

## **LAB 4 – DOS INTERRUPTS – FILE ACCESS**

### **4.1 Introduction to DOS Interrupts for Files**

All DOS files are sequential files. All sequential files are stored and accessed from the beginning of the file towards the end. File is usually accessed through DOS INT 21H function calls. In this session we will practice, how to create, read and write a file. There are two ways of handling a file. First via the file control block and second via the file handle. We will use file handle, as this is the most common and easier of the two methods.

### **4.2 File Handle**

DOS File Handle Functions - a group of INT 21h functions that allows DOS to track open file data in its own internal tables. File Handle Functions also permit users to specify file path names. For the purposes of the following discussion, reading means copying all or part of an existing file into memory; writing a file means copying data from memory to a file; rewriting a file means replacing a file's content with other data.

#### *File Handle*

When a file is created or opened in a program, DOS assigns it a unique number called the file handle. This number is used to identify the file, so the program must save that information. (Note: a file stream in C/C++/Java is the same thing as a file handle in Assembler.)

There are 5 predefined file handles:

- 0 keyboard
- 1 screen
- 2 error output - usually the screen
- 3 COM1
- 4 printer

Additional user-defined files are assigned file handles starting with 5, 6, 7, etc - which are assigned to your files.

#### *File Errors*

There can be many types of errors in using INT 21h file handling functions. Each error type is identified by a code number. In the following functions, if an error occurs the CF is set and the code number is stored in AX.

A list of common file-handling errors:

Error Code:      Meaning:

- |   |                                                             |
|---|-------------------------------------------------------------|
| 1 | invalid function number                                     |
| 2 | file not found                                              |
| 3 | path not found                                              |
| 4 | all available handles in use                                |
| 5 | access denied (file may already be open by another process) |
| 6 | invalid file handle                                         |
| C | invalid access code                                         |
| F | invalid drive specified                                     |

- 10 attempt to remove current directory
- 11 not the same device
- 12 no more files to be found

### THE FILE POINTER

The file pointer is used to locate a position in a file.

When the file is opened, the file pointer is positioned at the beginning of the file.

After a read operation, the file pointer indicates the next byte to be read; after writing a new file, the file pointer is at EOF.

### 4.3 File Interrupts

Purpose: Create a File – Function 3C<sub>H</sub> – Create a File

Input:

AH = 3Ch

DS:DX = address of filename (an ASCIIZ string ending with a zero byte)

e.g of ASCIIZ – 'C:\MASM611\BIN\abc.txt',0

CL = attribute

Attribute – Bit map

| Bits        | 7         | 6 | 5       | 4         | 3          | 2      | 1      | 0         |
|-------------|-----------|---|---------|-----------|------------|--------|--------|-----------|
| Description | shareable | - | archive | directory | vol. label | system | hidden | read-only |

Output:

If successful CF = 0 , AX = file handle

Error: if CF = 1, AX = error code (3, 4, or 5)

Possible errors:

1. path doesn't exist
2. all file handles in use
3. access denied --- directory is full or file is read-only

**Example: Program Segment open a new read-only file called "FILE1"**

FNAME DB 'FILE1', 0

HANDLE DW ?

.CODE

```

MOV  AH, 3CH      ; open file function
LEA  DX, FNAME    ; copy address to DX
MOV  CL, 1        ; read-only attribute
INT  21H          ; open the file
MOV  HANDLE, AX   ; handle or err code

```

### Purpose: Opening a existing File – Function 3D<sub>H</sub>

#### Input:

AH = 3D<sub>H</sub>

AL = access and sharing modes

0 = open for reading

1 = open for writing

2 = open for read/write

DS:DX = ASCIZ filename

#### Output:

CF clear if successful, AX = file handle

CF set on error AX = error code (01h,02h,03h,04h,05h,0Ch,56h)

### Purpose: Writing to a File – Function 40<sub>H</sub>

#### Input:

AH = 40h

BX = file handle

CX = number of bytes to write

DS:DX = data address

#### Output:

AX = count of bytes written.

If AX < CX, error (disk full).

If CF = 1, AX = error code (5, 6)

If CX is zero, no data is written, and the file is truncated or extended to the current position

Data is written beginning at the current file position, and the file position is updated after a successful write

The usual cause for AX < CX on return is a full disk

### Purpose: Closing a File – Function 3E<sub>H</sub>

A file should be closed after it has been processed. This frees the file handle for use with another file. If the file is being written, closing the file causes any data remaining in memory to be written to the file, and the file's time, date, and size will be updated in the directory entry.

#### Input:

AH = 3Eh

BX = file handle

#### Output:

Error if CF = 1, AX = error code (6)

### Purpose: Reading File – Function 3F<sub>H</sub>

#### Input:

AH = 3Fh

BX = file handle

CX = number of bytes to read

DS:DX = memory buffer address

#### Output:

AX = count of bytes actually read.

If AX = 0 or AX < CX, EOF

If CF = 1, AX = error code (5, 6)

### Purpose: Moving File Pointer 42<sub>H</sub>

#### Input:

AH = 42h

AL = movement code:

0 = relative to beginning of file

1 = relative to current file position

2 = move relative to end of file

BX = file handle

CX: DX = number bytes to move (signed)

#### Output:

DX:AX = new location in bytes from the beginning of the file

If CF = 1, AX = error code (1, 6)

#### *Note:*

CX:DX holds the number of bytes to move the pointer

< 0 => move pointer backward

> 0 => move pointer forward

If CX: DX is too large, the pointer could be moved past the beginning or end of the file. This is not an error, but will cause an error when the next read or write is executed.

If AL = 0 => move pointer from beginning of file (forward)

If AL = 1 => move pointer from current position (forward or backward)

If AL = 2 => move pointer from end of file (backward)

### Purpose: Deleting a File 41H

#### Input

AH = 41H

DS: DX = address of the ASCII-Z string file name

#### Output

AX = error code if carry is set

### Purpose: Renaming a File 56H

#### Input

AH = 56H

DS:DX = ASCII filename of existing file

ES:DI = ASCII new filename

CL = attribute mask

#### Output

CF clear if successful

CF set on error, AX= error code (02h,03h,05h,11h)

### Few More Interesting File Functions

#### GET/ SET FILE'S LAST-WRITTEN DATE AND TIME

##### Input

AH = 57H with AL = 01h (Set) AL = 00 (Get)

BX = file handle

##### Input/ Output

CX = time & DX = date

|        |       |         |         |        |      |       |     |
|--------|-------|---------|---------|--------|------|-------|-----|
| Time   | 15-11 | 10-5    | 4-0     | Day    | 15-9 | 8-5   | 4-0 |
| Format | Hrs   | Minutes | Seconds | Format | Year | Month | Day |

##### Output

CF clear if successful

CF set on error AX = error code (01h,06h)

#### GET/ SET FILE'S ATTRIBUTE

##### Input

AH = 43H

AL = 01h (Set) AL = 00 (Get)

DS:DX – ASCII filename

##### Input/ Output

CX = Attribute

##### Output

CF clear if successful

CF set on error AX = error code (01h,06h)

## **Tasks**

1. Create a new file of any name and in that file write your name and ID. No. twice on two different lines. Hint: make use of carriage return and line feed ASCII codes. Be sure to close the file.
2. To the file resulting from Task1, append your hostel name and room number. Close the file in the end.
3. Open the file you created in Task 2 and read its contents. You can count the number of bytes to be read beforehand. After reading the file, display the data using dos function call 09h. Close the file in the end.
4. Open the file you created in Task 2. Read the entire file one byte at a time and stop after you reach the end of file. After reading the file, display the data using dos function call 09h. Close the file in the end.
5. Create a new file and write your name and ID. No. in it. Use keyboard to input the data. Hint: Use dos function 0Ah for input from keyboard. Also try renaming the file and deleting it, changing its attributes date of creation & time.