Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

CSE2006
Microprocessor and Interfacing

Lab Assignment 4

Slot: L39+L40
Faculty: Dr. Kumaravelu R.

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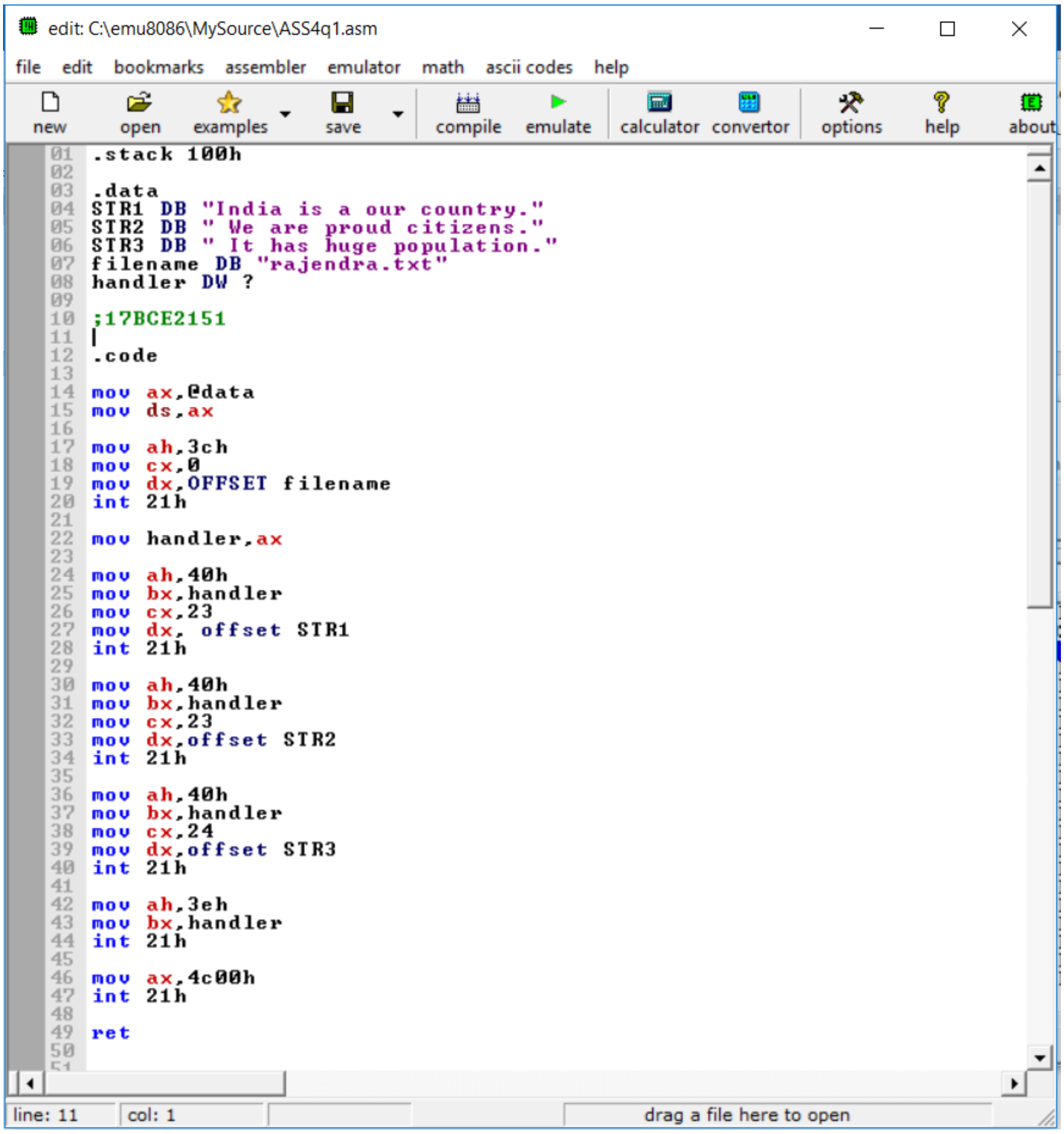
Reg. No: 17BCE2151

Question 1: Write an 8086 Assembly Language Program to write multiple strings in a file system using DOS Interrupts?

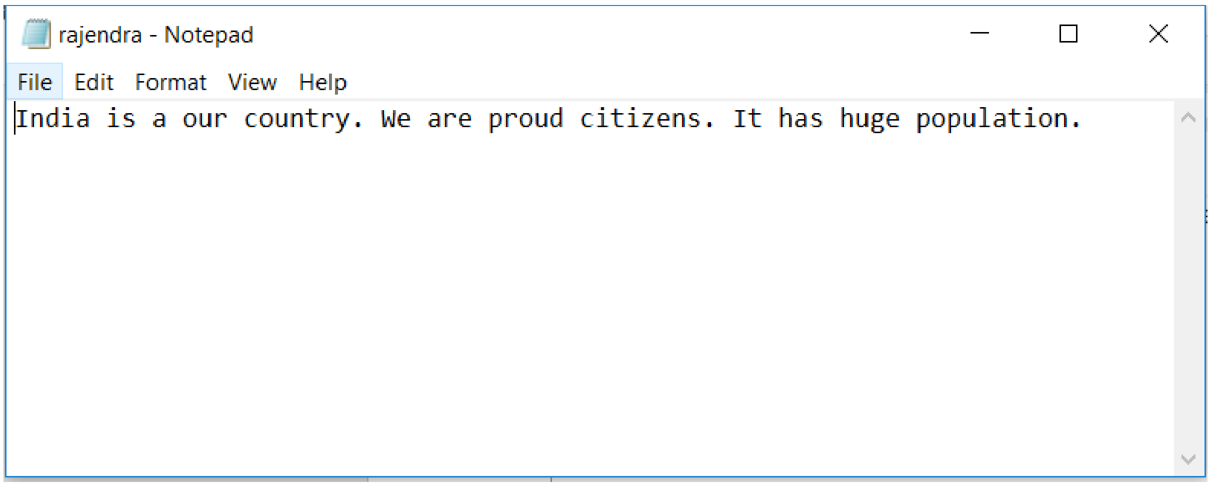
Code Snippet:


edit: C:\emu8086\MySource\ASS4q1.asm
file edit bookmarks assembler emulator math ascii codes help
new open examples save compile emulate calculator convertor options help about
line: 11 col: 1 drag a file here to open

```
.stack 100h

.data
STR1 DB "India is a our country."
STR2 DB " We are proud citizens."
STR3 DB " It has huge population."
filename DB "rajendra.txt"
handler DW ?

;17BCE2151

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

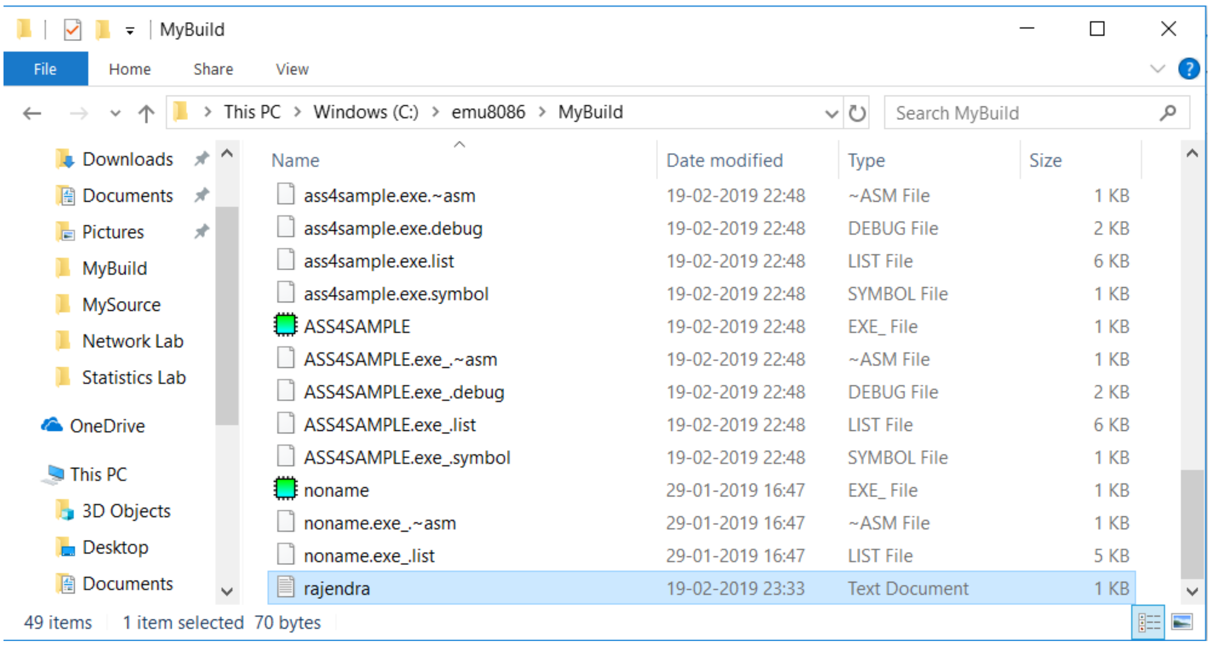
At first, we declare size of stack segment. Then declare 3 strings in data segment along with filename and handler declaration. Then in code segment we first initialize the data segment and create a file with the given filename. After that, using DOS interrupt we add STR1, STR2 and STR3 declared in data segment into the file created. Then we close the file using 3eh DOS interrupt and later end the program using 4c00h DOS interrupt.

Output File Created:



```
India is a our country. We are proud citizens. It has huge population.
```

File is found in MyBuild folder in the EMU8086 main folder.

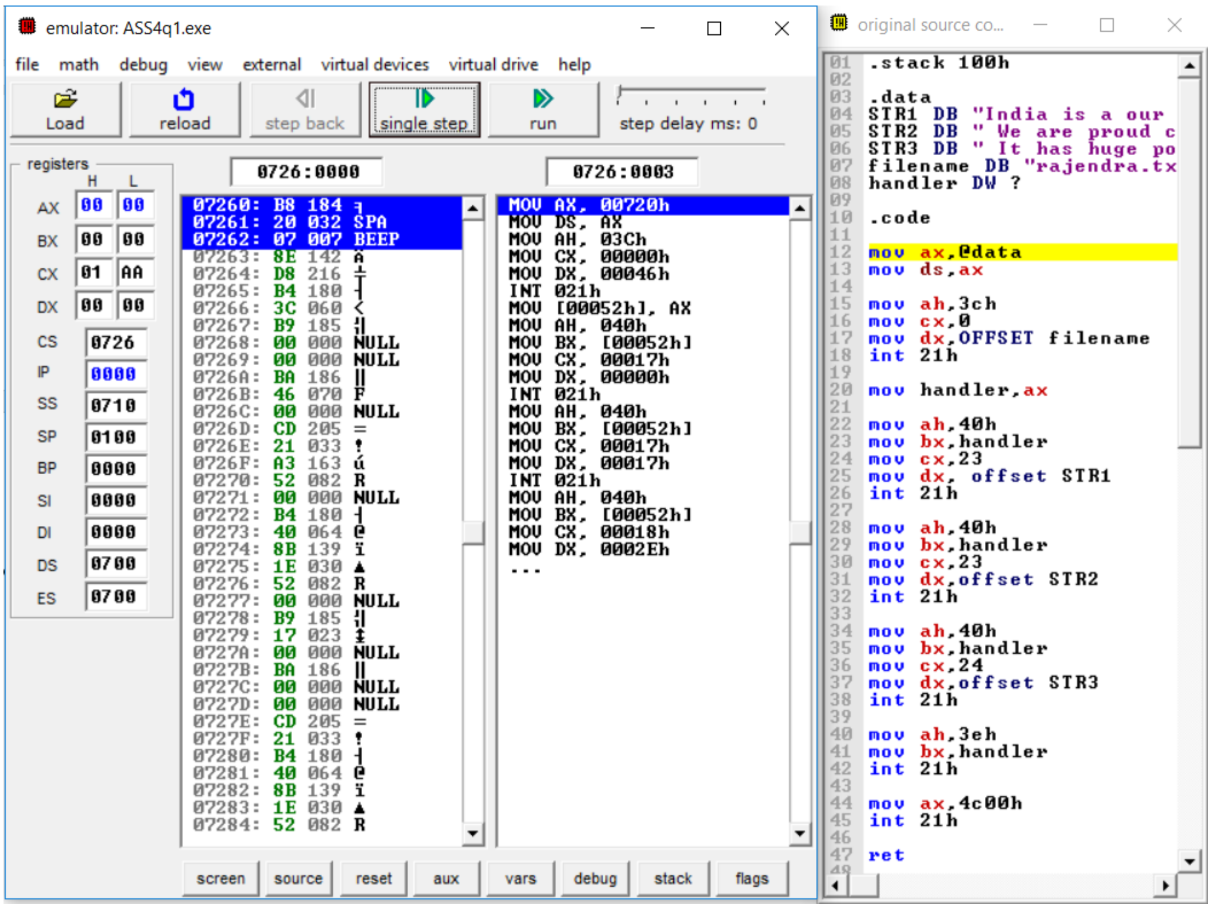


Name	Date modified	Type	Size
ass4sample.exe.~asm	19-02-2019 22:48	~ASM File	1 KB
ass4sample.exe.debug	19-02-2019 22:48	DEBUG File	2 KB
ass4sample.exe.list	19-02-2019 22:48	LIST File	6 KB
ass4sample.exe.symbol	19-02-2019 22:48	SYMBOL File	1 KB
ASS4SAMPLE	19-02-2019 22:48	EXE_ File	1 KB
ASS4SAMPLE.exe_.~asm	19-02-2019 22:48	~ASM File	1 KB
ASS4SAMPLE.exe_.debug	19-02-2019 22:48	DEBUG File	2 KB
ASS4SAMPLE.exe_.list	19-02-2019 22:48	LIST File	6 KB
ASS4SAMPLE.exe_.symbol	19-02-2019 22:48	SYMBOL File	1 KB
noname	29-01-2019 16:47	EXE_ File	1 KB
noname.exe_.~asm	29-01-2019 16:47	~ASM File	1 KB
noname.exe_.list	29-01-2019 16:47	LIST File	5 KB
rajendra	19-02-2019 23:33	Text Document	1 KB

49 items 1 item selected 70 bytes

Step by Step Execution:

1. Initially the program is loaded.

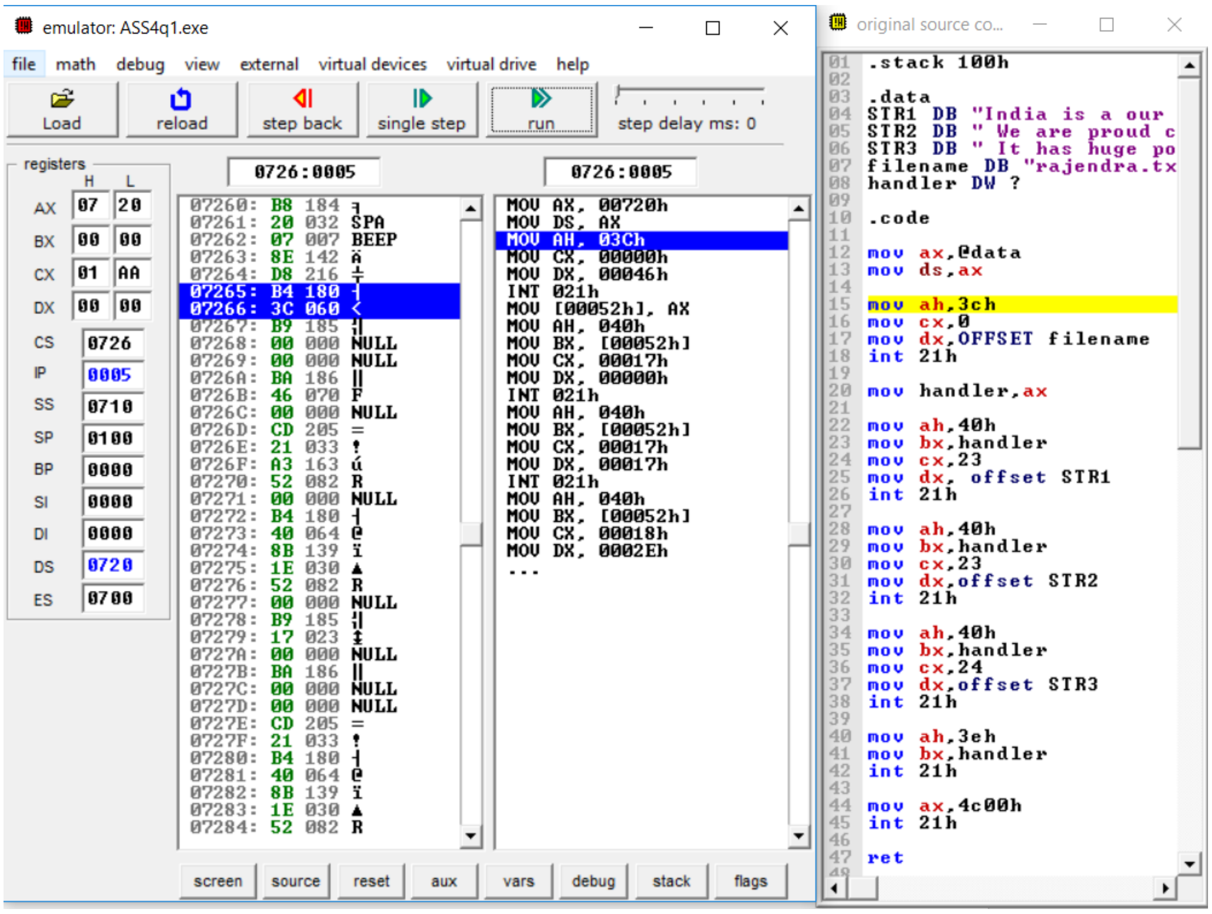

emulator: ASS4q1.exe
file math debug view external virtual devices virtual drive help
Load reload step back single step run step delay ms: 0
original source co...
screen source reset aux vars debug stack flags

```
registers
      H   L
AX   00  00
BX   00  00
CX   01  AA
DX   00  00
CS   0726
IP   0000
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0700
ES   0700
```

```
0726:0000                     0726:0003

07260: B8 184 ╕               MOV  AX, 00720h
07261: 20 032 SPA             MOV  DS, AX
07262: 07 007 BEEP            MOV  AH, 03Ch
07263: 8E 142 Ä               MOV  CX, 00000h
07264: D8 216 ╪               MOV  DX, 00046h
07265: B4 180 ┤               INT  021h
07266: 3C 060 <               MOV  [00052h], AX
07267: B9 185 ╣               MOV  AH, 040h
07268: 00 000 NULL            MOV  BX, [00052h]
07269: 00 000 NULL            MOV  CX, 00017h
0726A: BA 186 ║               MOV  DX, 00000h
0726B: 46 070 F               INT  021h
0726C: 00 000 NULL            MOV  AH, 040h
0726D: CD 205 ═               MOV  BX, [00052h]
0726E: 21 033 !               MOV  CX, 00017h
0726F: A3 163 ú               MOV  DX, 00017h
07270: 52 082 R               INT  021h
07271: 00 000 NULL            MOV  AH, 040h
07272: B4 180 ┤               MOV  BX, [00052h]
07273: 40 064 @               MOV  CX, 00018h
07274: 8B 139 ï               MOV  DX, 0002Eh
07275: 1E 030 ▲               ...
07276: 52 082 R
07277: 00 000 NULL
07278: B9 185 ╣
07279: 17 023 ↨
0727A: 00 000 NULL
0727B: BA 186 ║
0727C: 00 000 NULL
0727D: 00 000 NULL
0727E: CD 205 ═
0727F: 21 033 !
07280: B4 180 ┤
07281: 40 064 @
07282: 8B 139 ï
07283: 1E 030 ▲
07284: 52 082 R
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

2. Then the data segment register is initialised. Value of DS changes.

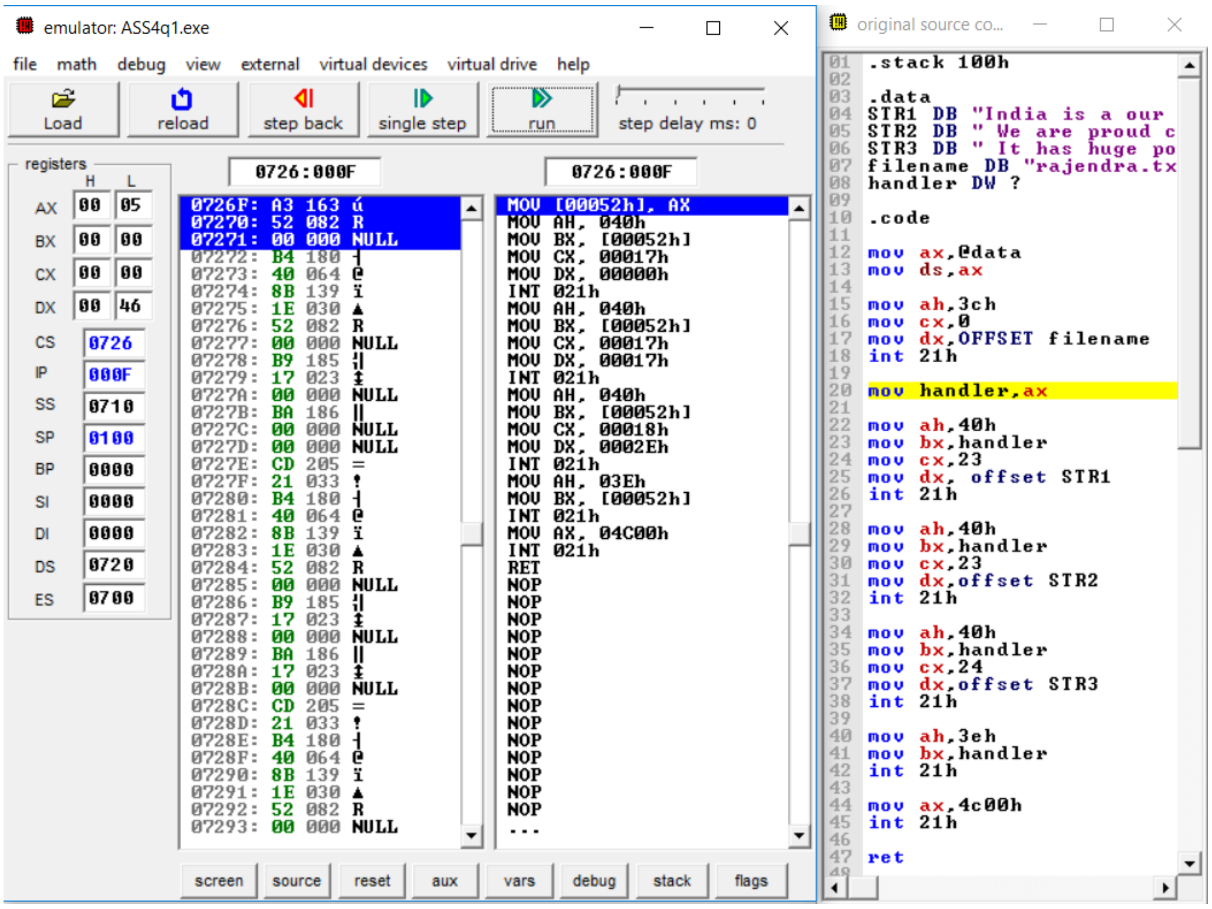

emulator: ASS4q1.exe
file math debug view external virtual devices virtual drive help
Load reload step back single step run step delay ms: 0
original source co...
screen source reset aux vars debug stack flags

```
registers
      H   L
AX   07  20
BX   00  00
CX   01  AA
DX   00  00
CS   0726
IP   0005
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0720
ES   0700
```

```
0726:0005                     0726:0005

07260: B8 184 ╕               MOV  AX, 00720h
07261: 20 032 SPA             MOV  DS, AX
07262: 07 007 BEEP            MOV  AH, 03Ch
07263: 8E 142 Ä               MOV  CX, 00000h
07264: D8 216 ╪               MOV  DX, 00046h
07265: B4 180 ┤               INT  021h
07266: 3C 060 <               MOV  [00052h], AX
07267: B9 185 ╣               MOV  AH, 040h
07268: 00 000 NULL            MOV  BX, [00052h]
07269: 00 000 NULL            MOV  CX, 00017h
0726A: BA 186 ║               MOV  DX, 00000h
0726B: 46 070 F               INT  021h
0726C: 00 000 NULL            MOV  AH, 040h
0726D: CD 205 ═               MOV  BX, [00052h]
0726E: 21 033 !               MOV  CX, 00017h
0726F: A3 163 ú               MOV  DX, 00017h
07270: 52 082 R               INT  021h
07271: 00 000 NULL            MOV  AH, 040h
07272: B4 180 ┤               MOV  BX, [00052h]
07273: 40 064 @               MOV  CX, 00018h
07274: 8B 139 ï               MOV  DX, 0002Eh
07275: 1E 030 ▲               ...
07276: 52 082 R
07277: 00 000 NULL
07278: B9 185 ╣
07279: 17 023 ↨
0727A: 00 000 NULL
0727B: BA 186 ║
0727C: 00 000 NULL
0727D: 00 000 NULL
0727E: CD 205 ═
0727F: 21 033 !
07280: B4 180 ┤
07281: 40 064 @
07282: 8B 139 ï
07283: 1E 030 ▲
07284: 52 082 R
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

3. Then the file is created and is empty as shown below.

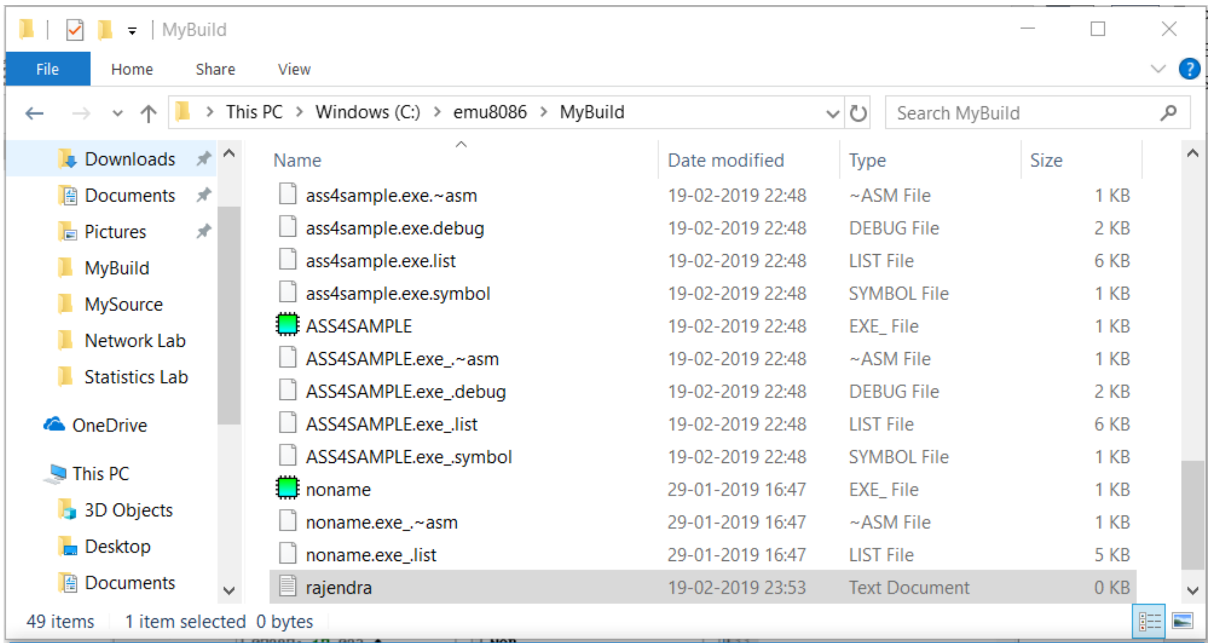

emulator: ASS4q1.exe
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
registers
screen source reset aux vars debug stack flags
original source co...

```
registers
      H   L
AX   00  05
BX   00  00
CX   00  00
DX   00  46
CS   0726
IP   000F
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0720
ES   0700
```

```
0726:000F
0726F: A3 163 ú
07270: 52 082 R
07271: 00 000 NULL
07272: B4 180 ┤
07273: 40 064 @
07274: 8B 139 ï
07275: 1E 030 ▲
07276: 52 082 R
07277: 00 000 NULL
07278: B9 185 ╣
07279: 17 023 ↨
0727A: 00 000 NULL
0727B: BA 186 ║
0727C: 00 000 NULL
0727D: 00 000 NULL
0727E: CD 205 ═
0727F: 21 033 !
07280: B4 180 ┤
07281: 40 064 @
07282: 8B 139 ï
07283: 1E 030 ▲
07284: 52 082 R
07285: 00 000 NULL
07286: B9 185 ╣
07287: 17 023 ↨
07288: 00 000 NULL
07289: BA 186 ║
0728A: 17 023 ↨
0728B: 00 000 NULL
0728C: CD 205 ═
0728D: 21 033 !
0728E: B4 180 ┤
0728F: 40 064 @
07290: 8B 139 ï
07291: 1E 030 ▲
07292: 52 082 R
07293: 00 000 NULL
```

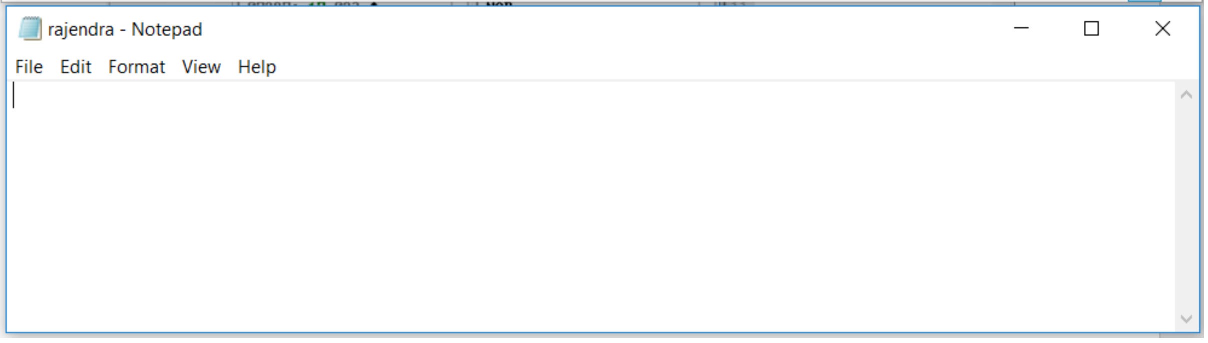
```
0726:000F
MOV [00052h], AX
MOV AH, 040h
MOV BX, [00052h]
MOV CX, 00017h
MOV DX, 00000h
INT 021h
MOV AH, 040h
MOV BX, [00052h]
MOV CX, 00017h
MOV DX, 00017h
INT 021h
MOV AH, 040h
MOV BX, [00052h]
MOV CX, 00018h
MOV DX, 0002Eh
INT 021h
MOV AH, 03Eh
MOV BX, [00052h]
INT 021h
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

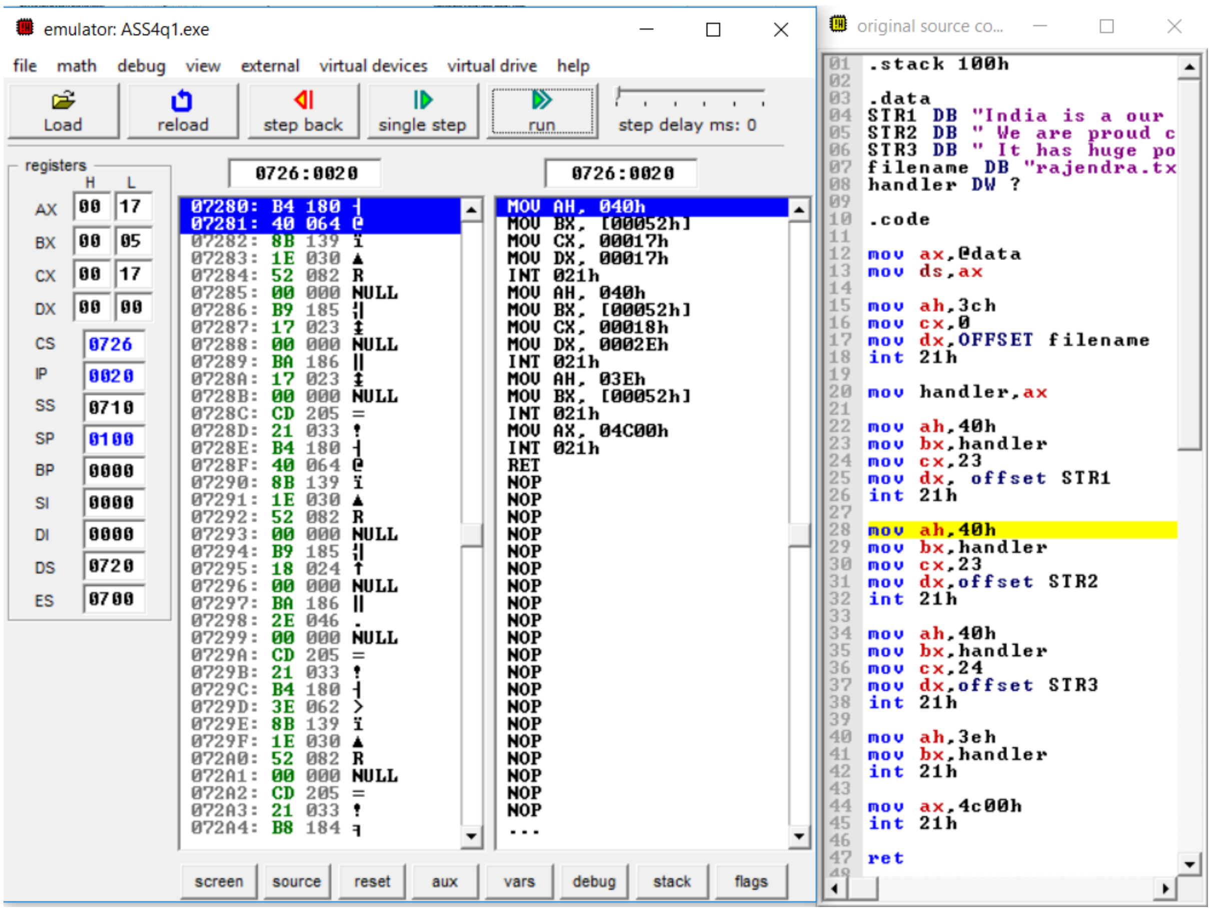


Name	Date modified	Type	Size
ass4sample.exe.~asm	19-02-2019 22:48	~ASM File	1 KB
ass4sample.exe.debug	19-02-2019 22:48	DEBUG File	2 KB
ass4sample.exe.list	19-02-2019 22:48	LIST File	6 KB
ass4sample.exe.symbol	19-02-2019 22:48	SYMBOL File	1 KB
ASS4SAMPLE	19-02-2019 22:48	EXE_ File	1 KB
ASS4SAMPLE.exe_.~asm	19-02-2019 22:48	~ASM File	1 KB
ASS4SAMPLE.exe_.debug	19-02-2019 22:48	DEBUG File	2 KB
ASS4SAMPLE.exe_.list	19-02-2019 22:48	LIST File	6 KB
ASS4SAMPLE.exe_.symbol	19-02-2019 22:48	SYMBOL File	1 KB
noname	29-01-2019 16:47	EXE_ File	1 KB
noname.exe_.~asm	29-01-2019 16:47	~ASM File	1 KB
noname.exe_.list	29-01-2019 16:47	LIST File	5 KB
rajendra	19-02-2019 23:53	Text Document	0 KB

49 items 1 item selected 0 bytes



4. First string i.e. STR1 is written into file.



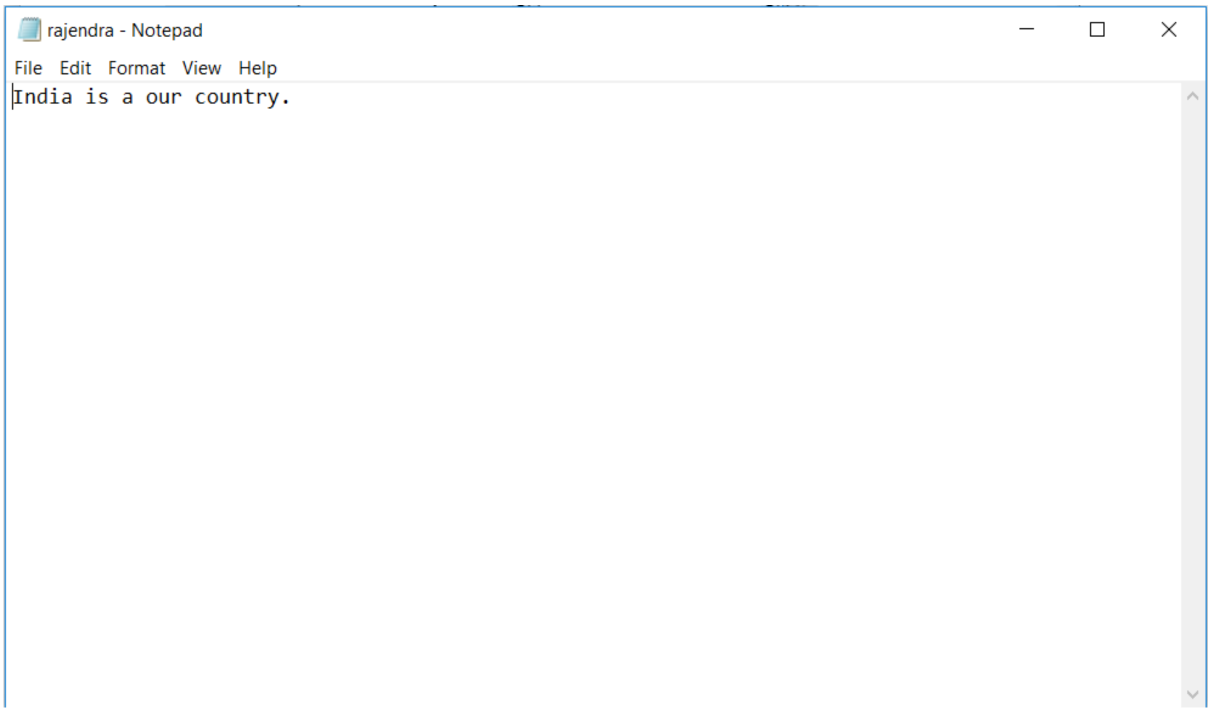
	H	L
AX	00	17
BX	00	05
CX	00	17
DX	00	00

CS	0726
IP	0020
SS	0710
SP	0100
BP	0000
SI	0000
DI	0000
DS	0720
ES	0700

```
0726:0020
07280: B4 180 ┤
07281: 40 064 @
07282: 8B 139 ï
07283: 1E 030 ▲
07284: 52 082 R
07285: 00 000 NULL
07286: B9 185 ╣
07287: 17 023 ↨
07288: 00 000 NULL
07289: BA 186 ║
0728A: 17 023 ↨
0728B: 00 000 NULL
0728C: CD 205 ═
0728D: 21 033 !
0728E: B4 180 ┤
0728F: 40 064 @
07290: 8B 139 ï
07291: 1E 030 ▲
07292: 52 082 R
07293: 00 000 NULL
07294: B9 185 ╣
07295: 18 024 ↑
07296: 00 000 NULL
07297: BA 186 ║
07298: 2E 046 .
07299: 00 000 NULL
0729A: CD 205 ═
0729B: 21 033 !
0729C: B4 180 ┤
0729D: 3E 062 >
0729E: 8B 139 ï
0729F: 1E 030 ▲
072A0: 52 082 R
072A1: 00 000 NULL
072A2: CD 205 ═
072A3: 21 033 !
072A4: B8 184 ╕
```

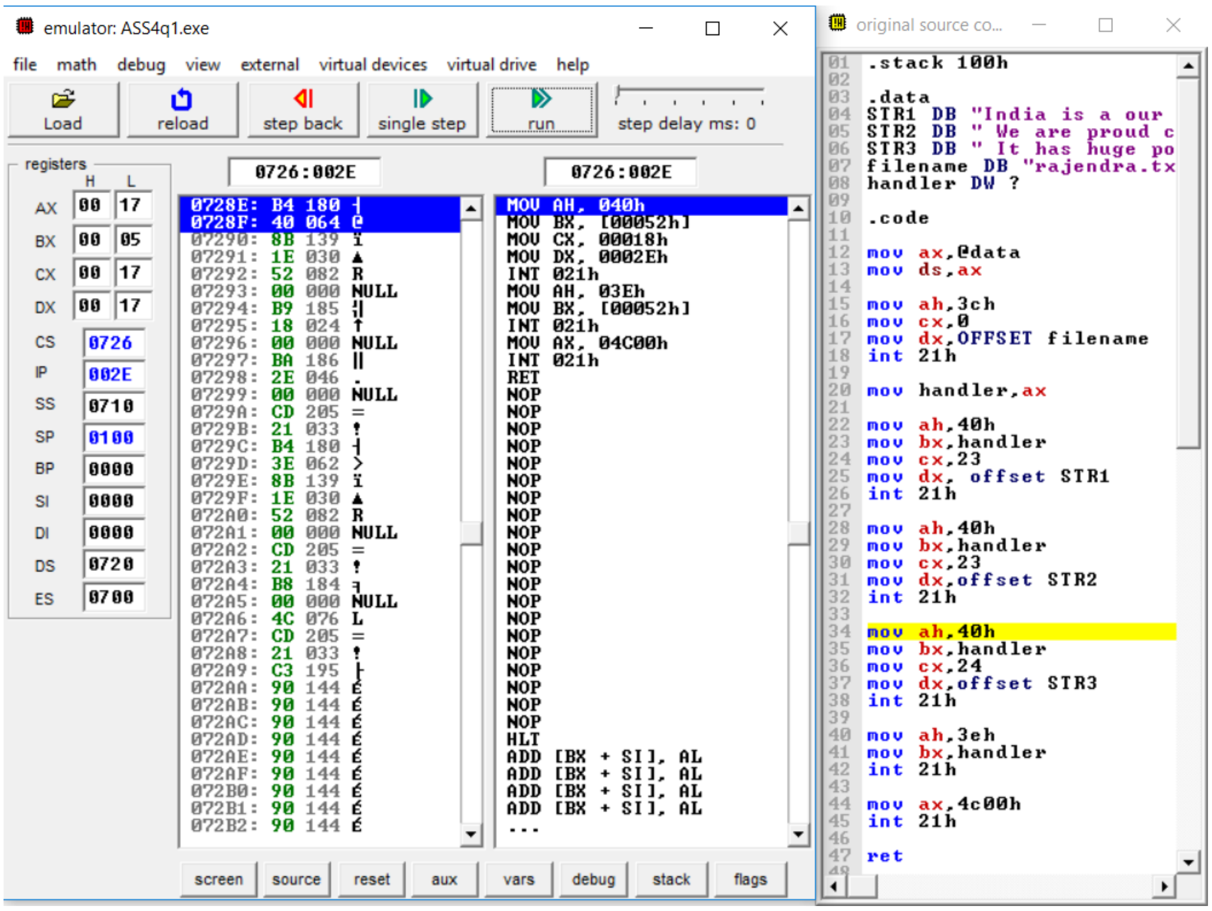
```
0726:0020
MOV  AH, 040h
MOV  BX, [00052h]
MOV  CX, 00017h
MOV  DX, 00017h
INT  021h
MOV  AH, 040h
MOV  BX, [00052h]
MOV  CX, 00018h
MOV  DX, 0002Eh
INT  021h
MOV  AH, 03Eh
MOV  BX, [00052h]
INT  021h
MOV  AX, 04C00h
INT  021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```



```
India is a our country.
```

5. Second string i.e. STR2 is written into file.



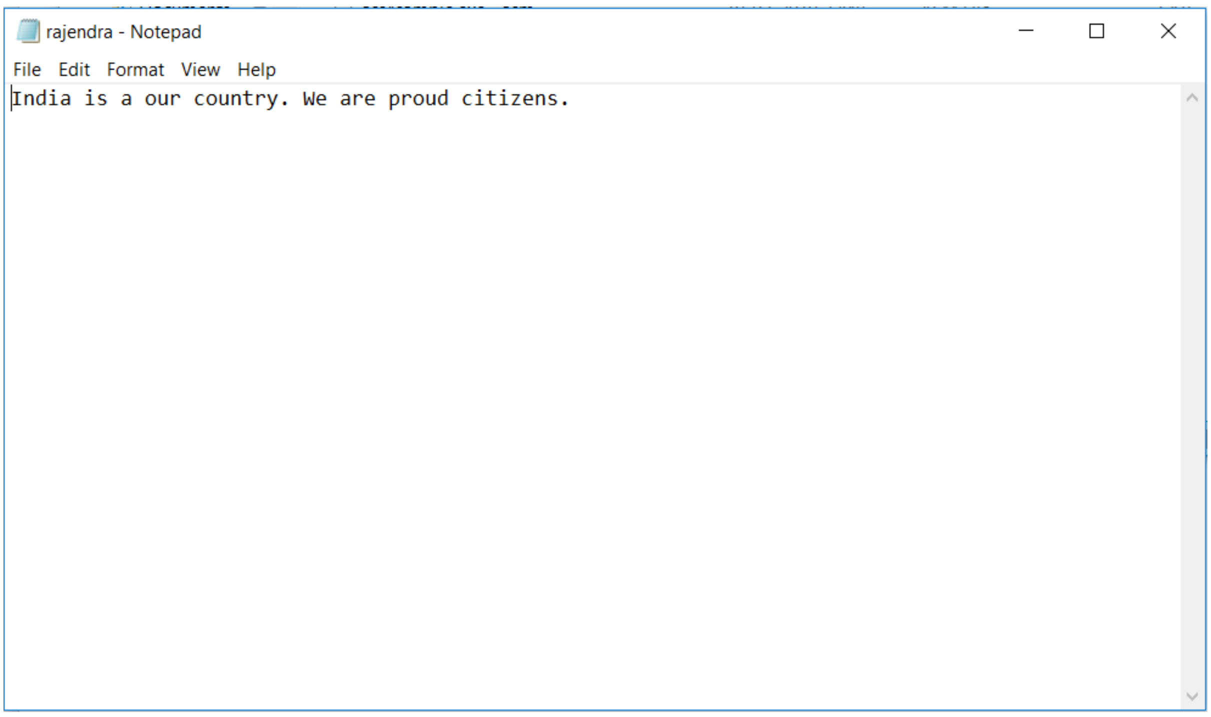
emulator: ASS4q1.exe
file math debug view external virtual devices virtual drive help
Load reload step back single step run step delay ms: 0
original source co...
screen source reset aux vars debug stack flags

```
registers
      H   L
AX   00  17
BX   00  05
CX   00  17
DX   00  17
CS   0726
IP   002E
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0720
ES   0700
```

```
0726:002E
0728E: B4 180 ┤
0728F: 40 064 @
07290: 8B 139 ï
07291: 1E 030 ▲
07292: 52 082 R
07293: 00 000 NULL
07294: B9 185 ╣
07295: 18 024 ↑
07296: 00 000 NULL
07297: BA 186 ║
07298: 2E 046 .
07299: 00 000 NULL
0729A: CD 205 =
0729B: 21 033 !
0729C: B4 180 ┤
0729D: 3E 062 >
0729E: 8B 139 ï
0729F: 1E 030 ▲
072A0: 52 082 R
072A1: 00 000 NULL
072A2: CD 205 =
072A3: 21 033 !
072A4: B8 184 ╕
072A5: 00 000 NULL
072A6: 4C 076 L
072A7: CD 205 =
072A8: 21 033 !
072A9: C3 195 ├
072AA: 90 144 É
072AB: 90 144 É
072AC: 90 144 É
072AD: 90 144 É
072AE: 90 144 É
072AF: 90 144 É
072B0: 90 144 É
072B1: 90 144 É
072B2: 90 144 É
```

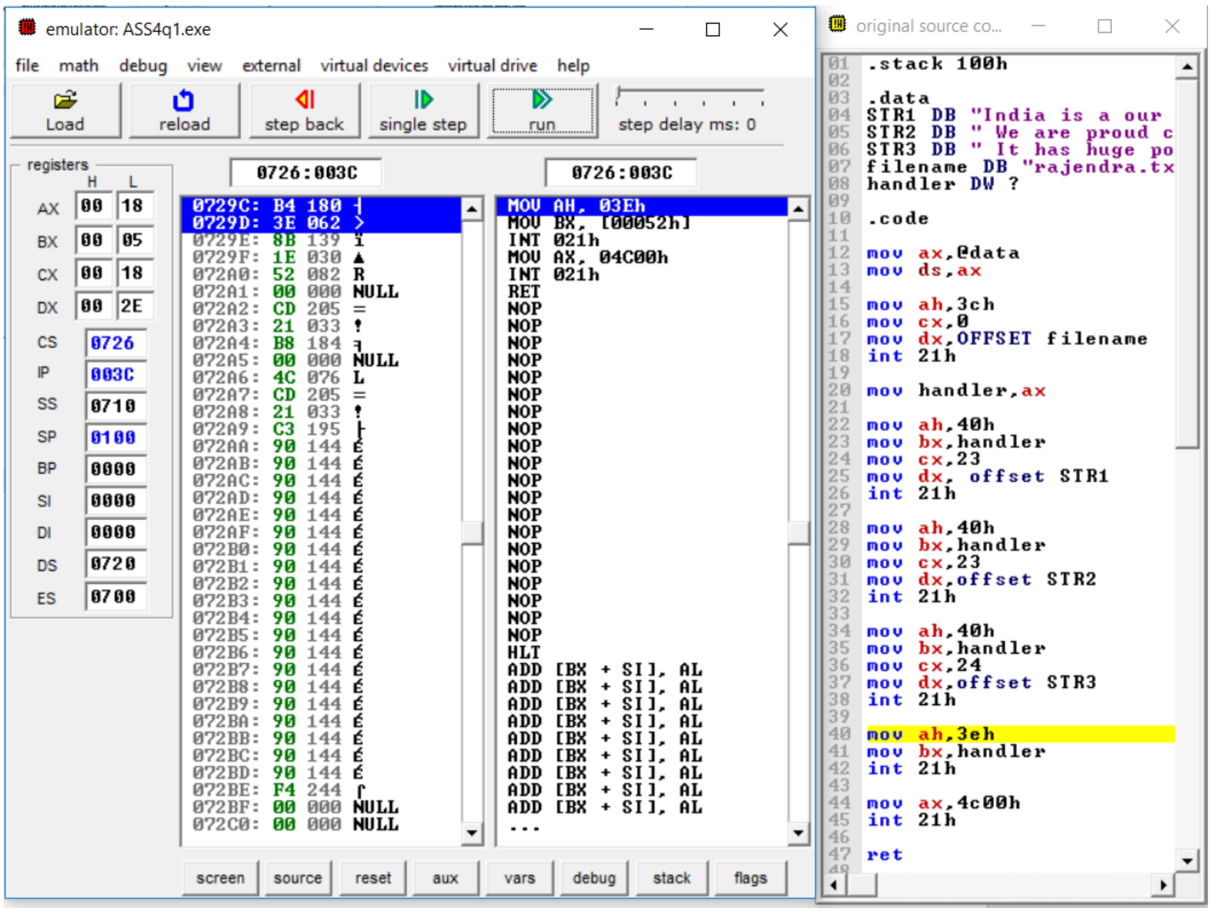
```
0726:002E
MOV AH, 040h
MOV BX, [00052h]
MOV CX, 00018h
MOV DX, 0002Eh
INT 021h
MOV AH, 03Eh
MOV BX, [00052h]
INT 021h
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
HLT
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
...
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```



```
India is a our country. We are proud citizens.
```

6. Third string i.e. STR3 is written into file.

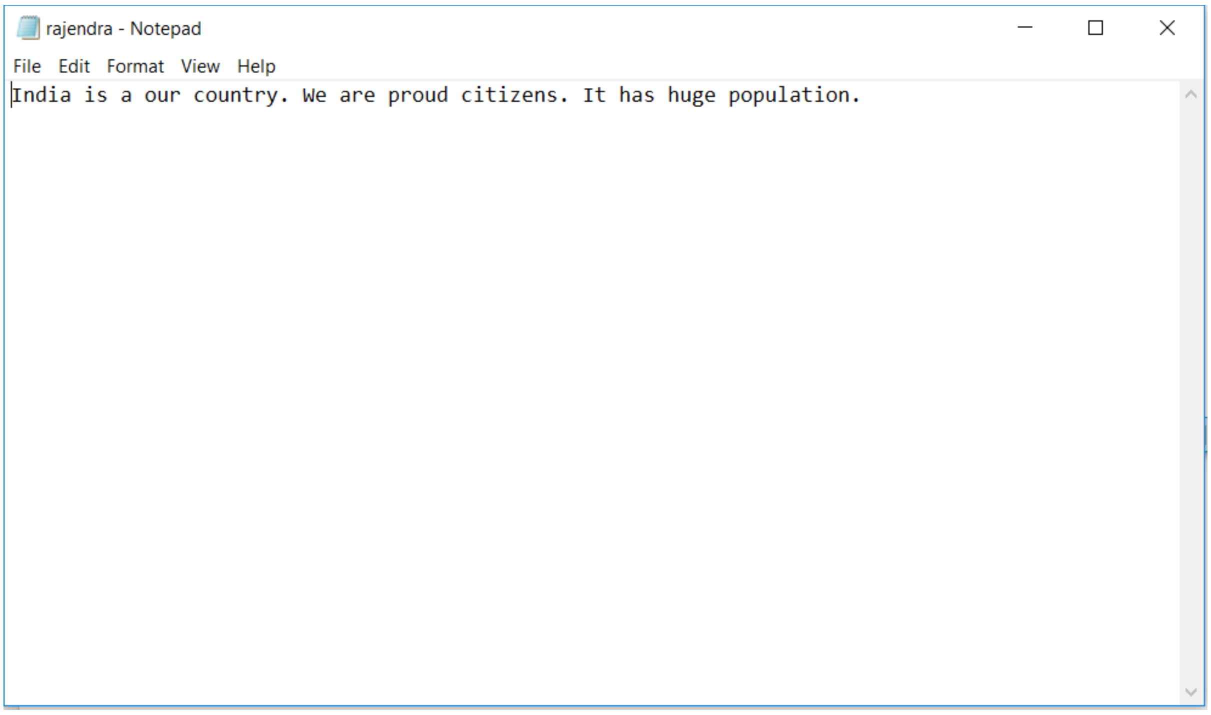


```
     H  L
AX  00 18
BX  00 05
CX  00 18
DX  00 2E
CS  0726
IP  003C
SS  0710
SP  0100
BP  0000
SI  0000
DI  0000
DS  0720
ES  0700
```

```
0726:003C

0729C: B4 180 ┤
0729D: 3E 062 >
0729E: 8B 139 ï
0729F: 1E 030 ▲
072A0: 52 082 R
072A1: 00 000 NULL
072A2: CD 205 ═
072A3: 21 033 !
072A4: B8 184 ╕
072A5: 00 000 NULL
072A6: 4C 076 L
072A7: CD 205 ═
072A8: 21 033 !
072A9: C3 195 ├
072AA: 90 144 É
072AB: 90 144 É
072AC: 90 144 É
072AD: 90 144 É
072AE: 90 144 É
072AF: 90 144 É
072B0: 90 144 É
072B1: 90 144 É
072B2: 90 144 É
072B3: 90 144 É
072B4: 90 144 É
072B5: 90 144 É
072B6: 90 144 É
072B7: 90 144 É
072B8: 90 144 É
072B9: 90 144 É
072BA: 90 144 É
072BB: 90 144 É
072BC: 90 144 É
072BD: 90 144 É
072BE: F4 244 ⌠
072BF: 00 000 NULL
072C0: 00 000 NULL
```

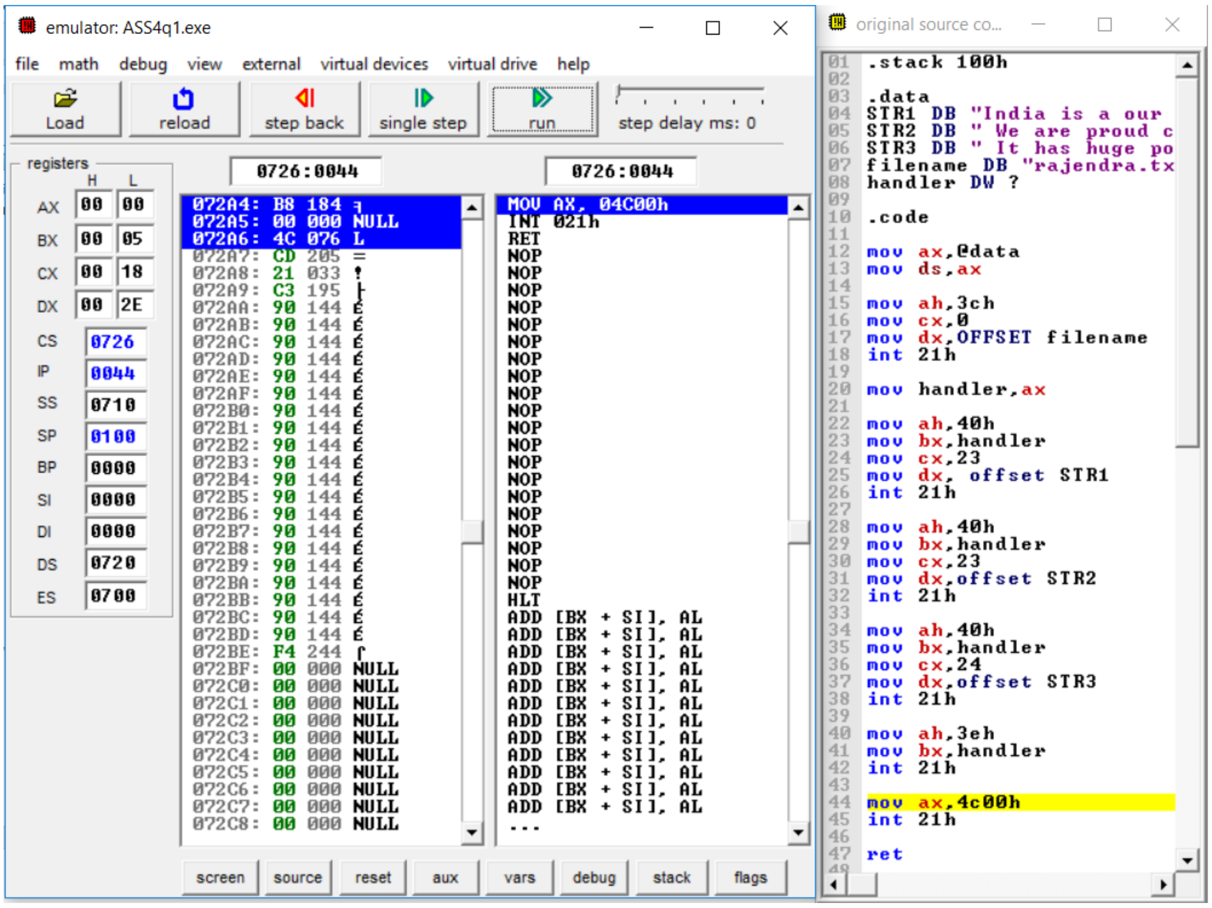
```
0726:003C

MOV AH, 03Eh
MOV BX, [00052h]
INT 021h
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
HLT
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
...
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```



```
India is a our country. We are proud citizens. It has huge population.
```

7. Then the file is closed.


emulator: ASS4q1.exe
file math debug view external virtual devices virtual drive help
Load reload step back single step run step delay ms: 0
registers
screen source reset aux vars debug stack flags
original source co...

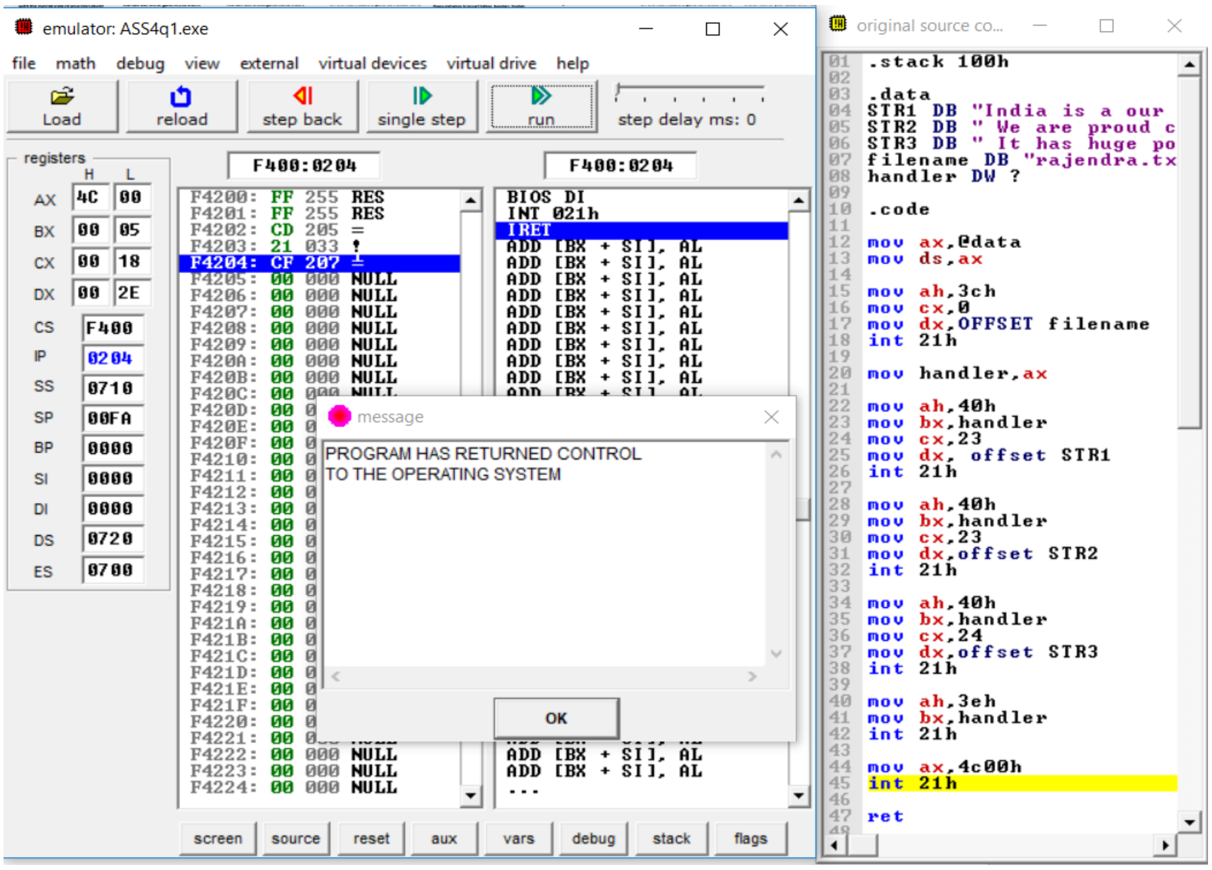
```
registers   H   L
AX         00  00
BX         00  05
CX         00  18
DX         00  2E
CS   0726
IP   0044
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0720
ES   0700
```

```
0726:0044
072A4: B8 184 ╕
072A5: 00 000 NULL
072A6: 4C 076 L
072A7: CD 205 ═
072A8: 21 033 !
072A9: C3 195 ├
072AA: 90 144 É
072AB: 90 144 É
072AC: 90 144 É
072AD: 90 144 É
072AE: 90 144 É
072AF: 90 144 É
072B0: 90 144 É
072B1: 90 144 É
072B2: 90 144 É
072B3: 90 144 É
072B4: 90 144 É
072B5: 90 144 É
072B6: 90 144 É
072B7: 90 144 É
072B8: 90 144 É
072B9: 90 144 É
072BA: 90 144 É
072BB: 90 144 É
072BC: 90 144 É
072BD: 90 144 É
072BE: F4 244 ⌠
072BF: 00 000 NULL
072C0: 00 000 NULL
072C1: 00 000 NULL
072C2: 00 000 NULL
072C3: 00 000 NULL
072C4: 00 000 NULL
072C5: 00 000 NULL
072C6: 00 000 NULL
072C7: 00 000 NULL
072C8: 00 000 NULL
```

```
0726:0044
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
HLT
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
...
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

8. The program is ended.


emulator: ASS4q1.exe
file math debug view external virtual devices virtual drive help
Load reload step back single step run step delay ms: 0
registers
screen source reset aux vars debug stack flags
original source co...
message
OK

```
registers   H   L
AX         4C  00
BX         00  05
CX         00  18
DX         00  2E
CS   F400
IP   0204
SS   0710
SP   00FA
BP   0000
SI   0000
DI   0000
DS   0720
ES   0700
```

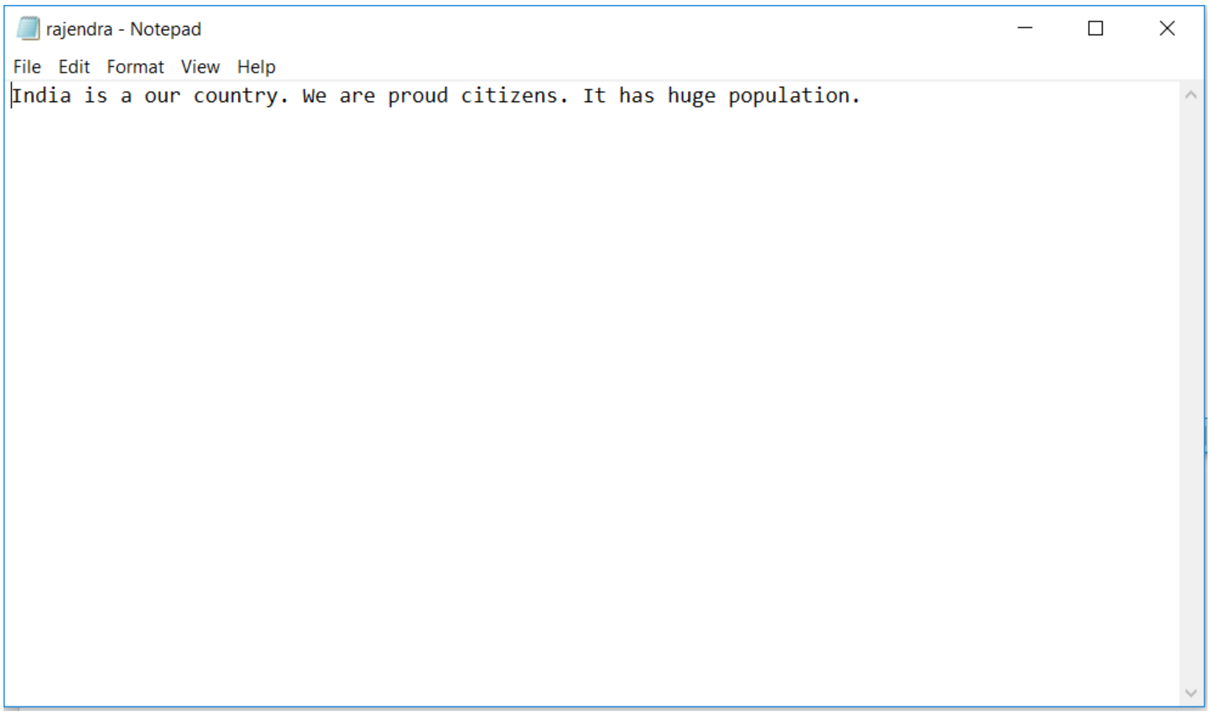
```
F400:0204
F4200: FF 255 RES
F4201: FF 255 RES
F4202: CD 205 ═
F4203: 21 033 !
F4204: CF 207 ╧
F4205: 00 000 NULL
F4206: 00 000 NULL
F4207: 00 000 NULL
F4208: 00 000 NULL
F4209: 00 000 NULL
F420A: 00 000 NULL
F420B: 00 000 NULL
F420C: 00 000 NULL
F420D: 00 0
F420E: 00 0
F420F: 00 0
F4210: 00 0
F4211: 00 0
F4212: 00 0
F4213: 00 0
F4214: 00 0
F4215: 00 0
F4216: 00 0
F4217: 00 0
F4218: 00 0
F4219: 00 0
F421A: 00 0
F421B: 00 0
F421C: 00 0
F421D: 00 0
F421E: 00 0
F421F: 00 0
F4220: 00 0
F4221: 00 0
F4222: 00 000 NULL
F4223: 00 000 NULL
F4224: 00 000 NULL
```

```
F400:0204
BIOS DI
INT 021h
IRET
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
ADD [BX + SI], AL
...
```

```
PROGRAM HAS RETURNED CONTROL
TO THE OPERATING SYSTEM
```

```
.stack 100h

.data
STR1 DB "India is a our
STR2 DB " We are proud c
STR3 DB " It has huge po
filename DB "rajendra.tx
handler DW ?

.code

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov ah,40h
mov bx,handler
mov cx,23
mov dx, offset STR1
int 21h

mov ah,40h
mov bx,handler
mov cx,23
mov dx,offset STR2
int 21h

mov ah,40h
mov bx,handler
mov cx,24
mov dx,offset STR3
int 21h

mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

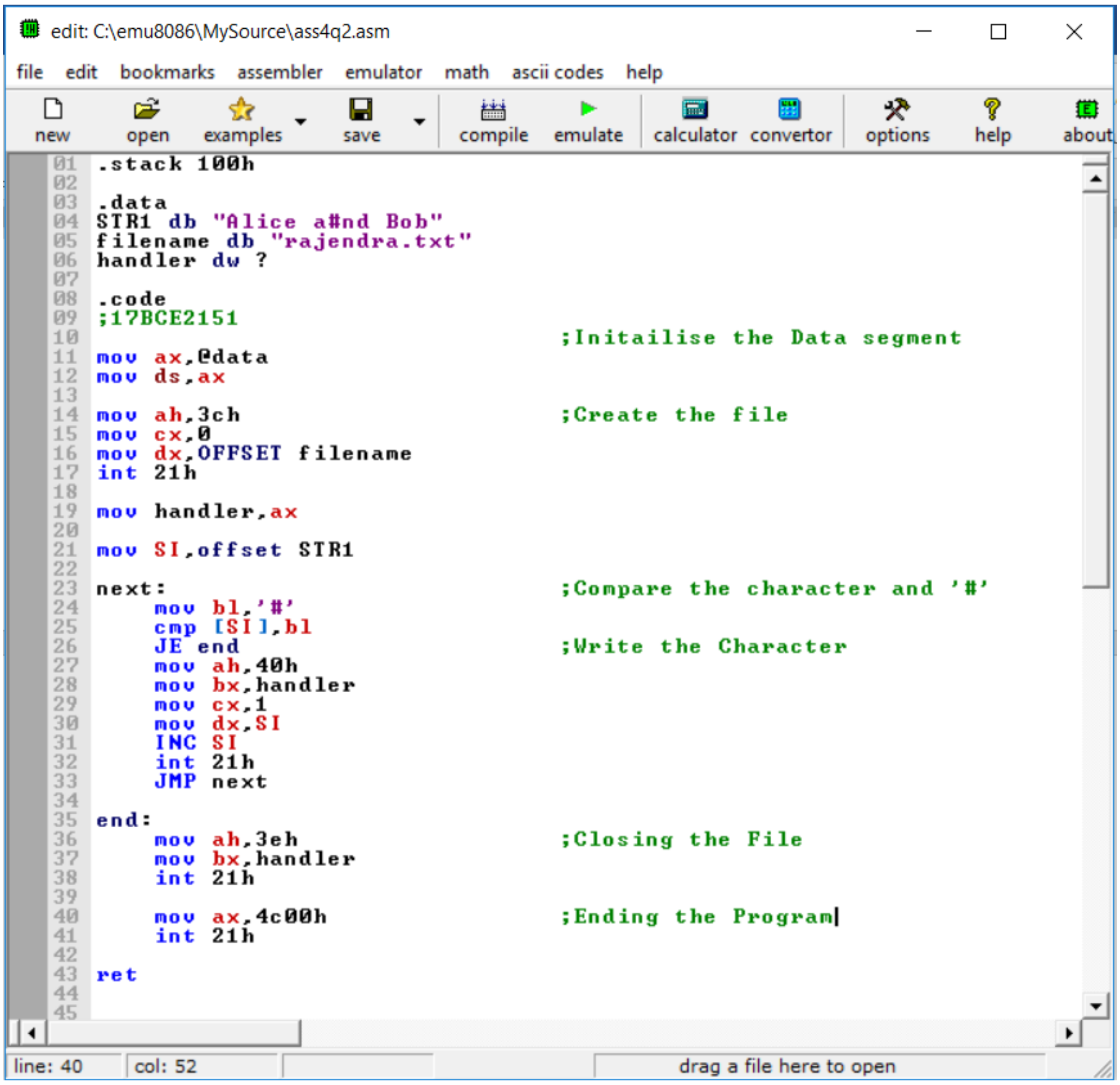
Final Contents of File are:



```
India is a our country. We are proud citizens. It has huge population.
```

Question 2: Write an 8086 Assembly Language Program to read and write a character until an END Delimiter in a file system using DOS Interrupts?

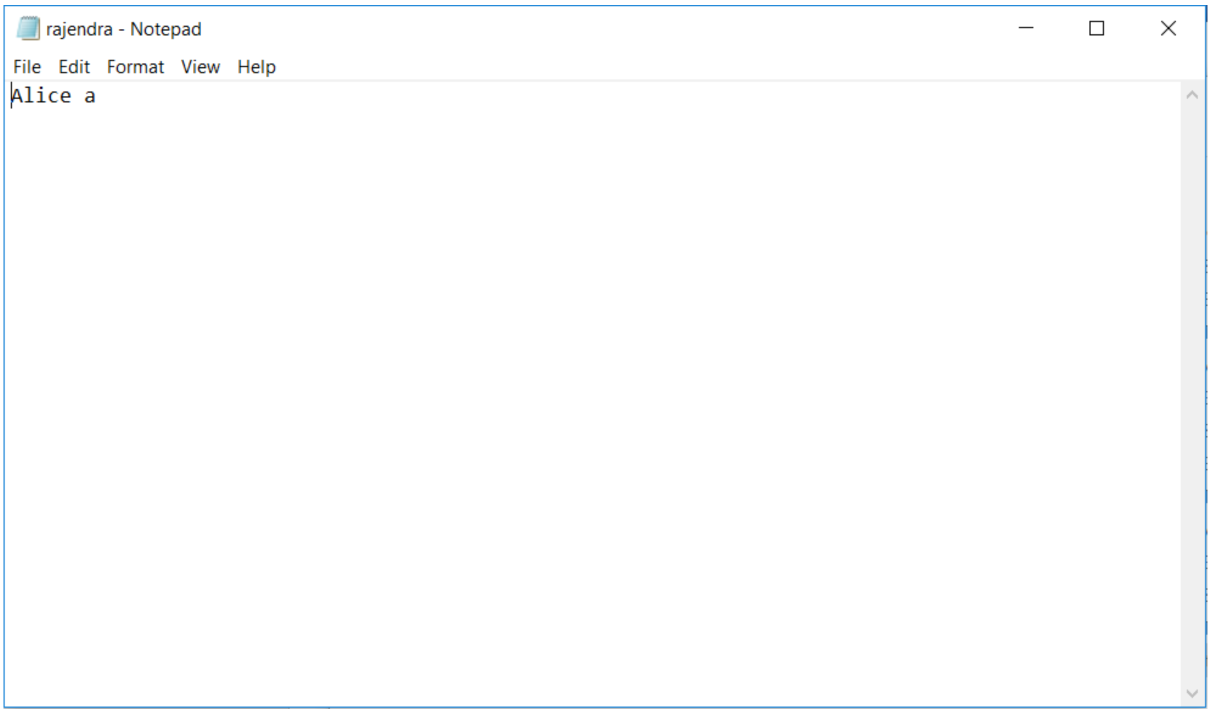
Code Snippet:


edit: C:\emu8086\MySource\ass4q2.asm
file edit bookmarks assembler emulator math ascii codes help
new open examples save compile emulate calculator convertor options help about
line: 40 col: 52 drag a file here to open

```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.txt"
handler dw ?

.code
;17BCE2151
                                ;Initailise the Data segment
mov ax,@data
mov ds,ax

mov ah,3ch                      ;Create the file
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:                           ;Compare the character and '#'
    mov bl,'#'
    cmp [SI],bl
    JE end                      ;Write the Character
    mov ah,40h
    mov bx,handler
    mov cx,1
    mov dx,SI
    INC SI
    int 21h
    JMP next

end:
    mov ah,3eh                  ;Closing the File
    mov bx,handler
    int 21h

    mov ax,4c00h                ;Ending the Program
    int 21h

ret
```

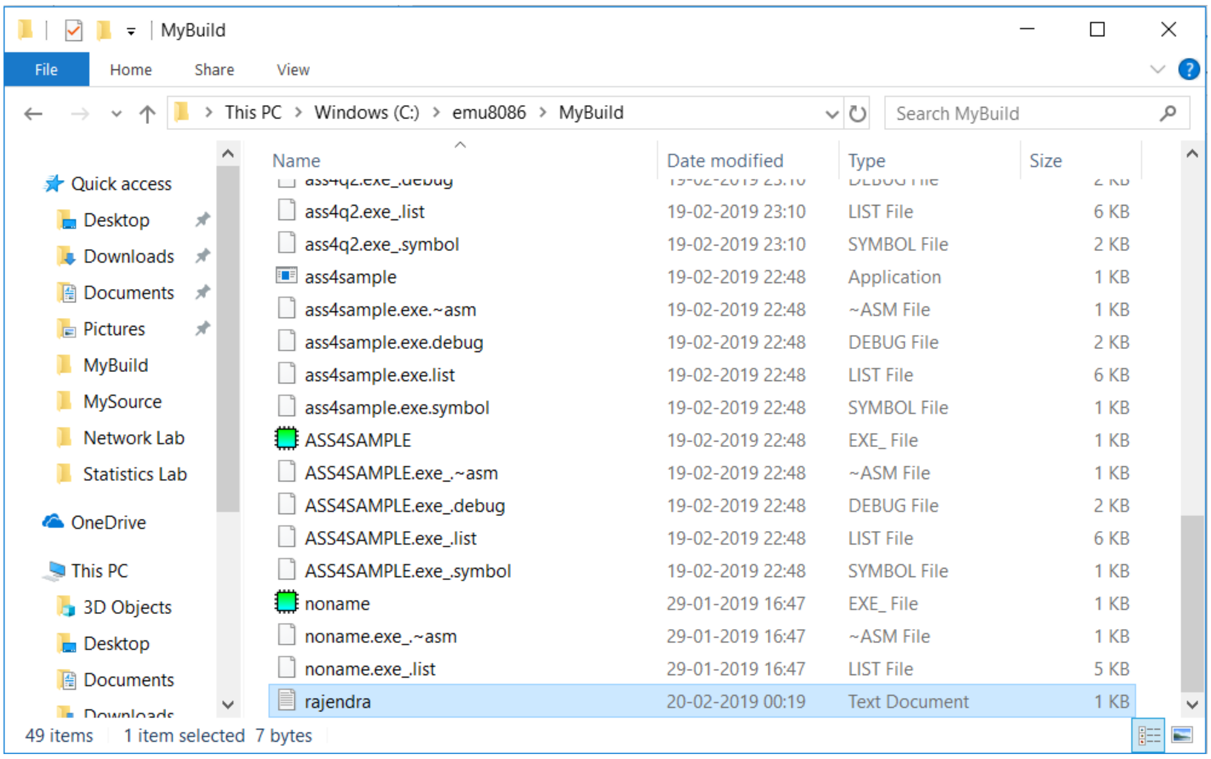
At first, stack segment is initialised and then STR1 is defined in data segment along with filename and handler. Then in code segment data segment register is initialised. Then file is created and later each character of STR1 is compared with '#'. If they are equal the file is closed and program terminates. If they are not equal the current character is written into file and next character is scanned. Here we have # after "Alice a" so only "Alice a" will be written to file.

Output file created:



```
Alice a
```

File is found in MyBuild folder in the EMU8086 main folder.

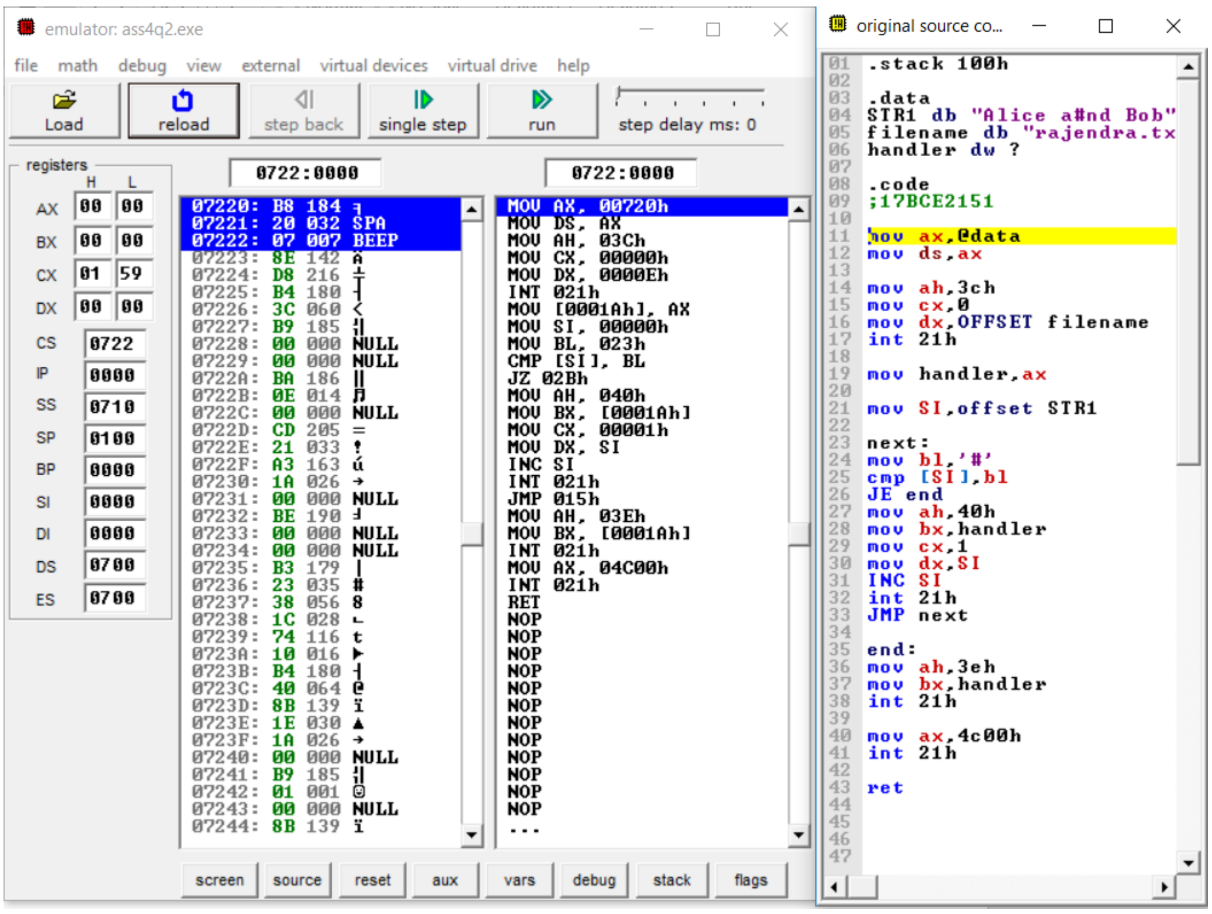


Name	Date modified	Type	Size
ass4q2.exe_.list	19-02-2019 23:10	LIST File	6 KB
ass4q2.exe_.symbol	19-02-2019 23:10	SYMBOL File	2 KB
ass4sample	19-02-2019 22:48	Application	1 KB
ass4sample.exe.~asm	19-02-2019 22:48	~ASM File	1 KB
ass4sample.exe.debug	19-02-2019 22:48	DEBUG File	2 KB
ass4sample.exe.list	19-02-2019 22:48	LIST File	6 KB
ass4sample.exe.symbol	19-02-2019 22:48	SYMBOL File	1 KB
ASS4SAMPLE	19-02-2019 22:48	EXE_ File	1 KB
ASS4SAMPLE.exe_.~asm	19-02-2019 22:48	~ASM File	1 KB
ASS4SAMPLE.exe_.debug	19-02-2019 22:48	DEBUG File	2 KB
ASS4SAMPLE.exe_.list	19-02-2019 22:48	LIST File	6 KB
ASS4SAMPLE.exe_.symbol	19-02-2019 22:48	SYMBOL File	1 KB
noname	29-01-2019 16:47	EXE_ File	1 KB
noname.exe_.~asm	29-01-2019 16:47	~ASM File	1 KB
noname.exe_.list	29-01-2019 16:47	LIST File	5 KB
rajendra	20-02-2019 00:19	Text Document	1 KB

49 items 1 item selected 7 bytes

Step by Step Execution:

1. Initially the program is loaded.


emulator: ass4q2.exe
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
screen source reset aux vars debug stack flags
original source co...

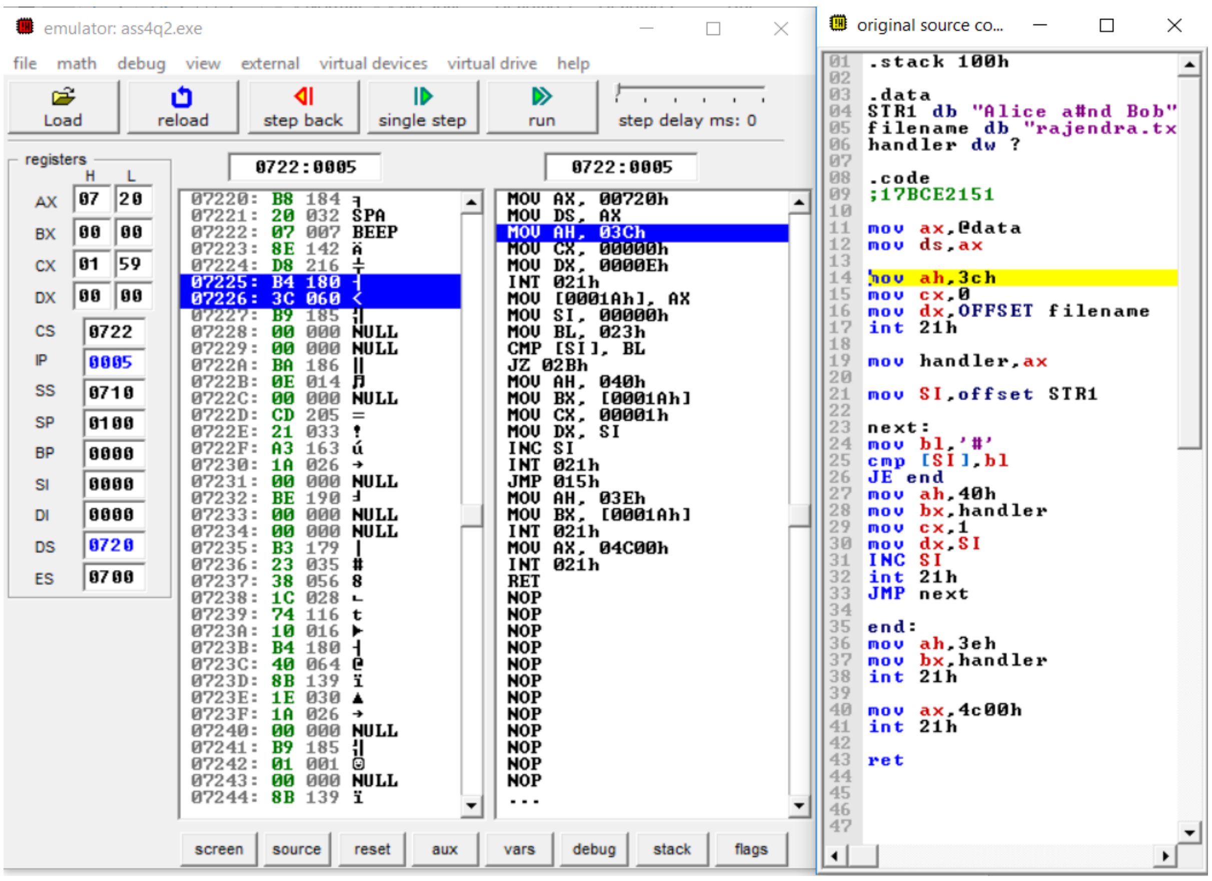
```
registers
     H   L
AX   00  00
BX   00  00
CX   01  59
DX   00  00
CS   0722
IP   0000
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0700
ES   0700
```

```
0722:0000

07220: B8 184 ╕
07221: 20 032 SPA
07222: 07 007 BEEP
07223: 8E 142 Ä
07224: D8 216 ╪
07225: B4 180 ┤
07226: 3C 060 <
07227: B9 185 ╣
07228: 00 000 NULL
07229: 00 000 NULL
0722A: BA 186 ║
0722B: 0E 014 ♫
0722C: 00 000 NULL
0722D: CD 205 ═
0722E: 21 033 !
0722F: A3 163 ú
07230: 1A 026 →
07231: 00 000 NULL
07232: BE 190 ╛
07233: 00 000 NULL
07234: 00 000 NULL
07235: B3 179 │
07236: 23 035 #
07237: 38 056 8
07238: 1C 028 ∟
07239: 74 116 t
0723A: 10 016 ►
0723B: B4 180 ┤
0723C: 40 064 @
0723D: 8B 139 ï
0723E: 1E 030 ▲
0723F: 1A 026 →
07240: 00 000 NULL
07241: B9 185 ╣
07242: 01 001 ☺
07243: 00 000 NULL
07244: 8B 139 ï
```

```
0722:0000

MOV AX, 00720h
MOV DS, AX
MOV AH, 03Ch
MOV CX, 00000h
MOV DX, 0000Eh
INT 021h
MOV [0001Ah], AX
MOV SI, 00000h
MOV BL, 023h
CMP [SI], BL
JZ 02Bh
MOV AH, 040h
MOV BX, [0001Ah]
MOV CX, 00001h
MOV DX, SI
INC SI
INT 021h
JMP 015h
MOV AH, 03Eh
MOV BX, [0001Ah]
INT 021h
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...
```

```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.tx
handler dw ?

.code
;17BCE2151

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:
mov bl,'#'
cmp [SI],bl
JE end
mov ah,40h
mov bx,handler
mov cx,1
mov dx,SI
INC SI
int 21h
JMP next

end:
mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

2. Then the Data segment register is initialised. See the changes in value of DS.


emulator: ass4q2.exe
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
screen source reset aux vars debug stack flags
original source co...

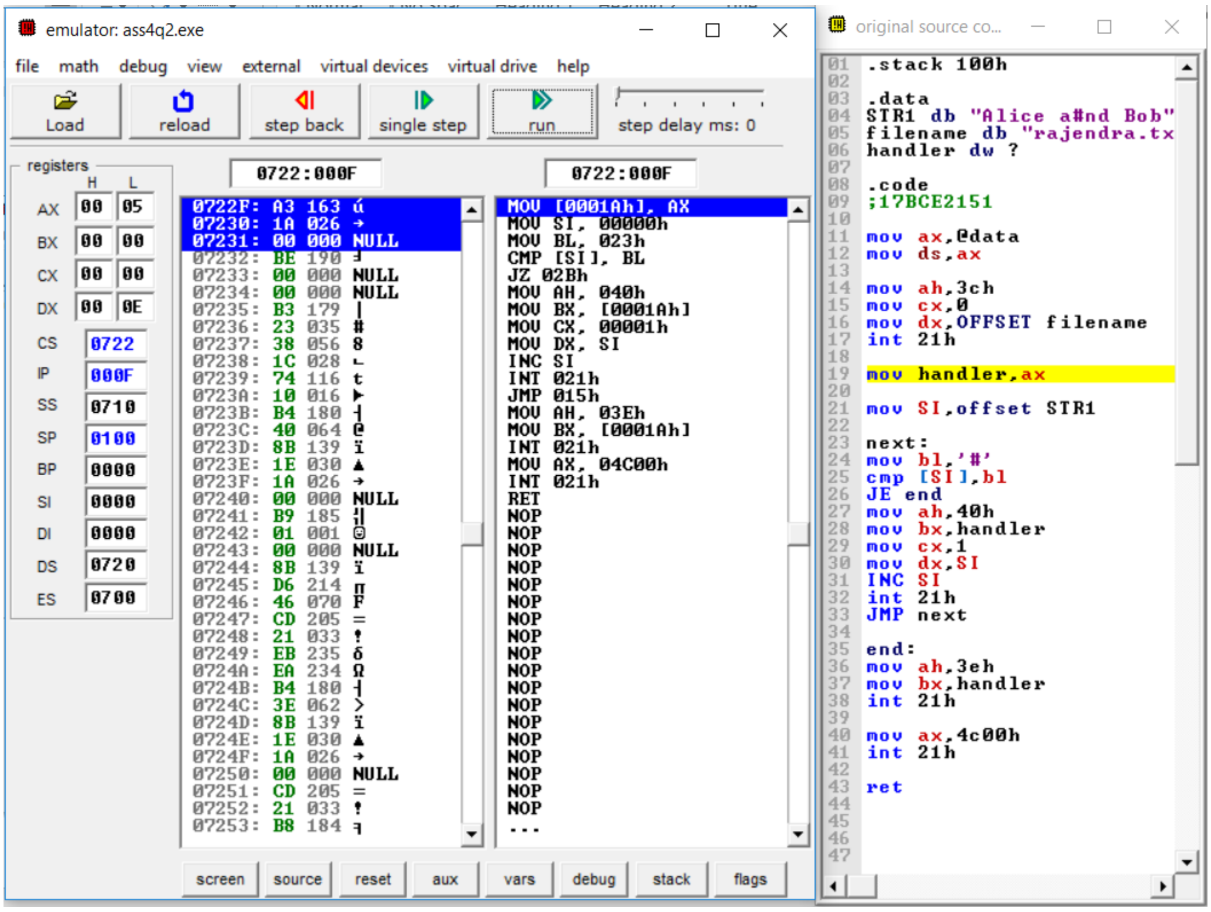
```
registers
     H   L
AX   07  20
BX   00  00
CX   01  59
DX   00  00
CS   0722
IP   0005
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0720
ES   0700
```

```
0722:0005

07220: B8 184 ╕
07221: 20 032 SPA
07222: 07 007 BEEP
07223: 8E 142 Ä
07224: D8 216 ╪
07225: B4 180 ┤
07226: 3C 060 <
07227: B9 185 ╣
07228: 00 000 NULL
07229: 00 000 NULL
0722A: BA 186 ║
0722B: 0E 014 ♫
0722C: 00 000 NULL
0722D: CD 205 ═
0722E: 21 033 !
0722F: A3 163 ú
07230: 1A 026 →
07231: 00 000 NULL
07232: BE 190 ╛
07233: 00 000 NULL
07234: 00 000 NULL
07235: B3 179 │
07236: 23 035 #
07237: 38 056 8
07238: 1C 028 ∟
07239: 74 116 t
0723A: 10 016 ►
0723B: B4 180 ┤
0723C: 40 064 @
0723D: 8B 139 ï
0723E: 1E 030 ▲
0723F: 1A 026 →
07240: 00 000 NULL
07241: B9 185 ╣
07242: 01 001 ☺
07243: 00 000 NULL
07244: 8B 139 ï
```

```
0722:0005

MOV AX, 00720h
MOV DS, AX
MOV AH, 03Ch
MOV CX, 00000h
MOV DX, 0000Eh
INT 021h
MOV [0001Ah], AX
MOV SI, 00000h
MOV BL, 023h
CMP [SI], BL
JZ 02Bh
MOV AH, 040h
MOV BX, [0001Ah]
MOV CX, 00001h
MOV DX, SI
INC SI
INT 021h
JMP 015h
MOV AH, 03Eh
MOV BX, [0001Ah]
INT 021h
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...
```

```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.tx
handler dw ?

.code
;17BCE2151

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:
mov bl,'#'
cmp [SI],bl
JE end
mov ah,40h
mov bx,handler
mov cx,1
mov dx,SI
INC SI
int 21h
JMP next

end:
mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

3. Then the file is created but is empty as no data is being written onto it.

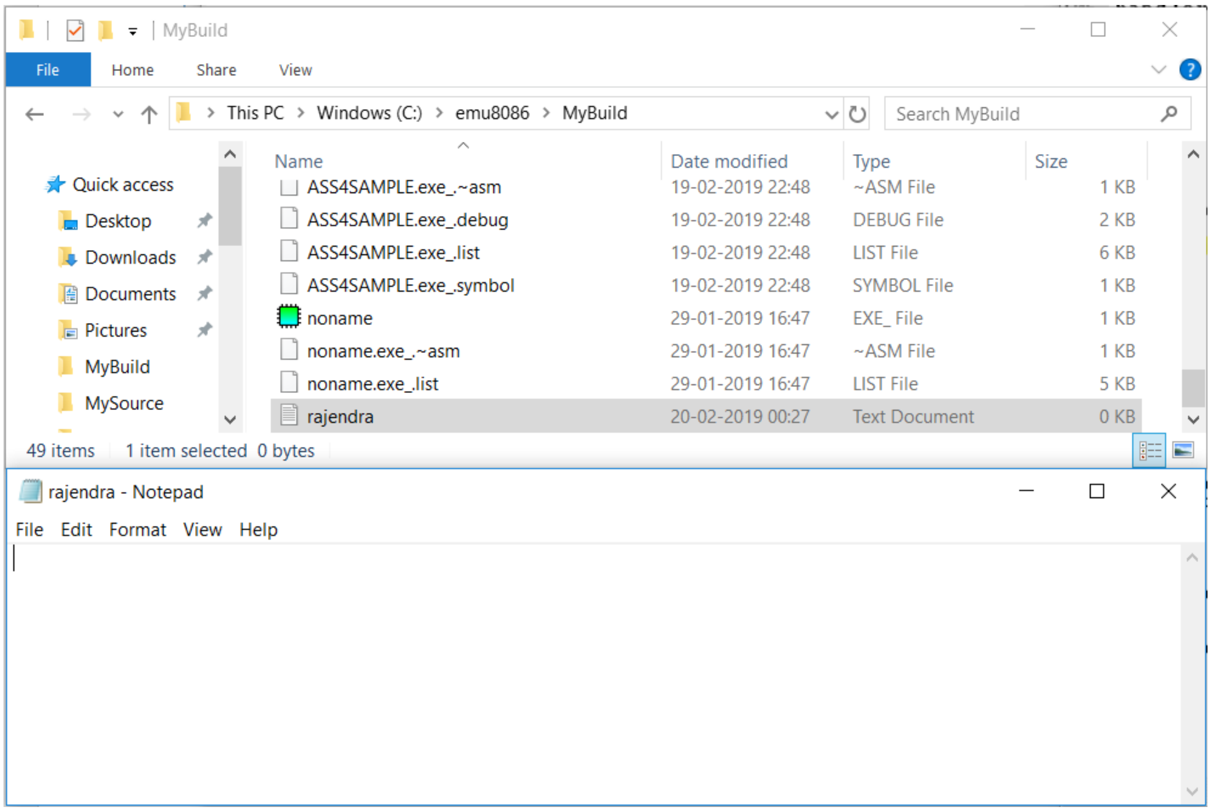

emulator: ass4q2.exe
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
registers
screen source reset aux vars debug stack flags
original source co...

```
      H   L
AX   00  05
BX   00  00
CX   00  00
DX   00  0E
CS   0722
IP   000F
SS   0710
SP   0100
BP   0000
SI   0000
DI   0000
DS   0720
ES   0700
```

```
0722:000F
0722F: A3 163 ú
07230: 1A 026 →
07231: 00 000 NULL
07232: BE 190 ╛
07233: 00 000 NULL
07234: 00 000 NULL
07235: B3 179 │
07236: 23 035 #
07237: 38 056 8
07238: 1C 028 ∟
07239: 74 116 t
0723A: 10 016 ►
0723B: B4 180 ┤
0723C: 40 064 @
0723D: 8B 139 ï
0723E: 1E 030 ▲
0723F: 1A 026 →
07240: 00 000 NULL
07241: B9 185 ╣
07242: 01 001 ☺
07243: 00 000 NULL
07244: 8B 139 ï
07245: D6 214 π
07246: 46 070 F
07247: CD 205 =
07248: 21 033 !
07249: EB 235 δ
0724A: EA 234 Ω
0724B: B4 180 ┤
0724C: 3E 062 >
0724D: 8B 139 ï
0724E: 1E 030 ▲
0724F: 1A 026 →
07250: 00 000 NULL
07251: CD 205 =
07252: 21 033 !
07253: B8 184 ╕
```

```
0722:000F
MOV [0001Ah], AX
MOV SI, 00000h
MOV BL, 023h
CMP [SI], BL
JZ 02Bh
MOV AH, 040h
MOV BX, [0001Ah]
MOV CX, 00001h
MOV DX, SI
INC SI
INT 021h
JMP 015h
MOV AH, 03Eh
MOV BX, [0001Ah]
INT 021h
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...
```

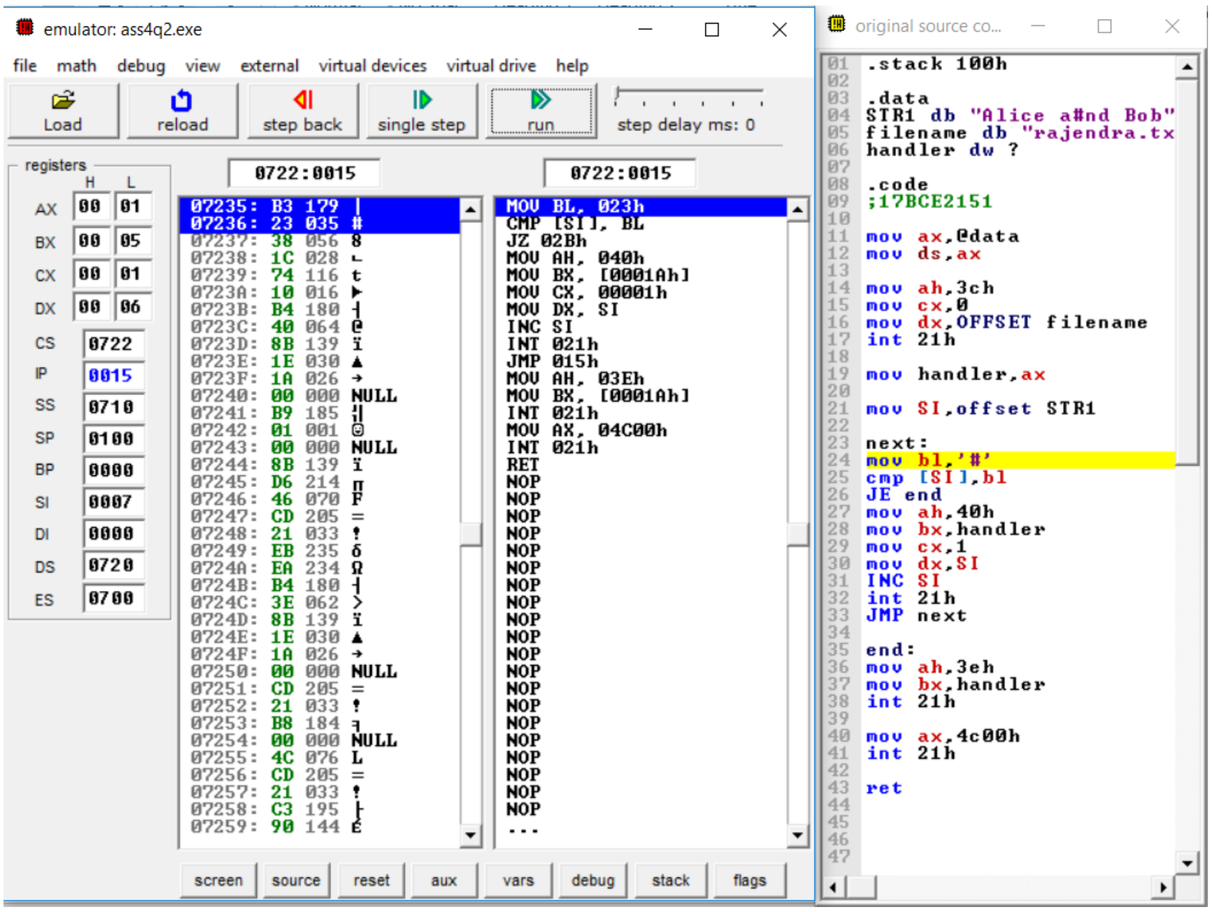
```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.tx
handler dw ?

.code
;17BCE2151

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:
mov bl,'#'
cmp [SI],bl
JE end
mov ah,40h
mov bx,handler
mov cx,1
mov dx,SI
INC SI
int 21h
JMP next

end:
mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```



Name	Date modified	Type	Size
ASS4SAMPLE.exe_~asm	19-02-2019 22:48	~ASM File	1 KB
ASS4SAMPLE.exe_debug	19-02-2019 22:48	DEBUG File	2 KB
ASS4SAMPLE.exe_list	19-02-2019 22:48	LIST File	6 KB
ASS4SAMPLE.exe_symbol	19-02-2019 22:48	SYMBOL File	1 KB
noname	29-01-2019 16:47	EXE_ File	1 KB
noname.exe_~asm	29-01-2019 16:47	~ASM File	1 KB
noname.exe_list	29-01-2019 16:47	LIST File	5 KB
rajendra	20-02-2019 00:27	Text Document	0 KB

49 items 1 item selected 0 bytes

4. Then the characters are scanned one by one and as “Alice a” has no # it is written as show below.

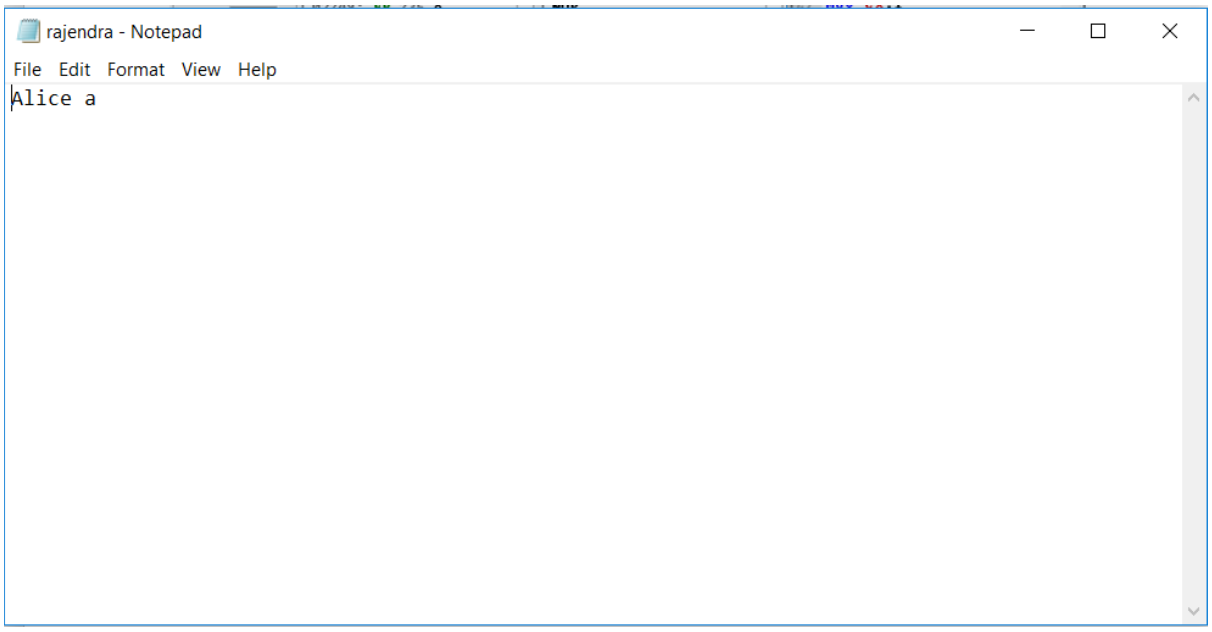


```
registers
     H  L
AX  00 01
BX  00 05
CX  00 01
DX  00 06
CS  0722
IP  0015
SS  0710
SP  0100
BP  0000
SI  0007
DI  0000
DS  0720
ES  0700
```

```
0722:0015

07235: B3 179 |
07236: 23 035 #
07237: 38 056 8
07238: 1C 028 ∟
07239: 74 116 t
0723A: 10 016 ►
0723B: B4 180 ┤
0723C: 40 064 @
0723D: 8B 139 ï
0723E: 1E 030 ▲
0723F: 1A 026 →
07240: 00 000 NULL
07241: B9 185 ╣
07242: 01 001 ☺
07243: 00 000 NULL
07244: 8B 139 ï
07245: D6 214 π
07246: 46 070 F
07247: CD 205 =
07248: 21 033 !
07249: EB 235 δ
0724A: EA 234 Ω
0724B: B4 180 ┤
0724C: 3E 062 >
0724D: 8B 139 ï
0724E: 1E 030 ▲
0724F: 1A 026 →
07250: 00 000 NULL
07251: CD 205 =
07252: 21 033 !
07253: B8 184 ╕
07254: 00 000 NULL
07255: 4C 076 L
07256: CD 205 =
07257: 21 033 !
07258: C3 195 ├
07259: 90 144 É
```

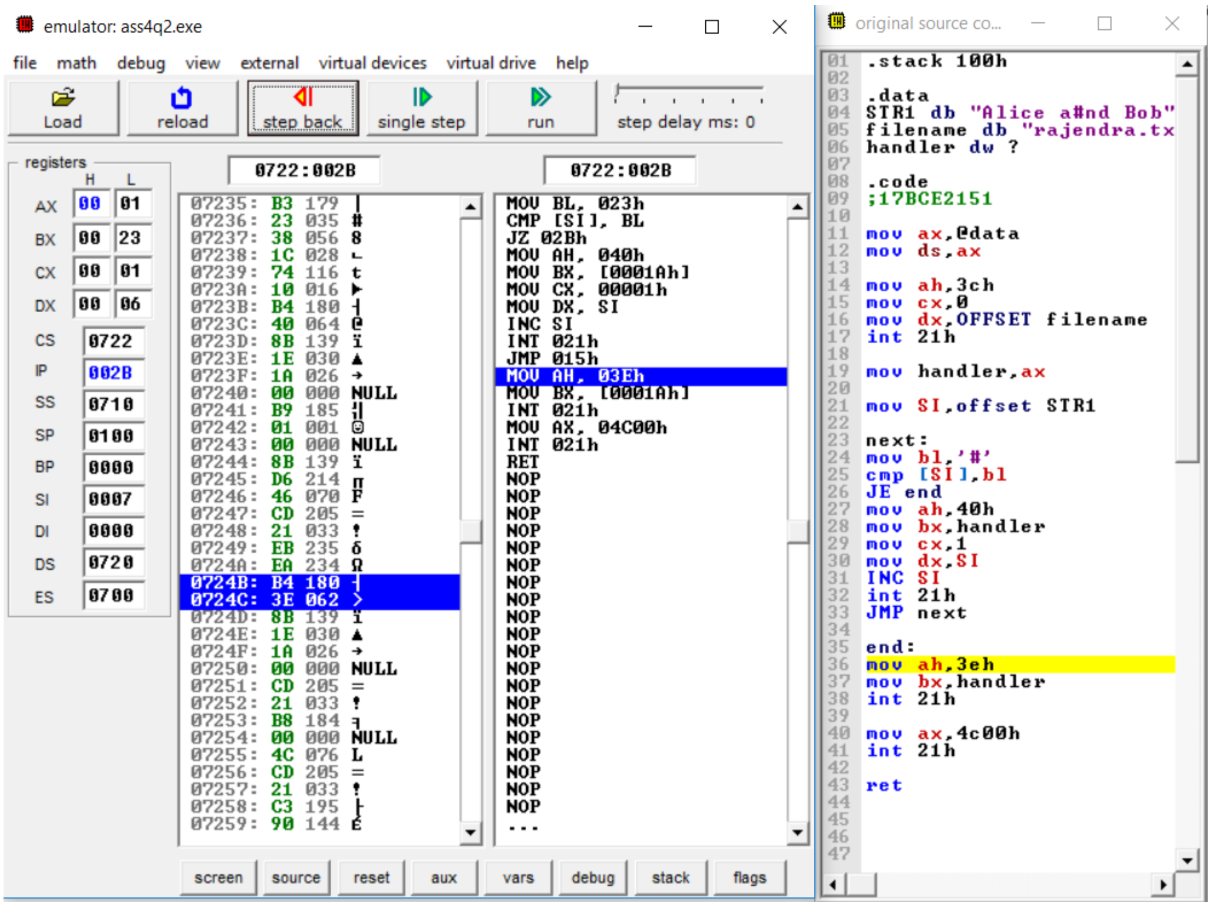
```
0722:0015

MOV BL, 023h
CMP [SI], BL
JZ 02Bh
MOV AH, 040h
MOV BX, [0001Ah]
MOV CX, 00001h
MOV DX, SI
INC SI
INT 021h
JMP 015h
MOV AH, 03Eh
MOV BX, [0001Ah]
INT 021h
MOV AX, 04C00h
INT 021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...
```

```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.tx
handler dw ?

.code
;17BCE2151

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:
mov bl,'#'
cmp [SI],bl
JE end
mov ah,40h
mov bx,handler
mov cx,1
mov dx,SI
INC SI
int 21h
JMP next

end:
mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```



```
Alice a
```

5. Now ‘#’ is under scan so the code jumps to end part.


emulator: ass4q2.exe
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
registers
screen source reset aux vars debug stack flags
original source co...

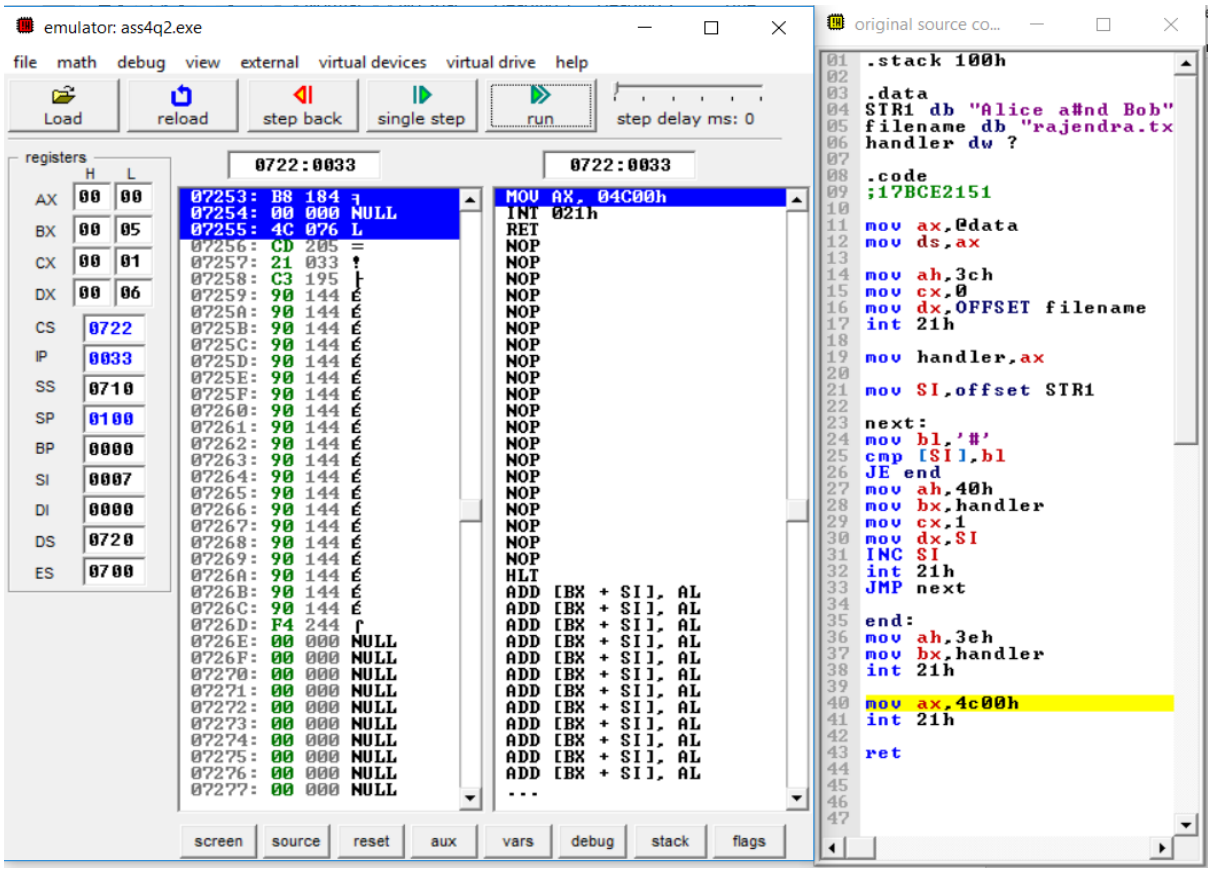
```
registers
      H   L
AX   00  01
BX   00  23
CX   00  01
DX   00  06
CS   0722
IP   002B
SS   0710
SP   0100
BP   0000
SI   0007
DI   0000
DS   0720
ES   0700
```

```
0722:002B
07235: B3 179 │
07236: 23 035 #
07237: 38 056 8
07238: 1C 028 ∟
07239: 74 116 t
0723A: 10 016 ►
0723B: B4 180 ┤
0723C: 40 064 @
0723D: 8B 139 ï
0723E: 1E 030 ▲
0723F: 1A 026 →
07240: 00 000 NULL
07241: B9 185 ╣
07242: 01 001 ☺
07243: 00 000 NULL
07244: 8B 139 ï
07245: D6 214 ╓
07246: 46 070 F
07247: CD 205 =
07248: 21 033 !
07249: EB 235 δ
0724A: EA 234 Ω
0724B: B4 180 ┤
0724C: 3E 062 >
0724D: 8B 139 ï
0724E: 1E 030 ▲
0724F: 1A 026 →
07250: 00 000 NULL
07251: CD 205 =
07252: 21 033 !
07253: B8 184 ╕
07254: 00 000 NULL
07255: 4C 076 L
07256: CD 205 =
07257: 21 033 !
07258: C3 195 ├
07259: 90 144 É
```

```
0722:002B
MOV  BL, 023h
CMP  [SI], BL
JZ 02Bh
MOV  AH, 040h
MOV  BX, [0001Ah]
MOV  CX, 00001h
MOV  DX, SI
INC  SI
INT  021h
JMP  015h
MOV  AH, 03Eh
MOV  BX, [0001Ah]
INT  021h
MOV  AX, 04C00h
INT  021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
...
```

```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.tx
handler dw ?

.code
;17BCE2151

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:
mov bl,'#'
cmp [SI],bl
JE end
mov ah,40h
mov bx,handler
mov cx,1
mov dx,SI
INC SI
int 21h
JMP next

end:
mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

6. Then the file is closed.


emulator: ass4q2.exe
file math debug view external virtual devices virtual drive help
Load
reload
step back
single step
run
step delay ms: 0
registers
screen source reset aux vars debug stack flags
original source co...

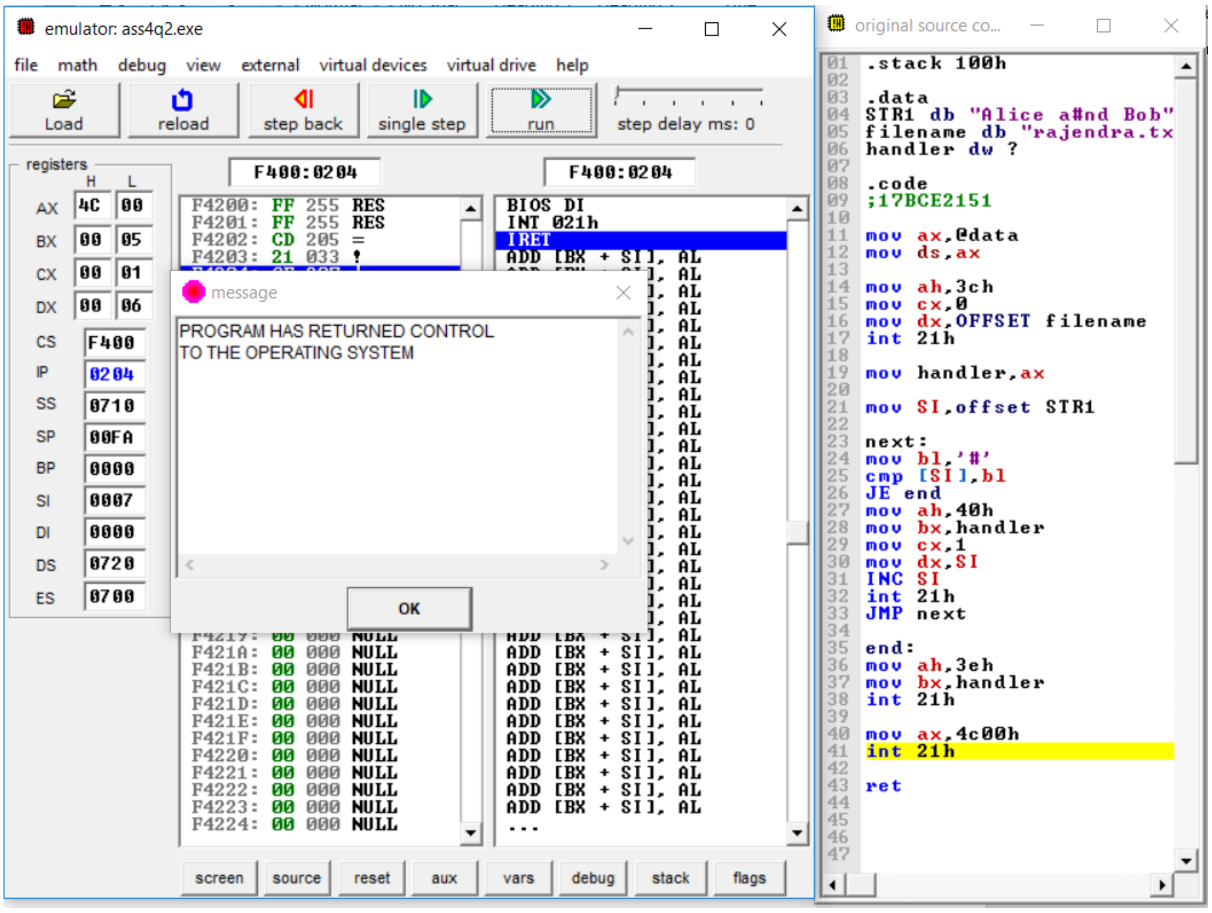
```
registers
      H   L
AX   00  00
BX   00  05
CX   00  01
DX   00  06
CS   0722
IP   0033
SS   0710
SP   0100
BP   0000
SI   0007
DI   0000
DS   0720
ES   0700
```

```
0722:0033
07253: B8 184 ╕
07254: 00 000 NULL
07255: 4C 076 L
07256: CD 205 =
07257: 21 033 !
07258: C3 195 ├
07259: 90 144 É
0725A: 90 144 É
0725B: 90 144 É
0725C: 90 144 É
0725D: 90 144 É
0725E: 90 144 É
0725F: 90 144 É
07260: 90 144 É
07261: 90 144 É
07262: 90 144 É
07263: 90 144 É
07264: 90 144 É
07265: 90 144 É
07266: 90 144 É
07267: 90 144 É
07268: 90 144 É
07269: 90 144 É
0726A: 90 144 É
0726B: 90 144 É
0726C: 90 144 É
0726D: F4 244 ⌠
0726E: 00 000 NULL
0726F: 00 000 NULL
07270: 00 000 NULL
07271: 00 000 NULL
07272: 00 000 NULL
07273: 00 000 NULL
07274: 00 000 NULL
07275: 00 000 NULL
07276: 00 000 NULL
07277: 00 000 NULL
```

```
0722:0033
MOV  AX, 04C00h
INT  021h
RET
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
HLT
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
ADD  [BX + SI], AL
...
```

```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.tx
handler dw ?

.code
;17BCE2151

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:
mov bl,'#'
cmp [SI],bl
JE end
mov ah,40h
mov bx,handler
mov cx,1
mov dx,SI
INC SI
int 21h
JMP next

end:
mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

7. Program is ended.



emulator: ass4q2.exe
file math debug view external virtual devices virtual drive help
Load reload step back single step run step delay ms: 0
screen source reset aux vars debug stack flags
original source co...

```
registers
     H   L
AX   4C  00
BX   00  05
CX   00  01
DX   00  06
CS   F400
IP   0204
SS   0710
SP   00FA
BP   0000
SI   0007
DI   0000
DS   0720
ES   0700
```

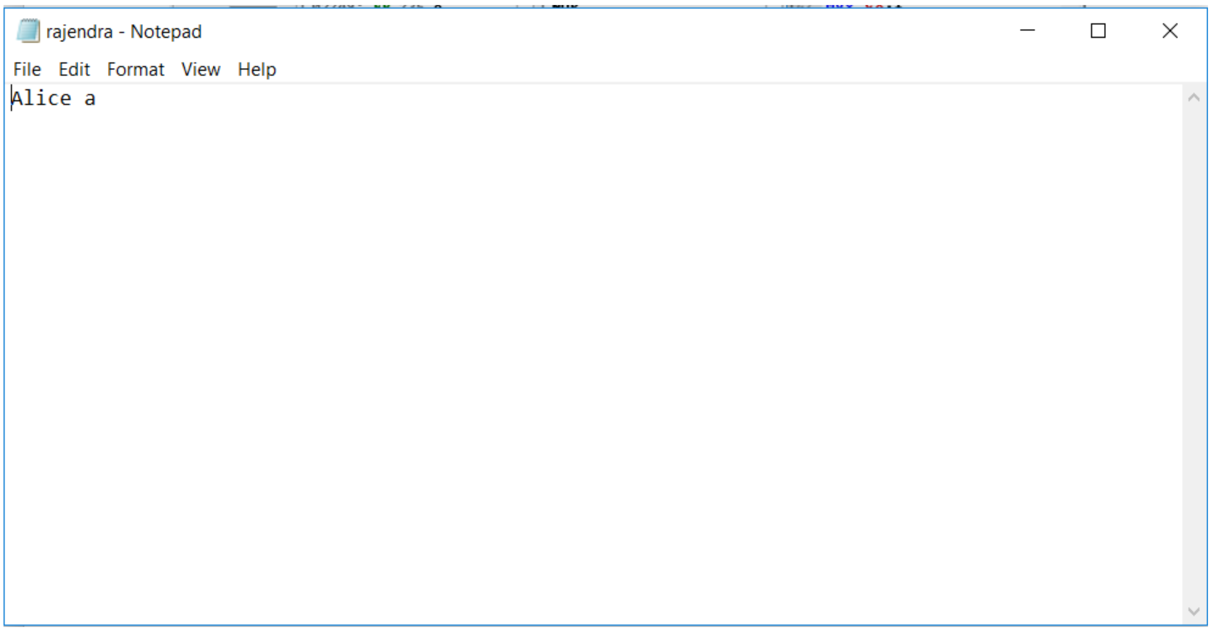
```
F400:0204
F4200:  FF 255  RES
F4201:  FF 255  RES
F4202:  CD 205  =
F4203:  21 033  !
...
F421A:  00 000  NULL
F421B:  00 000  NULL
F421C:  00 000  NULL
F421D:  00 000  NULL
F421E:  00 000  NULL
F421F:  00 000  NULL
F4220:  00 000  NULL
F4221:  00 000  NULL
F4222:  00 000  NULL
F4223:  00 000  NULL
F4224:  00 000  NULL
```

```
F400:0204
BIOS DI
INT 021h
IRET
ADD [BX + SI], AL
...
```

```
message
PROGRAM HAS RETURNED CONTROL
TO THE OPERATING SYSTEM
OK
```

```
.stack 100h

.data
STR1 db "Alice a#nd Bob"
filename db "rajendra.tx
handler dw ?

.code
;17BCE2151

mov ax,@data
mov ds,ax

mov ah,3ch
mov cx,0
mov dx,OFFSET filename
int 21h

mov handler,ax

mov SI,offset STR1

next:
mov bl,'#'
cmp [SI],bl
JE end
mov ah,40h
mov bx,handler
mov cx,1
mov dx,SI
INC SI
int 21h
JMP next

end:
mov ah,3eh
mov bx,handler
int 21h

mov ax,4c00h
int 21h

ret
```

The final Output of file is:



```
Alice a
```