

EUR 5115 e

COMMISSION OF THE EUROPEAN COMMUNITIES

MOSIF

**A DATA ACQUISITION SYSTEM FOR THE
STUDY OF SOLIDS MOTION IN FLUIDIZED BEDS**

by

J. EDER

1974



**Joint Nuclear Research Centre
Ispra Establishment - Italy**

Electronics Division

LEGAL NOTICE

This document was prepared under the sponsorship of the Commission of the European Communities.

Neither the Commission of the European Communities, its contractors nor any person acting on their behalf:

make any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, or that the use of any information, apparatus, method or process disclosed in this document may not infringe privately owned rights; or

assume any liability with respect to the use of, or for damages resulting from the use of any information, apparatus, method or process disclosed in this document.

This report is on sale at the addresses listed on cover page 4

at the price of B. Fr. 60.—

**Commission of the
European Communities**
D.G. XIII - C.I.D.
29, rue Aldringen
L u x e m b o u r g
March 1974

This document was reproduced on the basis of the best available copy.

EUR 5115 e

MOSIF — A DATA ACQUISITION SYSTEM FOR THE STUDY OF SOLIDS MOTION IN FLUIDIZED BEDS by J. EDER

Commission of the European Communities
Joint Nuclear Research Centre — Ispra Establishment (Italy)
Electronics Division
Luxembourg, March 1974 — 46 Pages — 7 Figures — B.Fr. 60.-

The manufacture of coated particles can be aided by a measuring technique for the study of particle motion in fluidized beds. The count rate of a radioactively marked particle traced by a fixed detector is used as an indicator for the distance of the particle from the detector. With the help of a suitable calibration curve for the count rate distance function, the motion path versus time can be described. The detector pulses are fed to the MOSIF-system (Motion Of Solids In Fluidized beds), where they are counted in a multiscaler mode into consecutive memory channels. The counting time for each channel gives the time scale. MOSIF is implemented

EUR 5115 e

MOSIF — A DATA ACQUISITION SYSTEM FOR THE STUDY OF SOLIDS MOTION IN FLUIDIZED BEDS by J. EDER

Commission of the European Communities
Joint Nuclear Research Centre — Ispra Establishment (Italy)
Electronics Division
Luxembourg, March 1974 — 46 Pages — 7 Figures — B.Fr. 60.-

The manufacture of coated particles can be aided by a measuring technique for the study of particle motion in fluidized beds. The count rate of a radioactively marked particle traced by a fixed detector is used as an indicator for the distance of the particle from the detector. With the help of a suitable calibration curve for the count rate distance function, the motion path versus time can be described. The detector pulses are fed to the MOSIF-system (Motion Of Solids In Fluidized beds), where they are counted in a multiscaler mode into consecutive memory channels. The counting time for each channel gives the time scale. MOSIF is implemented

EUR 5115 e

MOSIF — A DATA ACQUISITION SYSTEM FOR THE STUDY OF SOLIDS MOTION IN FLUIDIZED BEDS by J. EDER

Commission of the European Communities
Joint Nuclear Research Centre — Ispra Establishment (Italy)
Electronics Division
Luxembourg, March 1974 — 46 Pages — 7 Figures — B.Fr. 60.-

The manufacture of coated particles can be aided by a measuring technique for the study of particle motion in fluidized beds. The count rate of a radioactively marked particle traced by a fixed detector is used as an indicator for the distance of the particle from the detector. With the help of a suitable calibration curve for the count rate distance function, the motion path versus time can be described. The detector pulses are fed to the MOSIF-system (Motion Of Solids In Fluidized beds), where they are counted in a multiscaler mode into consecutive memory channels. The counting time for each channel gives the time scale. MOSIF is implemented

on a SPC-16 minicomputer with a 4 K-16 bit word memory. The software package DAVIS provides the operator with an extensive set of commands for Data Acquisition and Visualisation. It allows the user to generate the empirically measured calibration curve in the form of a stored function and provides a code for the conversion count rate/distance.

on a SPC-16 minicomputer with a 4 K-16 bit word memory. The software package DAVIS provides the operator with an extensive set of commands for Data Acquisition and Visualisation. It allows the user to generate the empirically measured calibration curve in the form of a stored function and provides a code for the conversion count rate/distance.

on a SPC-16 minicomputer with a 4 K-16 bit word memory. The software package DAVIS provides the operator with an extensive set of commands for Data Acquisition and Visualisation. It allows the user to generate the empirically measured calibration curve in the form of a stored function and provides a code for the conversion count rate/distance.

EUR 5115 e

COMMISSION OF THE EUROPEAN COMMUNITIES

MOSIF

**A DATA ACQUISITION SYSTEM FOR THE
STUDY OF SOLIDS MOTION IN FLUIDIZED BEDS**

by

J. EDER

1974



**Joint Nuclear Research Centre
Ispra Establishment - Italy**

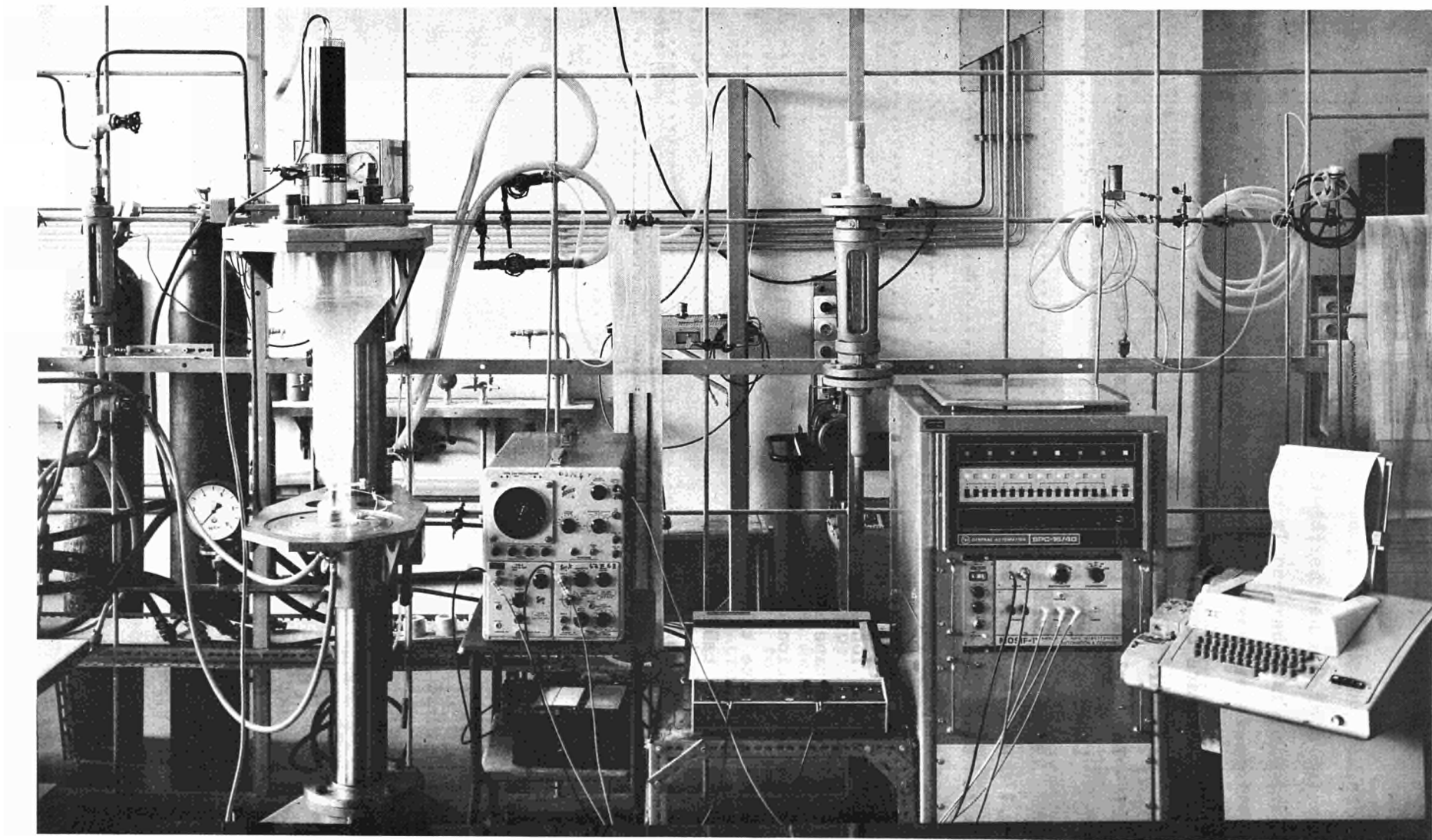
Electronics Division

SUMMARY

The manufacture of coated particles can be aided by a measuring technique for the study of particle motion in fluidized beds. The count rate of a radioactively marked particle traced by a fixed detector is used as an indicator for the distance of the particle from the detector. With the help of a suitable calibration curve for the count rate distance function, the motion path versus time can be described. The detector pulses are fed to the MOSIF-system (Motion Of Solids In Fluidized beds), where they are counted in a multiscaler mode into consecutive memory channels. The counting time for each channel gives the time scale. MOSIF is implemented on a SPC-16 minicomputer with a 4 K-16 bit word memory. The software package DAVIS provides the operator with an extensive set of commands for Data Acquisition and Visualisation. It allows the user to generate the empirically measured calibration curve in the form of a stored function and provides a code for the conversion count rate/distance.

KEYWORDS

MOTION
FLUIDIZED BED
COATED FUEL PARTICLES
MEASURING METHODS
RADIOISOTOPES
RADIATION DETECTORS
COMPUTER CALCULATIONS
CALIBRATION STANDARDS



CONTENT

	Page
1. Hardware configuration	5
2. Software package	6
2.1 Internal data formats and units conversion	8
3. Loading DAVIS	8
4. Executing DAVIS	10
4.1 Data Acquisition	11
4.2 Data Visualization	12
4.2.1 Display on Oscilloscope	13
4.2.2 Plotting	14
4.3 Tabulation	14
4.4. Paper tape output	14
4.5 Generation of the conversion function	15
4.5.1 Generate table	15
4.5.2 Verify table	16
4.5.3 Punch table	16
5. Summary of DAVIS control commands	17
6. Listing	20

1. HARDWARE CONFIGURATION

The basic configuration of MOSIF is shown in Fig. 1. For quantitative measurements of solids circulation in a fluidized bed a 3 inch NaI crystal with photo multiplier detects the radiation of one radioactively marked particle moving with the bed.^{1,2)} The detector pulses are preamplified and fed via discriminator and pulse shaper to a 16 bit counter. A quartz clock produces the counting intervals which may be selected manually in the following steps:

5 ms
10 ms
20 ms
50 ms
100 ms

Independently of the counter, the pulse rate delivered by the photo multiplier can be checked by a rate meter and an appropriate recorder or indicator. For checking of the digital part a test generator is built in which feeds a precise 400 000 c/s pulse rate to the counter.

For the dialogue with the computer a number of control signals are provided. After start of the data-acquisition the computer checks the signals READY and OVERRUN. READY becomes true as soon as the counter has finished its counting interval and the contents have been transferred to the latch. If the computer is ready for data input, it has to respond sending a READ request to the interface. This request however must arrive within a certain time limit (< counting interval), otherwise the next transfer would destroy the data not yet taken by the computer and counter values will be lost. If this should occur, the OVERRUN flag is set and can be sensed by the computer. Since the counting interval influences the result of measurements, a digital readout of the selector switch position is foreseen. The input to the computer takes place on a READ request which is accompanied by the appropriate address word. A more detailed circuit diagram of the whole interface is given in Fig. 2.

On the output side an interface with two buffered digital to analog converters (DAC) and a pen lift signal is provided. Each DAC converts a 12 bit binary number into an analog output voltage in the range of 10 V. The computer output bus contains simultaneously with the data word also the DAC address or in the case of Z-output, the pen up/down information. The addresses are decoded and enable either the

X-axis DAC or the Y-axis DAC. The analog outputs are used to generate displays on a plotter or an oscilloscope. The different display velocities for plotter and scope are produced by the program. Additional to X, Y and Z outputs (in the case of scope-display, the Z output may serve as blanking signal) a trigger signal is available for Y,t displays on scopes. Control commands are read to the computer via a standard ASR-33 teletype. The same teletype serves also for putting out the results in form of formatted lists or punched paper tape.

2. SOFTWARE PACKAGE

The limited core capacity of a minicomputer forces the programmer to find an acceptable compromise between a comfortable control program with a powerful set of control commands which might simplify the operators life, and the remaining core space for the data acquisition. In the case of MOSIF with only 4K memory capacity, a minimum buffer length of 3K words seemed to be indispensable since coating times of 300-400 seconds should be followed with counting intervals of 100 ms. Thus, only a minimum of 1K remains available for the control program DAVIS. Three tasks are to be handled by the control program.

- 1 Data acquisition
- 2 Execution of control commands
- 3 Display and visualization of data

The flow sheet Fig. 4 shows how these tasks are scanned in a loop, so that they seem to the operator to occur simultaneously.

Data-acquisition and display is controlled by switches on the computer console. Operating parameters together with control commands are typed in via teletype. DAVIS understands the following control commands:

B	BEGIN	-	address of data-acquisition
E	END	-	address of data-acquisition
F	FIRST	-	address to be displayed
L	LAST	-	address to be displayed
S	STEP	-	address increment
H	HEIGHT	-	scale factor
P	PUNCH		
T	TABLE		

G	GENERATE	-	conversion function
V	VERIFY	-	conversion function
Z	ZERO	-	buffer zone

A detailed explanation of all commands is given in chapter 4.

The total data buffer may be subdivided in zones defined by the pointers B and E for data acquisition and by the pointers F and L for display. All pointers may be chosen arbitrarily respecting the condition

$$0 \leq B \leq E \leq 3000$$

$$0 \leq F \leq L \leq 3000$$

Overlaying of acquisition and display zones is permitted, thus new data may be input into the buffer zone say from location 1000 to 2000 whilst simultaneously displaying data from the zone say from location 1500 to 3000.

A tabulated function is incorporated in DAVIS which allows to convert the stored values in other units. The original measured count rates are transformed into particle distance data as required by MOSIF. This conversion function is to be defined empirically rather than from a mathematical relation. To do so, the command G is used in the following way:

The count rate corresponding to a certain distance particle/detector is measured repetitively and averaged. The result is then inserted into the conversion table at the position (abscissa) given with the G-command.

Executing the G-command produces automatically the mean value from all values within the buffer sector defined by the B and E pointers. This buffer sector may be filled by the data acquisition procedure (CSW 1). If it is desired to have precise values rather than measured ones, the Z command can be applied to insert the desired values into the buffer sector limited by F and L pointers. If now F and L are chosen to coincide with B and E, the parameter associated with Z can be inserted into the conversion table. The G-command senses automatically the position of the counting interval (channel width) switch and stores its value in the memory for later use in the conversion routine. During generation of a conversion table the switch should therefore not be changed (see 4.5.1).

The switch position is also sensed during each data acquisition run. Consequently, the user needs not be concerned with scale factors due

to the selected channel width which is automatically taken into account by the conversion routine. The user is free to select the most suitable channel width for his measurement with the only restriction to use the same switch position during display.

Once the conversion function has been tabulated, it may be verified by command V, which types a list and/or punches a paper tape of the tabulated values.

2.1. Internal Data Formats and Units Conversion

The 16 bit counter which is used as input buffer has a counting range from 0 to 65.535 pulses or a maximum count rate of 655.350 pulses/sec at 100 ms channel width. With respect to time and core savings the internal arithmetic part has been programmed for one word length integers. Because of the sign bit the range of internal values is limited to + 32.767 maximum. For this reason the pulse values are divided by two before entering in arithmetic routines. This will result in a small loss of accuracy, however this loss can be disregarded if it is compared with the statistical nature of the signals. The factor of two is of course taken into account in all calculations, it appears only at the averaging mode by the G command. As a consequence, if instead of pulse counts the values introduced by the Z command are used for averaging, these values must be doubled the desired ones.

Some precautions are to be taken at the conversion of pulse counts into distances. The tabulated function must be monotonously increasing. Thus, all function values must be present in the table. Values lying between two adjacent table points are interpolated and the result is multiplied with a scale factor of 100. Actually the place for a 41-value table is reserved. The table size may however easily be increased or decreased with only a minimum programming effort. The same is valid for the buffer length.

3. LOADING DAVIS

DAVIS is written in CAP-16 assembler code and is supplied as paper tape in absolute PGS-format. The assembler listing can be found in the

appendix of this report. The program starts at location X'50'¹⁾ and needs X'2ED' = 749 locations of the core. The remaining core is available for the conversion table and the data buffer. For input output operations the following core locations may be of interest:

- X'33E' = first location of conversion table
- X'368' = first location of data buffer

DAVIS can be loaded with the GA - supplied PGS loader (GA-70001). The following procedure should be followed for a cold start (no program in memory).

LOAD PGS BOOTSTRAP LOADER (GA 70001)

- P.1 SET R/I SWITCH TO IDLE (DEWA)
- P.2 RESET ALL OTHER SWITCHES (UP)
- P.3 SELECT D-REGISTER, REGISTER SWITCHES 4 AND 2 DOWN
- P.4 ENTER X' 0800' INTO CONSOLE (CSW \neq 11 DOWN)
- P.5 PRESS ENTER
- P.6 SELECT P-REGISTER, P-SWITCH DOWN
- P.7 ENTER X' OFFG' INTO CONSOLE
- P.8 PRESS ENTER
- P.9 PRESS SYSTEMS RESET
- P.10 SET THE E/I SWITCH TO RUN (UP)
- P.11 PRESS STEP (RUN-LAMP MUST NOW BE ON)
- P.12 PLACE BOOTSTRAP LOADER INTO READER WITH THE FIRST DATA BYTE OVER THE STATION
- P.13 START READER

PROGRAM WILL NOW BE LOADED. AFTER TERMINATION PLACE THE DAVIS PGS TAPE INTO THE READER (GREEN TAPE)

- P.14 SET R/I SWITCH TO IDLE (DOWN)
- P.15 SELECT P-REGISTER, P-SWITCH DOWN
- P.16 ENTER X' 0800' INTO CONSOLE
- P.17 PRESS ENTER
- P.18 PRESS SYSTEMS RESET
- P.19 SET THE R/I SWITCH TO RUN (UP)
- P.20 PRESS STEP (RUN-LAMP MUST NOW BE ON)
- P.21 START READER

PROGRAM WILL NOW BE LOADED.

1) X'' means hexadecimal representation.

4. EXECUTING DAVIS

After DAVIS has been loaded into memory it can be executed at location X'50'. To do this, repeat steps P14 ÷ 20 of the loading procedure, however entering X'50' at step 16. DAVIS types a carriage return, and line feed and an asterisc, which means that it expects an input. At this time, the user may enter a control command to specify the function DAVIS is to perform. After each function is completed, control is returned to DAVIS to accept further input from the user. Each function may be called by a one character command followed by an equal sign and a numerical value of up to four digit length. A command is terminated by typing a CR. In the discussion of DAVIS control commands the following symbols are used:

Symbol	Denotation
nnnn	a decimal value of up to four digits
SP	blanc (space)
CR	Carriage return
LF	Line feed
CC	Control command
CSW	Console switch

All input data are decimal. Leading zeros may be omitted. Only the last four digits of a string are accepted. Therefore if an error is made in entering a value, the user should continue typing and enter four digits to represent the value correctly. If an error is made before the first digit has been typed, the control command can be cancelled by typing CR. If the user types an entry that DAVIS cannot recognize (that is a letter that is not a CC), DAVIS will respond with a CR, LF and *, and wait for further input. General form of a control command (characters typed by DAVIS are underlined):

* CC = n n n n CR LF
*
—

Examples:

- a) B = 0052CR valid command
- b) B = 52CR valid command, equivalent to a), leading zeros may be omitted
- c) B = 430052CR valid command, equivalent to a), only last four digits are considered
- d) M = 91CR invalid, M is not a CC, entry will be cancelled
- e) B = CR CC will be cancelled

DAVIS has the capability to type out the actual content of a control command. This can be initiated by typing a SP instead of n n n n

Example:

```
* CC = SP nnnn CR LF
*
```

Should an undesired function have been started, so the program can be stopped manually by pressing the CONSOLE INTERRUPT switch at the computer console. The program recovers automatically and responds with CR, LF and *.

4.1 Data Acquisition

DAVIS uses an internal buffer with 3000 locations of 16 bits each. The user may subdivide this buffer in as many zones as he desires by selecting the begin address and the end address of a data acquisition run. To set the pointers for begin and end, the following commands are provided

B = nnnn CR nnnn being the BEGIN ADDRESS

and

E = nnnn CR nnnn being the END ADDRESS

The following relation must be respected

$$0 \leq B \leq E \leq 3000$$

If B = E, only one value will be put in, or else E-B + 1 values will be put in since the E address is included in the input range.

The data acquisition is started setting CSW 0 in position ON (down).

The console display shows then the binary representation of the values

as they are put in. This display serves as a check that the data are really read in. DAVIS announces optically and acustically the termination of a data acquisition run. After a successfull termination the hexadecimal value

X'AAAA'

(a sequence of 1010...) will be displayed at the computer console. At the same time the teletype bell will remaind the operator. Should any error condition have occurred during the acquisition, the display shows

X'00FF'

and the program comes to a halt. DAVIS may then be restarted either by pressing CONSOLE INTERRUPT or STEP.

To start a new acquisition run the user must reset CSW 0 and set it again. If no new B and F pointers have been chosen the previous data in the buffer will be overlaid by the data of the new run.

4.2 Data Visualisation

With all data output procedures described below the user can choose among two modes of data representation

- output of pulse count rates, (as stored in the data buffer)
- output of converted values. Pulse counts are transformed in distance values before they are put out. The internal tabulated function is used with appropriate interpolation. Output values appear as integers multiplied with a scalefactor of 100.

Console switch 15 gives the output mode.

CSW 15	UP	Output with conversion
	DOWN	Output direct

Note: For correct output values the channel width switch must be in the same position as it was during acquisition of the data to be displayed.

4.2.1 Display on Oscilloscope

Any part of the internal buffer may be displayed on a scope. Depending on the scope XY-mode or in yt-mode display is possible. The following outputs are provided:

X channel number or time scale	(5 mV / channel)
Y pulse count or distance	(5 mV / unit)
Z pulse count or blanking	(+ 15 Volt)
T pulse count or start trigger	(+ 5 Volt, 240 ns)

The desired buffer zone is selected by means of two pointers determining the first and last location to be displayed. The pointers can be entered by the commands

F = nnnn CR nnnn being the FIRST LOCATION

and

L = nnnn CR nnnn being the LAST LOCATION

The display routine is normally off and can be activated by setting CSW 1 down.

Where large numbers of channels are to be displayed it may sometimes be usefull to display only a part of the channels. For this reason a step option has been included which allows to increment the channel address by nnnn units rather than by steps of one.

S = nnnn CR nnnn being the channel increment

A scale factor for the y - axis may be introduced with the command

H = nnnn CR where nnnn - 1, 2, 4 ... 128

H = 1 gives a full scale range of 10 Volt for the biggest positive number stored, i.e 32767. Values above this, provoke an overflow. The following table shows the maximum values which can be displayed without overflow as a function of the selected H-scale factor.

H	Y _{max} (10 Volt)
1	32767
2	16383
4	8191
8	4095
16	2047
32	1023
64	511
128	255

with B and E, the G command may be applied as above (Note that G takes only half the mean value! nnnn should therefore be twice the value to be inserted into the table).

4.5.2 Verify Table

DAVIS provides the command

V - nnnn CR nnnn being an arbitrary number

which produces a list of the conversion table. The format is identical to the one associated with the T command except that the first number here is the channel interval time, the conversion table has been generated with. Note that after execution of this command the pointers F and L are set outside of the buffer limits.

4.5.3 Punch Table

The command V can simultaneously produce a paper tape in ASCII code. The user has to turn on only the punch. However no leader and trailer will be punched.

5. SUMMARY OF DAVIS CONTROL COMMANDS

CONTROL COMMAND FORMAT

CC = nnnn CR
CC → CONTROL COMMAND CHARACTER (B,E,F,L,S,H,T,P,G,V,Z)
CR → CARRIAGE RETURN
nnnn → DECIMAL VALUE, UP TO A DIGITS

5.1. DATA ACQUISITION

B = nnnn CR SET BEGIN ADDRESS OF BUFFER
E = nnnn CR SET END ADDRESS OF BUFFER
 $0 \leq nnnn \leq 3000$
CSW 0 = DOWN START ACQUISITION

DISPLAY ON COMPUTER CONSOLE:

1010 1010 1010 1010 ACQUISITION TERMINATED
0111 1111 1111 1111 ADDRESS ERROR
0000 0000 1111 1111 DATA OVERRUN
ERROR RECOVERY: STEP OR CONSOLE INTERRUPT

5.2. DISPLAY

Note: CHANNEL WIDTH DISPLAY = CHANNEL WIDTH ACQUISITION!

F = nnnn CR SET FIRST DISPLAY ADDRESS
L = nnnn CR SET LAST DISPLAY ADDRESS
S = nnnn CR ADDRESS INCREMENT
H = nnnn CR DISPLAY SCALE FACTOR (1, 2, 4 ... 128)
CSW 1 = DOWN DISPLAY ON
CSW 2 = UP FAST DISPLAY (SCOPE)
CSW 2 = DOWN SLOW DISPLAY (PLOTTER)
CSW 15 UP OUTPUT OF CONVERTED DATA
CSW 15 DOWN DIRECT OUTPUT
OUTPUT X,Y 5 mV / ADDRESS STEP resp. BIT, 10 V max.
OUTPUT Z BLANKING PULSE + 15 Volt
OUTPUT T TRIGGER PULSE, FIRST ADDRESS, SYNC. + 5 V

5.3. TABULATION

F = nnnn CR SET FIRST TAB ADDRESS
L = nnnn CR SET LAST TAB ADDRESS
T = nnnn CR SET RECORD NUMBER

5.4. PUNCH PAPER TAPE

F = nnnn CR SET FIRST PUNCH ADDRESS
L = nnnn CR SET LAST PUNCH ADDRESS
P = nnnn CR SET RECORD NUMBER IF RECORD N

IF RECORD NUMBER = 0 ... 4999 PUNCH BINARY
IF RECORD NUMBER = 5000 ... 9999 PUNCH ASCII

5.5. GENERATE CONVERSION TABLE

B = nnnn CR SET BEGIN ADDRESS OF BUFFER
E = nnnn CR SET END ADDRESS OF BUFFER

- CHOOSE CHANNEL WIDTH ON FRONT PANEL (5, 10, 25, 50, 100 ms)
- SELECT DIRECT INPUT (CSW 15 = DOWN)

G1 START DATA ACQUISITION (CSW 0 = DOWN)
G2 AFTER TERMINATION ENTER THE COMMAND
G3 G = nnnn CR SET TABLE ADDRESS
G4 REPEAT STEPS G1 - G4 WITH NEXT TABLE ADDRESS

5.6. VERIFY CONVERSION TABLE

V = nnnn CR nnnn = ARBITRARY

THE FIRST VALUE PRINTED GIVES THE CHANNEL WIDTH IN ms
41 TABLE VALUES ARE PRINTED

Note: The command V changes the F, L pointers!

Note: SET CSW 15 DOWN!

5.7. ZERO BUFFER

F = nnnn CR SET FIRST BUFFER ADDRESS
L = nnnn CR SET LAST BUFFER ADDRESS
Z = nnnn CR THE BUFFER WILL BE LOADED WITH nnnn

REFERENCES

- 1) D. VAN VELZEN, H.J. FLAMM, H. LANGENKAMP "Motion of Solids in Fluidized Bed Coaters" paper presented at "Reaktortagung 1973" Karlsruhe (Germany), April 1973.
- 2) D. VAN VERZEN, H.J. FLAMM, H. LANGENKAMP "A Casile Motion of Solids in Spouted Beds" paper presented at "International Symposium on Spouted Beds" Vancouver, Sept. 1973 (paper No. 37d).

```

0001 * EURATOM CCR ISPRA      AUTOM&CONTRL      *
0002 *****
0003 *
0004 * PROGRAM NAME: DAVIS      *
0005 *
0006 * PURPOSE      : DATA ACQUISITION AND      *
0007 *              VISUALISATION      FOR      *
0008 *              PARTICLE MEASUREMENTS      *
0009 *
0010 * PROGRAMMERS : EDER-PAGNY      *
0011 *
0012 * DATE      : 20.8.1973      REV 02      *
0013 *
0014 *****
0015      DEF      BUSY,ERROR,BB,BUFF,TERM
0016      DEF      BUFFL,PGEND,PLTTM
0017      DEF      INTV,TABB,RECD,TABBL
0018      REF      INTERP,BBB
0019      REF      USANSW,USDEHE,USBNAS,BNAS
0020      REF      USMEAN
0021 *      *****
0022 #INPUT SUBVC      X,#1;
0023      SKN      #2;
0024      DTIR      A,TY
0025 *      *****
0026      DSECT
0027 *      *****
0000      0000 D      0028 DD      EQU      $
0000      0029 TX      EQU      0
0004      0030 RE      EQU      4
003F      0031 TY      EQU      X'3F'
0000      0032 RY      EQU      0
0000      0033 ON      EQU      0
0001      0034 NFT      EQU      1
0002      0035 PLT      EQU      2
0012      0036 INPT      EQU      X'12'
0001      0037 OVRN      EQU      1
00B8      0038 BUFFL      EQU      3000
0029      0039 TABBL      EQU      41
0040 *
0000      0041 SAVEPA DS      1
0001      0042 SAVOUT DS      1
0002      0043 SAVEZ DS      1
0003      0044 SAVE DS      1
0045 *
0004      0046 ID DS      1
0005      0047 PO DS      1
0006      0048 PP DS      1
0007      0049 PA DS      1
0008      0050 PT DS      1
0009      0051 PD DS      1
000A C2C5      0052 CC TEXT      'BEFLHSPTZGV'
000B C6CC
000C C8D3
000D D0D4
000E DAC7
000F D6A0
000C      0053 CCL EQU      ($-CC)*2

```

0010		0054	MODE	DS	1
0011		0055	AQU	DS	1
0012	0301	0056	SHFT	DC	X'301'
	0013 D	0057	CCV	EQU	\$
0013		0058	BEGA	DS	1
0014		0059	ENDA	DS	1
0015		0060	FIRST	DS	1
0016		0061	LAST	DS	1
0017	0001	0062	HEI	DC	1
0018	0001	0063	STEP	DC	1
0019		0064	PUN	DS	1
001A		0065	TAB	DS	1
001B		0066	ZER	DS	1
001C		0067	GEN	DS	1
001D		0068	VTB	DS	1
001E	000B	0069	CCVL	DC	\$-CCV
001F	008D	0070	CR	DC	X'8D'
0020	00BD	0071	BD	DC	X'BD'
0021	000A	0072	FIVE	DC	10
		0073	*		
0022	005D X	0074	EXE	DC	TERM
0023	005D X	0075		DC	TERM
0024	005D X	0076		DC	TERM
0025	005D X	0077		DC	TERM
0026	014B	0078		DC	EXEH
0027	005D X	0079		DC	TERM
0028	012E	0080		DC	EXEP
0029	0134	0081		DC	EXET
002A	0138	0082		DC	EXEZ
002B	0163	0083		DC	EXEG
002C	017C	0084		DC	EXEV
002D	0002	0085	TWO	DC	2
002E	0003	0086	THREE	DC	3
002F	0040	0087	SIXFOR	DC	64
0030	008A	0088	LF	DC	X'8A'
0031	0087	0089	BL	DC	X'87'
0032	00AA	0090	QM	DC	X'AA'
0033	AAAA	0091	OK	DC	X'AAAA'
0034	3FFF	0092	NOK	DC	X'3FFF'
0035		0093	SSVT	DS	1
0036		0094	SVMD	DS	1
0037		0095	BB	DS	1
0038	0BB8	0096	BUFL	DC	BUFFL
0039	000A	0097	TEN	DC	10
003A	0080	0098	EIGTY	DC	X'80'
003B	00FF	0099	FF	DC	X'FF'
003C	FFFE	0100	MIN2	DC	-2
003D		0101	INTV	DS	1
003E		0102	TABB	DS	TABBL
0067		0103	RECD	DS	1
0068		0104	BUFF	DS	BUFFL
	0C20 D	0105	PGEND	EQU	\$

```

0106 *****
0050 0107 PSECT X'50'
0108 * *****
0050 0109 INIT LDV D,DD
0051 0000 D
0052 483A 0110 LDA EIGTY
0053 187E 0111 DTOR A,X'3E'
0054 4839 0112 LDA TEN
0055 53AA 0113 STA 0
0056 418C 0114 LDA =ERR
0057 53E8 0115 STA X'40'
0058 418B 0116 LDA =INIT
0059 53E7 0117 STA X'41'
005A 53EC 0118 STA X'47'
005B 0600 0119 ZERO A
005C 5811 0120 STA AQU
0121 * *****
005D 0403 0122 TERM INE
005E 0600 0123 ZERO A
005F 5810 0124 STA MODE
0060 103F 0125 CTRL TX,TY
0061 481F 0126 LDA CR
0062 60C6 0127 JSR TY0
0063 4830 0128 LDA LF
0064 60C4 0129 JSR TY0
0065 4832 0130 LDA QM
0066 60C2 0131 JSR TY0
0067 F810 0132 INCM MODE
0068 143F 0133 CTRL RE,TY
0134 * *****
0069 0610 0135 BUSY RCSW A
006A 0107 0136 ANDVC A,2
006B 0002
006C 244B 0137 SKN DISPL
0138 * *****
006D 0610 0139 START RCSW A
006E 0107 0140 ANDVC A,1
006F 0001
0070 2C7A 0141 SKZ OFF
0071 A811 0142 TBIT ON,AQU
0072 2C7A 0143 SKZ GO
0073 B831 0144 SBIT NFT,AQU
0074 2C11 0145 SKZ FRST
0075 10D2 0146 AQU1 TEST RY,INPT
0076 7076 0147 JMP GO
0077 C845 0148 AQU2 LDR Y,PO
0078 4814 0149 LDA ENDA
0079 070E 0150 INCR A
007A 0846 0151 SUBC Y,A
007B 2C15 0152 SKZ AQUEND
007C 2E16 0153 SKP OVFL
007D 11D2 0154 TEST OVRN,INPT
007E 7001 0155 JMP AQU3
007F 7030 0156 JMP ERR
0080 1892 0157 AQU3 DTIR A,INPT
0081 DA1F 0158 AQU4 STR A,BUFF,Y
0082 0068 X
0083 0504 0159 DSPL A
0084 F805 0160 INCM PO
0085 73E7 0161 JMP START

```

		0162	*	*****	
0086	4838	0163	FRST	LDA	BUFL
0087	E814	0164		CMR	A, ENDA
0088	2E01	0165		SKP	F1
0089	5814	0166		STA	ENDA
008A	4813	0167	F1	LDA	BEGA
008B	0815	0168		RTR	A, A
008C	2E02	0169		SKP	F2
008D	0600	0170		ZERO	A
008E	5813	0171		STA	BEGA
008F	5805	0172	F2	STA	PO
0090	73E4	0173		JMP	AQU1
		0174	*	*****	
0091	4833	0175	AQUEND	LDA	OK
0092	7001	0176		JMP	OVFL1
0093	4834	0177	OVFL	LDA	NOK
0094	0504	0178	OVFL1	DSPL	A
0095	3811	0179		RBIT	ON, AQU
0096	3831	0180		RBIT	NFT, AQU
0097	4810	0181		LDA	MODE
0098	5836	0182		STA	SVMD
0099	0815	0183		RTR	A, A
009A	2C06	0184		SKZ	BEL1
009B	0600	0185		ZERO	A
009C	5810	0186		STA	MODE
009D	103F	0187		CTRL	TX, TY
009E	4146	0188	BEL2	LDA	=BELL
009F	5801	0189		STA	SAVOUT
00A0	704C	0190		JMP	GO
00A1	4801	0191	BEL1	LDA	SAVOUT
00A2	5835	0192		STA	SSVT
00A3	73FA	0193		JMP	BEL2
00A4	4831	0194	BELL	LDA	BL
00A5	6083	0195		JSR	TYO
00A6	4836	0196		LDA	SVMD
00A7	0815	0197		RTR	A, A
00A8	2C04	0198		SKZ	BEL3
00A9	5810	0199		STA	MODE
00AA	143F	0200		CTRL	RE, TY
00AB	18BF	0201		DTIR	A, TY
00AC	7040	0202		JMP	GO
00AD	4835	0203	BEL3	LDA	SSVT
00AE	5801	0204		STA	SAVOUT
00AF	703D	0205		JMP	GO
		0206	*	*****	
00B0	3811	0207	ERR	RBIT	ON, AQU
00B1	483B	0208		LDA	FF
00B2	0504	0209		DSPL	A
00B3	0000	0210		WAIT	
00B4	4805	0211		LDA	PO
00B5	0504	0212		DSPL	A
00B6	0000	0213		WAIT	
00B7	73B5	0214		JMP	START

		0215	*	*****	
00B8	0107	0216	DISPL	ANDVC	A,4
00B9	0004				
00BA	2429	0217		SKN	PLOTR
00BB	3851	0218		RBIT	PLT,AQU
00BC	C849	0219	DP1	LDR	Y,PD
00BD	E856	0220		CMR	Y, LAST
00BE	2E27	0221		SKP	DP2
00BF	E855	0222		CMR	Y, FIRST
00C0	2625	0223		SKM	DP2
00C1	2401	0224		SKN	NSYN
00C2	0480	0225		SYNC	
00C3	A851	0226	NSYN	TBIT	PLT,AQU
00C4	2C05	0227		SKZ	DP3
00C5	F05F	0228		DECM	ZAL
00C6	00E9				
00C7	2FA5	0229		SKP	START
00C8	4021	0230		LDA	PLTTM
00C9	501F	0231		STA	ZAL
00CA	CA1F	0232	DP3	LDR	A,BUFF,Y
00CB	0068 X				
00CC	6519	0233		JSR	INTERP
00CD	C892	0234		LDR	B, SHFT
00CE	0590	0235		XEC	B
00CF	01B5	0236		LDV	C,X'12'
00D0	0012				
00D1	1D70	0237		DTOR	C,X'30'
00D2	0117	0238		ANDV	A,X'7FF0'
00D3	7FF0				
00D4	070E	0239		INCR	A
00D5	1870	0240		DTOR	A,X'30'
00D6	0A15	0241		RTR	A,Y
00D7	C895	0242		LDR	B, FIRST
00D8	0C16	0243		SUB	A,B
00D9	030B	0244		SRC	A,12
00DA	0117	0245		ANDV	A,X'FFF0'
00DB	FFF0				
00DC	1870	0246		DTOR	A,X'30'
00DD	01B5	0247		LDV	C,X'02'
00DE	0002				
00DF	1D70	0248		DTOR	C,X'30'
00E0	C898	0249		LDR	B, STEP
00E1	0C59	0250		ADD	Y,B
00E2	D849	0251		STR	Y,PD
00E3	7389	0252		JMP	START
00E4	B851	0253	PLOTR	SBIT	PLT,AQU
00E5	25D6	0254		SKN	DP1
00E6	C855	0255	DP2	LDR	Y, FIRST
00E7	D849	0256		STR	Y,PD
00E8	7384	0257		JMP	START
00E9	2710	0258	ZAL	DC	10000
00EA	2710	0259	PLTTM	DC	10000

		0260	*	*****	
00EB	0504	0261	OFF	DSPL	A
00EC	B811	0262		SBIT	ON,AQU
00ED	0403	0263	GO	INE	
00EE	10FF	0264		TEST	RY,TY
00EF	7379	0265		JMP	BUSY
00F0	C830	0266		LDR	X,MODE
00F1	0126	0267		SUBVC	X,1
00F2	0001				
00F3	2E02	0268		SKP	INMOD
00F4	C8E1	0269		LDR	E,SAVOUT
00F5	05E3	0270		RTRN	E
		0271	*	*****	
00F6	0126	0272	INMOD	INPUT	1,EQUAL
00F7	0001				
00F8	240A				
00F9	18BF				
00FA	E81F	0273	CARR	CMR	A,CR
00FB	001F				
00FC	2D60	0274		SKZ	TERM
00FD	011D	0275		ORV	A,X'80'
00FE	0080				
00FF	5804	0276		STA	ID
0100	482D	0277		LDA	TWO
0101	5810	0278		STA	MODE
0102	7366	0279		JMP	BUSY
		0280	*	*****	
0103	0126	0281	EQUAL	INPUT	2,RESP
0104	0002				
0105	2413				
0106	18BF				
0107	E81F	0282		CMR	A,BD
0108	0020				
0109	25F0	0283		SKN	CARR
010A	0660	0284		ZERO	Z
010B	8B0A	0285	DECOD	LDBY	A,CC,Z
010C	E804	0286		CMR	A,ID
010D	2C05	0287		SKZ	FOUND
010E	076E	0288		INCR	Z
010F	0166	0289		SUBVC	Z,CCL
0110	000C				
0111	27F9	0290		SKM	DECOD
0112	734A	0291		JMP	TERM
		0292	*	*****	
0113	D862	0293	FOUND	STR	Z,SAVEZ
0114	0600	0294		ZERO	A
0115	5837	0295		STA	BB
0116	482E	0296		LDA	THREE
0117	5810	0297		STA	MODE
0118	7350	0298		JMP	BUSY

		0299	*	*****
0119	64CD	0300	RESP	JSR U\$ANSW
011A	7008	0301		JMP ANSW
011B	0600	0302		ZERO A
011C	5810	0303		STA MODE
011D	64CA	0304		JSR U\$DEHE
011E	C862	0305		LDR Z,SAVEZ
011F	DB93	0306		STR B,CCV,Z
0120	CB5F	0307		LDR Y,EXE,Z
0121	0022			
0122	0542	0308		EXIT Y
		0309	*	*****
0123	0600	0310	ANSW	ZERO A
0124	5810	0311		STA MODE
0125	C862	0312		LDR Z,SAVEZ
0126	CB13	0313		LDR A,CCV,Z
0127	60AA	0314		JSR PASC
0128	7334	0315		JMP TERM
		0316	*	*****
0129	D8E1	0317	TY0	STR E,SAVOUT
012A	05E1	0318		RISE E
012B	103F	0319		CTRL TX,TY
012C	187F	0320		DTOR A,TY
012D	733B	0321		JMP BUSY
		0322	*	*****
012E	605A	0323	EXEP	JSR TRAIL
012F	4819	0324		LDA PUN
0130	581A	0325		STA TAB
0131	6061	0326		JSR POUT
0132	6056	0327		JSR TRAIL
0133	7329	0328		JMP TERM
		0329	*	*****
0134	4834	0330	EXET	LDA NOK
0135	5819	0331		STA PUN
0136	605C	0332		JSR POUT
0137	7325	0333		JMP TERM
		0334	*	*****
0138	4838	0335	EXEZ	LDA BUFL
0139	070E	0336		INCR A
013A	E816	0337		CMR A, LAST
013B	2E01	0338		SKP EZ1
013C	5816	0339		STA LAST
013D	4815	0340	EZ1	LDA FIRST
013E	0855	0341		RTR Y,A
013F	2E02	0342		SKP EZ2
0140	0640	0343		ZERO Y
0141	D855	0344		STR Y,FIRST
0142	E856	0345	EZ2	CMR Y, LAST
0143	2602	0346		SKM EZ3
0144	2C01	0347		SKZ EZ3
0145	7317	0348		JMP TERM
0146	481B	0349	EZ3	LDA ZER
0147	DA1F	0350		STR A,BUFF,Y
0148	0068 X			
0149	074E	0351		INCR Y
014A	73F7	0352		JMP EZ2

		0353	*	*****	
014B	4817	0354	EXEH	LDA	HEI
014C	0135	0355		LDV	X,9
014D	0009				
014E	0155	0356		LDV	Y,128
014F	0080				
0150	0A06	0357	AN	SUBC	A,Y
0151	2E04	0358		SKP	EN
0152	072E	0359		INCR	X
0153	0250	0360		SRA	Y,1
0154	0A55	0361		RTR	Y,Y
0155	25FA	0362		SKN	AN
0156	0137	0363	EN	ANDV	X,X'F'
0157	000F				
0158	0126	0364		SUBVC	X,X'F'
0159	000F				
015A	2C05	0365		SKZ	NOTSHF
015B	0115	0366		LDV	A,X'0300'
015C	0300				
015D	091D	0367		OR	A,X
015E	5812	0368	NN	STA	SHFT
015F	72FD	0369		JMP	TERM
0160	0115	0370	NOTSHF	LDV	A,X'2400'
0161	2400				
0162	73FB	0371		JMP	NN
		0372	*	*****	
0163	4814	0373	EXEG	LDA	ENDA
0164	C893	0374		LDR	B,BEGA
0165	01B5	0375		LDV	C,BUFF
0166	0068 D				
0167	0C16	0376		SUB	A,B
0168	260E	0377		SKM	ERRG
0169	647F	0378		JSR	US\$MEAN
016A	C83C	0379		LDR	X,GEN
016B	0935	0380		RTR	X,X
016C	260A	0381		SKM	ERRG
016D	0126	0382		SUBVC	X,TABBL
016E	0029				
016F	2E07	0383		SKP	ERRG
0170	D99F	0384		STR	B,TABB,X
0171	003E X				
0172	1C90	0385		DTIR	B,X'10'
0173	6476	0386		JSR	BBB
0174	D89F	0387		STR	B,INTV
0175	003D X				
0176	72E6	0388		JMP	TERM
0177	0115	0389	ERRG	LDV	A,X'FE'
0178	00FE				
0179	0504	0390		DSPL	A
017A	0000	0391		WAIT	
017B	72E1	0392		JMP	TERM

		0393	*	*****	
017C	0115	0394	EXEV	LDV	A, TABB-BUFF
017D	FFD6				
017E	5815	0395		STA	FIRST
017F	0115	0396		LDV	A, TABB-BUFF+TABBL-1
0180	FFFE				
0181	5816	0397		STA	LAST
0182	483D	0398		LDA	INTV
0183	0895	0399		RTR	B, A
0184	0819	0400		ADD	A, A
0185	0819	0401		ADD	A, A
0186	0C19	0402		ADD	A, B
0187	581A	0403		STA	TAB
0188	73AB	0404		JMP	EXET
		0405	*	*****	
	00B0	0406	ERROR	EQU	ERR
		0407	*	*****	
0189	D8E3	0408	TRAIL	STR	E, SAVE
018A	05E1	0409		RISE	E
018B	482F	0410		LDA	SIXFOR
018C	5808	0411		STA	PT
018D	0600	0412	TR1	ZERO	A
018E	639A	0413		JSR	TYO
018F	F848	0414		DECM	PT
0190	2FFC	0415		SKP	TR1
0191	C8E3	0416		LDR	E, SAVE
0192	05E3	0417		RTRN	E
		0418	*	*****	
0193	D8E3	0419	POUT	STR	E, SAVE
0194	05E1	0420		RISE	E
0195	0135	0421		LDV	X, 4
0196	1387				
0197	E837	0422		CMR	X, PUN
0198	2607	0423		SKM	ASC
0199	483B	0424		LDA	FF
019A	638E	0425		JSR	TYO
019B	481A	0426		LDA	TAB
019C	0604	0427		EXBY	A
019D	638B	0428		JSR	TYO
019E	481A	0429		LDA	TAB
019F	7007	0430		JMP	BIN
01A0	4830	0431	ASC	LDA	LF
01A1	6387	0432		JSR	TYO
01A2	481A	0433		LDA	TAB
01A3	602E	0434		JSR	PASC
01A4	481F	0435		LDA	CR
01A5	6383	0436		JSR	TYO
01A6	4830	0437		LDA	LF
01A7	6381	0438	BIN	JSR	TYO
01A8	0600	0439		ZERO	A
01A9	5027	0440		STA	PFIVE
01AA	4815	0441		LDA	FIRST
01AB	5806	0442		STA	PP
01AC	E816	0443	P1	CMR	A, LAST
01AD	2C01	0444		SKZ	\$+2
01AE	2E20	0445		SKP	P4
01AF	C826	0446		LDR	X, PP
01B0	C91F	0447		LDR	A, BUFF, X
01B1	0068 X				
01B2	6433	0448		JSR	INTERP
01B3	0135	0449		LDV	X, 4999
01B4	1387				

01B5	E839	0450		CMR	X,PUN
01B6	260A	0451		SKM	P3
01B7	0604	0452		EXBY	A
01B8	6370	0453		JSR	TY0
01B9	C826	0454		LDR	X,PP
01BA	C91F	0455		LDR	A,BUFF,X
01BB	0068 X				
01BC	6429	0456		JSR	INTERP
01BD	636B	0457		JSR	TY0
01BE	F806	0458	P2	INCM	PP
01BF	4806	0459		LDA	PP
01C0	73EB	0460		JMP	P1
01C1	6010	0461	P3	JSR	PASC
01C2	F01F	0462		INCM	PFIVE
01C3	01D1				
01C4	400C	0463		LDA	PFIVE
01C5	E81F	0464		CMR	A,FIVE
01C6	0021				
01C7	27F6	0465		SKM	P2
01C8	0600	0466		ZERO	A
01C9	5007	0467		STA	PFIVE
01CA	481F	0468		LDA	CR
01CB	635D	0469		JSR	TY0
01CC	4830	0470		LDA	LF
01CD	635B	0471		JSR	TY0
01CE	73EF	0472		JMP	P2
01CF	C8E3	0473	P4	LDR	E,SAVE
01D0	05E3	0474		RTRN	E
01D1	0000	0475	PFIVE	DC	0
		0476	*	*****	
01D2	D8E0	0477	PASC	STR	E,SAVEPA
01D3	05E1	0478		RISE	E
01D4	0640	0479		ZERO	Y
01D5	D847	0480		STR	Y,PA
01D6	6414	0481		JSR	USBNAS
01D7	821F	0482	PA1	LDBY	A,BNAS,Y
01D8	0000 X				
01D9	634F	0483		JSR	TY0
01DA	F807	0484		INCM	PA
01DB	C847	0485		LDR	Y,PA
01DC	E05F	0486		CMR	Y,SIX
01DD	01E1				
01DE	27F8	0487		SKM	PA1
01DF	C8E0	0488		LDR	E,SAVEPA
01E0	05E3	0489		RTRN	E
01E1	0006	0490	SIX	DC	6
01E2	728A	0491		JMP	START
		0492	*	*****	
	0050	0493		END	INIT
01E3	00B0				
01E4	0050				
01E5	00A4				
01E6	0000 X				
01E7	0000 X				
01E8	0000 X				
01E9	0000 X				
01EA	0000 X				
01EB	0000 X				

00 ERRS

DBOS CC

?

```
0001 * EURATOM CCR ISPRA AUTOM&CONTROL *
0002 *****
0003 * *
0004 * U$ANSW *
0005 * *
0006 * SPECIAL TTY-INPUT ROUTINE *
0007 * *
0008 * (EDER 1. 5.1973) *
0009 * *
0010 *****
0011 * *
0012 DEF U$ANSW
0013 REF BUSY, BB
0000 0000 C09F 0014 U$ANSW PSECT
0001 0000 X 0015 LDR B, BB
0002 05E1 0016 RISE E
0003 18BF 0017 DTIR A, X'3F'
0004 0117 0018 ANDV A, X'7F'
0005 007F
0006 0106 0019 SUBVC A, X'40'
0007 0040
0008 2E09 0020 SKP EX
0009 0116 0021 SUBV A, X'30'
000A 0030
000B 2607 0022 SKM TEST
000C 038B 0023 SRC B, 12
000D 0197 0024 ANDV B, X'FFF0'
000E FFF0
000F 089D 0025 OR B, A
0010 D09F 0026 STR B, BB
0011 0000 X
0012 7409 0027 EX JMP BUSY
0013 0109 0028 TEST ADDVC A, X'23'
0014 0023
0015 2402 0029 SKN BLANC
0016 07EE 0030 INCR E
0017 05E3 0031 RTRN E
0018 0109 0032 BLANC ADDVC A, X'10'
0019 0010
001A 25F7 0033 SKN EX
001B 05E3 0034 RTRN E
0035 END
001C 0000 X
00 ERRS
```

DBOS CC

?

```

0001 * EURATOM CCR ISPRA AUTOM&CONTROL *
0002 *****
0003 *
0004 *          US$BNAS *
0005 *
0006 * CONVERTS ONE 16 BIT BINARY WORD *
0007 * INTO A 5 DIGIT DECIMAL ASCII WORD *
0008 * FOLLOWED BY A BLANK. *
0009 * BINARY WORD MUST BE IN A-REGISTER. *
0010 *
0011 *          (EDER      1. 5.1973) *
0012 *
0013 *****
0014 *
0015          DEF          US$BNAS,BNAS
0016 US$BNAS PSECT
0017          ENT          9

0000          F4C0
0001          C020
0002          09D5
0003          0139
0004          0009
0005          D020
0006          05E1
0007          0895          0018          RTR          B,A
0008          402C          0019          LDA          NULL
0009          5022          0020          STA          BNAS
000A          5022          0021          STA          BNAS+1
000B          402A          0022          LDA          NULL+1
000C          5021          0023          STA          BNAS+2
000D          0620          0024          ZERO          X
000E          2E08          0025          SKP          BI1
000F          0196          0026          SUBV          B,40000
0010          9C40
0011          811F          0027          LDBY          A,BNAS,X
0012          002C P
0013          0119          0028          ADDV          A,4
0014          0004
0015          911F          0029          STBY          A,BNAS,X
0016          002C P
0017          C1BF          0030          BI1          LDR          C,VV,X
0018          002F P
0019          811F          0031          BI2          LDBY          A,BNAS,X
001A          002C P
001B          070E          0032          INCR          A
001C          911F          0033          STBY          A,BNAS,X
001D          002C P
001E          0D96          0034          SUB          B,C
001F          2FF9          0035          SKP          BI2
0020          0702          0036          DECR          A
0021          911F          0037          STBY          A,BNAS,X
0022          002C P
0023          0D99          0038          ADD          B,C
0024          072E          0039          INCR          X
0025          E03F          0040          CMR          X,FIVE
0026          0034 P
0027          27EF          0041          SKM          BI1
0028          D0C0          0042          STR          D,0
0029          0402          0043          INH
002A          F480          0044          LARS          *0
002B          05E3          0045          RTRN          E
002C          B0B0          0046          BNAS          TEXT          '00000
002D          B0B0
002E          B0A0
002F          2710          0047          VV          DC          10000,1000,100,10,1
0030          03E8
0031          0064
0032          000A
0033          0001
0034          0005          0048          FIVE          DC          5
0035          B0B0          0049          NULL          TEXT          '000 '
0036          B0A0

0050          END

```

00 ERRS

DBOS CC

?

```

0001 * EURATOM CCR ISPRA    AUTOM&CONTROL    *
0002 *****
0003 *
0004 *                US$DEHE                *
0005 *
0006 * CONVERTS 4 BCD DIGITS (IN B-REG)    *
0007 * INTO HEXADECIMAL CODE (IN B-REG)    *
0008 *
0009 *                (EDER    1. 5.1973)    *
0010 *
0011 *****
0012 *
0013                DEF                US$DEHE
0014                REF                ERROR
0015 US$DEHE PSECT
0016    ENT 9

0000
0000 F4C0
0001 C020
0002 09D5
0003 0139
0004 0009
0005 D020
0006 05E1
0007 0620    0017    ZERO X
0008 06A0    0018    ZERO C
0009 038B    0019    L1 SRC B,12
000A 0C15    0020    RTR A,B
000B 0117    0021    ANDV A,X'000F'
000C 000F
000D 0106    0022    SUBVC A,X'000A'
000E 000A
000F 2E10    0023    SKP ERR
0010 08B9    0024    ADD C,A
0011 0D15    0025    RTR A,C
0012 072E    0026    INCR X
0013 0126    0027    SUBVC X,4
0014 0004
0015 2E05    0028    SKP L2
0016 0DB9    0029    ADD C,C
0017 0DB9    0030    ADD C,C
0018 08B9    0031    ADD C,A
0019 0DB9    0032    ADD C,C
001A 73EE    0033    JMP L1
001B 0402    0034    L2 INH
001C D8A4    0035    STR C,B,,1
001D D0C0    0036    STR D,0
001E F480    0037    LARS *0
001F 05E3    0038    RTRN E
0020 D0C0    0039    ERR STR D,0
0021 F480    0040    LARS *0
0022 7400    0041    JMP ERROR
0042    END

0023 0000 X
00    ERRS

```

DBOS CC

?

```

0001 * EURATOM CCR ISPRA  AUTOM&CONTROL  *
0002 *****
0003 *
0004 *          USMEAN
0005 *
0006 * CALCULATES MEANVALUE OF UNSIGNED
0007 * 16 BIT WORDS CONTAINED IN A BUFFER
0008 * C-REG = BUFFERADDRESS
0009 * B-REG = DISPLACEMENT OF FIRST WORD
0010 * A-REG = NUMBER OF WORDS - 1
0011 * 1/2*MEANVALUE OUTPUTTED IN B-REG.
0012 *
0013 *          (EDER  1. 5.1973)
0014 *
0015 *****
0016 *
0017          DEF      USMEAN
0018          REF      DIV
0019 USMEAN PSECT
0020          ENT      10

0000
0000 F4C0
0001 C020
0002 09D5
0003 0139
0004 000A
0005 D020
0006 05E1
0007 0D99      0021          ADD      B,C
0008 D889      0022          STR      B,9,,1
0009 0855      0023          RTR      Y,A
000A 0680      0024          ZERO     B
000B 06A0      0025          ZERO     C
000C CE69      0026 SUM      LDR      Z,*9,Y,1
000D 0BB9      0027          ADD      C,Z
000E 0781      0028          RLK      B
000F 0742      0029          DECR     Y
0010 2FFB      0030          SKP      SUM
0011 070E      0031          INCR     A
0012 01B7      0032          ANDV     C,-2
0013 FFFE
0014 6406      0033          JSR      DIV
0015 5800      0034          STA      0,1
0016 D8A4      0035          STR      C,B,,1
0017 D0C0      0036          STR      D,0
0018 0402      0037          INH
0019 F480      0038          LARS     *0
001A 05E3      0039          RTRN     E
0040          END

001B 0000 X
00 ERRS

```

DBOS CC

?

```

0001 * EURATOM CCR ISPRA AUTOM&CONTROL *
0002 *****
0003 * *
0004 * INTERP *
0005 * *
0006 * SPECIAL INTEGER INTERPOLATION ROUTINE*
0007 * *
0008 * (EDER 1. 5.1973) *
0009 * *
0010 *****
0011 * *
0012 DEF INTERP
0013 DEF DIV
0014 REF INTV,TABB,BBB
0000 0015 INTERP PSECT
0000 0690 0016 RCSW B
0001 0197 0017 ANDV B,X'8000'
0002 8000
0003 2C01 0018 SKZ CONV
0004 05E3 0019 RTRN E
0005 1C90 0020 CONV DTIR B,X'10'
0006 D0FF 0021 STR E,EE
0007 0028 P
0008 05E1 0022 RISE E
0009 6454 0023 JSR BBB
000A 0C99 0024 ADD B,B
000B C0BF 0025 LDR C,INTV
000C 0000 X
000D 601F 0026 JSR MTDV
000E 602B 0027 JSR SUCH
000F 0166 0028 SUBVC Z,40
0010 0028
0011 2E17 0029 SKP Z40
0012 076E 0030 INCR Z
0013 C39F 0031 LDR B,TABB,Z
0014 0000 X
0015 0762 0032 DECR Z
0016 2C0D 0033 SKZ ZEROZ
0017 08B6 0034 SUB C,A
0018 0896 0035 SUB B,A
0019 2401 0036 SKN INI
001A 078E 0037 INCR B
001B 4010 0038 INI LDA SKF
001C 6010 0039 JSR MTDV
001D 0B15 0040 RTR A,Z
001E 0D75 0041 RTR Z,C
001F C0BF 0042 MPZ LDR C,SKF
0020 002C P
0021 6024 0043 JSR MPY
0022 02B0 0044 SRA C,1
0023 0D79 0045 ADD Z,C
0024 0B15 0046 ZEROZ RTR A,Z
0025 C0FF 0047 LDR E,EE
0026 0028 P
0027 05E3 0048 RTRN E
0028 0049 EE DS 1
0029 0B15 0050 Z40 RTR A,Z
002A 0660 0051 ZERO Z
002B 73F3 0052 JMP MPZ
002C 0064 0053 SKF DC 100
0054 * *****

```

002D	D0FF	0055	MTDV	STR	E, SVE
002E	0038 P				
002F	05E1	0056		RISE	E
0030	D09F	0057		STR	B, DIVIS
0031	0039 P				
0032	6013	0058		JSR	MPY
0033	4005	0059		LDA	DIVIS
0034	601C	0060		JSR	DIV
0035	C0FF	0061		LDR	E, SVE
0036	0038 P				
0037	05E3	0062		RTRN	E
0038		0063	SVE	DS	1
0039		0064	DIVIS	DS	1
		0065	*	*****	
003A	0175	0066	SUCH	LDV	Z, 40
003B	0028				
003C	05E1	0067		RISE	E
003D	E3BF	0068	LOOPS	CMR	C, TABB, Z
003E	0000 X				
003F	2E03	0069		SKP	FND
0040	0762	0070		DECR	Z
0041	2FFB	0071		SKP	LOOPS
0042	0660	0072		ZERO	Z
0043	C31F	0073	FND	LDR	A, TABB, Z
0044	0000 X				
0045	05E3	0074		RTRN	E
		0075	*	*****	
0046	0135	0076	MPY	LDV	X, 15
0047	000F				
0048	05E1	0077		RISE	E
0049	0680	0078		ZERO	B
004A	0280	0079	LOOPM	SRCL	B, 1
004B	03B0	0080		SRCL	C, 1
004C	2201	0081		SKR	NEXT
004D	0899	0082		ADD	B, A
004E	0722	0083	NEXT	DECR	X
004F	2FFA	0084		SKP	LOOPM
0050	05E3	0085		RTRN	E
		0086	*	*****	
0051	0135	0087	DIV	LDV	X, 14
0052	000E				
0053	05E1	0088		RISE	E
0054	0C99	0089	LOOPD	ADD	B, B
0055	0DB9	0090		ADD	C, C
0056	0781	0091		RLK	B
0057	0886	0092		SUBC	B, A
0058	2602	0093		SKM	ZERO
0059	0896	0094		SUB	B, A
005A	07AE	0095		INCR	C
005B	0722	0096	ZERO	DECR	X
005C	2FF7	0097		SKP	LOOPD
005D	05E3	0098		RTRN	E
		0099		END	
005E	0000 X				
	00 ERRS				

DBOS CC

?

```
0001 * EURATOM CCR ISPRA AUTOM&CONTROL *
0002 *****
0003 * *
0004 *          BBB *
0005 * *
0006 * SPECIAL CODE CONVERSION ROUTINE *
0007 * *
0008 *          (EDER 1. 5.1973) *
0009 * *
0010 *****
0011 * *
0012          DEF      BBB
0013          REF      TERM
0000 0000          0014 BBB PSECT
0000 003F          0015          STR      X,XX
0001 0019 P
0002 0135          0016          LDV      X,4
0003 0004
0004 E19F          0017 LOOPB CMR      B,TABI,X
0005 000F P
0006 2C05          0018          SKZ      SETB
0007 0722          0019          DECR     X
0008 2FFB          0020          SKP      LOOPB
0009 0584          0021          DSPL     B
000A 0000          0022          WAIT
000B 740E          0023          JMP      TERM
000C C19F          0024 SETB    LDR      B,TABII,X
000D 0014 P
000E 05E3          0025          RTRN     E
000F 000C          0026 TABI   DC      12,10,9,4,2
0010 000A
0011 0009
0012 0004
0013 0002
0014 0014          0027 TABII  DC      20,10,5,2,1
0015 000A
0016 0005
0017 0002
0018 0001
0019          0028 XX    DS      1
          0029          END
001A 0000 X
      00 ERRS
```

DBOS CC

?

DAVIS CORE LOAD MAP

\$CLB
?*MAP
?*BOUND,P@50,D@300
?*BUILD

	2FDF	BB	0337	BBB	02DF	BNAS	0235
BUFF	0368	BUFFL	0BB8	BUSY	0069	DIV	02D1
ERROR	00B0	INTERP	0280	INTV	033D	PGEND	0F20
PLTTM	00EA	RECD	0367	TABB	033E	TABBL	0029
TERM	005D	U\$ANSW	01EC	U\$BNAS	0209	U\$DEHE	0240
USMEAN	0264						
0F20							
DBOS	CC						
?							

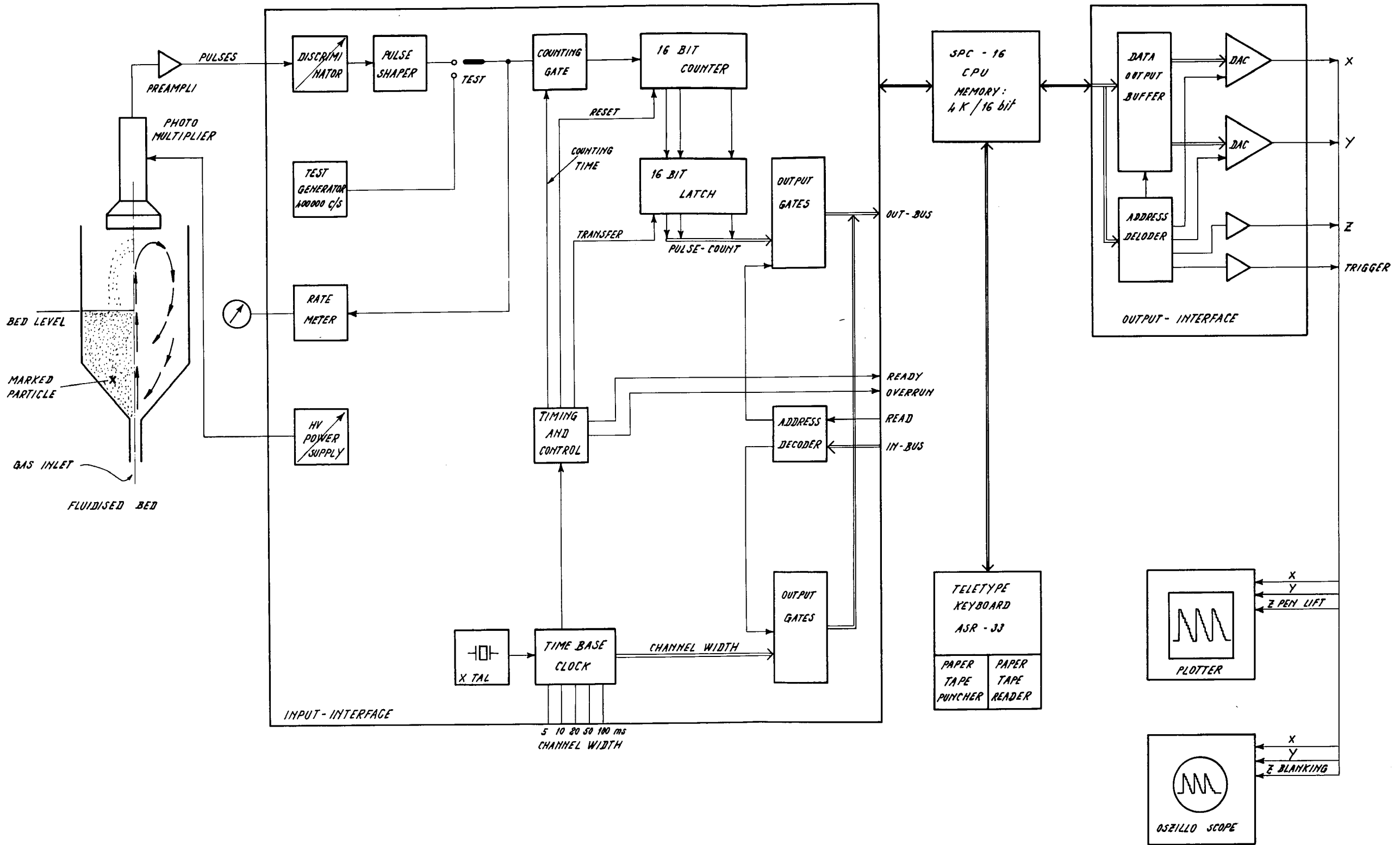


Fig. 1 MOSIF - BLOCKDIAGRAM

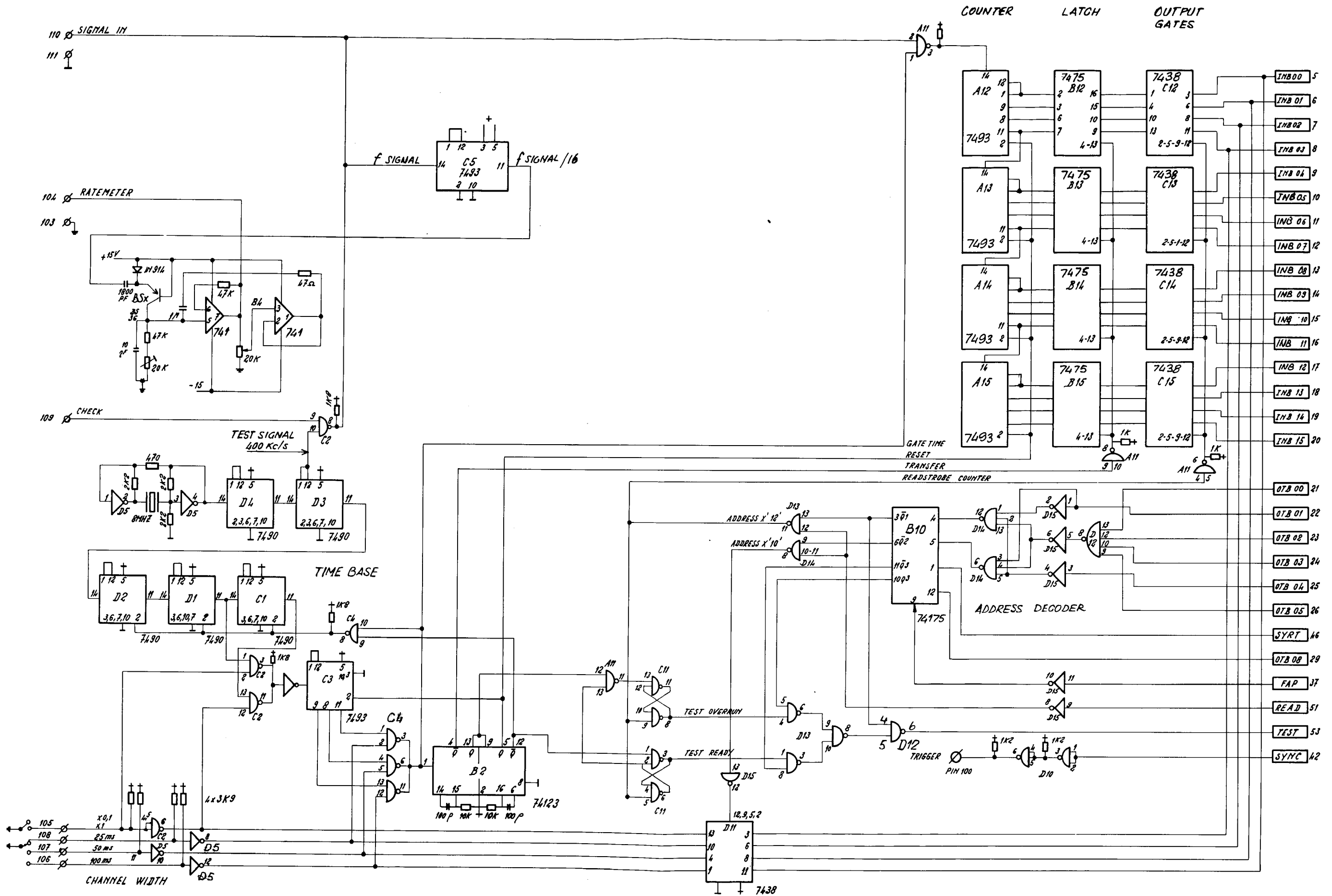


Fig. 2 - INPUT INTERFACE BOARD

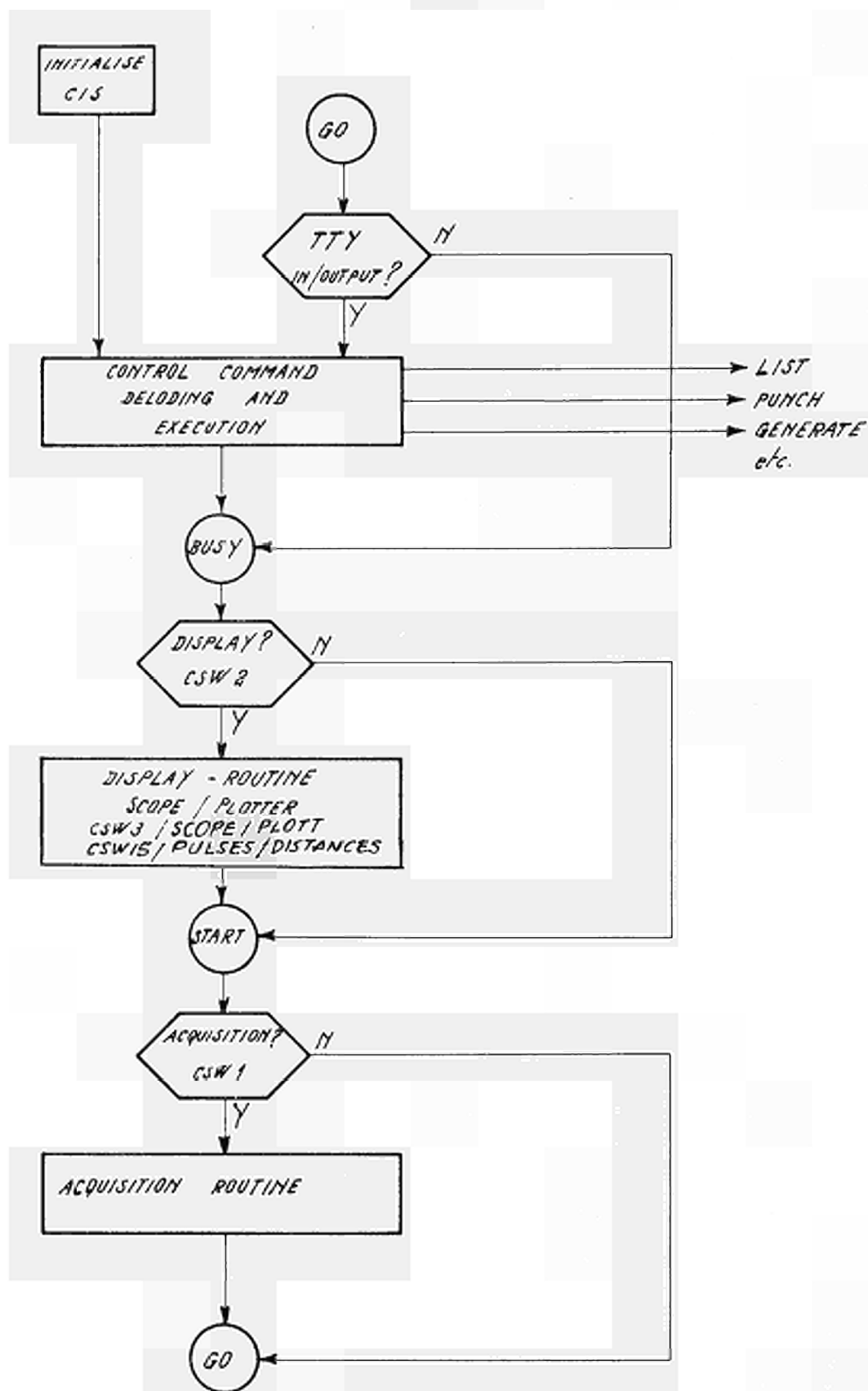


Fig. 4 - SOFTWARE-STRUCTURE
(CSW = Computer Console Switch)
(CIS = Console Interrupt Switch)

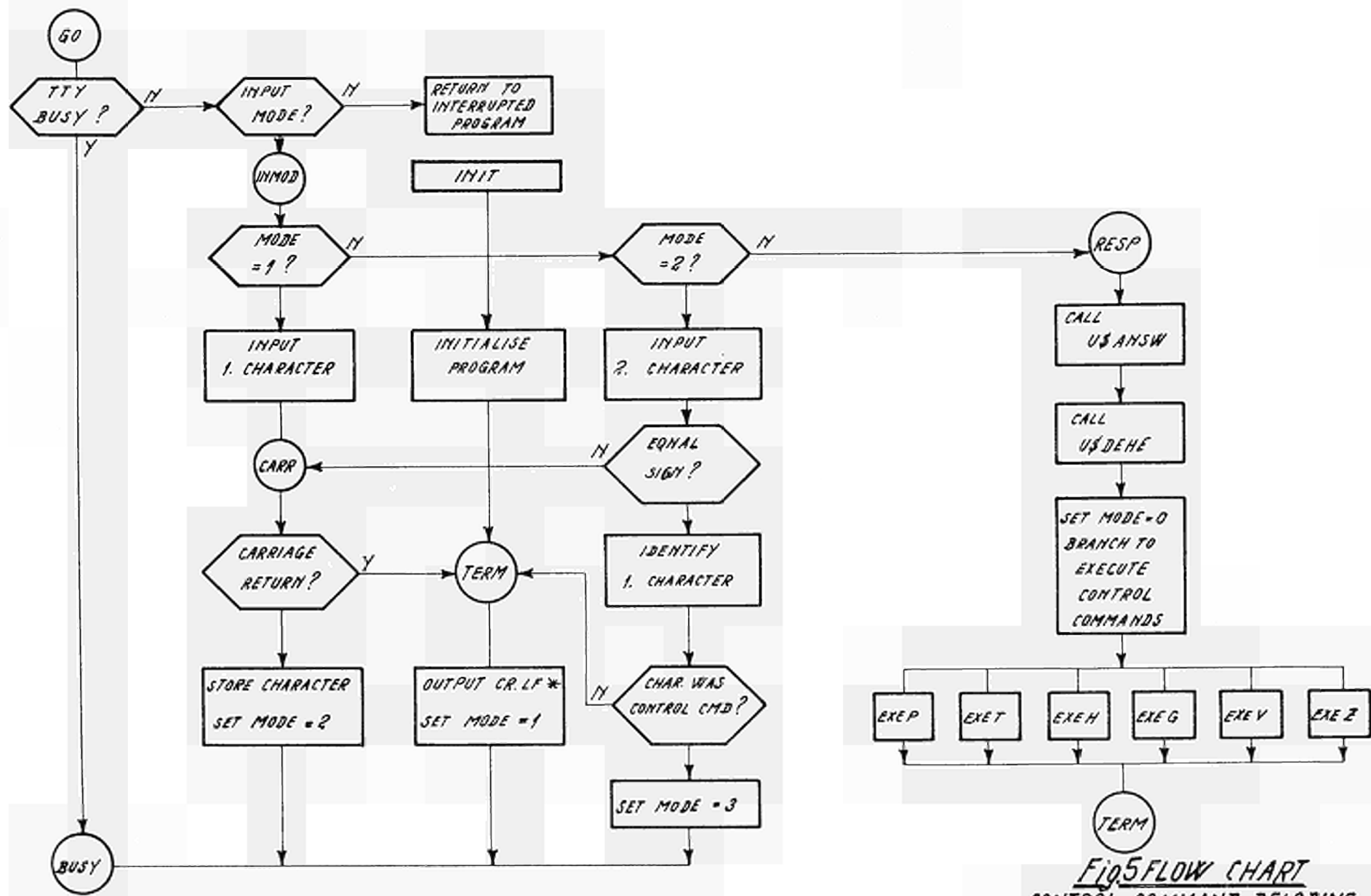


Fig 5 FLOW CHART
CONTROL COMMAND DECODING

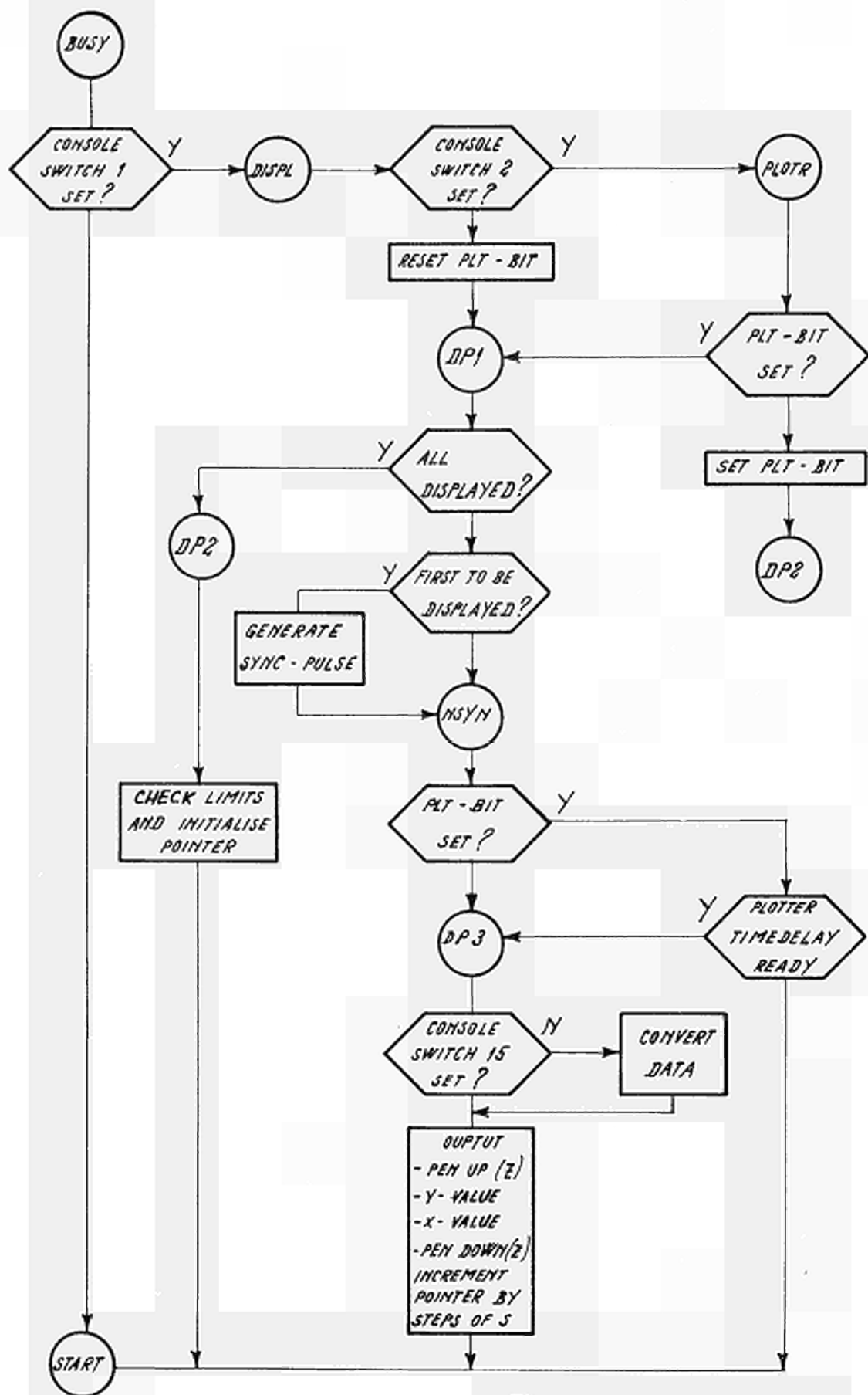


Fig. 6- FLOW CHART
DISPLAY-ROUTINE

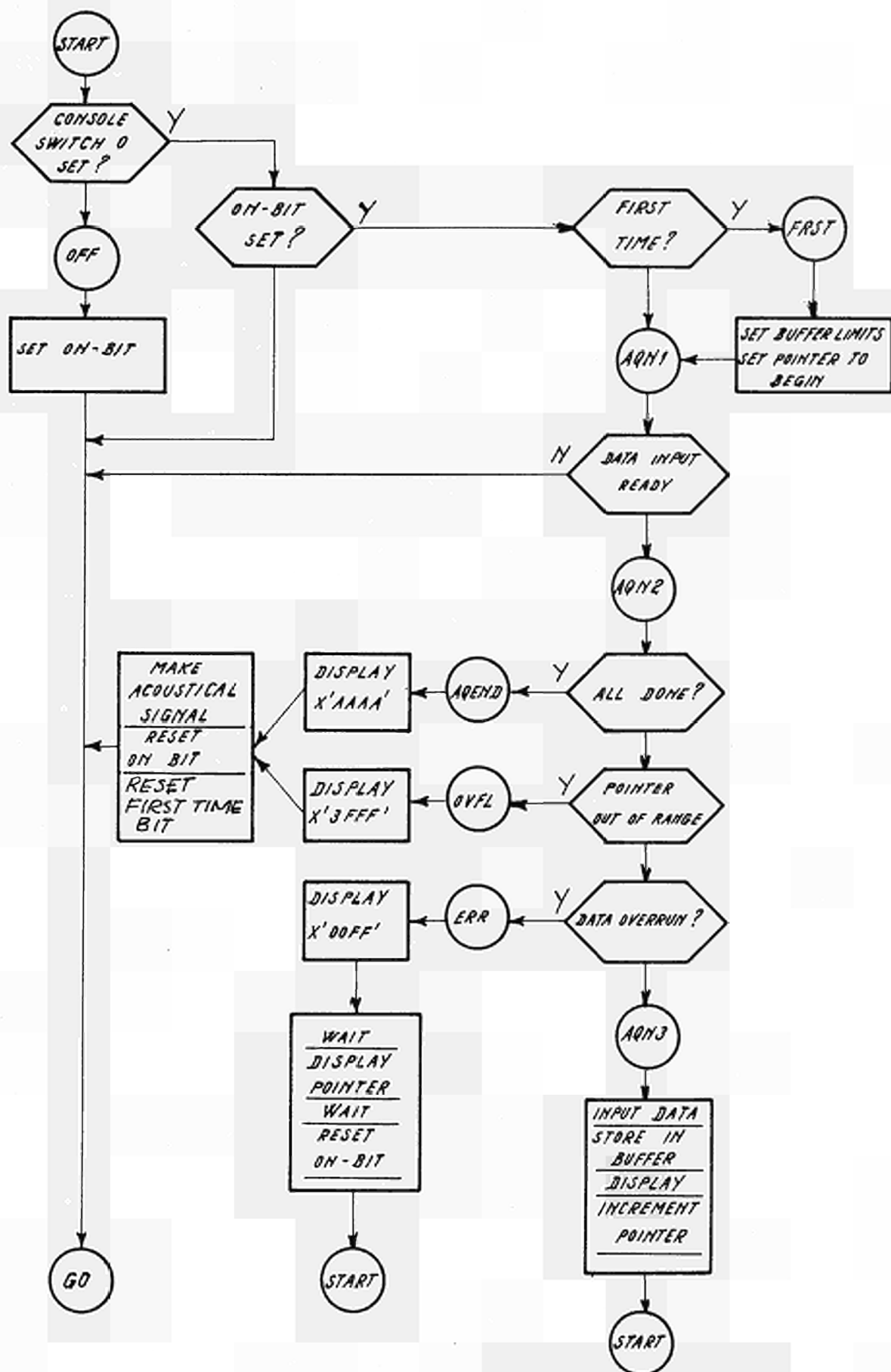


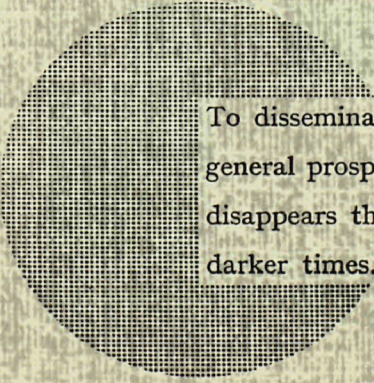
Fig. 7- FLOW CHART
DATA ACQUISITION



NOTICE TO THE READER

All scientific and technical reports published by the Commission of the European Communities are announced in the monthly periodical "euro-abstracts". For subscription (1 year: B.Fr. 1 025,—) or free specimen copies please write to :

Office for Official Publications
of the European Communities
Case postale 1003
Luxembourg 1
(Grand-Duchy of Luxembourg)



To disseminate knowledge is to disseminate prosperity — I mean general prosperity and not individual riches — and with prosperity disappears the greater part of the evil which is our heritage from darker times.

Alfred Nobel

SALES OFFICES

The Office for Official Publications sells all documents published by the Commission of the European Communities at the addresses listed below, at the price given on cover. When ordering, specify clearly the exact reference and the title of the document.

UNITED KINGDOM

H.M. Stationery Office
P.O. Box 569
London S.E. 1 — Tel. 01-928 69 77, ext. 365

BELGIUM

Moniteur belge — Belgisch Staatsblad
Rue de Louvain 40-42 — Leuvenseweg 40-42
1000 Bruxelles — 1000 Brussel — Tel. 12 00 26
CCP 50-80 — Postgiro 50-80

Agency :
Librairie européenne — Europese Boekhandel
Rue de la Loi 244 — Wetstraat 244
1040 Bruxelles — 1040 Brussel

DENMARK

J.H. Schultz — Boghandel
Møntergade 19
DK 1116 København K — Tel. 14 11 95

FRANCE

*Service de vente en France des publications
des Communautés européennes — Journal officiel*
26, rue Desaix — 75 732 Paris - Cédex 15^e
Tel. (1) 306 51 00 — CCP Paris 23-96

GERMANY (FR)

Verlag Bundesanzeiger
5 Köln 1 — Postfach 108 006
Tel. (0221) 21 03 48
Telex: Anzeiger Bonn 08 882 595
Postscheckkonto 834 00 Köln

GRAND DUCHY OF LUXEMBOURG

*Office for Official Publications
of the European Communities*
Boîte postale 1003 — Luxembourg
Tel. 4 79 41 — CCP 191-90
Compte courant bancaire: BIL 8-109/6003/200

IRELAND

Stationery Office — The Controller
Beggars Bush
Dublin 4 — Tel. 6 54 01

ITALY

Libreria dello Stato
Piazza G. Verdi 10
00198 Roma — Tel. (6) 85 08
CCP 1/2640

NETHERLANDS

Staatsdrukkerij- en uitgeverijbedrijf
Christoffel Plantijnstraat
's-Gravenhage — Tel. (070) 81 45 11
Postgiro 42 53 00

UNITED STATES OF AMERICA

European Community Information Service
2100 M Street, N.W.
Suite 707
Washington, D.C., 20 037 — Tel. 296 51 31

SWITZERLAND

Librairie Payot
6, rue Grenus
1211 Genève — Tel. 31 89 50
CCP 12-236 Genève

SWEDEN

Librairie C.E. Fritze
2, Fredsgatan
Stockholm 16
Post Giro 193, Bank Giro 73/4015

SPAIN

Libreria Mundi-Prensa
Castello 37
Madrid 1 — Tel. 275 51 31

OTHER COUNTRIES

*Office for Official Publications
of the European Communities*
Boîte postale 1003 — Luxembourg
Tel. 4 79 41 — CCP 191-90
Compte courant bancaire: BIL 8-109/6003/200