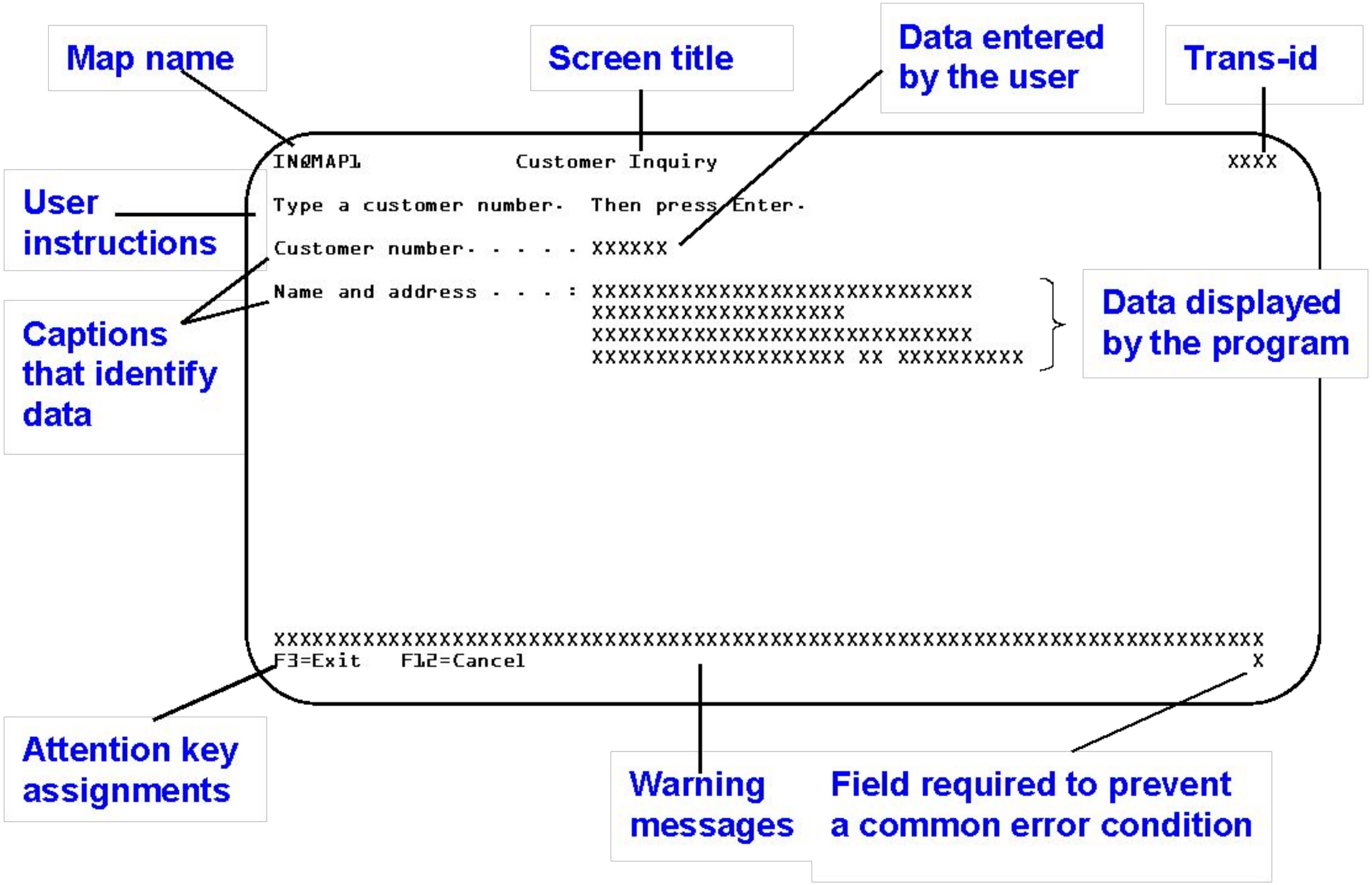
Chapter 4

How to create a BMS mapset

Objectives

1. Describe the function of attribute bytes in a 3270 display.
2. List the three attributes controlled by standard attribute bytes.
3. Explain why two attribute bytes are required for an unprotected field.
4. Explain the function of the Modified Data Tag.
5. List the three extended highlighting attributes.
6. List the three BMS macros and identify the function of each.
7. Describe the function of the fields generated in the symbolic map for each named map field.
8. Explain when it is appropriate to use a programmer-generated symbolic map.
9. Given a sample screen layout, code the BMS mapset for it.

The screen layout for the customer inquiry program



```
IN0MAP1            Customer Inquiry                                         XXXX

Type a customer number.  Then press Enter.

Customer number. . . . . XXXXXX

Name and address . . . : XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                         XXXXXXXXXXXXXXXXXXXX
                         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                         XXXXXXXXXXXXXXXXXXXX XX XXXXXXXXXX









XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
F3=Exit   F12=Cancel                                                          X
```

Map name

Screen title

Data entered by the user

Trans-id

User instructions

Captions that identify data

Data displayed by the program

Attention key assignments

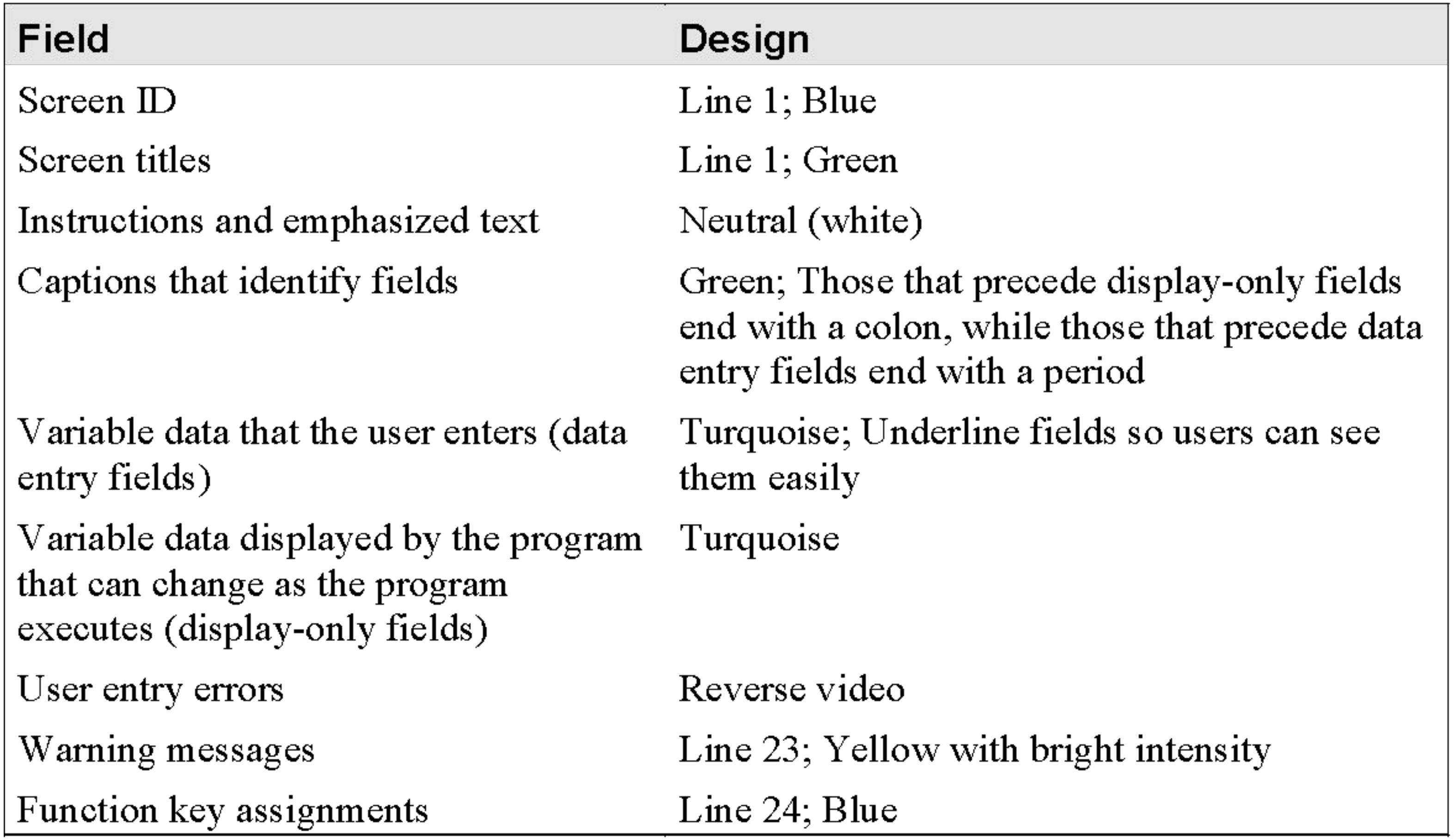
Warning messages

Field required to prevent a common error condition

Typical fields on a display screen

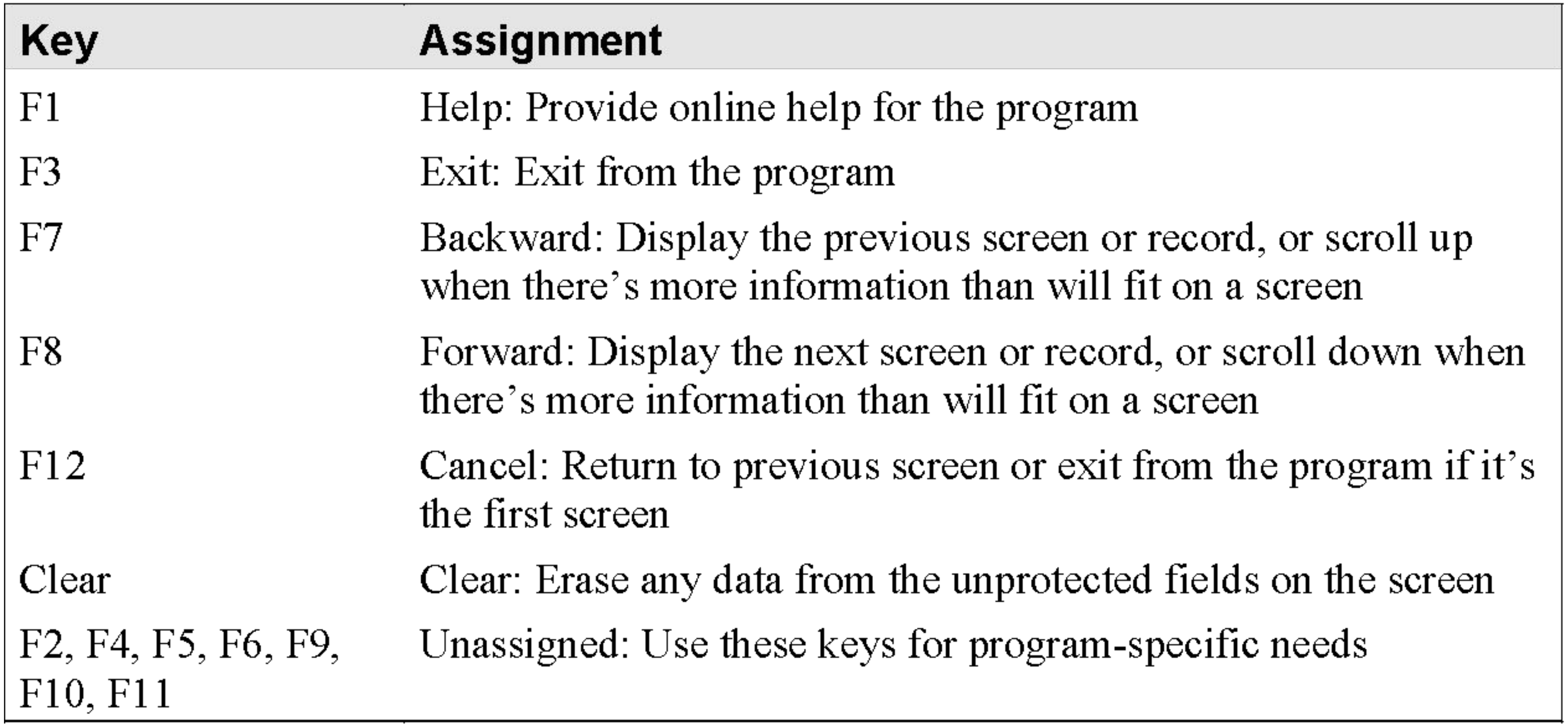
- In a CICS program, the display screen is divided into user-defined *fields.*
- Each screen field is a specified area that contains a particular category of information.
- *Display-only fields* are used to display messages, captions, and data that can't be changed by the user.
- *Data entry fields* allow the user to enter data into the screen.
- Each screen should end with a single-byte field that ensures that at least one byte of data is sent to the program when the user presses an attention key.

Guidelines for the color and position of screen fields



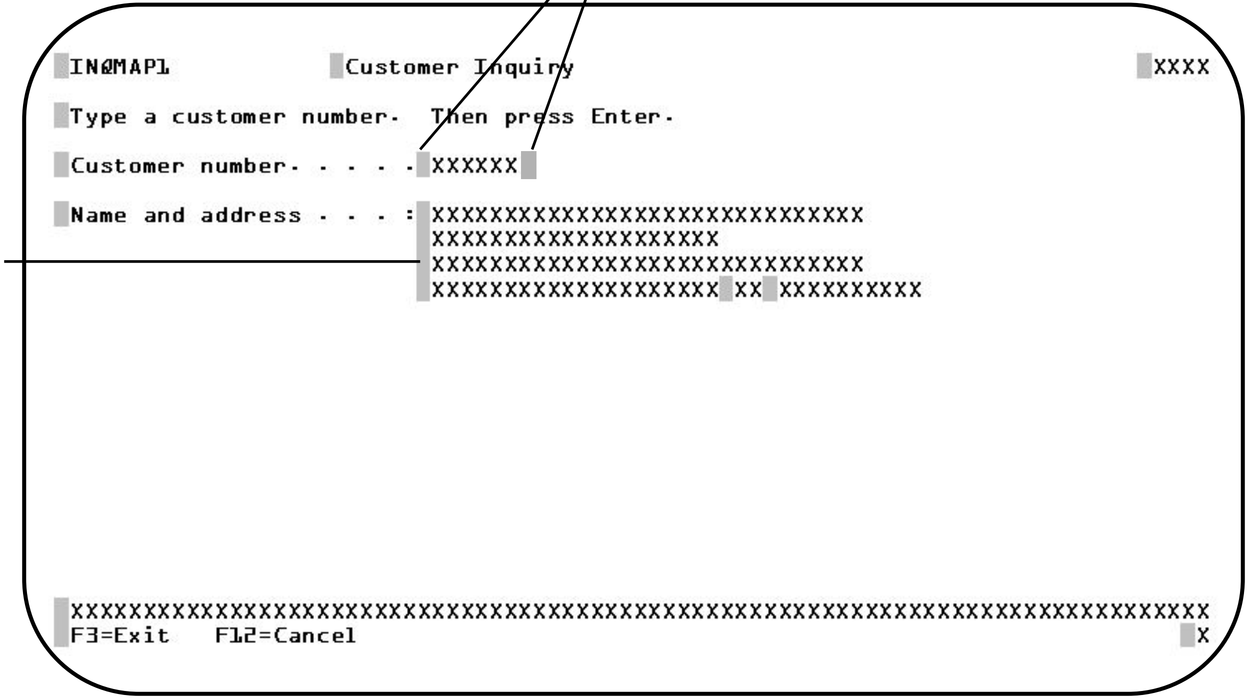
Field	Design
Screen ID	Line 1; Blue
Screen titles	Line 1; Green
Instructions and emphasized text	Neutral (white)
Captions that identify fields	Green; Those that precede display-only fields end with a colon, while those that precede data entry fields end with a period
Variable data that the user enters (data entry fields)	Turquoise; Underline fields so users can see them easily
Variable data displayed by the program that can change as the program executes (display-only fields)	Turquoise
User entry errors	Reverse video
Warning messages	Line 23; Yellow with bright intensity
Function key assignments	Line 24; Blue

Guidelines for function key assignments



Key	Assignment
F1	Help: Provide online help for the program
F3	Exit: Exit from the program
F7	Backward: Display the previous screen or record, or scroll up when there’s more information than will fit on a screen
F8	Forward: Display the next screen or record, or scroll down when there’s more information than will fit on a screen
F12	Cancel: Return to previous screen or exit from the program if it’s the first screen
Clear	Clear: Erase any data from the unprotected fields on the screen
F2, F4, F5, F6, F9, F10, F11	Unassigned: Use these keys for program-specific needs

The attribute bytes on a screen



```
 INQMAP1            Customer Inquiry                                        XXXX

 Type a customer number.  Then press Enter.

 Customer number. . . . . XXXXXX

 Name and address . . . : XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                          XXXXXXXXXXXXXXXXXXXX
                          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                          XXXXXXXXXXXXXXXXXXXX XX XXXXXXXXXX







 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 F3=Exit   F12=Cancel                                                          X
```

Attribute bytes mark the beginning and end of a data entry field

An attribute byte marks the beginning of a display-only field

Field attributes

- The location and characteristics of screen fields are determined by special characters called *attribute bytes*. An attribute byte takes up one position on the screen, but it's displayed as a space.
- A field starts immediately following its attribute byte and ends immediately before the next field's attribute byte.
- A data entry field requires two attribute bytes: one to mark the beginning of the field, and the other to mark the end.

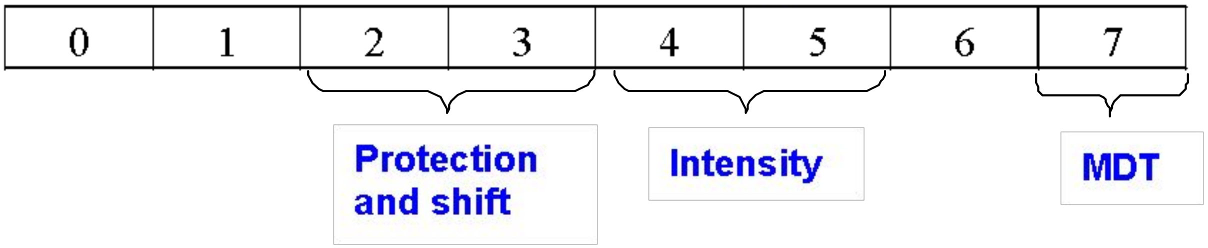
Standard field attributes

Protection	Shift	Intensity
Unprotected	Alphanumeric	Normal
Protected	Numeric	Bright
Auto-skip		Dark (No-display)

Description

- Users can key data into an *unprotected field*, but not into a *protected field*.
- A *skip field* is skipped over and causes the cursor to automatically advance to the next unprotected field.
- The numeric option turns on the numeric lock feature (Num Lock) on the terminal.
- A dark, or no-display, field displays only spaces, no matter what characters the field contains.

The bit positions in an attribute byte



0	1	2	3	4	5	6	7

Protection and shift

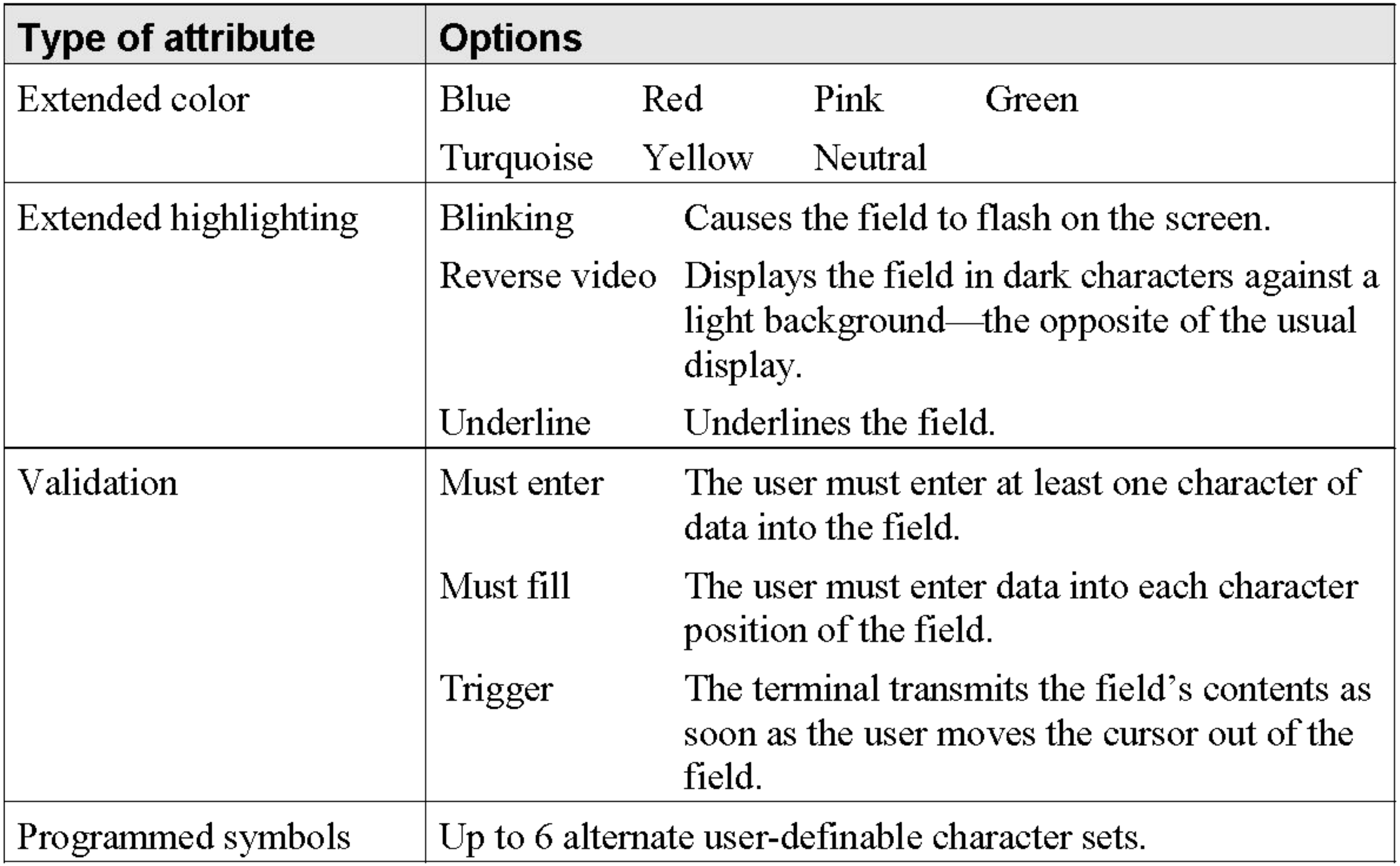
Intensity

MDT

The contents of an attribute byte

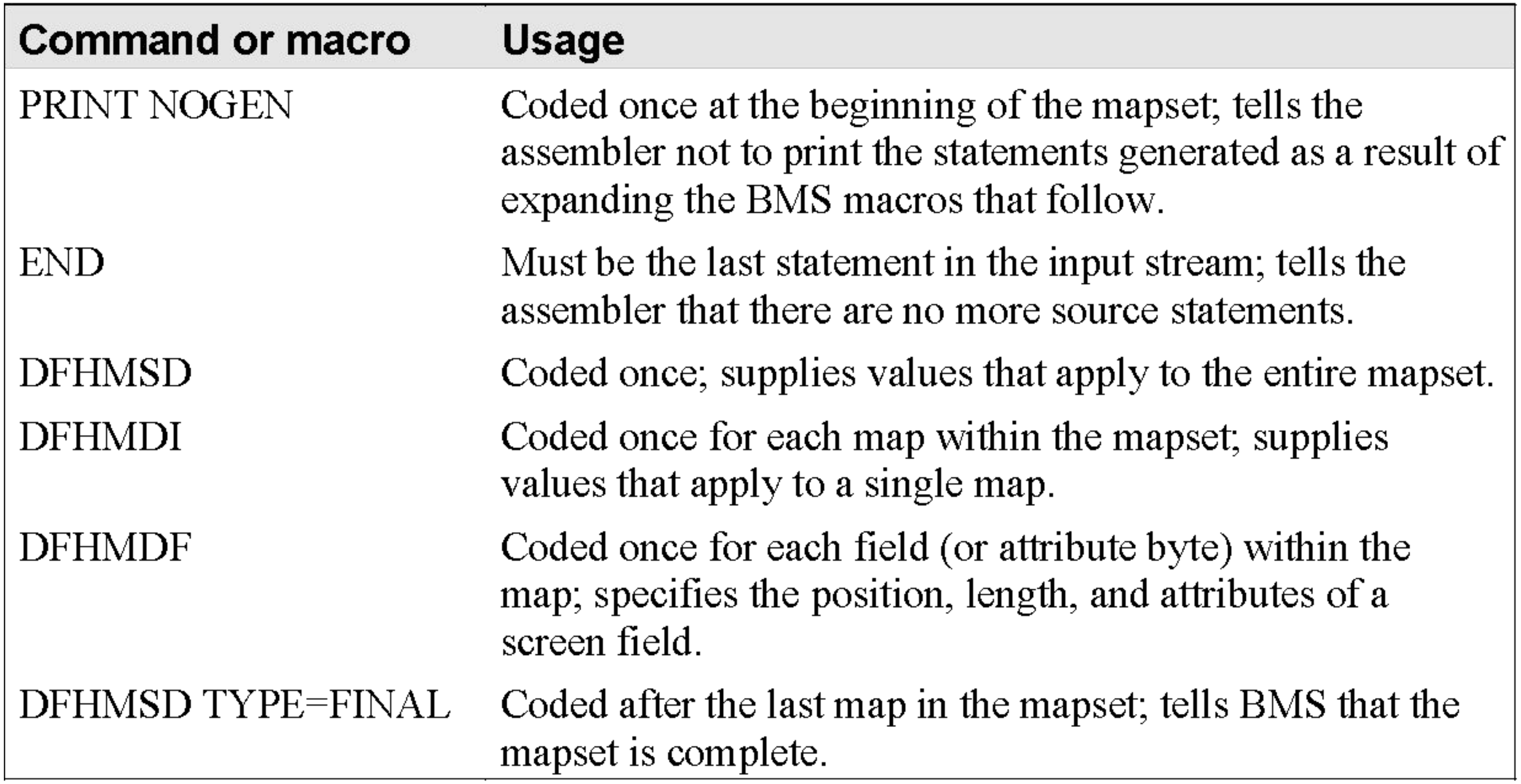
Bit positions	Functions	Bit settings
0-1		Depends on the contents of bits 2-7
2-3	Protection and shift	00 = Unprotected alphanumeric 01 = Unprotected numeric 10 = Protected 11 = Protected skip
4-5	Intensity	00 = Normal 01 = Normal 10 = Bright 11 = Dark (No-display)
6		Must be 0
7	MDT	0 = Field has not been modified 1 = Field has been modified

Extended attributes



Type of attribute	Options	
Extended color	Blue Turquoise	Red Yellow
	Pink Neutral	Green
Extended highlighting	Blinking	Causes the field to flash on the screen.
	Reverse video	Displays the field in dark characters against a light background—the opposite of the usual display.
	Underline	Underlines the field.
Validation	Must enter	The user must enter at least one character of data into the field.
	Must fill	The user must enter data into each character position of the field.
	Trigger	The terminal transmits the field’s contents as soon as the user moves the cursor out of the field.
Programmed symbols	Up to 6 alternate user-definable character sets.	

The assembler commands and macros used in BMS mapsets



Command or macro	Usage
PRINT NOGEN	Coded once at the beginning of the mapset; tells the assembler not to print the statements generated as a result of expanding the BMS macros that follow.
END	Must be the last statement in the input stream; tells the assembler that there are no more source statements.
DFHMSD	Coded once; supplies values that apply to the entire mapset.
DFHMDI	Coded once for each map within the mapset; supplies values that apply to a single map.
DFHMDF	Coded once for each field (or attribute byte) within the map; specifies the position, length, and attributes of a screen field.
DFHMSD TYPE=FINAL	Coded after the last map in the mapset; tells BMS that the mapset is complete.

The general syntax of an assembler language statement

```
label    op-code parameters...
```

A DFHMDF macro that defines a data entry field

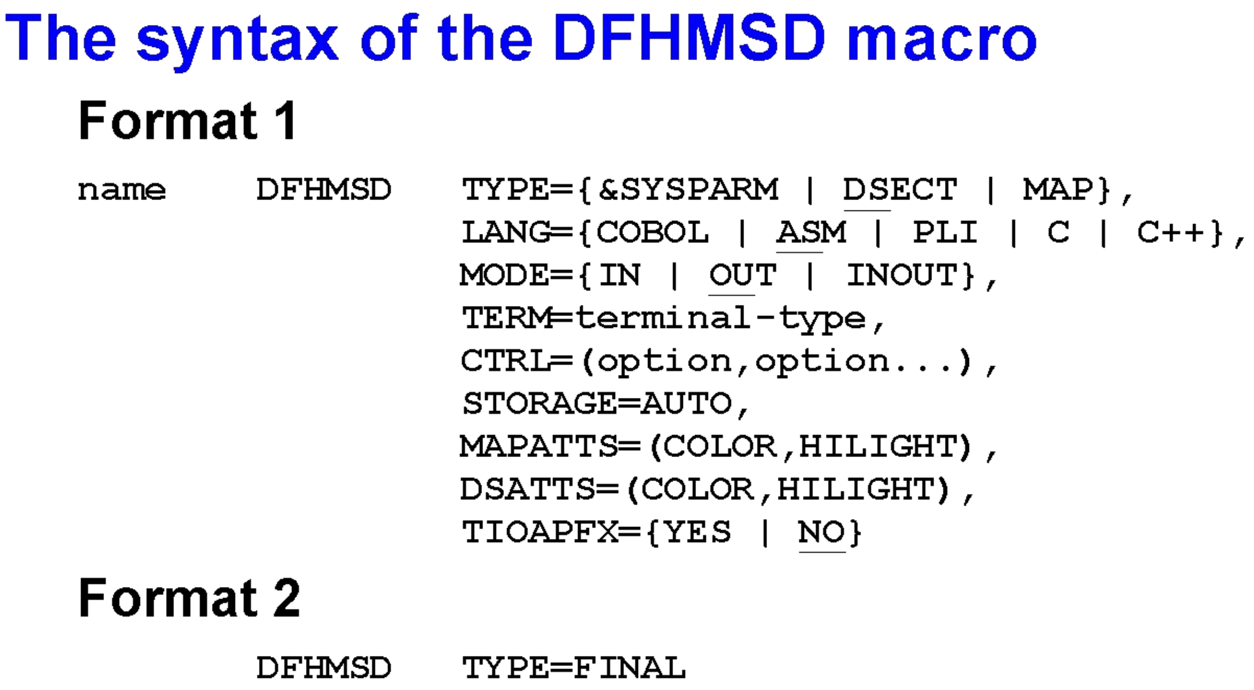
```
CUSTNO   DFHMDF POS=(5,26),                                            X
               LENGTH=6,                                               X
               ATTRB=(NORM,UNPROT,IC),                                 X
               COLOR=TURQUOISE,                                        X
               INITIAL='______'
```

Description

- The *label* begins in column 1 and supplies a symbolic name for the statement.
- The *op-code* specifies the instruction to be executed and begins in column 10.
- The *parameters* (or *operands*) provide the information the instruction requires to work properly. The first parameter should follow the op-code after one space.

How to code assembler language statements

- The parameters are separated from one another by commas with no intervening spaces and can be coded in any order.
- To specify a parameter’s value, use an equals sign. If more than one value is required, separate the values with commas and enclose them in parentheses.
- If a value contains special characters or spaces, enclose it in single quotes.
- To include an apostrophe in a value, code two consecutive apostrophes where you want the single apostrophe to appear.
- To continue a statement on the next line, code a comma after the parameter, place any non-blank character in column 72, and code the next parameter starting in column 16 of the following line.
- Any line with an asterisk in column 1 and a blank in column 72 is treated as a *comment line*.



The syntax of the DFHMSD macro

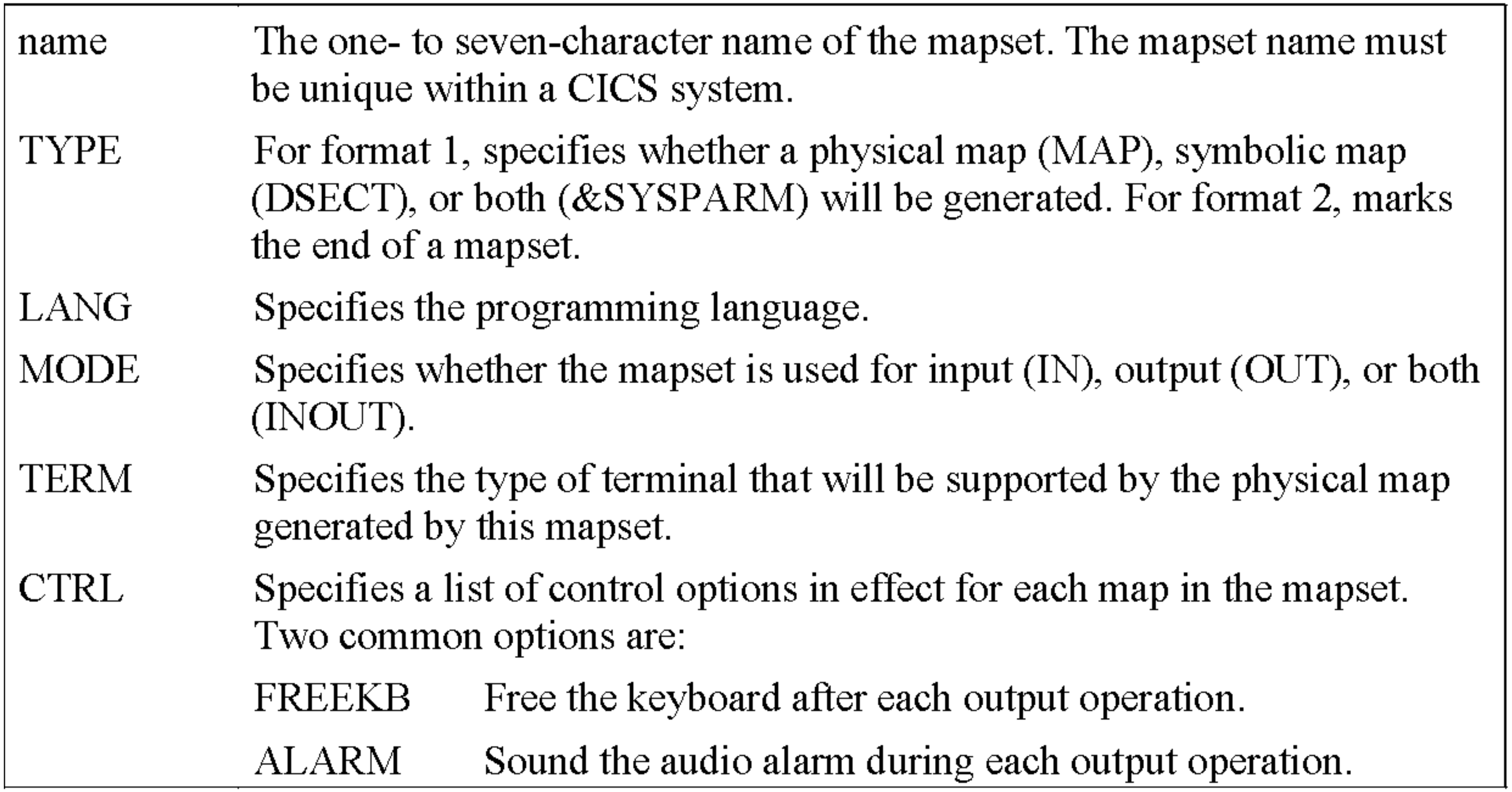
Format 1

```
name     DFHMSD   TYPE={&SYSPARM | DSECT | MAP},
                  LANG={COBOL | ASM | PLI | C | C++},
                  MODE={IN | OUT | INOUT},
                  TERM=terminal-type,
                  CTRL=(option,option...),
                  STORAGE=AUTO,
                  MAPATTS=(COLOR,HILIGHT),
                  DSATTS=(COLOR,HILIGHT),
                  TIOAPFX={YES | NO}
```

Format 2

```
         DFHMSD   TYPE=FINAL
```

Explanation of the DFHMSD macro

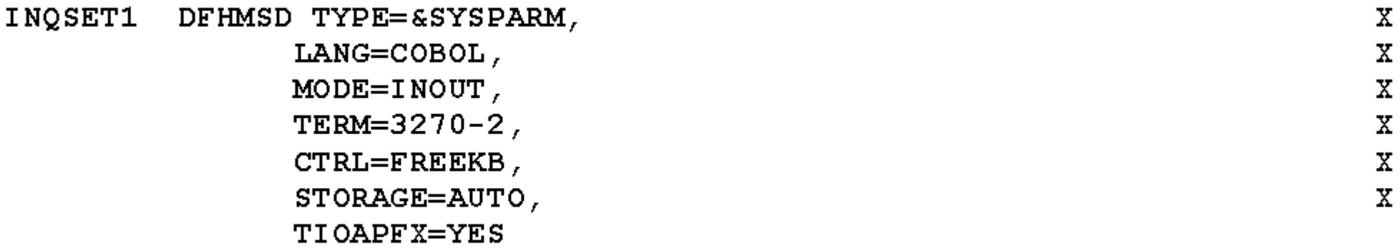


name	The one- to seven-character name of the mapset. The mapset name must be unique within a CICS system.
TYPE	For format 1, specifies whether a physical map (MAP), symbolic map (DSECT), or both (&SYSPARM) will be generated. For format 2, marks the end of a mapset.
LANG	Specifies the programming language.
MODE	Specifies whether the mapset is used for input (IN), output (OUT), or both (INOUT).
TERM	Specifies the type of terminal that will be supported by the physical map generated by this mapset.
CTRL	Specifies a list of control options in effect for each map in the mapset. Two common options are: FREEKB Free the keyboard after each output operation. ALARM Sound the audio alarm during each output operation.

Explanation of the DFHMSD macro (continued)

STORAGE	If STORAGE=AUTO is coded, the symbolic maps for the maps in the mapset will occupy separate storage locations. Otherwise, they'll occupy the same storage location.
MAPATTS	Specifies which extended attributes should be supported by the physical map.
DSATTS	Specifies which extended attributes should be supported by the symbolic map.
TIOAPFX	YES generates a 12-byte FILLER item at the beginning of the symbolic map that the system uses to maintain control information.

The starting DFHMSD macro in the BMS mapset for the inquiry program



```
INQSET1  DFHMSD TYPE=&SYSPARM,                                         X
               LANG=COBOL,                                             X
               MODE=INOUT,                                             X
               TERM=3270-2,                                            X
               CTRL=FREEKB,                                            X
               STORAGE=AUTO,                                           X
               TIOAPFX=YES
```

Description

- When you specify LANG=COBOL, the symbolic map will be an 01-level group item that can be copied into a COBOL program.
- If the CTRL options don't apply to all the maps in the mapset, you can code them on the DFHMSD macro.
- You should always code the FREEKB option of the CTRL parameter so the keyboard is unlocked when a map is sent to the terminal.

The syntax of the DFHMDI macro

```
name     DFHMDI   SIZE=(lines,columns),
                  LINE=line-number,
                  COLUMN=column-number,
                  CTRL=(option,option...)
```

Explanation

name	The one- to seven-character name of the map. Each map within a mapset must have a unique name.
SIZE	Specifies the size of the map in lines and columns.
LINE	Specifies the line number on the screen where the map starts.
COLUMN	Specifies the column number on the screen where the map starts.
CTRL	Specifies a list of control options in effect for the map. Two common options are: FREEKB Free the keyboard after each output operation. ALARM Sound the audio alarm during each output operation.

The DFHMDI macro in the BMS mapset for the inquiry program

```
INQMAP1  DFHMDI SIZE=(24,80),                                          X
               LINE=1,                                                 X
               COLUMN=1
```

Description

- You use the DFHMDI macro to define a map within a mapset.
- The label on the DFHMDI macro is the name you'll use to refer to the map in your COBOL code.
- If you don't code the CTRL parameter on the DFHMSD macro for the entire mapset, you can code it on the DFHMDI macro for an individual map.

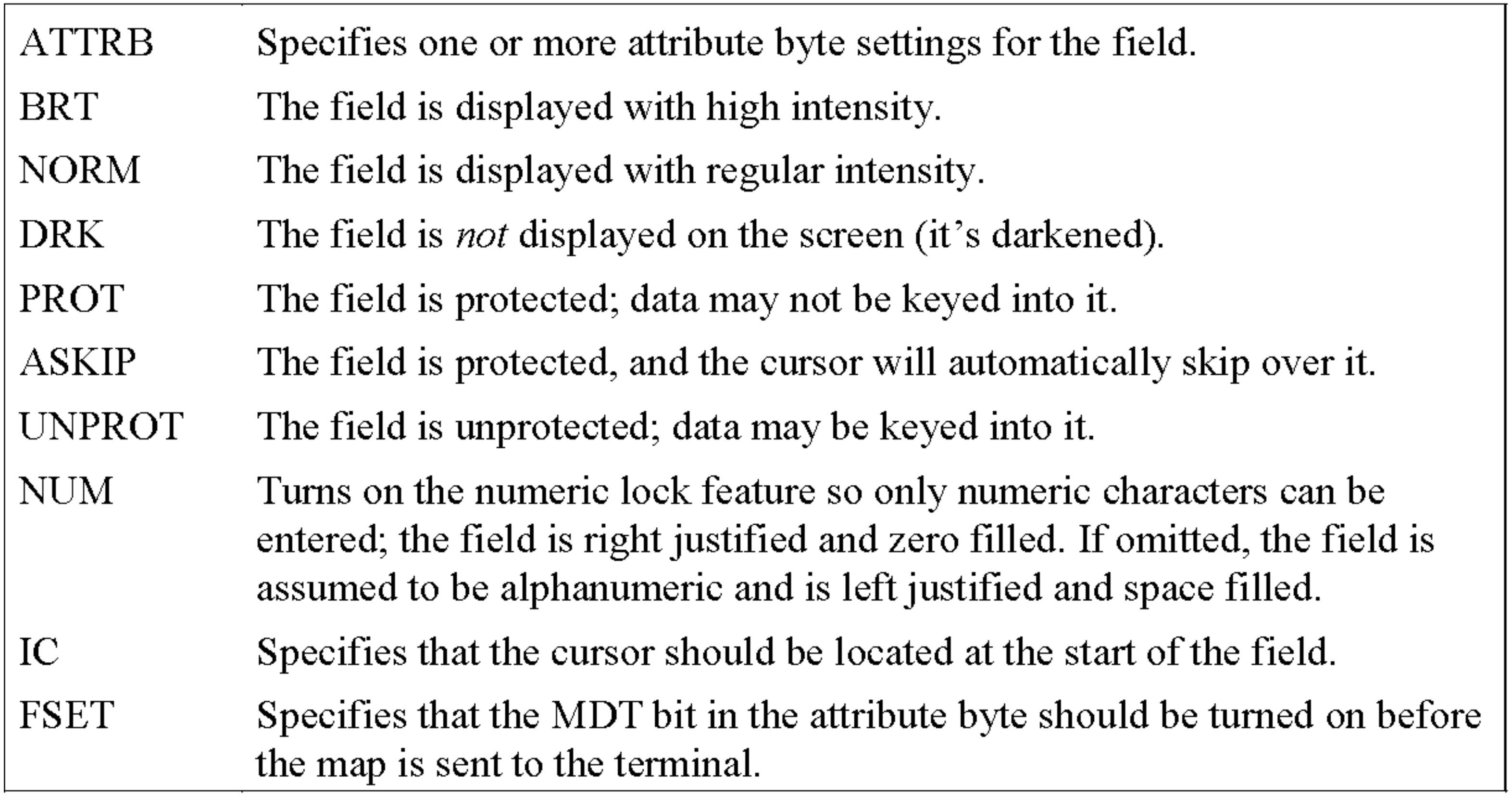
The syntax of the DFHMDF macro

```
name     DFHMDF    POS=(line,column),
                   LENGTH=field-length,
                          { BRT  }   { PROT   }
                   ATTRB=({ NORM } , { ASKIP  }   ,NUM,IC,FSET),
                          { DRK  }   { UNPROT }
                   COLOR=color,
                   HILIGHT=highlight,
                   INITIAL='literal',
                   PICIN='picture-string',
                   PICOUT='picture-string',
                   GRPNAME=data-name
```

Explanation

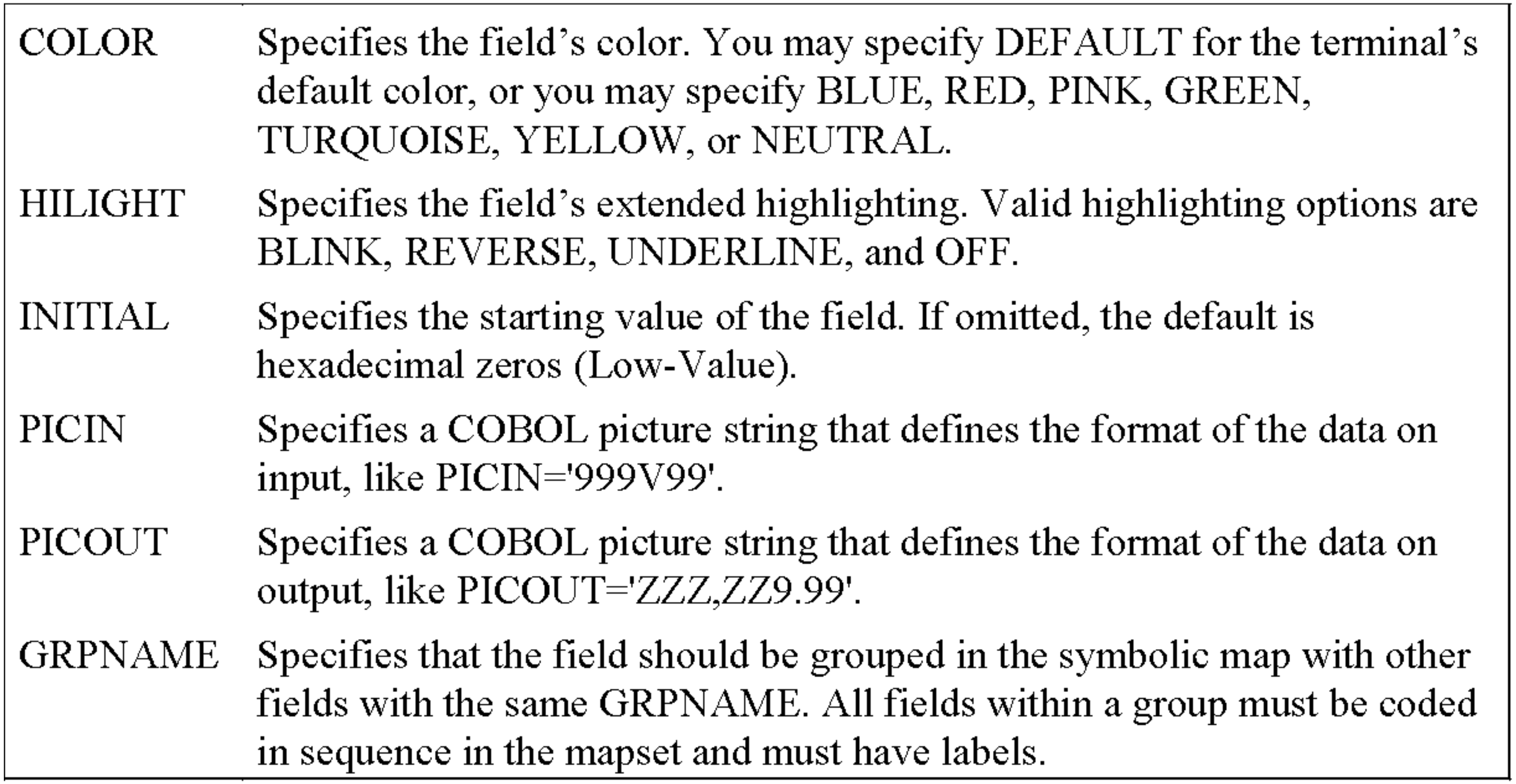
name	The 1- to 29-character name for the field. If omitted, the field is not included in the symbolic map.
POS	Specifies the line and column position of the attribute byte.
LENGTH	Specifies the length of the field, *not* including the attribute byte.

Explanation of the DFHMDF macro (continued)



ATTRB	Specifies one or more attribute byte settings for the field.
BRT	The field is displayed with high intensity.
NORM	The field is displayed with regular intensity.
DRK	The field is *not* displayed on the screen (it's darkened).
PROT	The field is protected; data may not be keyed into it.
ASKIP	The field is protected, and the cursor will automatically skip over it.
UNPROT	The field is unprotected; data may be keyed into it.
NUM	Turns on the numeric lock feature so only numeric characters can be entered; the field is right justified and zero filled. If omitted, the field is assumed to be alphanumeric and is left justified and space filled.
IC	Specifies that the cursor should be located at the start of the field.
FSET	Specifies that the MDT bit in the attribute byte should be turned on before the map is sent to the terminal.

Explanation of the DFHMDF macro (continued)



COLOR	Specifies the field’s color. You may specify DEFAULT for the terminal’s default color, or you may specify BLUE, RED, PINK, GREEN, TURQUOISE, YELLOW, or NEUTRAL.
HILIGHT	Specifies the field’s extended highlighting. Valid highlighting options are BLINK, REVERSE, UNDERLINE, and OFF.
INITIAL	Specifies the starting value of the field. If omitted, the default is hexadecimal zeros (Low-Value).
PICIN	Specifies a COBOL picture string that defines the format of the data on input, like PICIN='999V99'.
PICOUT	Specifies a COBOL picture string that defines the format of the data on output, like PICOUT='ZZZ,ZZ9.99'.
GRPNAME	Specifies that the field should be grouped in the symbolic map with other fields with the same GRPNAME. All fields within a group must be coded in sequence in the mapset and must have labels.

The DFHMDF macros that define a data entry field in the inquiry program

```
CUSTNO   DFHMDF POS=(5,26),                                            X
               LENGTH=6,                                               X
               ATTRB=(NORM,UNPROT,IC),                                 X
               COLOR=TURQUOISE,                                        X
               INITIAL='______'
         DFHMDF POS=(5,33),                                            X
               LENGTH=1,                                               X
               ATTRB=ASKIP
```

Description

- The DFHMDF macro defines an attribute byte for a screen field.
- If you want to work with a screen field in your COBOL program, you must code a name for it. Then, data items for the field are generated in the symbolic map.
- The IC option of the ATTRB parameter should be coded only for the first data entry field on the screen.

Description of the DFHMDF macro (continued)

- The FSET option of the ATTRB parameter causes the MDT bit to be turned on so that the field contents are transmitted back to the program, regardless of whether they’re changed.
- A field that contains hexadecimal zeros (Low-Value) is never transmitted to the program.
- If PICIN or PICOUT is omitted, X(*n*) will be the assumed picture, where *n* is the LENGTH value.
- To cause at least one byte of data to be sent to the program, the last DFHMDF macro in a map should define a field named DUMMY that’s one byte long, has an initial value of space, and has these attributes: DRK, PROT, and FSET.

Example 1: A constant field (user instructions)

```
         DFHMDF POS=(3,1),                                             X
               LENGTH=42,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=NEUTRAL,                                          X
               INITIAL='Type a customer number.  Then press Enter.'
```

Example 2: An alphanumeric data entry field and its caption

```
         DFHMDF POS=(5,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Customer number. . . . .'
CUSTNO   DFHMDF POS=(5,26),                                            X
               LENGTH=6,                                               X
               ATTRB=(NORM,UNPROT),                                    X
               COLOR=TURQUOISE,                                        X
               INITIAL='______'
         DFHMDF POS=(5,33),                                            X
               LENGTH=1,                                               X
               ATTRB=ASKIP
```

Example 3: A numeric data entry field

```
QTY      DFHMDF POS=(6,26),                                            X
               LENGTH=3,                                               X
               ATTRB=(NORM,NUM),                                       X
               COLOR=TURQUOISE,                                        X
               INITIAL='___'
         DFHMDF POS=(6,30),                                            X
               LENGTH=1,                                               X
               ATTRB=ASKIP
```

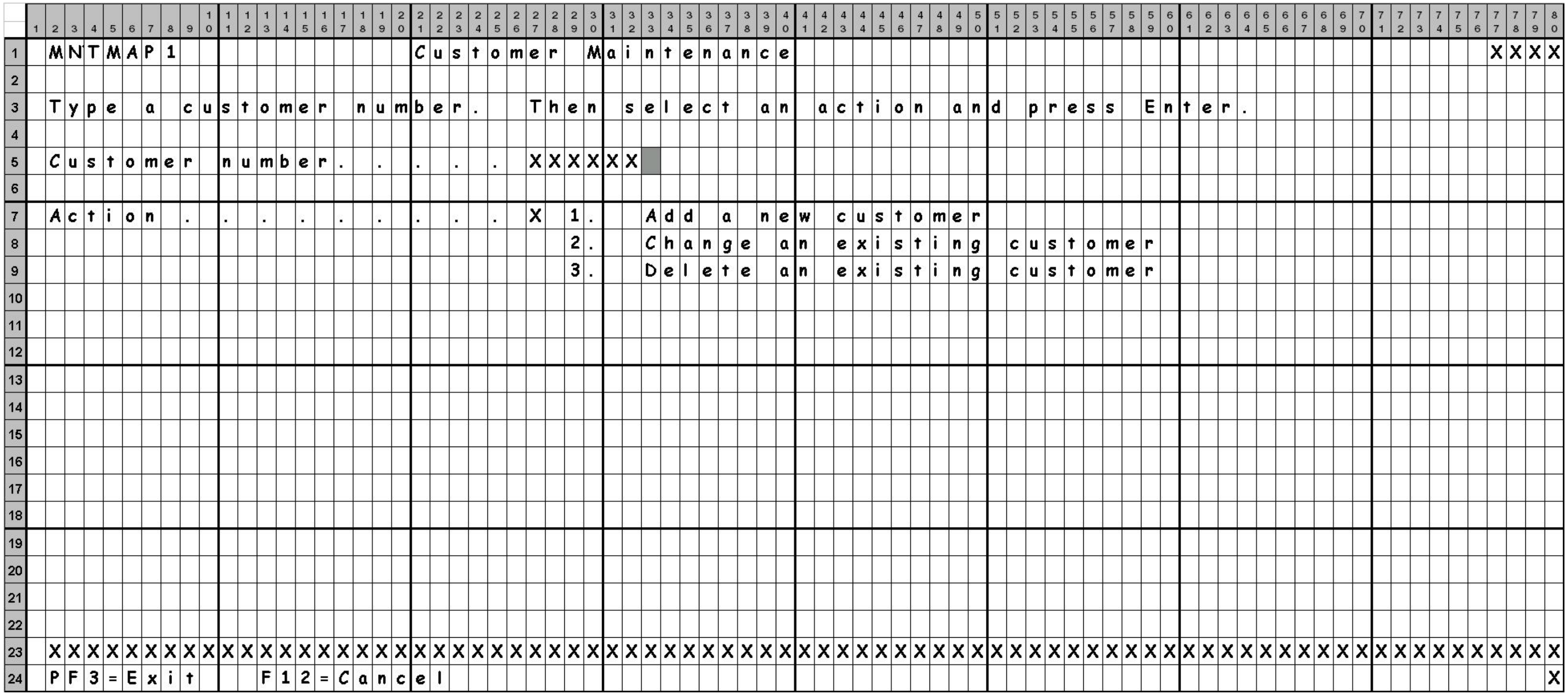
Example 4: A display-only field with numeric variable data and its caption

```
         DFHMDF POS=(7,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Balance due. . . . . . :'
BALDUE   DFHMDF POS=(7,26),                                            X
               LENGTH=13,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=TURQUOISE,                                        X
               PICOUT='ZZ,ZZZ,ZZ9.99'
```

Example 5: A message area, function key area, and FSET field

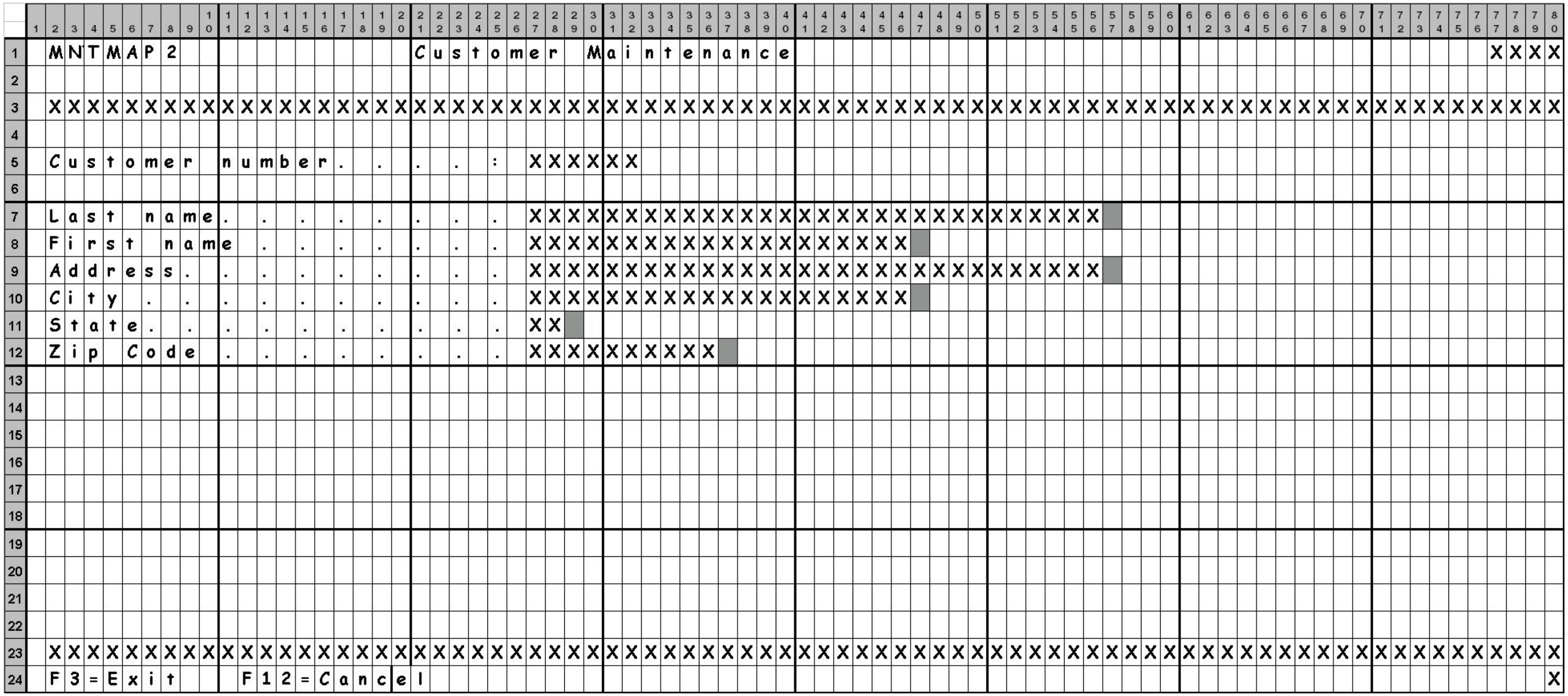
```
MESSAGE  DFHMDF POS=(23,1),                                            X
               LENGTH=79,                                              X
               ATTRB=(BRT,PROT),                                       X
               COLOR=YELLOW
         DFHMDF POS=(24,1),                                            X
               LENGTH=20,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=BLUE,                                             X
               INITIAL='F3=Exit   F12=Cancel'
DUMMY    DFHMDF POS=(24,79),                                           X
               LENGTH=1,                                               X
               ATTRB=(DRK,PROT,FSET),                                  X
               INITIAL=' '
```

The screen layout for the key map



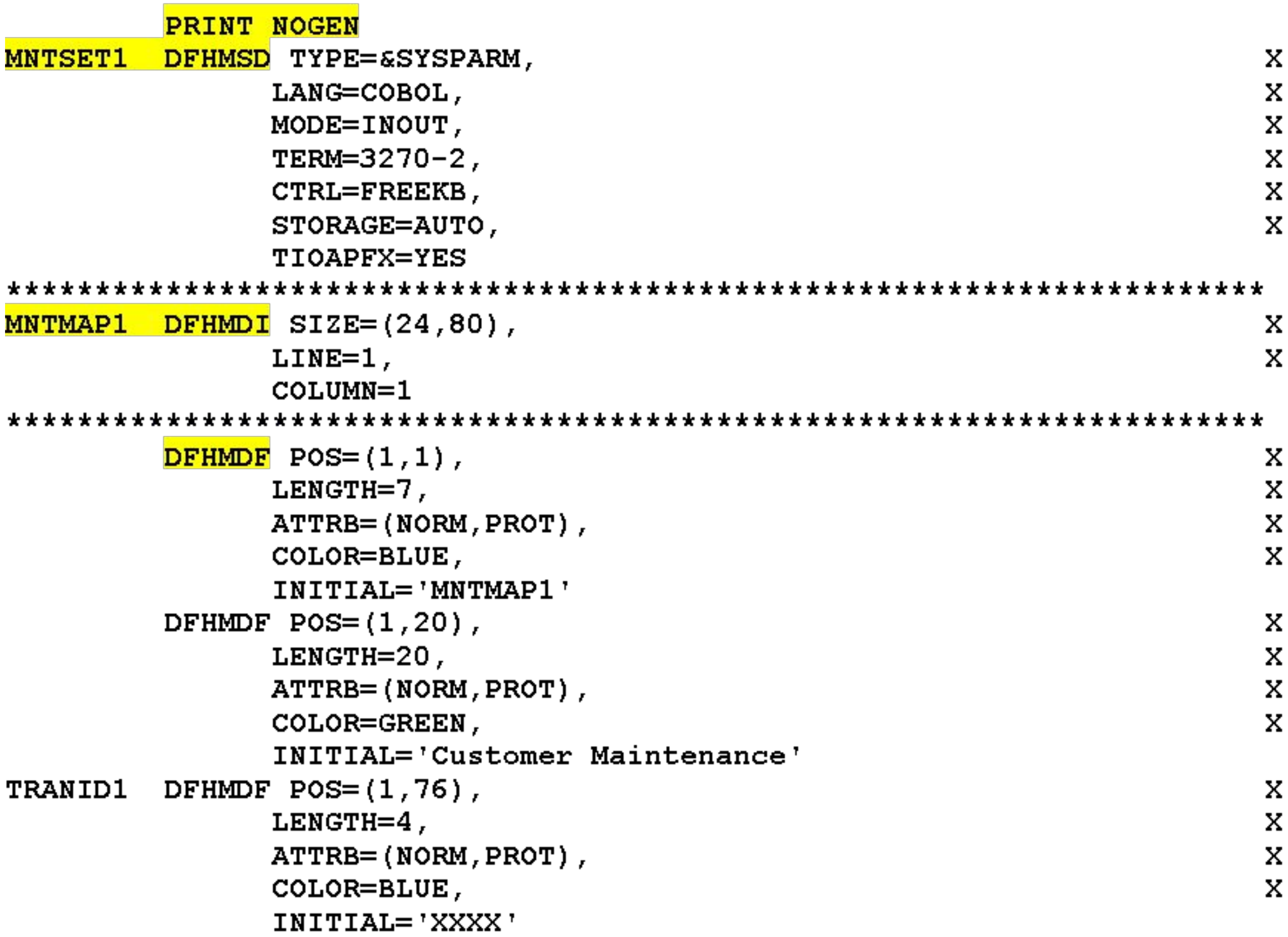
```
 MNTMAP1            Customer Maintenance                                    XXXX

 Type a customer number.  Then select an action and press Enter.

 Customer number. . . . . XXXXXX

 Action . . . . . . . . . X 1.  Add a new customer
                            2.  Change an existing customer
                            3.  Delete an existing customer














 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 PF3=Exit   F12=Cancel                                                         X
```

The screen layout for the data map



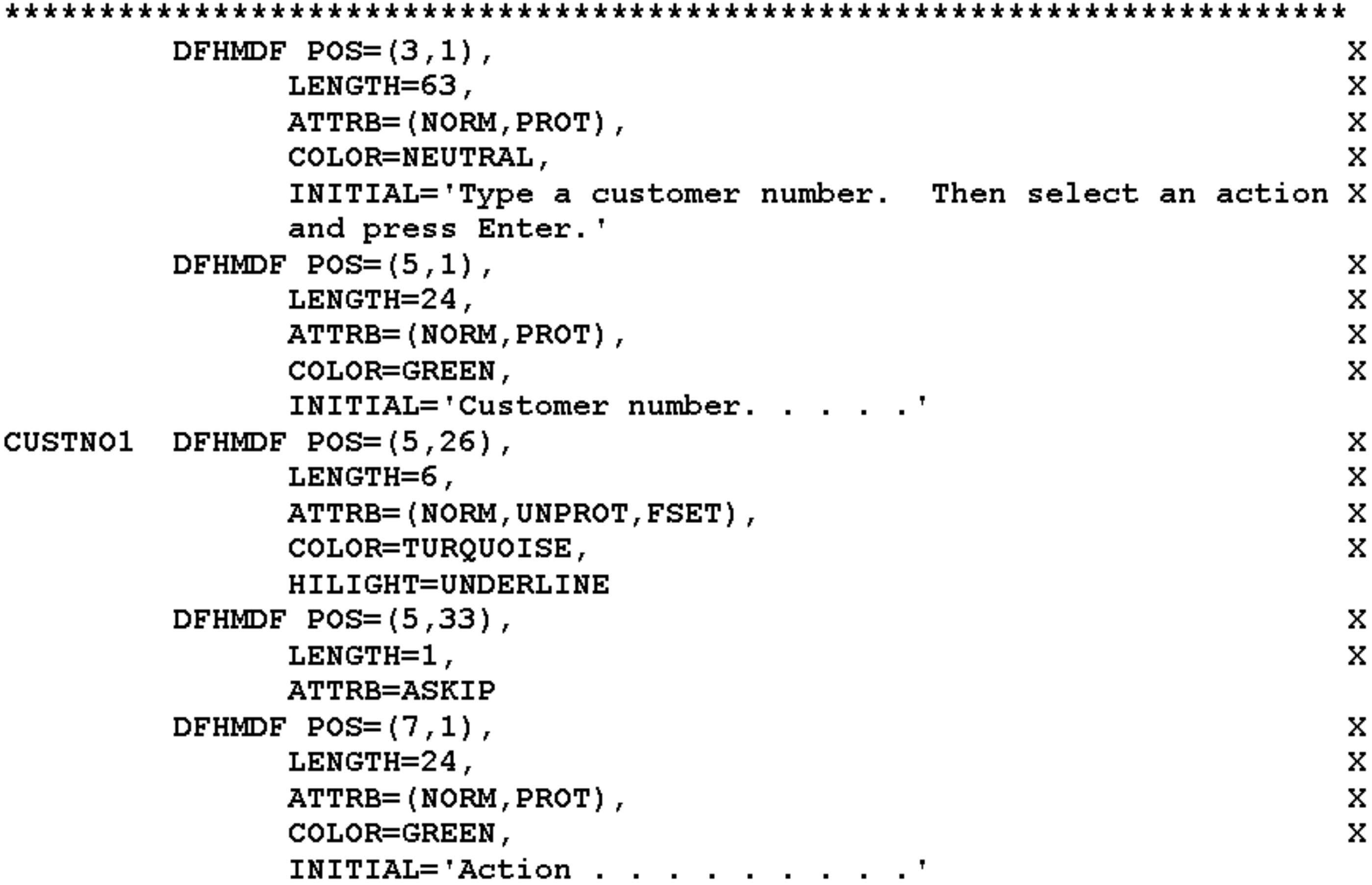
```
 MNTMAP2            Customer Maintenance                                    XXXX

 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

 Customer number. . . . : XXXXXX

 Last name. . . . . . . . XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX▨
 First name . . . . . . . XXXXXXXXXXXXXXXXXXXX▨
 Address. . . . . . . . . XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX▨
 City . . . . . . . . . . XXXXXXXXXXXXXXXXXXXX▨
 State. . . . . . . . . . XX▨
 Zip Code . . . . . . . . XXXXXXXXXX▨










 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 F3=Exit   F12=Cancel                                                          X
```

The BMS mapset for the maintenance program



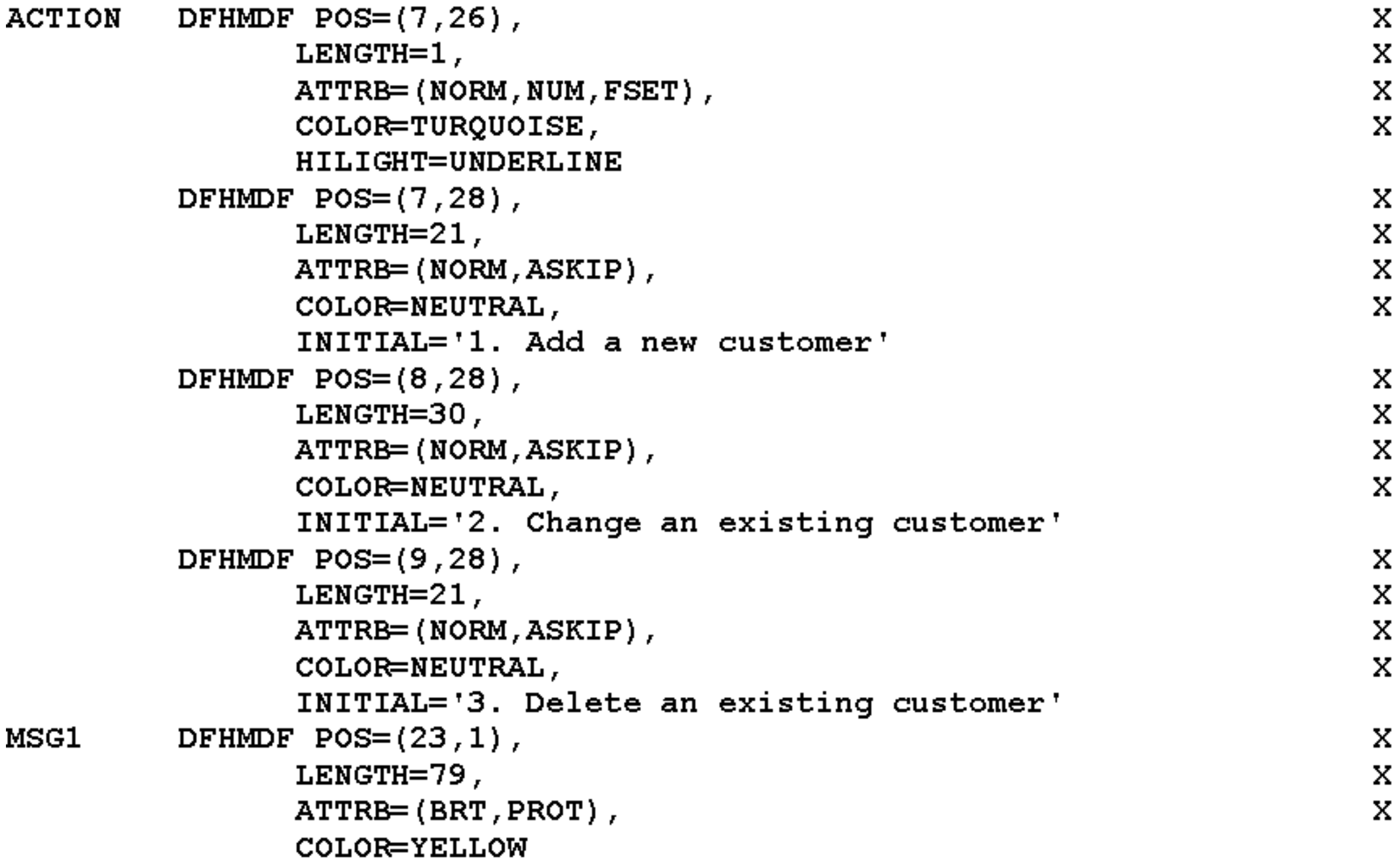
```
         PRINT NOGEN
MNTSET1  DFHMSD TYPE=&SYSPARM,                                         X
               LANG=COBOL,                                             X
               MODE=INOUT,                                             X
               TERM=3270-2,                                            X
               CTRL=FREEKB,                                            X
               STORAGE=AUTO,                                           X
               TIOAPFX=YES
***********************************************************************
MNTMAP1  DFHMDI SIZE=(24,80),                                          X
               LINE=1,                                                 X
               COLUMN=1
***********************************************************************
         DFHMDF POS=(1,1),                                             X
               LENGTH=7,                                               X
               ATTRB=(NORM,PROT),                                      X
               COLOR=BLUE,                                             X
               INITIAL='MNTMAP1'
         DFHMDF POS=(1,20),                                            X
               LENGTH=20,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Customer Maintenance'
TRANID1  DFHMDF POS=(1,76),                                            X
               LENGTH=4,                                               X
               ATTRB=(NORM,PROT),                                      X
               COLOR=BLUE,                                             X
               INITIAL='XXXX'
```

The BMS mapset for the maintenance program (continued)



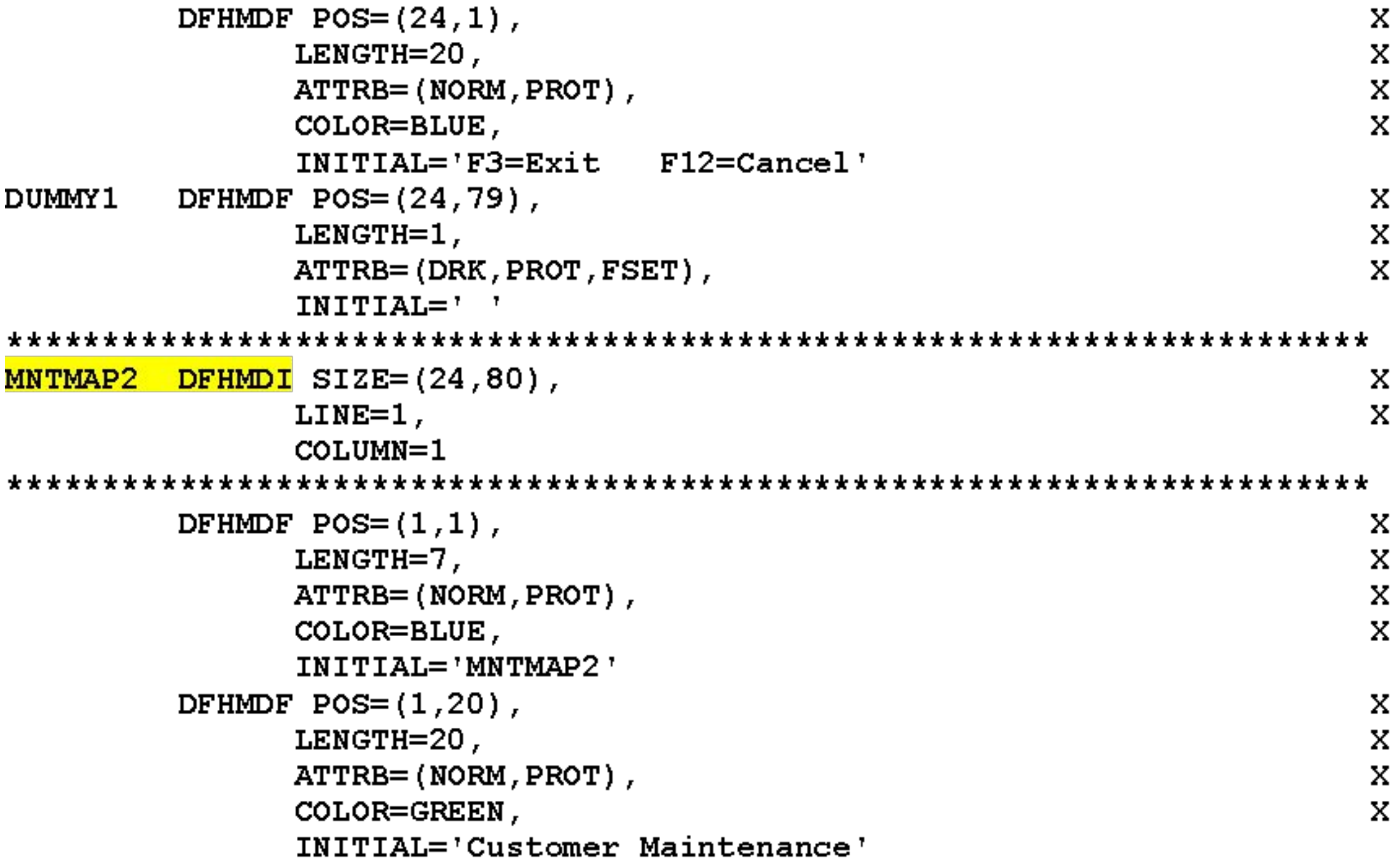
```
***********************************************************************
         DFHMDF POS=(3,1),                                             X
               LENGTH=63,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=NEUTRAL,                                          X
               INITIAL='Type a customer number.  Then select an action X
               and press Enter.'
         DFHMDF POS=(5,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Customer number. . . . .'
CUSTNO1  DFHMDF POS=(5,26),                                            X
               LENGTH=6,                                               X
               ATTRB=(NORM,UNPROT,FSET),                               X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
         DFHMDF POS=(5,33),                                            X
               LENGTH=1,                                               X
               ATTRB=ASKIP
         DFHMDF POS=(7,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Action . . . . . . . . .'
```

The BMS mapset for the maintenance program (continued)

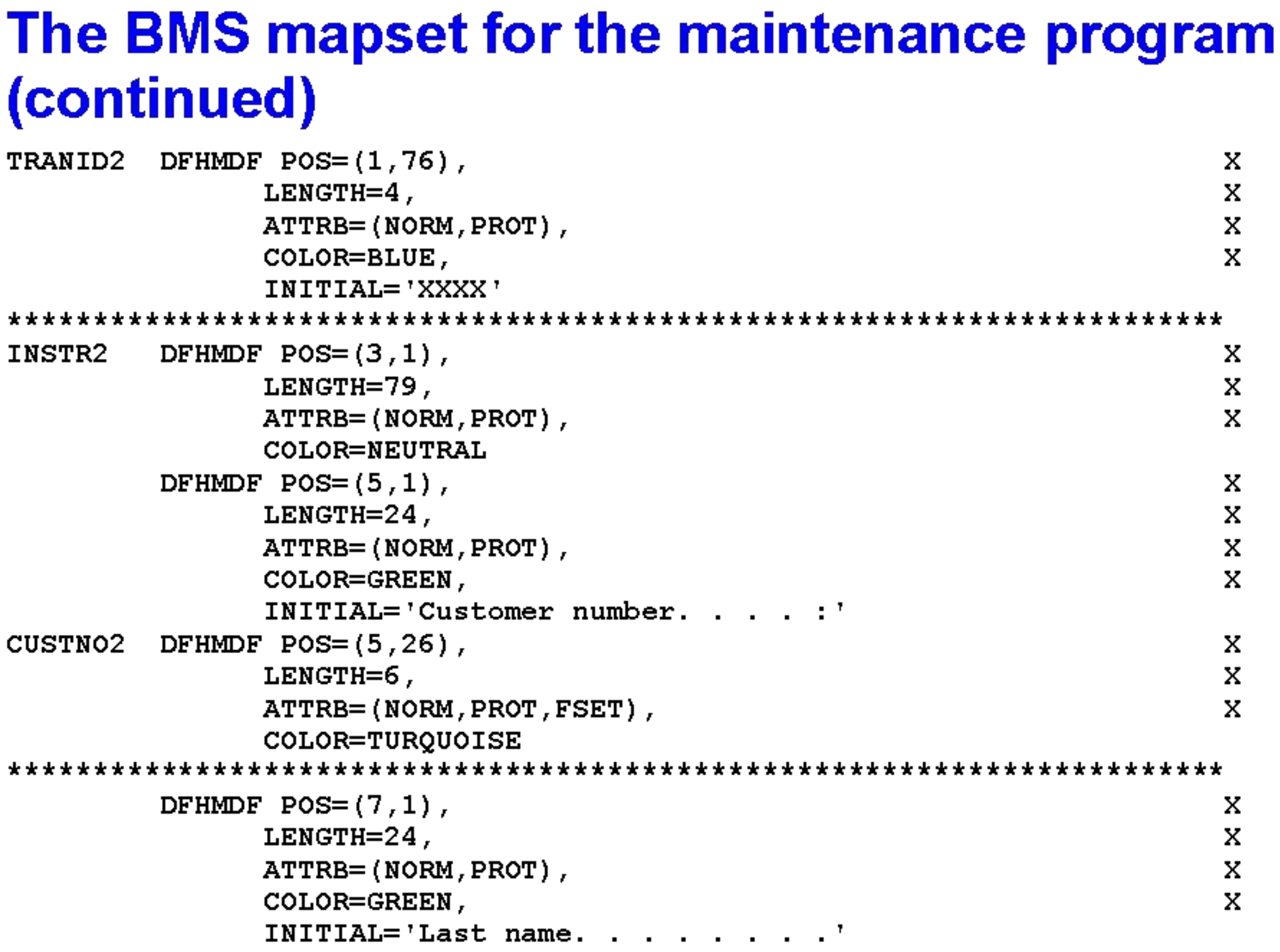


```
ACTION   DFHMDF POS=(7,26),                                            X
               LENGTH=1,                                               X
               ATTRB=(NORM,NUM,FSET),                                  X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
         DFHMDF POS=(7,28),                                            X
               LENGTH=21,                                              X
               ATTRB=(NORM,ASKIP),                                     X
               COLOR=NEUTRAL,                                          X
               INITIAL='1. Add a new customer'
         DFHMDF POS=(8,28),                                            X
               LENGTH=30,                                              X
               ATTRB=(NORM,ASKIP),                                     X
               COLOR=NEUTRAL,                                          X
               INITIAL='2. Change an existing customer'
         DFHMDF POS=(9,28),                                            X
               LENGTH=21,                                              X
               ATTRB=(NORM,ASKIP),                                     X
               COLOR=NEUTRAL,                                          X
               INITIAL='3. Delete an existing customer'
MSG1     DFHMDF POS=(23,1),                                            X
               LENGTH=79,                                              X
               ATTRB=(BRT,PROT),                                       X
               COLOR=YELLOW
```

The BMS mapset for the maintenance program (continued)



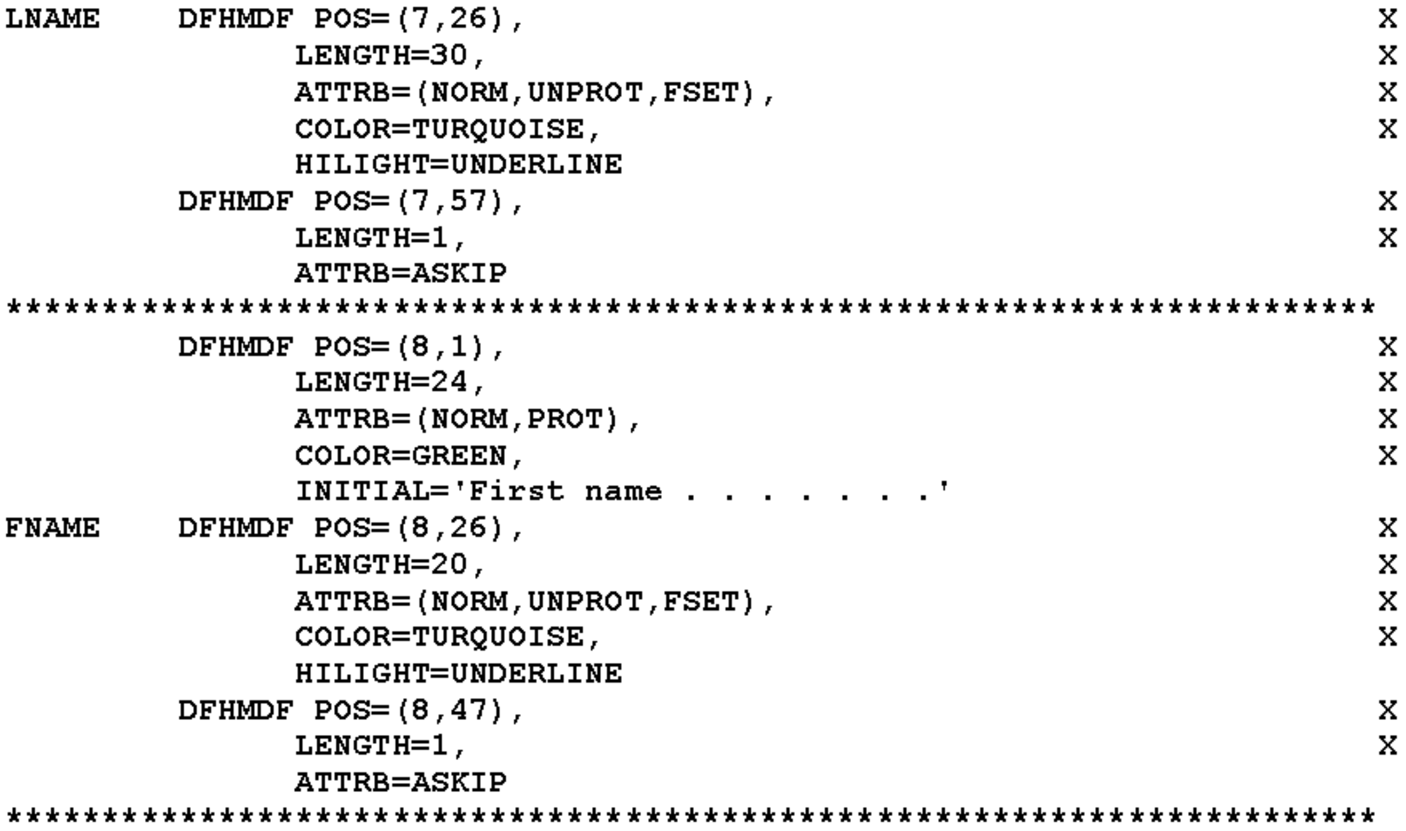
```
         DFHMDF POS=(24,1),                                            X
               LENGTH=20,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=BLUE,                                             X
               INITIAL='F3=Exit   F12=Cancel'
DUMMY1   DFHMDF POS=(24,79),                                           X
               LENGTH=1,                                               X
               ATTRB=(DRK,PROT,FSET),                                  X
               INITIAL=' '
***********************************************************************
MNTMAP2  DFHMDI SIZE=(24,80),                                          X
               LINE=1,                                                 X
               COLUMN=1
***********************************************************************
         DFHMDF POS=(1,1),                                             X
               LENGTH=7,                                               X
               ATTRB=(NORM,PROT),                                      X
               COLOR=BLUE,                                             X
               INITIAL='MNTMAP2'
         DFHMDF POS=(1,20),                                            X
               LENGTH=20,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Customer Maintenance'
```



The BMS mapset for the maintenance program (continued)

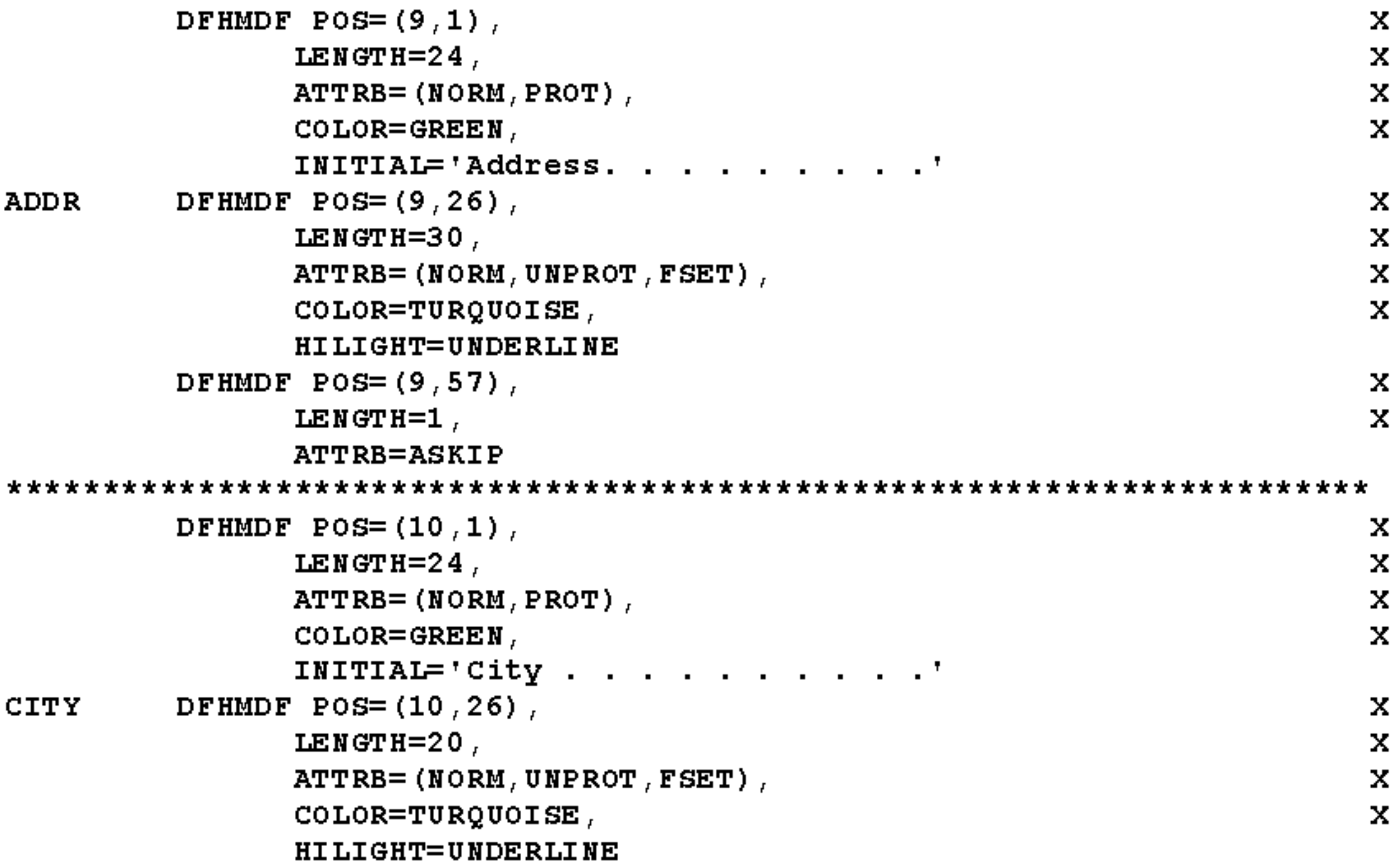
```
TRANID2  DFHMDF POS=(1,76),                                            X
               LENGTH=4,                                               X
               ATTRB=(NORM,PROT),                                      X
               COLOR=BLUE,                                             X
               INITIAL='XXXX'
***********************************************************************
INSTR2   DFHMDF POS=(3,1),                                             X
               LENGTH=79,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=NEUTRAL
         DFHMDF POS=(5,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Customer number. . . . :'
CUSTNO2  DFHMDF POS=(5,26),                                            X
               LENGTH=6,                                               X
               ATTRB=(NORM,PROT,FSET),                                 X
               COLOR=TURQUOISE
***********************************************************************
         DFHMDF POS=(7,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Last name. . . . . . . .'
```

The BMS mapset for the maintenance program (continued)



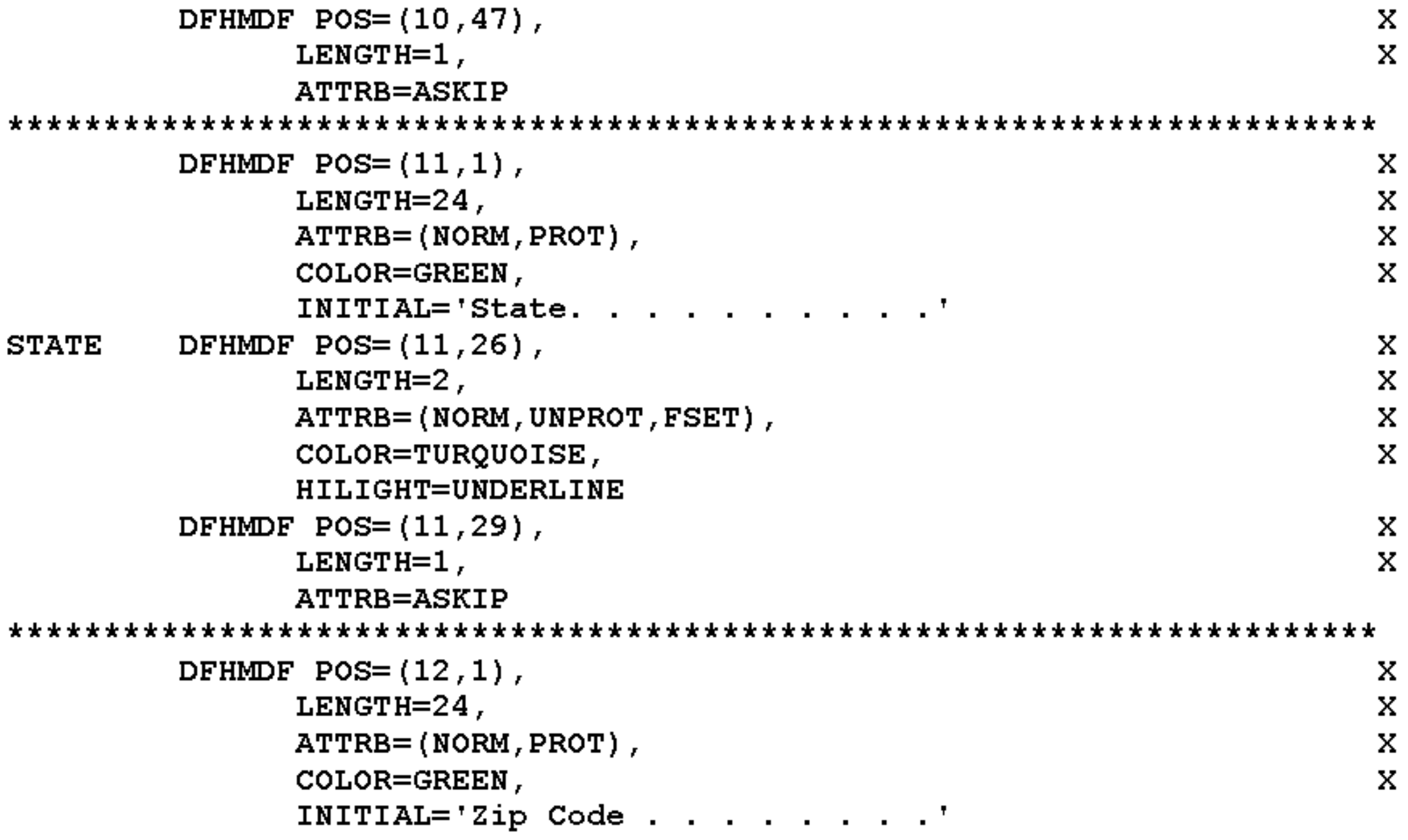
```
LNAME    DFHMDF POS=(7,26),                                            X
               LENGTH=30,                                              X
               ATTRB=(NORM,UNPROT,FSET),                               X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
         DFHMDF POS=(7,57),                                            X
               LENGTH=1,                                               X
               ATTRB=ASKIP
***********************************************************************
         DFHMDF POS=(8,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='First name . . . . . . .'
FNAME    DFHMDF POS=(8,26),                                            X
               LENGTH=20,                                              X
               ATTRB=(NORM,UNPROT,FSET),                               X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
         DFHMDF POS=(8,47),                                            X
               LENGTH=1,                                               X
               ATTRB=ASKIP
***********************************************************************
```

The BMS mapset for the maintenance program (continued)



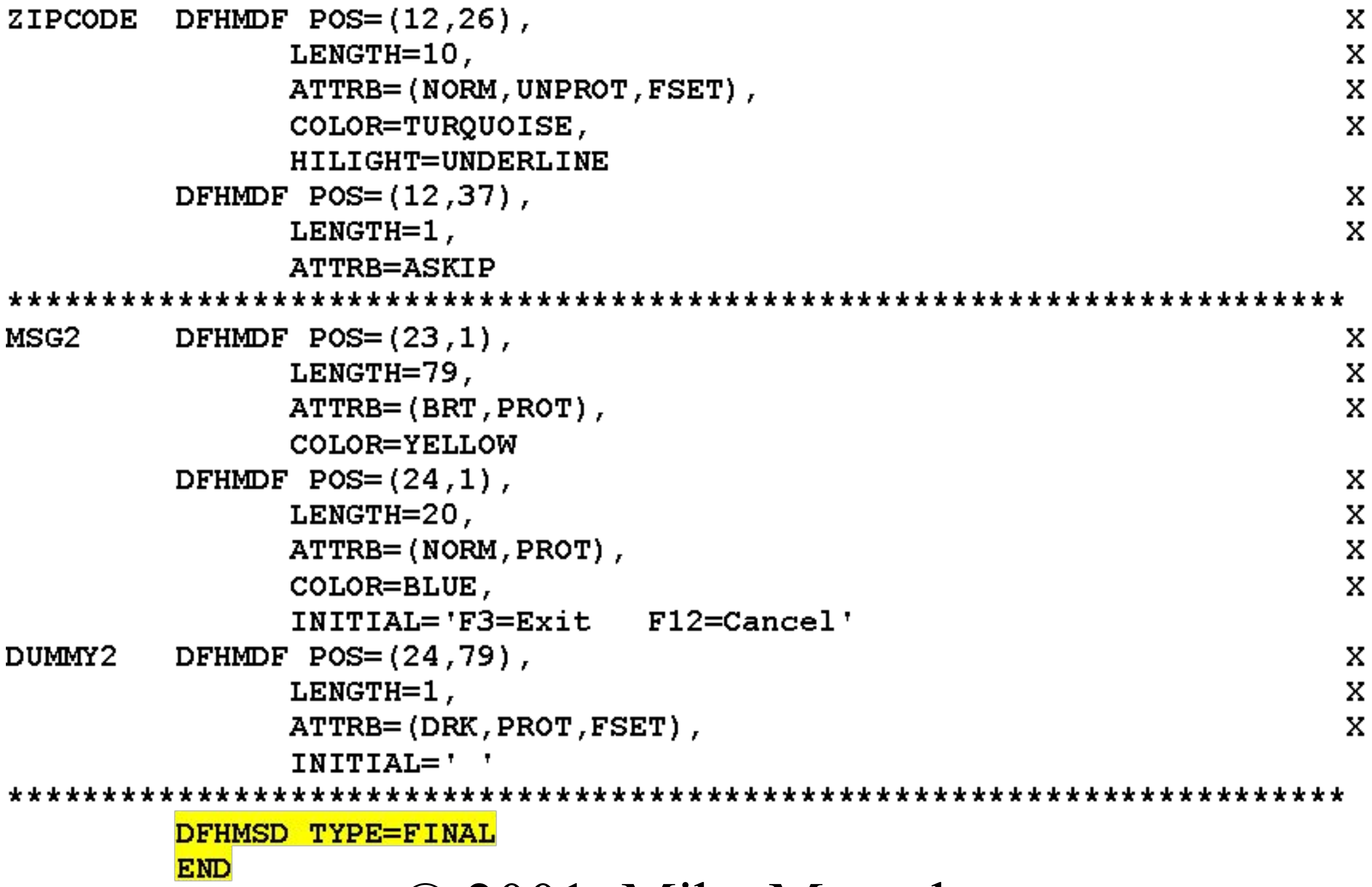
```
         DFHMDF POS=(9,1),                                             X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Address. . . . . . . . .'
ADDR     DFHMDF POS=(9,26),                                            X
               LENGTH=30,                                              X
               ATTRB=(NORM,UNPROT,FSET),                               X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
         DFHMDF POS=(9,57),                                            X
               LENGTH=1,                                               X
               ATTRB=ASKIP
************************************************************************
         DFHMDF POS=(10,1),                                            X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='City . . . . . . . . . .'
CITY     DFHMDF POS=(10,26),                                           X
               LENGTH=20,                                              X
               ATTRB=(NORM,UNPROT,FSET),                               X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
```

The BMS mapset for the maintenance program (continued)



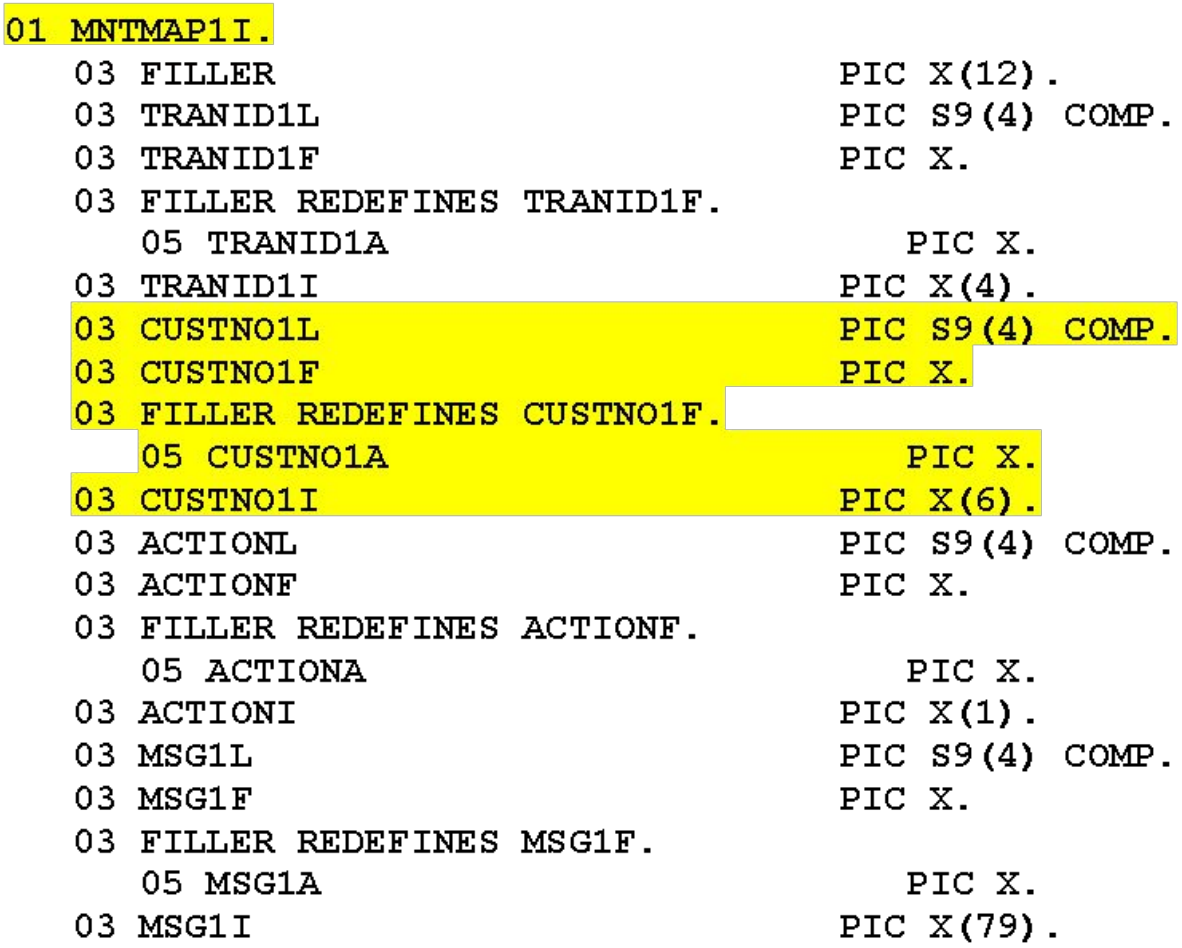
```
         DFHMDF POS=(10,47),                                           X
               LENGTH=1,                                               X
               ATTRB=ASKIP
***********************************************************************
         DFHMDF POS=(11,1),                                            X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='State. . . . . . . . . .'
STATE    DFHMDF POS=(11,26),                                           X
               LENGTH=2,                                               X
               ATTRB=(NORM,UNPROT,FSET),                               X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
         DFHMDF POS=(11,29),                                           X
               LENGTH=1,                                               X
               ATTRB=ASKIP
***********************************************************************
         DFHMDF POS=(12,1),                                            X
               LENGTH=24,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=GREEN,                                            X
               INITIAL='Zip Code . . . . . . . .'
```

The BMS mapset for the maintenance program (continued)



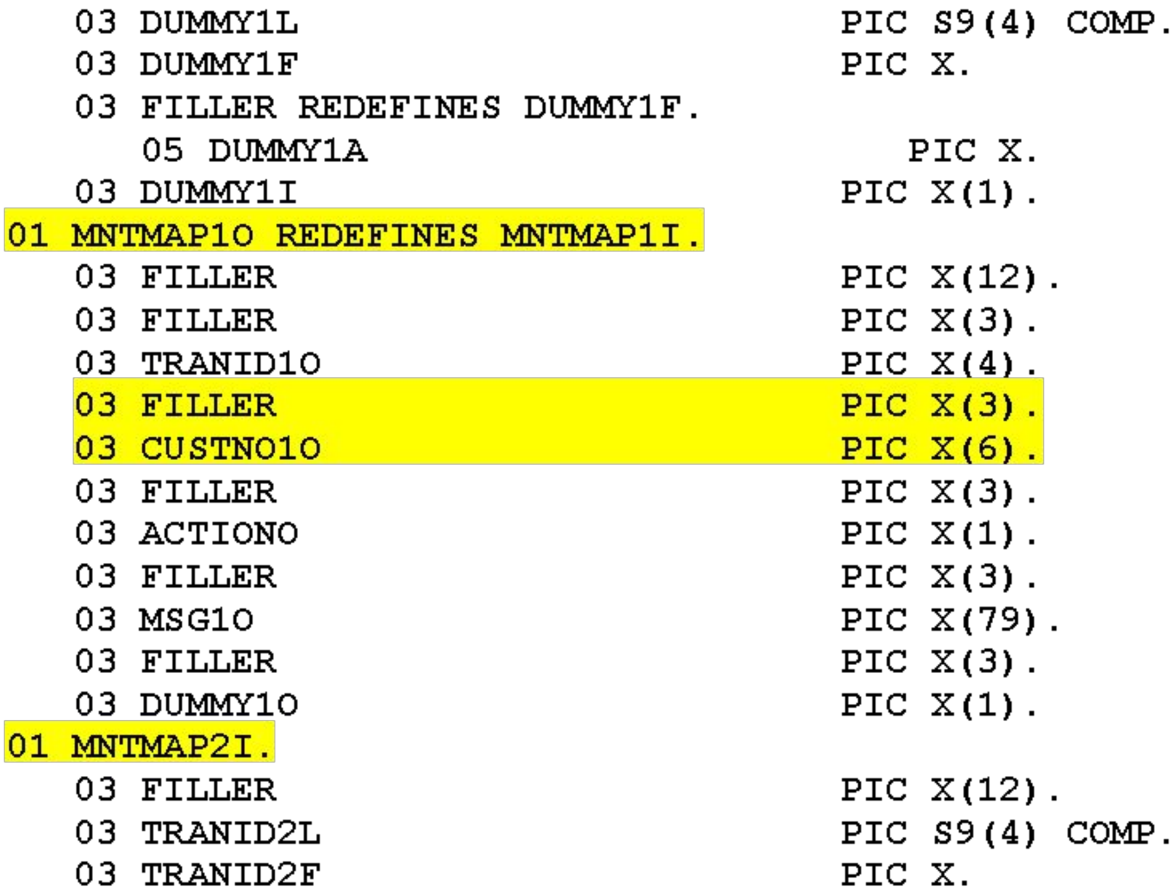
```
ZIPCODE  DFHMDF POS=(12,26),                                           X
               LENGTH=10,                                              X
               ATTRB=(NORM,UNPROT,FSET),                               X
               COLOR=TURQUOISE,                                        X
               HILIGHT=UNDERLINE
         DFHMDF POS=(12,37),                                           X
               LENGTH=1,                                               X
               ATTRB=ASKIP
***********************************************************************
MSG2     DFHMDF POS=(23,1),                                            X
               LENGTH=79,                                              X
               ATTRB=(BRT,PROT),                                       X
               COLOR=YELLOW
         DFHMDF POS=(24,1),                                            X
               LENGTH=20,                                              X
               ATTRB=(NORM,PROT),                                      X
               COLOR=BLUE,                                             X
               INITIAL='F3=Exit   F12=Cancel'
DUMMY2   DFHMDF POS=(24,79),                                           X
               LENGTH=1,                                               X
               ATTRB=(DRK,PROT,FSET),                                  X
               INITIAL=' '
***********************************************************************
         DFHMSD TYPE=FINAL
         END
```

The symbolic map for the maintenance program



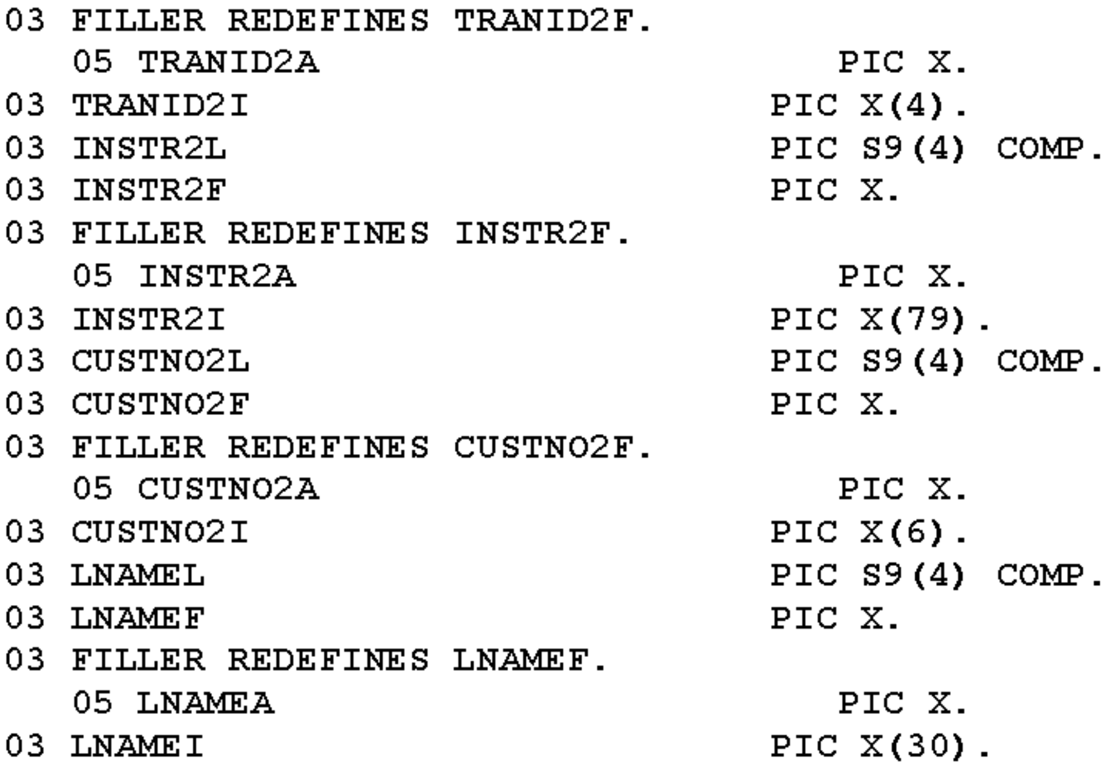
```
01 MNTMAP1I.
   03 FILLER                         PIC X(12).
   03 TRANID1L                       PIC S9(4) COMP.
   03 TRANID1F                       PIC X.
   03 FILLER REDEFINES TRANID1F.
      05 TRANID1A                       PIC X.
   03 TRANID1I                       PIC X(4).
   03 CUSTNO1L                       PIC S9(4) COMP.
   03 CUSTNO1F                       PIC X.
   03 FILLER REDEFINES CUSTNO1F.
      05 CUSTNO1A                       PIC X.
   03 CUSTNO1I                       PIC X(6).
   03 ACTIONL                        PIC S9(4) COMP.
   03 ACTIONF                        PIC X.
   03 FILLER REDEFINES ACTIONF.
      05 ACTIONA                        PIC X.
   03 ACTIONI                        PIC X(1).
   03 MSG1L                          PIC S9(4) COMP.
   03 MSG1F                          PIC X.
   03 FILLER REDEFINES MSG1F.
      05 MSG1A                          PIC X.
   03 MSG1I                          PIC X(79).
```

The symbolic map for the maintenance program (continued)



```
   03 DUMMY1L                         PIC S9(4) COMP.
   03 DUMMY1F                         PIC X.
   03 FILLER REDEFINES DUMMY1F.
      05 DUMMY1A                         PIC X.
   03 DUMMY1I                         PIC X(1).
01 MNTMAP1O REDEFINES MNTMAP1I.
   03 FILLER                          PIC X(12).
   03 FILLER                          PIC X(3).
   03 TRANID1O                        PIC X(4).
   03 FILLER                          PIC X(3).
   03 CUSTNO1O                        PIC X(6).
   03 FILLER                          PIC X(3).
   03 ACTIONO                         PIC X(1).
   03 FILLER                          PIC X(3).
   03 MSG1O                           PIC X(79).
   03 FILLER                          PIC X(3).
   03 DUMMY1O                         PIC X(1).
01 MNTMAP2I.
   03 FILLER                          PIC X(12).
   03 TRANID2L                        PIC S9(4) COMP.
   03 TRANID2F                        PIC X.
```

The symbolic map for the maintenance program (continued)

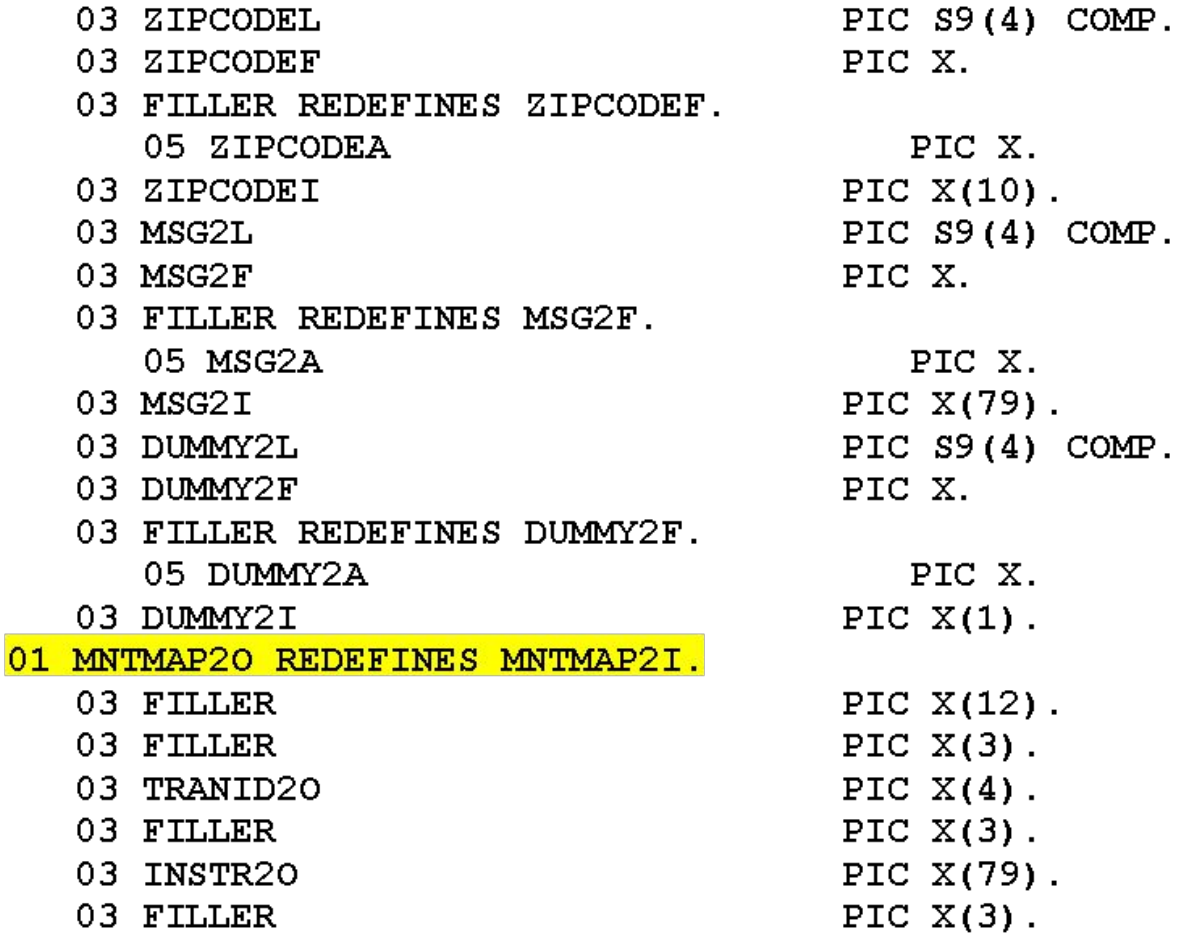


```
03 FILLER REDEFINES TRANID2F.
   05 TRANID2A                       PIC X.
03 TRANID2I                       PIC X(4).
03 INSTR2L                        PIC S9(4) COMP.
03 INSTR2F                        PIC X.
03 FILLER REDEFINES INSTR2F.
   05 INSTR2A                        PIC X.
03 INSTR2I                        PIC X(79).
03 CUSTNO2L                       PIC S9(4) COMP.
03 CUSTNO2F                       PIC X.
03 FILLER REDEFINES CUSTNO2F.
   05 CUSTNO2A                       PIC X.
03 CUSTNO2I                       PIC X(6).
03 LNAMEL                         PIC S9(4) COMP.
03 LNAMEF                         PIC X.
03 FILLER REDEFINES LNAMEF.
   05 LNAMEA                         PIC X.
03 LNAMEI                         PIC X(30).
```

The symbolic map for the maintenance program (continued)

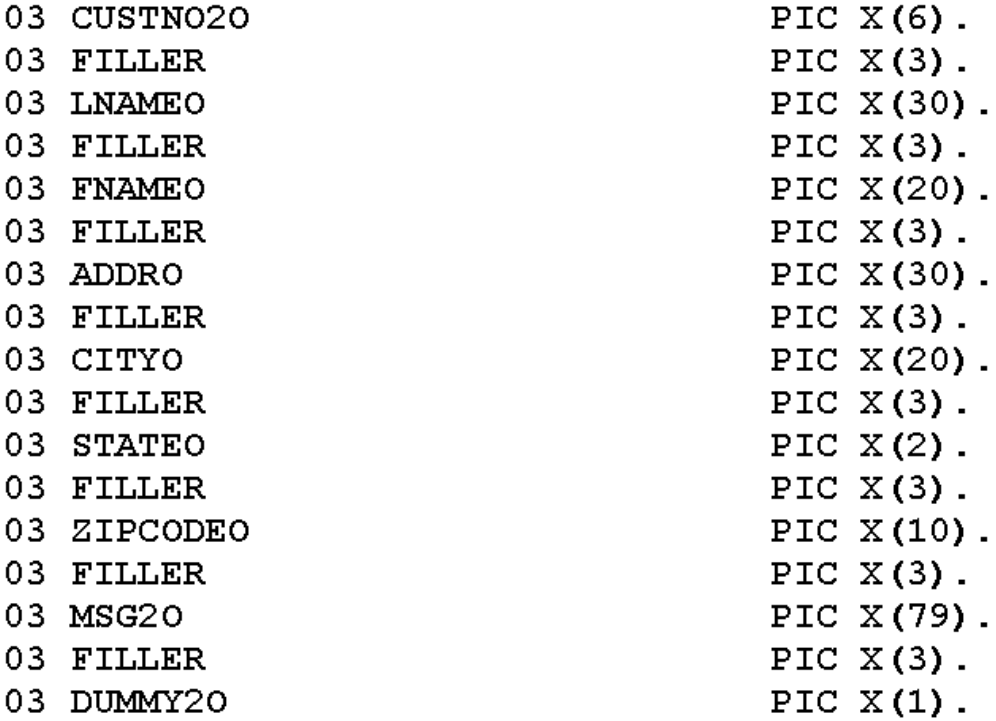
```
03 FNAMEL                         PIC S9(4) COMP.
03 FNAMEF                         PIC X.
03 FILLER REDEFINES FNAMEF.
   05 FNAMEA                         PIC X.
03 FNAMEI                         PIC X(20).
03 ADDRL                          PIC S9(4) COMP.
03 ADDRF                          PIC X.
03 FILLER REDEFINES ADDRF.
   05 ADDRA                          PIC X.
03 ADDRI                          PIC X(30).
03 CITYL                          PIC S9(4) COMP.
03 CITYF                          PIC X.
03 FILLER REDEFINES CITYF.
   05 CITYA                          PIC X.
03 CITYI                          PIC X(20).
03 STATEL                         PIC S9(4) COMP.
03 STATEF                         PIC X.
03 FILLER REDEFINES STATEF.
   05 STATEA                         PIC X.
03 STATEI                         PIC X(2).
```

The symbolic map for the maintenance program (continued)



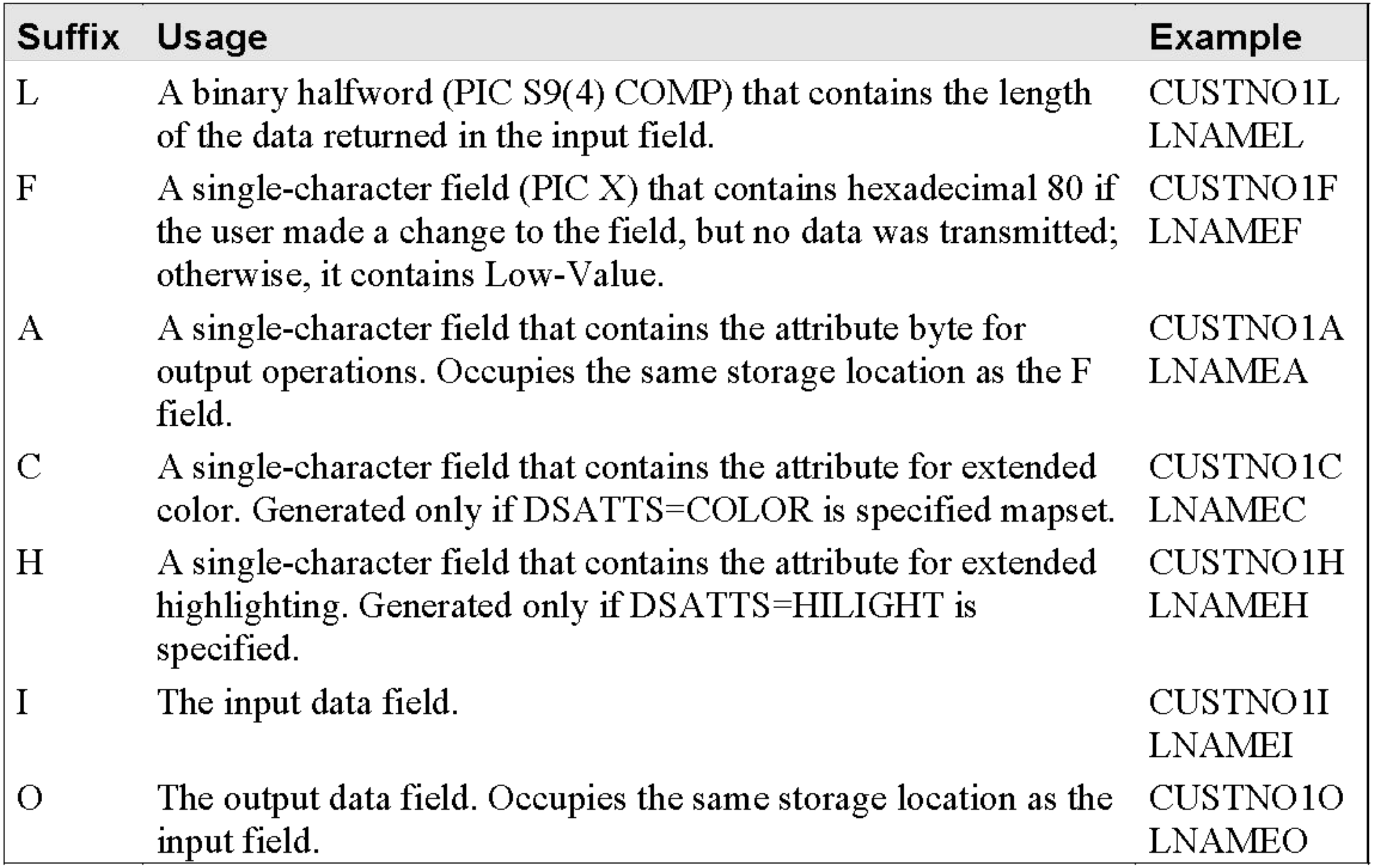
```
   03 ZIPCODEL                       PIC S9(4) COMP.
   03 ZIPCODEF                       PIC X.
   03 FILLER REDEFINES ZIPCODEF.
      05 ZIPCODEA                       PIC X.
   03 ZIPCODEI                       PIC X(10).
   03 MSG2L                          PIC S9(4) COMP.
   03 MSG2F                          PIC X.
   03 FILLER REDEFINES MSG2F.
      05 MSG2A                          PIC X.
   03 MSG2I                          PIC X(79).
   03 DUMMY2L                        PIC S9(4) COMP.
   03 DUMMY2F                        PIC X.
   03 FILLER REDEFINES DUMMY2F.
      05 DUMMY2A                        PIC X.
   03 DUMMY2I                        PIC X(1).
01 MNTMAP2O REDEFINES MNTMAP2I.
   03 FILLER                         PIC X(12).
   03 FILLER                         PIC X(3).
   03 TRANID2O                       PIC X(4).
   03 FILLER                         PIC X(3).
   03 INSTR2O                        PIC X(79).
   03 FILLER                         PIC X(3).
```

The symbolic map for the maintenance program (continued)



```
    03 CUSTNO2O                        PIC X(6).
    03 FILLER                          PIC X(3).
    03 LNAMEO                          PIC X(30).
    03 FILLER                          PIC X(3).
    03 FNAMEO                          PIC X(20).
    03 FILLER                          PIC X(3).
    03 ADDRO                           PIC X(30).
    03 FILLER                          PIC X(3).
    03 CITYO                           PIC X(20).
    03 FILLER                          PIC X(3).
    03 STATEO                          PIC X(2).
    03 FILLER                          PIC X(3).
    03 ZIPCODEO                        PIC X(10).
    03 FILLER                          PIC X(3).
    03 MSG2O                           PIC X(79).
    03 FILLER                          PIC X(3).
    03 DUMMY2O                         PIC X(1).
```

Data name suffixes

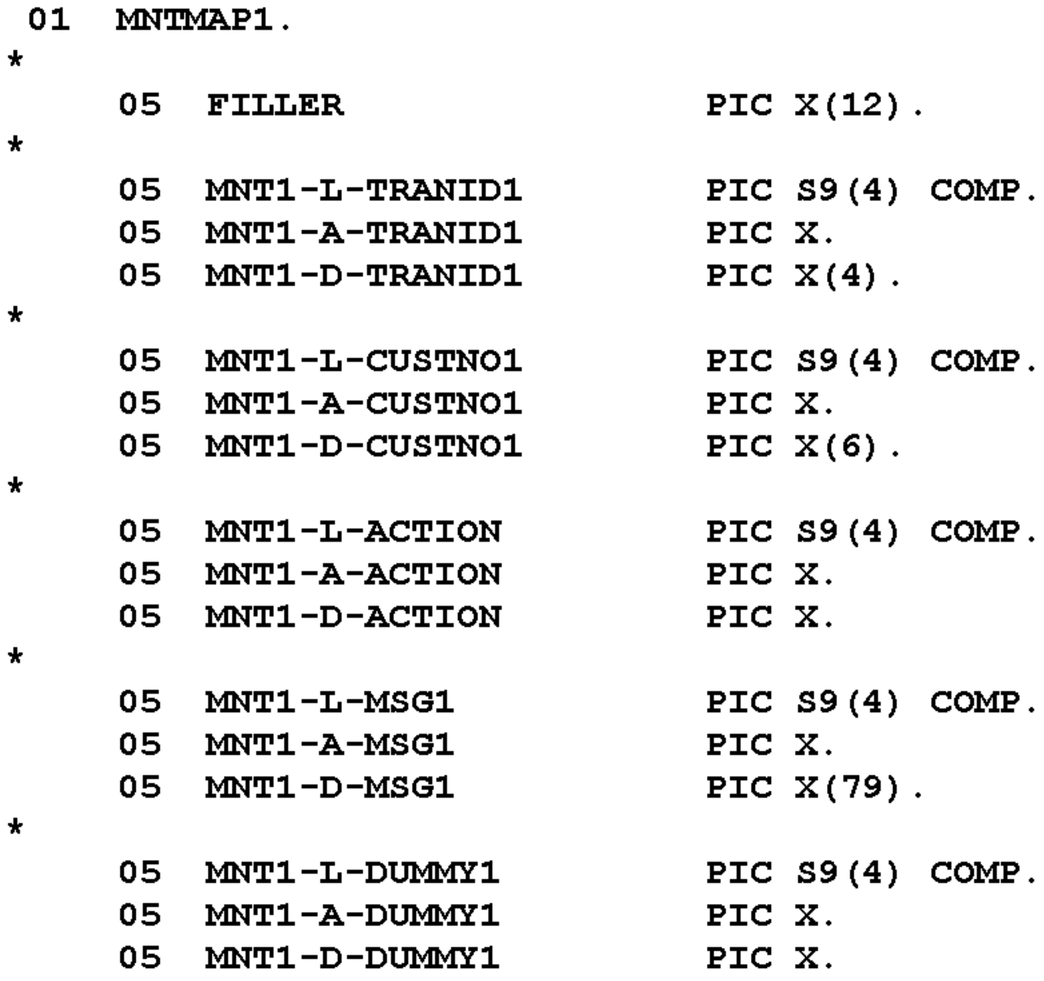


Suffix	Usage	Example
L	A binary halfword (PIC S9(4) COMP) that contains the length of the data returned in the input field.	CUSTNO1L LNAMEL
F	A single-character field (PIC X) that contains hexadecimal 80 if the user made a change to the field, but no data was transmitted; otherwise, it contains Low-Value.	CUSTNO1F LNAMEF
A	A single-character field that contains the attribute byte for output operations. Occupies the same storage location as the F field.	CUSTNO1A LNAMEA
C	A single-character field that contains the attribute for extended color. Generated only if DSATTS=COLOR is specified mapset.	CUSTNO1C LNAMEC
H	A single-character field that contains the attribute for extended highlighting. Generated only if DSATTS=HILIGHT is specified.	CUSTNO1H LNAMEH
I	The input data field.	CUSTNO1I LNAMEI
O	The output data field. Occupies the same storage location as the input field.	CUSTNO1O LNAMEO

The fields in a symbolic map

- The length field (suffix L) takes up two bytes of storage and records the number of characters the user enters in the field. If the user doesn't enter any data, the length field is set to zero.
- The flag field (suffix F) contains a *flag byte* that is normally set to Low-Value. But if the user modifies the input field without entering data into it, the flag byte is set to hexadecimal 80.
- The attribute field (suffix A) is used for output operations to override the field attributes defined in the physical map.
- If you specify extended attributes for the mapset, fields for those attributes will appear in the symbolic map following the flag and attribute fields. The two most common attributes are color (suffix C) and highlighting (suffix H).
- The input field (suffix I) and output field (suffix O) are generated for the data field itself. They occupy the same storage location, but allow the Picture clauses to differ for input and output.

A programmer-generated symbolic map



```
 01  MNTMAP1.
*
     05  FILLER                PIC X(12).
*
     05  MNT1-L-TRANID1        PIC S9(4)  COMP.
     05  MNT1-A-TRANID1        PIC X.
     05  MNT1-D-TRANID1        PIC X(4).
*
     05  MNT1-L-CUSTNO1        PIC S9(4)  COMP.
     05  MNT1-A-CUSTNO1        PIC X.
     05  MNT1-D-CUSTNO1        PIC X(6).
*
     05  MNT1-L-ACTION         PIC S9(4)  COMP.
     05  MNT1-A-ACTION         PIC X.
     05  MNT1-D-ACTION         PIC X.
*
     05  MNT1-L-MSG1           PIC S9(4)  COMP.
     05  MNT1-A-MSG1           PIC X.
     05  MNT1-D-MSG1           PIC X(79).
*
     05  MNT1-L-DUMMY1         PIC S9(4)  COMP.
     05  MNT1-A-DUMMY1         PIC X.
     05  MNT1-D-DUMMY1         PIC X.
```

Guidelines for creating your own symbolic map

1. Code only one 01-level item rather than separate 01-level items that redefine one another for input and output purposes.
2. Code a 12-byte FILLER item for TIOAPFX at the beginning of the map.
3. For each labeled map field, code a group of 05-level items, following these rules to create the data names:
   a. Start each name with a two- to four-character prefix that relates the data name to the 01-level item.
   b. Include one character to identify the field's function: L for the length field, A for the attribute field, and D for the data field.
   c. If you need different pictures for input and output, create a fourth data name that redefines the data field. Then, identify the input and output data fields with the characters I and O.

Guidelines for creating your own symbolic map (continued)

   d. If you specified extended attributes with the DSATTS parameter, insert fields for them between the attribute field and the data field. Use the characters C and H to identify extended color and extended highlighting attributes.

4. Separate each set of data names with a blank comment line.
5. Align the elements of the symbolic map so it's easy to read.

Note

- When you create your own symbolic map, it's up to you to make sure that any changes to the mapset are reflected in your symbolic map.

An OS/390 procedure for preparing a mapset

```
//MM01MAPS JOB 36512,'R.MENENDEZ',MSGCLASS=X,CLASS=C,
//         REGION=4M,NOTIFY=MM01
//MAPASM   EXEC DFHMAPS,
//  MAPLIB='MM01CICS.CICSTS13.LOADLIB',    TARGET LOADLIB FOR MAP
//  DSCTLIB='MM01.CICS.COPYLIB',           TARGET COPYLIB FOR DSECT
//  MAPNAME=ORDSET1                        NAME OF MAPSET (REQUIRED)
//COPY.SYSUT1 DD DSN=MM01.CICS.SOURCE(ORDSET1),DISP=SHR   MAPSET SOURCE
/*
```

Description of the OS/390 procedure for preparing a mapset

- The JCL for preparing a mapset executes a cataloged procedure named DFHMAPS. This procedure includes a step that creates a physical map and a step that creates a symbolic map.
- The MAPLIB parameter of the EXEC statement identifies the load library where the physical map will be stored.
- The DSCTLIB parameter of the EXEC statement identifies the copy library where the symbolic map will be stored.
- The MAPNAME parameter of the EXEC statement specifies the name that will be given to the physical and symbolic maps.
- The SYSUT1 DD statement identifies the library and member that contains the source code for the mapset you want to assemble.