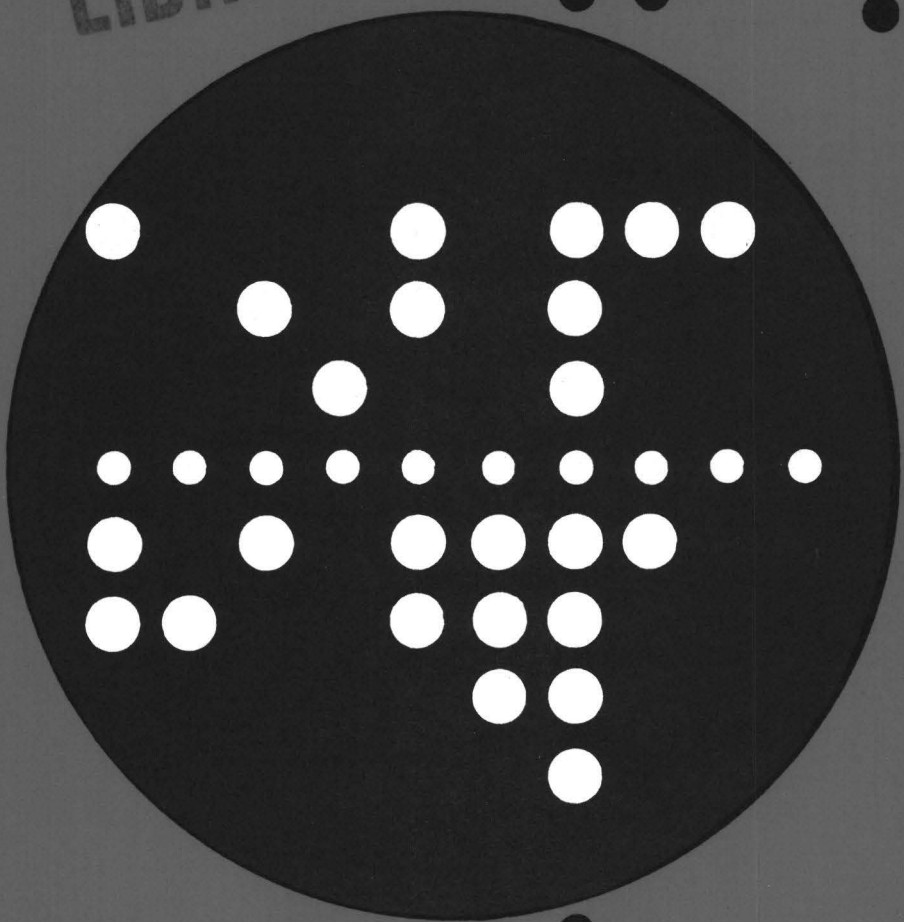
Commission of the European Communities

Joint Research Centre - Ispra

Computing Centre Newsletter



October 1977 ● No 15

Contents

Editor's Note	2
GINO-F, A Graphics Package	3
Statistics of computing installation, September	10
Utilization by objectives and accounts, September	11
Table of equivalent time, summary per month and cumulative	12
Mathematical Subroutine Packages	13
U.G. Short News : Internal Meeting of October 6th	17
Note to the Users	18

Note of the Editor

The present Newsletter is published monthly except for August and December.

The Newsletter includes:

- Developments, changes, uses of installations
- Announcements, news and abstracts on initiatives and accomplishments.

The Editor thanks in advance those who want to contribute to the Newsletter by sending articles in English or French to one of the following persons of the Editorial Board.

Note de la Rédaction

Le présent Bulletin est publié mensuellement excepté durant les mois d'août et décembre.

Le Bulletin traite des:

- Développements, changements et emploi des des installations
- Avis, nouvelles et résumés concernant les initiatives et les réalisations.

La Rédaction remercie d'avance ceux qui veulent bien contribuer au Bulletin en envoyant des articles en anglais ou français à l'un des membres du Comité de Rédaction.

Computing Centre References

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o Program Information Service	G. Gaggero	1874	787
Adjoined	S. Leo Menardi	1884	721
o Graphics and Support to Users	H.I. de Wolde	1890	753
Adjoined	A. Pollicini	1867	753
Application Packages	A. Inzaghi	1887	755
Programming Languages	C. van den Muyzenberg	1848	781

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GINO-F, A Graphics Package

Herman I. de Wolde

GINO-F consists of a library of drawing routines to perform tasks ranging from simple 2D drawings to complex 3D images. Presently the package may be used for the CALCOMP only, but we hope to make it available interactively on the Tektronik 4015 by the end of the year.

This article is not intended as a complete description but only to demonstrate the potentials of this package and to facilitate the utilization of the User Manual which is rather poorly composed. A copy of the Users Manual is deposited at the Library of Manuals (Mrs. Cambon). The users are warned that people lacking the understanding of the 2D representation of 3D objects will have big difficulties in applying this software tool.

A mathematical background on transformations will be an important help.

Many routines have 2D and 3D versions, for example:

LINTO2(X,Y)	}	**write a straight line from present**
LINTO3(X,Y,Z)	}	**point to the specified point**

However, before using any 3D routine a specification of the axis, viewpoint and method of projection is required.

The basic routines may define absolute or relative movements:

MOVTO2	**(X,Y)**	**move pen (up) to coordinates X,Y**
MOVBY2	**(DX,DY)**	**move pen (up) over the distance DX,DY**

Some basic functions are:

- positioning
- drawing straight lines
- drawing arcs
- drawing a spline fitting through a series of points
- defining units of expression

Many types of lines may be defined, for example: solid, broken, dashed/dotted, and chained. This is performed by defining a line mode; all following drawing actions are executed in the requested type.

The real potential of GINO-F is shown in its handling of transformations and viewing projections. It is possible to compose a series of 2D subroutines into a 3D representation. Furthermore 3D and 2D objects may be assembled. Sequentially all kind of transformation may be applied:

- Translation

- Rotation
- Shearing
- Scaling
- Permuting the axis

GINO-F recognizes two coordinate systems:

- The basic coordinate system with rectangular axis. The origin is the left under corner of the plotting surface. The horizontal axis is the X-direction, the vertical is the Y-direction and the Z-axis is perpendicular to the plane of drawing.

  The system does not allow for a modification in this basic coordinate system.
- The relative coordinate system which is initially the same as the basic system but which may be altered by the programmer through one or more of the available transformations.

Normally the drawing of an object is programmed as a series of incremental penmovements, assuming an orthogonal coordinate system. For example:

```
SUBROUTINE BOX2
CALL LINBY2 (5.0,0.0)
CALL LINBY2 (0.0,2.0)
CALL LINBY2 (-5.0,0.0)
CALL LINBY2 (0.0,-2.0)
RETURN
END
```

This routine draws a rectangle starting at the point where the pen is present, according to the valid coordinate system which is either the basic system, if no transformations have been defined, or the current transformation.

The next main program uses the subroutine BOX2 to draw two times a rectangle.

CALL PLOTTE	device nomination i.e. Calcomp plotter
CALL UNITS(10.0)	all measures are given in units of 10 mm
CALL MOVTO2(0.0,0.0)	move pen to zero point of basic system
CALL BOX2	draw rectangle according to orthogonal system
CALL TRANS(2)	initializes the transformation matrix
CALL SHIFT2(2.0,3.0)	move axis system 2 cm in X-direction and 3 cm in Y-direction
CALL ROTAT2(30.0)	turn axis system over 30 degrees
CALL MOVTO2(0.0,0.0)	move pen to zero point of relative axis system

```
CALL BOX2                    draw rectangle according to the relative
                             axis system
CALL DEVEND                  put end of file
STOP
END
```

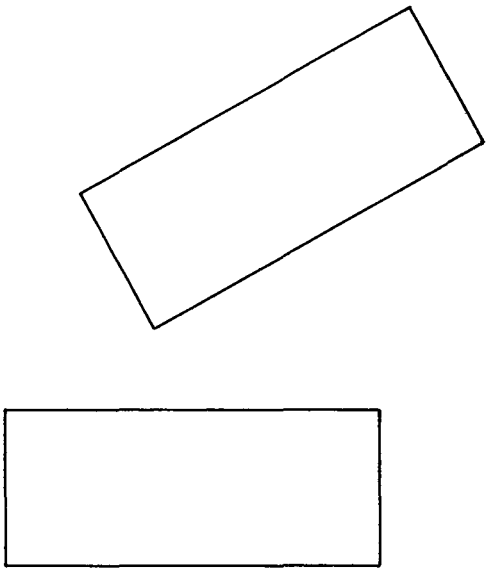


Fig. 1

Consecutive drawings are executed according to the defined relative axis system unless the transformation is annulated by:

CALL TRANS(0)

In this case the basic coordinate system reenters as the reference system.

The permitted arguments for the subroutine TRANSF are:

- **I=2 switches transforming on**
- **I=0 switches transforming off and saves the current matrix**
- **I=1 switches transforming on and restores the transformation.**

N.B. CALL TRANSF(1) is only allowed in an execution sequence after a CALL TRANSF(0).

The subroutine BOX2 may be used to create a three dimensional drawing, for example to model a 3D slab of 1 cm thickness:

```
SUBROUTINE BOX3
CALL MOVTO3(0.0,0.0,0.0)          move to zero point
CALL ROTAT3(1,90.0)               rotate coordinate system around the
                                  X-axis over 90 degrees
CALL BOX2                         draw first rectangle
CALL SHIFT3(0.0,0.0,-1.0)         shift coordinate system
CALL MOVTO3(0.0,0.0,0.0)          move to zero point
CALL BOX2                         draw second rectangle
CALL SHIFT3(0.0,0.0,1.0)          restore original coordinate system
CALL ROTAT3(1,-90.0)              by the inverse transformation
CALL MOVTO3(0.0,0.0,0.0)          move to zero point
CALL LINBY3(0.0,1.0,0.0)   \
CALL MOVBY(0.0,0.0,2.0)    |
CALL LINBY3(0.0,-1.0,0.0)  |
CALL MOVBY3(5.0,0.0,0.0)   |      draw connecting lines
CALL LINBY3(0.0,1.0,0.0)   /
CALL MOVBY3(0.0,0.0,-2.0)
CALL LINBY3(0.0,-1.0,0.0)
CALL MOVBY3(-5.0,0.0,0.0)         return to zero point
RETURN
END
```

The subroutine BOX3 may now be handled as an independent object. All kind of transformations may be applied providing that a proper axis system, viewpoint and method of projection have been defined. For example:

CALL PLOTTE	device nomination
CALL UNITS(10.0)	all measures are given in units of 10 mm
CALL MOVTO3(0.0,0.0,0.0)	move to zero point of basic system
CALL WINDOW(3)	to prevent degeneration of drawing
CALL TRANSF(2)	initialize the transformation
CALL SHIFT3(10.0,10.0,0.0)	move axis system
CALL PROJ3(10.0,10.0,10.0)	define the mode of projection and place of viewpoint; perspective view
CALL MOVTO3(0.0,0.0,0.0)	move to zero point of relative coordinates system
CALL BOX3	draw box
CALL TRANSF(0)	annulate all transformations
CALL TRANSF(2)	initialize new transformation
CALL SHIFT3(15.0, 15.0,0.0)	move axis system
CALL AXON3(5.0,10.0,10.0)	define the mode of projection and place of viewpoint; parallel projection
CALL MOVTO3(0.0,0.0,0.0)	move to zero point
CALL SCALE(0.4,2.0,1.0)	new scaling factors
CALL BOX3	draw box
CALL DEVEND	put end of file
STOP	
END	

The WINDOW routine prevents degeneration of the transformation; only calculated values within certain boundaries will be represented. The following statements are permitted:

CALL WINDOW(I) with

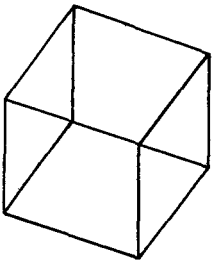
I=0 switches windowing off
I=2 two-dimensional windowing with automatic limits
I=3 three-dimensional windowing with automatic limits

CALL WINDO2(XMIN,XMAX,YMIN,YMAX)
CALL WINDO3(XMIN,XMAX,YMIN,YMAX,ZMIN,ZMAX)

The latter two statements may also be used to select certain parts of a complex drawing and to project them as an entity. The arguments of the WINDOW routine are referring to the basic coordinate system.

The subroutine PROJ3 projects the three dimensional object on a plane perpendicular to the line through the point of view and the zero point of the current axis system.

The subroutine SCALE3 changes the units on the axis to obtain a cube. The coordinates are multiplied with the respective arguments. The given example transforms the slab into a cube of 2 cm. This routine must be called immediately prior to the drawing routine.



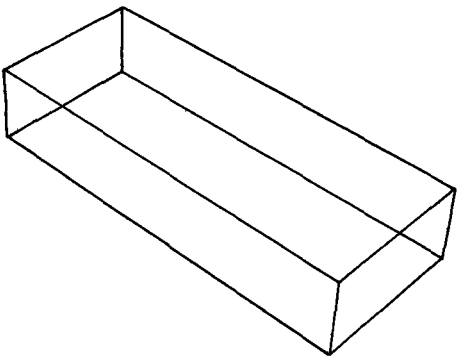


Fig. 2

The same result may be obtained in various ways. The number of statements may be reduced by clever manipulation with transformations. However, it is advisable to avoid complex programming by:

- Distinguishing clearly each entity of transformations
- Programming the subroutines describing objects, as based on the basic coordinate system. The applied transformations must be annulated by inverse operations.
- Avoiding the closing and opening of transformations in the subroutine by CALL TRANSF(0) and CALL TRANSF(2)
- On leaving the subroutines, the pen must be in the same position as on entering.

As a final remark it must be noted that the package is not yet sufficiently tested for large scale use. Much more work has to be done to offer a profound assistance towards the use of this software tool. However, interested programmers are invited to use the package so the gained experiences may be shared.

The access to the library of GINO-F routines is obtained by the procedure statement:

```
//  EXEC FTGCLG,PRN=GINOF,VLB=COPICA,ULB=DISK
```

A copy of the manual is deposited at the Library of Manuals (Mrs. Cambon).
The DD statement for tape output is the same as for the current Calcomp procedure.

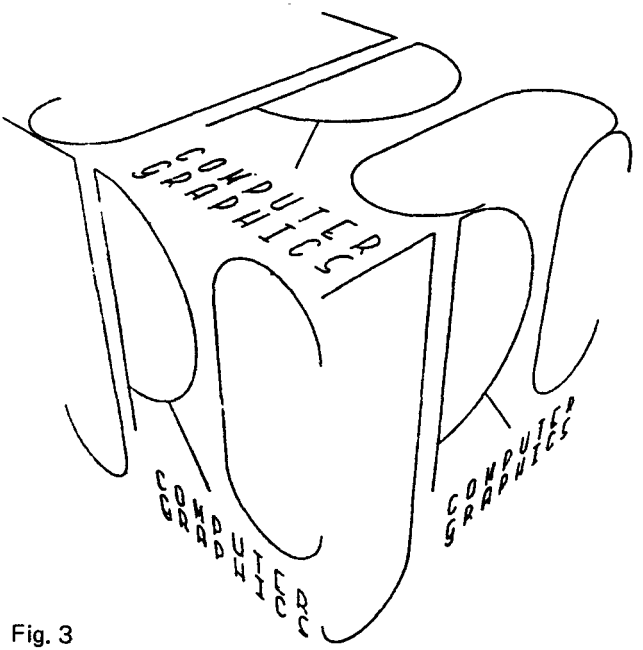


Fig. 3

Statistics of computing installation utlization

Report of computing installation exploitation for the month of September 1977

	YEAR 1977	YEAR 1976
Number of working days	22 d	22 d
Work hours from 8.00 to 24.00 for	16.00 h	16.00 h
Duration of scheduled maintenance	22.67 h	21.08 h
Duration of unexpected maintenance	5.00 h	6.72 h
Total maintenance time	27.67 h	27.80 h
Total exploitation time	324.33 h	324.20 h
CPU time in problem mode	145.60 h	114.12 h
Conversational systems:		
CPU time	2.70 h	2.00 h
I/O number	483,000	333,000
Equivalent time	6.06 h	4.33 h
Elapsed time	431.00 h	143.00 h
Batch processing:		
Number of jobs	9,470	10,460
Number of cards read	2,898,000	3,368,000
Number of cards punched	130,900	212,000
Number of lines printed	26,997,000	27,838,000
Number of pages printed	605,000	634,000

BATCH PROCESSING DISTRIBUTION BY REQUESTED CORE MEMORY SIZE

	100	200	300	400	600	800	1000	1400	total
Number of jobs	2345	3124	2309	1010	259	103	16	28	9194
Elapsed time (hrs)	51	166	204	161	81	44	4	2	713
CPU time (hrs)	2.6	24.3	37.5	32.5	24.5	14.1	1.0	6.1	143
Equivalent time (hrs)	17	57	78	68	37	23	2	9	291
Turn around time (hrs)	0.3	0.5	0.9	3.4	1.6	2.1	2.0	2.8	0.9

PERCENTAGE OF JOBS FINISHED IN LESS THAN

TIME	15'	30'	1h	2h	4h	8h	1D	2D	3D	6D
% year 1976	51.6	69.2	83.1	93.3	98.2	99.4	99.6	99.9	99.9	100
% year 1977	46.7	66.8	82.6	93.1	98.0	99.1	99.5	100	–	–

Utilisation of computer center by the objectives and appropriation accounts for the month of September 1977

		IBM 370/165 equivalent time in hours
1.20.2	General Services - Administration - Ispra	25.90
1.20.3	General Services - Technical - Ispra	1.02
1.30.4	L.M.A.	0.07
1.90.0	ESSOR	9.42
1.92.0	Support to the Commission	19.30
2.10.1	Reactor Safety	113.37
2.10.2	Plutonium Fuel and Actinide Research	2.93
2.10.3	Nuclear Materials	5.19
2.20.1	Solar Energy	2.99
2.20.2	Hydrogen	0.03
2.20.4	Design Studies on Thermonuclear Fusion	4.04
2.30.0	Environment and Resources	11.16
2.40.0	METRE	5.09
2.50.1	Data Processing	74.83
2.50.3	Safeguards	1.99
	TOTAL	277.37
1.94.0	Services to External Users	26.10
	TOTAL	**303.47**

EQUIVALENT TIME TABLE FOR ALL JOBS OF THE GENERAL SERVICES - Monthly and Cumulative Statistics

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	84	82	101	77	57	64	73	54	61	59	36	46
accumulation	84	166	267	344	401	465	538	592	653	712	748	794
Year 1977	44	74	78	32	26	36	27	25	27			
accumulation	44	118	196	228	254	290	317	342	369			

EQUIVALENT TIME TABLE FOR THE JOBS OF ALL THE OBJECTIVES AND GENERAL SERVICES - Monthly and Cumulative Statistics

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	206	237	270	241	229	248	249	223	233	244	159	150
accumulation	206	443	713	954	1183	1431	1680	1903	2136	2380	2539	1689
Year 1977	135	218	312	193	180	269	244	214	303			
accumulation	135	353	665	858	1038	1307	1551	1765	2068			

EQUIVALENT TIME TABLE FOR THE JOBS OF THE EXTERNAL USERS - Monthly and Cumulative Statistics

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	18	19	28	16	25	32	14	11	27	31	29	12
accumulation	18	37	65	81	106	138	152	163	190	221	250	262
Year 1977	13	14	18	16	13	22	19	18	26			
accumulation	13	27	45	61	74	96	115	133	159			

EQUIVALENT TIME TABLE FOR ALL JOBS OF ALL USERS - Monthly and Cumulative Statistics

	January	February	March	April	May	June	July	August	September	October	November	December
Year 1976	233	271	313	280	277	281	260	245	273	287	206	172
accumulation	233	504	817	1097	1374	1655	1915	2160	2433	2720	1926	3098
Year 1977	158	241	314	242	202	294	266	217	299			
accumulation	158	399	713	955	1157	1451	1717	1934	2233			

Mathematical Subroutine Packages

Herman I. de Wolde

The users of the JRC computer installations might have been disappointed by the description of the direct services of the unit "Support to Computing" as explained in the Newsletter No. 11. However, the present article deals with a topic which is of much more importance than the detection of errors in programs.

The tendency of using ready elements in new software products is increasing. As mentioned before, the average programmer produces ca. 3000 valid endproduct statements per year. The intelligent author of any scientific program may easily double his production by using existing subroutines. Of course the linking of the main program to the calling sequence of a defined subroutine needs some effort. However if the programmer realizes that the average daily production of valid statements is about 20, he may quietly dedicate half a day to understand the prerequisites of a subroutine of 40 thoroughly tested statements. Even one or two days to test the behaviour of a complicated subroutine, lacking a precise description, may offer an economic gain in production.

It is a known fact that people creating the most intelligent solutions to complex problems in informatics often lack the ability to transfer their solutions to less specialized users. It is our opinion that an important obligation of the unit "Support to Computing" is the transfer of knowledge and to make the available means digestable for the common user.

Some particular fields, for example, have produced integrated systems with the result that a technical oriented user may construct very complicated applications with a limited knowledge of informatics.

The scientific programmer in general is confronted with more problems. One day he might be engaged by statistical problems and the next task is to apply a spline fitting to a series of differential boundary equations with the request to produce a layout of the results ready for reproduction of A4 format.

Especially for the scientific applications it seems that standardization and the construction of integrated systems is an utopian goal.
However the frequently disdained FORTRAN environment offers a treasure of applicable elements which may help to improve production and product quality.

The present collection of ready subroutines at the Computing Centre is extensive but rather poorly used. We do hope, in close collaboration with the Users Group, to promote the use of the systems and to extend the materials according to the actual needs. However it is out of the scope of the unit "Support to Computing" to enter into the purely mathematical aspects of the routines.

The next paragraphs give an outline of the presently available collections.

CSSL

The name of the library is derived from Cetis Scientific Subroutine Library. The collection is always directly accessible as it is concatenated with the system libraries. CSSL contains 126 thoroughly tested routines divided in a number of categories.
The basic information on available routines is obtained from the Installation Notes by the following job :

```
//    JOB.....
$     TIME....
$     LINES...
//    EXEC  LINHO,MEMB=CSSL
```

Detailed descriptions of the subroutines in a specific category is produced by :

```
//    EXEC  LINHO,MEMB=xx
```

in which **xx** is the desired category according to the general description.

SSP

The Scientific Subroutine Package has been produced by IBM, however the collection is not sustained anymore. This means that the subroutines do not always reflect the current state of the art in statistics and numerical analysis.
The collection offers about 200 routines both in single and double precision, in source form.

The description is given in the IBM publication GH20-0205. A copy of this manual is deposited at the Library of Manuals (Mrs. Cambon).
The package contains many interesting elements.

IMSL

The International Mathematical Subroutine Library is a commercial product of US origin, which contains almost 400 elements. The computer centre leases it on a yearly base. There are some minor restrictions on the distribution of the subroutines. For example the single routines may not be distributed outside the Centre, however complete programs with IMSL elements are not restricted.
The collection is especially useful for statisticiancs.The quality and producer's maintenance is of high level.
By lack of manpower the in-house maintenance and assistance have been rather poor but we hope to improve this situation with the help of the users. The documentation on this package may be consulted at the Library of Manuals (Mrs. Cambon).

N A G Package

For completeness sake I mention here also the Numerical Algorithm Group library, being also a commercial product of British origin with presently 160 elements.
This package is not yet available at the Computer Installations but it may be an attractive collection to complete the IMSL package as the orientation of NAG seems somewhat move directed to numerical analysis. In this case also the help of the users is required for an evaluation of the materials in relation to the existing needs.

A proposal for a work schedule to enhance the situation is given as a series of action points.

- The installation of a working group for numerical analysis and statistical subroutines with the tasks :
  - To maintain the contacts between the users for sharing of experiences
  - to advise on the improving and extension of the basic collection
  - to perform comparative studies on the existing and new materials
- the organization of a smooth access to the available subroutines
- the addition of requested subroutines to the CSSL library for direct calling by the main programs
- the promotion of the use as an economic way of saving time and improving product quality.

The unit "Support to Computing" is gladly willing to extend its obligations with the last three tasks, but hopes to receive assistance from the users towards the first item.

U. G. Short News: Internal Meeting of October 6th

J.P. Halleux

- Two new members have joined the UG:
  - Mr. Faini, from Università Bocconi, who represents the external users;
  - Mr. Jaarsma from Dept. A.
- The steering committee looks like follows:

  Secretary : Mr. Halleux
  Substitutes : Mr. Fangmeyer
  Mr. Kolar

  a third person will be designed during the next meeting.
- **Disc space availability:**

  After discussion, it appeared that all members want something to be done, but it was not agreed on what. The Secretary has been asked to discuss the problem with the C.C. and Mr. Fangmeyer will prepare a summary of the actual situation. It is hoped that in the next meeting a solution to this growing problem can be found.
- **Mathematical libraries:**

  On request of the C.C., the problem of the maintenance of the various mathematical libraries has been discussed. The Secretary should organize a discussion between the interested people and report to the U.G.

The Newsletter is available at:	*Des exemplaires du Bulletin sont disponibles chez:*
Mrs. A. Cambon Support to Computing Bldg. 36 - Tel. 730	**Mme A. Cambon** Support to Computing Bât. 36 - Tel. 730

Note to the Users

In order to complete the information given in the article "IBM Time Sharing Option (TSO) – Concepts, Features and Facilities" (Computing Centre Newsletter, No. 14, pp. 16-25), we inform the users about some facilities available at the present time or in the next future.

- A complete set of TSO manuals is available at the office of Mrs. Cambon for consultation.
- The forms to request TSO manuals should be delivered to Mrs. Cambon, at the building 36 A (tel. 730).
- IBM product program TSO-FORTRAN G1 prompter is just running under TSO; the users can utilize it. Product use is described in the manual: TSO Terminal User's for FORTRAN (G1) Programmer's Guide – SC28-6855.
- IBM product program PL/I Optimizing Compiler is just running under TSO; the users can utilize it. Product use is described in the manual: OS PL/I Optimizing Compiler TSO User's Guide – SC33-0029.
- The TSO terminal network will have an extension with the connection of some terminals for private use.
- Probably another terminal for public use will be made available to TSO users. This terminal will be installed in the building 36 A.
- A description on how to use the command procedures:
  - to create and reserve a data set;
  - to print a data set on the fast line printers in the machine room;
  - to punch a data set on cards;
  - to submit a job to be executed in batch mode;

  is available at the office of Mrs. Cambon.

Les personnes intéressées et désireuses de recevoir régulièrement "Computing Centre Newsletter" sont priées de remplir le bulletin suivant et de l'envoyer à

Mme A. Cambon
Support to Computing
Bât. 36, Tel. 730

Nom .....

Adresse .....

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Tel. .....

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