LAB 05: Interrupt a Running Program

1、实验要求

1. Write the user program described below.
2. Write the keyboard interrupt service routine described below

2、代码实现

a、The user program

```
.ORIG x3000
LOOP:
LEA R0,ICS
PUTS
LEA R0,SPACE
PUTS
BRnzp DELAY
NEXT:
BRnzp LOOP
HALT
DELAY ST R1, SaveR1
LD R1, COUNT
REP ADD R1, R1, #-1
BRp REP
LD R1, SaveR1
BRnzp NEXT
HALT
COUNT .FILL x7FFF
SaveR1 .BLKW #1
ICS .STRINGZ "ICS2020"
SPACE .STRINGZ " "
.END
```

代码分析：

LOOP模块输出“ICS2020”和“ ”，执行之后跳转到DELAY模块，DELAY模块来自实验文档，主要作用是延时，使得输出速度不太快，之后再次跳转到LOOP部分继续执行。

b、The keyboard interrupt service routine

```
.ORIG x1000
AND R0,R0,#0
GETC
AND R1,R1,#0
ADD R1,R0,#0
AND R2,R2,#0
AND R3,R3,#0
```

```
LD R3,ZERO
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,ONE
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,TWO
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,THREE
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,FOUR
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,SIX
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,SEVEN
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,EIGHT
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
LD R3,NINE
NOT R3,R3
ADD R3,R3,#1
ADD R3,R3,R1
BRz YES
BRnzp NO
YES:
ADD R0,R1,#0
OUT
LEA R0,YESNOTE
PUTS
RTI
```

```
NO:
ADD R0,R1,#0
OUT
LEA R0,NONOTE
PUTS
RTI
HALT
ZERO .STRINGZ "0"
ONE .STRINGZ "1"
TWO .STRINGZ "2"
THREE .STRINGZ "3"
FOUR .STRINGZ "4"
FIVE .STRINGZ "5"
SIX .STRINGZ "6"
SEVEN .STRINGZ "7"
EIGHT .STRINGZ "8"
NINE .STRINGZ "9"
YESNOTE .STRINGZ " is a decimal digit"
NONOTE .STRINGZ " is not a decimal digit."
        ; *** End user program code here ***
        .END
```

代码分析：

主要思想是从键盘读入字符，与数字进行比较，如果与其中一个数字相同，跳转到YES模块，否则跳转到NO模块，输出相应的信息。

3、测试样例

输出结果（部分）

```
ICS2020 ICS2020 ICS2020 ICS2020 ICS2020 ICS2020 ICS2020 3 is a
decimal digitICS2020 ICS2020 ICS2020 ICS2020 ICS2020 ICS2020
ICS2020 g is not a decimal digit.ICS2020 ICS2020 ICS2020
ICS2020 ICS2020 w is not a decimal digit.ICS2020 s is not a
decimal digit.ICS2020 ICS2020 ICS2020 ICS2020 ICS2020 ICS2020
ICS2020 □
```