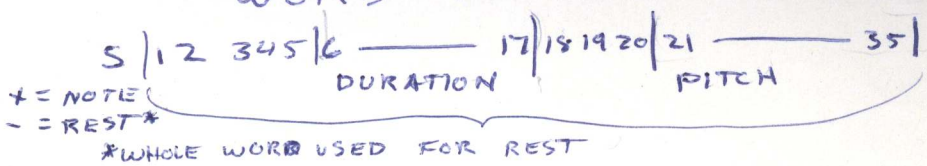
IBM 704 MUSIC

```
30    PSE     140
31    RDS     321
32    MSE     141     IS THIS FIRST CARD ?
33    TRA     136     YES - SET CPY ADDRESS
34    PSE     141     NO
35    TRA      50
36    CLA      62     CONSTANT = TO PROGRAM AREA
37    CPY      26     9L (-=LAST CARD, ADDRESS = NO. OF NOTES & RESTS ON CARD)
40    ADD      26     L(9L)
41    TMI      52     TO DELAY BEFORE PLAY
42    STA      44
43    LXA   A  26     L(9L)
44    CPY   A  [  ]
45    TIX 0001 A      44
46    STO      27     LAST ADDRESS MEMORY
47    TRA      31
50    CLA      27     LAST ADDRESS MEMORY
51    TRA      37
52    LXA  ABC 61     L(7777)      }
53    ANS   A  ~~53~~               } DELAY BEFORE PLAY
54    TIX 0001 A  53                }
55    TIX 0001 B  53                }
56    TIX 0001 C  53
57    TRA      64     BEGIN PLAY
```

WORD FORMAT



60		+0000 0000 00000		ZEROS
61		-3777 777 777 77777		ONES
62		+0000 000 000 00140		CONSTANT = TO PROGRAM AREA
63				NOTE & REST CNTR.
64	CLA		27	L (LAST ADDRESS MEMORY) -
65	STA		~~71 73~~ 72	
66	SUB		62	CONSTANT = TO PROGRAM AREA
67	ALS		21	
70	STD		63	SET NOTE & REST CNTR.
71	LXD	C	63	2(NOTE & REST CNTR)
72	CLA	C	[ ]	
73	TIX	0001 C	77	STEP NOTE CNTR, IS SONG OVER
74	PSE		161	~~STOP BEFORE PLAYING NEXT SONG ?~~ READ IN NEW SONG OR REPEAT
75	TRA		30	~~NO~~ READ IN NEW SONG
76	~~TRA~~ ~~HTR~~		52 ~~30~~	~~YES~~ REPEAT
77	SXD	C	63	
100	TMI		130	IS THIS WORD A NOTE OR A REST (REST = -)
101	NOP	LXA C	61	FOR LATER USE
102	NOP	TIX 0001 C	102	
103	NOP			
104	PDX	C		
105	STA		25	FREQ. SET
106	PSE		141	TONE GENERATOR
107	PSE		142	

```
110     PSE          143
111     LXA   B      115    L(2)
112     LXA   A       25    L(FREQ. SET)
113     TIX 0001 A   113
114     MSE          141
115     NOP            2
116     LXA   A       25    L(FREQ. SET)
117     TIX 0001 A   117
120     PSE          141
121     MSE          142
122     PSE          142
123     TIX 0001 B   112
124     MSE          143
125     PSE          143
12C     TIX 0001 C   111
127     TRA           71    GET NEXT NOTE
130   + 0000000000001       ONE
131     ADD          130
132     TNZ          131
133     TRA           71
134
135
136   PSE            141
137   TRA             3C
```

TONE GENERATOR

REST EXECUTION
(MAY REQUIRE ADDITIONAL TIME CONSUMING INSTRUCTIONS)

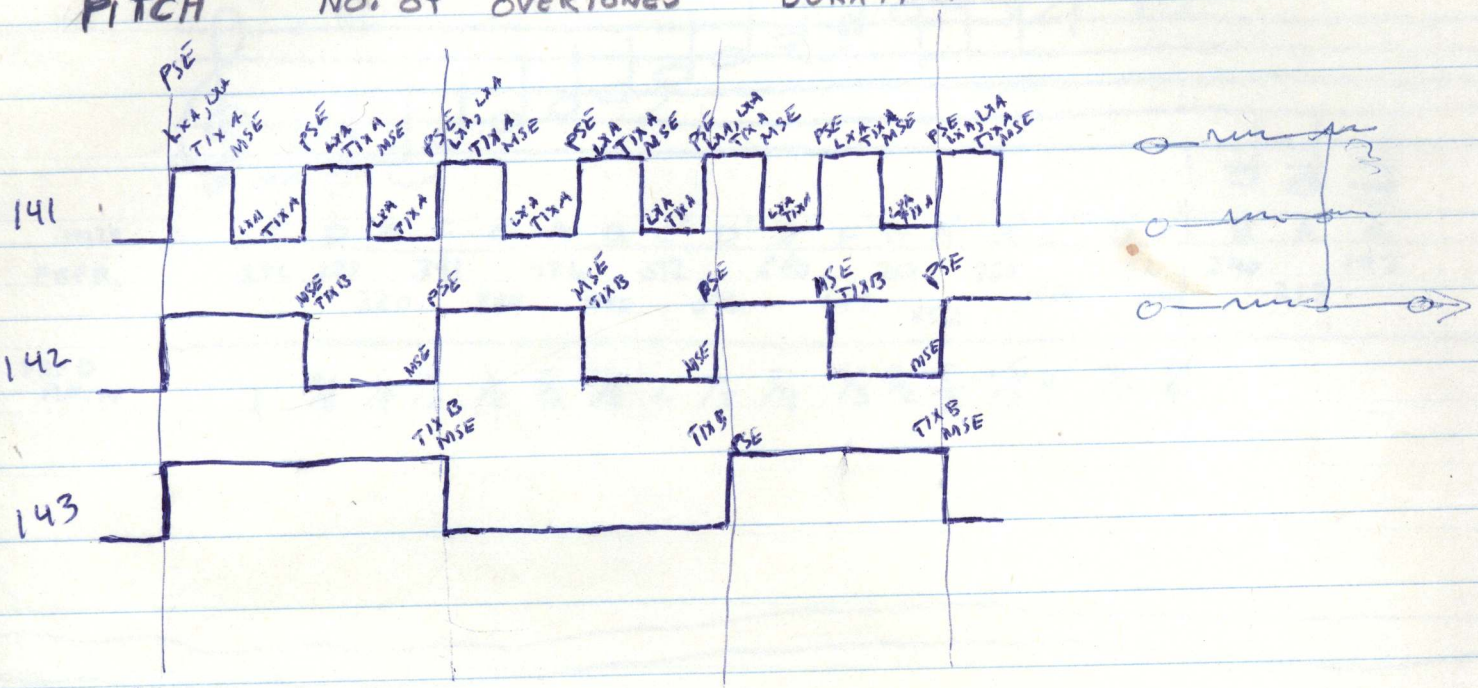
~~#~~ DUR. #OVT. PITCH

5 | 2 | 3–5 | 6 —— 17 | 18-20 | 21 —— 35

+ = 1 NOTE WITH INDICATED OVT.

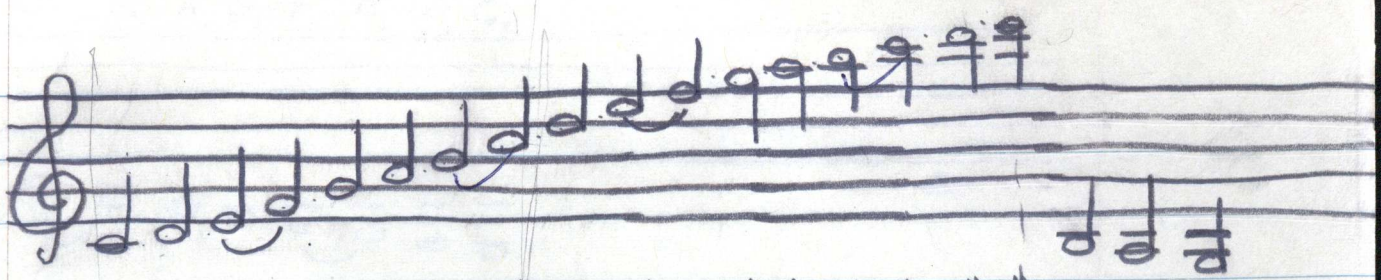
- = 2 NOTE WITH 3–5 INDICATING STEP (2nd NOTE ALWAYS HIGHER THAN FUNDEMENTAL INDICATED BY ADDRESS

PITCH NO. OF OVERTONES DURATION



3	PSE	141		22	PSE	143
4	PSE	142		23	TRA	C
5	PSE	143			TIX 0001	C
6	LXA B		L(2)			6 — FOR CONTROLED DURATION
7	LXA A		L(FREQ. SET)			6
10	TIX 0001 A	10				3
11	MSE	141				5
12	NOP					3
13	~~LXA~~ A	~~E~~	L(FREQ. SET)			
14	TIX 0001 A	14				
15	PSE	141				
16	MSE	142				
17	PSE	142				
20	TIX 0001 B	7				
21	MSE	143				

BASIC MUSICAL FUNCTIONS



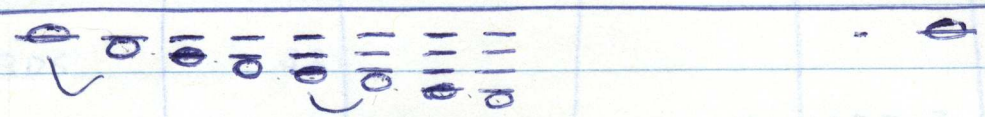
NOTE	C	D	E	F	G	A	B	C'	D'	E'	F'	G'	A'	B'	C"	D"	E"	B	A	G
FREQ.	256	288	320	341	384	426	480	512	576	640	682	768	853	960	1024	1152	1280	240	213	192
FREQ RATIO	1	9/8	5/4	4/3	3/2	5/3	15/8	2	9/8	5/4	4/3	3/2	5/3	15/8	4	9/4	5/4			

OVERTONES — HARMONICS

2nd HARMONIC ≡ 1ST OVERTONE

	C	C'	G'	C"	E"
E G B D F					
A C E G	256	512	768	1024	1280
	FUNDEMENTAL OR 1ST HARMONIC	2nd HARMONIC 1ST OVERTONE	3RD HARM. 2nd OVER.	4TH HARM. 3RD OVER.	5TH HARM. 4TH OVER.
	1·C	2·C	3·C	4·C	5·C

C B, A, G, F, E, D, C,



213 170.6 144

256 240 192 160 128

$$\frac{41666.6}{\text{FREQ}} = \text{NO. OF INST. (24}\mu\text{s) TO GIVE REQUIRED PITCH}$$

FUND.	3RD OVERTONE	FREQ. OF FUND	FREQ. OF 3RD	OCTAL NUMBER TO SET FREQ.
C''	G''	1024	3072	6