

## บรรณานุกรม

1. William M.Newman & Robert F.Sproull in Principles of Interactive Computer Graphics (Charles E.Stewart) McGraw-Hill Inc., 1981.
2. John J.Donovan in System Programming (David M.Jones) ,pp.60-80, McGraw-Hill Inc.,1972.
3. Phillip Tupp in The Apple Music II Owner's Manual ALF Products Inc.,Denver,1980.
4. William Cole in Rudiments and Theory of Music pp.1-30, The Sssociated Board of The Royal Schools of Music, Lodon, 1958.
5. PC-8001 B N-Basic reference manual, Nippon Electric Corp.,1978.
6. PC-8001 B User manual, Nippon Electric Corp., 1978.
7. FGU-2200 reference manual, Nippon Electric Corp., 1978.

ภาคผนวก

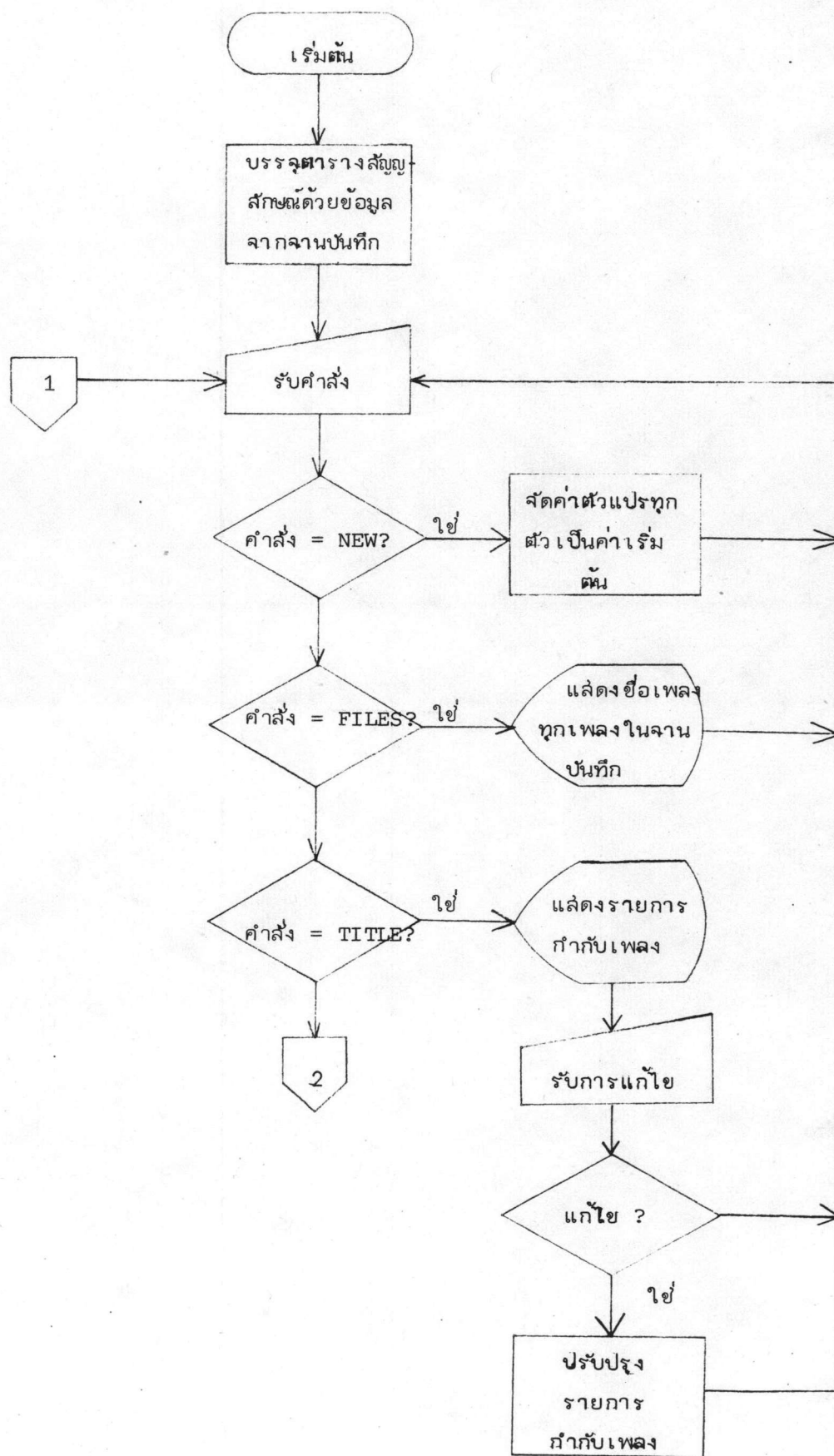
## ภาคผนวก ก

## ผังขั้นตอนการทำงานของระบบงานเขียนโน้ตดนตรี

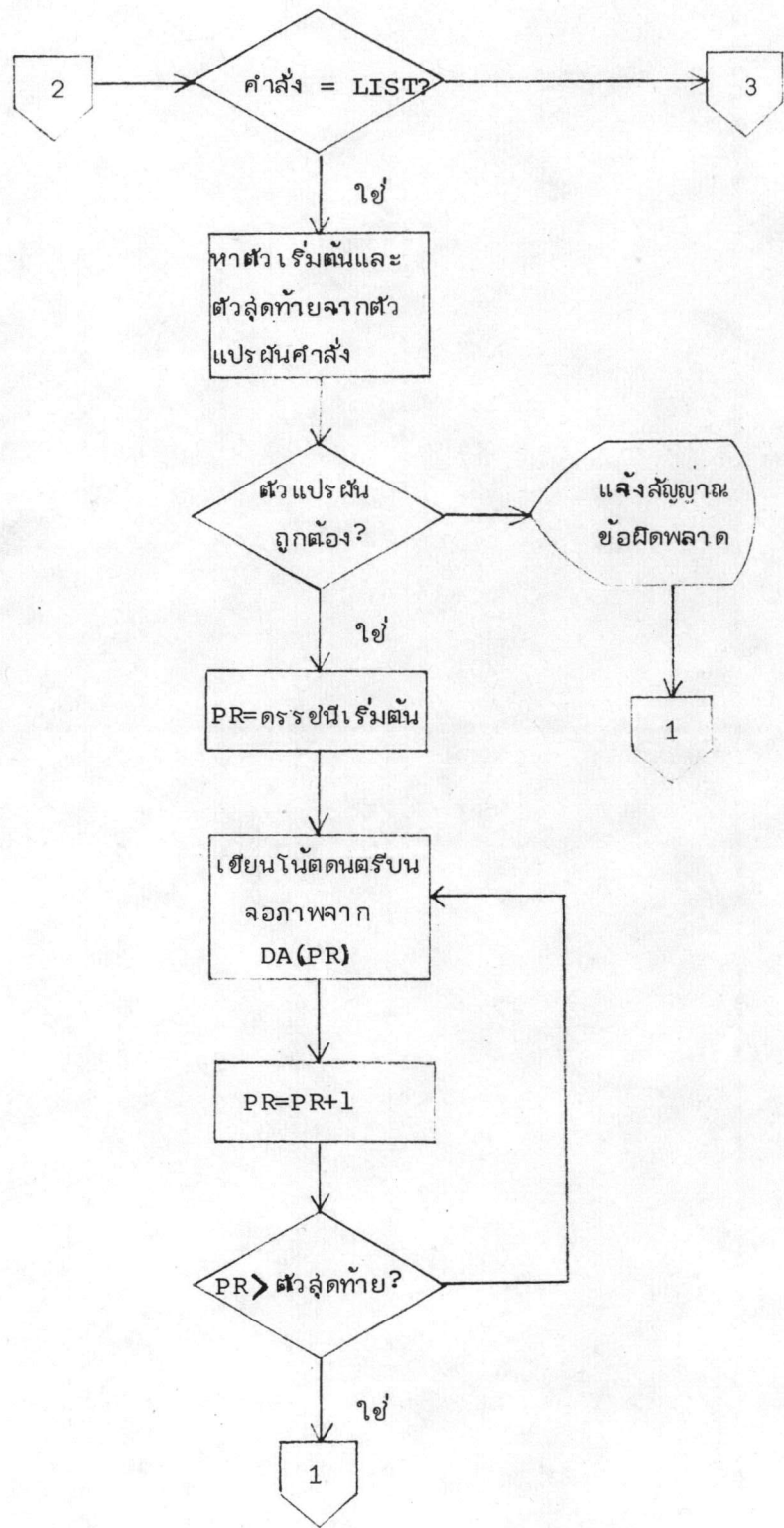
สัญลักษณ์ที่ใช้แทนตัวแปรต่าง ๆ มีดังนี้

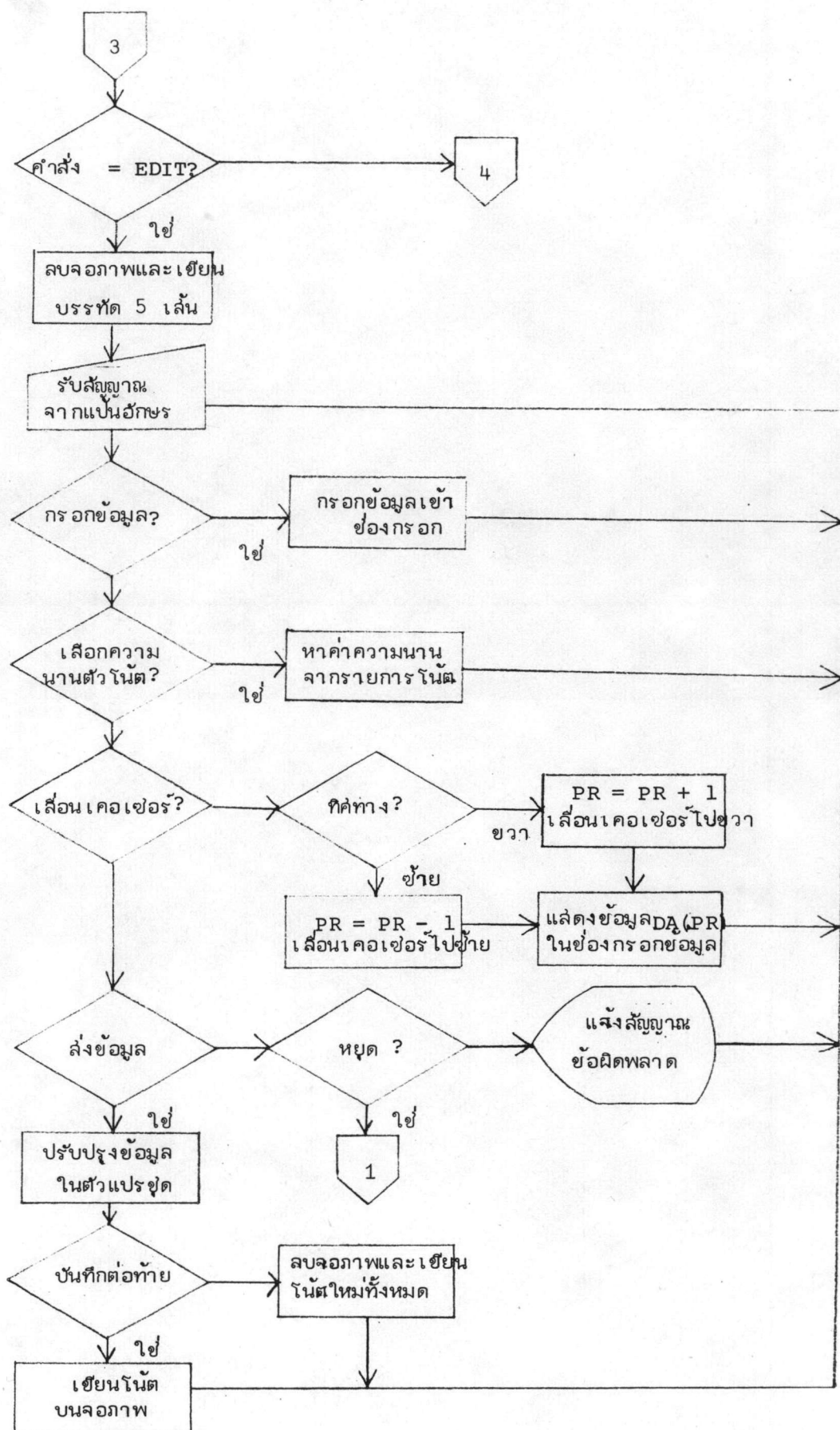
- PR = ตัวนับตำแหน่งข้อมูลโน้ตดนตรีในตัวแปรชุด
- DA = ตัวแปรชุดเก็บข้อมูลโน้ตดนตรีชั่วคราว
- ED = ดรรชนีบอกตำแหน่งสุดท้ายของข้อมูลในตัวแปรชุด
- SL $\phi$  = ตัวควบคุมจำนวนห้องของเพลงและจำนวนโน้ตในแต่ละห้อง
- CT $\phi$  = ตัวควบคุมจอภาพ

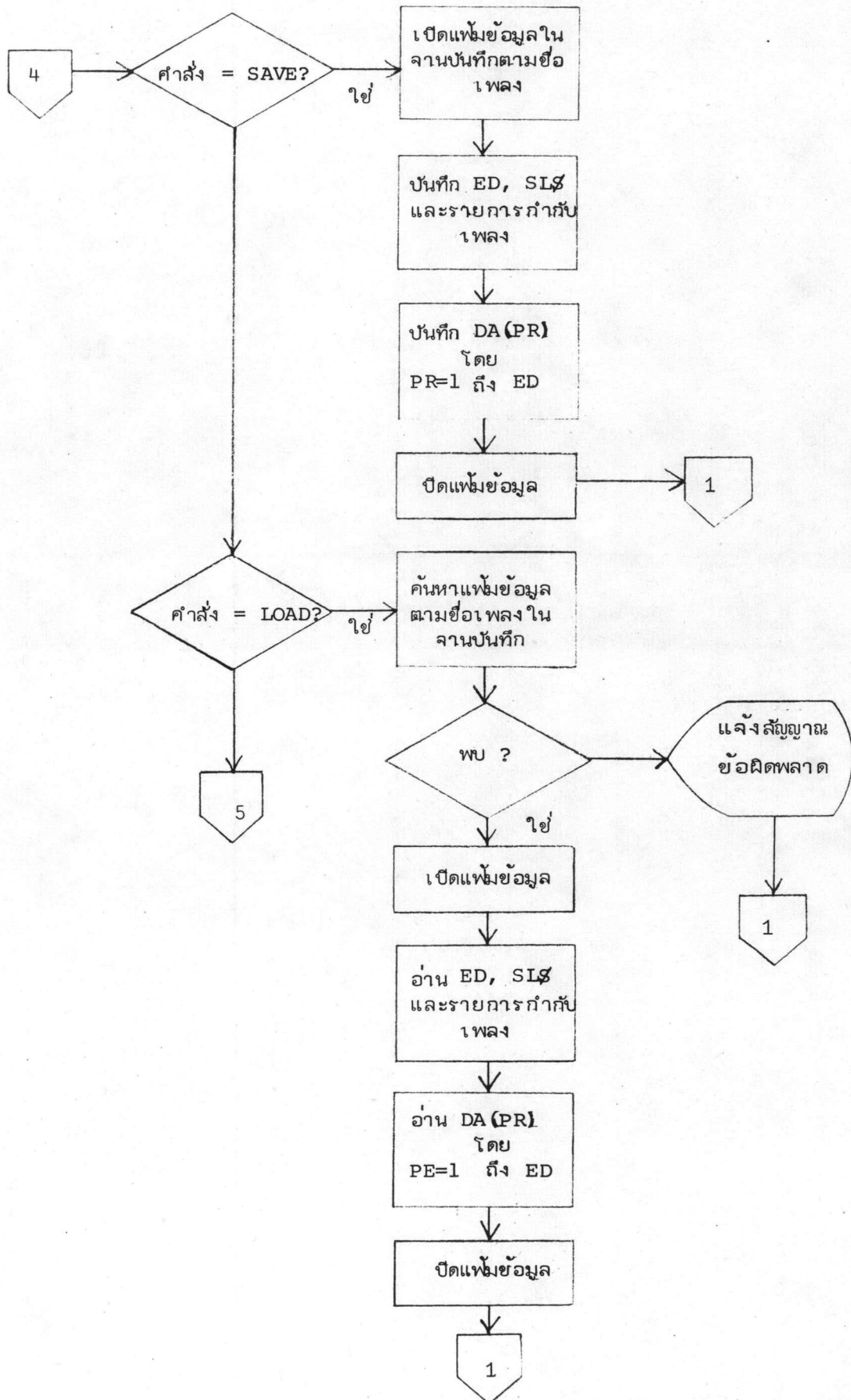
อนึ่ง ชื่อของตัวแปรดังกล่าวเป็นชื่อที่ใช้ในโปรแกรมด้วย ซึ่งรูปแบบของตัวแปรนั้น ๆ ได้กล่าวไว้ในหัวข้อ 3.2.3 ถึง 3.2.8

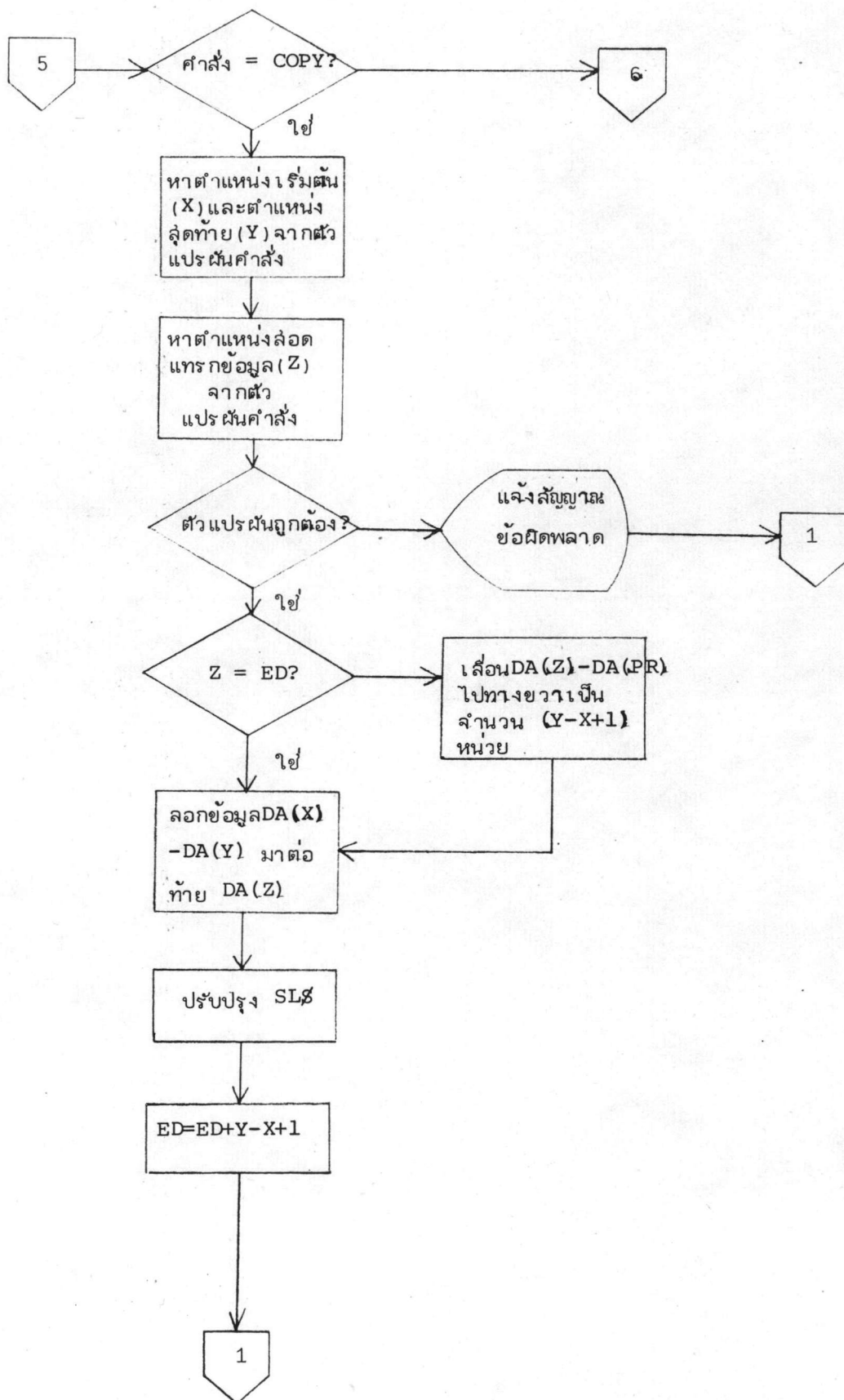


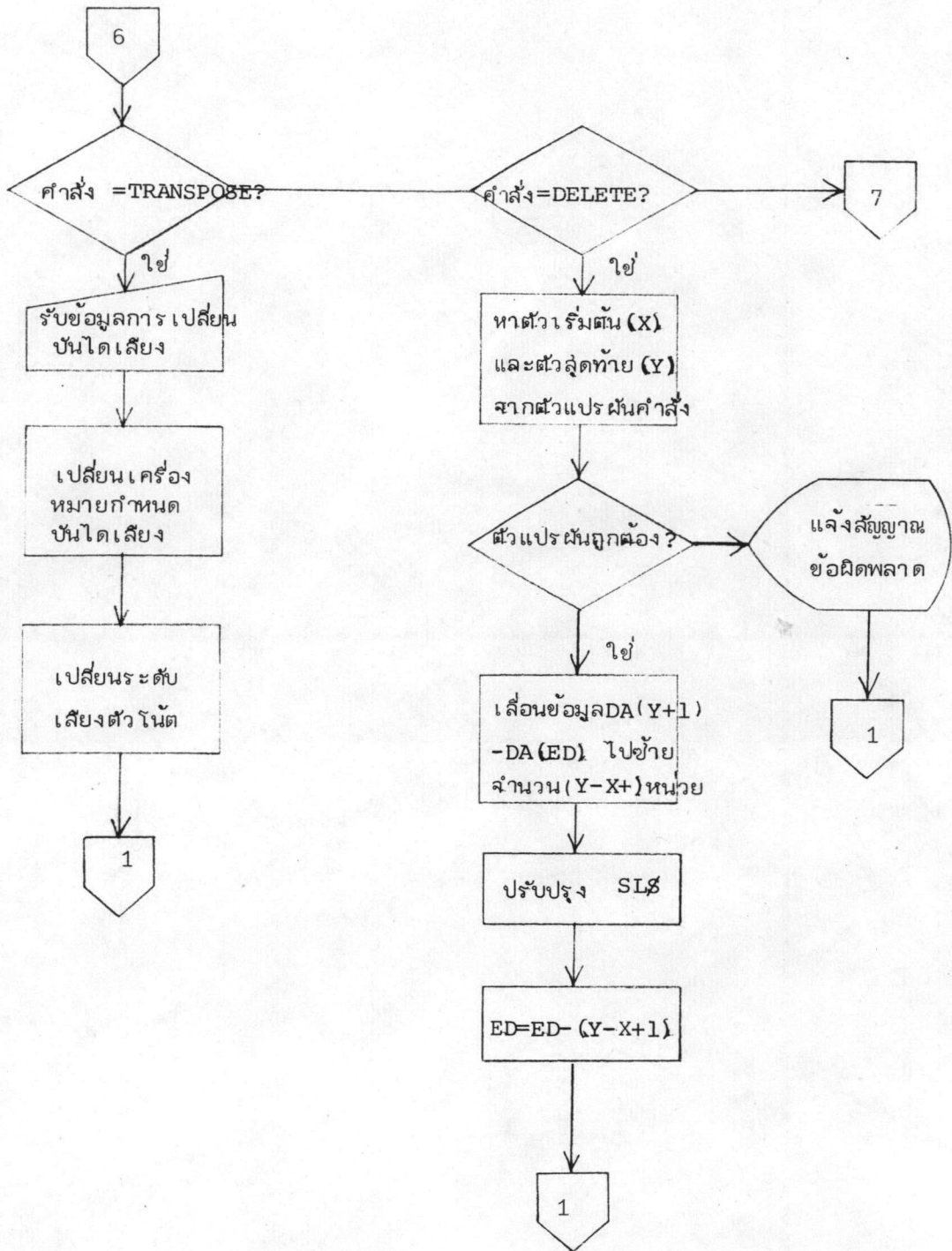




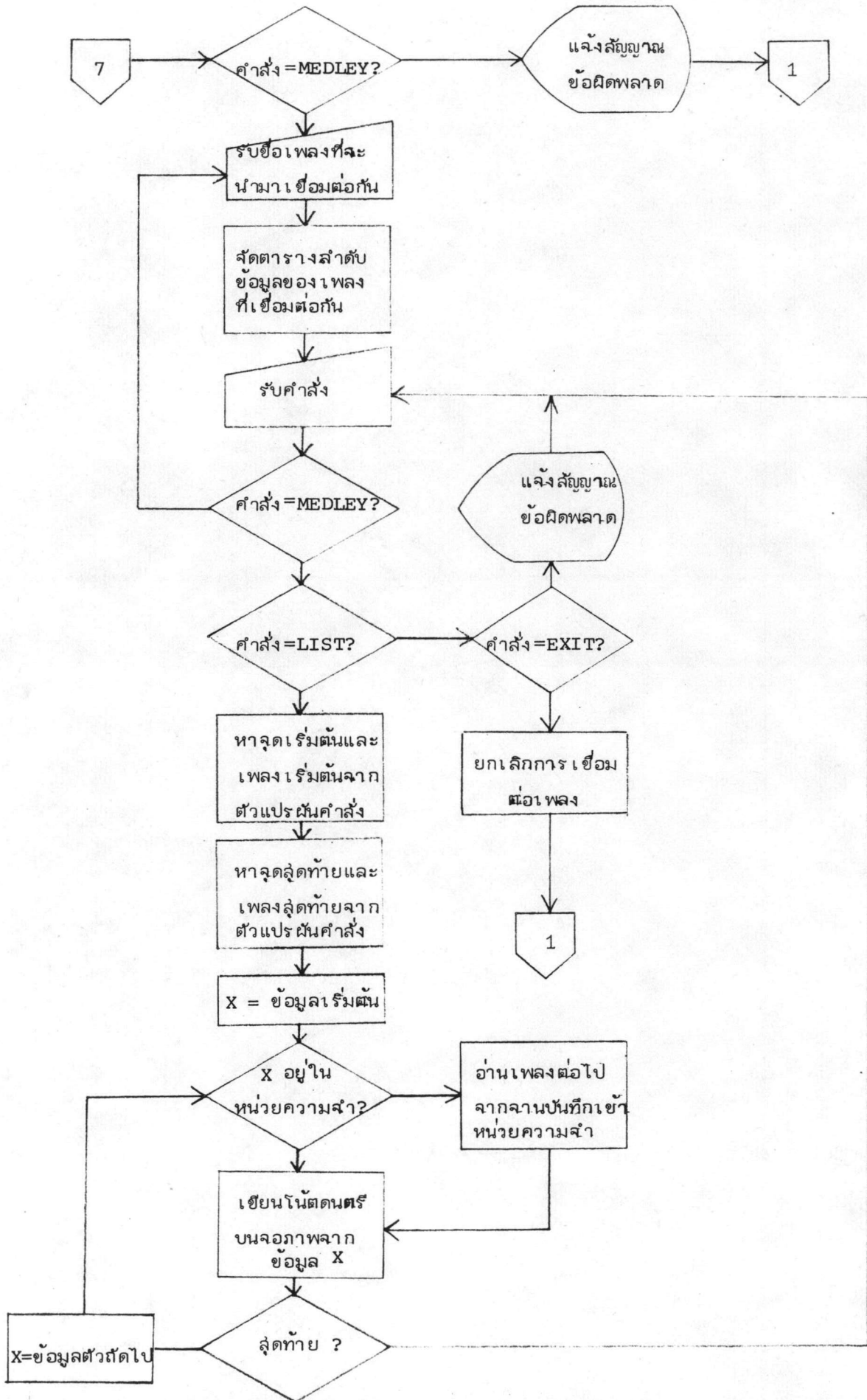


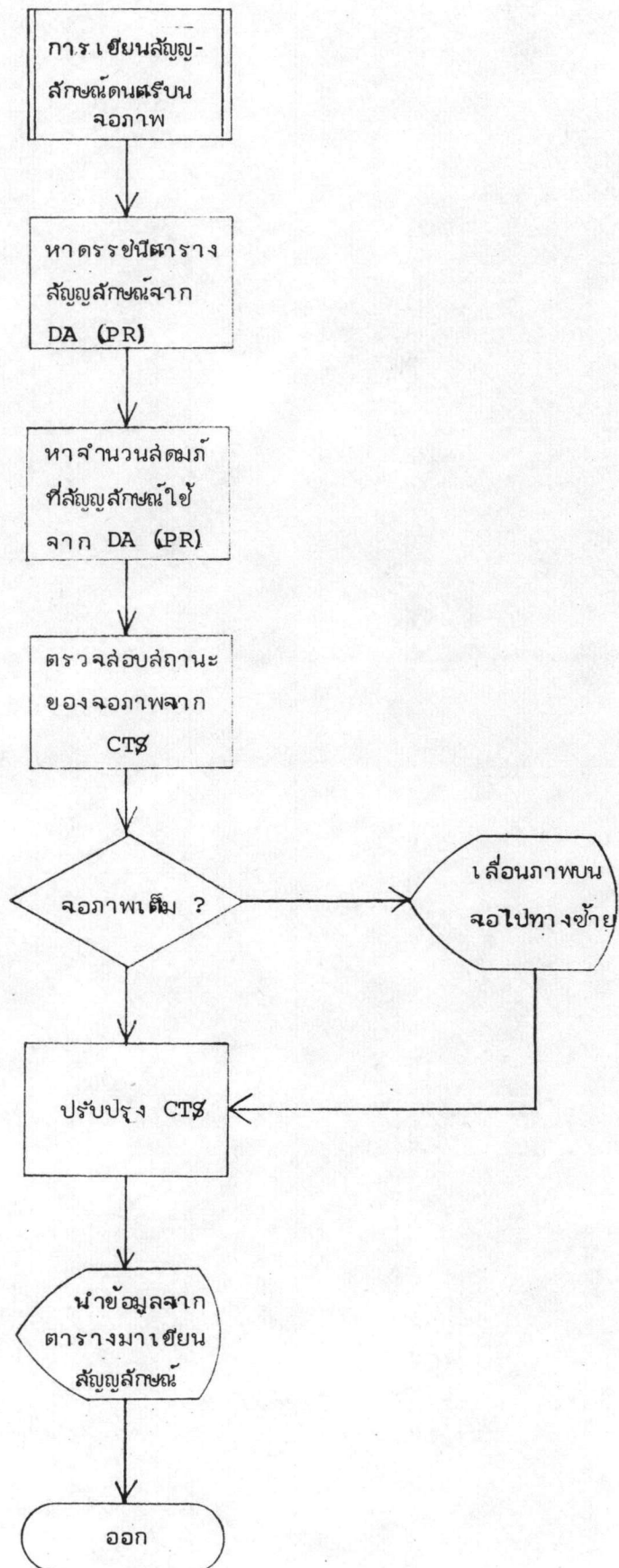


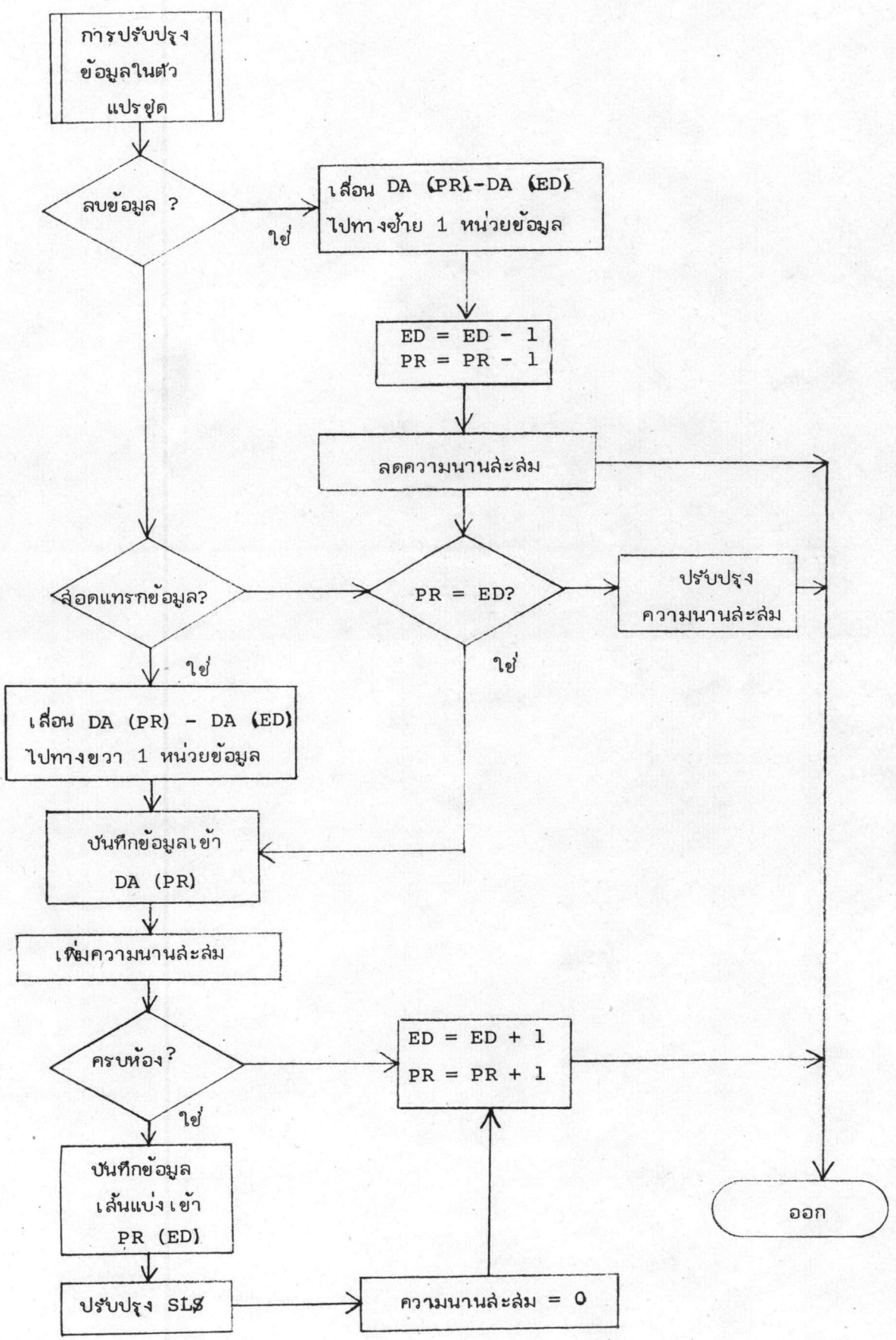












ภาคผนวก ข  
รายละเอียดโปรแกรม

1. โปรแกรม "music"

```

100 '-----L, load graphic data-----
110 CLEAR1000
120 WIDTH80,25:CONSOLE0,25,0,0
130 OPEN "symb-dat" AS #1
140 FIELD #1,128 AS A$,128 AS B$
150 GOTO 220
160 DATA &He5,&Hc5,&Hd5,&H13,&H21,&H00,&H00,&H19,&H5e
170 DATA &H23,&H56,&H21,&H00,&H00,&H19,&He5,&H21,&H2f
180 DATA &H90,&H5e,&H23,&H56,&H01,&H80,&H00,&He1,&H7e
190 DATA &H12,&H23,&H13,&H0b,&H79,&Hb0,&Hc2,&H1a,&H90
200 DATA &H21,&H00,&H00,&H19,&H22,&H2f,&H90,&Hd1,&Hc1
210 DATA &He1,&Hc9,&H00,&H60,&Hff
220 L=&H9000:IF L<0 THEN L=L+65536!
230 RESTORE
240 READ D%
250 IF HEX$(D%)="FF" THEN 290
260 POKE L,D%
270 L=L+1
280 GOTO 240
290 DEFUSR 0 = &H9000
300 LZ=&H4000
310 K%=1
320 GET #1,K%
330 D%=A$
340 X%=USR 0 (D%)
350 D%=B$
360 X%=USR 0 (D%)
370 K%=K%+1
380 IF LZ>&H4600 THEN 420
390 LZ=LZ+&H80
400 LZ=LZ+&H80
410 GOTO 320
420 CLOSE #1
430 '-----Double Bar-----
440 AD=&H6593
450 POKE AD,1:AD=AD+1:POKE AD,&H19:AD=AD+1
460 FORI%=1TO25:POKE AD,34:AD=AD+1:NEXT
470 RUN"set-key"

```



## 2. โปรแกรม "set-key"

```

100 '#####routine to set status befor using pc-8001#####
110 'date 25/6/82
120 CLEAR256
140 KEY1,"a%=usr4(0)+"CHR$(13)
150 KEY2," "
160 KEY3,""
170 KEY4,CHR$(5)+"list"
180 KEY5,CHR$(5)+"run"+CHR$(13)
190 KEY6,CHR$(5)+"load"+CHR$(34)
200 KEY7,CHR$(5)+"save"+CHR$(34)
210 KEY8,"delete"
220 KEY9,CHR$(5)+"copy"
230 KEY10,CHR$(5)+"edit"+CHR$(13)
240 PRINT CHR$(12)
250 RUN"load-obj"

```



## 3. โปรแกรม "load-obj"

```

100 '#####routine to display title#####
110 'date 23/9/82
120 DEFUSR1=&HD1A6:ADDR=&HD1A6+65536!:RG%=72
130 RESTORE 150
140 READ C:IF C=1000 THEN GOTO 160:ELSE POKE ADDR,C:ADDR=ADDR+1:GOTO 140
150 DATA &h3e,&h18,&h21,&h00,&h00,&he5,&h01,&h00,&h00,&h54,&h5d,&h23,&hed,&hb0,&h2b,&hd9,&h01,&h78,&
h00,&he1,&h09,&h3d,&hc2,&hab,&hd1,&hc9,1000
160 PRINTCHR$(12)
170 LC=0:HC=79
180 'LOCATE5,1:PRINT"enter direction (L/R) ";:D%=INPUT$(1)
190 D$="r"
200 S1$=" W E L C O M E "
210 S2$=" "
220 S3$=" "
230 S4$=" "
240 GOSUB 340:FORI=1TO1500:NEXT
250 LOCATE34,12:PRINT" T O "
260 FORI=1TO1300:NEXT:GOSUB 580
270 D$="l"

```



```

280 S1$=""
290 S2$=""
300 S3$=""
310 S4$=""
320 GOSUB 340:GOSUB 610:GOSUB800
330 RUN"load-add"
340 IF D$="l" THEN POKE &HD1B1,&H23:POKE &HD1B3,&HB0:POKE &HD1B4,&H2B:ADDR=&HF300+LC+65536!:MM=79:FG=
-1
350 IF D$="r" THEN POKE &HD1B1,&H2B:POKE &HD1B3,&HB8:POKE &HD1B4,&H23:ADDR=&HF300+HC+65536!:MM=0:FG=
-1
360 AD$=HEX$(ADDR)
370 ADDR=VAL("&h"+MID$(AD$,1,2)):POKE &HD1AA,ADDR
380 ADDR=VAL("&h"+MID$(AD$,3,2)):POKE &HD1A9,ADDR
390 POKE &HD1AD,HC-LC
400 PRINTCHR$(12)
410 IF D$="r" THEN GOTO 430
420 FORI=1TOLEN(S1$):GOTO 440
430 FORI=LEN(S1$)TO1STEP-1
440   LOCATEMM,10:PRINT MID$(S1$,I,1)
450   LOCATEMM,11:PRINT MID$(S2$,I,1)
460   LOCATEMM,12:PRINT MID$(S3$,I,1)
470   LOCATEMM,13:PRINT MID$(S4$,I,1)
480   A=USR1(0):GOSUB 600
490   LOCATEMM,10:PRINT " "
500   LOCATEMM,11:PRINT " "
510   LOCATEMM,12:PRINT " "
520   LOCATEMM,13:PRINT " "
530 NEXT
540 FORI=1TO(80-LEN(S1$))\2+2*FG
550   FORJ=1TO50:NEXT:GOSUB 600:A=USR1(0)
560 NEXT
570 RETURN
580 FORI=1TO25:FORJ=1TO40:NEXT:PRINT:NEXT
590 RETURN
600 RETURN
610 '*****load machine language*****
620 'machine subroutine at address &hEE50-&hEE64,&hEE70-&hEEC0,&hEED0-EEE6,&hF2B0-&hF2D6
630 ADDR=&hEE70+65536!:RESTORE 700:GOSUB 690
640 ADDR=&hEE50+65536!:RESTORE730:GOSUB 690
650 ADDR=&hEED0+65536!:RESTORE740:GOSUB 690
660 ADDR=&hF290+65536!:RESTORE750:GOSUB 690
670 ADDR=&hF2B0+65536!:RESTORE760:GOSUB 690
680 RETURN
690 READ C:IF C=1000 THEN RETURN:ELSE POKE ADDR,C:ADDR=ADDR+1:GOTO 690

```

```

700 DATA &h3e,&h41,&hd3,&hef,&hcd,&ha5,&hee,&h3e,&h71,&hd9,&h01,&h50,&h00,&hed,&h42,&h36,&h00,&h3d,&
hc2,&h7d,&hee,&h3e,&h05,&h21,&h0f,&h93,&h01,&he0,&h01,&h36,&haa,&h09,&h3d
710 DATA &hc2,&h8d,&hee,&h3e,&h00,&h3d,&hca,&ha0,&hee,&hcd,&ha5,&hee,&hc3,&h96,&hee,&h3e,&h01,&hd3,&
hef,&hc9,&hf5,&h3e,&h71,&h21,&h00,&h85,&he5,&h01,&h4f,&h00
720 DATA &h54,&h5d,&h23,&hed,&hb0,&h2b,&hd9,&h01,&h50,&h00,&he1,&h09,&h3d,&hc2,&hab,&hee,&hf1,&hc9,1
000
730 DATA &h3e,&h41,&hd3,&hef,&h21,&h00,&h00,&h3e,&h00,&h36,&haa,&h23,&h3d,&hc2,&h59,&hee,&h3e,&h01,&
hd3,&hef,&hc9,1000
740 DATA &H3E,&H41,&HD3,&HEF,&H21,&H0,&H80,&H36,&H0,&H11,&H1,&H80,&H1,&H0,&H2D,&HED,&HB0,&H3E,&H1,&H
D3,&HEF,&HC9,1000
750 DATA &H3E,&H41,&HD3,&HEF,&H21,&H0,&H80,&H36,&H0,&H11,&H1,&H80,&H1,&H0,&H40,&HED,&HB0,&H3E,&H1,&H
D3,&HEF,&HC9,1000
760 DATA &H2a,&H00,&H00,&Hed,&H4b,&H00,&H00,&H09,&H7e,&Hfe,&H01,&Hca,&Hca
770 DATA &Hf2,&Hfe,&H05,&Hca,&Hca,&Hf2,&H2b,&H0b,&H2b,&H0b,&Hc3,&HbB,&Hf2
780 DATA &H23,&H7e,&Hfe,&H00,&H2b,&Hc2,&Hc3,&Hf2,&Hed,&H43,&H00,&H00,&Hc9
790 DATA 1000
800 '-----Assembly Routine To Move Graphic Data-----
810 ' date 1/12/82
820 DATA &H2a,&H00,&H00,&Hed,&H5b,&H00,&H00,&H46,&H23,&H4e
830 DATA &H3e,&H41,&Hd3,&Hef,&H23,&Hd5,&Hc5,&H1a,&Hb6,&H12
840 DATA &H23,&H13,&H10,&Hf9,&H00,&H00,&Hc1,&H0d,&H28,&H0d
850 DATA &H00,&Hd1,&Hc5,&Heb,&H01,&H50,&H00,&H09,&Hed,&Hc1
860 DATA &H18,&He5,&H00,&Hd1,&H3e,&H01,&Hd3,&Hef,&Hc9,&Hff
870 ADD=&HEF00+65536!
880 READ CZ: IF CZ<>&HFF THEN POKE ADD,CZ:ADD=ADD+1: GOTO 880
890 RETURN

```

## 4. โปรแกรม "load-add"

```

100 'Routine to modify basic load address
110 '*****
120 A$="6600"
130 L=VAL("&H"+A$): IF L<0 THEN L=L+65536!
140 D=&H8000+65536!
150 FOR I=1 TO 32
160   POKE L,PEEK(D)
170   L=L+1:D=D+1
180 NEXT
190 POKE &HEB54,VAL("&H"+MID$(HEX$(L),3,2))
200 POKE &HEB55,VAL("&H"+MID$(HEX$(L),1,2))
210 RUN"MAIN"

```

## 5. โปรแกรม "MAIN"

```

1000 CLEAR1000:BOZ=0:CQZ=0:OAZ=0:OBZ=0:TX$="NONAME"
1010 AZ=VARPTR(BOZ):POKE&HEF01,VAL("&H"+MID$(HEX$(AZ),3,2))
1020 POKE &HEF02,VAL("&H"+MID$(HEX$(AZ),1,2))
1030 AZ=VARPTR(CQZ):POKE&HEF05,VAL("&H"+MID$(HEX$(AZ),3,2))
1040 POKE &HEF06,VAL("&H"+MID$(HEX$(AZ),1,2))
1050 AZ=VARPTR(OAZ):POKE&HF2B1,VAL("&H"+MID$(HEX$(AZ),3,2))
1060 POKE&HF2B2,VAL("&H"+MID$(HEX$(AZ),1,2))
1070 AZ=VARPTR(OBZ):POKE&HF2B5,VAL("&H"+MID$(HEX$(AZ),3,2))
1080 POKE&HF2B6,VAL("&H"+MID$(HEX$(AZ),1,2))
1090 POKE&HF2D4,VAL("&H"+MID$(HEX$(AZ),3,2))
1100 POKE&HF2D5,VAL("&H"+MID$(HEX$(AZ),1,2))
1110 DIMDAZ(1000):DEFUSR0=&HEE50:DEFUSR1=&HEE70:DEFUSR2=&HEED0
1120 DEFUSR3=&HEF00:DEFUSR4=&HF290:DEFUSR5=&HF2B0
1130 RGZ=72:BASEZ=RGZ+45:ATZ=75:TA$="123456789":EDZ=1:AZ=USR4(0)
1140 TB$="ZXCVBNMzxcvbnmasdfghjkwertyu1234567!"+CHR$(34)+"%&%"
1150 COLOR1:LINE(0,17)-(79,24)," ",BF:COLOR0
1160 COZ=50:DRZ=1:RWZ=159:GOSUB3770
1170 FORIIZ=2TO6:COZ=50+(IIZ-1)*5:RWZ=146:DRZ=IIZ:GOSUB3770:NEXIIZ:GOSUB5130
1180 LINE(0,0)-(79,16)," ",BF
1190 IFPEEK(&H65C0)<>1THEN1200ELSEPOKE&H65C0,0:CM$="wrk-file":GOSUB1640
1200 '-----Get Command
1210 ONERRORGOTO1660

```

```

1220 BEEP1:FORI%=1TO70:NEXT:BEEP0:LOCATE5,1:PRINT"ready!"
1230 LOCATE5,3:LINEINPUT CM$:LINE(0,0)-(79,17)," ",BF
1240 AZ=INSTR(CM$," "):IFAZ=0THEN1250ELSECM%=LEFT$(CM$,AZ-1)+RIGHT$(CM$,LEN(CM$)-AZ):GOTO1240
1250 IF CM$="edit"THENGOSUB1670:GOTO1220
1260 IF CM$<>"new"THEN1280
1270 TX$="NONAME":SL$="":K$="":KS$="":T$="":RC%=0:ED%=1:BR%=0:BT=0:TN=0:GOSUB5130:GOTO1220
1280 IF MID$(CM$,1,4)<>"list" THEN 1380
1290 COLOR1:LINE(0,17)-(79,24)," ",BF:COLOR0
1300 GOSUB6700:IFCM$=""THEN SBZ=0:EK%=ED%:GOTO1370
1310 GOSUB6700:SBZ=NU%:IFSBZ>LEN(SL$)\2-1THEN1610
1320 IFCM$=""THENSABZ=SBZ:GOTO1360
1330 GOSUB6700:IFSX$<>"",ANDSX$<>"- "THEN1610
1340 IFCM$=""THENEK%=ED%:GOTO1370ELSEGOSUB6700
1350 IFCM$<>" "THEN1610ELSESAZ=NU%:IFSAZ<SBZORSABZ>LEN(SL$)\2-1THEN1610
1360 SAZ=SAZ+1:SWAPSAZ,SBZ:GOSUB5150:EK%=PR%:SWAPSAZ,SBZ
1370 GOSUB 5150:GOSUB 5180:GOTO 1220
1380 IF MID$(CM$,1,5)<>"save"+CHR$(34)THEN 1410
1390 X%=LEN(CM$)-5:IF RIGHT$(CM$,1)=CHR$(34)THEN X%=X%-1
1400 IF X%=0 THEN 1610:ELSE CM$="2:"+MID$(CM$,6,X%):GOSUB1620:GOTO1220
1410 IF MID$(CM$,1,5)<>"load"+CHR$(34)THEN1440
1420 X%=LEN(CM$)-5:IF RIGHT$(CM$,1)=CHR$(34)THEN X%=X%-1
1430 IFX%=0THEN1610ELSECM$="2:"+MID$(CM$,6,X%):GOSUB1640:GOTO1220
1440 IFMID$(CM$,1,4)<>"copy"THEN1460
1450 GOSUB6990:IFX3%=0THENCT$="":GOTO1220ELSEIFX3%=2THENLOCATE5,1:PRINT"out of memory":GOTO1230ELSE1
610
1460 IFMID$(CM$,1,6)<>"delete"THEN1480
1470 GOSUB7200:IFX3%=0THENCT$="":GOTO1220ELSE1610
1480 IFCM$<>"transpose"THEN1500
1490 CM$="wrk-file":GOSUB1620:AZ=USR4(0):RUN"transpos"
1500 IFCM$<>"medley"THEN1520
1510 CM$="wrk-file":GOSUB1620:RUN"medley"
1520 IFCM$<>"files"THEN1540
1530 AZ=USR2(0):LOCATE0,4:FILES2:CT$="":GOTO1220
1540 IFMID$(CM$,1,6)<>"tempo"THEN1560
1550 GOSUB6700:IFCM$=""THENMP%=0:GOTO1220ELSEMP%=VAL(CM%):GOTO1220
1560 IFCM$<>"title"THEN1610
1570 LOCATE5,0:COLOR4:PRINT"Title";:COLOR0:PRINT" (0-254 characters)"
1580 LOCATE0,2:PRINT">":LOCATE1,2:PRINTTX$:LOCATE1,2:LINEINPUTCM$
1590 IFCM$<>" "THENTX%=CM$
1600 LINE(0,0)-(79,7)," ",BF:GOTO1220
1610 BEEP:LOCATE5,1:PRINT"invalid command":GOTO1230
1620 OPENCM$FOROUTPUTAS#1:XX=1:PRINT#1,TX$:PRINT#1,ED%:PRINT#1,SL$:PRINT#1,MP%
1630 IFX%=ED%THENCLOSE:RETURNELSEPRINT#1,DAZ(X%):XX=XX+1:GOTO1630
1640 OPENCM$FORINPUTAS#1:XX=1:LINEINPUT#1,TX$:INPUT#1,ED%:INPUT#1,SL$:INPUT#1,MP%

```



```

1650 IFXZ=EDZTHENCT$="" :CLOSE:RETURNELSEINPUT#1,DAZ(XZ):XZ=XZ+1:GOTO1650
1660 BEEP:LOCATE5,1:PRINT"invalid command":RESUME1230
1670 '-----Edit
1680 IFCT$<>" THEN1700ELSEIFLEN(SL$)<2THENSBZ=0ELSESBZ=LEN(SL$)\2-1
1690 GOSUB5150:EKZ=EDZ:GOSUB5180
1700 PRINTCHR$(12)
1710 LOCATE40,21:PRINT"Duration":LOCATE5,17:PRINT"Bar count = ";SBZ
1720 BT=0:PDZ=PRZ:IFPRZ=EDZTHEN1740
1730 FSZ=1:ETZ=PDZ:SWAPETZ,EDZ:SZ$=RIGHT$(SL$,LEN(SL$)-2*SBZ):SL$=LEFT$(SL$,2*SBZ)
1740 IFEDZ=1THENGOSUB4600
1750 LOCATE5,23:PRINT"Sound(1-7) Tie (S,E) Dot(D) Accidental(F,S,N)"
1760 BNZ=0:CRZ=51:LOCATECRZ,21:COLOR2:PRINT"■";:COLOR0

1770 BEEP1:FORIZ=1TO5:NEXT:BEEP0:SWZ=0:GOSUB 2050:IFSWZ=0THEN1860
1780 IFSWZ=2THEN1770
1790 IFSWZ<>3ANDSWZ<>4THEN1830
1800 U1Z=PRZ:U2Z=SBZ:PRZ=PDZ-LEN(CT$):IFSWZ=3THENPRZ=PRZ+1
1810 IFPRZ<1THENPRZ=1
1820 EKZ=PDZ:GOSUB5180:PRZ=U1Z:SBZ=U2Z:LOCATE17,17:PRINTSBZ;:GOSUB5440:GOTO1770
1830 GOSUB5440:IFNOT(TFZ=2ORFYZ=1)THEN1770
1840 GOSUB4510:TN=TN+DT*SWZ:IFTN=TLTHENFYZ=0:TN=0
1850 GOTO1770
1860 IFVLZ<>176THEN1900
1870 IFPRZ=PDZTHEN1880ELSEPRZ=PRZ+1:IFDAZ(PRZ-1)=0THENSBZ=SBZ+1:GOTO1870ELSE1870
1880 IFFSZ=1THENFSZ=0:SWAPEDZ,ETZ:SL$=SL$+SZ$
1890 RCZ=0:TN=0:FYZ=0:RETURN
1900 GOSUB4510:BT=BT+DT:IFTFZ=0THEN1940
1910 TC=TC+DT:IFEFZ<>2THENTN=TN+DT
1920 IFTC>=TLTHENTFZ=0:TC=0:PFZ=0:TPZ=0:LINE(40,19)-(79,19)," "
1930 IFTN=TLTHENTN=0
1940 GOSUB5060:IFEFZ=0THENGOSUB3330:GOTO1970
1950 U1Z=PRZ:U2Z=SBZ:PRZ=PDZ-LEN(CT$):IFEFZ=3THENPRZ=PRZ-1
1960 EFZ=0:EKZ=PDZ:GOSUB5180:PRZ=U1Z:SBZ=U2Z:LOCATE17,17:PRINTSBZ;
1970 IFBT<BLTHEN2040ELSEIFLEN(SL$)\2>SBZTHEN1980ELSE2000
1980 CM$=STR$(RCZ):CM$=RIGHT$(CM$,LEN(CM$)-1)
1990 MID$(SL$,2*SBZ+1,2)=RIGHT$("00"+CM$,2):GOTO2040
2000 SBZ=SBZ+1:BT=0:LOCATE 17,17:PRINT SBZ;:PRZ=EDZ
2010 TN=0:NTZ=0:GOSUB5060:GOSUB3330
2020 CM$=STR$(RCZ):CM$=RIGHT$(CM$,LEN(CM$)-1):SL$=SL$+RIGHT$("00"+CM$,2):RCZ=0
2030 IFLEN(SL$)>252THENBEEP:LOCATE5,1:PRINT"out of memory ! do SAVE and NEW"
2040 NTZ=DAZ(PRZ):GOSUB5440:GOTO1770
2050 '-----Input
2060 IFTNZ=0THEN2080
2070 ON BNZ GOTO 2220,2330,2430,2530
2080 ACZ=0:DOZ=0:SRZ=0

```



```
2090 LOCATE5,23:COLOR4:PRINT"Sound";:COLOR0:LOCATE6,24:PRINT" ";
2100 GOSUB2590:IFVL%=176THEN RETURN
2110 IFVL%<>20RPR%=ED%THEN2130
2120 IFDAX(PRX)=0THENDAX(PRX)=4:SW%=4:RETURNELSEIFDAX(PRX)=4THENDAX(PRX)=0:SW%=4:RETURN
2130 IFVL%=32THENLOCATE5,23:PRINT"Sound":LOCATE6,24:PRINT"rest";:PT%=0:GOTO2330
2140 X%=INSTR(TB%,V%):IFX%=0THENLOCATE5,1:PRINT"invalid input";:GOTO2210
2150 Y%=X%MOD7:IFY%=0THENY%=7
2160 IFK%<>"t"THEN2180
2170 PT%=X%-5:IFPT%<10RPT%>31THEN2200ELSE2190
2180 PT%=X%:IFPT%>31THEN2200
2190 LOCATE5,23:PRINT"Sound":LOCATE7,24:PRINTMID$("CDEFGAB",Y%,1);:GOTO2220
2200 LOCATE5,1:PRINT"note out of range";
2210 BEEP:FF%=1:GOTO2090
2220 SR%=0:LOCATE19,24:PRINT" ";:LOCATE18,23:COLOR4:PRINT"Tie ";:COLOR0:GOSUB2590:IFVL%=176THENRETUR
N
2230 IFVL%=101THENSR%=2:GOTO2320
2240 IFVL%=69THENSR%=3:GOTO2320
2250 IFVL%=115THENSR%=1:GOTO 2320
2260 IFVL%=32THEN2320
2270 IFVL%=48THENLOCATE18,23:PRINT"Tie ":GOTO2090
2280 IFNOT(VL%=13ORVL%=18)THENLOCATE5,1:PRINT"invalid input";:GOTO2310
2290 GOSUB5750:IFEF%=1THEN2310
2300 LOCATE18,23:PRINT"Tie ":GOTO 2570
2310 FF%=1:BEEP:GOTO2220
2320 LOCATE18,23:PRINT"Tie ":LOCATE19,24:PRINT V%;
2330 DO%=0:LOCATE31,24:PRINT" ";:LOCATE30,23:COLOR4:PRINT"Dot";:COLOR0:GOSUB2590:IFVL%=176THENRETURN
2340 IFVL%=48THENLOCATE30,23:PRINT"Dot":IFPT%=0THEN2090ELSE2220
2350 IFNOT(VL%=13ORVL%=18)THEN2380
2360 GOSUB5750:IFEF%=1THEN2420
2370 LOCATE30,23:PRINT"Dot":GOTO2570
2380 IFVL%=32THENDO%=0:LOCATE30,23:PRINT"Dot":GOTO2430
2390 IFVL%<>100THENLOCATE5,1:PRINT"invalid input";:GOTO2420
2400 IFCR%=76THENLOCATE5,1:PRINT"smallest duration have no dot";:GOTO2420
2410 DO%=1:LOCATE30,23:PRINT"Dot":LOCATE31,24:PRINTV%;:GOTO2430
2420 FF%=1:BEEP:GOTO 2330
2430 LOCATE45,24:PRINT" ";:AC%=0:LOCATE39,23:COLOR4:PRINT"Accidental";:COLOR0:GOSUB2590:IFVL%=176THE
NRETURN
2440 IFVL%=102THENAC%=1:GOTO2510
2450 IFVL%=115THENAC%=2:GOTO2510
2460 IFVL%=110THENAC%=3:GOTO2510
2470 IFVL%=48THENLOCATE39,23:PRINT"Accidental";:GOTO2330
2480 IFNOT(VL%=13ORVL%=32ORVL%=18)THENLOCATE5,1:PRINT"invalid input";:GOTO2520
2490 GOSUB5750:IFEF%=1THEN2520
2500 LOCATE39,23:PRINT"Accidental":GOTO2570
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2510 LOCATE39,23:PRINT"Accidental";:LOCATE45,24:PRINTV$;:GOTO2530
2520 FFZ=1:BEEP:GOTO2430
2530 GOSUB2590:IFVLZ=176THENRETURN
2540 IFVLZ=48THEN2430
2550 IFNOT(VLZ=13ORVLZ=18)THENBEEP:FFZ=1:LOCATE5,1:PRINT"press RETURN or 0 only";:GOTO2530
2560 GOSUB5750:IFEFZ=1THENBEEP:FFZ=1:GOTO2530
2570 IFPTZ>=16THENPTZ=PTZ-16:NTZ=&H8000:ELSE NTZ=0
2580 NTZ=NTZOR(PTZ*(2^11))ORACZOR(DOZ*(2^10))OR(SRZ*(2^8))OR(TPZ*4)OR(DRZ*(2^5)):RETURN
2590 '-----Keyboard
2600 GOSUB5970:LOCATECUZ,9:V$=INPUT$(1):VLZ=ASC(V$)
2610 IFVLZ=176ANDBT<>0ANDBT<>BLTHENLOCATE5,1:PRINT"complete bar before go out";:GOTO3160
2620 IFFFZ=1THENFFZ=0:LINE(5,1)-(60,1)," ",BF
2630 IFVLZ<>205THEN2680
2640 LOCATE62,0:PRINT"Clef      =   ":LOCATE62,3:PRINT"Tempo      =   "
2650 LOCATE62,1:PRINT"Key_sign. =   ":LOCATE62,2:PRINT"Time_sign. =   "
2660 LOCATE75,0:PRINTK$:LOCATE75,1:PRINTKS$:LOCATE75,2:PRINTT$:LOCATE75,3:PRINTMPZ
2670 XZ=INP(9):IFXZ=247THEN2670ELSELINE(62,0)-(78,3)," ",BF:GOTO2600
2680 IFTFZ<>3THEN2760
2690 IFVLZ<>13THEN2740
2700 TN=DRZ:TC=DOZ:DOZ=0:DRZ=(CRZ-50)\5+1:GOSUB4510:TPZ=DRZ:DRZ=TN:DOZ=TC:TC=0:TN=0
2710 IFBT+DT>BLTHENLOCATE5,1:PRINT"triplet group is too big for this bar";:GOTO3160
2720 IFCRZ=75THENLOCATE5,1:PRINT"triplet group duration is unexceptable";:GOTO3160
2730 TL=DT+DT/2:TFZ=2:BT=BT-DT/2:BEEP1:FORIZ=1TO40:NEXT:BEEP0:LOCATE40,19:PRINT"triplet";:GOTO2600
2740 IFVLZ<>48THEN3180
2750 TFZ=0:TPZ=0:LINE(40,19)-(79,19)," ":GOTO2600
2760 IFNOT(VLZ=20ANDTFZ=0)THEN2790
2770 TFZ=3:LOCATE40,19:COLOR4:PRINT"triplet":COLOR0
2780 COLOR4:LOCATECRZ,19:PRINT"$":COLOR0:GOTO2600
2790 IFVLZ=8THENGOSUB6810:IFVLZ=176THENSWZ=3:RETURNELSE3160
2800 IFVLZ<>28THEN2960
2810 IFPRZ=PDZTHEN3140
2820 IFTN=TCANDTFZ>0THEN3150ELSESWZ=1
2830 IFDAZ(PRZ)<>0ANDDAZ(PRZ)<>4THEN2900
2840 IFNOT((BT=0)OR(BT=BL))THENSWZ=0:GOTO3130
2850 SBZ=SBZ+1:LOCATE17,17:PRINTSBZ
2860 IFPDZ<>PRZ+1THENRCZ=VAL(MID$(SL$,2*SBZ+1,2)):BT=BL:GOTO2900
2870 BT=0:RCZ=0:IFPDZ=EDZTHEN3100
2880 FSZ=1:ETZ=PDZ:SWAPETZ,EDZ:SZ$=RIGHT$(SL$,LEN(SL$)-2*SBZ)
2890 SL$=LEFT$(SL$,2*SBZ):GOTO3100
2900 NTZ=DAZ(PRZ+1):X1Z=(NTZAND&HE0)\(2^5):IFX1Z<>0THEN2940
2910 X1Z=NTZAND3:IFX1Z<>1THEN3100
2920 PRZ=PRZ+1:GOSUB6500:GOSUB6540:GOSUB6630:PRZ=PRZ-1
2930 IFDAZ(PRZ)=0ORDAZ(PRZ)=4THENBT=BL
2940 NTZ=DAZ(PRZ):IFNOT(((NTZAND&HE0)\32<>0)AND((NTZAND&H1C)\4<>0))THEN3100

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2950 FYZ=1:IFTN<>0THEN3100ELSEX1Z=(NTZAND&H1C)\4:SWAPDRZ,X1Z:DOZ=0:GOSUB4510:TL=DT+DT/2:SWAPDRZ,X1Z:
GOTO3100
2960 IFVLZ<>29THEN3170
2970 IF(PDZ-PRZ)=LEN(CT#)THEN3140
2980 IFTN=0ANDTFZ>0THEN3150ELSESWZ=-1
2990 IFDAZ(PRZ-1)<>0ANDDAZ(PRZ-1)<>4THEN3030
3000 IFNOT((BT=0)OR(BT=BL))THENSXZ=0:GOTO3130
3010 SBZ=SBZ-1:LOCATE17,17:PRINTSBZ:RCZ=VAL(MID$(SL#,2*SBZ+1,2)):BT=BL
3020 IFFSZ=1THENFSZ=0:SWAPEDZ,ETZ:SLZ=SLZ+SXZ
3030 NTZ=DAZ(PRZ):X1Z=(NTZAND&HE0)\(2^5):IFX1Z<>0THEN3070
3040 X1Z=NTZAND3:IFX1Z<>1THEN3070
3050 PRZ=PRZ-1:GOSUB6500:GOSUB6540:GOSUB6630:PRZ=PRZ+1
3060 IFDAZ(PRZ-1)=0ORDAZ(PRZ)=4THENBT=BL
3070 NTZ=DAZ(PRZ-1):IFNOT(((NTZAND&HE0)\32<>0)AND((NTZAND&H1C)\4<>0))THEN3090
3080 FYZ=1:IFTN<>0THEN3100ELSEX1Z=(NTZAND&H1C)\4:SWAPDRZ,X1Z:DOZ=0:GOSUB4510:TL=DT+DT/2:SWAPDRZ,X1Z:
TN=TL:GOTO3100
3090 IFFYZ=1THENFYZ=0
3100 PRZ=PRZ+SWZ:NTZ=DAZ(PRZ)
3110 IFPRZ=EDZTHENNTZ=0
3120 VLZ=176:RETURN
3130 LOCATE5,1:PRINT"complete bar before move to next";GOTO3160
3140 LOCATE5,1:PRINT"reach at limit";GOTO3160
3150 LOCATE5,1:PRINT"complete triplet group before move to next";
3160 BEEP:FFZ=1:GOTO2600
3170 IFVLZ=11THENGOSUB4600:VLZ=176:SWZ=2:RETURN
3180 IFVLZ<>46THEN3230
3190 IFTFZ=3THENLINE(CRZ,19)-(CRZ,19)," "
3200 LINE(CRZ,21)-(CRZ,21)," ":CRZ=CRZ+5
3210 IF CRZ>76 THEN CRZ=51
3220 GOTO3310
3230 IFV#<>"p"THEN3270
3240 LOCATE5,0:COLOR4:PRINT"TITLE":COLOR0
3250 LOCATE0,2:PRINT">";TX#
3260 VLZ=INP(4):IFVLZ<>254THENLINE(0,0)-(78,6)," ",BF:GOTO2600ELSE3260
3270 IFVLZ<>44THENRETURN
3280 IFTFZ=3THENLINE(CRZ,19)-(CRZ,19)," "
3290 LINE(CRZ,21)-(CRZ,21)," ":CRZ=CRZ-5
3300 IF CRZ<51 THEN CRZ=76
3310 IFTFZ=3THENCOLOR4:LOCATECRZ,19:PRINT"↓":COLOR0
3320 COLOR2:LINE(CRZ,21)-(CRZ,21),"↑":COLOR0:GOTO 2600
3330 '-----Interpret
3340 DRZ=(NTZAND&HE0)\(2^5):IF DRZ<>0 THEN 3490
3350 ACZ=NTZAND3
3360 IF ACZ<>0 THEN 3390

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3370 BUZ=3:DPZ=1:CPZ=1:RWZ=60:GOSUB4180:GOSUB6020
3380 IFNTZ=4THENBQZ=&H6593:AZ=USR3(0):RETURNELSEBQZ=&H646E:AZ=USR3(0):RETURN
3390 IF ACZ<>1 THEN 3420
3400 DOZ=(NTZAND4)\4:IFDOZ=0THENK$="t":LTZ=2:HTZ=6:OCZ=4ELSEK$="b":LTZ=1:HTZ=5:OCZ=3
3410 BUZ=7:DPZ=1:CPZ=3:GOSUB4180:GOSUB3940:LOCATE75,0:RETURN
3420 IF ACZ<>2 THEN 3460
3430 ACZ=(NTZAND12)\4:IFACZ=3THENK$="n":BUZ=2:DPZ=0:CPZ=1:GOSUB4180:GOTO3450
3440 NZ=(NTZAND&H700)\(2^8):KS$=STR$(NZ):GOSUB4390
3450 RETURN
3460 XZ=(NTZAND&HF00)\(2^12):YZ=(NTZAND&HF00)\(2^8):BL=XZ/YZ
3470 T$=MID$(TA$,XZ,1)+"/"+MID$(TA$,YZ,1)
3480 BUZ=8:DPZ=2:CPZ=3:GOSUB4180:GOSUB3850:RETURN
3490 QPZ=(NTZAND&H1C)\4:IF(QPZ=0)OR(QPZ=HZ)THEN3520
3500 CNZ=DRZ:DRZ=QPZ:DOZ=0:GOSUB4510:DRZ=CNZ:LM=DT+DT/2:DC=0:HZ=QPZ:CNZ=0
3510 IFJFZ=1THENPZ=PRZELSEPZ=PRZ-1
3520 IFQPZ<>HZTHENHZ=0:QPZ=0
3530 PTZ=(NTZAND&H7800)\(2^11):IF NTZ<0 THEN PTZ=PTZOR&H10
3540 DOZ=(NTZAND&H400)\(2^10):SRZ=(NTZAND&H300)\(2^8)
3550 IFPTZ<>0THEN3590ELSEGOSUB5300:GOSUB4180:GOSUB4030
3560 IFDOZ<>1THEN3710
3570 COZ=COZ+2:RWZ=69:BQZ=&H6573:IFDRZ<3THENCQZ=COZ+1
3580 GOSUB6020:AZ=USR3(0):GOTO3710
3590 RWZ=BASEZ-(PTZ-1)*3:GOSUB5370
3600 IFDRZ=1THENRWZ=RWZ-2ELSEIFPTZ>16THENRWZ=RWZ-2ELSERWZ=RWZ-15
3610 ACZ=NTZAND3:IF ACZ=0 THEN 3650
3620 BUZ=BUZ+2:CPZ=CPZ+2:GOSUB 4180
3630 CLZ=COZ:RLZ=RWZ:IFDRZ=1THENRWZ=RWZ-6ELSEIFPTZ>16THENRWZ=RWZ-6ELSERWZ=RWZ+7
3640 GOSUB3970:COZ=CLZ+2:RWZ=RLZ:GOTO 3660
3650 GOSUB 4180:S1Z=COZ:S2Z=RWZ
3660 GOSUB4300:CLZ=COZ:RLZ=RWZ:GOSUB3770
3670 IF DOZ<>1THEN3710
3680 IFPTZ>16THENRWZ=RWZ+1ELSERWZ=RWZ+14
3690 IF(PTZ>16ANDDRZ=4)OR(PTZ<=16ANDDRZ=5)THENBQZ=&H6573:ELSEBQZ=&H6570
3700 COZ=COZ+2:GOSUB6020:AZ=USR3(0)
3710 IFHZ=0THEN3740ELSECNZ=CNZ+1:GOSUB4510:DC=DC+DT:IFDC<>LMTTHEN3740
3720 IFJFZ=1THENT1Z=PRZELSET1Z=PRZ-1
3730 GOSUB6370:PZ=0:HZ=0
3740 IF SRZ<2 THEN RETURN
3750 IFJFZ=1THENT1Z=PRZELSET1Z=PRZ-1
3760 GOSUB6140:RETURN
3770 '-----Note
3780 IFDRZ=1THENBQZ=&H61BC:GOTO3840
3790 IFDRZ=2THENIFPTZ>16THENBQZ=&H60E6:GOTO3840ELSEBQZ=&H623D:GOTO3840
3800 IFDRZ=3THENIFPTZ>16THENBQZ=&H6120:GOTO3840ELSEBQZ=&H52C3:GOTO3840

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3810 IFDRX=4THENIFPTX>16THENBQZ=&H615A:GOTO3840ELSEBQZ=&H6277:GOTO3840
3820 IFDRX=5THENIFPTX>16THENBQZ=&H6182:GOTO3840ELSEBQZ=&H62FD:GOTO3840
3830 IFDRX=6THENIFPTX>16THENBQZ=&H6371:ELSEBQZ=&H6337
3840 GOSUB6020:AZ=USR3(0):RETURN
3850 '-----Time-sign.
3860 CLZ=COZ:RWZ=RGZ-11:C#=MID$(T$,1,1):GOSUB3880:GOSUB6020:AZ=USR3(0)
3870 COZ=CLZ:RWZ=RGZ+1:C#=MID$(T$,3,1):GOSUB 3880:GOSUB6020:AZ=USR3(0):RETURN
3880 IFC#="2"THENBQZ=&H64E1:RETURN
3890 IFC#="3"THENBQZ=&H640A:RETURN
3900 IFC#="4"THENBQZ=&H60CC:RETURN
3910 IFC#="5"THENBQZ=&H6223:RETURN
3920 IFC#="6"THENBQZ=&H648B:RETURN
3930 IFC#="8"THENBQZ=&H64FB:RETURN
3940 '-----Claf
3950 IFK#="t"THENBQZ=&H6000:RWZ=5BELSEBQZ=&H61CF:RWZ=61
3960 GOSUB6020:AZ=USR3(0):RETURN
3970 '-----Accidental
3980 QNACZGOTO3990,4000,4010
3990 BQZ=&H60AE:RWZ=RWZ-1:GOTO4020
4000 BQZ=&H63DC:RWZ=RWZ+2:GOTO4020
4010 BQZ=&H63FA:RWZ=RWZ+2
4020 GOSUB6020:AZ=USR3(0):RETURN
4030 '-----Rest
4040 IFDRX=1THENBQZ=&H63AB:RWZ=67:GOTO4100
4050 IFDRX=2THENBQZ=&H63AB:RWZ=69:GOTO4100
4060 IFDRX=3THENBQZ=&H64AC:RWZ=63:GOTO4100
4070 IFDRX=4THENBQZ=&H63B8:RWZ=64:GOTO4100
4080 IFDRX=5THENBQZ=&H6426:RWZ=64:GOTO4100
4090 IFDRX=6THENBQZ=&H644A:RWZ=64
4100 GOSUB6020:AZ=USR3(0):RETURN
4110 '-----Stave
4120 POKE &HEE58,LX
4130 FOR IX=RGZ-12 TO RGZ+12 STEP 6
4140 ST=SC+&H8000+65536!+B0*IX :ST#=HEX$(ST)
4150 ST=VAL("&h"+MID$(ST$,1,2)):POKE &HEE56,ST
4160 ST=VAL("&h"+MID$(ST$,3,2)):POKE &HEE55,ST
4170 A=USR0(0):NEXT:RETURN
4180 '-----CRT-management
4190 IFBUZ=>LBZTHEN4250
4200 LBZ=LBZ-BUZ
4210 CT#=CT#+HEX$(BUZ)
4220 IFRFX=0THENPS#=PS#+MID$(TA$,CPZ,1)
4230 COZ=LEZ+DPZ:LEZ=LEZ+BUZ
4240 RETURN

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4250 NB%=VAL("&h"+LEFT$(CT$,1))
4260 LB%=LBX+NB%;LE%=LE%-VAL("&h"+LEFT$(CT$,1))
4270 CT%=RIGHT$(CT$,LEN(CT$)-1)
4280 PS%=RIGHT$(PS$,LEN(PS$)-1)
4290 POKE &HEE95,NB%;A=USR1(0):GOTO4190
4300 '-----Leger Line
4310 CL%=RG%:IFNOTPTX>21THEN4340
4320 IFPTXMOD2=0THENRG%=RWX+14ELSERG%=RWX+17
4330 GOTO4370
4340 IFNOTPTX<11THEN4380
4350 IFPTXMOD2=0THENRG%=RWX+3ELSERG%=RWX
4360 IFDR%=1THENRG%=RG%-13
4370 SC=COX:LX=2:GOSUB4110
4380 RG%=CL%:RETURN
4390 '-----Key-sign.
4400 'parameters are n,no. of acc and ac,type of acc
4410 CPX=1:IFK$="t"THENINX=0ELSEINX=6
4420 IFACX=1THENRESTORE4490:KS%=KS%+"f"ELSERESTORE4500:KS%=KS%+"s"
4430 FORIX=1TONX:READCX:NNX(IX)=CX:NEXT
4440 BUX=NX*2:CPX=BUX\2:DPX=0:GOSUB4180:SZX=COX
4450 FORIX=1TONX
4460 RWX=RG%+NNX(IX)+INX-8:COX=SZX
4470 GOSUB3970:SZX=SZX+2
4480 NEXT:RETURN
4490 DATA 0,-9,3,-6,6,-3
4500 DATA -12,-3,-15,-6,3,-9
4510 '-----Duration
4520 IF DRX=1 THEN DT=1:GOTO 4580
4530 IF DRX=2 THEN DT=.5:GOTO 4580
4540 IF DRX=3 THEN DT=.25:GOTO 4580
4550 IF DRX=4 THEN DT=.125:GOTO 4580
4560 IF DRX=5 THEN DT=.0625:GOTO 4580
4570 IF DRX=6 THEN DT=.03125
4580 IF DOX=1 THEN DT=DT+DT/2
4590 RETURN
4600 '-----Get Key
4610 LINE(0,23)-(75,24)," ",BF
4620 GOSUB5050:LOCATE14,19:COLOR4:PRINT"C1ef";:COLOR0:PRINT"(T/B) = ";
4630 LOCATE26,19:V%=INPUT$(1):IFV$<"0"THEN4660
4640 IFEDX=1THENBEEP:GOTO4630ELSEU1X=PRX:U2X=SBX:PRX=PDX-LEN(CT$)
4650 EKX=PDX:GOSUB5180:PRX=U1X:SBX=U2X:LOCATE17,17:PRINTSBX;:GOTO5030
4660 IFV$="t"THENKF%=1:GOTO4680
4670 IFV$="b"THENKF%=5:GOTO4680ELSEBEEP:GOTO4630
4680 LOCATE14,19:PRINT"C1ef(T/B) = ";V%;NTX=KF%:GOSUB3330

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4690 IFBT<>0THEN4760
4700 GOSUB5050:LOCATE5,21:COLOR4:PRINT"Key-sign.":COLOR0:PRINT"(N/nF/nS) = ";
4710 KEZ=2:LOCATE26,21:V#=INPUT$(1):IFV#<>"0"THEN4740
4720 LOCATE5,21:PRINTSTRING$(22," "):U1Z=PRZ:U2Z=SBZ:PRZ=PDZ-LEN(CT#)+1
4730 EKZ=PDZ:GOSUB5180:PRZ=U1Z:SBZ=U2Z:LOCATE17,17:PRINTSBZ;:GOTO4620
4740 IFV#="n"THENKEZ=KEZOR12:NZ=0:GOTO4810
4750 IFASC(V#)<>13THEN4770ELSEIFEDZ=1THENBEEP:GOTO4710
4760 NTZ=KFZ:GOSUB5060:GOTO5030
4770 NZ=INSTR("123456",V#):IFNZ=0THENBEEP:GOTO4710ELSELOCATE26,21:PRINTV#
4780 LOCATE27,21:V#=INPUT$(1):IFV#="0"THENLOCATE26,21:PRINT" ":GOTO4710
4790 IFV#="f"THENKEZ=KEZOR4:GOTO4810
4800 IFV#="s"THENKEZ=KEZOR8:GOTO4810ELSEBEEP:GOTO4780
4810 LOCATE5,21:PRINT"Key-sign.":LOCATE27,21:PRINTV#
4820 KEZ=KEZORNZ*256:NTZ=KEZ:GOSUB3330
4830 GOSUB5050:LOCATE8,23:COLOR4:PRINT"Time-sign.":COLOR0:PRINT"(n/m) = "
4840 LOCATE26,23:V#=INPUT$(1):IFV#<>"0"THEN4880
4850 LOCATE8,23:PRINTSTRING$(20," "):U1Z=PRZ:U2Z=SBZ:PRZ=PDZ-LEN(CT#)+2
4860 EKZ=PDZ:GOSUB5180:PRZ=U1Z:SBZ=U2Z:LOCATE17,17:PRINTSBZ;
4870 NTZ=KFZ:GOSUB3330:LOCATE26,21:PRINT" ":GOTO4700
4880 NZ=INSTR("234568",V#):IFNZ=0THENBEEP:GOTO4840
4890 LOCATE26,23:PRINTV#:XZ=VAL(MID$("234568",NZ,1))
4900 LOCATE27,23:V#=INPUT$(1):IFV#="0"THENLOCATE26,23:PRINT" ":GOTO4840
4910 IFV#<>"/"THENBEEP:GOTO4900ELSELOCATE27,23:PRINTV#
4920 LOCATE28,23:V#=INPUT$(1):IFV#="0"THENLOCATE26,23:PRINT" ":GOTO4840
4930 IFV#="4"ANDXZ<>6ANDXZ<>8THENYZ=4:GOTO4950
4940 IFV#="8"AND(XZ=3ORXZ=6)THENYZ=8:GOTO4950ELSEBEEP:GOTO4920
4950 LOCATE8,23:PRINT"Time-sign.":LOCATE28,23:PRINTV#;
4960 TMZ=3OR(XZ*4096)OR(YZ*256):NTZ=TMZ:GOSUB3330
4970 GOSUB5050:V#=INPUT$(1):IFV#<>"0"THEN5010
4980 LOCATE8,23:PRINTSTRING$(22," "):U1Z=PRZ:U2Z=SBZ:PRZ=PDZ-LEN(CT#)+3
4990 EKZ=PDZ:GOSUB5180:PRZ=U1Z:SBZ=U2Z:LOCATE17,17:PRINTSBZ;
5000 NTZ=KFZ:GOSUB3330:NTZ=KEZ:GOSUB3330:GOTO4830
5010 IFASC(V#)<>13THENBEEP:GOTO4970
5020 NTZ=KFZ:GOSUB5060:NTZ=KEZ:GOSUB5060:NTZ=TMZ:GOSUB5060
5030 LINE(5,19)-(30,23)," ",BF:LOCATE5,23
5040 PRINT"Sound(1-7) Tie(S,E) Dot(D) Accidental(F,S,N)":RETURN
5050 BEEP1:FORI=1TO5:NEXT:BEEP0:RETURN
5060 '-----Write Data
5070 IFFSZ=1THENXXZ=ETZELSEXXZ=EDZ
5080 IF(EFZ=3)OR(EFZ=0ANDFSZ=1)THENFORI=XXZTOPRZSTEP-1:DAZ(IZ)=DAZ(IZ-1):NEXT
5090 DAZ(PRZ)=NTZ:IFEZ=2THEN5110
5100 EDZ=EDZ+1:RCZ=RCZ+1:PRZ=PRZ+1:PDZ=PDZ+1:ETZ=ETZ+1
5110 IFEZ>990THENBEEP:LOCATE5,1:PRINT"out of memory ! do SAVE and NEW"
5120 RETURN

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5130 '-----Clear
5140 HZ=0:COZ=0:CT$="":PS$="":LBZ=80:LEZ=0:DFZ=1:C1Z=0:RETURN
5150 '-----Bar Locate
5160 IF SBZ=0 THEN PRZ=1:RETURN
5170 PRZ=0:FORI=0TOSBZ-1:PRZ=PRZ+VAL(MID$(SL$,2*I+1,2)):NEXT:PRZ=PRZ+1:RETURN
5180 '-----List
5190 JFZ=1:LFZ=0:A=USR2(0):LZ=80:SC=0:GOSUB4110:GOSUB5130:LOCATE5,17:PRINT"bar count = ";SBZ
5200 IFPRZ<>1THENGOSUB6500:GOSUB6540:GOSUB6630
5210 IFPRZ=EKZTHENS290ELSENTZ=DAZ(PRZ):GOSUB3330:PRZ=PRZ+1
5220 IFNOT(DRZ=0ANDACZ=0)THENIFLFZ<>2THENS240ELSE5210
5230 SBZ=SBZ+1:LOCATE17,17:PRINTSBZ:IFLFZ=2THENS290
5240 CM$=INKEY$:IFCM$=""THENS210
5250 IFASC(CM$)=176THENLFZ=2:LOCATE5,0:PRINT"break at bar";SBZ;BEEP:GOTO5210
5260 IFASC(CM$)<>32THENS210
5270 IFLFZ=1THENLFZ=0:GOTO5210:ELSEBEEP
5280 CM$=INKEY$:IFCM$=""THENS280:ELSELFZ=1:GOTO5250
5290 JFZ=0:RETURN
5300 '-----Byte of Rest
5310 IFDRZ=1THENBUZ=9:DPZ=3:CPZ=4
5320 IFDRZ=2THENBUZ=7:DPZ=2:CPZ=3
5330 IFDRZ=3THENBUZ=5:DPZ=1:CPZ=2
5340 IFDRZ=4THENBUZ=4:DPZ=1:CPZ=2
5350 IF DRZ>4 THEN BUZ=3:DPZ=0:CPZ=1
5360 RETURN
5370 '-----Byte of Note
5380 IFDRZ=1THENBUZ=9:DPZ=3:CPZ=4
5390 IFDRZ=2THENBUZ=7:DPZ=2:CPZ=3
5400 IFDRZ=3THENBUZ=5:DPZ=1:CPZ=2
5410 IFDRZ=4THENBUZ=4:DPZ=0:CPZ=1:IFPTZ>16THENDPZ=1
5420 IFDRZ>4THENBUZ=3:DPZ=0:CPZ=1
5430 RETURN
5440 '-----Display Data
5450 LOCATE5,23:PRINT"Sound(1-7) Tie (S,E) Dot(D) Accidental(F,S,N)"
5460 LINE(0,24)-(75,24)," ":BNZ=0:IFNTZ=0THENS490
5470 IFPRZ=EDZTHENRETURN
5480 DRZ=(NTZAND&HE0)\(2^5):IFDRZ<>0THENS520
5490 IFPFZ=0THENRETURN
5500 IFTFZ=0THENLINE(40,19)-(79,19)," "
5510 PFZ=0:RETURN
5520 LINE(CRZ,21)-(CRZ,21)," ":CRZ=(DRZ-1)*5+51
5530 COLOR2:LINE(CRZ,21)-(CRZ,21),"█":COLOR0
5540 YZ=(NTZAND&H1C)\4:IFYZ=PFZTHENS590
5550 IFTFZ=0THENLINE(40,19)-(79,19)," "
5560 PFZ=YZ:IFYZ=0THENS590

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5570 XZ=(YZ-1)*5+51:COLOR4:LOCATEXZ,19:PRINT"%":COLOR0
5580 LOCATE40,19:PRINT"triplet"
5590 PTZ=(NTZAND&H7800)\(2^11):IF NTZ<0 THEN PTZ=PTZOR&H10
5600 IFPTZ=0THENLOCATE6,24:PRINT"rest";:BNZ=2:GOTO5640
5610 IFK$="t"THENXZ=PTZ+5ELSEXZ=PTZ
5620 YZ=XZMOD7:IFYZ=0THENYZ=7
5630 LOCATE7,24:PRINTMID$("CDEFGAB",YZ,1);:BNZ=1
5640 DOZ=(NTZAND&H400)\(2^10):SRZ=(NTZAND&H300)\(2^8)
5650 IFSRZ=0THEN5690ELSEBNZ=2
5660 IFSRZ=1THENLOCATE19,24:PRINT"s";:GOTO5690
5670 IFSRZ=2THENLOCATE19,24:PRINT"e";:GOTO5690
5680 IFSRZ=3THENLOCATE19,24:PRINT"E";
5690 IFDOZ<>0THENLOCATE31,24:PRINT"d";:BNZ=3
5700 ACZ=NTZAND3:IFACZ=0THEN5740ELSEBNZ=4
5710 IFACZ=1THENLOCATE45,24:PRINT"f";:GOTO5740
5720 IFACZ=2THENLOCATE45,24:PRINT"s";:GOTO5740
5730 IFACZ=3THENLOCATE45,24:PRINT"n";:GOTO5740
5740 RETURN
5750 '-----Beat Check
5760 'efz=0,add data/efz=1,error/efz=2,redisplay/efz=3,shift data&redisplay
5770 EFZ=0:DRZ=(CRZ-50)\5+1:GOSUB4510
5780 IFPRZ<>EDZTHEN5820
5790 IFVLZ=18THENEFZ=1:LOCATE5,1:PRINT"invalid input";:RETURN
5800 IFTFZ=0THEN5810ELSEIFTC+DT>TLTHENEFZ=1:LOCATE5,1:PRINT"duration is too big for triplet group";:
RETURNELSERETURN
5810 IFBT+DT>BLTHEN5960ELSERETURN
5820 IFVLZ<>18THEN5880
5830 XZ=(DAZ(PRZ)AND&HE0)\(2^5):IFXZ<>0THEN5850
5840 XZ=DAZ(PRZ)AND3:IFXZ<>0THENEFZ=1:LOCATE5,1:PRINT"cannot insert before this data";:RETURN
5850 IFTFZ=0THEN5860ELSEIFTC+DT>TLTHENEFZ=1:LOCATE5,1:PRINT"duration is too big for triplet group";:
RETURNELSEEFZ=3:RETURN
5860 IFTN>0THENEFZ=1:LOCATE5,1:PRINT"cannot insert in complete triplet group":RETURN
5870 IFBT+DT>BLTHEN5960ELSEEFZ=3:RETURN
5880 X1Z=DOZ:X2Z=DRZ:X3Z=TPZ:X4Z=NTZ:X5=DT
5890 NTZ=DAZ(PRZ):DRZ=(NTZAND&HE0)\(2^5):IFDRZ<>0THEN5910
5900 EFZ=1:LOCATE5,1:PRINT"this data cannot be substituted";:RETURN
5910 TPZ=(NTZAND&H1C)\4:DOZ=(NTZAND&H400)\(2^10):GOSUB4510:IFTFZ=0THEN5930
5920 IFTC-DT+X5>TLTHENEFZ=1:LOCATE5,1:PRINT"duration is too big for triplet group";:RETURNELSEEFZ=2:
TC=TC-DT:BT=BT-DT:GOTO5950
5930 IFTPZ=0THEN5940ELSEIFX5>DTTHEN5950ELSETC=TL:X3Z=TPZ:TFZ=2:GOTO5920
5940 IFBT-DT+X5<BLTHENEFZ=2:BT=BT-DT
5950 DOZ=X1Z:DRZ=X2Z:TPZ=X3Z:NTZ=X4Z:DT=X5:IFEFFZ=2THENRETURN
5960 EFZ=1:LOCATE5,1:PRINT"exceed duration";:RETURN
5970 '-----Cursor

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5980 IIX=PDZ-PRZ:IF IIX<>0 THEN 6000
5990 BUZ=2:DPZ=8:RFZ=1:GOSUB 4180:RFZ=0:CT%=LEFT$(CT%,LEN(CT%)-1):LEZ=LEZ-BUZ:LBZ=LBZ+BUZ:CUZ=LEZ+1:R
RETURN
6000 CUZ=LEZ:FOR IX=1 TO IIX:CUZ=CUZ-VAL(MID$(CT%,LEN(CT%)-IX+1,1)):NEXT
6010 CUZ=CUZ+VAL(MID$(PS%,LEN(PS%)-IIX+1,1)):RETURN
6020 '-----Address
6030 CQZ=VAL("&H"+HEX$(&H8000+CQZ+RWZ*8&H50)):RETURN
6040 '-----Top & Bottom
6050 DRZ=(NTZAND&HE0)\(2^5):IF DRZ<>0 THEN 6090
6060 ACZ=NTZAND3
6070 IF ACZ<>0 THEN 6080 ELSE 6130
6080 IF ACZ<>1 THEN 6130 ELSE DOZ=(NTZAND4)\4:IF DOZ=0 THEN TWZ=58:BWZ=92:RETURN ELSE 6130
6090 PTZ=(NTZAND&H7800)\(2^11):IF NTZ<>0 THEN PTZ=PTZOR&H10
6100 IF PTZ=0 THEN 6130 ELSE TWZ=BASEZ-(PTZ-1)*3
6110 IF DRZ=1 THEN TWZ=TWZ-2:BWZ=TWZ+6:RETURN
6120 IF PTZ>16 THEN TWZ=TWZ-2:BWZ=TWZ+18:RETURN ELSE TWZ=TWZ-15:BWZ=TWZ+18:RETURN
6130 TWZ=60:BWZ=84:RETURN
6140 '-----Tie
6150 T2Z=LEN(CT%):T3Z=0:T5Z=VAL("&H"+RIGHT$(CT%,1))-VAL(RIGHT$(PS%,1))+2:MXZ=0:MNZ=199
6160 IF T2Z<>0 THEN 6220
6170 COZ=0:BQZ=&H656B:IF SRZ=3 THEN 6200
6180 RWZ=MNZ-8:IF RWZ<85 AND RWZ>52 THEN RWZ=52
6190 GOTO 6310
6200 RWZ=MXZ+6:IF RWZ<86 AND RWZ>60 THEN RWZ=86
6210 GOTO 6350
6220 NTZ=DAX(T1Z):GOSUB 6040
6230 IFTWZ<MNZ THEN MNZ=TWZ
6240 IF BWZ>MXZ THEN MNZ=BWZ
6250 T3Z=T3Z+VAL("&H"+MID$(CT%,T2Z,1))
6260 T4Z=(NTZAND&H300)\(2^8):IFT4Z<>1 THEN 6280
6270 T3Z=T3Z-VAL(MID$(PS%,T2Z,1)):COZ=LEZ-T3Z:IF SRZ<3 THEN 6290 ELSE 6330
6280 T1Z=T1Z-1:T2Z=T2Z-1:GOTO 6160
6290 RWZ=MNZ-8:IF RWZ<85 AND RWZ>52 THEN RWZ=52
6300 GOSUB 6020:BQZ=&H6515:AZ=USR3(0):COZ=COZ+2:T3Z=T3Z-2:BQZ=&H656B
6310 IFT3Z-T5Z<=0 THEN 6320 ELSE GOSUB 6020:AZ=USR3(0):COZ=COZ+1:T3Z=T3Z-1:GOTO 6310
6320 BQZ=&H6527:GOSUB 6020:AZ=USR3(0):RETURN
6330 RWZ=MXZ:IF RWZ<86 AND RWZ>60 THEN RWZ=86
6340 GOSUB 6020:BQZ=&H6540:AZ=USR3(0):COZ=COZ+2:T3Z=T3Z-2:BQZ=&H656B:RWZ=RWZ+6
6350 IFT3Z-T5Z<=0 THEN 6360 ELSE GOSUB 6020:AZ=USR3(0):COZ=COZ+1:T3Z=T3Z-1:GOTO 6350
6360 RWZ=RWZ-6:BQZ=&H6552:GOSUB 6020:AZ=USR3(0):RETURN
6370 '-----Triplet
6380 T2Z=LEN(CT%):T3Z=0:T5Z=VAL("&H"+RIGHT$(CT%,1))-VAL(RIGHT$(PS%,1)):MXZ=0:MNZ=199
6390 NTZ=DAX(T1Z):GOSUB 6040
6400 IFTWZ<MNZ THEN MNZ=TWZ

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6410 T3Z=T3Z+VAL("&H"+MID$(CT$,T2Z,1))
6420 IFT1Z<>PXTHEN6440
6430 T3Z=T3Z-VAL(MID$(PS$,T2Z,1)):COZ=LEZ-T3Z:XZ=COZ:GOTO6450
6440 T1Z=T1Z-1:T2Z=T2Z-1:GOTO6390
6450 RWZ=MNZ-8:IFRWZ<85ANDRWZ>52THENRWZ=52
6460 GOSUB6020:BQZ=&H6576:AZ=USR3(0):COZ=COZ+1:T3Z=T3Z-1:BQZ=&H656B
6470 IFT3Z-T5Z<=0THEN6480ELSEGOSUB6020:AZ=USR3(0):COZ=COZ+1:T3Z=T3Z-1:GOTO6470
6480 BQZ=&H6580:GOSUB6020:AZ=USR3(0)
6490 COZ=(COZ+XZ)\2+1:BQZ=&H658A:RWZ=RWZ-6:GOSUB6020:AZ=USR3(0):RETURN
6500 '-----Search Clef
6510 OBZ=2*(PRZ-1):OAZ=VARPTR(DAZ(1)):AZ=USR5(0):OBZ=OBZ/2+1
6520 IFDAZ(OBZ)=1THENK$="t"ELSEK$="b"
6530 RETURN
6540 '-----Search Key_sign.
6550 OBZ=PRZ
6560 OBZ=2*(OBZ-1):OAZ=VARPTR(DAZ(1)):AZ=USR5(0):OBZ=OBZ/2+2
6570 IF(DAZ(OBZ)AND&HE0)\32<>ODR((DAZ(OBZ)AND3)<>2)THENOBZ=OBZ-3:GOTO6560
6580 NTZ=DAZ(OBZ):YZ=(NTZAND12)\4
6590 IFYZ=3THENKS$="n":GOTO6620
6600 NZ=(NTZAND&H700)\(2^8):KS$=STR$(NZ)
6610 IFYZ=1THENKS$=KS$+"f"ELSEKS$=KS$+"s"
6620 RETURN
6630 '-----Search Time_sign.
6640 OBZ=PRZ
6650 OBZ=2*(OBZ-1):OAZ=VARPTR(DAZ(1)):AZ=USR5(0):OBZ=OBZ/2+3
6660 IF(DAZ(OBZ)AND&HE0)\32<>ODR((DAZ(OBZ)AND3)<>3)THENOBZ=OBZ-3:GOTO6650
6670 NTZ=DAZ(OBZ):XZ=(NTZAND&HF000)\(2^12):YZ=(NTZAND&HF00)\(2^8):BL=XZ/YZ
6680 T$=MID$(TA$,XZ,1)+"/"+MID$(TA$,YZ,1)
6690 RETURN
6700 '-----Token
6710 NUZ=0: SX$="":IFCM$=""THENRETURN
6720 IZ=1:XZ=ASC(MID$(CM$,IZ,1)):IFXZ<48ORXZ>57THEN6770ELSE6730
6730 XZ=ASC(MID$(CM$,IZ,1)):IFXZ<48ORXZ>57THEN6760
6740 SX$=SX$+MID$(CM$,IZ,1)
6750 IZ=IZ+1:IFIZ>LEN(CM$)THEN6760ELSE6730
6760 NUZ=VAL(SX$):CM$=RIGHT$(CM$,LEN(CM$)-IZ+1):RETURN
6770 XZ=ASC(MID$(CM$,IZ,1)):IFXZ>47ANDXZ<58THEN6800
6780 SX$=SX$+MID$(CM$,IZ,1)
6790 IZ=IZ+1:IFIZ>LEN(CM$)THEN6800ELSE6770
6800 NUZ=VAL(SX$):CM$=RIGHT$(CM$,LEN(CM$)-IZ+1):RETURN
6810 '-----Delete
6820 IFPRZ=EDZTHENLOCATE5,1:PRINT"no data to delete":RETURN
6830 NTZ=DAZ(PRZ):X1Z=DRZ:X2Z=DOZ:X3Z=TPZ:X4Z=DT
6840 DRZ=(NTZAND&HE0)\(2^5):IFDRZ=0THENLOCATE5,1:PRINT"cannot delete this data":RETURN

```

```

6850 DOX=(NTZAND&H400)\(2^10):GOSUB4510:X5=DT
6860 TPX=(NTZAND&H1C)\4:IFTP%=0THEN6910
6870 IFTFX<>0THEN6890
6880 TFX=2:X3X=TPX:SWAPTPX,DRX:DOX=0:GOSUB4510:TL=DT+DT/2:TC=TL:TFX=2:SWAPTPX,DRX
6890 TC=TC-X5:IFTC<>0THEN6910
6900 BT=BT+TL/3:TFX=0:X3X=0:TN=0:LINE(40,19)-(79,19)," "
6910 BT=BT-X5:RCX=RCX-1:IFBT<>0ORRCX<>1ORSBX=LEN(SL$)\2THEN6940
6920 SL$=LEFT$(SL$,2*SBX)+RIGHT$(SL$,LEN(SL$)-2*(SBX+1))
6930 RCX=VAL(MID$(SL$,2*SBX,2)):GOSUB6950
6940 GOSUB6950:DRX=X1X:DOX=X2X:TPX=X3X:DT=X4:VLX=176:RETURN
6950 '-----Shift
6960 IFFSX=1THENXXZ=ETXELSEXXZ=EDX
6970 FORIX=PRXTOXXZ:DAZ(IX)=DAZ(IX+1):NEXT
6980 PDZ=PDZ-1:EDZ=EDZ-1:ETZ=ETZ-1:RETURN
6990 '-----Copy
7000 GOSUB6700:IFCM$=""THENX3Z=1:RETURN
7010 GOSUB6700:IFNUZ>(LEN(SL$)\2-1)THENX3Z=1:RETURNELSEX1Z=NUZ
7020 GOSUB6700:IFSX$<>,"THENX2Z=X1X:GOTO7050
7030 GOSUB6700:IFNUZ>(LEN(SL$)\2-1)ORNUZ<X1ZTHENX3Z=1:RETURN
7040 X2Z=NUZ:GOSUB6700
7050 IFSX$<>"to"THEN7080
7060 GOSUB6700:IFNUZ>(LEN(SL$)\2-1)OR(NUZ>=X1ZANDNUZ<X2Z)THENX3Z=1:RETURN
7070 X3Z=NUZ:IFCM$<>"THENX3Z=1:RETURNELSE7090
7080 IFSX$<>"THENX3Z=1:RETURNELSEX3Z=LEN(SL$)\2-1
7090 SX$=MID$(SL$,2*X1Z+1,(X2Z-X1Z+1)*2)
7100 IFEDZ+X2Z-X1Z+1>995THENX3Z=2:RETURN
7110 CM$=LEFT$(SL$, (X3Z+1)*2)+SX$+RIGHT$(SL$,LEN(SL$)-(X3Z+1)*2)
7120 SBZ=X1Z:GOSUB5150:X1Z=PRX
7130 SBZ=X2Z+1:GOSUB5150:X2Z=PRX-1:X4Z=X2Z-X1Z+1
7140 SBZ=X3Z+1:GOSUB5150:X3Z=PRX
7150 IFX3Z=EDZTHEN7170
7160 FORIX=EDZ-1TOX3ZSTEP-1:JZ=IX+X4Z:DAZ(JZ)=DAZ(IX):NEXT
7170 IFX3Z<X1ZTHENX1Z=X1Z+X4Z:X2Z=X2Z+X4Z
7180 X3Z=X3Z+X4Z-1:FORIX=X2ZTOX1ZSTEP-1:DAZ(X3Z)=DAZ(IX):X3Z=X3Z-1:NEXT
7190 SL$=CM$:EDZ=EDZ+X4Z:X3Z=0:GOSUB5130:RETURN
7200 '-----Bar Delete
7210 GOSUB6700:IFCM$=""THEN7270
7220 GOSUB6700:IF(NUZ>LEN(SL$)\2-1)ORNUZ=0THEN7270ELSEX1Z=NUZ
7230 IFCM$=""THENX2Z=X1X:GOTO7280
7240 GOSUB6700:IFSX$<>"-ANDSX$<>,"THEN7270
7250 GOSUB6700:IFCM$<>"THEN7270
7260 IFNUZ<X1ZORNUZ>(LEN(SL$)\2-1)THEN7270ELSEX2Z=NUZ:GOTO7280
7270 X3Z=1:RETURN
7280 CM$=LEFT$(SL$,2*X1Z)+RIGHT$(SL$,LEN(SL$)-2*(X2Z+1))

```



```

7290 SBZ=X1Z:GOSUB5150:X1Z=PRZ
7300 SBZ=X2Z+1:GOSUB5150:X2Z=PRZ
7310 FORI1=1TOEDZ-X2Z:DAZ(X1Z+I1-1)=DAZ(X2Z+I1-1):NEXT
7320 EDZ=EDZ-X2Z+X1Z:SL$=CM$:X3Z=0:GOSUB5130:RETURN

```

## 6. โปรแกรม "transpose"

```

100 '-----Transposition Routine-----
110 CONSOLE5,20,0,0
120     DIM TAX(13,3): DIM DAZ(1200)
130 DATA 266,1030,778,518,1290,14,1286,522,774,1034,262,1546,1542
140 DATA 1,0,1,0,1,1,0,1,0,1,0,1,0
150 DATA 0,1,0,1,0,1,1,0,1,0,1,0,1
160     RESTORE130: FOR I1=1 TO 13: READ TAX(I1,1): NEXT
170     RESTORE140: FOR I1=1 TO 13: READ TAX(I1,2): NEXT
180     RESTORE150: FOR I1=1 TO 13: READ TAX(I1,3): NEXT
190 PRINTCHR$(12)
200     LOCATE23,2: COLOR4: PRINT"           ": COLOR0
210     LOCATE23,3: COLOR4: PRINT" TRANSPOSITION ": COLOR0
220     LOCATE23,4: COLOR4: PRINT"           ": COLOR0
230 LOCATE10,8: LINEINPUT "up or down (U/D) ? ": V$
240     IF V$="u" OR V$="d" THEN 250 ELSE BEEP:GOTO230
250 LOCATE10,10: INPUT "no. of semitones to transpose (1-12) = ": VLZ
260     IF VLZ<1 OR VLZ>12 THEN BEEP:GOTO250
270 SBZ=0: RCZ=0
280 OPEN "wrk-file" FOR INPUT AS#1
290     LINEINPUT#1,TX$: INPUT#1,EDZ: INPUT#1,SL$: INPUT#1,MPZ: KZ=1
300     IF KZ=EDZ THEN 680 ELSE INPUT#1,NTZ
310 DRZ=(NTZAND&HE0)\(2^5):IF DRZ<>0 THEN 530
320 ACZ=NTZAND3
330 IF ACZ<>0 THEN 360
340     SBZ=SBZ+1: RCZ=0: PRINT"transpose at bar ";SBZ
350     GOTO 660
360 IF ACZ<>1 THEN 390
370     DOZ=(NTZAND4)\4: IF DOZ=0 THEN K$="t" ELSE K$="b"
380     GOTO 660
390 IF ACZ<>2 THEN 660

```



```

400 IZ=1: SMZ=VLZ
410 IF NTZ<>TAX(IZ,1) THEN IZ=IZ+1: GOTO 410
420 JZ=IZ: IF JZ=13 THEN JZ=12
430 IF V$(">"u) THEN 480
440 DPZ=0: SMZ=JZ+SMZ: IF SMZ>12 THEN SMZ=SMZ-12
450 IF JZ=SMZ THEN 520 ELSE DPZ=DPZ+TAX(JZ,2) : JZ=JZ+1
460 IF JZ>12 THEN JZ=1
470 GOTO 450
480 DPZ=0: SMZ=JZ-SMZ: IF SMZ<1 THEN SMZ=SMZ+12
490 IF JZ=SMZ THEN 520 ELSE DPZ=DPZ-TAX(JZ,3) : JZ=JZ-1
500 IF JZ<1 THEN JZ=12
510 GOTO 490
520 NTZ=TAX(SMZ,1): GOTO 670
530 TPZ=(NTZAND&H1C)\4
540 PTZ=(NTZAND&H7800)\(2^11): IF NTZ<0 THEN PTZ=PTZOR&H10
550 DOZ=(NTZAND&H400)\(2^10) : SRZ=(NTZAND&H300)\(2^8)
560 IF PTZ<>0 THEN 570 ELSE 650
570 PTZ=PTZ+DPZ: IF PTZ<31 THEN 600
580 PRINT "note number ";RCZ;" at bar ";SBZ;" is higher than limit ,default down 1 octave"
590 PTZ=PTZ-7: GOTO 630
600 IF PTZ=>1 THEN 630
610 PRINT "note number ";RCZ;" at bar ";SBZ;" is lower than limit ,default up 1 octave"
620 PTZ=PTZ+7
630 ACZ=NTZAND3: IF ACZ=0 THEN 640
640 IF PTZ>=16 THEN PTZ=PTZ-16: NTZ=&H8000: ELSE NTZ=0
650 NTZ=NT ZOR (PTZ*2048) OR ACZ OR (DOZ*1024) OR (SRZ*256)
PZ*4) OR (DRZ*32) OR (T
660 PTZ=0: ACZ=0: DOZ=0: SRZ=0: TPZ=0: DRZ=0
670 DAZ(KZ)=NTZ: KZ=KZ+1: RCZ=RCZ+1: GOTO 300
680 CLOSE
690 OPEN "wrk-file" FOR OUTPUT AS#1
700 XZ=1: PRINT#1,TX$: PRINT#1,EDZ: PRINT#1,SL$: PRINT#1,MPZ
710 IF XZ=EDZ THEN 720 ELSE PRINT#1,DAZ(XZ): XZ=XZ+1: GOTO 710
720 CLOSE: POKE &H65C0,1: CONSOLE0,25,0,0
730 RUN"MAIN"

```

## 7. โปรแกรม "medley"

```

1000 CLEAR1000:BOZ=0:COZ=0:OAZ=0:OBZ=0
1010 AZ=VARPTR(BOZ):POKE&HEF01,VAL("&H"+MID$(HEX$(AZ),3,2))
1020 POKE &HEF02,VAL("&H"+MID$(HEX$(AZ),1,2))
1030 AZ=VARPTR(COZ):POKE&HEF05,VAL("&H"+MID$(HEX$(AZ),3,2))
1040 POKE &HEF06,VAL("&H"+MID$(HEX$(AZ),1,2))
1050 AZ=VARPTR(OAZ):POKE&HF2B1,VAL("&H"+MID$(HEX$(AZ),3,2))
1060 POKE&HF2B2,VAL("&H"+MID$(HEX$(AZ),1,2))
1070 AZ=VARPTR(OBZ):POKE&HF2B5,VAL("&H"+MID$(HEX$(AZ),3,2))
1080 POKE&HF2B6,VAL("&H"+MID$(HEX$(AZ),1,2))
1090 POKE&HF2D4,VAL("&H"+MID$(HEX$(AZ),3,2))
1100 POKE&HF2D5,VAL("&H"+MID$(HEX$(AZ),1,2))
1110 DIMDAZ(1000):DEFUSR0=&HEE50:DEFUSR1=&HEE70:DEFUSR2=&HEED0
1120 DEFUSR3=&HEF00:DEFUSR4=&HF290:DEFUSR5=&HF2B0
1130 RGZ=72:BASEZ=RGZ+45:ATZ=75:TA$="123456789":EDZ=1:AZ=USR4(0)
1140 TB$="ZXCVBNMzxcvbnmasdfghjkwertyu1234567!"+CHR$(34)+"###&' "
1150 DIM NM$(13):DIM BRZ(13):DIM KYZ(3)
1160 '-----medley
1170 PRINTCHR$(12):AZ=USR4(0):LOCATE0,2:COLOR4:PRINT" enter names of songs ";:COLOR0
1180 PRINT"(s1,s2,...,s12)":KYZ(1)=0:KYZ(2)=0:KYZ(3)=0
1190 LOCATE0,4:LINEINPUTNM$(13):IZ=1:JZ=1
1200 LINE(0,1)-(60,1)," ":FDZ=0
1210 NM$(IZ)=""
1220 IFJZ>LEN(NM$(13))THEN1270
1230 IFMID$(NM$(13),JZ,1)="",THENIZ=IZ+1:IFIZ>12THEN1250ELSEJZ=JZ+1:GOTO1210
1240 NM$(IZ)=NM$(IZ)+MID$(NM$(13),JZ,1):JZ=JZ+1:GOTO1220
1250 BEEP:LOCATE0,1:PRINT"too much song to medley, enter again !"
1260 LINE(0,4)-(79,4)," ":GOTO1190
1270 IZ=1:BRZ(13)=0
1280 OPEN"2:"+NM$(IZ)FORINPUTAS#1:LINEINPUT#1,TX$:INPUT#1,EDZ
1290 INPUT#1,SL$:BRZ(IZ)=LEN(SL$)\2:BRZ(13)=BRZ(13)+BRZ(IZ)
1300 IZ=IZ+1:CLOSE:IFIZ>12ORNM$(IZ)=""THEN1310ELSE1280
1310 PRINTCHR$(12)
1320 '-----Get Command
1330 BEEP1:FORIZ=1TO70:NEXT:BEEP0
1340 LOCATE5,1:COLOR4:PRINT" enter command ";:COLOR0:PRINT" (MEDLEY,LIST,EXIT)"
1350 LOCATE5,3:LINEINPUT CM$:LINE(0,0)-(79,17)," ",BF
1360 AZ=INSTR(CM$," "):IFAZ=0THEN1370ELSECM$=LEFT$(CM$,AZ-1)+RIGHT$(CM$,LEN(CM$)-AZ):GOTO1360
1370 IFMID$(CM$,1,4)<>"list"THEN1450
1380 GOSUB4230:IFCM$=""THENB1Z=0:B2Z=BRZ(13)-1:GOTO1440
1390 GOSUB4230:IFNUZ>BRZ(13)-1THEN1480ELSEB1Z=NUZ
1400 IFCM$=""THENB2Z=B1Z:GOTO1440
1410 GOSUB4230:IFSX$<>,"ANDSX$<>"-THEN1480
1420 IFCM$=""THENB2Z=BRZ(13)-1:GOTO1440
1430 GOSUB4230:IFNUZ<B1ZORNUZ>(BRZ(13)-1)THEN1480ELSEB2Z=NUZ

```

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1440 BSZ=B1Z:GOSUB1490:GOTO1330
1450 IFCM$<>"medley"THEN1460ELSE1170
1460 IFCM$<>"exit"ANDCM$<>""THEN1480
1470 POKE&H65C0,1:RUN"MAIN"
1480 BEEP:LOCATE5,0:PRINT"invalid command ":GOTO1340
1490 '-----List processing
1500 CTZ=0:JJZ=0
1510 CTZ=CTZ+BRZ(JJZ):IFB1Z>CTZ-1THENJJZ=JJZ+1:GOTO1510
1520 SBZ=B1Z-CTZ+BRZ(JJZ)
1530 A=USR2(0):LX=80:SC=0:GOSUB2430:GOSUB2920
1540 LOCATE5,17:PRINT"bar count = ";BSZ
1550 IFFDZ<>JJZTHENCM$=NM$(JJZ):GOSUB1610:FDZ=JJZ
1560 GOSUB2940:B1Z=PRZ:IFB2Z>CTZ-1THENNFZ=1:EKZ=EDZ:GOTO1580
1570 NFZ=0:SBZ=B2Z-CTZ+BRZ(JJZ)+1:GOSUB2940:EKZ=PRZ
1580 PRZ=B1Z:GOSUB2970:IFLFZ=2THENNFZ=0
1590 IFNFZ=0THENRETURN
1600 JJZ=JJZ+1:SBZ=0:CTZ=CTZ+BRZ(JJZ):GOTO1550
1610 '-----Load
1620 OPEN"2:"+CM$FORINPUTAS#1:XZ=1:LINEINPUT#1,TX$:INPUT#1,EDZ:INPUT#1,SL$:INPUT#1,MPZ
1630 IFXZ=EDZTHENCLOSE:RETURNELSEINPUT#1,DAZ(XZ):XZ=XZ+1:GOTO1630
1640 '-----Data Interpretation
1650 DRZ=(NTZAND&HE0)\(2^5):IF DRZ<>0 THEN 1810
1660 ACZ=NTZAND3
1670 IF ACZ<>0 THEN 1700
1680 BUZ=3:DPZ=1:CPZ=1:RWZ=60:GOSUB2500:GOSUB3540
1690 IFNTZ=4THENBQZ=&H6593:AZ=USR3(0):RETURNELSEBQZ=&H646E:AZ=USR3(0):RETURN
1700 IF ACZ<>1 THEN 1740
1710 IFNTZ=KYZ(1)ANDDAZ(PRX+1)=KYZ(2)ANDDAZ(PRX+2)=KYZ(3)THENPRZ=PRZ+2:RETURN
1720 KYZ(1)=NTZ:DOZ=(NTZAND4)\4:IFDOZ=0THENK$="t":ELSEK$="b"
1730 BUZ=7:DPZ=1:CPZ=3:GOSUB2500:GOSUB2260:LOCATE75,0:RETURN
1740 IF ACZ<>2 THEN 1780
1750 ACZ=(NTZAND12)\4:IFACZ=3THENKS$="n":BUZ=2:DPZ=0:CPZ=1:GOSUB2500:GOTO1770
1760 NZ=(NTZAND&H700)\(2^8):KS$=STR$(NZ):GOSUB2710
1770 KYZ(2)=NTZ:RETURN
1780 XZ=(NTZAND&HF00)\(2^12):YZ=(NTZAND&HF00)\(2^8):BL=XZ/YZ
1790 T$=MID$(TA$,XZ,1)+"/"+MID$(TA$,YZ,1)
1800 BUZ=8:DPZ=2:CPZ=3:GOSUB2500:GOSUB2170:KYZ(3)=NTZ:RETURN
1810 QPZ=(NTZAND&H1C)\4:IF(QPZ=0)OR(QPZ=HZ)THEN1840
1820 CNZ=DRZ:DRZ=QPZ:DOZ=0:GOSUB2830:DRZ=CNZ:LM=DT+DT/2:DC=0:HZ=QPZ:CNZ=0
1830 IFJFZ=1THENPXZ=PRZELSEPXZ=PRZ-1
1840 IFQPZ<>HZTHENHZ=0:QPZ=0
1850 PTZ=(NTZAND&H7800)\(2^11):IF NTZ<0 THEN PTZ=PTZOR&H10
1860 DOZ=(NTZAND&H400)\(2^10):SRZ=(NTZAND&H300)\(2^8)
1870 IFPTZ<>0THEN1910ELSEGOSUB3090:GOSUB2500:GOSUB2350

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1880 IFDOX<>1THEN2030
1890 COZ=COZ+2:RWZ=69:BQZ=&H6573:IFDRX<3THENCOZ=COZ+1
1900 GOSUB3540:AZ=USR3(0):GOTO2030
1910 RWZ=BASEX-(PTX-1)*3:GOSUB3160
1920 IFDRX=1THENRWZ=RWZ-2ELSEIFPTX>16THENRWZ=RWZ-2ELSERWZ=RWZ-15
1930 ACZ=NTXAND3:IF ACZ=0 THEN 1970
1940 BUZ=BUZ+2:CPZ=CPZ+2:GOSUB 2500
1950 CLZ=COZ:RLZ=RWZ:IFDRX=1THENRWZ=RWZ-6ELSEIFPTX>16THENRWZ=RWZ-6ELSERWZ=RWZ+7
1960 GOSUB2290:COZ=CLZ+2:RWZ=RLZ:GOTO 1980
1970 GOSUB 2500:S1Z=COZ:S2Z=RWZ
1980 GOSUB2620:CLZ=COZ:RLZ=RWZ:GOSUB2090
1990 IF DOX<>1THEN2030
2000 IFPTX>16THENRWZ=RWZ+1ELSERWZ=RWZ+14
2010 IF(PTX>16ANDDRX=4)OR(PTX<=16ANDDRX=5) THENBQZ=&H6573:ELSEBQZ=&H6570
2020 COZ=COZ+2:GOSUB3540:AZ=USR3(0)
2030 IFHZ=0THEN2060ELSECNZ=CNZ+1:GOSUB2830:DC=DC+DT:IFDC<>LMTHEN2060
2040 IFJFX=1THENT1Z=PRZELSET1Z=PRZ-1
2050 GOSUB3900:PZ=0:HZ=0
2060 IF SRX<2 THEN RETURN
2070 IFJFX=1THENT1Z=PRZELSET1Z=PRZ-1
2080 GOSUB3660:RETURN
2090 '-----Note
2100 IFDRX=1THENBQZ=&H61BC:GOTO2160
2110 IFDRX=2THENIFPTX>16THENBQZ=&H60E6:GOTO2160ELSEBQZ=&H623D:GOTO2160
2120 IFDRX=3THENIFPTX>16THENBQZ=&H6120:GOTO2160ELSEBQZ=&H62C3:GOTO2160
2130 IFDRX=4THENIFPTX>16THENBQZ=&H615A:GOTO2160ELSEBQZ=&H6277:GOTO2160
2140 IFDRX=5THENIFPTX>16THENBQZ=&H6182:GOTO2160ELSEBQZ=&H62FD:GOTO2160
2150 IFDRX=6THENIFPTX>16THENBQZ=&H6371:ELSEBQZ=&H6337
2160 GOSUB3540:AZ=USR3(0):RETURN
2170 '-----Time-sign.
2180 CLZ=COZ:RWZ=RGZ-11:C#=MID$(T$,1,1):GOSUB2200:GOSUB3540:AZ=USR3(0)
2190 COZ=CLZ:RWZ=RGZ+1:C#=MID$(T$,3,1):GOSUB 2200:GOSUB3540:AZ=USR3(0):RETURN
2200 IFC#="2"THENBQZ=&H64E1:RETURN
2210 IFC#="3"THENBQZ=&H640A:RETURN
2220 IFC#="4"THENBQZ=&H60CC:RETURN
2230 IFC#="5"THENBQZ=&H6223:RETURN
2240 IFC#="6"THENBQZ=&H648B:RETURN
2250 IFC#="8"THENBQZ=&H64FB:RETURN
2260 '-----Clef
2270 IFK#="t"THENBQZ=&H6000:RWZ=58ELSERQZ=&H61CF:RWZ=61
2280 GOSUB3540:AZ=USR3(0):RETURN
2290 '-----Accidental
2300 ONACZGOTO2310,2320,2330
2310 BQZ=&H60AE:RWZ=RWZ-1:GOTO2340

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2320 BQ%=&H63DC:RW%=RW%+2:GOTO2340
2330 BQ%=&H63FA:RW%=RW%+2
2340 GOSUB3540:AZ=USR3(0):RETURN
2350 '-----Rest
2360 IFDR%=1THENBQ%=&H63AB:RW%=67:GOTO2420
2370 IFDR%=2THENBQ%=&H63AB:RW%=69:GOTO2420
2380 IFDR%=3THENBQ%=&H64AC:RW%=63:GOTO2420
2390 IFDR%=4THENBQ%=&H63BB:RW%=64:GOTO2420
2400 IFDR%=5THENBQ%=&H6426:RW%=64:GOTO2420
2410 IFDR%=6THENBQ%=&H644A:RW%=64
2420 GOSUB3540:AZ=USR3(0):RETURN
2430 '-----Stave
2440 POKE &HEE58,L%
2450 FOR I%=R6%-12 TO R6%+12 STEP 6
2460 ST=SC+&H8000+65536!+80*I%:ST%=HEX$(ST)
2470 ST=VAL("&h"+MID$(ST$,1,2)):POKE &HEE56,ST
2480 ST=VAL("&h"+MID$(ST$,3,2)):POKE &HEE55,ST
2490 A=USR0(0):NEXT:RETURN
2500 '-----CRT-management
2510 IFBU%=>LB%THEN2570
2520 LB%=LB%-BU%
2530 CT%=CT%+HEX$(BU%)
2540 IFRF%=0THENPS%=PS%+MID$(TA%,CP%,1)
2550 CO%=LE%+DP%:LE%=LE%+BU%
2560 RETURN
2570 NB%=VAL("&h"+LEFT$(CT$,1))
2580 LB%=LB%+NB%:LE%=LE%-VAL("&h"+LEFT$(CT$,1))
2590 CT%=RIGHT$(CT$,LEN(CT$)-1)
2600 PS%=RIGHT$(PS$,LEN(PS$)-1)
2610 POKE &HEE95,NB%:A=USR1(0):GOTO2510
2620 '-----Leger Line
2630 CL%=R6%:IFNOTPTX>21THEN2660
2640 IFPTXMOD2=0THENRG%=RW%+14ELSERG%=RW%+17
2650 GOTO2690
2660 IFNOTPTX<11THEN2700
2670 IFPTXMOD2=0THENRG%=RW%+3ELSERG%=RW%
2680 IFDR%=1THENRG%=RG%-13
2690 SC=CO%:LX=2:GOSUB2430
2700 RG%=CL%:RETURN
2710 '-----Key-sign.
2720 'parameters are n,no. of acc and ac,type of acc
2730 CP%=1:IFK%="t"THENIN%=0ELSEIN%=6
2740 IFAC%=1THENRESTORE2810:KS%=KS%+"f"ELSERESTORE2820:KS%=KS%+"s"
2750 FORI%=1TON%:READC%:NN%(I%)=C%:NEXT

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2760 BUZ=NX#2:CPZ=BUZ\2:DPZ=0:GOSUB2500:SZZ=COZ
2770 FORIZ=1TONZ
2780 RWZ=RGZ+NNZ(IZ)+INZ-8:COZ=SZZ
2790 GOSUB2290:SZZ=SZZ+2
2800 NEXT:RETURN
2810 DATA 0,-9,3,-6,6,-3
2820 DATA -12,-3,-15,-6,3,-9
2830 '-----Get Duration Time
2840 IF DRZ=1 THEN DT=1:GOTO 2900
2850 IF DRZ=2 THEN DT=.5:GOTO 2900
2860 IF DRZ=3 THEN DT=.25:GOTO 2900
2870 IF DRZ=4 THEN DT=.125:GOTO 2900
2880 IF DRZ=5 THEN DT=.0625:GOTO 2900
2890 IF DRZ=6 THEN DT=.03125
2900 IF DOZ=1 THEN DT=DT+DT/2
2910 RETURN
2920 '-----Clear
2930 HZ=0:COZ=0:CT#="" :PS#="" :LBZ=80:LEZ=0:DFZ=1:CIZ=0:RETURN
2940 '-----Bar Locate
2950 IF SBZ=0 THEN PRZ=1:RETURN
2960 PRZ=0:FORIZ=0TOSBZ-1:PRZ=PRZ+VAL(MID$(SL$,2*IZ+1,2)):NEXT:PRZ=PRZ+1:RETURN
2970 '-----List
2980 JFZ=1:LFZ=0
2990 IFPRZ<>1THENGOSUB4030:GOSUB4070:GOSUB4160
3000 IFPRZ=EKZTHEN3080ELSENTZ=DAZ(PRZ):GOSUB1640:PRZ=PRZ+1
3010 IFNOT(DRZ=0ANDACZ=0)THENIFLFZ<>2THEN3030ELSE3000
3020 BSZ=BSZ+1:LOCATE17,17:PRINTBSZ:IFLFZ=2THEN3080
3030 CM#=INKEY$:IFCM#=""THEN3000
3040 IFASC(CM#)=176THENLFZ=2:LOCATE5,0:PRINT"break at bar";BSZ:BEEP:GOTO3000
3050 IFASC(CM#)<>32THEN3000
3060 IFLFZ=1THENLFZ=0:GOTO3000:ELSEBEEP
3070 CM#=INKEY$:IFCM#=""THEN3070:ELSELFZ=1:GOTO3040
3080 JFZ=0:RETURN
3090 '-----Byte Use of Rest
3100 IFDRZ=1THENBUZ=9:DPZ=3:CPZ=4
3110 IFDRZ=2THENBUZ=7:DPZ=2:CPZ=3
3120 IFDRZ=3THENBUZ=5:DPZ=1:CPZ=2
3130 IFDRZ=4THENBUZ=4:DPZ=1:CPZ=2
3140 IF DRZ>4 THEN BUZ=3:DPZ=0:CPZ=1
3150 RETURN
3160 '-----Byte Bse of Note
3170 IFDRZ=1THENBUZ=9:DPZ=3:CPZ=4
3180 IFDRZ=2THENBUZ=7:DPZ=2:CPZ=3
3190 IFDRZ=3THENBUZ=5:DPZ=1:CPZ=2

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3200 IFDRZ=4THENBUZ=4:DPZ=0:CPZ=1:IFPTZ>16THENDPZ=1
3210 IFDRZ>4THENBUZ=3:DPZ=0:CPZ=1
3220 RETURN
3230 '-----Display Data
3240 LOCATE5,23:PRINT"Sound(1-7) Slur(S,E) Dot(D) Accidental(F,S,N)"
3250 LINE(0,24)-(75,24)," ":BNZ=0:IFNTZ=0THEN3280
3260 IFPRZ=EDZTHENRETURN
3270 DRZ=(NTZAND&HE0)\(2^5):IFDRZ<>0THEN3310
3280 IFFPZ=0THENRETURN
3290 IFTFZ=0THENLINE(40,19)-(79,19)," "
3300 PFZ=0:RETURN
3310 LINE(CRZ,21)-(CRZ,21)," ":CRZ=(DRZ-1)*5+51
3320 COLOR2:LINE(CRZ,21)-(CRZ,21),"#":COLOR0
3330 YZ=(NTZAND&H1C)\4:IFYZ=PFZTHEN3380
3340 IFTFZ=0THENLINE(40,19)-(79,19)," "
3350 PFZ=YZ:IFYZ=0THEN3380
3360 XZ=(YZ-1)*5+51:COLOR4:LOCATEXZ,19:PRINT"#":COLOR0
3370 LOCATE40,19:PRINT"triplet"
3380 PTZ=(NTZAND&H7800)\(2^11):IF NTZ<0 THEN PTZ=PTZOR&H10
3390 IFPTZ=0THENLOCATE6,24:PRINT"rest";:BNZ=2:GOTO3430
3400 IFK#="t"THENXZ=PTZ+5ELSEXZ=PTZ
3410 YZ=XZMOD7:IFYZ=0THENYZ=7
3420 LOCATE7,24:PRINTMID$("CDEFGAB",YZ,1);:BNZ=1
3430 DOZ=(NTZAND&H400)\(2^10):SRZ=(NTZAND&H300)\(2^8)
3440 IFSRZ=0THEN3480ELSEBNZ=2
3450 IFSRZ=1THENLOCATE19,24:PRINT"s";:GOTO3480
3460 IFSRZ=2THENLOCATE19,24:PRINT"e";:GOTO3480
3470 IFSRZ=3THENLOCATE19,24:PRINT"E";
3480 IFDOZ<>0THENLOCATE31,24:PRINT"d";:BNZ=3
3490 ACZ=NTZAND3:IFACZ=0THEN3530ELSEBNZ=4
3500 IFACZ=1THENLOCATE45,24:PRINT"f";:GOTO3530
3510 IFACZ=2THENLOCATE45,24:PRINT"s";:GOTO3530
3520 IFACZ=3THENLOCATE45,24:PRINT"n";:GOTO3530
3530 RETURN
3540 '-----Get Target Address
3550 COZ=VAL("&H"+HEX$(&H8000+COZ+RWZ*&H50)):RETURN
3560 '-----Get Top & Bottom Row Of Graphic
3570 DRZ=(NTZAND&HE0)\(2^5):IFDRZ<>0THEN3610
3580 ACZ=NTZAND3
3590 IFACZ<>0THEN3600ELSE3650
3600 IFACZ<>1THEN3650ELSEDOZ=(NTZAND4)\4:IFDOZ=0THENTWZ=58:BWZ=92:RETURNELSE3650
3610 PTZ=(NTZAND&H7800)\(2^11):IFNTZ<0THENPTZ=PTZOR&H10
3620 IFPTZ=0THEN3650ELSETWZ=BASEZ-(PTZ-1)*3
3630 IFDRZ=1THENTWZ=TWZ-2:BWZ=TWZ+6:RETURN

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3640 IFPTX>16THENTWX=TWX-2:BWZ=TWX+18:RETURNELSETWX=TWX-15:BWZ=TWX+18:RETURN
3650 TWX=60:BWZ=84:RETURN
3660 '-----Tie Processing
3670 'T1X is the parameter represent current data
3680 T2X=LEN(CT#):T3X=0:T5X=VAL("&H"+RIGHT$(CT#,1))-VAL(RIGHT$(PS#,1))+2:MXZ=0:MNZ=199
3690 IFT2X<>0THEN3750
3700 COZ=0:BQZ=&H656B:IFSRZ=3THEN3730
3710 RWZ=MNZ-8:IFRWZ<85ANDRWZ>52THENRWZ=52
3720 GOTO3840
3730 RWZ=MXZ+6:IFRWZ<86ANDRWZ>60THENRWZ=86
3740 GOTO3880
3750 NTX=DAZ(T1X):GOSUB3560
3760 IFTWX<MNZTHENMNZ=TWX
3770 IFBWZ>MXZTHENMXZ=BWZ
3780 T3X=T3X+VAL("&H"+MID$(CT#,T2X,1))
3790 T4X=(NTXAND&H300)\(2^8):IFT4X<>1THEN3810
3800 T3X=T3X-VAL(MID$(PS#,T2X,1)):COZ=LEZ-T3X:IFSRZ<3THEN3820ELSE3860
3810 T1X=T1X-1:T2X=T2X-1:GOTO3690
3820 RWZ=MNZ-8:IFRWZ<85ANDRWZ>52THENRWZ=52
3830 GOSUB3540:BQZ=&H6515:AZ=USR3(0):COZ=COZ+2:T3X=T3X-2:BQZ=&H656B
3840 IFT3X-T5X<=0THEN3850ELSEGOSUB3540:AZ=USR3(0):COZ=COZ+1:T3X=T3X-1:GOTO3840
3850 BQZ=&H6527:GOSUB3540:AZ=USR3(0):RETURN
3860 RWZ=MXZ:IFRWZ<86ANDRWZ>60THENRWZ=86
3870 GOSUB3540:BQZ=&H6540:AZ=USR3(0):COZ=COZ+2:T3X=T3X-2:BQZ=&H656B:RWZ=RWZ+6
3880 IFT3X-T5X<=0THEN3890ELSEGOSUB3540:AZ=USR3(0):COZ=COZ+1:T3X=T3X-1:GOTO3880
3890 RWZ=RWZ-6:BQZ=&H6552:GOSUB3540:AZ=USR3(0):RETURN
3900 '-----Triplet Processing
3910 T2X=LEN(CT#):T3X=0:T5X=VAL("&H"+RIGHT$(CT#,1))-VAL(RIGHT$(PS#,1)):MXZ=0:MNZ=199
3920 NTX=DAZ(T1X):GOSUB3560
3930 IFTWX<MNZTHENMNZ=TWX
3940 T3X=T3X+VAL("&H"+MID$(CT#,T2X,1))
3950 IFT1X<>PZTHEN3970
3960 T3X=T3X-VAL(MID$(PS#,T2X,1)):COZ=LEZ-T3X:YZ=COZ:GOTO3980
3970 T1X=T1X-1:T2X=T2X-1:GOTO3920
3980 RWZ=MNZ-8:IFRWZ<85ANDRWZ>52THENRWZ=52
3990 GOSUB3540:BQZ=&H6576:AZ=USR3(0):COZ=COZ+1:T3X=T3X-1:BQZ=&H656B
4000 IFT3X-T5X<=0THEN4010ELSEGOSUB3540:AZ=USR3(0):COZ=COZ+1:T3X=T3X-1:GOTO4000
4010 BQZ=&H6580:GOSUB3540:AZ=USR3(0)
4020 COZ=(COZ+YZ)\2+1:BQZ=&H658A:RWZ=RWZ-6:GOSUB3540:AZ=USR3(0):RETURN
4030 '-----Search Clef
4040 OBZ=2*(PRZ-1):OAZ=VARPTR(DAZ(1)):AZ=USR5(0):OBZ=OBZ/2+1
4050 IFDAZ(OBZ)=1THENK$="t"ELSEK$="b"
4060 KYZ(1)=DAZ(OBZ):RETURN
4070 '-----Search Key_sign.

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4080 OBZ=PRZ
4090 OBZ=2*(OBZ-1):OAZ=VARPTR(DAZ(1)):AZ=USR5(0):OBZ=OBZ/2+2
4100 IF(DAZ(OBZ)AND&HE0)\32<>0OR((DAZ(OBZ)AND3)<>2)THENOBZ=OBZ-3:GOTO4090
4110 NTZ=DAZ(OBZ):YZ=(NTZAND12)\4
4120 IFYZ=3THENKS$="n":GOTO4150
4130 NZ=(NTZAND&H700)\(2^8):KS$=STR$(NZ)
4140 IFYZ=1THENKS$=KS$+"f"ELSEKS$=KS$+"s"
4150 KYZ(2)=DAZ(OBZ):RETURN
4160 '-----Search Time_sign.
4170 OBZ=PRZ
4180 OBZ=2*(OBZ-1):OAZ=VARPTR(DAZ(1)):AZ=USR5(0):OBZ=OBZ/2+3
4190 IF(DAZ(OBZ)AND&HE0)\32<>0OR((DAZ(OBZ)AND3)<>3)THENOBZ=OBZ-3:GOTO4180
4200 NTZ=DAZ(OBZ):XZ=(NTZAND&HF000)\(2^12):YZ=(NTZAND&HF00)\(2^8):BL=XZ/YZ
4210 T$=MID$(TA$,XZ,1)+"/"+MID$(TA$,YZ,1)
4220 KYZ(3)=DAZ(OBZ):RETURN
4230 '-----Command Token
4240 NUZ=0:SX$="":IFCM$=""THENRETURN
4250 IZ=1:XZ=ASC(MID$(CM$,IZ,1)):IFXZ<48ORXZ>57THEN4300ELSE4260
4260 XZ=ASC(MID$(CM$,IZ,1)):IFXZ<48ORXZ>57THEN4290
4270 SX$=SX$+MID$(CM$,IZ,1)
4280 IZ=IZ+1:IFIZ>LEN(CM$)THEN4290ELSE4260
4290 NUZ=VAL(SX$):CM$=RIGHT$(CM$,LEN(CM$)-IZ+1):RETURN
4300 XZ=ASC(MID$(CM$,IZ,1)):IFXZ>47ANDXZ<58THEN4330
4310 SX$=SX$+MID$(CM$,IZ,1)
4320 IZ=IZ+1:IFIZ>LEN(CM$)THEN4330ELSE4300
4330 NUZ=VAL(SX$):CM$=RIGHT$(CM$,LEN(CM$)-IZ+1):RETURN

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## 8. โปรแกรมย่อยภาษาเครื่อง

\*\*\*\* Z-80 ASSEMBLY LIST \*\*\*\* USR0 PAGE= 0

ADRS	OBJECT	OP	OPRAND	COMMENT
EE50	3E41	LD	A,41H	
EE52	D3EF	OUT	(EFH),A	
EE54	210000	LD	HL,0000H	
EE57	3E00	LD	A,00H	
EE59	36AA	LD	(HL),AAH	
EE5B	23	INC	HL	
EE5C	3D	DEC	A	
EE5D	C259EE	JP	NZ,EE59H	
EE60	3E01	LD	A,01H	
EE62	D3EF	OUT	(EFH),A	
EE64	C9	RET		* RETURN *

\*\*\*\* Z-80 ASSEMBLY LIST \*\*\*\* USR2 PAGE= 0

ADRS	OBJECT	OP	OPRAND	COMMENT
EED0	3E41	LD	A,41H	
EED2	D3EF	OUT	(EFH),A	
EED4	210080	LD	HL,8000H	
EED7	3600	LD	(HL),00H	
EED9	110180	LD	DE,8001H	
EEDC	01002D	LD	BC,2D00H	
EEDF	EDB0	LDIR		
EEE1	3E01	LD	A,01H	
EEE3	D3EF	OUT	(EFH),A	
EEE5	C9	RET		* RETURN *

\*\*\*\* Z-80 ASSEMBLY LIST \*\*\*\* USR1 PAGE= 0

ADRS	OBJECT	OP	OPRAND	COMMENT
EE70	3E41	LD	A,41H	
EE72	D3EF	OUT	(EFH),A	
EE74	CDASEE	CALL	EEA5H	
EE77	3E71	LD	A,71H	
EE79	D9	EXX		
EE7A	015000	LD	BC,0050H	
EE7D	ED42	SBC	HL,BC	
EE7F	3600	LD	(HL),00H	
EE81	3D	DEC	A	
EE82	C27DEE	JP	NZ,EE7DH	
EE85	3E05	LD	A,05H	
EE87	210F93	LD	HL,930FH	
EE8A	01E001	LD	BC,01E0H	
EE8D	36AA	LD	(HL),AAH	
EE8F	09	ADD	HL,BC	
EE90	3D	DEC	A	
EE91	C28DEE	JP	NZ,EE8DH	
EE94	3E00	LD	A,00H	
EE96	3D	DEC	A	
EE97	CAA0EE	JP	Z,EEA0H	
EE9A	CDASEE	CALL	EEA5H	
EE9D	C396EE	JP	EE96H	
EEA0	3E01	LD	A,01H	
EEA2	D3EF	OUT	(EFH),A	
EEA4	C9	RET		* RETURN *
EEA5	F5	PUSH	AF	
EEA6	3E71	LD	A,71H	
EEA8	2100B5	LD	HL,8500H	
EEAB	E5	PUSH	HL	
EEAC	014F00	LD	BC,004FH	
EEAF	54	LD	D,H	
EEB0	5D	LD	E,L	
EEB1	23	INC	HL	
EEB2	EDB0	LDIR		
EEB4	2B	DEC	HL	
EEB5	D9	EXX		
EEB6	015000	LD	BC,0050H	
EEB9	E1	POP	HL	
EEBA	09	ADD	HL,BC	
EEBB	3D	DEC	A	
EEBC	C2ABEE	JP	NZ,EEABH	
EEBF	F1	POP	AF	
EEC0	C9	RET		* RETURN *

\*\*\*\* Z-80 ASSEMBLY LIST \*\*\*\* USR3 PAGE= 0

ADRS	OBJECT	OP	OPRAND	COMMENT
EF00	2AB8BC	LD	HL, (BCB8H)	
EF03	ED58BD8C	LD	DE, (BCBDH)	
EF07	46	LD	B, (HL)	
EF08	23	INC	HL	
EF09	4E	LD	C, (HL)	
EF0A	3E41	LD	A, 41H	
EF0C	D3EF	OUT	(EFH), A	
EF0E	23	INC	HL	
EF0F	D5	PUSH	DE	
EF10	C5	PUSH	BC	
EF11	1A	LD	A, (DE)	
EF12	B6	OR	(HL)	
EF13	12	LD	(DE), A	
EF14	23	INC	HL	
EF15	13	INC	DE	
EF16	10F9	DJNZ	*-5	*-5=EF11H
EF18	00	NOP		
EF19	00	NOP		
EF1A	C1	POP	BC	
EF1B	0D	DEC	C	
EF1C	280D	JR	Z, *+15	*+15=EF2BH
EF1E	00	NOP		
EF1F	D1	POP	DE	
EF20	C5	PUSH	BC	
EF21	EB	EX	DE, HL	
EF22	015000	LD	BC, 0050H	
EF25	09	ADD	HL, BC	
EF26	EB	EX	DE, HL	
EF27	C1	POP	BC	
EF28	18E5	JR	*-25	*-25=EF0FH
EF2A	00	NOP		
EF2B	D1	POP	DE	
EF2C	3E01	LD	A, 01H	
EF2E	D3EF	OUT	(EFH), A	
EF30	C9	RET		* RETURN *



\*\*\*\* Z-80 ASSEMBLY LIST \*\*\*\* **USR4** PAGE= 0

ADRS	OBJECT	OP	OPRAND	COMMENT
F290	3E41	LD	A,41H	
F292	D3EF	OUT	(EFH),A	
F294	210080	LD	HL,8000H	
F297	3600	LD	(HL),00H	
F299	110180	LD	DE,8001H	
F29C	010040	LD	BC,4000H	
F29F	EDB0	LDIR		
F2A1	3E01	LD	A,01H	
F2A3	D3EF	OUT	(EFH),A	
F2A5	C9	RET		* RETURN *

\*\*\*\* Z-80 ASSEMBLY LIST \*\*\*\* **USR5** PAGE= 0

ADRS	OBJECT	OP	OPRAND	COMMENT
F2B0	2AC2BC	LD	HL,(BCC2H)	
F2B3	ED4BC7BC	LD	BC,(BCC7H)	
F2B7	09	ADD	HL,BC	
F2B8	7E	LD	A,(HL)	
F2B9	FE01	CP	01H	
F2BB	CACAF2	JP	Z,F2CAH	
F2BE	FE05	CP	05H	
F2C0	CACAF2	JP	Z,F2CAH	
F2C3	2B	DEC	HL	
F2C4	0B	DEC	BC	
F2C5	2B	DEC	HL	
F2C6	0B	DEC	BC	
F2C7	C3B8F2	JP	F2B8H	
F2CA	23	INC	HL	
F2CB	7E	LD	A,(HL)	
F2CC	FE00	CP	00H	
F2CE	2B	DEC	HL	
F2CF	C2C3F2	JP	NZ,F2C3H	
F2D2	ED43C7BC	LD	(BCC7H),BC	
F2D6	C9	RET		* RETURN *

## ภาคผนวก ค

## สรุปคำสั่ง

## ประเภท 1 คำสั่งแสดงข้อมูลบนจอภาพ

รูปแบบ	คำอธิบาย
LIST m, n	เขียนโน้ตดนตรีบนจอภาพ (หัวข้อ 3.3.1.1.1)
FILES	แสดงชื่อเพลงในจานบันทึก (หัวข้อ 3.3.1.1.2)
TITLE	แสดง แก๊โซรายการกำกับเพลงบนจอภาพ (หัวข้อ 3.3.1.1.1.3)

## ประเภท 2 คำสั่งนำเข้าหรือส่งออกข้อมูลในหน่วยความจำสำรอง

รูปแบบ	คำอธิบาย
SAVE "name"	เก็บข้อมูลจากหน่วยความจำเข้าสู่จานบันทึก (หัวข้อ 3.3.1.1.2.1)
LOAD "neme"	บรรจุข้อมูลจากจานบันทึกเข้าสู่หน่วยความจำ (หัวข้อ 3.3.1.1.2.2)

## ประเภท 3 คำสั่งปรับปรุงข้อมูลเชิงกลุ่ม

รูปแบบ	คำอธิบาย
NEW	เริ่มต้นระบบงานใหม่ (หัวข้อ 3.3.1.1.3.1)
COPY m, n, TO r	ลอกข้อมูลโน้ตดนตรีไปแทรกต่อท้ายห้อง (หัวข้อ 3.3.1.1.3.2)

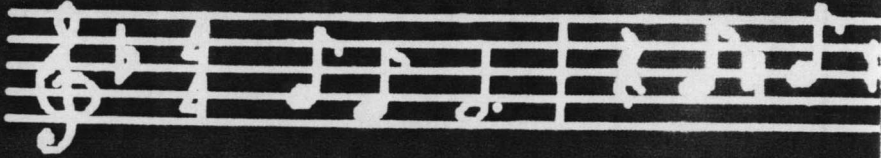
รูปแบบ	คำอธิบาย
DELETE m, n	ตัดทอนข้อมูลโน้ตดนตรีออกเป็นจำนวนห้อง (หัวข้อ 3.3.1.1.3.3)
TRANSPOSE	เปลี่ยนบันไดเสียงของเพลง (หัวข้อ 3.3.1.1.3.4)
MEDLEY	เชื่อมต่อเพลง (หัวข้อ 3.3.1.1.3.5)

ประเภท 4 คำสั่งปรับปรุงข้อมูลแบบโต้ตอบ

รูปแบบ	คำอธิบาย
EDIT	ปรับปรุงข้อมูลแบบโต้ตอบทีละ 1 หน่วยข้อมูล (หัวข้อ 3.3.1.1.4)

ภาคผนวก ง.


แสดงตัวอย่าง ผลการทำงานของระบบงานเขียนโน้ตดนตรี



bar count = 2

A musical staff with a treble clef and a 4/4 time signature. The notation consists of two measures. The first measure contains a quarter note on G4, a quarter note on A4, and a quarter note on B4. The second measure contains a quarter note on C5, a quarter note on B4, and a quarter note on A4.

ready!



bar count = 3

A musical staff with a treble clef and a 4/4 time signature. The notation consists of three measures. The first measure contains a quarter note on G4, a quarter note on A4, and a quarter note on B4. The second measure contains a quarter note on C5, a quarter note on B4, and a quarter note on A4. The third measure contains a quarter note on G4, a quarter note on A4, and a quarter note on B4. There are slurs over the first two notes of the first measure and the last two notes of the second measure.






bar count = 2

Duration ↑

Interval (1-7) T to (3,5) Int(3) Accidental (F, G, B)



break at bar 3  
rest:



bar count = 4

bar count = 2

A musical staff on a black background. The staff is in treble clef and 4/4 time. It contains two measures. The first measure has a whole note G4. The second measure has a quarter note G4, a quarter note A4, a quarter note B4, and a quarter note C5. There are some faint markings above the staff in the second measure.

break at bar 1  
ready!

bar count = 2

A musical staff on a black background. The staff is in treble clef and 4/4 time. It contains two measures. The first measure has a quarter note G4, a quarter note A4, a quarter note B4, and a quarter note C5. The second measure has a quarter note G4, a quarter note A4, a quarter note B4, and a quarter note C5. There is a small square symbol below the first measure.

ready!

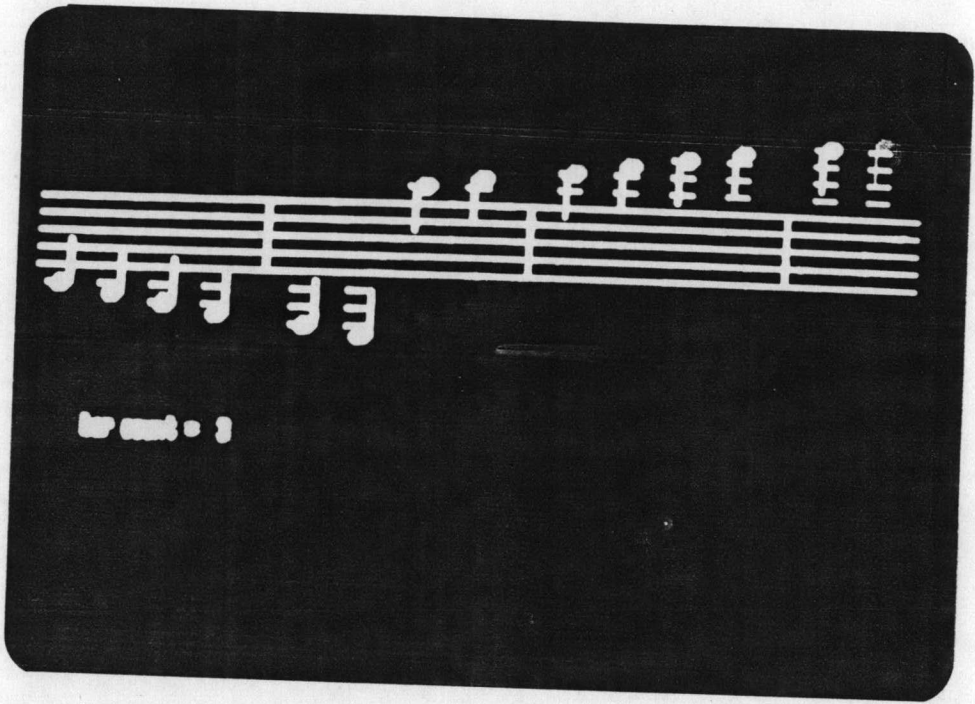
for count = 3



for count = 2

Section

MP3-7 To G.D. 2000 Available F.S.D





## ประวัติผู้เขียน

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วิศวกรรมคอมพิวเตอร์ ในปี พ.ศ. ๒๕๒๔

