EDMK D1(L1,B1),D2(B2)

Edit and Mark

SS_1

Op Code	LL_1	B_1D_1	D_1D_1	B_2D_2	D_2D_2

Packed decimal fields can be converted to a character format using the **EDMK** instruction. Additionally, editing symbols and features like commas, decimal points, and leading zero suppression can be included in the character version of the packed decimal field that is being edited. EDMK is equivalent to the ED instruction but offers additional functionality which will be covered later in this discussion.

The first step in editing a packed decimal field is to create an "edit word" which is a pattern of what the character output of the edit process should look like. Typically, the edit word is moved to a field in the output buffer which is being built, prior to printing. Then the packed decimal field is "edited" into the output field, destroying the copy of the edit word.

First, we consider how to construct an appropriate edit word for a given packed decimal field. This can be accomplished by defining a string of hexadecimal bytes that represents the edit word. Each byte in the edit word corresponds to a byte in the edited character representation. In creating the edit word there are a collection of standard symbols which are used to describe each byte:

X'40'	This symbol, which represents a space, is usually coded as the first byte of the edit word where it acts as a "fill character". The fill character is used to replace leading zeroes which are not "significant".
X'20'	Called a "digit selector", this byte represents a position in which a significant digit from the packed field should be placed.
X'21'	This hexadecimal byte represents a digit selector and a significance starter. Significance starts when the first non-zero digit is selected. Alternatively, we can force significance to start by coding a single x'21' in the edit word. In this case, significance starts in the byte **following** the x'21'. Significance is important because every significant digit is printed, even if it is a leading zero.
X'6B'	This is the EBCDIC code for a comma.
X'4B'	This is the EBCDIC code for a decimal point.
X'60'	This is the EBCDIC code for a minus sign. This symbol is sometimes coded on the end of an edit word when editing signed fields. The x'60' byte will be replaced with the fill character if the number being edited is positive. If the number is in fact negative, the x'60' will not be "filled", and the negative sign will appear in the edited output.
X'C4C2'	The EBCDIC version of "DB" (Debit). This functions like the x'60'. Coding these symbols at the end of an edit word causes "DB" to appear in the output if the field being edited is negative, otherewise the "DB" is "filled".

X'C3D9'	The EBCDIC version of "CR" (Credit). This functions like the Debit symbol above. When the number being edited is negative, the "CR" symbol will appear in the edited output, otherwise it will be "filled".
X'5C'	The EBCDIC symbol for an asterisk. This character is sometimes used as a fill character when editing dollar amounts on checks.

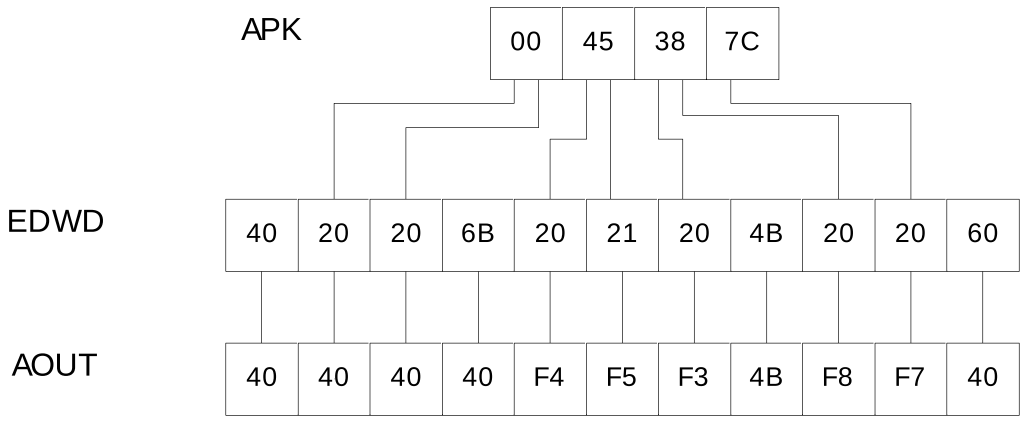
We now consider a sample edit word and the output it would create for several packed fields.

```
EDWD     DC     X'4020206B2021204B202060'
AOUT     DC     CL11
APK      DC     PL4'45387'
```

Assume we execute the instructions below,

```
MVC      AOUT,EDWD
EDMK     AOUT,APK
```

First, the edit word is moved to a field in the output buffer. Then the packed field is "edited" into the output field. The results are illustrated in the diagram below.



The diagram indicates the results of the edit process: The fill character (x'40') is unaffected, and is left in its position. The first decimal digit, 0, is "selected" by the first x'20', and since leading 0's are not significant, the x'20' is replaced by the fill character. The second digit, 0, is also selected, and it too, is filled with a x'40'. Since significance has not started, the x'6B' is filled with x'40'. The first non-zero digit, 4, is selected and this signals that significance has started. (Any non-zero digit which is selected turns on the significance indicator.) Each digit after the 4 will appear in the edited result. The "4" is replaced with its character equivalent - x'F4'. At this point, the address of AOUT+4 (the position occupied by the first significant digit x'F4', is copied into register 1. (The **ED** instruction would **not** initialize register 1.) Afterward, the "5" is selected and its x'20' is replaced with x'F5'. The "3" is selected and is represented as x'F3'. The x'4B', a decimal point, remains unaffected. The "8" is selected and is represented as x'F8'. The "7" is selected and is represented as x'F7'. Since the number being edited is positive, the x'60' is filled with x'40'. The final result would print as "   453.87 ".

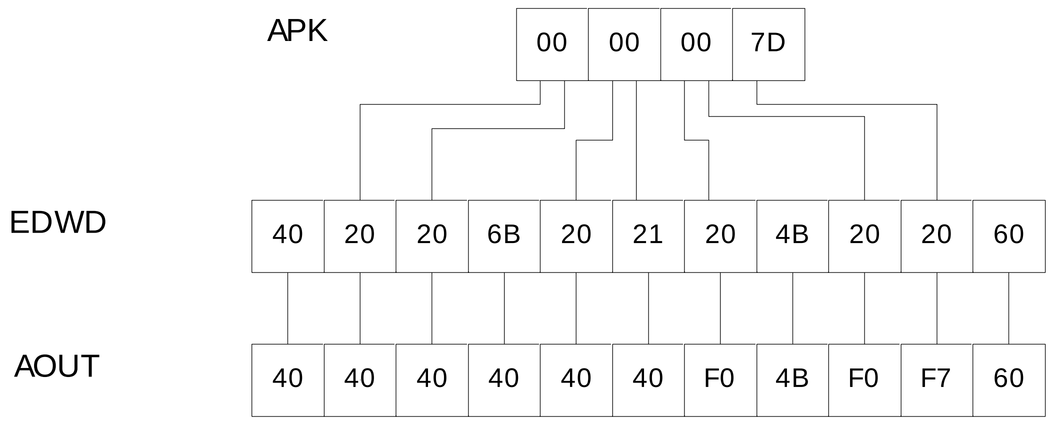
Consider a second edit which uses the same edit word as in the previous example, but with a different value for APK.

```
EDWD     DC     X'4020206B2021204B202060'
AOUT     DC     CL11
```

```
                APK       DC     PL4'-7'
```

Again we execute the same sequence of instructions.

```
                MVC       AOUT,EDWD
                EDMK      AOUT,APK
```



As in every edit, the x'40' fill character is unaffected by the edit process. The first and second digits, both 0, are selected, and since they are leading 0's and significance has not started, they are filled with x'40'. The x'6B' is also filled with x'40' since significance has not started. The next two digits, both 0, are selected and filled. Since the x'21' selected a leading 0, the significance indicator is turned on - significance starts with the **next** digit. This means that all other digits will appear in a character representation, even if they are leading 0's. All other editing symbols will be printed as well. Unlike the previous example, register 1 is not initialized because a significant digit was never encountered while the significance indicator was off. The fifth digit, 0, is selected and represented as x'F0'. The x'4B' is preserved. The next two digits, 0 and 7, are selected and represented as x'F0' and x'F7'. Finally, since the APK contains a negative number, the x'60' is preserved. The final result would print as "   0.07-".

It is important to understand that **ED** and **EDMK** are equivalent instructions except that under certain conditions, **EDMK** will change the contents of register 1. To be precise, EDMK sets register 1 to the address of the first non-zero digit in the target field if the corresponding significant digit in the source field was encountered while the significance indicator was off. Otherwise, register 1 is unaffected. This gives rise to the common practice of initializing register 1 with the address of the byte following the significance starter (x'21') in the target field prior to issuing the **EDMK** instruction. By doing this, the programmer can be assured that register 1 is pointing at the first significant digit in the target, regardless of the manner in which significance was started. Consider the example below.

```
                 MVC  XOUT,EDWD    SET UP EDIT WORD
                 LA   R1,XOUT+4    POINT AT SIG.STARTER+1
                 EDMK XOUT,XPK     EDIT THE DATA
                 ...
         XOUT    DS   CL7
         EDWD    DC   X'402020214B2020'
         XPK     DS   PL3
```

Suppose XPK contains x'00000C'. After editing, XOUT contains "   .00", and register 1 contains the address of the decimal point. In this case the significance was turned on by the significance starter.

On the other hand, suppose XPK contains x’05643C’. After editing, XOUT contains “ 56.43”, and register 1 contains the address of the “5” XOUT. In this case significance was started because a non-zero digit was selected while significance was off. In both of the previous cases, register 1 contains the address of the first significant digit. The address in register 1 could be used to insert an edititing character in front of the first significant digit:

```
                         MVI   0(R1),C’$’    FLOAT A DOLLAR SIGN
```

Examples

Some Unrelated EDMK’s:

```
APK       DC    PL2’123’   X‘123C’
AOUT      DS    CL4
AEDWD     DC    X’40202120’
                ...              Result:
          MVC   AOUT,AEDWD
          LA    R1,AOUT+3
          ED    AOUT,APK        AOUT = X’40F1F2F3’ - ‘ 123’
                                REGISTER 1 CONTAINS ADDRESS OF AOUT+1
BPK       DC    PL2’0’   X‘000C’
BOUT      DS    CL4
BEDWD     DC    X’40202120’
                ...              Result:
          MVC   BOUT,BEDWD
          LA    R1,BOUT+3
          ED    BOUT,BPK        BOUT = X’404040F0’ - ‘    ’
                                REGISTER 1 CONTAINS ADDRESS OF BOUT+3
CPK       DC    PL2’0’   X‘000C’
COUT      DS    CL4
CEDWD     DC    X’40212020’
                ...              Result:
          MVC   COUT,CEDWD
          LA    R1,COUT+2
          ED    COUT,CPK        COUT = X’404040F0’ - ‘  00’
                                REGISTER 1 CONTAINS ADDRESS OF COUT+3

DPK       DC    PL2’0’   X‘000C’
DOUT      DS    CL4
DEDWD     DC    X’5C202120’   ASTERISK IS USED AS A FILL CHARACTER


                ...              Result:
          MVC   DOUT,DEDWD
          LA    R1,DOUT+3
          ED    DOUT,DPK        DOUT = X’5C5C5CF0’ - ‘***0’
                                REGISTER 1 CONTAINS ADDRESS OF DOUT+3

EPK       DC    PL2’-300’   X’300D’  NEGATIVE NUMBER
EOUT      DS    CL5
EEDWD     DC    X’4020212060’
                ...              Result:
          MVC   EOUT,EEDWD
          LA    R1,EOUT+3
          ED    EOUT,EPK        EOUT = X’4040F3F0’ - ‘ 300-’
                                REGISTER 1 CONTAINS ADDRESS OF EOUT+1
```

Tips

1. There are two errors that beginners make when using **EDMK** :

   1) The number of x’20’s and x’21’s does not match the number of decimal digits in the field being edited. This is a critical error. If the packed field has length “n”, the number of x’20’s and x’21’s is 2n - 1. For example, if you are editing a packed field of length 6, the edit word must contain exactly 11 x’20’s and x’21’s. A bad edit word will produce unpredictable output.

   2) The output field size does not match the edit word size. For example, suppose you coded the following,

```
AEDWD      DC   X’402020202120’
AOUT       DS   CL5
```

   When the edit word is moved to AOUT, the last byte of the edit word is not moved since the edit word is 6 bytes and the target field is 5 bytes. The effect is that we are using an incorrect edit word, even though the definition of the edit word was correct.

2) When editing, start with the packed field and design an edit word that matches it. Then define the output field to match the edit word. For example, if we start with a packed field of length 3 (5 decimal digits), we could design x’402021204B2020’ as an appropriate edit word (5 x’20’s and x’21’s). Since the edit word is 7 bytes long, we would design a 7 byte output field to hold the edit word.

```
XPK        DS      PL3
XEDWD      DC      X’402021204B2020’
XOUT       DS      CL7
           ...
           MVC     XOUT,XEDWD
           LA      R1,XOUT+3
           EDMK    XOUT,XPK
```

3) Be sure to initialize R1 before issuing the **EDMK** instruction. R1 should contain the address of the byte following the significance starter (x’21’).