NATIONAL INSTITUTE OF OCEANOGRAPHY
WORMLEY, GODALMING, SURREY

N.I.O. Computer Programs 14

N. I. O. Internal Report No. N.14

JANUARY 1970

N.I.O. COMPUTER PROGRAMS 14

edited by

B.J.HINDE

N.I.O. Internal Report No. N. 14

National Institute of Oceanography

1) PROGRAMS

121	List output of SBWRO	LISTO
122	General Progressive vector diagrams	GPVD
123	Fourier Analysis	FRANO
	Amendment	
125	Computer Usage Statistics	CUS
125A	Computer Usage Statistics File Initialisation	CUSFI
126	Console Interrupt Program	CONS5
127-133	Dummy Mainline core-loads queued by CONS5	CONO
		CON1
		CON2
		CON3
		CON4
		CON5
		CON6
134	Process Cold Start - time sharing	NPTS5
135	Guard Interrupt Program	DIC5
136	Correct Shipborne wave recorder analysis output	CORRO
137	List output of CORRO	MALIS

2) SUBPROGRAMS

-19	Read sense Program - C.E.Switches	FUNCTION IPRGW(O)
-18	Read Data Switches	FUNCTION IADTW(O)

N.I.O. PROGRAM 121

Title	List SBMRO output.
Name	LIST0
Machine	IBM 1800
Language	1800 Fortran IV
Purpose	To list, on the 1443 Printer, the SBMRO output stored on disk.
Input	Job description and parameters:-

```
                    cc,18
//bJOB              14
//b*Job No./Name/Job Title
//bXEQbLIST
*FILES(1,,1)
*CCARD
```

Where name is the user's name.
Card 1 is the name of the disk file which contains the data to be listed (3A2 Format).
Card 2 contains the data title, read in in 36A2 format.
Card 3 contains P, (I4 Format) the number of records of output to be listed calculated by the formula 9(No. of days).
The input to be listed is stored on disk by the program SBMRO. This consists of a line containing the month number and year (stored as integers each of one word length), followed by a month's results. Each line of data is preceded by one word of storage which describes any special characteristics about the record. The remainder of the record is in the format 1 integer, 12 real variables, 1 integer, where integer numbers occupy one word of storage and real variables three words. Each disk file may contain a maximum of twelve month's data.

Output	The output for this program is identical to that produced by SBMRO(NIO 89). The title of the ship from which the records were obtained is printed on the first page, while each subsequent page is headed with the month and year, followed on the

next line by

DATE TIME TZ H1 H2 EH1'H2'HS1 HS2 HS HMAX (3 HRS) DURATION

These headings are produced by the program as they are not stored on disk.

The remainder of the output is copied from disk, and listed in the appropriate columns:-

a) the day of the month

b) the time at which the record started

c) the wave period in seconds, correct to two decimal places (T_z)

d) the height, in feet, correct to one decimal place, of the highest crest plus the lowest trough (H_1)

e) the height, in feet, correct to one decimal place, of the second highest crest plus the second lowest trough (H_2)

f) the spectral width parameter (E) to three decimal places

g) H_1 corrected to allow for instrumental response (H_1')

h) H_2 corrected to allow for instrumental response (H_2')

i) and j) the mean height of the highest one-third of the waves each correct to one decimal place calculated from H_1' and H_2' respectively (Hs_1 and Hs_2)

k) the average of Hs_1 and Hs_2 to give Hs. program computes the average of the numbers contained in the machine store and not those printed under Hs_1 and Hs_2

l) the most probable height of the highest wave which would occur in a period of three hours, correct to one decimal place ($H_{max(3\ hrs.)}$)

m) the duration of the record in minutes.

If no measurements were available, the words

" RECORD FAULTY" or

"RECORD MISSING"

will be printed on the right-hand side of the page against the appropriate date and time.

If the record was too small to measure, the word "CALM" will be printed in the TZ column.

The record number is printed at the right hand side of each record.

Restrictions

Up to twelve months data may be stored on disk in one file.

Method

The program calls DFT to determine which disk data file is to be listed. If the call is in error, the error number is printed and the program exits. After printing the title the program evaluates the number of records in the month about to be output before printing the month, year and headings. Word one of each disk record is tested. If it is "C" the word "CALM" is printed, for "M", "RECORD MISSING" is printed, for "F", "RECORD FAULTY" is printed, and for "." the line is left blank except for the date and time, which is printed on every line regardless of the value of word one. If word one contains a space a complete line of results is printed.

After each line is printed the program tests for the end of the file, day, month or page of listing. At the end of one day's output an extra blank line is printed, when a month has ended the program skips to a new page and prints new headings. Each page contains five day's records, after which a new page is started. At the end of the file, i.e. when P records have been printed the program stops.

Programmer

Eileen Page.

N.I.O. PROGRAM 122

Title General progressive vector diagrams

Name GPVD

Machine IBM 1800 (Atlas version also available)

Language 1800 Fortran IV

Purpose To compute N-S, E-W components of current speed and to convert these into cumulative displacements in these directions.

Input Job and data cards. Main data from magnetic tape previously corrected using ERC00.

Job Description

```
                                  CC19
// Job                            X
// *Job No./Name/Title
// XEQ GPVD
*FILES(1,Name,1)
*CCMD
```

Data Cards

K Format I7

This is the record number of the first record to be processed. (The first record of each set of data on magnetic tape will have the current meter reference number.)

R,N,J,V.

R defines the type of current meter used. (0 for Plessey, 1 for Bergen, 2 for Braincon)

N current meter reference number.

J the number of lines of data

V the local magnetic variation in degrees + ve if W of North.

Format I3, 2I5, F5·1

Output

Meter number is { Bergen / Plessey / Braincon } MN

N	N COMP CM/SEC	E COMP CM/SEC	N DISPL KM	E DISPL KM
(Line Number)	(North component)	(E component)	(N displacement)	(E displacement)

Restrictions This deals with data collected at 10 min sampling for Bergen and Plessey meters and 20 min for Braincons.

For other sampling rates one constant must be changed in the program.

Execution time Depends on the position of the input data on the magnetic tape as records are read in X format up to record K, but will be at least N/120 minutes where N is the number of lines of data.

Programmer W. J. Gould

N.I.O. PROGRAM 123

Title Fourier Analysis

Program Name FRANO

Language 1800 Fortran IV

Machine IBM 1800

Purpose To compute the fourier coefficients of a given periodically tabulated function.

Input Job and data on cards.

Job Description

```
// JOB
// *(Job No./Name/Title)
// XEQ FRANO
*LOCAL(ESIN,ECOS,FORIT,STFAC,SBFAC),(INVRT,MCOMP,MDRED,
       MIOI,MIOFX,MIOF)
*CCEND
```

Data This immediately follows *CCEND and commences with the following card:-

1) Total number of terms (N); number of harmonics required (M).

Format 2I6

N.B. N must be odd.

Then follow cards containing the tabulated function values. These may be in either integer or real format, with a maximum of ten values per card, each number being right-justified in its field.

Format 10F8.0

Output The output consists of the values of j, a_j, b_j, c_j, and Ψ_j (x_j) for j = 0(1)M; and terminates with END OF DATA on a new line.

Restrictions The total number of terms cannot exceed 1001; and thus the maximum number of harmonics is 500.

N.B. The program can deal only with an odd number of terms.

Method The program is built round the IBM supplied scientific subroutine 'FORIT' as outlined in the manual entitled:-

1130 Scientific Subroutine Package 1130-CM-02X

Given F(x) is of period 2π, its values y_r being known only at a discrete set of equally spaced points, y_r, covering a period interval, the coefficients a_j, b_j, c_j and Ψ_j are computed when F(x) is expressed in the form:-

$$y = a_0 + a_1 \cos x + a_2 \cos 2x + \ldots + a_j \cos jx + \ldots$$
$$+ b_1 \sin x + b_2 \sin 2x + \ldots + b_j \sin jx + \ldots$$

or

$$y = c_0 + c_1 \sin(x+\Psi_1) + c_2 \sin(2x + \Psi_2) + \ldots +$$
$$c_j \sin(jx + \Psi_j) + \ldots$$

Execution Time Approx. $\frac{MN}{7000}$ minutes

Programmer Catherine Clayson

Data Processing Group

A M E N D M E N T

N.I.O. PROGRAM 123

Title Fourier Analysis

Under Job Description amend *LOCAL card to read

*LOCAL(ESIN,ECOS,FORIT,STFAC,SBFAC),(MWRT,MCOMP,MRED,MIOI,MIOF,BT1BT)

C. Clayson

N.I.O. PROGRAM 125

Title Computer Usage Statistics

Name CUS

Machine IBM 1800

Lnaguage 1800 Fortran IV

Purpose To accumulate on a disk file

a) the total computer time used on each N.I.O. project per calendar month.

b) the total computer time used on all jobs per day.

To print on the 1443 printer the contents of the two files.

Input Cards punched from computer room log sheets containing

e.g.

```
cc. 1     5     10  13    19
    A1-b-5bbb24b-4bbbb-40
```

Card columns 1-6 contain project number
Card columns 10-11 contain day of month
Card columns 13-14 contain month of year
Card columns 19-21 contain time in minutes

A blank card at the end of the data acts as a terminator and must be inserted if the contents of the two disk files are to be printed.

Job Description

```
// JOB
// *(Job No./Name/Title)
// XEQ CUS
*FILES (1,MONTH,D)
*FILES (2,JDAYS,D)
*CCEND
```

Output Output will be in the following forms:

a)

Proj. No.	Month	Hours	Mins.
A1-1	4	1	25
A1-1	5	0	20
....	...	...	....
A1-1	3	2	21

i.e. There will be one line printed for each project for each month giving total time used in hours and minutes beginning in April.

b)

Day	Month	Hours	Mins.
1	4	1	16
2	4	9	24
...	...	...	....
30	3	10	20
31	3	9	35

The contents of each data card is also printed but with its accumulated time and its record number.

Error Message

If a card is read and the project number is not in the file or the date is incorrect an error message will be printed listing the contents of that card.
e.g. Error---Project No. is not on disk check card
--- A4-5 24 4 240.

Execution Time

Execution time ≃ 9 secs. per card
Printing time ≃ 7 mins.
Total time ≃ (9N+420) secs where N is the number of cards.

Programmer

R. Bromley

Data Processing Group

A M E N D M E N T

N.I.O. PROGRAM 145

Add to Job Description

* FILES(3,IPROJ,O)

Amend Output (b) to read

The total time used per day is printed with 2 character code for day of week and date.

The total time used per week is printed and the total for that year is printed.

N.I.O. PROGRAM 145/A

Amend Input to read

(Ten cards must be followed by a card containing the year in I2 format).

b) To add a project number to the file the following card must be punched followed by nine blank cards and the year card

e.g.

cc. 2 8
b99bbbbXXXXXX

where XXXXX is the project number to be added.

e.g.

A07b05

N.I.O. PROGRAM 125/A

Title	Computer Usage Statistics File Initialisation
Name	CUSFI
Machine	IBM 1800
Language	1800 Fortran IV
Purpose	a) To initialise two disk files at beginning of financial year for use with Program 125. b) To add an extra project number to the file without reinitialising the other records.
Input	a) The project numbers are read in on ten cards, ten project numbers per card. e.g. cc 1 5 8 12 A07b01bA07b02bA07b03 ..... The initialisation program will only initialise those projects that are on the cards. If a new project number is added it must immediately follow the previous project number that was punched. (Ten cards must be in although some may be blanks). b) To add a project number to the file the following card must be punched. e.g. cc. 2 5 8 b99bXXbYYYYYY XX is a two digit number denoting the number of project numbers that preceed the one to be added. YYYYYY is the project number to be added e.g. A07b05
Output	Two lines are printed on the lineprinter and should read 1200 records have been written to disc into file - month 336 records have been written to file - Jdays.
Restrictions	Only 100 project numbers can be written onto the file.
Execution time	4 minutes.
Programmer	R. Bromley

N.I.O. PROGRAM 126

Title	Console Interrupt Program
Name	CONS5
Machine	1801, 1802
Language	1800 TSX Fortran
Purpose	To queue mainline programs after console interrupt as determined by the sense switches.

Input and Operation

1. Depress console interrupt with sense switch 7 off.
2. Set sense switch 1 to 6 as desired to queue one of 7 programs CON0 to CON6 for execution.
3. Press console interrupt again - be sure sense switch 7 is off.

Output

Dependent on sense switch setting one of several programs is queued for execution.

No Sense switches on - CON0 is queued
Sense switch 1 on - CON1 is queued
etc.
..... 6 on - CON6 is queued.

Notes

It is probable that the actual core-loads queued will change with different on-line packs by use of *SEQCH cards.

Programmer

J. Crease

N.I.O. PROGRAMS 127 to 133

Title	Dummy mainline core-loads queued by CONS5.
Name	CON0, CON1, CON2, CON3, CON4, CON5, CON6
Machine	1901, 1902
Language	1900 TSX Fortran
Purpose	To provide mainline dummy core-loads to service CONS5 (Program 126) when core-loads have not been written to do a specific job.
Input	VIAQ from CONS5
Output	Message to say that the program was queued and executed. No other action.
Notes	See CONS5 (Program 126).
Programmer	J. Crease

N.I.O. PROGRAM 134

Title	Process cold start - time sharing
Name	NPTS5
Machine	1801, 1802
Language	TSX Fortran
Purpose	To unmask and CALL VIAQ to give indefinite time sharing.
Input	-
Output	CALL VIAQ
Programmer	J. Crease

N.I.O. PROGRAM 135

Title	Guard interrupt program
Name	DIC5
Machine	1901, 1902
Language	TSX Fortran
Purpose	To provide a guard interrupt core-load to levels which are serviced by out of core interrupts and which do not have any special interrupt core-loads written for them as yet.
Input	-
Output	Message to say that interrupt has occurred on level serviced by out of core interrupt.
Notes	This core-load is attached to the appropriate level by a *DICTE control card.
Programmer	J. Crease

N.I.O. PROGRAM 136

Title Correct Shipborne wave recorder analysis output

Name CORRO

Machine IBM 1800

Language 1800 Fortran IV

Purpose To add to the SBWRO output on disk interpolated results for "missing" and "faulty" records. The corrected results are stored on magnetic tape.

Inputs Job description and parameters:-

cc 18
// JOB 14

// *Job No./Name/Job Title

// XEQ CORRO

*FILES(1,NAMEP,1)

*FILES(201,M9,0)

*CCEND

where NAMEP is the name of the disk file where the SBWRO output is stored.

Then follow two cards, the first containing a title in 36A2 format, the second containing P, the number of records to be read from disk in I4 format.

Data:

One card is punched for each set of results to be inserted in the analysis in the following format

a) the day of the month - format I2

b) the time at which the record started - F6.2

c) the wave period in seconds - F6.2

d) the height, in feet, of the highest crest plus the lowest trough - F5.1

e) the height, in feet, of the second highest crest plus the second lowest trough - F5.1

f) the spectral width parameter - F6.3

g) H_1 corrected to allow for instrumental response - F5.1

h) H_2 corrected to allow for instrumental response - F5.1

i and j) the mean height of the highest one third of the waves - F5.1

k) the average of i and j - F5.1

l) the most probable height of the highest wave which would occur in a period of three hours - F5.1

m) the duration of the record in minutes - F6.2

n) the record number - I4.

Output

The output on magnetic tape is identical to that produced by NIO 89 (SBWR) with the interpolated results inserted in the correct positions. The title and one line of headings (as printed in NIO 89 output) are printed on the 1443 printer. As each month is corrected, the month number and year followed by the month's corrections are printed. At the end of the job the message "End of job N records have been written to magnetic tape" is printed on the 1443 printer.

Method

The program reads each record from disk and tests word 1. If it contains the code for a correct record the record is written to magnetic tape, otherwise a correction card is read in. The line number from the disk record is compared with that on the card. If they are different an error message is printed and the program stops, otherwise the correct record is written to magnetic tape and printer. The title and page headings are added where necessary.

The program halts when P records have been read from disk.

Programmer

Eileen Page.

N.I.O. PROGRAM 137

Title	List CORRO output
Name	MALIS
Machine	IBM 1800
Language	1800 Fortran IV
Purpose	To list, on the 1443 printer, a year's corrected wave analysis which have been stored on magnetic tape.

Input	// JOB
	// *Job No./Name/Job Title
	// XEQ MALIS
	*CCEND
	Then follows two data cards each in I4 format. The first card contains N, the number of the magnetic tape file to be listed. The second card contains M, the number of records to be listed. This number is output at the end of each successful run of CORRO which writes the data onto the magnetic tape.

Output	The output is identical to that of SBWRO in layout, with the addition of interpolated results for "missing" and "faulty" records which occurred in the original SBWRO analysis.
Restrictions	Only one file may be listed in any one job.
Method	Each magnetic tape record is read into core, and then printed on the 1443 printer in 72A2 format.
Programmer	Eileen Page.

N.I.O. SUB-PROGRAM -19

Title	Read Sense, Program and C.E. switches
Name	Function IPRGW(0)
Language	1800 Assembler
Machine	1800
Purpose	To read the above switches into the accumulator
Input	The sense, program and C.E. switch settings.
Output	The sense, program and C.E. switch settings in accumulator
Notes	This routine can be used as an integer Fortran Function Subprogram e.g. INPUT = IPRGW(0) puts the switch settings into the variable INPUT. The parameter is dummy. The routine is re-entrant. If only the program and sense switch settings are required in the lower order 8 bits of a variable do an integer division by 256.
Programmer	J. Crease

N.I.O. SUB-PROGRAM -18

Title	Read Data Switches
Name	Function IDATW(0)
Language	1800 Assembler
Machine	1800
Purpose	To read data swithces into accumulator.
Input	The data switch settings.
Output	Data switch settings in accumulator.
Notes	This assembler routine can be called as an integer Fortran Function subprogram e.g. INPUT = IDATW(0) puts the data switch settings into INPUT. The parameter of the function is dummy and can be any integer. The routine is re-entrant
Programmer	J. Crease