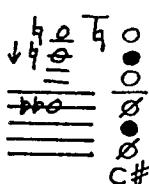
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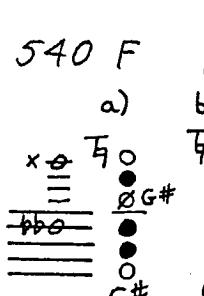
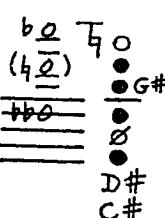
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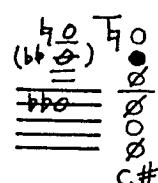
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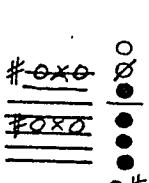
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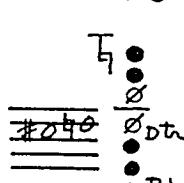
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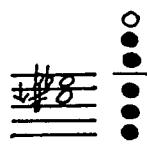
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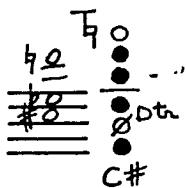
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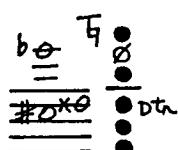
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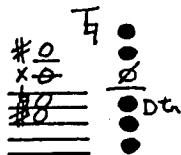
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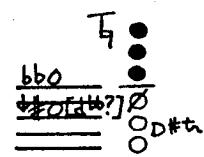
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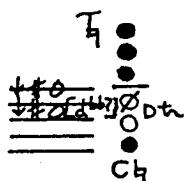
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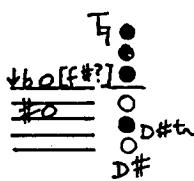
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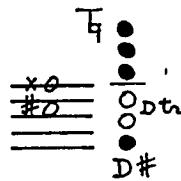
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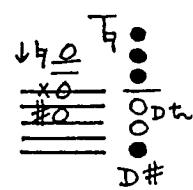
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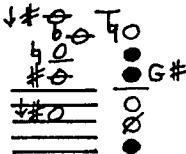
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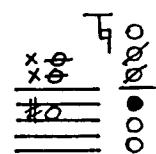
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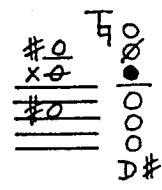
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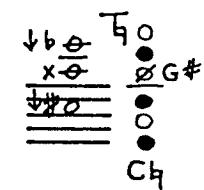
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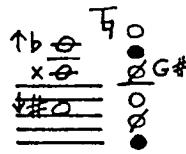
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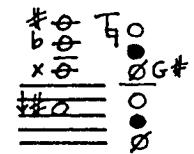
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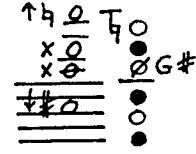
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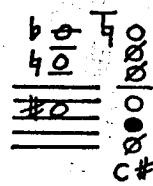
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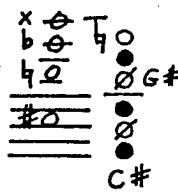
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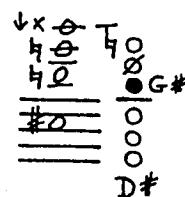
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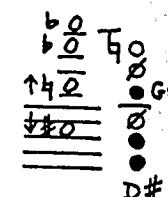
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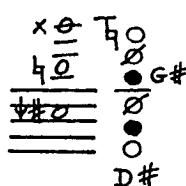
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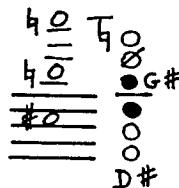
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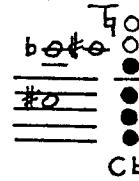
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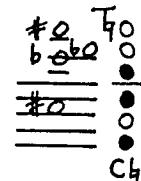
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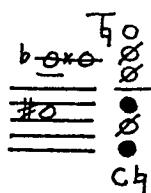
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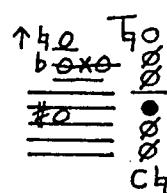
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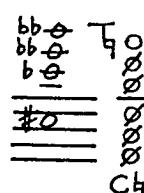
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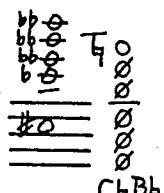
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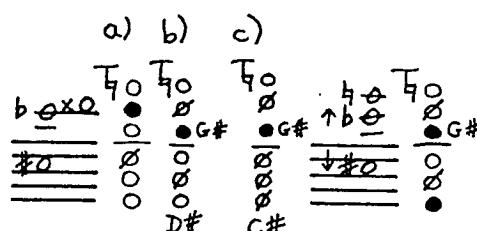
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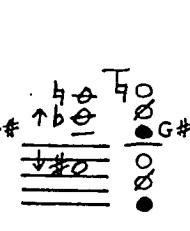
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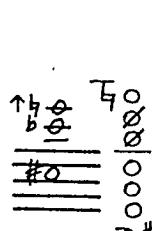
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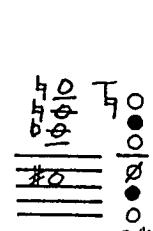
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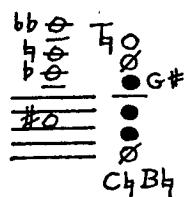
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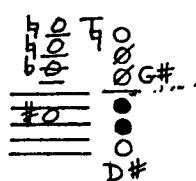
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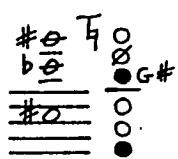
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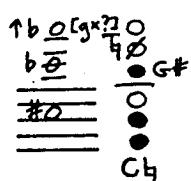
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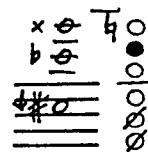
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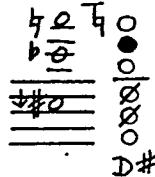
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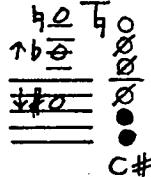
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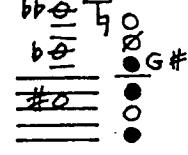
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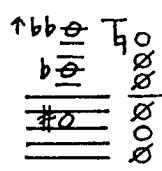
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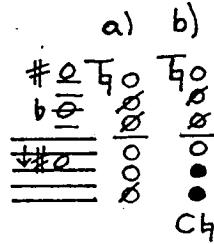
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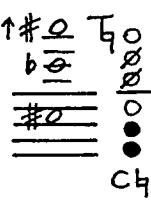
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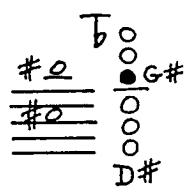
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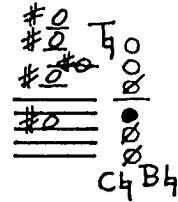
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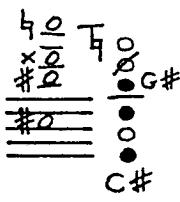
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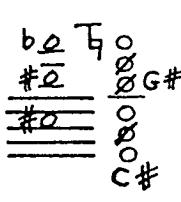
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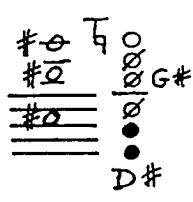
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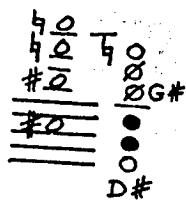
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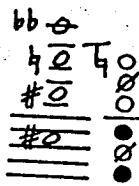
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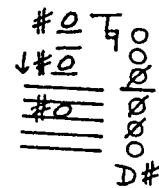
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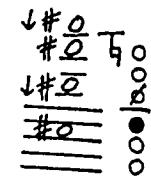
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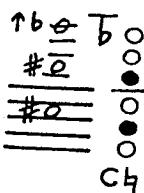
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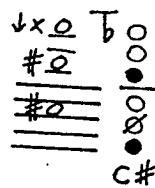
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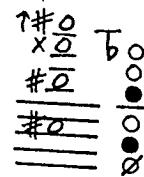
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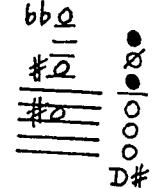
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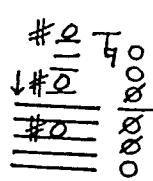
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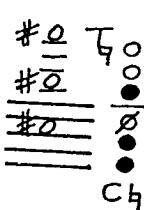
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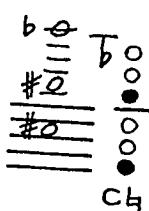
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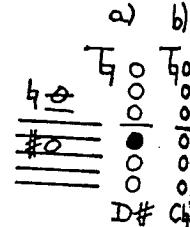
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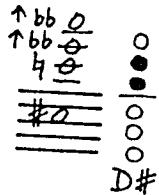
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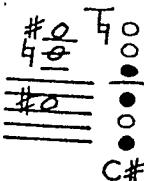
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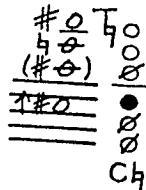
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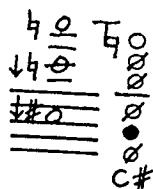
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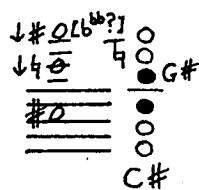


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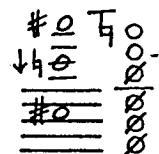


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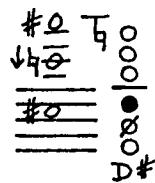
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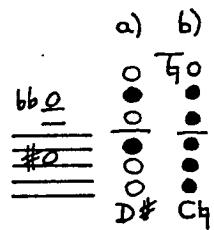
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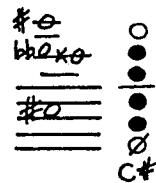
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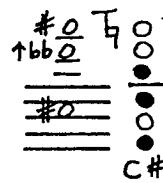
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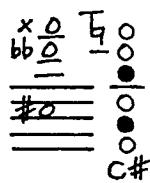
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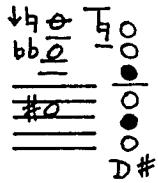
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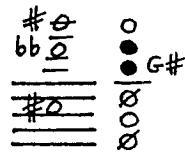
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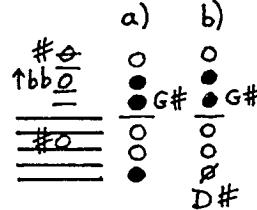
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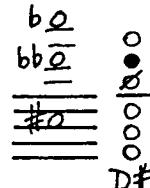
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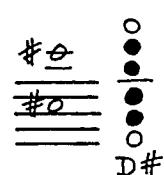
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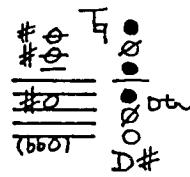
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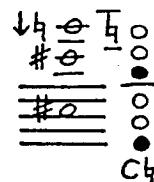
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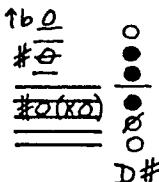
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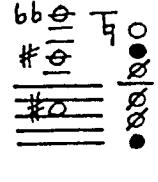
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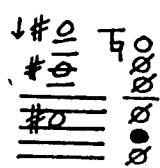
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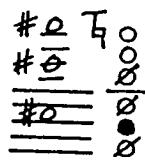
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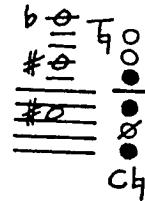
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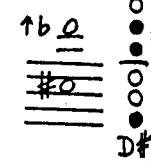
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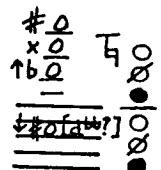
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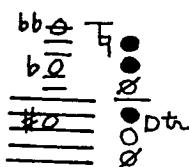
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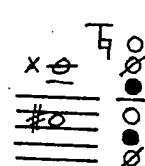
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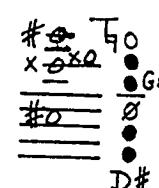
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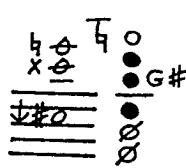
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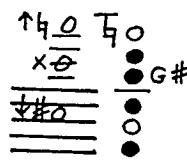
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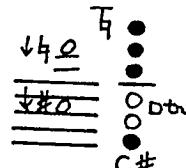
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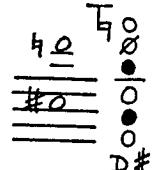
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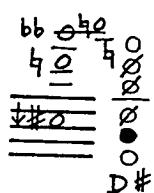
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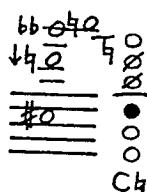
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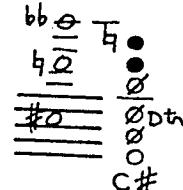
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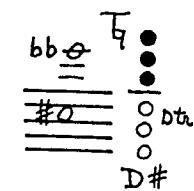
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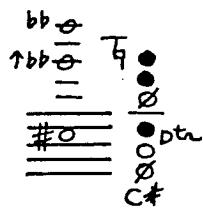
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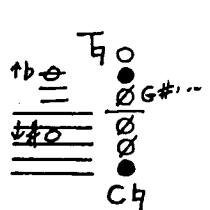
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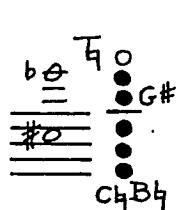
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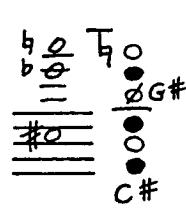
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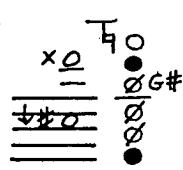
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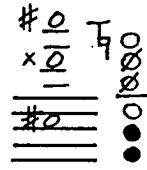
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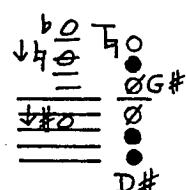
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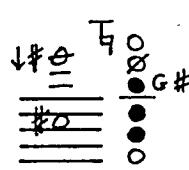
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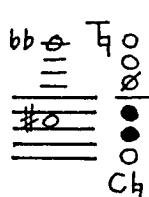
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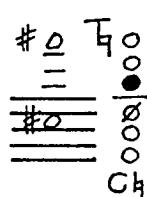
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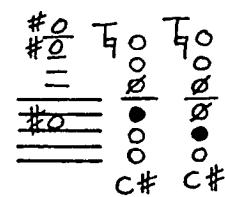


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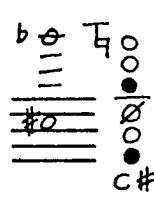


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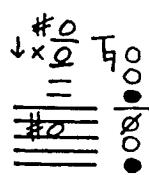
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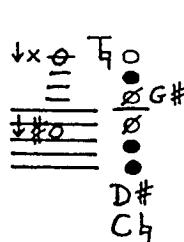
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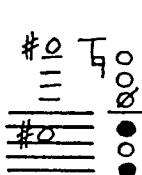
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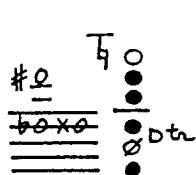
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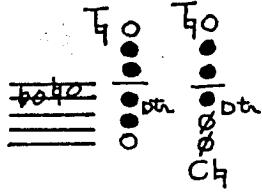


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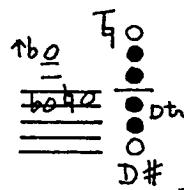


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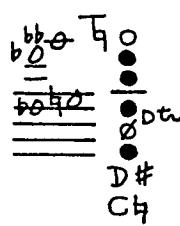


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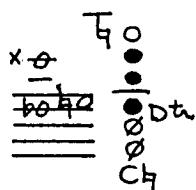
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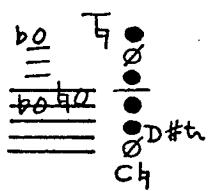
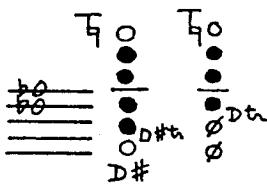
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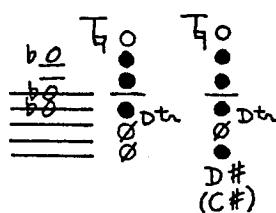
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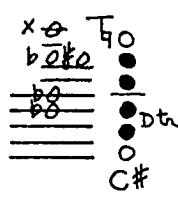
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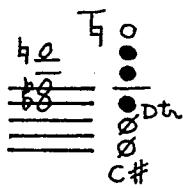
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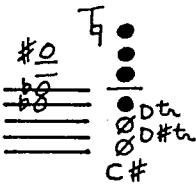
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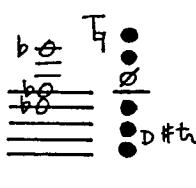
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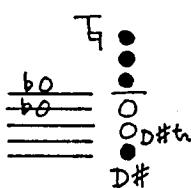
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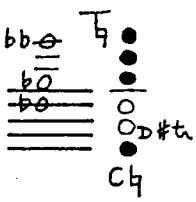
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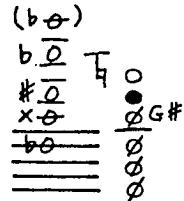
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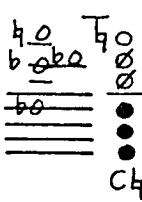
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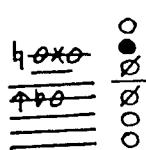
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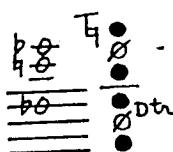
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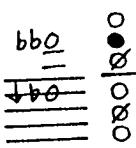
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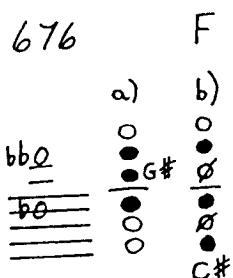
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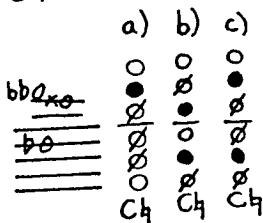
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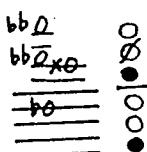
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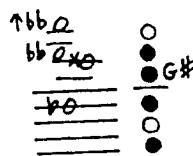
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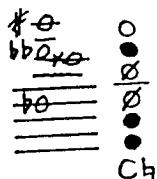
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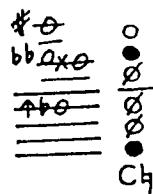
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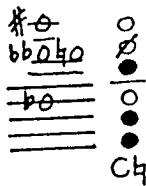
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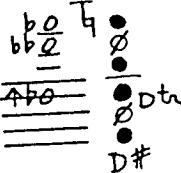
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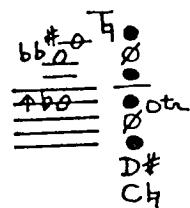
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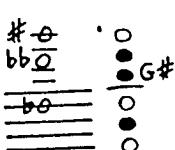
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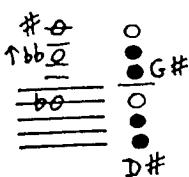
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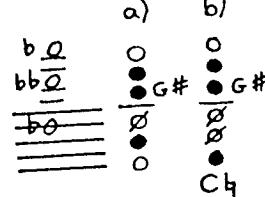
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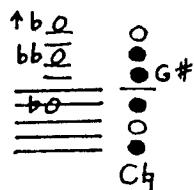
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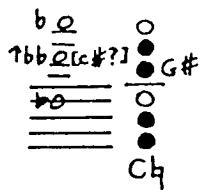
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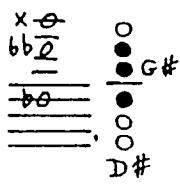
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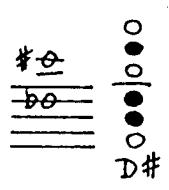
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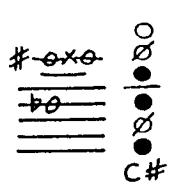
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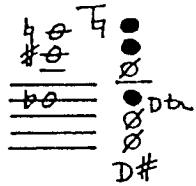
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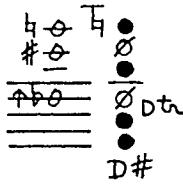
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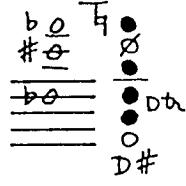
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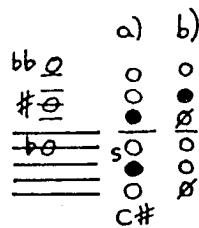
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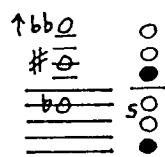
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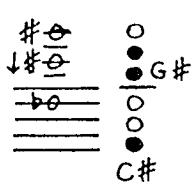
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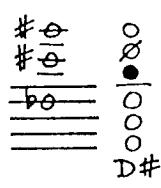
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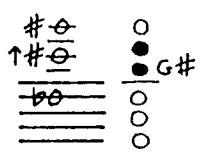
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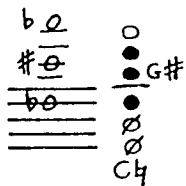
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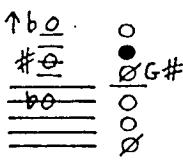
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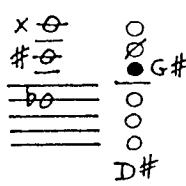
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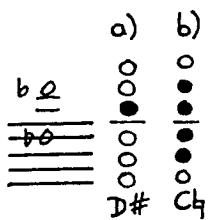


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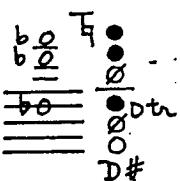


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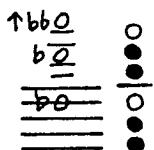
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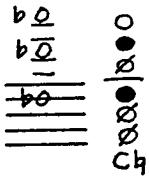
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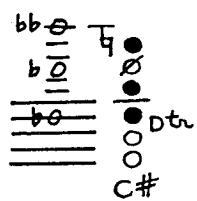
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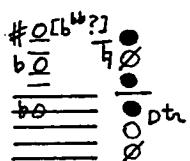
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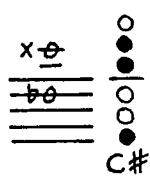
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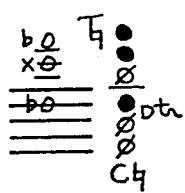
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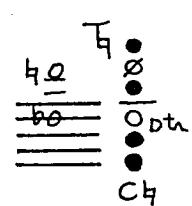
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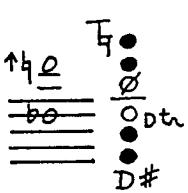
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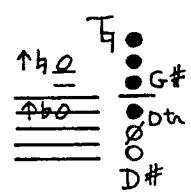
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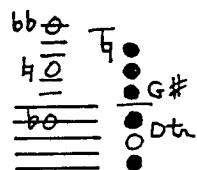
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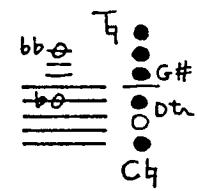
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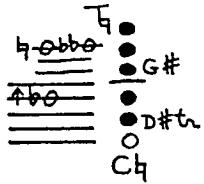
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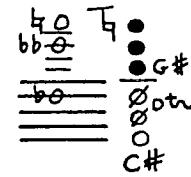
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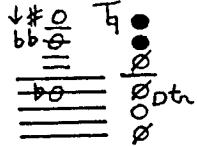
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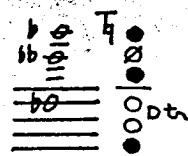
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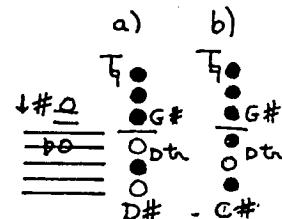
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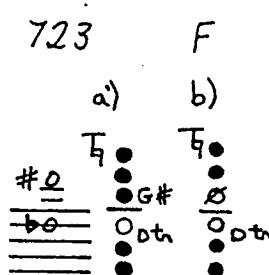
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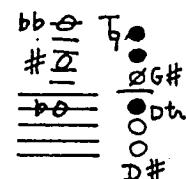
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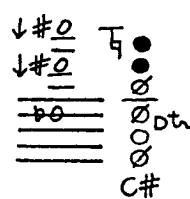
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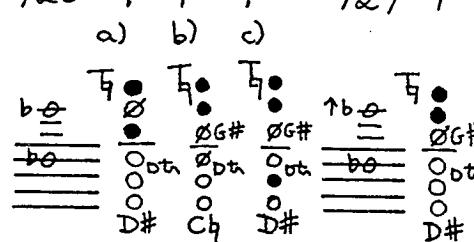
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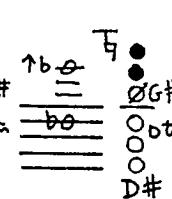
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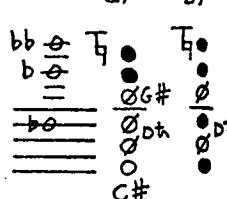
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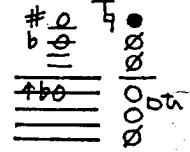
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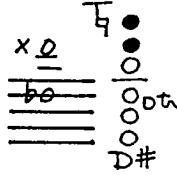
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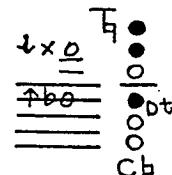
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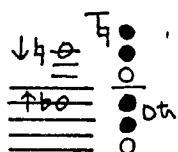
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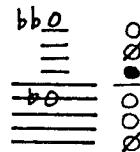
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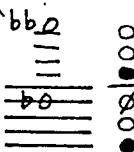
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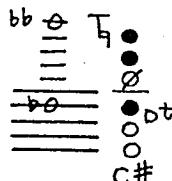
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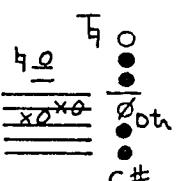
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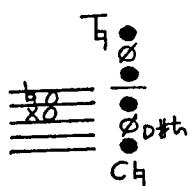


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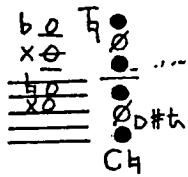


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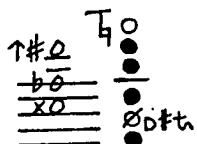
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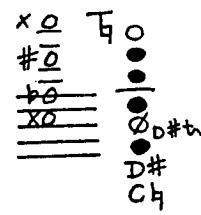
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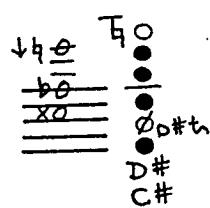
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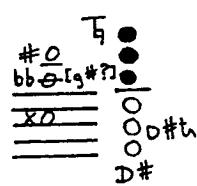
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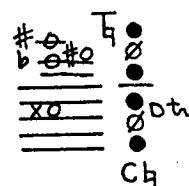
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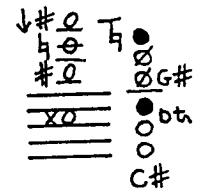
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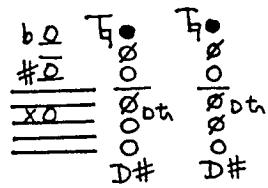


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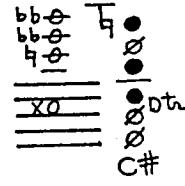


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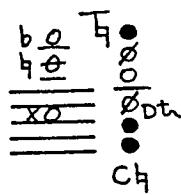
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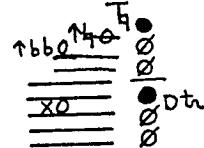
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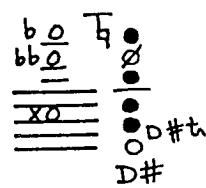
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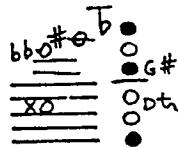
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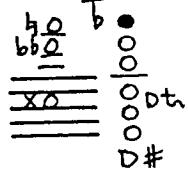
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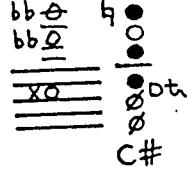
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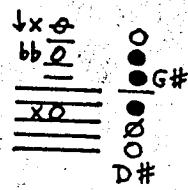
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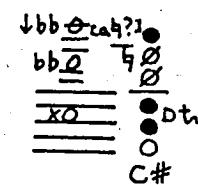
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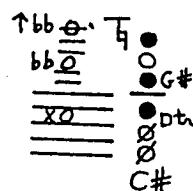
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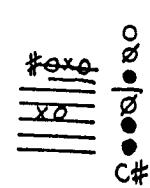
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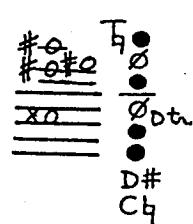
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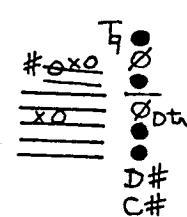
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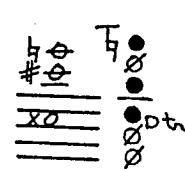
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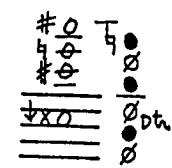
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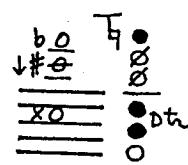
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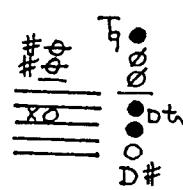
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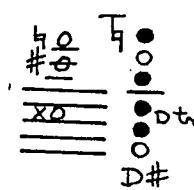
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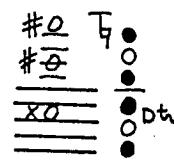
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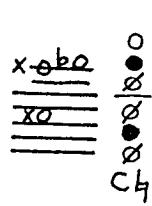
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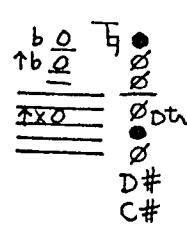
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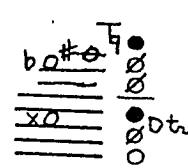
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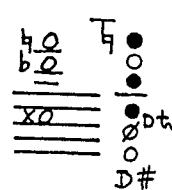
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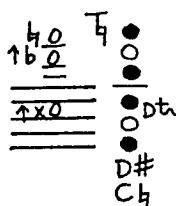
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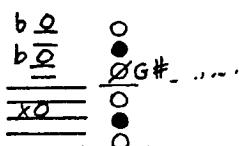
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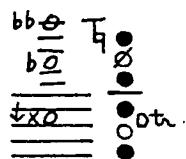
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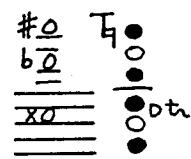
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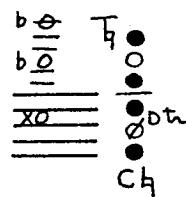
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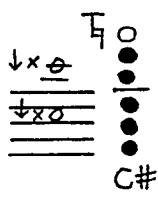
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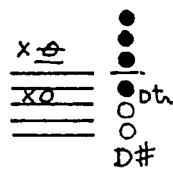
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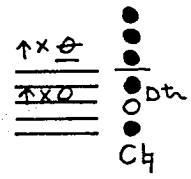
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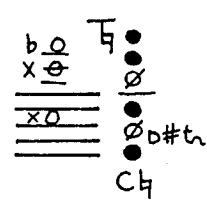
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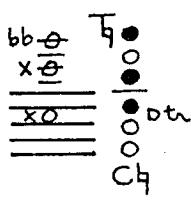
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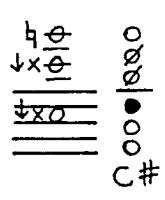
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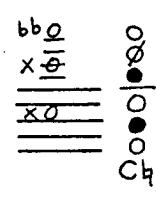
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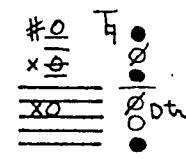
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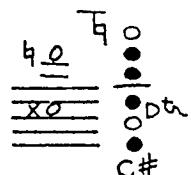
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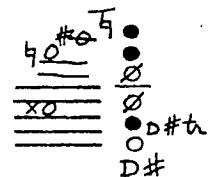
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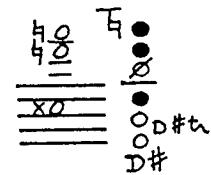
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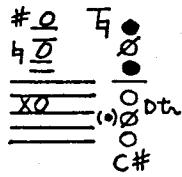
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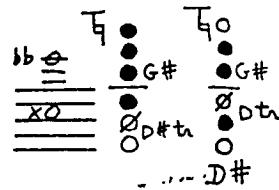


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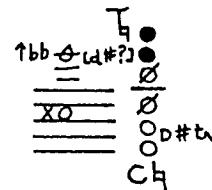


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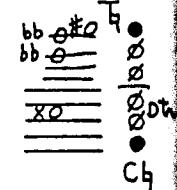
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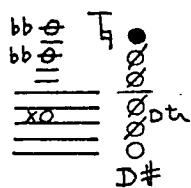
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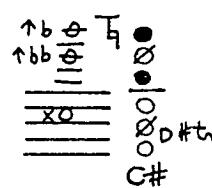
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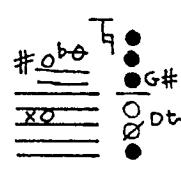
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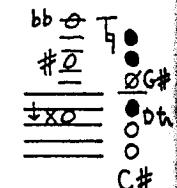
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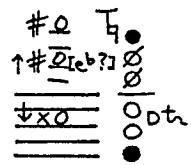
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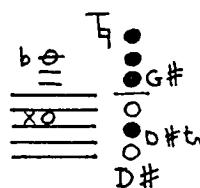
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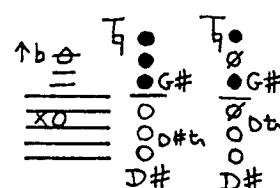
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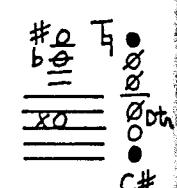
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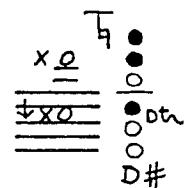
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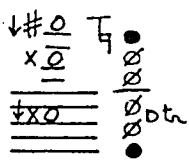
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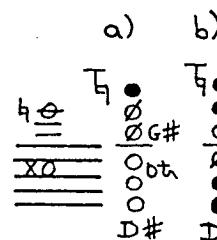
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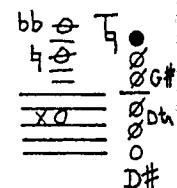
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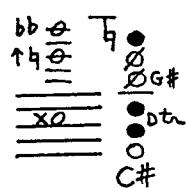
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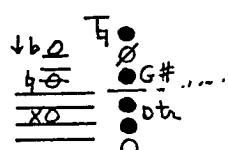
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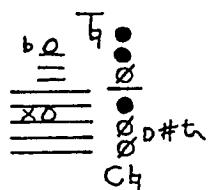
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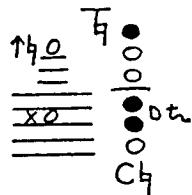
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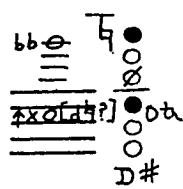
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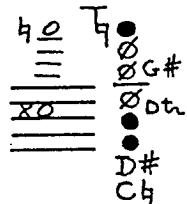
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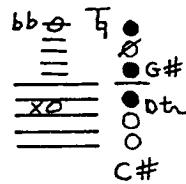
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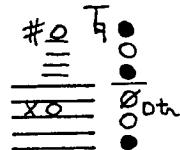
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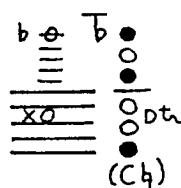
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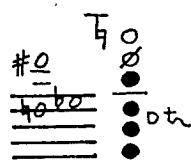
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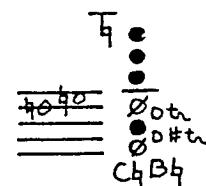
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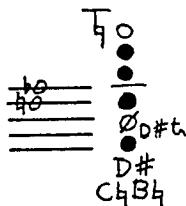
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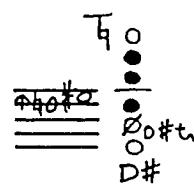
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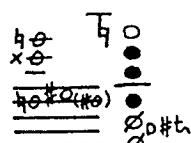
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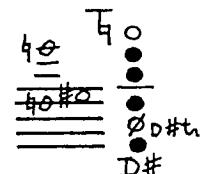
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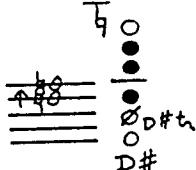
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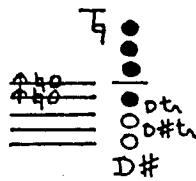
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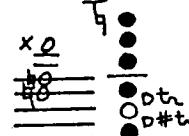
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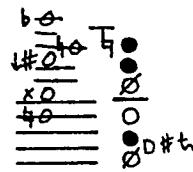
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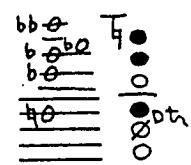
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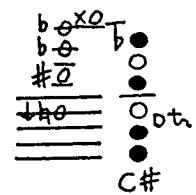
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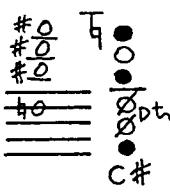
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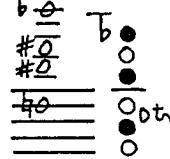
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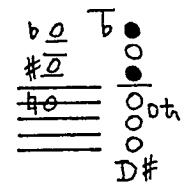
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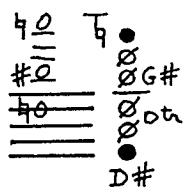
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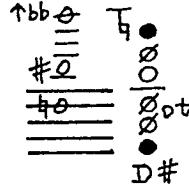
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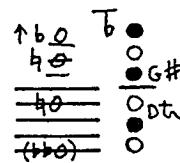
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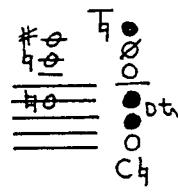
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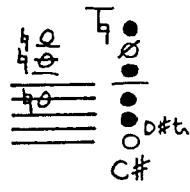
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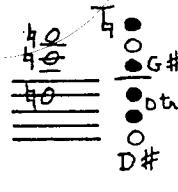
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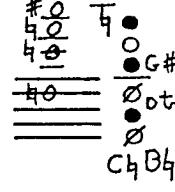
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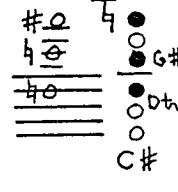
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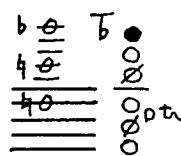
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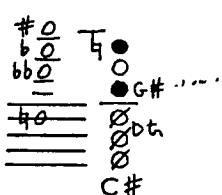
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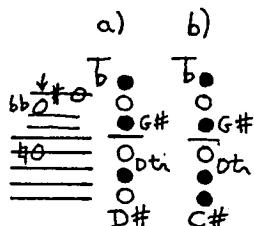
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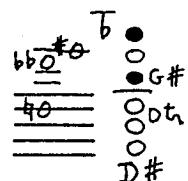
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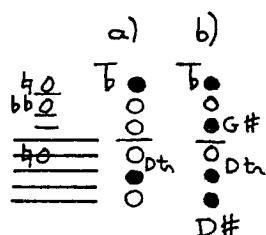
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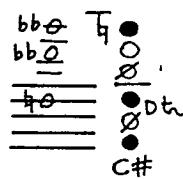
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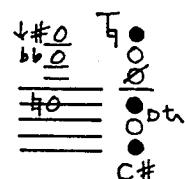
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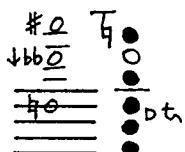
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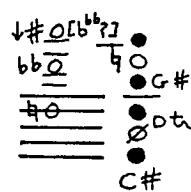
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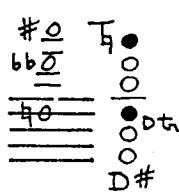
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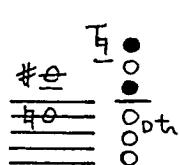
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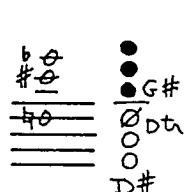
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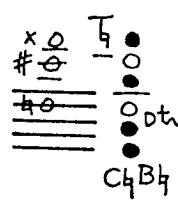
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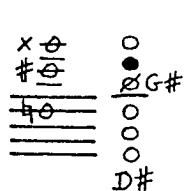
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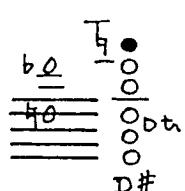
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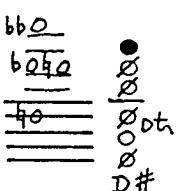
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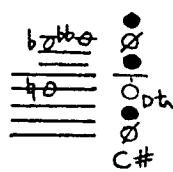
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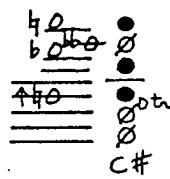
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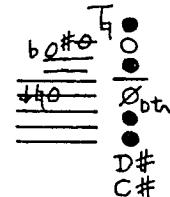
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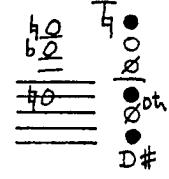
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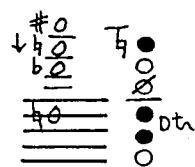
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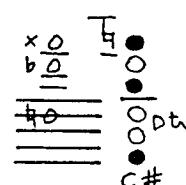
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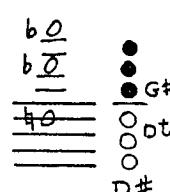
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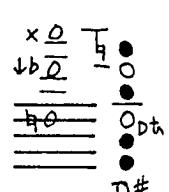
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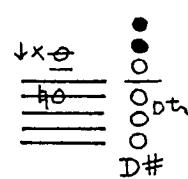
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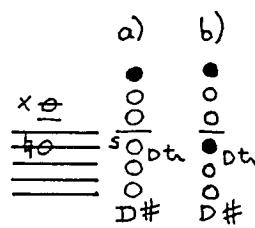
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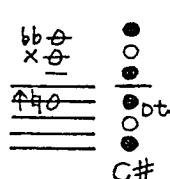
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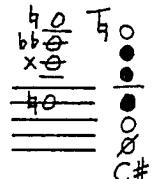
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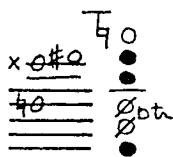
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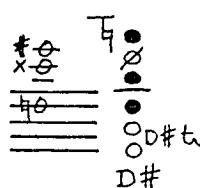
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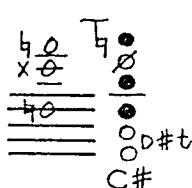
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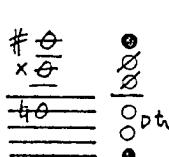
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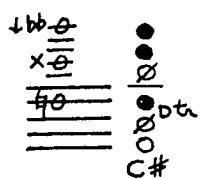
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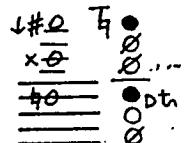
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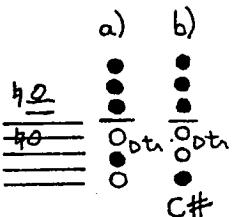
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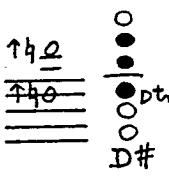
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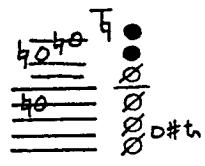
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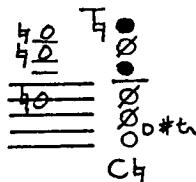
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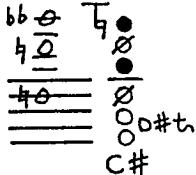
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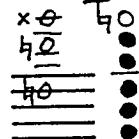
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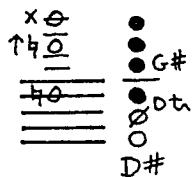
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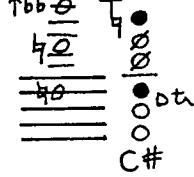
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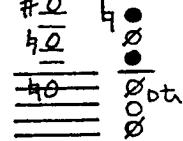
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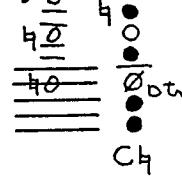
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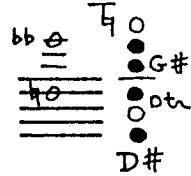
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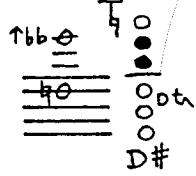
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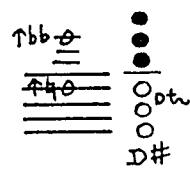
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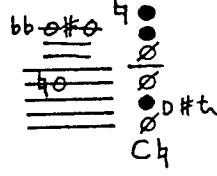
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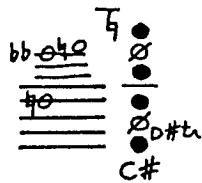
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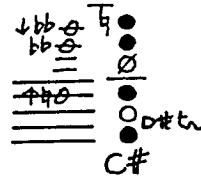
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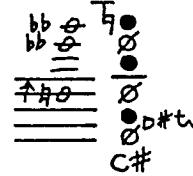
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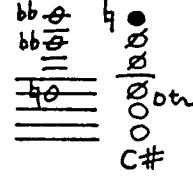
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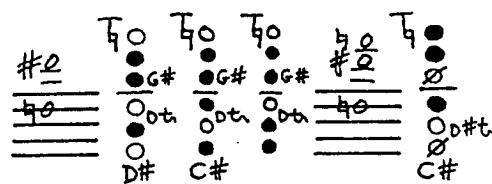


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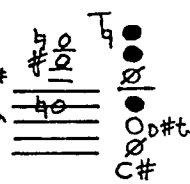


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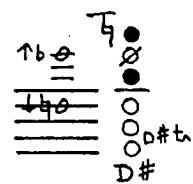
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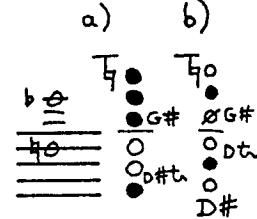
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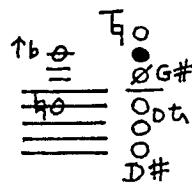
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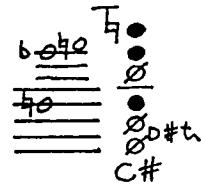
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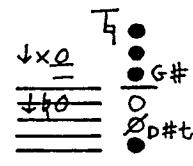
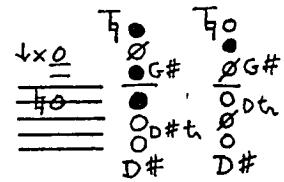
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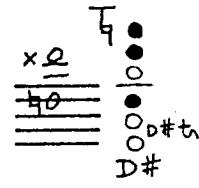
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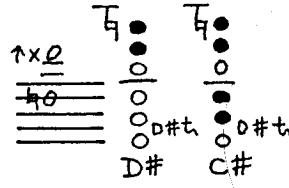
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892 F F
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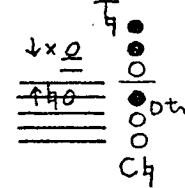
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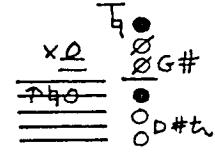
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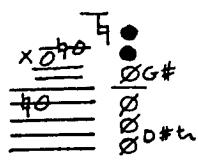
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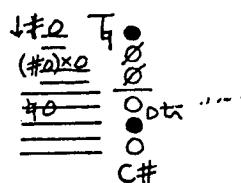
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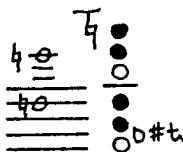
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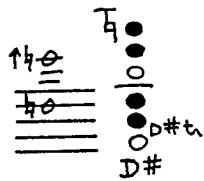
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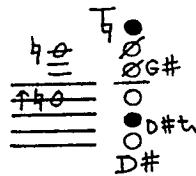
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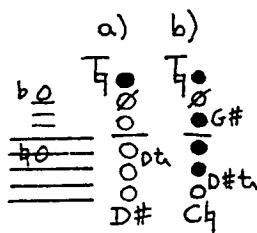
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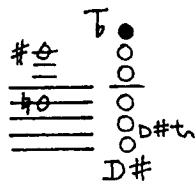
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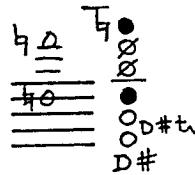
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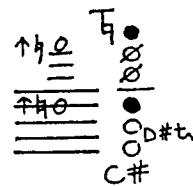
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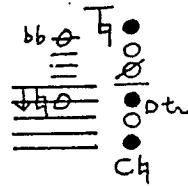
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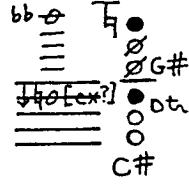
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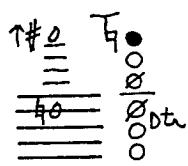
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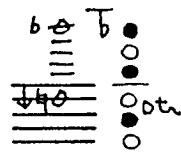
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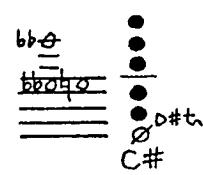
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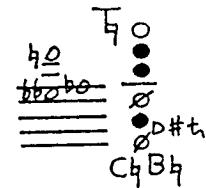
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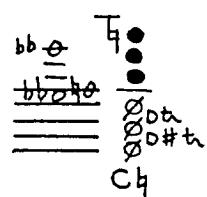
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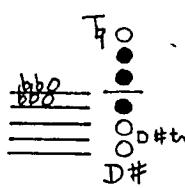
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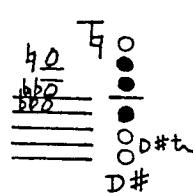
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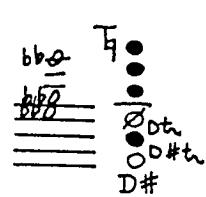
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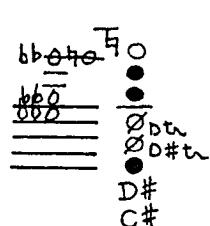
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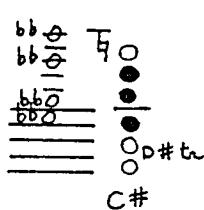
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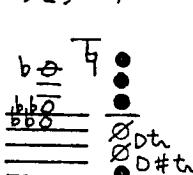
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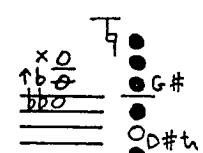
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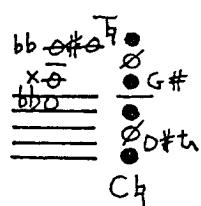
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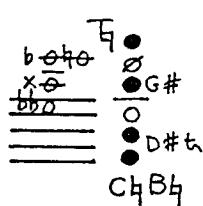
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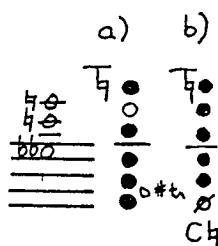
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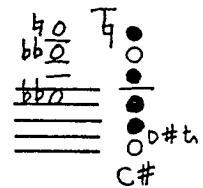
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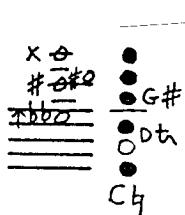
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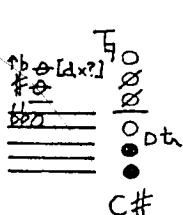
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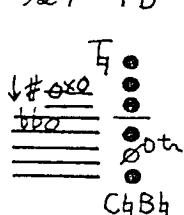
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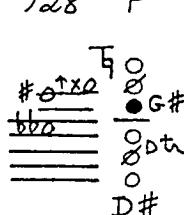
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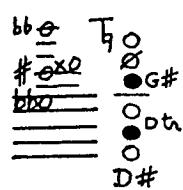
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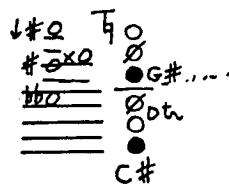
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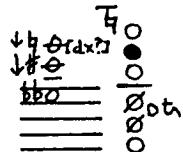
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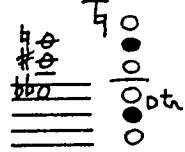
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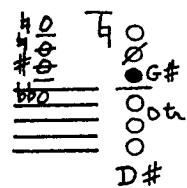
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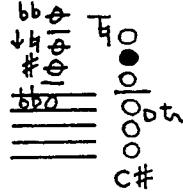
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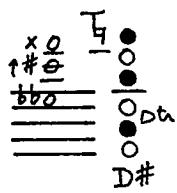
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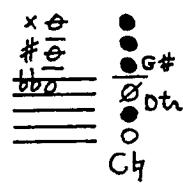
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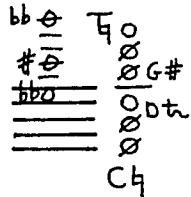
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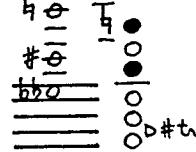
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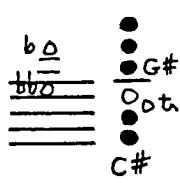
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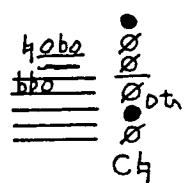
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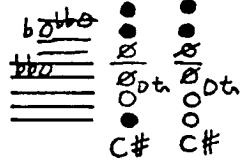
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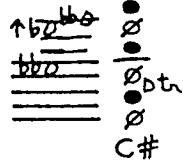
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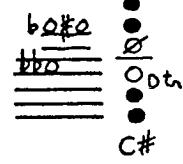
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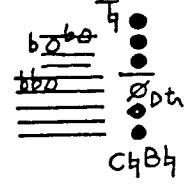
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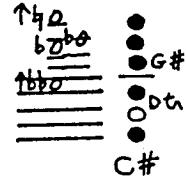
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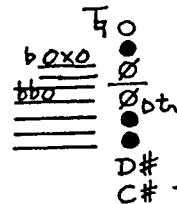
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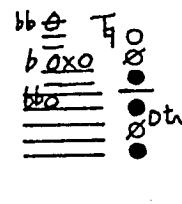
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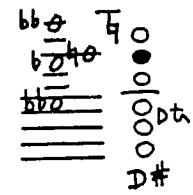
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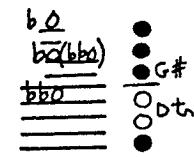
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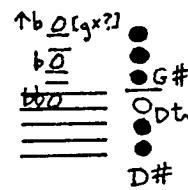
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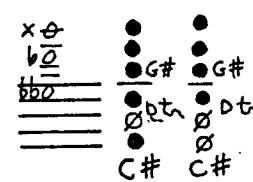
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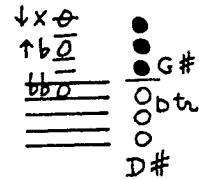
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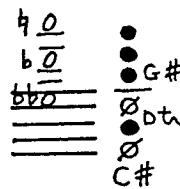
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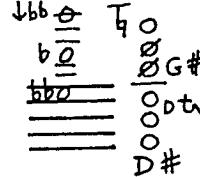
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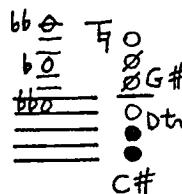
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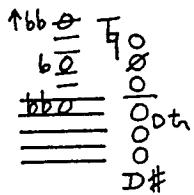
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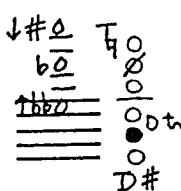
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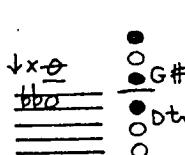
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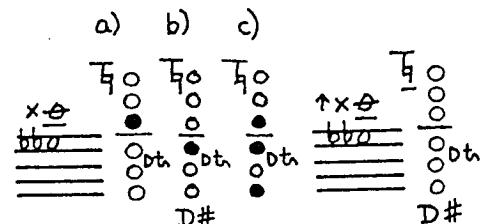
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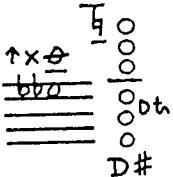
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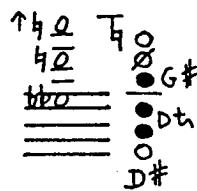
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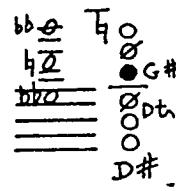
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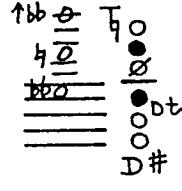
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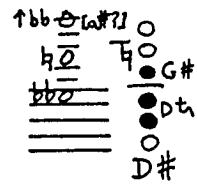
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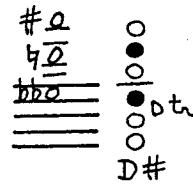
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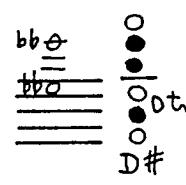
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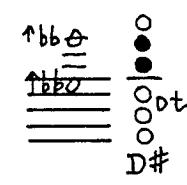
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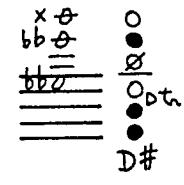
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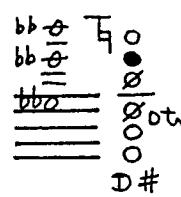
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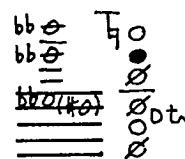
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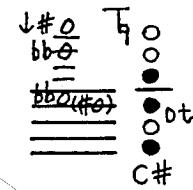
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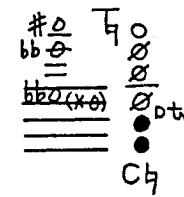
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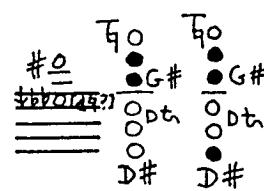


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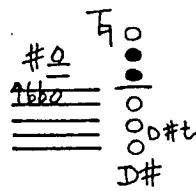


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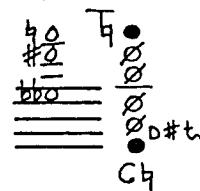
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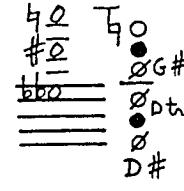
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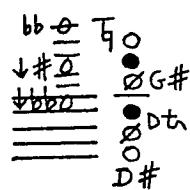
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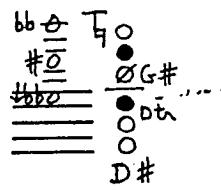
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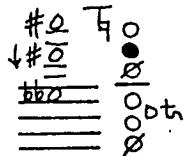
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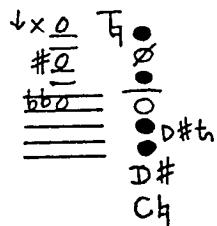
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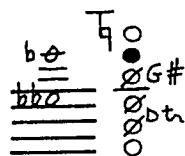
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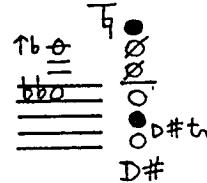
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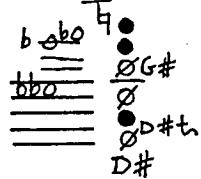
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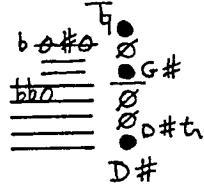
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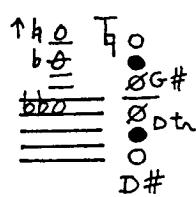
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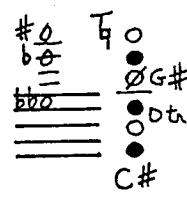
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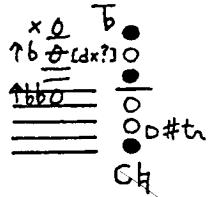
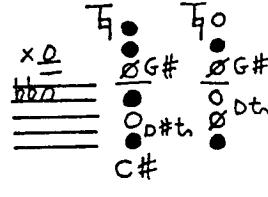
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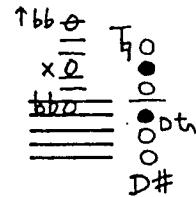
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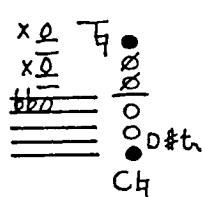
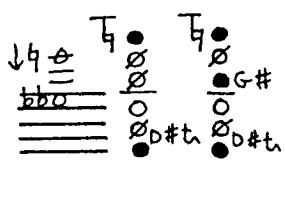
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1004 F
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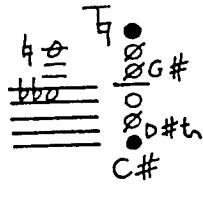
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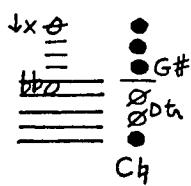
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1007 F
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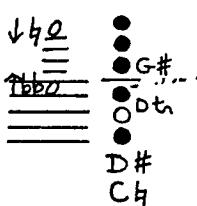
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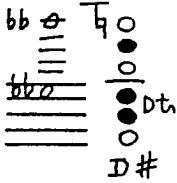
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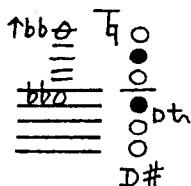
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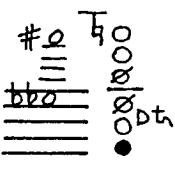
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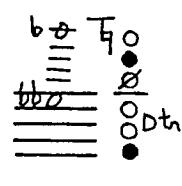
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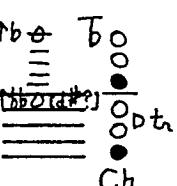
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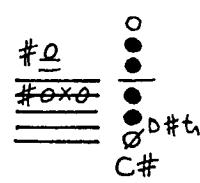
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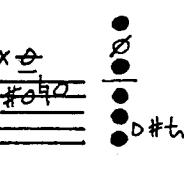
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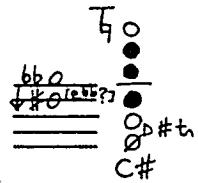
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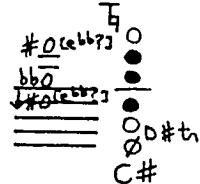
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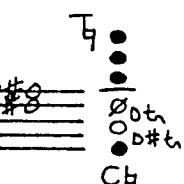
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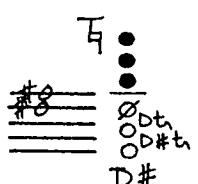
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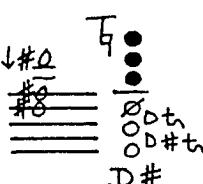
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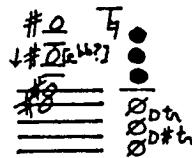
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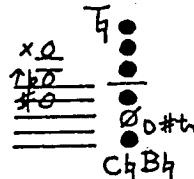
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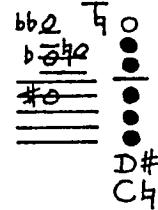
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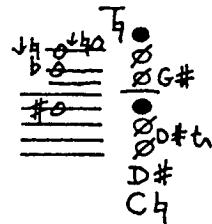
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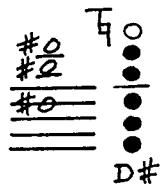
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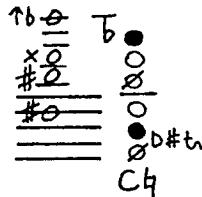
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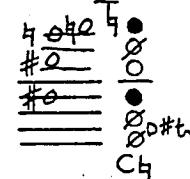
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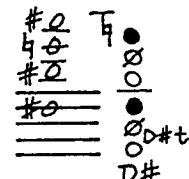
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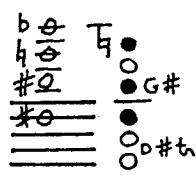
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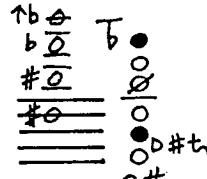
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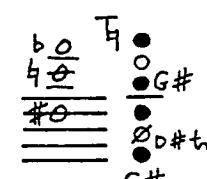
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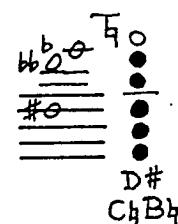
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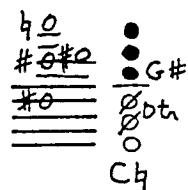
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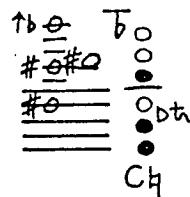
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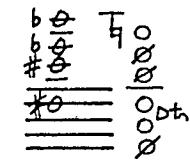
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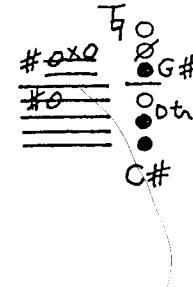
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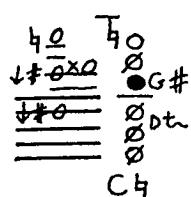
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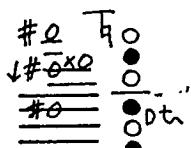
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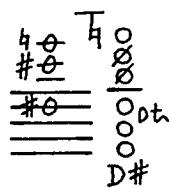
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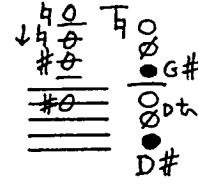
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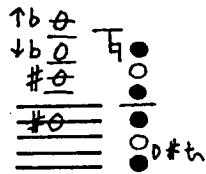
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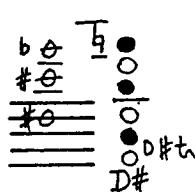
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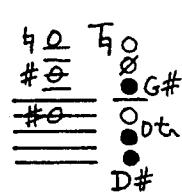
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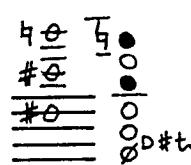
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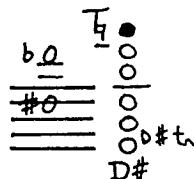
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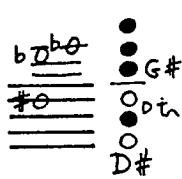
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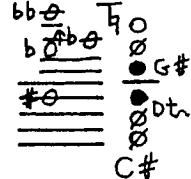
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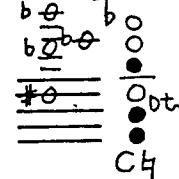
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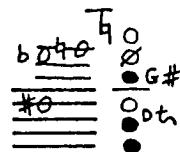
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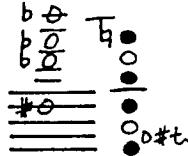
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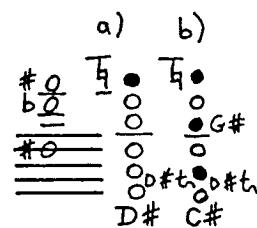
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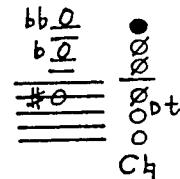
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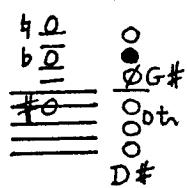
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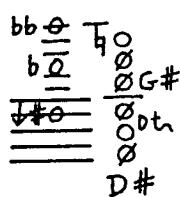
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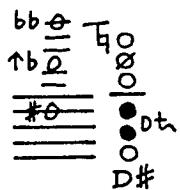
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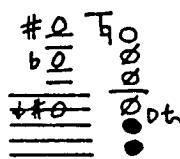
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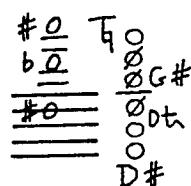
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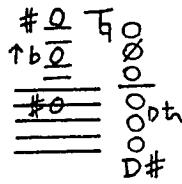
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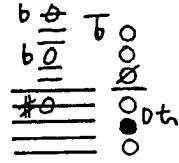
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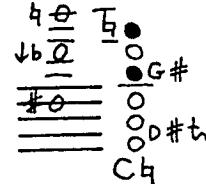
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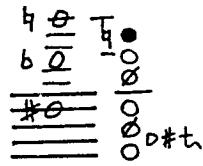
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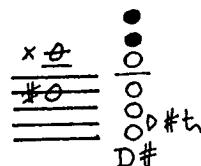
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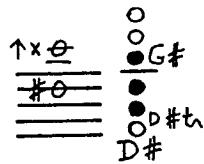
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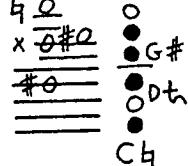
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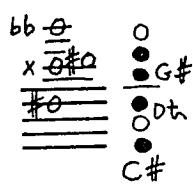
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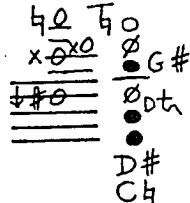
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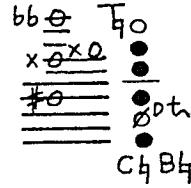
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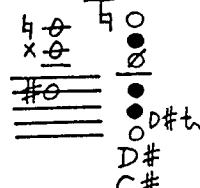
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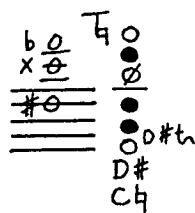
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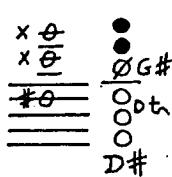
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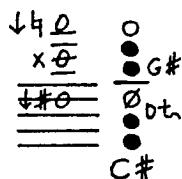
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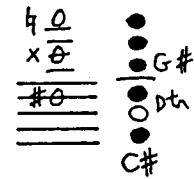
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1091 F

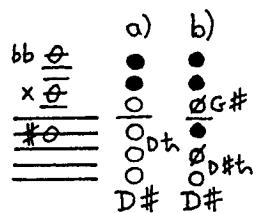


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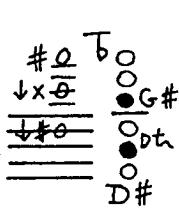


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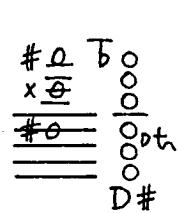
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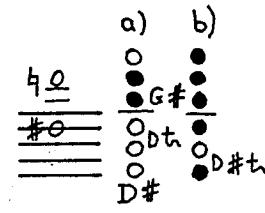
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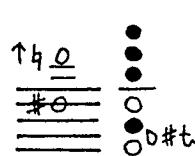


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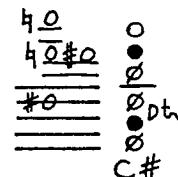


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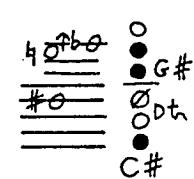
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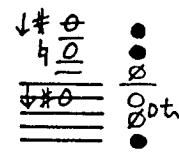
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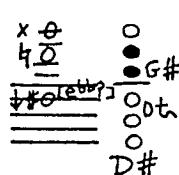
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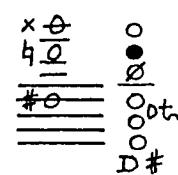
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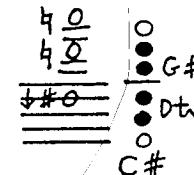
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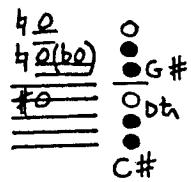
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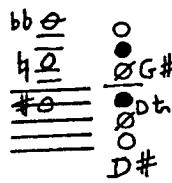
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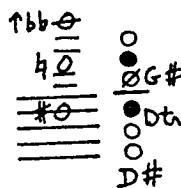
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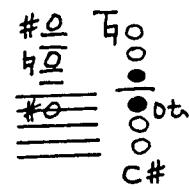
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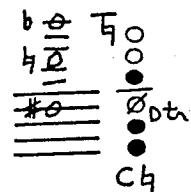
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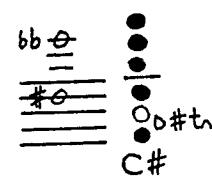
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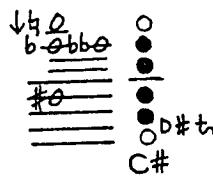
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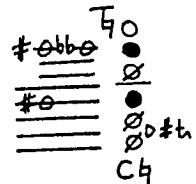
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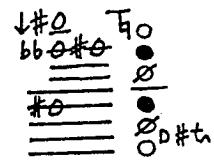
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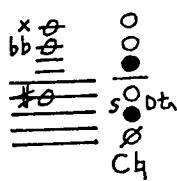
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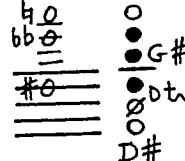
1113 F



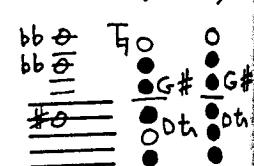
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1115 F

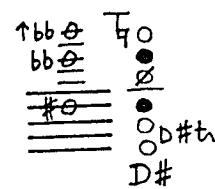


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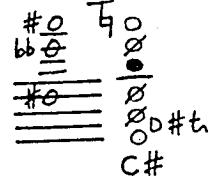


a) b)

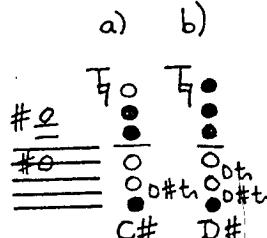
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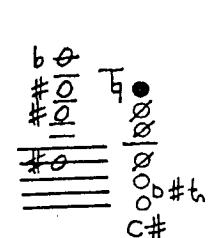
1118 F



1119



a) b)



1122

1123 F
 #
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1124 F
bθ
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1128 F
 bb \ominus T O \otimes
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1130 F

1131 F
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1132 F
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 D#

1133 F
#0 B
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0 0
C#

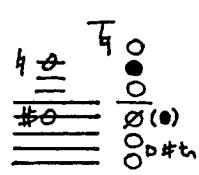
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1135 F
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 ↓ × G#
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 #0 O D#h

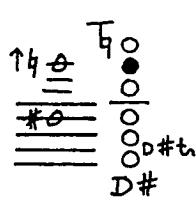
1136
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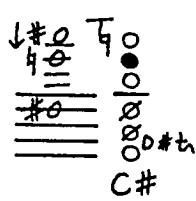
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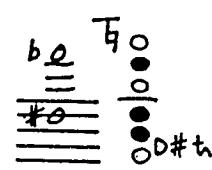
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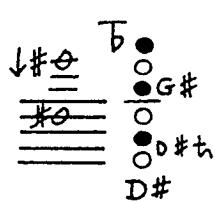
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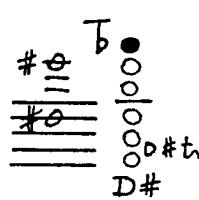
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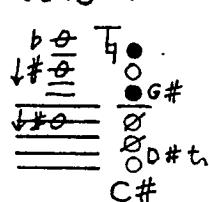
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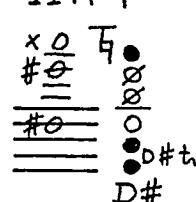
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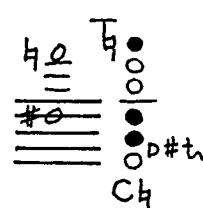
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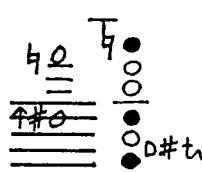
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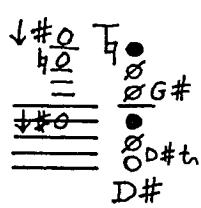
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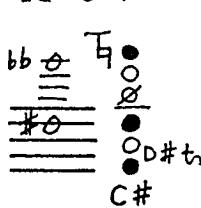
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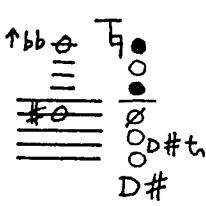
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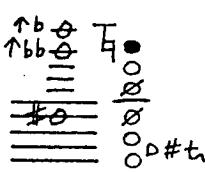
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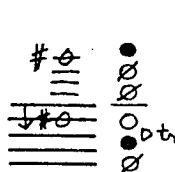
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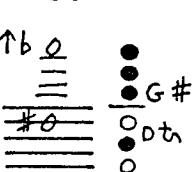
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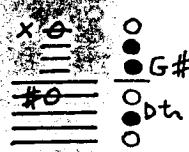
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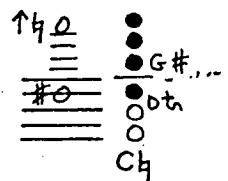
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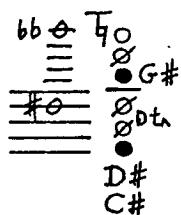
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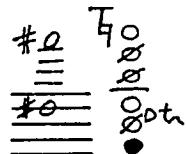
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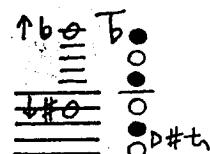
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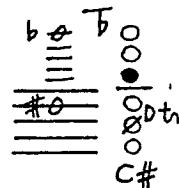
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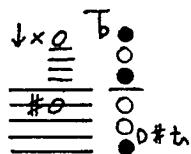
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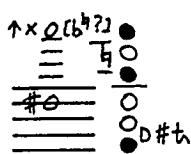
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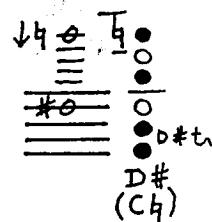
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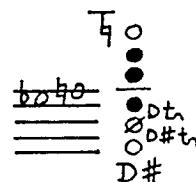
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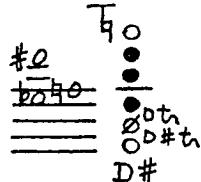
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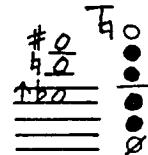
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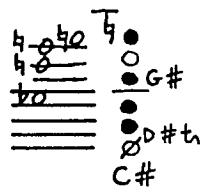
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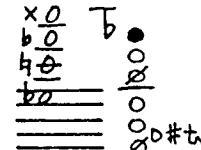
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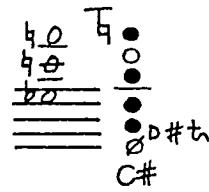
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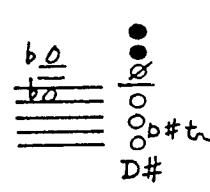
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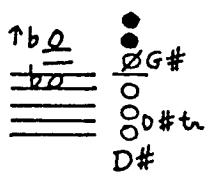
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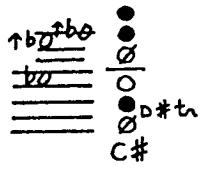
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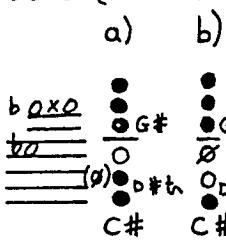
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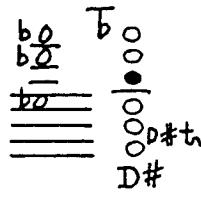
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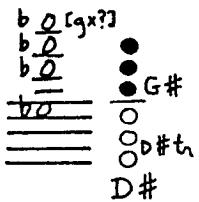
1171 (F)

a)
b)

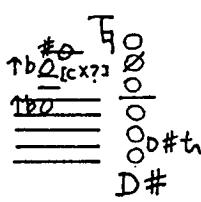
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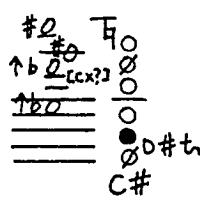
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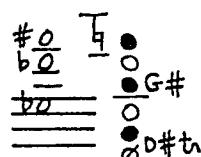
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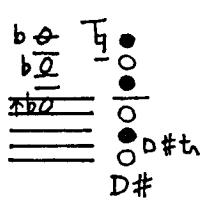
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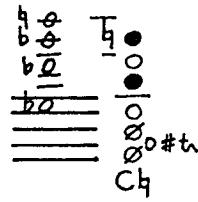
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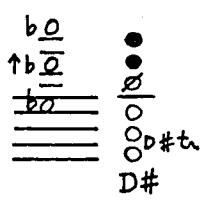
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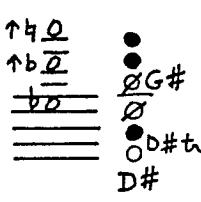
1178 F



1179 F

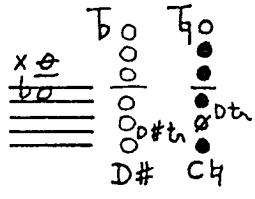


1180 F

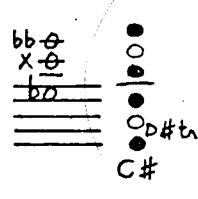


1181 F

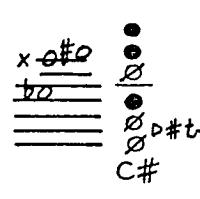
a) b)



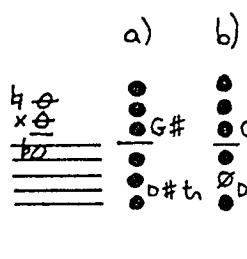
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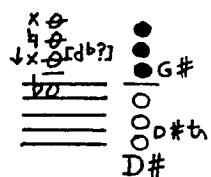
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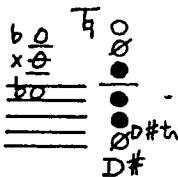
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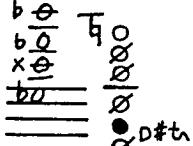
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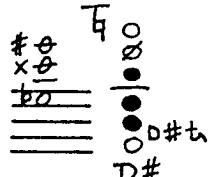
1186 F



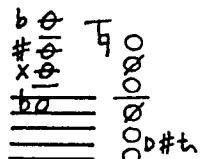
1187 F



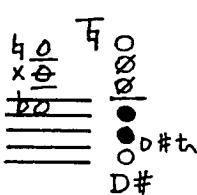
1188 F



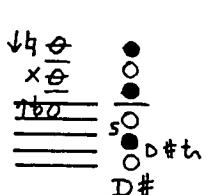
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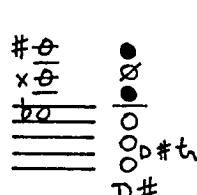
1190 F



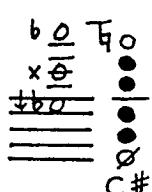
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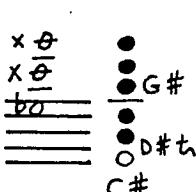
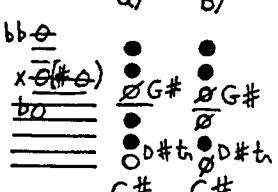
1192 F



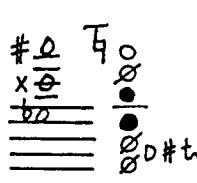
1193 F



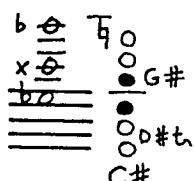
1194

1195 F F
a) b)

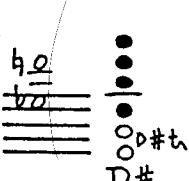
1196 F



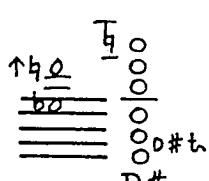
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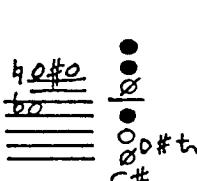
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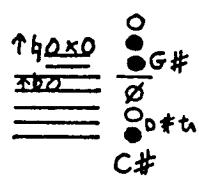
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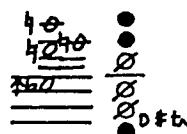
1200 F



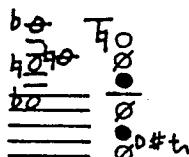
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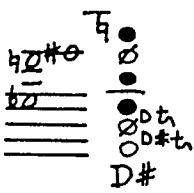
1202 F



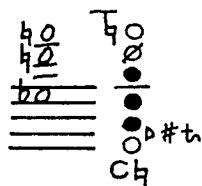
1203 F



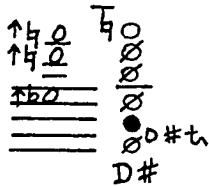
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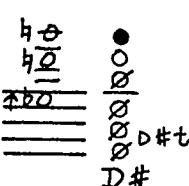
1205 F



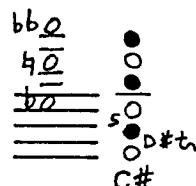
1206 F



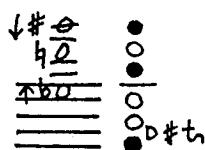
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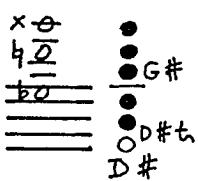
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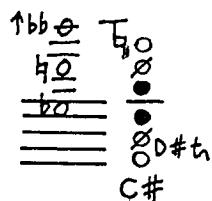
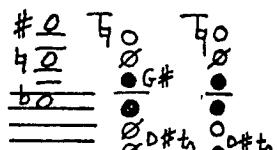
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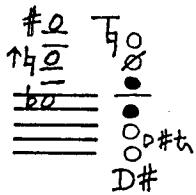
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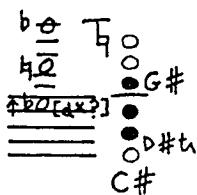
1211 F

1212 F F
a) b)

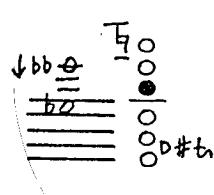
1213 F



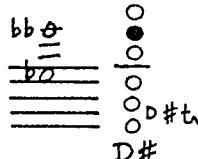
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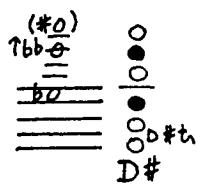
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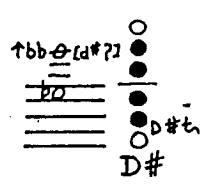
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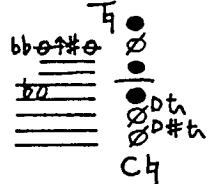
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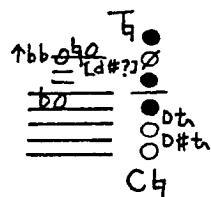
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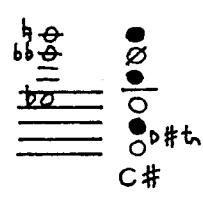
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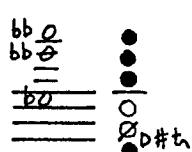
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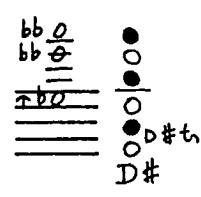
1222 F



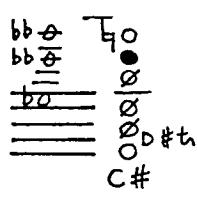
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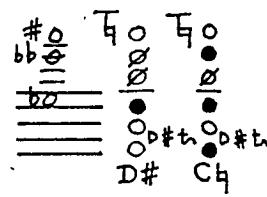
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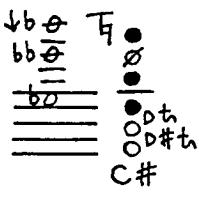
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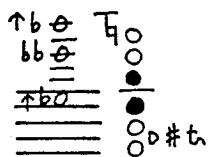
1226 F F
a) b)



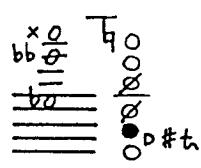
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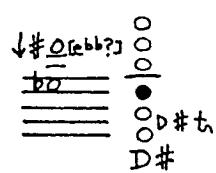
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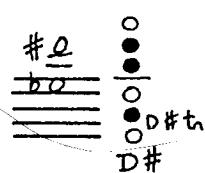
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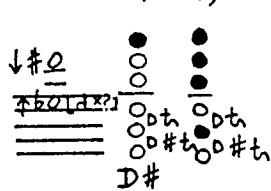
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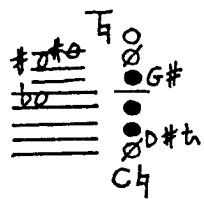
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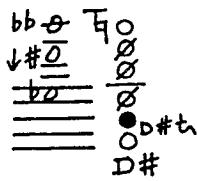
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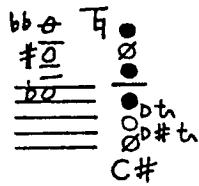
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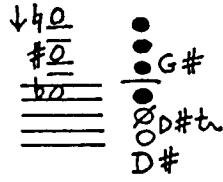
1234 F



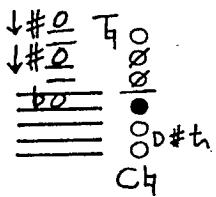
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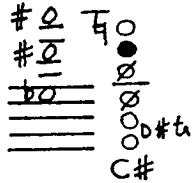
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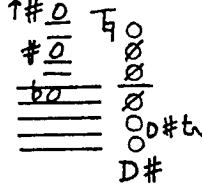
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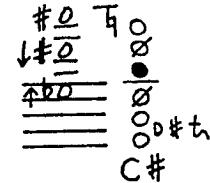
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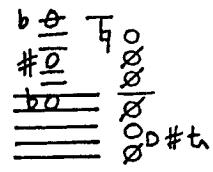
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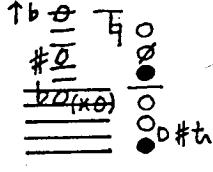
1240 F



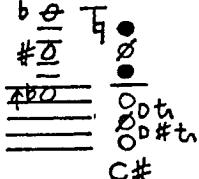
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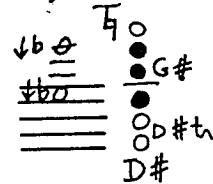
1242 F



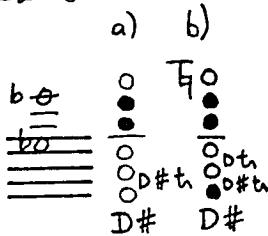
1243 F



1244

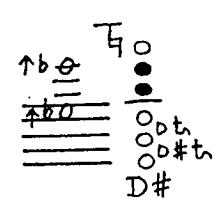


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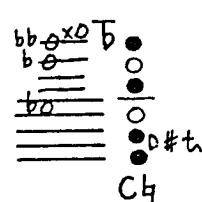


a) b)

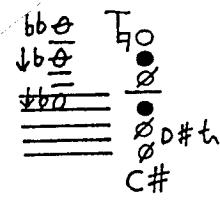
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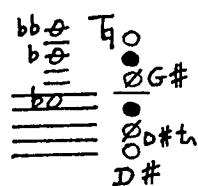
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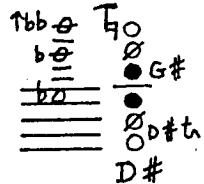
1248 F



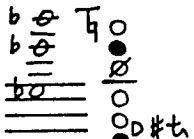
1249 F



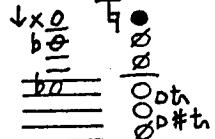
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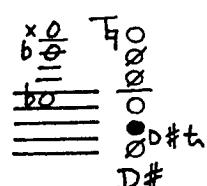
1251 F



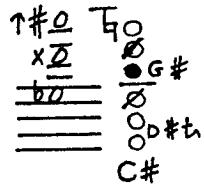
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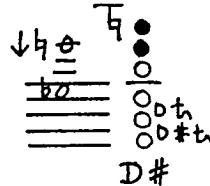
1253 F



1254 F

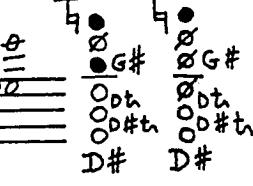


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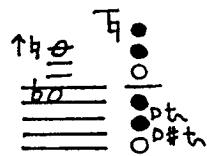
1256 F

a)

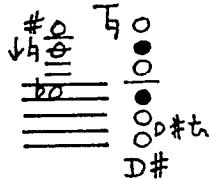


b)

1257

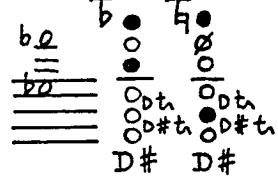


1258

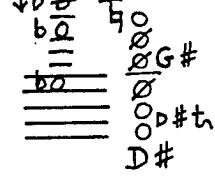


1259 F

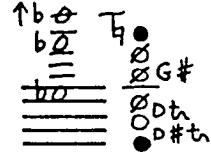
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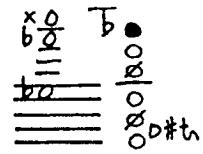
1260 F



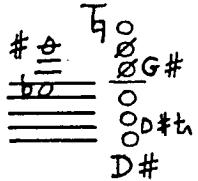
1261 F



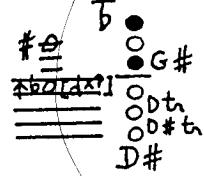
1262 F



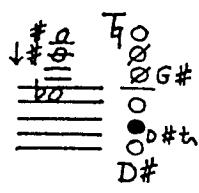
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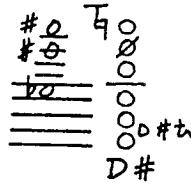
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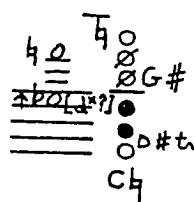
1265 F



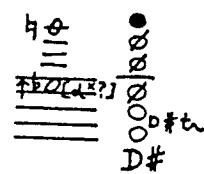
1266 F



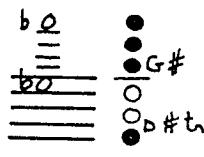
1267 F



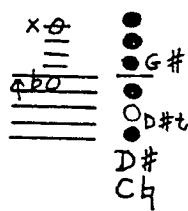
1268 F



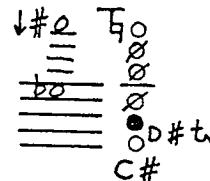
1269



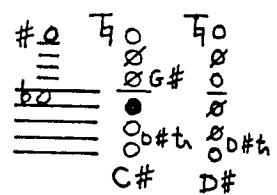
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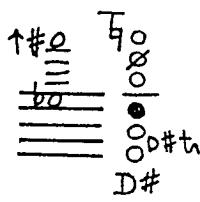
1271 F



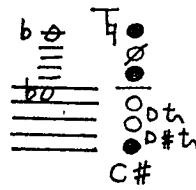
1272 F



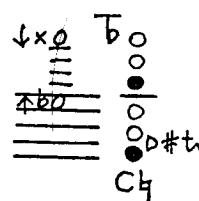
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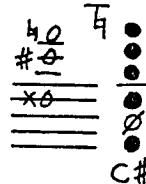
1274 F



1275



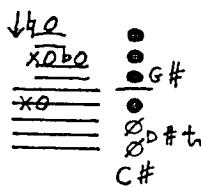
1276 F



1277 F



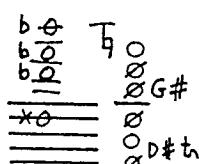
1278 F



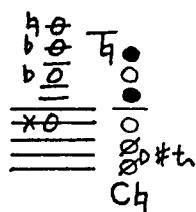
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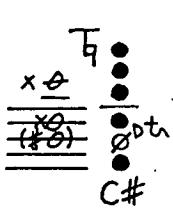
1280 F



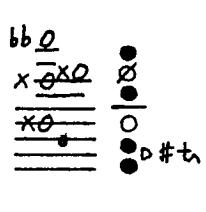
1281 F



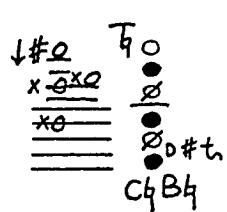
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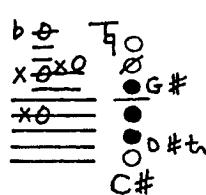
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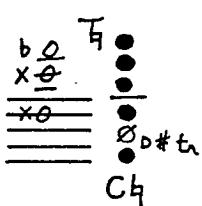
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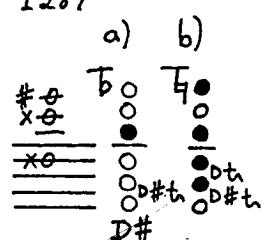
1285 F



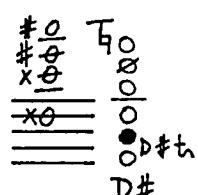
1286 F



1287

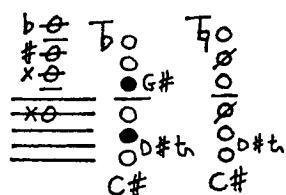


1288 F



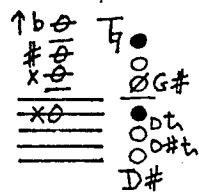
1289

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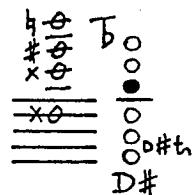


b)

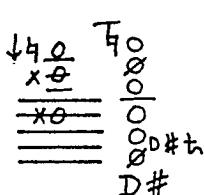
1290 F



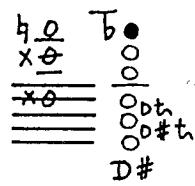
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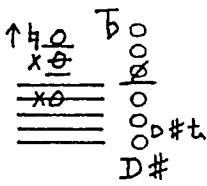
1292 F



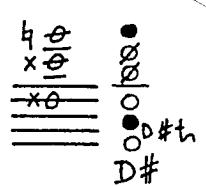
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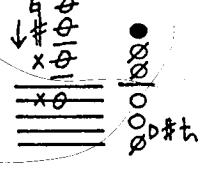
1294 F



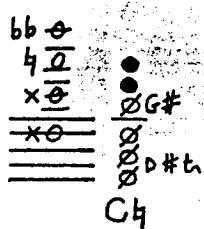
1295 F



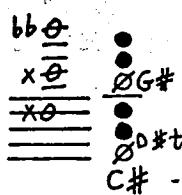
1296 F



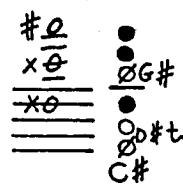
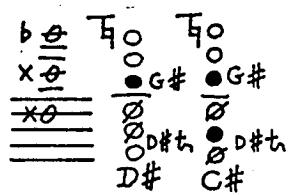
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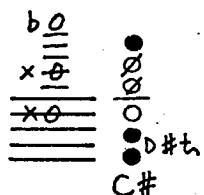
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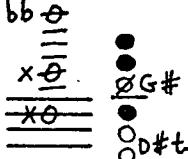
1299 F

1300 F
a) F
b)

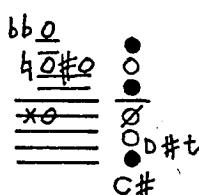
1301 F



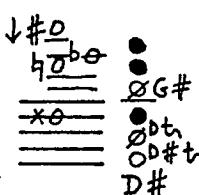
1302 F



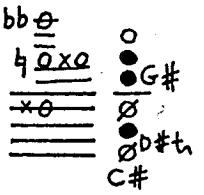
1303 F



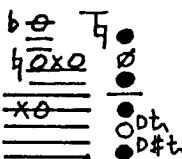
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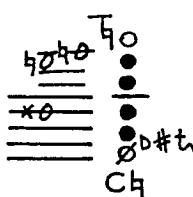
1305 F



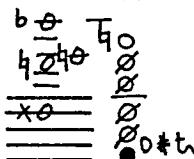
1306 F



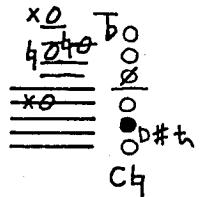
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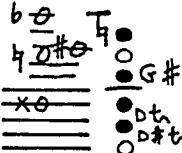
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1309 F



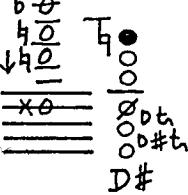
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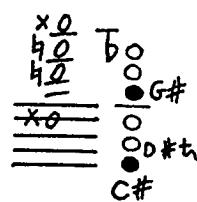
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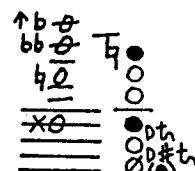
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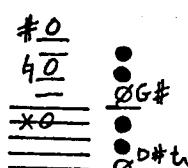
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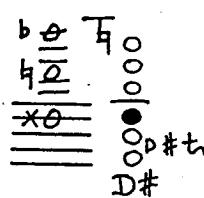
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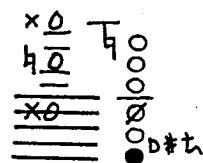
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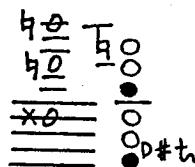
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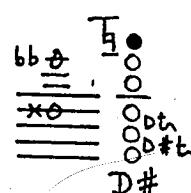
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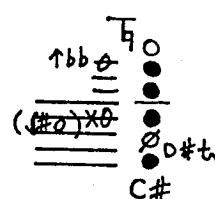
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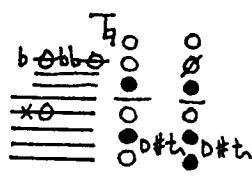
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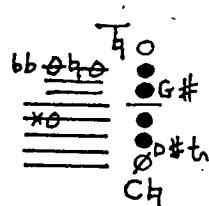
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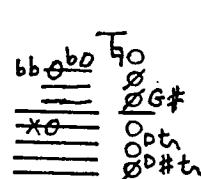
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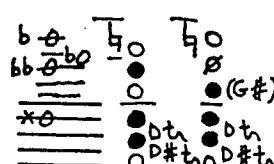
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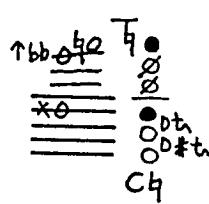
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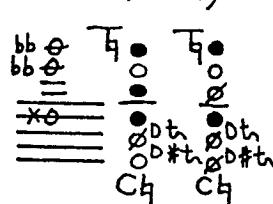
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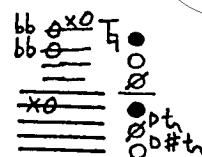
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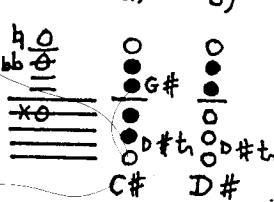
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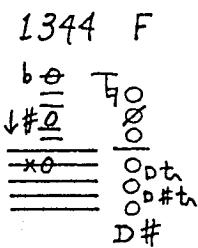
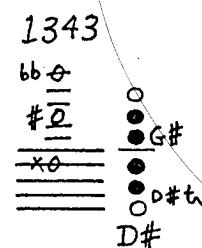
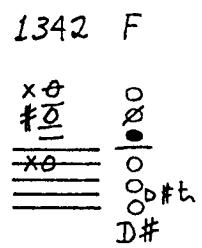
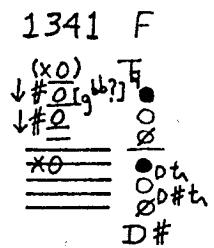
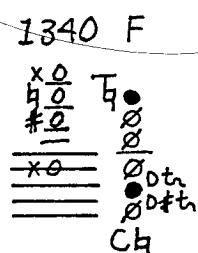
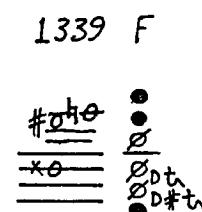
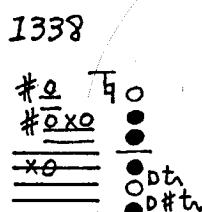
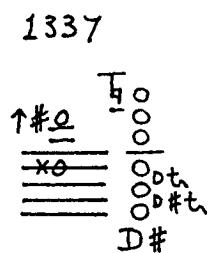
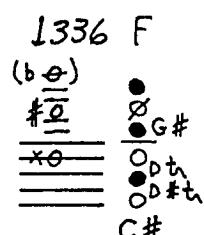
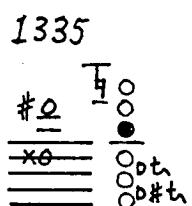
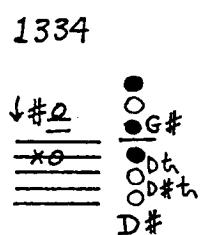
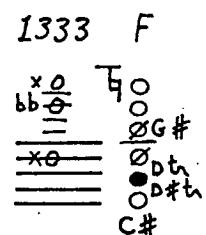
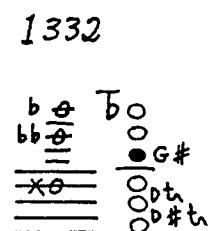
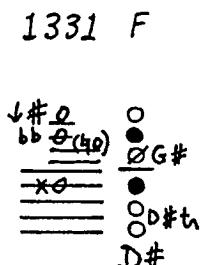
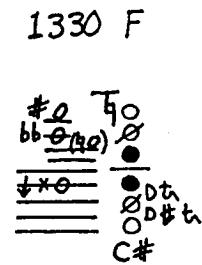
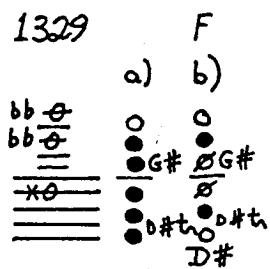


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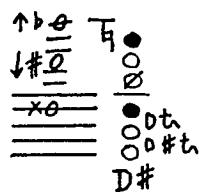


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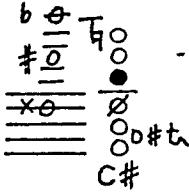




1345 F

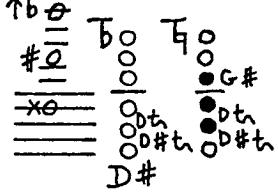


1346 F

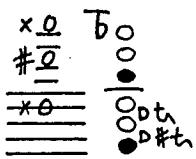


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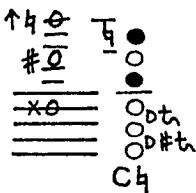
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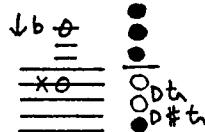
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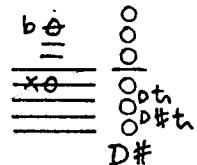
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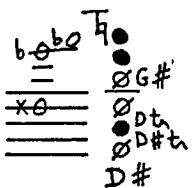
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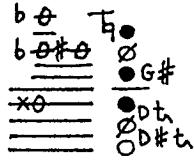
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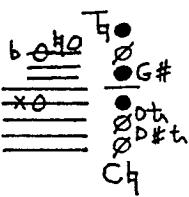
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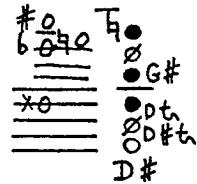
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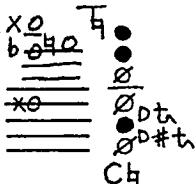
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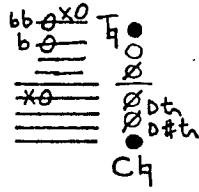
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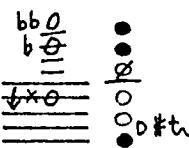
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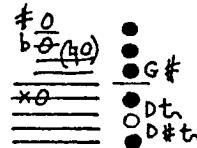
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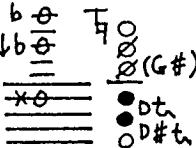
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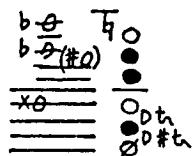
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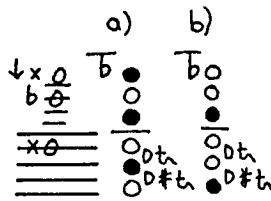
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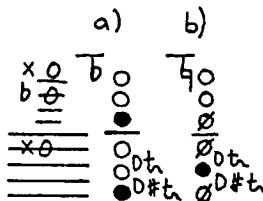
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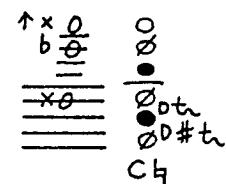
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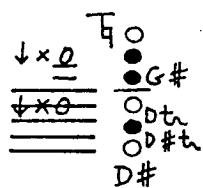
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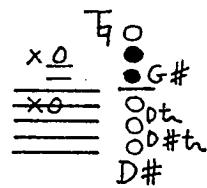
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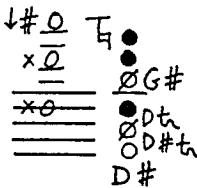
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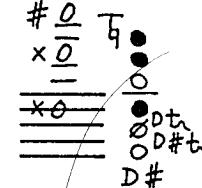
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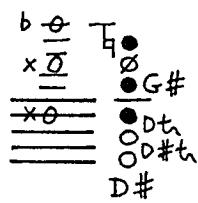
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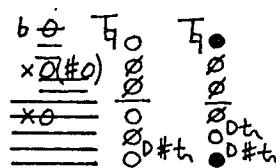
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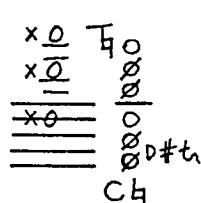
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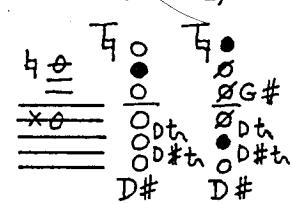
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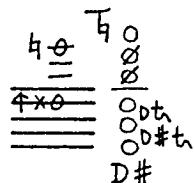
1371 F



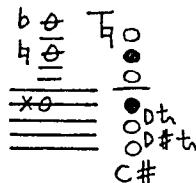
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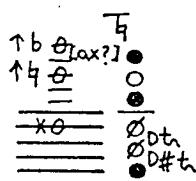
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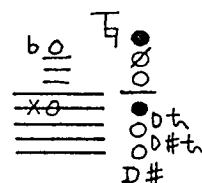
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1375 F



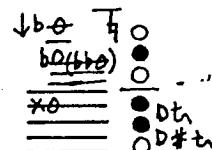
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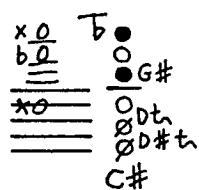
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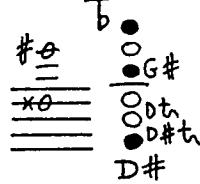
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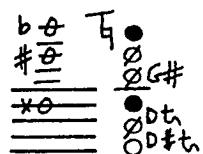
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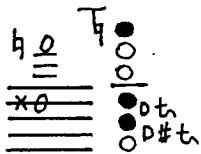
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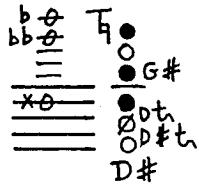
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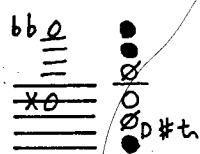
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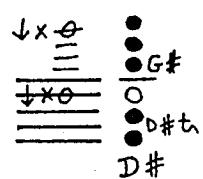
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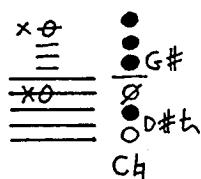
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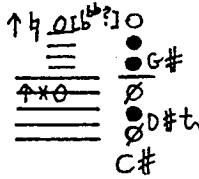
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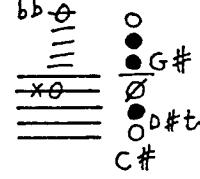
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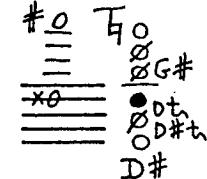
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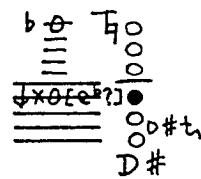
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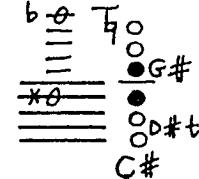
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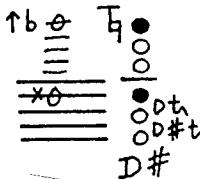
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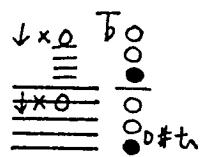
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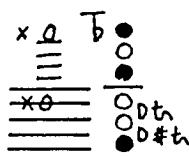
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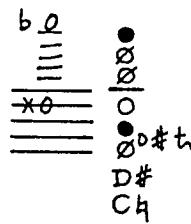
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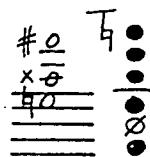
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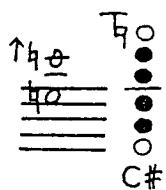
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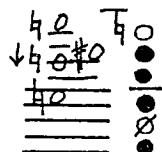
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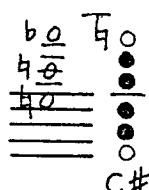
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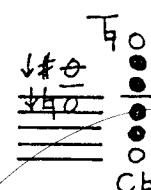
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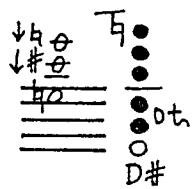
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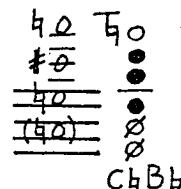
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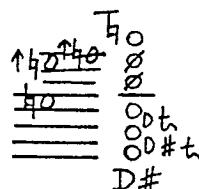
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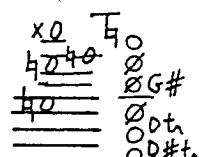
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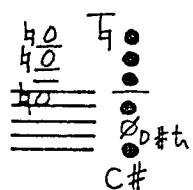
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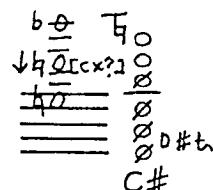
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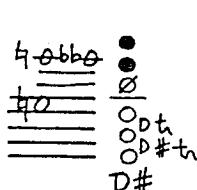
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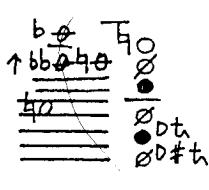
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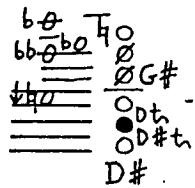
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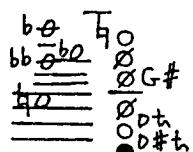
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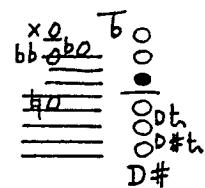
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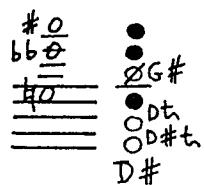
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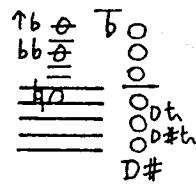
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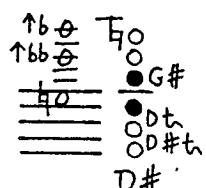
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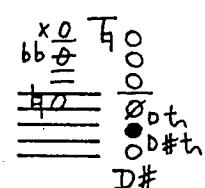
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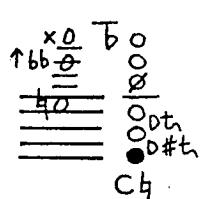
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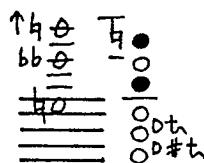
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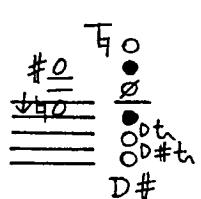
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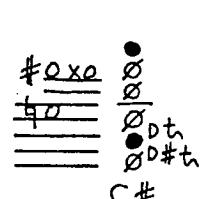
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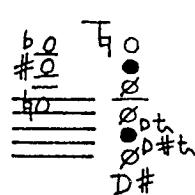
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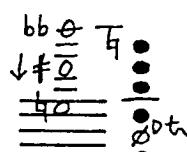
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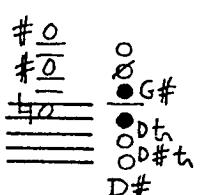
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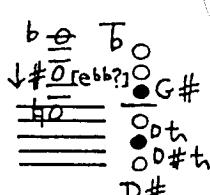
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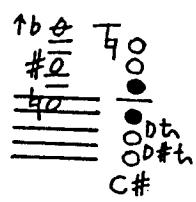
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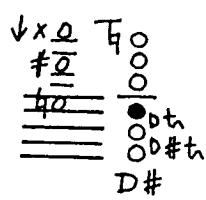
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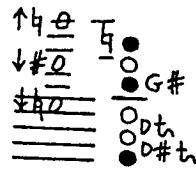
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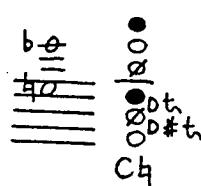
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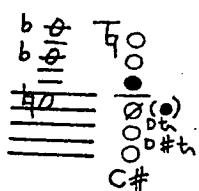
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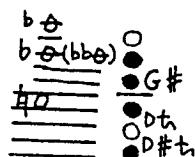
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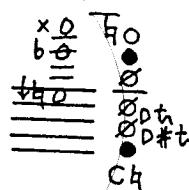
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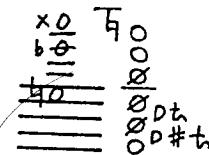
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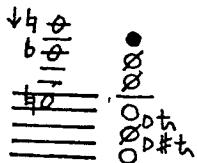
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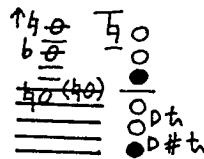
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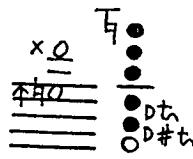
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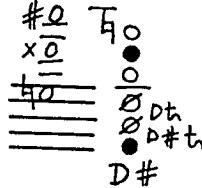
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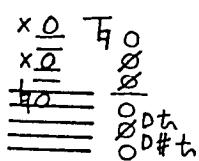
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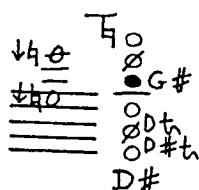
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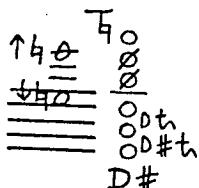
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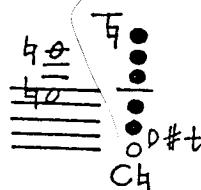
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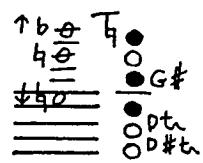
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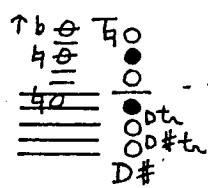
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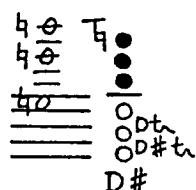
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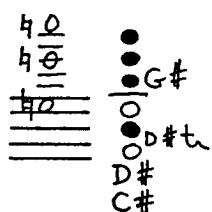
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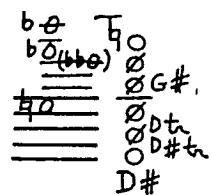
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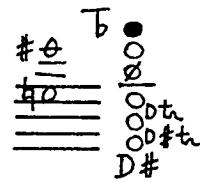
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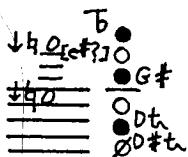
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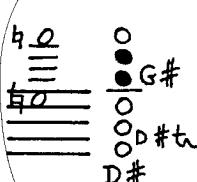
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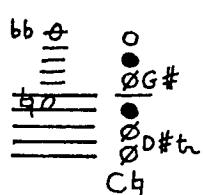
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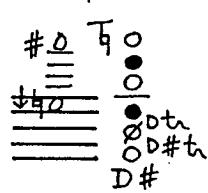
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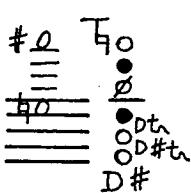
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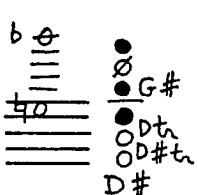
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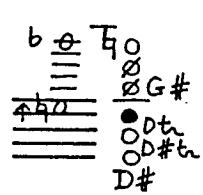
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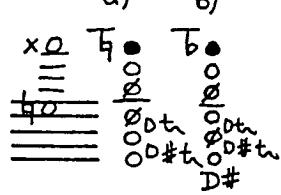
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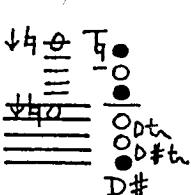
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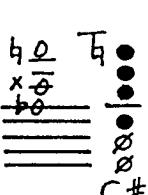
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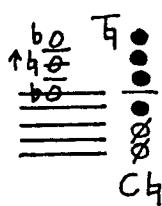
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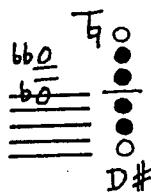
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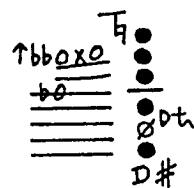
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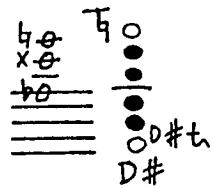
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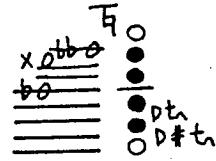
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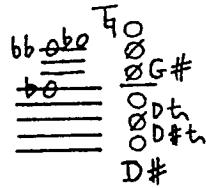
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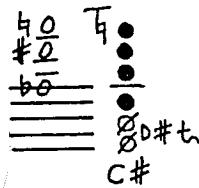
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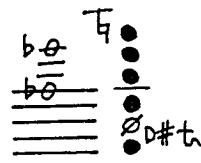
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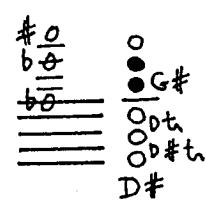
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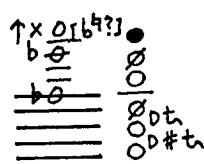
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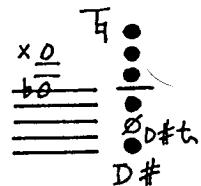
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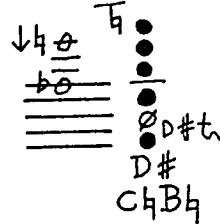
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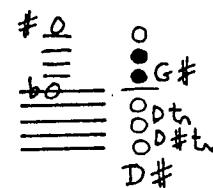
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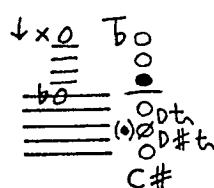
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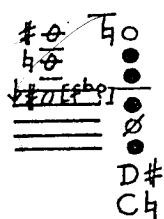
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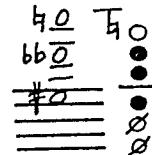
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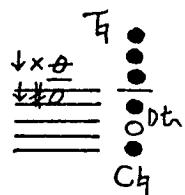
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1472 F



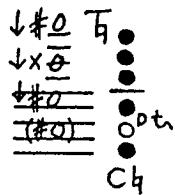
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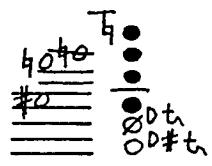
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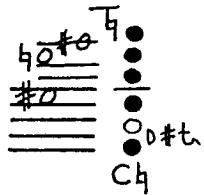
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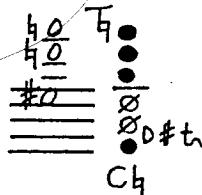
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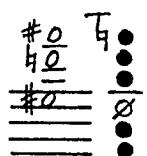
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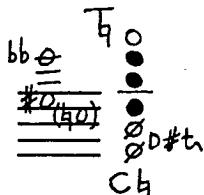
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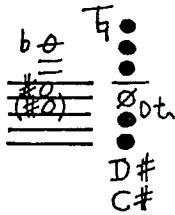
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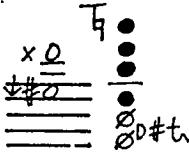
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1481 F



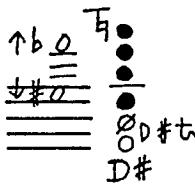
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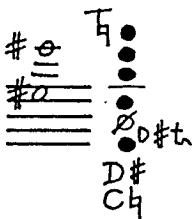
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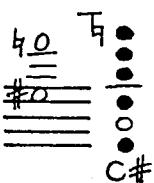
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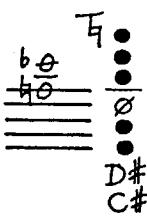
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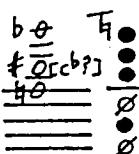
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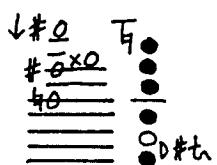
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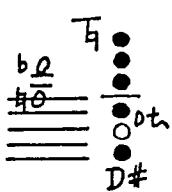
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1489



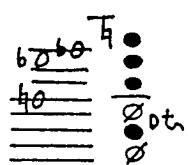
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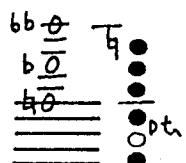
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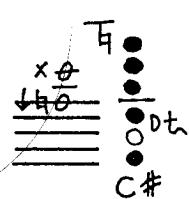
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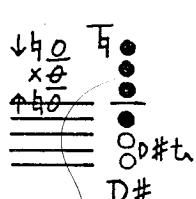
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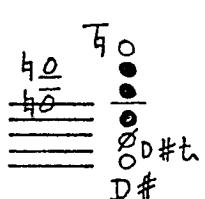
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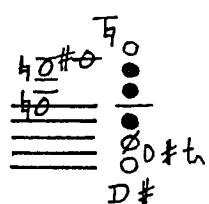
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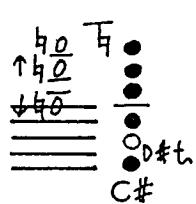
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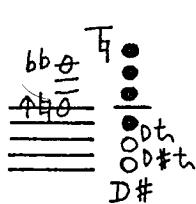
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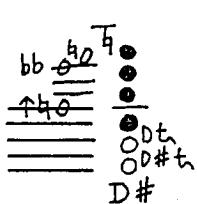
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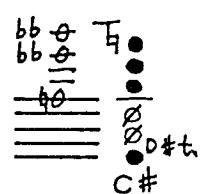
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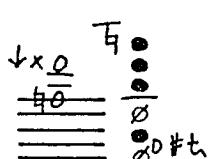
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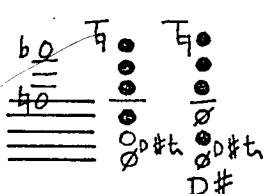
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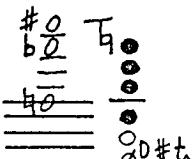
1502 F



1503 F F
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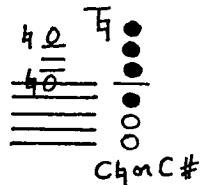


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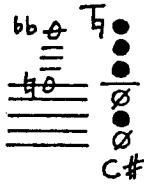


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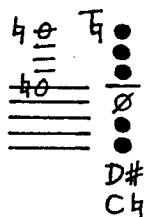
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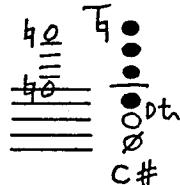
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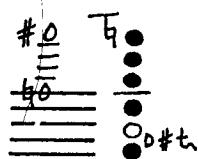
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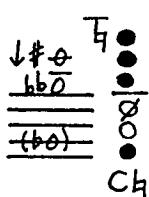
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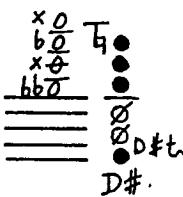
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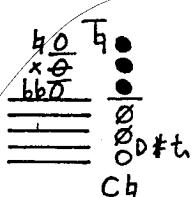
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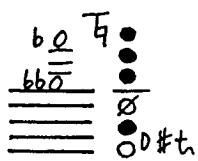
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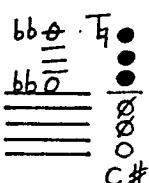
1512 F



1513 F



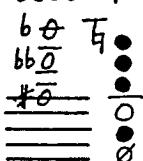
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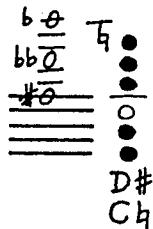
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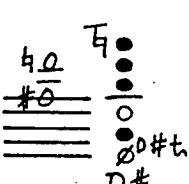
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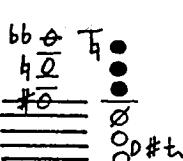
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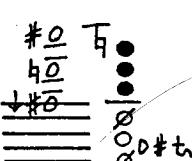
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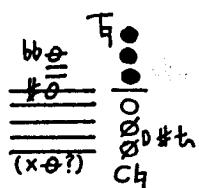
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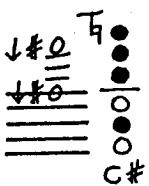
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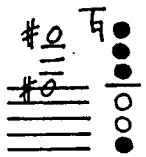
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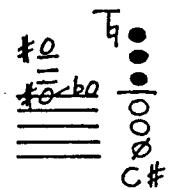
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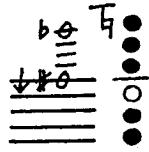
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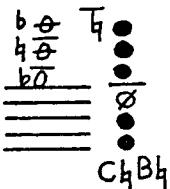
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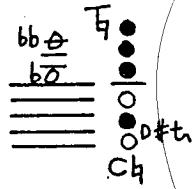
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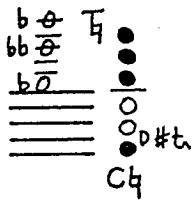
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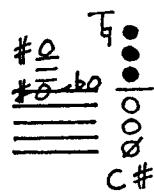
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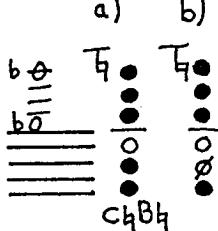
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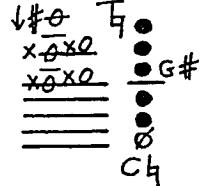
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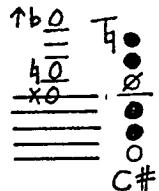
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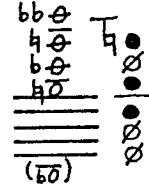
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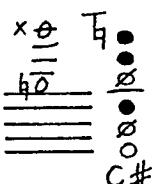
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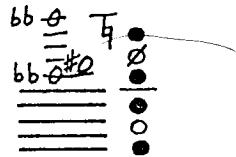
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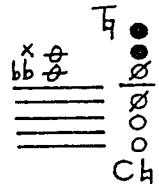
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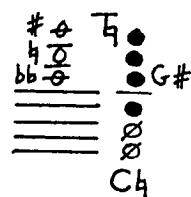
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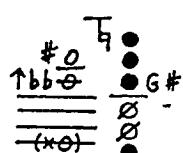
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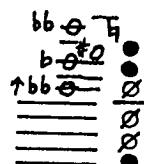
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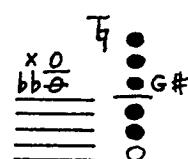
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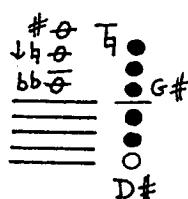
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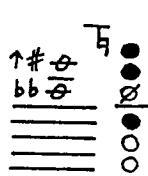
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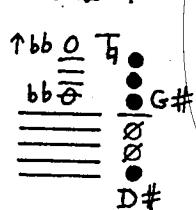
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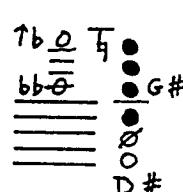
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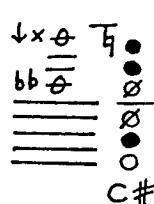
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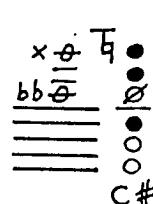
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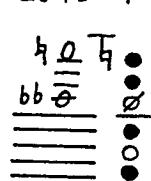
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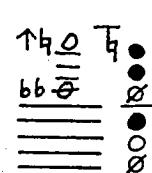
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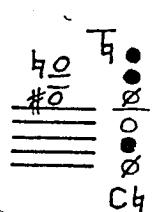
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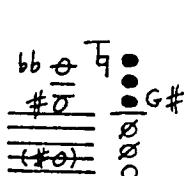
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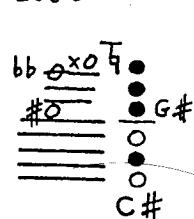
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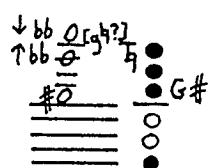
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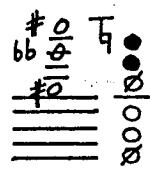
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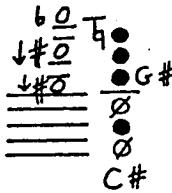
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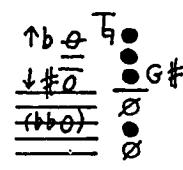
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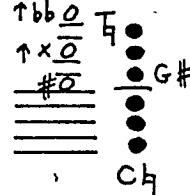
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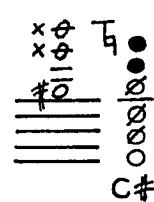
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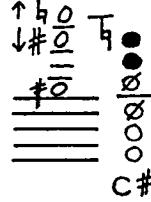
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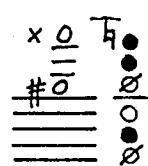
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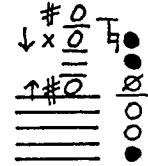
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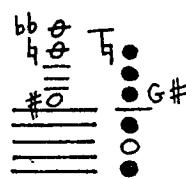
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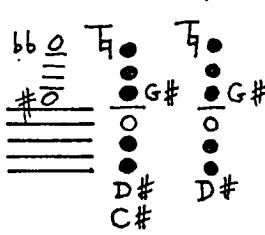
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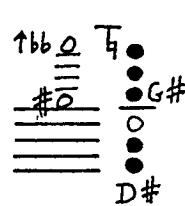
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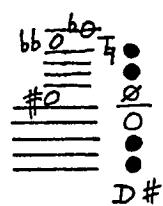
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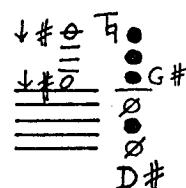
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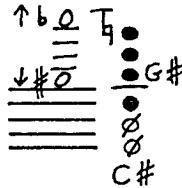
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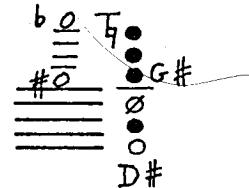
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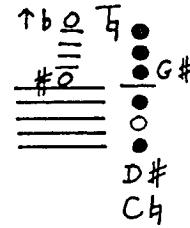
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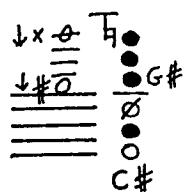
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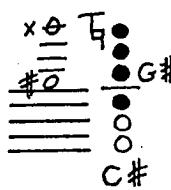
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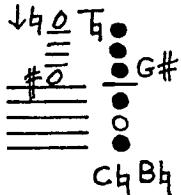
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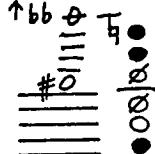
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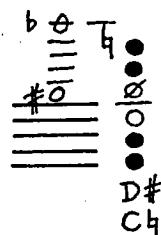
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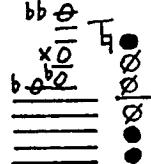
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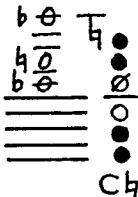
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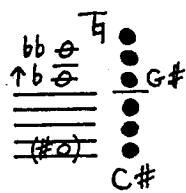
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1574 F



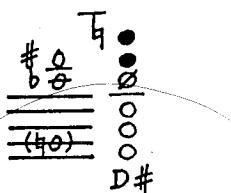
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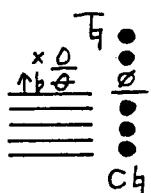
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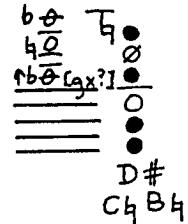
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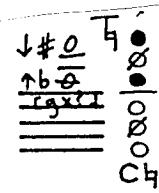
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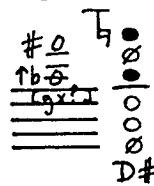
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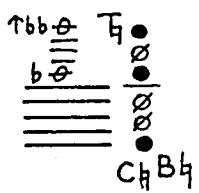
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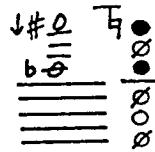
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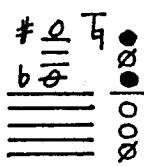
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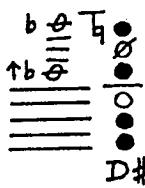
1583 F



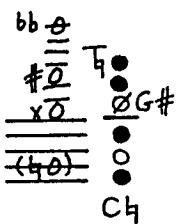
1584 F



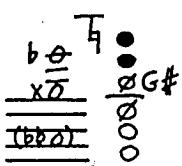
1585 F



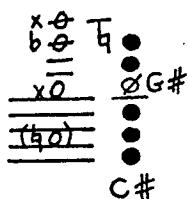
1586 F



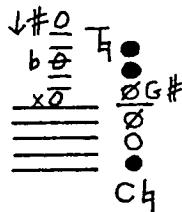
1587 F



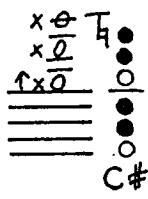
1588 F



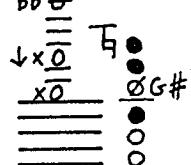
1589 F



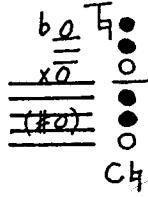
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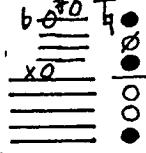
1591 F



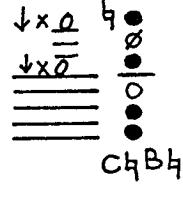
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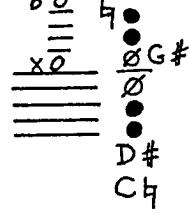
1593 F



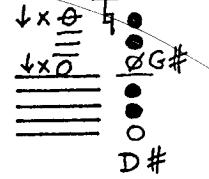
1594 FB



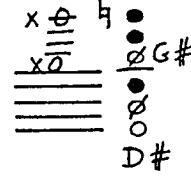
1595 F



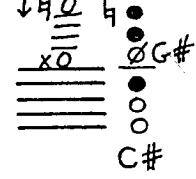
1596 F



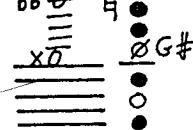
1597 F



1598 F

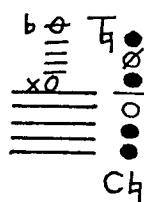


1599



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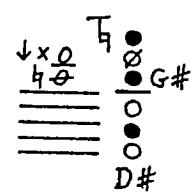
1600 F



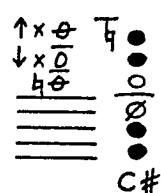
1601 F



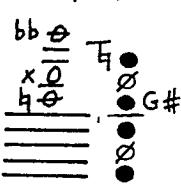
1602 F



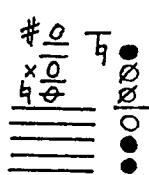
1603 F



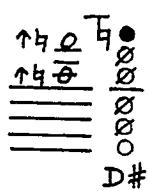
1604 F



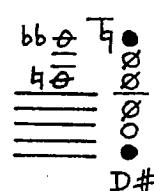
1605 F



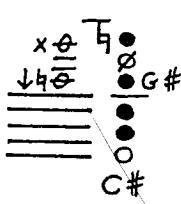
1606 F



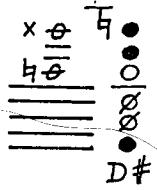
1607 F



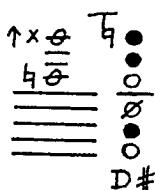
1608 F



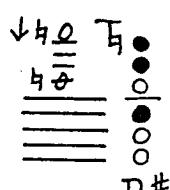
1609 F



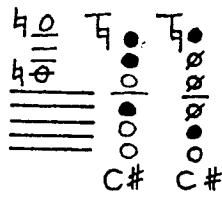
1610 F



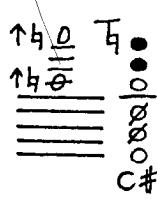
1611



1612 F
a) C#
b) C#



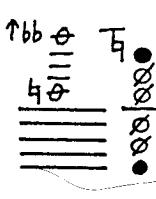
1613 F



1614 F



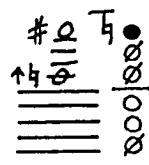
1615 F



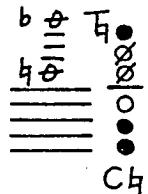
1616 F



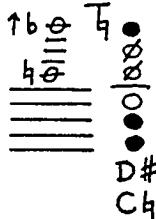
1617 F



1618 F



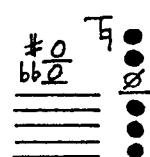
1619 F



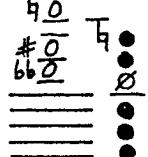
1620 B



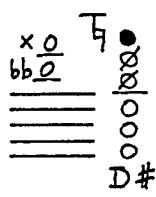
1621 F



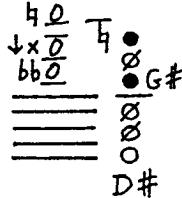
1622 F



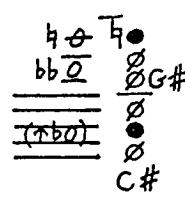
1623 F



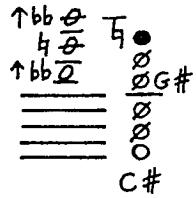
1624 F



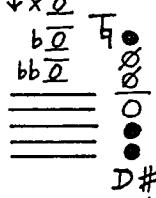
1625 F



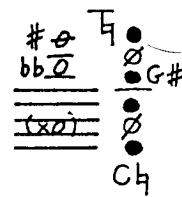
1626 F



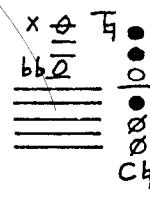
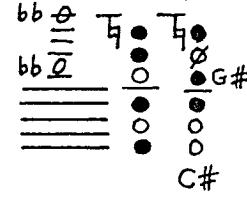
1627 F



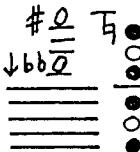
1628 F



1629 F

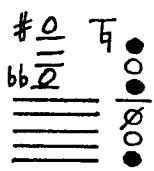
1630 F
a) b)

1631

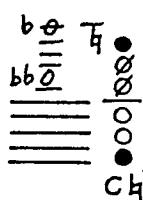


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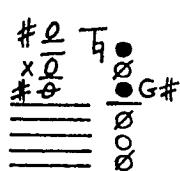
1632 F



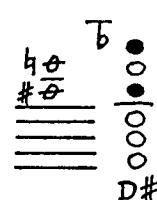
1633 F



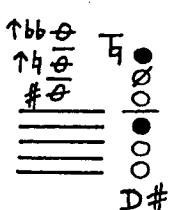
1634 F



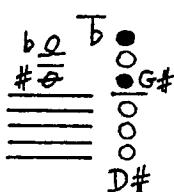
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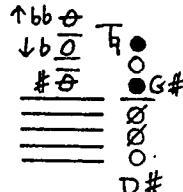
1636 F



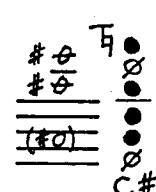
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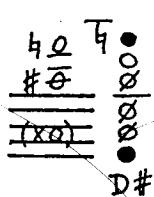
1638 F



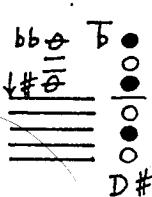
1639 F



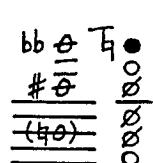
1640 F



1641



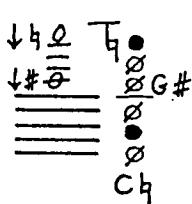
1642 F



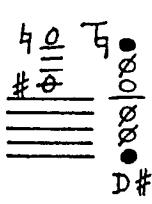
1643 F



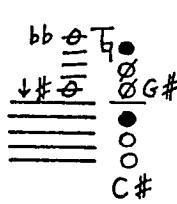
1644 F



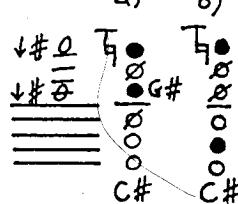
1645 F

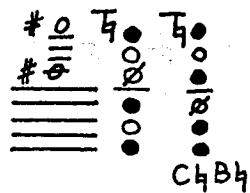


1646 F

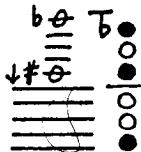


1647 F F
a) b)

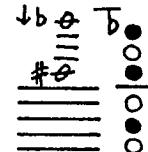


1648 F FB
a) b)

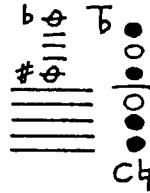
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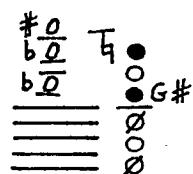
1650



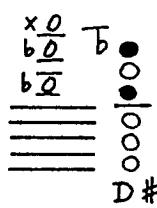
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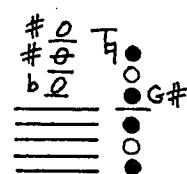
1652 F



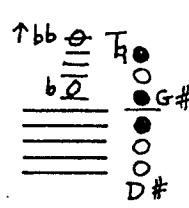
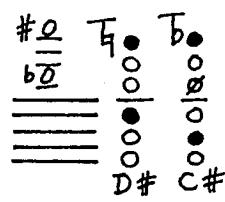
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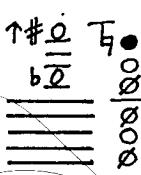
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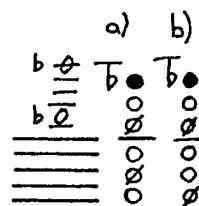
1655

1656 F
a) b)

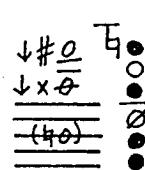
1657 F



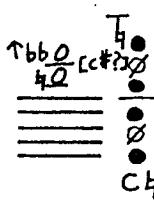
1658 F F



1659 F



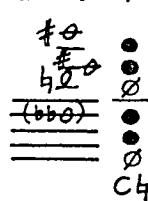
1660 F



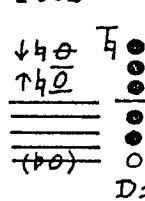
1661 F



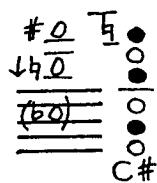
1662 F



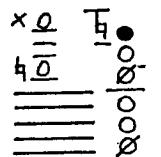
1663



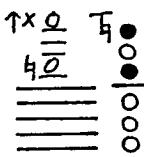
1664



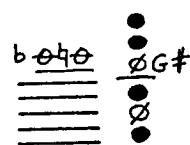
1665 F



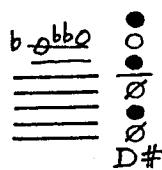
1666



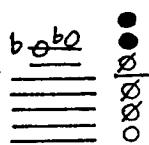
1667 F



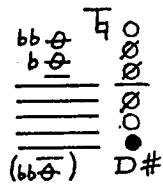
1668 F



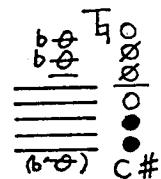
1669 F



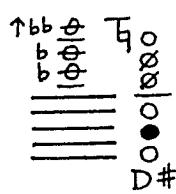
1670 F



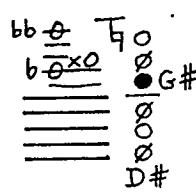
1671 F



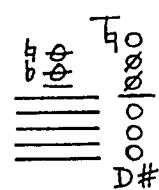
1672 F



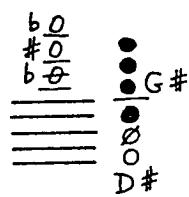
1673 F



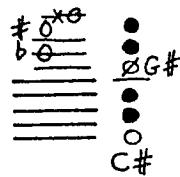
1674 F



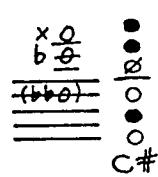
1675 F



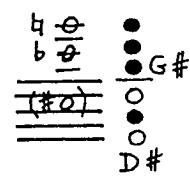
1676 F



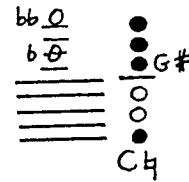
1677 F



1678



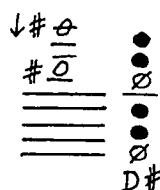
1679



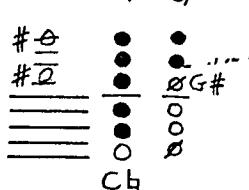
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a) b)			
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1692	1693 F	1694 F	1695 F

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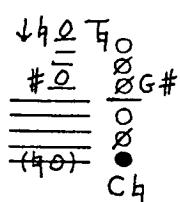
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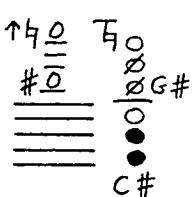
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a) b)



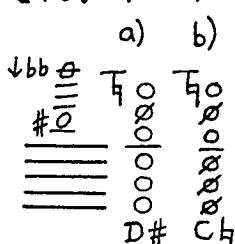
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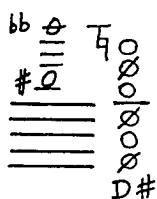
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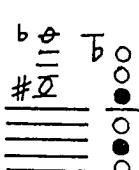
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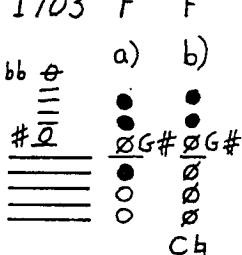
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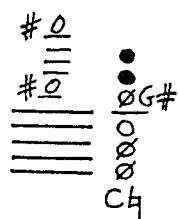
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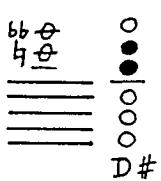
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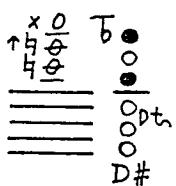
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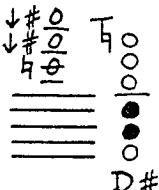
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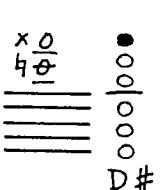
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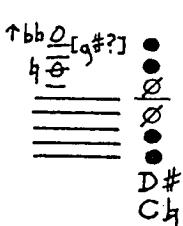
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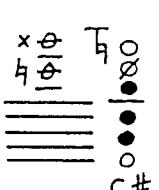
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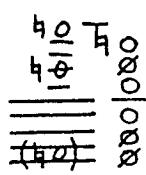
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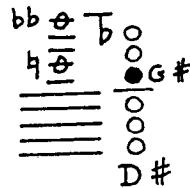
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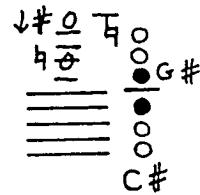
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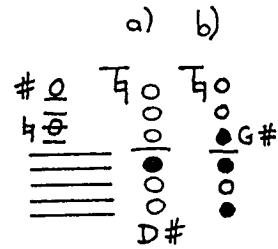
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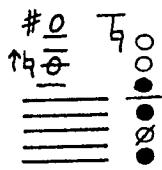
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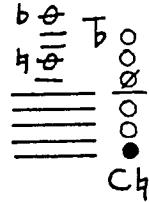
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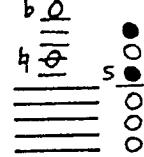
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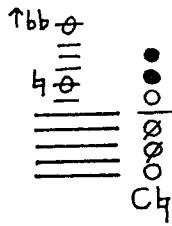
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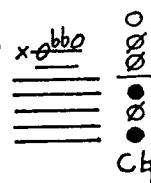
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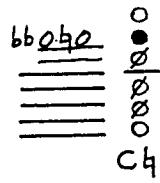
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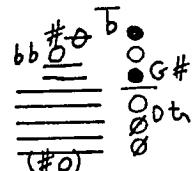
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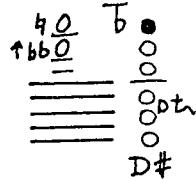
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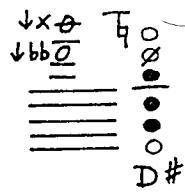
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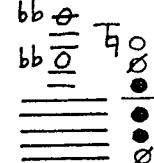
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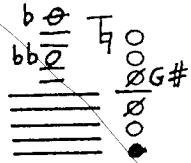
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1726 F

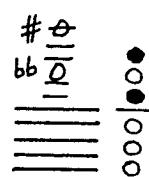


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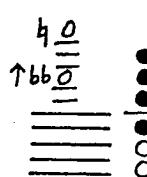


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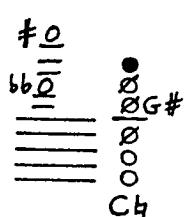
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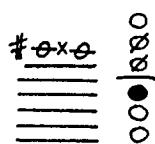
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1730 F



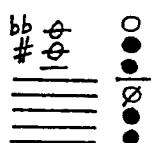
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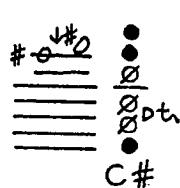
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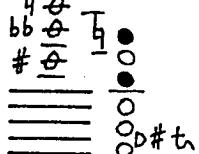
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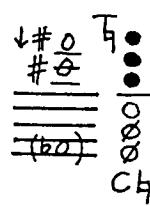
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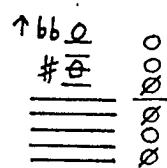
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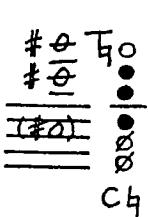
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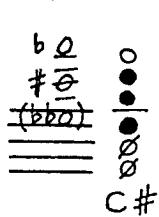
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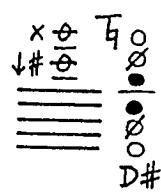
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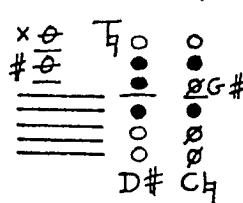
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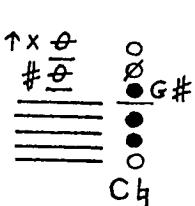
1740 F



1741 F
a) b)

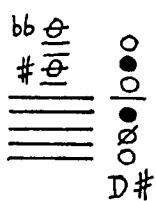


1742 E

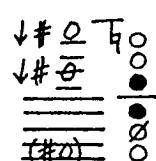


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1744 F



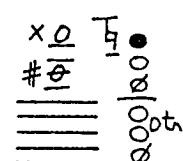
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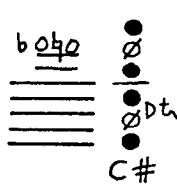
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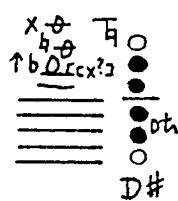
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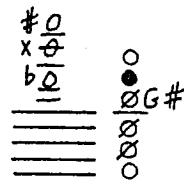
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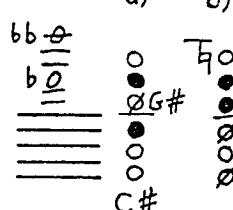
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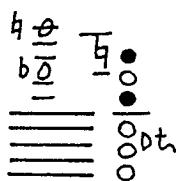
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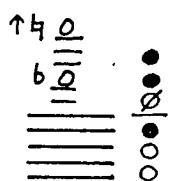
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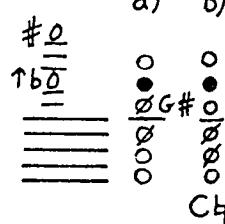
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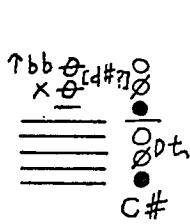
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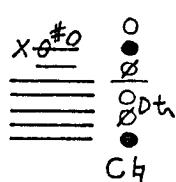
1754 F F



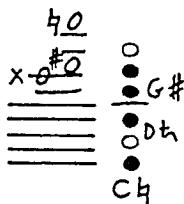
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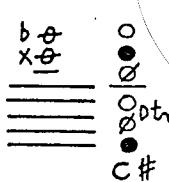
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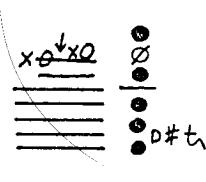
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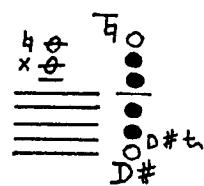
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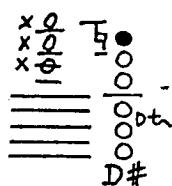
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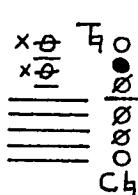
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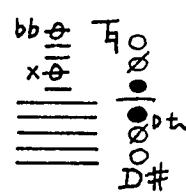
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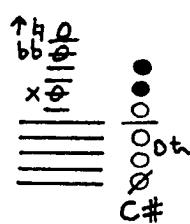
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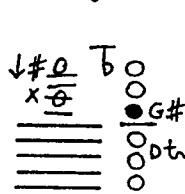
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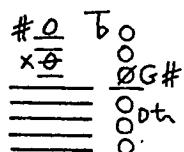
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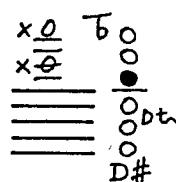
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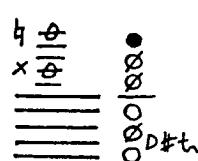
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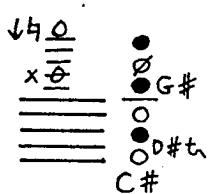
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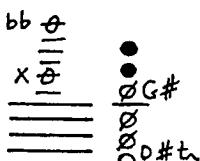
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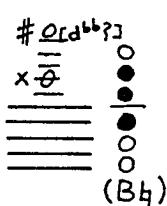
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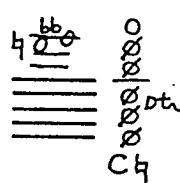
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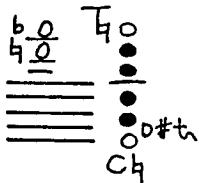
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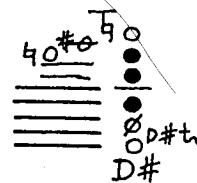
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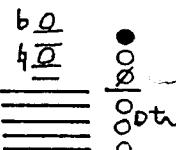
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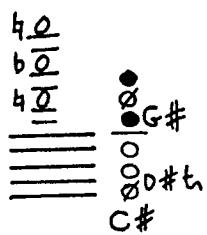
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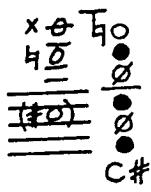
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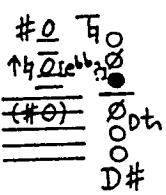
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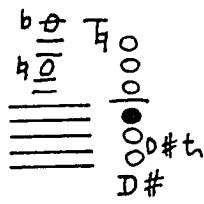
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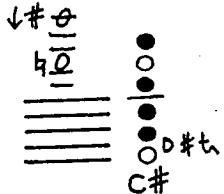
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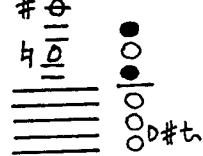
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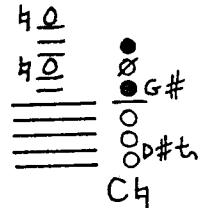
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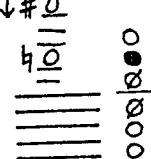
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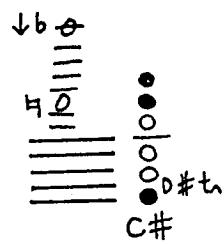
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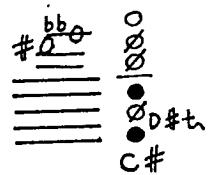
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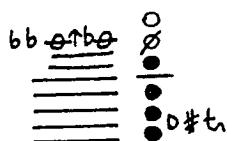
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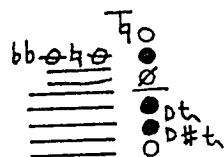
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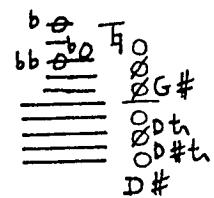
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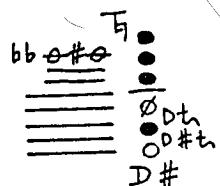
1787 F



1788 F



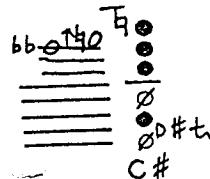
1789 F



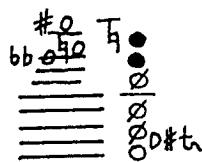
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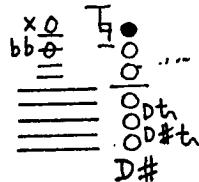
1791 F



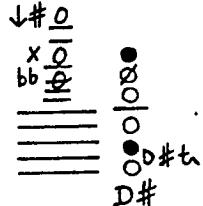
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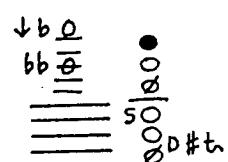
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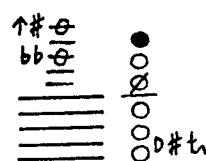
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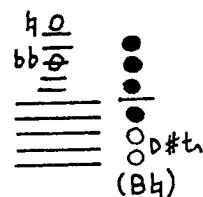
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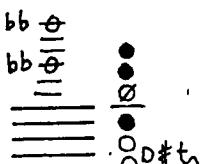
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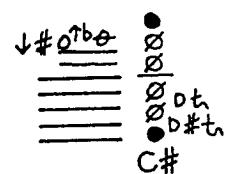
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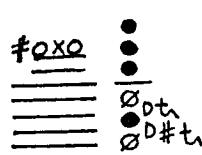
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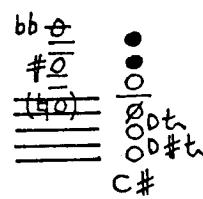
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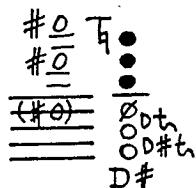
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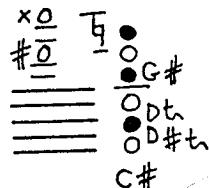
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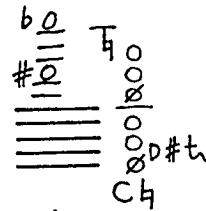
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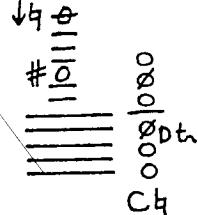
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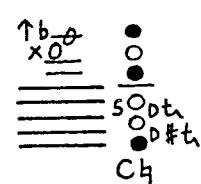
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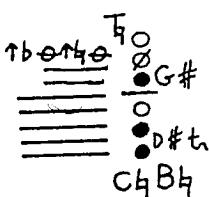
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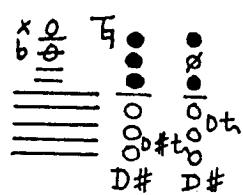
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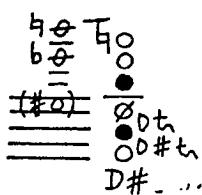
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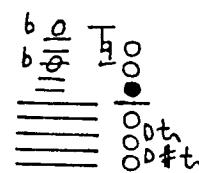
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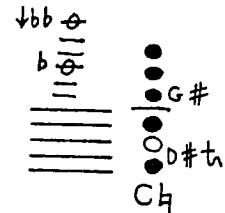
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1810



1811

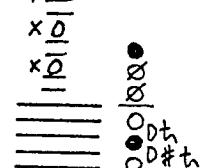
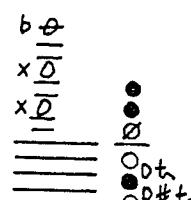
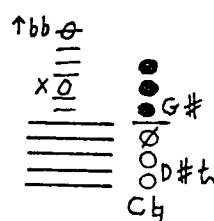
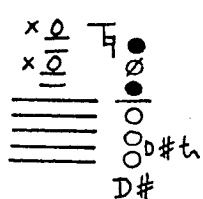


1812 F

1813 F

1814 F

1815 F

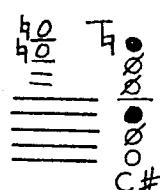
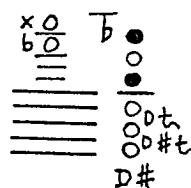
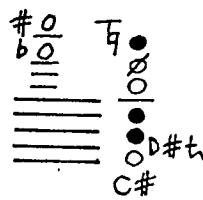
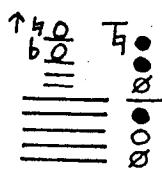


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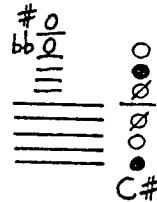
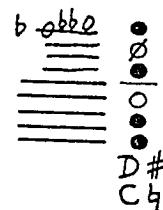
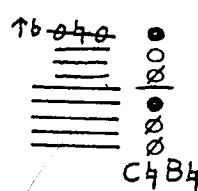


1820 F

1821 FB

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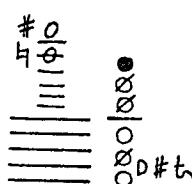
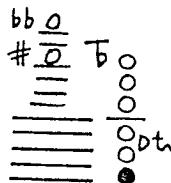
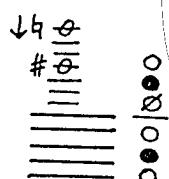
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1826 F



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