SECTION 4 ACTIVITIES OF COMPUTING COMMITTEES

Rutherford Laboratory Computer Advisory Committee

At the start of 1978, Professor W Galbraith became Chairman of the RLCAC. Professor Collinge serves on the Committee being the Chairman of the Daresbury Computer Advisory Committee. Other members of the RLCAC reflect the spectrum of use of the IBM 360/195 computers. They include Dr R J Ellison, Dr P I P Kalmus, Dr P J Dornan and Dr B R C Martin (Nuclear Physics Board), Mr O S Mills and Professor M G Haines (Science Board), Dr E M Freeman (Engineering Board), and Dr E B Dorling and Dr B R Martin (ASR Board). Dr J A McGinnety represents the interests of NERC.

Meetings were held on 7 May 1978 and 21 July 1978. At both of these meetings, the principal matter discussed was the future development of the Rutherford Laboratory Computer Centre.

At the earlier meeting an outline of possible short, medium and long term developments was put forward. The Committee accepted the outline and invited detailed proposals following further studies. In particular, the Committee asked the C & A Division to carry out detailed technical studies of a Front End Computer for the existing 195 system. The purposes of the Front End Computer were seen as:

(1) achieving a continuity of service and facilities during the transition in the 1980s from the 360/195s to some replacement system, so that users would suffer the minimum disruption to their work;

(2) providing greater flexibility for the introduction, through a modern operating system, of new sofware facilities which would be supported by the manufacturer;

(3) allowing a considerable increase in the number of active ports, currently constrained in ELECTRIC to maintain reasonable response times;

(4) relieving the 360/195 of the burden imposed by the existing telecommunication network, and freeing the central processors for use on more computationally intensive activities;

(5) the possible provision of better facilities for database activities where peripheral activity is usually high compared to central processor use.

Papers seeking support for enhancements to the channels, magnetic tape system, and to the disk capacity were presented at the July meeting. The cases for the channels and magnetic tapes were

endorsed for submission to the FCC for funding approval. The Committee supported the technical case for the provision of disks of IBM 3350 type, and agreed that the Laboratory should obtain detailed tenders from various suppliers so that not only the specification of the equipment but the availability of engineering and software support could be fully investigated.

At each meeting, the Committee received a progress report reviewing the performance of the computing equipment in the previous quarter. This had recently highlighted the pressure points in ELECTRIC, the restricted amount of filespace and the imposed maximum in the number of active slots. Although the Committee recognised the continued demand for expansion of the ELECTRIC facilities, it had refrained from recommending a curtailment of the registration of new ELECTRIC users, preferring instead to await the effects of the wider introduction of the Data Editing 4080 service, planned following an adequate period of local field trial.

SRC Facility Committee for Computing

The membership of this committee is now as follows:

Prof. R J Elliot (Oxford)	Chairman
Prof. D W Barron (Southampton)	
Prof. W Galbraith (Sheffield)	Nuclear Physics Board
Dr P C Hedgecock (IC)	ASR Board
Prof. A G J Macfarlane (Cambridge)	Engineering Board
Mr D W Mann (Logica)	
Mr O S Mills (Manchester)	Science Board
Mr A E Seddon (NERC)	Other Research Councils

with assessors:

Mr B R Taylor	Dept. of Industry
Dr H J Norton	Computer Board

The committee met on 10 July and 25 September 1978; the following topics were among those discussed at the first of these meetings:

(i) ICL DAP at QMC. The recommendations of the ad hoc Panel chaired by Prof. Rosenbrock for the Engineering Board were endorsed;

(ii) Prof. Kirstein's proposed programme to study communications protocols in X25 networks.

An interim report from the CB/RC Network Unit, NERC's computing plans and the Computer Board's preliminary conclusions about the future of its major centres were also discussed.

Committees

At its latest meeting the committee, after noting progress reports on computing from Rutherford and Daresbury, considered the estimates for 1979/80. The committee then:

(i) discussed the CB/RC Network Unit's latest report and recommended that a Joint Network Team be set up to coordinate various aspects of Research Council's and Computer Board's network developments;

(ii) approved for a further year Prof. Kirstein's application for continued support for the provision of computer services for UK research workers on ARPANET;

(iii) approved the purchase of peripheral enhancements to the dual 195 system:

(a) 2 x 3350 disk units (giving 4 spindles), controller and an upgrade to one of the existing controllers;

(b) 2 x 3420/8 6250 bpi magnetic tape drives;

(c) a 2-channel block multiplexor.

The latter two items are subject to availability of funds;

(iv) discussed proposals for a 3032 to front end the dual 195 system at RL and a CRAY1 to be situated at Daresbury.

Technical Note on Hardware Enhancements

The IBM 3350 drives have non-removable packs each with a density of 317 Mbytes and have 1.14 megabytes of storage addressable via a fixed-head feature, giving zero seek time. It may be of some interest to compare the major characteristics of the 3350, the 3330-1, and the 3330-11.

Capacity	3350	3330-1	3330-11
per spindle (Mb)	317	100	200
track (bytes)	19069	13030	13030
cylinder (Kb)	572	247	247
Cylinders per spindle	555	404	808
Tracks per cylinder	30	19	19

Performance	3350	3330-1	3330-11
Average seek (Ms)	25	30	30
Data-transfer (Kb/sec)	1198	806	806
Fixed Head Capacity (Mb)	1.14	None	None

SECTION 5 THE TAPE AND DISK MANAGEMENT SYSTEM

Introduction

There are about 35000 tapes kept in the tape library and about 130 demountable 3330 disks. No job needing either a tape or a demountable disk may begin execution until the necessary tapes or disks have been mounted. Tapes or disks are mounted on drives as they become free under the control of SETUP which reads down the job queue seeking a job which requires tapes or disks that may be mounted on the free drives. SETUP commands the operator to mount the tapes or disks and the job may then begin execution.

That describes the way the system operated until April 1978. It presupposed that every tape and every disk was accessible to the operator so that he could obey each mount command. The tape library had grown so large that it might take several minutes to find a tape. Furthermore there was no means of detecting a request for a non-existent tape. More seriously there was no means of detecting unauthorised use of a tape, although there was a rudimentary scheme which could prevent some accidental overwriting.

When it was decided that the tape library should be divided into two or more parts with only an active subset of the tape library available for immediate mounting, it became necessary to introduce a system of managing tape movements which would prevent operators being told to mount tapes which were not in the computer area. In short, the system needs to know the status of every tape. The tape and disk management system produced by the Systems Group does this and also incorporates information which may be used to control access.

The remainder of this article describes: the physical arrangements of the tape libraries and the disk library; how movements are arranged; facilities that are or will be available to the general user; services which can be requested from the tape librarian; and some general considerations.

Physical Arrangements of the Tape Libraries

The approximate size of the Tape Library (Autumn 1978) is 35000 tapes. These are distributed among the Local, Home and Archive Libraries.

The Local Library contains between 4000 and 4500 tapes all of which have been used in the recent past or are scheduled for use by at least one job on the input queue. It is situated in part of the main computer area which is fully air conditioned. Only those tapes which are in the Local Library are available for

immediate processing. The definition of 'recent past' will vary from time to time in order to keep the size of the Local Library within its prescribed limits. It is not anticipated that this period will fall below 2 months. Currently it stands at about 4 months.

The Home Library contains about 20000 tapes and will normally consist of those tapes which do not qualify for the Local Library but have been used within the last three years, say, or are likely to be used in the near future. Newly issued tapes are normally placed in the Home Library. The Home Library is housed in a temperature controlled building but it is not air conditioned like the Local Library. In principle some period of acclimatisation might be necessary when tapes are transferred from the Home Library to the Local Library. Early experience suggests that there is little problem in this respect but it is recognised as an aspect to be kept under review whether a formal acclimatisation period should be incorporated into the transfer process and whether such a period should depend on the duration of the time spent in the Home Library.

When the Home Library becomes almost full, those tapes which no longer qualify for the Home Library will be transferred to the Archive Library. At present the Home Library and the Archive Library occupy different parts of the same building. If the tape library continues to grow, then eventually the Archive Library would have to be kept somewhere else but that is not expected to happen during the next few years or so.

The Tape and Disk Management System has provision for the addition of other libraries. One such library is the conceptual Absent Library which is discussed below under the heading of Tape Movements.

Movement of Tapes between the Libraries

The normal sequence of events is seen as the following. Tapes will be transferred into the Local Library some time after the receipt of a job requiring their use. Tapes will migrate to the Home and Archive Libraries according to some ageing algorithm. Other transfers may be initiated by the tape librarian or the owner of a tape.

Transfer of tapes between the Home and Local Libraries takes place three times per day on normal Mondays to Fridays and at least once per day at weekends and during holiday periods. The normal transfer times are 11.00 (recently amended from 10.00), 16.00 and between 20.00 and 22.00 on normal working days. Transfers at other times are determined by the requirements of the jobs in the system.

Transfers from the Archive Library to the Local Library take

place once per day, normally at the same time as the the morning transfer from the Home Library. (However if it became necessary to house the Archive Library further away, then the frequency of transfers out of the Archive Library would probably diminish).

Thus, for the forseeable future, the maximum transfer time is about 24 hours. In practice, the move will seldom take longer than a few hours.

The Issue of Magnetic Tapes

Any authorised user of the 195 may request the tape librarian to issue magnetic tapes for use on the 195. The Rutherford Laboratory retains ownership of all tapes issued. Each tape has a registered owner (ID) and is associated with an account number (ACCT). There is an initialisation process which must be performed before a newly issued tape can be used. Requests for small numbers of tapes are normally dealt with overnight (except on Saturdays and Sundays), but large numbers take longer.

It is a laboratory standard that each tape issued will be a 9 track tape, written at 6250 bytes per inch, and use IBM Standard Labels. Experience has shown such tapes to be the most reliable and there are more tape drives available at this density. Tapes can be issued at lower densities, or as 7 track tapes, but fewer tape drives are available on which to mount them. Such tapes will only be issued if they are to be sent to some other computer which is unable to accept Rutherford standard tapes. Unlabelled 9 track tapes should only be written in special circumstances. Even when tapes are exported it is normally possible to read tapes with IBM Standard Labels by ignoring the label files if necessary.

Whenever a new tape is issued, its characteristics, ownership, and mode of access (see below) are recorded in the Tape and Disk Management System. The tape is initialised and normally placed in the Home Library.

Import and Export of Tapes

A distinction is made between tapes which have been issued by the tape librarian and those tapes which originate elsewhere. The latter are termed Foreign Tapes. Both types of tape could, in principle, be found in the Local, Home and Archive Libraries and therefore be known to TDMS. Foreign tapes are normally kept in the Local Library only as long as they remain in use and are then returned to the owner.

When a tape is taken away from the tape library, the two types are treated differently. Normally a Foreign Tape will be

deleted from the system. Rutherford tapes, however, are nominally removed into what is known as the Absent Library, so that the details of ownership, permitted access and usage statistics etc. are preserved. Any job that requests the use of a tape in the Absent Library will be rejected.

When tapes arrive from outside Rutherford, particularly via post, they must be acclimatised before use. Such tapes are normally kept in the machine room area for up to 24 hours before being made available. If attempts are made to use a tape without a proper period of acclimatisation, then unpredictable results may follow.

When a Rutherford Tape is returned to the tape library it will be known to the system, so unless any of the physical characteristics of the tape have been changed, the user is not required to supply any further information. The tape will be acclimatised and placed in the Home Library, unless the user specifies the Archive Library or requests a place in the Local Library. Not until the transfer is registered by TDMS will the system accept any job that requires that tape. Note that TDMS does not assume that recently arrived tapes are required for imminent use.

When a foreign tape is sent to the tape library it will in general be unknown to TDMS. The user must supply the necessary characteristic information. (If a Foreign Tape is likely to commute then it would be appropriate for its absences from Rutherford to be treated as for a Rutherford Tape and this should be explained to the tape librarian each time the tape leaves the tape library). The information required from the user is indicated on the following form facsimile. If for some reason a characteristic (such as density) is unknown, the tape library may be able to assist, but clearly this will introduce a delay in the registration of the tape which might typically be 24 hours.

```
        TO R.L.TAPE LIBRARIAN
TAPE-VOLID:
DENSITY: 6250   1600   800   556
LABEL
   9 TRACK      7 TRACK
OWNER NAME:
ACCT NO/ID
```

Foreign tapes will not normally be retained indefinitely. Unless requested otherwise, a Foreign Tape will be returned to its owner if it is unused for a period of six weeks. Alternatively the owner may request that the tape be retained at Rutherford for a specific period.

Information kept by the Tape and Disk Management System

Three basic types of information are kept by TDMS - characteristic, statistical and control. In addition a limited amount of user supplied comment may be stored. The information is stored in Fields having particular names which are indicated in the lists below. Users may interrogate TDMS about most of the fields and where appropriate modify them. Other functions and requests should be made through the tape librarian.

Characteristic Information includes:

Volume Serial Number	VOLUME
Owner ID	ID
Owner ACCT	ACCT
Tape Manufacturer	MAKE
Last Issue Date	ISSUDATE
Tape Density	DENSITY
Tape Length	TAPELEN
Label Type	LABELTYPE
Name of Home Library	HOME
Home Rack Number	
Device Type	DEVTYPE

Statistical Information includes:

Current Library	CURRENT
Local Rack Number	
Date last moved	
Library last moved from	
Date last used	
Date last written	
Date last cleaned	CLEAN
Review date for Foreign Tapes	REVIEW

Control Information is used to control access to tapes and disks. (Access is discussed in the following section). Such information includes:

Default Access	ACCESS
List of Passwords with associated access	PASSWORD

User Information is stored in:

Comments (up to 44 characters)	COMMENT
User data (8 bytes)	USER

How TDMS Controls Access to Tape and Disks

Access to tapes and disks may be controlled by the use of TDMS passwords.

Each tape and disk may have a number of passwords with associated access rights. Whenever a job is submitted requiring access to a tape with a TDMS password, TDMS will verify that such access is permitted. Access to tapes which have no passwords is unrestricted.

The SETUP card specifies which access is required - read or write. If the tape has one or more TDMS passwords then the access will only be permitted if:

(i) TDMS finds a password with the required access right;

or (ii) the required access is allowed without a password.

If neither of these conditions are met, the job will be rejected with the message 'ACCESS VIOLATION'.

TDMS will look for passwords in two places. The user may supply a password on the SETUP card, or TDMS will scan its user database. (Note these are exclusive. If you supply an incorrect password, or one not having the desired access right, TDMS will not switch to a search of the user database).

A user is characterised by an account/id pairing. Each user may keep a list of passwords in the TDMS user database. When TDMS is looking for a valid password, each of the stored user passwords will be tried until a valid one is found. If the search fails, and the default access does not permit the access then the job will be rejected.

To specify a password on the SETUP card, the tape or disk name is qualified by the alphanumeric password of up to 8 characters length eg.

```
/*SETUP   999999(HELPHELP)
```

How TDMS Controls Access to its own Information

Access to the information in TDMS is controlled by keys. If a volume or a user has a key, then TDMS will allow access to the information if and only if the key is provided. A key is up to eight characters in length.

Tapes are normally issued with no key. (More strictly the key is 8 blanks). To give a key, use the ADDKEY command.

Interrogation and Other User Facilities

An interim facility, allowing users to find the current library containing tapes with particular volume serial numbers, was introduced earlier this year. It is described in paragraph 3.5 in Section 1 of this edition of FORUM.

The full set of user commands when they are fully implemented, will be as described in Section D12 of CIGAR. The commands descibed there will allow users to: LIST chosen fields of tapes having certain attributes; SET and REMOVE passwords; COMMENT certain volumes; supply keys; and CHANGE ownership and certain other fields.

The release of these facilities is intended in the near future and will be announced by means of central computer notices etc. Read these carefully to note any commands which are only partially implemented to begin with.

Services Available for the Tape Librarian

If you need any of the services of the tape library you should contact the tape librarian in one of the following ways:

(i) write to the Tape Librarian, C&A Division, Building R27, Rutherford Laboratory;
(ii) make use of existing courier services;
(iii) telephone 0235-21900 extension 333;
(iv) call from or leave a message at Computer Reception;
(v) use the ELECTRIC message and mail facility TOID=JU;
(vi) send a message to the hard copy terminal ++T.

The services available include the following:

(1) Issue tapes and private disks;
(2) Transfer tapes between libraries;
(3) Withdraw tapes;
(4) Accept tapes for inclusion in the library;
(5) Clean tapes;
(6) Initialise tapes;

Considerations for Disks

The primary application of TDMS concerns magnetic tapes and most of what is written above is written from that standpoint. TDMS covers the library of disks also and some aspects of that are described now.

There are between 100 and 200 demountable disks most of which are private. Unlike magnetic tapes there is virtually no import

and export of disks and the question of magnetic labelling does not generally arise. These disks are organised into two libraries – one for the 100Mb disks, and the other for the 200Mb disks. Both libraries are kept in the computer area and transfer between libraries does not arise. Most of the fields used by TDMS apply to disks, but some such as length do not. The password protection applies to the volume only. It does not apply at the data set level.

General Considerations

TDMS was first implemented in April 1978 when the magnetic tapes were organised into the three libraries and a single disk library was formed. Password protection was added on a limited scale during October 1978. The LIST facility has not yet become available but its specification is described in Section D12 of CIGAR. Its implementation will be announced in the normal way.

The Tape and Disk Management System is generally believed to be working satisfactorily but will still be reviewed after increased experience. Observations etc. are therefore still welcome and should be addressed to A R Mayhook, Systems Group, C&A Division.

SECTION 6 INTERAVAILABILITY OF CERN AND RUTHERFORD LIBRARIES

Introduction

Each laboratory has copies of the other's program library. It should always be remembered that the implementation dates at the two laboratories will not generally be in step.

Rutherford Library at CERN

The Rutherford Subroutine Library is now available on the IBM 370/168 at CERN as CR.PUB.RHELIB; anyone who has been using the library WI.MAJ.RHELIB should convert their JCL accordingly. Please note that some Rutherford routines are in CR.PUB.PULIB and these do not appear in CR.PUB.RHELIB; these routines are felt to be of sufficiently general use to be fully supported at CERN. Appropriate JCL is therefore:

```
//   LLB4='CR.PUB.PULIB',LLB5='CR.PUB.RHELIB'
```

Differences between the operating systems have necessitated changes being made to some routines but in all cases these should

be transparent to the user. In a few other cases minor changes which are totally backward compatible have been made. Please bring any problems to the attention of one of: J Hutton, HEP Division, RL; A Berglund or H Renshall, DD Division, CERN. Users or potential users are recommended to read a technical note detailing the changes that have been made. Please note that:

ASKOP is not available at CERN. Users must rewrite their code.

IDVICE will return DUMMY status for JES datasets.

UZERO is available in its two argument form in CR.PUB.RHELIB but that the standard CERN version requires three arguments. Users are recommended to use VZERO instead of the two argument version of UZERO.

EXCPIN a modified version with a different argument list exists in CR.PUB.CERNLIB. The version in CR.PUB.RHELIB is the same as that at RL.

CERN Software at Rutherford

The current situation regarding CERN software at Rutherford is as follows. The library called SYS1.CERNLIB contains the TC General Section library as it was around 1974/5. This was approximately a subset of the CERN Program Library. That library was checked out before releasing for use on the 195. In addition to the TC library one or two other CERN Program Library routines have been added having been tested on the 195.

Certain CERN library routines have been rewritten for the 195 to improve the performance. The improved versions are in both SYS1.CERNLIB and SYS1.RHELIB. The subroutines are: UZERO, UBLANK, UFILL, VZERO, VBLANK, VFILL, UCOPY, UMOVE, UCOPY1, UBLAN1 and UFILL1. Besides performance improvements there are extensions. Any program written using the extensions described in the Rutherford Program Library Manual cannot use the CERN versions on the 168 which do not have the Rutherford extensions.

Source material for other subroutines are available on tape. CIGAR section C10.5 explains how to access them. That material is for CERN 7600 versions.

The IBM version of the CERN Program Library has not yet been checked out on the 195. The load module library SYS1.CERN360 is a copy of the load module library on the CERN 168 in January 1978. Problems of system dependence have not been addressed and users may use this library if it is of any use to them, but any problems will have to await a proper implementation.

Besides the Program library there are particular pieces of CERN software which have been implemented by various groups of 195 users including such items as HYDRA, PATCHY, SUMX, HBOOK, FOWL, MINUIT. Some details are given in Section 3 of this FORUM.

SECTION 7 NOTE ON BACK-TO-BACK CONNECTION BETWEEN THE 360/195 AND THE CERN 370/168

This facility will be installed in November to begin tests immediately. The hardware consists of a PDP11 (Daresbury style workstation) looking like an RJE to both the 360/195 and the 370/168. Each "RJE" using the same buffers provides a file transfer capability between the two mainframes.

The facilities which will be available when the system becomes operational will be as follows:-

1. Job output from one host can be printed on any printer attached to the other host.
2. Card input to one host can be sent to the other.
3. Program files on one host can be sent to the other.

Terminal facilities will not be available.

Note that although the facilities listed will be available there has never been any intention that this system should replace the need for printers on the CERN workstation. Users will not be able to send all their 360/195 output to CERN printers. The facility is intended as providing a backup to the workstation printers. The transfer of program files will be the major use of the system under normal circumstances.

SECTION 8 POST OFFICE EXPERIMENTAL PACKET SWITCHED SERVICE

Introduction

EPSS is the British Post Office's Experimental Packet Switched Service. It is officially scheduled to run for a two year period from April 1977 to April 1979, but it may remain available for a while beyond this.

As far as the Rutherford Laboratory is concerned, it is not desirable in view of its limited lifetime, that any substantial volume of real user traffic should be routed via EPSS. However, certain users may find it useful as a temporary measure, in the absence of a more direct path.

EPSS is to be considered as the forerunner of a permanent Packet Switched Service (PSS) likely to be announced shortly by the Post Office. However, PSS will use completely different protocols, conforming to the new X25 international standard.

Apart from its connection to EPSS, the Laboratory, in collaboration with Daresbury, has implemented a private packet switched network. Ay present this still uses the old EPSS-compatible protocols to a large extent, but work is well advanced on converting these to X25.

Access to EPSS via the 360/195

1. To connect to the network: Type
   ++B DEST N
   and get OK in reply

2. To make a call: Type @V.nnnnnppp or @VT.nnnnnppp The first form should be used if the remote application sends data transparently to the terminal; the second if it sends text which requires translation before output. If necessary, try both to find out which is appropriate.

3. To clear a call: Type @Q

4. Whatever terminator is needed to send a line, only <CR> goes out to the network.

5. @ is an escape character at the beginning of a line. To input @ as data in that position, @@ must be typed.

6. To send a null line to the network (i.e:<CR> only), type a single @ character.

7. To send a line to network with no <CR> on the end, terminate it with <CTRL N>.

8. Lines longer than 100 characters are unacceptable as input, and will produce the reply -B ERROR

9. Lines beginning with ++ must be preceded by the header ++N and one space.

10. <CTRL H> means 'backspace', and is acted upon locally.

11. # at the end of a line means 'erase line' and is interpreted locally.

12. Calls cannot be reset from either end. If an attempt is made, the call will hang up until cleared by @Q.

13. Calls will normally time out after 10 minutes of inactivity.

14. When calls are rejected or terminated, the user is told: CALL REJECTED or CALL TERMINATED. If due to a NIP, the NIP codes are given alongside in hexadecimal.

COP-100 Messages: Messages are sent to another EPSS Host thus:

++102 COPON Replies OK.

nnnnnppp text (where nnnnnppp is the address).

Switch off when finished by typing:

++102 COPOFF

Access to the 360/195 via EPSS

1) Terminals dialling in via the PSE should make calls to Process Numbers 310 to 313. The last digit of the Process Number specifies how many 'nulls' the 360 is required to insert between lines of output. The complete address may therefore be 54290311, for instance.

   If the user's terminal does not supply its own line feed when a line of input is sent, the user should type the necessary LF before the CR. (The 360 will ignore LF if it is immediately followed by CR, so the extra LF is harmless).

   If Process Numbers 310 to 313 are used, the buffer control algorithm is such that the user can type in at any time. In particular, he can type 'STOP' to ELECTRIC, in order to stop the output from an ELECTRIC file.

2) Terminals attached to a host implementation of Character VPT should use Process Number 300. This uses the buffer control algorithm appropriate for such calls.

3) RESETs are not implemented in the 360. An attempt to reset a call causes it to hang up. The only remedy is to clear it.

4) On dialled calls, 'CONTROL H' may be used as BACKSPACE, and '#' immediately before the LF CR will cause the whole line to be rejected by the 360, producing the reply -B ERROR.

Host implementations may use their own local editing conventions.

SECTION 9 FORTRAN BUG LIST

There are three parts of Fortran to consider - the G1 Compiler, the H Extended Plus Compiler, and the Fortran H Extended Plus Library. From time to time new versions of one may be implemented without affecting the others. The bugs reported below relate to versions and updates indicated.

Fortran G1 Compiler Version 2.0 (undated)

1. Compiler does not detect the use of the same index variable in nested loops.

Fortran H Extended Plus Compiler Version 2.1 (Sept 76)

Because this is the only compiler which calls the Partial Array Handler, any associated bugs are included in this list. Such bugs (marked with a P) will only be corrected by a new version of the Fortran library.

It should be stressed that most of the faults described below occur quite rarely, sometimes requiring a combination of circumstances to produce them.

1. Bad code for a Logical*1 compare.

2P. Complex array is read incorrectly by the Partial Array Handler.

3. An isolated comment card compiles as a main routine. (You also get the level 8 messages about missing END and STOP statements). If you update a load module in a user library, this could be disastrous.

4. Bad code for COMPLEX*16 (abend 0C6).

5. EQUIVALENCE to a variable passed as an argument is not flagged as an error.

6. Assigning different values in two DATA statements was not flagged as an error. (The second value ruled).

7. Optimization Error, extracts redundant code from a DO loop which should not be executed. For example:

```
      DO 7 I=1,10
      IF(X.EQ.0) GO TO 7
      Z(I)=Y/X
7     CONTINUE
```

will try to compute Y/X before starting the loop.

8. Invalid branch from an outer DO loop to an inner DO loop was not detected as an error by the compiler. For example:

```
      DO 8 I=1,10
      IF(....) GO TO 8
      DO 8 J=1,10
      ....
8     CONTINUE
```

9. WRITE statement containing an array whose subscript is a statement function with one of the arguments as the counter in an implied DO gets IFE580I compiler error.

10. A subroutine was compiled to different lengths when it was first and in a later position in a group of subroutines when using OPT=0. (The code was logically correct in both versions).

11. A DO loop closed with a RETURN statement was not reported as an error, but several other error messsages were produced about this and other loops.

12. A variable stored from an undefined register when executing END= code.

13. An argument list has the same array name twice and the second occurrence is not flagged as invalid.

14P. Incorrectly printed part of a 2-d COMPLEX*16 array using D Format. ie.

```
      WRITE (6,6) (X(1,J),J=1,2)
6     FORMAT (1X,2(D10.3,D10.3))
```

was printed 0.111D 01-0.111D 01 0.222E 01 0.0

whereas WRITE(6,6) X(1,1),X(1,2) was correctly printed
0.111D 01-0.111D 01 0.222D 01-0.222D 01

15. IMPLICIT statement not being the first statement of a subroutine caused compiler failure.

16. Inconsistent EQUIVALENCE statements caused an invalid object module.

17. Optimization Error. Fails to store updated variable in code such as

```
      DO 17 I=1,17
      NT=NT+1
      IF(...(NT)...) GO TO
17    CONTINUE
```

NT was stored after the CONTINUE but not for the GO TO.

18. Optimization error in connection with READ statement, so that if the input record or list is incomplete, previous values are not remembered.

For example I=3 J=4 READ(5,*)I,J

left I and J undefined on reading an empty list.

19. Incorrect arguments in a CALL statement caused compiler failure.

20. An expression in an i/o list was not detected. Bad code was generated giving 0C1.

21. Error in Type statement caused Compiler Failure.

22. Bad code from optimization involving a two dimensional array.

23P. Wrong data transmitted writing partial arrays.

24. A Format Error involving ' caused bad object code.

25. Missing Format statement caused generation of erroneous diagnostic.

Fortran H Extended Plus Library Version 2.1

These are the subroutines which appear in the linkage editor listings with names that typically begin IHOxxxxx. These subroutines perform the Fortran i/o and provide the basic mathematical functions. There was a major modification to the library made in 1973 to make it reentrant (ie. to allow several jobs to share a single copy of the code). The type of error associated with the library are: mishandling i/o; misinterpretation of format statement; mathematical problems. The last of these does not include calling a subroutine with such small arguments that underflows etc. occur. Except in one important area, the partial array handler, few bugs are known in the Fortran Library.

1. DCOS rejects arguments > 2 times 2**50. It should accept up to 3.14159 times 2**50.

2. Asynchronous i/o WAIT statement caused 522 abend.

3. Partial Array Handler used by H Extended Plus causes several errors described separately in the list for that compiler with numbers such as 14P.