File I/O

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Simple PRINT

A simple form of Output in Fortran is the PRINT statement:

PRINT *format-reference, I/O list*

- The simplest ***format-reference*** is the * (asterisk), which directs unformatted data to the standard output channel (the terminal screen)
- The ***I/O list*** must be a comma-separated list of variables or strings

For example:

```
character(len=*), parameter :: myString = “Fortran is”
real :: x = 1
logical :: myLogic = .FALSE.
PRINT *, "X = ", x
PRINT *, myString, myLogic, “U N !”
```

Output:

```
X =      1.00000000
Fortran is F U N !
```

Simple READ

A simple form of Input in Fortran is the READ statement:

READ *format-reference, I/O list*

Similar to PRINT, the ***format-reference*** * (asterisk), accepts unformatted data from the standard input channel (the terminal screen), and the ***I/O list*** must be a comma-separated list of variables or strings

For example:

```
integer :: A, B, sum
PRINT *,'Please type in 2 numbers'
READ *, A, B
sum = A + B
PRINT *, A,' + ', B,' = ', sum
```

- After printing the instruction, this code will wait for you to enter 2 numbers, separated by a comma:

```
$ Please type in 2 numbers
$ 3,4
$ 3 + 4 = 7
```

Opening Files

Most I/O is done by accessing data files. The OPEN command is required to access files for reading or writing:

```
OPEN (UNIT = number, FILE = "name", IOSTAT = "ios", &
      & STATUS = "status", ERR = "err")
```

Specifier	Description
number	Normally in the range 9 – 99; each file's unit # must be unique
name	Complete file name; a character variable or expression
ios	INTEGER file-opening status, 0 if success, non-zero if failure
status	"NEW", "OLD"-must exist, "REPLACE"-create or replace existing file
err	Label to which code jumps in case of an error

Reading and Writing Files

After opening the file, we can READ from or WRITE to the file, using the following syntax:

```
READ (UNIT=number, FMT=fmt, ADVANCE=adv, IOSTAT=ios, &
      & ERR=err, END=end)
WRITE (UNIT=number, FMT=fmt, ADVANCE=adv, IOSTAT=ios, ERR=err)
```

The optional specifier **ADVANCE="no"** means the reading or writing should continue on the same record (or line), starting from the position where the last READ or WRITE stopped.

The READ statement also permits the important option "**END=**", with the equals followed by a label number to which to program branches when the End of File is reached.

I/O Format

The READ and WRITE commands also require a format specification:

FMT=*fmt*

- The * (asterisk) can be used for list-directed output (1 item per record/line).
- There are numerous format descriptors, but these are most commonly used:

Descriptor	Meaning
X	One space
/	New line
A	One character string
Iw	Integer with w digits (w characters wide, including sign)
Fw.d	Fixed point, w digits wide, d decimal places
Ew.d	Floating point with Exponent, w digits, d decimal places, E11.4 --> sx.xxxxEsxx

I/O Format (cont'd)

Repetitions

- An **`A, I, F, E`** format descriptor may be preceded by a number showing how many times it should be used:

`(I6, I6, I6, I6)` ➔ **`(4I6)`**

- Format groups can also be repeated, using parenthesis:

`(2X, F8.3, I2, F8.3, I2)` ➔ **`(2X, 2(F8.3, I2))`**

Closing Files

After you've finished reading or writing your files, it is good practice to close the associated file, and free up the unit number.

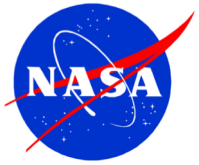
The syntax is very simple:

`CLOSE (UNIT=`*`number`*`)`

`*Note:` This is not essential, since files are automatically closed when the program ends

Example

```
program Kelvin2Fahrenheit

    ! Read in list of Kelvin temps and output list in Fahrenheit
    implicit none
    real :: tempK, tempF

    open (unit=10, file="KelvinList.txt", err=200, status="old")
    open (unit=20, file="FahrenheitList.txt, err=200, status="replace")

    do
       READ (unit=10, fmt=format(F7.2), END=100) tempK
       tempF = (tempK – 273.15) * 9 / 5 – 32
       WRITE (unit=20, fmt=format(F7.2)) tempF
    end do
100 continue

    close(10)
    close(20)
    stop

200 PRINT *, "Error opening file"

end program Kelvin2Fahrenheit
```



Exercise