

EMSTOT  
PDP-15  
KLAUS APPEL  
MATS S ANDERSSON  
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MACRO-15 PROGRAM CALLED FROM FORTRAN  
PURPOSE:

TO WRITE MAGNETIC TAPES WITH EMS INFORMATION  
WHICH CAN BE PLAYED EITHER ON EMS' OWN TAPE TRANSPORTS  
(A1-FORMAT) OR THROUGH PDP-15 (A1 OR A2 FORMAT)  
USE THE SUBROUTINE WREMA1 TO WRITE A1-TAPE (UNBLOCKED)  
AND THE SUBROUTINE WREMA2 TO WRITE A2-TAPE (BLOCKED)  
EMSTOT PERMITS PROGRAM CONTROL OF ALL ADDRESSABLE  
FUNCTIONS IN EMS

USE:

- 1 THE PROGRAM IS INITIALIZED BY  
CALL BAND (LUN) WHERE LUN (7 OR 10)  
IS THE UNIT ON WHICH THE INFORMATION  
IS WRITTEN  
THE WHOLE STUDIO IS CLEARED AND A RECORD  
CONTAINING 5 SECONDS OF SILENCE IS OUTPUT
- 2 EACH FOLLOWING RECORD ON THE TAPE  
IS MADE WITH AN ARBITRARY NUMBER OF CALLS  
TO THE SUBROUTINES  
TONGEN, TONGQ, FILTER, FILTQ, AMPL, AMPLQ, KOPPLA, KOPPLU AND EKOTID  
THE RECORD IS OUTPUT WITH AN ENDING CALL TO THE  
ROUTINE TID  
IMMEDIATLY BEFORE 'CALL TID' THE ROUTINE SETSU  
CAN BE CALLED
- 3 THE PROGRAM IS CLOSED WITH  
CALL SPELSU WHICH CLEARS THE STUDIO AND WRITES  
ONE RECORD WITH 5 SECONDS OF SILENCE  
THE GENERATION OF TAPES CAN CONTINUE  
THE RECORD NUMBER IS CLEARED ONLY IF 'BAND'  
IS CALLED AGAIN

NOTE

THE SOUND GENERATOR INTENSITIES ARE CLEARED  
EACH TIME A RECORD HAS BEEN WRITTEN, WHILE ALL  
THE OTHER PARAMETERS ARE UNCHANGED  
UNTIL THEY ARE AFFECTED BY SOME SUBROUTINE CALL.  
NORMALLY THE RECORD CONTAINS ONLY THE CHANGES  
FROM LATEST RECORD AND ALL THE SOUND GENERATORS  
INTENSITY EXCEPT IN THE FOLLOWING CASES

- A RECORDNUMBER EQUALS 1
- B RECORDNUMBER EQUALS 20, 40, 60, 80, , , ,
- C THE NUMBER OF CHANGES CAUSES A RECORD  
LONGER THAN A RECORD CONTAINING  
ALL THE EMS PARAMETERS

NOTE

WHEN LISTENING FROM A POINT OTHER THAN THE  
BEGINNING OF THE PIECE ONE MUST BEGIN WITH  
A RECORD WHOSE NUMBER IS 20, 40, 60, 80, , , ,  
TO BE SURE THAT ALL EMS ADDRESSES GET THEIR  
RIGHT VALUE  
IN THE FOLLOWING DISCUSSION ALL PARAMETERS ARE INTEGERS

CALL TONGEN (NR, IFREQ, IWAVE, INTENS)

NR SOUND GENERATOR NUMBER (1-24)  
IFREQ FREQUENCY (0-15999)  
IWAVE WAVEFORM (0-7)  
INTENS AMPLITUDE IN DB (0-120)

CALL TONGQ (NR,IFREQ,IWAVE,INTENS)  
NR SOUND GENERATOR NUMBER (1-24)  
IFREQ FREQUENCY (0-15999)  
IWAVE WAVEFORM (0-7)  
INTENS AMPLITUDE IN QUARTER OF DB (0-480)

CALL FILTER (NR,ICH,INTENS)  
NR FILTER NUMBER (1-2)  
ICH CHANNEL NUMBER (1-28)  
INTENS AMPLITUDE IN DB (0-120)

CALL FILTQ (NR,ICH,INTENS)  
NR FILTER NUMBER (1-2)  
ICH CHANNEL NUMBER (1-28)  
INTENS AMPLITUDE IN QUARTER OF DB (0-480)

CALL AMPL (NR,INTENS)  
NR AMPLIFIER NUMBER (0-21) ACCORDING TO TABLE 1  
INTENS AMPLITUDE IN DB (0-120)

CALL AMPLQ (NR,INTENS)  
NR AMPLIFIER NUMBER (0-21) ACCORDING TO TABLE 1  
INTENS AMPLITUDE IN QUARTER OF DB (0-480)

CALL KOPPLA (FROM,TO)  
SET CONNECTION BIT BETWEEN 'FROM' AND 'TO'

CALL KOPPLU (FROM,TO)  
CLEAR CONNECTION BIT BETWEEN 'FROM' AND 'TO'

FROM AND TO CAN TAKE VALUES FROM TABLE 1 AND 2 BELOW

CALL EKOTID (NR,K)  
NR REVERBATION UNIT NUMBER (1-2)  
K REVERBATION TIME (1-15) APPROXIMATELY  $K * 0.35$  SEC.

CALL SETSU  
MAY BE CALLED IMMEDIATELY BEFORE TID  
THE RECORD WRITTEN AT NEXT 'CALL TID' CONTAINS  
A STOP MARK INSTEAD OF JUST AN END OF RECORD MARK  
THIS CONDITION WILL LAST ONLY FOR ONE RECORD

CALL NOLLST  
THIS ROUTINE CLEARS EMSTOT'S INTERNAL TABLES  
CONTAINING THE PRESENT STATE OF EMS,  
I.E., ALL PARAMETER VALUES ARE SET TO ZERO  
AND ALL CONNECTIONS ARE CLEARED

CALL TID (MS)  
MS RECORDTIME IN MILLISECONDS  
TID IS THE LAST SUBROUTINE CALLED TO PRODUCE A RECORD.  
THE SAMPLED INFORMATION FROM ALL SUBROUTINE

CALLS SINCE LAST 'CALL TID' AND ALL UNCHANGED INFORMATION SINCE EARLIER RECORDS (EXCEPT SOUND GENERATORS INTENSITY) IS WRITTEN ON TAPE WITH TIME MS AND RECORDNUMBER ONE MORE THAN LATEST RECORD (THE RECORD GENERATED BY 'CALL BAND' HAS NUMBER 1) SINCE ALL THE SOUND GENERATORS INTENSITIES ARE CLEARED A MS MILLISECONDS PAUSE IS GENERATED IF ANOTHER 'CALL TID' IS MADE IMMEDIATLY (IF NOISE GENERATOR IS USED ITS AMPLITUDE HAS TO BE SET TO ZERO BY CALL AMPL (2,0) )

CALL SPELSU (NREC,ISEC,MSEC)  
 NREC NUMBER OF RECORDS GENERATED IN THIS COMPOSITION  
 ISEC SECOND PART OF MUSICTIME  
 MSEC MILLISECOND PART OF MUSICTIME  
 THE VALUES OF NREC,ISEC AND MSEC ARE CALCULATED AND SET BY THE PROGRAM  
 THIS SUBROUTINE ENDS EACH COMPOSITION AND THE RECORD GENERATED (5 SECONDS OF SILENCE) CONTAINS A STOP MARK.

EMSTOT WILL CHECK ALL PARAMETERS AND GIVE ERROR MESSAGES ON LISTING UNIT -12  
 THE ERROR MESSAGE WILL BE OF FORM

\*\*\*\*\*ERROR CALLED FROM XXXXX  
 \*\*ILLEGAL YYYYY AC= ZZZZZ RN=UUUUU SEC=VVVVV MS=WWWWW

XXXXX ADDRESS OF LATEST EMSTOT CALL  
 YYYYY ERROR TYPE MNEMONIC ACCORDING TO TABLE 4  
 ZZZZZZ ACCUMULATOR CONTENTS IN OCTAL.  
 IN ALL CASES BUT 'KOPPLA' AND 'KOPPLU'  
 THIS WILL BE THE ERRONEOUS PARAMETER VALUE  
 IN 'KOPPLA' AND 'KOPPLU' CASES THE LEFTMOST THREE FIGURES WILL BE THE OCTAL VALUE OF THE 'FROM' PARAMETER AND THE RIGHTMOST THREE FIGURES THE OCTAL VALUE OF THE 'TO' PARAMETER  
 UUUUU CURRENT RECORDNUMBER IN OCTAL  
 VVVVV CURRENT SECOND PART OF MUSICTIME IN OCTAL  
 WWWWW CURRENT MILLISECOND PART OF MUSICTIME IN OCTAL

IF ALL ENTRIES EXCEPT SETSU AND SPELSU ARE USED AS INTEGER FUNCTIONS, EMSTOT WILL RETURN AN ERROR CODE AS FUNCTION VALUE.  
 IF NO ERROR, VALUE WILL BE ZERO  
 OTHERWISE, A NEGATIVE VALUE ACCORDING TO TABLE 4

BY INCLUDING THE FOLLOWING INTEGER AND DATA DECLARATIONS IN THE CALLING PROGRAM,  
 THE AMPLIFIERS IN AMPL AND AMPLQ ROUTINES AND THE CONNECTION POINTS IN KOPPLA AND KOPPLU ROUTINES COULD BE SYMBOLIC NAMES.

C  
 C  
 C

INTEGER AND DATA DECLARATIONS FOR EMSTOT

INTEGER EKO1 , EKO2 , BRUS , BS1 , BS2 , BS3 , BS4 , RM1 , RM2 , RM3

INTEGER AM1,AM2,DG1,DG2,L1,L2,L3,L4,K1,K2  
 INTEGER K3,K4,TG3,TG6,TG9,TG12,TG15,TG18,TG19,TG20  
 INTEGER TG21,TG22,TG23,TG24,F1,F2,RM1A,RM1B,RM2A,RM2B  
 INTEGER AM1A,AM1B,AM2A,AM2B,L5,L6,L7,L8,VITT,ROSA  
 INTEGER TG22B,FRO

C  
C  
C

-----  
 DATA EKO1,EKO2,BRUS,BS1,BS2,BS3,BS4/0,1,2,3,4,5,6/  
 DATA RM1,RM2,RM3,AM1,AM2,DG1,DG2/7,8,9,10,11,12,13/  
 DATA L1,L2,L3,L4,K1,K2,K3/14,15,16,17,18,19,20/  
 DATA K4,TG3,TG6,TG9,TG12,TG15,TG18/21,22,23,24,25,26,27/  
 DATA TG19,TG20,TG21,TG22,TG23,TG24,F1/28,29,30,31,32,33,34/  
 DATA F2,RM1A,RM1B,RM2A,RM2B,AM1A,AM1B/35,36,37,38,39,40,41/  
 DATA AM2A,AM2B,L5,L6,L7,L8,VITT/42,43,44,45,46,47,48/  
 DATA ROSA,TG22B,FRO/49,50,51/

C  
C  
C

EXAMPLE

CALL KOPPLA (TG3,K1)  
 CALL AMPL (K1,100)

THESE TWO LINES WILL CONNECT SOUND GENERATORS  
 GROUP 1-3 TO CHANNEL 1 AND SET THE CHANNEL 1  
 OUTPUT AMPLITUDE TO 100 DB

TABLE 1

AMPLIFIER AND CONNECTION POINT NUMBERS

NUMBER    AMPLIFIER

0	EKO1	REVERBATION UNIT ONE
1	EKO2	REVERBATION UNIT TWO
2	BRUS	NOISE GENERATOR
3	BS1	TAPE RECORDER INPUT CHANNEL ONE
4	BS2	TAPE RECORDER INPUT CHANNEL TWO
5	BS3	TAPE RECORDER INPUT CHANNEL THREE
6	BS4	TAPE RECORDER INPUT CHANNEL FOUR
7	RM1	RING MODULATOR ONE
8	RM2	RING MODULATOR TWO
9	RM3	RING MODULATOR THREE
10	AM1	AMPLITUDE MODULATOR ONE
11	AM2	AMPLITUDE MODULATOR TWO
12	DG1	AMPLIFIER ONE
13	DG2	AMPLIFIER TWO
14	L1	POSITION ONE CHANNEL ONE
15	L2	POSITION ONE CHANNEL TWO
16	L3	POSITION ONE CHANNEL THREE
17	L4	POSITION ONE CHANNEL FOUR
18	K1	OUTPUT CHANNEL ONE
19	K2	OUTPUT CHANNEL TWO
20	K3	OUTPUT CHANNEL THREE

21 K4 OUTPUT CHANNEL FOUR

TABLE 2

CONNECTION POINT NUMBERS

NUMBER POINT

22	TG3	SOUND GENERATORS GROUP 1-3
23	TG6	SOUND GENERATORS GROUP 4-6
24	TG9	SOUND GENERATORS GROUP 7-9
25	TG12	SOUND GENERATORS GROUP 10-12
26	TG15	SOUND GENERATORS GROUP 13-15
27	TG18	SOUND GENERATORS GROUP 16-18
28	TG19	SOUND GENERATOR 19
29	TG20	SOUND GENERATOR 20
30	TG21	SOUND GENERATOR 21 (GROUP 19-21)
31	TG22	SOUND GENERATOR 22
32	TG23	SOUND GENERATOR 23
33	TG24	SOUND GENERATOR 24 (GROUP 22-24)
34	F1	FILTER NUMBER ONE
35	F2	FILTER NUMBER TWO
36	RM1A	RING MODULATOR ONE INPUT A
37	RM1B	RING MODULATOR ONE INPUT B
38	RM2A	RING MODULATOR TWO INPUT A
39	RM2B	RING MODULATOR TWO INPUT B
40	AM1A	AMPLITUDE MODULATOR ONE INPUT A
41	AM1B	AMPLITUDE MODULATOR ONE INPUT B
42	AM2A	AMPLITUDE MODULATOR TWO INPUT A
43	AM2B	AMPLITUDE MODULATOR TWO INPUT B
44	L5	OUTPUT TO TAPE RECORDER CHANNEL ONE
45	L6	OUTPUT TO TAPE RECORDER CHANNEL TWO
46	L7	OUTPUT TO TAPE RECORDER CHANNEL THREE
47	L8	OUTPUT TO TAPE RECORDER CHANNEL FOUR
48	VITT	SET NOISE COLOUR TO WHITE
49	RDSA	SET NOISE COLOUR TO PINK
50	TG22B	SOUND GENERATOR BUS OUTPUT
51	FRO	FREQUENCY SHIFTER

TABLE 3

LEGAL CONNECTIONS

FROM TO

TG3 K1  
K2  
K3  
K4  
L1  
TG6

TG6 F1  
F2  
RM1A  
RM1B  
RM2B

EK01  
EK02  
AM1B  
K1  
K2  
K3  
K4  
L1  
TG9

TG9 K1  
K2  
K3  
K4  
L1  
TG12

TG12 F1  
F2  
RM1A  
RM1B  
RM2B  
EK01  
EK02  
AM1B  
K1  
K2  
K3  
K4  
L1  
TG15

TG15 K1  
K2  
K3  
K3  
L1  
TG18

TG18 F1  
F2  
RM1B  
RM2B  
EK01  
EK02  
AM1B  
AM2B  
K1  
K2  
K3  
K4  
L1  
TG19

TG19 TG22B

TG20 FR0

TG19

TG21 K1  
K2  
K3  
K4  
L1  
RM1A  
TG19

TG22 RM2A  
TG22B

TG23 AM1A  
TG22B

TG24 F1  
F2  
RM1B  
RM2B  
EK01  
EK02  
AM1B  
AM2B  
K1  
K2  
K3  
K4  
L1  
AM2A  
TG22B

BRUS F1  
F2  
RM2B  
EK01  
AM2B  
K1  
K2  
K3  
K4  
L1  
ROSA  
VITT

F1 F2  
RM1A  
RM1B  
RM2B  
EK02  
AM1A  
AM2B  
DG1  
DG2  
K2  
K3  
K4

	L1
F2	F1 RM2B EK02 AM1B AM2A DG1 DG2 K2 K3 K4 L1
EK01	AM1B AM2B DG1 DG2 K1 K2 K3 K4 L1
EK02	AM1B AM2B DG1 DG2 K1 K2 K3 K4 L1
BS1	F1 F2 RM1B RM2B EK01 EK02 AM1B AM2B L5
BS2	F1 F2 RM1B RM2B EK01 EK02 AM1B AM2B L6
BS3	F1 F2 RM1B



RM2B  
EK01  
EK02  
AM1B  
AM2B  
L7

864

F1  
F2  
RM1B  
RM2B  
EK01  
EK02  
AM1B  
AM2B  
L8

RM1

F1  
F2  
EK02  
AM1A  
AM2B  
DG1  
DG2  
K1  
K2  
K3  
K4  
L1

RM2

F1  
F2  
EK02  
AM1B  
AM2A  
DG1  
DG2  
K1  
K2  
K3  
K4  
L1

RM3

F1  
F2  
EK02  
AM2B  
DG1  
DG2  
K1  
K2  
K3  
K4  
L1

AM1

K1  
K2

	K3
	K4
	L1
AM2	K1
	K2
	K3
	K4
	L1
DG1	F1
	F2
	RM1B
	RM2B
	EK02
	AM1B
	AM2B
DG2	F1
	F2
	RM1B
	RM2B
	EK02
	AM1B
	AM2B

TABLE 4

ERROR CODES

MNEMONIC

-11	ILLEGAL LOGIC UNIT	LUN	
-21	ILLEGAL SOUND GENERATOR NUMBER	SG	
-22	ILLEGAL SOUND GENERATOR FREQUENCY	FREQ	
-23	ILLEGAL SOUND GENERATOR WAVEFORM	VAGF	
-24	ILLEGAL SOUND GENERATOR INTENSITY	INTEN	
-31	ILLEGAL FILTER NUMBER	FLNR	
-32	ILLEGAL FILTER CHANNEL	CHNR	
-33	ILLEGAL FILTER INTENSITY	FAMP	
-41	ILLEGAL AMPLIFIER NUMBER	AMPNR	
-42	ILLEGAL AMPLIFIER INTENSITY	AMP	
-51	ILLEGAL CONNECTION (DISCONNECTION)	KOPPL	
-61	ILLEGAL REVERBERATION UNIT NUMBER		EKONR
-62	ILLEGAL REVERBERATION TIME	EKOTD	
-71	ILLEGAL TIME	TID	