

Since the CALL instruction is a NEAR call, meaning that it is in the same code segment (different IP, same CS), only IP is saved on the stack. In this case, the IP address of the instruction after the call is saved on the stack as shown in Figure 2-5. That IP will be 0206, which belongs to the "MOV AX,142F" instruction.

The last instruction of the called subroutine must be a RET instruction which directs the CPU to POP the top 2 bytes of the stack into the IP and resume executing at offset address 0206. For this reason, the number of PUSH and POP instructions (which alter the SP) must match. In other words, for every PUSH there must be a POP.

```
12B0:0300 53 PUSH BX
12B0:0301 ... ..
.....
12B0:0309 5B POP BX
12B0:030A C3 RET
```

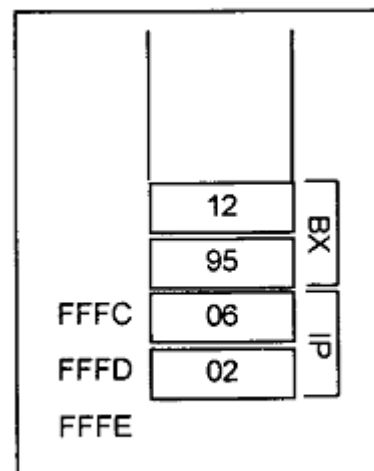


Figure 2-5. IP in the Stack

2.2 Assembly language subroutines

In Assembly language programming it is common to have one main program and many subroutines to be called from the main program. This allows you to make each subroutine into a separate module. Each module can be tested separately and then brought together, as will be shown next chapters. The main program is the entry point from DOS and is FAR, as explained earlier, but the subroutines called within the main program can be FAR or NEAR.

Remember that NEAR routines are in the same code segment, while FAR routines are outside the current code segment. If there is no specific mention of FAR after the directive PROC, it defaults to NEAR, as shown in Figure 2-6. From now on, all code segments will be written in that format.

Rules for names in Assembly language

By choosing label names that are meaningful, a programmer can make a program much easier to read and maintain. There are several rules that names must follow. **First**, each label name must be unique. The names used for labels in Assembly

language programming consist of alphabetic letters in both upper and lower case, the digits 0 through 9, and the special characters question mark (?), period (.), at (@), underline (_), and dollar sign (\$). The first character of the name must be an alphabetic character or special character. It cannot be a digit. The period can only be used as the first character, but this is not recommended since later versions of MASM have several reserved words that begin with a period. Names may be up to 31 characters long.

```

MAIN      .CODE
          PROC FAR           ;THIS IS THE ENTRY POINT FOR DOS
          MOV AX,@DATA
          MOV DS,AX
          CALL SUBR1
          CALL SUBR2
          CALL SUBR3
          MOV AH,4CH
          INT 21H
MAIN      ENDP
;
SUBR1     PROC
          ...
          RET
SUBR1     ENDP
;
SUBR2     PROC
          ...
          RET
SUBR2     ENDP
;
SUBR3     PROC
          ...
          RET
SUBR3     ENDP
;
          END MAIN          ;THIS IS THE EXIT POINT

```

Figure 2-6. Shell of Assembly Language Subroutines